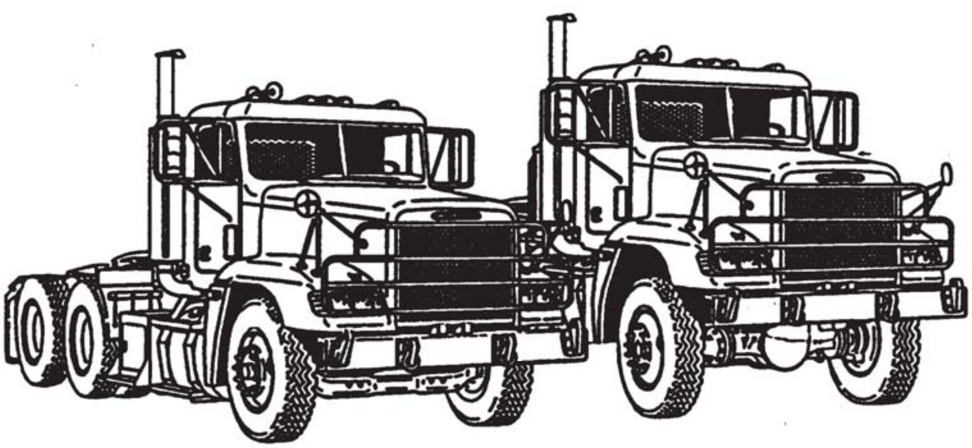
TM 9-2320-363-20-1
VOLUME NO. 1

TECHNICAL MANUAL

UNIT MAINTENANCE MANUAL FOR

TRUCK, TRACTOR, LINE HAUL
52,000 GVWR, 6 X 4, M915A2
(NSN 2320-01-272-5029)

TRUCK, TRACTOR, LIGHT EQUIPMENT TRANSPORTER (LET)
68,000 GVWR, 6 X 6, W/WINCH, M916A1
(NSN 2320-01-272-5028)



Approval for public release distribution is unlimited

HEADQUARTERS, DEPARTMENT OF THE ARMY JUNE 1992

WARNING

CARBON MONOXIDE POISONING CAN BE DEADLY

CARBON MONOXIDE IS A COLORLESS, ODORLESS, DEADLY POISONOUS GAS, WHICH, WHEN BREATHED, DEPRIVES THE BODY OF OXYGEN AND CAUSES SUFFOCATION. EXPOSURE TO AIR CONTAMINATED WITH CARBON MONOXIDE PRODUCES SYMPTOMS OF HEADACHE, DIZZINESS, LOSS OF MUSCULAR CONTROL, APPARENT DROWSINESS, OR COMA. PERMANENT BRAIN DAMAGE OR DEATH CAN RESULT FROM SEVERE EXPOSURE.

CARBON MONOXIDE OCCURS IN THE EXHAUST FUMES OF FUEL-BURNING HEATERS AND INTERNAL-COMBUSTION ENGINES AND BECOMES DANGEROUSLY CONCENTRATED UNDER CONDITIONS OF INADEQUATE VENTILATION. THE FOLLOWING PRECAUTIONS MUST BE OBSERVED TO ENSURE THE SAFETY OF PERSONNEL WHENEVER THE PERSONNEL HEATER, MAIN, OR AUXILIARY ENGINE OF ANY VEHICLE IS OPERATED FOR MAINTENANCE PURPOSES OR TACTICAL USE:

1. DO NOT operate engine of vehicle in an enclosed area unless it is ADEQUATELY VENTILATED.
2. DO NOT idle engine for long periods without maintaining ADEQUATE VENTILATION in the personnel compartments.
3. DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
4. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either is present, IMMEDIATELY VENTILATE personnel compartments. If symptoms persist, remove affected personnel from vehicle and treat as follows: expose to fresh air; keep warm, DO NOT PERMIT EXERCISE; if necessary, administer artificial respiration (see FM 21-11).

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS ADEQUATE VENTILATION.

WARNING

COMPRESSED AIR

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.). Failure to do so could result in serious injury to personnel.

WARNING

Drycleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 100°-138°F (38 °-50° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

WARNING

Spilled hydraulic fluid is very slippery. Wipe up any spilled fluid immediately. Failure to do so could result in serious injury to personnel.

WARNING

Do not disconnect any air system lines or fittings unless vehicle engine is shut off and air system pressure is relieved. To do so could result in serious injury to personnel.

WARNING

Disconnect negative battery terminal before connecting or disconnecting any electrical connectors. Failure to do so may result in electrical shock and injury to personnel.

WARNING

Diesel fuel is flammable. Do not work on fuel system in presence of sparks or open flame. To do so could result in serious injury to personnel.

WARNING

Use care to prevent refrigerant from touching your skin or eyes, because liquid refrigerant, when exposed to air, quickly evaporates and will freeze skin or eye tissue. Serious injury or blindness could result if you come into contact with liquid refrigerant.

WARNING

Refrigerant R-134a air conditioning systems should not be pressure tested or leak tested with compressed air. Combustible mixtures of air and R-134a may form, resulting in a fire or explosion, which could cause personnel injury.

WARNING

To avoid eye injury, eye protection is required when working around batteries. Do not smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry, such as rings, ID tags, watches, and bracelets. If jewelry contacts a battery terminal, a direct short will result in instant heating of tools, damage to equipment, and cause injury to personnel.

WARNING

When servicing this vehicle, performing maintenance, or disposing of materials such as engine coolant, transmission fluid, lubricants, battery acids or batteries and CARC paint, consult your Unit/Local Hazardous Waste Disposal Center or safety office for local regulatory guidance. If further information is needed, please contact the Army Environmental Hotline at 1-800-872-3845.

WARNING

DO NOT take transmission oil sample from transmission oil sampling valve until engine has cooled down at least five minutes. Touching hot engine exhaust pipe near oil sampling valve could result in serious burns.

CHAN E
NO. 4

HEAD UARTERS
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Washington D.C., *10 March 2006*

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(N N 2320-01- 31-1163)

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CHANGE
NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., *30 December 1997*

UNIT MAINTENANCE MANUAL

FOR

TRUCK, TRACTOR, LINE HAUL: 52,000 GVWR, 6 X 4, M915A2
(NSN 2320-01-272-5029)

TRUCK TRACTOR, LIGHT EQUIPMENT TRANSPORTER (LET)
68,000 GVWR, 6 X 6, W/WINCH, M916A1
(NSN 2320-01-272-5028)

TRUCK TRACTOR, LIGHT EQUIPMENT TRANSPORTER (LET)
68,000 GVWR, 6 X 6, W/WINCH, M916A2
(NSN 2320-01-431-1163)

TRUCK, DUMP, HEAVY, CHASSIS
68,000 GVWR, 6 X 6, 14 CU YD, ON-OFF HIGHWAY
M917A1 (NSN 3805-01-431-1165)
M917A1 W/MCS (NSN 3805-01-432-8249)

VOLUME 1 OF 2

TM 9-2320-363-20-1, dated 11 June 1992, is changed as follows:

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2-25 thru 2-28	2-25 thru 2-28
3-1 and 3-2	3-1 and 3-2
3-9 and 3-10	3-9 and 3-10
3-13 thru 3-16	3-13 thru 3-16
3-19 and 3-20	3-19 and 3-20
3-23 and 3-24	3-23 and 2-24
3-55 thru 3-58	3-55 thru 3-58
3-65 thru 3-68	3-65 thru 3-68
3-79 thru 3-92	3-79 thru 3-92
	3-92.1 thru 3-92.9/(3-92.10 Blank)
	3-92.11 thru 3-92.49/(3-92.50 Blank)

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3-101 and 3-102	*3-101 and 3-102*
3-345 and 3-346	*3-345 and 3-345.0*
	3-345.1 thru 3-345.426
	3-345.427 and 3-346
Index-1 thru Index-3/(Index-4 Blank)	*Index -1 thru Index-4*

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Official:

Joel B. Hudson

JOEL B. HUDSON
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NO. 2

HEADQUARTERS
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Washington, D. C., 3 April 1995

UNIT MAINTENANCE MANUAL FOR

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52,000 GVWR, 6 x 4 M915A2
(NSN 2320-01-272-5029)

TRUCK, TRACTOR, LIGHT EQUIPMENT TRANSPORTER (LET)
68,000 GVWR, 6 x 6, W/WINCH, M916A1
(NSN 2320-01-272-5028)

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CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 3 April 1995

UNIT MAINTENANCE MANUAL
FOR

TRUCK TRACTOR, LINE HAUL
52,000 GVWR, 6 x 4, M915A2
(NSN 232041-272-5029)

TRUCK TRACTOR, LIGHT EQUIPMENT
TRANSPORTER (LET)
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(NSN 2320-01-272-5028)

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Dates of issue for original and change pages are

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Change 1 - 3 April 1995
Change 2 - 3 April 1995
Change 3 - 30 December 1997
Change 4 - 10 March 2006

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Technical Manual
No. 9-2320-363-20-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., 11 June 1992

UNIT MAINTENANCE MANUAL

FOR

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M917A1 W/MCS (NSN 3805-01-432-8249)

VOLUME 1 OF 2

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. You may mail, fax or e-mail your DA Form 2028 (Recommended Changes to Publications and Blank Forms), located at the back of this manual direct to: Commander, US Army Tank-automotive and Armaments Command, ATTN: AMSTA-LC-LPIT, Rock Island, IL 61299-7630. You may also submit through the Internet on the AEPS website. The address is http://aeps.ria.army.mil. Locate DA Forms 2028 at ONLINE FORMS PROCESSING section. TACOM's datafax number is DSN 793-0726 or Commercial (309) 2782-0726 and the e-mail address is: TACOM-TECH-PUBS@ria.army.mil.

TABLE OF CONTENTS

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a

HOW TO USE THIS MANUAL

This manual has an edge index that will help you find specific information in a hurry. Simply spread the pages in the right edge of the manual until the printed blocks can be seen. Open the manual where the block on the edge of the page lines up with your selected topic printed in the front cover block.

OVERVIEW

This manual is organized by chapters, sections and appendices. A summary of the organization of this manual, by major divisions, follows:

Front cover index gives you a quick reference to chapters, sections, and appendices that you will use often.

WARNINGS - All warnings you should observe while working on or around the M915 family of vehicles are shown in this part of the manual. These are repeated in the parts of the manual where they apply.

Table of Contents - The contents of the chapters and appendices are listed here.

Chapter 1 - This chapter contains general information about the M915 family of vehicles.

Chapter 2 This chapter describes services and inspections that must be performed at the unit level, such as services you must perform upon receipt of the vehicle, and preventive maintenance checks and services. Other sections contain painting and restenciling of markings, and general repair and cleaning methods.

Chapter 3 This chapter outlines troubleshooting of the M915 family of vehicles and their systems It includes a troubleshooting index, by symptom and system, for troubleshooting.

Chapter 4 This chapter contains step-by-step instructions for doing the maintenance tasks. Each system of the M915 family of vehicles has its own section within the chapter, and any special tools, equipment, or supplies you may need for a task are listed.

Appendix A This appendix lists the technical manuals and other publications you may have to refer to while working on the vehicle.

Appendix B This appendix contains the Maintenance Allocation Chart (MAC) for the M915 family of vehicles.

Appendix C -This appendix lists the expendable supplies and materials you will need while performing maintenance on the M915 family of vehicles.

Appendix D This appendix describes any manufactured items you will need for performing maintenance on the M915 family of vehicles.

Appendix E - This appendix describes the proper method of tightening fasteners.

Index - The index is an alphabetical listing of the contents of this manual.

Back Cover - This inside back cover contains a metric conversion table.

USING THE MANUAL ON THE JOB

Find the task or component that needs repair by using the Index (page Index-1), then turn to the page listed for that task or component.

Read the INITIAL SETUP procedures, and gather the necessary items and personnel. Pay attention to the warnings. The INITIAL SETUP sheet is described on page v.

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

SCOPE

Type of Manual: Unit Maintenance Manual.

Model Numbers and Equipment Names:

1. Truck, Tractor, Line Haul: 52,000 GVWR, 6 x 4, M915A2.
2. Truck, Tractor, Light Equipment Transporter (LET): 68,000 GVWR, 6 x 6, w/Winch, M916A1 and M916A2.
3. Truck, Dump, Heavy, Chassis: 6 x 6, M917A1 and M917A1 w/MCS.

Purpose of Equipment: The M915A2 truck tractor is a 6 x 4 prime mover of the M871, M872, and M1062 semitrailers used primarily to transport containers, bulk cargo, and petroleum products over primary and secondary roads under worldwide climatic conditions in a military environment.

The M916A1 and M916A2 truck tractors are 6 x 6 prime movers of low-bed M172 and M870 semitrailers, used primarily to transport heavy engineering equipment over primary and secondary roads, and off-roads, under worldwide climatic conditions in a military environment.

The M917A1 and M917A1 w/MCS dump truck is a 6 x 6 vehicle used to transport, dump or spread aggregate, hot mix asphalt and similar materials over primary and secondary roads and offroad.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

When the tactical situation requires that Army materiel be abandoned, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use, for procedures on destruction of the vehicle.

PREPARATION FOR STORAGE OR SHIPMENT

Instructions for storage and shipment, including administrative storage, are found in TM 740-901 and MIL-V-62038D.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs)

If your vehicle needs improvement, let us know. Send us a Quality Deficiency Report. You the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (QDR) and mail it to:

COMMANDER
U.S. Army Tank-automotive and Armaments Command
ATTN: AMSTA-AC-NML
Rock Island, IL 61299-7630

WARRANTY INFORMATION

The vehicles are warranted by Freightliner Corporation in accordance with TB 9-2320-363-15. Warranty starts on the date found in block 23, DA Form 2408-9 in the logbook. Report all defects in material or workmanship to your supervisor, who will take appropriate action through your direct and general support maintenance shop.

METRIC SYSTEM

The equipment described herein contains metric components and requires metric common and special tools; therefore, metric units in addition to English units will be used throughout the manual. An English-to-metric conversion table is included as the last page of this manual inside the back cover.

Section II. EQUIPMENT DESCRIPTION AND DATA

OVERVIEW

This section contains information that may be useful when performing unit maintenance tasks on the M915 family of vehicles. For additional information, refer to TM 9-2320-363-10.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

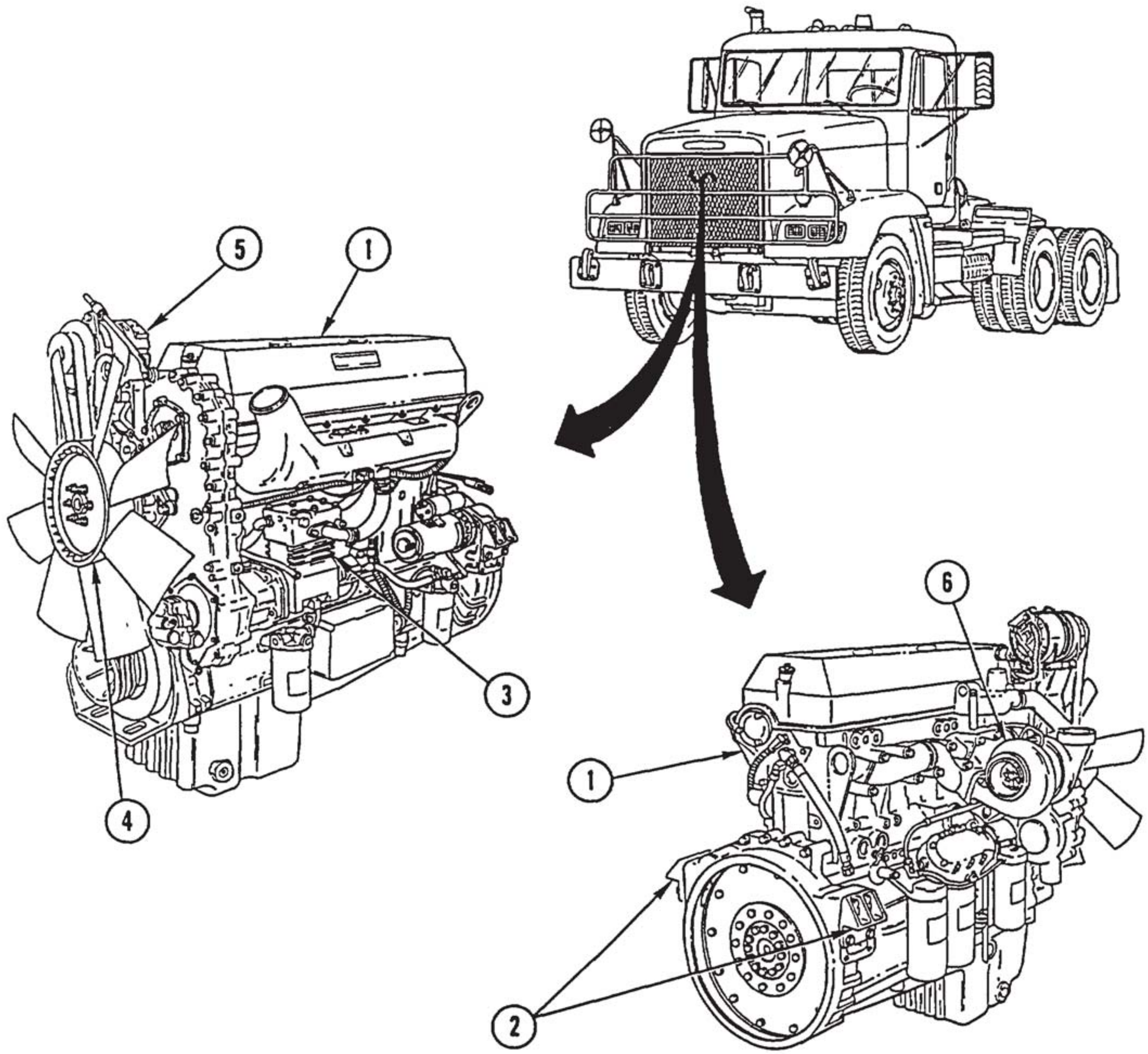
Characteristics:

- The M915A2 is used to transport M871, M872, and M1062 semitrailers on line haul missions.
- The M916A1 and M916A2 are used to transport M172 and M870 semitrailers carrying engineering/construction equipment.
- The M917A1 and M917A1 w/MCS dump truck is used to transport, dump or spread aggregate, hot mix asphalt and similar materials over primary and secondary roads and off road.

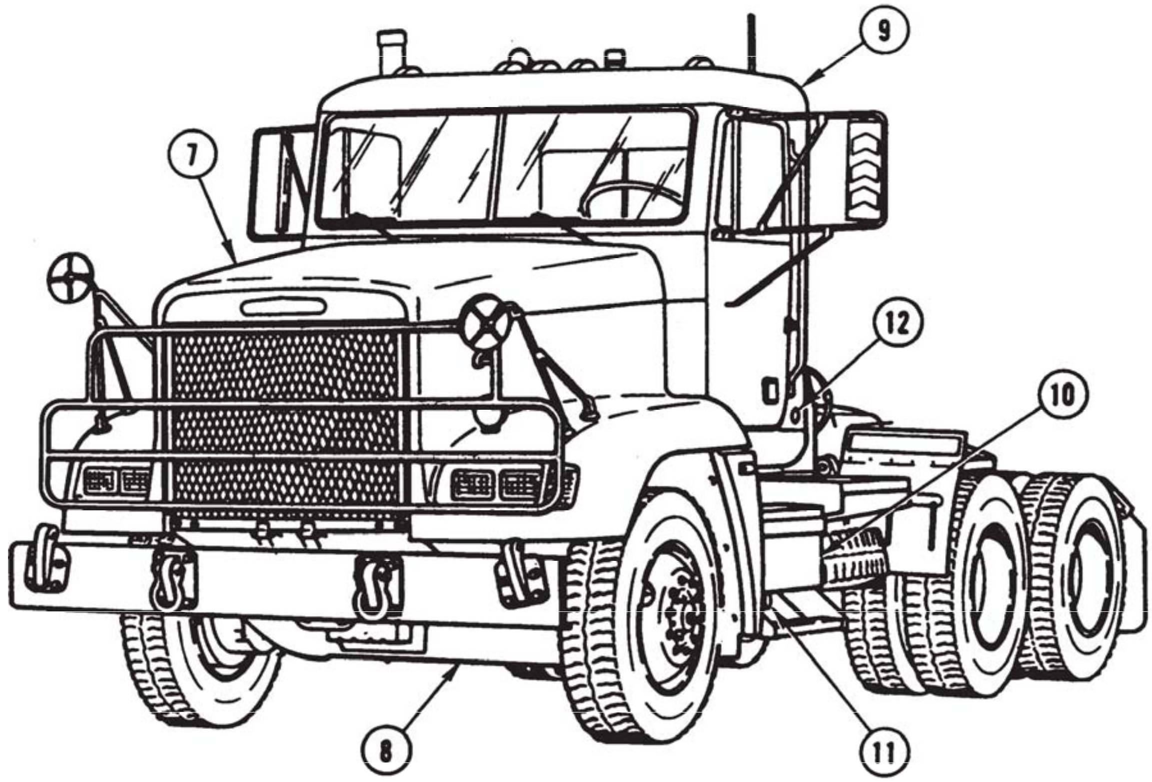
Capabilities and Features:

- All models feature a 4-channel Anti-Lock Brake System (ABS). The ABS is an electronically controlled braking system that provides the operator significantly improved handling and controllability. The ABS aids in preventing skids during emergency stops and also provides even braking where snow, ice, and heavy water are present.
- While operating on Class I roads, a fully loaded M915A2 tractor can maintain a speed of 55 mph (88.5 kph) on level roads and 29 mph (40.22 kph) while ascending a 3 percent grade.
- While operating on Class I roads, all other vehicles can maintain a speed of 54 mph (85.3 kph) on level roads and 25 mph (40.22 kph) while ascending a 3 percent grade.
- All models can start and climb a 20 percent grade at Gross Combination Weight Rating (GCWR) in both forward and reverse directions. All models are capable of operating on side slopes up to 10 percent where adequate traction is available.
- All models can ford water up to 20 in (51 cm) deep for 5 minutes without damage or requiring maintenance before operations can continue.
- All models are capable of operation in temperatures from -25°F to +125°F (-320C to +52°C), and to -40°F (-40°C) with Arctic kit installed.
- Average cruising ranges at GCWR with a full tank of fuel will vary based on many conditions. For on-highway use under full power at 2100 rpm with 400 hp, the fuel rate will be 20.5-21.4 gph (77.6-81.0 lph). Varying loads; prolonged idle, such as using the Power Take-Off (PTO); off-road driving; and climatic conditions will affect the rate of fuel consumption.
- The minimum turning diameter, curb-to-curb, is 53 ft 9 in. (16.44 m) for the M915A2, 80.0 ft (24.38 m) for the M916A1 and M916A2, and 38.9 ft (11.9 m) for the M917A1 and M917A1 w/MCS.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



1. Engine. Provides power to operate the vehicle and all vehicle subsystems.
2. Rear Motor Mounts. Support engine and transmission assembly.
3. Air Compressor. Supplies compressed air to the brakes and all air operated systems.
4. Fan Clutch. Temperature controlled, air engaged.
5. Alternator. Supplies electrical power for battery charging and electrical system operation.
6. Turbocharger. Produces compressed air for engine.



7. Engine Hood. Can be tilted forward for easy access to engine.

8. Front Axle. Non-drive, steering axle supports front of truck on two leaf springs, to minimize road shock.

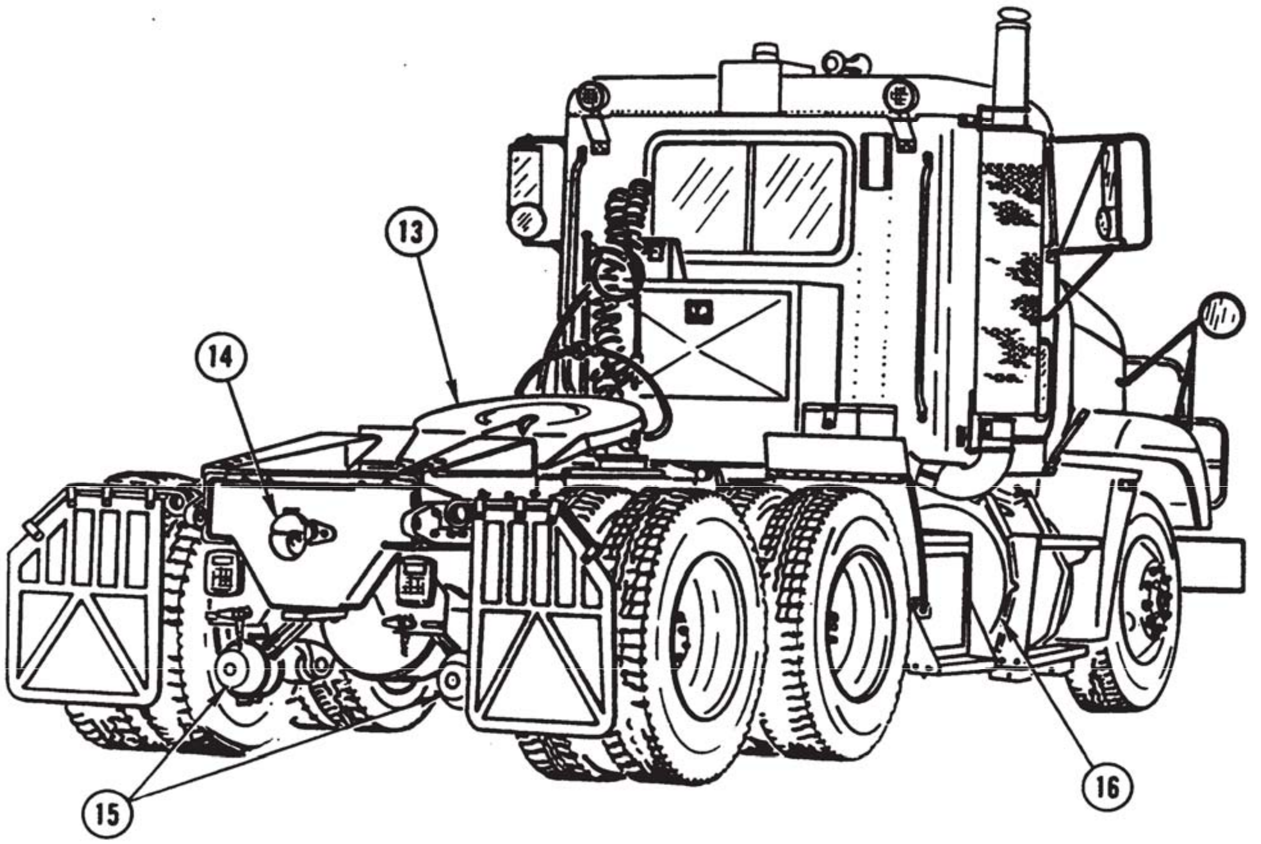
9. Cab. Provides protection from weather for crew, and contains vehicle controls, gages, and indicators.

10. Battery Box. Contains four 12-volt batteries; also serves as a step.

11. NATO Slave Receptacle. Used when slave starting vehicle.

12. Work Lamp Receptacle. For use with the portable work lamps, provided with the B11.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (CONT)

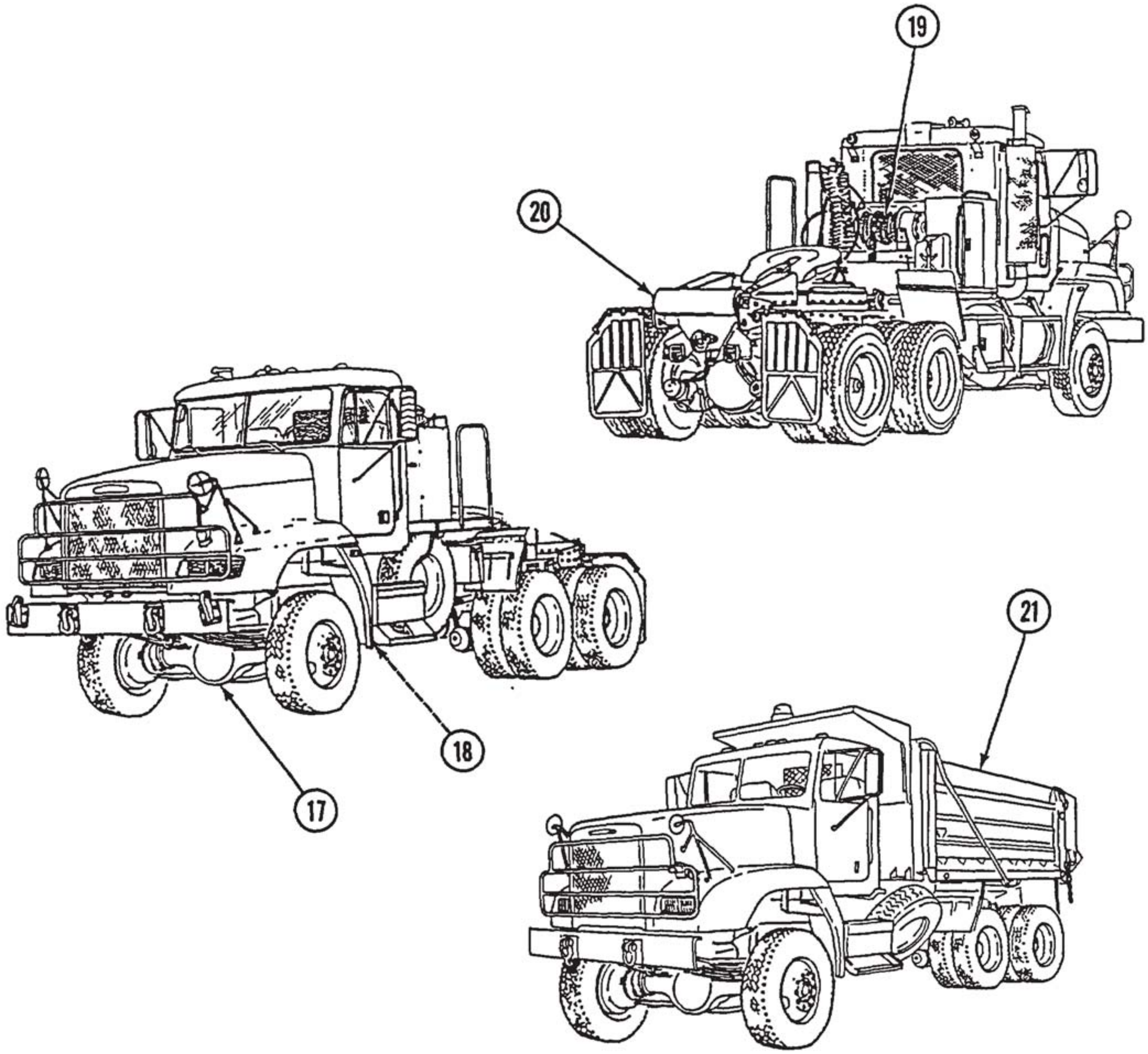


13. Sliding Fifth Wheel. Slides to accommodate different semitrailers and to adjust the load over the rear wheels.

14. Pintle Hook. Used for towing smaller trailers.

15. Brake Chambers. Spring loaded to provide safety brakes in the event of air pressure loss.

16. Fuel Tank. Storage of fuel for operation of vehicle.



M916A1 and M916A2

17. Front Drive Axle. Provides 6x6 mode, for off-road operation.

18. Transfer Case. Allows high/low shifting and engages front drive axle.

19. Hydraulic Winch. Used for lifting semitrailer onto the truck, for coupling.

20. Tail Roller. Allows winch cable rollover, clear of frame components.

M917A1 and M917A1 w/MCS

21. Dump Body. Used for transporting and spreading bulk materials.

DIFFERENCES BETWEEN MODELS

ITEM	Vehicle Model M915A2	M916A1	M916A2	M917A1/ M917A1 w/MCS
Engine Model DDEC II	X	X		
Engine Model DDEC III			X	X
Manual Ether Quick-Start	X	X		
Automatic Ether Quick-Start			X	X
Transfer Case		X	X	X
Driving Front Axle		X	X	X
Non-Driving Front Axle	X			
Highway Tires	X			
On/Off Road Tires		X	X	X
Central Tire Inflation System (CTIS)				X
Spare Wheel and Tire Assembly	X	X	X	X
Full 2-Way Sliding Fifth Wheel	X			
Full 4-Way Oscillating Fifth Wheel		X	X	
Tail Roller		X	X	
Hydraulic Winch		X	X	
Tachograph	X	X		
Datalogger.			X	X
Air Conditioner			X	X

Equipment Data: Performance and specification data, refer to TM 9-2320-363-10.

Section III. PRINCIPLES OF OPERATION

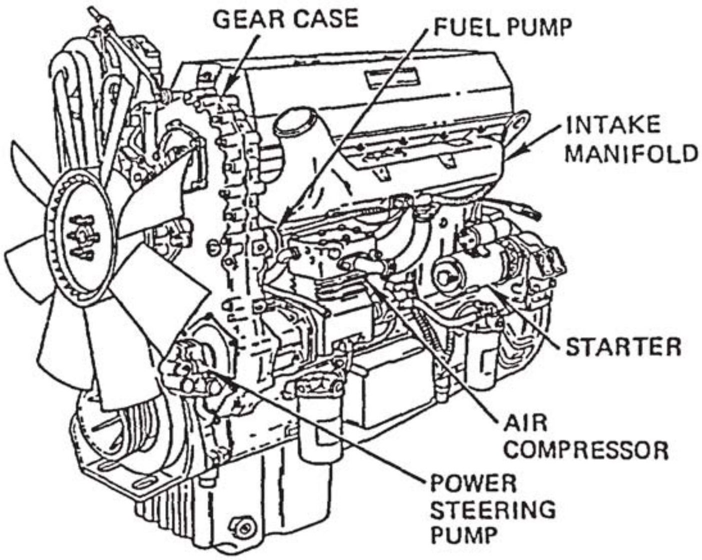
OVERVIEW

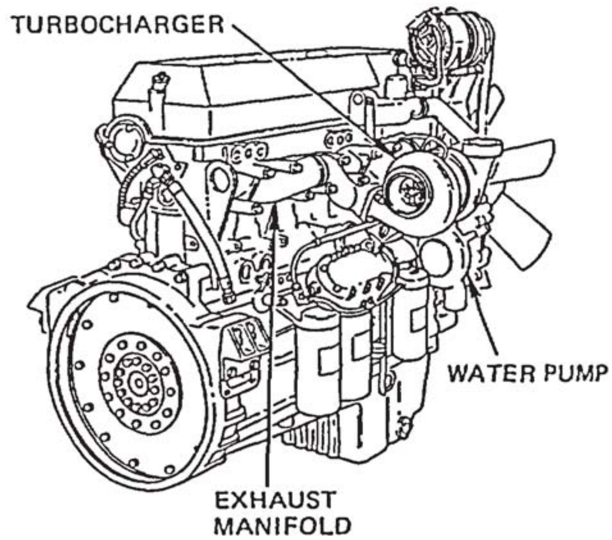
This section contains information on the principles of operation of the M915 family of vehicles. The general functional description of the vehicle's separate systems is contained in this section. Organizational maintenance personnel should be familiar with the principles of operation of these systems before working on or troubleshooting these systems.

These systems are:

Engine
Transmission
Transfer Case (All Except M915A2)
Rear Axles
Air and Brakes
Fuel
Cooling
Electrical
Steering
Exhaust
Hydraulic Winch (M916A1 and M916A2) i
Suspension
Central Tire Inflation System (M917A1 and M917A1 w/MCS)
Heating and Air Conditioning System (All Except M915A2 and M915A2 and M916A1)

ENGINE





The M915 family of vehicles are equipped with the Series 60 Detroit Diesel electronically controlled engine. This engine is a high-speed, 4-stroke-cycle, diesel engine.

The engine uses an in-line cast iron block and has a cast iron cylinder head that contains a single overhead camshaft, which actuates all the valves (two intake, two exhaust per cylinder) and operates the fuel injectors. The vertically alined gear train, located at the front end of the engine in a gear case, contains drive gears for the lubricating oil pump, crankshaft, camshaft, air compressor drive, fuel pump drive, water pump, and alternator drive.

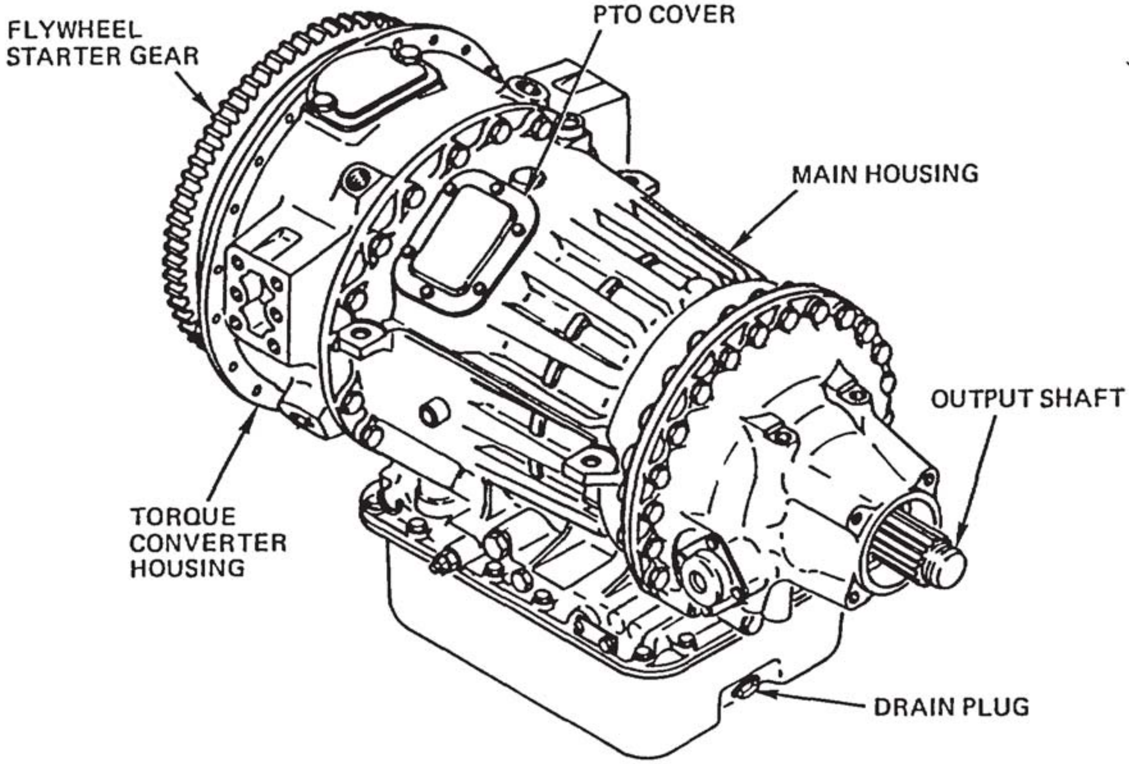
Each engine is equipped with dual full-flow oil filters, a bypass oil filter, an oil cooler, two fuel oil filters, turbocharger, starting motor, and electronic engine control system.

Full-pressure lubrication is supplied to all main, connecting, and camshaft bearings and to other moving parts. A gear-type pump draws oil from the oil pan through a screen and delivers it to the oil filters. From the filter, a small portion of the oil is delivered directly to the turbocharger by an external oil line. The remainder of the oil flows to the oil cooler and then enters a longitudinal oil gallery in the cylinder block where the supply divides. Part of the oil goes to the cylinder head, where it feeds the camshaft bearings and rocker assemblies; the remainder of the oil goes to the main bearings and connecting rod bearings via the drilled oil passages in the crankshaft. Drilled passages in the connecting rod feed oil to the piston pin and the inner surface of the piston crown.

Air is supplied by the turbocharger to the intake manifold and into the engine cylinders after passing through an air-to-air intercooler mounted ahead of the cooling system radiator. The intercooler cools the pressurized intake air charge coming from the turbocharger before it enters the intake manifold.

Engine starting is provided by an electric starting motor energized by a storage battery. A battery-charging alternator, with a voltage regulator, serves to keep the battery charged.

TRANSMISSION



These vehicles are equipped with an Allison HT 740 automatic transmission, incorporating four speeds forward and one reverse. The transmission features:

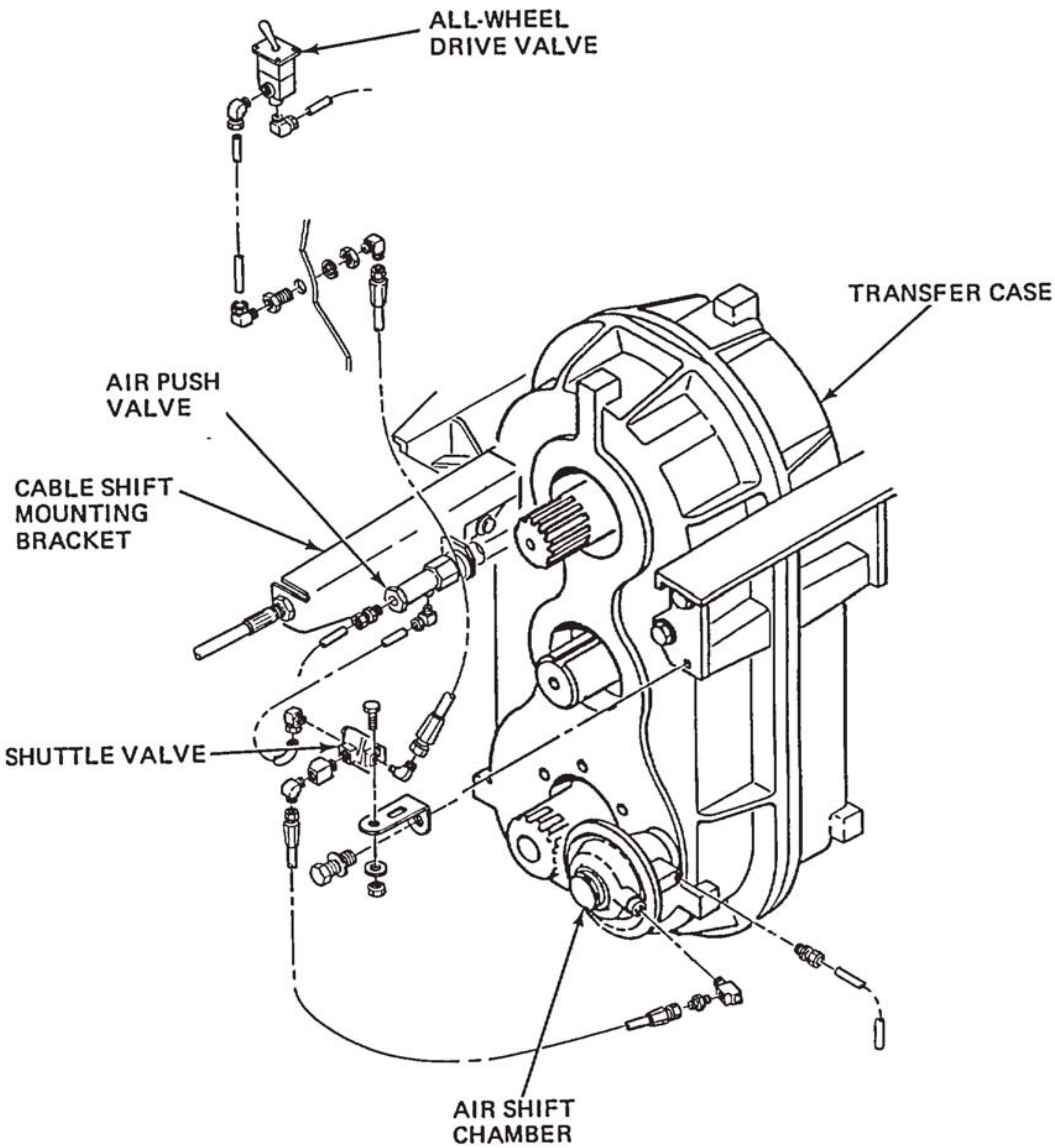
Torque Converter. A simple, 3-element torque converter transmits power from the engine to the transmission gearing. The torque converter serves as both a fluid coupling and a torque multiplier.

Lockup Clutch. This clutch automatically locks the turbine element of the torque converter to the flywheel. When the turbine approaches the speed of the pump, hydraulic pressure automatically applies the lockup clutch. With the lockup clutch applied, engine output is directed to the transmission gearing at a 1: 1 speed ratio. A decrease in speed automatically releases the lockup clutch.

Planetary Gearing, Clutches. Three planetary gear sets establish the four forward speeds and one reverse in the HT 740 transmission. The planetaries are controlled by five hydraulic-applied clutches. All gearing is in constant mesh.

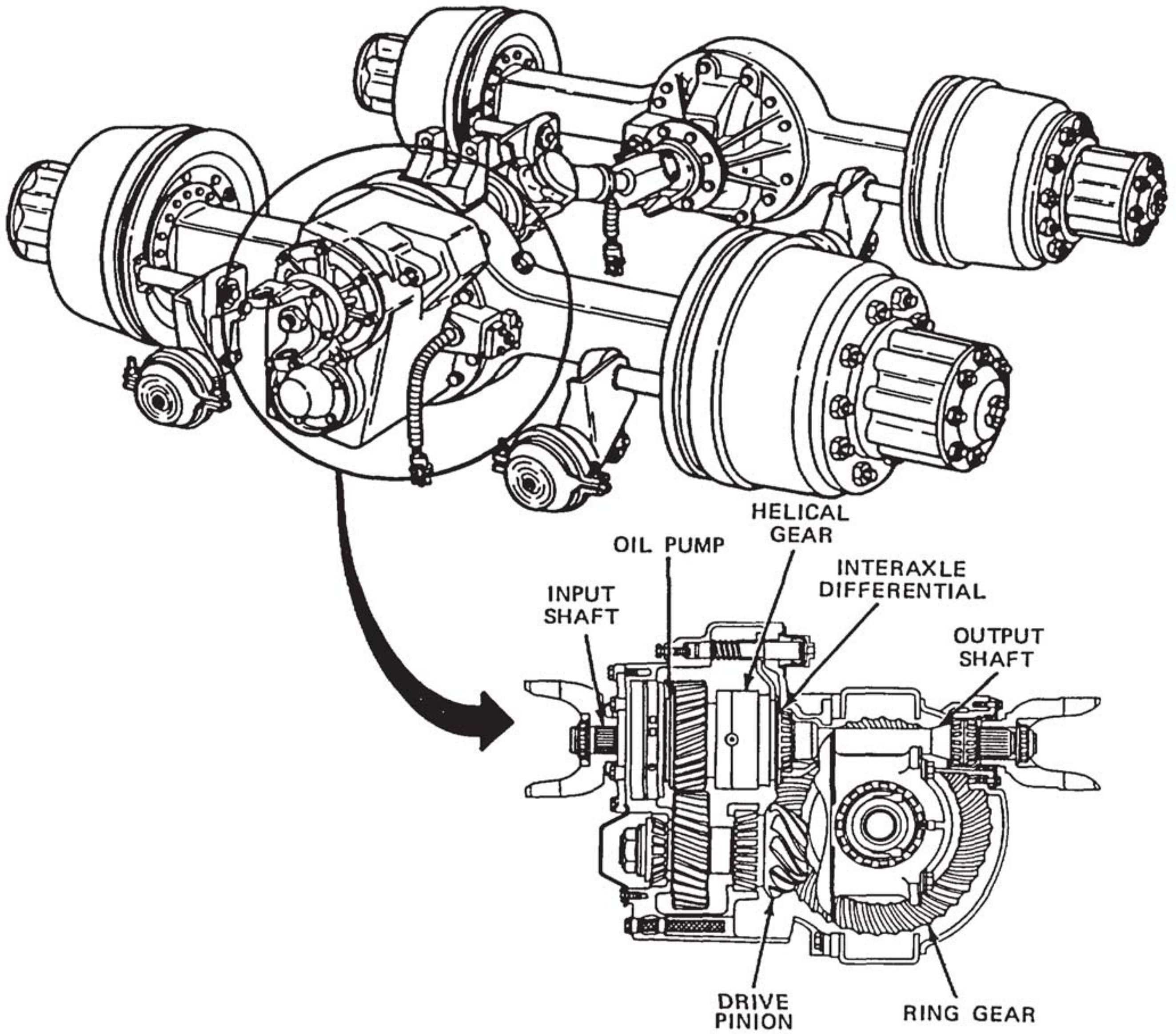
Control Valve Body Assembly. The control valve body assembly is the brain of the transmission. It is hydraulically operated. Oil passages, valves, and springs are designed to allow the flow of hydraulic fluid to pre-designated areas. Through variations of pressure and spring tension, the components in the valve body are hydraulically moved at the precise time, redirecting fluid to pre-selected locations.

TRANSFER CASE (ALL EXCEPT M915A2)



The cable shift linkage on the upper part of the transfer case controls high, neutral, and low range. In order for the front drive axle to be engaged, air pressure must be applied to the air shift chamber. There are two ways to do this: (1) move the all-wheel drive valve (inside the cab) to the engaged position; or (2) move the shifter to the low position. The shifting rod on the transfer case is pulled out, which activates an air push valve on the mounting bracket and applies air pressure to the shift chamber through the shuttle valve.

REAR AXLES



The forward axle drive units of these tandem axles have single-reduction, through drive carriers. The drive gearing is made of a two helical gear train and a hypoid ring gear and pinion. Bevel gears are used in the main differential and the interaxle differential.

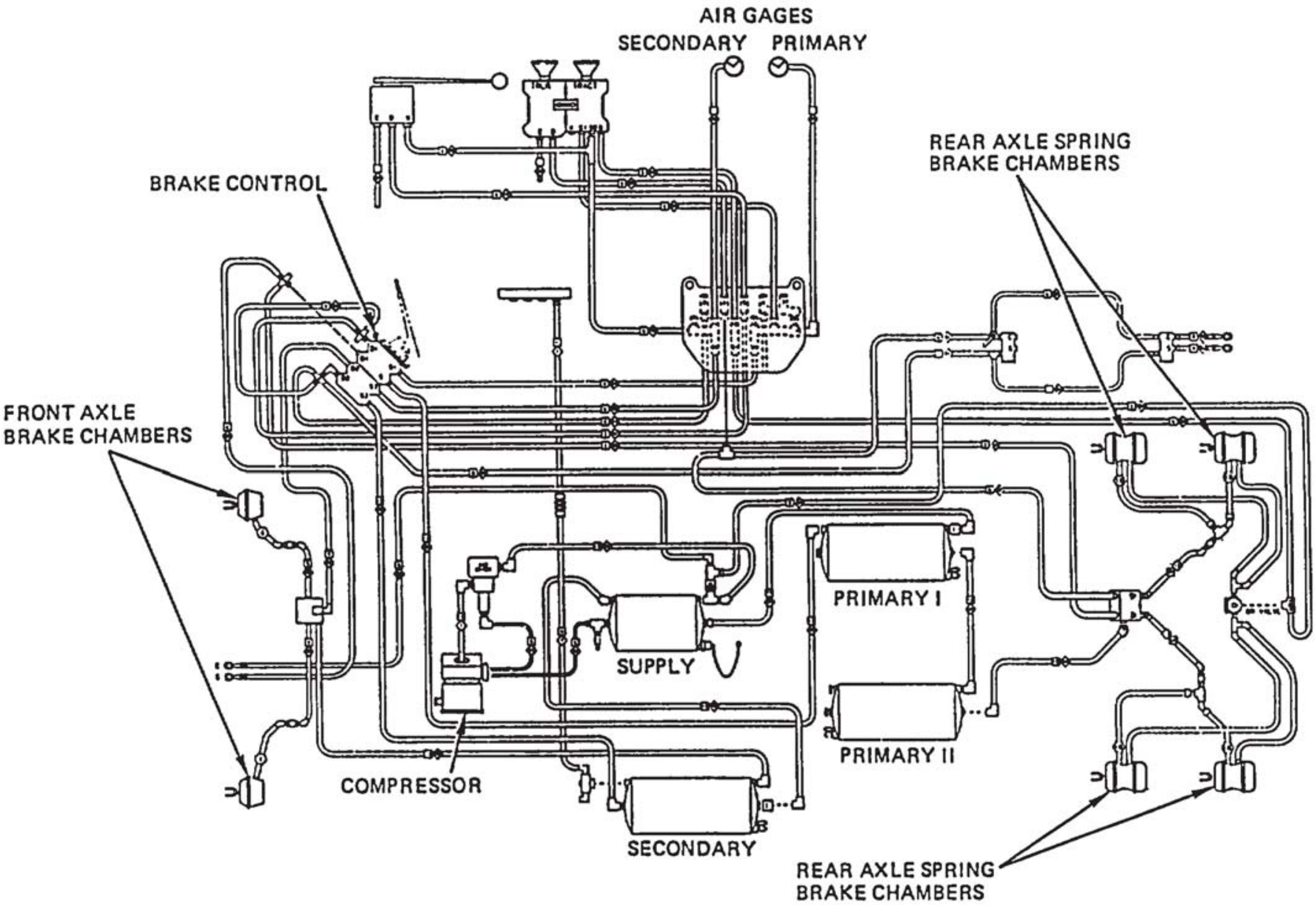
The interaxle differential is located behind the upper helical gear on the input shaft. The forward side gear of the interaxle differential is part of the upper helical gear hub and the through shaft is splined to the rear side gear of the interaxle differential.

The M916A1, M916A2, and M917A1/M917A1 w/MCS axles are different from the M915A2 axle in the following components:

- The axle has a wider helical driven gear.
- There are two notches on the interaxle differential case of the axles. The notches permit the differential case to clear the helical driven gear when the input shaft assembly is removed from the carrier.

AIR AND BRAKES

NOTE
Refer to TM 5-3805-264-14&P for dump truck MCS circuitry.



The air system consists of the air compressor, air holding tanks, and various air lines. Also included in the air system are the air pressure gages located on the dashboard for the purpose of monitoring the air pressure for safe operation of all air-operated components of the vehicle.

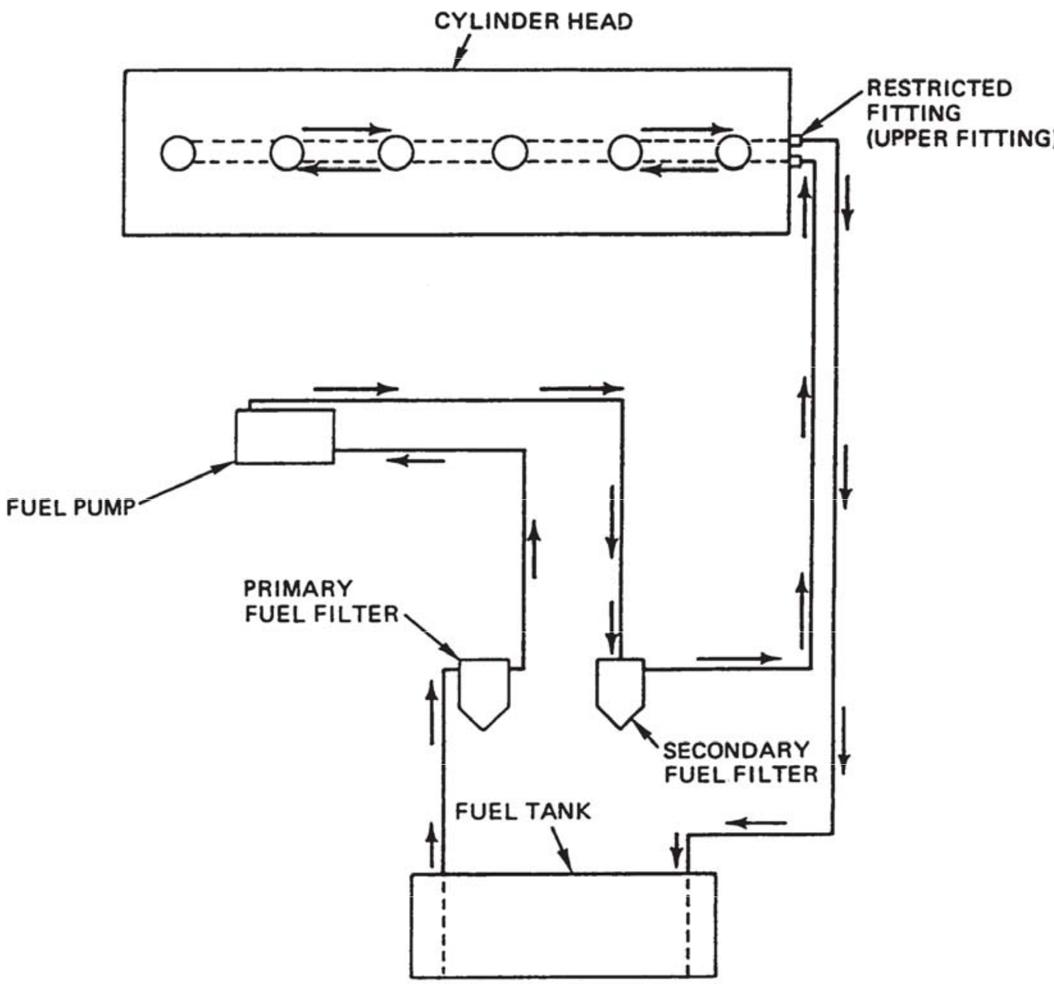
The dual air brake system consists of two independent air brake systems that use a single set of brake controls. Each system has its own reservoirs, plumbing, and brake chambers. The primary system operates the service brakes on the rear axle; the secondary system operates the service brakes on the front axle. Service brake signals from both systems are sent to the trailer.

Loss of air pressure In the primary system causes the rear service brakes to become inoperative; front brakes will continue to be operated by the secondary system air pressure. In addition, trailer brakes will be operated by the secondary system. Loss of secondary system air pressure causes the front axle brakes to become Inoperative; rear service brakes and trailer brakes will be operated by the primary system.

The warning light and buzzer come on If air pressure drops below 64-76 psi (441-524 kPa) in either system. If this happens, check the dual system air pressure gage to determine which system has low air pressure. Although the vehicle's speed can be reduced using the foot brake control pedal, either the front or rear service brakes will not be operating, causing a longer stopping distance. Bring the vehicle to a safe stop, and have the air system repaired before continuing.

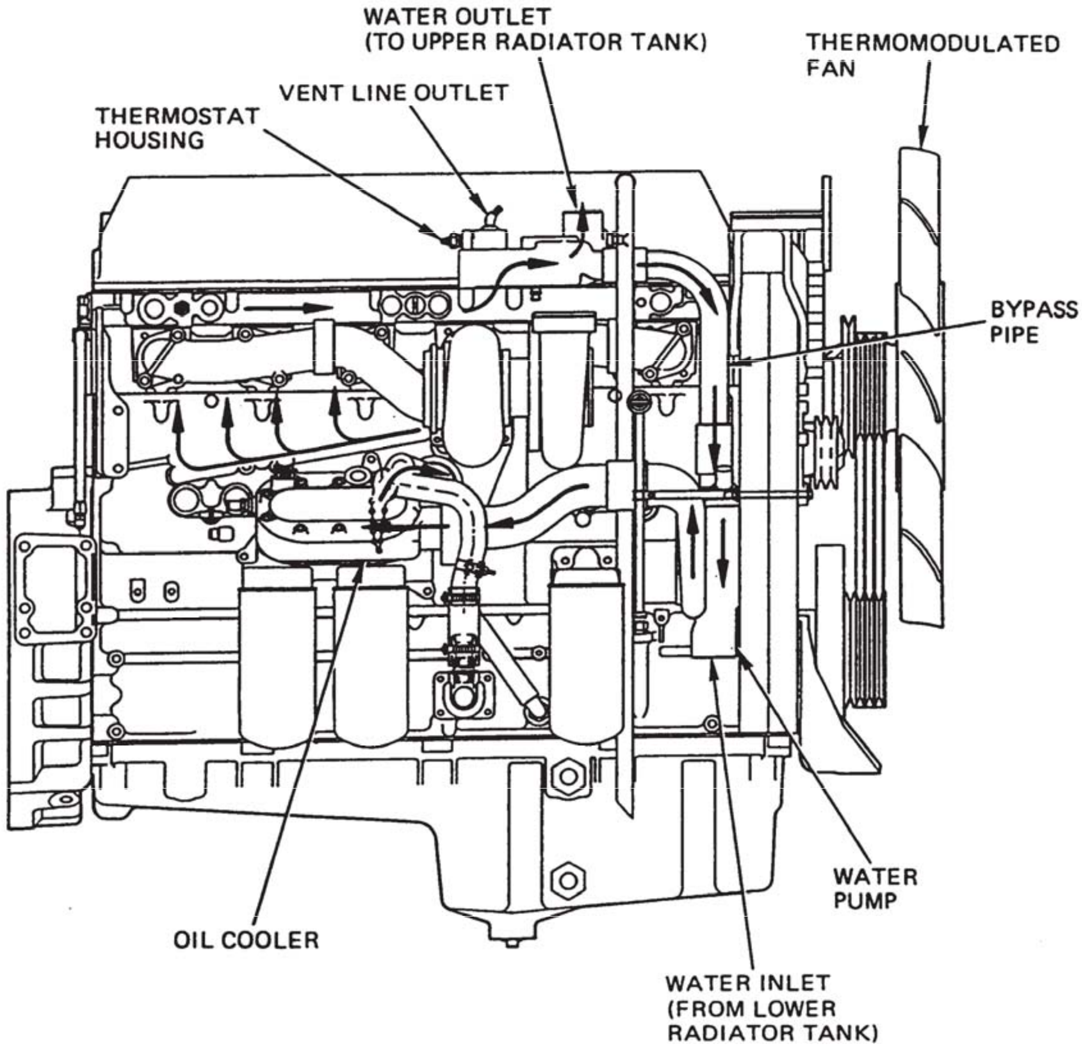
On tractor trailer vehicles if both the primary and secondary systems become inoperative, the trailer service brakes or spring parking brakes will automatically apply when air pressure drops to 35-45 psi (242-310 kPa The tractor spring parking brakes will automatically apply when air pressure drops below 45 psi (310 Kpa

FUEL



Fuel is drawn from the supply tank through the primary fuel filter by a gear-type fuel pump. From there, the fuel is forced through the secondary fuel filter and into the fuel inlet manifold in the cylinder head and to the injectors. Excess fuel ‘is returned, through a restricted fitting, to the supply tank through the outlet connecting line. Since the fuel is constantly circulating through the injectors, it serves to cool the injectors and to carry off any air in the fuel system.

COOLING

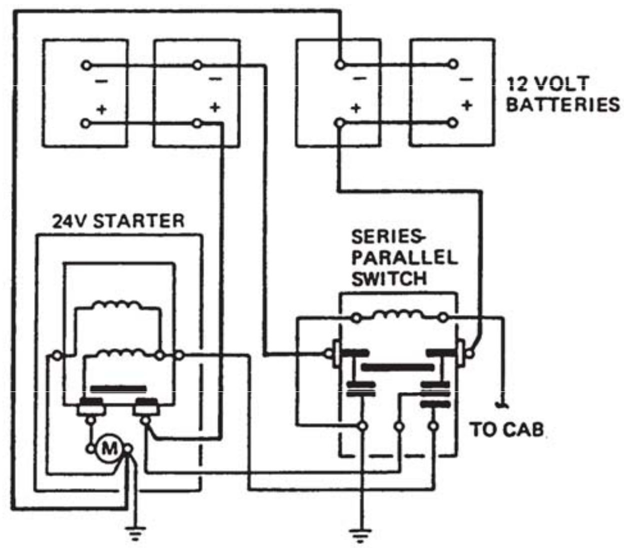


The engine coolant is drawn from the lower portion of the radiator by the water pump and is forced through the oil cooler and into the cylinder block.

From the cylinder block, the coolant passes up through the cylinder head and, when the engine is at normal operating temperature, through the thermostat housing and into the upper portion of the radiator. Then the coolant passes down a series of tubes where the coolant temperature is lowered by the air stream created by the revolving fan and the motion of the vehicle.

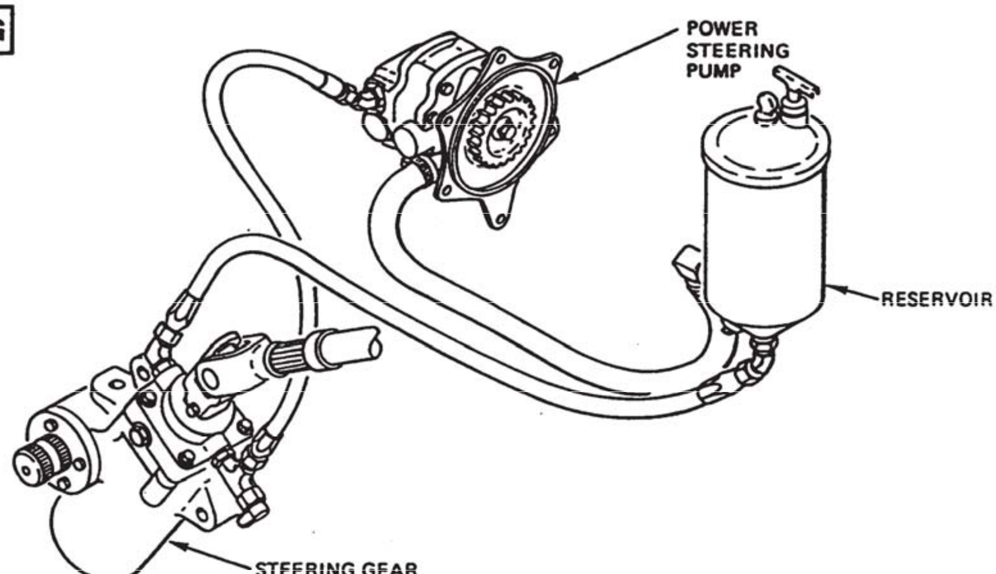
Upon starting a cold engine or when the coolant is below operating temperature, the coolant is restricted at the thermostat housing and a bypass pipe from the thermostat housing to the water pump housing provides water circulation within the engine during the warmup period.

ELECTRICAL



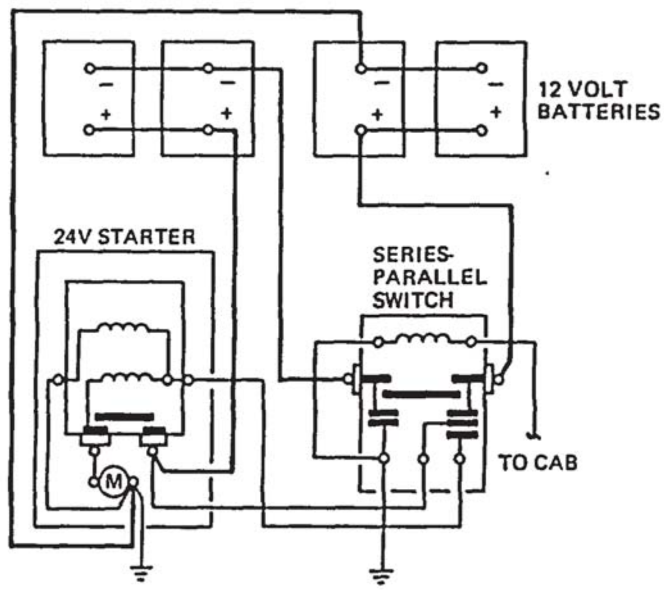
The electrical system is a 12-volt/24-volt cranking system. The system has four 12-volt batteries connected" in series-parallel. The cold cranking capacity is 950 amps @ O"F (-18°C) @ 24 volts. The alternator provides 12/24 volts and 85/15 amps. The blackout lights and starter are operated by 24 volts; all other systems are 12 volt.

STEERING



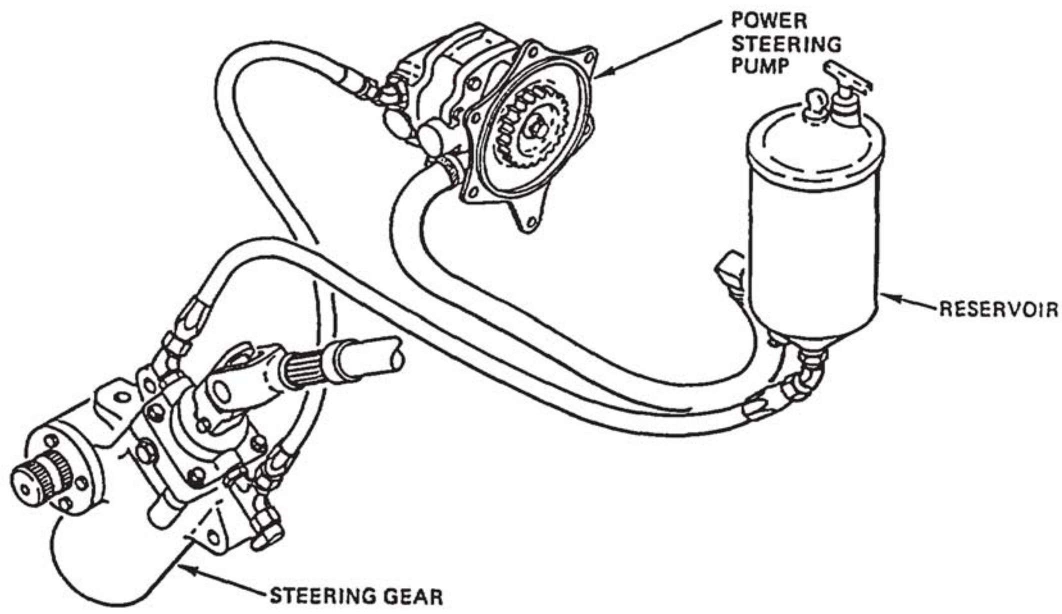
The power steering system consists of an integral steering gear (which includes a manual steering mechanism and hydraulic control valve), hydraulic hoses, power steering pump, reservoir and other components. The power steering pump, driven by the engine, provides the power assist for the steering system.

ELECTRICAL



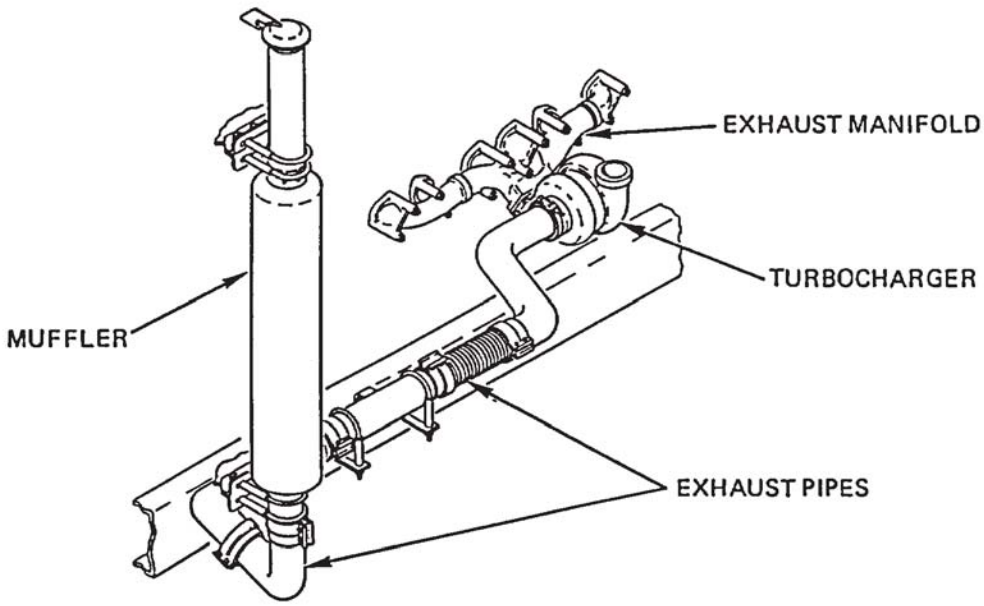
The electrical system is a 12-volt/24-volt cranking system. The system has four 12-volt batteries connected in series-parallel. The cold cranking capacity is 950 amps 0°F (-180C) 24 volts. The alternator provides 12/24 volts and 85/15 amps. The blackout lights and starter are operated by 24 volts; all other systems are 12 volt.

STEERING



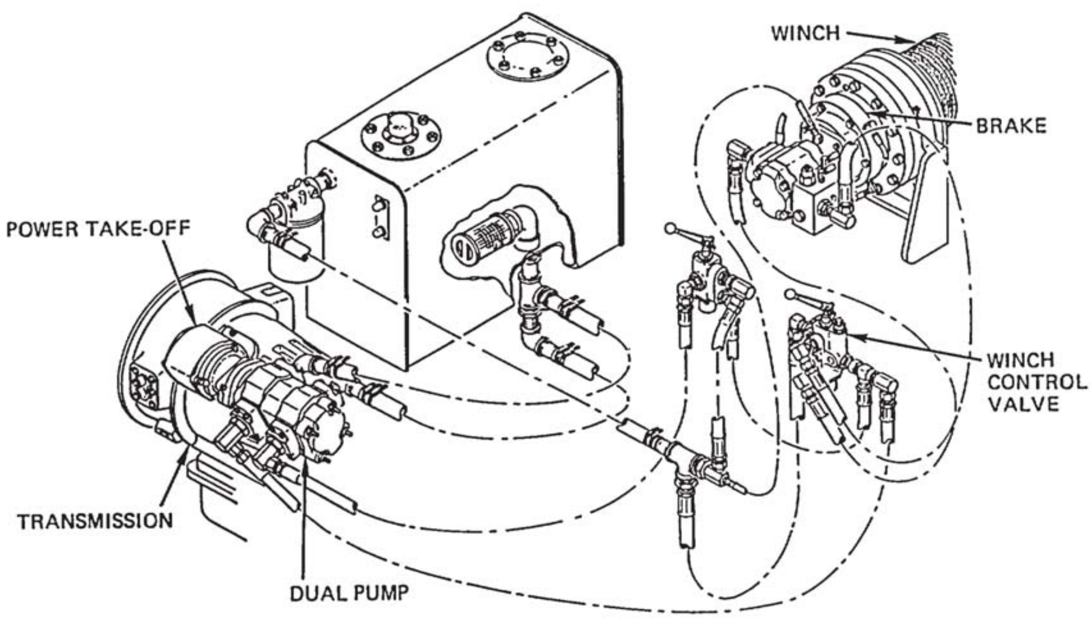
The power steering system consists of an Integral steering gear (which includes a manual steering mechanism and hydraulic control valve), hydraulic hoses, power steering pump, reservoir, and other components. The power steering pump, driven by the engine, provides the power assist for the steering system.

EXHAUST



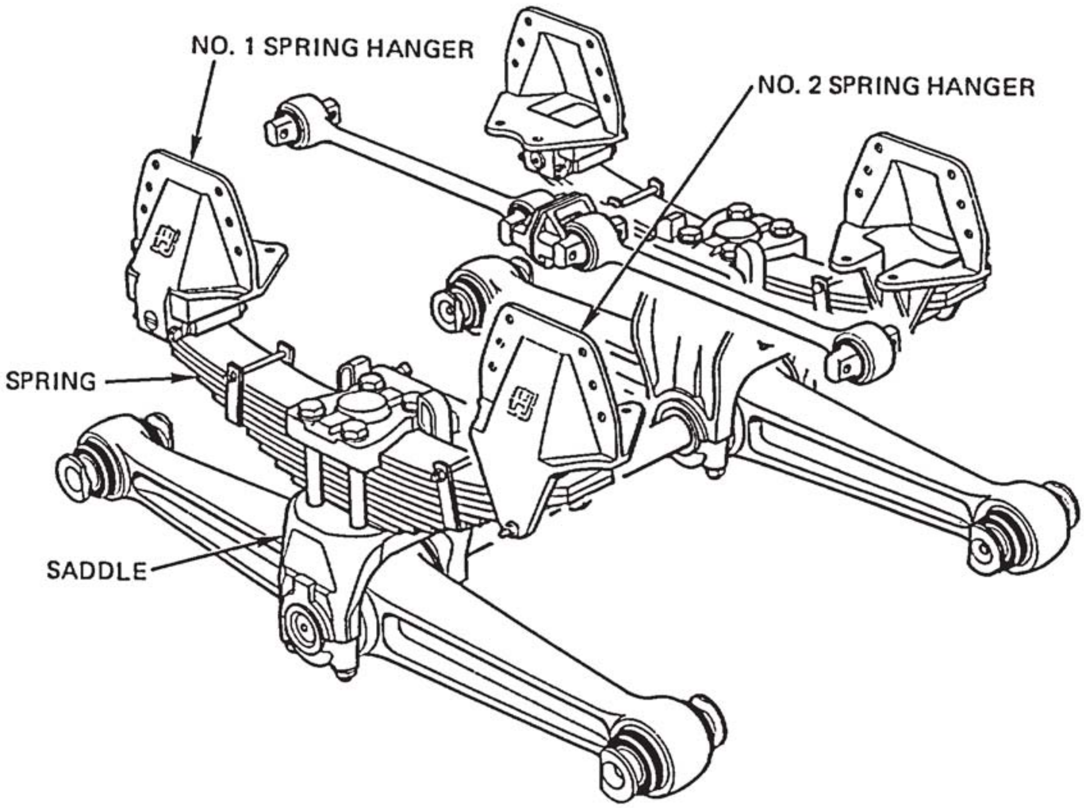
The exhaust system removes exhaust gases from the engine through the exhaust manifold and turbocharger and into exhaust pipes and a muffler to the atmosphere above the cab.

HYDRAULIC WINCH (M916A1 AND M916A2)



The M916A1 and M916A2 are equipped with a full hydraulic winch mounted on the frame behind the cab. The winch is a fail-safe spring-loaded brake that will automatically set any time the winch control valve is in neutral, or in case of power failure (hydraulic pressure drops to less than 200 psi). The winch operates at 2100-psi hydraulic pressure from a dual pump driven by a Power Take-Off (PTO) on the transmission. The rated capacity of the winch is 45,000 lb (20,250 kg).

SUSPENSION



The suspension uses leaf springs to cushion road shocks. The springs are mounted on saddle assemblies above the equalizing beams and are connected at the front ends to spring hangers with spring eye pins through the spring eyes. The rear ends of the springs have no rigid attachment to the spring hangers and are free to move forward and backward to accommodate spring deflection.

The leaf springs have a pilot cup forged upward in the main leaf at the center bolt. This cup pilots into a cavity in the spring top pad to ensure the correct positioning of the spring in the saddle assembly.

There are no adjustments required for alinement of the suspension. The points controlling alinement are:

- The location of the spring hangers on the frame as installed by the vehicle manufacturer.

- The location of the beam hangers on the axles.

CENTRAL TIRE INFLATION SYSTEM (CTIS) (M917A1 AND M917A1 W/MCS)

CTIS is used to regulate tire pressure at all wheels. This allows operation of the dump truck on all road surfaces across a wide variety of terrain, including off road, and when vehicle is stuck due to extreme conditions.

CTIS uses air from the dump truck's air system. Air is routed to the wheels via a dedicated pneumatic system plumbed from the vehicle's wet tank. An Operator Control Panel (OCP) and Electronic Control Unit module is mounted to the shift tower inside the cab.

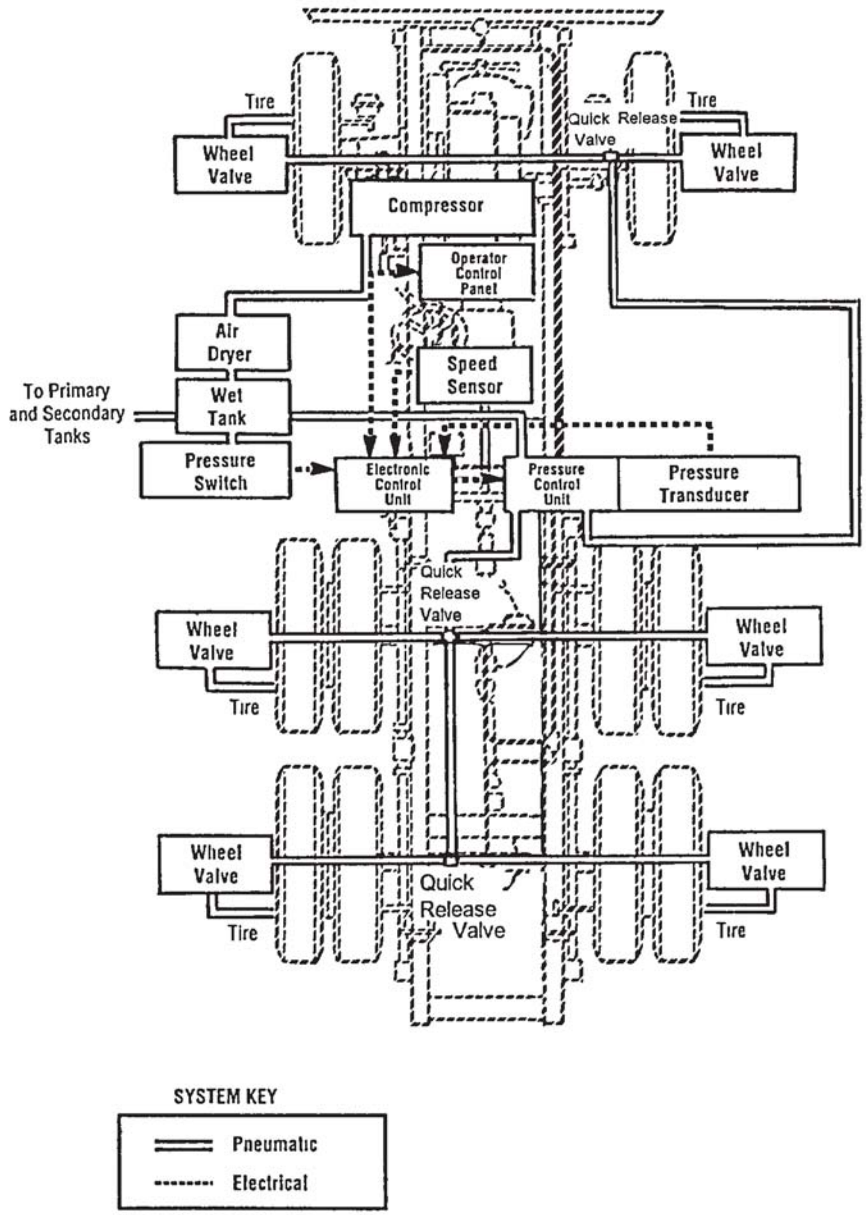
Four air pressures have been programmed into CTIS:

Highway	90 psi (at 60 mph overspeed takes effect)
Cross-country	55 psi (at 40 mph overspeed takes effect)
Sand	40 psi (at 25 mph overspeed takes effect)
Emergency	30 psi (at 10 mph overspeed takes effect)

When the engine is started, tire pressures will be pressures LAST ACHIEVED when vehicle was operated.

Major components of the system are:

OCP/Electronic Control Unit Modular unit mounted on the Shift Tower	The OCP allows for operator selection of tire pressures based on road conditions and displays service codes and system status. The ECU is The ECU is the control center for the entire CTIS.
Wheel Valves	Located at each wheel end (at outer wheel of dual wheels). Provides for inflation of tires from the vehicle's air supply via the Pneumatic Control Unit, and deflation of tires upon system demand.
Pneumatic Control Unit	A solenoid controlled manifold that receives commands from the ECU and controls the air system. Also contains the pressure transducer which transmits pressure readings to the ECU. The unit delivers the proper control signal to the appropriate channel.
Pressure Switch	Acts as an electronic brake priority switch. It prevents CTIS from consuming air from the wet tank until the air brake system is fully charged. Therefore, CTIS safeguards safe operating pressures in the primary and secondary tanks.
Speed Sensor	Provides the ECU with vehicle speed information.

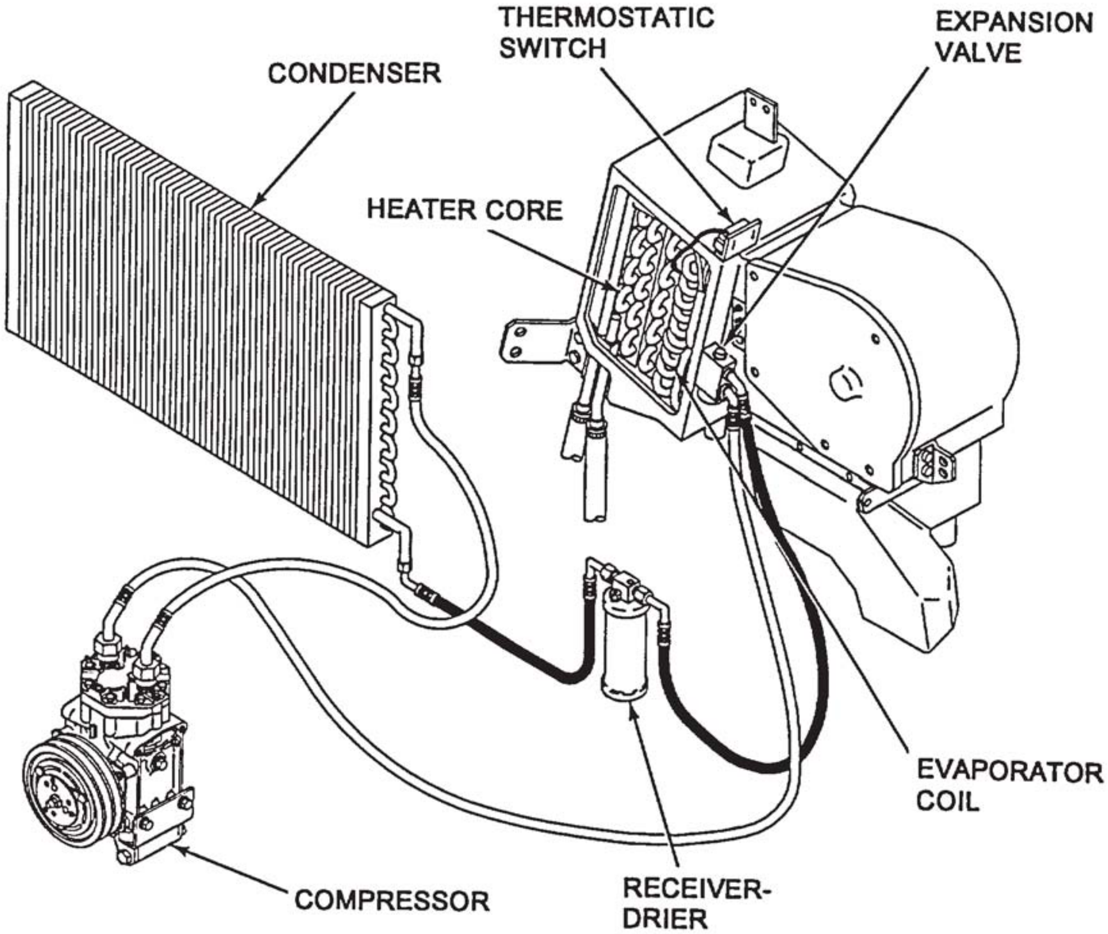

Tire
Tire
Quick Release Valve
Wheel Valve
Wheel Valve
Compressor
Operator Control Panel
Air Dryer
Speed Sensor
To Primary and Secondary Tanks
Wet Tank
Pressure Switch
Electronic Control Unit
Pressure Control Unit
Pressure Transducer
Quick Release Valve
Wheel Valve
Wheel Valve
Tire
Tire
Wheel Valve
Wheel Valve
Quick Release Valve
Tire
Tire
SYSTEM KEY
Pneumatic
Electrical

HEATING AND AIR CONDITIONING SYSTEM (ALL EXCEPT M915A2 AND M916A1)

The heating and air conditioning unit is mounted under the glove compartment. It is a single unit consisting of a heater core, air conditioning evaporator coil, blower motor, control valves, and air ducts. The system is turned on by the mode control lever and the four-speed blower switch, which also controls flow rate. An even cab temperature is maintained by controlling the coolant flow through the heater core, or refrigerant flow through the evaporator coil.

Major components of the system are:

Expansion Valve	The expansion valve is the dividing point between the high- and low-pressure parts of the refrigerant system. High-pressure liquid refrigerant from the receiver-drier passes through the expansion valve and moves into the low-pressure area of the evaporator coil.
Evaporator Coil	The evaporator coil, in an area of low pressure in the system, lowers the boiling point of refrigerant, which causes it to absorb heat from the tubing walls and fins of the coil. As it absorbs heat, liquid refrigerant quickly boils and turns into a gas.
Compressor	The compressor squeezes low-pressure gas from the evaporator coil into a much smaller space. When gas is compressed, the heat it contains becomes concentrated. In this way, the gas is made hotter than the outside air, without adding heat. The compressor also moves refrigerant through the system.
Condenser	The condenser turns hot refrigerant gas, coming from the compressor, into liquid. Because of its location, the condenser transfers heat to air that is drawn in by the engine fan and by air that is forced into the engine compartment as the vehicle moves forward.



Receiver-Drier	The receiver-drier is a reservoir and filter that removes water and acids from the refrigerant.
Heater Core	The heater core is a series of fins through which tubing is routed. Engine coolant flows through the tubes heating the tubes and fins. The heat is absorbed by air that is forced through the heater core by the blower motor.
Thermostatic Switch	The thermostatic switch engages and disengages the compressor by monitoring the temperature near the evaporator coil tubes.

CHAPTER 2
SERVICES AND SCHEDULED VEHICLE MAINTENANCE

SCOPE

This chapter contains information you will need to prepare the vehicle for daily use and to perform preventive and scheduled maintenance. The following sections are included in this chapter.

Section 1. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

OVERVIEW

This section includes information on tools and equipment you need to support the M915 family of vehicles.

COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit. Tool kits required for each task in this manual are listed on the INITIAL SETUP page for each task.

SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools and support equipment required to maintain the M915 family of vehicles, are listed in the Maintenance Allocation Chart (MAC), Appendix B of this manual, and in the Repair Parts and Special Tools List (TM 9-2320-363-24P). Tools that are to be manufactured are described and listed in Appendix D of this manual.

REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (TM 9-2320-363-24P).

Section II. SERVICE UPON RECEIPT

OVERVIEW

This section contains information on what to do when the vehicle is received.

INITIAL SERVICES

1. Follow all precautions and instructions on tag DD Form 1397, Processing Record for Shipment, Storage, and Issue of Vehicle and Spare Engines.

2. Remove all packing and shipping material, such as tape, tie downs, protective covers, and shipping seals.

3. Remove all Basic Issue Item (Bll), Additional Authorization List (AAL), and Component of End Item (COEI) equipment and store in accordance with TM 9-2320-363-10.

4. If batteries have not been serviced, refer to TM 9-6140-200-14.

5. Service the vehicle in accordance with TM 9-2320-363-10 and Unit PMCS.

6. Refer to TM 9-2320-363-10 and TM 5-3805-264-14&P and perform functional checks of all major vehicle systems.

Section III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

GENERAL

To ensure that the M915 family of vehicles are ready for operation at all times, they must be lubricated and inspected on a regular basis so that defects may be found before they result in serious damage, equipment failure, or injury to personnel. Table 2-1 lists the types, amounts, and temperature ranges of the lubricants required for specified Intervals. Table 2-2 contains systematic Instructions on lubrications, inspections, adjustments, and corrections to be performed by Unit Maintenance to keep the vehicles in good operating condition and read for their primary mission.

EXPLANATION OF TABLE ENTRIES

a. Item Number (Item No.) Column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order you must perform checks and services for the interval listed.

b. Interval Column. This column tells you when you must perform the procedure in the procedure column. Intervals are based on calendar.

(1) Semiannual procedures must be done once every six months.

(2) Annual procedures must be done once each year.

c. Location, Item to Check/Service Column. This column identifies the location and the item to be checked or serviced

NOTE

The WARNINGs and CAUTIONs appearing in your PMCS table should always be observed. WARNINGs and CAUTIONs appear before applicable procedures. These WARNINGs and CAUTIONs must be observed to prevent serious Injury to yourself and others or to prevent your equipment from being damaged.

d. Procedure Column. This column gives the procedure you must perform to check or service the item listed in the Item to Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must perform the procedure at the time stated in the interval column.

e. Not Fully Mission Capable if: Column. Information in this column tells you what fault will keep your equipment from being capable of performing its primary mission. If you make check and service procedures that show faults listed in this column, the equipment is not mission-capable. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

GENERAL LUBRICATION PROCEDURES

a. Recommended intervals are based on normal conditions of operation, temperature, and humidity. When operating under extreme conditions, such as high or low temperatures, fording in water over 20 Inches deep, or exposure to sand or dust, lubricants should always be changed more frequently. Lubricants that have become contaminated will be changed regardless of interval. When in doubt, notify your supervisor.

b. Keep all lubricants in a closed container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.

c. Maintain a good record of all lubrication performed and report any problem noted during lubrication. Refer to DA Pam 738-750 for maintenance forms and procedures to record and report any findings.

d. Keep all external parts of equipment not requiring lubrication free of lubricants. Before lubrication, wipe lubrication fittings with a clean rag (Item 34, Appendix C). After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

e. Refer to FM 9-207 for lubrication instructions in cold weather.

f. Refer to AR 70-12 for use of standardized fuels and lubricants.

g. Oil filters will be changed when:

(1) they are known to be contaminated or clogged,
(2) service is directed by Army Oil Analysis Program (AOAP) laboratory analysis, or
(3) at prescribed hardtime intervals.

h. Engine oil, transmission fluid, and hydraulic fluid must be sampled initially at 90 days of operation as prescribed by DA Pam 738-750. Thereafter, engine oil and transmission fluid are sampled semiannually and hydraulic fluid is sampled annually, unless AOAP results dictate otherwise.

i. For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (i.e., longer than usual operating hours, extended idling periods, or extreme dust).

j. Dashed leader lines on illustrations related to lubrication indicate that lubrication is required on both sides of the equipment.

GENERAL PMCS PROCEDURES

a. Always perform PMCS in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry. If any deficiency is discovered, perform the appropriate troubleshooting task in Chapter 3 of this manual. If any component or system is not serviceable, or if the given service does not correct the deficiency, notify your supervisor.

b. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare all tools needed to make all checks. Have several clean rags (Item 34, Appendix C) handy. Perform ALL inspections at the applicable interval.

WARNING

Dry cleaning solvent, P-D-680, Is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat. The solvent's flash point Is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and seek medical attention.

(1) **Keep It Clean.** Dirt, grease, oil, and debris get in the way and may cover up a serious problem Clean as you work and as needed. Use dry cleaning solvent (Item 25, Appendix C) on all metal surfaces. Use detergent (Item 6.1, Appendix C) and water when you clean rubber, plastic, and painted surfaces.

(2) **Rust and Corrosion**. Check metal parts for rust and corrosion. If any bare metal or corrosion exists, clean and apply a light coat of lubricating oil (Item 18.1, Appendix C). Report it to your supervisor.

(3) **Bolts, Nuts, and Screws**. Check bolts, nuts, and screws for obvious looseness, missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose, tighten it.

(4) **Welds**. Look for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to your supervisor.

(5) **Electric Wires and Connectors**. Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and ensure that the wires are in good condition.

(6) **Hydraulic Hoses and Lines**. Look for wear, damage, and signs of leaks. Ensure that clamps and fittings are tight. Wet spots indicate leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, correct it if authorized by the Maintenance Allocation Chart (Appendix B). If not authorized, notify your supervisor.

(7) **Fluid Leakage**. It is necessary for you to know how fluid leakage affects the status of your truck. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your truck. Learn and be familiar with them, and remember - when in doubt, notify your supervisor.

Leakage Definitions for PMCS

Class I	Leakage indicated by wetness or discoloration, but not great enough to form drops
Class II	Leakage great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
Class III	Leakage great enough to form drops that fall from the item being checked/inspected.

CAUTION

Operation Is allowable with Class I and Class II leakage. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR. When operating with Class I or Class II leaks, check fluid levels more frequently. Class III leaks must be reported immediately to your supervisor. Failure to do this will result In damage to vehicle and/or components.

PMCS INITIAL SETUP

a. General.

(1) This paragraph lists tools, materials, and personnel required for PMCS and lubrication.
(2) Mandatory replacement parts for PMCS and lubrication are listed before Unit PMCS, Table 2-2.

b. Tools.

(1) Common No. 1 shop set (Item 101, Appendix B).
(2) General mechanic's tool kit (Item 105, Appendix B).
(3) Tensiometer, belt (Item 139, Appendix B).

c. Materials.

(1) Antifreeze (Item 4 or 4.1, Appendix C)
(2) AOAP sampling kit
(3) Detergent (Item 6.1, Appendix C)
(4) Dry cleaning solvent (Item 25, Appendix C)
(5) GAA grease (Item 14, Appendix C)
(6) Lubricating oil, OE/HDO 10 (Item 16, Appendix C)
(7) Lubricating oil, OE/HDO 40 (Item 17, Appendix C)
(8) Lubricating oil, OE/HDO 15/40 (Item 18, Appendix C)
(9) Lubricating oil, OE/HDO 30 (Item 18.1, Appendix C)
(10) Lubricating oil, OEA (Item 22, Appendix C)
(11) Lubricating oil, GO 85/140 (Item 19, Appendix C)
(12) Lubricating oil, GO 80/90 (Item 20, Appendix C)
(13) Lubricating oil, GO 75 (Item 21, Appendix C)
(14) Rags (Item 34, Appendix C)

d. Personnel.

(1) Driver/Operator
(2) Unit Maintenance Mechanic

Table 2-1. Lubrication Data

Lubricant/ Component	Refill Capacity	Expected Temperatures*		
		+6°F to +122°F (-14°C to +50°C)	**-4°F to +50°F (-20°C to +10°C)**	**-67°F to +32°F (-55°C to 0°C)**
OE/HDO (MIL-L-21 04) Lubricating Oil, ICE, Tactical				
OEA (MIL-L-46167) Lubricating Oil, ICE, Arctic				
Engine Crankcase w/ Filters	41 Qt (38.8 L)		See Chart A	
Transmission	33 Qt (31.2 L)		See Chart B	
Transfer Case (All Except M915A2)	5 Qt (4.7L)		See Chart C	
Power Steering Reservoir	2 Qt (1.9 L)		See Chart A	
Winch Reservoir (M916A1 & M916A2)	42 Gal (159 L)		See Chart D	
Winch Cable (M916A1 & M916A2)	As Reqd		See Chart A	
GO (MIL-L-2105) Lubricating Oil, Gear, Multipurpose				
Front Axle Wheel Bearings (M915A2)	As Reqd		See Chart E	
Front Axle Differential (All Except M915A2)	13.5 Qt (12.8 L)		See Chart E	
Rear Axle Differential, Forward-Rear (M915A2)	13 Qt (12.3 L)		See Chart E	
Rear Axle Differential, Rear-Rear (M915A2)	14.5 Qt (13.7 L)		See Chart E	
Rear Axle Differential, Forward-Rear (All Except M915A2)	22 Qt (20.8 L)		See Chart E	

Lubricant/ Component	Refill Capacity	Expected Temperatures*		
		+6°F to +122°F (-14°C to +50°C)	-4°F to +50°F (-20°C to +10°C)	-67°F to +32°F (-55°C to 0°C)
Rear Axle Differential, Rear-Rear (All Except M915A2)	23 Qt (21.8 L)	See Chart E		
Winch Drum (M916A1 & M916A2)	5 Qt (4.7 L)	See Chart E		
GAA (MIL-G-10924) Grease, Automotive and Artillery	As Reqd	All Temperatures		
ANTIFREEZE (MIL-A-46153) Ethylene Glycol, Inhibited, Heavy Duty				
ANTIFREEZE (MIL-A-11755) Ethylene Glycol, Arctic Grade				
Engine Radiator	65 Qt (61.5 L)	See Chart F		
*** For arctic operation, refer to FM 9-207**				

CHART A - ENGINE AND POWER STEERING RESERVOIR

	EXPECTED TEMPERATURE																			
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
Lubricant	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO (MIL-L-2104)	Lubricating Oil, ICE, Tactical																			
OEA (MIL-L-46167)	Lubricating Oil, ICE, Arctic																			
OEIHDO-15/40 (0-1236)																				
OE/HDO-10 * (0-237)																				
OE/HDO-30 (0-238)																				
OE/HDO-40 (N/A)																				
OEA * (0-183)																				

*If OEA lubricant is required to meet the low expected-temperature range, OEA lubricant is to be used in lieu of OE/HDO-10 lubricant for all expected temperatures where OE/HDO-10 is specified.

CHART B - TRANSMISSION

	EXPECTED TEMPERATURE																			
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
Lubricant	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO (MIL-L-2104)	Lubricating Oil, ICE, Tactical																			
OEA (MIL-L-46167)	Lubricating Oil, ICE, Arctic																			
OE/HDO-15/40 (0-1236)																				
OE/HDO-10 * (0-237)																				
OEA * (0-183)																				

*If OEA lubncant is required to meet the low expected-temperature range, OEA lubricant Is to be used in lieu of OE/HDO-15/40 lubncant for all expected temperatures where OE/HDO-10 and OE/HDO-15/40 are specified

CHART C - TRANSFER CASE (ALL EXCEPT M915A2)

Lubricant		EXPECTED TEMPERATURE																		
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO (MIL-L-2104)	Lubricating Oil, ICE, Tactical																			
OEA (MIL-L-46167)	Lubricating Oil, ICE, Arctic																			
OE/HDO-40 (N/A)																				
OEA * (0-183)																				

*If OEA lubricant is required to meet the low expected-temperature range, OEA lubricant isto be used in lieu of OEIHDO-10 lubricant for all expected temperatures where OEIHDO-10 is specified.

CHART D - WINCH RESERVOIR (M916A1 AND M916A2)

Lubricant		EXPECTED TEMPERATURE																		
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO (MIL-L-2104)	Lubricating Oil, ICE, Tactical																			
OEA (MIL-L-46167)	Lubricating Oil, ICE, Arctic																			
OE/HDO-10 * (2- 237)																				
OEA * (0-183)																				

*If OEA lubricant is required to meet the low expected-temperature range, OEA lubricant is to be used In lieu of OEIHDO-10 lubricant for all expected temperatures where OEIHDO-10 is specified

CHART E - FRONT AXLE WHEEL BEARINGS (M915A2),

AXLE DIFFERENTIALS, AND WINCH DRUM (M916A1 AND M916A2)

Lubricant	EXPECTED TEMPERATURE																			
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
GO (MIL-L-2105)	Lubricating Oil, Gear, Multipurpose																			
GO-75 (0-186)																				
GO-80/90 (0-226)																				
GO-85/140 (0-228)																				

CHART F - ANTIFREEZE

Lubricant	EXPECTED TEMPERATURE																			
	°F	-90	-80	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90
	°C	-68	-62	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32
MIL-A-46153	Antifreeze, Ethylene Glycol, Inhibited, Heavy Duty																			
MIL-A-11755	Antifreeze, Arctic Grade																			
MIL-A-46153																				
MIL-A-11755																				

PMCS MANDATORY REPLACEMENT PARTS LIST

NOTE

Refer to TM 9-2320-363-24P for more information on mandatory replacement parts.

Semiannual

Nomenclature	Qty	P/N	NSN
Power steering reservoir, filter element	1	83213D	4330-01-330-8203
Transmission (external), filter element	1	25010335	4330-01-132-4842
Fuel filter, filter elements	2	R90-DDC-01 TP916 (OEM)	2910-01-022-8183
Engine oil, filter element, bypass (M915A2 and M916A1)	1	25011188	2945-01-370-6717
Engine oil, filter element, fullflow	2	25010495	2940-01-197-7106

Annual

Nomenclature	Qty	P/N	NSN
Forward-rear differential, filter element	1	3280-V-8394	2940-00-586-4792
Front axle, oil seal (M915A2)	2	35066	5330-01-149-9677
Front axle, oil seal (all except M915A2)	2	1367260	5330-01-164-8552
Forward-rear axle, oil seal (M915A2)	2	47697	
Forward-rear axle, oil seal (all except M915A2)	2	47697	
Rear-rear axle, oil seal (M915A2)	2	47697	
Rear-rear axle, oil seal (all except M915A2)	2	47690	5330-01-346-3804
Air dryer, canister cartridge kit (M915A2 and M916A1)	1	KAF953	4330-01-332-6058
Air dryer, canister cartridge kit (all except M915A2 and M916A1)	1	R950011	
Hydraulic winch reservoir, filter element (M916A1 and M916A2)	1	74011	4330-01-330-0670
Hydraulic winch reservoir, filter element (M916A1 and M916A2)	1	74001	4330-01-085-6291
Water filter, filter element	1	WF-2077	2910-01-274-1915

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			WARNING **Unless otherwise specified, perform all lubrication and preventive maintenance checks and services with truck on level ground, transmission in N (Neutral), parking brake applied, and engine off. Failure to follow this warning may result In personnel injury.** **NOTE** • **To validate the vehicle's warranty, an initial service must be completed at 5000 miles. All other services will be scheduled from the Initial 5000 mile service.** • **For PMCS and lubrication of M917A1/M917A1 w/MCS Dump Truck Body, refer to TM 5-3805-264-14&P.** • **Performall operator PMCS, as appropriate, while performing road test (TM 9-2320-363-10). Drive at least 5 mi (8 km) to give enough time to detect malfunctions.**	
1	Semi-annual	<u>Road Test</u>, Starter	While starting vehicle, listen for unusual noises and difficult cranking of starter.	
2	Semi-annual	<u>Road Test</u>, Engine and Engine Compartment	a. Listen for unusual noises, hesitation, and varying Idle speed. Observe accelerator response. b. Ensure that engine does not exceed maximum governed speed (2100 rpm). c. Check Instrument panel for proper operation of switches, gages, and Indicator and warning lights (TM 9-2320-363-10).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			NOTE **Refer to TM 9-2320-363-10 for operation of brake components.**	
3	Semi-annual	<u>Road Test</u>, Brakes	a. Test braking response to brake pedal. Response should be immediate. b. At approximately 30 mph (48 kph), apply brake pedal. Vehicle should stop smoothly without noticeable side pull or chatter. c. After stopping vehicle, with transmission in gear, release brake pedal. Wheel brake release should be immediate. d. With vehicle on downgrade and transmission in N (Neutral), set parking brake. Vehicle should not move. e. Start vehicle moving downhill. Engage engine Jake brake and check operation In all switch positions (2, 4, and 6 cylinders braking power). Ensure that vehicle speed drops in each position, with maximum braking power with all 6 cylinders engaged In braking. **WARNING** **Cautiously feel each wheel hub and brakedrum. Wheel hubs and brakedrums may be hot. Failure to follow this warning may result In serious burns.** f. Immediately after road test, carefully check and compare each wheel hub and brakedrum for overheating, which could Indicate a dragging brake. A cool wheel hub and brakedrum could mean Improperly adjusted, defective, or Inoperative brakes.	

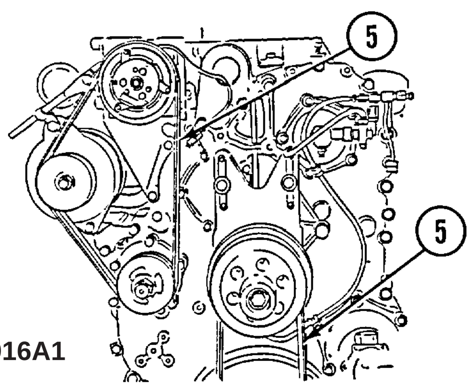
Ta l 2-2 n n Ma n nanc ck and c (M)
M91 a l cl (n)

I N	In al	ca n / I T ck/ c	c d	N ll M n a a l l
	- ann al	R ad T In - a l ck (M91 A2) All-W l (All c M91 A2)	Check operation of interaxle lockout 15A2 or all-wheel drive all except 15A2 T -2320-3 3-10 .	
	- ann al	R ad T n	Check vehicle response to steering wheel action. ehicle should respond quickly. With vehicle on straight level ground, lightly hold steering wheel to check for pull or wander. With vehicle in motion, free play should be no more than 2 in. .4 cm in either direction.	
6	- ann al	R ad T n n	Observe how vehicle responds to road shocks. Shifts, knocks, or constant bouncing indicate possible malfunctions.	
7			Deleted	
8			Deleted	
9	Semi-annual	Engine Compartment, Engine	a. Check all oil lines, fittings and hoses for leaks. b. Check oil filter housing, oil pan and oil pan drain plug for leaks. Tighen or replace any damaged component, if authorized. c. Check rocker arm cover for leaks. Tighten or replace any damaged component, if authorized. d. Check mounting hardware and attaching hardware for looseness. Tighten or replace any damaged component, if authorized.	

Ta l 2-2 n n Ma n nanc ck and c (M)
M91 a l cl (n)

I N	In al	ca n / l T ck/ c	c d	N ll M n a a l l
			WARNING l l la a l N T k n l n nc a k n la T d c ld l n n nn l	
10	- ann al	n n a n l	a. Replace all fuel filter elements page 4-44 . b. Inspect fuel lines, fuel tank, and fuel system components for leaks and damage. If authorized, replace damaged components page 4-38 .	
11	- ann al	n n a n B l and ll	a. Check for loose, missing, worn, broken, frayed, or cracked drive belts 5 .	

A T M91 A2 AN M916A1



			b. Check alternator mounting for looseness. Inspect alternator bracket and attaching hardware for cracks, bends, and loose mounting. Replace damaged components as needed page 4-14 and 4-153.0 . c. Use a belt tension gage placed at the center of the longest belt free-span to check belt tension. age should register 0-80 lb-ft 81-108 N.m for 15A2 and 1 A1. age should register 0-100 lb-ft 122-13 N.m for all other models. Adjust tension as required page 4-154 and 4-155.0 .	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
11 (Cont)	Semi-annual	Engine Compartment, Drive Belts and Pulleys	d. Checked for cracked pulleys or pulleys out of alignment.	
			WARNING **If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**	
12	Semi-annual	Engine Compartment, Air Intake System	a. Check air cleaner, hoses, and air cleaner seal for proper installation, cracks, breaks, or loose connections that could let unfiltered air into air Intake system.	
			b. Check air cooler Intake screen for debris and damage.	
			c. Check air Intake filter element for clogging and wear.	
			NOTE **Refer to TM 750-651 for cooling system service Information.**	
13	Semi-annual	Engine Compartment, Cooling System	a. Remove debris from cooling fins and check for bent fins.	
			b. Inspect radiator and charge air cooler for leaks.	
			c. Check radiator hoses for cracks, bulges, or soft spots. Ensure that hose clamps are tight.	
			d. Check radiator cap, gaskets, and rubber isolator mounts and fan shroud for cracks and leaks.	
			e. Inspect water pump for leaks.	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

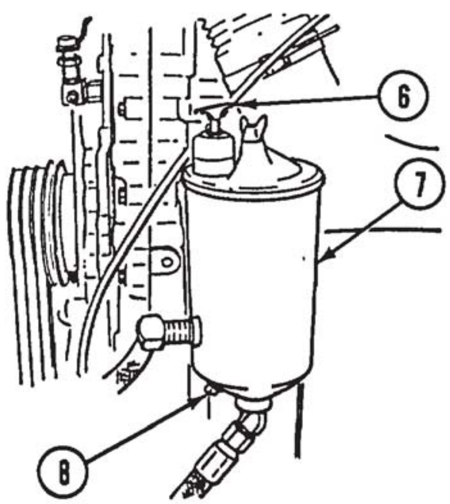
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
14	Semi-annual	<u>Engine Compartment</u>, Power Steering Components	a. Inspect power steering pump and reservoir (7) for leaks, cracks, loose hoses, or other damage. b. Remove plug (8) from reservoir (7) and drain fluid into a suitable container. c. Replace filter element (page 4-616). d. Install plug (8). Fill reservoir (7) through dipstick (6) opening with OEIHDO (Items 16 through 18.1 or 22, Appendix C). Capacity is approximately 2 qt (1.9 l). e. Start engine (TM 9-2320-363-10). Bring to operating temperature. Turn steering wheel in both directions to circulate power steering fluid. f. Check level of fluid on dipstick (6). Add fluid as required until level shows within correct range on dipstick. 	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
15	Semi-annual	Engine Compartment, Electrical Components	a. Inspect wiring for frays, splits, missing insulation, or poor connections. Make repairs as needed and as authorized. b. Check alternator wiring for frays, splits, missing Insulation, and loose terminal connections. Make repairs as needed, If authorized.	
16	Semi-annual	Cab Floor and Engine Compartment Firewall, Foot Brake Valve	Remove foot brake valve from firewall. Lubricate sliding surfaces of plunger and adapter bore with silicone grease (Item 15.1, Appendix C). Reinstall foot brake valve (page 4-572).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			WARNING **To avoid eye Injury, eye protection is required when working around batteries. Do not smoke, use open flame, make sparks, or create other Ignition sources around batteries. If a battery is giving off gases, it can explode and cause Injury to personnel. Remove all jewelry such as I.D. tags, rings, watches, and bracelets. If jewelry contacts battery terminal, a direct short will result in instant heating of tools, damage to equipment, and cause Injury to personnel.** **CAUTION** **To reduce battery damage, do not remove batteries from battery box unless battery compartment is corroded (greenish/white powder) or during battery replacement. Do not jerk or pull on battery cables during visual inspection. Battery replacement will be performed only by Unit Maintenance personnel.**	
17	Semi-annual	Battery Box, Batteries	a. Remove batteries from battery box (page 4-254). b. Check for damaged or missing filler caps. c. Check for damaged terminal posts. d. Check electrolyte level (TM 9-6140-200-14). e. Check and record specific gravity of each cell in all batteries (TM 9-6140-200-14).	b. Filler caps are damaged or missing. c. Terminal posts are damaged. d. Electrolyte is not at proper level. e. Specific gravity Is not within standards.

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
17 (Con't)	**Semi-annual**	**Battery Box, Batteries**	f. Check battery cables for frays, splits, and breaks. g. Clean battery box. h. Install batteries (page 4-254). i. Coat terminals lightly with grease (Item 14, Appendix C). **WARNING** **Exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands or allow body to come in Contact with exhaust pipe and muffler. Exhaust system parts can become hot enough to cause serious burns.**	f. Cables are missing, frayed, split, or broken.
18	**Semi-annual**	**Exhaust System**	a. Inspect exhaust manifold, exhaust pipes, muffler, and tailpipe for leaks. Check for damaged pipes, loose clamps, and damaged gaskets and seals. Replace damaged components as needed (page 4-88). b. Check that raincap operates freely.	
19	**Semi-annual**	**Air System, Brakes (All Models) and Central Tire Inflation System (CTIS) (M917A1/ M917A1 w/MCS)**	a. Fully charge air system (TM 9-2320-363-10). b. Listen for sounds of leaks in all air lines and at valves and fittings. c. With air system fully pressurized, apply a solution of detergent (Item 6.1, Appendix C) and water to air lines, valves, and fittings. Tighten loose connections. Make repairs as needed (pages 4-401 and 4-582). d. Inspect CTIS hoses at wheels for signs of chafing, rubbing, dry rot, punctures, or cuts. Replace hoses as needed (page 4-582).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
19 (Con't)	Semi-annual	**Air System, Brakes (All Models) and Central Tire Inflation System (CTIS) (M917A1/ M917A1 w/MCS)**	e. Ensure that all air lines are not kinked and that they are properly supported.	
20	Semi-annual	**Air Conditioning System, (All Except M915A2 and M916A1)**	Leak test air conditioning system (page 4-878).	
21	Semi-annual	**Under Vehicle, Frame and Crossmembers**	a. Inspect frame and side rails for cracks, breaks, bends, wear, deterioration, and loose bolts. b. Inspect crossmembers for weld breaks, wear, and missing capscrews and rivets.	
22	Semi-annual	**Vehicle Exterior**	a. Inspect for corrosion in accordance with TB 43-0213. b. Inspect cab glass and doors, fenders, stowage boxes, and brackets for damage.	
23			Deleted	
24			Deleted	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
25	Semi-annual	**Front Axle Steering Components, Lubrication**	a. (M915A2). Apply grease (Item 14, Appendix C) to grease fittings (15) at top and bottom of steering knuckle (17) until old lubricant is purged and fresh grease comes out areas indicated by arrows (16). Perform service at both axle ends.	

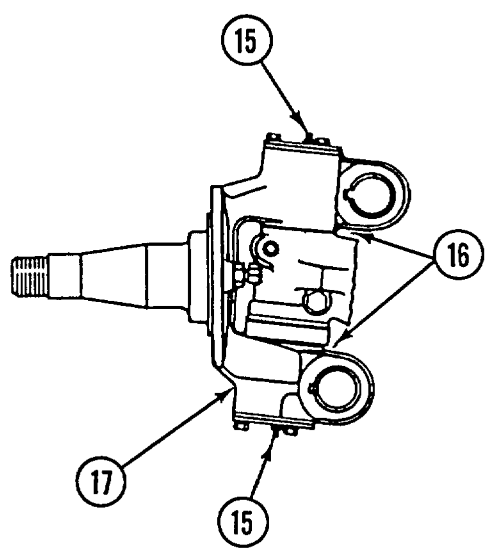
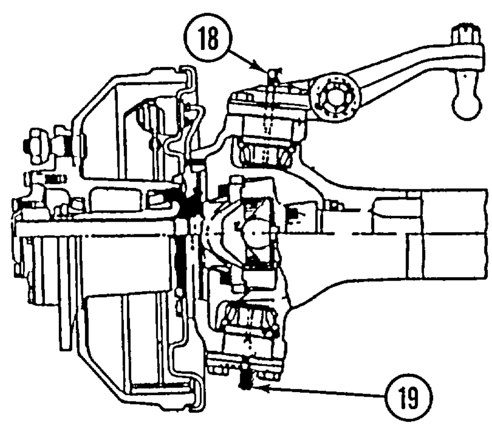
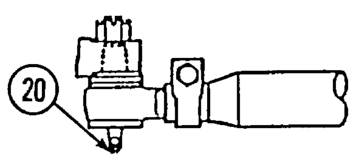


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
25 (Con't)	Semi-annual	Front Axle Steering Components, Lubrication	**CAUTION** **If excess grease accumulates at front axle ball exterior between services, notify Direct Support Maintenance. Ball seal may be worn or leaking.** b. (All except M915A2). Remove bottom plug (19) and lubricate trunnion bearing and universal joint top grease fitting (18) with grease (Item 14, Appendix C). Stop when new grease comes out bottom plug opening. Wipe off excess grease from bearing exterior. Install bottom plug.	



			c. (M915A2). Lubricate two tie-rod end grease fittings (20) with grease (Item 14, Appendix C).	

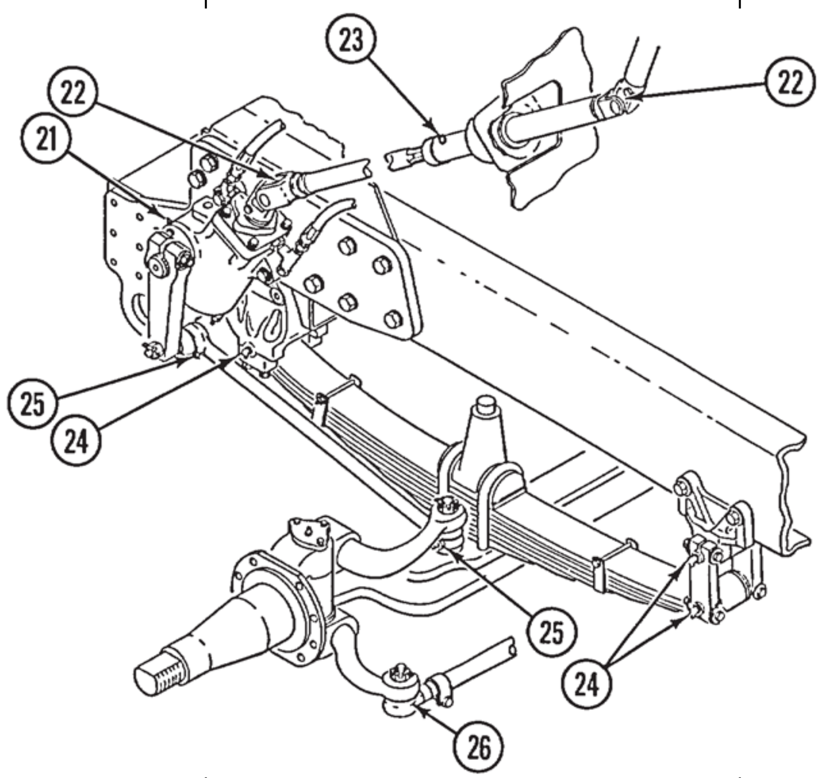


			d. (All except M915A2). Lubricate two tie-rod end grease fittings (26) with grease (Item 14, Appendix C). e. Lubricate two drag link grease fittings (25) with grease (Item 14, Appendix C).	

Page 2-18.9 through 2-18.12 were deleted.

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
25 (Cont)	Semi-annual	Front Axle Steering Components, Lubrication	f. Lubricate steering column fitting (23) and two U-joint grease fittings (22) with grease (Item 14, Appendix C). Observe purging from all seals until new grease comes out. If grease does not purge, manipulate U-joints until purging occurs.	



			CAUTION **Do not use an automatic or power grease gun on fitting on trunnion side of steering gear, because the rate of flow Is too high. High flow rate could force grease Inside high-pressure seal, contaminating hydraulic system and promoting seal leakage.** g. Lubricate grease fitting (21) on trunnion side of steering gear, near output shaft, with grease (Item 14, Appendix C).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

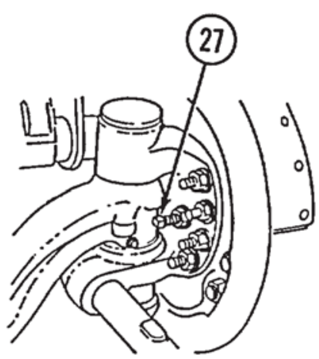
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
26	Semi-annual	Front Axle Steering Components, Inspection	a. Check for looseness in steering column U-joints. b. Check steering gear for leaks and loose mounting bolts and components. Tighten or replace any damaged component, if authorized. c. Check tie-rod and drag link for movement by attempting to move by hand. Visually check ball joint ends for worn or damaged dust seals. If movement or damage is present, make repairs if authorized. d. Inspect all steering lines and fittings for looseness, damage or leaks. Tighten if loose or replace if damaged (page 4-613). e. Check adjustment of front axle steering stops (27). With brakes fully applied, turn steering wheel to one side to end of travel. Check both sides of vehicle for interference at tires and wheels. Minimum clearance is /2 In. (1.3 cm) from any fixed object and 314 in. (1.9 cm) from any moving object. Repeat for opposite end of steering wheel travel. Make adjustments as required (page 4-399). 	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
27	**Semi-annual**	**Front Axle, Suspension**	a. Inspect spring leaves for cracks and breaks. b. Inspect spring clips, saddles, saddle caps, spring hangers, and attaching hardware for looseness, cracks, or other damage. Tighten or replace any damaged component, if authorized. c. Check for loose screws and missing and damaged front axle mounting hardware. **NOTE** **When lubricating front axle suspension components, vehicle must be raised to take weight off suspension to permit lubrication to reach bearing surfaces.** d. Lubricate three spring grease fittings (24) with grease (Item 14, Appendix C).	

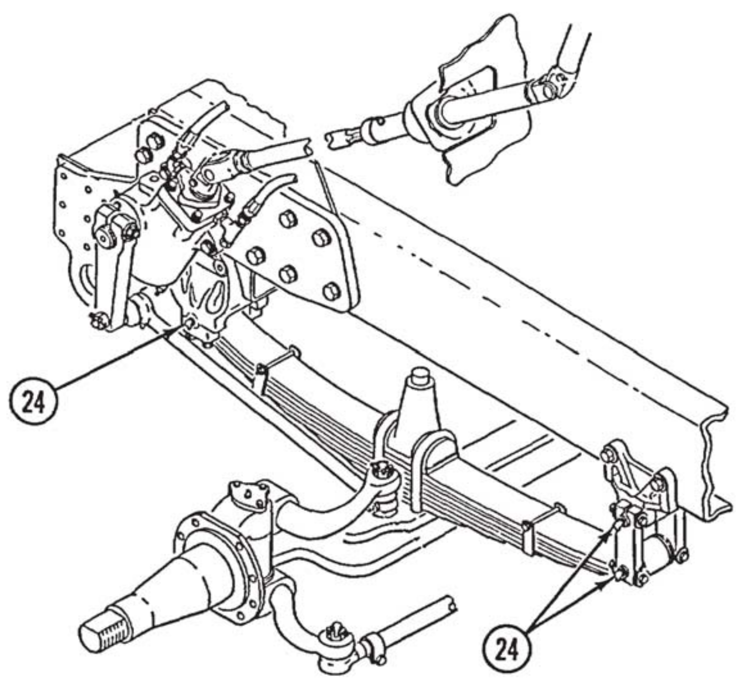


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

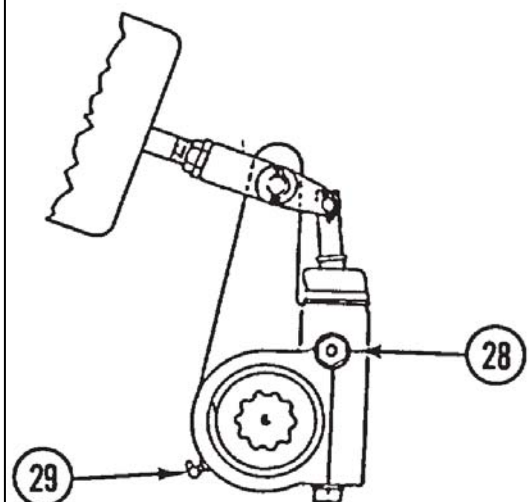
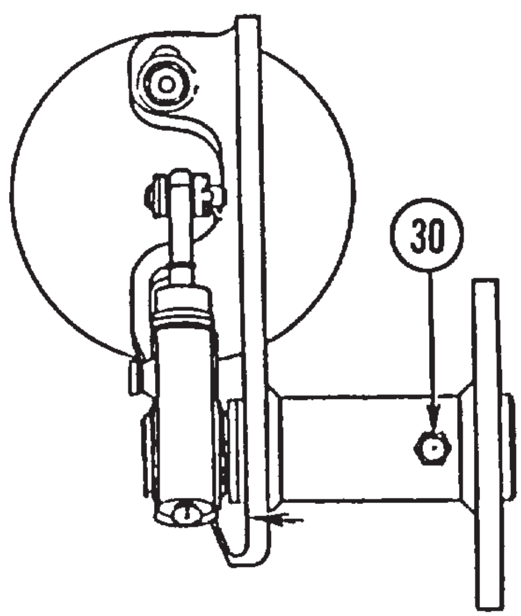
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
28	**Semi-annual**	**<u>Front Axle Brake Components</u>, Slack Adjusters**	Lubricate grease fitting (29) at each slack adjuster with grease (Item 14, Appendix C) until new grease flows from pressure relief valve in pawl capscrew (28).  	
29	**Semi-annual**	**<u>Front Axle Brake Components</u>, Camshaft Bushings**	Lubricate grease fitting (30) at each camshaft bracket with grease (Item 14, Appendix C).  	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
30	Semi-annual	**Front Axle, Differential (All Except M915A2)**	Remove filler plug (31) and check level of fluid in differential. When housing is cold, level should be even with bottom of filler plug opening. As required, add gear lubricating oil (Item 19, 20, or 21, Appendix C).	

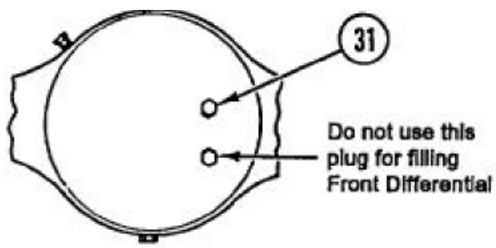


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
32	**Semi-annual**	**<u>Drivelines</u>**	a. Check for looseness or side play in front and rear drivelines. There should be no play at U-Joints. Check for bends, cracks, and missing weights. Make repairs as needed (page 4-385). b. Check that U-Joint mounting screw torque is 33-38 lb-ft (44-52 N.m). c. Inspect for loose or worn bearings, damaged seals, and damaged or missing grease fittings. Make repairs as needed (page 4-385). d. Using a hand-type grease gun, lubricate five grease fittings (36) at each driveline with grease (Item 14, Appendix C) until purging takes place at air hole in the end of the slip yoke. Cover pressure relief hole while lubricating. e. Inspect for damaged or leaking input or output shaft seals (37). If damaged or leaking, notify Direct Support Maintenance.	

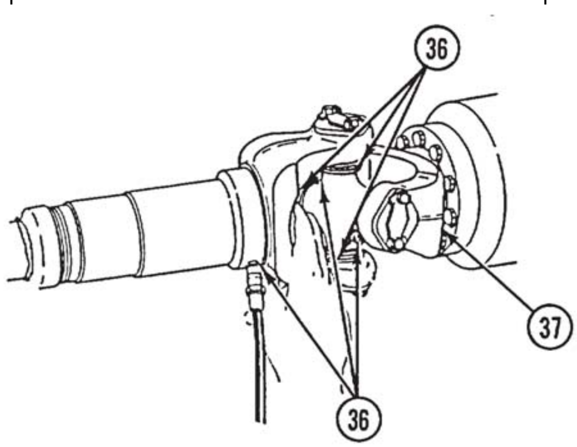


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

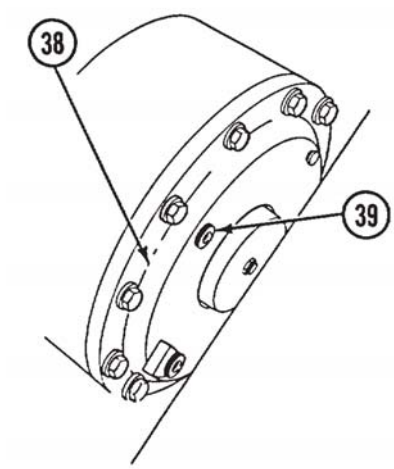
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
33	**Semi-annual**	**Hydraulic Winch, Winch Cable (M916A1 and M916A2)**	Unwind entire length of cable (TM 9-2320-363-10). Soak cable with clean OE/HDO (Item 18.1, Appendix C) and clean with a brush. Wipe off excess oil and coat cable with grease (Item 14, Appendix C) before rewinding on drum.	
34	**Semi-annual**	**Hydraulic Winch, Winch Drum (M916A1 and M916A2)**	a. Remove filler plug (39) and check level of oil in drum (38). Level should be even with bottom of filler plug opening. b. If level is low, fill drum (38) with gear lubricating oil (Item 19, 20, or 21, Appendix C) through filler plug (39) opening. Approximate capacity is 5 qt (4.7 l). Install filler plug. 	
			When lubricating rear axle suspension components, vehicle must be raised to take weight off suspension to permit lubrication to reach bearing surfaces.	
35	**Semi-annual**	**Rear Axles, Suspension**	a. Lubricate spring grease fitting (42) Inside vehicle frame with grease (Item 14, Appendix C). b. (All except M915A2). Lubricate equalizing beam grease fitting (41) with grease (Item 14, Appendix C).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

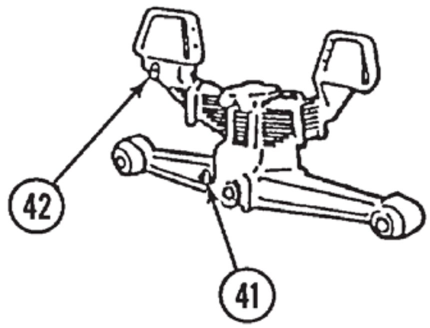
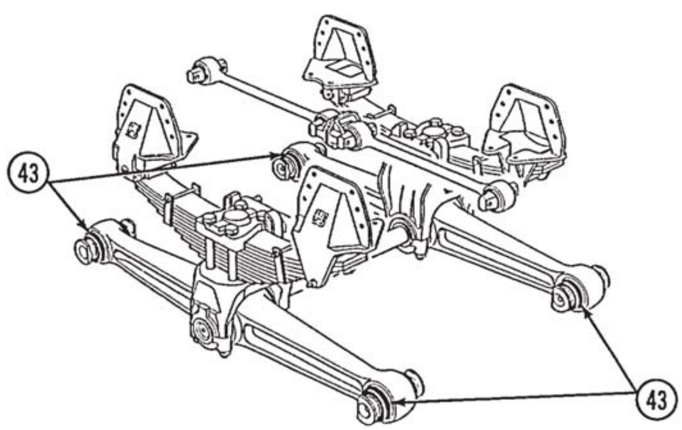
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
35 (Cont)	**Semi-annual**	**Rear Axles, Suspension**	 c. Inspect spring leaves for cracks or breaks. d. Inspect spring clips, saddles, saddle caps, spring hangers, and attaching hardware for looseness, cracks, or other damage. Tighten or replace damaged components if authorized. e. Check equalizing beam rubber bushings (43) for splitting or deterioration. Notify Direct Support Maintenance of any damage found.	
				
36	**Semi-annual**	**Rear Axle Brake Components, Slack Adjusters**	a. (M915A2 andM916A1). Check length of spring brake chamber push rods. Minimum length must be $^{1}/_{2}$ in. (12.7 mm). If not, adjust slack adjusters (page 4-446.1 or 4-448).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

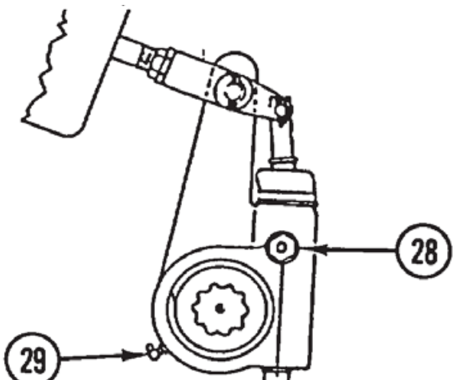
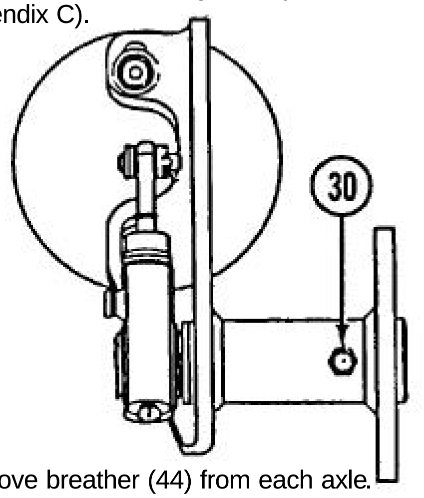
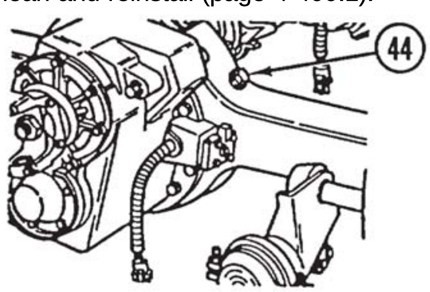
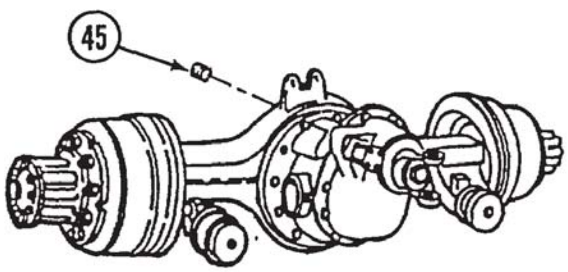
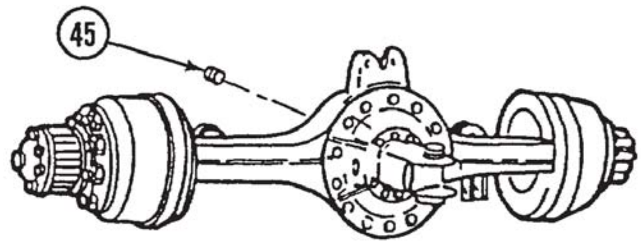
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
36 (Cont)	**Semi-annual**	**<u>Rear Axle</u>** **<u>Brake Compo-nents</u>, Slack Adjusters**	b. Lubricate grease fitting (29) at each slack adjuster with grease (Item 14, Appendix C) until new grease flows from pressure relief valve in pawl capscrew (28).  	
37	**Semi-annual**	**<u>Rear Axle</u>** **<u>Brake Compo-nents</u>, Camshaft Bushings**	Lubricate grease fitting (30) at each camshaft bracket with grease (Item 14, Appendix C).  	
38	**Semi-annual**	**<u>Rear Axles</u>, Breathers**	Remove breather (44) from each axle. Clean and reinstall (page 4-400.1).  	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
39	**Semi-annual**	**<u>Rear Axles</u>, Differentials**	Remove filler plugs (45) and check level of fluid in differentials. When housing is cold, level should be even with bottom of filler plug opening. As required, add gear lubricating (Item 19, 20, or 21, Appendix C). Install filler plugs.	



FORWARD-REAR AXLE



REAR-REAR AXLE

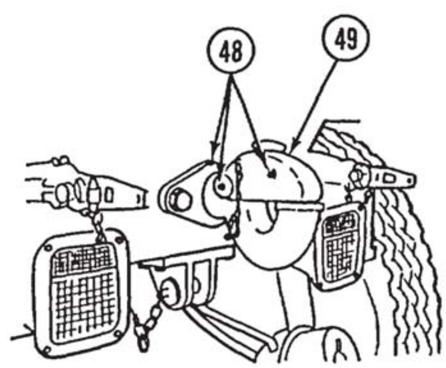
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
40	**Semi-annual**	**<u>Rear of Vehicle</u>, Pintle Hook**	a. Lubricate four pintle hook grease fittings (48) with grease (Item 14, Appendix C). b. Check pintle hook (49) for proper operation. Ensure that mounting hardware is tight. 	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

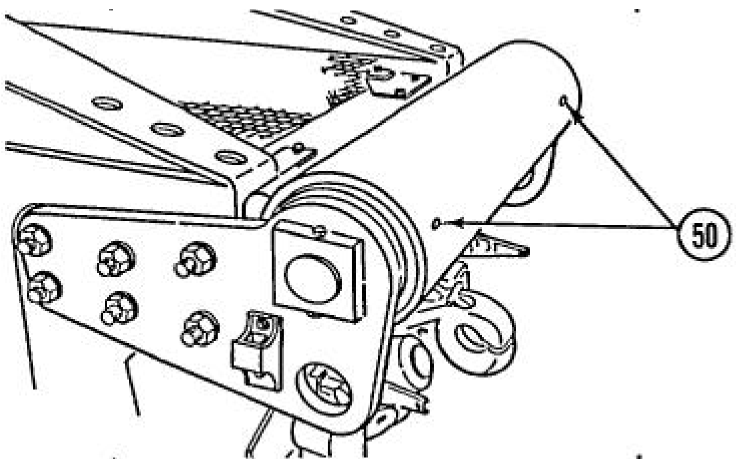
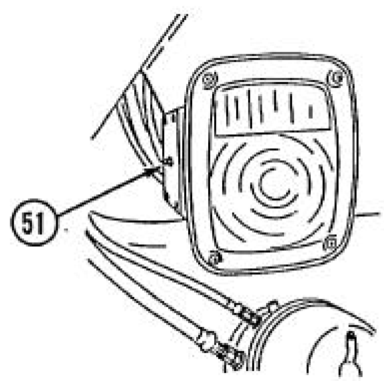
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
41	**Semi-annual**	**<u>Rear of Vehicle</u>, Tail Roller (M916A1 and M916A2)**	Lubricate two tail roller grease fittings (50) with grease (Item 14, Appendix C). Rotate tail roller while lubricating.	
				
42	**Semi-annual**	**<u>Rear of Vehicle</u>, Taillights (M915A2 and M916A1)**	Lubricate taillight grease fitting (51) with grease (Item 14, Appendix C). 	
43	**Semi-annual**	**<u>Cab Compartment</u>, Seats and Seat Belts**	Check seats and seat belts for loose mountings and damage. Replace seat/seat mounts if damaged. Replace seat belts if any seat belt system shows cuts, fraying, extreme wear, abrasions to seat belt webbing or damage to buckle or latch plate retractor hardware.	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Cont).

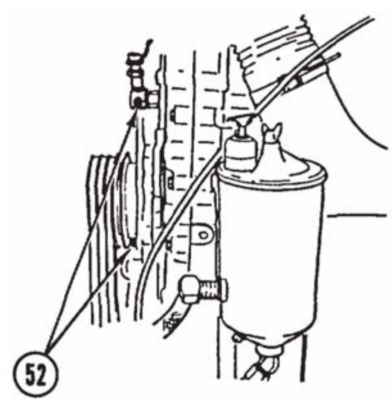
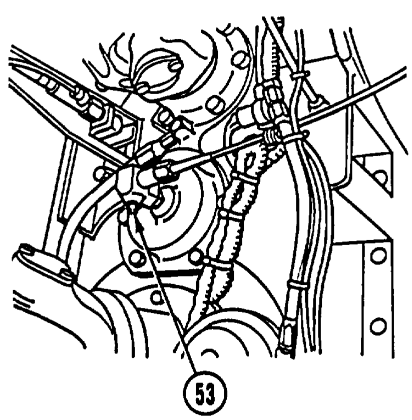
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
44	**Annual**	**<u>Engine Compartment</u>, Tachometer Drive and Fan Hub (M915A2 and M916A1)**	Apply grease (Item 14, Appendix C) to tachometer drive and fan hub grease fittings (52).  	
45	**Annual**	**<u>Engine Compartment</u>, Cooling System**	a. Test, drain, and refill cooling system in accordance with TB 750-651 and page 4-141). Use antifreeze (Item 4 or 4.1, Appendix C). b. Change water filter element (page 4-144). **NOTE** **Location of air dryer(s) differs for different model trucks.**	
46	**Annual**	**Air Dryer(s)**	Service air dryer(s) (page 4-560 or 4-561.0).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

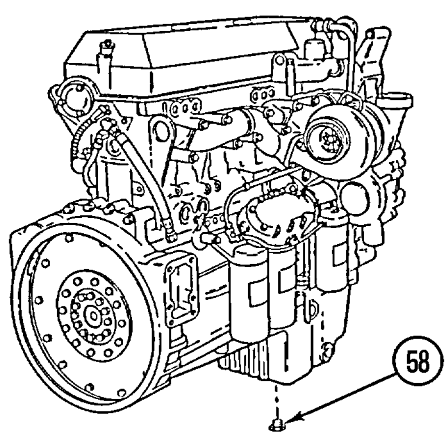
Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
48	Annual	Transfer Case, Speedometer Angle Drive (M916A1)	Apply grease (Item 14, Appendix C) to grease fitting (53).	



Pages 2-18.27 through 2-18.30 were deleted.

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

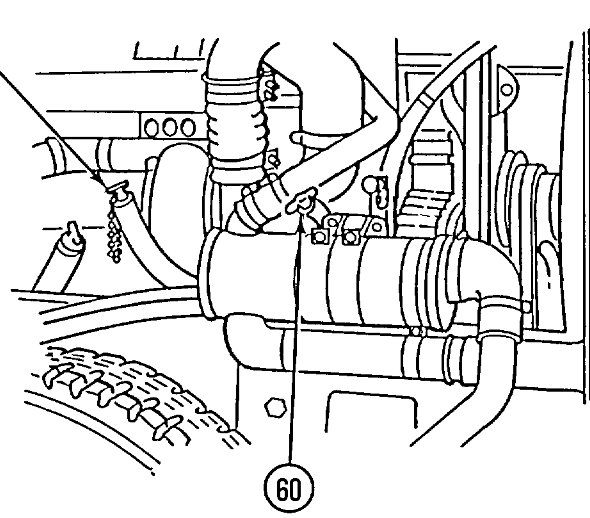
Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
52	**Annual**	**<u>Front and Rear Wheels</u>, Wheel Bearings**	Remove, clean, inspect, pack, install, and adjust wheel bearings (Page 4-582).	
53	**Annual**	**<u>Front and Rear Wheels</u>, Brake-shoe Linings**	Check brakeshoe linings for a minimum thickness of 1/4 in. (6.5 mm). Replace worn or damaged brakeshoes (page 4-401).	
54	**Annual**	**<u>Front Axle</u>, Stop Cushions**	Check front axle stop cushions for wear or deterioration.	
55	**Annual**	**Data Plates**	Check data plates to ensure legibility.	
56	**10,000 Miles or Annual**	**<u>Engine Compartment</u>, Engine Crankcase**	a. With engine warm, remove drain plug (58) from oil pan and completely drain oil from crankcase. b. Replace all oil filters (page 4-2). c. Install drain drug (58).	



			d. Fill crankcase with OE/HDO or OEA (Item 16 through 18.1 or 22, Appendix C) through filler tube (59) opening. Capacity with filters is approximately 41 qt (38.8 l).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
56 (Con't)	10,000 Miles or Annual	**Engine Compartment**, Engine Crankcase	e. Run engine. Remove dipstick (60) and check level of oil on dipstick. Level should be between ADD and FULL marks on dipstick.	



Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
57	10,000 Miles or Annual	Transmission	a. With transmission warm, remove drain plug (61) from oil pan and completely drain oil. Install drain plug.	

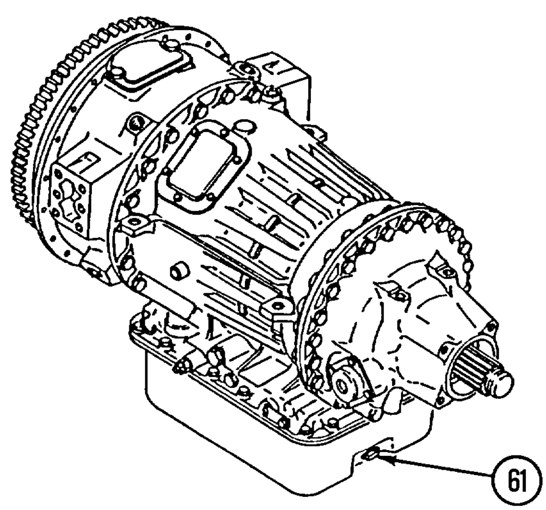
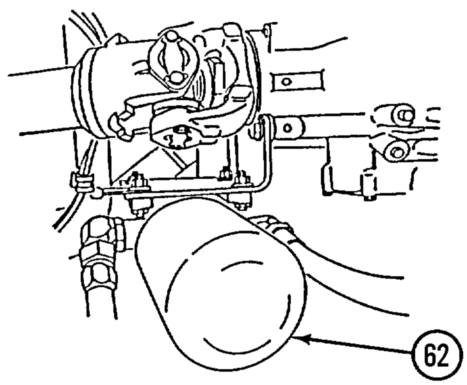


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
57 (Con't)	10,000 Miles or Annual	Transmission	b. Replace transmission external filter element (62) (page 4-346).	



Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
			c. Fill transmission with OE/HDO or OEA (Item 16, 18, or 22, Appendix C) through fill tube (64) opening. Capacity is approximately 33 qt (31.2 l).	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location / Item To Check/ Service	Procedure	Not Fully Mission Capable If:
57 (Con't)	10,000 Miles or Annual	Transmission	d. Run engine and check level of oil on dipstick (63): (1) When transmission registers 60°F-120°F (16°C-49°C), level on dipstick (63) should be in COLD RUN band. Add oil as required. (2) When transmission reaches 160°F-200°F (71°C-93°C), level on dipstick (63) should be in **HOT RUN** band. If it registers on or below the bottom line of **HOT RUN** band, add oil to bring level to middle of band. Approximately 1 qt (0.95 l) of oil is needed to move oil level from bottom to middle line on **HOT RUN** band.	

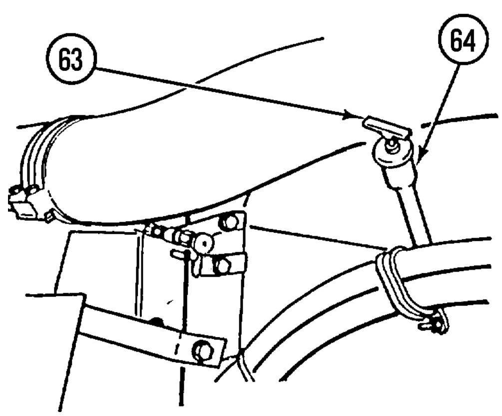
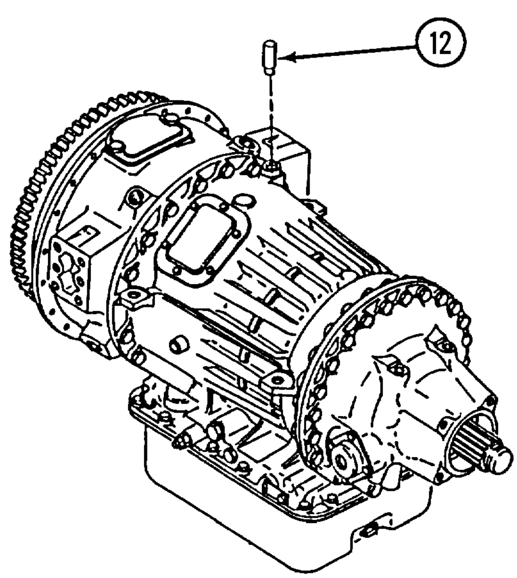


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
57 (Con't)	10,000 Miles or Annual	Transmission	**WARNING** **Dry cleaning solvent, P-D-680, is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and seek medical attention.** e. Remove breather (12) from transmission. Clean in dry cleaning solvent and allow to air dry. Install breather in transmission (page 4-366).	



			f. Check transmission for leaks, loose bolts, and obvious damage.	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
57 (Con't)	**10,000 Miles or Annual**	**Transmission**	g. Check output shaft seal for damage and leaks. h. Check transmission shift cable for kinks, wear, or damage. **NOTE** **When lubricating front axle steering components, vehicle must be raised to take weight off the suspension to permit lubrication to reach all axle bearing surfaces.**	
58	**10,000 Miles or Annual**	**<u>Transfer Case</u>, (All Except M915A2)**	a. With transfer case warm, remove drain plug (66) and filler plug (65) and drain fluid into a suitable container. Install drain plug. Add OE/HDO or OEA (Item 17 or 22, Appendix C) until level is even with bottom of filler plug opening. Capacity is approximately 5 qt (4.7 l).	

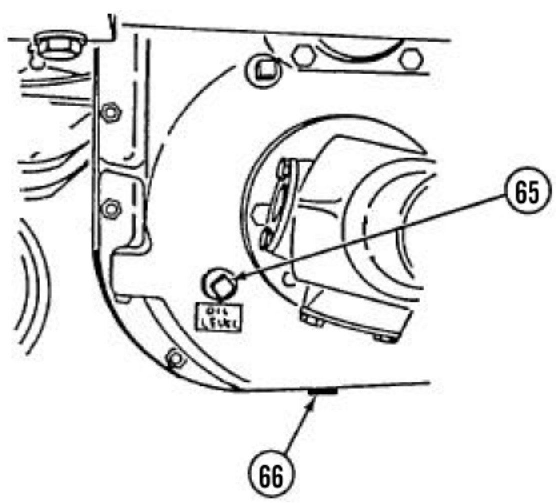
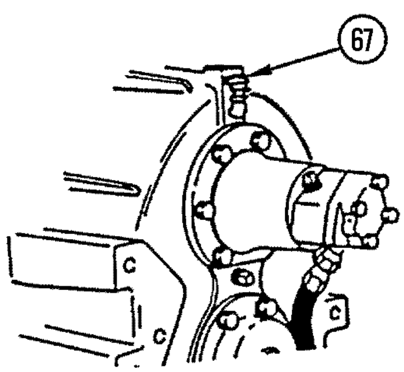


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

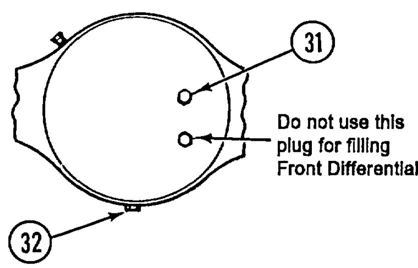
Item No.	Interval	Location / Item To Check/ Service	Procedure	Not Fully Mission Capable If:
58 (Con't)	10,000 Miles or Annual	Transfer Case, (All Except M915A2)	**WARNING** **Dry cleaning solvent, P-D-680, is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and seek medical attention.** b. Remove breather (67) from transfer case. Clean with dry cleaning solvent (Item 25, Appendix C) and allow to air dry. Install breather in transfer case (page 4-384).	



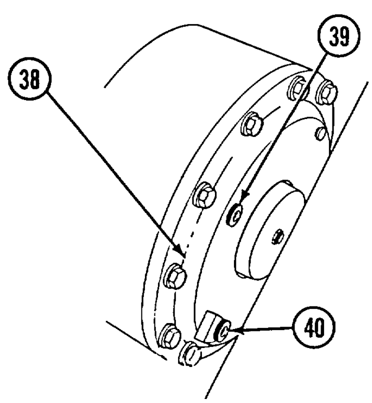
			c. Inspect transfer case for loose or damaged bolts. Tighten any loose bolts. Check for signs of leakage from oil seals. Notify Direct Support Maintenance if damage or leaks are found.	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location / Item To Check/ Service	Procedure	Not Fully Mission Capable If:
59	10,000 Miles or Annual	Front Axle, Differential (All Except M915A2)	a. Remove plug (32) and drain fluid while assembly is still warm from operation. Check magnetic drain plug for excessive metal particle buildup. Notify Direct Support Maintenance if this condition exists. Clean plug. b. Install plug (32) and fill differential with gear lubricating oil (Item 19, 20, or 21, Appendix C) until level is even with filler plug (31) opening. Capacity is approximately 13.5 qt (12.8 l). Do not overfill.	



Item No.	Interval	Location / Item To Check/ Service	Procedure	Not Fully Mission Capable If:
60	10,000 Miles or Annual	Hydraulic Winch, Reservoir and Drum (M916A1 and M916A2)	a. Remove drain plug (68) from winch reservoir. Remove drain plug (40) from drum (38). Drain fluids into a suitable container.	



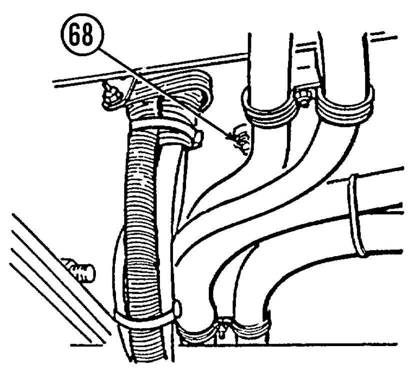
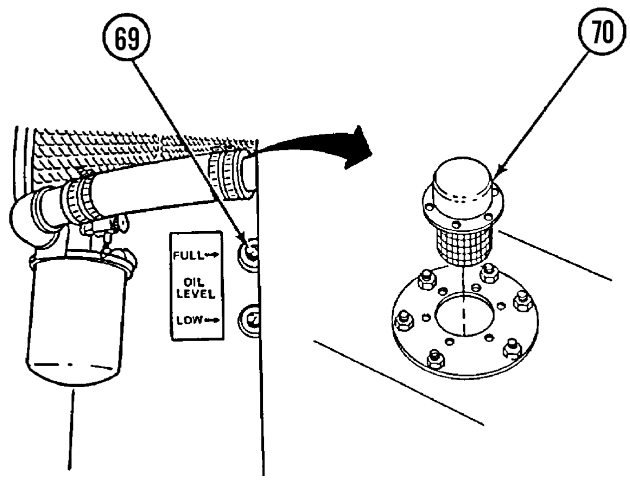


Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

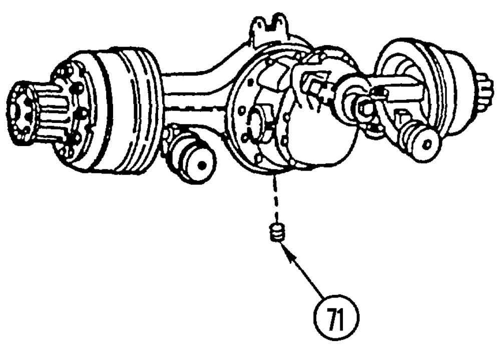
Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
60 (Con't)	10,000 Miles or Annual	Hydraulic Winch, Reservoir and Drum (M916A1 and M916A2)	b. Remove filler cap (70) from reservoir. Clean filler cap strainer (page 4-762).	



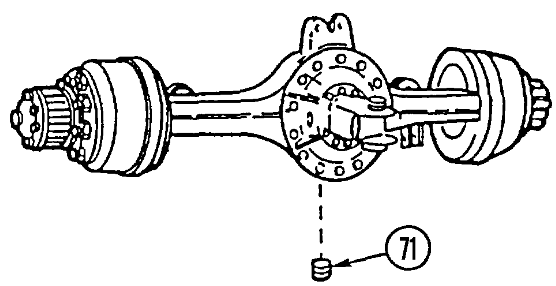
Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
			c. Replace reservoir oil filter element (page 4-766). d. Replace filter element inside reservoir (page 4-762). e. Install drain plug (68) in winch reservoir. Install drain plug (40) in drum (38). f. Fill reservoir with OE/HDO or OEA (Item 16 or 22, Appendix C) through filler cap (70) opening until level is visible in top sight indicator (69). Approximate capacity is 42 gal (159 l). Install filler cap. g. Fill drum (38) with gear lubricating oil (Item 19, 20, or 21, Appendix C) through filler plug (39) opening. Approximate capacity is 5 qt (4.7 l). Level should be even with bottom of filler plug opening. Install filler plug.	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
61	10,000 Miles or Annual	<u>Rear Axles</u>, Differentials	a. Remove plugs (71) and drain fluid while assemblies are still warm from operation. Check magnetic drain plugs for excessive metal particle buildup. Notify Direct Support Maintenance if this condition exists. Clean plugs.	



FORWARD-REAR AXLE

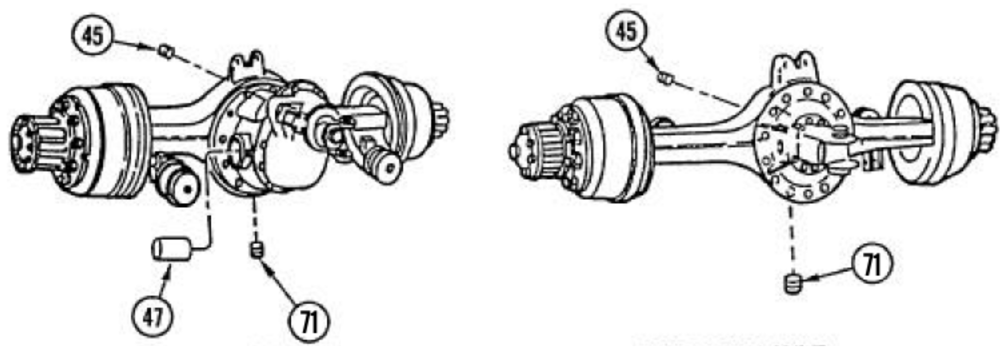


REAR-REAR AXLE

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
			NOTE **There may be approximately 1 pt (0.47 l) of lubricant remaining in filter element. Be careful not to spill it when removing element.** b. Use a suitable filter strap wrench to replace filter element (47) from forward-rear axle differential. c. Install plugs (46) and fill differentials with gear lubricating oil (Item 19, 20, or 21, Appendix C) until level is even with filler plug (45) openings. Use the following capacities as a guide. Do not overfill:	

Table 2-2. Unit Preventive Maintenance Checks and Services (PMCS) for the M915 Family of Vehicles (Con't).

Item No.	Interval	Location Item To Check/ Service	Procedure	Not Fully Mission Capable If:
61 (Con't)	10,000 Miles or Annual	<u>Rear Axles</u>, Differentials		



FORWARD-REAR AXLE

REAR-REAR AXLE

			<u>M915A2 Rear Tandem</u> Forward-Rear 13 qt (12.3 l) Rear-Rear 14.5 qt (13.7 l) **<u>All Except M915A2 Rear Tandem</u>** Forward-Rear 22 qt (20.8 l) Rear-Rear 23 qt (21.8 l)	

Section IV. PAINTING AND RESTENCILING MARKINGS

GENERAL

Complete painting of the vehicle is authorized for and done by direct support maintenance or higher. Spot painting and restenciling vehicle markings are done by unit maintenance. Instructions for material preparation and painting are given in TM 43-0139, Painting Instructions for Field Use.

VEHICLE INTERIOR

Prepare surface in accordance with TM 43-0139 and MIL-STD-193. Coat surface with color white, specification MIL-C-22750.

VEHICLE EXTERIOR

Prepare surface in accordance with TM 43-0139 and MIL-STD-193. Coat surface with color forest green, black, or brown, specification MIL-C-46168.

NONSKID AREAS

Deck covering compound, non-slip, type Ill, MIL-D-23003 will be used to coat deck areas where personnel walk.

RESTENCILING MARKINGS

All stenciled markings on the M915 family of vehicles are black. Use paint conforming to specifications MIL-C-46168.

Section V. GENERAL REPAIR AND CLEANING METHODS

OVERVIEW

This section describes general maintenance instructions that apply to all parts of this manual. To avoid repetition, these procedures will not be described in specific maintenance sections.

GENERAL REMOVAL INSTRUCTIONS

1. Work Required. Remove only those parts needing repair or replacement. Do not disassemble a component any further than needed.

2. Preparation. Before removing any part of the electrical, hydraulic, or air systems, make certain system is not energized or pressurized. Disconnect battery cables. Relieve all pressure from air system. Make sure brakes are locked and that all controls are in OFF position before starting any removal procedure.

3. Removal. Make sure there is enough clearance to remove part. Disassemble adjacent parts as needed to provide working clearance.

4. Lifting. Always use chain hoist, jack, or other aid when lifting heavy parts. Make certain load limit of lifting device exceeds weight being lifted. Position and rig lifting device before disconnecting part for removal.

5. Identification. Tag or mark all similar parts, such as electrical leads, before disconnecting and removing such parts. This will make proper assembly easier. Be sure to identify mating ends of electric lines, hydraulic lines, and air tubes as they are disconnected.

6. Position of Valves. Before removing valve handles, mark or diagram their positions when open and closed. This will help during assembly.

GENERAL DISASSEMBLY INSTRUCTIONS

1. Cleanliness. Work area must be kept as clean as possible. This will prevent injury or contamination of internal parts. This is especially true for valves, cylinders, and other hydraulic or air system parts.

2. Expendable Parts. As indicated in this manual, all gaskets, packings, and seals removed during repair must be discarded and replaced with new parts. These items are usually damaged during removal. In the same way, all lockwire, cotter pins, and like items must be replaced at time of assembly.

3. Removing Seals. When removing gaskets, packings, or seals, do not use any metal tool that will scratch the surfaces next to these Items.

4. Disassembly. Before disassembly of any item, study the Illustration carefully. Note relationship of internal parts. Knowing details of a component will speed up disassembly and assembly and will help avoid mistakes.

5. Parts Protection. To prevent moisture and dirt from entering open housings, lines, and other openings, apply protective caps and plugs as soon as possible after disassembly. Wrap all removed parts in clean paper or dip parts In preservative oil.

GENERAL CLEANING INSTRUCTIONS

WARNING

- Cleaning solvents may be toxic to skin, eyes, and respiratory tract. Skin and eye protection are required. Avoid repeated or prolonged contact. Good general ventilation is normally adequate. Failure to heed this warning could result in serious injury to personnel.
- Never use gasoline to clean parts. Gasoline is highly flammable. Serious personal injury could result if fuel ignites during cleaning.

CAUTION

- Petroleum solvents may damage parts that are in contact with hydraulic fluids.
- To prevent damage to equipment, do not clean tires, lubricant seals, rubber hoses, or electrical components with solvent mixture.

1. Cleaning Solvents. Use only approved cleaning solvents to clean parts. Drycleaning solvent SD-2 is commonly used. Always work in a well-ventilated area.

WARNING

Compressed air used for cleaning and drying purposes shall not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.). Failure to do so could result in serious injury to personnel.

2. Removing Deposits. After soaking parts in solvent, wash away deposits by flushing or spraying. Where necessary, brush with a soft-bristle brush moistened in solvent. Use compressed air to dry all parts, except bearings. Bearings must be allowed to air dry.
3. Tools. Do not use abrasive wheels, or compounds in cleaning parts, unless called for in detailed instructions. These procedures may weaken a highly stressed part.
4. Ball and Roller Bearings. When cleaning ball or roller bearings, place them in a basket and suspend them in a container of drycleaning solvent. If needed, use a brush to remove bearing before solid particles are removed to prevent damaging races and balls. When bearings have been cleaned, coat them lightly with lubricating oil to remove solvent. Refer to TM 9-214 for additional instructions on cleaning bearings.
5. Rubber Parts. Do not clean O-rings or other rubber parts in drycleaning solvent. Clean by washing with a mild solution of soap and water. Wipe with a clean, dry, lint-free cloth.

GENERAL CLEANING INSTRUCTIONS (CONT)

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection are required.

6. Exterior Parts. Steam clean all exterior parts thoroughly before removing. This will make inspection and disassembly easier.

WARNING

Solvents used with spray gun must be used in spray booth with filter. Face shield must be used by personnel operating spray gun. Failure to do so could result in serious injury to personnel.

7. Engine, Cab, and Body. Use a spray gun and solvent mixture for cleaning exterior of engine, cab, and body. Allow mixture to remain on item surface for about 10 minutes before rinsing. Rinse with hot water under 80-120 pounds of pressure, if available. An ordinary garden hose with nozzle may be used if other equipment is not available. Rinse thoroughly.

8. Degreasing Machine. A degreasing machine may be used to remove heavy grease and oil accumulations from metal parts.

9. Passages. After removing parts from degreasing machine, and before coating with rust preventive, check all oil passages and cavities for dirt or blockage. A thin, flexible wire should be run through oil passages to make certain they are not clogged. Individual passages that are dirty may be cleared using a pressure spray gun and drycleaning solvent.

CAUTION

To prevent corrosion, parts should be dipped in rust preventive compound within 2 hours after degreasing.

10. Electrical Parts. Electrical parts, such as coils, junction blocks, switches, and igniters, which use insulating materials, should not be soaked or sprayed with cleaning solutions. Clean these parts with a clean, lint-free cloth moistened with drycleaning solvent.

11. Electrical Grounds. Clean electrical ground contacts with crocus cloth.

12. Oil and Fuel Tank. Pay special attention to all warnings and cautions when working on vehicle's fuel tank. Oil tanks and fuel tanks should be flushed, using a spray gun and drycleaning solvent.

13. Battery. Exterior surfaces of the electrical system and battery should be cleaned with a weak solution of baking soda and water. Apply solution with a bristle brush to remove any corrosion.

> **CAUTION**
>
> To prevent damage to equipment, never use gasoline or other petroleum-base products to clean or preserve hydraulic system parts.

14. Hydraulic System. When cleaning hydraulic system parts, use drycleaning solvent SD-2. Clean and dry parts thoroughly to make sure no residue remains. If a coating of preservative is required before assembly, apply a light film of preservative oil. If petroleum-free solvents are not available, use the same hydraulic fluid as used in the hydraulic system.

GENERAL INSPECTION INSTRUCTIONS

1. Sealing Surfaces. Inspect all surfaces in contact with gaskets, packings, or seals. Make sure there are no nicks, burrs, or scratches. If any defect is found, remove or repair it as outlined under General Repair Instructions in this manual.

2. Bearings. Check bearings for rusted or pitted balls, races, or separators. Check balls and races for brinnelling, abrasion, and serious discoloration. Refer to TM 9-214 for additional instructions for bearings. Following are causes for bearing rejection:
   - Cuts or grooves parallel to ball or roller rotation.
   - Fatigue pits (not minor machine marks or scratches).
   - Cracks.

3. Inspection. Inspection consists of checking for defects such as distortion, wear, cracks, and pitting. Parts under heavy load or pressure must be inspected more thoroughly. Clean all parts before inspection.

4. Drain Plugs. When removing drain plugs from transmission, engine, or hydraulic system components, inspect sediment adhering to plug. A buildup of grit and/or fine metal particles may indicate part failure. A few fine particles are normal. This inspection is effective in determining defective parts prior to internal inspection of parts.

5. Gears. Gear inspection cannot be described in detail here; there are too many differences in size and shape of gears. The following steps can be used to make a general visual inspection of all gears. Follow all steps listed in General Repair Instructions for final inspection.
   - Normal Wear. Loss of metal from the surface of gear teeth. Wear must not prevent gears from meshing or performing properly.
   - Initial Pitting. This may occur when a pair of gears is first started in service. It may continue until most high spots have been reduced, as long as contact surfaces are not affected. This pitting is not necessarily serious.
   - Destructive Pitting. This type of pitting occurs after initial pitting, often at an increasing rate. This will destroy contact area and reduce the gear's ability to carry a load. Rapid destruction will occur with use.
   - Abrasive Wear. This damage is caused by the fine particles that may come from many sources: metal detached from gear teeth or bearings, abrasives not completely removed before assembly, sand or scale from castings, or other impurities in oil or air.

GENERAL INSPECTION INSTRUCTIONS (CONT)

- Scoring. Slight scoring, scuffing, galling, or other surface damage is identified by tears or scratches in the direction of sliding. It starts in areas having the highest stress and speed. This is usually at the tip of the teeth.
- Burning. Burning is indicated by discoloration and loss of hardness due to excessive temperature. This is caused by too much friction resulting from overload, overspeed, lack of backlash, or faulty lubrication. If discoloring can be wiped off with clean cloth, such discoloring usually can be traced to oilburn-trains, which are not serious.
- Rolling. This damage occurs mainly on plastic gears. Rolling is when material is pushed out of shape without breaking off. This is caused by heavy, even loads; sliding; or overheating.
- Brinelling. This can be identified by tiny indentations or ridges on the shoulder or race of a bearing.

6. Splines. Inspect shaft splines for wear, pitting, rolling, peening, and fatigue cracks. In many cases, the same inspection procedure will apply to gears. However, the problem, if present, will often be much less pronounced. Have a magnetic particle inspection performed on splines, if needed.

7. Tubes, Hoses, Fittings, and Connections. Check all hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or rubbing against other parts of the truck. Inspect air tubes for kinks. Inspect the fitting threads for damage. Replace any part found defective. Following assembly and during initial operation, check for leaking fittings and connections by coating fittings and connections with soap solution. No leakage is permissible.

8. Electrical Parts. Inspect all wiring harnesses for chafed or burned insulation. Inspect all terminal connectors for loose connections and broken parts.

9. Metal Parts. Visually inspect all castings and weldments for cracks. Parts that carry a great load should receive magnetic particle inspection. Critical nonferrous parts may be inspected with fluorescent penetrant.

10. Brake Drums. Check surfaces of brake drums for cracks or badly scored finish and for glossy or heat spots. Check brake drums for external or mating surface cracks and for balancing weight.

GENERAL REPAIR INSTRUCTIONS

WARNING

Drilling and grinding operations are hazardous to the eyes. Eye protection is required to help prevent injury to personnel.

1. Burrs. Remove burrs from gear teeth with a fine-cut file or hand grinder. Remove burrs on closely fitted mating surfaces by lapping the surfaces with abrasive grade compound.

2. Exterior Parts. Chassis and exterior painted parts may be resurfaced where paint is damaged, or where parts have been repaired, by using an abrasive disc driven by a flexible shaft. Paint metal surfaces as required per TM-9-2320-363-10.

3. Bearings. Remove residue and oil stain from bearing races with crocus cloth.

NOTE

The following procedure is used with polished and machined steel parts not protected by cadmium, tin, copper, or other plating or surface treatment. Bare metal surfaces must be free of moisture when protective coating is applied.

4. Protective Parts. During repair operations, protect bare steel surfaces from rusting when not actually undergoing repair work. Dip parts in, or spray them with, corrosion preventive compound. The same protective coating may be applied to other metals to prevent rust. Aluminum parts may require protection in atmospheres having a high salt content. Steel parts must always be protected.

CAUTION

Before welding, the following components must be disconnected: DDEC ECU, ABS ECU, CTIS ECU, DATALOGGER, and batteries (TM 9-2320-363-20-2). If welding on a trailer, it must be uncoupled from tractor/dump truck. Failure to follow this caution may damage electronic components.

5. Welding. Welding and brazing may be used to repair cracks in external steel parts, such as brackets, panels, and light framework. These repairs should be made only when replacement parts are not available. Do not weld or braze castings, running parts, or parts under great stress, except in emergencies. When welding is required, refer to TM 9-237.

6. Stud Installation. When installing studs in engine block and axle housings, use a driver designed for the stud to be installed. A worn stud driver may damage the end thread. This makes it necessary to use a chasing die before a nut can be screwed on. This procedure will remove cadmium plating and allow corrosion, which will make future disassembly difficult and cause stud to be backed out with nut. Before driving a stud, inspect hole for chips and liquid. Blow out any foreign matter. Start stud by hand. If it will not start into hole, it is too large or has defective end thread. Before final insertion, coat thread with antiseize compound; turn stud in slowly to prevent overheating and galling of casting metal.

7. Electrical Parts. Replace all broken, worn, or burned electrical wiring. Wires with several broken strands must be replaced. Broken strands will increase the resistance of the wire and impair efficiency of electrical components, especially the ignition system. When soldering is required, refer to TB SIG 222.

8. Hoses. Replace all broken, frayed, crimped, or soft flexible lines and hoses. Replace stripped or damaged fittings. Replace entire flexible hose if fittings are damaged. Make sure hose clamps do not crimp hoses.

9. Fasteners. Replace any bolt, screw, nut, or fitting with damaged threads. Inspect tapped holes for thread damage. If cross-threading or galling Is evident, retap the holes for the next oversize screw or stud. When retapping will weaken the part, or when the cost of the part makes retapping impractical, replace the damaged part. Chasing threads with the proper size tap or die may often be enough.

10. Dents. Straighten minor body dents by bumping with a soft-faced hammer while using a wooden block backing.

11. Sheet Metal Repair. Repair minor skin cracks by installing patches.

12. Mounting Holes. Reshape oval mounting holes to round. Drill to receive bushing with required Inner diameter. Stake bushing in place with center punch.

GENERAL ASSEMBLY INSTRUCTIONS

1. Preparation. Remove grease from new parts before Installation.

GENERAL ASSEMBLY INSTRUCTIONS (CONT)

2. Packing Installation. Lubricate all packings with a thin coating of light mineral oil before installation. Slightly stretch packing and place into position. Rotate component on flat surface or uniformly press the packing into position.

3. Pipe Joints. Use nonhardening pipe-joint compound or thread sealing tape when joining piping.

4. Gaskets. To provide added sealing for gasket, coat both sides with sealant. Remove all traces of previous gasket and sealant before installing new gasket.

5. Silicone Sealant.

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. Avoid prolonged contact with skin. Failure to do so could result in serious injury to personnel.

Silicone sealant is often used instead of a gasket to seal mating parts. Mating parts must be clean, dry, and free of oil or grease for proper adhesion. After silicone sealant has been applied, mating parts must be assembled within 15 minutes. Silicone sealant starts to set up in 15 minutes and takes 24 hours to completely cure. Excess silicone sealant should be wiped off after assembling mating parts.

6. Oil Seals. Install oil seals with seal lip facing toward lubricant, applying an even force to outer edge of seal. Coat oil seals evenly with grease before installing. If oil seals will be installed over keyed or splined shafts, use a guide. This will prevent sharp edge of keyway or splines from cutting the leather or neoprene seal. Construct guides of very thin-gage sheet metal and shape to required diameter. However, make certain guide edges are not sharp. Bend them slightly inward so they do not cut the seal.

7. Seal Rings. Coat seal rings with oil and carefully install into their bores. If seal rings must be installed over threaded parts, temporarily wrap the threads with tape to protect the seal ring; then remove the tape.

8. Bearings and Shafts. During assembly of shafts and bearings in housings, first mount bearing on shaft, then install the assembly by applying force to shaft. When mounting bearings on shafts, always apply force to the inner races of the bearing.

9. Bearing Lubrication. Lubricate bearings before reassembly with the type of lubricant normally used in the related housing or container. This will provide lubrication during the first run-in until lubricant from the system can reach the bearings.

GENERAL INSTALLATION INSTRUCTIONS

1. Preparation. Before installing any parts, make sure they are clean and that both mounting surfaces are clean and free of oil and grease (unless otherwise noted).

2. Installation. Make sure there is enough clearance to install part. Disassemble adjacent parts as needed to provide working clearance.

3. Lifting Always use chain hoist, jack, or other aid when lifting heavy parts. Make certain load limit of lifting device exceeds weight being lifted. Position and rig lifting device before connecting part for installation.

GENERAL LUBRICATION INSTRUCTIONS

Keep light coat of lubricating oil (PL-medium or PL-special) on parts during repair procedures to prevent rusting. Lubricate parts during the repair and assembly as required by TM 9-2320-363-10 and Unit PMCS.

GENERAL TORQUE VALUE INSTRUCTIONS

Use the torque values listed in the maintenance procedures, if they are given. When no torque values are given in the maintenance procedures, refer to the torque value guide in Appendix E.

PREPARATION FOR MAINTENANCE

Some maintenance tasks are necessary to prepare the vehicles for many of the maintenance procedures in Chapter 4. These tasks are required for personnel safety and for ease of maintenance. These preparation steps are described below.

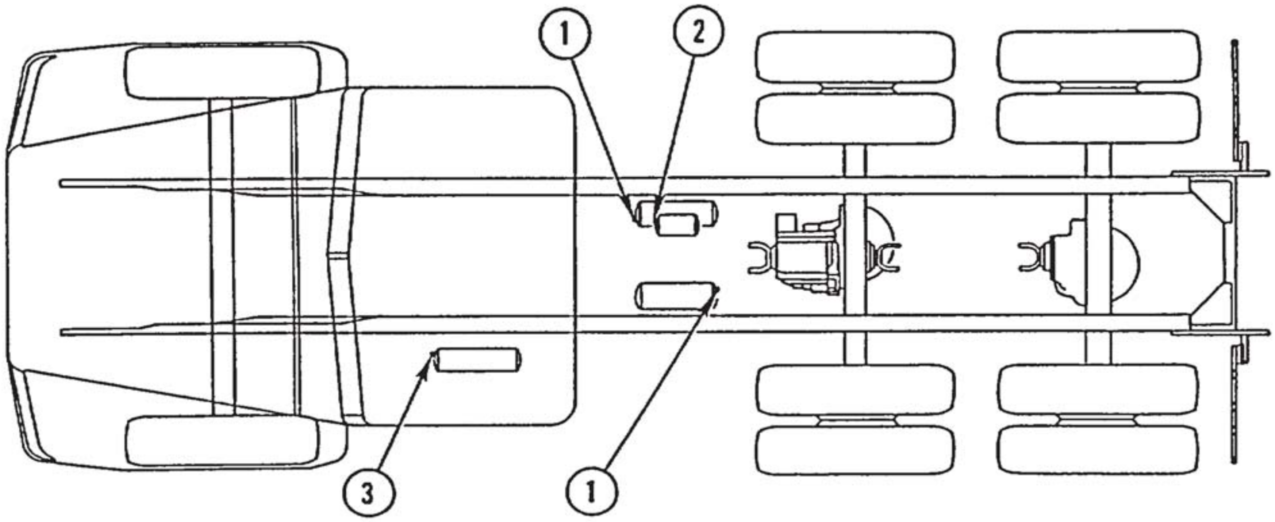
BLOCKING THE VEHICLE

During the maintenance procedures, the vehicle wheels must be chocked to prevent roll off. Chock all wheels both in front and behind each wheel.

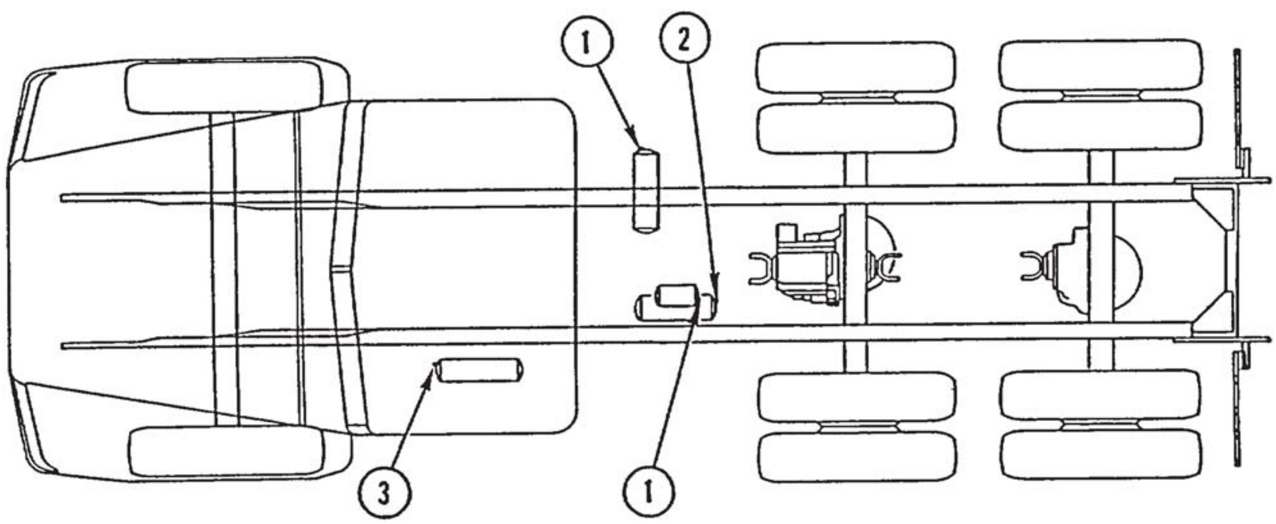
Refer to TM 5-3805-264-14&P for information on safety issues related to maintenance on components located under the dump body.

RELIEVING AIR PRESSURE

There are two separate air systems, the primary and the secondary, and it is necessary to relieve pressure from both.



M915A2



ALL EXCEPT M915A2

PRIMARY: OPEN MANUAL DRAIN VALVE (1) ON EITHER OF TWO PRIMARY AIR TANKS.

SECONDARY: PULL CABLE ATTACHED TO REMOTE DRAIN VALVE (2) ON AIR SUPPLY TANK, OR OPEN MANUAL DRAIN VALVE (3) ON SECONDARY AIR TANK.

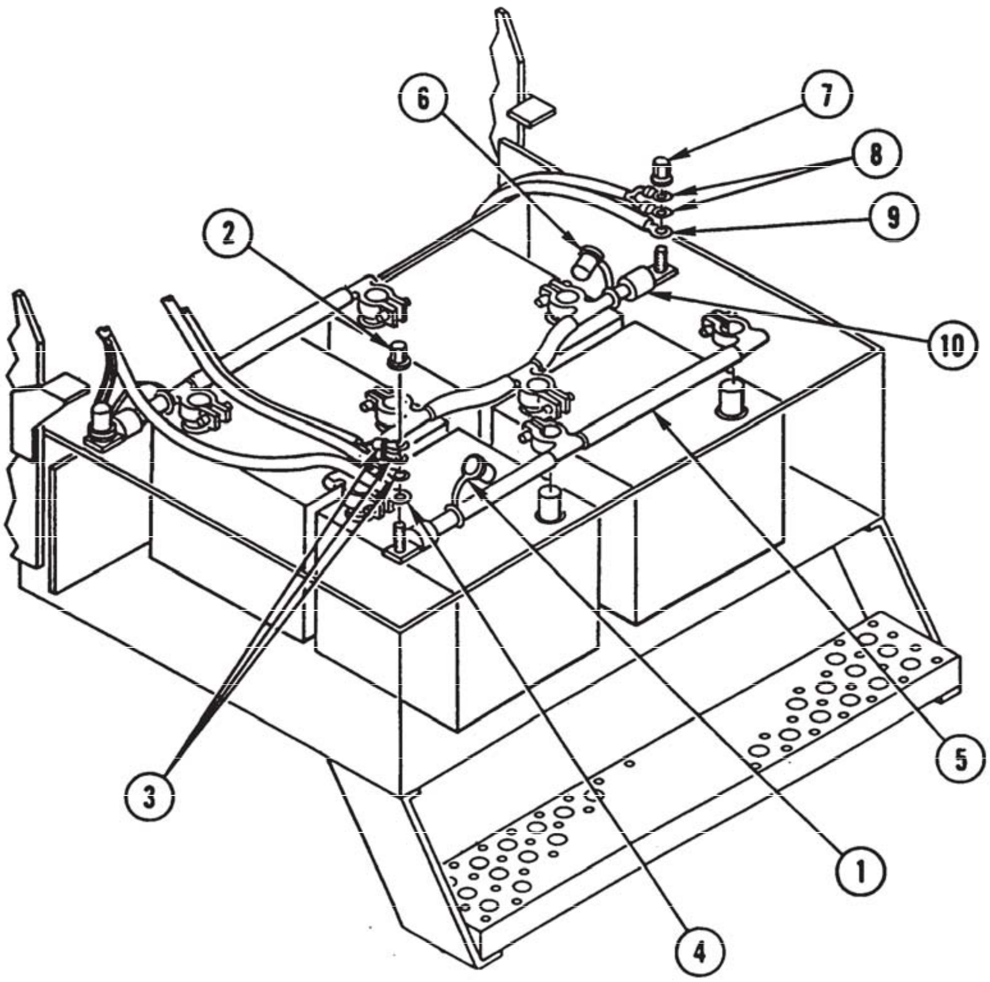
REFER TO TM 5-3805-264-14&P FOR PROCEDURES TO DRAIN THE MCS AIR SYSTEM ON THE M917A1 W/MCS.

DISCONNECTING/CONNECTING BATTERIES

DISCONNECT

1. REMOVE CAP (1), NUT (2), THREE WIRES (3), AND CABLE (4) FROM NEGATIVE BATTERY CABLE (5).

2. REMOVE CAP (6), NUT (7), TWO WIRES (8), AND CABLE (9) FROM CABLE (10).



CONNECT

1. INSTALL CABLE (9), TWO WIRES (8), NUT (7), AND CAP (6) ON CABLE (10).

2. INSTALL CABLE (4), THREE WIRES (3), NUT (2), AND CAP (1) ON NEGATIVE BATTERY CABLE (5).

ween connector 86 and ground for both relays. Step 7. Check for continuity betw

A T R 3
TR B TING

This chapter contains information you need to troubleshoot the 15 family of vehicles. It includes information on harness and cable repair, a malfunction symptom index with troubleshooting charts, troubleshooting and testing the Anti-Lock rake System A S , use of Detroit Diesel Electronic Controls DDEC II and DDEC III , and use of Simplified Test Equipment for Internal Combustion Engines STE/ICE .

Section I. WIRING HARNESS AND CABLE REPAIR

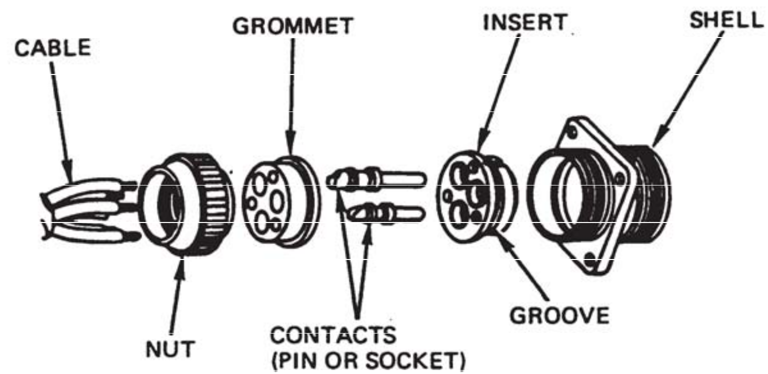
OVERVIEW

This section contains instructions on repair of wiring harnesses and cables (leads). The repair of wiring harnesses and cables consists of the replacement of defective connectors, shells, and terminal. Remove connectors and terminals using Repair Kit (P/N J35888-60). Install new connectors and new terminals using Wire Stripper (P/N J35615) and Repair Kit (P/N J35888-60). Tape cut or worn insulation and exposed wire conductors. Pages 3-3 through 3-8 show exploded views of typical harness and cable connectors. When soldering is required, procedures in TB SIG 222 must be followed. If multiple pin connectors are disassembled, tag or label all wires and cables to ensure that correct connections are made at time of assembly. The following connections are made at time of assembly:

TYPICAL PANEL MOUNTING RECEPTACLE: DISASSEMBLY AND ASSEMBLY

DISASSEMBLY

1. UNSCREW NUT FROM SHELL ASSEMBLY AND SLIDE BACK ON CABLE LEADS.
2. PUSH GROMMET BACK ON CABLE LEADS.
3. DRIVE CONTACTS OUT THRU REAR OF INSERT WITH PIN EXTRACTOR.
4. PUSH INSERT OUT THRU REAR OF SHELL.
5. UNSOLDER CABLE LEADS FROM CONTACTS.



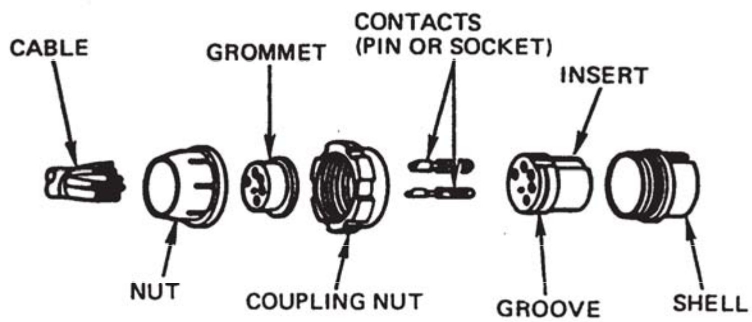
ASSEMBLY

1. STRIP CABLE INSULATION EQUAL TO DEPTH OF SOLDER WELLS OF CONTACTS.
2. SLIDE NUT OVER CABLE LEADS.
3. SLIDE GROMMET OVER CABLE LEADS.
4. INSERT CABLE LEADS INTO SOLDER WELLS OF CONTACTS, AND SOLDER.
5. PUSH INSERT INTO SHELL FROM REAR UNTIL SEATED. GROOVE IN INSERT MUST BE ALINED WITH GUIDE IN SHELL TO ENSURE PROPER FIT.
6. PUSH CONTACTS INTO INSERT FROM REAR UNTIL SEATED.
7. PUSH GROMMET DOWN CABLE LEADS AND OVER SOLDER WELLS OF CONTACTS.
8. SCREW NUT ONTO SHELL ASSEMBLY.

TYPICAL PLUG: DISASSEMBLY AND ASSEMBLY

DISASSEMBLY

1. UNSCREW NUT FROM SHELL ASSEMBLY AND SLIDE BACK ON CABLE LEADS.
2. SLIDE GROMMET BACK ON CABLE LEADS.
3. SLIDE COUPLING NUT OFF SHELL ASSEMBLY.
4. DRIVE CONTACTS OUT THRU REAR OF INSERT WITH PIN EXTRACTOR.
5. PUSH INSERT OUT THRU REAR OF SHELL.
6. UNSOLDER CABLE LEADS FROM CONTACTS.

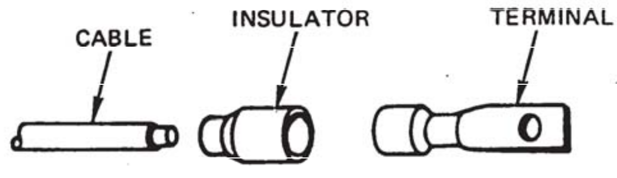


ASSEMBLY

1. STRIP CABLE INSULATION EQUAL TO DEPTH OF SOLDER WELLS OF CONTACTS.
2. SLIDE NUT OVER CABLE LEADS.
3. SLIDE GROMMET OVER CABLE LEADS.
4. INSERT CABLE LEADS INTO SOLDER WELLS OF CONTACTS, AND SOLDER.
5. PUSH INSERT INTO SHELL FROM REAR UNTIL SEATED. GROOVE IN INSERT MUST BE ALINED WITH GUIDE IN SHELL TO ENSURE PROPER FIT.
6. PUSH CONTACTS INTO INSERT FROM REAR UNTIL SEATED.
7. SLIDE COUPLING NUT ONTO SHELL ASSEMBLY.
8. PUSH GROMMET DOWN CABLE LEADS AND OVER SOLDER WELLS OF CONTACTS.
9. SCREW NUT ONTO SHELL ASSEMBLY.

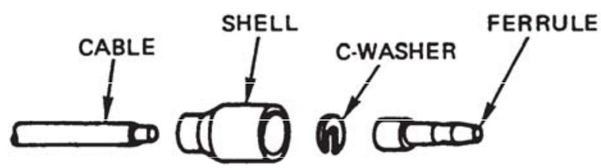
CABLE TERMINALS AND CONNECTORS REPLACEMENT

TERMINAL-TYPE CABLE CONNECTORS



1. STRIP CABLE INSULATION EQUAL TO DEPTH OF TERMINAL WELL.
2. SLIDE INSULATOR OVER CABLE.
3. INSERT CABLE INTO TERMINAL WELL, AND CRIMP.
4. SLIDE INSULATOR OVER CRIMPED END OF TERMINAL.

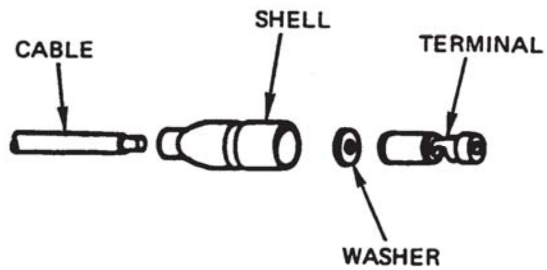
MALE CABLE CONNECTOR (WITH WASHER)



1. STRIP CABLE INSULATION EQUAL TO DEPTH OF FERRULE WELL.
2. SLIDE SHELL OVER CABLE.
3. INSERT CABLE INTO TERMINAL WELL, AND CRIMP.
4. PLACE C-WASHER OVER CABLE AT CRIMPED JUNCTION AND SLIDE SHELL OVER C-WASHER AND TERMINAL.

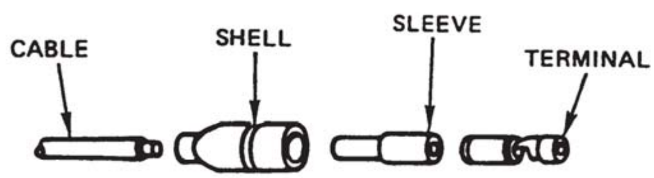
CABLE TERMINALS AND CONNECTORS REPLACEMENT (CONT)

FEMALE CABLE CONNECTOR (WITH WASHER)



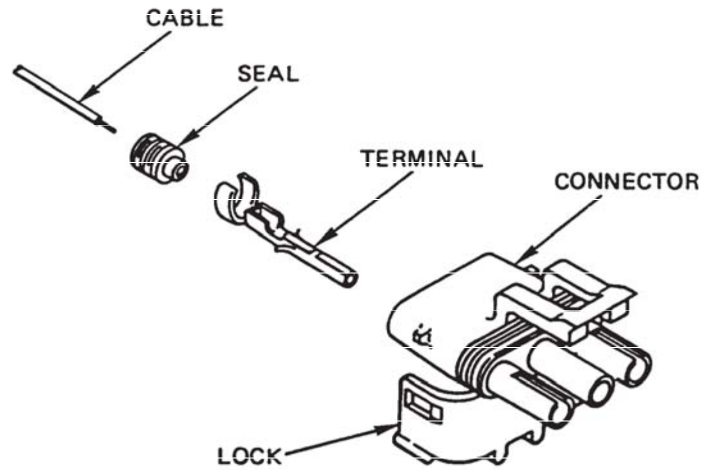
1. STRIP CABLE INSULATION APPROXIMATELY 1/8 IN. (3 mm).
2. SLIDE SHELL AND WASHER OVER CABLE.
3. PLACE CABLE IN CYLINDRICAL END OF TERMINAL, AND CRIMP.
4. SLIDE SHELL AND WASHER OVER TERMINAL.

FEMALE CABLE CONNECTOR (WITH SLEEVE)



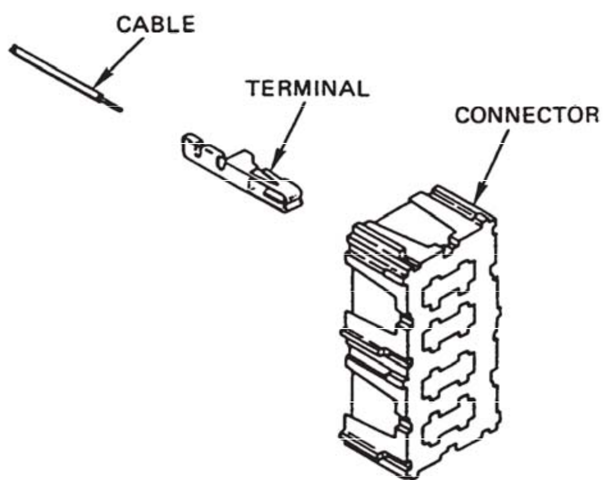
1. STRIP CABLE INSULATION APPROXIMATELY 1/8 IN. (3 mm).
2. SLIDE SHELL AND SLEEVE OVER CABLE.
3. PLACE CABLE IN CYLINDRICAL END OF TERMINAL, AND CRIMP.
4. SLIDE SHELL AND SLEEVE OVER TERMINAL.

TYPICAL SEALED CONNECTOR



1. STRIP CABLE INSULATION APPROXIMATELY 1/8 IN. (3 mm).
2. SLIDE SEAL ONTO CABLE.
3. CRIMP TERMINAL ONTO CABLE.
4. INSERT TERMINAL INTO CONNECTOR AND CLOSE LOCK.

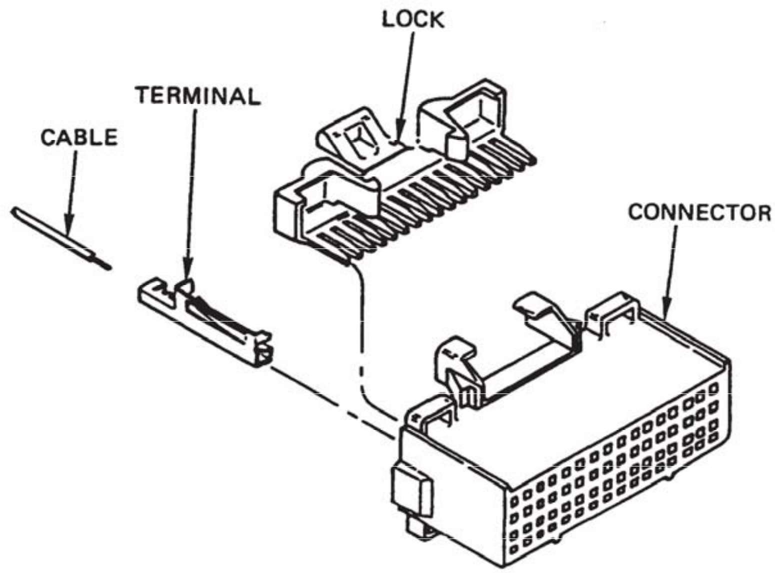
TYPICAL PANEL CONNECTOR



1. CRIMP TERMINAL ONTO CABLE.
2. INSERT TERMINAL INTO CONNECTOR.

CABLE TERMINALS AND CONNECTORS REPLACEMENT (CONT)

TYPICAL HARNESS CONNECTOR



1. CRIMP TERMINAL ONTO CABLE.
2. INSERT TERMINAL INTO CONNECTOR.
3. INSTALL LOCK IN CONNECTOR.

Section II. TROUBLESHOOTING CHARTS

PRELIMINARY TROUBLESHOOTING PROCEDURES

NOTE

Fluid leaks are classified as either Class I, Class II, or Class III:

Class I: Seepage of fluid, as indicated by wetness or discoloration, not great enough to form drops.

Class II: Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked or observed.

Class III: Leakage of fluid great enough to form drops that fall from the item being checked or observed.

Before starting any specific troubleshooting procedures, perform the following:

1. Visually check for ruptured oil hoses or tubes, and for Class II or Class III leaks.

2. Check for mechanical jamming or binding caused by rocks or other foreign matter.

3. Check fluid levels in subject area and service as required (TM 9-2320-363-10 or page 2-3, Unit PMCS in this manual).

RELIEVING HYDRAULIC SYSTEM PRESSURE (M916A1 AND M916A2)

Cycle controls a few times with hydraulic power off to relieve any residual pressure in lines.

ELECTRICAL TROUBLESHOOTING

Before you start detail troubleshooting procedures, review the wiring diagram to thoroughly familiarize yourself with the circuit(s) involved. Analyze the symptoms and conditions and use common sense and logic to determine the most likely cause for the problem, then troubleshoot that circuit first. The more information you have concerning the problem, the easier it will be to troubleshoot.

Isolate to the subsystem level (in cases where more than one subsystem is involved); next, isolate the problem to a single circuit within the subsystem; then, isolate the problem to the faulty component using the troubleshooting symptom index.

Frayed, broken, loose, or corroded wiring is a common source of problems in any electrical circuit. Always make visual inspection before starting detail troubleshooting. Observe in particular, contacts to ground. Components with case grounds are especially troublesome.

Most of the checks are made by voltage checks. Pay particular attention to the voltages being checked in the procedures. This equipment has a combination of 12 and 24 volt systems.

Instructions prior to the step instruct to disconnect at test point from the potential malfunctioning component. Once the check has been made, either repair the component or go to the referenced step. If going to another step, reconnect connection or do as otherwise instructed, such as install

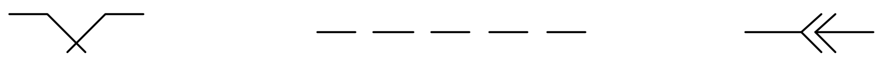
ELECTRICAL TROUBLESHOOTING (CONT)

jumper wires using Jumper Wire Kit (P/N J35751). When ready to make the prescribed check, apply power to the circuit (if required). A helper may be required if the switch or power source is out of reach. Release the power function prior to going on, to avoid damage to equipment.

When making continuity checks, make sure the test equipment is isolated from power source.

ELECTRICAL SYMBOLS

The following symbols are used in the troubleshooting schematics:



CONNECTORS   REFERENCE ONLY   BLADES

Troubleshooting Symptom Index

Troubleshooting Symptom Index (Cont)

Malfunction Number	Malfunction	Troubleshooting Procedure Page
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Troubleshooting Symptom Index (Cont)

Troubleshooting Symptom Index (Cont)

Malfunction Number	Malfunction	Troubleshooting Procedure Page
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Troubleshooting Symptom Index (Cont)

Troubleshooting Symptom Index (Cont)

Malfunction Number	Malfunction	Troubleshooting Procedure Page

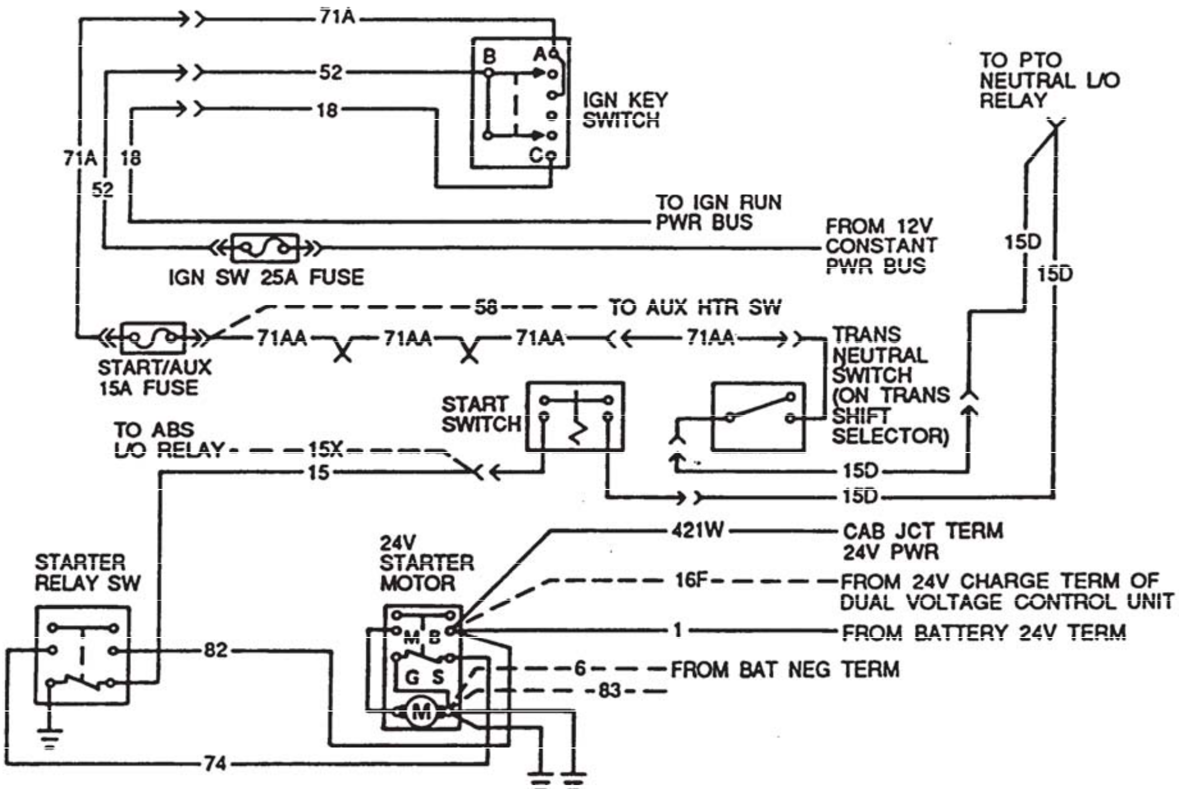
Troubleshooting Symptom Index (Cont)

Malfunction Number	Malfunction	Troubleshooting Procedure Page

Table 3-1. Troubleshooting

Malfunction
Test or Inspection
Corrective Action

ENGINE



Engine Starter Circuits

1. ENGINE FAILS TO CRANK OR CRANKS SLOWLY.

Step 1. Check transmission range indicator is in N (Neutral).

- Move transmission range indicator to N.

Step 2. Check for damaged or loose battery connections.

- Tighten or repair as required (page 4-256).

Step 3. Check for voltage at batteries for 22-26 volts.

- If voltage is below 22 volts, service batteries (TM 9-6140-200-14).

Step 4. Check neutral safety switch and connections for looseness or damage.

- Tighten or replace as necessary (page 4-315).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ENGINE (CONT)

Step 5. Check ignition switch 25A fuse for damage.

- Replace as necessary (page 4-204).

Step 6. Check start/auxiliary 15A fuse for damage.

- Replace as necessary (page 4-204).

Step 7. Check ignition key switch for loose or damaged connections.

- Tighten or replace as necessary (page 4-188).

Step 8. Check engine start button for loose or damaged connections.

- Tighten or replace as necessary (page 4-188).

Step 9. Check starter relay switch (magnetic) for 11-16 volts with ignition switch in start position.

- If no voltage is present, go to step 10.

Step 10. Check lead 15 for continuity.

- If no continuity is noted, repair lead 15 (page 3-2) or notify direct support maintenance.

Step 11. Check starter relay switch (magnetic) for 22-26 volts.

- If no voltage is present, check lead 82 for continuity.

Step 12. Check starter relay switch (magnetic) for 22-28 volts with ignition switch in start position and start button engaged.

- If no voltage is present at lead 74, replace starter relay switch (magnetic) (page 4-159).

Step 13. Check starter for loose or damaged connections.

- Tighten or replace as necessary (page 3-2).

Step 14. Test starter motor using STE/ICE tests.

- If results are negative, replace starter motor (page 4-156).

Step 15. If engine still fails to crank, notify direct support maintenance.

2. ENGINE CRANKS BUT FAILS TO START.

Step 1. Check fuel/water separator for water.

- Service fuel/water separator (TM 9-2320-363-10).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ENGINE (CONT)

Step 2. If engine still fails to start.
- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0)

3. ENGINE RUNS ERRATICALLY.

Step 1. Check for insufficient or aerated fuel.
- Prime fuel system (TM 9-2320-363-10).

Step 2. Check for misfiring cylinders.
- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0).

Step 3. Check for steady or intermittent CHECK ENGINE LIGHT.
- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0).

4. ENGINE LACKS POWER.

Step 1. Check that air inlet restrictor is within prescribed limits.
- Service air cleaner (page 4-61) or replace defective parts (page 4-52).

Step 2. Check air intake piping after turbocharger for evidence of oil from malfunctioning turbocharger.
- Notify direct support maintenance.

Step 3. Check for steady or intermittent CHECK ENGINE LIGHT.
- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0).

Step 4. Check for full throttle setting.
- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0).

Step 5. Check for insufficient or aerated fuel.
- Prime fuel system (TM 9-2320-363-10).

5. LOW OIL PRESSURE.

Step 1. Check engine oil level.
- Service with oil (TM 9-2320-363-10).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ENGINE (CONT)

Step 2. Remove and check oil pressure line and gage orifice to oil pressure sensor.

- If oil pressure line and gage orifice are free of restriction, refer to DDEC II troubleshooting for oil pressure sensor and gage (page 3-101) or DDEC III troubleshooting (page 3-345.0). If oil pressure line and gage orifice are restricted, remove and clean oil pressure line and gage orifice (page 4-322). If low oil pressure still exists, notify direct support maintenance.

6. HIGH OIL CONSUMPTION.

Step 1. Check for overfilled crankcase.

- Fill/drain to proper level (page 2-3, Unit PMCS).

Step 2. Check for oil in air reservoir tanks.

- If oil is found in tanks, replace air compressor (page 4-22).

Step 3. Check for indications of oil at turbocharger compressor outlet and turbine inlet.

- If oil is found, notify direct support maintenance.

7. ENGINE OVERHEATS.

Step 1. Check water pump for loose or damaged impeller.

- Replace water pump (page 4-132).

Step 2. Check for inoperative fan clutch.

- Refer to Malfunctions 1 and 2 (page 3-27).

Step 3. Check for steady or intermittent CHECK ENGINE LIGHT.

- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0).

Step 4. Check for faulty thermostats.

- Replace thermostats (page 4-128).

AIR/FUEL SYSTEM

1. RESTRICTED AIR FLOW INTO TURBOCHARGER.

Step 1. Check for clogged or faulty filter element.

- Replace filter element (page 4-61).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

AIR/FUEL SYSTEM (CONT)

Step 2. Check for collapsed duct assembly or tubing.

- Replace damaged duct assembly (page 4-52).

Step 3. Check for damaged or faulty air cleaner housing.

- Replace air cleaner housing (page 4-52).

2. FUEL CONTAMINATION.

Step 1. Check for loose, faulty, or missing filler cap.

- Replace filler cap (page 4-76).

Step 2. Check for dirty or corroded fuel tank.

- Purge or clean fuel tank (page 2-22).

3. RESTRICTED FUEL SUPPLY.

Check for faulty fuel tank or lines.

- Clean fuel lines (page 2-22) or replace fuel tank (page 4-76) or lines (page 4-41).

EXHAUST SYSTEM

1. EXHAUST GASES ENTER PASSENGER COMPARTMENT.

Step 1. Check for faulty muffler.

- Replace muffler (page 4-89).

Step 2. Check for loose, broken clamps or fasteners.

- Replace clamps and/or fasteners (page 4-94).

Step 3. Check for broken exhaust pipe(s) or engine exhaust manifold.

- Replace exhaust pipe(s) if broken (page 4-94). If engine exhaust manifold is broken, notify direct support maintenance.

COOLING SYSTEM

1. LOSS OF COOLANT.

Step 1. Check for deteriorated or collapsed hose(s).

- Replace as required (page 4-116).

Step 2. Check for structural cracks or fracture in radiator.

- Replace radiator (page 4-99).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM

Charging Circuits

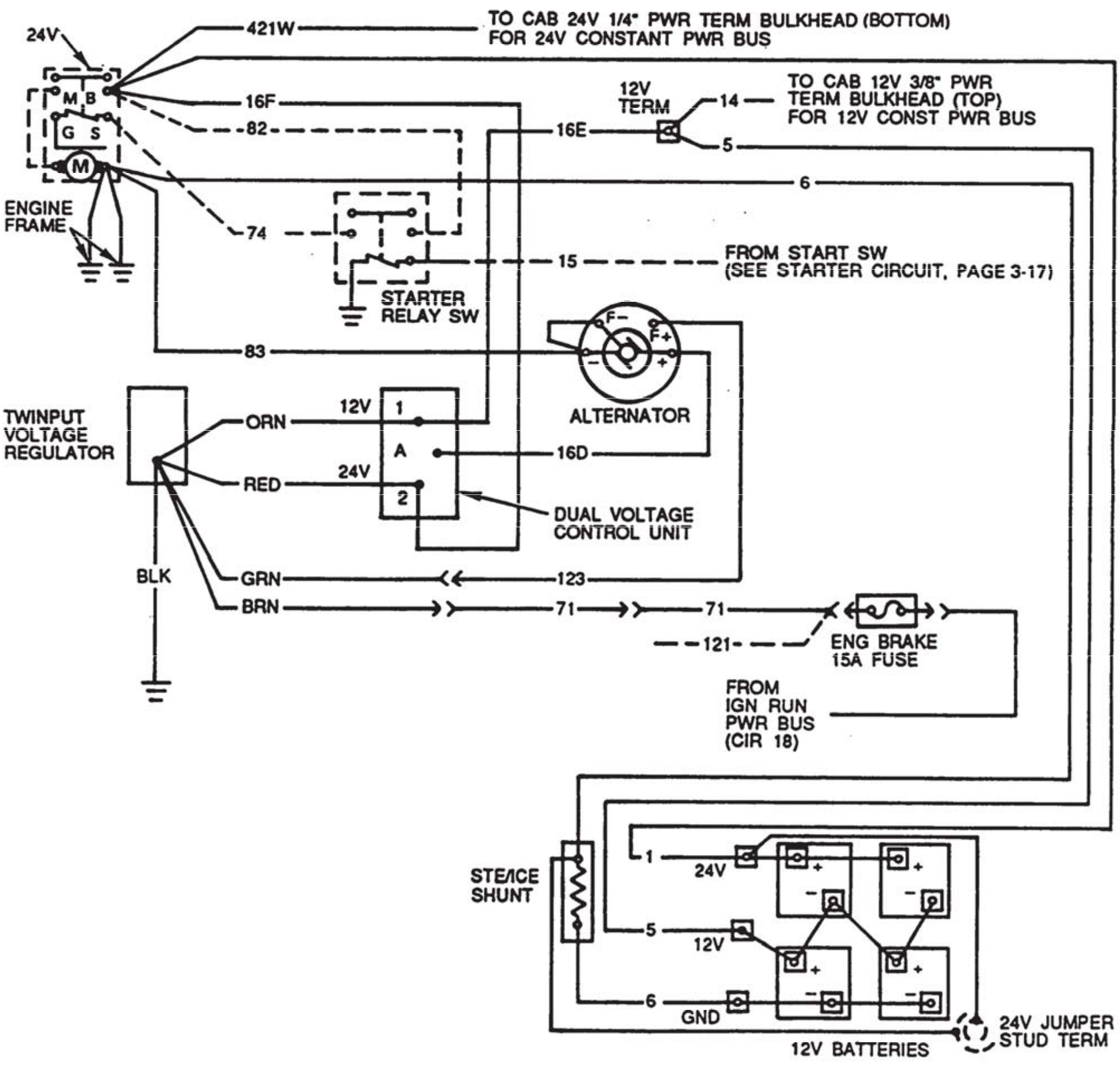


Table 3-1. Troubleshooting (Cont)

Malfunction

Test or inspection

Corrective action

ELECTRICAL SYSTEM (CONT)

Charging Circuits (Cont)

1. LOW BATTERY VOLTAGE.

- Refer to DDEC II troubleshooting (page 3-101).
- Refer to DDEC III troubleshooting (page 3-345.0).

2. BATTERIES NOT CHARGING (EITHER VOLTAGE), VOLTMETER INDICATES VOLTAGE.

Step 1. Check and clean battery terminals of corrosion and make sure connections are tight.

Step 2. Disconnect lead 6 from ground connection from batteries. Check for continuity between lead 6 and ground.

- If continuity is indicated, repair ground connection (page 3-2). If no continuity is indicated, go to step 3.

Step 3. Disconnect lead 6 from STE/ICE shunt. Check for continuity through the STE/ICE shunt.

- If continuity is indicated, repair lead 6 (page 3-2). If no continuity is indicated, go to step 4.

Step 4. Disconnect lead 6 from other end of STE/ICE shunt. Check for continuity at lead 6.

- If continuity is indicated, replace STE/ICE shunt (page 4-263). If no continuity is indicated, repair lead 6 (page 3-2).

3. BATTERIES NOT CHARGING, VOLTMETER DOES NOT INDICATE VOLTAGE.

Step 1. Disconnect lead 83 from negative (-) terminal on alternator. Check for continuity between lead 83 and ground.

- If continuity is indicated, go to step 2. If no continuity is indicated, repair lead 83 (page 3-2).

Step 2. Check for continuity between negative (-) terminal and negative field (F-) terminal on alternator.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace alternator (page 4-149).

Step 3. Disconnect lead 16D from positive (+) terminal on alternator. Check for +24 VDC at positive (+) terminal on alternator.

- If +24 VDC is present, go to step 4. If no voltage is present, replace alternator (page 4-149).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Charging Circuits (Cont)

Step 4. Disconnect lead 16D from dual voltage control unit. Check for +24 VDC at lead 16D.

- If +24 VDC is present, go to step 5. If no voltage is present, repair lead 16D (page 3-2).

Step 5. Disconnect lead 123 from positive field (F+) connector on alternator. Check for +24 VDC at positive field (F+) connector.

- If +24 VDC is present, go to step 6. If no voltage is present, replace alternator (page 4-149).

Step 6. Disconnect lead 123 from line disconnect to twinput voltage regulator. Check for +24 VDC at lead 123.

- If +24 VDC is present, replace twinput voltage regulator (page 4-158). If no voltage is present, repair lead 123 (page 3-2).

4. +12 VDC CIRCUITS NOT CHARGING, +24 VDC CIRCUITS NORMAL.

Step 1. Disconnect lead 16E from connector No. 1 on dual voltage control unit. Check for +12 VDC at dual voltage control unit.

- If +12 VDC is present, go to step 2. If no voltage is present, replace dual voltage control unit (page 4-202).

Step 2. Disconnect lead 16E from 12 V junction terminal. Check for +12 VDC at lead 16E.

- If +12 VDC is present, repair lead 5 (page 3-2). If no voltage is present, repair lead 16E (page 3-2).

5. +24 VDC CIRCUITS NOT CHARGING, +12 VDC CIRCUITS NORMAL.

Step 1. Disconnect lead 16F from connector No. 2 on dual voltage control unit. Check for +24 VDC at dual voltage control unit.

- If +24 VDC is present, go to step 2. If no voltage is present, replace dual voltage control unit (page 4-202).

Step 2. Disconnect lead 16F from connector on starter motor. Check for +24 VDC at lead 16F.

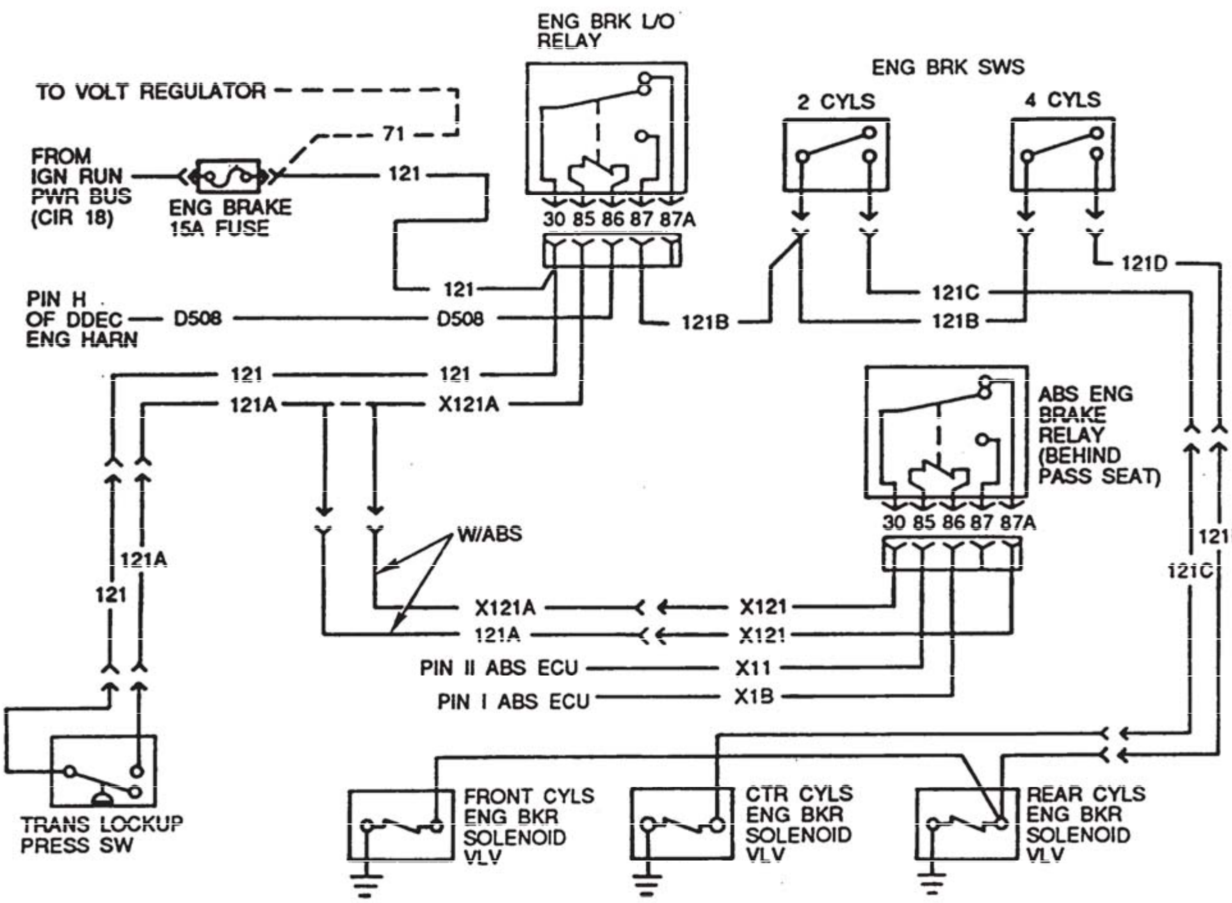
- If +24 VDC is present, repair lead 1 (page 3-2). If no voltage is present, repair lead 16F (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Engine Brake Retard Circuits



1. ENGINE BRAKE RETARD (JAKE BRAKE) NOT OPERATING, TRANSMISSION LOCKUP OPERATING NORMALLY.

Step 1. Check engine brake 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Disconnect lead 121B from two-cylinder brake switch. Check for +12 VDC at switch end of lead 121B.

- If +12 VDC is present, repair lead 121B at switch connector (page 3-2). If no voltage is present, repair lead 121B at connector 87 on engine brake lockout relay (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
 Test or Inspection
  Corrective Action

ELECTRICAL SYSTEM (CONT)

Engine Brake Retard Circuits (Cont)

2. ENGINE BRAKE RETARD (JAKE BRAKE) TWO-CYLINDER BRAKE NOT OPERATING, FOUR-CYLINDER BRAKE OPERATING NORMALLY.

Step 1. Disconnect lead 121C from two-cylinder brake switch. Check for +12 VDC at two-cylinder brake switch.

- If +12 VDC is present, go to step 2. If no voltage is present, replace two-cylinder brake switch (pages 4-178, 4-182).

Step 2. Disconnect lead 121C from line disconnect from two-cylinder brake switch. Check for +12 VDC at lead 121C.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 121C (page 3-2).

Step 3. Disconnect lead 121C from line disconnect to center cylinders engine brake solenoid valve. Check for +12 VDC at lead 121C.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 121C (page 3-2).

Step 4. Check for continuity between contact of center cylinders engine brake solenoid valve and ground.

- If continuity is indicated, notify direct support maintenance. If no continuity is indicated, repair ground (page 3-2).

3. ENGINE BRAKE RETARD (JAKE BRAKE) FOUR-CYLINDER BRAKE NOT OPERATING, TWO-CYLINDER BRAKE OPERATING NORMALLY.

Step 1. Disconnect lead 121B from four-cylinder brake switch. Check for +12 VDC at lead 121B to four-cylinder brake switch.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 121B (page 3-2).

Step 2. Disconnect lead 121D from four-cylinder brake switch. Check for +12 VDC at lead 121D to four-cylinder brake switch.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 121D (page 3-2).

Step 3. Disconnect lead 121D from line disconnect from two-cylinder brake switch. Check for +12 VDC at lead 121D.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 121D (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Engine Brake Retard Circuits (Cont)

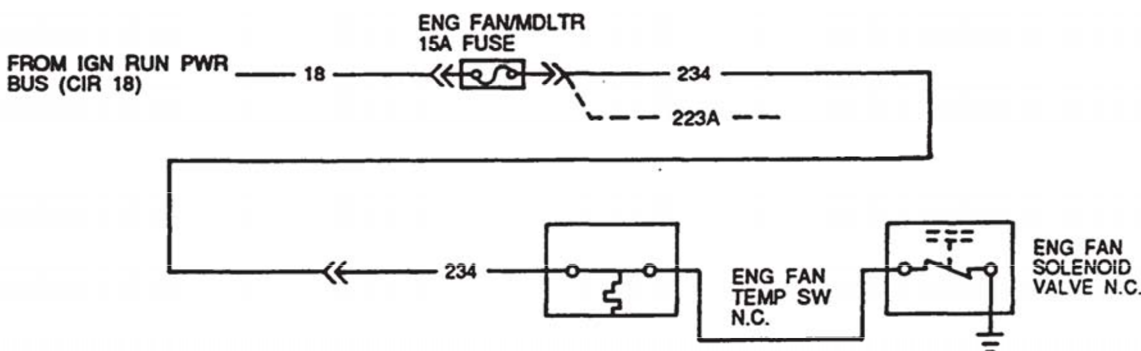
Step 4. Disconnect lead 121D from line disconnect to rear cylinders engine brake solenoid valve. Check for +12 VDC at lead 121D.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 121D (page 3-2).

Step 5. Check for continuity between contact of rear cylinders engine brake solenoid valve to ground, and contact of front cylinders engine brake solenoid valve to ground.

- If continuity is indicated, notify direct support maintenance. If no continuity is indicated, repair faulty ground (page 3-2).

Engine Fan Circuit



1. ENGINE FAN FAILS TO OPERATE WHEN COOLANT TEMPERATURE IS 190°F TO 210°F (87°C TO 98°C).

Check that engine fan operates within 190°F to 210°F (87°C to 98°C) temperature range.

- Replace fan clutch temperature switch (page 4-236).

2. LACK OF FAN CLUTCH DISENGAGEMENT.

Step 1. Check for air leaks.

- Replace failed air tube from air supply reservoir to fan clutch (pages 4-487, 4-503).

Step 2. Check engine fan/modulator 15A fuse.

- If burned out, replace engine fan/modulator 15A fuse (page 4-204).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Engine Fan Circuit (Cont)

Step 3. Check for +12 VDC at engine fan temperature switch and engine fan solenoid valve.

- If +12 VDC is present, go to step 6.
- If no voltage is present, go to step 4.

Step 4. Check for +12 VDC at circuit 18 from ignition run power bus.

- If +12 VDC is present, go to step 5. If no voltage is present, repair circuit 18 from ignition run power bus (page 3-2).

Step 5. Disconnect lead 234 at line disconnect. Check for +12 VDC at lead 234.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead 234 (page 3-2).

Step 6. Check for continuity between contacts of engine fan temperature switch.

- If continuity is indicated, go to step 7. If no continuity is indicated, replace engine fan temperature switch (page 4-124).

Step 7. Check for continuity between contacts of engine fan solenoid valve and ground.

- If continuity is indicated, repair ground lead (page 3-2). If no continuity is indicated, replace engine fan solenoid valve (page 4-124).

Step 8. Refer to DDEC II troubleshooting (page 3-101).

Headlight Circuits

1. NEITHER HEADLIGHT OPERATES WHEN SWITCH IS TURNED ON.

Step 1. Check left and right headlight 15A fuses.

- If defective, replace 15A fuses (page 4-204).

Step 2. Disconnect lead 420M from vehicular light switch. Check for +12 VDC at pin M.

- If +12 VDC is present at vehicular light switch, go to step 3. If no voltage is present at vehicular light switch, replace vehicular light switch (page 4-170).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Headlight Circuits (Cont)

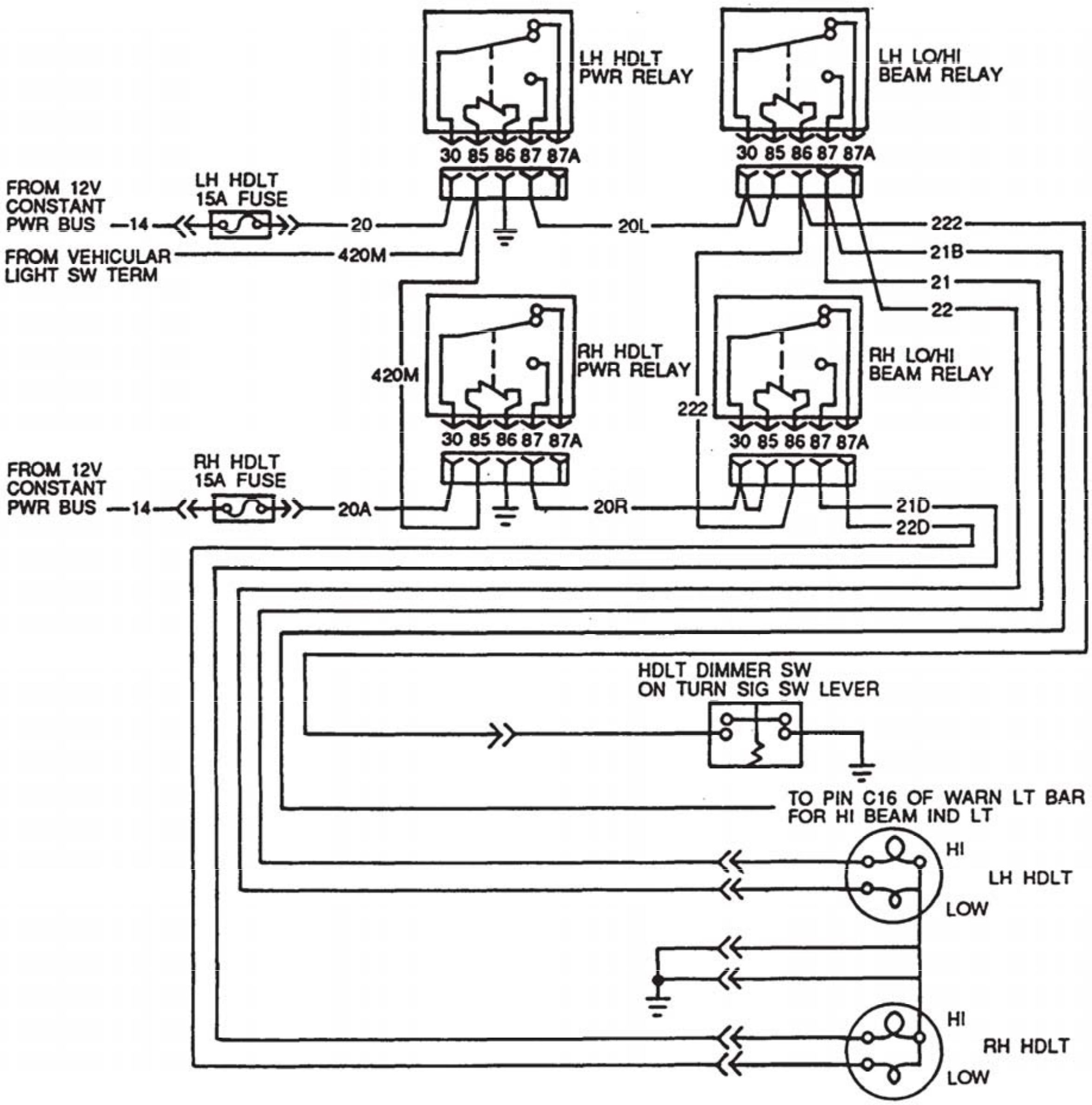


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Headlight Circuits (Cont)

Step 3. Disconnect left headlight power relay from connector. Check for +12 VDC at connector 85.

- If +12 VDC is present, replace left and right headlight power relay (pages 4-197, 4-198). If no voltage is present at connector 85, repair lead 420M (page 3-2).

2. LEFT HEADLIGHT FAILS TO OPERATE WHEN SWITCH IS TURNED ON.

Step 1. Inspect headlight bulb.

- Replace if broken or defective (page 4-206).

Step 2. Check left headlight 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 3. Disconnect lead 14 from left headlight 15A fuse. Check for +12 VDC at lead 14.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 14 (page 3-2).

Step 4. Disconnect ground lead from left headlight. Check for +12 VDC at ground lead to left headlight.

- If +12 VDC is present, repair ground lead (page 3-2). If no voltage is present, go to step 5.

Step 5. Disconnect left headlight power relay from connector. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 6. If no continuity is indicated, repair ground lead (page 3-2).

Step 6. Disconnect left headlight power relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 7. If no voltage is present, repair lead 20 (page 3-2).

Step 7. Disconnect left low/high beam relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, replace left low/high beam relay (pages 4-197, 4-198). If no voltage is present, go to step 8.

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Headlight Circuits (Cont)

Step 8. Check for continuity between connector 87 from left headlight power relay and connector 30 from left low/high beam relay.

- If continuity is present, replace left headlight power relay (pages 4-197, 4-198). If no continuity is indicated, repair lead 20L (page 3-2).

3. RIGHT HEADLIGHT FAILS TO OPERATE WHEN SWITCH IS TURNED ON.

Step 1. Inspect headlight bulb.

- Replace if broken or defective (page 4-206).

Step 2. Check right headlight 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 3. Disconnect lead 14 from right headlight 15A fuse. Check for +12 VDC at lead 14.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 14 (page 3-2).

Step 4. Disconnect ground lead from right headlight. Check for +12 VDC at ground lead to right headlight.

- If +12 VDC is present, repair ground lead (page 3-2). If no voltage is present, go to step 5.

Step 5. Disconnect right headlight power relay from connector. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 6. If no continuity is indicated, repair ground lead (page 3-2).

Step 6. Disconnect right headlight power relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 7. If no voltage is present, repair lead 20A (page 3-2).

Step 7. Disconnect left headlight power relay from connector. Check for continuity between connector 85 from right headlight power relay and connector 85 from left headlight power relay.

- If continuity is present, go to step 8. If no continuity is indicated, repair lead 420M between left headlight power relay and right headlight power relay (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Headlight Circuits (Cont)

Step 8. Disconnect right low/high beam relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 9. If no voltage is present, repair lead 20R (page 3-2).

Step 9. Disconnect left low/high beam relay from connector. Check for continuity between connector 86 from right low/high beam relay and connector 86 from left low/high beam relay.

- If continuity is present, replace right low/high beam relay (pages 4-197, 4-198). If no continuity is indicated, repair lead 222 between left low/high beam relay and right low/high beam relay (page 3-2).

4. NEITHER HEADLIGHT LOW/HIGH BEAM OPERATES WHEN TURN SIGNAL SWITCH LEVER IS SET.

Step 1. Disconnect ground lead from dimmer switch lever. Check for continuity between lead and ground.

- If continuity is present, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 2. Disconnect lead 222 from dimmer switch lever. Check for continuity between terminals of switch in both positions.

- If continuity is present, go to step 4. If no continuity is indicated, replace dimmer switch lever (page 4-168).

Step 3. Disconnect left low/high beam relay from connector. Check for continuity between connector 86 and lead 222.

- If continuity is present, replace left low/high beam relay (pages 4-197, 4-198). If no continuity is indicated, repair lead 222 (page 3-2).

5. LEFT HIGH-BEAM DOES NOT OPERATE.

Step 1. Inspect headlight bulb.

- Replace if broken or defective (page 4-206).

Step 2. Disconnect connector from left headlight. Check for continuity between ground and connector on left headlight at lead 21.

- If continuity is present, go to step 3. If no continuity is indicated, replace left headlight (page 4-206).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Headlight Circuits (Cont)

Step 3. Disconnect left low/high beam relay from connector. Check for continuity between lead 21 and connector 87.

- If continuity is present, replace left low/high beam relay. If no continuity is indicated, repair lead 21 (page 3-2).

6. LEFT LOW-BEAM DOES NOT OPERATE.

Step 1. Inspect headlight bulb.

- Replace if broken or defective (page 4-206).

Step 2. Disconnect connector from left headlight. Check for continuity between ground and connector on left headlight at lead 22.

- If continuity is present, go to step 3. If no continuity is indicated, replace left headlight (page 4-206).

Step 3. Disconnect left low/high beam relay from connector. Check for continuity between lead 22 and connector 87A.

- If continuity is present, replace left low/high beam relay. If no continuity is indicated, repair lead 22 (page 3-2).

7. RIGHT HIGH-BEAM DOES NOT OPERATE.

Step 1. Inspect headlight bulb.

- Replace if broken or defective (page 4-206).

Step 2. Disconnect connector from right headlight. Check for continuity between ground and connector on right headlight at lead 21D.

- If continuity is present, go to step 3. If no continuity is indicated, replace right headlight (page 4-206).

Step 3. Disconnect right low/high beam relay from connector. Check for continuity between lead 21D and connector 87.

- If continuity is present, replace right low/high beam relay. If no continuity is indicated, repair lead 21D (page 3-2).

8. RIGHT LOW-BEAM DOES NOT OPERATE.

Step 1. Inspect headlight bulb.

- Replace if broken or defective (page 4-206).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Headlight Circuits (Cont)

Step 2. Disconnect connector from right headlight. Check for continuity between ground and connector on right headlight at lead 22D.

- If continuity is present, go to step 3. If no continuity is indicated, replace right headlight (page 4-206).

Step 3. Disconnect right low/high beam relay from connector. Check for continuity between lead 22D and connector 87A.

- If continuity is present, replace right low/high beam relay. If no continuity is indicated, repair lead 22D (page 3-2).

Marker and Taillight Circuits

1. NONE OF THE MARKER LIGHTS AND TAILLIGHTS OPERATE.

Step 1. Check tractor tail marker 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Disconnect connector on vehicular light switch.

- Install jumper wire between connector 420F and pin F on switch. Check for +12 VDC at pin H.
- If +12 VDC is present, repair lead 420H (page 3-2). If no voltage is present at vehicular light switch, replace vehicular light switch (page 4-170).

2. LEFT FRONT MARKER LIGHT NOT OPERATING.

Step 1. Inspect light bulb.

- Replace if broken or defective (page 4-218).

Step 2. Remove lamp from socket (page 4-218). Check for continuity between contacts of lamp.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp (page 4-218).

Step 3. Check for continuity between socket and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

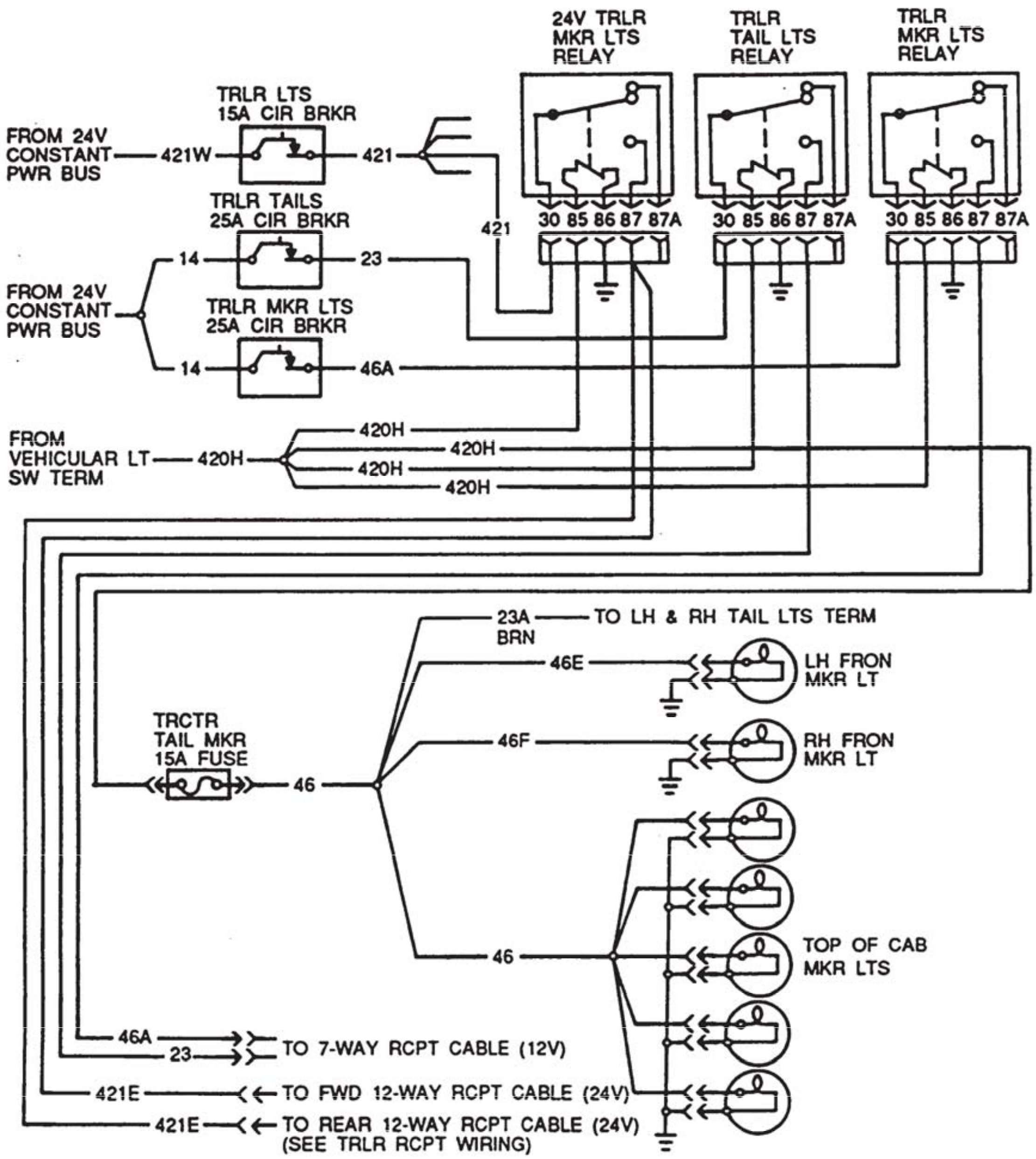
Malfunction

  Test or Inspection

    Corrective Action

ELECTRICAL SYSTEM (CONT)

Marker and Taillight Circuits (Cont)



Step 4. Disconnect lead 46E from lead 46. Check for +12 VDC at lead 46.

- If +12 VDC is present, repair lead 46E (page 3-2). If no voltage is present, repair lead 46 (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Marker and Taillight Circuits (Cont)

3. RIGHT FRONT MARKER LIGHT NOT OPERATING.

Step 1. Inspect light bulb.

- Replace if broken or defective (page 4-214).

Step 2. Remove lamp from socket (page 4-214). Check for continuity between contacts of lamp.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp (page 4-214).

Step 3. Check for continuity between socket and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Step 4. Disconnect lead 46F from lead 46. Check for +12 VDC at lead 46.

- If +12 VDC is present, repair lead 46E (page 3-2). If no voltage is present, repair lead 46 (page 3-2).

4. ONE OR MORE CAB MARKER LIGHTS NOT OPERATING.

Step 1. Inspect light bulbs.

- Replace if broken or defective (page 4-226).

Step 2. Remove lamp(s) from defective circuit(s) (page 4-226). Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp(s) (page 4-226).

Step 3. Disconnect ground lead from marker light(s). Check for continuity between ground lead(s) and ground.

- If continuity is indicated, repair lead(s) 46 (page 3-2). If no continuity is indicated, repair ground lead(s) (page 3-2).

5. BOTH TAILLIGHTS NOT OPERATING, ALL MARKER LIGHTS OPERATING.

Step 1. Inspect light bulbs.

- Replace if broken or defective (pages 4-220, 4-222).

Step 2. Disconnect lead 23A from taillight terminal. Check for +12 VDC at lead 23A.

- If +12 VDC is present, repair terminal connector (page 3-2). If no voltage is present, repair lead 23A (page 3-2).

Table 3-1. Troubleshooting (Cont)

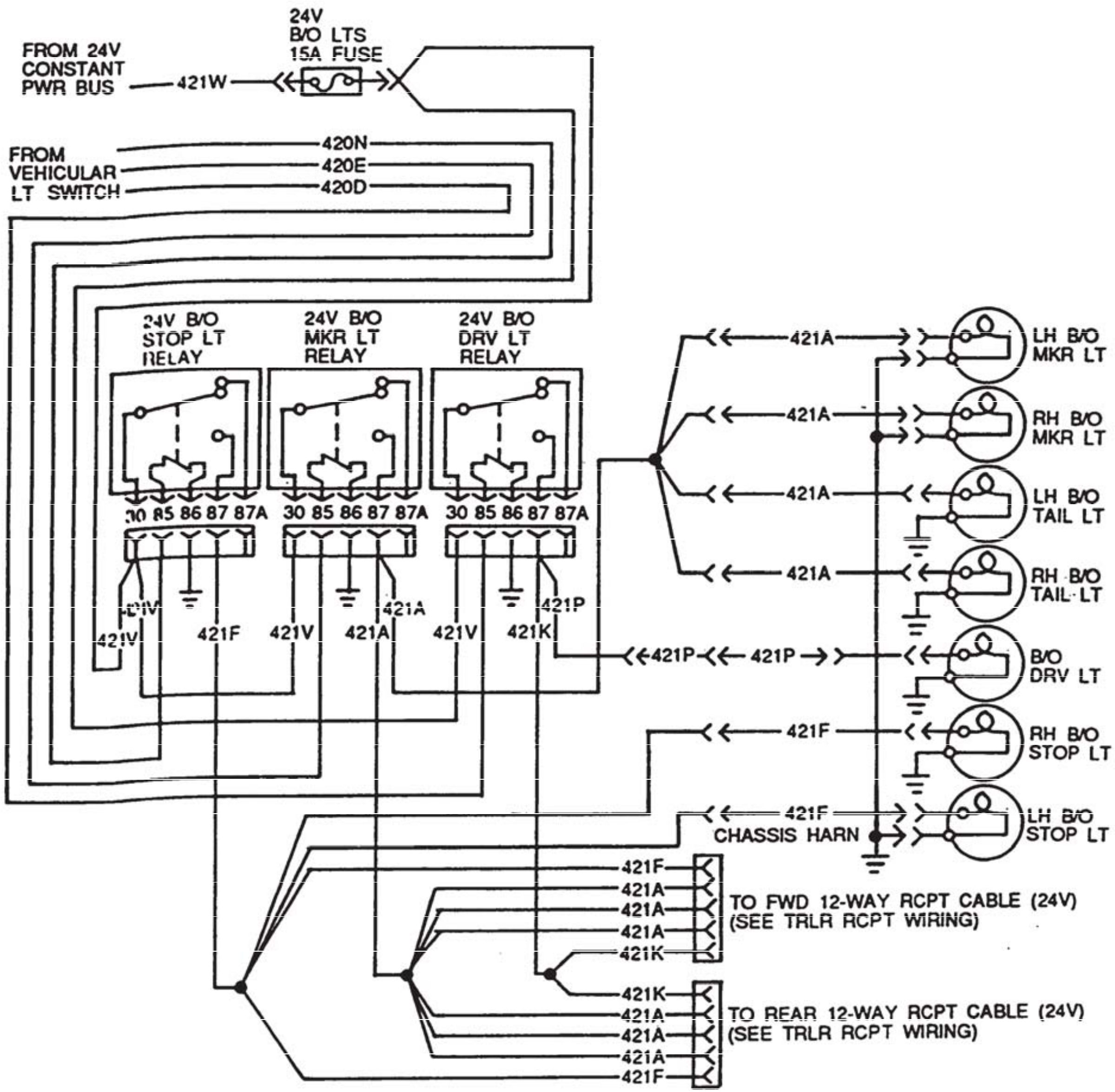
Malfunction

Test or Inspection

Corrective Action

ELECTRICAL SYSTEM (CONT)

Blackout Light Circuits



1. NONE OF THE BLACKOUT (B/O) LIGHTS OPERATE.

Check B/O 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Blackout Light Circuits (Cont)

2. NONE OF THE BLACKOUT (B/O) STOPLIGHTS OPERATE.

Step 1. Inspect light bulbs.

- Replace if broken or defective (page 4-216).

Step 2. Disconnect B/O stoplights relay from connector. Check for +24 VDC at connector 30.

- If +24 VDC is present, go to step 3. If no voltage is present, repair lead connector 421V (page 3-2).

Step 3. Check for +24 VDC at connector 85.

- If +24 VDC is present, go to step 4. If no voltage is present, repair lead 420N (page 3-2).

Step 4. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 5. If no continuity is indicated, repair ground lead (page 3-2).

Step 5. Install jumper wires between connector 30 and stoplights relay, connector 85 and stoplights relay, and connector 86 and stoplights relay. Check for +24 VDC at stoplights relay contact 87.

- If +24 VDC is present, repair lead 421F (page 3-2). If no voltage is present, replace B/O stoplights relay (pages 4-197, 4-198).

3. ONE OR MORE BLACKOUT (B/O) STOPLIGHTS NOT OPERATING.

Step 1. Inspect light bulb(s).

- Replace if broken or defective (page 4-216).

Step 2. Remove lamp(s) from defective circuit(s) (page 4-216). Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp(s) (page 4-216).

Step 3. Disconnect ground (B/O) stoplight(s). Check for continuity between ground lead(s) and ground.

- If continuity is indicated, repair lead(s) 421F (page 3-2). If no continuity is indicated, repair ground lead(s) (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Blackout Light Circuits (Cont)

4. NONE OF THE BLACKOUT (B/O) MARKER LIGHTS OPERATE.

Step 1. Inspect light bulbs.

- Replace if broken or defective (pages 4-211, 4-214, 4-216).

Step 2. Disconnect B/O marker lights relay from connector. Check for +24 VDC at connector 30.

- If +24 VDC is present, go to step 3. If no voltage is present, repair lead 421V (page 3-2).

Step 3. Check for +24 VDC at connector 85.

- If +24 VDC is present, go to step 4. If no voltage is present, repair lead 420E (page 3-2).

Step 4. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 5. If no continuity is indicated, repair ground lead (page 3-2).

Step 5. Install jumper wires between connector 30 and stoplights relay, connector 85 and stoplights relay, and connector 86 and stoplights relay. Check for +24 VDC at stoplights relay contact 87.

- If +24 VDC is present, repair lead 421A (page 3-2). If no voltage is present, replace B/O marker lights relay (pages 4-197, 4-198).

5. ONE OR MORE BLACKOUT (B/O) MARKER LIGHTS NOT OPERATING.

Step 1. Inspect light bulb(s).

- Replace if broken or defective (pages 4-211, 4-214, 4-216).

Step 2. Remove lamp(s) from defective circuit(s) (pages 4-211, 4-214, 4-216). Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp(s) (pages 4-211, 4-214, 4-216).

Step 3. Disconnect ground (B/O) marker light(s). Check for continuity between ground lead(s) and ground.

- If continuity is indicated, repair lead(s) 421A (page 3-2). If no continuity is indicated, repair ground lead(s) (page 3-2).

Check for continuity between connector 86 and ground Step 4

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Blackout Light Circuits (Cont)

6. NONE OF THE BLACKOUT (B/O) DRIVE LIGHTS OPERATE.

Step 1. Inspect light bulbs.

- Replace if broken or defective (page 4-211).

Step 2. Disconnect B/O drive lights relay from connector. Check for +24 VDC at connector 30.

- If +24 VDC is present, go to step 3. If no voltage is present, repair lead 421V (page 3-2).

Step 3. Check for +24 VDC at connector 85.

- If +24 VDC is present, go to step 4. If no voltage is present, repair lead 420D (page 3-2).

Step 4. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 5. If no continuity is indicated, repair ground lead (page 3-2).

Step 5. Install jumper wires between connector 30 and stoplights relay, connector 85 and stoplights relay, and connector 86 and stoplights relay. Check for +24 VDC at stoplights relay contact 87.

- If +24 VDC is present, repair lead 421P or lead 421K (page 3-2). If no voltage is present, replace B/O drive lights relay (pages 4-197, 4-198).

7. ONE OR MORE BLACKOUT (B/O) DRIVE LIGHTS NOT OPERATING.

Step 1. Inspect light bulb(s).

- Replace if broken or defective (page 4-211).

Step 2. Remove lamp from defective circuit (page 4-211). Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp (page 4-211).

Step 3. Disconnect ground (B/O) drive lights. Check for continuity between ground lead(s) and ground.

- If continuity is indicated, repair lead 421P (page 3-2). If no continuity is indicated, repair ground lead(s) (page 3-2).

Step 4. Check for +24 VDC at connector 421K at trailer receptacle(s).

- If +24 VDC is present, troubleshoot trailer circuit(s). If no voltage is present, repair lead(s) 421K (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Turn Signal and Stoplight Circuits

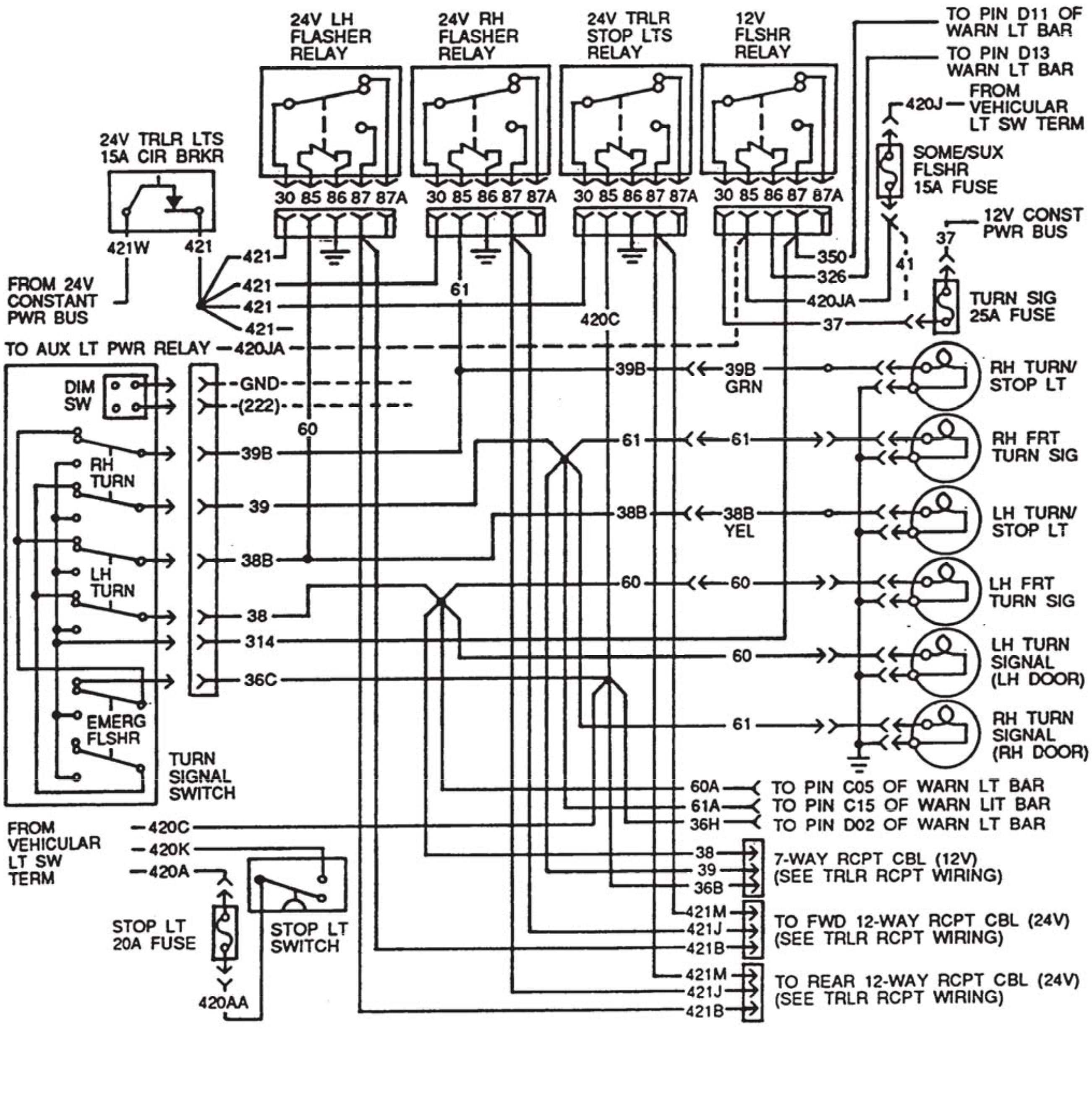


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Turn Signal and Stoplight Circuits (Cont)

1. NEITHER STOPLIGHT OPERATES.

Step 1. Check stoplight 20A fuse.

- If defective, replace 20A fuse (page 4-204).

Step 2. Inspect light bulbs.

- Replace if broken or defective (page 4-284).

Step 3. Disconnect leads 420A and 420K from stoplight switch. Check for continuity between switch contacts while pressing switch.

- If continuity is indicated, go to step 4. If no continuity is indicated, replace stoplight switch (page 4-228).

Step 4. Disconnect leads 420A and 420K from vehicular light switch. Check for continuity between leads 420A and 420K with stoplight switch closed.

- If continuity is indicated, go to step 5. If no continuity is indicated, repair lead 420A or lead 420K (page 3-2).

Step 5. Disconnect lead 420C from vehicular light switch. Disconnect lead 36C from turn signal switch. Check for continuity between lead 420C and 36C.

- If continuity is indicated, go to step 6. If no continuity is indicated, repair lead 420C or lead 36C (page 3-2).

Step 6. Disconnect lead 36C from vehicular turn signal switch. Check for +12 VDC in lead 36C with stoplight switch closed.

- If +12 VDC is present, replace turn signal switch (page 4-168). If no voltage is present, replace vehicular light switch (page 4-170).

2. LEFT STOPLIGHT NOT OPERATING.

Step 1. Inspect light bulb.

- Replace if broken or defective (page 4-284).

Step 2. Remove lamp from left stoplight (page 4-284). Check for continuity between contact points.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp (page 4-284).

Step 3. Remove left stoplight lamp. Check for continuity between socket and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Turn Signal and Stoplight Circuits (Cont)

Step 4. Check for +24 VDC at turn signal switch at lead 38B contact point.

- If +24 VDC is present, replace turn signal switch (page 4-168). If no voltage is present, repair lead 38B (page 3-2).

3. RIGHT STOPLIGHT NOT OPERATING.

Step 1. Inspect light bulb.

- Replace if broken or defective (page 4-284).

Step 2. Remove lamp from right stoplight (page 4-284). Check for continuity between contact points.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp (page 4-284).

Step 3. Remove right stoplight lamp. Check for continuity between socket and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Step 4. Check for +24 VDC at turn signal switch at lead 39B contact point.

- If +24 VDC is present, replace turn signal switch (page 4-168). If no voltage is present, repair lead 39B (page 3-2).

4. NONE OF THE LEFT FLASHER LIGHTS (24 V) OPERATING.

Step 1. Inspect light bulbs.

- Replace if broken or defective (pages 4-218, 4-284).

Step 2. Disconnect left flasher relay from connector. Check for +24 VDC at connector 30.

- If +24 VDC is present, go to step 3. If no voltage is present, repair lead 421 (page 3-2).

Step 3. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Step 4. Check for +12 VDC at connector 85.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 60 (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Turn Signal and Stoplight Circuits (Cont)

Step 5. Set turn signal switch in left turn mode. Install jumper leads between connectors 30, 85, and 86 to their respective connectors at left flasher relay. Check for +24 VDC at left flasher relay connection 87.

- If +24 VDC is present, go to step 6. If no voltage is present, replace left flasher relay (pages 4-197, 4-198).

Step 6. Set turn signal switch in left turn mode. Check for +24 VDC at trailer receptacle connectors 421B.

- If no voltage is present, repair leads 421B (page 3-2).

5. ONE OF THE LEFT TURN SIGNAL LIGHTS NOT OPERATING.

Step 1. Inspect light bulb.

- Replace if broken or defective (pages 4-218, 4-284).

Step 2. Remove lamp from defective left turn signal light (pages 4-218, 4-284). Check for continuity between contact points.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace lamp (pages 4-218, 4-284).

Step 3. Remove signal light lamp. Check for continuity between socket and ground.

- If continuity is indicated, repair lead 60 (page 3-2). If no continuity is indicated, repair ground lead (page 3-2).

6. LEFT TURN SIGNAL INDICATOR LIGHT NOT OPERATING, TURN SIGNALS OPERATING NORMALLY.

Step 1. Inspect light bulb.

- Replace if broken or defective (page 4-174).

Step 2. Disconnect lead 60A from warning light bar. Check for +24 VDC at lead 60A.

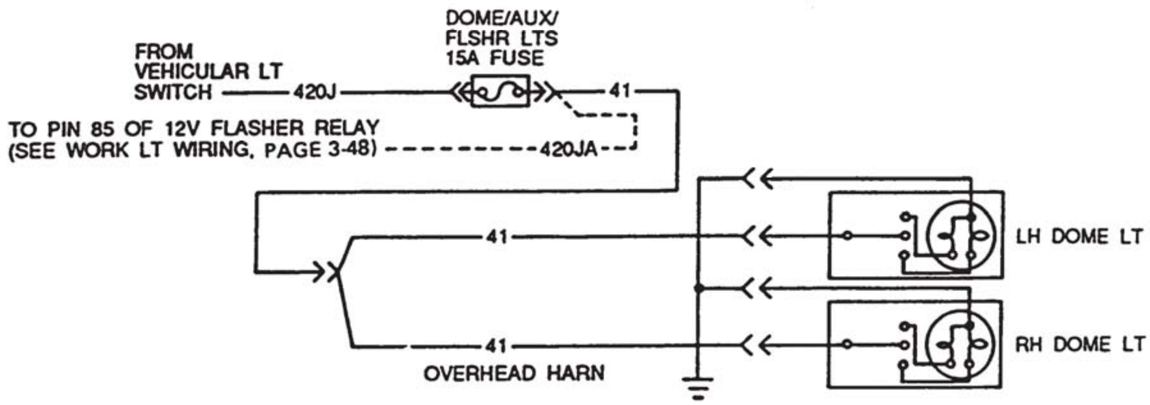
- If +24 VDC is present, troubleshoot warning light circuit (page 3-60). If no voltage is present, repair lead 60A (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Dome Light Circuits



1. NEITHER DOME LIGHT OPERATES.

Step 1. Check dome/auxiliary/flasher lights 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Disconnect lead 420J from dome/auxiliary/flasher 15A fuse. Check for +12 VDC at lead 420J.

- If +12 VDC is present, repair lead 41 (page 3-2). If no voltage is present, go to step 3.

Step 3. Disconnect connector from vehicular light switch. Check for +12 VDC at pin J.

- If +12 VDC is present, repair lead 420J (page 3-2). If no voltage is present, replace vehicular light switch (page 4-170).

2. ONE DOME LIGHT OPERATES, THE OTHER DOES NOT IN EITHER MODE.

Step 1. Inspect light bulb.

- Replace if broken or defective (page 4-227).

Step 2. Disconnect lead 41 from defective dome light. Check for continuity from dome light ground lead to ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Dome Light Circuits (Cont)

Step 3. Disconnect lead 41 from defective dome light. Check for +12 VDC at lead 41.

- If +12 VDC is present, replace dome light assembly (page 4-227). If no voltage is present, repair lead 41 (page 3-2).

3. DOME LIGHT OPERATES IN ONE SWITCH MODE ONLY.

Step 1. Inspect dome light lamp.

- If defective, replace lamp (page 4-227).

Step 2. Check for continuity between socket and ground.

- If continuity is indicated, replace dome light assembly (page 4-227).

Auxiliary Light Circuits

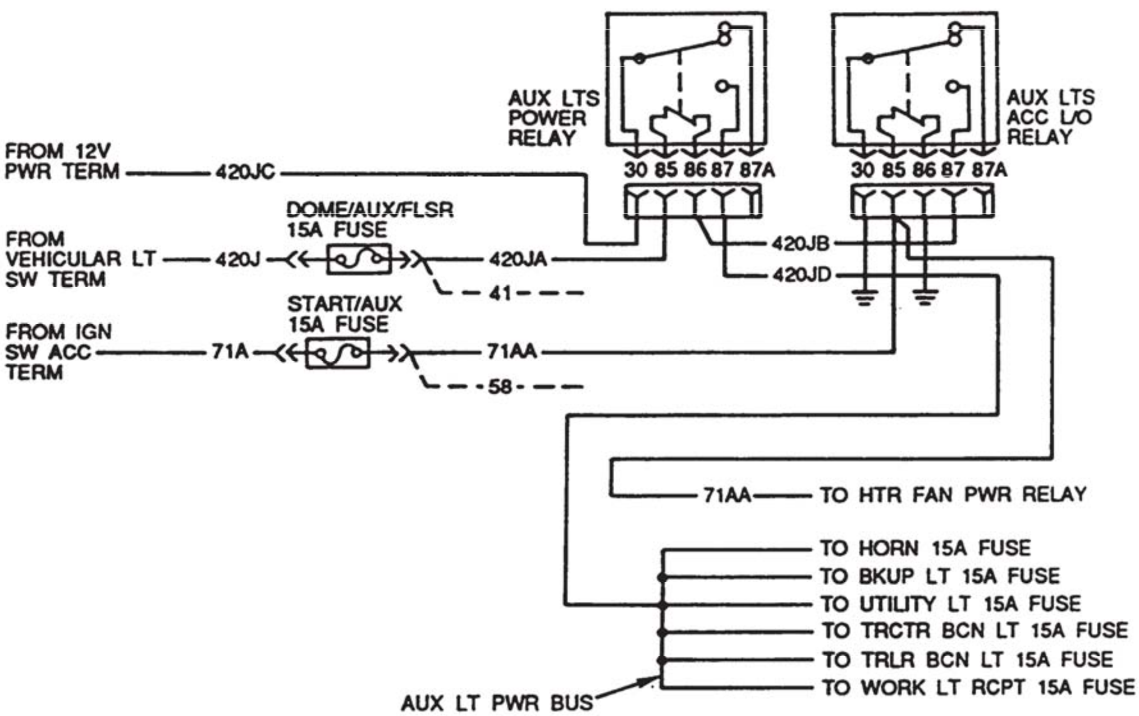


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Auxiliary Light Circuits (Cont)

1. NONE OF THE AUXILIARY LIGHTS OR ACCESSORY CIRCUITS OPERATE.

Step 1. Check for +12 VDC at auxiliary light power bus.

- If +12 VDC is present, repair auxiliary light power bus (page 3-2). If no voltage is present, go to step 2.

Step 2. Disconnect auxiliary lights power relay. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 420JC (page 3-2).

Step 3. Check for +12 VDC at auxiliary lights power relay connector 85.

- If +12 VDC is present, go to step 4. If no voltage is present, check dome/auxiliary/flasher 15A fuse. If defective, replace 15A fuse (page 4-204). Check for continuity in lead 420JA and lead 420J. If no continuity is indicated, repair lead 420JA or 420J (page 3-2). If +12 VDC is still not present at connector 85, replace vehicular light switch (page 4-170).

Step 4. Disconnect auxiliary lights accessory lockout relay. Check for +12 VDC at connector 87.

- If +12 VDC is present, go to step 5. If no voltage is present, check lead 420JB for continuity. If no continuity is indicated, repair lead 420JB (page 3-2). If voltage is still not present at connector 87, replace auxiliary lights power relay (pages 4-197, 4-198).

Step 5. Disconnect auxiliary lights accessory lockout relay. Check for +12 VDC at connector 85.

- If +12 VDC is present, go to step 6. If no voltage is present, check start/auxiliary 15A fuse. If defective, replace 15A fuse (page 4-204). Check for continuity in lead 71AA and lead 71A. If no continuity is indicated, repair lead 71AA and lead 71A (page 3-2). If voltage is still not present at connector 85, replace vehicular light switch (page 4-188).

Step 6. Disconnect auxiliary lights accessory lockout relay. Check for continuity from connectors 30 and 86 to ground.

- If continuity is indicated, go to step 7. If no continuity is indicated, repair connector lead 30 or connector lead 86 to ground (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Auxiliary Light Circuits (Cont)

Step 7. Check for +12 VDC at auxiliary light power bus.

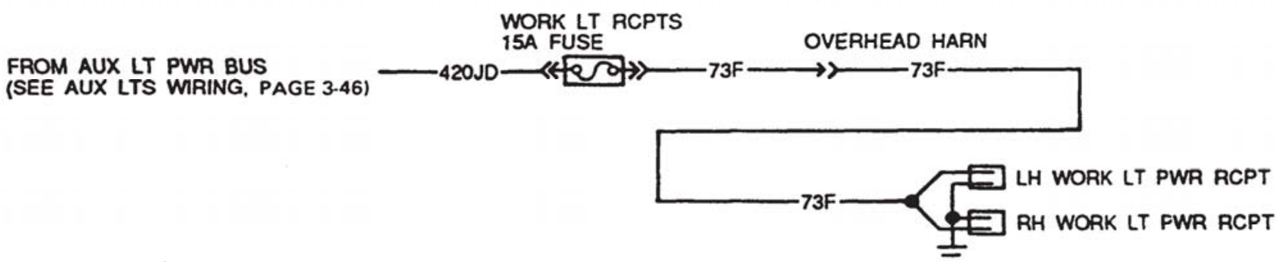
- If +12 VDC is not present, check for continuity in lead 420JD. If continuity is indicated, replace auxiliary lights power relay (pages 4-197, 4-198).

2. NO POWER TO AUXILIARY HEATER FAN POWER RELAY.

Disconnect auxiliary lights accessory lockout relay and heater fan power relay. Check for continuity in lead 71AA.

- If no continuity is indicated, repair lead 71AA (page 3-2).

Worklight Power Receptacle Circuits



1. NEITHER WORKLIGHT POWER RECEPTACLE OPERATES.

Step 1. Check worklight receptacles 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Check for +12 VDC at lead 420JD from auxiliary light power bus.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 420JD (page 3-2).

Step 3. Check for +12 VDC at lead 73F for left and right worklight power receptacles.

- If +12 VDC is present, repair ground lead from worklight power receptacles (page 3-2). If no voltage is present, repair lead 73F (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Worklight Power Receptacle Circuits (Cont)

2. ONE WORKLIGHT POWER RECEPTACLE NOT OPERATING, THE OTHER RECEPTACLE OPERATING NORMALLY.

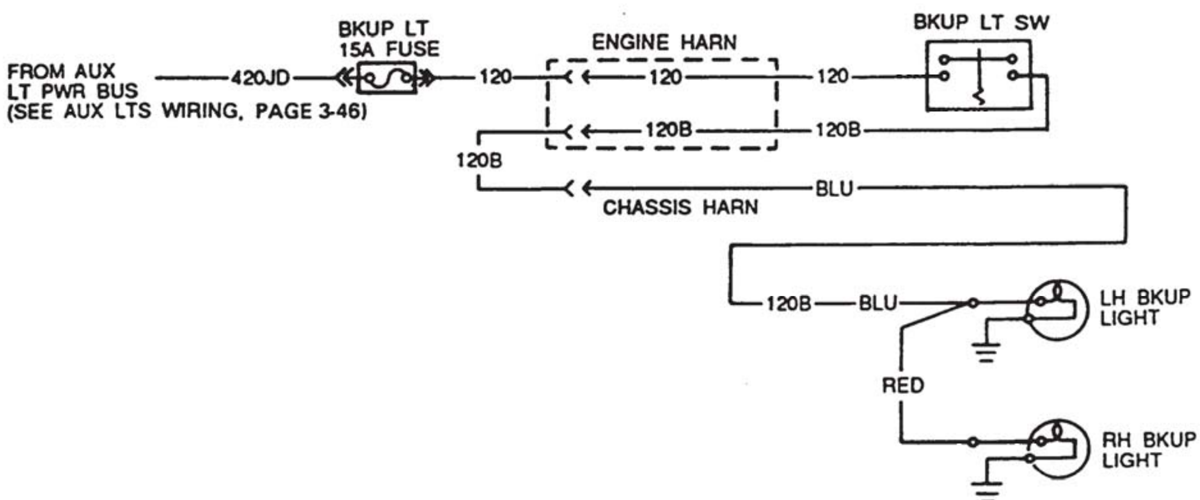
Step 1. Check for +12 VDC at lead 73F to worklight power receptacle.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 73F (page 3-2).

Step 2. Check for continuity between receptacle and ground.

- If continuity is indicated, replace defective receptacle (page 4-224). If no continuity is indicated, repair ground lead (page 3-2).

Backup Light Circuits



1. NEITHER BACKUP LIGHT OPERATES.

Step 1. Check backup light 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Inspect light bulbs.

- Replace if broken or defective (page 4-284).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Backup Light Circuits (Cont)

Step 3. Disconnect lead 420JD from backup light 15A fuse. Check for +12 VDC at lead 420JD.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 420JD (page 3-2).

Step 4. Disconnect lead 120 from backup light switch. Check for +12 VDC at lead 120.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 120 (page 3-2).

Step 5. Disconnect lead 120B from backup light switch. Press backup light switch. Check for continuity between switch contacts.

- If continuity is indicated, go to step 6. If no continuity is indicated, replace backup light switch (page 4-313).

Step 6. Disconnect lead 120B from chassis harness. Check for +12 VDC at lead 120B.

- If +12 VDC is present, go to step 7. If no voltage is present, repair lead 120B between chassis and backup light switch (page 3-2).

Step 7. Check for +12 VDC at backup receptacle socket 120B connector.

- If +12 VDC is present, repair receptacle socket ground leads to ground (page 3-2). If no voltage is present, repair lead 120B to chassis wiring harness (page 3-2).

2. RIGHT OR LEFT BACKUP LIGHT NOT OPERATING.

Step 1. Check backup light lamp.

- If defective, replace lamp (page 4-284).

Step 2. Check for continuity between socket and ground.

- If continuity is indicated, replace backup light (page 4-284). If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect red lead from backup light. Check for +12 VDC at red lead (for light on right side only).

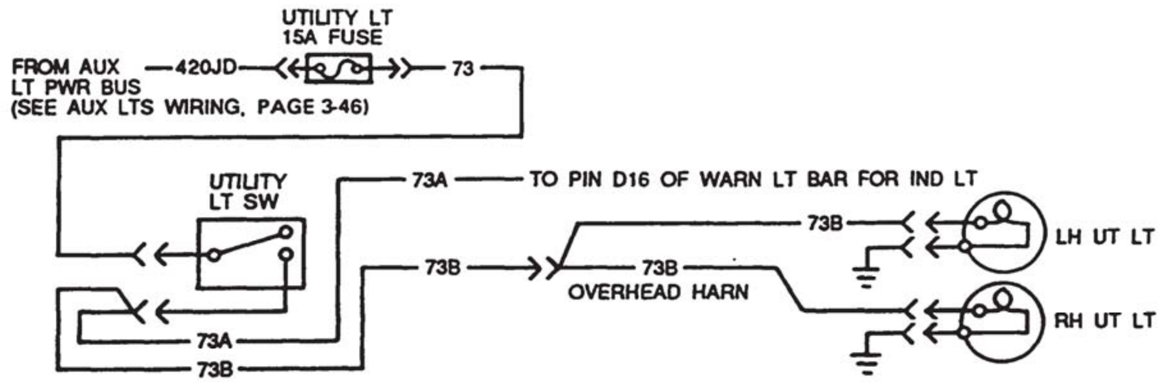
- If no voltage is present, repair red lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Utility Light Circuits



1. NEITHER UTILITY LIGHT OPERATES.

Step 1. Inspect light bulbs.

- Replace if broken or defective (page 4-224).

Step 2. Disconnect leads 420JD and 73 from 15A fuse. Check for continuity between contacts of 15A fuse.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace 15A fuse (page 4-204).

Step 3. Check for +12 VDC at lead 420JD from auxiliary light power bus.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 420JD (page 3-2).

Step 4. Disconnect lead 73 from utility light switch. Check for +12 VDC at lead 73.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 73 (page 3-2).

Step 5. Disconnect lead 73B from utility light switch. Activate switch. Check for continuity between switch contacts.

- If continuity is indicated, repair lead 73B (page 3-2). If no continuity is indicated, replace utility light switch (page 4-188).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Utility Light Circuits (Cont)

2. ONLY ONE UTILITY LIGHT OPERATING.

Step 1. Check backup lamp.

- If defective, replace lamp (page 4-284).

Step 2. Disconnect lead 73B from defective utility light. Check for +12 VDC at lead 73B.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 73B (page 3-2).

Step 3. Check for continuity between socket and ground.

- If continuity is indicated, replace utility light (page 4-224). If no continuity is indicated, repair ground lead (page 3-2).

3. UTILITY LIGHT INDICATOR LIGHT NOT OPERATING, UTILITY LIGHTS OPERATING NORMALLY.

Disconnect lead 73A from pin D16 of warning light bar. Check for +12 VDC at lead 73A.

- If +12 VDC is present, troubleshoot warning light circuit (page 3-60). If no voltage is present, repair lead 73A (page 3-2).

Electric Horn Circuits

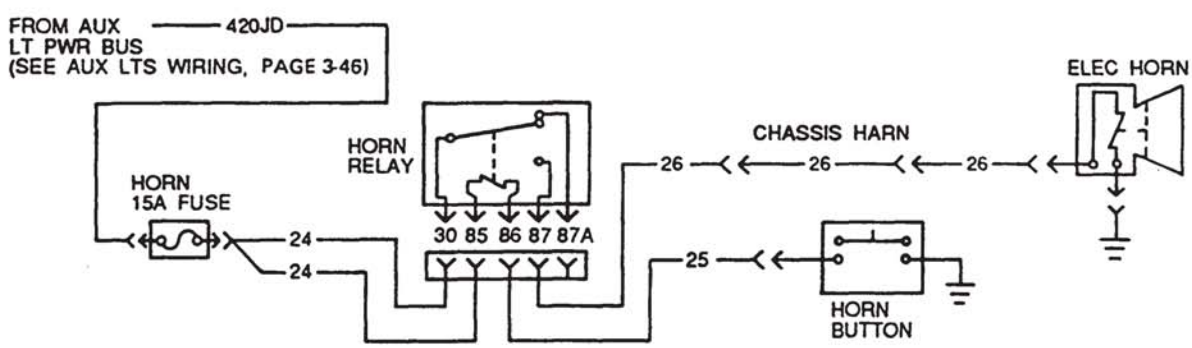


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Electric Horn Circuits (Cont)

1. ELECTRIC HORN DOES NOT OPERATE.

Step 1. Check horn 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Check for +12 VDC at lead 420JD from auxiliary light power bus.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 420JD (page 3-2).

Step 3. Disconnect horn relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 24 (page 3-2).

Step 4. Disconnect horn relay. Check for +12 VDC at connector 85.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 24 (page 3-2).

Step 5. Disconnect lead 25 from horn button. Check for +12 VDC at lead 25.

- If +12 VDC is present, go to step 6. If no voltage is present, replace horn relay (pages 4-197, 4-198).

Step 6. Disconnect ground lead from horn button. Check for continuity between ground lead and ground.

- If continuity is indicated, go to step 7. If no continuity is indicated, repair ground lead (page 3-2).

Step 7. Disconnect lead 25 from horn button. Press horn switch. Check for continuity between switch contacts.

- If continuity is indicated, go to step 8. If no continuity is indicated, replace horn button (page 4-606).

Step 8. Disconnect lead 26 from horn. Check for +12 VDC at lead 26 with horn button pressed.

- If +12 VDC is present, go to step 9. If no voltage is present, disconnect horn relay and check for continuity between connector 87 and lead 26. If continuity is indicated, replace horn relay (pages 4-197, 4-198). If no continuity is indicated, repair lead 26 (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

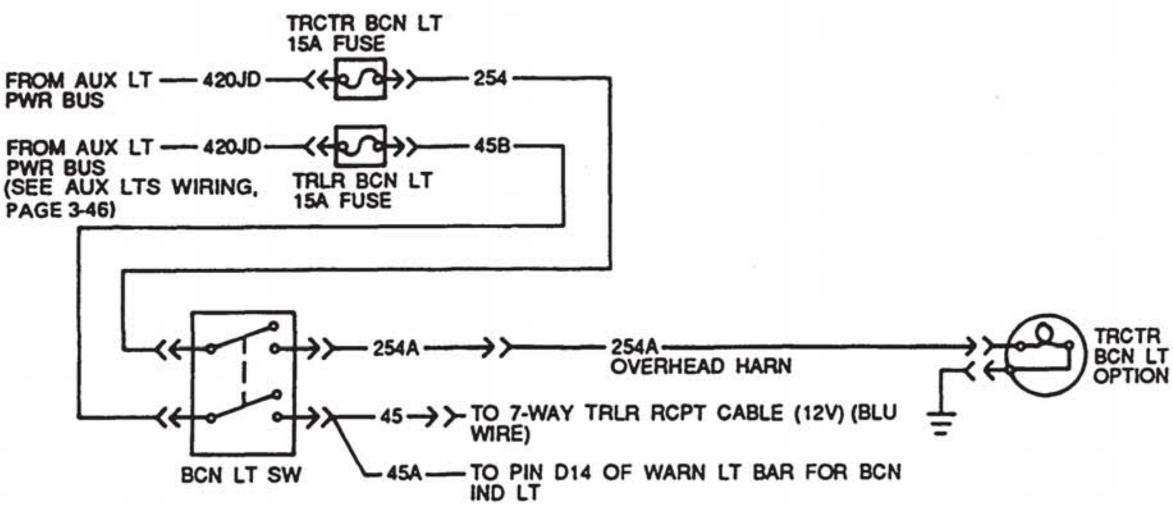
ELECTRICAL SYSTEM (CONT)

Electric Horn Circuits (Cont)

Step 9. Disconnect ground lead from horn. Check for continuity between ground lead and ground.

- If continuity is indicated, replace horn (page 4-252). If no continuity is indicated, repair ground lead (page 3-2).

Tractor Beacon Light Circuits



1. TRACTOR BEACON LIGHT NOT OPERATING.

Step 1. Check tractor beacon light 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Remove lamp from tractor beacon light. Check for continuity between contacts on lamp.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace tractor beacon light (TM 9-2320-363-10).

Step 3. Disconnect lead 254A from tractor beacon light. Check for +12 VDC at lead 254A with beacon light switch in on position.

- If no voltage is present, go to step 4. If +12 VDC is present, check for continuity between socket and ground. If continuity is indicated, replace tractor beacon light (TM 9-2320-363-10). If continuity is not indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Tractor Beacon Light Circuits (Cont)

Step 4. Remove tractor beacon light 15A fuse. Check for +12 VDC at lead 420JD fuse connector from auxiliary light power bus.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 420JD (page 3-2).

Step 5. Disconnect lead 254 from beacon light switch. Check for +12 VDC at lead 254.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead 254 (page 3-2).

Step 6. Disconnect lead 254 and lead 254A from switch. Activate switch. Check for continuity between contacts of switch.

- If continuity is indicated, go to step 7. If no continuity is indicated, replace beacon light switch (page 4-186).

Step 7. Disconnect lead 254A from tractor beacon light. Check for +12 VDC at lead 254A.

- If no voltage is present, repair lead 254A between beacon lights and beacon light switch (page 3-2).

Power Take-Off (PTO) Circuits (All Except M915A2)

1. PTO DOES NOT ENGAGE.

Step 1. Check reservoir heater/power take-off 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Check for +12 VDC at lead 18 from ignition switch terminal.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 18 (page 3-2).

Step 3. Disconnect lead 200D from PTO switch. Check for +12 VDC at lead 200D.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 200D (page 3-2).

Step 4. Disconnect lead 200E from PTO switch. Activate switch. Check for continuity between contacts of PTO switch.

- If continuity is indicated, go to step 5. If no continuity is indicated, replace PTO switch (page 4-182).

Table 3-1. Troubleshooting (Cont)

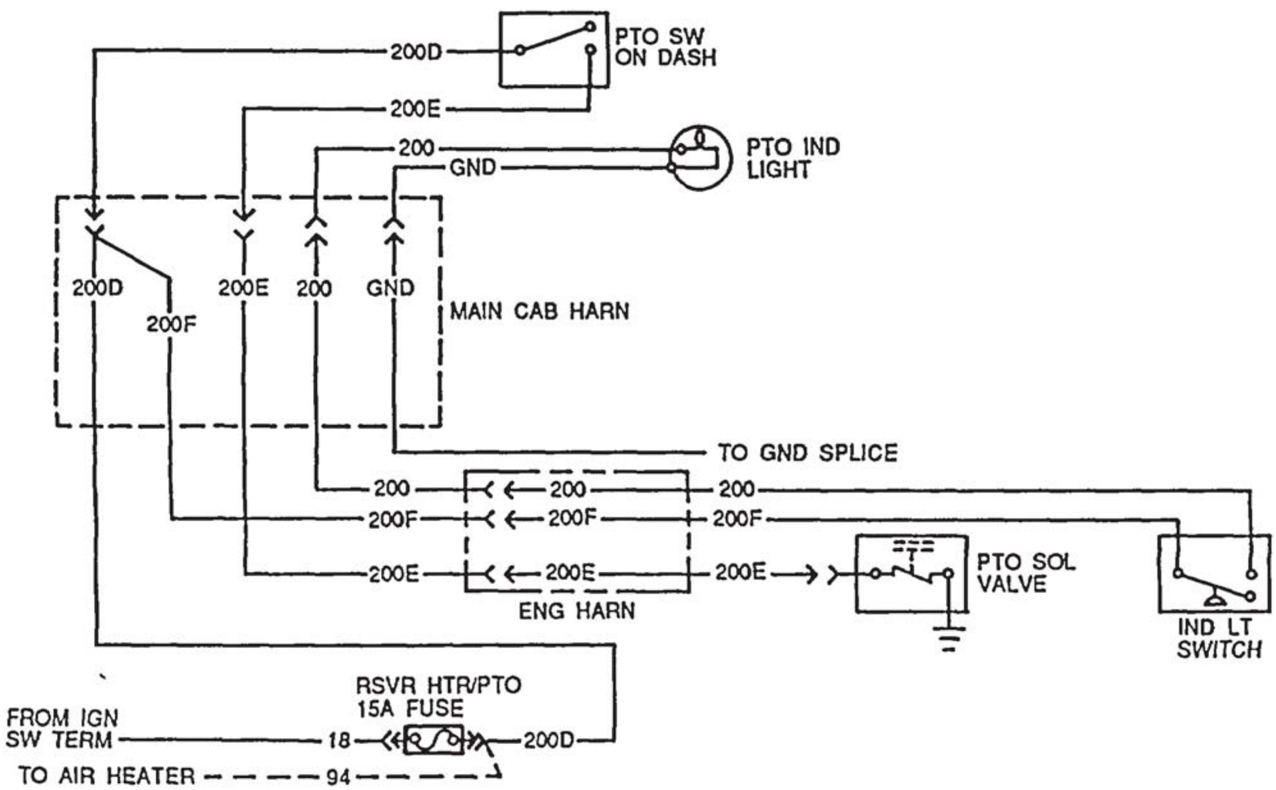
Malfunction

Test or inspection

Corrective action

ELECTRICAL SYSTEM (CONT)

Power Take-Off (PTO) Circuits (All Except M915A2) (Cont)



Step 5. Disconnect lead 200E from main cab harness. Check for +12 VDC at lead 200E.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead 200E between PTO switch and main cab harness (page 3-2).

Step 6. Disconnect lead 200E from engine harness. Check for +12 VDC at lead 200E.

- If +12 VDC is present, go to step 7. If no voltage is present, repair lead 200E in main cab harness (page 3-2).

Step 7. Disconnect lead 200E from PTO solenoid valve. Check for +12 VDC at lead 200E.

- If +12 VDC is present, go to step 8. If no voltage is present, repair lead 200E in engine harness (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Power Take-Off (PTO) Circuits (All Except M915A2) (Cont)

Step 8. Disconnect ground lead from PTO solenoid valve. Check for continuity between ground lead and ground.

- If continuity is indicated, notify direct support maintenance. If no continuity is indicated, repair ground lead (page 3-2).

2. PTO INDICATOR LIGHT NOT OPERATING, OTHER PTO CIRCUITS OPERATING NORMALLY.

Step 1. Check PTO indicator light.

- If defective, replace light (page 4-182).

Step 2. Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 200F from engine harness. Check for +12 VDC at lead 200F.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 200F (page 3-2).

Step 4. Disconnect lead 200F from PTO indicator light switch. Check for +12 VDC at lead 200F.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 200F (page 3-2).

Step 5. Disconnect lead 200F and lead 200 from PTO indicator light switch. Check for continuity between contacts of switch.

- If continuity is indicated, go to step 6. If continuity is not indicated, replace PTO indicator light switch (page 4-182).

Step 6. Disconnect lead 200 from engine harness. Check for +12 VDC at engine harness disconnect.

- If +12 VDC is present, go to step 7. If no voltage is present, repair lead 200 (page 3-2).

Step 7. Disconnect lead 200 from main cab harness. Check for +12 VDC at lead 200.

- If +12 VDC is present, go to step 8. If no voltage is present, repair lead 200 between main cab harness and engine harness (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Power Take-Off (PTO) Circuits (All Except M915A2) (Cont)

Step 8. Disconnect lead 200 from PTO indicator light. Check for +12 VDC at lead 200.

- If +12 VDC is present, replace PTO indicator light switch (page 4-182). If no voltage is present, repair lead 200 between PTO indicator light and main cab harness (page 3-2).

Panel Light Circuits

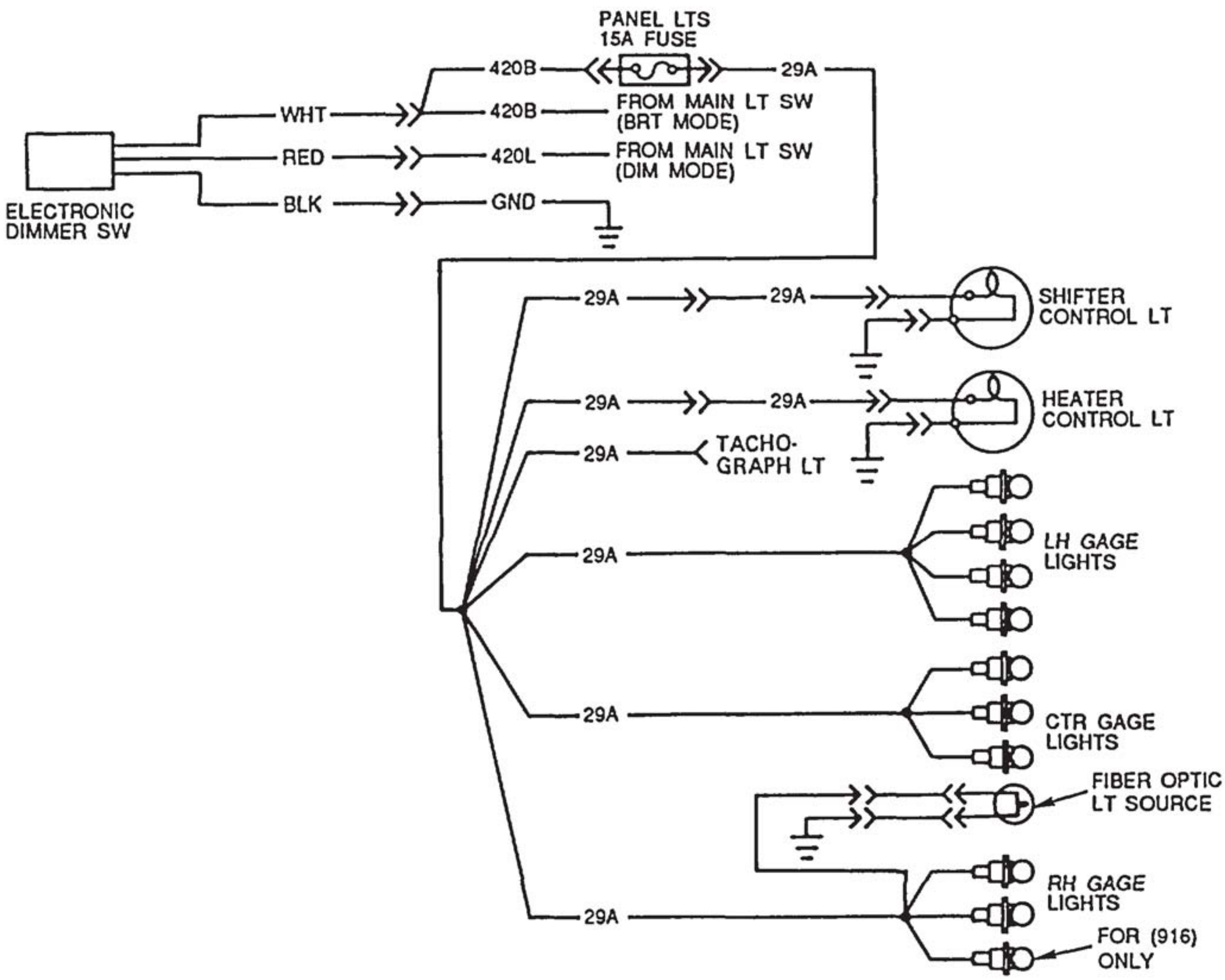


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Panel Light Circuits (Cont)

1. NONE OF THE PANEL LIGHTS OPERATING.

Step 1. Check panel lights 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Disconnect lead 420B from electronic dimmer switch. Check for +12 VDC at lead 420B from dimmer switch.

- If +12 VDC is present, repair lead 420B (page 3-2). If no voltage is present, go to step 3.

Step 3. Disconnect ground lead from dimmer switch. Check for continuity between ground lead and ground.

- If continuity is indicated, replace electronic dimmer switch (page 4-168). If no continuity is indicated, repair ground lead (page 3-2).

2. SHIFTER CONTROL LIGHT NOT OPERATING, OTHER SHIFTER CIRCUITS OPERATING NORMALLY.

Step 1. Check shifter control lamp.

- If defective, replace lamp (page 4-335).

Step 2. Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 29A from shifter control light. Check for +12 VDC at lead 29A from panel fuse.

- If +12 VDC is present, repair lead 29A to shifter control light. If no voltage is present, repair lead 29A from 15A fuse (page 3-2).

3. HEATER CONTROL LIGHT NOT OPERATING, OTHER HEATER CIRCUITS OPERATING NORMALLY.

Step 1. Check heater control lamp.

- If defective, replace lamp (page 4-190).

Step 2. Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Panel Light Circuits (Cont)

Step 3. Disconnect lead 29A from heater control light. Check for +12 VDC at lead 29A from panel fuse.

- If +12 VDC is present, repair lead 29A to heater control light. If no voltage is present, repair lead 29A from fuse (page 3-2).

4. ONE OR MORE GAGE LIGHTS NOT OPERATING.

Check panel gage lamp(s).

- If defective, replace lamp(s) (page 4-176).

5. FIBER OPTICS NOT OPERATING.

Step 1. Check fiber optic light source lamp.

- If damaged, replace lamp (page 4-193).

Step 2. Check for continuity between lamp socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect power lead to fiber optic light source. Check for +12 VDC at power lead.

- If +12 VDC is present, replace fiber optic light source light (page 4-193). If no voltage is present, repair power lead (page 3-2).

6. TACHOGRAPH LIGHT NOT OPERATING.

Step 1. Check for continuity between ground lead and ground.

- If continuity is indicated, go to step 2. If continuity is not indicated, repair ground lead (page 3-2).

Step 2. Disconnect lead 29A from tachograph. Check for +12 VDC at lead 29A.

- If +12 VDC is present, replace tachograph (pages 4-178, 4-182). If no voltage is present, repair lead 29A (page 3-2).

7. PANEL LIGHTS DO NOT DIM.

Disconnect lead 420B from electronic dimmer switch. Check for +12 VDC at lead 420B with main light switch in dim mode.

- If +12 VDC is present, replace main light switch (page 4-170). If no voltage is present, replace electronic dimmer switch (page 4-168).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

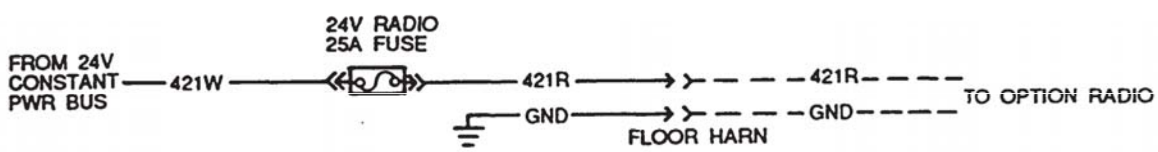
Panel Light Circuits (Cont)

8. PANEL LIGHTS DO NOT BRIGHTEN.

Disconnect lead 420B from electronic dimmer switch. Check for +12 VDC at lead 420B with main light switch in bright mode.

- If +12 VDC is present, replace main light switch (page 4-170).

Radio Circuits



24 V Radio Power Circuits

1. POWER SOURCE FOR 24 VDC RADIO DOES NOT OPERATE.

Step 1. Check 24 VDC 25A radio fuse.

- If defective, replace 25A fuse (page 4-204).

Step 2. Remove 24 VDC 25A radio fuse. Check for +24 VDC at lead 421W fuse connector.

- If +24 VDC is present, go to step 3. If no voltage is present, repair lead 421W to 24 VDC constant power bus (page 3-2).

Step 3. Check for continuity between ground lead and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Step 4. Check for +24 VDC at lead 421R from radio power source connector.

- If +24 VDC is not present, repair lead 421R.

Instrument Wiring Circuits

1. NONE OF THE INSTRUMENTS ON DASHBOARD OPERATING.

Step 1. Check instruments 10A fuse.

- If defective, replace 10A fuse (page 4-204).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Instrument Wiring Circuits (Cont)

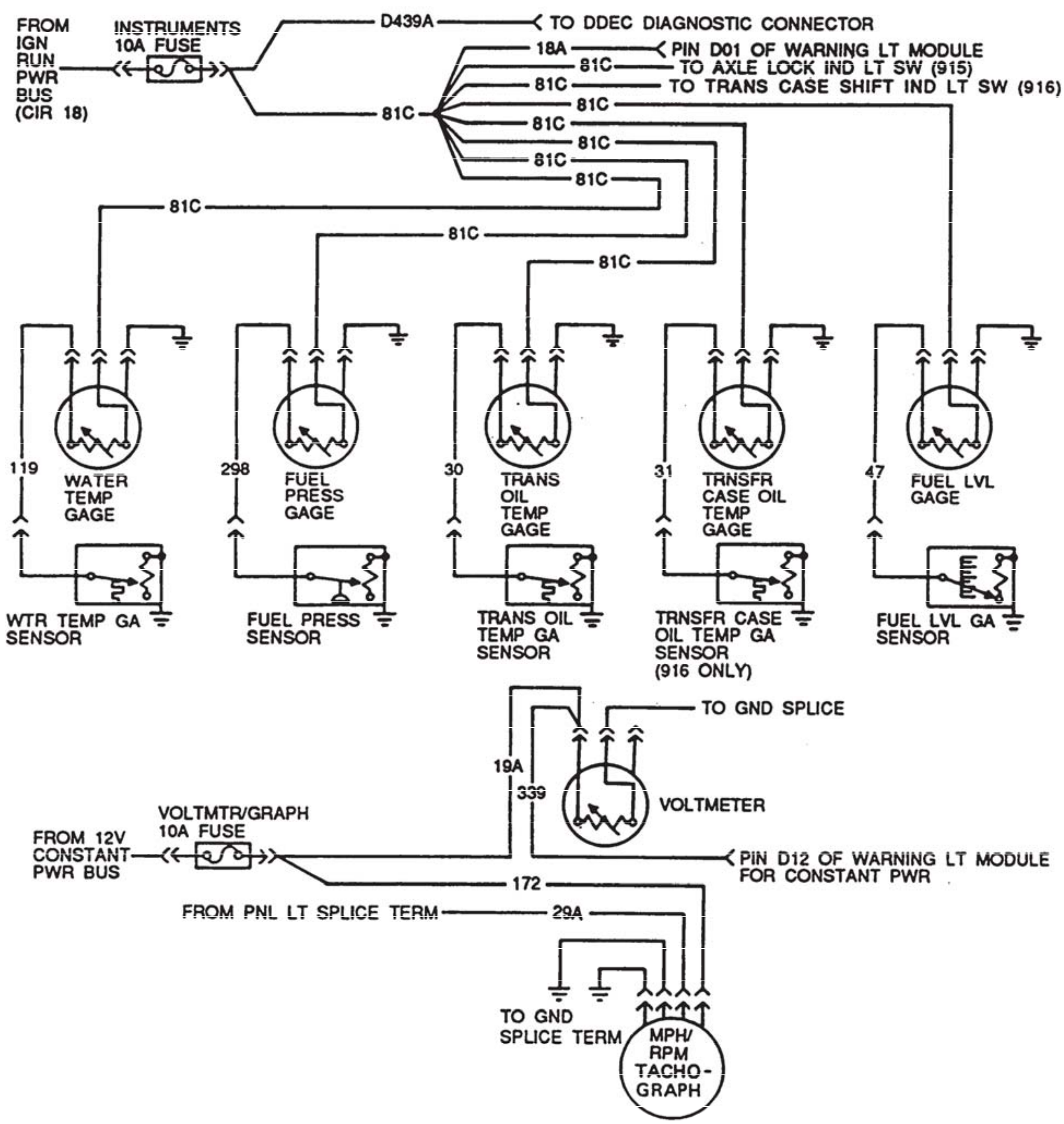


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Instrument Wiring Circuits (Cont)

Step 2. Check for +12 VDC at ignition run power bus connector.

- If +12 VDC is present, repair lead 81C (page 3-2). If no voltage is present, repair connector on ignition run power bus (page 3-2).

2. WATER TEMPERATURE GAGE DOES NOT OPERATE.

Step 1. Disconnect lead 81C from water temperature gage. Check for +12 VDC at lead 81C.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 81C (page 3-2).

Step 2. Disconnect ground lead from water temperature gage. Check for continuity between lead and ground.

- If continuity is present, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 119 from water temperature gage. Check for +8 to +12 VDC at water temperature gage.

- If +8 to +12 VDC is present, go to step 4. If no voltage is present, replace water temperature gage (page 4-172).

Step 4. Disconnect lead 119 from water temperature gage sensor. Check for +8 to +12 VDC at lead 119.

- If +8 to +12 VDC is present, replace water temperature gage sensor (page 4-238). If no voltage is present, repair lead 119 (page 3-2).

3. FUEL PRESSURE GAGE DOES NOT OPERATE.

Step 1. Disconnect lead 81C from fuel pressure gage. Check for +12 VDC at lead 81C.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 81C (page 3-2).

Step 2. Disconnect ground lead from fuel pressure gage. Check for continuity between lead and ground.

- If continuity is present, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Instrument Wiring Circuits (Cont)

Step 3. Disconnect lead 298 from fuel pressure gage. Check for +8 to +12 VDC at fuel pressure gage.

- If +8 to +12 VDC is present, go to step 4. If no voltage is present, replace fuel pressure gage (pages 4-174, 4-176).

Step 4. Disconnect lead 298 from fuel pressure sensor. Check for +8 to +12 VDC at lead 298.

- If +8 to +12 VDC is present, replace fuel pressure sensor (page 4-230). If no voltage is present, repair lead 298 (page 3-2).

4. TRANSMISSION OIL TEMPERATURE GAGE DOES NOT OPERATE.

Step 1. Disconnect lead 81C from transmission oil temperature gage. Check for +12 VDC at lead 81C.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 81C (page 3-2).

Step 2. Disconnect ground lead from transmission oil temperature gage. Check for continuity between lead and ground.

- If continuity is present, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 30 from transmission oil temperature gage. Check for +8 to +12 VDC at transmission oil temperature gage.

- If +8 to +12 VDC is present, go to step 4. If no voltage is present, replace transmission oil temperature gage (pages 4-174, 4-176).

Step 4. Disconnect lead 30 from transmission oil temperature gage sensor. Check for +8 to +12 VDC at lead 30.

- If +8 to +12 VDC is present, replace transmission oil temperature gage sensor (notify direct support maintenance). If no voltage is present, repair lead 30 (page 3-2).

5. FUEL LEVEL GAGE DOES NOT OPERATE.

Step 1. Disconnect lead 81C from fuel level gage. Check for +12 VDC at lead 81C.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 81C (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Instrument Wiring Circuits (Cont)

Step 2. Disconnect ground lead from fuel level gage. Check for continuity between ground lead and ground.

- If continuity is present, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 47 from fuel level gage. Check for +8 to +12 VDC at fuel level gage.

- If +8 to +12 VDC is present, go to step 4. If no voltage is present, replace fuel level gage (pages 4-174, 4-176).

Step 4. Disconnect lead 47 from fuel level sensor. Check for +8 to +12 VDC at lead 47.

- If +8 to +12 VDC is present, replace fuel level gage sensor (page 4-244). If no voltage is present, repair lead 47 (page 3-2).

6. TRANSFER CASE OIL TEMPERATURE GAGE DOES NOT OPERATE (ALL EXCEPT M915A2).

Step 1. Disconnect lead 81C from transfer case oil temperature gage. Check for +12 VDC at lead 81C.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 81C (page 3-2).

Step 2. Disconnect ground lead from transfer case oil temperature gage. Check for continuity between ground lead and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 31 from transfer case oil temperature gage. Check for +8 to +12 VDC at transfer case oil temperature gage.

- If +8 to +12 VDC is present, go to step 4. If no voltage is present, replace transfer case oil temperature gage (pages 4-174, 4-176).

Step 4. Disconnect lead 31 from transfer case oil temperature gage sensor. Check for +8 to +12 VDC at lead 31.

- If +8 to +12 VDC is present, replace transfer case oil temperature gage sensor (notify direct support maintenance). If no voltage is present, repair lead 31 (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Instrument Wiring Circuits (Cont)

7. VOLTMETER DOES NOT OPERATE, WARNING LIGHT OPERATING NORMALLY.

Step 1. Disconnect lead 19A from voltmeter. Check for +12 VDC at lead 19A.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 19A (page 3-2).

Step 2. Disconnect ground lead from voltmeter. Check for continuity between ground lead and ground.

- If continuity is indicated, replace voltmeter (page 4-172). If no continuity is indicated, repair ground lead (page 3-2).

8. TACHOGRAPH DOES NOT OPERATE, VOLTMETER AND PANEL LIGHT OPERATING NORMALLY (M915A2 AND M916A1).

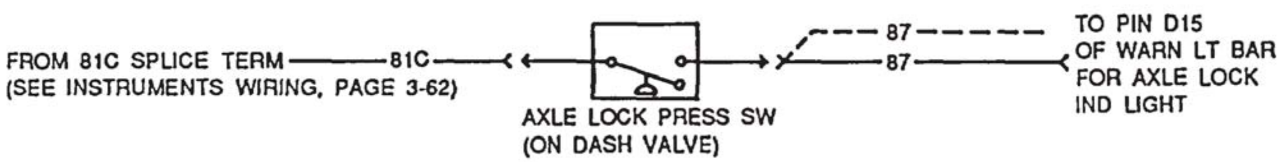
Step 1. Disconnect lead 172 from tachograph. Check for +12 VDC at lead 172.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 172 (page 3-2).

Step 2. Disconnect ground lead from tachograph. Check for continuity between ground lead and ground.

- If continuity is indicated, replace tachograph (pages 4-178, 4-182). If no continuity is indicated, repair ground lead (page 3-2).

Axle Lock Circuit (M915A2)



1. AXLE LOCK DOES NOT ENGAGE.

Step 1. Disconnect lead 81C from axle lock pressure switch. Check for +12 VDC at lead 81C.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 81C (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Axle Lock Circuit (M915A2) (Cont)

Step 2. Disconnect leads 87 and 81C from axle lock pressure switch. Check for continuity between contacts of switch.

- If continuity is indicated, go to step 3. If no continuity is indicated, replace axle lock pressure switch (pages 4-178, 4-182).

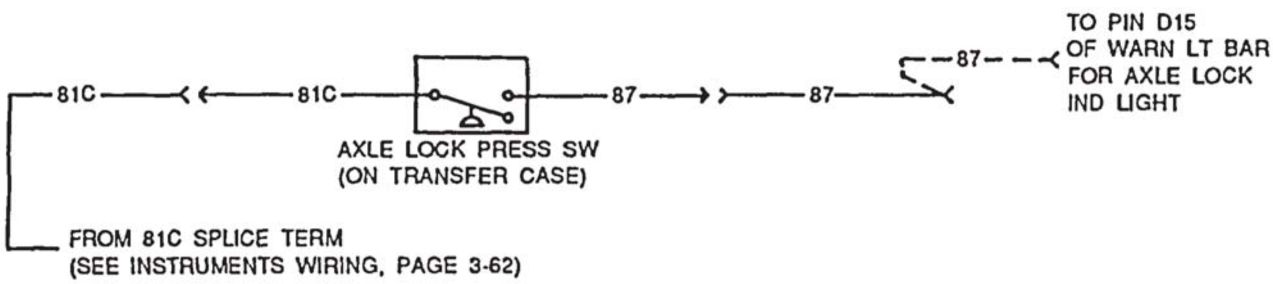
Step 3. Disconnect lead 87 from axle lock pressure switch. Check continuity between lead 87 and ground.

- If no continuity is indicated, repair lead 87 (page 3-2).

2. AXLE LOCK INDICATOR LIGHT DOES NOT OPERATE, AXLE LOCK OPERATES.
Disconnect lead 87 to pin D15 of warning light bar. Check for +12 VDC at lead 87.

- If +12 VDC is present, troubleshoot panel light circuit (page 3-58). If no voltage is present, repair lead 87 (page 3-2).

Axle Lock Circuit (All Except M915A2)



1. AXLE LOCK DOES NOT ENGAGE.

Step 1. Disconnect leads 87 and 81C from axle lock pressure switch. Check for continuity between contacts of switch.

- If continuity is present, go to step 2. If no continuity is indicated, replace axle lock pressure switch (pages 4-178, 4-182).

Step 2. Check for +12 VDC at lead 81C from instrument splice terminal.

- If +12 VDC is present, repair lead 81C. It no voltage is present, troubleshoot instrument circuits (page 3-62).

2. AXLE LOCK INDICATOR LIGHT DOES NOT OPERATE, AXLE LOCK OPERATES.
Disconnect lead 87 to pin D15 of warning light bar. Check for +12 VDC at lead 87.

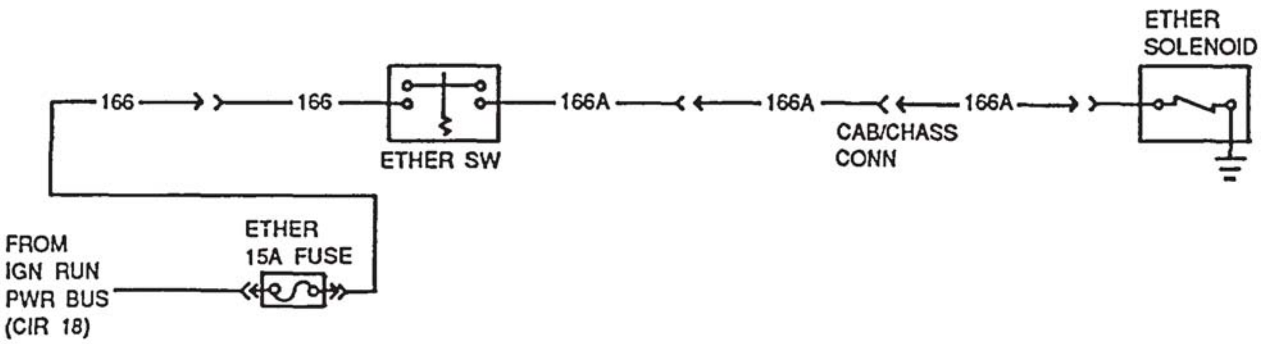
- If +12 VDC is present, troubleshoot panel light circuit (page 3-58). If no voltage Is present, repair lead 87 (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Ether Quick-Start Circuit



1. ETHER QUICK-START NOT OPERATING, CONTAINER HAS ETHER IN IT.

Step 1. Check ether 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Remove ether 15A fuse. Check for +12 VDC at fuse connector from ignition run power bus.

- If +12 VDC is present, go to step 3. If no voltage is present, repair circuit 18 (page 3-2).

Step 3. Disconnect lead 166 from ether switch. Check for +12 VDC at lead 166.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 166 (page 3-2).

Step 4. Disconnect lead 166 and lead 166A from ether switch. Check for continuity between contacts of switch with switch activated.

- If continuity is present, go to step 5. If no continuity is indicated, replace ether switch (page 4-188).

Step 5. Disconnect lead 166A at cab/chassis connection. Check for +12 VDC at lead 166A.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead 166A (page 3-2).

Step 6. Disconnect lead 166A from ether solenoid. Check for +12 VDC at lead 166A.

- If +12 VDC Is present, go to step 7. If no voltage is present, repair lead 166A (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

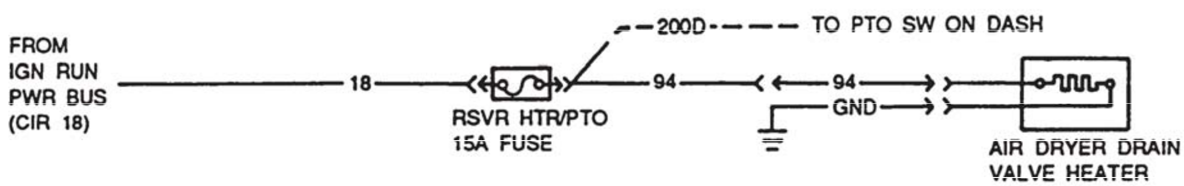
ELECTRICAL SYSTEM (CONT)

Ether Quick-Start Circuit (Cont)

Step 7. Disconnect ground lead from ether solenoid. Check for continuity between ground lead and ground.

- If continuity is indicated, replace ether solenoid (pages 4-65, 4-70). If no continuity is indicated, repair ground lead (page 3-2).

Air Dryer Heater Circuit



1. AIR DRYER HEATER NOT OPERATING.

Step 1. Check reservoir heater/power take-off 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Remove reservoir heater/power take-off 15A fuse. Check for +12 VDC at lead 18 fuse connector.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 18 to ignition run power bus (page 3-2).

Step 3. Disconnect lead 94 from air dryer drain valve heater. Check for +12 VDC at lead 94.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 94 (page 3-2).

Step 4. Disconnect ground lead from air dryer drain valve heater. Check for continuity between lead and ground.

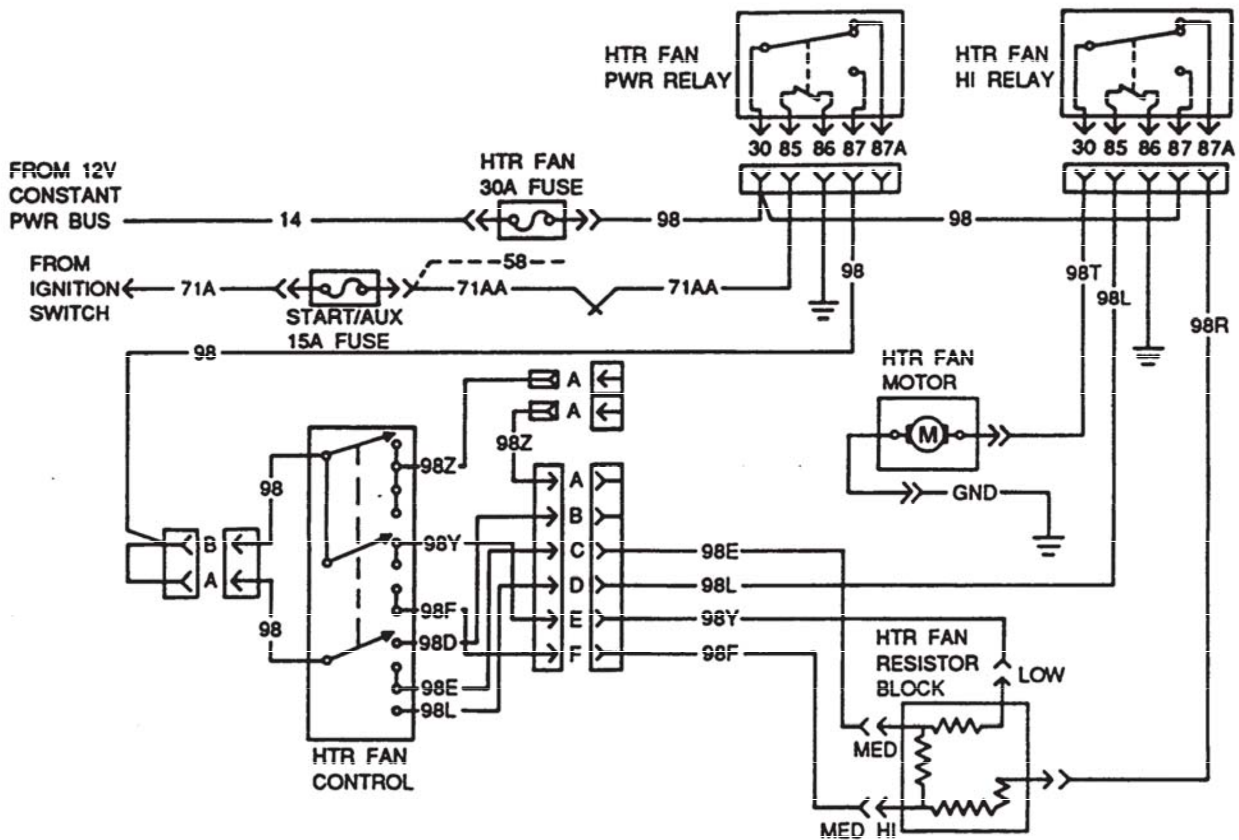
- If continuity is indicated, replace air dryer drain valve heater (pages 4-552, 4-556). If no continuity is indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Standard Heater Circuits



1. HEATER FAN DOES NOT OPERATE IN ANY SPEED.

Step 1. Check heater fan 30A fuse.

- If defective, replace 30A fuse (page 4-204).

Step 2. Check start/auxiliary 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 3. Remove heater fan 30A fuse. Check for +12 VDC at lead 14 fuse connector.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 14 to 12-volt constant power bus (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Standard Heater Circuits (Cont)

Step 4. Remove start/auxiliary 15A fuse. Check for +12 VDC at lead 71A fuse connector.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 71A (page 3-2).

Step 5. Disconnect heater fan power relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead 98 (page 3-2).

Step 6. Disconnect heater fan high relay from connector. Check for +12 VDC at connector 87.

- If +12 VDC is present, go to step 7. If no voltage is present, repair lead 98 (page 3-2).

Step 7. Check for continuity between connector 86 and ground for both relays.

- If continuity is indicated, go to step 8. If no continuity is indicated, repair ground lead (page 3-2).

Step 8. Disconnect heater fan power relay from connector. Check for +12 VDC at connector 85.

- If +12 VDC is present, go to step 9. If no voltage is present, repair lead 71AA (page 3-2).

Step 9. Disconnect lead 98 from heater fan control. Check for +12 VDC at lead 98.

- If +12 VDC is present, go to step 10. If no voltage is present, disconnect heater fan power relay. Check for continuity in lead 98. If continuity is indicated, replace heater fan power relay (pages 4-197, 4-198). If no continuity is indicated, repair lead 98 (page 3-2).

Step 10. Disconnect lead 98L from heater fan control. Check for +12 VDC at heater fan control connector (D) with heater fan control in high mode.

- If +12 VDC is present, go to step 11. If no voltage is present, replace heater fan control (page 4-190).

Step 11. Disconnect heater fan high relay from connector. Check for +12 VDC at connector 85 with heater fan control in high mode.

- If +12 VDC is present, go to step 12. If no voltage is present, repair lead 98L (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Standard Heater Circuits (Cont)

Step 12. Disconnect lead 98T from heater fan motor. Check for +12 VDC at lead 98T with heater fan control in high mode.

- If +12 VDC is present, go to step 13. If no voltage is present, disconnect heater fan high relay from connector. Check for continuity in lead 98T between connector 30 and heater fan motor. If continuity is indicated, replace heater fan high relay (pages 4-197, 4-198). If no continuity is indicated, repair lead 98T (page 3-2).

Step 13. Disconnect ground lead from heater fan motor. Check for continuity between ground lead and ground.

- If continuity is indicated, replace heater fan motor (page 4-192). If no continuity is indicated, repair ground lead (page 3-2).

2. NONE OF THE LOWER VARIABLE SPEEDS OPERATE.

Step 1. Disconnect leads 98Y, 98E, and 98F from heater fan control. Check for +12 VDC at connector (E) with heater fan control in low mode, at connector (C) with heater fan control in medium mode, and at connector (F) with heater fan control in medium-high mode.

- If +12 VDC is present, go to step 2. If no voltage is present, replace heater fan control (page 4-190).

Step 2. Disconnect lead 98L from heater fan control. Check for +12 VDC with heater fan control in low, medium, and medium-high mode.

- If +12 VDC is present, replace heater fan control (page 4-190). If no voltage is present, go to step 3.

Step 3. Disconnect lead 98R from heater fan resistor block. Check for +12 VDC with heater fan control in low mode.

- If +12 VDC is present, go to step 4. If no voltage is present, replace heater fan resistor block (notify direct support maintenance).

Step 4. Disconnect heater fan high relay from connector. Check for +12 VDC at connector 87A.

- If +12 VDC is present, go to step 5. If no voltage is present, repair lead 98R (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Standard Heater Circuits (Cont)

Step 5. Disconnect lead 98T from heater fan motor. Check for +12 VDC at lead 98.

- If no voltage is present, replace heater fan high relay (pages 4-197, 4-198).

3. HIGH SPEED DOES NOT OPERATE.

Step 1. Disconnect lead 98L from heater fan control. Check for +12 VDC at connector (D) with heater fan control in high mode.

- If +12 VDC is present, go to step 2. If no voltage is present, replace heater fan control (page 4-190).

Step 2. Disconnect heater fan high relay from connector. Check for +12 VDC at connector 85 with heater fan control in high mode.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 98L (page 3-2).

Step 3. Disconnect heater fan high relay from connector. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Step 4. Disconnect lead 98T from heater fan motor. Check for +12 VDC at lead 98T.

- If no voltage is present, replace heater fan high relay (pages 4-197, 4-198).

4. MEDIUM-HIGH SPEED DOES NOT OPERATE.

Step 1. Disconnect lead 98F from heater fan control. Check for +12 VDC at heater fan control connector (F) with heater fan control in medium-high mode.

- If +12 VDC is present, go to step 2. If no voltage is present, replace heater fan control (page 4-190).

Step 2. Disconnect lead 98F from heater fan resistor block. Check for +12 VDC at lead 98F.

- If no voltage is present, repair lead 98F (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Standard Heater Circuits (Cont)

5. MEDIUM SPEED DOES NOT OPERATE.

Step 1. Disconnect lead 98E from heater fan control. Check for +12 VDC at heater fan control connector (C) with heater fan control in medium mode.

- If +12 VDC is present, go to step 2. If no voltage is present, replace heater fan control (page 4-190).

Step 2. Disconnect lead 98E from resistor block. Check for +12 VDC at lead 98E.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 98E (page 3-2).

Step 3. Disconnect leads 98E and 98F from heater fan resistor block. Check for continuity between contacts of heater resistor block.

- If no continuity is indicated, replace resistor block (notify direct support maintenance).

6. LOW SPEED DOES NOT OPERATE.

Step 1. Disconnect lead 98Y from heater fan control. Check for +12 VDC at heater fan control connector (E) with heater fan control in low mode.

- If +12 VDC is present, go to step 2. If no voltage is present, replace heater fan control (page 4-190).

Step 2. Disconnect lead 98Y from heater fan resistor block. Check for +12 VDC at lead 98Y.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 98Y (page 3-2).

Step 3. Disconnect leads 98Y and 98E from heater fan resistor block. Check for continuity between contacts of resistor block.

- If no continuity is indicated, replace heater fan resistor block (notify direct support maintenance).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Auxiliary Heater Circuits

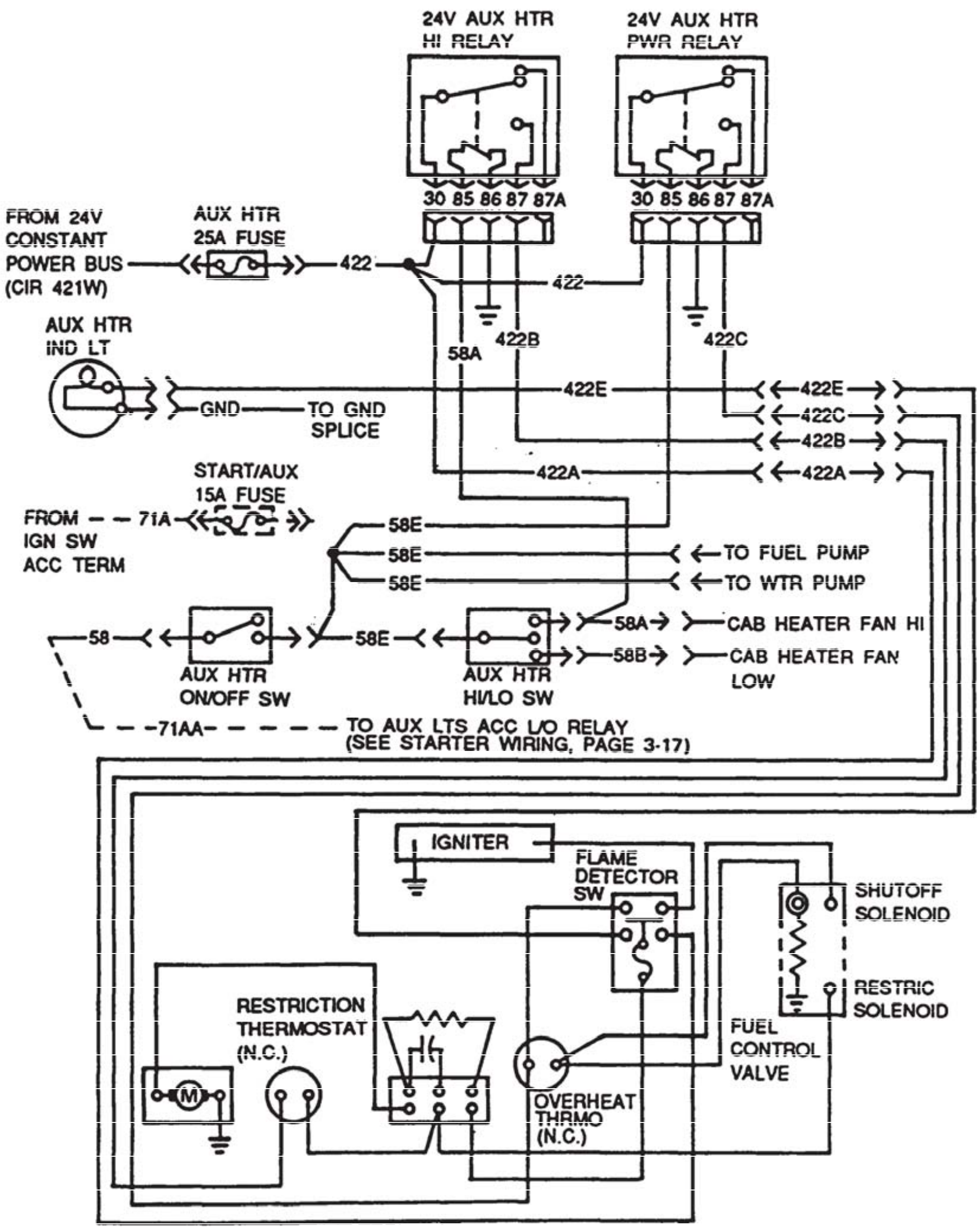


Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Auxiliary Heater Circuits (Cont)

1. AUXILIARY HEATER DOES NOT OPERATE, AUXILIARY LIGHTS OPERATING.

Step 1. Check auxiliary heater 25A fuse.

- If defective, replace 25A fuse (page 4-204).

Step 2. Remove auxiliary heater 25A fuse. Check for +24 VDC at fuse connector to 24 V constant power bus.

- If +24 VDC is present, go to step 3. If no voltage is present, repair lead (page 3-2).

Step 3. Disconnect lead 58 from auxiliary heater. Check for +24 VDC at lead 58.

- If +24 VDC is present, go to step 4. If no voltage is present, repair lead 58 (page 3-2).

Step 4. Disconnect leads 58 and 58E from auxiliary heater on/off switch. Check for continuity between contacts of auxiliary heater on/off switch.

- If continuity is indicated, go to step 5. If no continuity is indicated, replace auxiliary heater on/off switch (page 4-190).

Step 5. Disconnect 24 V auxiliary heater power relay from connector. Check for +24 VDC at connector 30 and 85 with auxiliary heater on/off switch closed.

- If +24 VDC is present, go to step 6. If no voltage is present, repair lead 422 or lead 58E (page 3-2).

Step 6. Disconnect 24 V auxiliary heater high relay from connector. Check for +24 VDC at connectors 30 and 85 with auxiliary heater on/off switch closed and auxiliary heater high/low switch in high mode.

- If +24 VDC is present, go to step 7. If no voltage is present at connector 30, repair lead 422 (page 3-2). If no voltage is present at connector 85, go to next corrective action.
- Disconnect lead 58E from auxiliary heater high/low switch. Check for +24 VDC at auxiliary heater high/low switch. If +24 VDC is present, go to next corrective action. If no voltage is present, repair lead 58E (page 3-2).
- Disconnect lead 58A from auxiliary heater high/low switch. Check for +24 VDC at auxiliary heater high/low switch. If +12 VDC is present, go to step 7. If no voltage is present, repair lead 58A (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Auxiliary Heater Circuits (Cont)

Step 7. Disconnect 24 V auxiliary heater high relay and 24 V auxiliary heater power relay from their connectors. Check for continuity between connectors 86 and ground.

- If continuity is indicated, go to step 8. If no continuity is indicated, repair ground lead (page 3-2).

Step 8. Disconnect 24 V auxiliary heater high relay from connector. Install jumper wires between connectors 30, 85, and 86 to their respective connections at 24 V auxiliary heater high relay. Check for +24 VDC at connection 87 on 24 V auxiliary heater high relay with auxiliary heater on/off switch closed and auxiliary heater high/low switch in high mode.

- If +24 VDC is present, go to step 9. If no voltage is present, replace 24 V auxiliary heater high relay (pages 4-197, 4-198).

Step 9. Disconnect lead 422B from restriction thermostat at auxiliary heater. Check for +24 VDC at restriction thermostat.

- If +24 VDC is present, go to step 10. If no voltage is present, repair lead 422B (page 3-2).

Step 10. Disconnect 24 V auxiliary heater power relay from connector. Install jumper wires between connectors 30, 85, and 86 to their respective connections at 24 V auxiliary heater power relay with auxiliary heater on/off switch closed. Check for +24 VDC at connection 87 on 24 V auxiliary heater power relay.

- If +24 VDC is present, go to step 11. If no voltage is present, replace 24 V auxiliary heater power relay (pages 4-197, 4-198).

Step 11. Disconnect lead 422C from overheat thermostat switch. Check for +24 VDC at lead 422C.

- If +24 VDC is present, repair auxiliary heater (notify direct support maintenance). If no voltage is present, repair lead 422C (page 3-2).

2. AUXILIARY HEATER INDICATOR LIGHT NOT OPERATING, HEATER OPERATING NORMALLY.

Step 1. Remove lamp from socket (page 4-190). Check for continuity between contacts of lamp.

- If continuity is indicated, go to step 2. If no continuity is indicated, replace lamp (page 4-190).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

ELECTRICAL SYSTEM (CONT)

Auxiliary Heater Circuits (Cont)

Step 2. Check for continuity between socket and ground.

- If continuity is indicated, go to step 3. If no continuity is indicated, repair ground lead (page 3-2).

Step 3. Disconnect lead 422E at line disconnect. Check for +24 VDC at lead 422E.

- If +24 VDC is present, repair lead 422E between line disconnect and heater (page 3-2). If no voltage is present, repair lead 422E between indicator light and line disconnect (page 3-2).

3. AUXILIARY HEATER HIGH/LOW SWITCH DOES NOT OPERATE.

Step 1. Disconnect lead 58E from auxiliary heater high/low switch. Check for +24 VDC at lead 58E with auxiliary heater high/low switch closed.

- If +24 VDC is present, go to step 2. If no voltage is present, repair lead 58E (page 3-2).

Step 2. Disconnect lead 58A from auxiliary heater high/low switch. Check for +24 VDC at auxiliary heater high/low switch with auxiliary heater high/low switch closed and in high mode.

- If +24 VDC is present, go to step 3. If no voltage is present, replace auxiliary heater high/low switch (page 4-190).

Step 3. Disconnect 24 V auxiliary heater high relay from connector. Check for +24 VDC at connector 30 and 85 with auxiliary heater on/off switch closed and auxiliary heater high/low switch in high mode.

- If +24 VDC is present, go to step 4. If no voltage is present, repair lead 422 or lead 58A (page 3-2).

Step 4. Disconnect 24 V auxiliary heater high relay from connector. Check for continuity between connector and ground.

- If continuity is indicated, go to step 5. If no continuity is indicated, repair ground lead (page 3-2).

Step 5. Disconnect 24 V auxiliary heater high relay from connector. Install jumper wires to connectors 30, 85, and 86 to their respective connections at auxiliary heater high relay. Check for +24 VDC at pin 87 on 24 V auxiliary heater high relay with auxiliary heater on/off switch closed and auxiliary heater high/low switch in high mode.

- If +24 VDC is present, go to step 6. If no voltage is present, replace 24 V auxiliary heater high relay (pages 4-197, 4-198).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Auxiliary Heater Circuits (Cont)

Step 6. Disconnect lead 422B from restriction thermostat. Check for +24 VDC at lead 422B with auxiliary heater on/off switch closed and auxiliary heater high/low switch in high mode.

- If no voltage is present, repair auxiliary heater (notify direct support maintenance).

Step 7. Disconnect lead 422B at line disconnect. Check for +24 VDC at lead 422B.

- If +24 VDC is present, go to step 8. If no voltage is present, repair lead 422B (page 3-2).

Step 8. Disconnect lead 422B at disconnect to heater. Check for +24 VDC at lead 422B.

- If +24 VDC is present, replace heater. If no voltage is present, repair lead 422B (page 3-2).

4. AUXILIARY HEATER FUEL PUMP DOES NOT OPERATE, REMAINING AUXILIARY HEATER CIRCUITS OPERATING.

Step 1. Disconnect lead 58E from auxiliary heater fuel pump. Check for +12 VDC at lead 58E with auxiliary heater on/off switch closed.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 58E (page 3-2).

Step 2. Disconnect auxiliary heater fuel pump ground lead from ground. Check continuity between ground lead and ground.

- If continuity is indicated, replace auxiliary heater fuel pump (page 4-816). If no continuity is indicated, repair ground lead (page 3-2).

5. AUXILIARY HEATER WATER PUMP DOES NOT OPERATE, REMAINING AUXILIARY CIRCUITS OPERATING.

Step 1. Disconnect lead 58E from auxiliary heater fuel pump. Check for +12 VDC at lead 58E with auxiliary heater on/off switch closed.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 58E (page 3-2).

Step 2. Check for continuity between auxiliary heater fuel pump ground lead and ground.

- If continuity is indicated, replace auxiliary heater fuel pump (page 4-816). If no continuity is Indicated, repair ground lead (page 3-2).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

ELECTRICAL SYSTEM (CONT)

Auxiliary Heater Circuits (Cont)

6. CAB HEATER HIGH-SPEED FAN DOES NOT OPERATE, LOW-SPEED FAN OPERATING NORMALLY.

Disconnect lead 58A from line disconnect to cab heater fan. Check for +24 VDC at lead 58A.

If +24 VDC is present, replace cab heater fan (notify direct support maintenance). If no voltage is present, repair lead 58A (page 3-2).

7. CAB HEATER LOW-SPEED FAN DOES NOT OPERATE, HIGH-SPEED FAN OPERATING NORMALLY.

Disconnect lead 58B from line disconnect to cab heater fan. Check for +24 VDC at lead 58B.

- If +24 VDC is present, replace cab heater fan (notify direct support maintenance). If no voltage is present, repair lead 58B (page 3-2).

TRANSMISSION

1. TRANSMISSION OIL TEMPERATURE GAGE CONTINUOUSLY READS OVER 2500F.

Step 1. Check transmission fluid level.

- Add or drain transmission fluid as required (page 2-3, Unit PMCS).

Step 2. Check for any kinked or damaged transmission cooler hoses and connections that would cause flow restriction.

- Replace any kinked or damaged hoses or connections (page 4-356).

Step 3. If problem still exists, notify direct support maintenance.

2. TRANSMISSION WILL NOT SHIFT INTO GEAR, OR ROUGH SHIFTING.

Step 1. Check transmission fluid level.

- Add or drain transmission fluid as required (page 2-3, Unit PMCS).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

TRANSMISSION (CONT)

Step 2. Check transmission shift control, shift control cable, or shift control linkage for damage, looseness, and proper adjustment.

- Replace any damaged transmission shift control, shift control cable, or shift control linkage (page 4-335). If transmission shift cable and linkage is out of adjustment, readjust cable and linkage (page 4-342).

Step 3. If problem still exists, notify direct support maintenance.

POWER TAKE-OFF (PTO) CIRCUITS (ALL EXCEPT M915A2)

1. POWER TAKE-OFF (PTO) DOES NOT ENGAGE.

Step 1. Check reservoir heater/power take-off 15A fuse.

- If defective, replace 15A fuse (page 4-204).

Step 2. Remove reservoir heater/power take-off 15A fuse. Check for +12 VDC at fuse connector from lead 18.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 18 (page 3-2).

Step 3. Disconnect lead 200D from power take-off switch on dash. Check for +12 VDC at lead 200D.

- If +12 VDC is present, go to step 4. If no voltage is present, repair lead 200D (page 3-2).

Step 4. Disconnect lead 200D and lead 200E from power take-off switch on dash. Check for continuity between contacts at power take-off switch with switch closed.

- If continuity is indicated, go to step 5. If no continuity is indicated, replace power take-off switch on dash (page 4-182).

Step 5. Disconnect lead 200E from power take-off solenoid valve. Check for +12 VDC at lead 200E with power take-off switch on dash closed.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead 200E (page 3-2).

Step 6. Disconnect lead 200E from power take-off solenoid valve. Disconnect power take-off solenoid ground lead from ground. Check for continuity between power take-off 200E connector and ground lead.

- If continuity is indicated, repair ground lead to ground. If no continuity is indicated, replace power take-off solenoid valve (page 4-768). If power take-off still will not engage, notify direct support maintenance.

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

POWER TAKE-OFF (PTO) CIRCUITS (ALL EXCEPT M915A2) (CONT)

2. POWER TAKE-OFF INDICATOR LIGHT DOES NOT OPERATE.

Step 1. Check power take-off indicator lamp.

- If defective, replace power take-off indicator lamp (page 4-200). If not defective, go to step 2.

Step 2. Disconnect lead 200F from power take-off pressure switch. Check for +12 VDC at lead 200F.

- If +12 VDC is present, go to step 3. If no voltage is present, repair lead 200F (page 3-2).

Step 3. Disconnect lead 200F and lead 200 from power take-off pressure switch. Check for continuity between contact at power take-off pressure switch.

- If continuity is indicated, go to step 4. If no continuity is indicated, replace power take-off pressure switch (page 4-768).

Step 4. Disconnect lead 200 from power take-off indicator light. Check for +12 VDC at lead 200.

- If +12 VDC is present, go to step 5. If no voltage is present, X, repair lead 200 (page 3-2).

Step 5. Remove power take-off indicator light lamp. Check for continuity between socket and ground.

- If no continuity is indicated, repair ground lead (page 3-2).

3. POWER TAKE-OFF (PTO) RPM CONTROL DOES NOT OPERATE.

Step 1. Disconnect power take-off neutral lockout relay from connector. Check for +12 VDC at connector 85.

- If +12 VDC is present, go to step 2. If no voltage is present, repair lead 15D (page 3-2).

Step 2. Disconnect power take-off neutral lockout relay from connector. Check for +12 VDC at connector 30.

- If +12 VDC is present, go to step 3. If no voltage is present, go to next corrective action.
- Disconnect lead D510 from pin R of DDEC engine harness connector. Check for continuity between connector 30 and lead D510. If continuity is not indicated, repair lead D510 (page 3-2). If continuity is indicated, refer to DDEC II troubleshooting (page 3-101).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

POWER TAKE-OFF (PTO) CIRCUITS (ALL EXCEPT M915A2) (CONT)

Step 3. Disconnect power take-off neutral lockout relay from connector. Check for continuity between connector 86 and ground.

- If continuity is indicated, go to step 4. If no continuity is indicated, repair ground lead (page 3-2).

Step 4. Disconnect power take-off neutral lockout relay from connector. Install jumper leads between connectors 30, 85, and 86 to their respective connections at power take-off lockout relay. Check for +12 VDC at connection 87 on power take-off lockout relay.

- If +12 VDC is present, go to step 5. If no voltage is present, replace power take-off lockout relay (pages 4-197, 4-198).

Step 5. Disconnect lead D510C from winch speed control switch on winch. Check for +12 VDC at lead D510C.

- If +12 VDC is present, go to step 6. If no voltage is present, repair lead D510C (page 3-2).

Step 6. Disconnect lead D510C and lead D510D from winch speed control switch on winch. Check for continuity between contacts of power take-off rpm switch with switch closed.

- If continuity Is indicated, go to step 7. If no continuity is indicated, replace winch speed control switch on winch (page 4-276).

Step 7. Disconnect lead D510D from rpm control module potentiometer located just above vehicular fuse/relay panel. Check for +12 VDC at lead D501D.

- If +12 VDC is present, go to step 8. If no voltage is present, repair lead D510D (page 3-2).

Step 8. Disconnect power take-off relay rpm control module potentiometer from connector. Check for 9 to 11 kohms between yellow and black wire.

- If 9 to 11 kohms is not present, replace potentiometer.

TRANSFER CASE (ALL EXCEPT M915A2)

1. TRANSFER CASE DOES NOT ENGAGE.

Step 1. Check transfer case shift control, shift control cable, and shift control linkage for damage, looseness, and proper adjustment.

- Replace any damaged transfer case shift control, shift control cable, or shift control linkage (page 4-376). Adjust shift control cable (page 4-342).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

TRANSFER CASE (ALL EXCEPT M915A2) (CONT)

Step 2. Check transfer case lockup valve, air lines, and fittings for damage and air leakage.
- Tighten or replace lockup valve, air lines, and fittings (page 4-381).

Step 3. If problem still exists, notify direct support maintenance.

INTERMEDIATE AXLE AND REAR AXLE DRIVELINE ASSEMBLIES

1. NO DRIVE AT FORWARD REAR AXLE AND/OR REAR-REAR AXLE.

Step 1. Check propeller shaft and universal joints from transfer rear output to forward-rear axle for broken universal joint(s) and broken or damaged tube, splines, or yoke(s).
- Replace any defective universal joint(s) (page 4-390).
- Replace defective propeller shaft (page 4-386).

Step 2. Check propeller shaft and universal joints from forward-rear axle to rear-rear axle for broken universal joint(s) and broken or damaged tube, splines, or yoke(s).
- Replace any defective universal joint(s) (page 4-390).
- Replace defective propeller shaft (page 4-386).

Step 3. Check forward-rear axle and rear-rear axle for broken axle shaft(s).
- Replace any broken axle shaft(s) (notify direct support maintenance).

Step 4. If problem still exists, notify direct support maintenance.

2. NO DRIVE AT FRONT AXLE (ALL EXCEPT M915A2).

Step 1. Check propeller shaft and universal joints from transfer case front output to forward axle for broken universal joint(s) and broken or damaged tube, spline(s), or yoke(s).
- Replace any defective universal joint(s) (page 4-390).
- Replace defective propeller shaft (page 4-388).

Step 2. If problem still exists, notify direct support maintenance.

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

INTERMEDIATE AXLE AND REAR AXLE DRIVELINE ASSEMBLIES (CONT)

3. VIBRATION OR NOISE DURING ON-ROAD OPERATION.

Step 1. Check propeller shafts and universal joints for obvious wear or damage.

- Replace any defective universal joint(s) (page 4-390).
- Replace defective propeller shaft (pages 4-386, 4-388).

Step 2. Check wheels for looseness and obvious damage.

- Tighten any loose wheel lug nuts (notify direct support maintenance).
- Replace any damaged wheel(s) (TM 9-2320-363-10).

Step 3. If problem still exists, notify direct support maintenance.

BRAKES

1. VEHICLE DOES NOT SLOW DOWN QUICKLY ENOUGH WHEN BRAKES ARE APPLIED.

Step 1. Check for proper lubrication and adjustment of brakes.

- Lubricate brake system (page 2-3, Unit PMCS); adjust brakes (pages 4-446, 4-448).

Step 2. Check for heat-damaged or glazed brake linings.

- Replace any damaged or glazed brake linings (brake linings must be fully replaced per axle) (pages 4-407 thru 4-417).

Step 3. Check brakedrums for excessive heat damage, cracks, scoring, and out-of-roundness.

- Replace any damaged brakedrums (pages 4-584 thru 4-599).

Step 4. Check for faulty air chambers.

- Replace faulty air chamber(s) (pages 4-420, 4-422, 4-424).

Step 5. Check for air pressure leakage to air chambers.

- Replace air compressor (notify direct support maintenance).

2. BRAKES DO NOT RELEASE OR RELEASE TOO SLOWLY.

Step 1. Check for proper lubrication of brake system.

- Lubricate brake system (page 2-3, Unit PMCS).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

BRAKES (CONT)

Step 2. Check that foot valve returns to fully released position.
- Remove any debris interfering with pedal travel, or adjust stop bolt (page 4-403).

Step 3. Check exhaust ports on brake foot valve, quick release valve, and gladhand vent holes for blockage.
- Clear exhaust port(s) and vents of obstructions.

Step 4. Check for weak or broken brakeshoe return springs.
- Replace weak or broken springs (pages 4-407 thru 4-417).

Step 5. Check for frozen brakeshoe anchor pins.
- Clean and lubricate sticking pins or replace if damaged (pages 4-407 thru 4-417).

Step 6. Check for broken spring in air chamber.
- Replace air chamber (pages 4-420, 4-422, 4-424).

3. BRAKES ARE UNEVEN, DRAG, OR PULL WHEN APPLIED.

Step 1. Check for uneven adjustment between axles.
- Adjust brakes (pages 4-446, 4-448, 4-450).

Step 2. Check for proper wheel bearing adjustment.
- Adjust wheel bearings (pages 4-584 thru 4-599).

Step 3. Check for grease-saturated or worn linings.
- Replace linings (pages 4-407 thru 4-417).

Step 4. Check for out-of-round brakedrum(s).
- Replace brakedrum(s) (pages 4-584 thru 4-599).

Step 5. Check for worn S-cam or roller.
- Replace S-cam or roller (pages 4-446, 4-448, 4-450).

4. ABS INDICATOR LIGHT STAYS ON AFTER VEHICLE REACHES 4-5 MPH.

Step 1. Perform ABS troubleshooting procedures using tester (page 3-93).

Step 2. Check for proper wheel bearing adjustment.
- Adjust wheel bearings as required (pages 4-584 thru 4-599).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

AIR SYSTEM

1. LOSS OF AIR PRESSURE.

Step 1. Check for leaks in lines and fittings.
- Replace damaged components (pages 4-454 thru 4-483).

Step 2. Check for faulty air supply tanks or components.
- Replace damaged components (pages 4-454 thru 4-483).

2. LOSS OF AIR SUPPLY FUNCTION.

Step 1. Check for blocked or kinked lines.
- Replace damaged lines (pages 4-487, 4-503).

Step 2. Check for faulty valves.
- Replace faulty valves (pages 4-528, 4-530, 4-532, 4-534, 4-546, 4-549, 4-572).

3. AIR DRYER LEAKS.

Check for faulty seal.
- Replace filter seal (page 4-560 or 4-561.0).

4. AIR DRYER FAILS TO ABSORB POLLUTANTS.

Step 1. Check for dirty filter(s).
- Service (page 4-560 or 4-561.0) or replace air dryer (pages 4-552, 4-556, or 4-559.0).

Step 2. Check for contaminated desiccant beads (drying beads).
- Service (page 4-560 or 4-561.0) or replace air dryer (pages 4-552, 4-556, or 4-559.0).

Step 3. Check for faulty purge valve.
- Service (page 4-560 or 4-561.0) or replace air dryer (pages 4-552, 4-556, or 4-559.0).

STEERING SYSTEM

1. LOSS OF STEERING CONTROL.

Step 1. Check for failed mounting of steering wheel to steering column shaft.
- Replace steering wheel or column shaft (page 4-606).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

STEERING SYSTEM (CONT)

Step 2. Check for faulty steering wheel or column.
- Replace steering wheel or column (page 4-606).

Step 3. Check for faulty universal joint.
- Replace universal joint (page 4-608).

Step 4. Check for faulty tie rod, pitman arm, or drag link.
- Replace tie rod, pitman arm, or drag link (page 4-611).

2. UNIVERSAL SHAFT FAILS.

Step 1. Check for faulty universal shaft.
- Replace universal shaft (page 4-608).

Step 2. Check for faulty yoke assembly.
- Replace universal shaft (page 4-608).

Step 3. Check for faulty attaching hardware.
- Tighten or replace attaching hardware (page 4-608).

3. TIE ROD AND/OR DRAG LINK AND/OR PITMAN ARM FAILS.

Step 1. Check for lack of lubrication.
- Replace tie rod assembly (notify direct support maintenance).

Step 2. Check for corrosion.
- Replace tie rod assembly (notify direct support maintenance).

4. HOSE ASSEMBLY FAILS (LEAKS).

Step 1. Check for loose or damaged fittings.
- Tighten or replace fittings (page 4-613).

Step 2. Check for cracked or brittle hose.
- Replace hose assembly (page 4-613).

Step 3. Check for extreme temperature conditions.
- Replace hose assembly (page 4-613).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

STEERING SYSTEM (CONT)

5. POWER STEERING RESERVOIR LEAKS.

Step 1. Check for dirty filter/contamination.
- Replace filter (page 4-616).

Step 2. Check for faulty fitting connection(s).
- Replace (page 4-613) or repair power steering fitting (page 4-616).

Step 3. Check for damaged cover assembly and loose or damaged wing screw.
- Tighten or replace cover assembly and/or wing screw (page 4-616).

Step 4. Check for faulty or cracked power steering reservoir.
- Replace power steering reservoir (page 4-613).

CHASSIS

1. ROLLER BINDS OR SEIZES (M916A1 AND M916A2).

Step 1. Check for lack of lubrication.
- Lubricate roller (page 2-3, Unit PMCS).

Step 2. Check for faulty bearings.
- Replace (page 4-636).

2. ASSEMBLY LOOSE OR MISSING.

Step 1. Check for loose or faulty attaching hardware.
- Tighten or replace attaching hardware (page 4-618).

Step 2. Check for failed brackets.
- Replace brackets (page 4-618).

3. LOOSE OR MISSING QUARTER FENDER.

Step 1. Check for loose or missing attaching hardware.
- Tighten or replace attaching hardware (pages 4-698, 4-704).

Step 2. Check for faulty mounting brackets.
- Replace faulty mounting brackets (pages 4-698, 4-704).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

CHASSIS (CONT)

4. PINTLE HOOK EYE NOT LOCKED.
   Check for faulty or missing lock pin.
   - Replace or repair pintle hook (page 4-642).

5. PINTLE DOES NOT SWIVEL.
   Step 1. Check for lack of lubrication.
   - Lubricate pintle (page 2-3, Unit PMCS).

   Step 2. Check for faulty assembly.
   - Replace or repair pintle hook (page 4-642).

FIFTH WHEEL

1. TRAILER WILL NOT COUPLE OR BECOMES UNCOUPLED.
   Step 1. Check for proper coupling by visually inspecting fifth wheel throat.
   - Reposition tractor (TM 9-2320-363-10).

   Step 2. Check fifth wheel for worn or damaged parts.
   - Replace worn or damaged parts (notify direct support maintenance).

   Step 3. Check operation of fifth wheel locking device.
   - Adjust locking mechanism (pages 4-639, 4-641).

2. RESTRICTED RELATIVE MOTION BETWEEN TRACTOR AND TRAILER.
   Check for faulty slide bracket.
   - Adjust slide bracket (pages 4-639, 4-641).

CAB

1. LOSS OF VEHICLE INSTRUMENTATION.
   Step 1. Check for faulty instrument panel.
   - Repair instrument panel (pages 4-170 thru 4-190).

   Step 2. Check for faulty tachograph.
   - Replace tachograph (pages 4-178, 4-182).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

CAB (CONT)

Step 3. Check for faulty tachometer and speedometer cables.
- Replace tachometer cable (page 4-866) or speedometer cable (pages 4-853, 4-860).

2. VEHICLE HEATER ASSEMBLY LEAKS COOLANT.

Step 1. Check for faulty or loose clamps.
- Tighten or replace clamps (page 4-796).

Step 2. Check for faulty heater hoses.
- Replace heater hoses (page 4-796).

Step 3. Check for leaking heater core.
- Replace heater assembly (page 4-796).

3. NO AIR CIRCULATION.

Check for faulty blower motor.
- Replace vehicle heater assembly (page 4-792).

4. IMPEDED OR BLOCKED AIR FLOW.

Step 1. Check for damaged ducts.
- Replace duct assembly (page 4-796).

Step 2. Check for faulty air cylinder.
- Replace duct assembly (page 4-796).

HYDRAULIC WINCH (M916A1 AND M916A2)

1. SLOW PAY OUT OR RETURN OF WINCH CABLE.

Check for low oil level in reservoir.
- Service reservoir with oil (TM 9-2320-363-10).

2. OIL FLOW BLOCK.

Check for contaminated or damaged filter.
- Replace filter element (page 4-766).

Table 3-1. Troubleshooting (Cont)

Malfunction
Test or inspection
Corrective action

HYDRAULIC WINCH (M916A1 AND M916A2) (CONT)

3. OIL FILTER LEAKS.

Step 1. Check for leaking hoses.

- Replace leaking hoses (page 4-758).

Step 2. Check for leaks and damage.

- Replace oil filter assembly (page 4-766).

4. HYDRAULIC OIL TANK LEAKS.

Step 1. Check for faulty seals.

- Repair hydraulic oil tank (page 4-762).

Step 2. Check for cracked or fractured tank material.

- Replace hydraulic oil tank (page 4-762).

Section II.1. TROUBLESHOOTING AND TESTING THE AIR CONDITIONING SYSTEM

Preliminary Checks

Before testing the operation of the air conditioning system, make the following checks:

1. Make sure the refrigerant compressor's drive belt is not damaged and is correctly tensioned. Also check the compressor mountings for tightness.

2. Check for broken, burst, or cut hoses; also check for loose fittings on all parts.

3. Check for road debris build-up on the condenser coil fins. Using air pressure and a whiskbroom or a soapy spray of water, carefully clean off the condenser; be careful not to bend the fins.

4. Check the color of the moisture indicator sight glass. If the color is a deep cobalt blue, the refrigerant charge is dry. If the indicator is not blue, the system is contaminated with moisture. Notify your supervisor.

5. If there is not enough airflow, make sure that leaves or other debris has not entered the fresh air ports under the windshield. If debris has entered, it could clog the fins of the evaporator core, and block airflow.

   Also, be sure that all ducts are connected to the dash louvers and that the air-control flaps in the heater housing are moving properly (this requires removal of the right and center dash panel).

Performance Tests

Following is a brief description of symptoms or conditions that could exist if something goes wrong with a refrigerant part.

RECEIVER-DRIER

The receiver-drier is normally at outside temperature. To the touch, the entire length of the unit should be the same temperature. If noticeable cool spots exist, notify your supervisor.

A blockage at the inlet of the unit will cause high head pressures; outlet blockages will cause low head pressures and little or no cooling.

If the moisture indicator is pink or white (showing that the system is wet), the receiver-drier is saturated with moisture and must be replaced. Notify your supervisor.

COOLING SYSTEM

Although they are not physically connected, there is a close tie between a vehicle's air conditioner and its cooling system. Poor air conditioner cooling can be the result of a problem in the cooling system.

If the cooling system does not work correctly, the heat of the engine will rise to abnormal levels. The added heat will transfer to the air conditioner, other underhood parts, and maybe make its way into the cab. The added heat makes it necessary for the air conditioner to work harder and, at the same time, it reduces the air conditioner's ability to cool down the air in the cab. Also, if the water regulating valve isn't closing all the way, heat will enter the cab, giving the impression that the air conditioning system is not working.

EXPANSION VALVE

Problems that start in the expansion valve show up as follows: when stuck closed, the evaporator coil and the expansion valve will be at outside temperature; when stuck open, both the coil and the valve will be extremely cold with frost or ice build-up.

Because the expansion valve channels are very small, blockages in the system tend to be found here (the valve is very sensitive to contamination). Usually, the contaminant is water; less than a drop of water is all it takes to make the valve inoperative. When water reaches the valve, the extreme cold that results from the pressure drop freezes the water, forming a block of ice in the valve. After the system shuts down and the valve warms up, the ice melts, and the valve operates again, only to freeze up when the moisture returns.

On-and-off operation of the expansion valve means that the receiver-drier is not removing moisture from the system. These contaminants should cause the moisture indicator's element to turn white and then pink.

REFRIGERANT COMPRESSOR

Compressor problems usually show in one of four ways: abnormal noise; seizure; leakage; or low suction and discharge pressures.

Resonant compressor noises are not causes for alarm; irregular noise or rattles are likely to be caused by broken parts.

EVAPORATOR

The evaporator coils are basically trouble-free when airflow over the fins is not blocked. External or, less often, internal blockages will cause low suction pressure as well as little or no cooling.

If a leak exists in the system, and it cannot be traced to other parts or fittings, suspect damage to one of the evaporator coils. Notify your supervisor.

CONDENSER

The condenser is usually trouble-free. Normally, the temperature of the condenser outlet line is noticeably cooler than the inlet line. However, when road debris (such as leaves or dirt buildup) cakes up, airflow over the condenser fins is blocked; air is not able to absorb enough heat to turn the hot refrigerant gas into a liquid. High head pressures will result. In these cases, carefully clean off the outer surfaces of the condenser with compressed air or a soap and water solution; be careful not to bend the fins.

High head pressures will also occur if the condenser's tubing is abnormally bent, blocking the flow of refrigerant. Frost will appear at the point where the flow is restricted.

Less common internal blockages (bits of foreign material or metallic grit build-up) will stop the flow of refrigerant.

A quick test to check that poor system performance is caused by the condenser is to direct a spray of water onto the condenser while the system is running. If the air conditioner cools better because of the assist provided by the water, it is a sign that the condenser is not working.

When troubleshooting a suspected condenser problem, remember that the problem may be caused by the radiator transferring high levels of heat to the condenser.

THERMOSTATIC SWITCH

IMPORTANT: Before troubleshooting the thermostatic switch, notify your supervisor to check for a full charge of refrigerant in the system. The compressor will not operate, or will cycle too often, if there is not enough refrigerant in the system.

Quick or delayed cycling of the compressor may be caused by a thermostatic switch that is working, but is out of adjustment. If, after doing the tests below, the switch seems to be out of adjustment, replace it (the thermostatic switch cannot be recalibrated).

1. Be sure the compressor clutch is operating correctly.

2. Expose the evaporator coil.

3. Start the engine. Place the air conditioner control at its coldest setting; turn on the air conditioner and the fan.

4. Place an accurate thermometer in contact with a tube on the evaporator coil. Be sure the thermometer is in good contact with the tube, or you will get a wrong reading.

   When the temperature drops below 31° to 36°F (-1° to 2°C), the compressor clutch should disengage and remain this way until the temperature rises to 39° to 44°F (4° to 7°C).

5. If the compressor did not engage when the temperature was above the accepted high range, do the following test:

   5.1 Connect a voltmeter or a test light from one of the terminals on the thermostatic switch to ground. Repeat this test with the other terminal on the switch.

5.2 With the engine running and the air conditioner and blower on, both terminals will show voltage when the compressor should be engaged; one terminal will show voltage when the compressor should be disengaged.

If there is no voltage, there is a problem in the electrical system from the batteries to the thermostatic switch. Check all circuits for the cause, and repair or replace the wiring or parts.

In all other cases where the compressor is not engaging and disengaging properly, the thermostatic switch is the cause. Replace it with a new switch.

6. Shut down the engine and, to prevent accidental electric shock or shorting during dash assembling, disconnect the batteries.

7. Assemble the dash.

LINE RESTRICTIONS

A restricted suction line causes low suction pressure at the compressor and little or no cooling. A restriction in a line between the compressor and the expansion valve can cause high discharge and low suction pressure, and insufficient cooling.

Usually, areas of ice or frost build-up mean a blockage. Parts that often freeze up are probably corroded or inoperative and should be replaced. Parts (such as the expansion valve) that freeze up once in a while may do so because of moisture in the system, which will cause the moisture indicator's element to turn white or pink; if this happens, notify your supervisor.

Safety Precautions

Whenever repairs are made to any air conditioner parts that hold refrigerant, you must discharge, purge or flush (if contaminated), evacuate, charge and leak test the system. In a good system, refrigerant lines are always under pressure and you should disconnect them only after the air conditioning system has been discharged to a refrigerant recovery unit through the service valves on the compressor.

Refrigerants are safe when used under the right conditions. Always wear safety goggles and nonleather gloves while discharging, purging, flushing, evacuating, charging, and leak testing the system. Do not wear leather gloves; when refrigerant gas or liquid contacts leather, the leather will stick to your skin.

WARNING

Use care to prevent refrigerant from touching your skin or eyes, because liquid refrigerant, when exposed to the air, quickly evaporates and will freeze skin or eye tissue. Serious injury or blindness could result if you come in contact with liquid refrigerant.

Refrigerant splashed in the eyes should first be treated with a few drops of sterile mineral oil in the eyes, then rinsed with a weak boric acid solution. Do not rub the eyes. Call a doctor right away.

Refrigerant splashed on the skin should be treated the same as for frostbite: gently pour cool water on the area, but do not rub the skin. Keep the skin warm with layers of soft, sterile cloth. Call a doctor right away.

Even though refrigerant does not burn, when it contacts extreme heat or flame, poisonous phosgene gas is created. This gas is also produced when an open flame leak detector is used. Phosgene fumes have an acrid (bitter) smell.

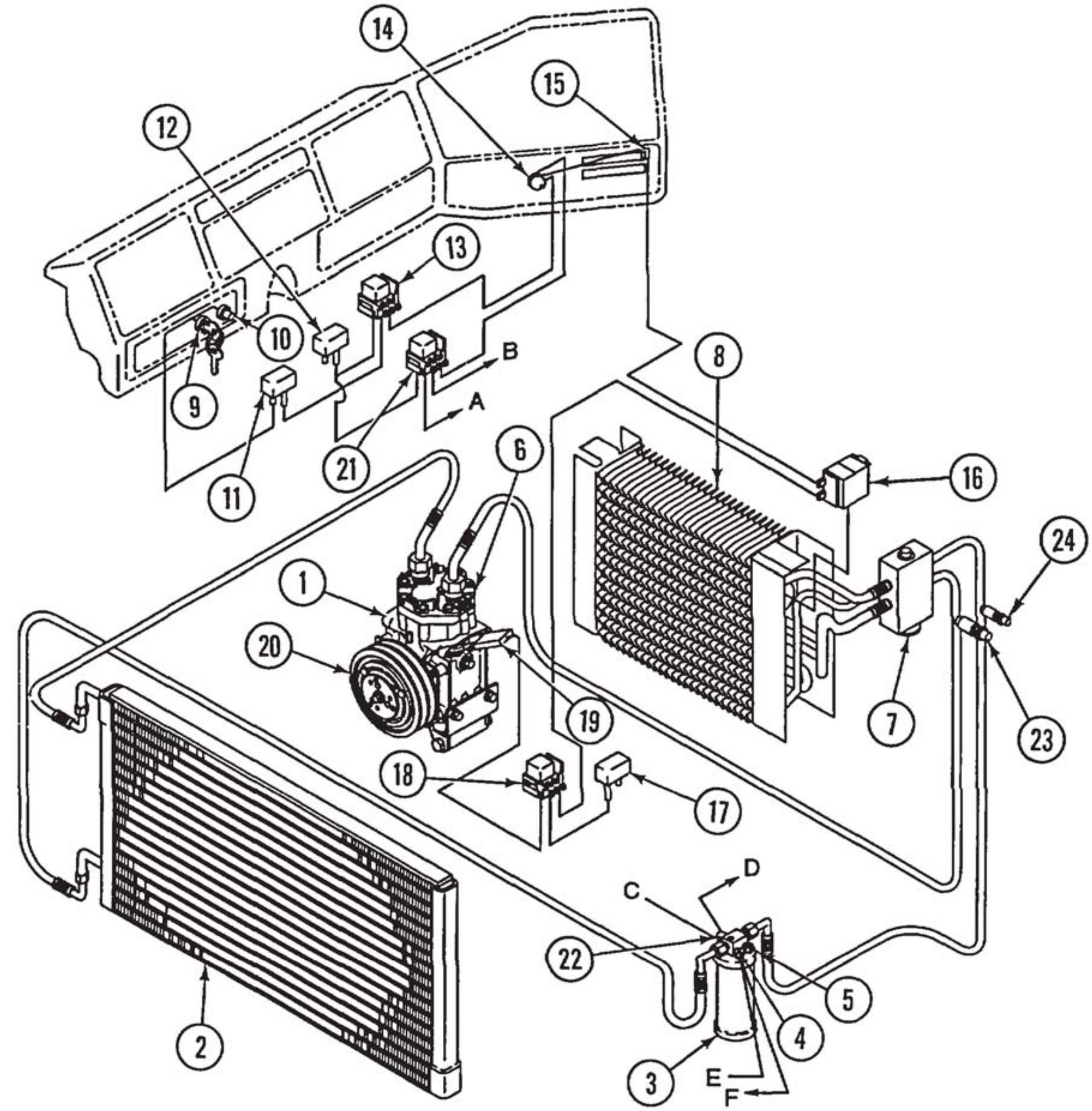
WARNING

Do not work in an area where refrigerant may contact an open flame or any burning material, such as a cigarette. When it contacts extreme heat, refrigerant breaks down into poisonous phosgene gas which, if breathed, causes severe respiratory irritation. Do not breathe the fumes from an open flame leak detector.

You must work in an area where there is a constant flow of fresh air when the system is discharged, flushed, charged, and leak tested using an open flame leak detector.

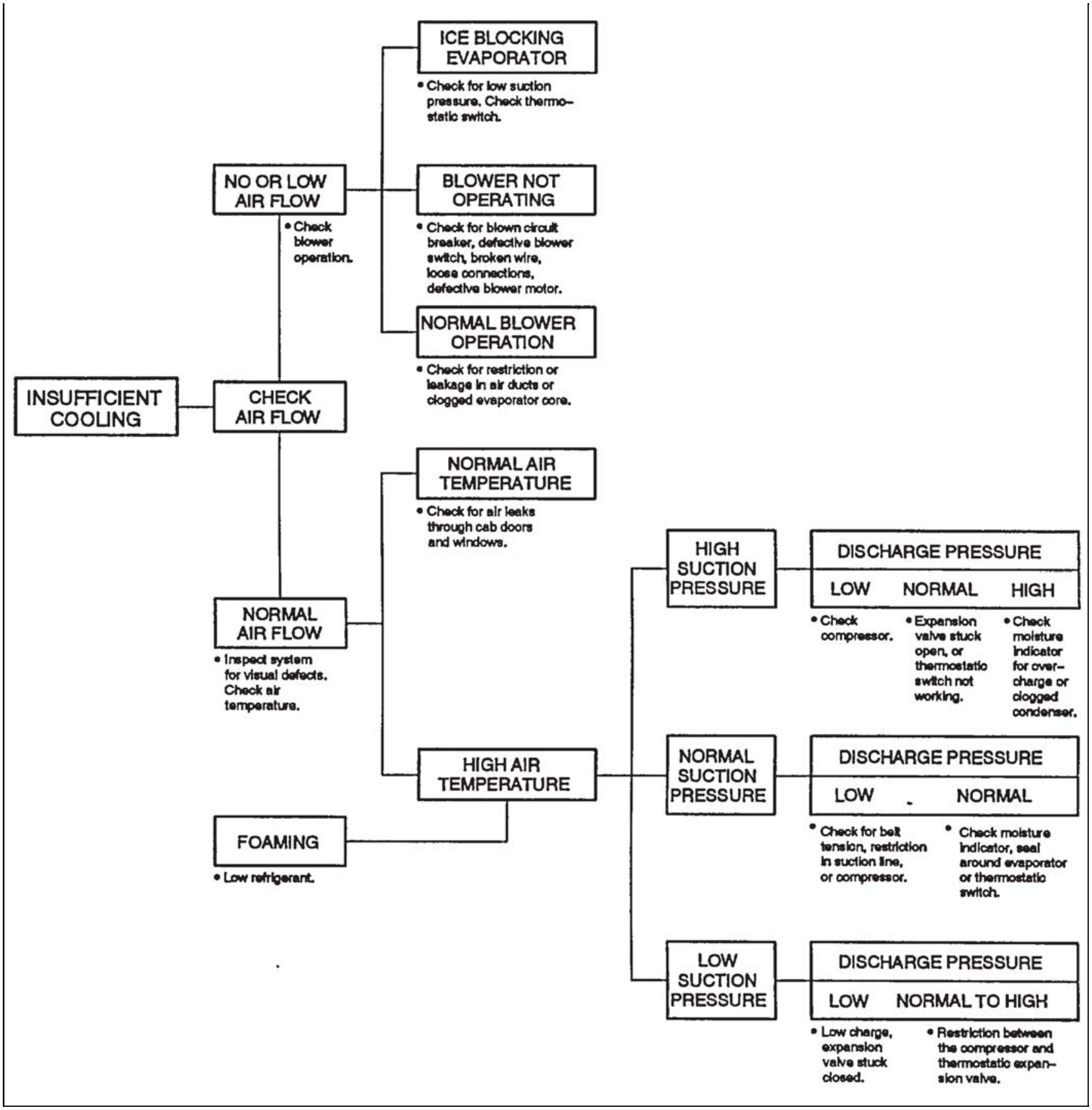
Changes in both federal and state laws will affect the way dealerships service air conditioning systems. Under current federal laws, refrigerant must be recovered and recycled by all users to protect the environment, and not released into the atmosphere. Many service operations not directly involving the air-conditioning system require the release of the refrigerant charge. Under the new regulations, dealerships not having the required recovery and recycling equipment (and properly trained and certified personnel) will not be allowed to do any of this service work.

Because of its very low boiling point, refrigerant must be stored under pressure. To prevent the refrigerant cans from exploding, never expose them to temperatures higher than 1250F (520C). Never leave refrigerant cans in the sun, and do not store them in sun-exposed areas where heat can build up, such as in gloveboxes, automobile trunks, etc.



A. to resistor block
B. to blower motor
C. from engine fan thermal switch
D. to engine fan thermal switch
E. from a/c clutch relay
F. to compressor clutch

1. Compressor
2. Condenser
3. Receiver-Drier
4. Binary Switch
5. Moisture Indicator
6. High Pressure Relief Valve
7. Expansion Valve
8. Evaporator
9. Ignition Switch
10. Start Button
11. Circuit Breaker (1OA)
12. Circuit Breaker (30A)
13. Power Relay
14. Blower Switch
15. 'On-Off" Microswitch
16. Thermostatic Switch
17. Circuit Breaker (15A)
18. A/C Clutch Relay
19. Diode
20. Compressor Clutch
21. High-Speed Relay
22. Fan Cycling Switch
23. Discharge Service Valve
24. Suction Service Valve


INSUFFICIENT COOLING
CHECK AIR FLOW
NO OR LOW AIR FLOW
• Check blower operation.
ICE BLOCKING EVAPORATOR
• Check for low suction pressure. Check thermo-static switch.
BLOWER NOT OPERATING
• Check for blown circuit breaker, defective blower switch, broken wire, loose connections, defective blower motor.
NORMAL BLOWER OPERATION
• Check for restriction or leakage in air ducts or clogged evaporator core.
NORMAL AIR FLOW
• Inspect system for visual defects. Check air temperature.
NORMAL AIR TEMPERATURE
• Check for air leaks through cab doors and windows.
HIGH AIR TEMPERATURE
FOAMING
• Low refrigerant.
HIGH SUCTION PRESSURE
DISCHARGE PRESSURE
LOW
NORMAL
HIGH
• Check compressor.
• Expansion valve stuck open, or thermostatic switch not working.
• Check moisture indicator for over-charge or clogged condenser.
NORMAL SUCTION PRESSURE
DISCHARGE PRESSURE
LOW
NORMAL
• Check for belt tension, restriction in suction line, or compressor.
• Check moisture indicator, seal around evaporator or thermostatic switch.
LOW SUCTION PRESSURE
DISCHARGE PRESSURE
LOW
NORMAL TO HIGH
• Low charge, expansion valve stuck closed.
• Restriction between the compressor and thermostatic expan-sion valve.

PROBLEM - LITTLE OR NO AIRFLOW

Possible Cause	Remedy
The blower is not operating	Check for an open circuit breaker. An open circuit indicates a short in the electrical system, which must be located and repaired.
	Check the air conditioner relays for operation. Replace as necessary.
	Make sure the blower motor switch is working. Replace if necessary.
	Check the wiring to the blower motor. If any connections are loose, securely tighten them.
	Check the blower motor for operation. Replace if sticking or otherwise inoperative.
	Check the resistor block. Replace if necessary.
	CAUTION: Never try to bypass the fuse in the resistor block. To do so could cause the blower motor to overheat, resulting In serious damage to the heater/air-conditioning system.
There are restrictions or leaks in the air ducts.	Examine all air ducts and remove any blockages. Stop any leaks or replace any portion where the leaks cannot be stopped.
Ice has formed on the evaporator coil.	Defrost the evaporator coil before resuming operation of the air conditioner.

PROBLEM - WARM AIRFLOW WHEN AIR CONDITIONER IS ON

Possible Cause	Remedy
There is no refrigerant charge in the system	Perform a leak test.
The refrigerant compressor is not operating.	Leak test the system. Drive belt needs repair or replacement.
The air conditioner microswitch is not working.	Replace the microswitch.
Ice has formed on the evaporator coil.	Defrost the evaporator coil before resuming operation of the air conditioner.

PROBLEM - HIGH COMPRESSOR DISCHARGE PRESSURE

Possible Cause	Remedy
Airflow through the condenser is restricted.	Remove the debris from the condenser.
Air is present in the system.	Perform a leak test.
Heavy frosting on the suction line suggests that the evaporator coil is flooded.	Defrost the evaporator coil before resuming operation of the air conditioner.

PROBLEM EVAPORATOR OUTLET AIR TEMPERATURE INCREASES AS COMPRESSOR DISCHARGE PRESSURE DROPS

Possible Cause	Remedy
There are leaks in the system.	Leak test the system.
Too much oil is in the system. An indication of this is clutch or belt slippage at governed engine speed.	Check and remove excess refrigerant oil. For instructions, refer to the refrigerant compressor section elsewhere in this group.

PROBLEM - COMPRESSOR OPERATES TOO OFTEN OR CONTINUOUSLY

Possible Cause	Remedy
There is too little refrigerant in the system.	Perform a leak test.
Ice has formed on the evaporator coil. as necessary.	Defrost the evaporator coil before resuming operation of the air conditioner. Check the operation of the thermostatic switch, and replace
Dirt and debris are clogging the condenser fins.	Remove all dirt and debris from the condenser fins.
The thermostatic switch isn't working.	Replace the thermostatic switch.

PROBLEM - QUICK OR DELAYED CYCLING OF COMPRESSOR

Possible Cause	Remedy
The thermostatic switch operates, but is out of adjustment.	Replace the thermostatic switch. Do not attempt to adjust it.
Loss of refrigerant is causing a delayed cycling of the compressor.	Leak test.

PROBLEM - TEMPERATURE IN CAB TOO LOW OR NO HEAT

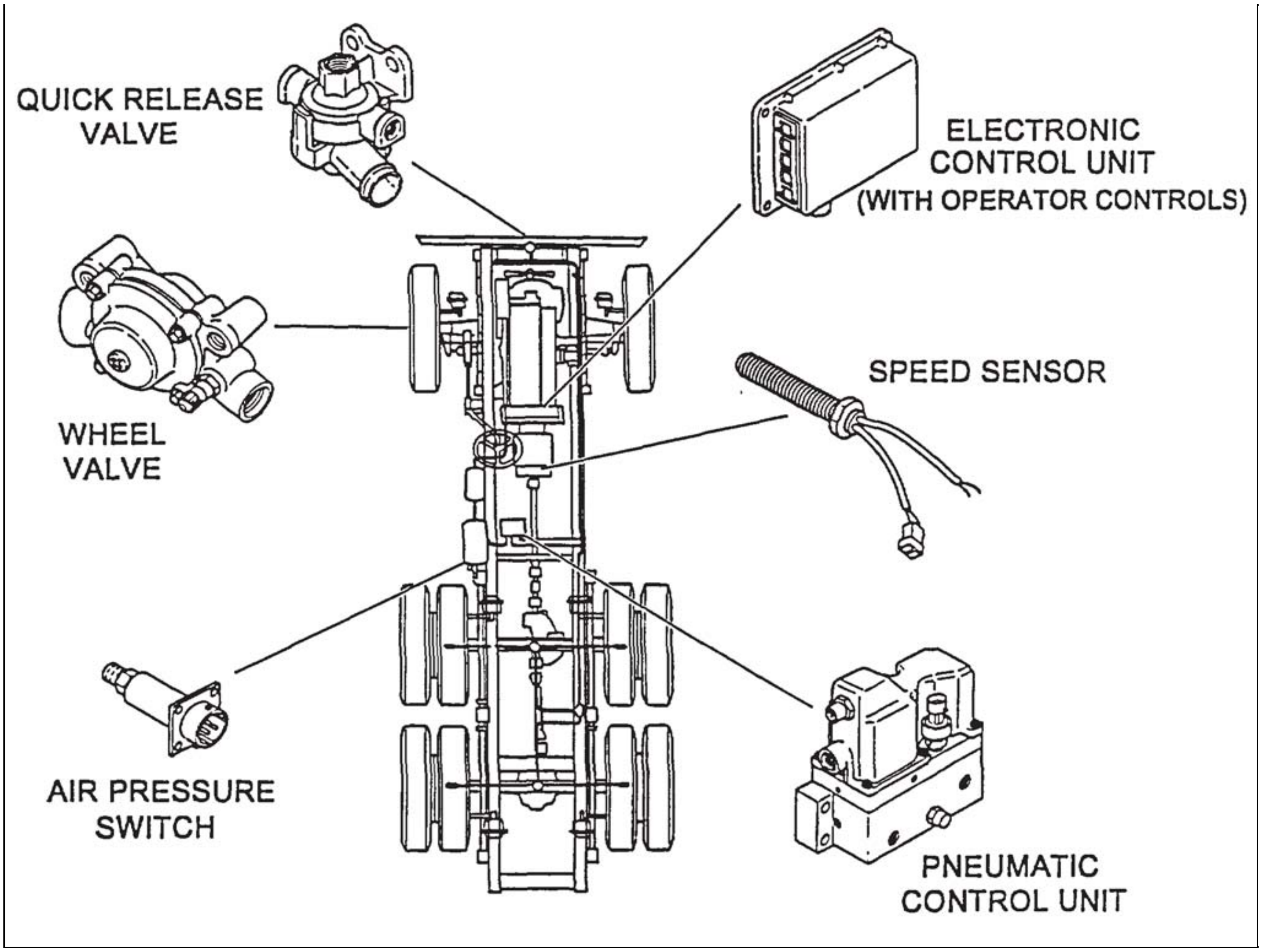
Possible Cause	Remedy
The water regulating valve is not opened.	Slide the temperature lever slide control toward "warm".
The water regulating valve is not opening all the way.	Adjust the water regulating valve cable.
The water regulating valve isn't working.	Replace the water regulating valve.
A heater hose is pinched or twisted.	Repair or replace the heater hose.
Coolant is leaking from the system.	Check for leakage at the heater core, and at all hose connections from the radiator coolant level, and add coolant , if necessary. Check and repair any leaks at the radiator.
Dust or dirt is clogging the heater core fins.	Remove and clean the heater core.

PROBLEM - CONDENSED WATER IS LEAKING FROM AIR CONDITIONER

Possible Cause	Remedy
The drain tubes are plugged.	Clean the drain holes and drain tubes.

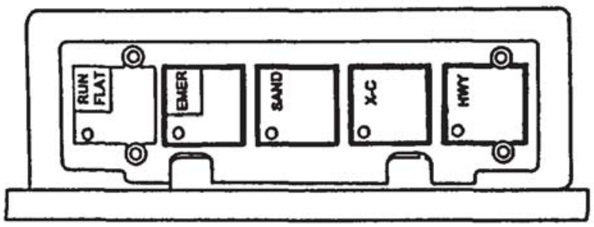
Section II.2. TROUBLESHOOTING AND TESTING THE CENTRAL TIRE INFLATION SYSTEM (CTIS)

The Central Tire Inflation System uses a dedicated pneumatic system plumbed from the vehicle's existing supply (wet) tank. Air lines between the Pneumatic Control Unit and the Quick Release Valves (QRV) are called "Upper Control Lines". Air lines between the QRVs and the Wheel Valves are called "Lower Control Lines".



Operator Controls

The integrated push button/display is the primary interface for display of system information and for push button entry of system instructions. The following sections explain the purpose and operation of the ECU controls and display.



Mode Keys

These keys select pressures appropriate for different surface conditions. Any mode may be selected at any time (within built in speed limitations). Depressing the button for the current mode will result in a pressure check.

HWY (Highway) For operation on improved paved surfaces.

XC (Cross Country) For operation on non-paved secondary roads.

SAND (Sand) For operation on trails and other unimproved surfaces.

EMER (Emergency) For selection of extremely low tire pressures to help free a stuck vehicle, or to traverse a short distance over a terrain known to require very low tire pressures. Since this is an extremely low pressure, the warning lamp will flash whenever this pressure is utilized.

▲**CAUTION: The EMER key is for extreme conditions only and should not be used for normal driving.**

Load Switch (Optional)

This switch selects pressures appropriate for different vehicle load conditions (loaded, part-loaded, un-loaded). Switching the load setting will result in a pressure check, and subsequent changing of the pressures as determined by the system.

Mode Annunciator Lights

The associated annunciator lights indicate the selected mode and signal one of two states:

•If the light is flashing the system is in the process of checking or changing pressures to attain the pressure(s) associated with that mode light.

Some clicking may be heard from the PCU as the system cycles to achieve the new pressure(s). A deflate will be periodically interrupted as the system checks tire pressures to determine how much further deflation is necessary.

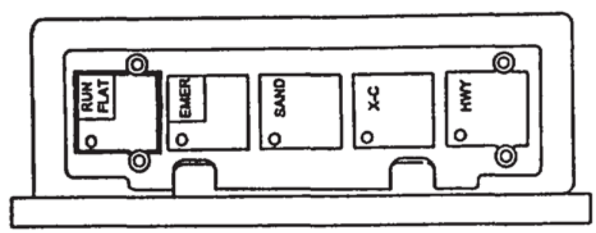
NOTE

Adequate supply system pressure is required to begin, or continue any pressure changing sequence.

• If the light is on steady the selected pressure has been achieved, the tires have been isolated and the system is depressurized. The system will cycle periodically to assure that tire pressure is maintained.

NOTE

The system is designed to allow tire pressure increase due to heat buildup during vehicle use. This system will not automatically deflate these pressure buildups a lower pressure mode selection by the operator must be selected to initiate a deflate.



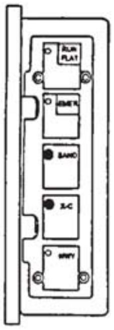
Run Flat Key and Annunciator Light

This key instructs the system to check tire pressures at more frequent intervals. This key also allows the operator to over-ride the 4 flashing lights (tire leak imbalance) codes and re-attempt 2 lights and some 5 lights codes. (See Warning Signals in next section). While the system is in RUN FLAT mode, the RUN FLAT light will flash on and off. The "RUN FLAT" feature will automatically deselect after 10 minutes, or may be shut off by pressing the button a second time.

▲**CAUTION: Selecting RUN FLAT to enable the system to inflate a significantly low tire may cause other tires on that channel to temporarily lose pressure. This condition will be corrected once the low tire is inflated to the pressure of the other tires.**

Warning Signals
Several warning signals report operating problems.

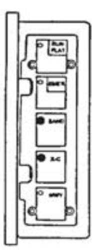
The Central Tire Inflation System uses five general sequences displayed on the Electronic Control Unit lights and an instrument panel mounted warning lamp to identify the type and area of fault.



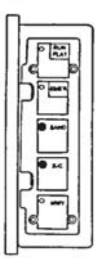
4 "Mode Lights" Flashing (Check Tire Conditions) - This signal reports that one tire may be at a significantly lower pressure than the others and could indicate that a tire is not holding air. The system has closed the wheel valves so the non-damaged tires will not lose pressure. The operator should immediately stop the vehicle and identify the extent of possible tire damage. The system may be used to re-inflate the low tire if damage is determined to be minimal (e.g., a minor puncture to slow leak) by selecting "RUN FLAT." Repeated use of RUN FLAT to override reoccurring "4 mode lights" warnings may result in tires inflating to higher than preprogrammed set-points.

NOTE: Excessive air seal leakage on cold weather start up may result in a "4 mode lights" or "5 mode lights" warning. If, upon inspection, no tire damage exists, the operator may proceed to operate the vehicle. This condition should correct itself (without the driver selecting RUN FLAT) as the seals warmup with use.

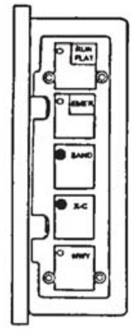
▲ **WARNING:** RUN FLAT should NOT be used to attempt inflating tires with substantial damage such as large cuts, chunkouts, or structural defects. Use of RUN FLAT in these circumstances can result in other tires on that channel losing pressure.



5 Lights Flashing - This signal reports that the built-in diagnostics of CTIS have detected a defect in a CTIS critical component and shut off the system, closing the wheel valves. Since the CTI system cannot properly function until the fault is corrected, there is no ability to override.



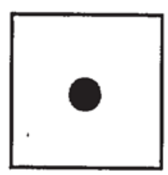
2 "Mode Lights" on Solid - This signal reports that the CTI system has shut off (closing the wheel valves) with the tire pressure between the two indicated modes. This occurs when the system is taking too long to either inflate or deflate the tires. Pressing any mode key will reattempt a change of pressures.



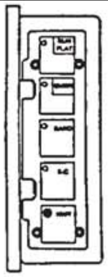
No Mode Lights This signal reports that the CTI system has sensed either a low system voltage or an electrical fault with a Pneumatic Control Unit solenoid, and has shut off the system, closing the wheel valves until the problem is corrected.

Lights Sequentially Flashing (One after another) This signal reports that there is a configuration error and the CTI memory has been "re-loaded" from the system defaults. Pressing the HWY and RUN-FLAT buttons at the same time will clear this display Note, however, that any configurable items (new pressure target, etc.) which in the past were updated in the ECU have now returned to their original values, and will need to be reprogrammed at the next convenient time.

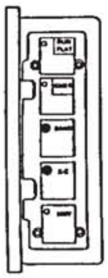
Flashing Warning Lamp and/or Buzzer (On instrument panel) This signal reports that the vehicle speed is too fast for the pressure selected. The operator must either reduce speed or select a higher pressure by pressing the appropriate key. Continued operation in this mode will result in the system automatically selecting a more appropriate pressure setting. In addition, the warning lamp may flash while the system is in EMERGENCY mode to caution the driver.



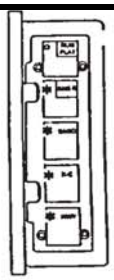
Solid Warning Lamp and/or Buzzer (On instrument panel) This signal reports that the ECU has seen 25-50 ignition cycles without seeing any speed signal. If no problem exists with speed circuit wiring or sensor, the lamp will go off when the vehicle is moved In addition, on vehicles equipped with a buzzer, the buzzer may be turned off by pressing any mode button on the ECU.



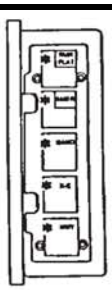
Single "Mode Light"
- **Flashing** - System working to achieve new pressures associated with that mode light
- **Solid** - Pressure achieved, system not active, wheel valves closed



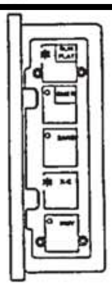
2 "Mode Lights" on Solid
- System has shut off with tire pressure between two mode settings
- CTIS is still operational
- Select any mode button to re-attempt pressure change
- Frequent occurrences may indicate a need for service



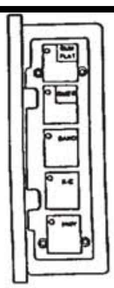
4 "Mode Lights" Flashing
- System shut off, waiting for operator instruction
- Possible tire damage
- CTIS may be operated by selecting RUN FLAT if tire damage is minimal
- CTIS should not be operated if major tire damage is found
- Tire should be repaired before continuing to operate vehicle



5 LIGHTS Flashing
- System has shut off at least one channel due to fault detection of a CTI component
- System may periodically cycle PCU to determine if fault still exists
- Get service at next opportunity



RUN FLAT Flashing (with a "Mode Light")
- RUN FLAT is selected. Tire pressures are checked at more frequent intervals
- If RUN FLAT is pushed to clear a "4 mode lights" flashing display, imbalance and confirmation fault detection is overridden for the duration of RUN FLAT
- May be turned off by depressing RUN FLAT again (or will '"time-out" after 10 minutes)



No "Mode Lights"
- Inadequate vehicle power
- Electrical solenoid fault

Lights Sequentially Flashing (One after another)
- System has re-loaded default configuration values
- Pressing HWY & RUN FLAT buttons together will clear display
- Any past changes of target pressures, etc. should be updated

Troubleshooting Tips

This checklist outlines some general hints and guidelines that will be helpful in tracking down and correcting operating problems.

✓ The ECU only displays one active code.

Only the most recent service code displays on the ECU lights. In troubleshooting, be alert for related codes. Use of a diagnostic tool offers the advantage of spotting multiple active codes as well as retrieving historical codes.

✓ A cleared code alone does not indicate a corrected problem.

A code is set by a specific fault condition and may be cleared by switching the ignition off, and then on. It's possible to clear a code (i.e., clear the flashing lights) only to have it display again when the fault condition reoccurs. To insure that a problem is fixed, you must run the system through the same operating modes that caused the problem and verify that the service code does not reappear.

✓ Electrical faults are often connection problems.

The most likely cause of electrical faults will be damaged wires or connections. As a first step in troubleshooting all electrical codes, switch off vehicle ignition, then disconnect applicable connectors and inspect for damage. (Switching off the ignition is required before disconnecting the harness at the Electronic Control Unit, but is also a recommended practice before all other electrical system disconnections.) Clean or repair all bad connections before proceeding.

✓ Disconnect the Electronic Control Unit connector with ignition off.

To avoid setting electrical fault codes, make sure that the ignition is off before unplugging the wire harness connection at the Electronic Control Unit module. Reconnect the connector before switching on the ignition.

✓ System is not continually pressurized.

When troubleshooting pneumatic faults, keep in mind that the air system is only pressurized as needed (for example, in the inflate mode).

This means that such procedures as checking for leaks require the system to be in an active, pressurized state. This can be accomplished most easily by using a diagnostic tool.

✓ Basic vehicle air and power systems are not covered in this guide.

The Central Tire Inflation System requires air pressure and electrical power supply from the base vehicle systems. Diagnosis and service of these systems is located elsewhere in this manual.

✓ Some faults will halt inflate or deflate sequence.

Upon sensing some faults, the Central Tire Inflation System will immediately go to the "maintain" mode. This may cause the mode light to stop flashing before the system has actually attained the pressures for the indicated mode.

This section covers the equipment and procedures used to find and correct Central Tire Inflation System problems.

Test Equipment

Central Tire Inflation System troubleshooting can be performed at three levels:

- Electronic Control Unit light codes
- Hand-held tester
- Personal computer based diagnostics

Regardless of the testing equipment used, the troubleshooting procedures will be based upon the diagnostic service codes. The hand-held tester and the personal computer system offer the advantages of computer-aided testing without interpreting service codes.

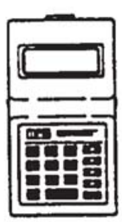
Each light sequence may represent more than one fault. Use of a hand-held or PC based diagnostic tool will give a brief description of the specific fault, narrowing the area of troubleshooting.

ECU Light Codes

The onboard system diagnostics are an important feature of Eaton's Central Tire Inflation System. For a description of light fault displays see Operator Instructions section of this manual.

Hand-Held Testers

An MPSI hand-held tester may be used to read and clear service codes and to obtain a short description of failures. The tester can initiate test sequences for controller outputs and can also read system parameters.



Personal Computer-Based Diagnostics

Personal computer based software provides the capability of hand-held testers with enhanced display and data logging capability. A personal computer can display multiple parameters and provide more comprehensive descriptions of fault conditions.

Use of a personal computer requires a serial link assembly (industry standard SAE J1587/1708) such as Kent-Moore's part number J38351 and Eaton's Central Tire Inflation System diagnostic software.

Diagnostic Connector

Connection of a Hand-Held or PC based diagnostic tool is at the standard SAE J1587 connector.

Test Modes

Hand-held or PC based diagnostic tools allow the system to be placed in several diagnostic modes:

Monitor (normal) - ECU controls tire pressure, while tool only monitors status.

Inflate - System "manually" inflates (test for large leaks).

Hold - Pressure is held in control lines (test for small leaks).

Deflate - System "manually" deflates (test relief valve pressure).

Pressure Check and Hold - System checks and displays tire pressures, then holds pressure in air lines (Quick test of control line and seal integrity).

Historical Service Codes

Anytime a fault occurs in the system, an active service code will be displayed on the ECU lights. Historical codes are stored in memory. Historical codes can only be accessed by a hand-held tester or personal computer. Historical codes are automatically cleared after 25-50 vehicle starts with no active faults.

Refer to the service code chart (beginning on page 3-92.18) for more detailed information on service codes.

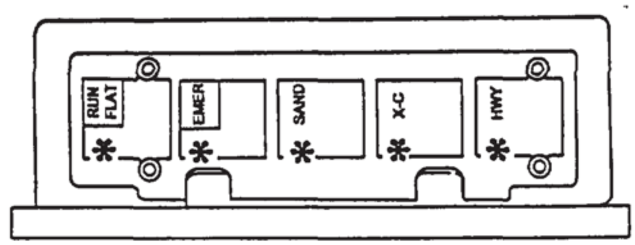
Multimeter

Based upon system schematics and aided by component-specific service codes, a Multimeter can be used to check sensor and solenoid resistances and to find wiring harness faults. The multimeter can be used to check the Central Tire Inflation System wiring and components for:

- continuity
- ground
- broken wires
- open circuits
- shorted circuits
- incorrect battery voltage

Display: **5 Flashing Lights**

Type: ***Pressure Read Low***



System Mode	Condition	Possible Causes*
System waits to check pressures	Faulty pneumatic system, or extremely low pressure reading	• Open line between Pneumatic Control Unit and wheel valve • Significant hub air seal leakage • Open solenoid (PCU electrically or pneumatically disconnected) • Crimped or plugged line between wet tank and Pneumatic Control Unit • Faulty pressure transducer (ex frozen water) • Pneumatic Control Unit failure, supply or control off • Pressure switch failure, shorted closed • Faulty Electronic Control Unit

*Possible causes are listed In order of likely occurrence.

Air Pressure Check

Note that the Central Tire Inflation System is not continuously pressurized; pressure checks occur on a periodic basis. During tire pressure checks, the system delivers compressed air to each channel for approximately two seconds while monitoring the pressure in that channel.

Code Description

A "Pressure Read Low" code indicates an extremely low pressure reading. The most likely cause is an open line which would have a clearly audible leak during a pressure check. A secondary cause could be a faulty air delivery system (i.e., PCU electrically or pneumatically disconnected).

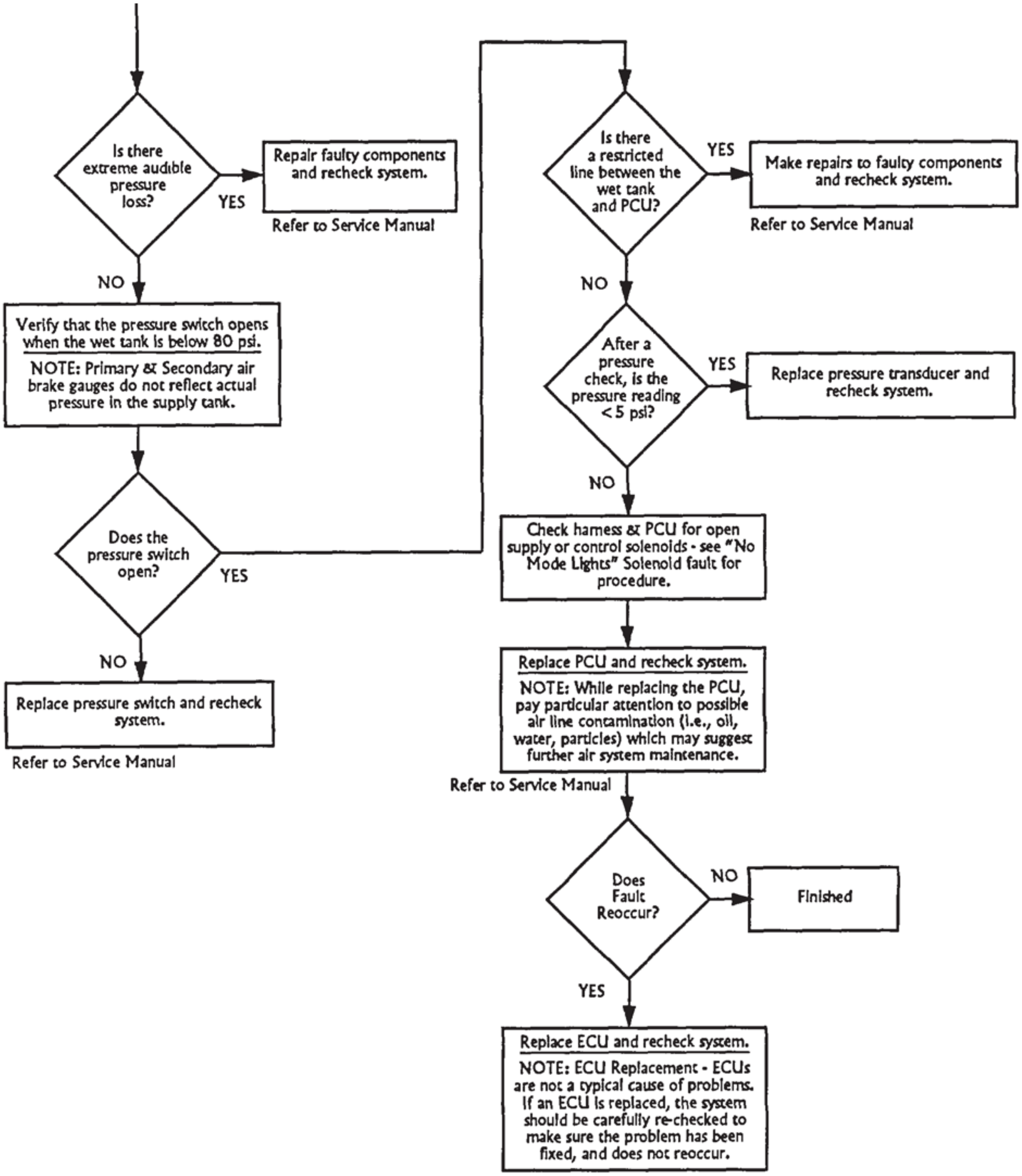
Other components that can cause a Pressure Read Low code are:

- Electrically or pneumatically disconnected PCU
- Faulty Pneumatic Control Unit (PCU)
- Restricted line between the wet tank and Pneumatic Control Unit
- Faulty pressure transducer
- Open line from Pneumatic Control Unit to Quick Release Valve
- Open line from Quick Release Valve to Wheel Valve

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Pressure Read Low troubleshooting tree.

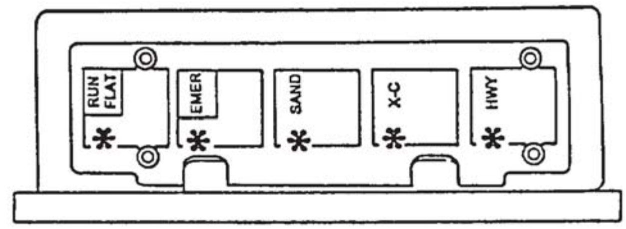
See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

Display: **5 Flashing Lights**
Type: ***Pressure Read Low***



Display: **5 Flashing Lights**

Type: ***Inadequate Air Pressure***



System Mode	Condition	Possible Causes*
System waits to check pressures	Pressure switch won't close	• Compressor governor cut-out set too low • Air dryer needs service • Pressure switch unplugged • Faulty pressure switch • Faulty compressor • Open or broken line from wet tank to Pneumatic Control Unit • Crimped or plugged line from wet tank to Pneumatic Control Unit

*Possible causes are listed In order of likely occurrence

Air Pressure Check

Note that the Central Tire Inflation System is not continuously pressurized; pressure checks occur on a periodic basis. During tire pressure checks, the system delivers compressed air to the tires for approximately two seconds while monitoring the pressure.

Code Description

An "Inadequate Air Pressure" code displays if system air pressure is inadequate to perform a tire pressure check.

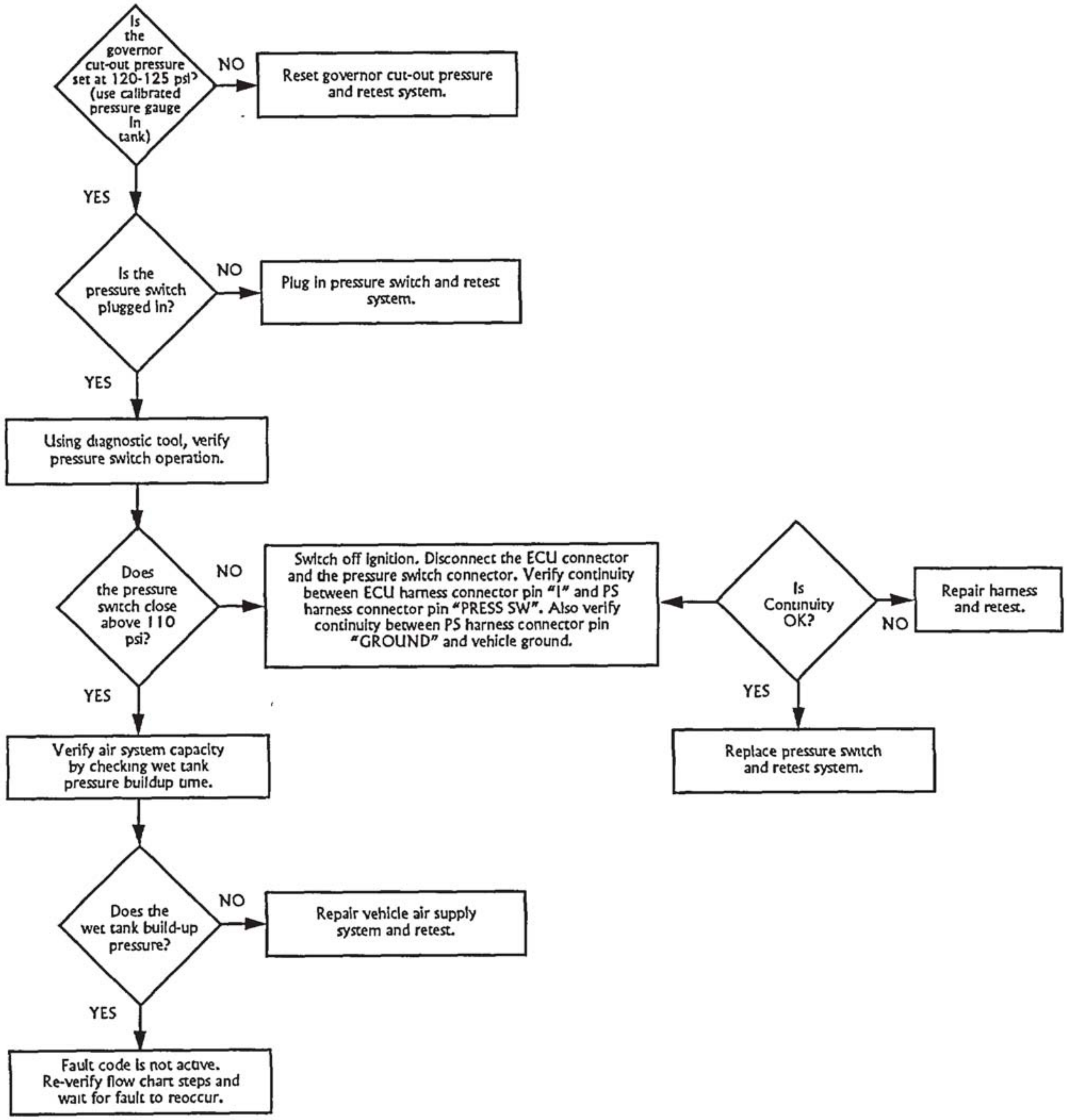
This occurs when the pressure switch will not close. The components that can cause the pressure switch to remain open include:

- Compressor governor cut-out set too low
- Pressure switch unplugged
- Faulty pressure switch
- Faulty compressor
- Open or broken line from wet tank to Pneumatic Control Unit
- Crimped or plugged line from wet tank to Pneumatic Control Unit

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Inadequate Air Pressure troubleshooting tree.

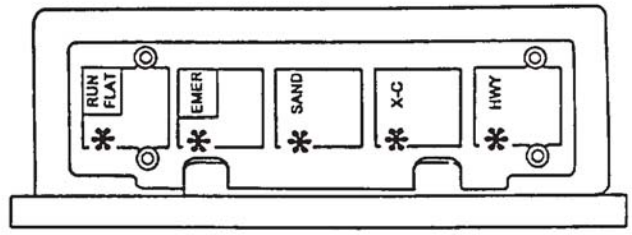
See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

Display: **5 Flashing Lights**
Type: ***Inadequate Air Pressure***



Display: **5 Flashing Lights**

Type: ***Atmospheric***



System Mode	Condition	Possible Causes*
System waits to check pressure	Pneumatic Control Unit pressure out of range when PCU s "'vented'	• Frozen water or other contaminant in transducer • Plugged PCU vent line • Poor ground connection to transducer • Faulty pressure transducer • Faulty Pneumatic Control Unit

* Possible causes are listed in order of likely occurrence.

Air Pressure Check

Note that the Central Tire Inflation System is not continuously pressurized; pressure checks occur on a periodic basis. During tire pressure checks, the system delivers compressed air to the tires for approximately two seconds while monitoring the pressure.

Code Description

An "Atmospheric" code is logged if the atmospheric pressure reading is out of range. The atmospheric pressure reading can be out of range as a result of a blocked or restricted PCU or vent line, contaminated pressure transducer (i.e., frozen water), air bleeding back into the Pneumatic Control Unit (PCU) or because of a faulty pressure transducer.

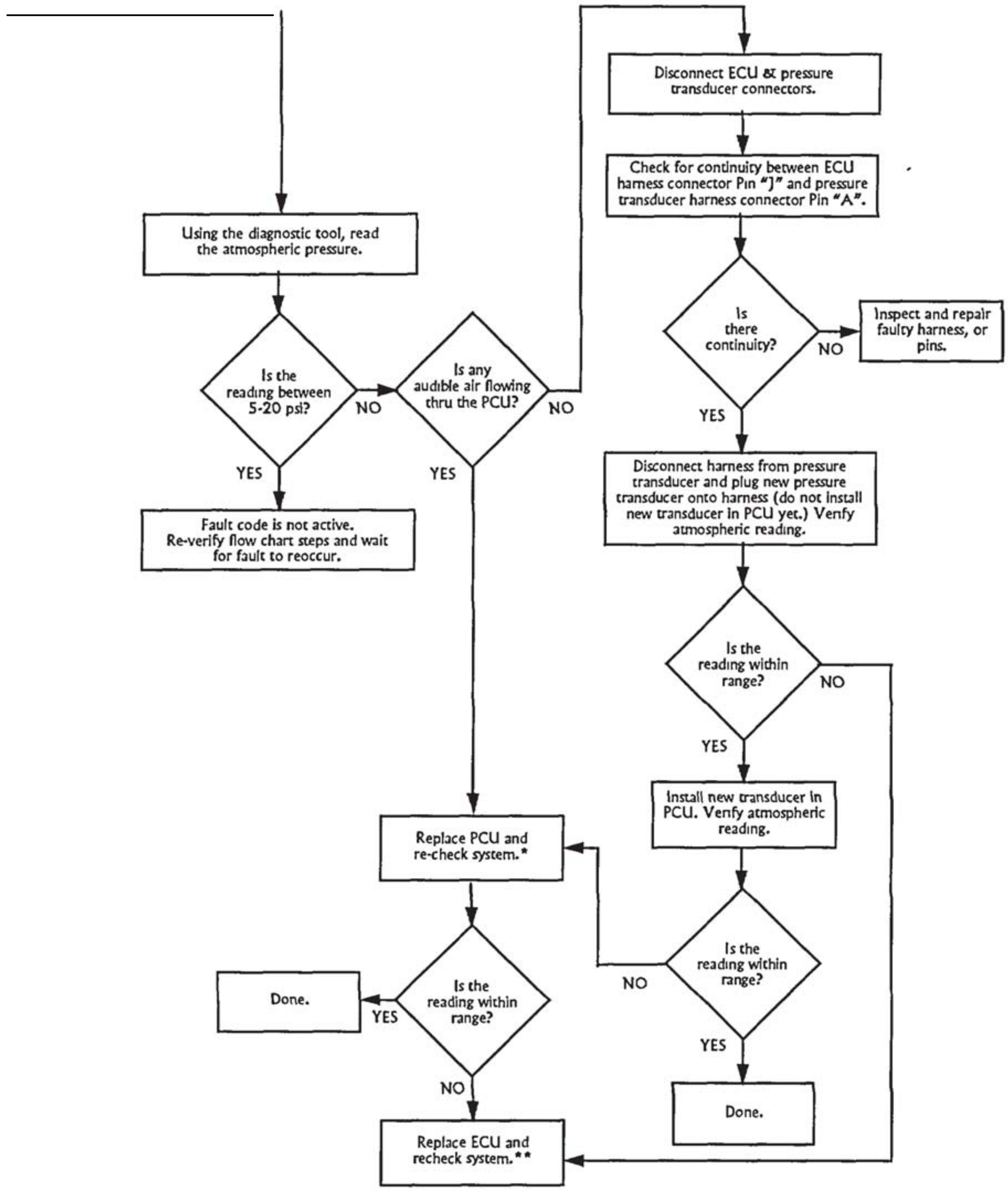
The components that can cause this code to be set include:

- Faulty or contaminated pressure transducer
- Faulty or contaminated Pneumatic Control Unit
- Faulty Electronic Control Unit (ECU)

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Atmospheric troubleshooting tree.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

Display: **5 Flashing Lights**
Type: ***Atmospheric***

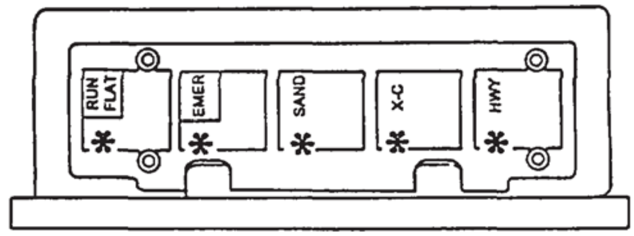


* NOTE: While replacing PCU, pay particular attention to possible air tire contamination (i.e., oil, water, particles) which may suggest further air system maintenance needs.

* * NOTE: ECU replacement ECUs are NOT a typical cause of problems. If an ECU is replaced, the system should be carefully re-checked to make sure the problem has been fixed, and does not re-occur.

Display: **5 Flashing Lights**

Type: ***Inflate Trend***



System Mode	Condition	Possible Causes*
Channel inoperative	Loss of channel pressure in inflate mode	• Damaged or leaking tire • Leaking lines • Leaking seals • Leaking QRV • Leaking wheel valve • Faulty Pneumatic Control Unit

* Possible causes are listed in order of likely occurrence.

Code Description

An "Inflate Trend" code displays when tire pressure readings are dropping while in inflate mode. Tire damage, which the compressor can not keep up with, may have occurred after starting an inflate sequence.

The air leak can be located either before or after the wheel valve location. The components located before the wheel valve that may cause this include:

- Leaking control lines
- Leaking Quick Release Valve exhaust port
- Leaking wheel air seals

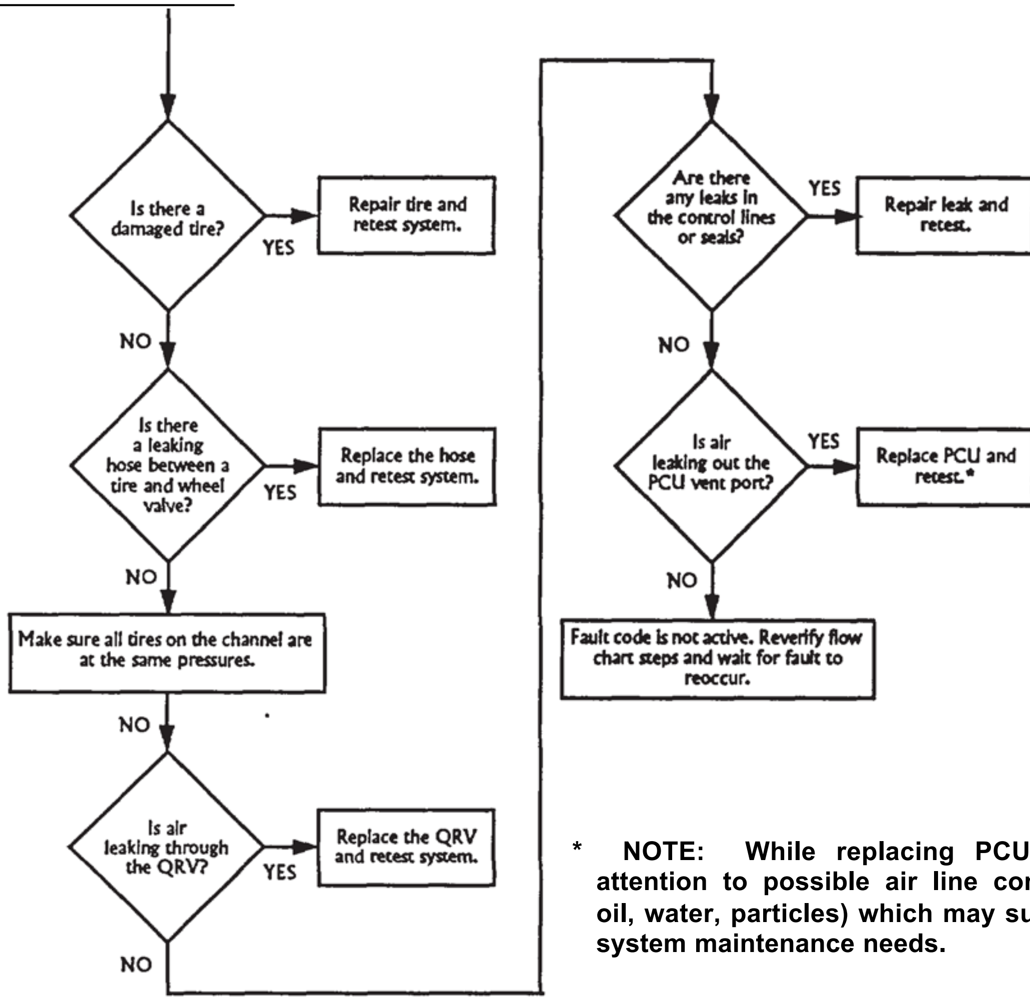
Components located after the wheel valve that may cause this include:

- Tire damage
- Rim leaks
- Leaking air lines.
- Faulty wheel valve

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Inflate Trend troubleshooting tree.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

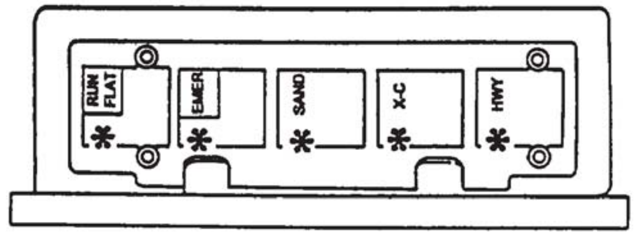
Display: **5 Flashing Lights**
Type: ***Inflate Trend***



* **NOTE: While replacing PCU, pay particular attention to possible air line contamination (i.e., oil, water, particles) which may suggest further air system maintenance needs.**

Display: **5 Flashing Lights**

Type: ***Deflate Trend***



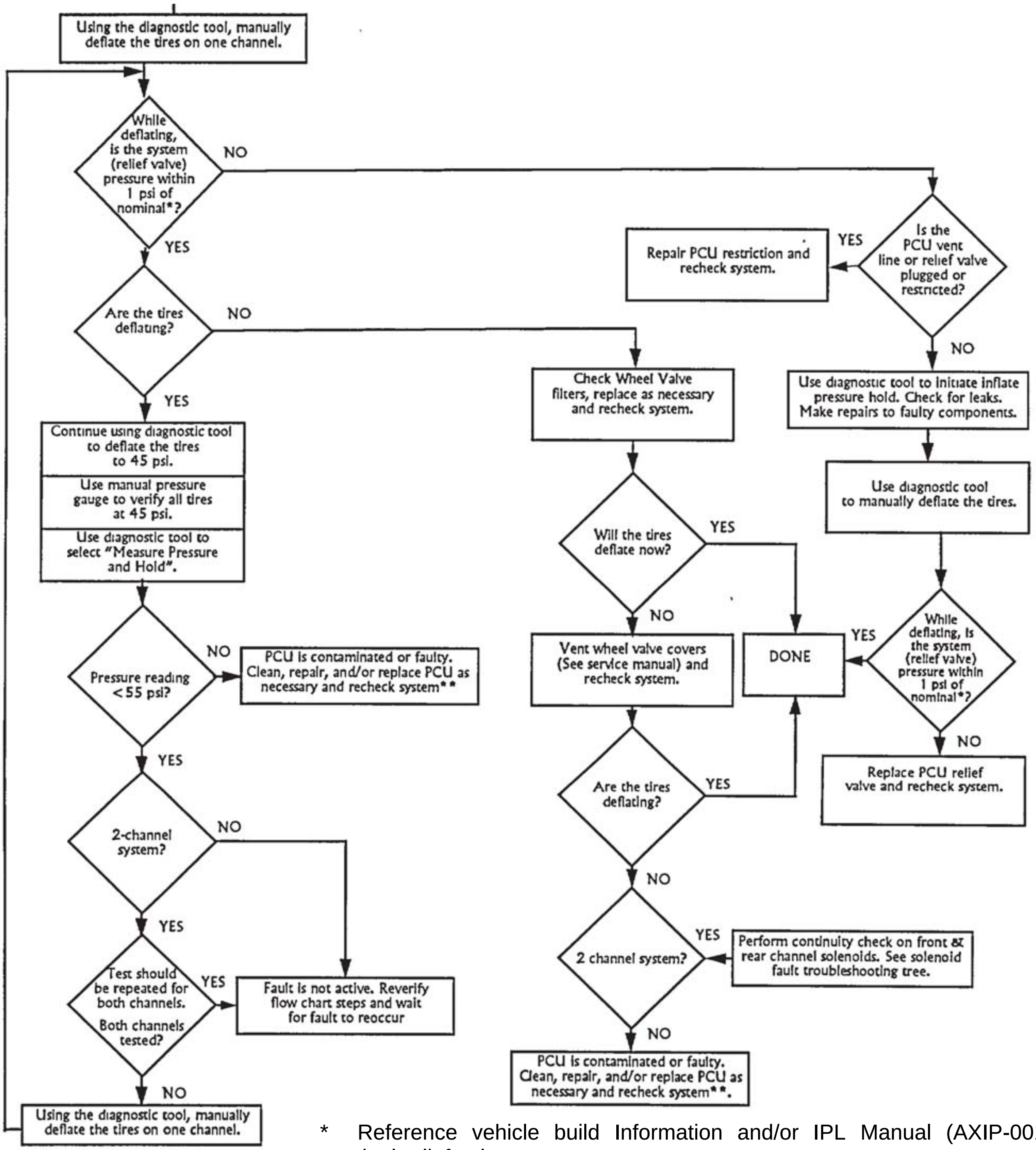
System Mode	Condition	Possible Causes*
Inflate only	Improper deflate sequence	• Plugged or restricted Pneumatic Control Unit (PCU) vent line • Faulty PCU relief valve • Poor ground connection to pressure transducer • Contaminated PCU • Faulty PCU

*Possible causes are listed in order of likely occurrence.

Code Description

A "Deflate Trend" code displays when the system has determined that a deflate sequence is not functioning correctly. This is the result of either a pressure increase during a deflation, or the system failing to lower the tires even a small amount of the desired pressure drop.

Display: **5 Flashing Lights**
Type: ***Deflate Trend***

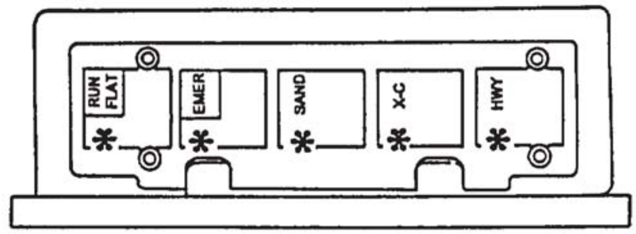


* Reference vehicle build Information and/or IPL Manual (AXIP-001 5) for nominal relief valve pressure.

**** NOTE: While removing PCU pay particular attention to possible air line contamination (I.e., oil, water, particles) which may suggest further air system maintenance needs.**

Display: **5 Flashing Lights**

Type: ***Pressure Transducer***



System Mode	Condition	Possible Causes*
No operation	No pressure transducer reading	• Transducer electrically disconnected • Pressure signal wire open • Pressure signal wire shorted to ground • Pressure transducer Vref wire open • Pressure transducer Vref wire shorted to ground • Pressure transducer ground wire open • Faulty transducer • Faulty Electronic Control Unit
No operation	High pressure transducer reading	• Pressure signal wire shorted to Vbat or Vref • Faulty transducer • Faulty Electronic Control Unit

* Possible causes are listed in order of likely occurrence.

Code Description

A "Pressure Transducer" code occurs when the Electronic Control Unit (ECU) receives an unusually high or low reading from the pressure transducer. A diagnostic tool will specify which of the two conditions is responsible for setting the code.

Initial troubleshooting steps involve checking for shorted-to-ground or an open pressure transducer circuit.

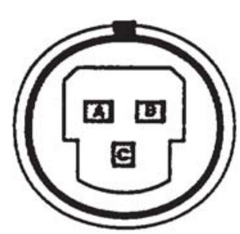
If the circuits check out OK, secondary causes could involve a faulty transducer or a faulty Electronic Control Unit.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

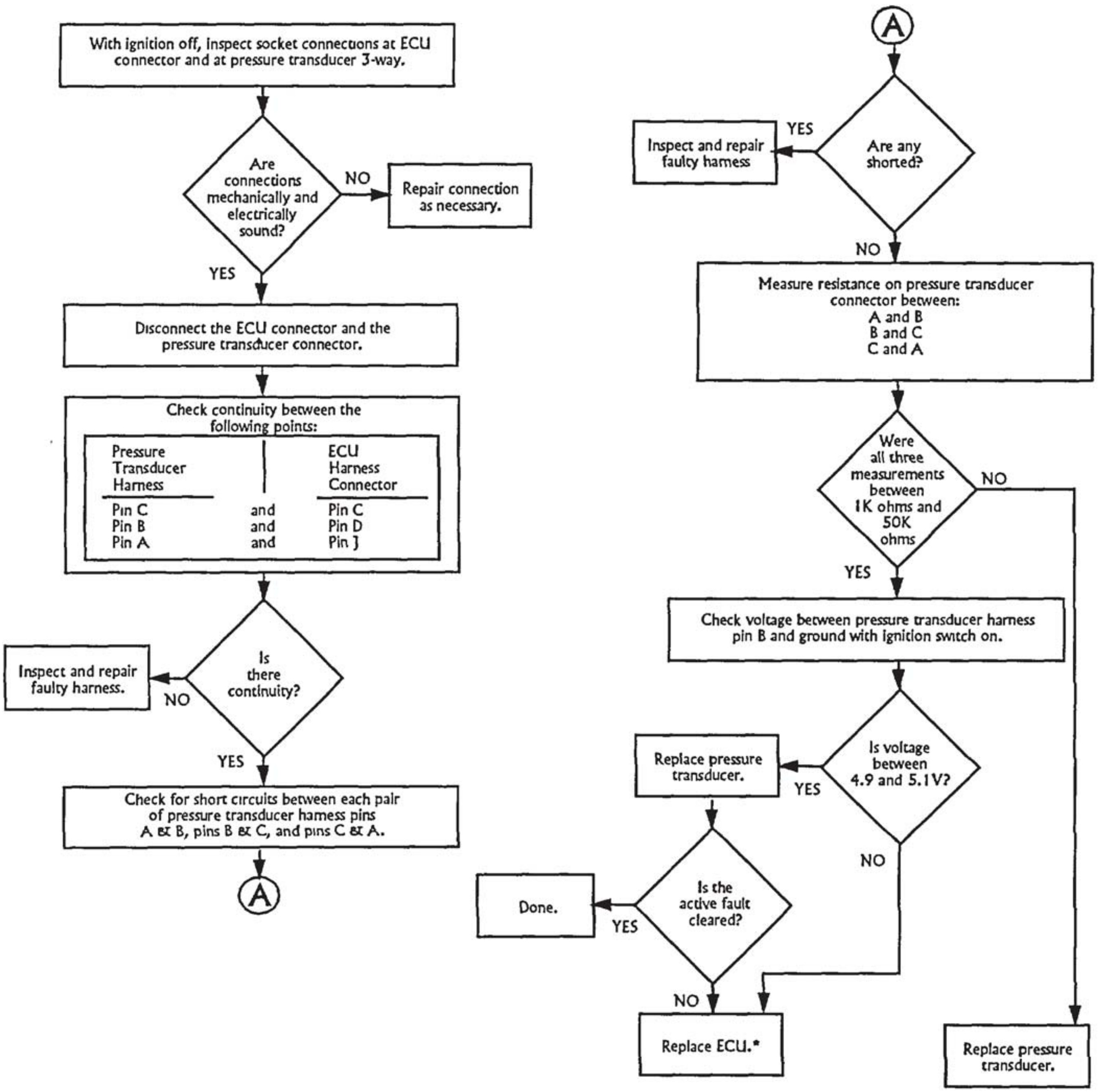
Pressure Transducer Harness Connector

ECU Harness Connector

Pressure Transducer Connector



Display: **5 Flashing Lights**
Type: ***Pressure Transducer***

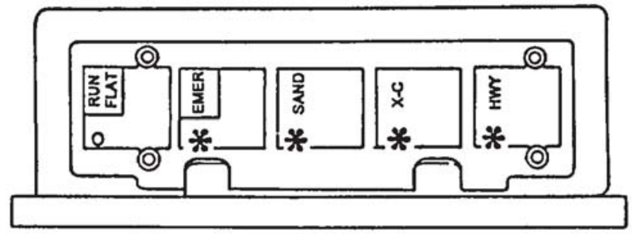


* **NOTE: ECU replacement ECUs are NOT a typical cause of problems. If an ECU is replaced, the system should be carefully rechecked to make sure the problem has been found, and does not reoccur.**

Display: **4 Flashing Lights**

Type: ***Tire Leak (Imbalance)***

NOTE: RUN FLAT overrides this fault



System Mode	Condition	Possible Causes*
Channel only checks pressures	Tire pressure lower on one tire than others	• Minor tire leakage at start up (leaked overnight) • Severe tire damage or leaks • Contaminated wheel valve filters • Restricted tire valve stem • Leaking lines • Leaking seals • Leaking wheel valve • Crimped or restricted control lines

*Possible causes are listed In order of likely occurrence.

Air Pressure Check

Note that the Central Tire Inflation System is not continuously pressurized; pressure checks occur on a periodic basis. During tire pressure checks, the system delivers compressed air to the each channel for approximately two seconds while monitoring the pressure in that channel.

Code Description

A "Tire Leak (Imbalance)" code indicates that either the tire pressure on one tire or wheel end was read lower than the other tires, or there is an air leak someplace in the system.

Low tire pressure can be caused by a damaged tire, plugged wheel valve filter or leaking air lines. An air leak can be located either before or after the wheel valve.

NOTE

When using a diagnostic tool to inflate or inflate-hold a channel with one low tire, air may be heard leaking out of the QRV(s) by the higher pressure tires. This is normal and should stop once the low tire is inflated to the pressure of the other tires.

The components located before the wheel valve that may cause a "Tire Leak (Imbalance)" code include:

- Leaking wheel air seals
- Leaking control lines
- Restricted QRV exhaust port

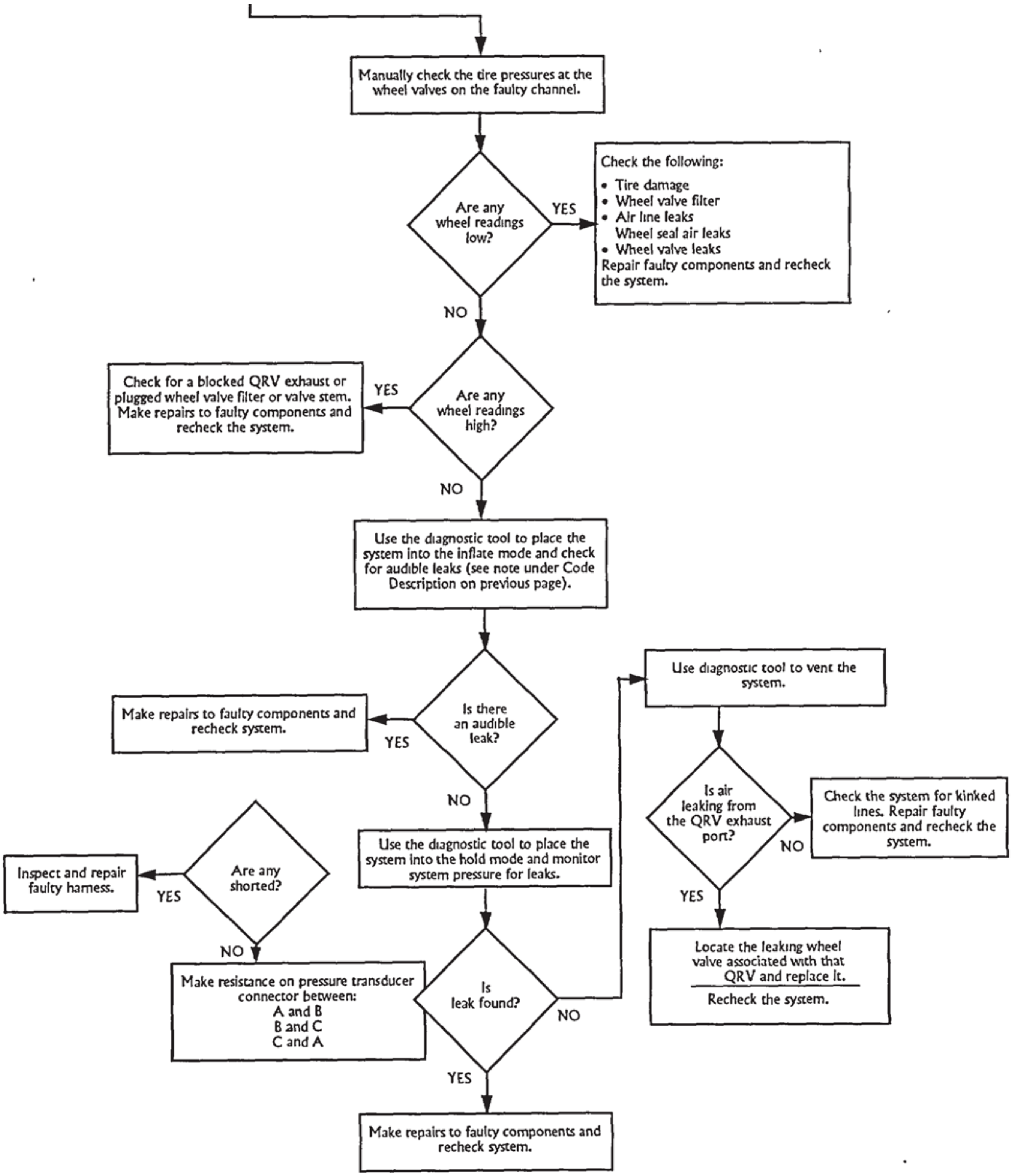
Components located after the wheel valve that may cause an imbalance include:

- Damaged tire
- Rim leaks
- Clogged or restricted wheel valve filter or valve stem
- Leaking air lines
- Wheel valve damage

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Tire Leak (Imbalance) troubleshooting tree.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

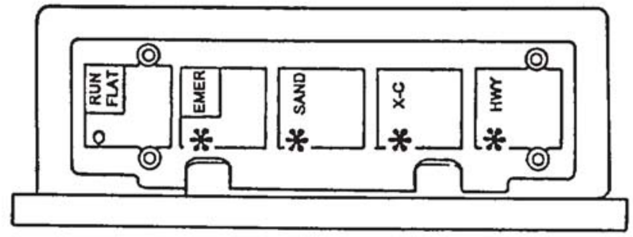
Display: **4 Flashing Lights**
Type: ***Tire Leak (Imbalance)***



Display: **4 Flashing Lights**

Type: ***Tire Leak (Confirm)***

NOTE: RUN FLAT overrides this fault



System Mode	Condition	Possible Causes*
Channel inoperative	Channel confirmation failure	• Damaged or leaking tire • Leaking line between wheel valve and tire • Plugged or restricted Quick Release Valve • Leaking Wheel Valve • Plugged or restricted PCU vent line

*Possible causes are listed in order of likely occurrence.

Air Pressure Check

Note that the Central Tire Inflation System is not continuously pressurized; pressure checks occur on a periodic basis. During tire pressure checks, the system delivers compressed air to each channel for approximately two seconds while monitoring the pressure in that channel.

Code Description

A "Tire Leak (Confirm)" code occurs if a channel fails to confirm tire pressure. Following an inflate or deflate sequence, the Central Tire Inflation System will return to confirm, or "double-check" the new pressure. If the pressure has dropped, the system will re-inflate, and then reconfirm the tires. After multiple failed confirmation attempts, the system will log a Tire Leak (Confirm) code and the system will become inoperative.

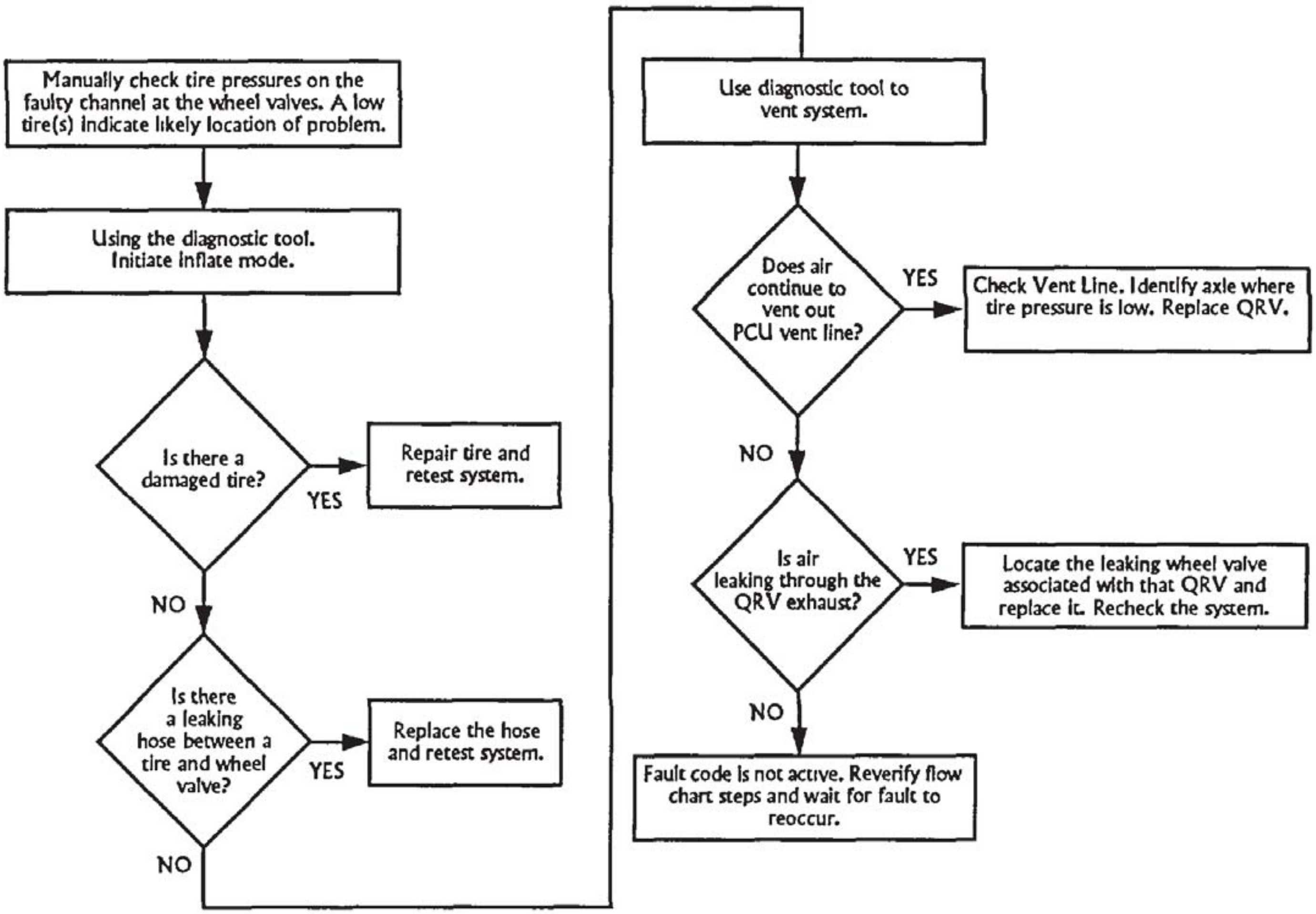
A confirmation failure can be caused by:

- Damaged or leaking tire
- Leaking air line between the wheel valve and tire
- Plugged or restricted Quick Release Valve
- Leaking wheel valve
- Plugged or restricted PCU vent line

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Tire Leak (confirm) troubleshooting tree.

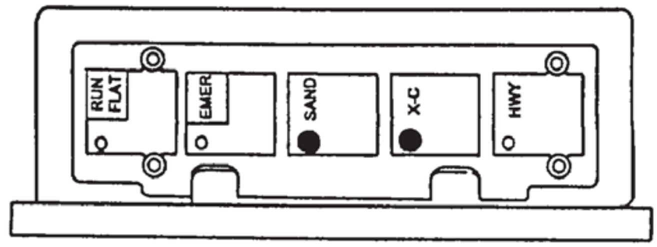
See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

Display: **4 Flashing Lights**
Type: **Tire Leak (Confirm)**



Display: **2 Solid Lights**

Type: ***Between Modes***



System Mode	Condition	Possible Causes*
Pressure check only	Slow inflate	• Faulty compressor • Restricted flow at wheel valve air filters • Crimped or plugged lines
	Slow deflate	• Restricted flow at wheel valve air filters or valve stem • Leaking upper control lines • Plugged or restricted Pneumatic Control Unit vent port • Restricted tire valve stem • Faulty PCU relief valve • Restricted QRV exhaust port

* Possible causes are listed In order of likely occurrence.

Code Description

A "Between Modes" code occurs if a channel inflates or deflates too slowly. The maximum allotted time for an inflate is 40 minutes, or 20 minutes for a deflate. The most likely cause is a faulty compressor or similar problem resulting in inadequate air supply to the Central Tire Inflation System.

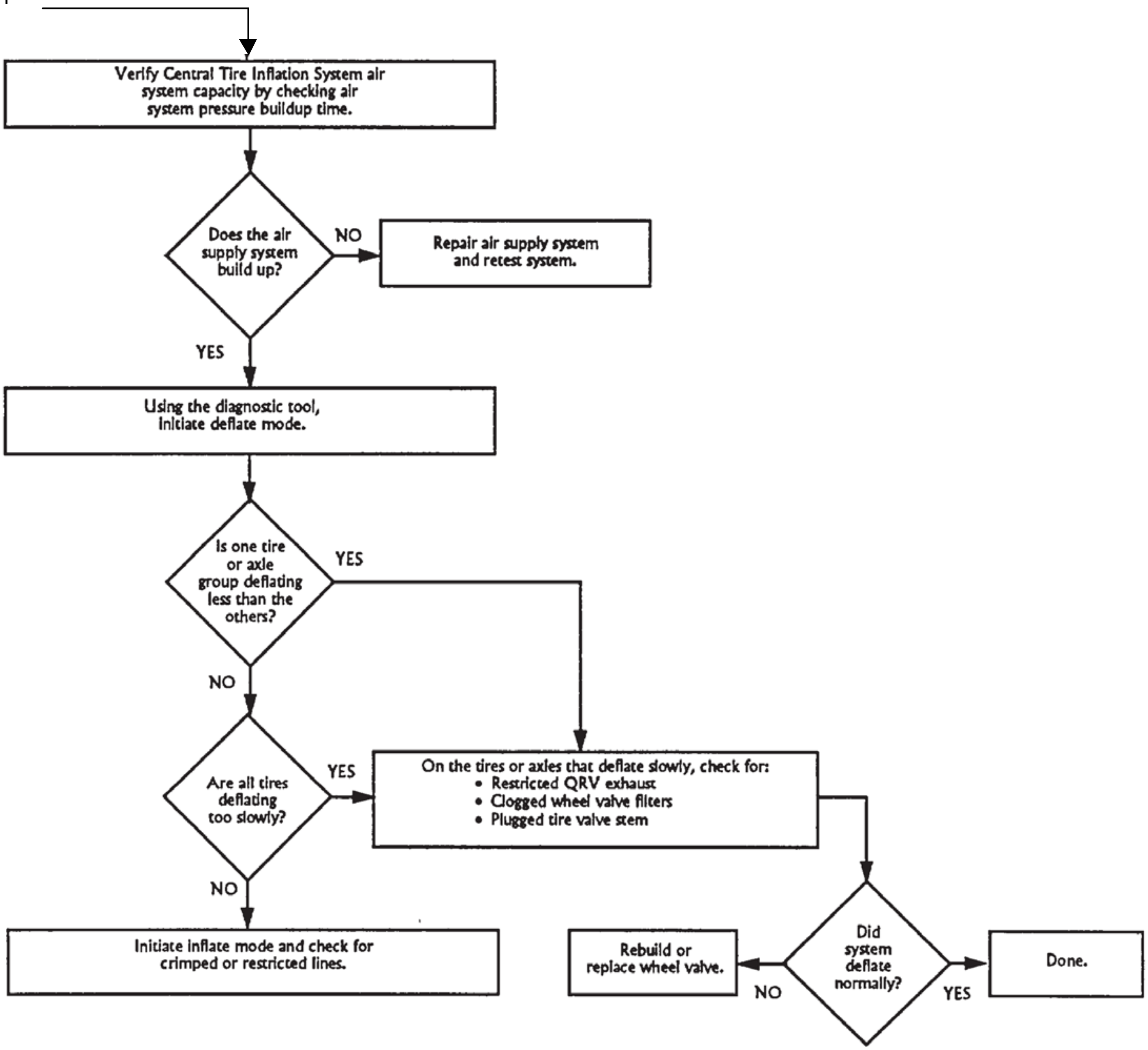
If the system is able to generate a sufficient air supply, a "Between Modes" code means that a leak or restriction exists in an air passage. The components that may contain a restricted or leaking air passage include:

- Wheel valve air filters
- Quick Release Valve (QRV)
- Pneumatic Control Unit (PCU) vent port restriction
- Air supply lines
- Restricted tire valve stem
- Faulty PCU relief valve
- Restricted QRV exhaust

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment, and descriptions) and follow the procedure in the Between Modes troubleshooting tree.

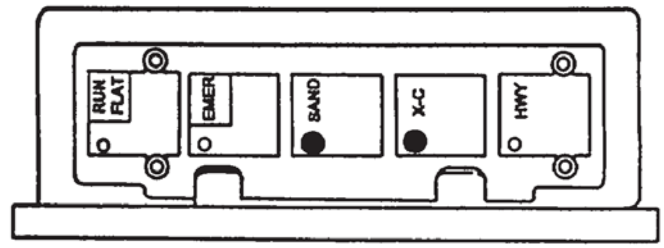
See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

Display: **2 Solid Lights**
Type: ***Between Modes***



Display: **2 Solid Lights**

Type: ***Loss of Deflate Signal or Channel Deflate Loss***



System Mode	Condition	Possible Causes*'
Inflate only	Inadequate deflate signal in the Pneumatic Control Unit and Control lines	• Plugged or restricted Pneumatic Control Unit vent line • Faulty PCU relief valve • Faulty Pneumatic Control Unit • Poor ground connector to transducer • Faulty pressure transducer

*Possible causes are listed In order of likely occurrence.

Code Description

Deflate Signal code is logged. A "Channel Deflate Loss or Loss of Deflate Signal" code indicates inadequate deflate signal in the Pneumatic Control Unit (PCU) or failure to sustain the signal in the control lines of a given channel.

When a deflate is requested, the system drops the control line pressure to a preset level which is established by the PCUs relief valve.

If the pressure (typically 10-18 psi depending on the PCU being used) cannot be maintained by the PCU, either a Channel Deflate Loss or Loss of

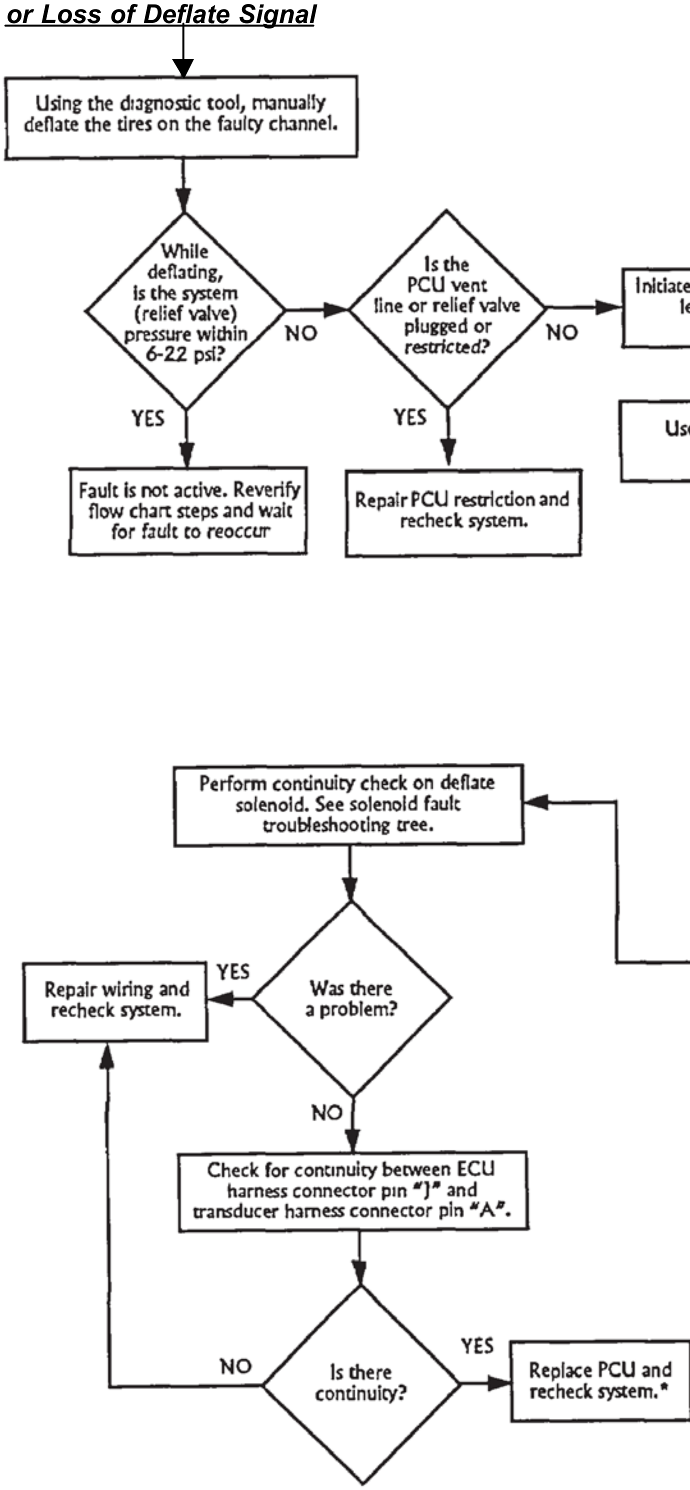
This can be caused by:

- Faulty Pneumatic Control Unit (relief valve)
- Plugged or restricted Pneumatic Control Unit vent line
- Line leak

To correctly diagnose the faulty component, connect the Diagnostic Tool (see Page 3-92.16 for test equipment and descriptions) and follow the procedure in the Channel Deflate Loss or Loss of Deflate Signal troubleshooting tree.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

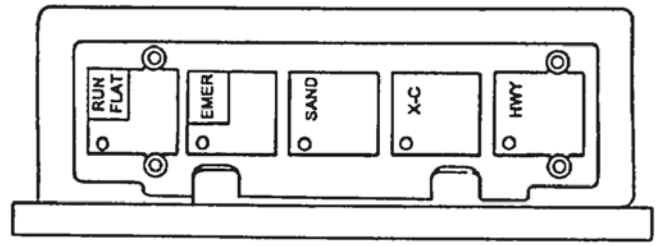
Display: **2 Solid Lights**
Type: ***Channel Deflate Loss***
<u>or Loss of Deflate Signal</u>



* **NOTE: While replacing PCU, pay particular attention to possible air tire contamination (i.e., oil, water, particles) which may suggest further air system maintenance needs.**

Display: **No Mode Lights**

Type: ***Power***



System Mode	Condition	Possible Causes*
No operation	Power out of range	• Low battery voltage • Poor ground connection to Electronic Control Unit • Poor switched Ignition connection to Electronic Control Unit • High vehicle electrical system voltage • Faulty Electronic Control Unit

*Possible causes are listed In order of likely occurrence.

Code Description

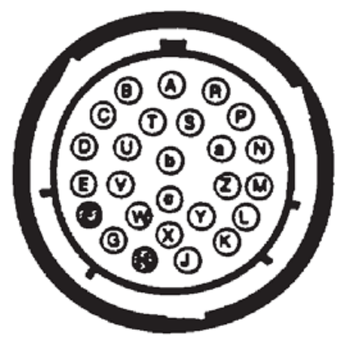
A "Power" code indicates a power fault and sets when the system power is outside a 24 Volt system's acceptable range of 18 to 32 Volts. The fault could be caused by low battery power or some other problem with the basic vehicle electrical system.

If the vehicle power system checks out satisfactorily, other possible causes include bad Electronic Control Unit (ECU) connections, or a faulty ECU.

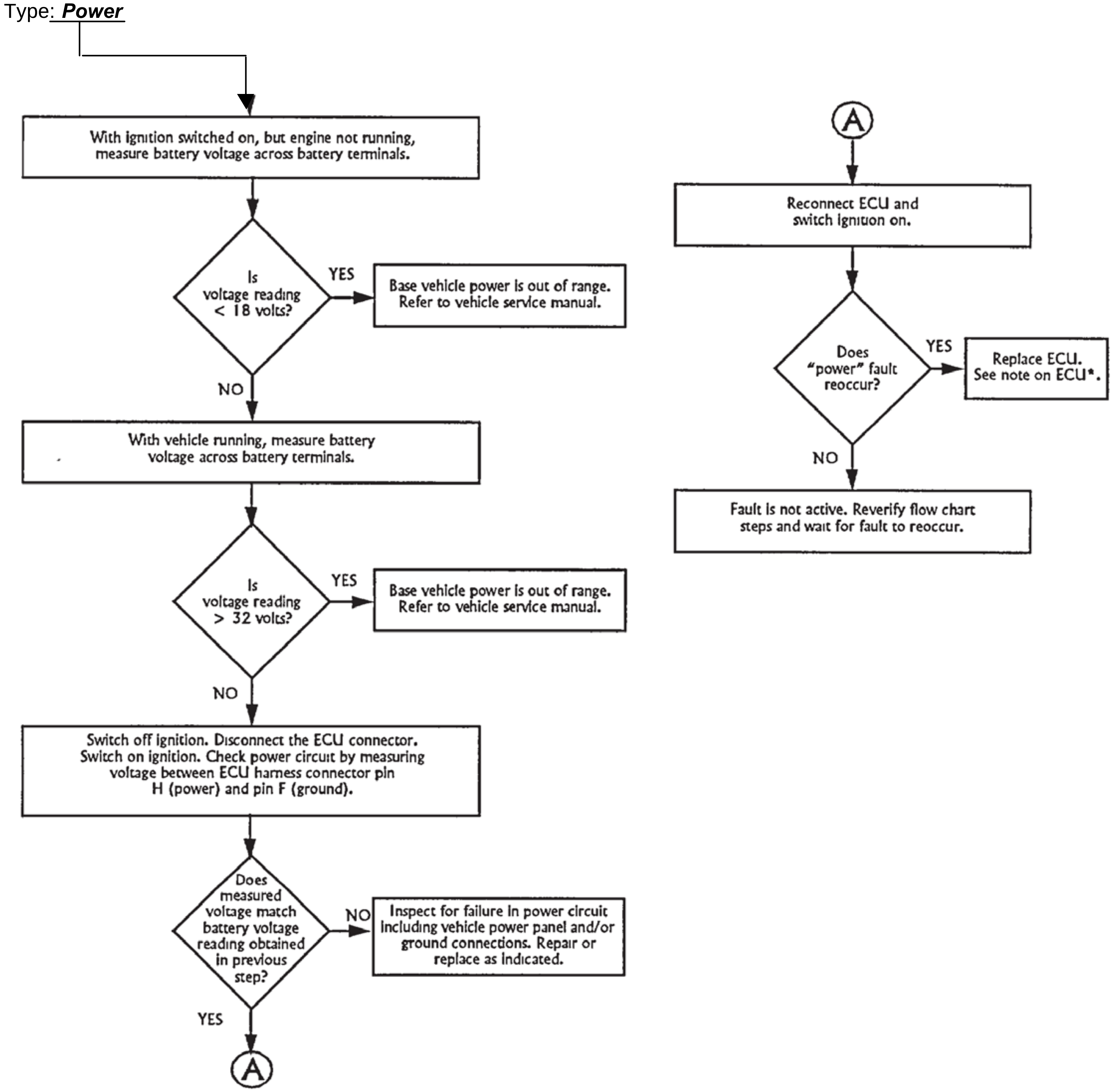
In inspecting circuits and connections for a Power Code, pay particular attention to a bad ground connection, which could be causing the fault.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

ECU
Harness Connector



Display: **No Mode Lights**
Type: ***Power***

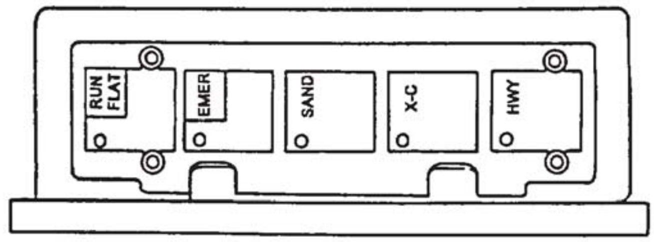


* **NOTE: ECU replacement - ECUs are NOT a typical cause of problems. If an ECU is replaced, the system should be carefully rechecked to make sure the problem has been found, and does not reoccur.**

Display: **No Mode Lights**

Type: ***Solenoid Fault***

(Supply, Deflate, Control, Front, or Rear)



System Mode	Condition	Possible Causes*
No operation	Pneumatic Control Unit solenoid failed electrical diagnostic test	• Solenoid wire shorted to ground • Solenoid wire shorted to power • Faulty solenoid • Faulty Electronic Control Unit

* Possible causes are listed in order of likely occurrence.

Code Description

A "Solenoid Fault" code indicates an electrical fault in the Pneumatic Control Unit (PCU). System operation is disabled when these faults are detected.

The system shuts down in a fail-safe mode and turns off the power to the solenoids.

The troubleshooting tree first tests internal solenoid circuitry. Resistance outside the specified range of 30 to 80 ohms indicates a defective solenoid. Succeeding steps check continuity of the wire harness circuits between the Pneumatic Control Unit and Electronic Control Unit (ECU). If the problem can be traced to a faulty circuit or connector, make the necessary repairs. If the troubleshooting routine leads to a problem with the solenoid itself, the Pneumatic Control Unit must be repaired or replaced. If both the solenoid and the circuitry check out OK, the Electronic Control Unit is faulty.

See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

PCU Connector

PCU Harness Connector

ECU Harness Connector

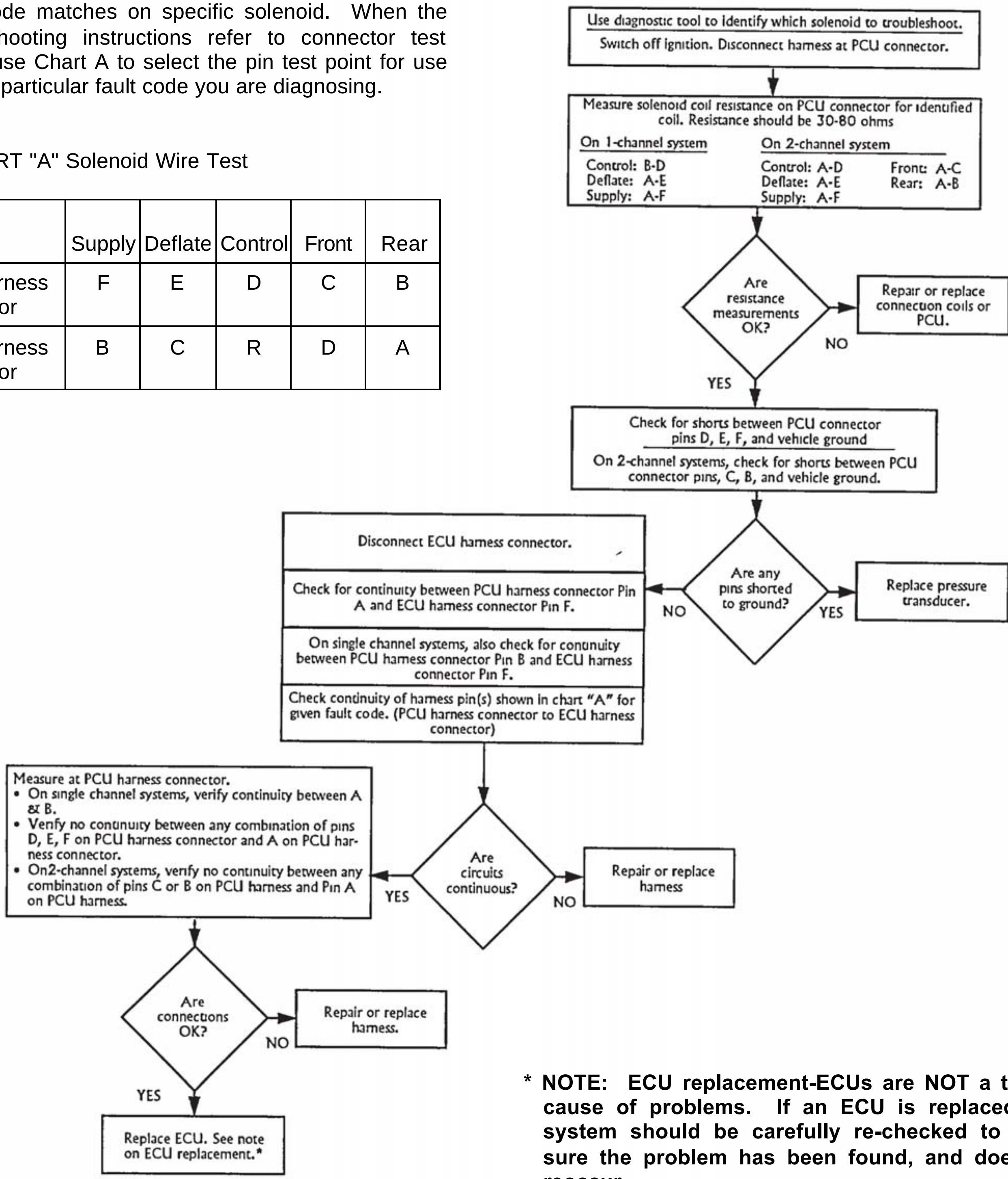
Display: **No Mode Lights**
Type: ***Solenoid Fault***

(Supply, Deflate, Control, Front, or Rear)

Each code matches on specific solenoid. When the troubleshooting instructions refer to connector test points, use Chart A to select the pin test point for use with the particular fault code you are diagnosing.

CHART "A" Solenoid Wire Test

Fault Code	Supply	Deflate	Control	Front	Rear
PCU Harness Connector	F	E	D	C	B
ECU Harness Connector	B	C	R	D	A

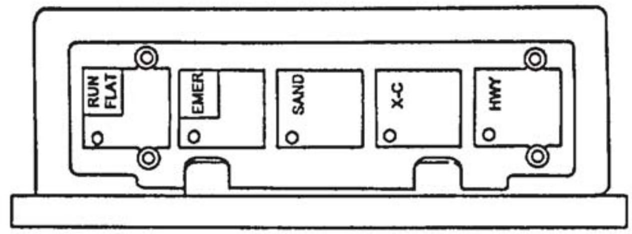


*** NOTE: ECU replacement-ECUs are NOT a typical cause of problems. If an ECU is replaced, the system should be carefully re-checked to make sure the problem has been found, and does not reoccur.**

Display: **Lights Sequentially Flashing**

Type: ***Configuration Error***

NOTE: Pressing HWY and RUN FLAT together clears this display



System Mode	Condition	Possible Causes*
Limp home/	System using default values	• Both Configuration Wires shorted to ground
Normal operation		• Loss of Programmed Values
		• Faulty Electronic Control Unit (ECU)
		• Possible causes are listed In order of likely occurrence.

Code Description

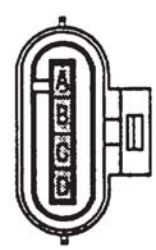
A "Configuration Error" code displays when the system has re-loaded the system defaults into ECU memory, eliminating any changes (target pressures, etc.) previously programmed via a diagnostic tool. This code will also display on systems which have harness selected the download configuration and not programmed any values into the ECU yet.

The ECU will re-load its memory anytime the harness configuration selection changes. This allows the ECU to be moved from vehicle to vehicle and change its interaction with those vehicles as needed. On all systems (except harness selected download config), pressing the HWY and RUN FLAT buttons at the same time will clear the display.

The troubleshooting procedure involves verifying that the harness configuration selection wires are making a good connection. If the configuration wires are good, and the problem repeatedly occurs, the ECU may need to be replaced.

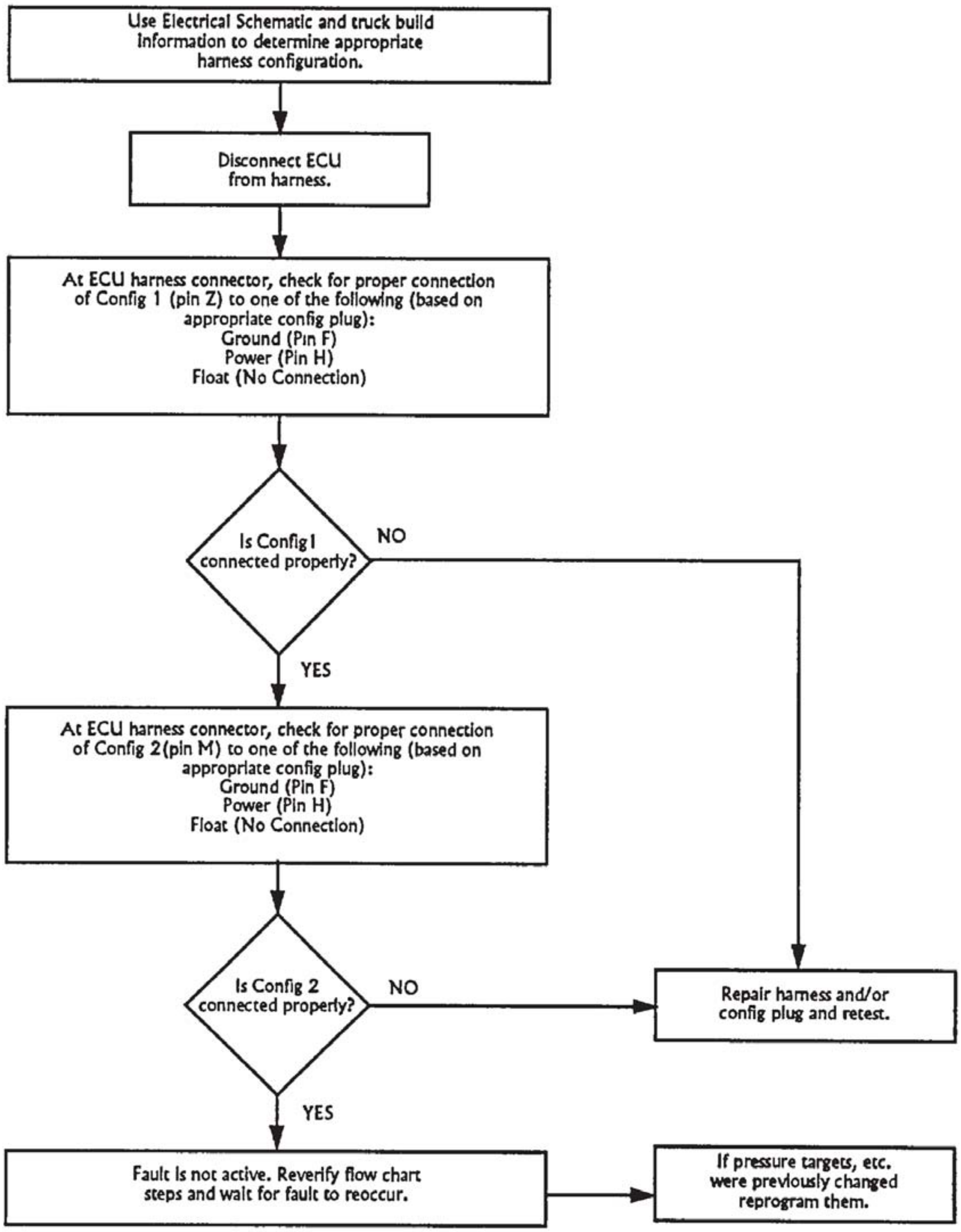
Configuration Connector

Configuration Harness Connector



ECU Harness Connector

Display: **Lights Sequentially Flashing**
Type: ***Configuration Error***

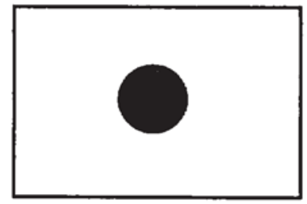


*** NOTE: ECU's are NOT a typical cause of problems, however, If this fault reoccurs multiple times, and wiring harness has been confirmed to be good, ECU replacement may be necessary.**

Display: **Solid Warning Lamp**

Type: ***Speed Signal***

On Instrument Panel



System Mode	**Condition**	**Possible Causes***
Normal operation	No speed signal	• Vehicle started 25 to 50 times without being moved • Sensor disconnected or loose plug • Either speed sensor wire is open (broken wire) • Either speed sensor wire Is shorted to ground (bare wire Is touching the frame) • Faulty speed sensor • Tang drive broken/disconnected on mechanical sensor • Gap not adjusted correctly on pole sensor • Sensor wires shorted together • Faulty Electronic Control Unit

* Possible causes are listed in order of likely occurrence.

Code Description

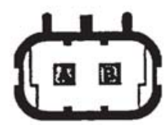
A "Speed Signal" code indicates a faulty speed sensor signal which can be set by one of two conditions:

- A wiring or sensor connection may cause the signal to fail to get to the ECU.
- A misadjusted or faulty sensor may result in no speed signal being generated.

Note: This fault may occur if ignition has been cycled 25 to 50 times without moving the vehicle.

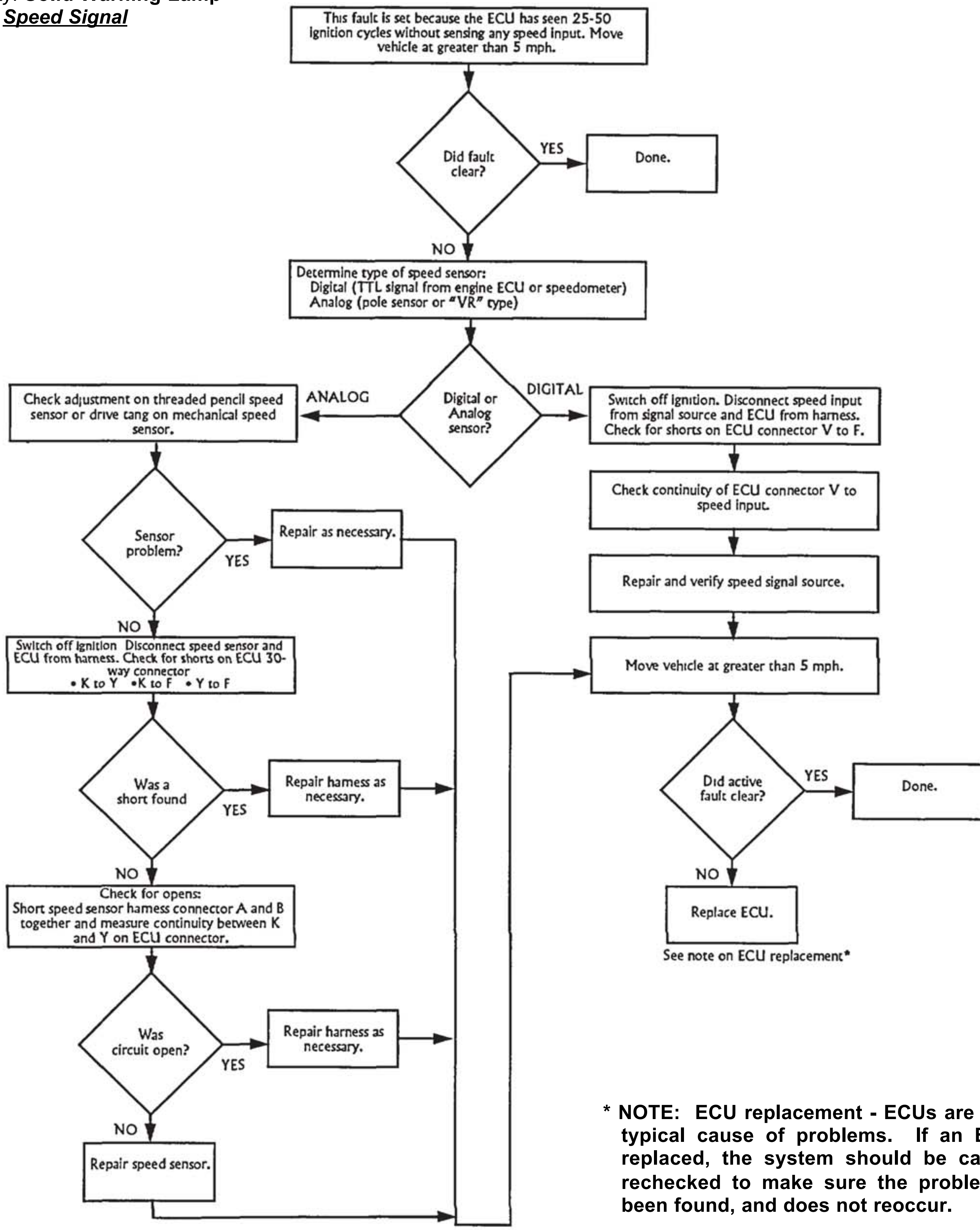
See "Troubleshooting Tips" on page 3-92.15 for general guidelines on system diagnostics.

Speed Sensor Harness Connector



ECU Harness Connector

Display: **Solid Warning Lamp**
Type: ***Speed Signal***



*** NOTE: ECU replacement - ECUs are NOT a typical cause of problems. If an ECU is replaced, the system should be carefully rechecked to make sure the problem has been found, and does not reoccur.**

Display: **NO Code**

Type: ***Miscellaneous***

Although the Central Tire Inflation System is self-diagnosing, there are some operating problems that do not trigger a fault code. The following chart lists these conditions along with possible causes and solutions:

Condition **Operating problems that do not trigger a fault code.**	**Possible Causes*** **Since a fault code was not set, these conditions may be universal and not call for a troubleshooting routine.**	**Solution** **Where fault codes appear, refer to the troubleshooting procedures listed** under that code.
ECU Display		
Blank Electronic Control Unit (ECU) display	• Power fuse blown • Bad ground to ECU • Bad switched Ignition line to ECU • Faulty ECU	• Check Fuses • See "Power" code
System loses programmed tire pressure settings	• Improperly followed programming procedure • Faulty Electronic Control Unit	• Reference programming procedure • Replace Electronic Control Unit
Tire Pressure		
Diagnostic tool display shows tires at higher pressure than target, yet system does not attempt to deflate	Tire pressure rises due to temperature, are not bled off by the Central Tire Inflation System This is normal operation than current target is selected	System will only Initiate a deflate if a mode with a lower target pressure
No apparent inflate or deflate Pressure Imbalance (tires on same channel at different pressures)	• Pressure switch not closed • Defective hose • Clogged filters	See "Inadequate Air Pressure" code See "Tire Leak (Imbalance)" code
No inflate or deflate of particular tire	• Valve stem core not removed on tire • Clogged wheel valve filter or valve stem	Remove hose from tire valve stem and remove core. Replace hose Change filter.
Inaccurate tire pressures (From targets PC tool shows)	• Leaking control lines • Faulty pressure transducer • Faulty Electronic Control Unit	See 'Atmospheric" and 'Tire Leak (Imbalance)" codes
Incorrect tire pressure targets	• System defaults to original targets	See 'Configuration Error" code

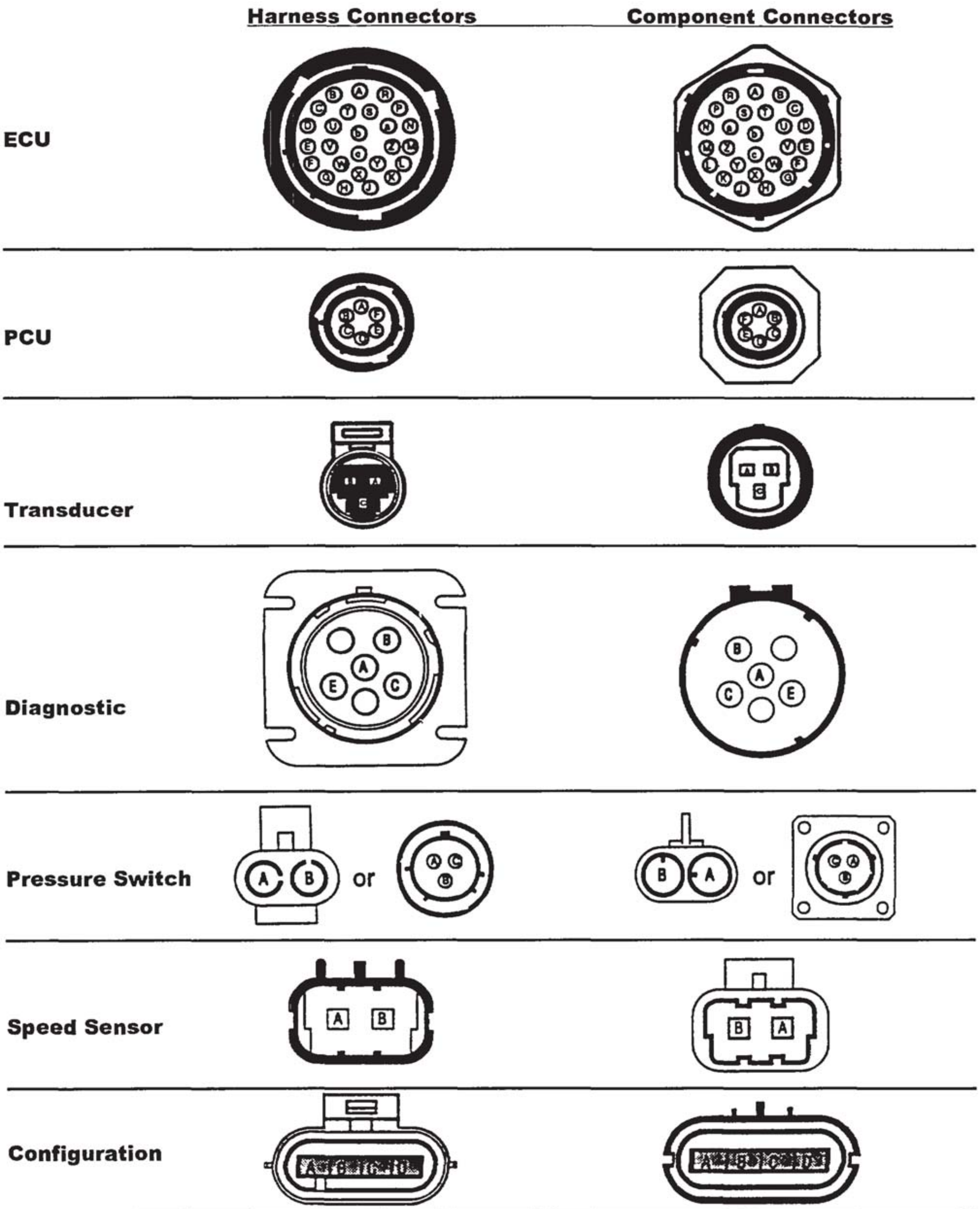
* Possible causes are listed in order of likely occurrence

Display: **No Code**

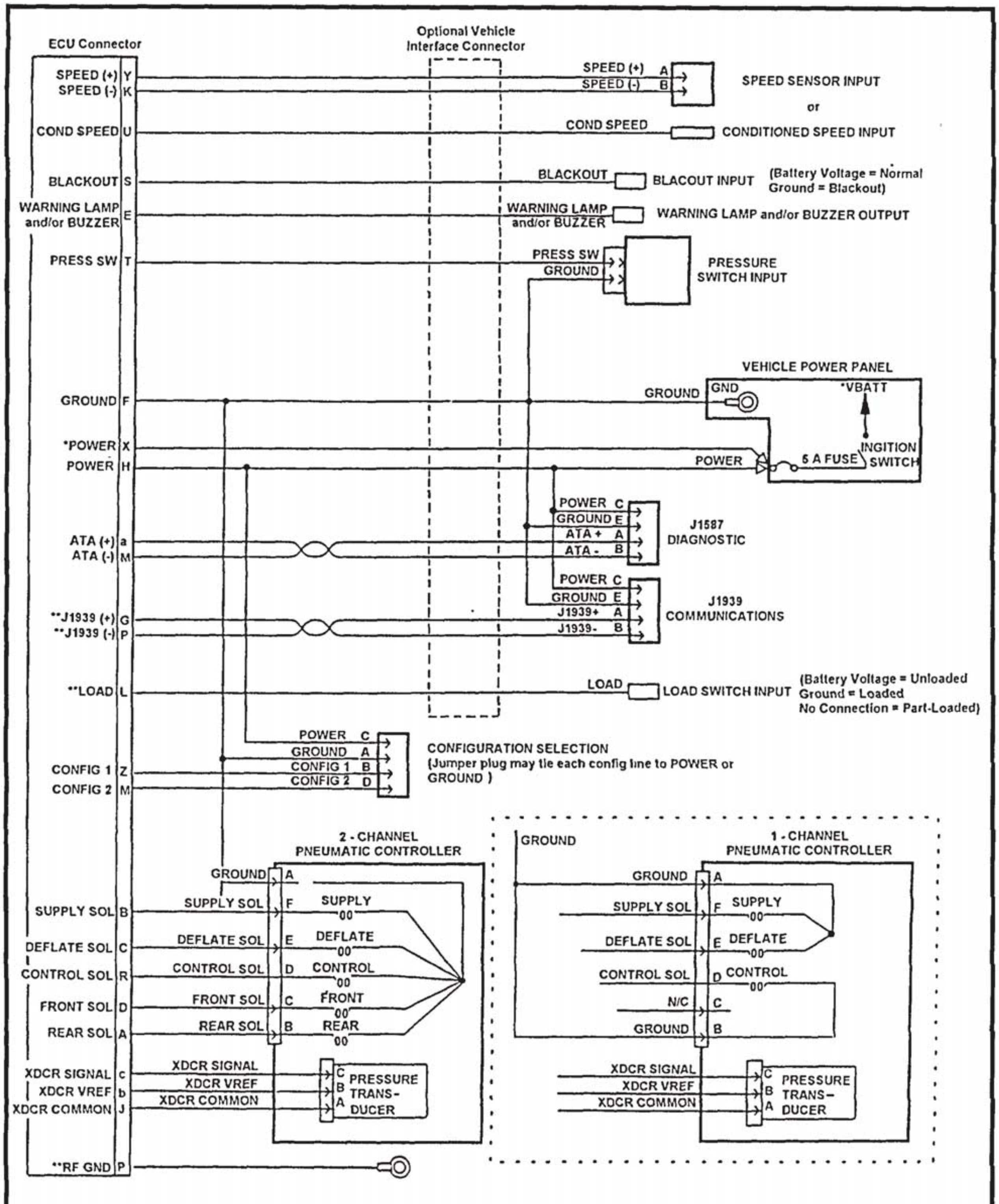
Type: **Miscellaneous**

Condition **Operating problems that do not trigger a fault code.** **under that code**	**Possible Causes*** **Since a fault code was not set, these conditions may be universal and not call for a troubleshooting routine.**	**Solution** **Where fault codes appear, refer to the troubleshooting procedures listed**
Air Leaks Air bleeding from drive axle vents	• Air Seal leaks (Extreme cold temperatures)	Drive vehicle to 'warm up" seals
Tires fall to deflate when lower pressures are requested	• Pneumatic system problem	See "No Deflate Signal" code
Leaking tires	• Damaged tire • Loose connection between wheel valve and tire • Faulty wheel valve	• Replace tire • Tighten connection • Replace wheel valve
Air bleeding (audible) through QRV when ignition is turned off	• Wheel valve is leaking back through control lines • QRV vent plugged	Identify tire with low pressure and replace faulty wheel valve
Other Apparent continuous operation, or slow inflates or deflates	• Too long changing pressures • Loss of pressure during inflate	See 'Between Modes", "Trend Fault", "Tire Leak (Confirm)" codes
System stopped In middle of inflate or deflate (display shows steady mode light before reaching targeted pressures)	• Intermittent transducer short or open	See "Pressure Transducer" code
Wheel end oil leak	• Faulty air or oil seal	
Optional "load" switch seems to have no effect	• Broken, shorted, or open wire to load switch • Faulty load switch	Use diagnostic tool In monitor mode to verify load status changes when switch position changes Use wiring diagram to test harness for shorts or opens Replace load switch

* Possible causes are listed In order of likely occurrence



Connector Illustrations



ELECTRICAL SCHEMATIC

TI N III TR B TING AN T TING T ANTI- BRA T M (AB) WIT R - IN (M91 A2 AN M916A1)

a

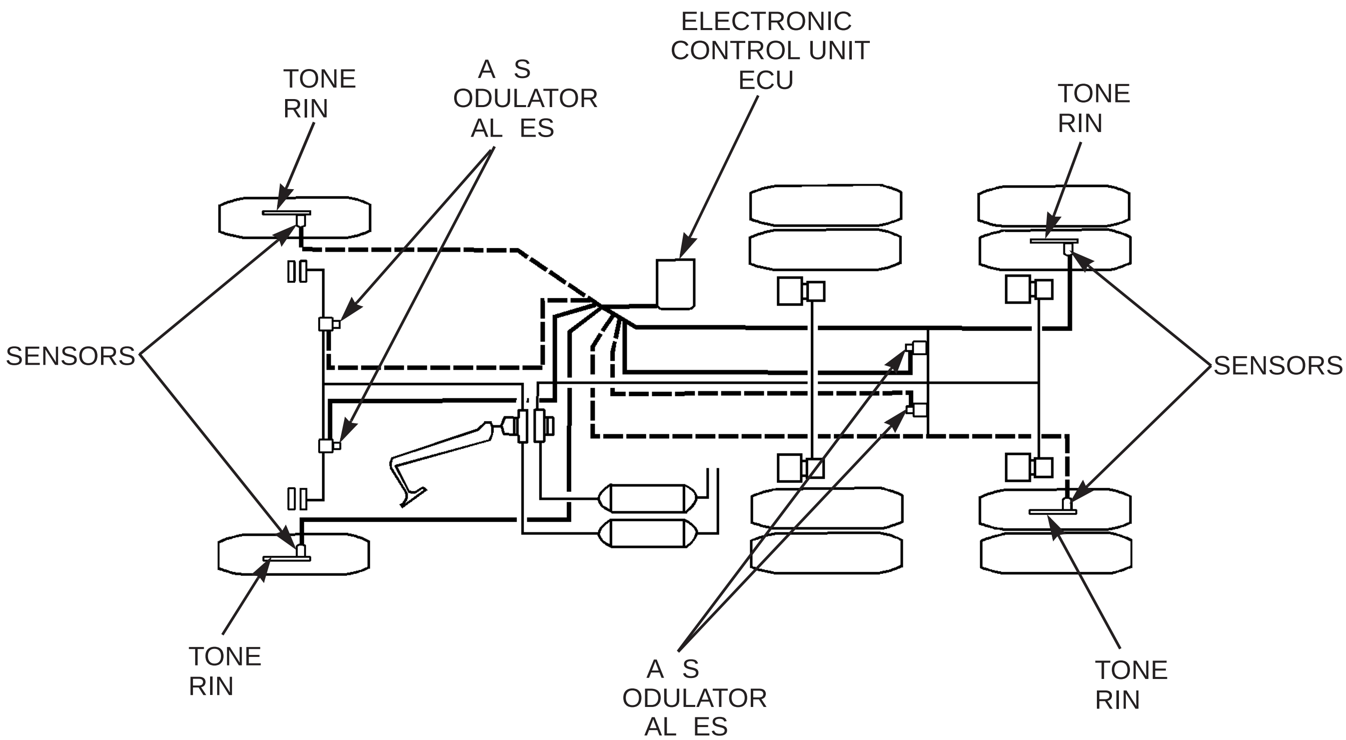
INTR TI N

This section contains information on troubleshooting and testing the Anti-Lock rake System A S on the 15A2 and 1 A1 using ro-Link. The A S is an electronic system that monitors and controls wheel speed at all times, and controls braking only during emergency situations. The A S controls the braking of each wheel separately, which prevents wheel locking, maintains steerability, and reduces stopping distance. The A S has two diagonal circuits. Each circuit connects the front wheel of one side of the tractor to the rear wheels of the opposite side. In case of a system fault, only half of the A S stops working. Control of that half is returned to the standard brake system. The A S uses a tone ring and sensor on the hub of each monitored wheel. The sensor sends wheel speed information to the Electronic Control Unit ECU . The ECU signals the modulator valve for that wheel to increase, reduce, or maintain air pressure in the brake chamber.

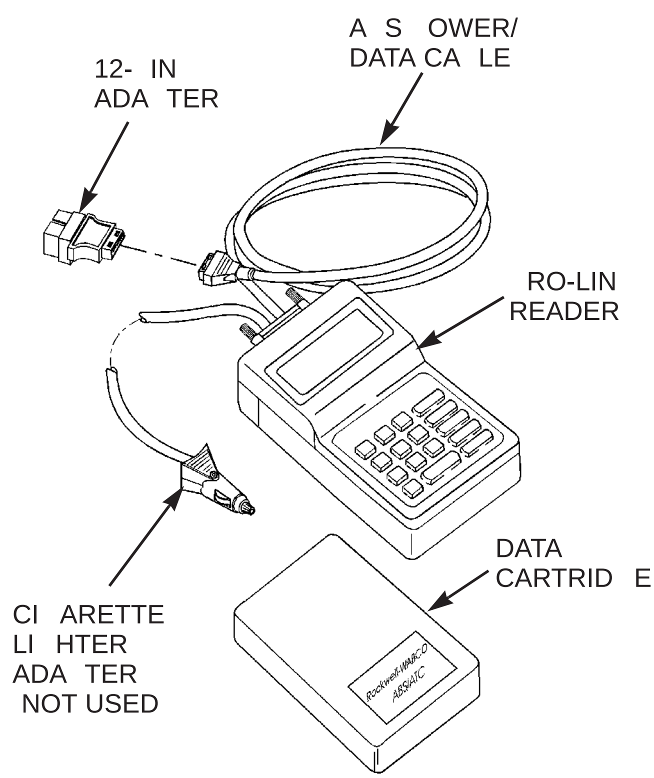
R T T IN TI N

1. rior to performing the vehicle test, ensure the daily preventive maintenance inspections and procedures have been performed.

R T T IN TI N (n)

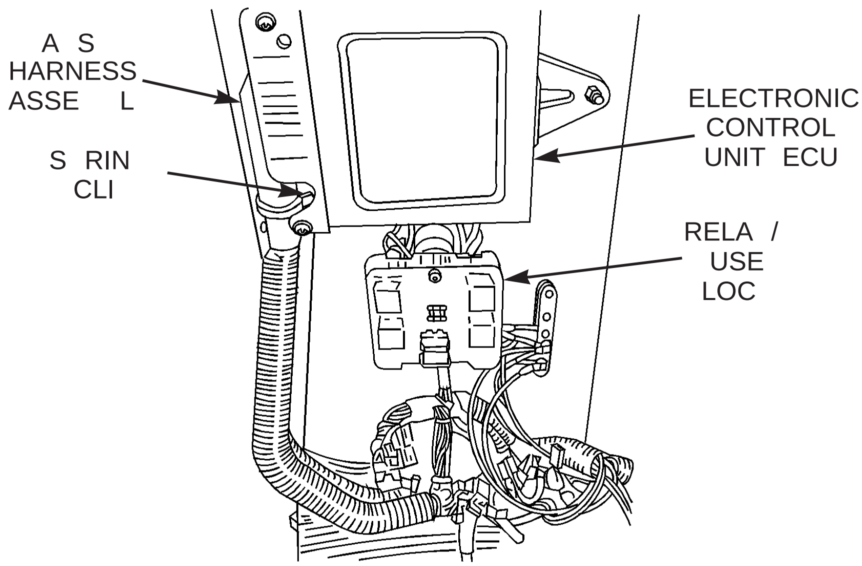


2. efore beginning any troubleshooting or testing of the A S with ro-Link, read all introductory material for instructions on proper usage of the ro-Link, and related personnel and equipment safety issues pages 3- 3 through 3-100. .



N T

Electronic Control Unit ECU is located behind the passenger s seat.



R - IN ATA ARTRI G IN TA ATI N AN T I

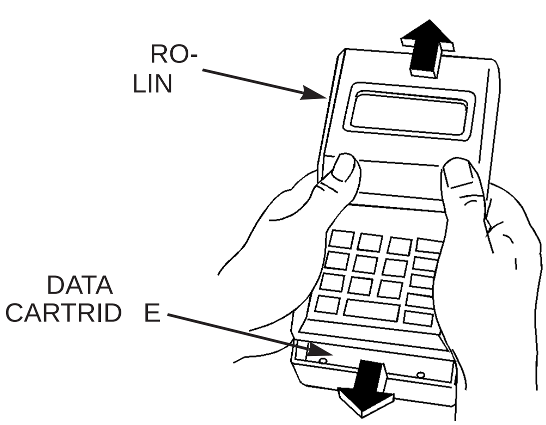
1. Remove the current data cartridge from the ro-Link if it is not the Rockwell WA CO A S data cartridge

   a Hold ro-Link with thumbs placed against slanted surface and grasp cartridge with fingers.

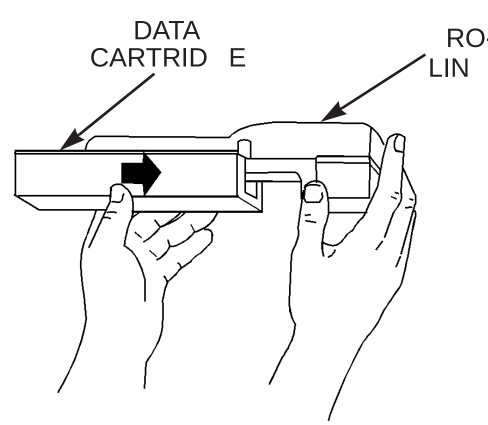
   b ush thumbs forward against slanted surface while squeezing ro-Link and slide cartridge back at the same time. The retention latches will release the outer end.

   c Slide cartridge straight out until the edgeboard is clear of the connector in the ro-Link.

2. Install Rockwell WA CO A S data cartridge until cartridge clicks into place Item 144 of Section III, Appendix , page -21, T -2320-3 3-20-2 .



R M A



IN TA ATI N

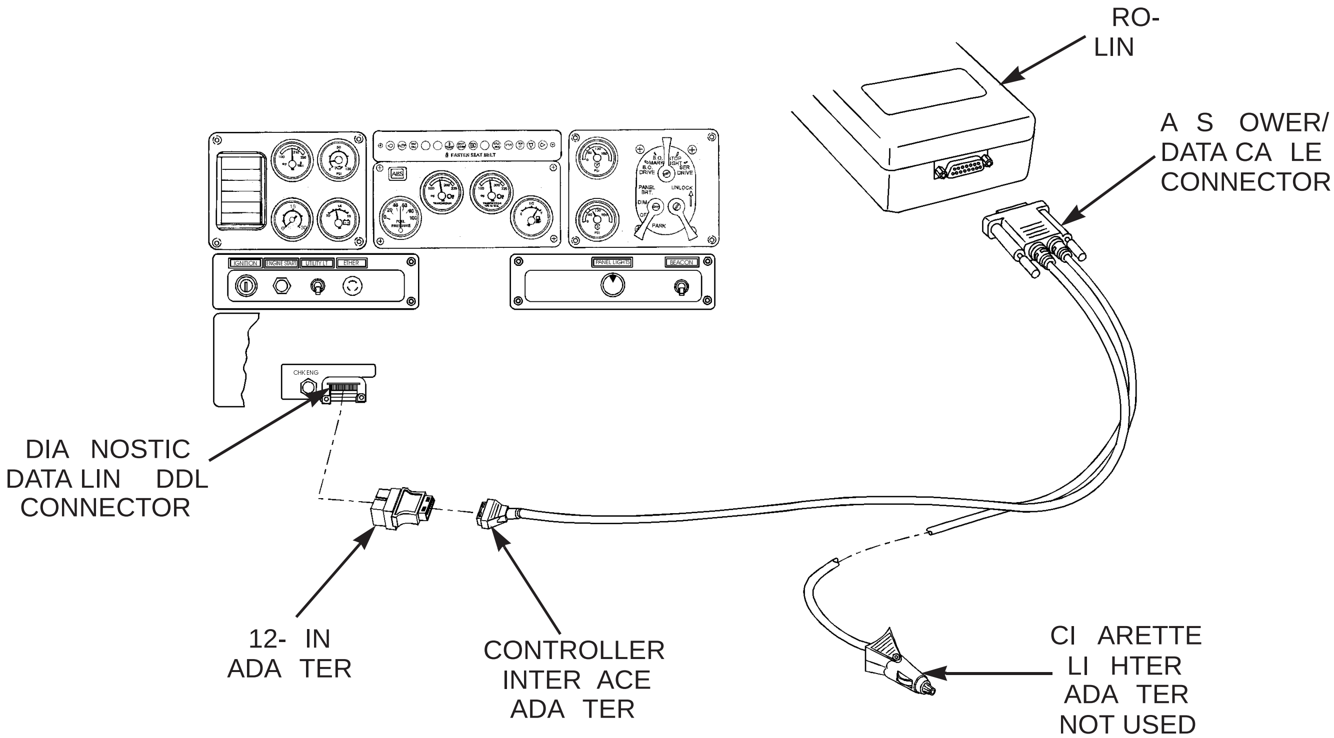
R - IN ATA ARTRI G IN TA ATI N AN T I (n)

3. Connect the A S power/data cable connector to the ro-Link and connect the 12-pin adapter to the other end controller interface adapter of the A S power/data cable.

A TI N

ehicle ignition switch must be in O position prior to connecting ro-Link to the diagnostic data link DDL connector, to prevent possible damage to ro-Link.

4. Turn ignition switch to O position. Connect the 12-pin adapter to the DDL connector on the vehicle.



N T

In order for the ro-Link to read data from the ECU, ensure that the A S harness assembly is connected to the ECU.

5. Turn ignition switch to ON position to power up ro-Link. ro-Link will display the copyright screen for several seconds, then request control data from the ECU.

. If the connection is good, ro-Link will display the existing fault information

```
E ISTIN    AULT S      NO
STORED   AULT S        NO

       UNC      OR    ENU
```

Ta l 3-3 c n la n n

la	n n
E ISTIN AULT S	Indicates if a fault is presently active.
STORED AULT S	Indicates if previous faults have been stored in memory, but are not presently active.
UNC OR ENU	Accesses the A S unction enu when pressed.

7. Should a communications error occur, a NO DATA RECEI ED display will be shown. ress either the ENTER key or UNC key to continue. If it appears that the ECU does not communicate with the ro-Link, ensure that

   a the ignition switch is in ON position

   b the connection of the A S power/data cable is secure at both ends

   c the 5A A S fuse is not blown refer to art at top of page 3- 5 and 3-100.30 for location and

   d the diagnostic data link wiring is correct page 3-100. 3 .

W T T R - IN

AB N TI N M N

1. The A S unction enu provides the available menu selections.
2. Using the U and DOWN arrow keys on the ro-Link keypad, scroll through the listed selections until the required function is located.
3. ress the ENTER key on the keypad to select the displayed function.

A S ENU
- - - - -SELECTIONS- - - - -
↑ E ISTIN AULT ↓

Available Selections
- E ISTIN AULT S
- STORED AULT S
- RO RA ID
- CO ONENT TESTS
- RS-232 SERIAL ORT
- CONTRAST AD UST

Ta l 3- AB nc n M n la n n (n n d n N a)

la	n n
E ISTIN AULT S	rovides description of a fault that is presently active.
STORED AULT S	**N T** Stored faults are cleared from the ECU memory by using the RI HT and LE T arrow keys to move the brackets over to clear a stored fault or over N to maintain a stored fault, and pressing the ENTER key. rovides a description of any faults stored in memory, but not presently active. If more than one stored fault is stored in memory, use the U and DOWN arrow keys to display additional faults.

W T T R - IN (n)

AB N TI N M N (n)

Ta l 3- AB nc n M n la n n (n)

la	n n
RO RA ID	**N T** The 15A2 and 1 A1 do not have ATC Automatic Traction Control . ATC menu selections do, however, reside in the ro-Link. Stores A S/ATC ECU production information e.g., software version number, part number, and build date .
CO ONENT TESTS	Accesses the Component Tests enu.
RS-232 SERIAL ORT	Used only when a printer is connected to ro-Link.
CONTRAST AD UST	Adjusts viewing angle of display.

4. ress the UNC key to exit each function and return to the A S unction enu.

M N NT T T M N

1. The Component Tests enu is accessed from the A S unction enu and provides the available component tests.
2. Using the U and DOWN arrow keys on the ro-Link keypad, scroll through the listed selections until the required test is located.
3. ress the ENTER key on the keypad to select the displayed test.

N T

Though all component test selections reside on the ro-Link, only the EHICLE OLTA ES and the A S AL ES component tests are used in the troubleshooting and testing section beginning in Table 3-7 on page 3-100.8.

The 15A2 and 1 A1 do <u>not</u> have ATC Automatic Traction Control . ATC menu selections do, however, reside in the ro-Link.

Ta l 3- n n T M n la n n

la	n n
EHICLE OLTA ES	onitor ignition and battery voltage signals.
A S AL ES	erify proper A S valve function and location L left front R right front RR right rear and LR left rear . Allow exercise of A S valve individually by changing chamber pressures. Default activation time values DE AULT are generally used, but custom values can be selected for special applications.

4. ro-Link may display the measurement symbols described in Table 3- when performing selected component tests. Some of these symbols also appear in the troubleshooting and testing procedures beginning in Table 3-7 on page 3-100.8.

Ta l 3-6 M a n l d - nk

la / l	n n
	easurement is less than the quantity shown e.g., 7.00 indicates a measurement less than 7.00 .
_	easurement is less than or equal to the quantity shown e.g., _ 7.00 indicates a measurement less than or equal to 7.00 .
	easurement is greater than the quantity shown e.g., 7.00 indicates a measurement greater than 7.00 .
_	easurement is greater than or equal to the quantity shown e.g., _ 7.00 indicates a measurement greater than or equal to 7.00 .

5. ress the UNC key to exit each test and return to the Component Tests enu.

R IMINAR T TR B TING AN T TING

BATT R TAG AN I A

N T

rior to beginning A S troubleshooting, the 12-volt voltage supply to the A S should be tested to ensure proper voltage.

1. Hook up ro-Link to vehicle page 3- 5 .
2. Access ro-Link s A S unction enu page 3- 7 and Component Tests enu page 3- 8 .
3. Access EHICLE OLTA E test and read the A S voltage.
4. If voltage does not show 11-15 , refer to battery circuit troubleshooting page 3-23 .
5. If voltage shown is 11-15 , check ro-Link s E ISTIN AULT S . If existing faults are indicated, refer to the A S Troubleshooting and Testing Symptom Index page 3-100.7 and continue with the appropriate troubleshooting and testing procedures Table 3-7 .

G N RA TR B TING AN T TING R R N R R

N T

This section contains instructions to perform certain specific procedures that are referenced throughout the troubleshooting and testing procedures in Table 3-7. Instead of repeating instructions within the table each time they are needed, they are described one time only in this section.

AB ARN A MB T BR A T B

A TI N

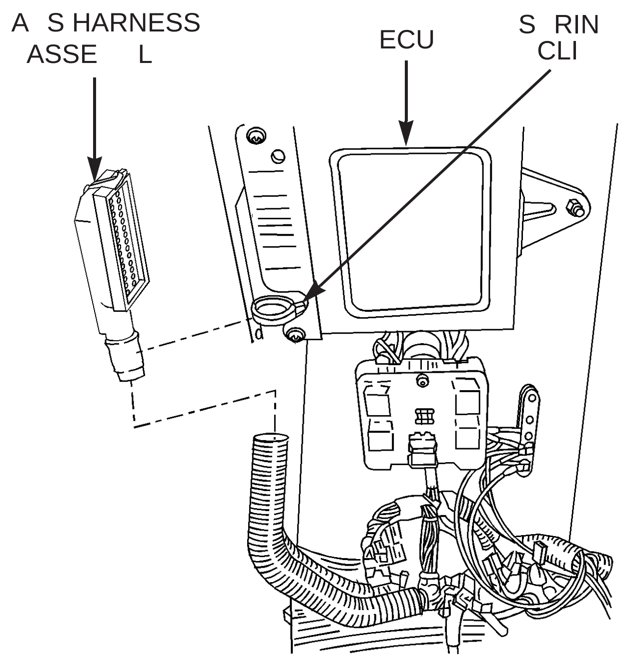
To prevent possible damage to the ECU, ensure that ignition switch is in O position before disconnecting the A S harness assembly.

1. Remove ECU cover from mounting panel behind passenger s seat page 4-2 , step 1 .

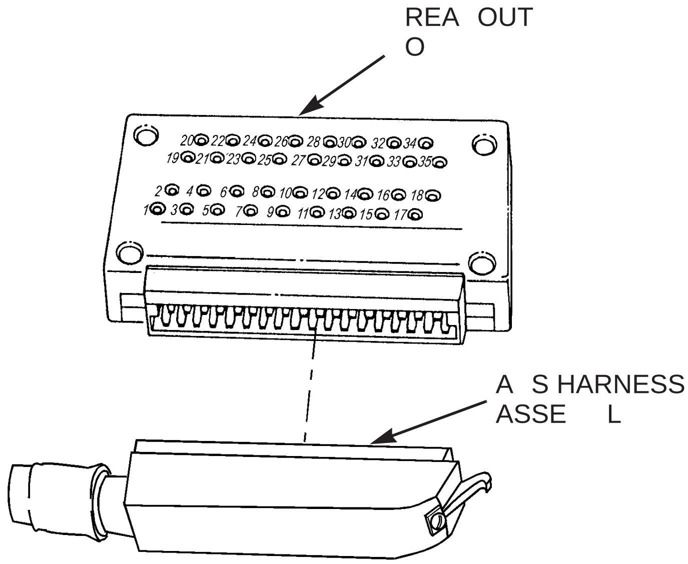
N T

ou do not need to remove the small screw at the top of A S harness assembly to disconnect harness from ECU.

2. ress down on spring clip and disconnect A S harness assembly from the ECU page 4-2 7, step 2 .



3. Connect A S harness assembly to the breakout box Item 145 of Section III, Appendix , page -21, T -2320-3 3-20-2 .



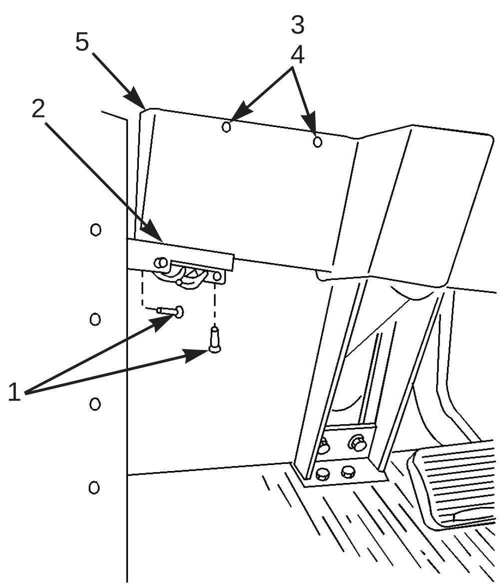
4. roceed with troubleshooting and testing procedures Table 3-7 .

A ING IGNITI N WIT WIR

N T

To access any of the three wires 18, 52, and 71A connected to the back of the ignition switch, perform the following steps

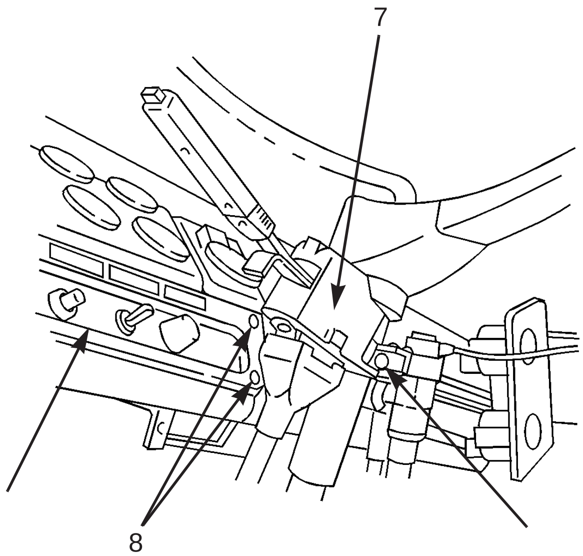
1. Remove two screws 1 and set engine check switch bracket 2 aside.
2. Remove five screws 3 , five washers 4 , and cover 5 .



G N RA TR B TING AN T TING R R N R R (n)

A ING IGNITI N WIT WIR (n)

3. Loosen clamp to allow turn signal switch assembly 7 to be moved enough to gain access to two right screws 8 on left-hand switch panel .
4. Remove four screws from left-hand switch panel .
5. ull left-hand switch panel away from dashboard.



WIRING ARN NN T R NTIN IT

A TI N

When using a multimeter for continuity/resistance ohms tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure that ignition switch is in O position.

N T

All A S wiring harness connectors are located inside the vehicle cab near the ECU. or further assistance, also refer to the A S Wiring Diagram page 3-100.84 .

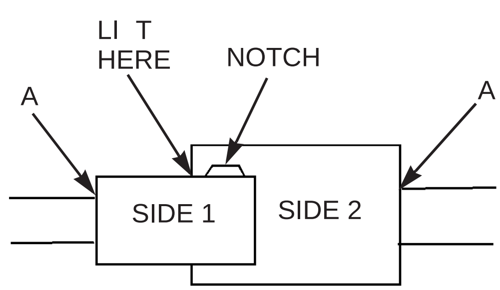
or ease of illustration, procedures and figures below show how and where to probe to check continuity of upper connection only. Continuity of bottom connection can just as easily be checked by probing respective points on the bottom of the connector.

1. Continuity Check With Connectors Attached

a robe point A on side 1 and point A on side 2.

b If no open is detected, continue with troubleshooting procedures Table 3-7 .

c If an open is detected, separate connectors by lifting up top of side 2 connector over the notch on side 1 connector and pull connectors apart.



2. Continuity Check With Connectors Separated

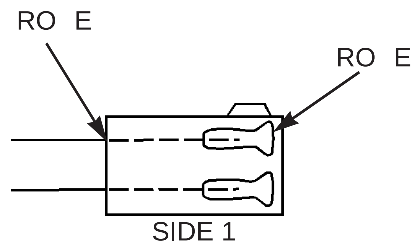
a Side 1 Check. Check continuity of side 1 by probing with one lead the side where the wire is installed in the connector, and probing with second lead inside the receptacle.

1 If continuity exists, check the continuity of side 2 subparagraph b below .

2 If continuity does not exist, repair wire and/or replace terminal end. Retest to ensure that continuity exists.

a. If continuity exists, continue with troubleshooting procedures Table 3-7 .

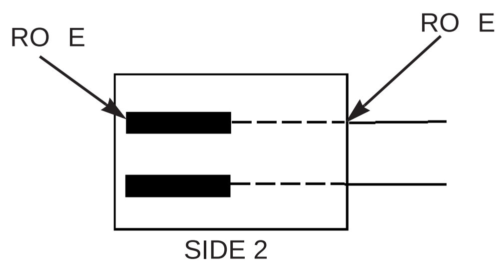
b. If continuity does not exist, perform subparagraph b below.



b Side 2 Check. Check continuity of side 2 by probing with one lead the side where the wire is installed in the connector, and probing with second lead inside the receptacle.

1 If continuity exists, continue with troubleshooting procedures Table 3-7 .

2 If continuity does not exist, repair wire and/or replace terminal end. Retest to ensure that continuity exists. Continue with troubleshooting procedures Table 3-7 .



G N RA TR B TING AN T TING R R N R R (n)

ING

N T

Use the following procedures to check the continuity of any fuse.

ING

- Remove fuse.
- Set multimeter to OHMS.
- Set multimeter range to 200 ohms.
- Probe one end of fuse with red lead and other end with black lead.

Is open detected?

NO: Fuse is okay. → Resume troubleshooting.

YES: Replace fuse. → Resume troubleshooting.

ATING N AN RT IR IT

N T

Use the following procedures when asked to do a continuity check of any wire to determine if an open or short is detected.

1 WIR NTIN IT - N IR IT

- Set multimeter to OHMS.
- Set multimeter range to 200 ohms.
- Probe one end of wire with black lead.
- Probe other end of wire with red lead.

Is resistance less than or equal to 1 ohm?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

YES: Wire is okay. → Resume troubleshooting.

NO:
- If resistance is "NO CONTINUITY", wire is broken or open.
- Repair or replace wire (page 2-20) or replace applicable harness, as appropriate.

→ Resume troubleshooting.

2 WIR RT IR IT - WIR RT T G T R

- Set multimeter to OHMS.
- Set multimeter range to 200 ohms.
- Probe one wire with black lead.
- Probe other wire with red lead.

Is resistance less than or equal to 1 ohm?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

YES

Two wires are shorted together.

NO

If resistance is "NO CONTINUITY", wires are not shorted together.

Resume troubleshooting.

3 WIR RT IR IT - WIR RT T A I GR N

- Set multimeter to OHMS.
- Set multimeter range to 200 ohms.
- Connect black lead to chassis.
- Probe wire with red lead.

Is resistance less than or equal to 1 ohm?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

YES

Wire is shorted to chassis ground.

NO

If resistance is "NO CONTINUITY", wire is not shorted to chassis ground.

Resume troubleshooting.

T R R

1. When a fault is present in the A S, the operator will be informed in one of three ways
   - a The A S indicator lamp does not light when the ignition switch is in ON position.
   - b The A S indicator lamp does not turn off when the vehicle speed exceeds 4 mph kph .
   - c The A S indicator lamp turns on while driving.
2. If a fault is present, proceed with the following check list
   - a Hook up ro-Link to vehicle page 3- 5 .
   - b erform battery voltage check page 3- .
   - c Read the fault from ro-Link s E ISTIN AULT S category page 3- 7 .
   - d ind the fault ro-Link is displaying in the A S Troubleshooting and Testing Symptom Index page 3-100.7 and go to the appropriate troubleshooting and testing procedures Table 3-7 .

N T

Refer to A S Wiring Diagram on page 3-100.84 for assistance in troubleshooting.

   - e Use the troubleshooting procedures to isolate and fix the fault.
   - f Reinstall any components removed and reconnect any wiring harness connectors disconnected during the troubleshooting process. Ensure that A S harness assembly is reconnected to the ECU.
   - g Correct all existing faults until ro-Link displays NO for E ISTIN AULT S .

E ISTIN AULT S NO
STORED AULT S ES

UNC OR ENU

   - h Test drive vehicle and ensure that A S indicator lamp turns off when vehicle speed exceeds 4 mph kph

AB TR B TING AN T TING M T M IN

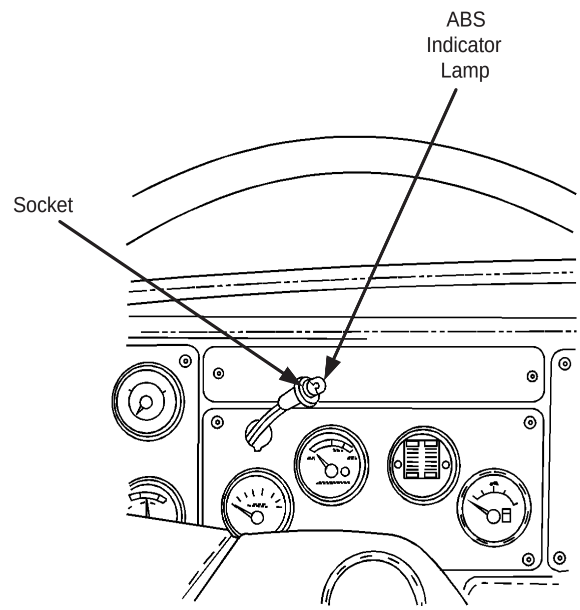
Mal nc n	T l n c d a
A S Indicator Lamp Does Not Light When Ignition Is Turned On	3-100.8
A S Indicator Lamp Does Not Turn Off When ehicle Speed Exceeds 4 mph kph or A S Indicator Lamp Turns On While Driving ro-Link Displays	
attery oltage - Under oltage	3-100.2
L , R , LR, RR Sensor Open or Cable Damaged	3-100.13
L , R , LR, RR Sensor Out of Adjustment	3-100.1
L , R , LR, RR alve Open or Cable Damaged	3-100.22
No Data Received	3-100. 3
ro-Link Does Not ower Up	3-100.7

Ta l 3- AB T l n and T n

T T 01 ABS INDICATOR LAMP DOES NOT LIGHT WHEN IGNITION IS TURNED ON

N T

Refer to ABS Wiring Diagram on page 3-100.84 for assistance in troubleshooting.



1 AB Ind ca a

1 **AB IN I AT R AM**

- Remove ABS indicator lamp from socket (page 4-309 and Figure 1).
- Set multimeter to OHMS.
- Set multimeter to 200 ohms range.
- Probe wires on lamp with multimeter leads.

Is resistance 2-10 ohms?

YES → Reinstall lamp in socket. → Step 2

NO →

- Replace indicator lamp with a new one.
- Turn ignition to ON position.

Does lamp light?

YES → END

NO → Step 2

2 **TAG T AM**

- Set multimeter to volts dc (Vdc).
- Set multimeter to 20V range.
- Probe wire X26L on back of lamp socket with red lead and chassis ground with black lead.
- Turn ignition to ON position.

Is voltage 11-15V?

A TI N
When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

Go to next page.

Ta l 3- AB T l n and T n (n)

T T 01 ABS INDICATOR LAMP DOES NOT LIGHT WHEN IGNITION IS TURNED ON

Continued from Block 2, previous page.

Is voltage 11-15V?

YES

Turn ignition switch to OFF position.

Check indicator lamp relay. Go to Common Test for All Relays, page 3-100.30.

T T 02

B

NO

- Turn ignition to OFF position.
- Hook up Pro-Link to vehicle (page 3-95).
- Check battery voltage using Pro-Link (page 3-99).

Is voltage 11-15V?

A TI N

When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

N T

Some ABS faults will not allow you to check battery voltage with Pro-Link. In this case, check battery voltage at the battery terminals with a multimeter and heed above Caution.

YES

Go to next page.

B 3

NO

Refer to battery circuit troubleshooting (page 3-23).

Ta l 3- AB T l n and T n (n)

T T 01 ABS INDICATOR LAMP DOES NOT LIGHT WHEN IGNITION IS TURNED ON (CONT)

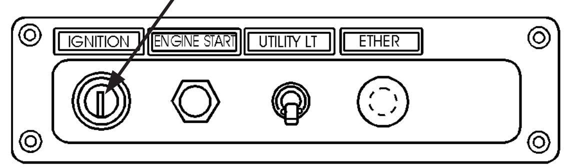
3 **WIR R M IGNITI N WIT T AB IN I AT R AM**

- Access ignition switch wires (page 3-100.1 and Figure 2).
- Set multimeter to OHMS.
- Set multimeter range to 200 ohms.
- Check continuity of wire 71A from ignition switch to ABS indicator lamp wire X81C.

Is resistance < 100 ohms?

A TI N
When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure that ignition switch is in OFF position.

Ignition Switch



2 I n n c

YES → Go to next page.

NO → Repair or replace wire (page 2-20).

Does indicator lamp light?

NO → Go to next page.

YES → END

Go to next page. → **B**

Ta l 3- AB T l n and T n (n)

T T 01 ABS INDICATOR LAMP DOES NOT LIGHT WHEN IGNITION IS TURNED ON (CONT)

R TAG AT IGNITI N WIT

- Set multimeter to volts dc (Vdc).
- Set multimeter to 20V range.
- Probe wire 52 on back of ignition switch (red lead) and chassis ground (black lead).

Is voltage 11-15V?

A TI N

When using a multimeter for voltage tests, prevent damage to multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

YES — NO

6 2 A IGNITI N WIT

- Remove relay/fuse panel access cover under dash, between driver's and passenger's seats (page 4-204).
- Remove 25A IGN SW fuse (Figure 3).
- Check for a blown fuse (page 3-100.4).

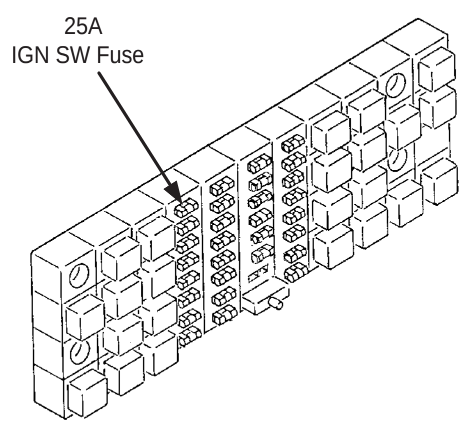
Is open detected?

IGNITI N WIT

- Probe wire 71A on back of ignition switch (red lead) and chassis ground (black lead).
- Turn ignition switch to ON position.
- Record voltage.
- Turn ignition switch to OFF position.

Is voltage 11-15V?

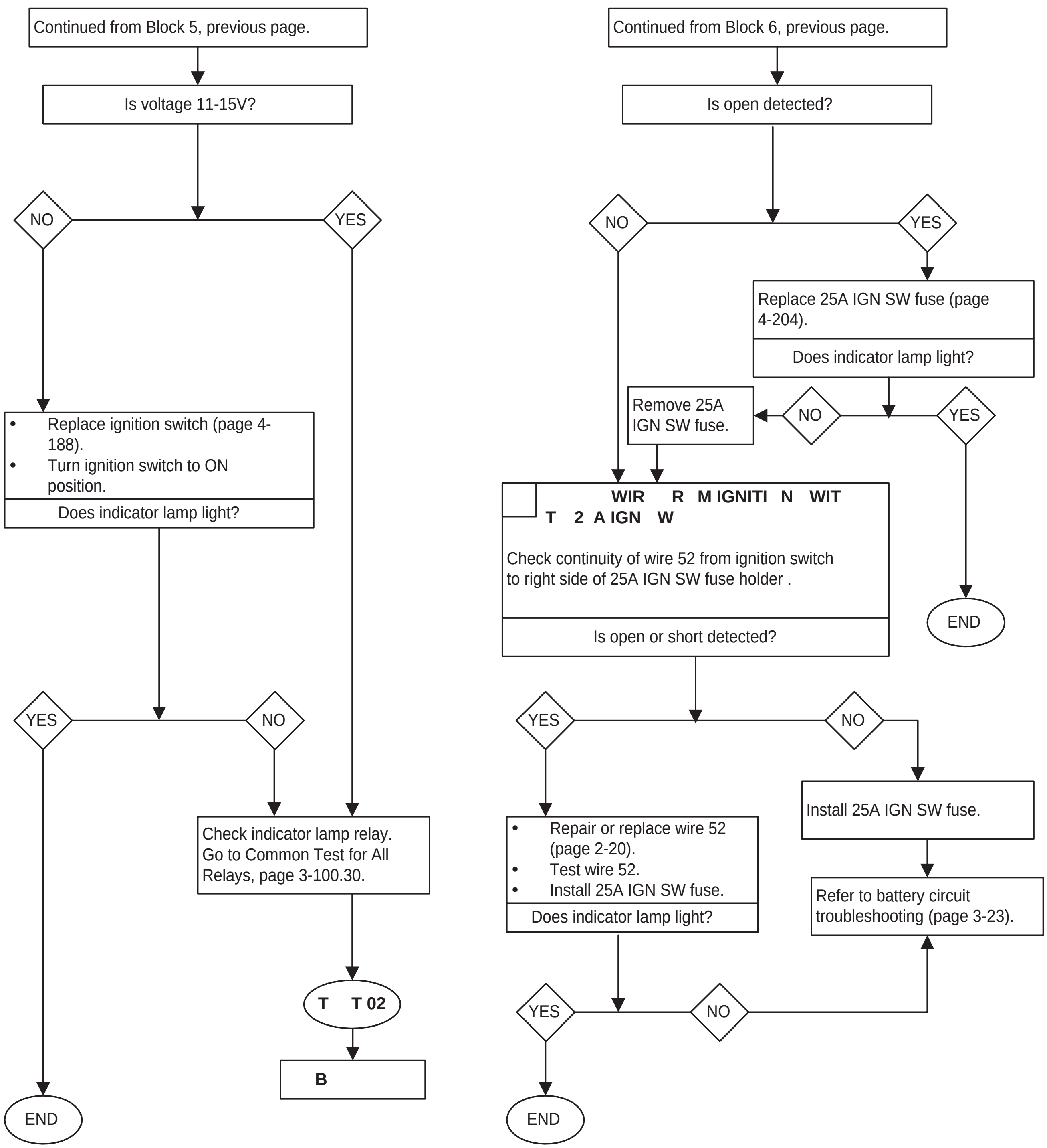
Go to next page.



3 R la / an l nd a

Ta l 3- AB T l n and T n (n)

T T 01 ABS INDICATOR LAMP DOES NOT LIGHT WHEN IGNITION IS TURNED ON (CONT)



Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING

N T

Refer to ABS Wiring Diagram on page 3-100.84 for assistance in troubleshooting.

1 R - IN I A (R R RR) N R N R AB AMAG

- Disconnect ABS harness assembly from ECU and connect to breakout box (page 3-100).
- Set multimeter to OHMS.
- Set multimeter to 2 k ohms range.

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

Ta l A n R anc ck

ca n	B ak B ck N	M a d R anc
LF	15 and 32	1370-1990 ohms
RF	17 and 34	1370-1990 ohms
LR	18 and 35	1370-1990 ohms
RR	16 and 33	1370-1990 ohms

Ta l B n R anc G nd ck

ca n	B ak B ck N	M a d R anc
LF	15 and 27	> 30,000 ohms
RF	17 and 27	> 30,000 ohms
LR	18 and 27	> 30,000 ohms
RR	16 and 27	> 30,000 ohms

Check sensor resistance across sensor by probing appropriate sockets (Table A). Record value.

- Set multimeter to 200 k ohms range.
- Check sensor resistance to ground by probing appropriate sockets (Table B). Record value.

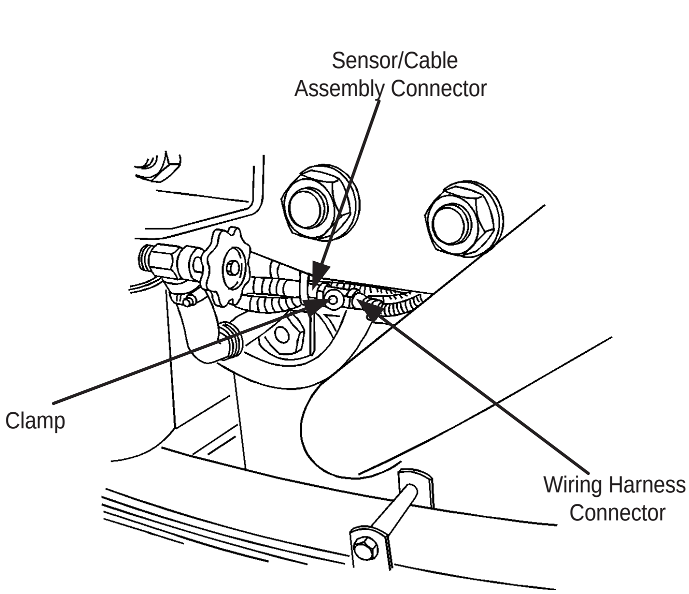
Is resistance across sensor 1.37-1.99 k ohms AND resistance to ground > 30 k ohms?

YES → Go to page 3-100.19 → **B 2**

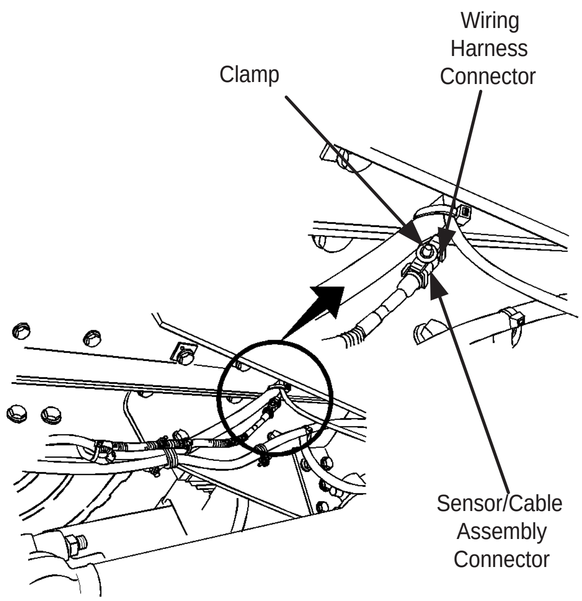
NO → Go to next page. → **B 1A**

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



n AB n nn c



R a AB n nn c

1A

- Disconnect applicable sensor cable.
- Set multimeter to OHMS.
- Set multimeter to 2 k ohms range.
- Measure resistance of sensor/cable assembly by probing the socket side (side connected to sensor) of sensor connector (Figure 6).

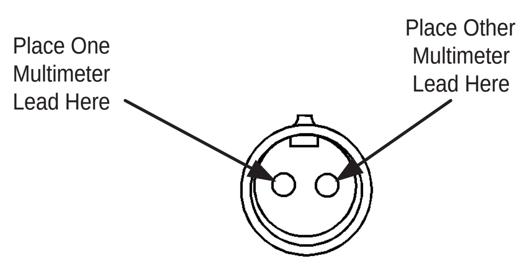
Is resistance 1.37-1.99 k ohms?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

NO → Go to page 3-100.16. → **B 1**

YES → Go to next page. → **B 1B**



6 ck d A l ca l n nn c

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

1B

Check continuity from sensor connector pin end to breakout box. Probe one pin on sensor connector with one lead and probe corresponding socket number on breakout box with other lead (Figure 7).

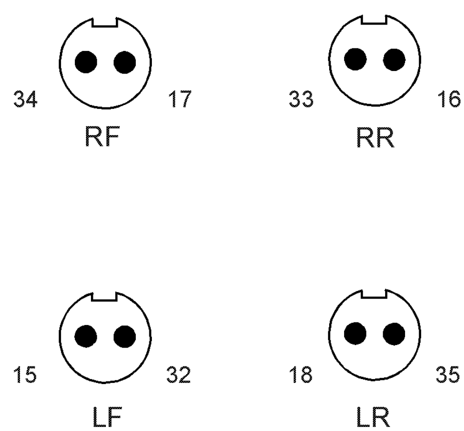
Is open or short detected?

N T

Breakout box socket numbers to probe are indicated by numbers shown outside of Figure 7 illustrations.

YES — Go to page 3-100.17. — **B 1**

NO — Go to page 3-100.19. — **B 2**



n nn c - n nd

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

1

Replace sensor/cable assembly (page 4-285, 4-290 or 4-290.2).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES

- Remove all components and disconnect all connectors that were installed or connected in previous block.
- Connect ABS harness assembly to breakout box (page 3-100).

Go to page 3-100.15.

B 1B

NO

1 A A T AR N IRMATI N

Is a new existing fault indicated?

YES

Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

NO

- Install any removed relay/fuse blocks, access covers, panels, etc.
- Drive vehicle at a speed above 4 mph (6 kph).

Does ABS indicator lamp remain on?

YES

- Hook up Pro-Link to vehicle (page 3-95).
- Check Pro-Link's EXISTING FAULT(S) category.

NO

END

Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

1

Check continuity of wires from sensor connector to ABS wiring harness connector.

Is open or short detected?

YES

NO

Repair wires (page 2-20) or replace harness.

Check continuity of ABS wiring harness connector (page 3-100.2).

Is open detected?

1

- Remove all components and disconnect all connectors that were installed or connected in previous block.
- Connect ABS harness assembly to breakout box (page 3-100).

NO

YES

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

Replace ABS wiring harness connector (page 3-2).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

NO

YES

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES

NO

Perform Block 1F steps,THEN RETURN HERE TO CONTINUE.

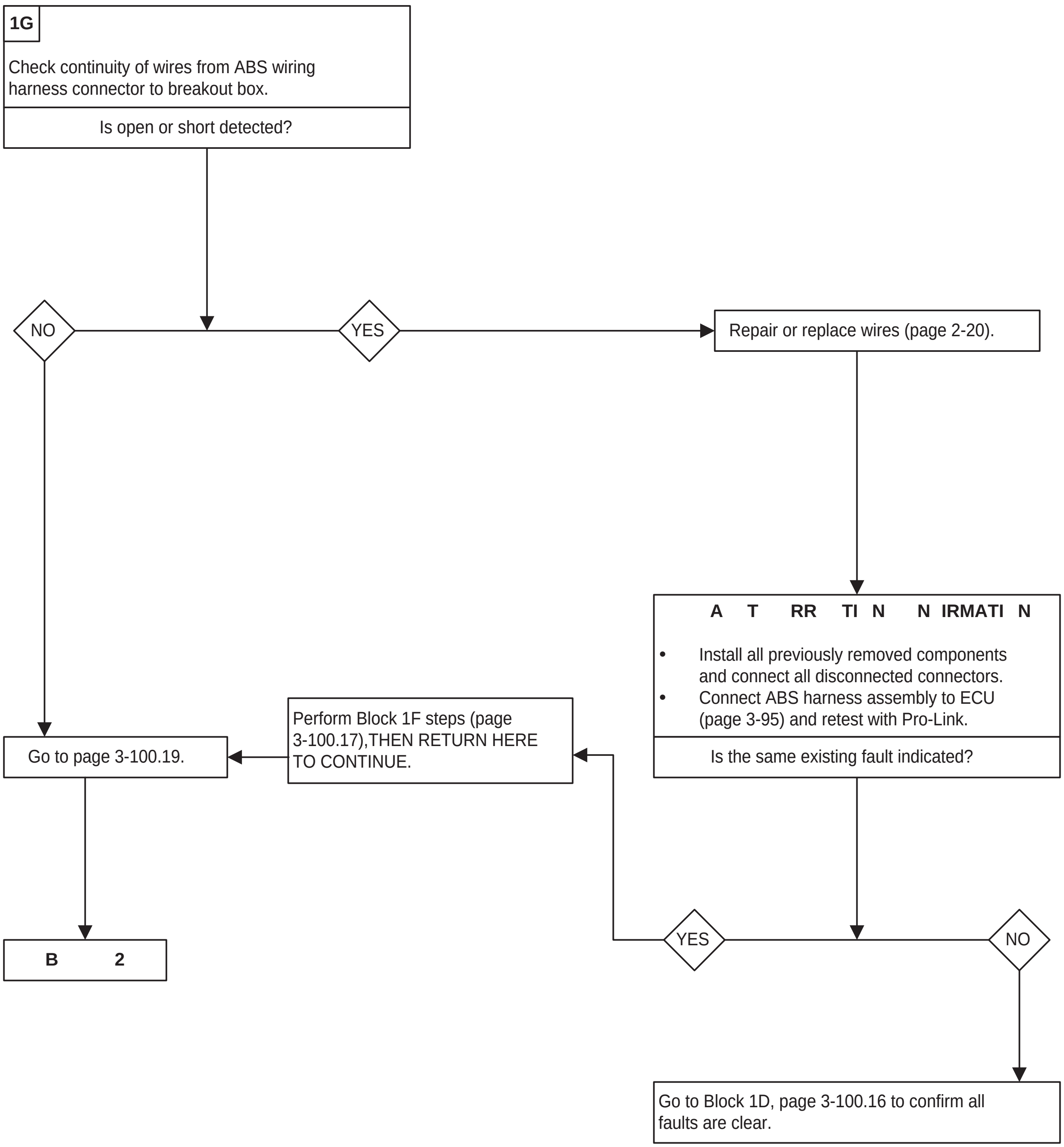
Go to next page.

B 1G

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

N T

- Refer to ABS Wiring Diagram on page 3-100.84 for assistance in troubleshooting.
- In order for Pro-Link to display "SENSOR OUT OF ADJUSTMENT", vehicle must be driven over 4 mph (6 kph) with Pro-Link hooked up.

2 **R - IN I A (R R RR) N R T A TM NT**

- Disconnect ABS harness assembly from ECU and connect to breakout box (page 3-100).
- Set multimeter to volts ac (Vac).
- Set multimeter range to 20V.
- Spin wheel by hand (wheel speed should be 1/2 revolution/second) and measure AC voltage by probing appropriate breakout box socket numbers (Table C).

Is voltage >0.2 Vac?

A TI N

When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage range higher than the voltage to be measured.

N T

Use floor jack to lift required wheel from the ground.

N T

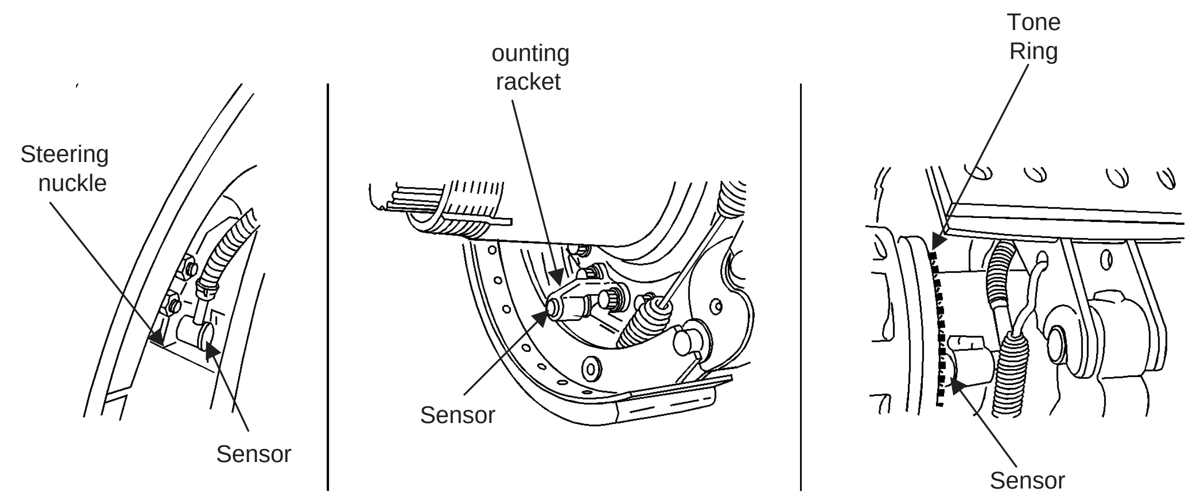
To obtain a positive voltage reading, ensure multimeter red lead is connected to the higher of the two breakout box socket numbers.

YES → Replace ECU (page 4-296). → END

NO → Go to next page. → **B 2A**

Ta l n Ad n ck

ca n	B ak B ck N	A l a
LF	15 and 32	>0.2 Vac
RF	17 and 34	>0.2 Vac
LR	18 and 35	>0.2 Vac
RR	16 and 33	>0.2 Vac



M91 A2 (n) **M916A1 (n)** **M91 A2 and M916A1 (R a)**

AB W l n

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

2A

Check that sensor is completely seated into mounting bracket and that sensor end is against tone ring (page 4-285, 4-290 or 4-290.2 and Figure 8 on page 3-100.19).

Is sensor correctly seated?

N T

The M915A2 front wheel sensors are the only ones that can be adjusted without removing the wheel and hub.

YES

Go to next page.

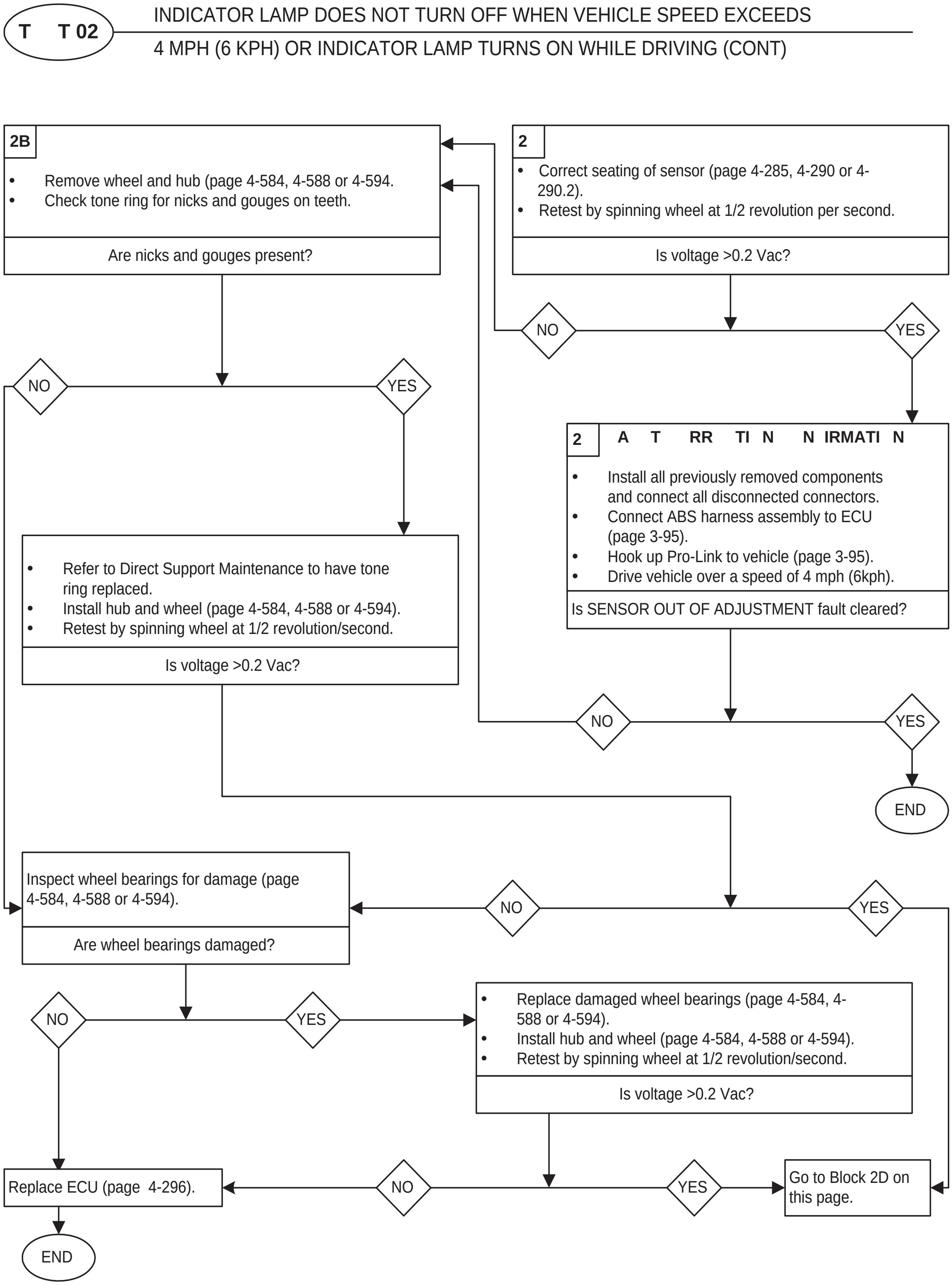
B 2B

NO

Go to next page.

B 2

Ta l 3- AB T l n and T n (n)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

N T

Refer to ABS Wiring Diagram on page 3-100.84 for assistance in troubleshooting.

3 **R - IN I A (R R RR) A N R AB AMAG**

- Disconnect ABS harness assembly from ECU and connect to breakout box (page 3-100).
- Set multimeter to OHMS.
- Set multimeter to 200 ohms range.

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

Check modulator valve coil resistance (Table D).

Ta l M d la al l R anc ck

ca n	B ak B ck N d
LF Inlet LF Exhaust	23 and 27 24 and 27
RF Inlet RF Exhaust	6 and 27 7 and 27
LR Inlet LR Exhaust	21 and 27 22 and 27
RR Inlet RR Exhaust	4 and 27 5 and 27

a nal 2 (LF, RR)

a nal 1 (RF, LR)

Is resistance 4-8 ohms?

YES → Replace ECU (page 4-296). → END

NO → Go to next page. → **B 3A**

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

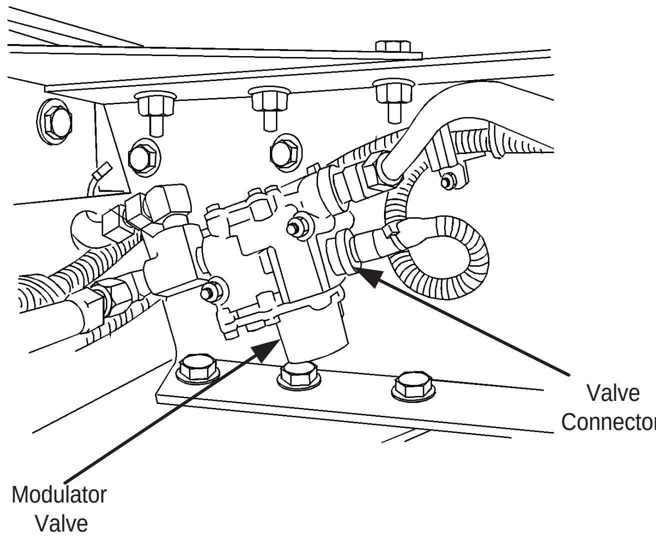
3A

- Disconnect modulator valve connector from modulator valve (Figure 9).
- Orient valve connector socket so that ground is located at 12 o'clock position (Figure 10).
- Check continuity of modulator valve ground wire by probing from ground socket on valve connector to breakout box socket 27.

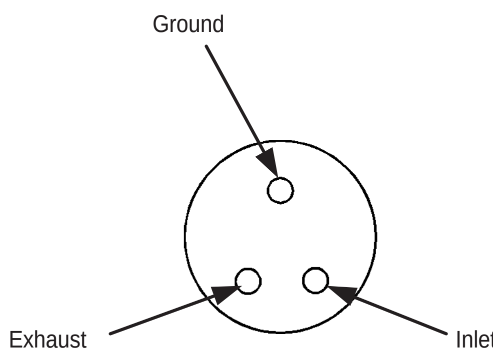
Is open or short detected?

YES → Go to next page. → **B 3B**

NO → Check modulator valve resistance at modulator valve (page 3-100.26). → **B 3**



9 AB M d la al



10 al nn c (ck d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

3B

Check continuity of ground wire from modulator valve connector to ABS wiring harness connector.

Is open or short detected?

YES

Repair ground wire (page 2-20) or replace harness.

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES

NO

Check continuity of ABS wiring harness connector (page 3-100.2).

Is open detected?

YES

Replace ABS wiring harness connector (page 3-2).

NO

Go to next page.

B 3

3

- Remove all components and disconnect all connectors that were installed or connected in previous block.
- Connect ABS harness assembly to breakout box (page 3-100).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES

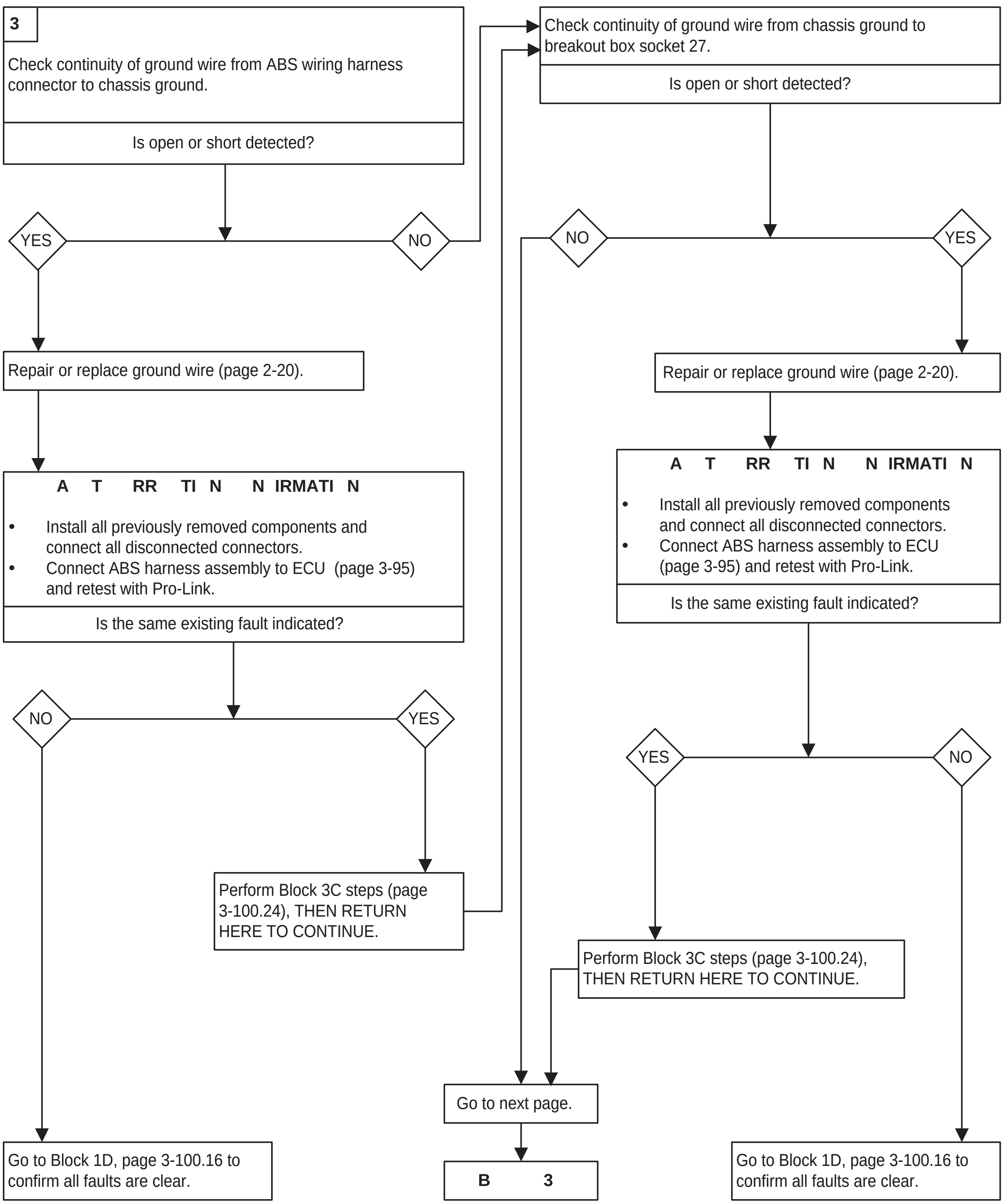
Perform Block 3C steps, THEN RETURN HERE TO CONTINUE.

Go to next page.

B 3

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



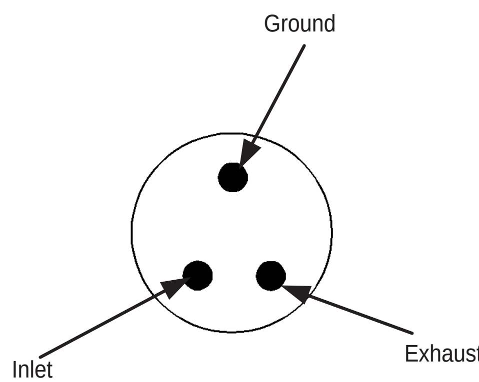
Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

3

Check valve resistance at modulator valve by measuring resistance from inlet pin to ground pin and from exhaust pin to ground pin on modulator valve (Figure 11).

Are both resistance values 4-8 ohms?



11 M d la al n

YES → Go to next page.

NO → Replace modulator valve (page 4-576 or 4-579).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES → Perform Block 3C steps (page 3-100.24), THEN RETURN HERE TO CONTINUE. → Go to next page.

NO → Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Go to next page. → **B 3**

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

3

- Orient valve connector socket so that ground is located at 12 o'clock position (Figure 12).
- Check continuity of applicable modulator valve inlet and exhaust wiring. Probe with one multimeter lead the socket labeled either IN or EXH. Probe with other lead the corresponding breakout box socket number as indicated in Table E.

Is open or short detected?

YES / NO

NO: Replace ECU (page 4-296). → END

YES:

Check wiring from socket side of modulator valve connector to ABS wiring harness connector.

Is open or short detected?

NO / YES

YES: Repair wiring (page 2-20) or replace harness.

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

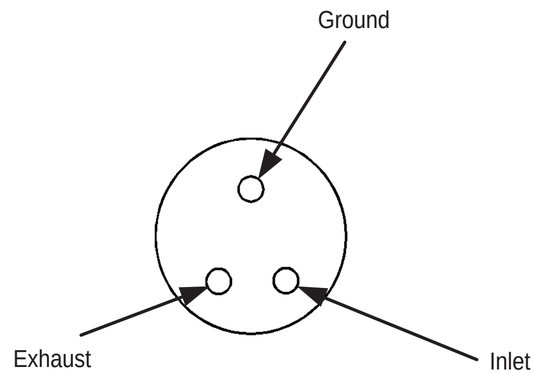
Is the same existing fault indicated?

YES / NO

NO: Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES: Perform Block 3C steps (page 3-100.24), THEN RETURN HERE TO CONTINUE.

Go to next page. → **B 3G**



12 M d la al nn c ck

Ta l M d la al Inl and a W n n n ck

T ck	nn c ck	B ak B ck
LF Inlet LF Exhaust	IN EXH	23 24
RF Inlet RF Exhaust	IN EXH	6 7
LR Inlet LR Exhaust	IN EXH	21 22
RR Inlet RR Exhaust	IN EXH	4 5

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

3G

Check continuity of ABS wiring harness connector (page 3-100.2).

Is open detected?

YES — Replace ABS wiring harness connector (page 3-2).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES — Perform Block 3C steps (page 3-100.24), THEN RETURN HERE TO CONTINUE.

NO — Go to Block 1D, page 3-100.16 to confirm all faults are clear.

NO — Check continuity of wiring from ABS wiring harness connector to breakout box .

Is open or short detected?

YES — Repair or replace wiring (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES — Replace ECU (page 4-296).

NO — Go to Block 1D, page 3-100.16 to confirm all faults are clear.

END

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

N T

Refer to ABS Wiring Diagram on page 3-100.84 for assistance in troubleshooting.

R - IN I A BATT R TAG - N R TAG

Perform battery voltage check (page 3-99).

Is battery voltage identified by Pro-Link 11-15V?

A TI N

Ensure that parking brake is set.

N T

If BATTERY VOLTAGE - UNDER VOLTAGE is displayed and Pro-Link identifies that the battery is good, there is a problem with one of the four ABS relays and/or the ABS relay wiring. A bad valve relay and/or bad wiring will affect both ABS valves on the same diagonal circuit.

NO: Perform battery circuit troubleshooting (page 3-23).

YES:

- Build up air pressure in brake chamber to 60 psi (414 kPa).
- Access Pro-Link's Component Tests Menu and select ABS VALVES (page 3-98).
- Exercise each ABS valve individually. If ABS valve is working properly, it should be easily heard during exercising procedure.
- Record whether or not ABS valves are working.

Are all four ABS valves working properly?

N T

- Buildup of air pressure to 60 psi (414 kPa) will allow the mechanic to hear the ABS valves as they actuate.
- Brake pedal should be pressed while exercising ABS valves.

YES: Check engine brake relay (Common Test for All Relays).

NO: Are RF and LR ABS valves working?

YES: Check valve relay 2 (VR-2) (Common Test for All Relays).

NO: Check valve relay 1 (VR-1) (Common Test for All Relays).

Go to next page.

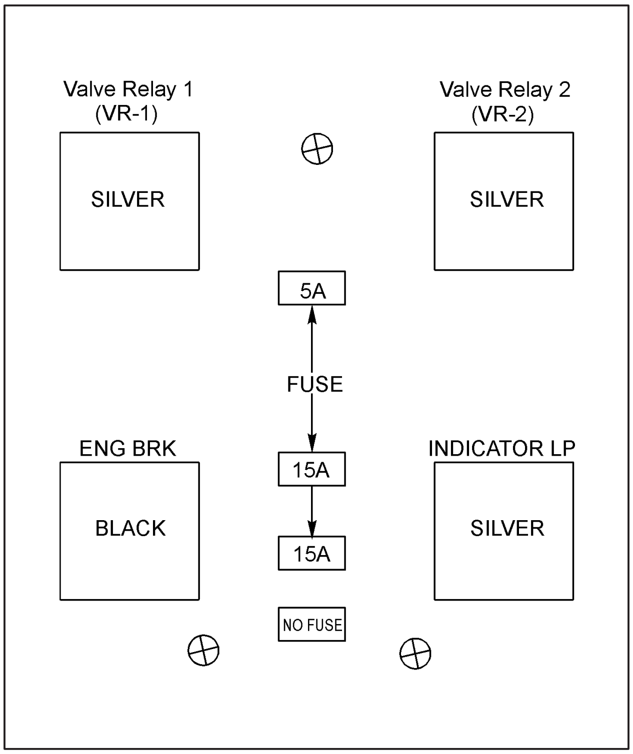
B

Ta l 3- AB T l n and T n (n)

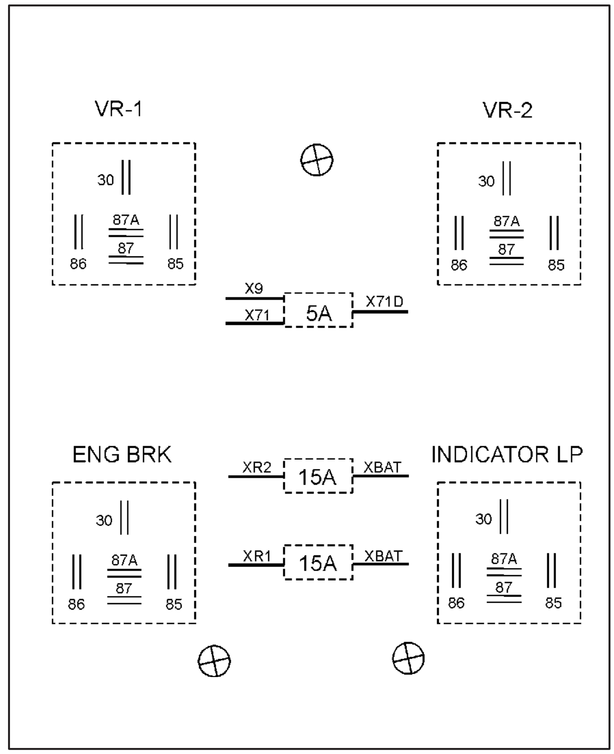
T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

N T

- Refer to ABS Wiring Diagram on page 3-100.84 and Figures 13 and 14 for assistance in troubleshooting.
- Refer to page 3-95 for illustration showing location of relay/fuse block.



13 R la / Bl ck



1 R la / Bl ck ck and W ca n (W n n R d)

MM N T T R A R A
• Set multimeter to OHMS. • Set multimeter to 200 ohms range. • Check applicable relay by removing it from relay/ fuse block (Figure 13 and page 4-307). • Measure coil resistance by probing pin 85 to pin 86 on relay.
Is resistance 80-95 ohms?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

Go to next page.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from Block 5, previous page.

Is resistance 80-95 ohms?

YES

Go to next page.

B B

NO

Replace relay (page 4-307).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES

A

- Remove all components and disconnect all connectors that were installed or connected in previous block.
- Connect ABS harness assembly to breakout box (page 3-100).

Go to page 3-100.34.

B

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

B

- Measure contact resistance by probing pin 30 to pin 87A on relay. Record value.
- Measure contact resistance by probing pin 30 to pin 87 on relay. Record as "open" or "short".

Is resistance for pin 30 to pin 87A < 1 ohm AND is an open detected for pin 30 to pin 87?

NO: Replace relay (page 4-307).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES: Perform Block 5A steps (page 3-100.31), THEN RETURN HERE TO CONTINUE.

Go to page 3-100.34. → **B**

NO: Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES:

A TI N

When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

- Disconnect ABS harness assembly from ECU and connect to breakout box (page 3-100).
- Set multimeter to volts dc (Vdc).
- Set multimeter to 20V range.
- Probe breakout box sockets 9 (red lead) and 27 (black lead).
- Turn ignition switch to ON position.

Is voltage 11-15V?

Go to next page.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Is voltage 11-15V?

YES

NTA T R TI ING

- Turn ignition switch to OFF position.
- Jumper one wire from breakout box socket 9 to relay pin 85.
- Jumper another wire from breakout box socket 27 to relay pin 86.
- Listen for relay clicks one click when ignition is turned on one click when ignition is turned off.

Are relay clicks audible?

NO

Go to next page.

B

YES

Relay is okay.

Go to next page.

B

NO

NTA T R TI ING

- Turn ignition switch to OFF position.
- Remove relay/fuse panel access door under dash between driver's and passenger's seat (page 4-204).
- Remove 25A IGN SW fuse (Figure 3, page 3-100.11).
- Jumper one wire from left side of 25A IGN SW fuse holder to relay pin 85.
- Jumper another wire from chassis ground (screw head on either door) to relay pin 86.
- Listen for relay clicks one click when you touch jumper wire from chassis ground to relay pin 86 one click when you remove jumper wire from relay pin 86.

Are relay clicks audible?

YES

Relay is okay.

NO

Go to next page.

B

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Replace relay (page 4-307).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

NO: Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES: Perform Block 5A steps (page 3-100.31), THEN RETURN HERE TO CONTINUE.

WARNING

Disconnect battery before repairing or replacing relay wiring. Failure to do so could result in electrical shock and injury to personnel.

N T

Should any wiring require repair or replacement, the relay/fuse block behind passenger's seat and the relay/fuse panel under the dash may need to be removed from their mounted position (page 4-299 and 4-205.0).

T RMIN A R RIAT R A WIRING T

Did you just check VR-1?

YES: Go to next page. → **B**

NO: Did you just check VR-2?

YES: Go to page 3-100.40 → **B**

NO: Did you just check ENG BRK relay?

YES: Go to page 3-100.46 → **B**

NO: You just checked INDICATOR LP relay. → Go to page 3-100.51 → **B T**

Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

R-1 AN R A WIRING

- Remove relay/fuse panel access cover under dash (page 4-204).
- Remove 30A ABS fuse (Figure 15).
- Set multimeter to volts dc (Vdc).
- Set multimeter to 20V range.
- Probe left side of 30A ABS fuse holder (red lead) and chassis ground (black lead).

Is voltage 11-15V?

A TI N

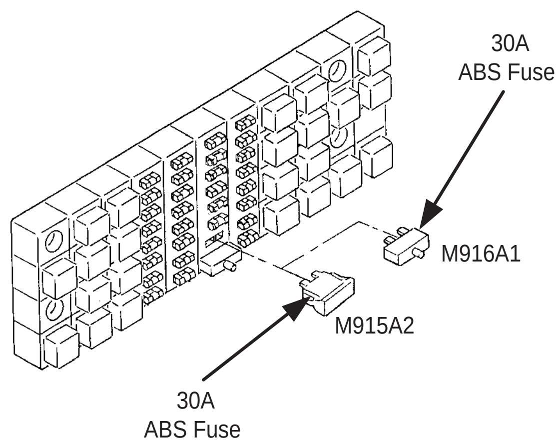
When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

NO: Refer to battery circuit troubleshooting (page 3-23).

YES: Check 30A ABS fuse (page 3-100.4).

Is open detected?

YES: Replace 30A ABS fuse (page 4-204).



1 R la / an l nd a

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES: Perform Block 5A steps (page 3-100.31), THEN RETURN HERE TO CONTINUE.

Go to next page.

NO (open detected): Go to next page.

NO (same fault): Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Check continuity from socket 30 on relay/ fuse block (where VR-1was removed) (Figure 14) to right side of 30A ABS fuse holder (Figure 15, page 3-100.35).

Is open or short detected?

- YES: Check VR-1 15A fuse (bottom fuse on relay/fuse block)(page 3-100.4).
- NO: Go to page 3-100.55. → **B W**

Check VR-1 15A fuse (bottom fuse on relay/fuse block)(page 3-100.4).

Is open detected?

- YES: Replace VR-1 15A fuse (page 4-303).
- NO: Go to next page. → **B**

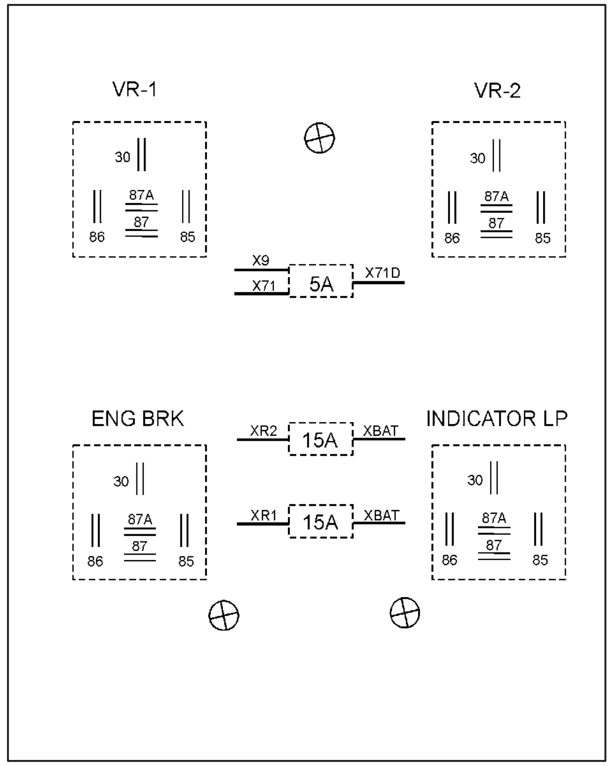
Replace VR-1 15A fuse (page 4-303).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

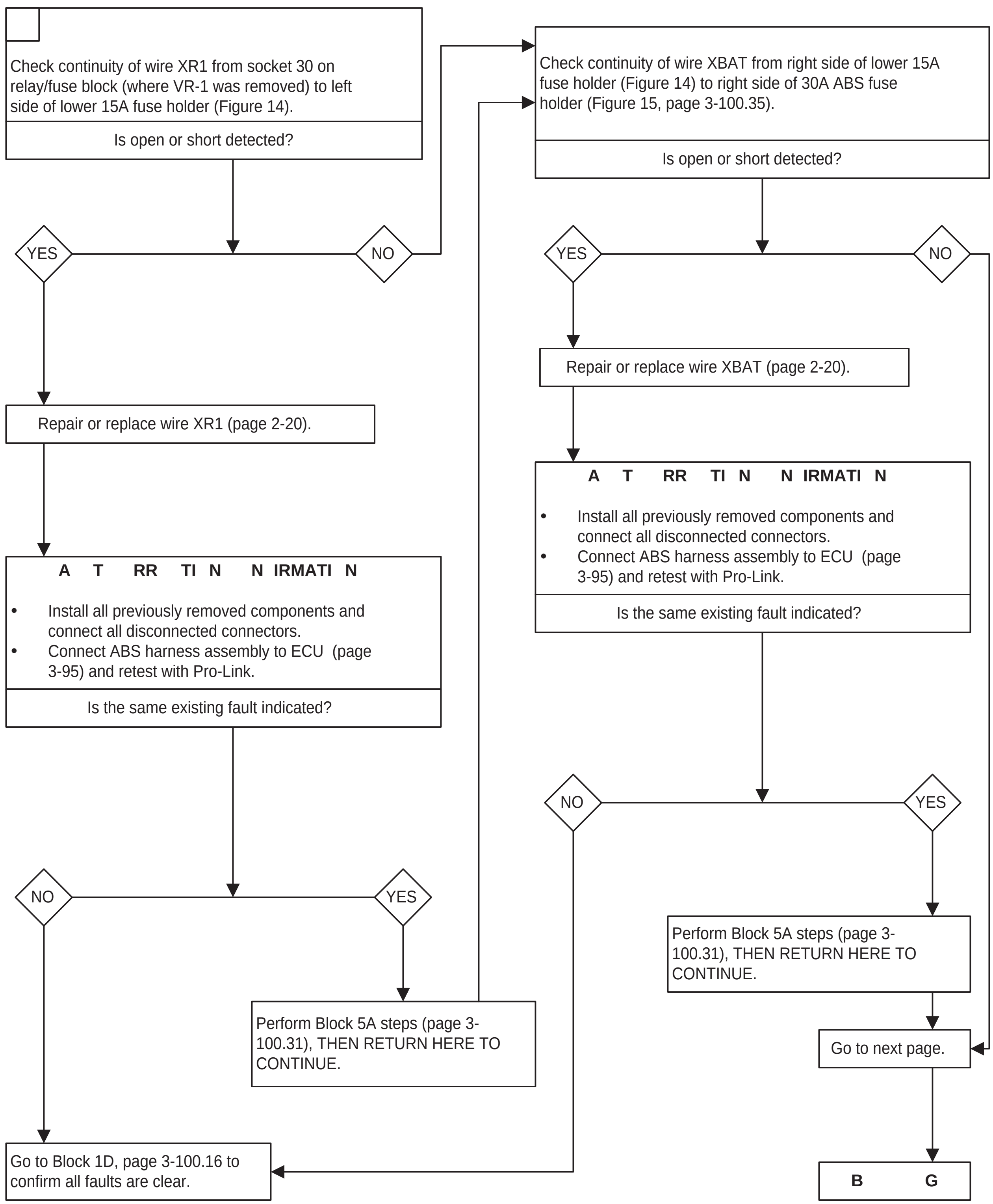
- NO: Go to Block 1D, page 3-100.16 to confirm all faults are clear.
- YES: Perform Block 5A steps (page 3-100.31), THEN RETURN HERE TO CONTINUE. → Go to next page.



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

G

Check continuity of wire X1 from socket 87 on relay/fuse block (where VR-1 was removed) (Figure 14) to breakout box socket 1.

Is open or short detected?

YES — Repair or replace wire X1 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

NO — Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES — Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

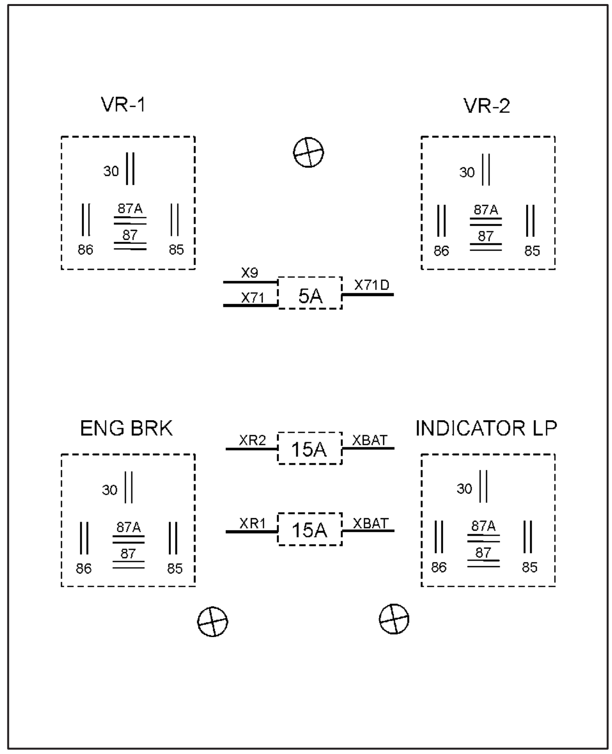
NO (from Block G) —

Check continuity of wire X8 from socket 86 on relay/fuse block (where VR-1 was removed) (Figure 14) to breakout box socket 8.

Is open or short detected?

YES — Go to next page. — **B**

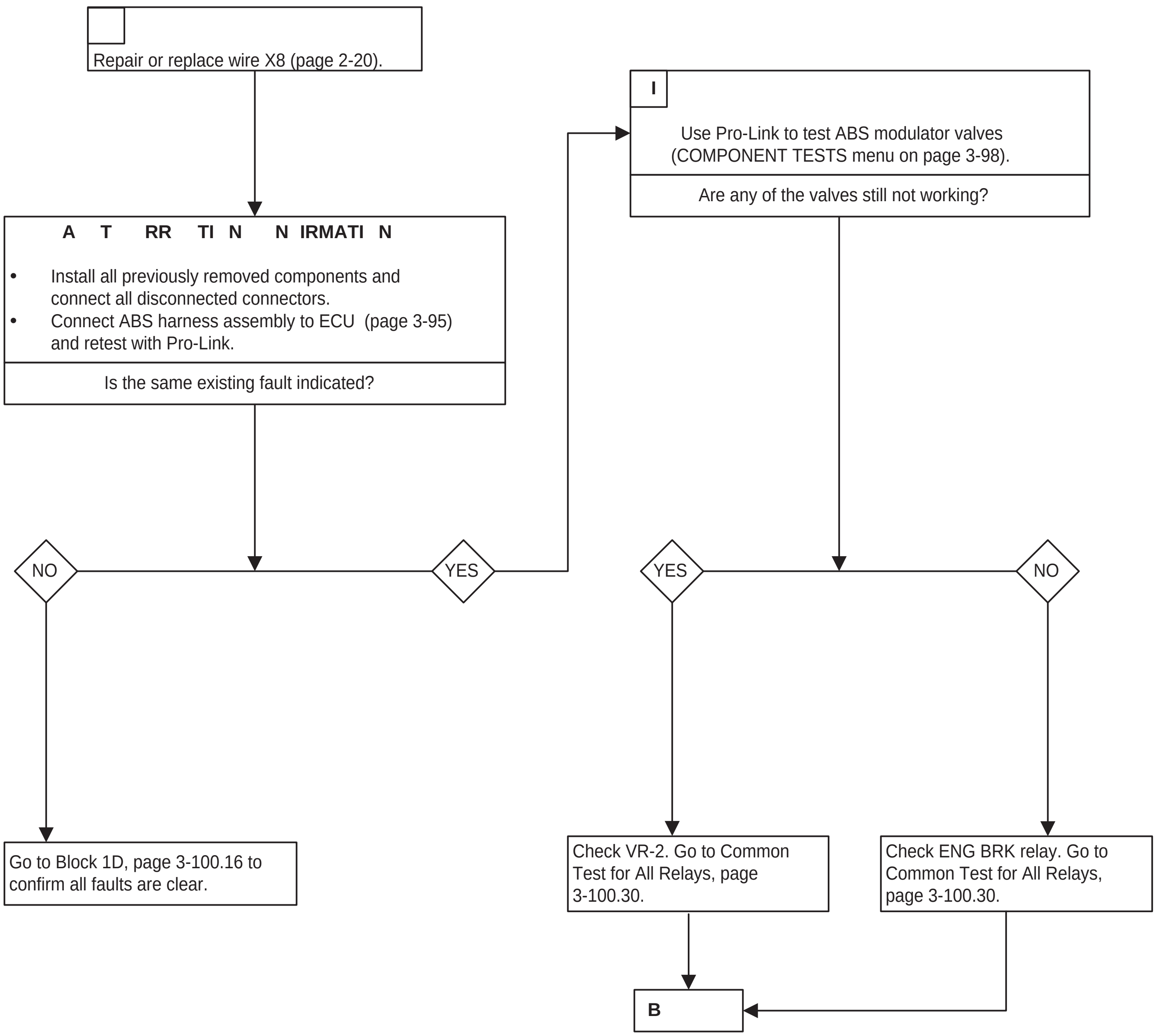
NO — Go to next page. — **B I**



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

R-2 AN R A WIRING

- Remove relay/fuse panel access cover under dash (page 4-204).
- Remove 30A ABS fuse (Figure 15, page 3-100.35).
- Set multimeter to volts dc (Vdc).
- Set multimeter to 20V range.
- Probe left side of 30A ABS fuse holder (red lead) and chassis ground (black lead).

Is voltage 11-15V?

A TI N

When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

NO: Refer to battery circuit troubleshooting (page 3-23).

YES: Check 30A ABS fuse (page 3-100.4).

Is open detected?

YES: Replace 30A ABS fuse (page 4-204).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

YES: Perform Block 5A steps (page 3-100.31), THEN RETURN HERE TO CONTINUE.

NO: Go to Block 1D, page 3-100.16 to confirm all faults are clear.

NO: Check continuity from socket 30 on relay/fuse block (where VR-2 was removed) (Figure 14) to right side of 30A ABS fuse holder (Figure 15, page 3-100.35).

Is open or short detected?

YES: Go to page 3-100.42.

B

NO: Go to next page.

B

Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

- Remove VR-1 from relay/fuse block (Figure 13, page 3-100.30).
- Check continuity of wire X71 from socket 86 on relay/fuse block (where VR-2 was removed) to socket 85 on relay/fuse block (where VR-1 was removed) (Figure 14).

Is open or short detected?

YES / NO

Go to page 3-100.55.

B W

YES:

- Remove INDICATOR LP relay from relay/fuse block (Figure 13, page 3-100.30).
- Check continuity of wire X71 from socket 86 on relay/fuse block (where VR-2 was removed) to socket 86 on relay/fuse block (where indicator lamp relay was removed) (Figure 14).

Is open or short detected?

NO / YES

YES: Repair or replace wire X71 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and retest with Pro-Link.

Is the same existing fault indicated?

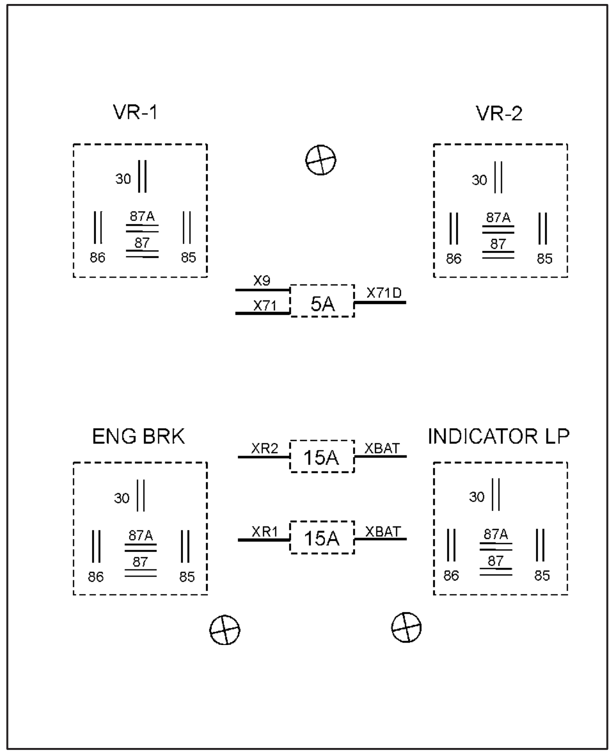
YES / NO

YES: Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Go to next page.

B M



1 R la / Bl ck ck and W ca n
(W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Check VR-2 15A fuse (middle fuse on relay/fuse block) (page 3-100.4).

Is open detected?

YES — Replace VR-2 15A fuse (page 4-303).

NO — Go to next page. **B N**

A T RR TI N N IRMATI N

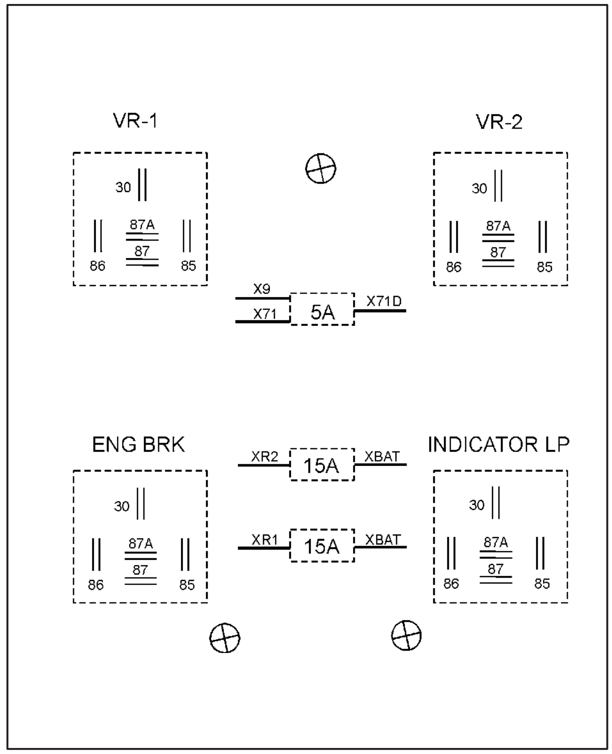
- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO — Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES — Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

Go to next page. **B N**



1 R la / Bl ck ck and W ca n
(W n n R d)

M

Check continuity of wire X71 from socket 86 on relay/fuse block (where INDICATOR LP relay was removed) to socket 85 on relay/ fuse block (where VR-1 was removed) (Figure 14).

Is open or short detected?

YES — Repair or replace wire X71 (page 2-20).

NO — Install INDICATOR LP relay. Go to page 3-100.55. **B W**

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO — Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES — Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE. Then Install INDICATOR LP relay.

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

N

Check continuity of wire XR2 from socket 30 on relay/fuse block (where VR-2 was removed) to left side of middle 15A fuse holder (Figure 14).

Is open or short detected?

YES

Repair or replace wire XR-2 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

NO

Check continuity of wire from right side of middle 15A fuse holder to right side of lower 15A fuse holder (Figure 14).

Is open or short detected?

YES

Repair or replace wire (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

NO

Check continuity of wire XBAT from right side of lower 15A fuse holder (Figure 14) to right side of 30A ABS fuse holder (Figure 15, page 3-100.35).

Is open or short detected?

Go to next page.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Is open or short detected?

YES

Repair or replace wire XBAT (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

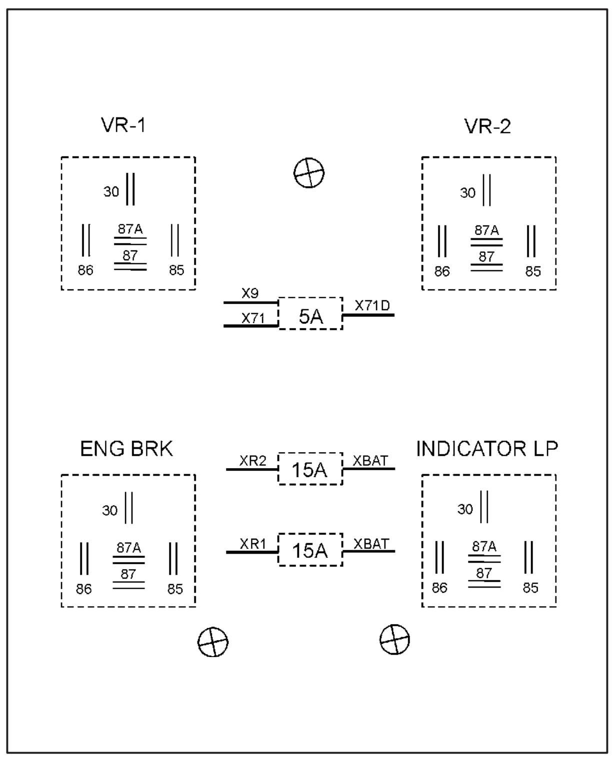
YES

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

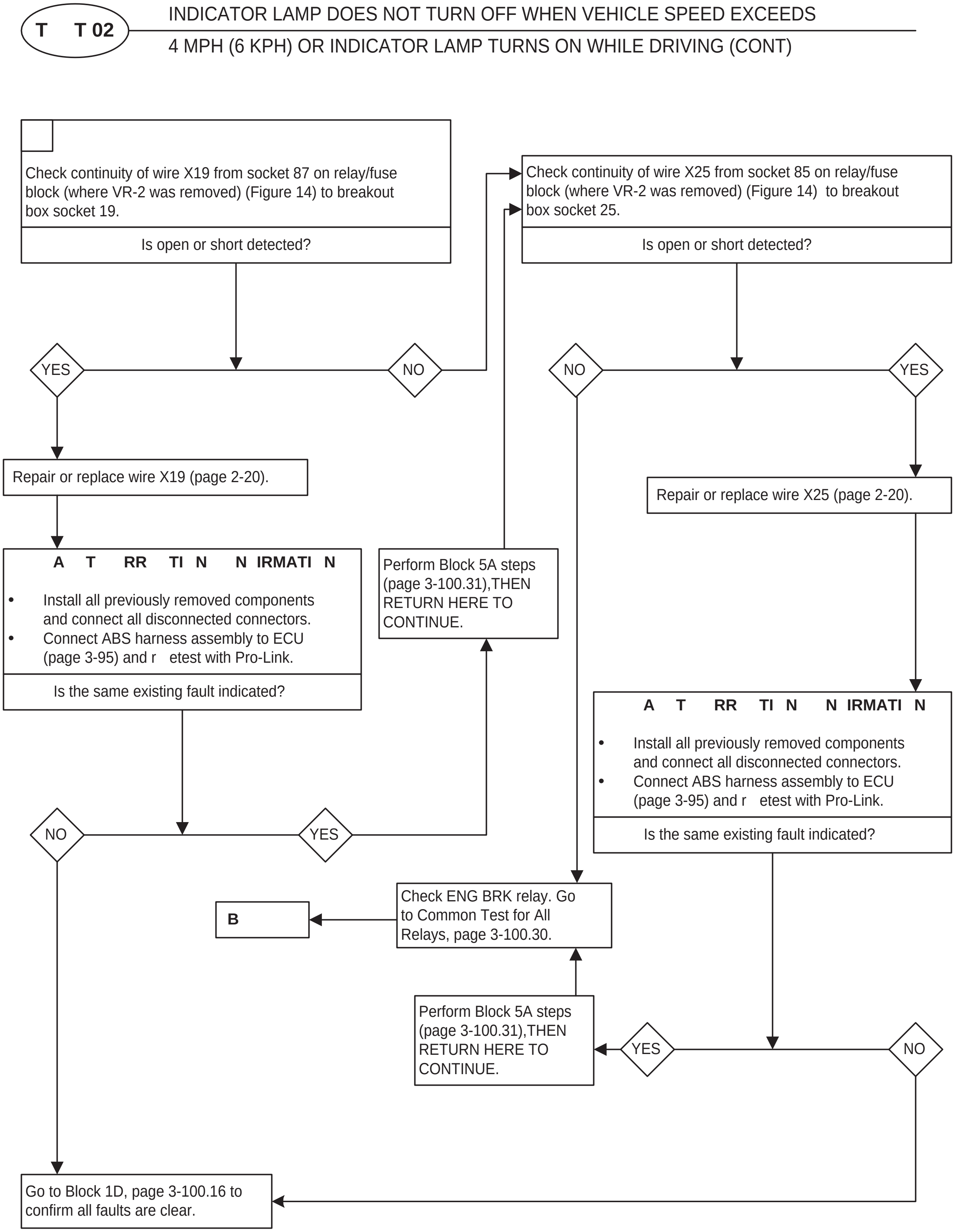
Go to next page.

B



1 R la / Bl ck ck and W ca n
(W n n R d)

Ta l 3- AB T l n and T n (n)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

NG BR R A WIRING

- Reinstall ENG BRK relay onto relay/fuse block.
- Disconnect ENG BRK connector, located behind passenger's seat below the relay/fuse block. To gain access, bunched wires and connectors may need to be pulled out and tie wraps cut (Figure 16).
- Check continuity of wire X121 from ENG BRK connector pin A to ENG BRK connector pin B (Figure 16).

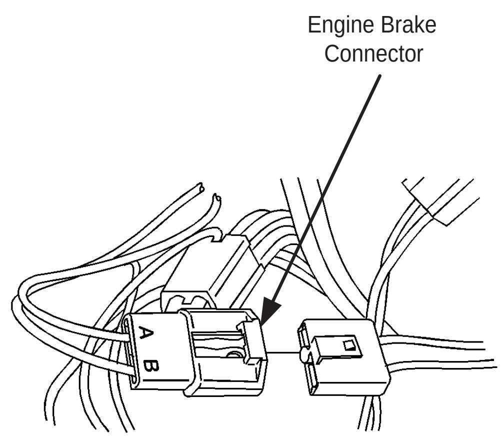
Is open or short detected?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

YES → Go to next page. → **B**

NO → Go to page 3-100.48. → **B R**



16 n n B ak nn c

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

- Remove ENG BRK relay from relay/fuse block (Figure 13, page 3-100.30).
- Check continuity of wire X121 from ENG BRK connector (Figure 16, page 3-100.46) to socket 30 on relay/fuse block (where ENG BRK relay was removed) (Figure 14).

Is open or short detected?

YES

Repair or replace wire X121 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES

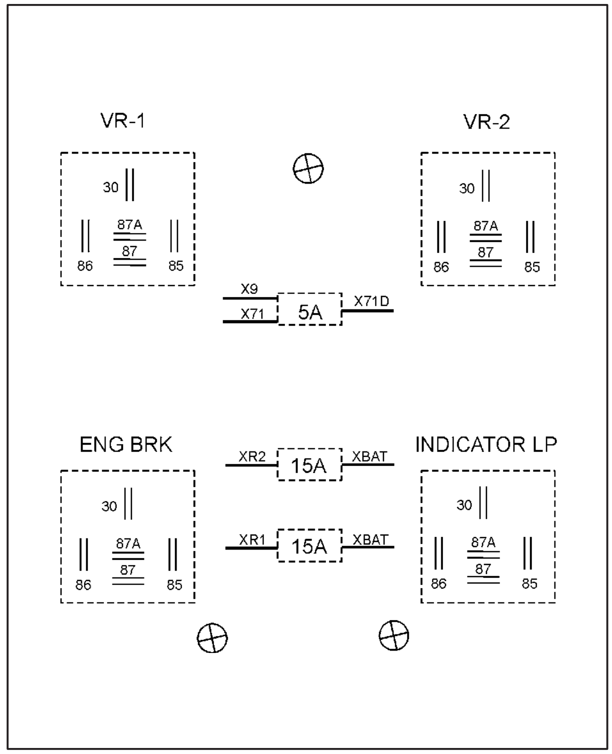
Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

Check continuity of wire X121 from socket 87A on relay/fuse block (where ENG BRK relay was removed) (Figure 14) to ENG BRK connector (Figure 16, page 3-100.46).

Is open or short detected?

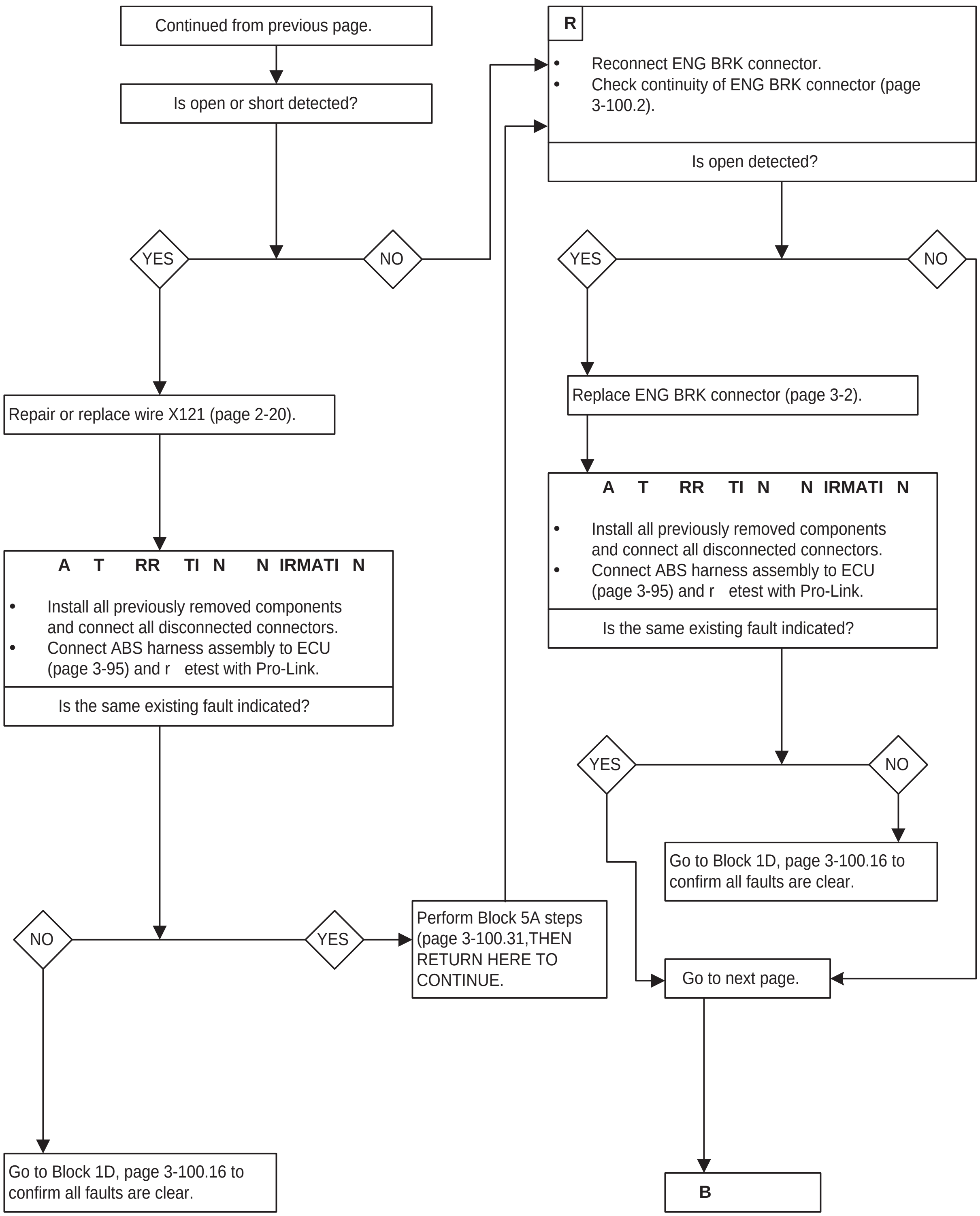
Go to next page.



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

- Remove ENG BRK relay from relay/fuse block (Figure 13, page 3-100.30).
- Check continuity of wire X11 from socket 85 on relay/fuse block (where ENG BRK relay was removed) (Figure 14) to breakout box socket 11.

Is open or short detected?

YES: Repair or replace wire X11 (page 2-20).

NO: Check continuity of wire X19B from socket 86 on relay/fuse block (where ENG BRK relay was removed) (Figure 14) to breakout box socket 19.

Is open or short detected?

NO: Check INDICATOR LP relay. Go to Common Test for All Relays, page 3-100.30. → B

YES:
- Remove VR-2 from relay/fuse block (Figure 13, page 3-100.30).
- Check continuity of wire X19B from socket 86 on relay/fuse block (where ENG BRK relay was removed) to socket 87 on relay/fuse block (where VR-2 was removed) (Figure 14).

Is open or short detected?

Go to next page.

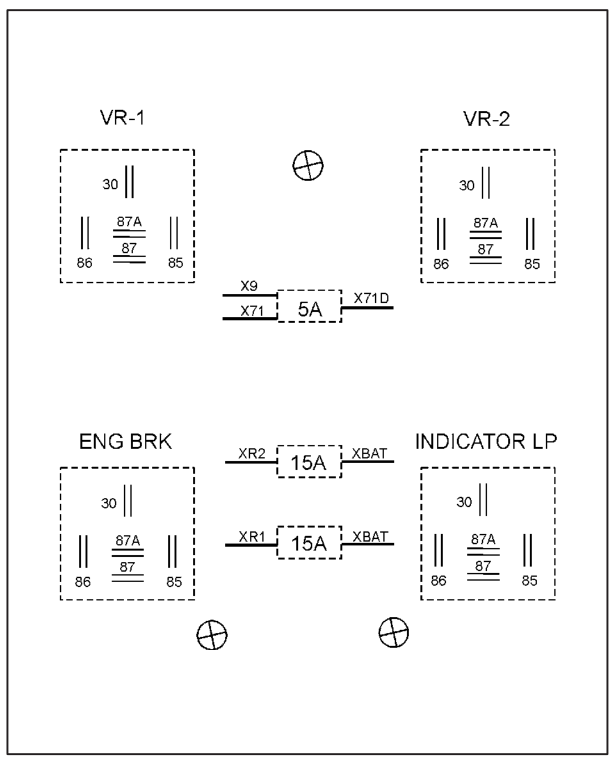
A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES: Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

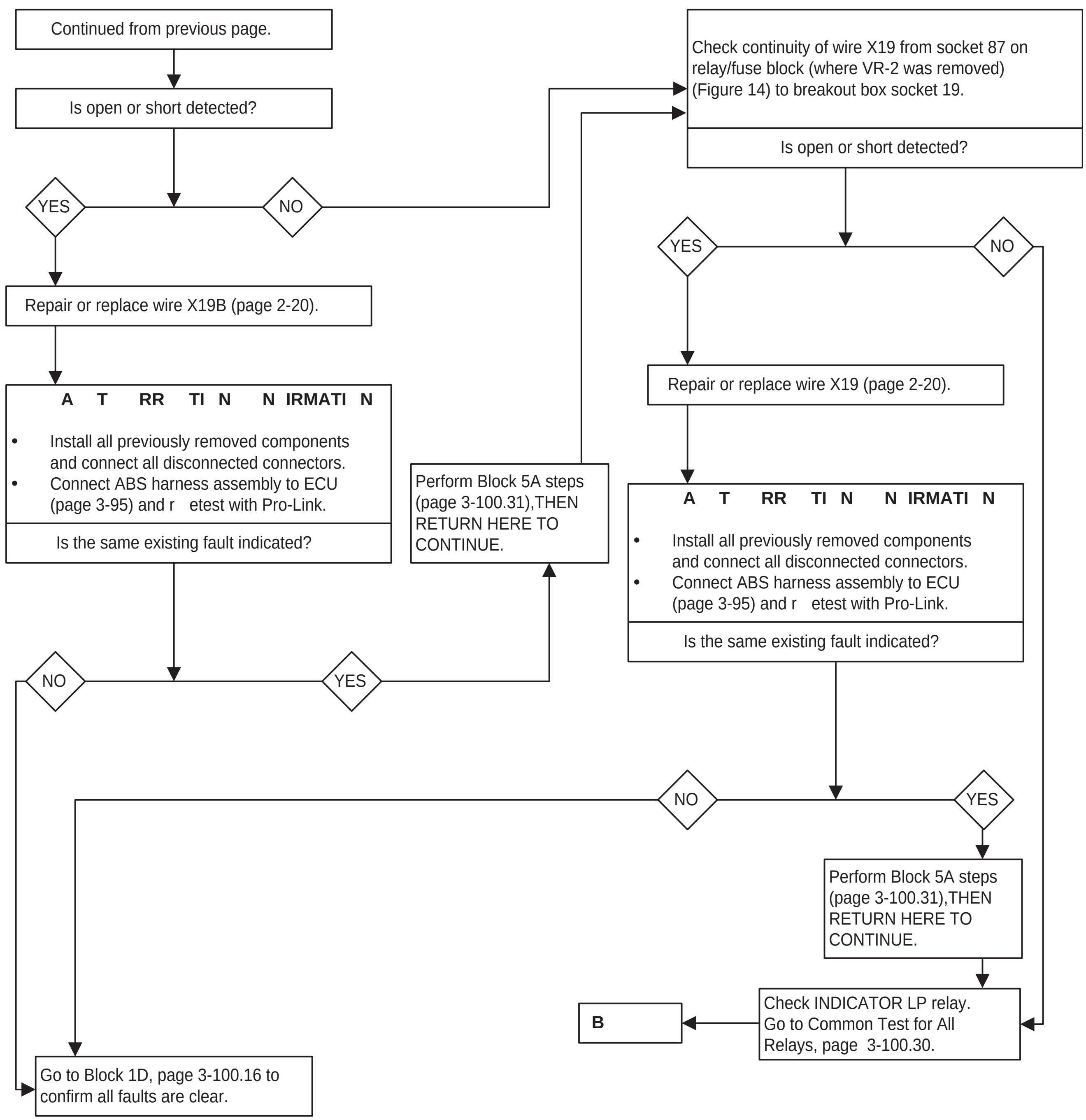
NO: Go to Block 1D, page 3-100.16 to confirm all faults are clear.



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

T IN I AT R AM ( ) R A WIRING

- Remove indicator lamp assembly from dashboard (page 4-309, step 1 and Figure 17).
- Check continuity of wire X26L from indicator lamp to socket 30 on relay/fuse block (where INDICATOR LP relay was removed) (Figure 14).

Is open or short detected?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

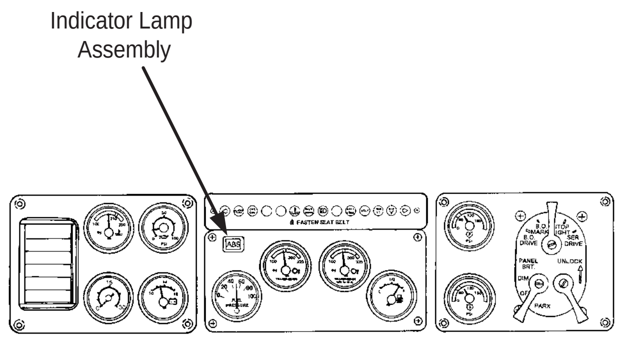
NO → Go to page 3-100.53. → **B**

YES →

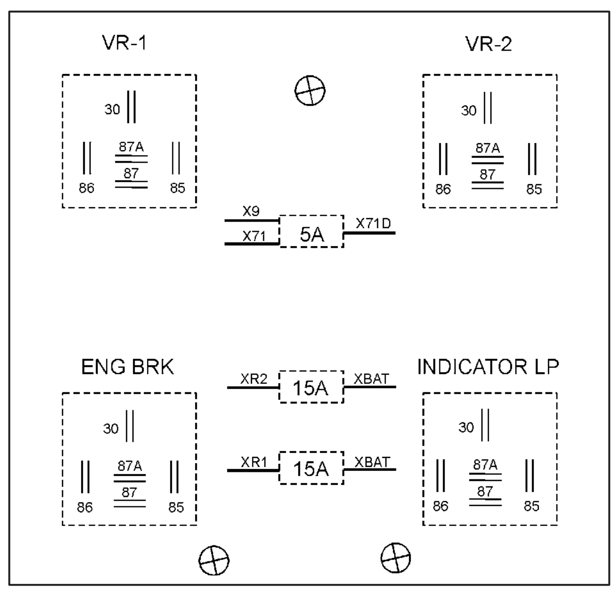
Check continuity of wire X26L from indicator lamp connector to socket 30 on relay/fuse block (where INDICATOR LP relay was removed) (Figure 14).

Is open or short detected?

→ Go to next page.



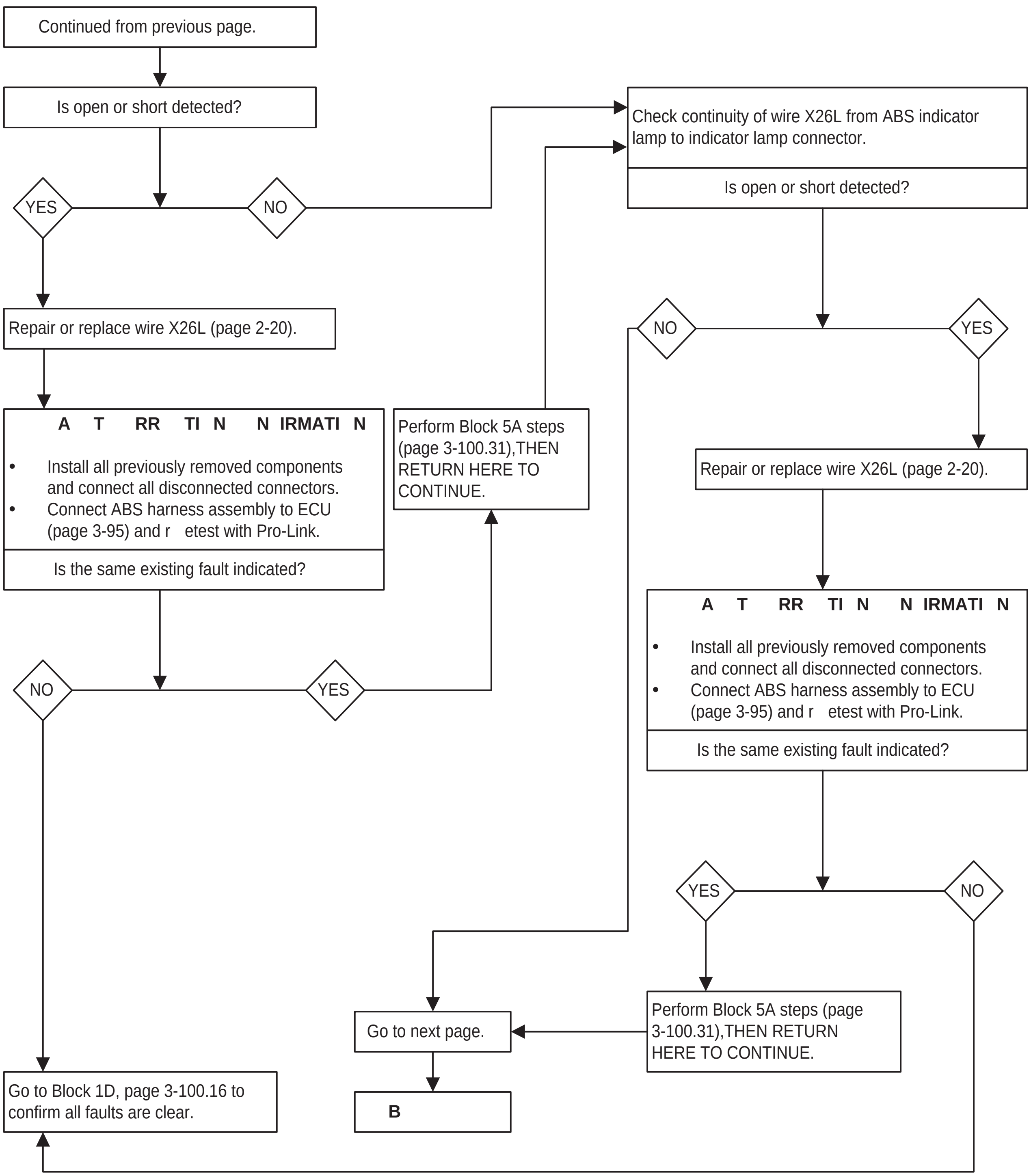
1 AB Ind ca a n a a d



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Check continuity of indicator lamp connector (page 3-100.2).

Is open detected?

YES

Replace indicator lamp connector (page 3-2).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

Check continuity of wire X26 from socket 30 on relay/fuse block (where INDICATOR LP relay was removed) (Figure 14) to breakout box socket 26.

Is open or short detected?

YES

Repair or replace wire X26 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

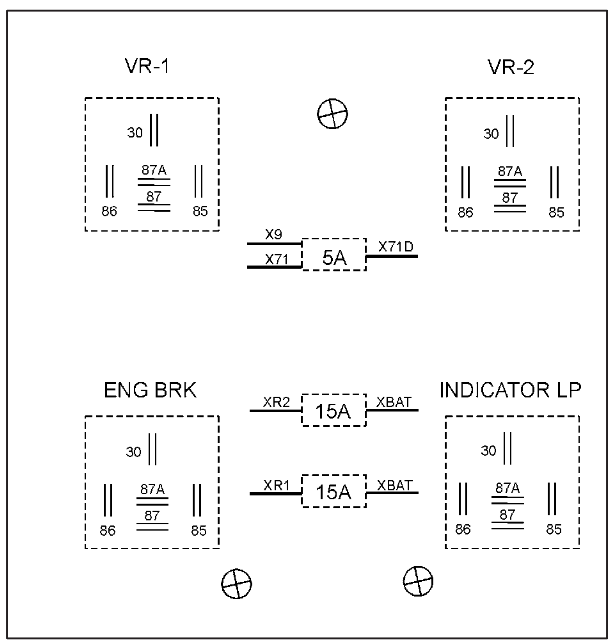
YES

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

Go to next page.

NO

Go to next page.



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

- Remove VR-1 from relay/fuse block (Figure 13, page 3-100.30).
- Check continuity of wire X71 from socket 86 on relay/fuse block (where INDICATOR LP relay was removed) to socket 85 on relay/fuse block (where VR-1 was removed) (Figure 14).

Is open or short detected?

YES

Repair or replace wire X71 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

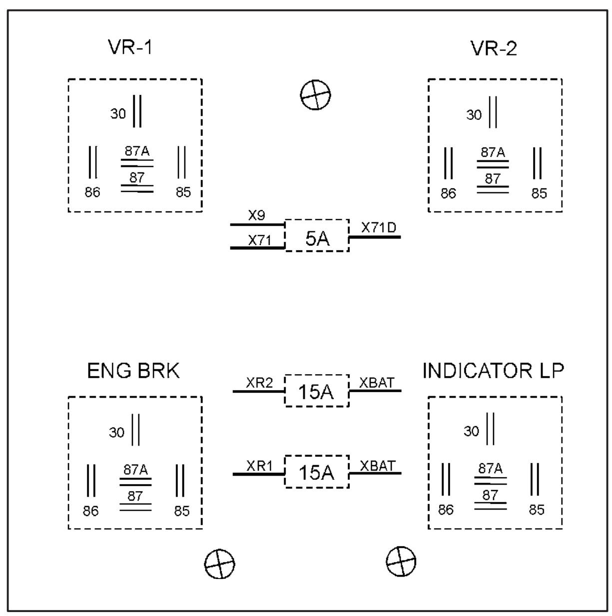
YES

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

Go to next page.

B W



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

W

- Remove VR-1 from relay/fuse block, if not already removed (Figure 13, page 3-100.30).
- Access ignition switch wires (page 3-100.1 and Figure 2, page 3-100.10).
- Check continuity of wire 18 from ignition switch to socket 85 on relay/fuse block (where VR-1 was removed) (Figure 14).

Is open or short detected?

YES → Go to next page. → **B**

NO

Was VR-1 initially being checked?

YES → Go to page 3-100.38. → **B G**

NO

Was VR-2 initially being checked?

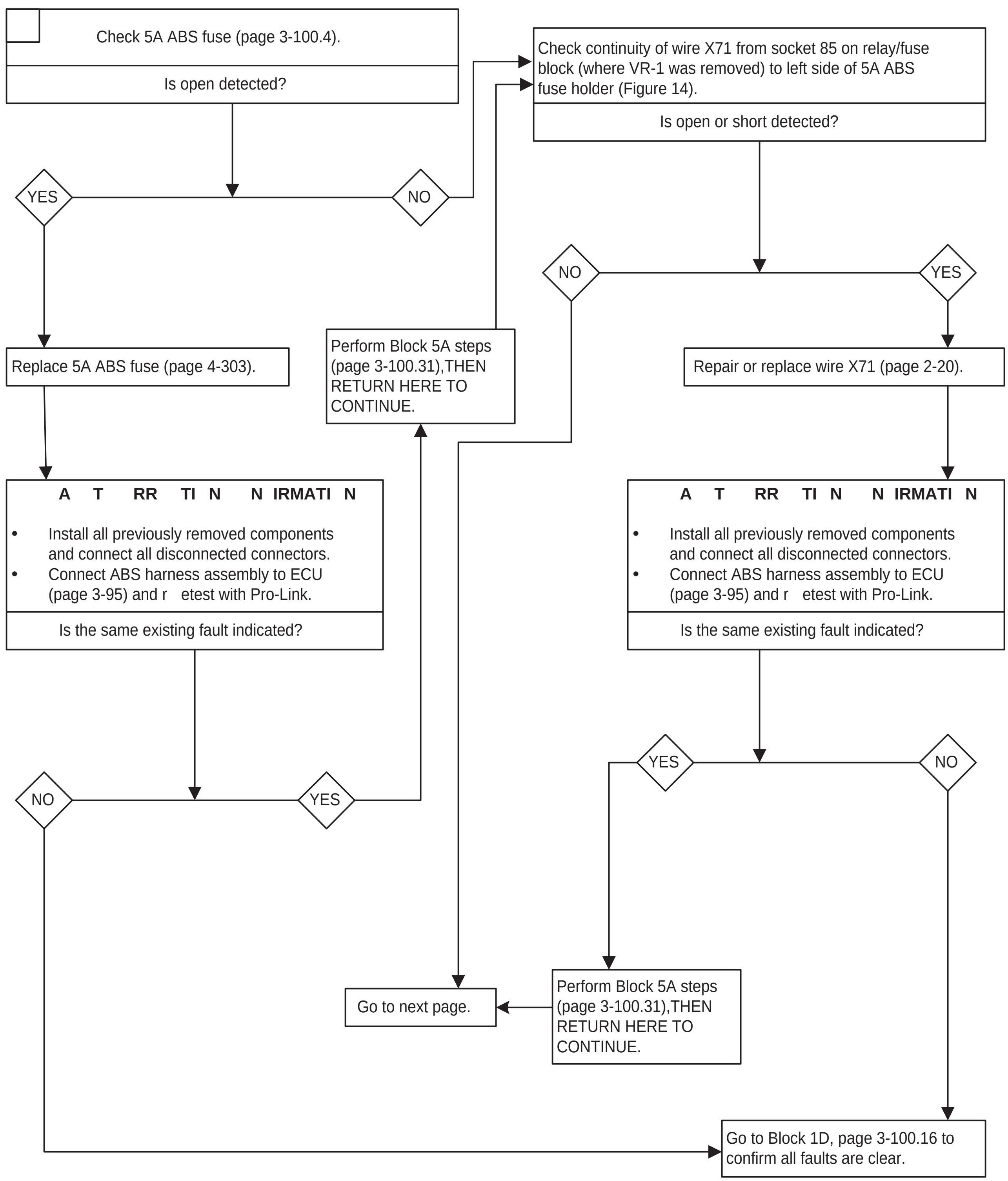
YES → Go to page 3-100.45. → **B**

NO

Check INDICATOR LP relay wiring. → Go to page 3-100.60. → **B**

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Check continuity of wire X71D from right side of 5A ABS fuse holder (Figure 14) to indicator lamp connector.

Is open or short detected?

N T

Indicator lamp connector has two white wires and four yellow wires.

YES

NO

Go to next page.

B

Repair or replace wire X71D (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES

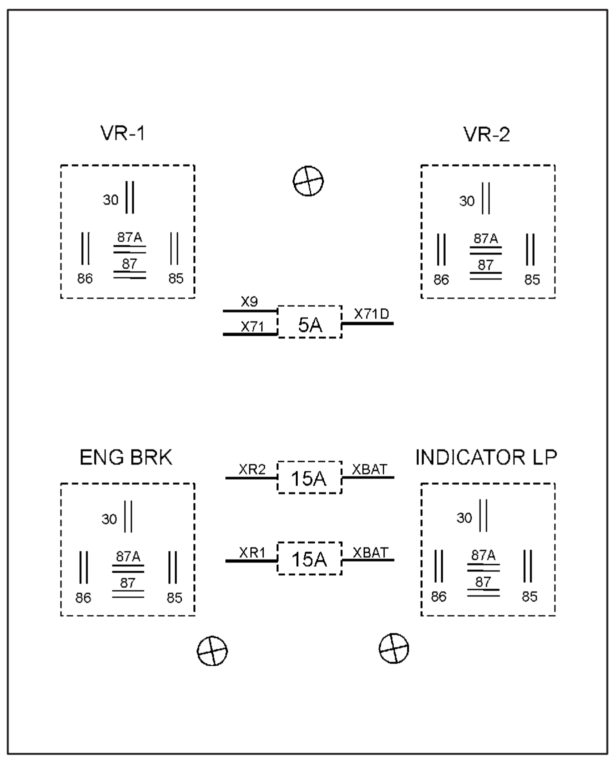
NO

Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Go to next page.

B



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

- Access ignition switch wires (page 3-100.1 and Figure 2, page 3-100.10).
- Check continuity of wire X71D from indicator lamp connector to ignition switch wire 18.

Is open or short detected?

N T

Indicator lamp connector has two white wires and four yellow wires.

YES

Repair or replace wire X71D (page 2-20).

NO

Check continuity of indicator lamp connector (page 3-100.2).

Is open detected?

Go to next page.

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES

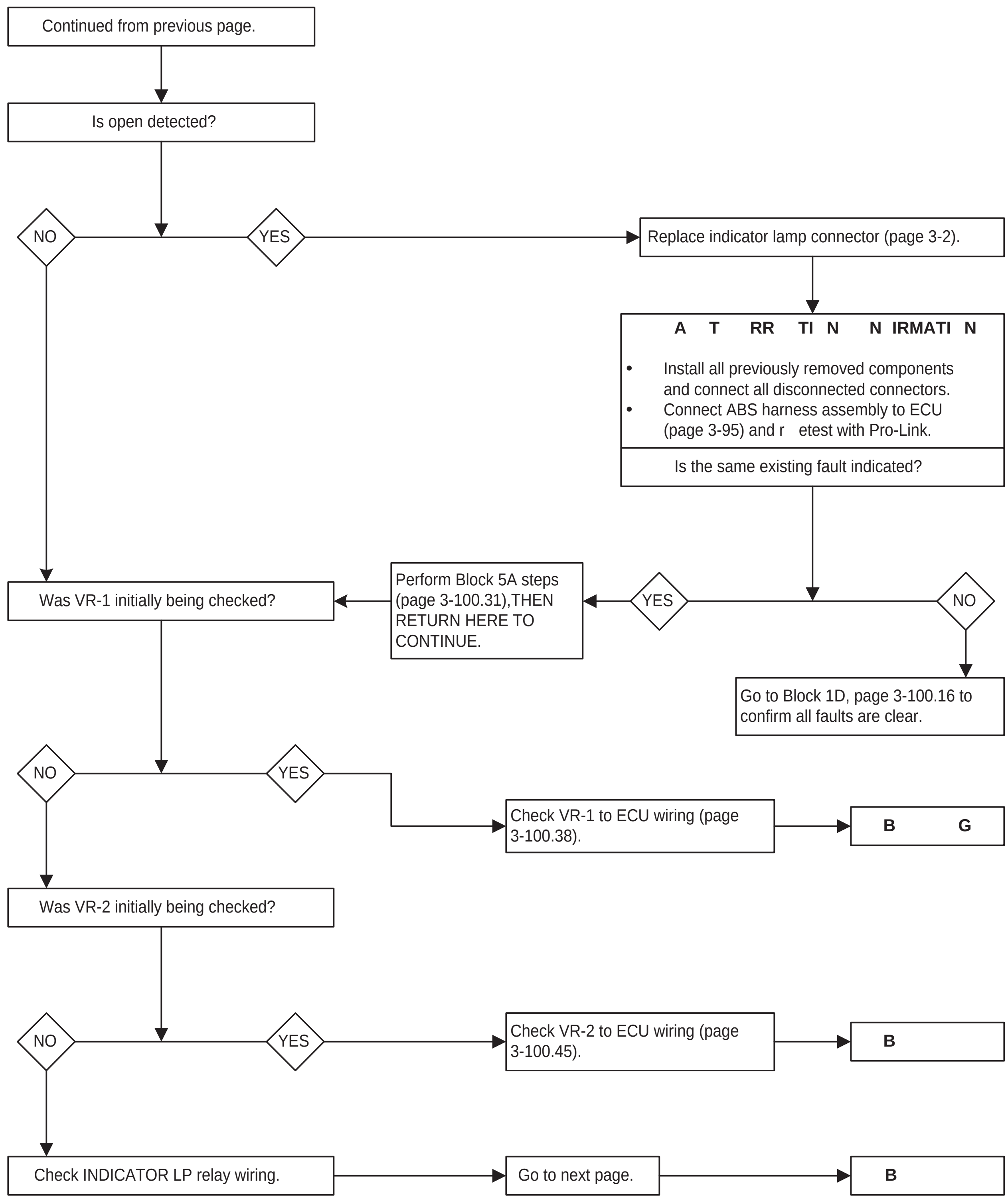
Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Check continuity of ground wire from socket 87A on relay/ fuse block (where INDICATOR LP relay was removed) (Figure 14) to breakout box socket 27.

Is open or short detected?

NO → Go to next page. → B AA

YES ↓

Check continuity of ground wire from socket 87A on relay/ fuse block (where INDICATOR LP relay was removed) (Figure 14) to vehicle chassis.

Is open or short detected?

YES → Repair or replace ground wire (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO → Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES → Repair or replace ground wire between chassis and breakout box socket 27 (page 2-20).

NO (from continuity check to vehicle chassis) → Repair or replace ground wire between chassis and breakout box socket 27 (page 2-20).

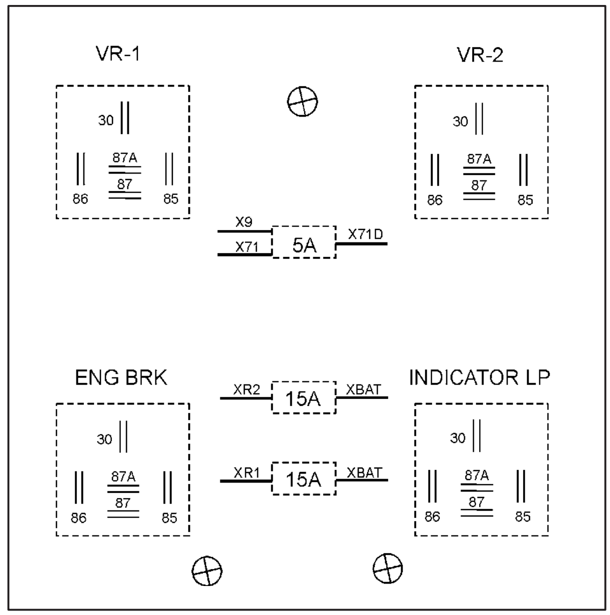
A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

NO → Go to Block 1D, page 3-100.16 to confirm all faults are clear.

YES → Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE. → Go to next page. → B AA



1 R la / Bl ck ck and W ca n (W n n R d)

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

AA

Check continuity of wiring from socket 85 on relay/fuse block (where INDICATOR LP relay was removed) (Figure 14) to breakout box socket 8.

Is open or short detected?

NO — Internal ECU logic is not functioning properly. Replace ECU (page 4-296).

YES —

- Remove VR-1 from relay/fuse block, if not already removed (Figure 13, page 3-100.30).
- Check continuity of wire X8L from socket 85 on relay/fuse block (where INDICATOR LP relay was removed) to socket 86 on relay/fuse block (where VR-1 was removed) (Figure 14).

Is open or short detected?

NO —

Check continuity of wire X8 from socket 86 on relay/fuse block (where VR-1 was removed) (Figure 14) to breakout box socket 8.

Is open or short detected?

NO — Internal ECU logic is not functioning properly. Replace ECU (page 4-296). — END

YES — Go to next page.

YES — Repair or replace wire X8L (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES — Perform Block 5A steps (page 3-100.31),THEN RETURN HERE TO CONTINUE.

NO — Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Repair or replace wire X8 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is the same existing fault indicated?

YES

NO

Go to Block 1D, page 3-100.16 to confirm all faults are clear.

Internal ECU logic is not functioning properly. Replace ECU (page 4-296).

END

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

N T

Refer to ABS Wiring Diagram on page 3-100.84 for assistance in troubleshooting.

6 **R - IN I A N ATA R I**

Check ABS power/data cable connection to Pro-Link and to Diagnostic Data Link (DDL) connector (page 3-95).

Is connection good?

N T

In order for Pro-Link to read data from the ECU, ensure that the ABS harness assembly is connected to the ECU and the ignition switch is in ON position.

YES

NO

Reconnect ABS power/data cable (page 3-95).

Is NO DATA RECEIVED fault cleared?

NO

YES

- Turn ignition switch to OFF position.
- Remove 5A ABS fuse from relay/fuse block (page 4-303).
- Check for a blown 5A ABS fuse (page 3-100.4).

Is open detected?

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

NO

YES

Go to next page.

Go to next page.

B 6A

B 6B

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6A **NTIN IT AB W R/ ATA AB**

- Disconnect ABS power/data cable.
- Use a multimeter to probe each pin on ABS power/data cable connector with corresponding socket on controller interface adapter (page 3-96 art).

Is open or short detected?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

6B

- Replace 5A ABS fuse (page 4-303).
- Turn ignition switch to ON position.

Is NO DATA RECEIVED fault cleared?

NO

Turn ignition switch to OFF position.

YES

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

NO

YES

- Repair or replace ABS power/data cable.
- Hook up Pro-Link to vehicle (page 3-95).

Is NO DATA RECEIVED fault cleared?

NO

Turn ignition switch to OFF position.

YES

Go to next page.

B 6

Ta l 3- AB T l n and T n (n)

T T 02 — INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6 **IAGN TI ATA IN ( )**
NN T R WIRING AN / R AB WIRING

- Disconnect ABS harness assembly from ECU and connect to breakout box (page 3-100).
- Set multimeter to OHMS.
- Set multimeter to 200 ohms range.
- Check continuity of wire X13 from breakout box socket 13 to DDL connector socket K (Figure 18).

Is open or short detected?

A TI N

When using a multimeter for continuity/resistance (ohms) tests, prevent incorrect measurements and possible damage to multimeter by ensuring that power is removed from the circuit being tested. Ensure ignition switch is in OFF position.

NO:

Go to page 3-100.69.

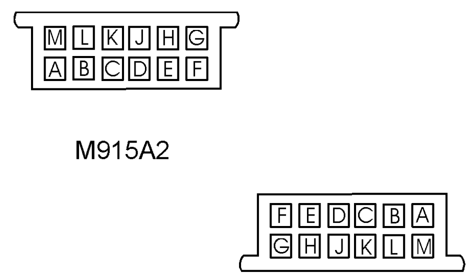
B 6

YES:

Check continuity of wire X13 from breakout box socket 13 to ABS wiring harness connector.

Is open or short detected?

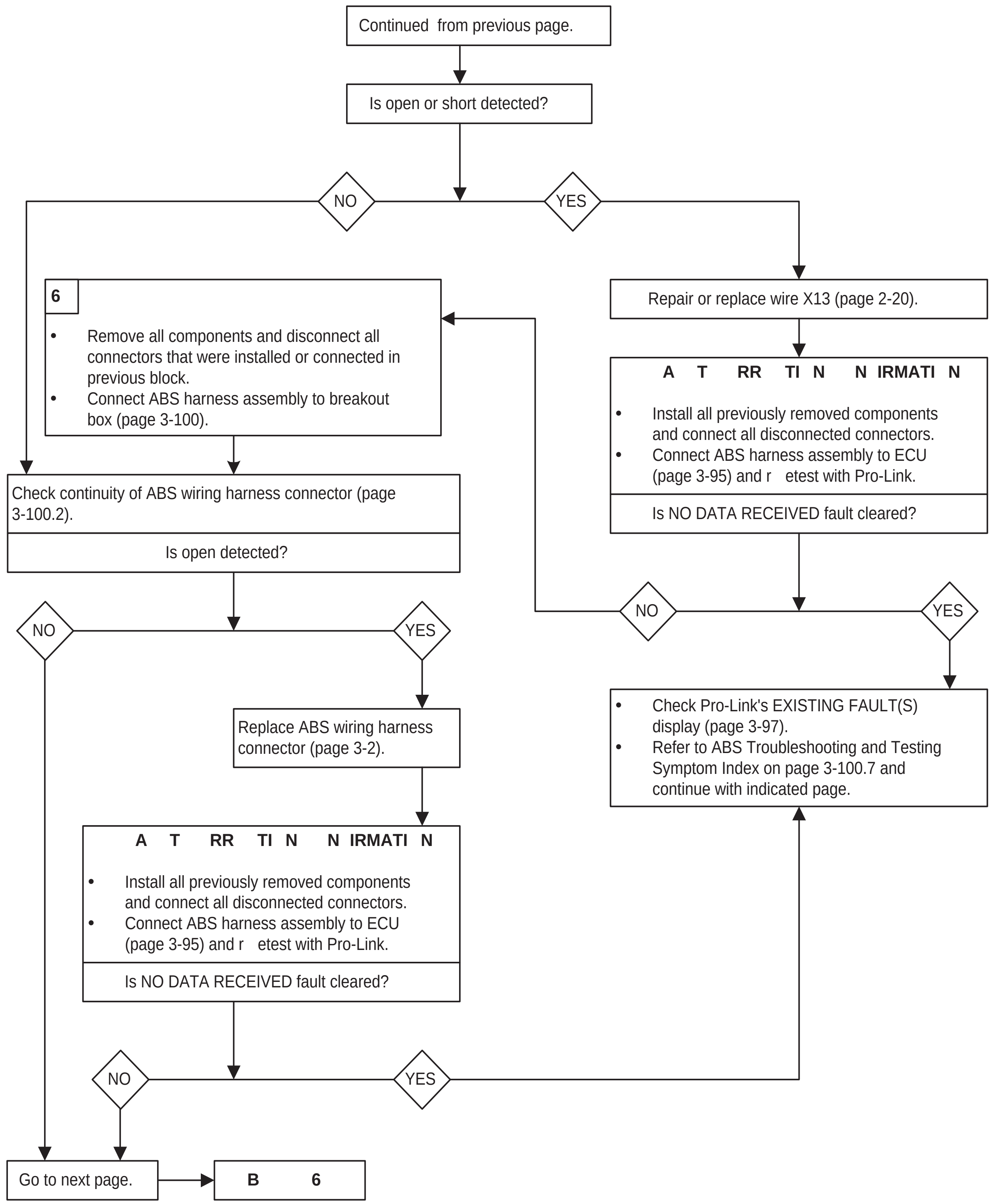
Go to next page.



1 a n c a a nk ( )
nn c n a n

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6

Check continuity of wire X013 from ABS wiring harness connector to connector located behind relay/fuse panel access door, between driver's and passenger's seats.

Is open or short detected?

NO

YES

Repair or replace wire X013 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

NO

Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE.

YES

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

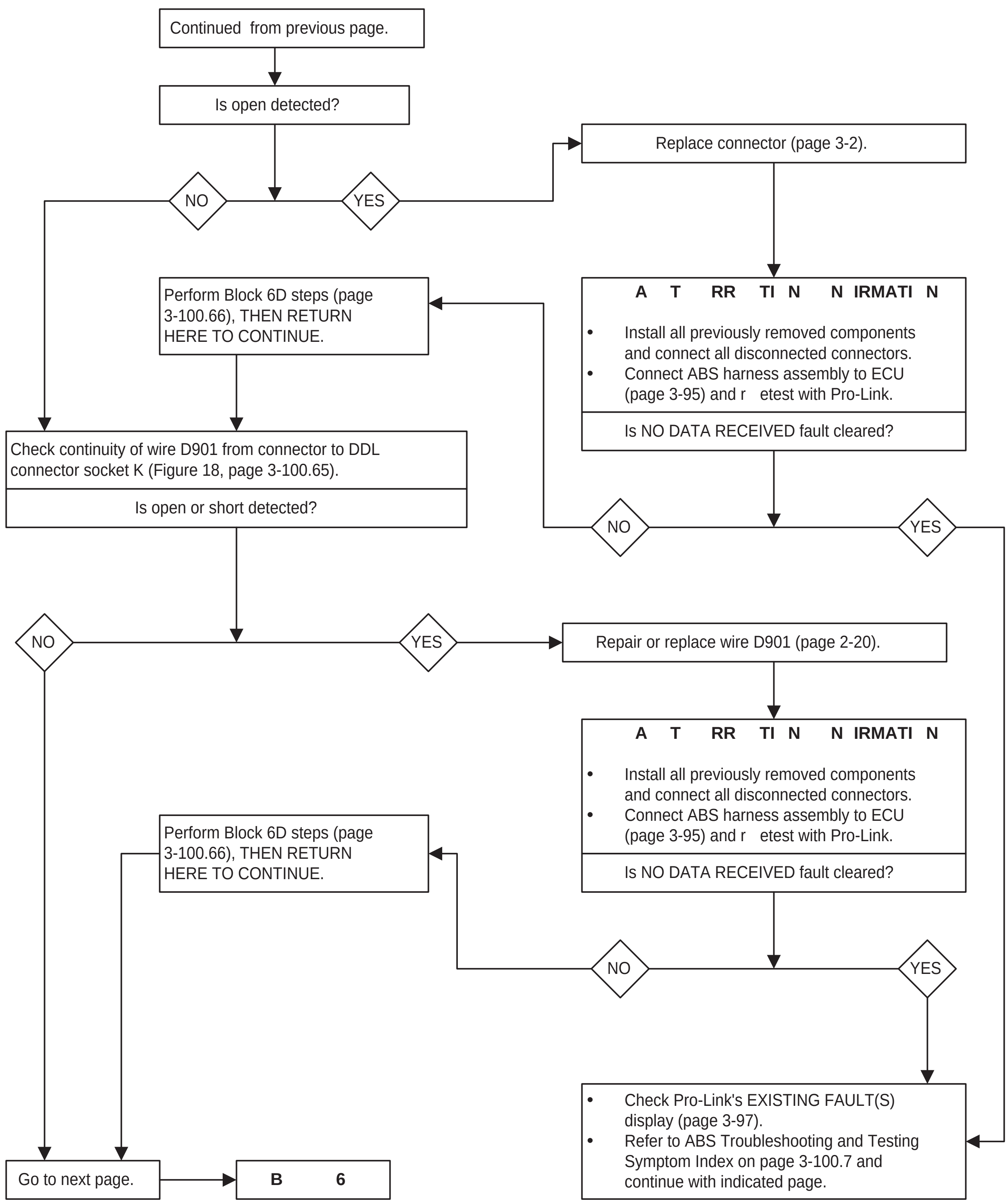
Check continuity of connector.

Is open detected?

Go to next page.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6

Check continuity of wire X14 from breakout box socket 14 to DDL connector socket J (Figure 18, page 3-100.65).

Is open or short detected?

NO

YES

Check continuity of wire X14 from breakout box socket 14 to ABS wiring harness connector.

Is open or short detected?

NO

YES

Go to page 3-100.72.

B 6I

Repair or replace wire X14 (page 2-20).

Check continuity of ABS wiring harness connector (page 3-100.2).

Is open detected?

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

NO

YES

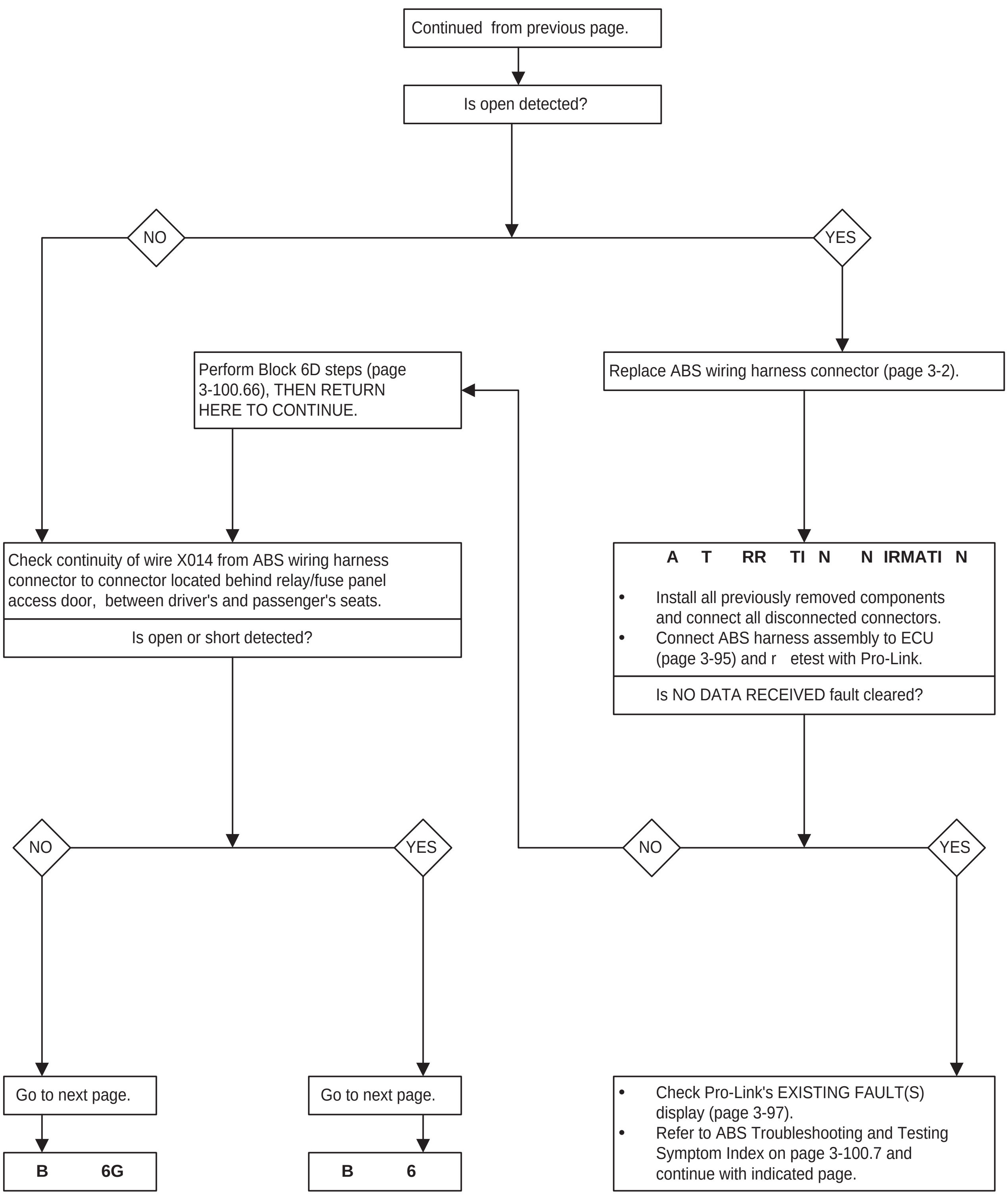
Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE.

Go to next page.

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

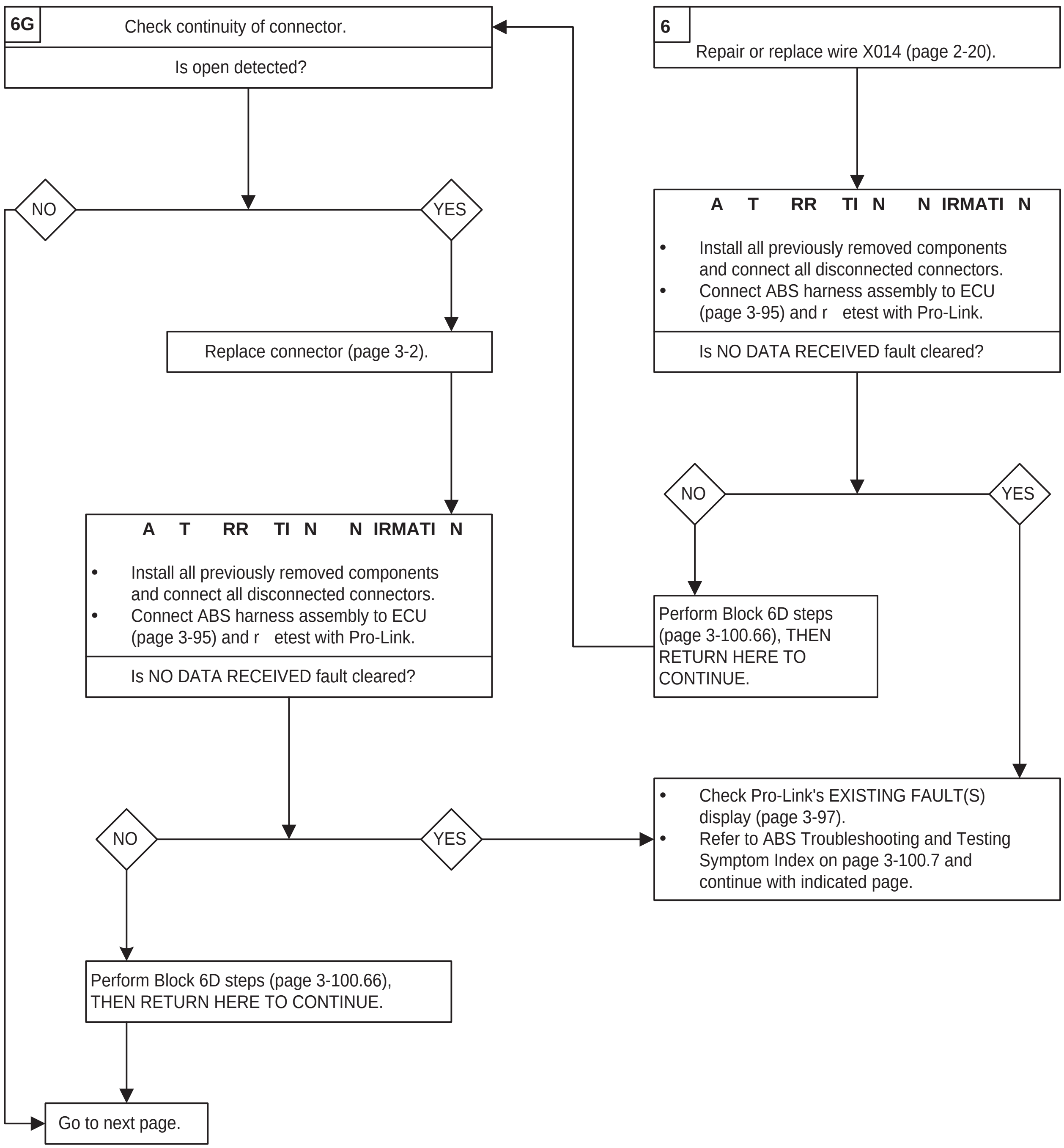
Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Check continuity of wire D900 from connector to DDL connector socket J (Figure 18, page 3-100.65).

Is open or short detected?

NO → 6I

YES → Repair or replace wire D900 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

NO → Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE.

YES →

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

6I

- Access ignition switch wires (page 3-100.1 and Figure 2, page 3-100.10).
- Check continuity of wire 18 from ignition switch to breakout box socket 9.

Is open or short detected?

NO → Go to next page. → **B 6**

YES → Go to next page. → **B 6**

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6

- Replace Pro-Link.
- Hook up new Pro-Link to vehicle and power up (page 3-95).

Did Pro-Link power up without NO DATA RECEIVED fault?

NO: Replace ECU (page 4-296). → END

YES:
- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

6

- Remove 5A ABS fuse (page 4-303).
- Check continuity of wire X9 from breakout box socket 9 to left side of 5A ABS fuse holder.

Is open or short detected?

YES: Repair or replace wire X9 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

YES:
- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

NO: Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE.

NO:

N T

Indicator lamp connector has two white wires and four yellow wires.

Check continuity of wire X71D from right side of 5A ABS fuse holder to yellow wire marked X71D of indicator lamp connector.

Is open or short detected?

Go to next page.

Ta l 3- AB T l n and T n (n)

T T 02

INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

Continued from previous page.

Is open or short detected?

NO

YES

Repair or replace wire X71D (page 2-20).

Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE.

Check continuity of indicator lamp connector (page 3-100.2).

Is open detected?

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

NO

YES

NO

YES

Go to next page.

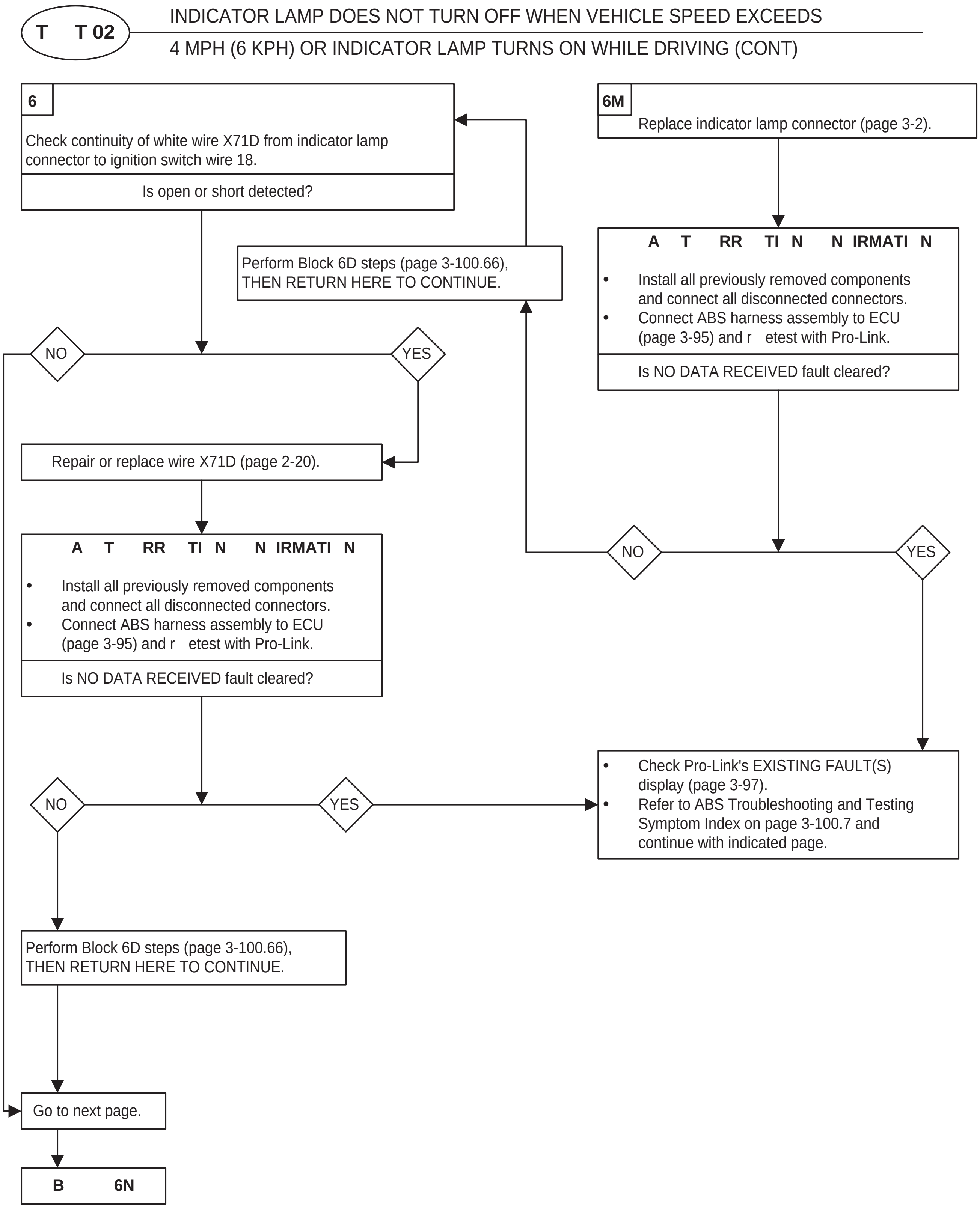
Go to next page.

B 6

B 6M

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

Ta l 3- AB T l n and T n (n)



Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6N **R TAG AT IGNITI N WIT**

- Access ignition switch wires (page 3-100.1).
- Set multimeter to volts dc (Vdc).
- Set multimeter to 20V range.
- Probe wire 52 on back of ignition switch (red lead) and chassis ground (black lead).

Is voltage 11-15V?

A TI N

When using a multimeter for voltage tests, prevent damage to the multimeter by ensuring that multimeter is set to a voltage mode with a range higher than the voltage to be measured.

YES

Go to page 3-100.78.

B 6R

NO

6 **2 A IGNITI N WIT**

- Remove relay/fuse panel access cover under dash between driver's and passenger's seats (page 4-204).
- Remove 25A ignition switch fuse (Figure 3, page 3-100.11).
- Check for a blown fuse (page 3-100.4).

Is open detected?

NO

Go to next page.

B 6

YES

Go to next page.

B 6

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6 **WIR R M IGNITI N WIT T 2 A IGN W**

Check continuity of wire 52 from ignition switch to right side of 25A IGN SW fuse holder.

Is open or short detected?

YES — Repair or replace wire 52 (page 2-20).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

YES — go to final box.

NO — Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE. → Refer to battery circuit troubleshooting (page 3-23).

NO (open or short) — Refer to battery circuit troubleshooting (page 3-23).

6

Replace 25A IGN SW fuse (page 4-204).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

NO — Perform Block 6D steps (page 3-100.66), THEN RETURN HERE TO CONTINUE.

YES —

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

Ta l 3- AB T l n and T n (n)

T T 02 INDICATOR LAMP DOES NOT TURN OFF WHEN VEHICLE SPEED EXCEEDS 4 MPH (6 KPH) OR INDICATOR LAMP TURNS ON WHILE DRIVING (CONT)

6R **IGNITI N WIT**

- Probe wire 71A on back of ignition switch (red lead) and chassis ground (black lead).
- Turn ignition switch to ON position.
- Record voltage and turn ignition switch to OFF position.

Is voltage 11-15V?

YES

NO

Replace ignition switch (page 4-188).

A T RR TI N N IRMATI N

- Install all previously removed components and connect all disconnected connectors.
- Connect ABS harness assembly to ECU (page 3-95) and r etest with Pro-Link.

Is NO DATA RECEIVED fault cleared?

NO

YES

- Replace Pro-Link.
- Hook up new Pro-Link to vehicle and power up (page 3-95).

Did Pro-Link power up without NO DATA RECEIVED fault?

NO

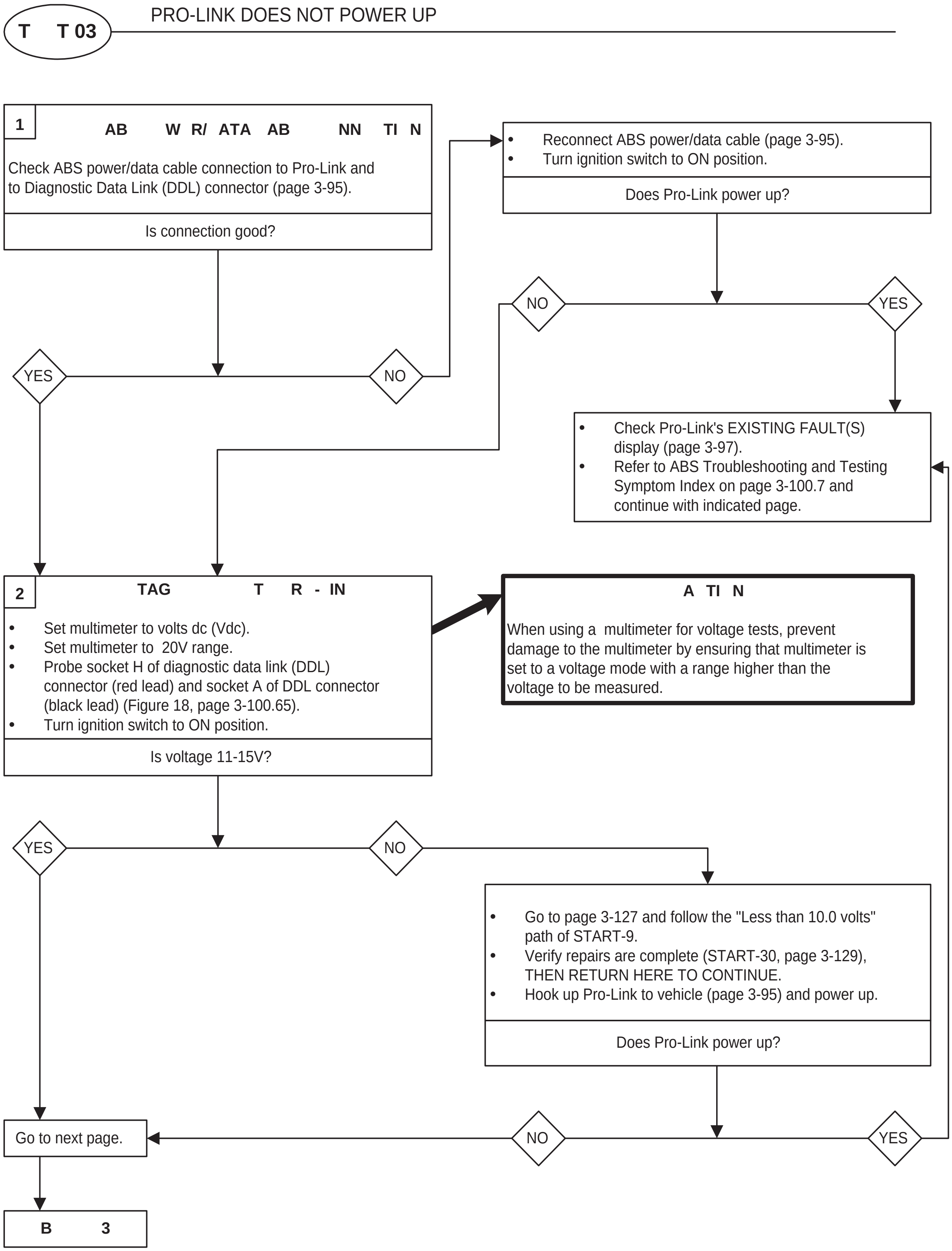
YES

Replace ECU (page 4-296).

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

END

Ta l 3- AB T l n and T n (n)



Ta l 3- AB T l n and T n (n)

T T 03 PRO-LINK DOES NOT POWER UP

3 **AB ATA ARTRI G IN TA ATI N**

Check that ABS data cartridge is properly seated on back of Pro-Link and slid all the way forward until it clicks into place (page 3-95).

Is ABS data cartridge installed correctly?

YES

NO

Reinstall ABS data cartridge onto Pro-Link (page 3-95).

Does Pro-Link power up?

NO

YES

AB ATA ARTRI G G B AR NN T R

- Remove ABS data cartridge from Pro-Link (page 3-95).
- Inspect edgeboard connector for worn contacts and buildup of dirt (Figure 19).

Is edgeboard connector dirty or worn?

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

NO

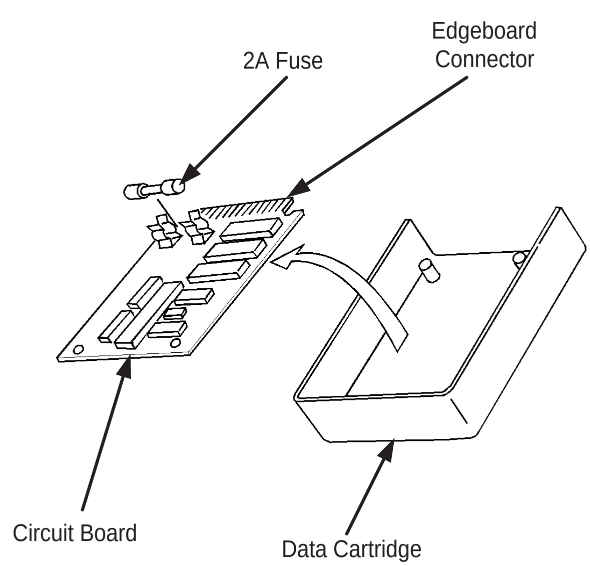
YES

Go to next page.

Go to next page.

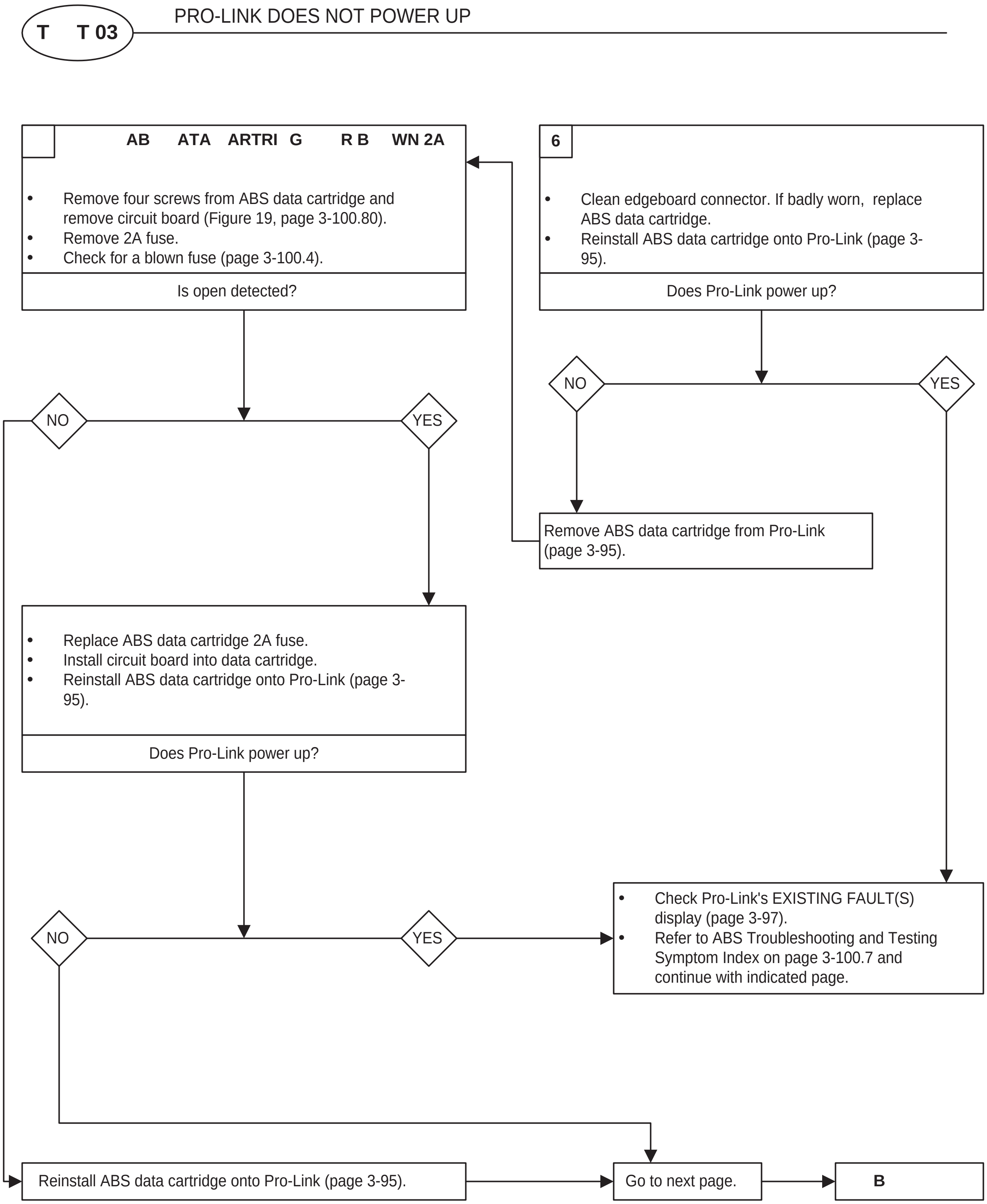
B

B 6



19 - nk AB a a a d

Ta l 3- AB T l n and T n (n)



Ta l 3- AB T l n and T n (n)

T T 03 PRO-LINK DOES NOT POWER UP

NTIN IT AB W R/ ATA AB

- Disconnect ABS power/data cable from DDL connector and from Pro-Link (page 3-95).
- Set multimeter to OHMS.
- Set multimeter to 200 ohms range.
- Probe each pin of ABS power/data cable connector with corresponding socket on controller interface adapter (page 3-96 art).

Is open or short detected?

YES

- Repair or replace ABS power/data cable.
- Hook up Pro-Link to vehicle and power up (page 3-95).

Does Pro-Link power up?

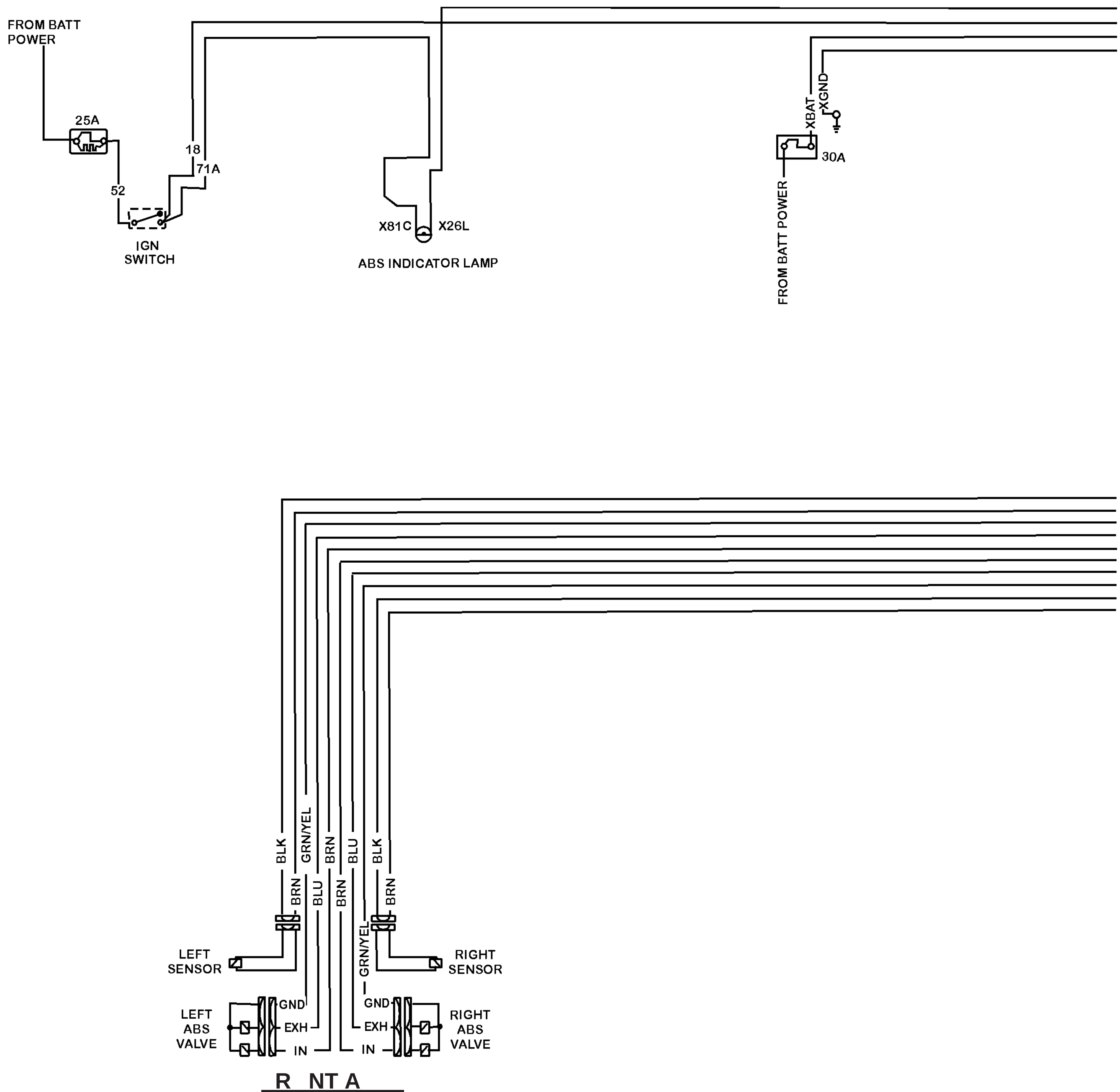
YES

- Check Pro-Link's EXISTING FAULT(S) display (page 3-97).
- Refer to ABS Troubleshooting and Testing Symptom Index on page 3-100.7 and continue with indicated page.

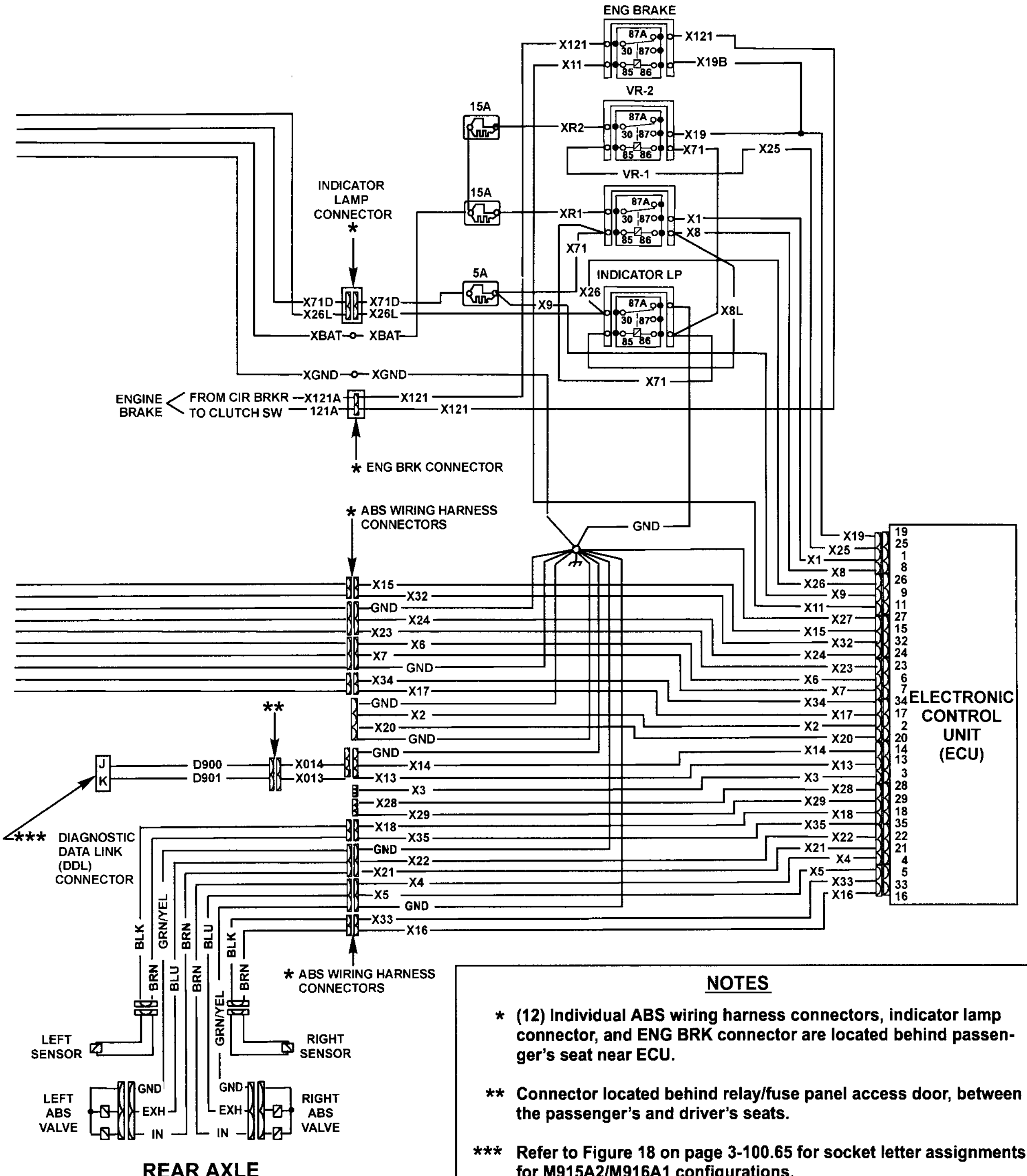
NO

Replace Pro-Link.

END



AB WIRING IAGRAM (1 2)



NOTES

* (12) Individual ABS wiring harness connectors, indicator lamp connector, and ENG BRK connector are located behind passenger's seat near ECU.

** Connector located behind relay/fuse panel access door, between the passenger's and driver's seats.

*** Refer to Figure 18 on page 3-100.65 for socket letter assignments for M915A2/M916A1 configurations.

AB WIRING IAGRAM (2 2)

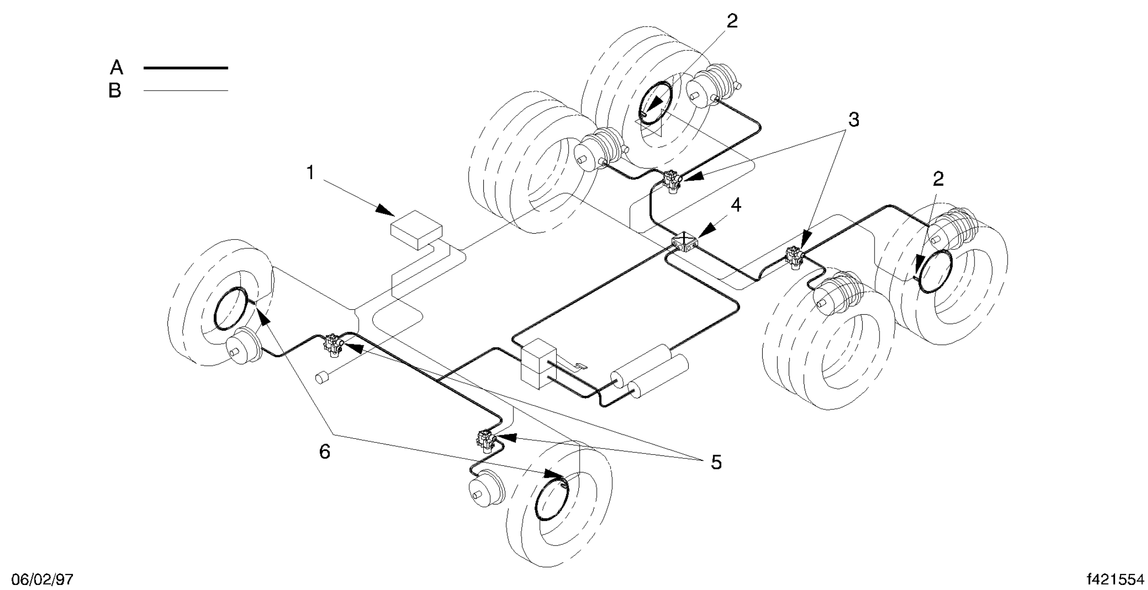
c n III 1 TR B TING AN T TING T ANTI- BRA T M (AB) (A T M91 A2 AN M916A1)

INTR TI N

This section contains information on troubleshooting and testing the Anti-lock rake System A S using link Code Diagnostics and ro-Link. The A S is an electronic system that monitors and controls wheel speed at all times, and controls braking only during emergency situations. The A S controls the braking of each wheel separately, which prevents wheel locking, maintains steerability, and reduces stopping distance. The A S has two diagonal circuits. Each circuit connects the front wheel of one side of the tractor to the rear wheels of the opposite side. In case of a system fault, only half of the A S stops working. Control of that half is returned to the standard braking system. The A S uses a tone ring and sensor on the hub of each monitored wheel. The sensor sends wheel speed information to the Electronic Control Unit ECU . The ECU signals the modulator valve for that wheel to increase, reduce, or maintain air pressure in the brake chamber. See 1

R T T IN TI N

rior to performing the tractor test ensure that the daily preventive maintenance inspections and procedures have been performed on the tractor.



A A n
B l c cal n

1 a -M n d **3 AB M d la al** **AB M d la al**
2 W l d n **R la al** **6 W l d n**

1 ca n AB n n n T ac

G N RA IN RMATI N

a. Rockwell WA CO A S D- ersion is an electronic system that monitors and controls wheel speed during braking. The system works with standard air brake systems. A S monitors wheel speeds at all times and controls braking during wheel lock situations. The system improves vehicle stability and control by reducing wheel lock during braking.

b. The ECU receives and processes signals from the wheel speed sensors. When the ECU detects a wheel lockup, the unit activates the appropriate modulator valve, and air pressure is controlled. In the event of a malfunction in the system, the A S in the affected wheel s is disabled that wheel still has normal brakes. The other wheels keep the A S function.

c. An A S warning lamp lets the driver know the status of the system. If the ECU senses a fault during normal vehicle operation, the A S warning lamp will come on. This lamp is also used to display blink code diagnostics.

AB WARNING AM

The A S warning lamp works as shown in Table 1. If the ECU senses a fault during normal vehicle operation, the A S warning lamp will come on and stay on.

Ta l 1 Wa n n a a n

W a	W a a n	W a M an
Turn the ignition on.	The A S lamp comes on momentarily for a bulb check, then goes out.	The system is okay.
	The A S lamp does not go out at ignition.	If the bulbs go out when the vehicle is driven above 4 mph km/h , the system is okay. If the lamp does not go out at speeds above 4 mph km/h , the ECU senses a fault in the A S system.

AB M AT R A

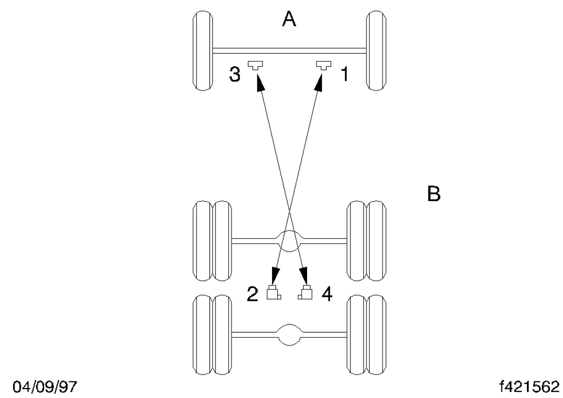
a. odulator alves control the air pressure to each affected brake during an A S function.

b. To make sure the A S valves are working, listen to them as follows
1. Turn on the ignition.
2. Wait for the A S light.

N T

T al ll c cl n 1-2-3- d n d a nall n 1-2 and 3- d .

3. Listen for the valves to cycle one by one, then together diagonally. See **2.**



N T T al ll c cl n 1-2-3- d n d a - nall n 1-2 and 3- d

A a
B d

2 M d la al ck n

AB N R

A S sensor systems consist of a tooth wheel mounted on the hub of each monitored wheel and a sensor installed so that its end is against the tooth wheel. The sensor continuously sends wheel speed information to the ECU. A sensor clip holds the sensor in place at the tooth wheel.

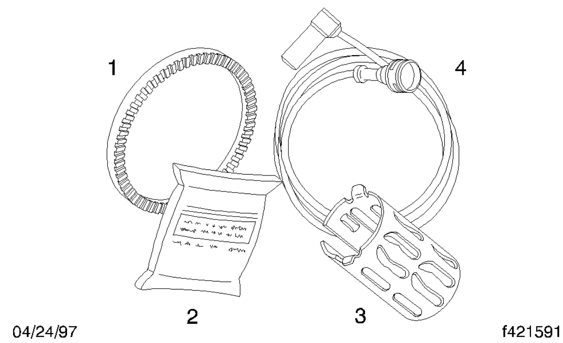
The type of axle determines the sensor mounting location

1. Steering axle sensors are installed in the steering knuckle or in a bolted-on bracket.
2. Drive axle sensors are mounted in a block attached to the axle housing or in a bolted-on bracket.

T M M N NT

The ECU is the brain of the A S system. It receives information from the sensors and sends signals to the A S valves. See **1**.

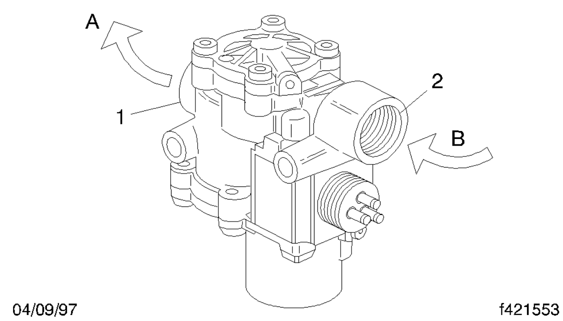
A tooth wheel see **3** is mounted at the hub of each sensed wheel, with a sensor installed so that its end is against the tooth wheel. A sensor clip holds the sensor in place at the tooth wheel. The sensor and clip must be greased with Rockwell WA CO-recommended lubricant.



1 T W l
2 can
3 n l
n

3 n n n

An A S modulator valve controls air pressure to each affected brake during emergency braking situations. See .

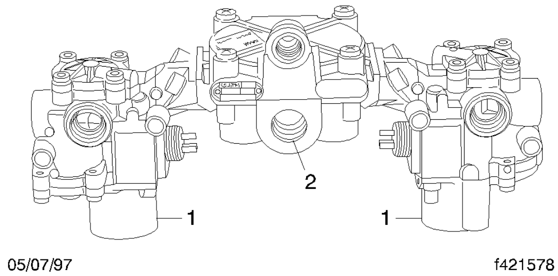


A
B In

1 2
2 1

AB M d la al n n

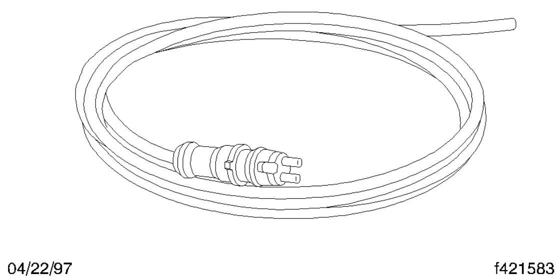
The A S valve package is an alternative to individual valves on the rear axles. It combines two A S modulator valves and one service relay valve. See .



1 M d la
2 R la al

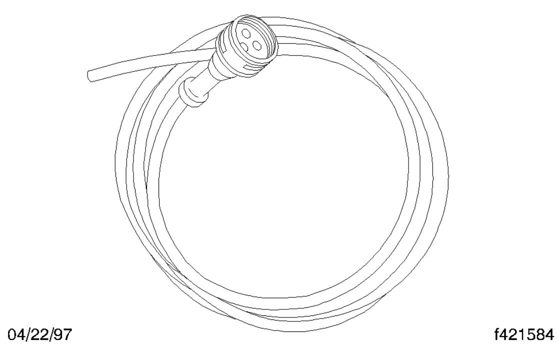
AB al acka

Sensor cables connect the sensor to the ECU. See **6**.



6 AB n a l

A S modulator valve cables connect the modulator valve to the ECU. See .



AB M d la al a l

AM B B

To make sure the A S lamp is operating, drivers should check the lamp every time the vehicle is started. When the vehicle is started, the A S lamp should come on momentarily. If it does not come on, it could mean a burned-out bulb.

IAGN TI

ou can troubleshoot the system in the following ways
link Code Diagnostics
ro-Link 000

a. ***Blink Code Diagnostics:***

efore using blink code diagnostics, you should be familiar with a few basic terms. If you used previous versions of Rockwell WA CO s blink code diagnostics, review these definitions to identify major changes.

AB Wa n n a This lamp serves two purposes it alerts drivers to an A S fault and it is used during diagnostics to display the blink code.

Bl nk d A series of blinks or flashes that describe a particular A S system fault or condition.

Bl nk d cl A set of two flashes with each flash separated by a one-and-one-half second pause. link codes are defined in **Ta l 2**

Bl nk d c A switch that activates blink code diagnostic capabilities. Switch types and locations vary, depending on the vehicle.

l a The process of erasing faults from the ECU.

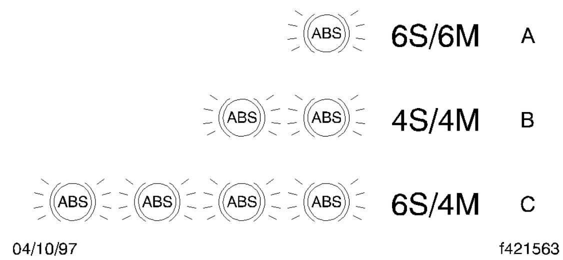
a n c The process of using blink codes to determine A S system faults.

a l An A S malfunction detected and stored in memory by the Rockwell WA CO ECU. System faults may be Active or Stored.

Ac a l A condition that currently exists in the A S system for example, a sensor circuit malfunction on the left front steering axle. An active fault must be repaired before it can be cleared from memory and before you can display additional codes.

d a l There are two types of stored faults One type is a repaired fault that has not been cleared from the ECU. The other type is a fault that occurred but no longer exists. or example, a loose wire that makes intermittent contact. ecause stored faults are not currently active they do not have to be repaired before they can be cleared from memory.

n a n d A one digit code link Code 2 is displayed during the clear mode. link codes for common A S system configurations are shown in .



A Bl nk d 1
B Bl nk d 2
Bl nk d

n a n d

Ta l 2 Bl nk d ld n ca n

(a l)	**c nd (c c l ca n a l)**
1 No aults	**1** No 1 aults
2 A S modulator valve **3** Too much sensor gap Sensor short or open Sensor signal erratic **6** Tooth wheel	**1** Right front steer axle curb side **2** Left front steer axle driver s side **3** Right forward/rear tandem drive axle curb side Left forward/rear tandem drive axle driver s side Right rearmost tandem drive axle curb side **6** Left rearmost tandem drive axle driver s side
System function	**1** 1 22 or 1 3 datalink **2** ATC valve Not Used **3** Retarder relay third brake A S warning lamp ATC configuration Not Used **6** Reserved for future use
ECU	**1** Low power supply **2** High power supply **3** Internal fault System configuration error round

b. ***Diagnostic Mode***

To enter the diagnostic mode, press and hold the blink code switch for one second, then release.

c. ***Clear Mode:***

To erase faults from the ECU, you must be in the clear mode. To enter the clear mode, press and hold the blink code switch for at least three seconds, then release.

If the system displays eight quick flashes followed by a system configuration code, the clear was successful. The A S fault has been cleared from memory.

If you do not receive eight flashes, there are still active faults that must be repaired before they can be cleared.

d. ***Blink Code Diagnostic Procedures:***

or the step-by-step blink code diagnostic procedure, see **Ta l 3**.

Ta l 3 Bl nk d a n c c d

M d	c d	R n	Ac n
Diagnostic	**1** Turn the ignition on.	The A S warning lamp comes on momentarily then goes out, indicating System Okay.	No recognizable faults in the A S. No action required.
		The A S warning lamp does not light, indicating possible wiring fault or burned-out bulb.	Inspect the wiring. Inspect the bulb. ake necessary repairs.
		The A S warning lamp stays on, indicating there is a fault, or faults, in the system.	Continue with the blink code diagnostics. o to the next step.
	2 ress and hold the link Code Switch for one second, then release.	The A S warning lamp begins flashing two-digit blink codes s .	Determine if the fault is active or stored **Ac a l** The lamp will repeatedly display one code. **d a l** The lamp will display the code for each stored fault then stop blinking. aults will be displayed *one at a time*.
	3 Count the flashes to determine the blink code.	irst Digit 1 to 8 flashes, ause 11/2 seconds . Second Digit 1 to flashes, ause 4 seconds .	Turn the ignition off. ind the definition for the blink code on the blink code chart.
	Repair and record the faults.	Active ault.	ake the necessary repairs. Repeat the first three steps of this procedure until System Okay Code 1-1 received.
		Stored aults.	Record for future reference. NOTE The last fault code stored is the first fault code displayed.
Clear	Clear faults from the memory ress and hold the blink code switch for at least three seconds, then release.	The A S warning lamp flashes eight times.	All faults are successfully cleared. Turn the ignition off.
		Eight flashes are not received.	Active faults still exist, repeat the first four steps of this procedure.

e. ***Blink Codes Illustrated*:**

Refer to the following figures for examples of typical blink codes

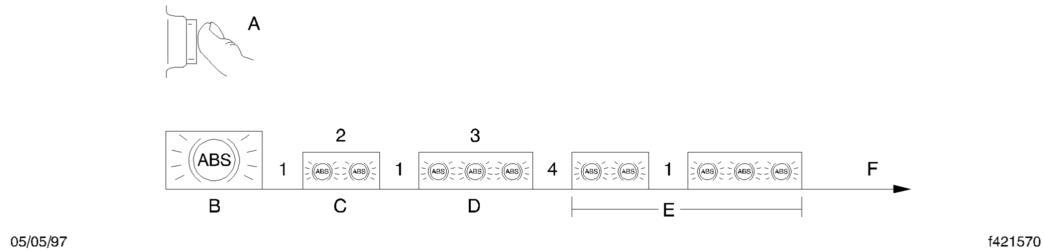
or a typical Active ault code, see **9**

or typical Stored ault codes, see **10**.

or the System Okay code, see **11**.

or the Stored aults Cleared code, see **12**.

or the aults Not Cleared active faults exist code, see **13**.

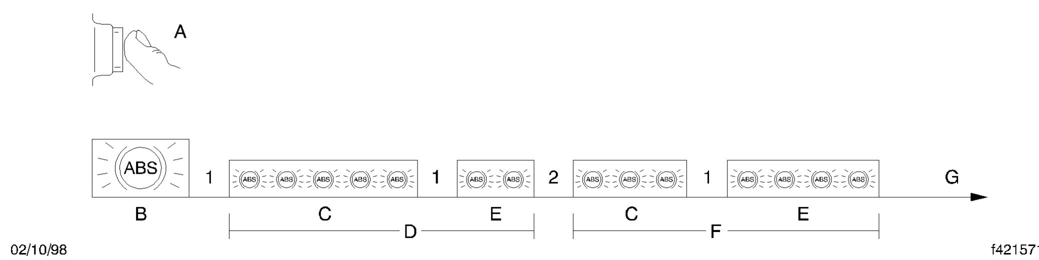


N T Bl nk d 2-3 n a l n AB d la al d a d- a a l

A ld 1 c nd (2) R a l nk c d
B n c nd (3) n n n l n n n d

1 a 1 c nd
2 1 la
3 1 6 la
a c nd

9 T cal Ac a l d

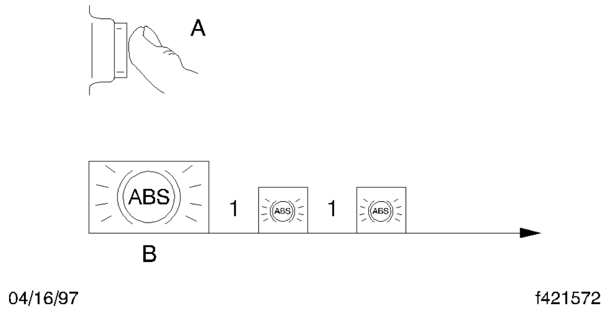


N T Bl nk d -2 and 3- a n d -2 n nal a c l - n a l d 3- T c n a l d a d- a a l

A ld 1 c nd c nd G la all d a l a nc -
B n d a l c nd d a l la a l d
d la d

1 a 1 c nd
2 a c nd

10 d a l d

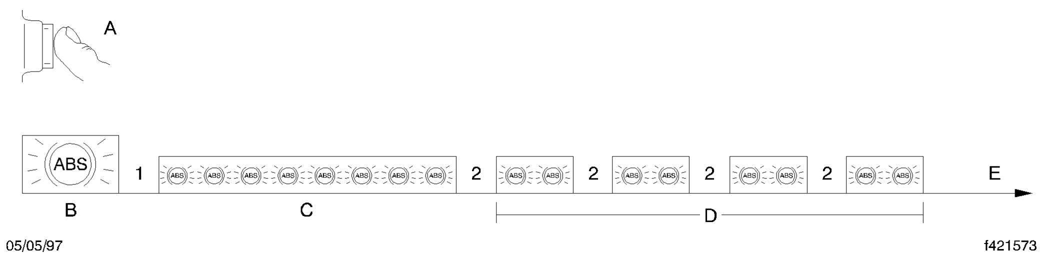


N T Bl nk d 1-1 n ka

A ld 1 c nd
B n

1 a 1 c nd

11 ka d

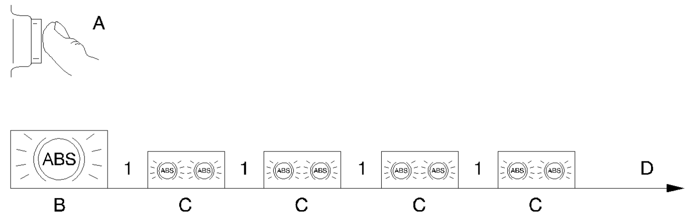


N T c n a n c d 2 n / M A a l a cl a d and cl a d AB la ll a n n l cl d n (6 k /)

A ld 3 c nd ck l nk - a l l a d n n n l n n n d
B n d n ca n

1 a 1 c nd
2 a c nd

12 d a l l a d d



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A ld 3 c nd d n ca n n n n l n n n d
B n

1 a c nd

13 a l N l a d d

f. ***Working with Blink Codes***

If problems occur while working with blink codes, see Table 4.

Ta l Bl nk d nd n		
nd n	**R a n**	**Ac n**
A S lamp does not come on at ignition.	Loose or burned-out bulb.	Check A S bulb and connections.
	oltage not within acceptable range 11 to 15 volts	Check for proper battery voltage. Check for proper voltage at A S lamp connector. Check 10 amp ignition fuse.
	aulty wiring between A S ECU and A S indicator lamp.	Check for continuity between pins 7 and 18 wires 37 L and 37 C on the A S ECU wiring harness, and the A S indicator lamp.
Can t use blink code diagnostics A S lamp will not go off when blink code is activated.	Switch not held for the proper length of time. 1 Second - Diagnostics ode 3 Seconds - Clear All ode	Repeat test.
	aulty A S ECU	See Table 5.1.
	aulty wiring.	Inspect and repair the wiring.
Eight flashes not received after blink code switch is pressed for at least three seconds, then released.	Active faults still exist.	Identify the active faults, then make necessary repairs. Turn the ignition off for 15 seconds, then repeat the link Code Diagnostics.

g. ***Repairs Required by Blink Codes*:**

or the specific tests or repairs required by each blink code, see **Ta l** .

Ta l T l n and R a		
Bl nk d	**Ac n R d**	**R nc**
2-1 2-2 2-3 2-4 2-5 2-	Check the A S modulator valve, valve cable, and connections.	Do the Resistance Check.
3-1 3-2 3-3 3-4 3-5 3-	Adjust the wheel sensor to touch the tooth wheel. Check the sensor gap. Check for loose wheel bearings or excessive hub runout.	Do the Sensor Adjustment, Sensor oltage Test, or ro-Link Component Test.
4-1 4-2 4-3 4-4 4-5 4-	Check sensor, sensor cable, and connectors.	Do the Resistance Check.
5-1 5-2 5-3 5-4 5-5 5-	Check for tire size mismatch or tooth wheel difference.	Review the Tire Size Range.
-1 -2 -3 -4 -5 -	Check for damaged tooth wheel.	
7-1	Check for proper data link connection 1 22 and 1 3	Refer to the wiring diagrams.
7-2	Check the ATC valve, valve cables, and connectors. Not used	Do the Resistance Check.
7-3	Check the brake relay connections.	Refer to the wiring diagrams.
7-4	Check the A S warning light connections.	

Ta l T l n and R a (n)		
Bl nk d	**Ac n R d**	**R nc**
7-5	erify proper ATC set-up. Not used	
7-	erify the accuracy of the blink code and clear it from the ECU memory.	Review link Code Diagnostics.
8-1	Check vehicle voltage and supply to the ECU 11 to 14 volts .	Refer to the wiring diagrams. Do the oltage Check.
8-2	Check the vehicle voltage 11 to 14 volts . erify the accuracy of the blink code and clear it from the ECU memory.	Do the oltage Check. Review link Code Diagnostics.
8-3	erify the accuracy of the blink code and clear it from the ECU memory.	Review link Code Diagnostics.
8-4	erify the accuracy of the blink code and clear it from the ECU memory. *If the code does not clear, it may be necessary to replace the ECU.*	Contact Rockwell Customer Service at 1-800-535-55 0.
8-5	Check the A S ground connections.	Refer to the wiring diagrams.

Ta l 1 AB a W ll N la Bl nk d (a a n) and - nk na l R c a a		
N T **All ld d a l an danc 10 a .**		
Step 1	Check for proper voltage to A S ECU located behind passenger seat .	a. Disconnect the A S ECU wiring harness multi connector, nearest to the passenger side door, from the ECU. b. Turn on ignition and check for 11 to 15 volts at A S ECU wiring harness terminals 7, 8, and . i. If proper voltage is present, go to step 2. ii. If voltage is not present, repair faulty wiring.

Ta l 1 AB a W ll N la Bl nk d (a a n) and - nk na l R c a a (n)

Step 2	Check for proper ground to A S ECU.	Check A S ECU wiring harness terminals 10, 11, and 12 for continuity. i. If there is less than 5 ohms resistance, go to step 3. ii. If resistance is greater than 5 ohms, repair faulty wiring.
Step 3	Check for continuity between A S ECU and Diagnostic Connector.	a. Check for continuity between A S ECU wiring harness terminal 14 to pin A on diagnostic connector. b. Check for continuity between A S ECU wiring harness terminal 13 to pin on diagnostic connector. i. If there is less than 5 ohms resistance, go to step 4. ii. If resistance is greater than 5 ohms, repair faulty wiring.
Step 4	Replace A S ECU.	

M I R - IN 9000

N T

- n ca d - n

Use the ro-Link 000 to

Diagnose system faults on A S or A S/ATC systems.
erform component measurement and function tests.

N T

T - nk 9000 a d n lac l nk c d d a n c c d

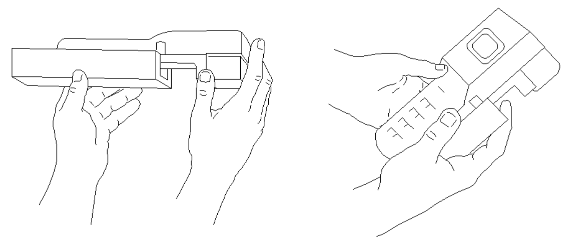
M N NT T T

Components that may be tested with the ro-Link 000 are

ehicle oltages
A S odulator alves
A S Lamps
Sensors
A S Switches

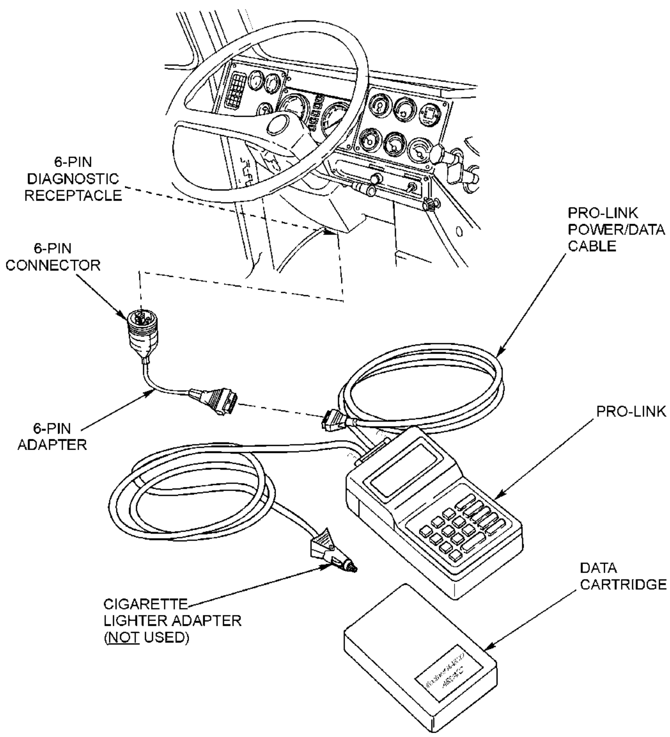
IAGN TI AN T TING R R

a. Slide the Rockwell WA CO D-version cartridge into the ro-Link keypad until the connection is tight. See 1 .



1 - nk a d R lac n

b. Chock the wheels, apply the parking brake, and make sure the ignition power is off.
c. Locate the -pin diagnostic receptacle in the vehicle cab. Insert the -pin connector from the ro-Link into the receptacle. See 1 .



1 - nk k- cl

d. Turn the ignition to the ON/RUN position. The ro-Link screen should power up. If the ro-Link does not power up, or if the screen indicates NO DATA RECEI ED

Check connections.
ake sure the cartridge is properly connected to the ro-Link keypad.
erify 12 volts DC power and ground at the connector and A S ECU.
Check the fuse panel for a blown fuse.
Check for proper wiring in the diagnostic connector.

R - IN R N

This paragraph provides basic screen explanations for the ro-Link 000 with a Rockwell WA CO D-version cartridge. or complete operating instructions and test information, refer to the ro-Link manual. The most commonly used types of screens are the ault Information screens and the Component Test screens.

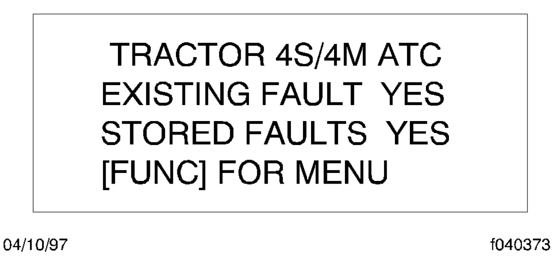
a. ***Fault Information Screens:***

1. **n a l** Use these screens to identify existing faults. The ro-Link screen displays a written description of the fault, including the location on the vehicle where each exists. As long as there is an active existing fault in the system, the ro-Link will not let you clear faults.
2. **d a l** Use these screens to identify faults stored in the ECU memory. Stored faults may be existing faults that have been repaired, or faults that existed for a short time, then corrected themselves. After displaying the stored faults, the ro-Link lets you erase them from memory. All stored faults are cleared at one time.

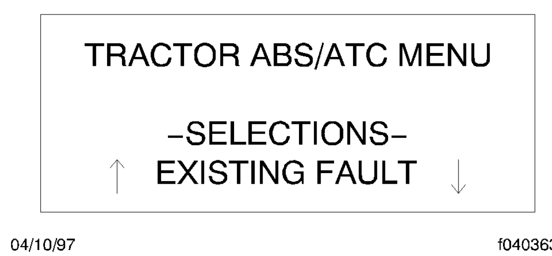
b. ***Using Pro-Link:***

The following illustrates a typical fault screen sequence for a 4S/4 A S system with an existing fault.

1. **16** indicates existing and stored faults in the system. ress UNC to display the menu shown in **1** .



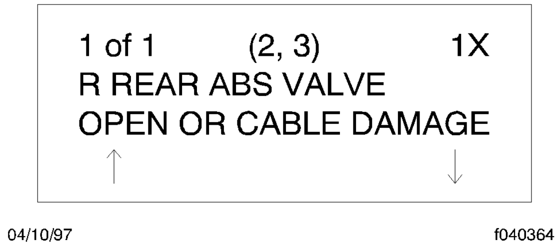
16 - nk c n n



1 - nk c nT

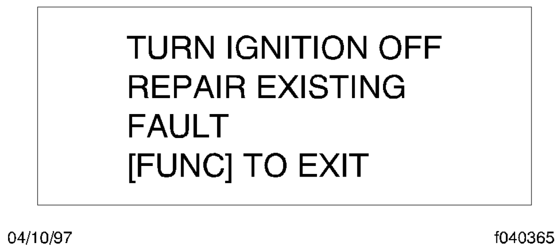
2. Select Existing ault to display the active fault. ress ENTER to select and the screen shown in **1** should appear.

The first line displays the number of existing faults 1 of 1 , the blink code 2-3 , and the number of times the fault occurred 1 time . Lines two and three provide a written description of the fault.



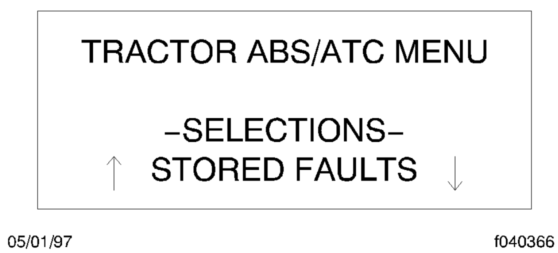
1 - nk c n T

3. ress UNC to exit. The screen shown in **19** should appear. Remove power from the ECU, make necessary repairs, and recycle the ECU.



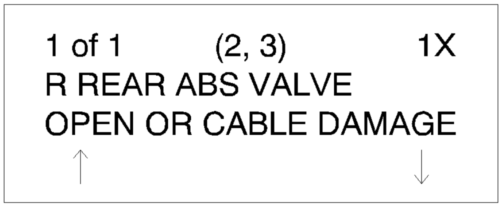
19 - nk c n

4. ress UNC to return to the Tractor A S/ATC menu shown in **20**.



20 - nk c n

5. ress ENTER to display stored faults as shown in **21**. A description of the stored fault appears. In this example, only one fault is stored in memory, as indicated on line one. The blink code and number of times the fault occurred also appear on line one. Lines two and three provide a written description of the fault. ress UNC to exit. The screen shown in **22** appears if you try to clear a stored code with an existing fault present.



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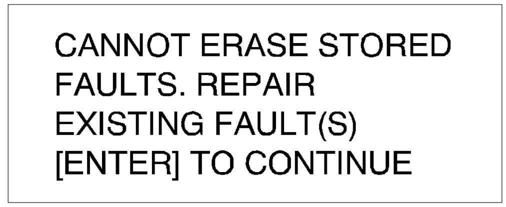


f040367

21 - nk c n **22 - nk c n n**

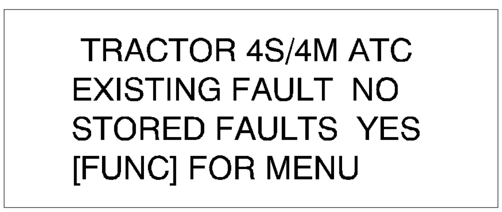
. Remove the power from the ECU, make necessary repairs, and recycle the ECU.

c. ***Clearing Stored Faults*:**

The screens you will see when clearing stored faults are illustrated in **1** and **19**.

1. **23** shows there are no existing faults. Select stored faults to view and clear the memory. ress UNC to display the menu shown in **2**

23 - nk c n **2 - nk c n N n**



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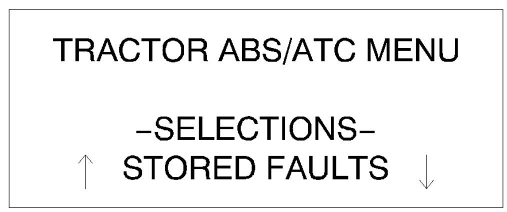

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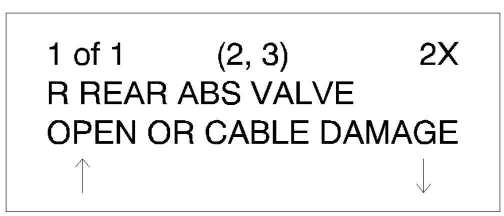
2. Select Stored aults, then press ENTER to display the stored faults shown in **2** . ro-Link displays number, blink code, number of occurrences, and written description of the stored faults.



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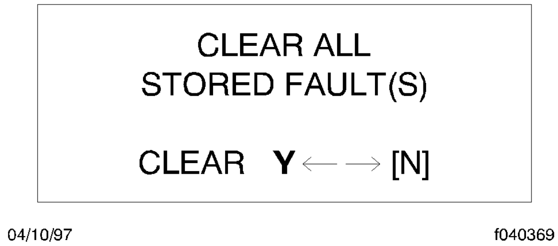
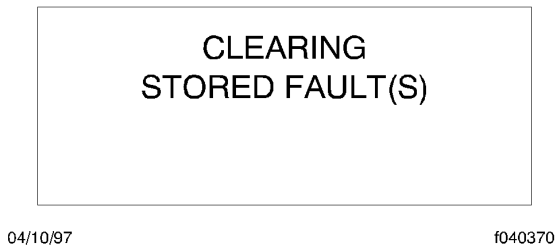
2 - nk c n T n

3. ress UNC, and the screen shown in **26** will appear.

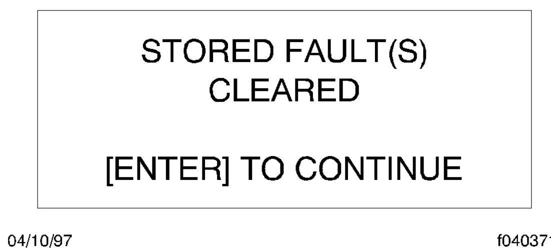


26 - nk c n l n

4. When the faults are cleared, ro-Link will prompt you to continue. See **2 and 2** .



2 - nk c n T l



2 - nk c n T n

5. ress ENTER to return to the A S menu.

d. ***Component Test Screens:***

These screens help you test A S components. Select this function from the Tractor A S/ATC menu. See **29** Select the appropriate function. Each screen has instructions to guide you through the test. Refer to the ro-Link service information for complete instructions.

TRACTOR COMP TESTS

–SELECTIONS–

↑ VEHICLE VOLTAGES ↓

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29 T cal n n T c n

ou can test the following components

A S alves
A S Lamp
A S Switches
Sensors

See **Ta l 6** for definitions that explain the function of each test.

Ta l 6 T nc n

n n T	**nc n**
ehicle oltages	onitors the two voltage signals powering the ECU.
A S alves	Cycles the valves, one at a time. ou will hear each valve cycle. A menu selection lets you choose from four or six valves. This test may also be used to verify valve locations. NOTE The treadle may be applied to put air in the chambers.
A S Lamp	onitors the commanded on/off states of the A S lamp. ollow screen prompts 1 On, 2 Off to change the status of the lamp on the instrument panel.
Sensors	onitors the input to the ECU from the wheel. Wheels must be rotated during this test.

M N NT T TING

WARNING

W n l n and n AB d n da a c nn c nal a a d nal can l n n nc n n c c l and n cl acc d n l n n nal n and da a

a. ***Voltage Check:***

The voltage must be between 11 and 14 volts. The ignition must be turned on for this test. easure the voltage between pins 7 and 10, pins 8 and 11, and pins and 12 on cab-mounted systems.

b. ***Sensor Adjustment:***

1. ush the sensor in until it contacts the tooth wheel.
2. Do not pry or push sensors with sharp objects. Sensor will self-adjust after wheel rotation.
3. On steering axles, the sensor is accessibly on the in-board side of the steering knuckle.
4. On drive axles, the drum assembly may have to be pulled to gain access to the sensor.

c. ***Sensor Output Voltage Test:***

The voltage must be at least 0.200 volts AC at 30 rpm. Check sensor voltage as follows

1. Turn off the ignition.
2. Rotate the wheel by hand at 30 rpm 2 revolutions per second .
3. easure voltage at the points shown in **Ta l** .

Ta l l a T n

	n	nn c	n
Cab- ounted	L R LR RR	- in - in 15- in 15- in	4 and 5 4 and 5 5 and 8 and

TIR I RANG

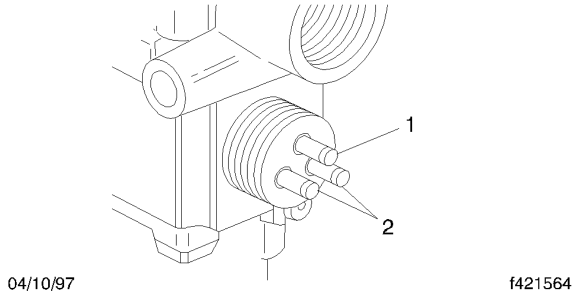
or proper A S operation with the standard ECU, front and rear tire sizes must be within 14 of each other. When the tire size range is exceeded without electronically modifying the ECU, the system performance can be affected and the warning lamp can illuminate.

Call Rockwell WA CO at 1-800-535-55 0 if you plan a tire size difference greater than 14 . Calculate the tire size with the following equation

Difference R Steer divided by R Drive minus 1 x 100 in this equation R means tire revolutions per mile

AB M AT R A T T

a. easure the resistance across each valve solenoid coil terminal and ground on the A S valve to ensure 4.0 to 8.0 ohms. See **30**.

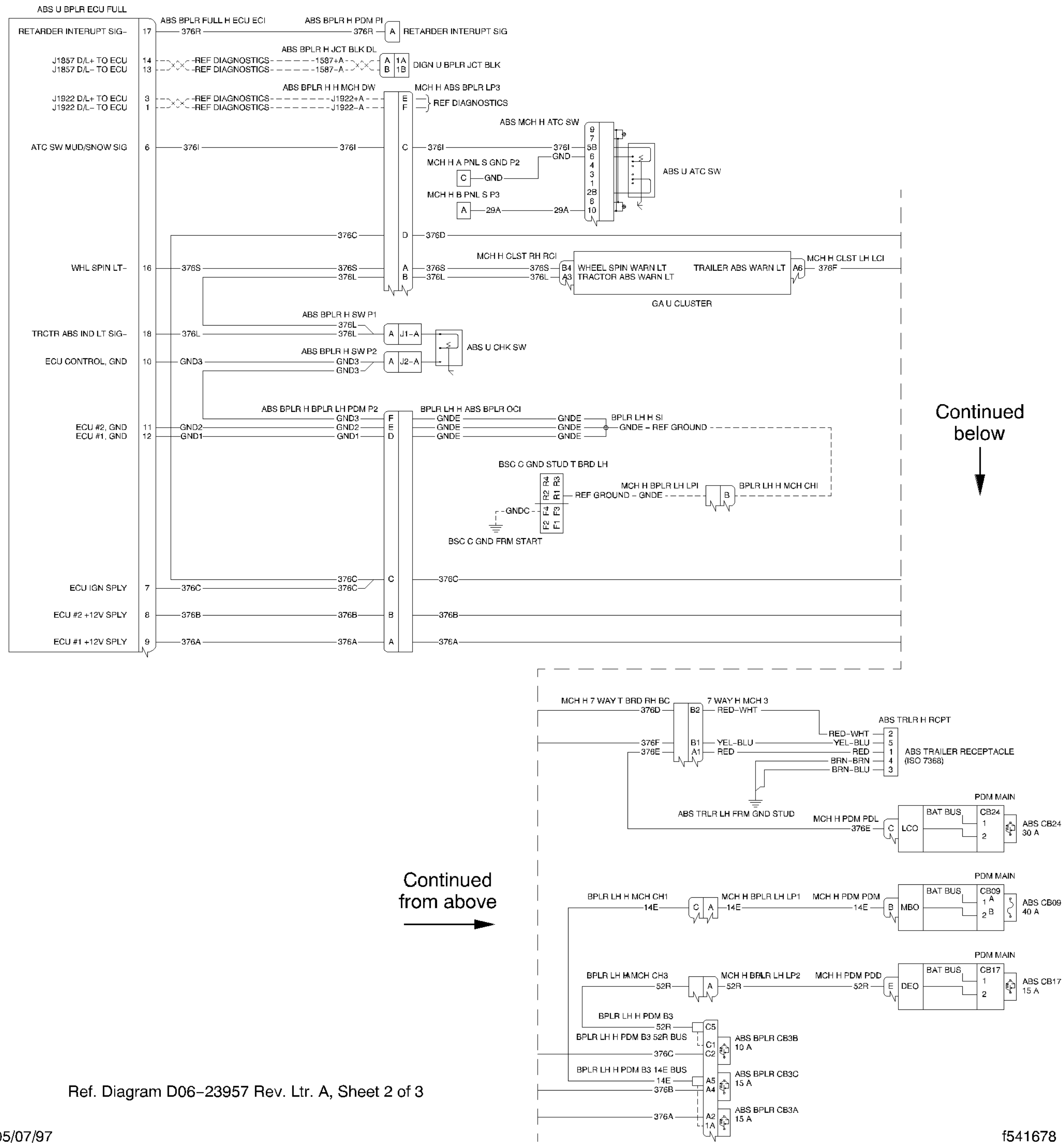


1 G nd T nal
2 l n d

30 AB M d la al

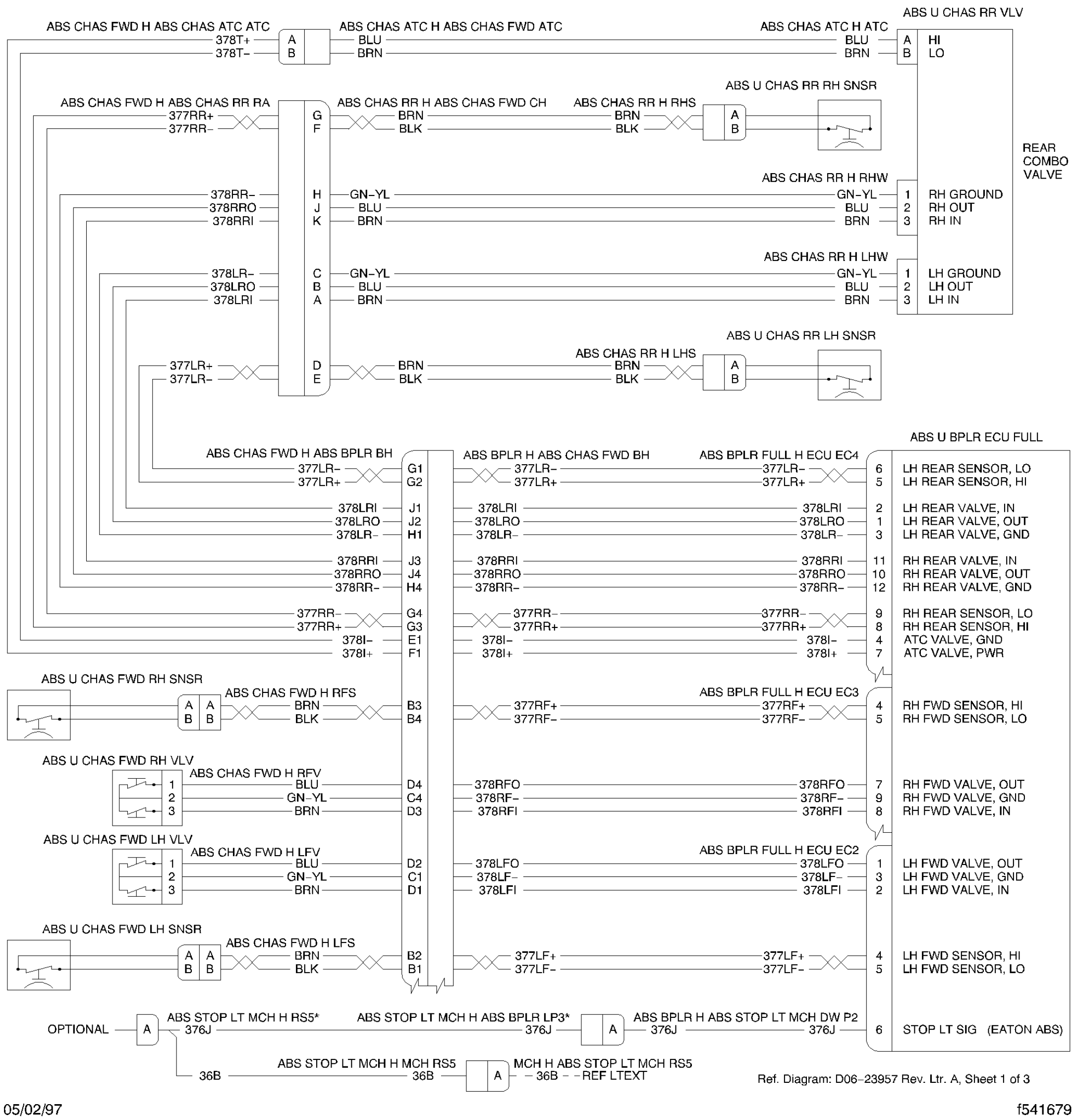
b. If the resistance is greater than 8.0 ohms, clean the electrical contacts in the solenoid. Check the resistance again.

c. To check the cable and the A S valve as one unit, measure the resistance across the pins on the ECU connector of the harness. Check the wiring diagrams of the system you are testing. See **31 32 33** and **3** .

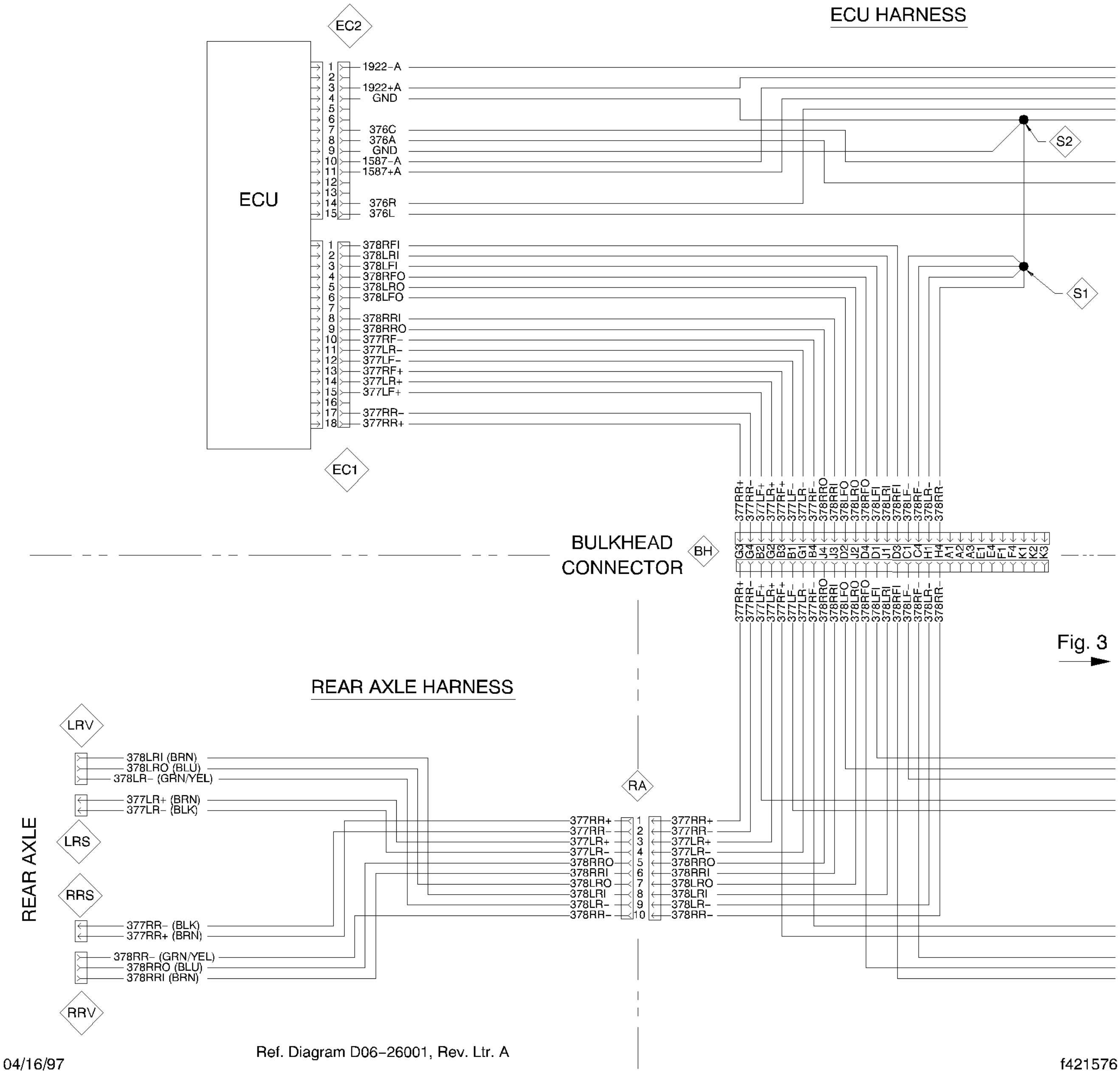


05/07/97 f541678

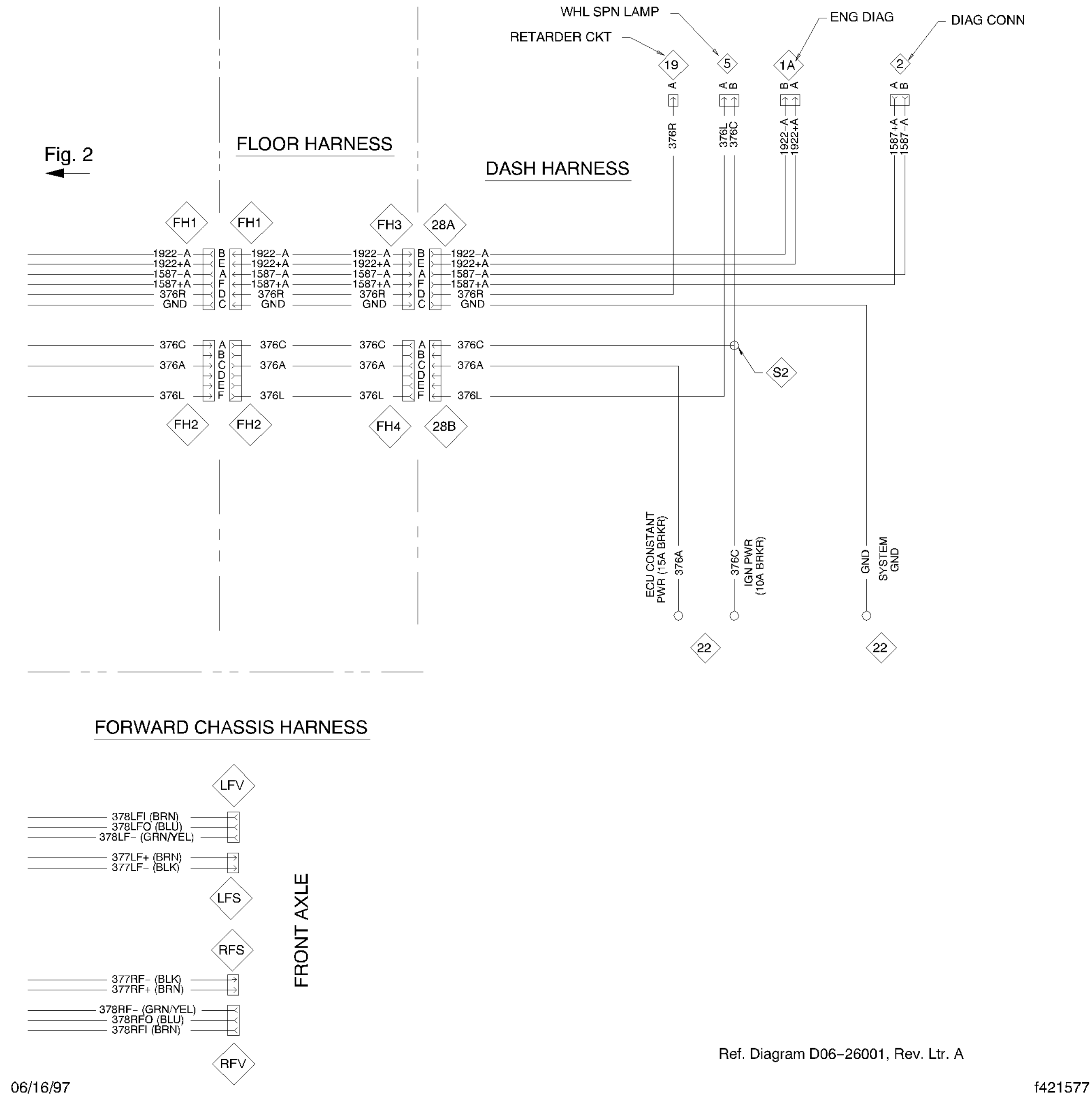
31 W n a a and n l W n



32 W n a a n and al W n



33 W n a a Ba c WAB W n (a al)



3 W n a a Ba c WAB W n (a al)

SECTION IV. DDEC II TROUBLESHOOTING

TABLE OF CONTENTS

NOTE

If your vehicle Is equipped with a DDEC III Engine refer to Section IV.1 (page 3-345.0).

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

Section 1
HOW TO USE THIS BOOK

1. Sections 2 (Basic Knowledge Required) and 3 (Testing the DDEC II System) should be read and understood completely.

2. If basic mechanical checks have been made, no trouble was found, and the problem is now believed to be in the DDEC II System, turn to Section 4- Troubleshooting Charts. Always start with the first Chart (labelled START) on Page 3-121. If a Diagnostic Data Reader (DDR) is not available, the chart labelled CEL (Check Engine Light) can be used.

3. Use the charts to pinpoint the problem and perform repairs. The charts are in a three-column format. The first column lists the test steps to perform and in what sequence to perform them. The second column gives the list of possible results you may obtain, based on the steps performed. The third column indicates what to do next, based on your result.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-9 Check ECM Connectors		
● Turn ignition off. ● Disconnect all connectors at the ECM. ● Check terminals at all ECM connectors (both the ECM and harness side) for damage, corrosion and unseated pins or sockets.	Terminals and connectors are okay. →	Replace ECM. Then go to C2-30.
	Problem found. →	Repair terminals/connectors. Then go to C2-30.

4. The charts will always instruct you to clear the codes after all repair work is done, and confirm the repair (typically by running the engine and checking if the codes and/or symptoms have returned).

5. Assistance may be required during performance of certain tasks.

Section 2
BASIC KNOWLEDGE REQUIRED

Before using this manual, there are some areas that you should be familiar with. With this basic knowledge, you will have success using the diagnostic charts.

A. ELECTRICAL CIRCUITS

- You should understand the theory of electricity and know the meaning of voltage and ohms. You should understand what happens in a circuit and an open or shorted wire. You should be able to read and understand a wiring diagram.

- You should be able to use jumper wires to make circuit checks.

B. USE OF DIGITAL VOLT-OHM METER

. You should be familiar with the digital volt-ohm meter. You should be able to measure voltage and resistance. You should be familiar with the controls of the meter and how to use it correctly.

Instructions for use of a typical digital volt-ohm meter are as follows:

<u>Resistance Measurements</u>

1. Connect the red test lead to the V-Ω (Volt-Ohm) input connector and the black lead to the com input connector on the meter.

2. Set the function/range switch to the desired Ω position. If the magnitude of the resistance is not known, set the switch to the highest range, then reduce until a satisfactory reading is obtained.

3. If the resistance being measured is connected to a circuit, turn off the power to the circuit being tested (turn off ignition).

4. Connect the test leads to the circuit being measured. When measuring high resistance, be careful not to contact adjacent points, even if they are insulated. Some insulators have a relatively low insulation resistance which can affect the resulting measurement.

5. Read the resistance value on the digital display.

<u>Continuity Checks</u>

In addition to measuring the specific resistance value of a circuit, some meters will also tell if a continuous electrical path exists. If a path exists, the circuit is said to have "continuity" (This continuity check can be used in any section of the DDECII Troubleshooting Guide where the test is looking for greater than, less than or equal to 5 ohms.)
An open circuit (broken electrical path) would have-resistance and would not have continuity. To utilize this continuity feature of certain meters:

1. Place the function/range switch in any Ω range.

2. Connect the red lead to the V-Ω connector and the black lead to the com connector on the meter. With the test leads separated or measuring an out-of-range resistance, the digital display will indicate "OLD' (overlimit; some meters show "1+", "↑", or simply "1")

Section 2
BASIC KNOWLEDGE REQUIRED (Cent'd.)

3. Put one test lead probe at one end of the wire or circuit to be tested. Use the other test lead to trace the circuit. When continuity is established, an ⌒ symbol will appear in the upper left corner of the digital display. If contact in the wire is maintained long enough (about 1/4 of a second), the OL will disappear and the resistance value of the wire or circuit will appear next to the symbol.

4 If your VOM does not work in the manner described above, you must know how your VOM operates in order to use this troubleshooting guide.

<u>Voltage Measurements</u>

1. Connect the red test lead to the V- ⌒ input connector and the black lead to the com input on the meter. If a DC-AC switch is present, make sure it is switched to the DC position.

2. Set the function/range switch to the desired volts position. If the magnitude of the voltage is not known, set the switch to a range which will be able to read most voltages seen on a vehicle. (Typically, a 20V range will do.) Then reduce the range until a satisfactory reading is obtained.

3. Connect the test leads to the circuit being measured. In the DDEC II diagnostic procedures, voltage measurements are always given as being taken at pins. sockets, Battery + or ground. Following the voltage measurement point, the color test lead to be used is given in parenthesis (red is the V- ⌒ connection, and black is the com connection).

C. IMPORTANT INFORMATION

The following items must be read and thoroughly understood before using this manual.

1. The engine and ignition should always be off before the harness connectors are disconnected or reconnected.

2 When disconnecting harness connectors, be sure that the pulling force is applied to the connectors themselves and not the wires extending from them.

3. After harness connectors are reconnected to the DDEC II system, the computer diagnostics should be ignored and cleared.

Section 2

BASIC KNOWLEDGE REQUIRED (Cont'd.)

D. EXPLANATION OF ABBREVIATIONS/TERMS

AID Analog to Digital: The computer inside the ECM uses an A/D converter is convert a sensor voltage into a number which the computer can work with.

BAT - Battery

BOI - Beginning of injection: The number of crank angle degrees. before TOP Dead Center. that the ECM is requesting the injectors be turned on.

CCM - Crankcase Monitor Sensor: Monitors Crankcase Pressure.

CEL - "Check Engine Light: typically mounted on the instrument panel. It has two functions:

- It is used as a warning lamp to tell the driver that a problem has occurred and that the vehicle should be taken in for service as soon as possible.

- it is used by the technician to read out "trouble codes" to help diagnose System problems.

As a light bulb check and system check the "Check Engine"' light will come on for about 5 seconds when the ignition IS turned "ON". If the CEL remains on. the self-diagnostic system has detected a problem. If the problem goes away the light will go out. but a trouble code will be stored in the ECM.

CKT - Circuit

CLS - Coolant Level Sensor: Monitors coolant level at the radiator tank top

CP - Crank Position: An ECM output generated anytime an SRS signal occurs (at the first cylinder)

COM - Common

CTS - Coolant Temperature Sensor: Can be used in place of the Oil Temperature Sensor for measuring engine . temperature (assuming DDEC II has been set-up for the CTS).

DDEC II - 2nd generation Detroit Diesel Electronic Controls

DDL - Diagnostic Data Link: The lines (wires) over which the ECM communicates information can be read by a Diagnostic Data Reader.

DDR - Diagnostic Data Reader: The hand-held tool for use in troubleshooting DDEC PRO-LINK.

DL+ - Data Link, positive side. Used for communications to the Diagnostic Data Reader, as well as other applications.

DL - Data Link, negative side.

DL2+ - Proprietary Data Link. positive side. It's main function is for dual engine applications where two ECM'S must talk to each other.

DL2- - Proprietary Data Link, negative side.

DREQ - Diagnostic Request Terminal: The pin on the DDL connector which must be grounded to obtain diagnostic codes (pin M).

ECM - Electronic Control Module The brains of DDEC II It reads the DDEC II sensors and switches. calculates injector flrmg times and duration (using a built-in computer). and fires the injectors at the appropriate times.

EEPROM - Electrically Erasable Programmable Read Only Memory. Contains the en gine calibration.

EFPA	- Electronic Foot Pedal Assembly: Contains the Throttle Position Sensor.
EUI	- Electronic Unit Injector: Replaces the Mechanical Unit Injector (MUI).
FPS	- Fuel Pressure Sensor: Monitors Fuel Pressure at the Fuel Spill.
FTS	- Fuel Temperature Sensor: Monitors fuel temperature at the output of the secondary filter.
GND	- Ground: Battery -
INJ	- Injector (fuel)
N/A	- Not available at this time.
OPS	- Oil Pressure Sensor: Monitors oil pressure at the main oil gallery.
OTS	- Oil Temperature Sensor: Monitors oil temperature in the turbo oil supply line
PC	- Power Control Switch
PGC	- Pressure Governor Control: Regulates engine speed to maintain a selected external pressure.
PW	- Pulsewidth: The amount of time in crank degrees that the ECM is requesting the injectors be turned on.
SEL	- "Stop Engine" Light: Typically mounted on the instrument panel. Its main function is to turn on and warn the driver when a potential engine damaging condition has been detected (low oil pressure. low coolant, or engine overtemperature). As a light bulb check & system check. the "Stop Engine"' light will come on for about 5 seconds when the Ignition turns on.
SRS	- Synchronous Reference Sensor: Detects when the first cylinder in the firing order is about to be fired.
TBS	- Turbo Boost Sensor: Used to monitor turbo boost pressure This sensor generates a voltage (from 0 to 5 volts) which is proportional to pressure.
TO	- Tachometer Driver: One of two outputs of the ECM for electronic tachometers and/or data loggers.
TPS	- Throttle Position Sensor: Used to detect throttle request.
TRS	Timing Reference Sensor: Detects whenever any cylinder is about to be fired.
TSG	- Two Speed Governor Switch Detects when the vehicle is in top gear.
VIN	- Vehicle Identification Number
VSS	- Vehicle Speed Sensor: Used to detect vehicle (road) speed.
VSS OC	Vehicle Speed Sensor. Open Collector: An ECM input which must be used in addition to the VSS positive Input when certain types of vehicle speed sensors are used. (Refer to the application manual for a particular installation.)

E. GENERAL DIAGNOSTIC INFORMATION

When the Diagnostic Request terminal (pin M on the DDL connector) is grounded to pin A on the DDL connector, the diagnostic system will flash the yellow "Check Engine" light located in the cab. (More information on retrieving codes is given in Section 3C.) The light will be flashing a diagnostic code indicating the problem area.

As a bulb and system check. the "Check Engine" and "'Stop Engine" lights will come on for 5 seconds when the ignition switch is first turned "on". The Cruise Active light will also turn on for 5 seconds if a DDEC cruise control is present. If the Diagnostic Request terminal (DREQ) is then grounded, the "Check Engine"' light will flash a Code 25 which indicates the self-diagnostic system is working and that no faults have been detected. A Code 25 consists of two flashes followed by a short pause. then five flashes in quick succession. After a longer pause, the code will repeat.

If the "Check Engine" light remains on, the self-diagnostic system has detected a fault. If the Diagnostic Request terminal is then grounded and the engine is not running. the trouble code will be flashed. Diagnostic codes will flash in numerical order (i.e., lowest number code first). The diagnostic code series will repeat as long as the diagnostic request terminal is grounded.

A diagnostic code indicates a problem in a given circuit (i.e., diagnostic Code 14 indicates a problem in the oil or coolant temperature sensor circuit. This includes the oil or coolant temperature sensor, connector, harness and Electronic Control Module (ECM)). The procedure for finding the problem can be found in Diagnosis Chart Code 14. Similar charts are provided for each code. Remember, diagnosis should always begin at the starting chart (START). For an oil or coolant temperature sensor problem, it will quickly lead you to Chart 14-but first gets you to verify the code/symptom.

Since the self-diagnostics do not detect all possible faults, the absence of a code does not mean there are no problems in the system. If the DDEC II problem is suspected, even in the absence of a code, go to START anyway. This chart can lead you to other charts which can aid in the troubleshooting process-where DDEC II problems may occur but do not generate a code. Basic mechanical checks, however, are not covered in this guide.

F. USING THE MPSI READER

Plug the DDR into the 12 pin DDL connector.

Turn the ignition key to the "ON" position.

The reader will display the first 4 lines on the ECM Data. See area "A". There are 54 lines of ECM Data.

You can scroll through the data one line at a time using the up or down arrow keys. You can also scroll through the data 4 lines at a time using the left or right arrow keys.

A line of data can be frozen on the screen by touching key numbers 1-4. Touching number 2 freezes data on line 2 of the reader display. Touching the 2 again will unfreeze the data on line 2. If all 4 lines of data have been frozen, touching the O key will unfreeze them.

The "FUNC" key allows the operator to move between ECM Data (menu "A") and the function area (area "8"). It also allows movement from menu "C" to area "B".

The enter key is used to make a selection, confirm an answer, or instruct the DDR to continue to the next step.

A push button is located on the left side of the DDR. It is used to manually cut out individual cylinders when operating in the cylinder cutout mode.

TO PERFORM ENGINE FUNCTIONS

Plug the DDR into the 12 pin DDL connector.

Turn the ignition key to the on position and allow the DDR to warm up.

Touch the "FUNC" key. You should now be in area "B" and the brackets should be around "ENGINE".

Touch the "ENTER" key. This allows access to the features and data under the Engine Menu of area "C". Use the up or down arrow keys to scroll through the Engine Menu.

When you find the feature you want, touch enter and follow the instructions on the screen or use the up or down arrow keys to scroll through the information on the screen.

If you wish to exit the Engine Menu touch the "FUNC" key. You should now be back in area "B". To get back into ECM Data touch the "FUNC" key once more.

MPSI READER MENU SELECTIONS

ECM DATA

"A"

01 Active Codes (Yes/No)
02 Historical Codes (Yes/No)
04 Engine RPM
05 ECM Input Voltage
06 % Engine Load
07 Throttle Sensor
08 Pulsewidth
09 BOI
12 Coolant Level
13 Coolant Temp
14 Fuel Pressure
15 Fuel Temp
16 Oil Level
17 Oil Pressure
18 Oil Temp
19 Turbo Boost/Baro
20 Idle Speed
21 PTO Counts
22 PTO RPM
24 Spd Sensor Diag
25 Vehicle Speed
26 Act Driver 1%
27 Act Driver 2%
28 Act Driver 3%
29 Mist Switches
30 Mist Outputs
31 Mist Status
37 #of EEPROM Chgs
48 External Pump PSI
49 Air Inlet Rest.

ENGINE ← "B" → PRO-LINK

"C"

DIAGNOSTIC CODES

01 Active Codes
20 Hist Codes
40 Code Erase
Code Options

03 PROM ID
10 INJ. RESPONSE TIMES
11 CYL. CUTOUT REQUEST
MID MSGS BEING RECVD.
34 VAR CHAR REQUEST

ENGINE TRIP DATA

35 Fuel GPH
35 Total Gallons
38 Engine Hours
39 PTO Hours
43 Instantaneous MPG
44 Average Trip MPG
45 Trip Miles
46 Trip Gallons
37 REPROGRAM EEPROM
Reprogram EEPROM
Change Password

41 SPECIAL TESTS

CUSTOM DATA LIST

Display Standard
Display Custom
Edit Custom
Reset Custom

CONTRAST ADJUST

ENGLISH/METRIC

SNAPSHOT

RESTART

—-

Section 3
TESTING THE DDEC II SYSTEM

A. TOOLS NEEDED TO DIAGNOSE THE SYSTEM

The following tools and equipment are required to properly diagnose a complete system:

- Voltmeter and Ohmmeter: Use a digital volt-ohmmeter J-34029 or equivalent to measure voltage and resistance where required. A digital volt-meter must be used when specified in a procedure.
- Test Light 6V: Must be used when specified in the procedure.
- Jumper Wires: To bypass a circuit and to insert between special connectors. This will permit access to the connector terminals for circuit checking.
- Diagnostic Data Reader (DDR): PRO-LINK 9000 J 38500-203

In addition, the tools listed below can be of aid in properly identifying problems, but are not required for this Troubleshooting Guide:

- Tachometer: Either a crankshaft harmonic balance revolution pickup type or electronic coil trigger signal pickup type tachometer can be used for diagnosis.
- Pressure Gauge: To monitor turbo boost pressure (for purposes of comparison with the DDEC II Turbo Boost Sensor).

B READING THE DIAGNOSTIC CODES

NOTE: If you have turned here to begin diagnosis of a problem and already know how to read codes, as well as understand active and historical codes, turn to the first chart (labelled START) on page 17.

1. Active vs. Historical Codes:

DDEC II makes use of both types of codes As their names imply, the difference between the two are as follows:

a. Active Codes - These are the codes which are currently keeping the “Check Engine” light on. They can only be read using the Diagnostic Data Reader.

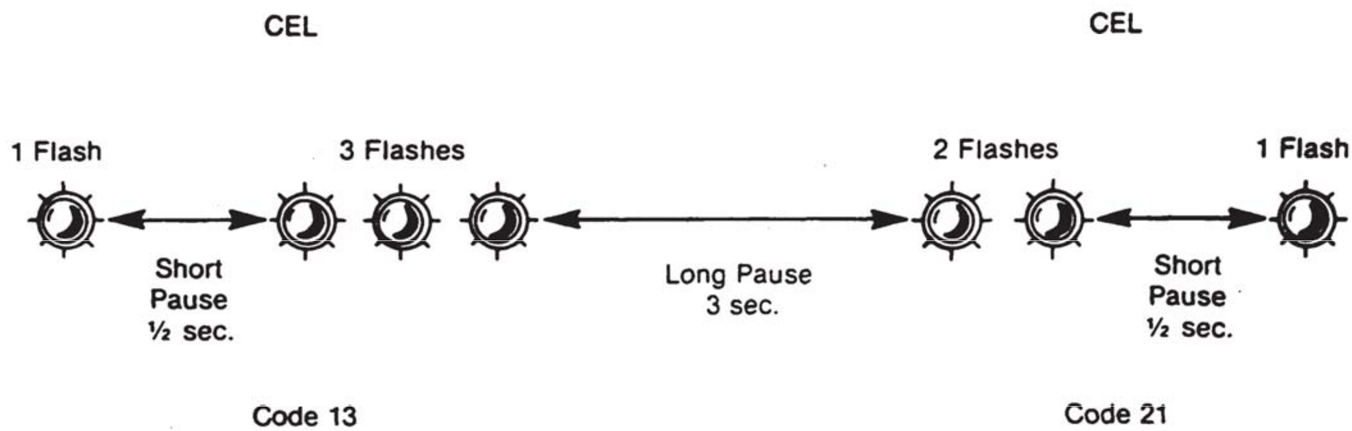
b. Historical Codes - These are all the codes logged in the ECM (whether or not they are currently turning on the “’Check Engine” light). These codes can be cleared by using the Diagnostic Data Reader.

Codes 22, 43-45 and 85 will show additional information. Refer to Code 85 for a discussion of this.

2. Using the "Check Engine" Light (CEL)

This Troubleshooting Guide is intended to be used with a Diagnostic Data Reader. In certain instances, only the Reader can provide the information necessary for quick diagnosis of the problem. Should you just need to read out codes, however, and not have a Reader available. the following procedure will let you read out codes on the CEL:

a. Turn ignition off.
b. Jumper pin A to pin M on the 12 pin, DDL connector (typically located in the cab).
c. Turn ignition on and observe the codes flashing out on the CEL. Example: Code 13 and 21.



This will continue as long as the pins are jumpered with the ignition on.

3. Using the PRO-LINK 9000

Proper use of this reader is described In the Instruction manual supplied. This device is infinitely more useful in reading fault codes and diagnosing engine electronic faults than the Check Engine Light code process.

C. CLEARING CODES

This can only be done using the Diagnostic Data Reader (DDR). Refer to Mode 40 of the DDR Instruction Manual for details.

Note that removing the battery cables will not cl ear codes.

D. EEPROM REPROGRAMMING

The Dlagnostlc Data Reader is equipped with capabilities to reprogram part of the engine calibration in the ECM. Specifically. the following calibration changes can be made using the DDR:

1. Change DDR. EEPROM password
2. Add/Delete 5 minute idle shutdown
3. Change droop
4. Set the initial speed if cruise control switches are used as a power take-off option
5. Set PTO droop
6. Enable/Disable cruise control
7. Add/Delete a vehicle speed sensor
8. Change road speed limit
9 Change cruise control speed limit
10. Add/Delete engine shutdown feature

D. EEPROM REPROGRAMMING (CONT'D.)

With the release of PRO-LINK 9000 Cartridge Model 203, new reprogramming features are available. The calibration changes that can be made with this cartridge include all of those listed above plus the following enhancements and additions:

1. Set idle shutdown timer to any whole number value between 3 and 100 minutes
2. Enable/Disable idle shutdown on PTO governor.
3. Enable/Disable shutdown override feature.
4. Enable/Disable cruise switch PTO.
5. Set maximum as well as minimum PTO speed.
6. Enable/Disable idle shutdown. throttle inhibit. and auxiliary power control

For more information on how to change these features. refer to the DDR Instruction Manual.

E. CONNECTOR CHECKOUT

All system connections are environmentally protected. These new connectors protect the terminations from the harsh corrosive engine compartment environment, This is important since most system signals are low voltage and corrosion could make them inoperative.

Before repairing or replacing any system component (i.e. harness. sensor. ECM etc.) as indicated by the diagnostic charts. you should

1. Disconnect the appropriate connector(s) associated with the suspected defective component and check for bent, broken. or dirty terminals or mating tabs. Clean. straighten. or replace as required

2. If a problem was found. reconnect all connectors previously disconnected then recheck the system to see if the problem has been corrected

NOTE: Don-t probe the back of a connector or pierce the DDEC II wrong for purposes of taking measurements. This can cause intermfttent faults or system failures and may affect the DDEC II warranty

Section 4
TROUBLESHOOTING CHARTS

A. THE DIAGNOSTIC PROCEDURE • WHERE TO START

When diagnosing the cause for engine performance. fuel economy or exhaust system complaints, perform normal checks (non DDEC II equipped engine) before considering DDEC II as the possible source of the problem.

When diagnosing the system, always start with the first chart (labelled “START”) on Page 3-121. This will utimately lead to other diagnostic charts, even in the cases where no codes were logged but a symptom(s) was noted. In fact, if no codes were recorded (but a symptom remains), the “START” chart will refer you to the “Customer Complaint” Chart 1, which can identify fault trees to use based on the customer complaint.

NOTICE: Although there are many charts connected with diagnostics. only one is needed to determine that the system is operating properly. Normally, only two charts are necessary to find a problem.

B. DIAGNOSTIC CODES • WHAT THEY MEAN

The following pages give a brief description of each diagnostic code. Basic facts about these codes are given below:

- Most problems must occur for a total of at least two (2) seconds before the “Check Engine” light comes on and a code is stored.
- If a problem goes away, the “Check Engine” light will turn off. But the code will remain stored in the ECM
- Code 25 means no codes were stored at all.

Code 13 Coolant Level Sensor (CLS) - System running for 2 seconds with too low a voltage at the ECM input. Battery voltage at the ECM must also be greater than 11 volts.

Code 14 Oil or Coolant Temperature Sensor (OTS or CTS) - Engine running for 8 minutes with too high a voltage at the OTS or CTS input to the ECM.

Code 15 Oil or Coolant Temperature Sensor (OTS or CTS). Engine running for 2 seconds with too low a voltage at the OTS or CTS input to the ECM.

Code 16 Coolant Level Sensor (CLS) - System running for 2 seconds with too high a voltage at the ECM input. Battery voltage at the ECM must also be greater than 11 volts.

Code 21 Throttle Position Sensor (TPS) - System running for 2 seconds with too high a voltage at the TPS input to the ECM.

Code 22 Throttle Position Sensor (TPS) - System running for 2 seconds with too low a voltage at the TPS input to the ECM.

Code 23 Fuel Temperature Sensor (FTS) - Engine running for 8 minutes with too high a voltage at the FTS input to the ECM.

Code 24 Fuel Temperature Sensor (FTS) - Engine running for 2 seconds with too low a voltage at the FTS input to the ECM.

Code 25 No Codes - No faults have been detected by DDEC-II since the last time the codes were cleared

Code 31 Fault on auxiliary output: one of the following faults has been detected for more than 2 seconds:

- Open in "Check Engine" of "Stop Engine" Light circuit. or
- Short to ground in "Check Engine". "Stop Engine". Light circuits or in the Crank Position, Engine Brake or one of three auxiliary drive (labelled PWM or AUX) circuits. Battery voltage at the ECM must also be greater than 8 volts.

Code 32 ECM Failure - The backup system inside the ECM has failed

Code 33 Turbo Boost Sensor (TBS) - Engine running (at less than 800 RPM or less than 30% of maximum torque) for 5 seconds with too high a voltage at the TBS input to the ECM

Code 34 Turbo Boost Sensor (TBS) - Engine running for 2 seconds with too low a voltage at the TBS input to the ECM.

Code 35 Oil Pressure Sensor (OPS) - Engine running for 2 seconds at less than 800 RPM with too high a voltage at the OPS input to the ECM. Oil or coolant temperature must be greater than 50 degrees C to log This code.

Code 36 Oil Pressure Sensor (OPS) - Engine running for 2 seconds with too low a voltage at the OPS input to the ECM.

Code 37 Fuel Pressure Sensor (FPS) - Engine running for 2 seconds with too high a voltage at the FPS input to the ECM.

Code 38 Fuel Pressure Sensor (FPS) - Engine running for 2 seconds with too low a voltage at the FPS input to the ECM.

Code 43 Low Coolant - System running with low coolant for 7 seconds. Battery voltage at the ECM must also be greater than 11 volts. This fault will cause both the “Stop Engine and “Check Engine” lights to turn on.

Code 44 Oil or Coolant Over Temperature - System running for 2 seconds with the oil or coolant temperature greater than a calibrated limit. This fault will cause both the "Stop Engine" and "Check Engine" lights to turn on, and will power down (and eventually shutdown) the engine if the engine protection system is equipped with the shutdown feature. (NOTE: if the oil or coolant IS only slightly overtemperature. the following occurs: the “’Check Engine" light comes on after 2 seconds and a code is logged.

Code 45 Low Oil Pressure - Engine running with the oil pressure less than the limit (different limits at different RPM's) for 7 seconds. This fault will cause both the “Stop Engine" and "Check Engine" lights to turn on.

Code 46 Low Battery Voltage - Engine running with low battery voltage (less than 10,0 volts) for more than 30 seconds.

Code 47 High Fuel Pressure - Engine running with high fuel pressure for more than 30 seconds.

Code 48 Low Fuel Pressure - Engine running with low fuel pressure for more than 30 seconds The fuel pressure low limit value varies with engine RPM.

Code 51 EEPROM Error -An error has been detected in the EEPROM (Electrically Erasable. Programmable, Read Only Memory) inside the ECM.

Code 52 ECM Failure - The ECM was unable to correctly convert sensor voltages into numbers for computer usage.

Code 53 EEPROM Memory Failure -An error has been detected in the EEPROM inside the ECM which affects the logging of trouble codes

Code 54 Vehicle Speed Sensor (VSS) Failure - The DDEC-II system has detected a fault with the DDEC-II VSS. This fault may have been either a short. open or an inconsistency between the VSS speed reading. and an ECM calculated speed based on RPM and the injector pulsewidth.

Code 55 Proprietary Communication Link Failure - An error has occurred in the communication link used between two ECMS on a dual engine set-up.

Code 56 ECM Failure - The ECM was unable to correctly convert sensor voltages into numbers for computer usage.

Code 61, 62,63,64, 65.66.67.68- response time too long.
The response time of the injector was longer than the maximum limit or the injector never responded at all. Oil or coolant temperature must be greater than 30 degrees C and battery voltage must be between 11 volts and 16 volts to log this code. Also. the code is only logged at less than 2000 RPM.

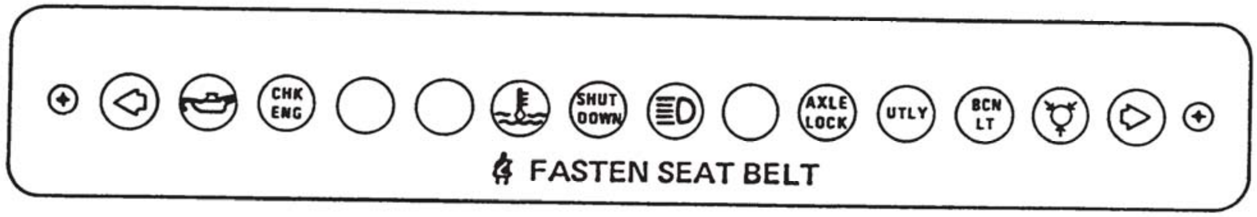
Codes 71 72, 73, 74.75.76.77.78- response time too short.
The response time of the injector was shorter than the minimum limit. Oil or coolant temperature must be greater than 30 degrees C and battery voltage must be between 11 volts and 16 volts to log this code. Also. the code is only logged at less than 2000 RPM.

Code 81 Crankcase Monitor Sensor (CCM) - Engine running for 2 seconds with too high a voltage at the CCM input to the ECM (149 Series Engine Only).

Code 82 Crankcase Monitor Sensor (CCM) - Engine running for 2 seconds with too low a voltage at the CCM input to the ECM (149 Series Engine Only).

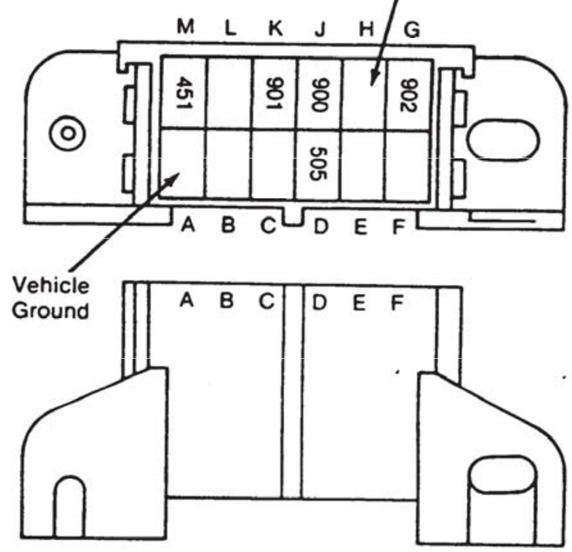
Code 84 Crankcase Monitor Tripped - This indicates the CCM has tripped due to high crankcase pressure (149 Series Engine Only).

Code 85 The engine has been operating over 2500 RPM for at least two seconds.



Dash Lights

Pro-Link 9000
(Printer is optional)



12 Pin DDL Connector P/N 12020043

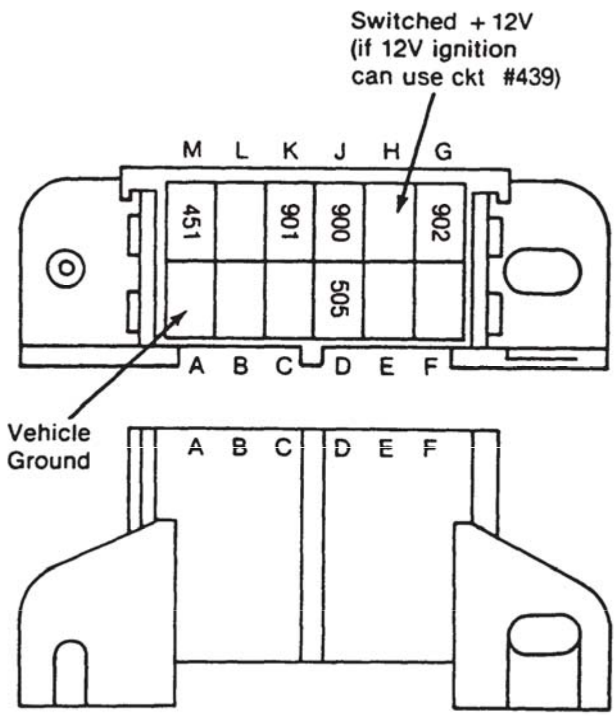
Section 4

TROUBLESHOOTING CHARTS

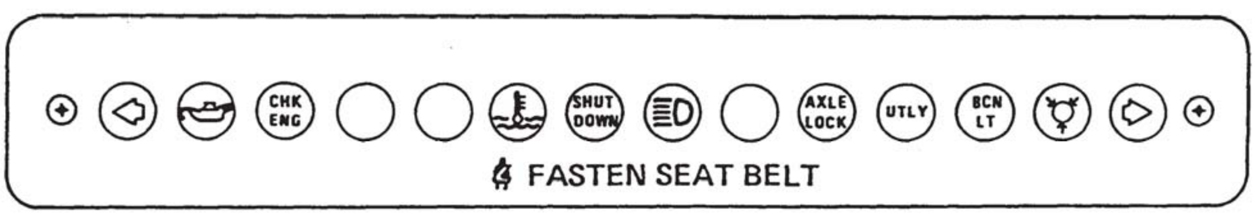
C. START • FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR

WARNING: The engine and ignition should always be off before connecting or disconnecting sensors or wiring harness. Failure to follow this warning could damage the ECM.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-1 Note "Check Engine" Light		
• Turn ignition on while at the same time observing the "Check Engine" light. • Be sure there is not a jumper wire between pins A and M of the DDL connector and any switch for flashing out codes should be in the off position.	Light comes on and stays on.	Go to START-2.
	Light comes on for up to 5 seconds, then goes out.	Go to START-3.
	Light is off.	Go to Chart 4, page 3-164.
	Erratic or intermittent light.	Go to START-7.
START-2 Read Active Codes Using DDR		
• Plug DDR into the 12 pin DDL connector. • Read active codes by selecting MODE 01 (ACTIVE CODES) on the DDR. • Read historical codes by selecting MODE 02 (HISTORICAL CODES) on the DDR. • Record ail active and historical codes.	Active codes (other than Code 25) on DDR.	Follow appropriate diagnostic charts for code(s) received. (See Index on page 3-101).
	Active Code 25 and historical Code 51 (other codes may be present).	Go to Code 51, page 3-311.
	Active Code 25 only.	Go to Chart 5, page 3-169.
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".	Go to START-6.
	DDR display is blank or random.	Go to START-9.



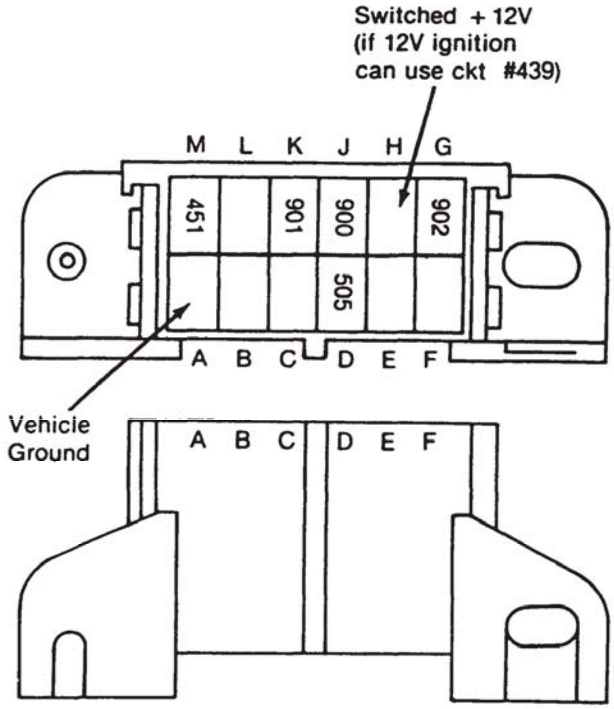
12 Pin DDL Connector P/N 12020043



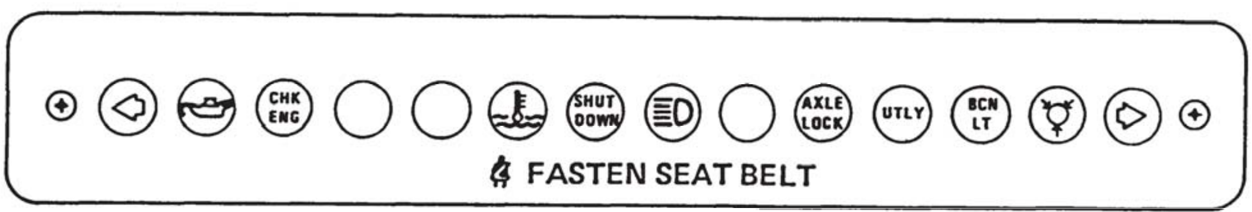
Dash Lights

C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-3 Read All Codes Using DDR		
• Plug DDR into the 12 pin DDL connector. • Read all historical codes by selecting MODE 02 (HISTORICAL CODES) on the DDR.	Codes 14,23 or 85.	Follow appropriate diagnostic charts for code(s) received. (See Index on page 3-101.)
	Any codes except 14, 23, 25, 58 or 85.	Go to START-4.
	Code 25 only.	Go to Chart 1, page 3-136.
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".	Go to Chart 7, page 3-177.
	DDR display is blank or random.	Go to START-9.
START-4 Attempt to Make Codes Active		
• clear codes by selecting MODE 40 (CODE ERASE) on the DDR. • Attempt to start and run the engine. • Try to get the "Check Engine" light on by: - warming up the engine - slowly changing the RPM from idle to no load speed. • Run engine for 1 minute or until "Check Engine" light comes on.	Engine will not start.	Go to Chart 2, page 3-141.
	"Check Engine" light is on.	Read Active Codes (MODE 01 on DDR) while light is on and follow appropriate diagnostic chart (See Index on page 3-101).
	"Check Engine" light is off or only flashes briefly.	Go to Start-5.



12 Pin DDL Connector P/N 12020043



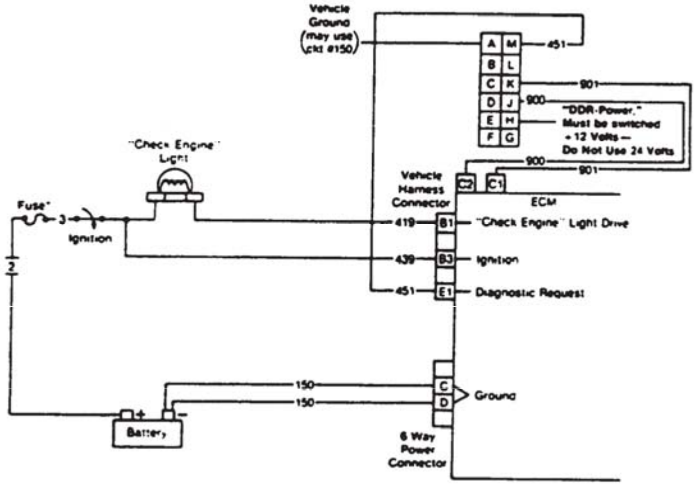
Dash Lights

Section 4

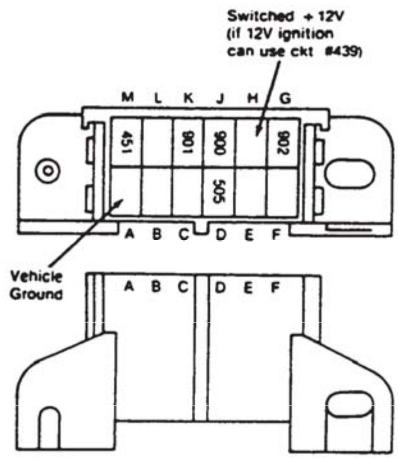
TROUBLESHOOTING CHARTS

C. START. FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

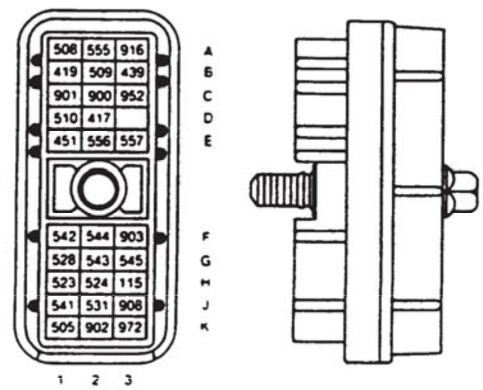
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-5 Read All Codes Again . Read historical codes (MODE 02) on DDR.	Codes 31, 51-56, 61-68 or 71-78.	Follow appropriate diagnostic charts for code(s) received. (See Index on page 3-101).
	Any other codes.	Go to Chart 1, page 3-136.
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".	Go to Chart 7, page 3-177.
	DDR display is blank or random.	Go to START-9.
START-6 Read Codes on the "Check Engine" Light • Unplug the DDR. • Short pin A to pin M on the 12 pin DDL connector. • Read codes flashing out on the "Check Engine" Light.	Flashes out codes.	To diagnose codes, go to CEL-3 (page 3-131). To service DDR system, go to C7-4 (page 3-177).
	Does not flash out codes.	Go to Chart 6, page 3-173.
START-7 Intermittent Check • Note whether flashing "Check Engine" Light is reading a valid code or if it's just erratic.	Flashing a valid code.	Go to START-8.
	Erratic or intermittent "Check Engine" light.	Go to Chart 1, page 3-136.



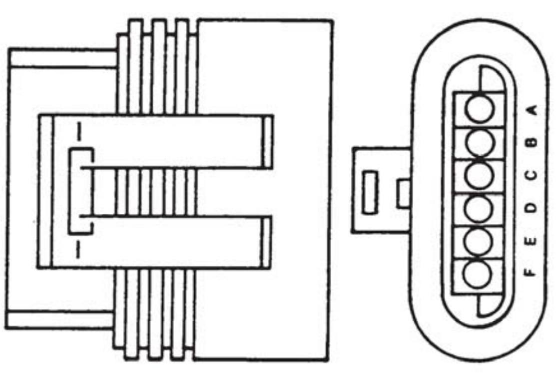
Check Engine, Diagnostic Request, and Ignition Circuits



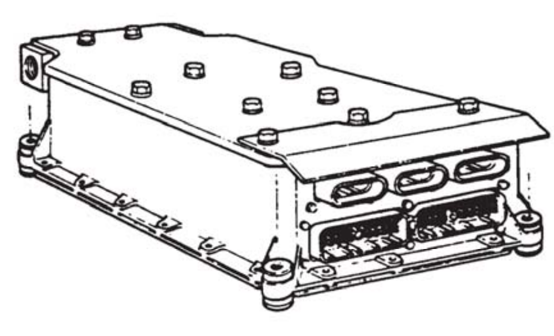
12 Pin DDL Connector P/N 12020043



ECM Vehicle Harness Connector
P/N 12034398



6-Way Power Harness Connector
P/N 12066317



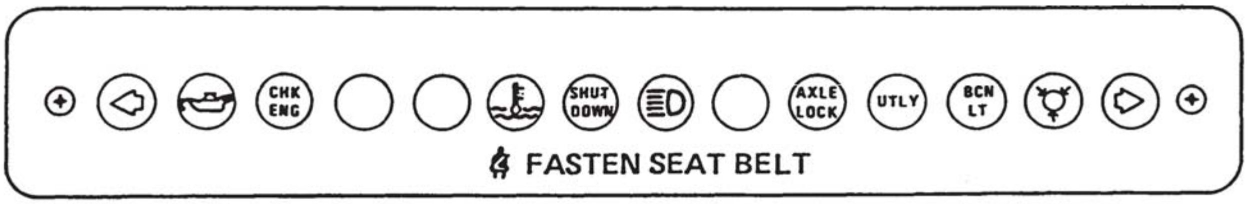
Electronic Control Module (ECM)

C. START- FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

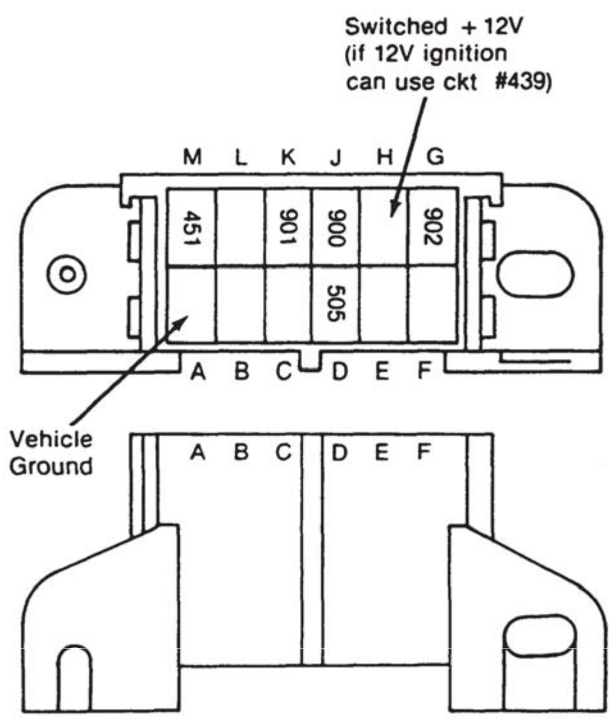
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-8 Check for Short • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between pins A and M of the 12 pin, DDL connector.	Less than or equal to 200 ohms.	The Diagnostic Request line (Ckt #451) is shorted to ground either ckt #150 or chassis ground). Contact Direct Support.
	Greater than 200 ohms or open.	Go to START-1O
START-9 Check for +12 Volts at DDL Connector • Turn ignition on. • Read voltage at the 12 pin DDL connector, from pin H to pin A.	Greater than or equal to 10.0 volts.	There is a problem with either the DDR or the data link lines. Go to C7-4 (page 3-179). (For diagnosis of DDEC-II without a DDR, go to CEL-1 on page 3-131).
	Less than 10.0 volts.	Either the switched +12 volt line (ckt #439 or other appropriate circuit) or the ground line is open to the 12 pin, DDL connector. Repair open. Then go to START-30.
START-10 Check ECM Connectors • Disconnect the 6-way power harness connector at the ECM. • Check terminals at the ECM 6-way power and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to START-30.
	Problem found.	Repair terminals/connectors. Then go to START-30.

C. START • FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on. • Observe the *'Check Engine" Light.	"Check Engine" Light comes on for up to 5 seconds, then goes out. →	Repairs are complete.
	"Check Engine" Light is flashing. →	All system diagnostics are complete. Please review this section from the first step to find the error.
	"Check Engine" Light comes on and stays on. →	Go to START-1 .



Dash Lights



12 Pin DDL Connector P/N 12020043

Section 4

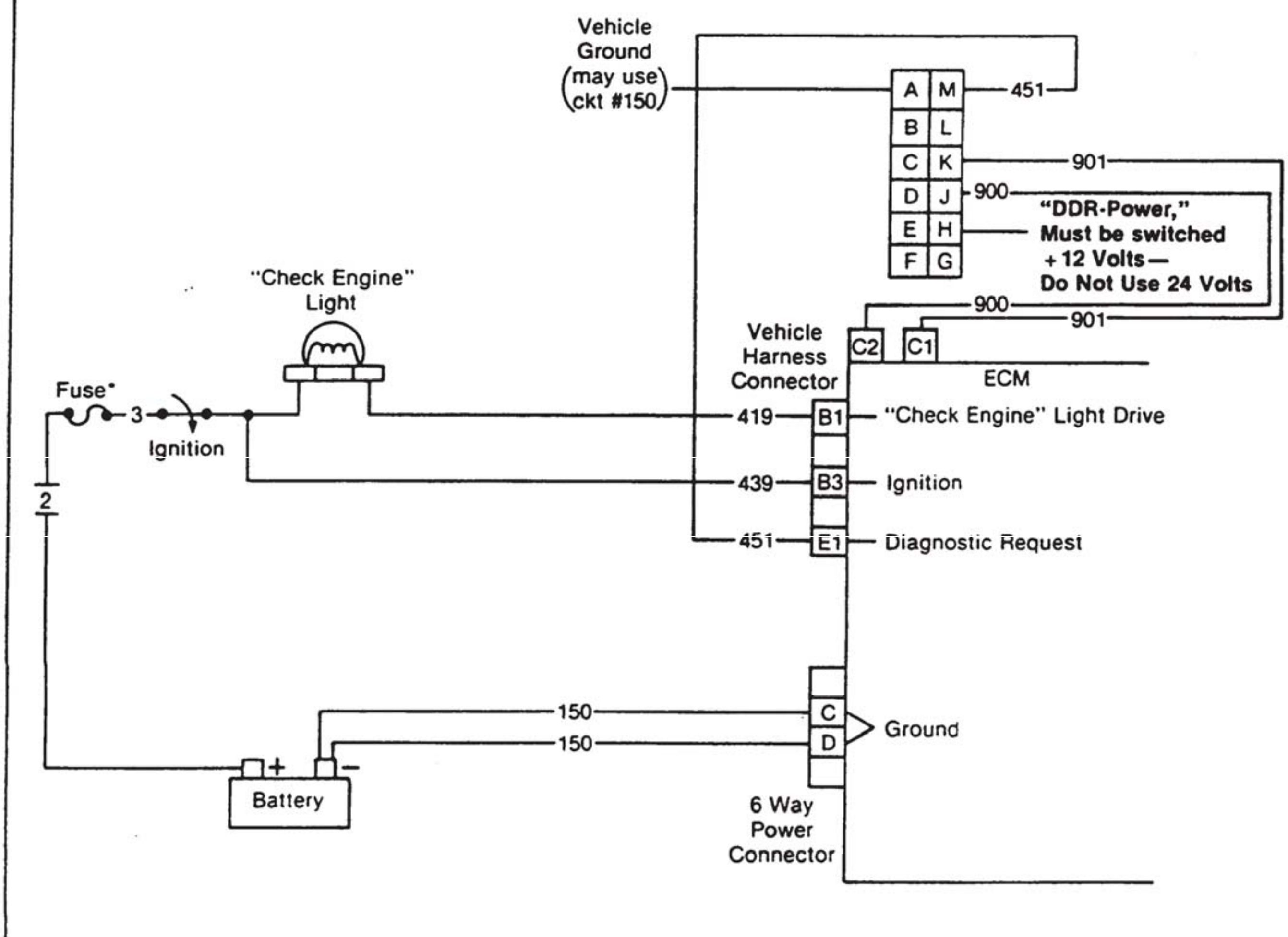
TROUBLESHOOTING CHARTS

C. CEL . FIRST CHART FOR DIAGNOSIS OF DDEC II WHEN NO DDR IS AVAILABLE

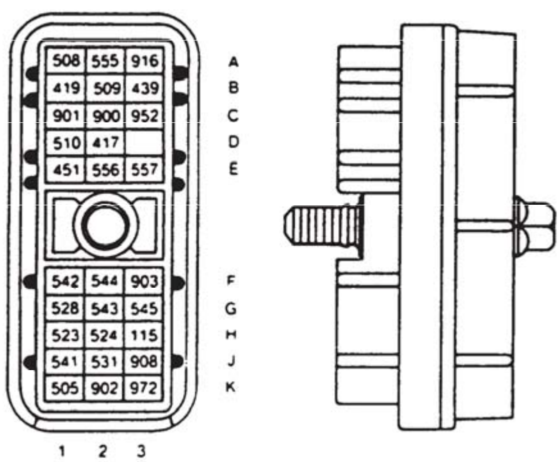
NOTE: Although this section will help you get started. later sections of the Troubleshooting Guide may require using a DDR

WARNING The engine and ignition should always be off before connecting or disconnecting sensors or wiring harness. Failure to follow this warning could damage the ECM.

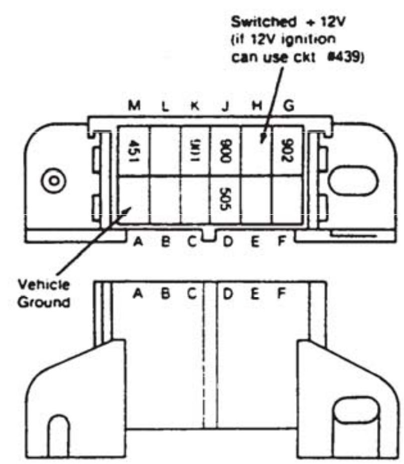
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-1 Note "Check Engine" Light l Turn ignition on while at the same time observing the "Check Engine" light.	Light comes on and stays on.	Go to CEL-2.
	Light comes on for up to 5 seconds, then goes out.	Go to CEL-2.
	Light is off.	Go to Chart 4, page 3-164.
	Flashing light.	Go to CEL-8.
CEL-2 Read Codes . Install a jumper wire between pins A and M of the 12 pin. DDL connector or use the switch for flashing out codes (if installed).	Flashes out codes.	Go to CEL-3.
	"Check Engine" light is always on but doesn't flash out codes.	Go to chart 6, page 3-173.
	"Check Engine" light never comes on.	Go to CEL-6.
CEL-3 Follow Codes ● Note and record code(s)	Code 14, 23, or 85.	Follow appropriate diagnostic charts for the code(s) received. (See Index on page 3-101).
	Any codes except 14, 23, 25 or 85.	Go to CEL-4.
	Code 25 only.	If drive complaint persists, go to Chart 1, page 3-136.



Check Engine, Diagnostic Request, and Ignition Circuits



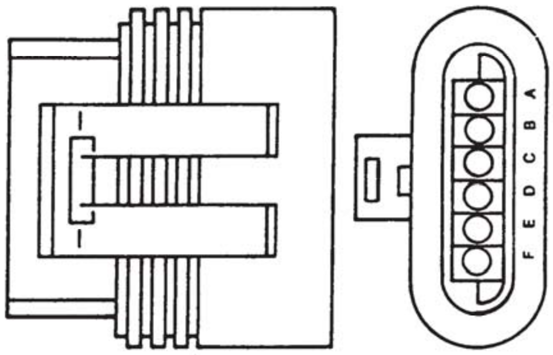
ECM Vehicle Harness Connector
P/N 12034398



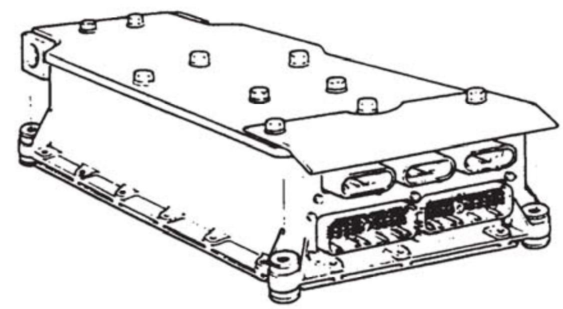
12 Pin DDL Connector P/N 12020043

C. CEL .FIRST CHART FOR DIAGNOSIS OF DDEC-II WHEN NO DDR IS AVAILABLE (Cont'd.)

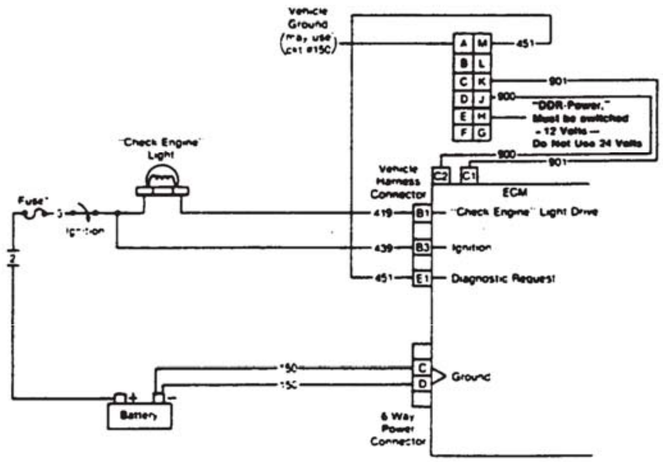
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-4 Verify Code(s) ● Remove jumper wire between pins A and M. ● Turn ignition on. ● Obtain a DDR. ● Clear codes. ● Turn ignition off, then back on. ● Note status of "Check Engine" light.	"Check Engine" light stays on.	Read codes (by installing jumper wire again) and follow appropriate diagnostic chart. (See Index on page 3-101).
	"Check Engine" light goes on for 5 seconds, then goes out.	Go to CEL-5.
	"Check Engine" light is erratic or intermittent.	Go to CEL-8.
CEL-5 Verify Code(s) with the Engine Running ● Attempt to start and run the engine. ● Try to get the "Check Engine" light on by: — warming up the engine — slowly changing the engine from idle to no load speed. ● Run engine until the "Check Engine" light comes on or for 1 minute.	Engine will not start.	Go to Chart 2, page 3-141.
	"Check Engine" light is off.	Previous codes should be regarded as intermittent. Go to Chart 1, page 3-136.
	"Check Engine" light is on.	Read codes (by installing jumper wire again) and follow appropriate diagnostic chart. (See Index on page 3-101).
CEL-6 Check for Open ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Install a jumper wire between sockets C1 and El of the vehicle harness connector. ● Read resistance between pins K and M of the 12 pin, DDL connector. ● Also read resistance between pin A of the DDL connector and a good ground.	Less than or equal to 5 ohms on both readings.	Go to CEL-7.
	Greater than 5 ohms or open on either reading.	An open exists either in the Diagnostic Request line (ckt #451) or in the DDL ground line (ckt #901). Repair open. Then go to CEL-30.



6-Way Power Harness Connector
P/N 12066317

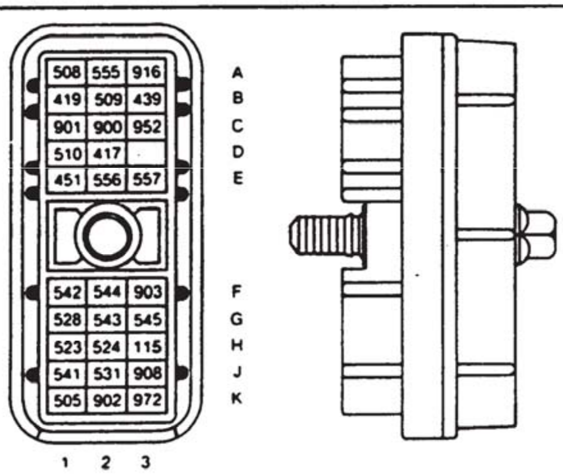


Electronic Control Module (ECM)

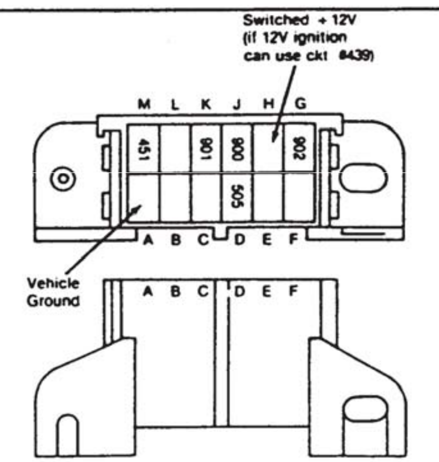


(*Note: Some applications may have circuit breakers instead of fuses.)

Check Engine, Diagnostic Request, and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



12 Pin DDL Connector P/N 12020043

C. CEL .FIRST CHART FOR DIAGNOSIS OF DDEC-II WHEN NO DDR IS AVAILABLE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-7 Check ECM Connectors ● Disconnect the 6-way, power harness connector at the ECM. ● Check terminals at both the 6-way power harness connector, and vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM. Page 4-192. Then go to CEL-30.
	Problem found.	Repair terminals/connectors. Then go to CEL-30.
CEL-8 Intermittent Check ● Note Whether flashing "Check Engine" light is reading a valid code or if it's just erratic.	Flashing a valid code.	Go to CEL-9.
	Erratic or intermittent "Check Engine" light.	Go to Chart 1, page 3-136.
CEL-9 Check for Short ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Read resistance between pins A and M of the 12-pin, DDL connector.	Less than or equal to 200 ohms.	the Diagnostic Request line (ckt #45 1) is shorted to ground (either ckt #150 or chassis ground). Refer to direct support.
	Greater than 200 ohms or open.	Go to CEL-7.
CEL-30 Verify Repairs ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. . Clear codes. ● Turn ignition off. ● Turn ignition on while at the same time observing the "Check Engine" Light. NOTE: Some calibrations will not allow clearing codes this way. Obtain a DDR or consult a dealer.	"Check Engine" light comes on for up to 5 seconds, then goes out.	Repairs are complete.
	"Check Engine" light is flashing.	All system diagnostics are complete. Please review this section from the first step to find the error.
	"Check Engine" light comes on and stays on.	Go to CEL-1

Section 4
TROUBLESHOOTING CHARTS

D. CHART 1 . INTERMITTENT CODE OR A SYMPTOM AND NO CODES

NOTE — This chart is only to be used If
1) All base mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start- 1 (page 3-121) and you have now been referred here

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CI ● 1 Diagnosis by Symptom ● Turn ignition off. ● Go to appropriate result in the next column based on engine symptom.	Intermittent code.	Go to C1-2, page 3-139.
	Engine cranks but will not start.	Go to Chart 2, Page 3-141.
	Poor performance and no codes.	Go to Chart 3, page 3-161.
	No "Check Engine" Light during bulb check at key on.	Go to Chant 4, page 3-164.
	"Check Engine" Light on and Code 25 on DDR .	Go to Chart 5, page 3-169.
	"Check Engine" Light always on, no data link and won't flash codes.	Go to Chart 6, page 3-173.
	No data link and bulb check Okay at key on.	Go to Chart 7, page 3-177.
	"Stop Engine" Light always on and no codes.	Go to Chart 8, page 3-183.
	No "Stop Engine" Light during bulb check at key on.	Go to Chart 9, page 3-185.

Section 4
TROUBLESHOOTING CHARTS

D. CHART 1 . INTERMITTENT CODE OR A SYMPTOM AND NO CODES (C0nt'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C1 ● 1 Diagnosis by Symptom (Cont'd)		
	Engine brake (if tied into DDEC system) is always enabled. →	Go to Chart 17, page 3-191.
	Engine brake (if tied into DDEC system) is inoperative. →	Go to Chart 18, page 3-193.
	Power Control input inoperative. —throttle inhibit —auxiliary engine protection →	Go to Chart 19, page 3-197.
	Throttle inhibit feature always on →	Go to Chart 21, page 3-201.

D. CHART 1 . INTERMITTENT CODE OR A SYMPTOM AND NO CODES (Cent'd.)

STEP/SEQUENCE
C1 ● 2 Diagnosis of an Intermittent

NOTICE: Do not use any other procedures in this manual (except for the suggestions listed below) when trying to solve an intermittent problem. Use of any other procedures for this kind of problem can result in the replacement of non-defective parts.

Many intermittent problems are caused by faulty electrical connectors or wiring. Diagnosis must include a careful inspection of the indicated circuit wiring and connectors. Example: an intermittent Code 35 (Oil Pressure Sensor High) should cause suspicion of a problem in the following areas associated with the Oil Pressure Sensor:

1. Wire #'s 530 (signal line), 416(+5 Volt line) or 452 (ground line).

2. The Oil Pressure Sensor connector or ECM connector.

3. An intermittent in the Oil Pressure Sensor (least likely)

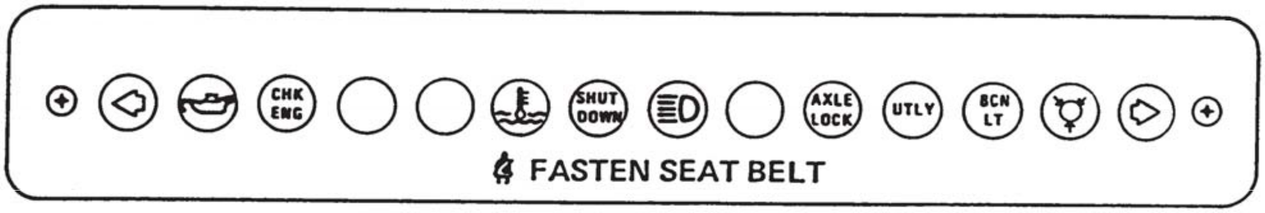
A good check list to run through includes the following:

1. Check for poor mating of the connector halves or terminals not fully seated in the connector body ("backed-out" terminals).

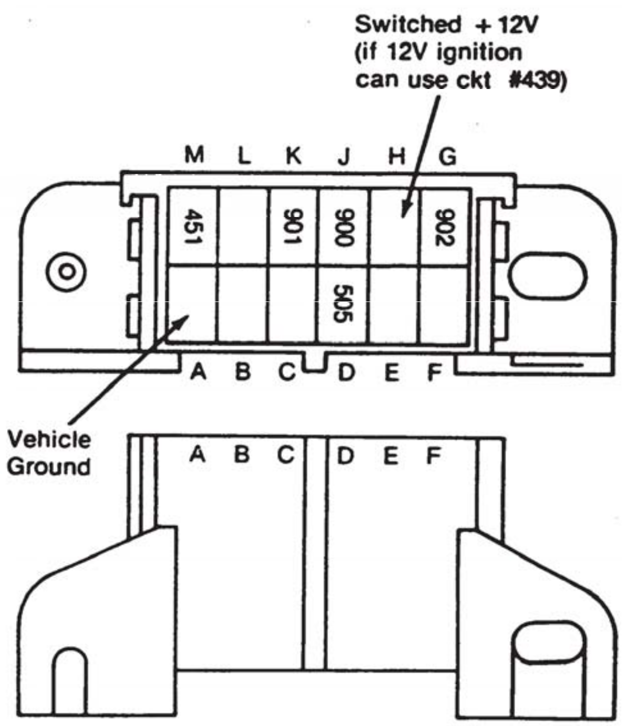
2. Look for improperly formed or damaged terminals. All connector terminals in the problem circuit should be carefully reformed to contact tension.

3. Electrical system interference caused by a defective relay. ECM driven solenoid, or a switch causing an electrical surge. Look for problems with the charging system (alternator, etc.). In certain cases, the problem can be made to occur when the faulty component is operated (as in the case of a relay).

After repairs or adjustments have been made, clear the codes and confirm that the "Check Engine* Light does not come on (except for the 5 second bulb check when the ignition is first turned on). Also run the engine to see if that problem is cured. If the "Check Engine" Light stays on, refer to the START Chart on page 3-121.



Dash Lights



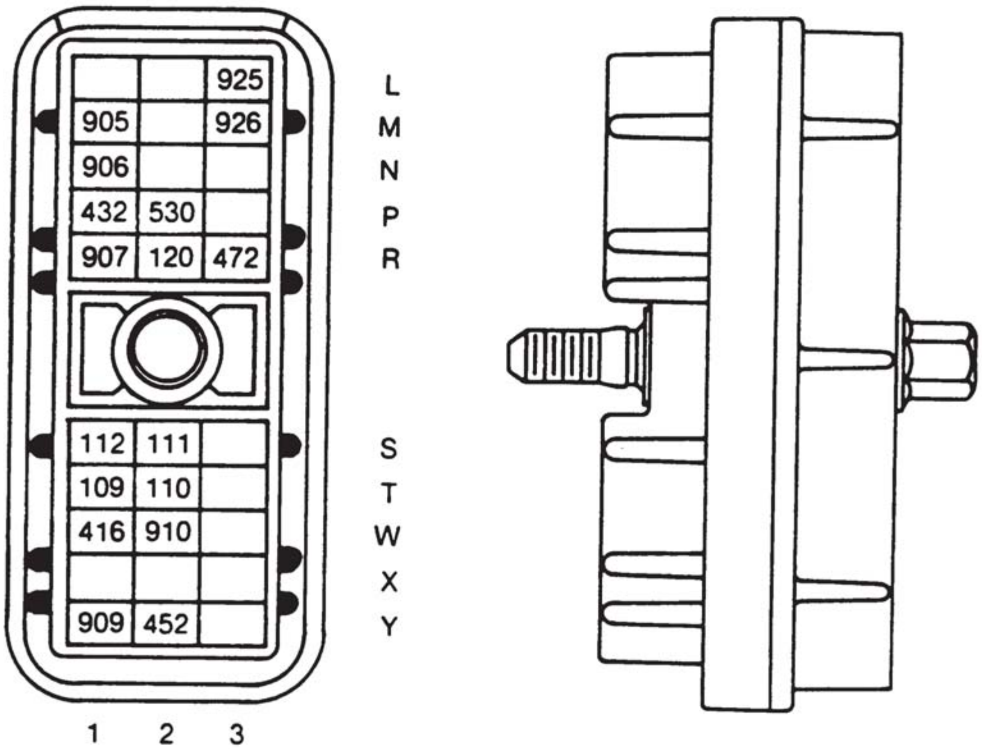
12 Pin DDL Connector P/N 12020043

Section 4
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START

NOTE — This chart is only to be used if.
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

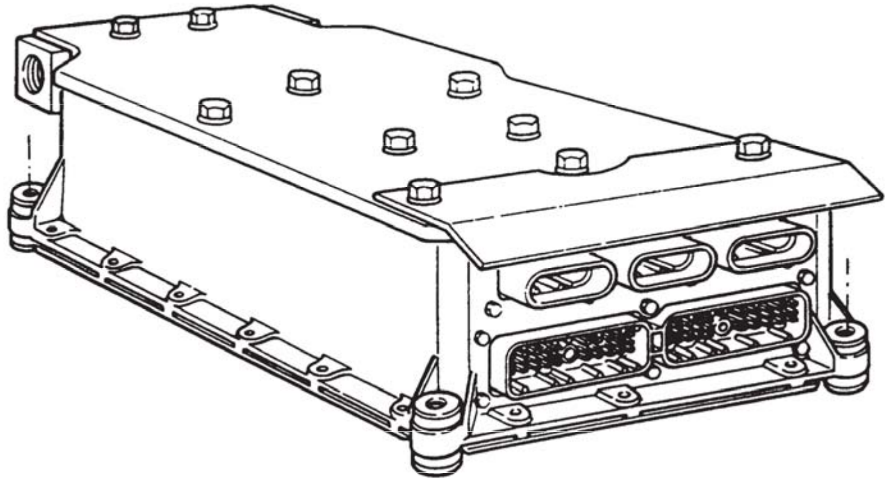
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-1 Observe "Check Engine" Light Status ● Turn ignition on while observing the "Check Engine" Light.	"Check Engine" Light comes on for up to 5 seconds. then goes out.	Go to C2-3.
	"Check Engine" Light does not come on at all.	Go to C2-17.
	"Check Engine" Light comes on and stays on.	Go to C2-2.
C2-2 Read Active Codes Using DDR ● Plug DDR into the 12 pin DDL connector ● Read active codes by selecting MODE 01 (ACTIVE CODES) on the DDR.	Active codes (other than Code 25) on DDR.	Follow appropriate diagnostic charts for code(s) received. (See Index on page 3-101).
	Active Code 25.	Go to C5-1 (page 3-169).
	Display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING" or a blank or random display.	Go to Start -6 (page 3-121.)
C2-3 Check if Out of Fuel ● Check fuel supply.	Fuel supply okay.	Go to C2-4.
	No fuel.	Refuel vehicle. May have to prime system TM9-2320-363-10). Then go to C2-30.



ECM Engine Harness Connector
P/N 12034400

D. CHART2• ENGINE CRANKS BUT WILL NOT START (Cont'd.)

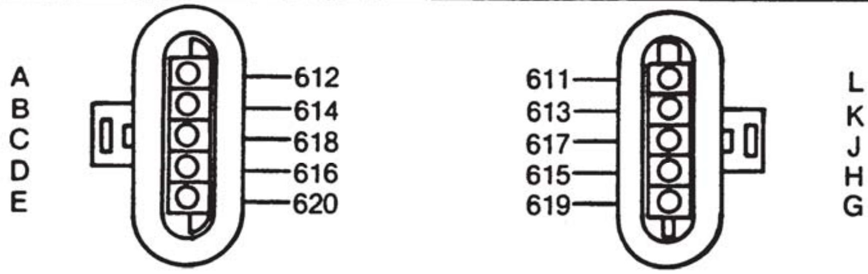
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-4 Check for Aerated Fuel ● Loosen fuel return line. ● Observe fuel flow out of line while cranking. Use suitable container to contain fuel.	Flow is steady. No flow or intermittent flow.	Go to C2-5 Check fuel filter(s) and supply lines to determine cause of problem. Page 4-38.
C2-5 Check for White Smoke ● Reconnect fuel return line. ● Look for white smoke coming out of the exhaust stack while cranking the engine.	White smoke. No white smoke.	Your problem appears to be with cylinder compression. Contact Direct Support. Your problem appears to be restricted air intake page 4-52. Go to C2-31 .
C2-6 Check TRS Status via RPM Read-out ● Select Engine RPM on DDR (Mode 04). ● Crank engine while observing DDR display **(NOTE:** Battery voltage surges while cranking with electric starters may blank out or reset DDR.)	Display always reads greater than or equal to 60 RPM while cranking. Display sometimes or always reads less than 60 RPM while cranking.	Go to C2-12. Go to C2-7.
C2-7 Check TRS ● Turn Ignition off. ● Disconnect engine harness connector at the ECM. ● Read resistance between sockets T1 and T2 at the engine harness connector.	Between 100 and 200 ohms. Greater than 200 ohms or less than 100 ohms.	Go to C2-9. Your problem appears to be in the TRS. Contact Direct Support.



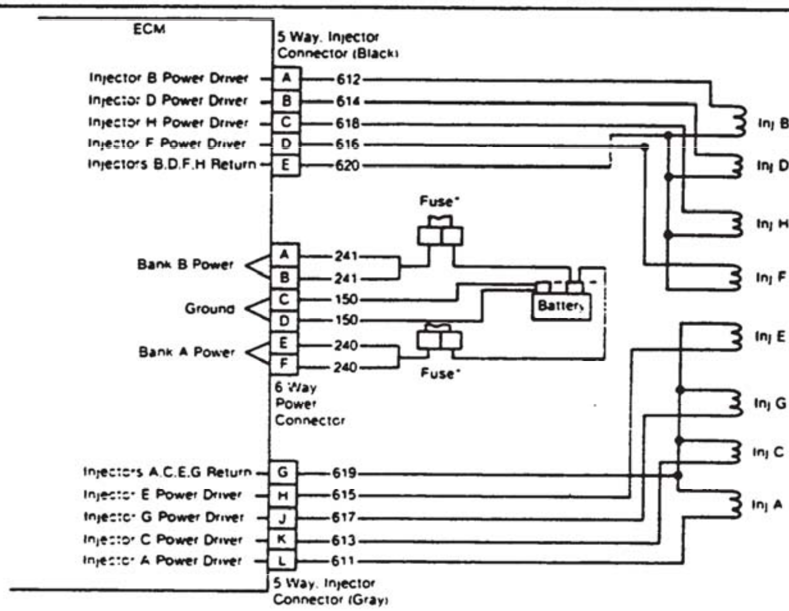
Electronic Control Module (ECM)

D. CHART 20 ENGINE CRANKS BUT WILL NOT START (Cont'd.)

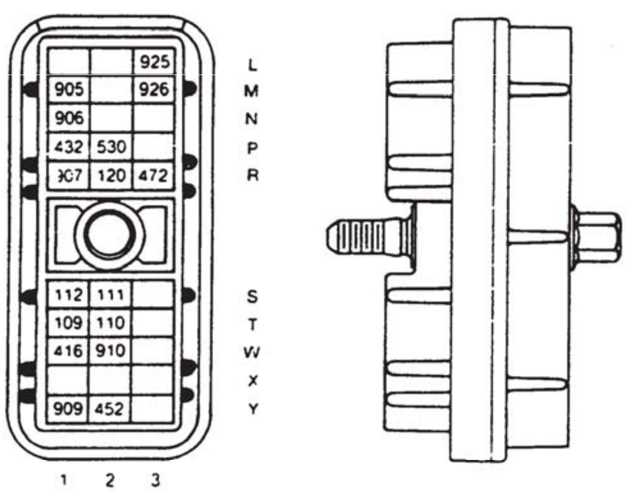
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-9 Check SRS/TRS Mounting Bracket		
● Inspect SRS/TRS mounting	Loose.	Tighten bolt (or replace if necessary), page 4-326. Then go to C2-30.
	Sensor is securely fastened.	Contact Direct Support.
C2-11 Check ECM Connectors		
● Turn ignition off. ● Disconnect all connectors at the ECM. ● Check terminals at all ECM connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to C2-30.
	Problem found.	Repair terminals/connectors. Then go to C2-30.



5-Way, Injector Harness Connectors



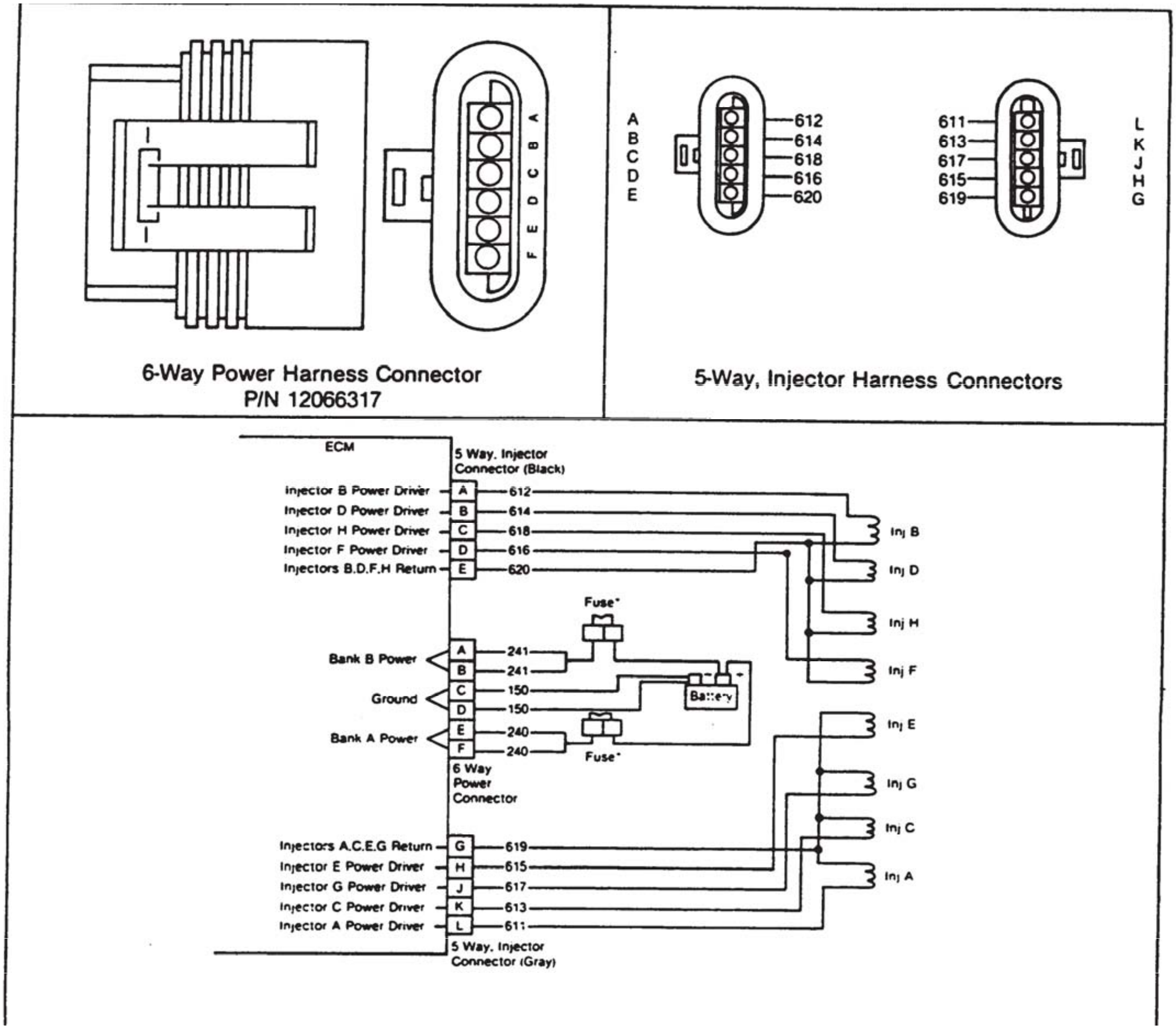
ECM Power and Injector Circuits—8V92



ECM Engine Harness Connector
P/N 12034400

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-12 Check for Good SRS Signal ● Select Mist Status on DDR (Mode 31). ● Crank engine while observing DDR display of /SRS RECEIVED" **(NOTE:** Battery voltage surges while cranking with electric starters may blank out or reset DDR)	Display reads "YES SRS RECEIVED" while cranking.	Go to C2-14.
	Display reads "NO SRS RECEIVED" while cranking.	Go to C2-13.
C2-13 Check SRS ● Turn ignition off. ● Disconnect engine harness connector at the ECM. ● Read resistance between sockets S1 and S2 at the engine harness connector.	Between 100 and 200 ohms.	Go to C2-9.
	Greater than 200 ohms or less than 100 ohms.	Problem appears to be with the TRS. Contact Direct Support.
	Greater than 200 ohms.	Go to 41-2. page 275).
C2-14 Check if Injector Return Wires are Open ● Turn ignition off. ● Disconnect both 5-way injector harness connectors at the ECM. ● Read resistance between the injector return pin and all the power driver pins on both harness connectors (example: G to L. and E to A).	Less than or equal to 5 ohms for any reading.	Go to C2-15.
	Greater than 5 ohms on any reading.	An open exists in one of the injector power driver or return wires. Contact Direct Support. Then go to C2-30.

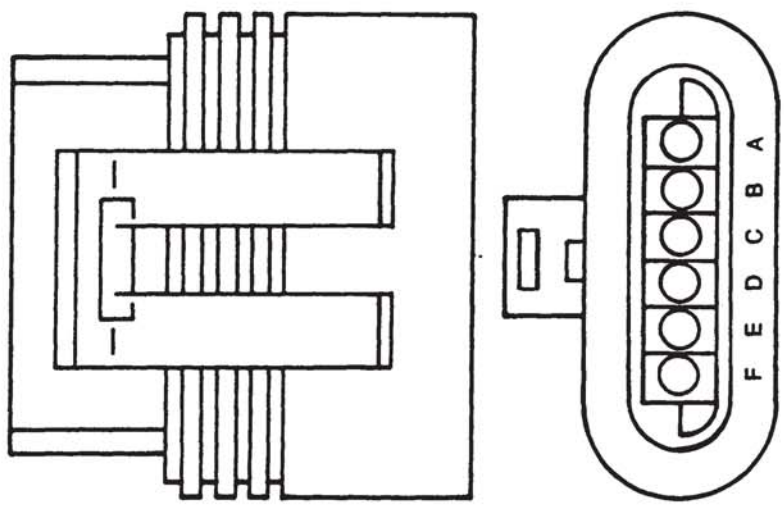


ECM Power and Injector Circuits–8V92

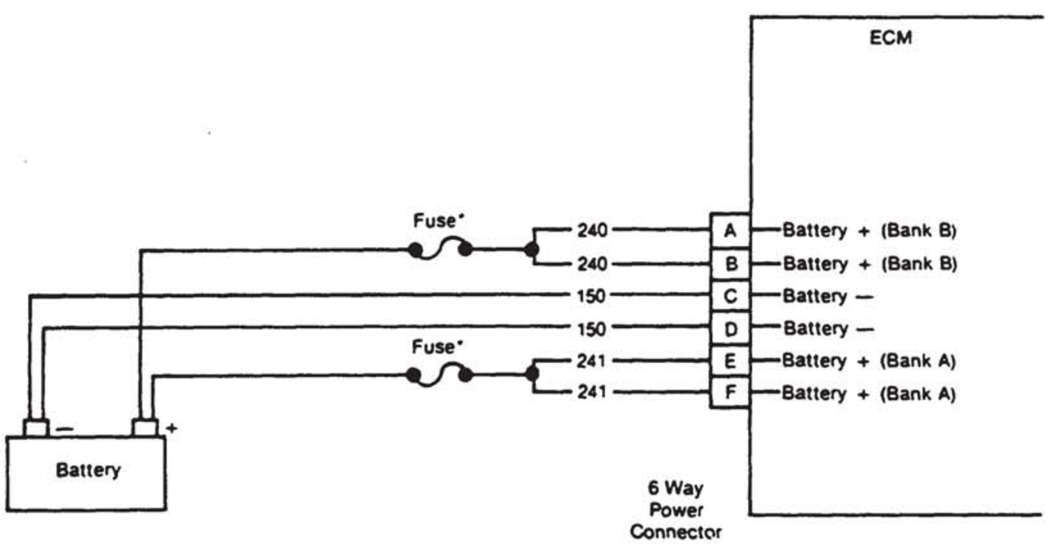
Section 4
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO 00 NEXT
C2-15 Check if Injector Drive or Return Lines are Shorted to Ground		
● Disconnect the 6-way power harness connector at the ECM. ● Read resistance between socket C of the 6-way, power harness connector to the following sockets on the injector harness connectors A, B, C, D, E, G, H, J, K, and L.	Greater than or equal to 10,000 ohms or open on all readings.	Contact Direct Support.
	Less than 10,000 ohms on any reading.	A short to ground on wire where resistance was less than 10,000 ohms. Contact Direct Support. Then go to C2-30.
C2-17 Check DDEC Fuses		
● Check both ECM power fuses	Blown fuse(s)	Go to C2-28.
	Both fuses are okay.	Go to C2-18.



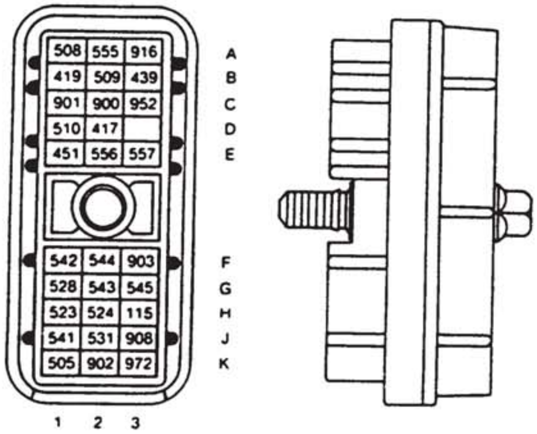
6-Way Power Harness Connector
P/N 12066317



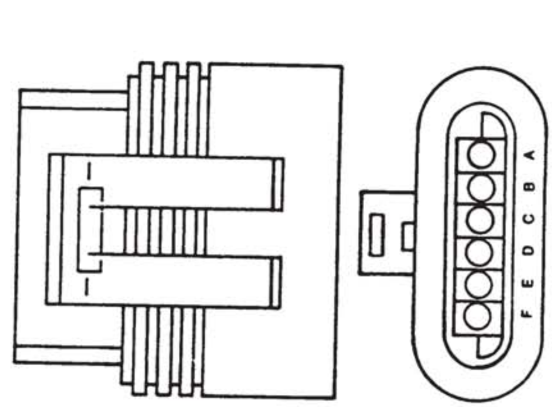
Battery Power and Ground Circuits

D. CHART 2. ENGINE CRANKS BUT WILL NOT START (Cont'd.)

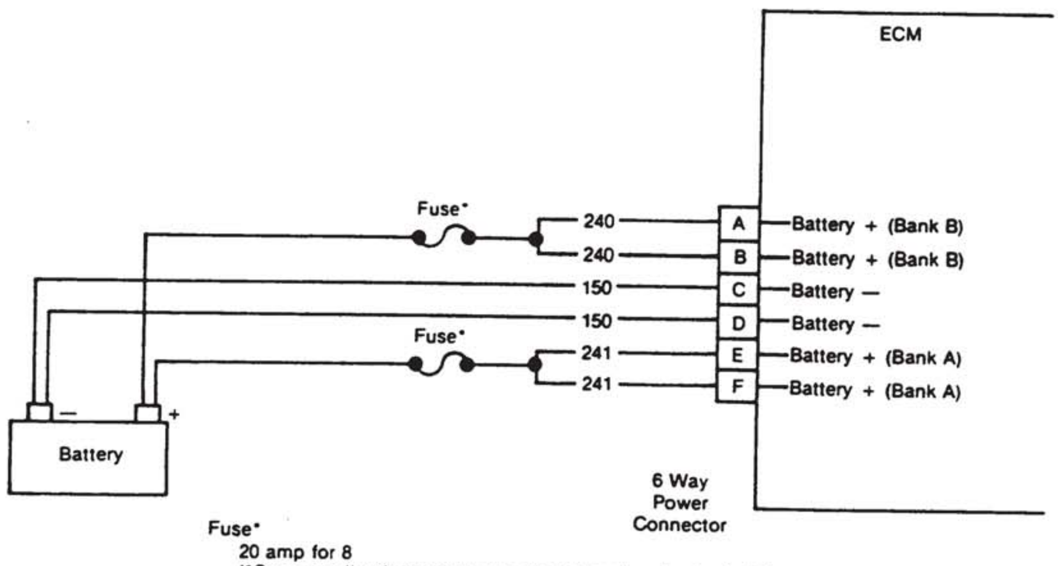
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-18 Check for 12 Volts at the 6-Way, Power Harness Connector		
• Turn ignition off. • Disconnect the 6-way power harness connector. • Read voltage from socket A and B of the 6-way power harness connector to a good ground. • Also read voltage from socket E and F to a good ground.	Less than 11.5 volts on any reading.	Go to C2-19.
	Greater than 11.5 volts on all readings.	Go to C2-21 .
C2-19 Check if ECM Power Line(s) are Open		
• Read voltage between battery side of one ECM fuse or circuit breaker and a good ground. • Read voltage reading at the other ECM fuse or circuit breaker. (Note: the battery side does not contain the #240 or #241 wires.)	Less than 11.5 volts on either reading.	Go to C2-20.
	Greater than 11.5 volts on both readings.	An open exists in either Bank A Power (ckt #240) or Bank B Power (ckt #241). Contact Direct Support. Then go to C2-30.
C2-20 Check Battery		
• connect all connectors. • Turn ignition on. • Try to start engine. • Read voltage at the battery+ terminal to the battery- terminal.	Less than 10.0 volts.	Service discharged battery. **(Note:** if a shod to ground exists any-where in a battery + circuit, the engine will shut down again if not repaired). Dust vac maybe bad, page 4-202. Then go to C2-30.
	Greater than or equal to 10.0 volts.	An open or short to ground exists in the Batt + line. Repair open or short to ground, page 3-2. Then go to C2-30.



ECM Vehicle Harness Connector
P/N 12034398



6-Way Power Harness Connector
P/N 12066317

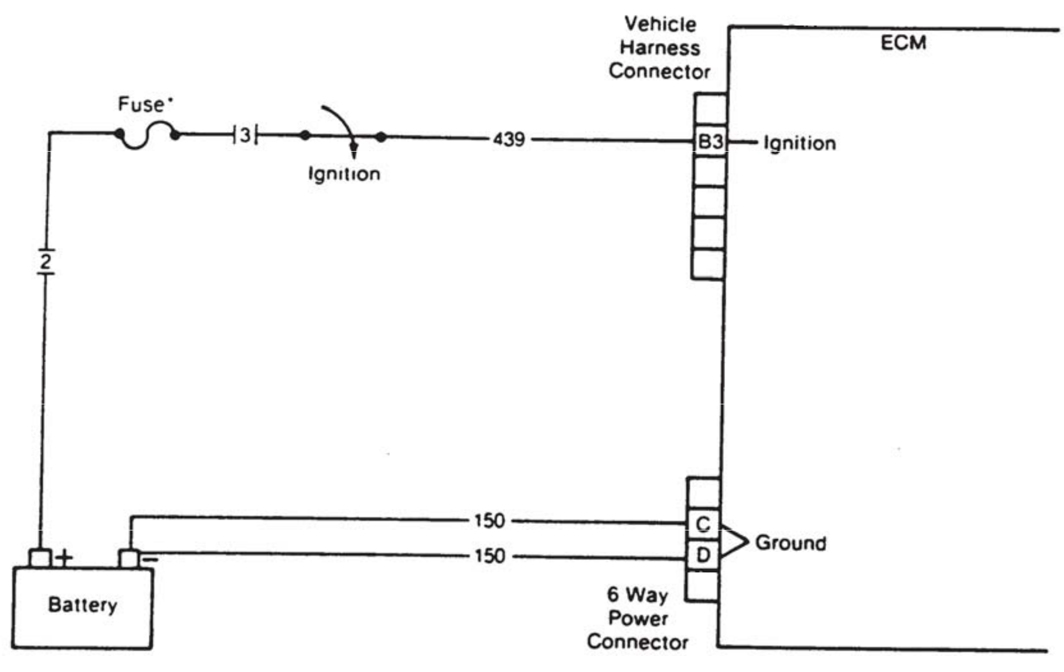


Battery Power and Ground Circuits

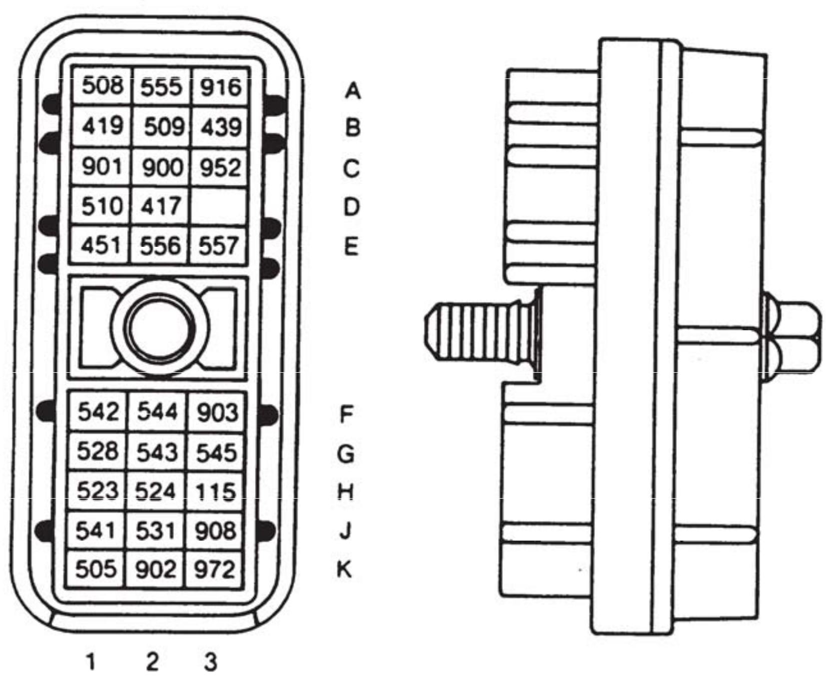
Section 4
TROUBLESHOOTING CHARTS

D. CHART 2. ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-21 Check for +12 or +24 Volts at Ignition Wire ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Turn ignition on. ● Read voltage between socket B3 on the vehicle harness connector (red lead) and a good ground (black lead).	Less than 23 volts.	Go to C2-23.
	Greater than or equal to 23 volts.	Go to C2-22.
C2-22 Check for Good Ground Wire ● Read voltage between socket B3 on the vehicle harness connector and socket C and Don the 6-way. power harness connector.	Less than 23 volts.	The ECM ground wire (ckt #150) is open or has a poor connection. Repair open or poor connection, page 3-2. Then go to C2-30.
	Greater than or equal to 23 volts.	Go to C2-11.
C2-23 Check if Ignition Fuse is Okay ● Turn ignition off. ● check 5 Amp ignition fuse.	Fuse is okay.	Go to C2-24.
	Fuse blown.	Go to C2-25.



Ignition and Ground Circuits Sketch

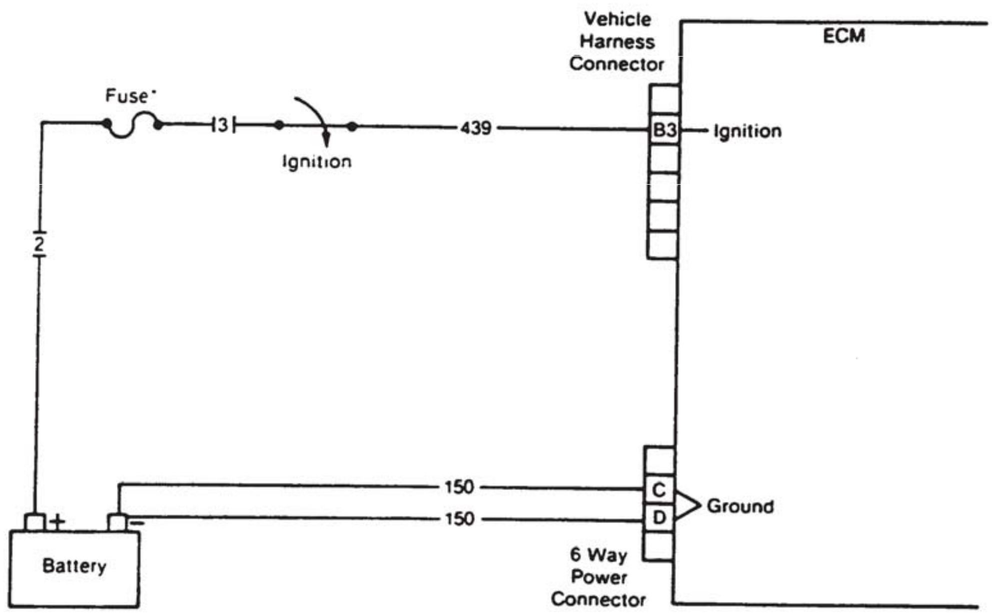


ECM Vehicle Harness Connector
P/N 12034398

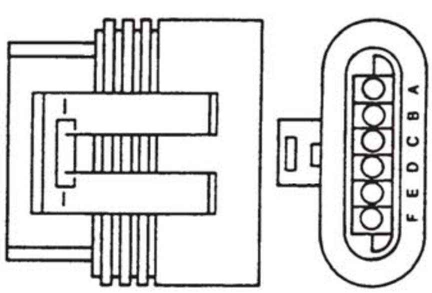
Section 4
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL **NOT START** (Cont'd.)

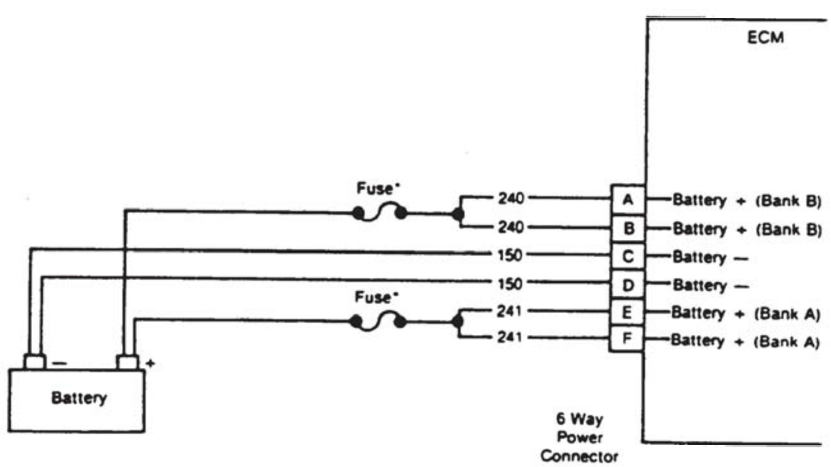
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-24 Check if Ignition Wire (Circuit #2) is Open ● Read voltage between battery side (hot side) of the 5 Amp ignition fuse and a good ground.	Less than 23 volts.	Go to C2-27.
	Greater than or equal to 23 volts.	The ignition line (ckt #3 or #439) is open. Contact Direct Support. Then go to C2-30.
C2-25 Check if Ignition Wire is Shorted to Ground ● Replace blown fuse. ● Turn ignition on for at least 10 seconds. ● Turn ignition off. ● Check 5 Amp ignition fuse.	Fuse is still okay.	Go to C2-26.
	Fuse blown or circuit breaker open.	The ignition line (ckt #439) is shorted to ground. Repair short, page 3-2. Then go to C2-30.
C2-26 Check if ECM is Blowing Fuses ● Reconnect all harness connectors at the ECM. ● Attempt to start engine. ● If engine starts, run engine for at least one minute. ● Turn ignition off. ● Check 5 Amp ignition fuse	Fuse is still okay.	NO short is currently present. (Warning: if there is an intermittent short, the engine will shut down again if not repaired. Also note: fuse may have blown due to temporary reverse voltage at the battery). Go to C2-30.
	Fuse blown.	Go to C2-11.



Ignition and Ground Circuits Sketch



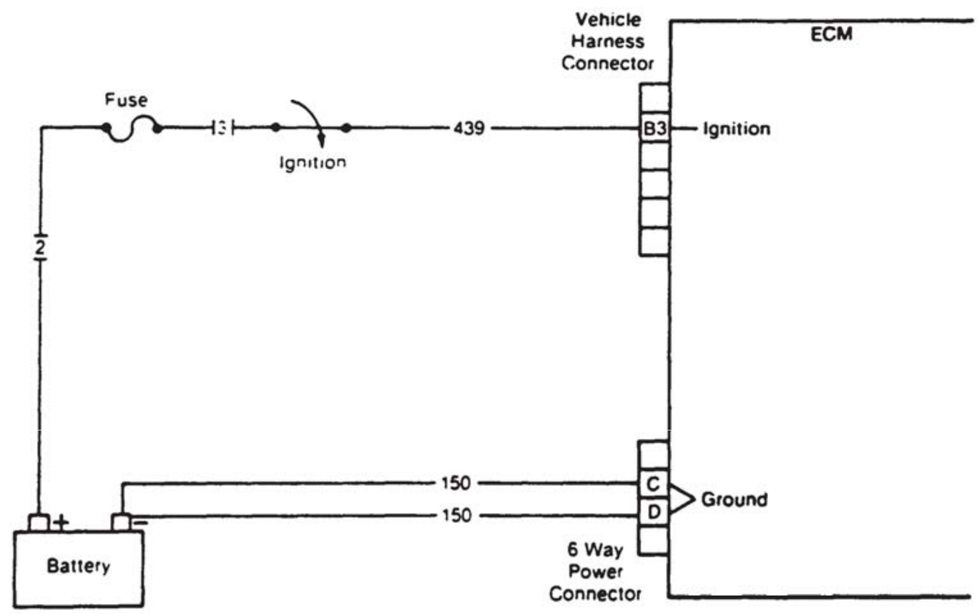
6-Way Power Harness Connector
P/N 12066317



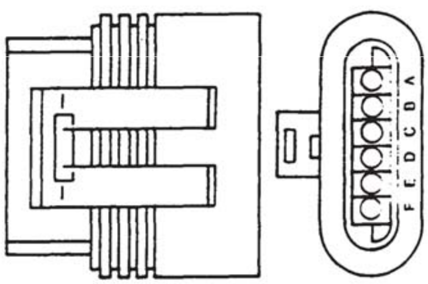
Battery Power and Ground Circuits

D. CHART2. ENGINE CRANKS BUT WILL NOT START (Cent'd.)

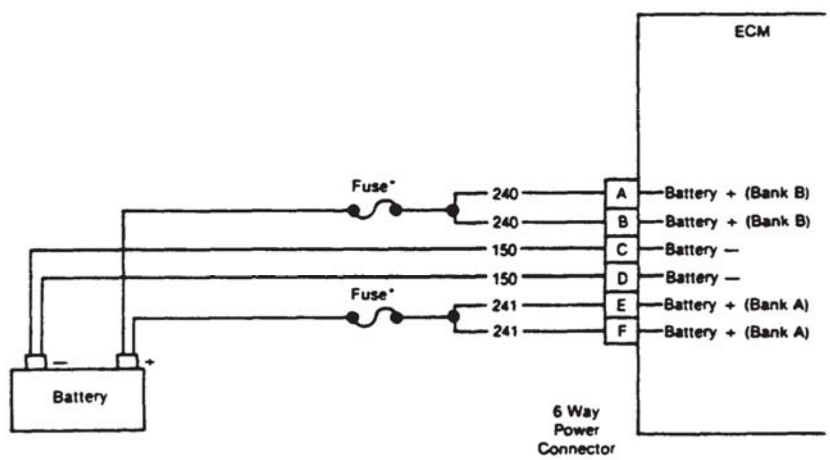
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-27 Check Battery ● Disconnect battery cables at the 12 volt battery. ● Read voltage at the battery + terminal to the battery – terminal.	Less than 11.5 volts.	Service discharged battery. (Note: if a short to ground exists anywhere in a battery + circuit, this truck will shut down again if not repaired). Then go to C2-30
	Greater than or equal to 11.5 volts.	An open or short to ground exists in the unfused ignition line (ckt #2). Repair open or short to ground, page 3-2. Then go to C2-30.
C2-28 Check if Fuses Blow Again ● Turn ignition off. ● Disconnect the 6-way power harness connector at the ECM. ● Replace blown fuse(s). ● Wait 10 seconds. ● Check if fuse(s) has blown.	Fuse(s) or still okay.	Go to C2-26.
	Fuse(s) are blown or open again.	Go to C2-29.
C2-29 Check for Short to Ground in Wiring ● Read resistance between Bank B power (circuit #240) and a good ground. ● Read resistance between Bank A power (circuit #241) and a good ground.	Greater than or equal to 10,000 ohms or open on all readings.	Go to C2-11.
	Less than 10,000 ohms on any reading.	Short to ground exists. Contact Direct Support. Then go to C2-30.



Ignition and Ground Circuits Sketch



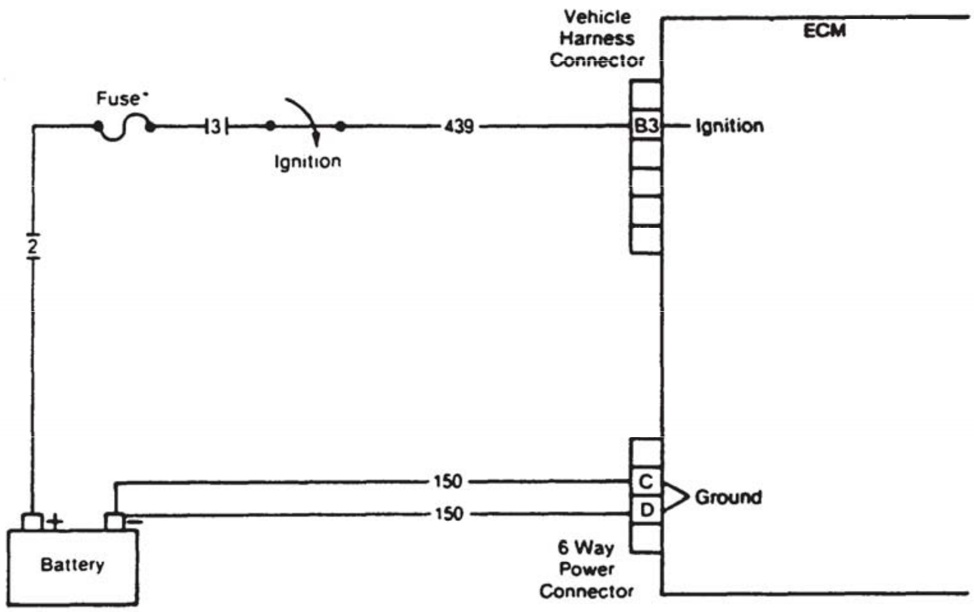
6-Way Power Harness Connector
P/N 12066317



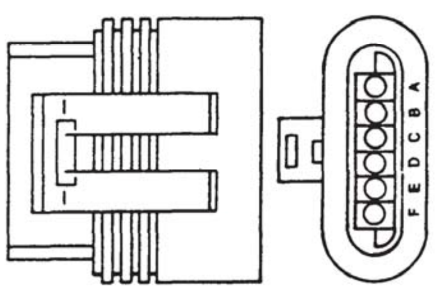
Battery Power and Ground Circuits

D. CHART2. ENGINE CRANKS BUT WILL NOT START (Cont'd.)

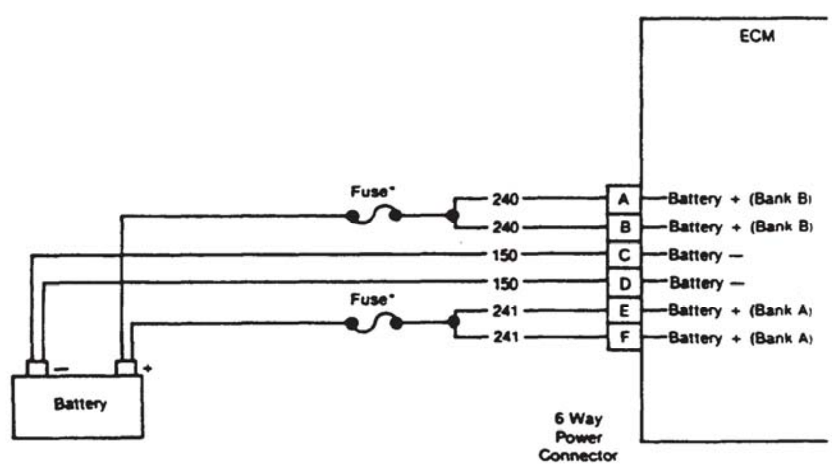
STEP/SEQUENCE	RESULT	WHAT TO DO **NEXT**
C2-30 Verify Repairs ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. . Clear-codes. ● Note status of "Check Engine" Light. ● If "Check Engine" Light does not stay on, start engine and run for 1 minute or until "Check Engine" Light comes on. Stop engine. ● Read historical codes.	Engine will not start.	All system diagnostics are complete. Please review this section from the first step to find the error.
	Engine starts and DDR reads Code 25 (no codes).	Repairs are complete.
	Engine starts and codes other than Code 25 appear.	Go to START-1, page 3-121, to service codes.
C2-31 Check Fuel Filters ● Turn ignition off. ● Check primary and secondary fuel filters to be sure they are not clogged and that they are full of clean fuel.	Clogged filter(s).	Replace filter(s), page 44$. Prime system, if required.(TM9-2330-263-10) Then go to C2-30.
	Clean filters and no air in filters.	Go to C2-6.



Ignition and Ground Circuits Sketch



6-Way Power Harness Connector
P/N 12066317

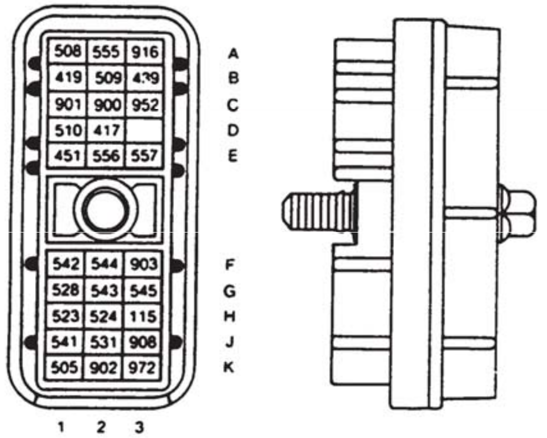


Battery Power and Ground Circuits

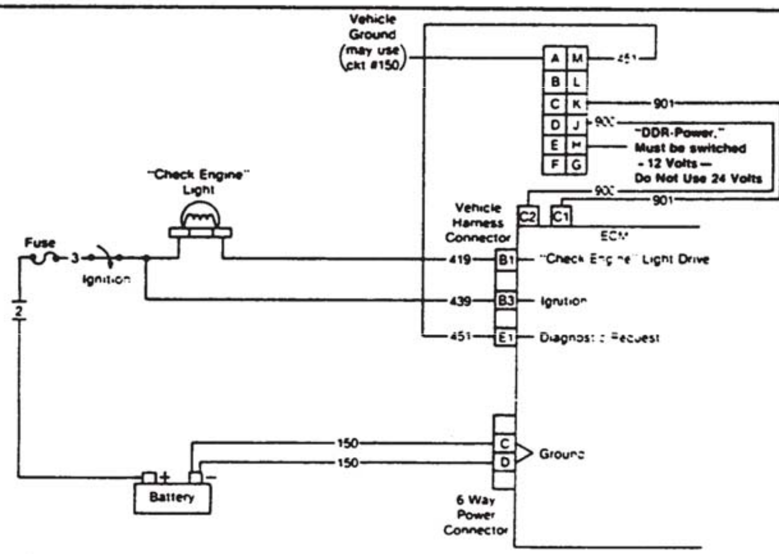
D. CHART3. POOR PERFORMANCE AND NO CODES

This is a helpful hints chart. It assumes that you have received no codes, made all the basic mechanical checks first. could not find the problem, and suspect the DDEC II system to be at fault Based on the particular symptom here's what to look for

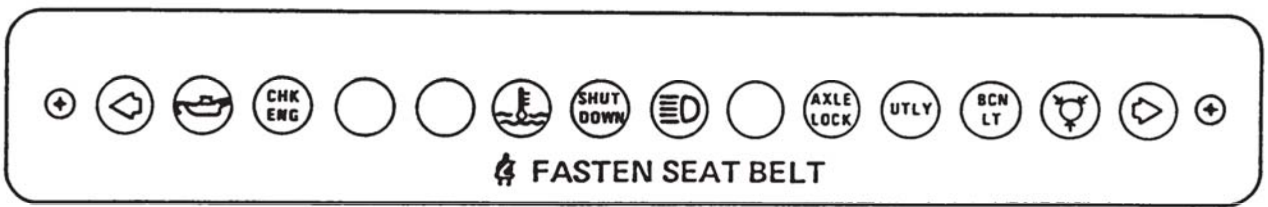
SYMPTOM	WHAT TO LOOK FOR
1. Can't get full throttle/power.	Miscalibrated Throttle Position Sensor (TPS). See Step 21-4 for TPS adjustment (page 3-223). Plugged fuel filters. Hose not connected to Turbo Boost Sensor (TBS).
2. Runs rough, misses and/or occasionally stalls.	• Diagnostic request (ckt #451) is intermittently shorting to ground. • Loose battery power (ckt #240 or #24 1) ignition (ckt #439) or ground (ckt #1 50) wires • Check for signs of insulation wear on injector harnesses. • Check power contribution from each cylinder using the cylinder cut-out feature described in Diagnostic Data Reader (DDR) instruction manual.
3. Engine idles high (after warm-up) or hangs during shift.	• Check calibration of the Throttle Position Sensor (TPS) using procedure in Step 214 (page 3-223). You may have a TPS, linkage or pedal problem. Check PTOSA signal line (ckt #51 0) for short to voltage source.
4. Low road speed.	Determine road speed specifications from vehicle manufacturer data. If road speed is less than specified and all mechanical (driveline. speedometer) checks are correct. then the EEPROM calibration is suspect. This portion of the calibration can be reprogrammed using Mode 37 (EEPROM CHANGES) on the Diagnostic Data Reader (DDR). Refer to DDR Instruction Manual for details.



ECM Vehicle Harness Connector
P/N 12034398



Check Engine, Diagnostic Request, and Ignition Circuits



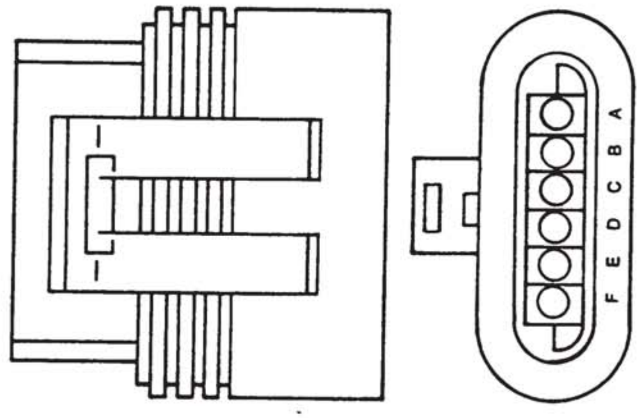
Dash Lights

D. CHART4. NO "CHECK ENGINE'' LIGHT DURING BULB CHECK OR CANNOT CLEAR CODES

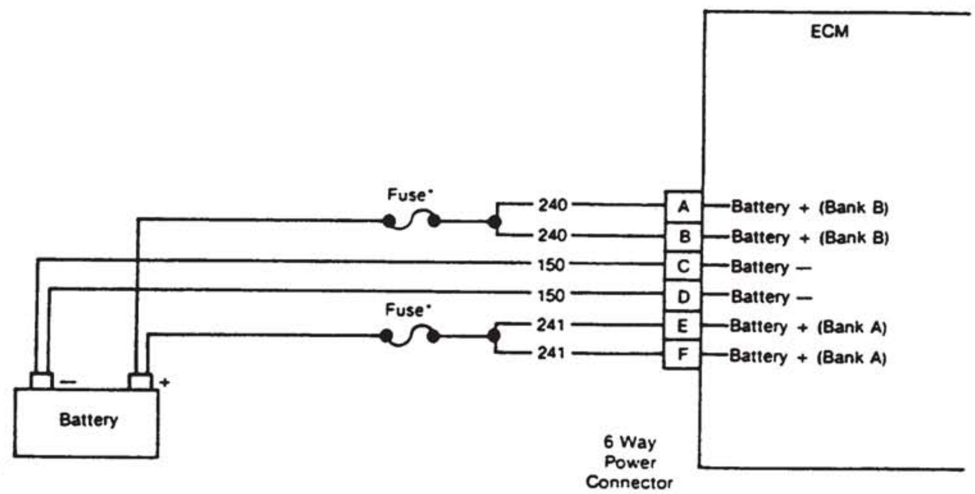
NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C4-1 Try to Force CEL On ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● install a jumper wire between socket B1 on the vehicle harness connector and a good ground. ● Turn the ignition on (engine not running). ● Note the CEL status.	"Check Engine" light is still off.	Go to C4-2.
	"Check Engine" light is on.	GO to C4-4.
C4-2 Check for Ignition ● Remove jumper wire. ● Read voltage on vehicle harness connector. socket B3 (red lead) to a good ground (black lead) with the Ignition on and engine off.	Less than 10.0 volts	The 5 Amp, ignition fuse is blown and/or wires #2 or ##3 are open or shorted to ground, and/or the ignition line (ckt #439) is shorted to ground or is not wired to switch ignition source (See note below). Repair problem, page 3-2. Then go to C4-30.
	Greater than or equal to 10.0 volts	Go to C4-3
C4-3 CEL Driver Line and Bulb Check ● Turn ignition off. ● Remove CEL bulb and check whether it's burned out or otherwise damaged	Bulb is okay.	CEL Driver line (ckt #419) or ground line (ckt #150) is open. Contact Direct Support. Then go to C4-30.
	Bulb is not okay.	Replace bulb. Then go to C4-30.

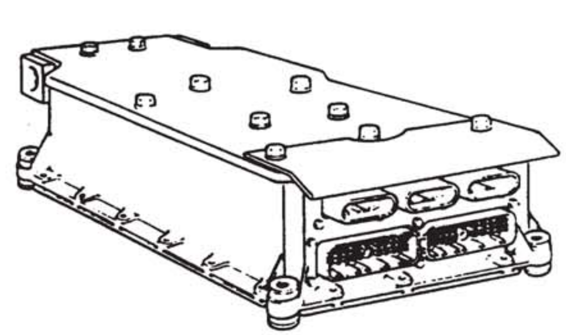
● NOTE: Historical codes will not clear and engine hours/fuel consumption values will not update if main ECM power (circuits #240 and #241) is switched off with ignition.



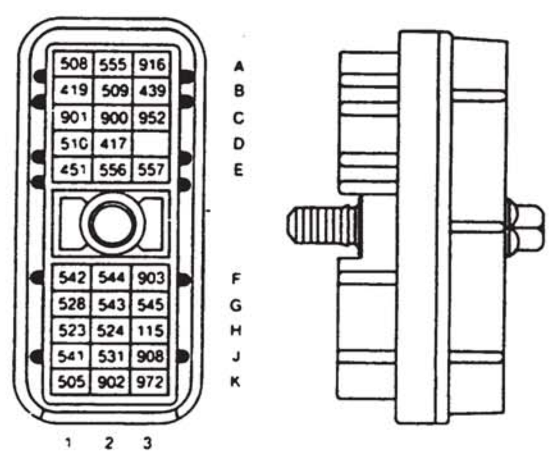
6-Way Power Harness Connector
P/N 12066317



Battery Power and Ground Circuits



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

D. CHART4. NO "CHECK ENGINE" LIGHT DURING BULB CHECK OR CANNOT CLEAR CODES (Cont'd.)

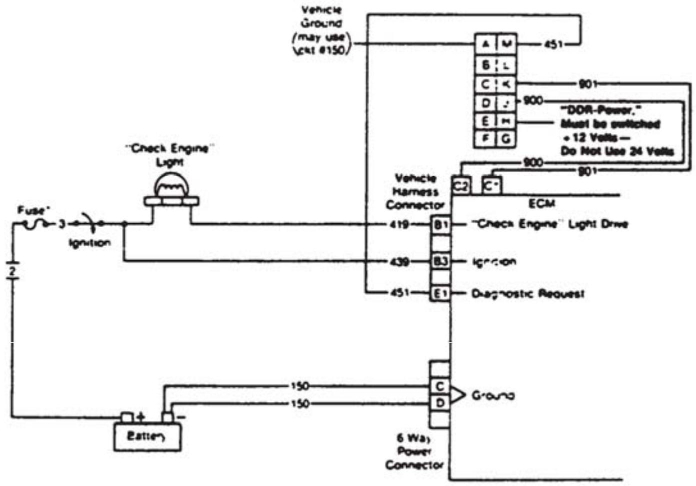
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C4-4 Check for Open ● Remove jumper wire. With ignition on, read voltage on vehicle harness connector, socket B3 to a good ground.	Less than 10.0 volts. →	The ignition line (ckt #439) is open. Contact Direct Support. Then go to C4-30.
	Greater than or equal to 10.0 volts. →	Go to C4-5.
C4-5 Check for Bat + ● Turn ignition off. ● Disconnect the 6-way power harness connector. ● Read voltage at the 6-way power harness connector. Socket A to a good ground. ● Repeat voltage readings on 6-way power harness connector, keeping the black lead to a good ground and the red lead to. —socket B —socket E —socket F	Less than 10.0 volts on any reading. →	Either one of the 240 Amp, ECM fuses is blown and/or the Battery Power line(s) (ckt #240 or #241) has an open or short to ground. Check that the battery power (Circuits #240 and #241) are not switched off when the ignition is turned off (See note below). Repair problem. Then go to C4-30.
	Greater than or equal to 10.0 volts on all readings →	Go to C4-6.

● NOTE: Historical codes will not clear and engine hours/fuel consumption values will not update if main ECM power (circuits #240 and #24 1) is switched off with ignition.

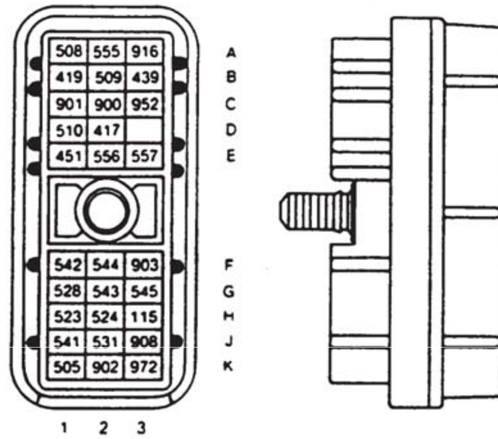
D. CHART 4- NO “CHECK ENGINE” LIGHT DURING BULB CHECK OR CANNOT CLEAR CODES (Cont’d

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C4-6 Check for Ground ● Move black lead of voltmeter to socket **C** (of the 6-way power connector). ● Read voltage using red lead at sockets A, B. E and F of the 6-way power harness connector. ● Move black lead of voltmeter to socket D of the 6-way power harness connector. ● Again read voltage at sockets A, B, E and F of the 6-way power harness connector.	Less than 10.0 volts on any reading.	Ground line(s) (Ckt #l 50) has an open. Repair open, page 3-2. Then got to C4-30.
	Greater than or equal to 10.0 volts on all readings.	GO to C4-7.
C4-7 Check ECM Connectors ● Check terminals at the vehicle harness (especially B3 and B1) and all the terminals in the 6-way power harness connectors (both the ECM and harness side) for damage; bent. corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to C4-30.
	Problem found.	Repair terminais/connectors, page 3-2. Then go to C4-30.
C4-30 Verify Repairs ● Turn ignition off. ● Reconnect all Connectors. ● Turn ignition on. . Clear codes ● Turn ignition off. ● Turn ignition on while at the same time observing the “Check Engine” light.	"Check Engine" light comes on for up to 5 seconds. then goes out.	Repairs are complete.
	"Check Engine" light does not come on at all	All system diagnostics are complete. Please review this section from the first step to find the error.
	"Check Engine" Light comes on and stays on.	Go to START-1, page 3-121.

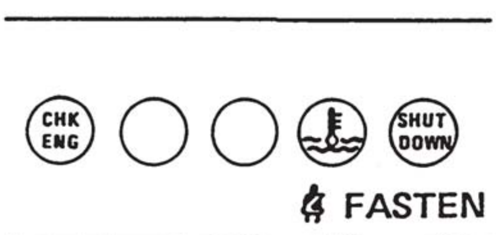
NOTE: Historical codes will not clear and engine hours/fuel consumption values will not update if main ECM power (circuits #240 and #241) is switched off with-ignition.



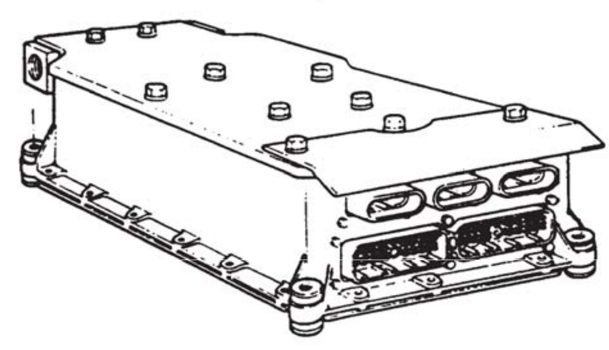
Check Engine, Diagnostic Request, and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



Dash Lights



Electronic Control Module (ECM)

D. CHART5. "CHECK ENGINE" LIGHT ON AND CODE 25 ON DDR

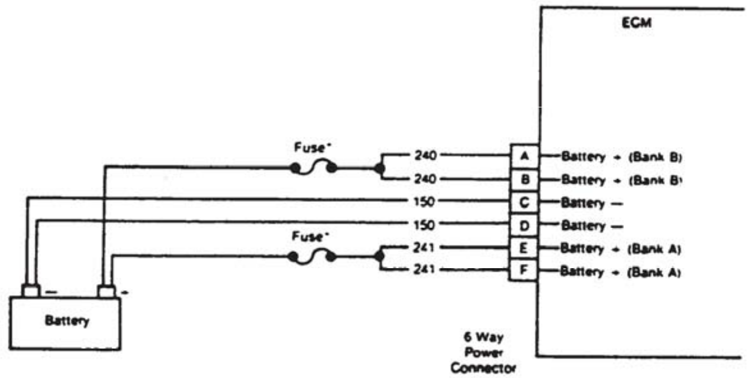
NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C5-1 Check for Short (Ckt #451) ● Turn ignition on. observe 'Check Engine" light. ● Start engine and increase RPM with throttle and observe "Check Engine" light.	Erratic or intermittent "Check Engine" light and engine runs erratic or has low power.	Check **for** short to ground on Diagnostic Request (Ckt #451). Contact Direct Support. Then go to C5-30.
	"Check Engine" light comes on and stays on.	Go to C5-2.
C5-2 Check for Short (Ckt #419) ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Turn Ignition on (engine not running) while at the same time observing the "'Check Engine" light	"Check Engine" light comes on and stays on.	CEL Driver line (ckt #419) is shorted to ground. Contact Direct Support. Then go to C5-30.
	"Check Engine" light stays off.	Go to C5-3
CS-3 Force CEL On ● Install a jumper wire between socket B1 of the vehicle harness connector and a good ground. ● Observe "Check Engine" light	"Check Engine" light comes on and stays on.	Go to C5-4.
	"Check Engine" light stays off.	The ignition line (ckt #439) is not correctly wired to the CEL bulb. See if the bulb has been wired into the ignition line (#439) instead of the proper #419 wire Correct problem. Then go to C5-30.

Section 4
TROUBLESHOOTING CHARTS

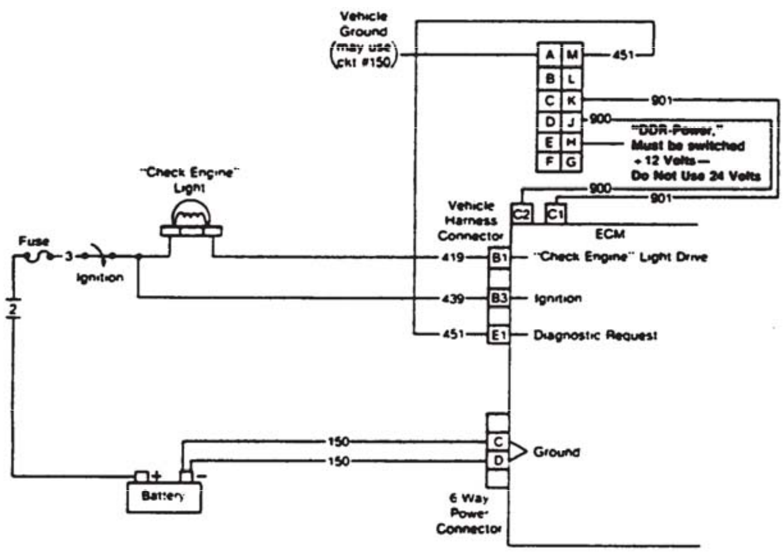
D. CHART 5 - "CHECK ENGINE" LIGHT ON AND CODE 25 ON DDR (C0nt'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C5-4 Check ECM Connectors		
● Turn ignition off. ● Check terminals at the vehicle harness connectors (both the ECM and harness side) for damage: bent, corroded and unseated pins or sockets. ● Check terminals in connector to be sure B1 is wire #419 and B3 is wire #439.	Terminals and connectors are okay.	Go to C5-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to C5-30.
C5-30 Verify Repairs		
● Turn ignition Off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Turn ignition off. ● Turn ignition on while at the same time observing the "Check Engine" light. ● If "check Engine" light stays **on,** read historical code.	"Check Engine" light comes on for up to 5 seconds. then goes out.	Repairs are complete.
	"Check Engine" light does not come on at all.	GO to C4-1, page 3-164.
	Code 25 (no codes) and "Check Engine" light comes on and stays on.	All system diagnostics are complete. Please review this section from the first step to find the error.
	Codes other than Code 25	Go to START-1 to service other codes, page 3-121.

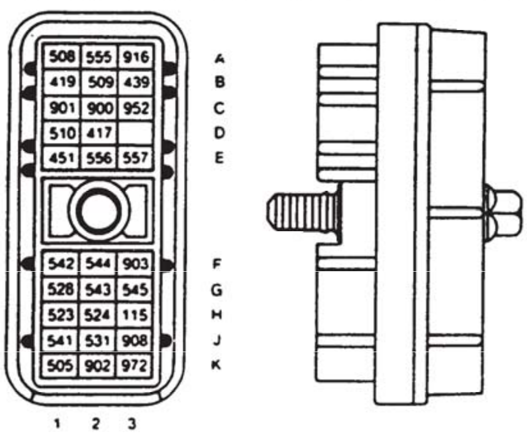


Battery Power and Ground Circuits

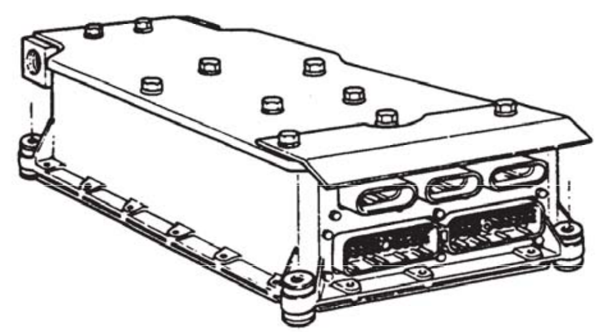
Dash Lights



Check Engine, Diagnostic Request, and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

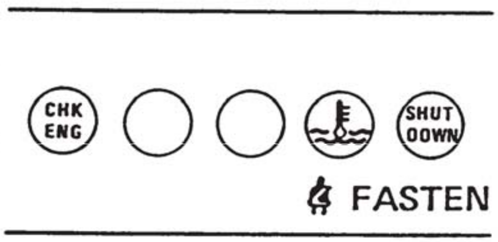
D. CHART 6 . "CHECK ENGINE" LIGHT ALWAYS ON, NO DATA LINK AND WON'T FLASH CODES

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

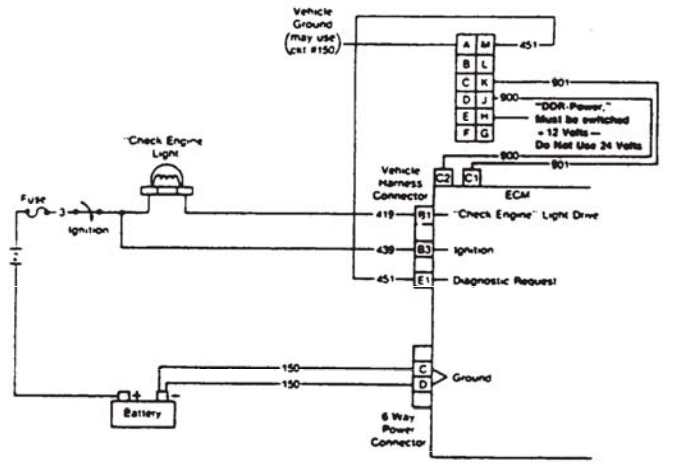
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C6-1 Check ECM Fuses ● Turn ignition off. ● Check both fuses or circuit breakers to the ECM.	Fuses are okay.	Go to C6-2.
	Fuse(s) is blown.	Replace blown fuse, page 4-204. Then go to C6-30. (Note: the fuse may blow again if an intermittent short to ground exists in either ckt #240 or ckt #241).
C6-2 Check for Open in DDL Connector ● Check resistance between cavity A of the DDL connector and a known good ground. ● Disconnect the vehicle harness connector at ECM. ● Check resistance between cavity M of the DDL and cavity El of the ECM 30 pin connector. ● Check resistance between cavity J of the DDL connector and cavity C2 of the ECM 30 pin connector. ● Check resistance between cavity K of the DDL connector and cavity Cl or the ECM 30 pin connector.	Any resistance reading greater than 3000 ohms.	Open in circuit. Contact Direct Support Go to C6-30.
	All resistance readings are less than 3000 ohms.	Go to C6-3
C6-3 Check for Short ● Disconnect the vehicle harness connector at the ECM. ● Turn **ignition on** (engine not running) while at the same time observing the "'Check Engine" light.	"Check Engine" light comes on and stays on.	CEL Driver line (ckt #419) is shorted to ground. Contact Direct Support. Then go to C6-30. The DDR system also needs repair. Go to C7-4.
	"Check Engine" light stays off.	Go to C6-3.

D. CHART6. "CHECK ENGINE" LIGHT ALWAYS ON, NO DATA LINK AND WON'T FLASH CODES (Cent'd.)

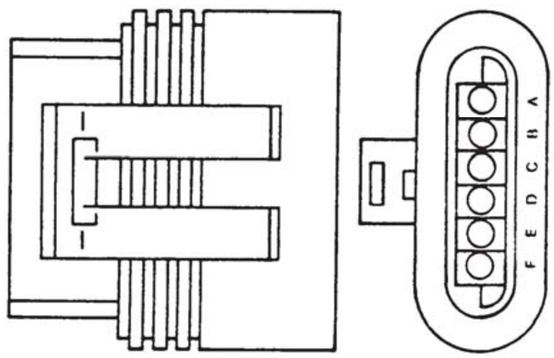
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C6-4 Check ECM Connectors		
● Turn ignition off. ● Check terminals at the vehicle harness connectors (both the ECM and harness side) for damage: bent, corroded and unseated pins or sockets. Pay special attention to the terminals and sockets in the 6-pin power connector and sockets B 1 and B3 of the 30-pin vehicle harness.	Terminals and connectors are okay.	Go to C6-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to C6-30.
C6-30 Verify Repairs		
● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. . Clear codes ● Turn ignition off. ● Turn ignition on while at the same time observing the "'Check Engine" light. ● If "Check Engine" light stays on. read historical codes.	"Check Engine" light comes on for up to 5 seconds. then goes out.	Repairs are complete.
	"Check Engine" light does not come on at all.	Go to C4-1. Page 3-164.
	"Check Engine light comes on and stays on. but codes don't flash out	All system diagnostics are com plete Please review this see: on from the first step to find the error
	Codes other than code 25.	Go to START-1, page 3-121, to service codes.



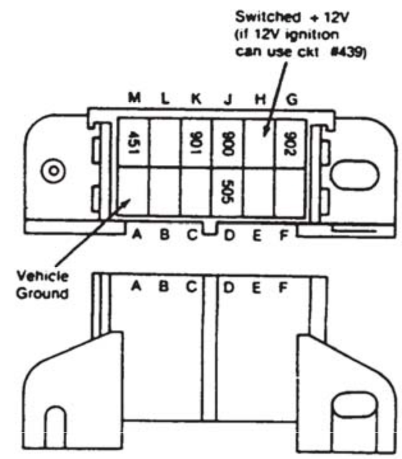
Dash Lights



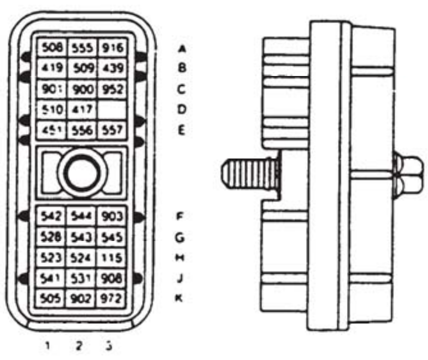
Check Engine, Diagnostic Request, and Ignition Circuits



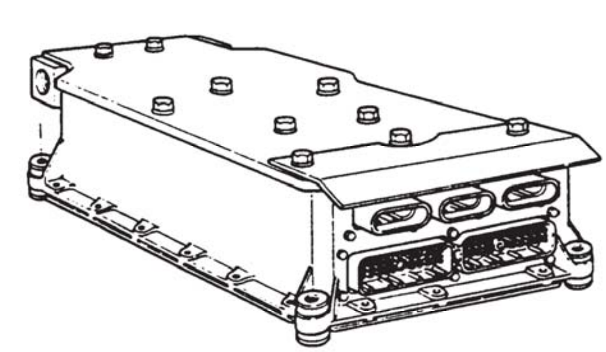
6-Way Power Harness Connector
P/N 12066317



12 Pin DDL Connector P/N 12020043



ECM Vehicle Harness Connector
P/N 12034398

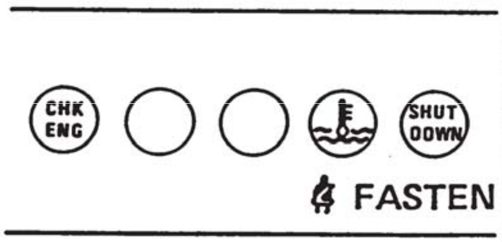


Electronic Control Module (ECM)

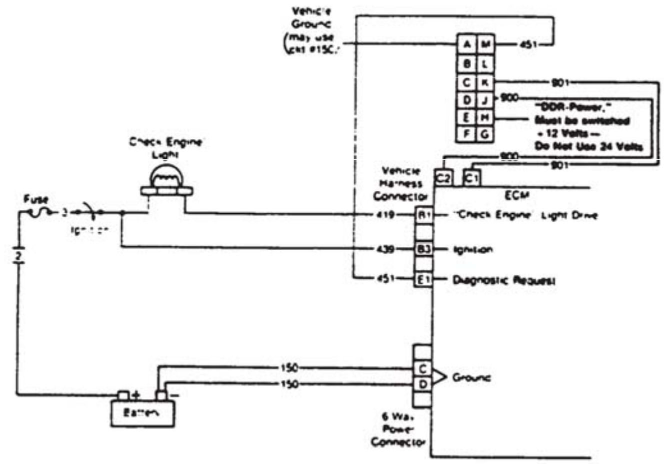
D. CHART 7 . NO DATA LINK AND BULB CHECK OKAY

NOTE — This chart is only to be used if
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

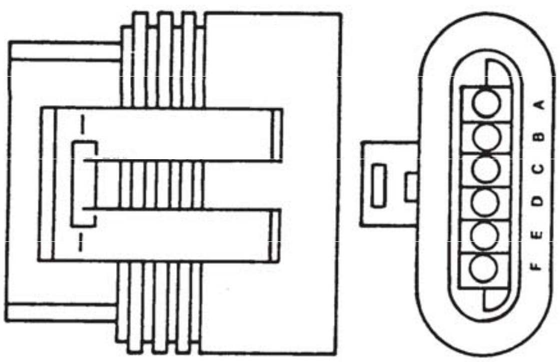
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C7-1 Read Codes on the "Check Engine" Light ● Unplug the DDR. ● Short pin A to pin M on the 12 pin DDL connector. ● Read codes flashing out on the "Check Engine" light.	Flashes out codes.	Go to C7-4 (note: if you wish to bypass diagnosis of a potential data link or DDR problem for now, go to CEL-3, page 3-131.)
	Does not flash out codes.	Go to C7-2
C7-2 Check Diagnostic Request Line ● Turn ignition off. ● Disconnect both the vehicle harness and 6-way power harness connectors at the ECM. ● Install a jumper wire between El of the vehicle harness connector and socket D of the 6-way power harness connector. ● Read resistance between sockets A and M on the 12 pin, DDL connector.	Greater than 5 ohms or open.	The Diagnostic Request line (ckt #1451) is open or an open or poor ground exists at pin A of the DDL Connector. Repair open wire or bad ground, page 3-2. Then go to C7-30.
	Less than or equal to 5 ohms.	Go to C7-3.
C7-3 Check ECM Connectors ● Check terminals at both the vehicle harness and 6-way power harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM. page 4-192. Then go to C7-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to C7-30.



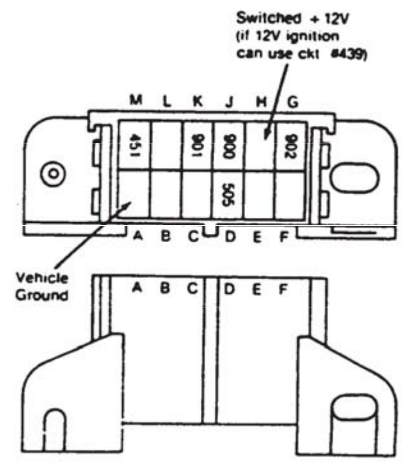
Dash Lights



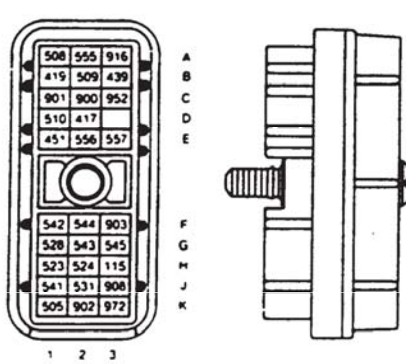
Check Engine, Diagnostic Request, and Ignition Circuits



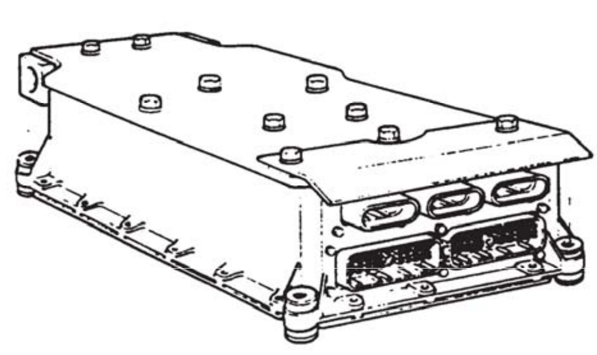
6-Way Power Harness Connector
P/N 12066317



12 Pin DDL Connector P/N 12020043



ECM Vehicle Harness Connector
P/N 12034398

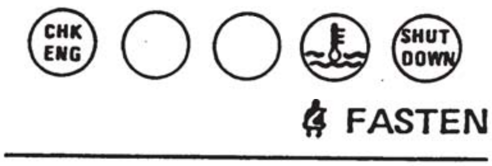


Electronic Control Module (ECM)

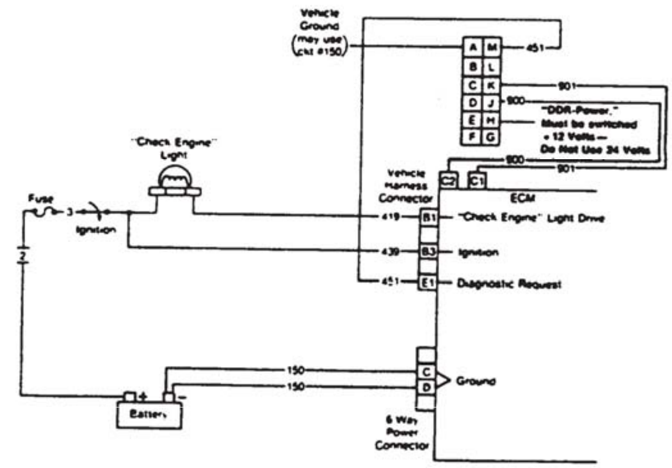
Section 4
TROUBLESHOOTING CHARTS

D. CHART 7. NO DATA LINK AND BULB CHECK OKAY (Co nt'd.)

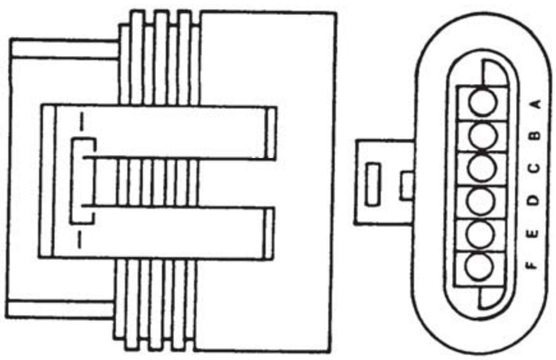
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C7-4 Check for Open ● Turn off ignition. ● Remove all jumpers from 12-pin DDL connector. ● Place jumper across pins J and K on the 12-pin DDL connector. ● Unplug the vehicle harness connector and measure resistance between sockets Cl and C2.	Greater than 5 ohms.	One or both data lines (ckt #900 or #901) is open. Contact Direct support.
	Less than 5 ohms.	Go to C7-5.
C7-5 Check for Short ● Remove jumper wires from the 12-pin DDL connector. ● Read resistance between sockets C1 & C2 of the vehicle harness connector.	Less than 5 ohms.	The two data lines are shorted together (ckt #900 and #901). Contact Direct Support.
	Greater than 5 ohms.	Go to C7-6.
C7-6 Check for Short to Ing. & Ground ● Remove all jumpers from the 12-pin DDL connector. ● Measure resistance between sockets J and A. then J and H next. Measure resistance between sockets K and A, then K and H of the DDL connector.	Less than 5 ohms on any reading.	A short exists between a data line and ignition (ckt #439) or ground (ckt #150). Contact Direct Support.
	Greater than 5 ohms on any reading.	Go to C7-7.
C7-7 Check DDR on Another Engine ● Connect DDR to another engine and read PROM ID or any other parameter in the menu.	Works OK	Go to C7-30
	Does not work	The DDR is probably defective. See DDR instruction manual for repair.



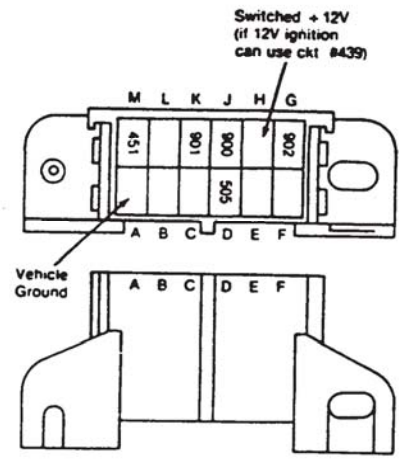
Dash Lights



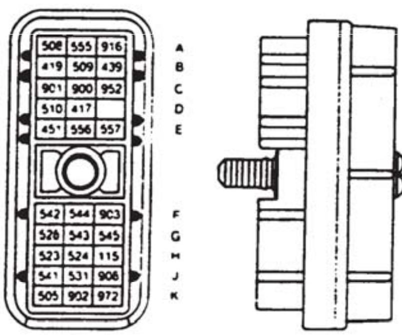
Check Engine, Diagnostic Request, and Ignition Circuits



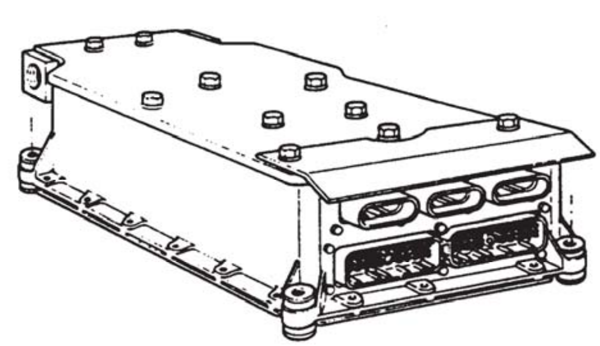
6-Way Power Harness Connector
P/N 12066317



12 Pin DDL Connector P/N 12020043



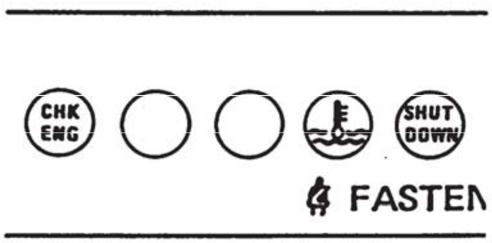
ECM Vehicle Harness Connector
P/N 12034398



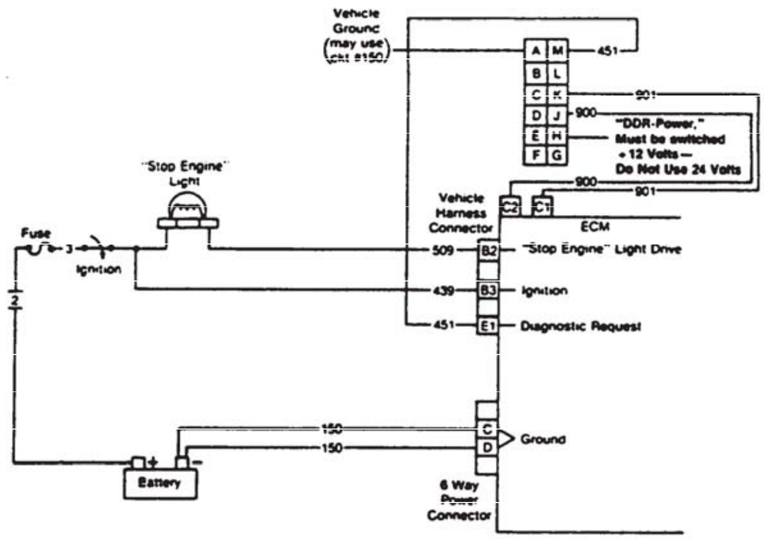
Electronic Control Module (ECM)

D. CHART 7 - NO DATA LINK AND BULB CHECK OKAY (Cont'd.)

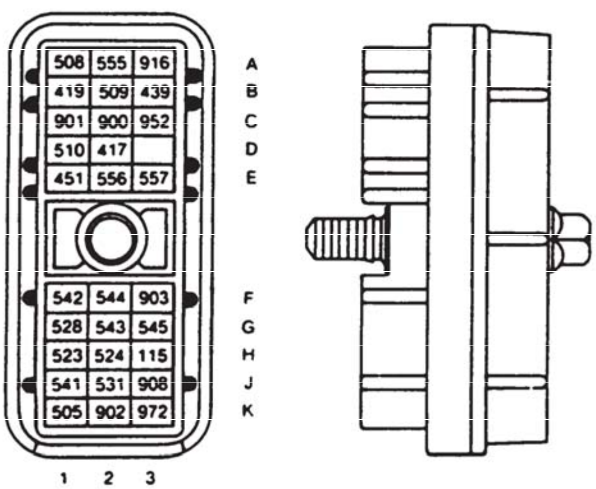
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C7-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until 'Check Engine" light comes on. Stop engine. • Read historical codes.	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".	→ All system diagnostics are complete. Please review this section from the first step to find the error.
	Engine starts, and DDR reads Code 25 (no codes).	→ Repairs are complete.
	Engine starts, and codes other than Code 25 appear.	→ Go to START-1, page 3-121, to service codes.



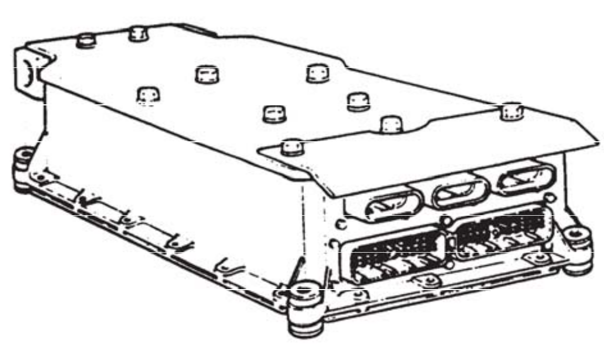
Dash Lights



Stop Engine Light, Diagnostic Request, and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



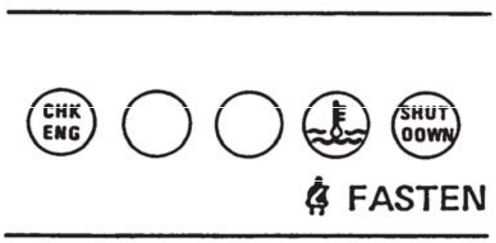
Electronic Control Module (ECM)

D. CHART 8 - "STOP ENGINE" LIGHT ALWAYS ON AND CODE 25 ON DDR

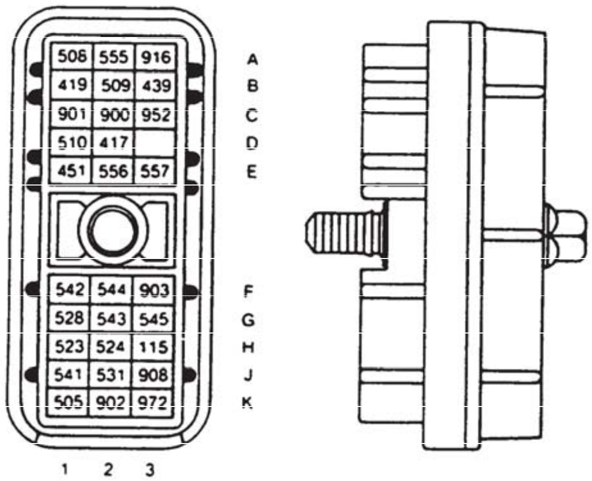
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

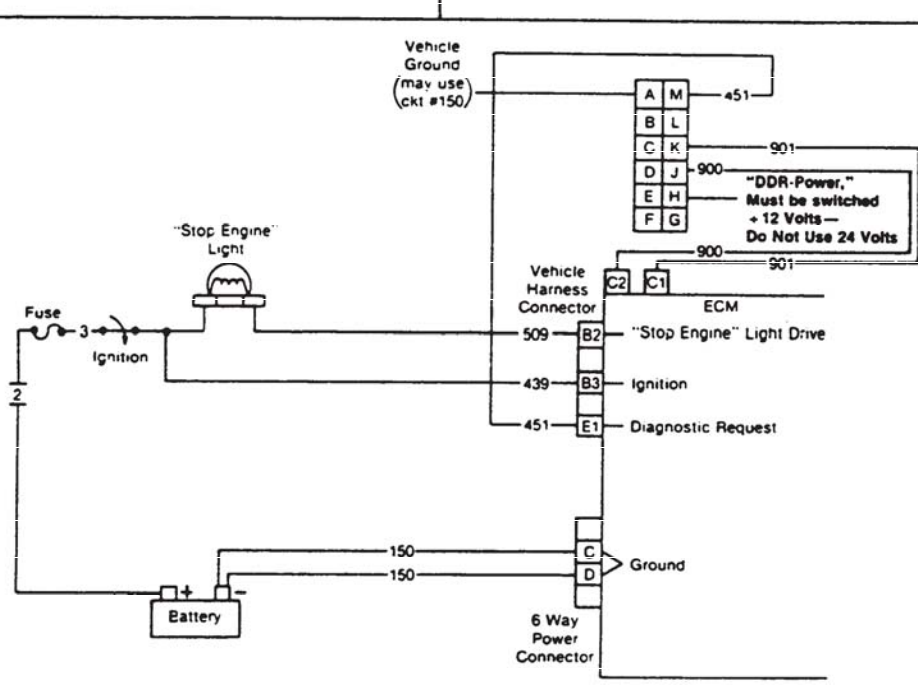
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C8-1 Determine "Stop Engine" Light Status		
• Turn ignition on (engine not running) while at the same time observing the "Stop Engine" light.	"Stop Engine" light comes on for up to 5 seconds, then goes out.	This is the normal operation. Unless other problems exist, return to service.
	"Stop Engine" light comes on and stays on.	Go to C8-2.
C8-2 Check For Short		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn ignition on (engine not running) while at the same time observing the "Stop Engine" light.	"Stop Engine" light comes on and stays on.	"Stop Engine" light driver line (ckt #509) is shorted to ground. Contact Direct Support. Then go to C8-30.
	"Stop Engine" light stays off.	Go to C8-3.
C8-3 Check ECM Connectors		
• Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Pay close attention to B2 and B3.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to C8-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to C8-30.
C8-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Stop Engine" light.	"Stop Engine" light comes on for up to 5 seconds, then goes out.	Repairs are complete.
	"Stop Engine" light comes on and stays on.	All system diagnostics are complete. Please review this section from the first step to find the error.



Dash Lights



ECM Vehicle Harness Connector
P/N 12034398



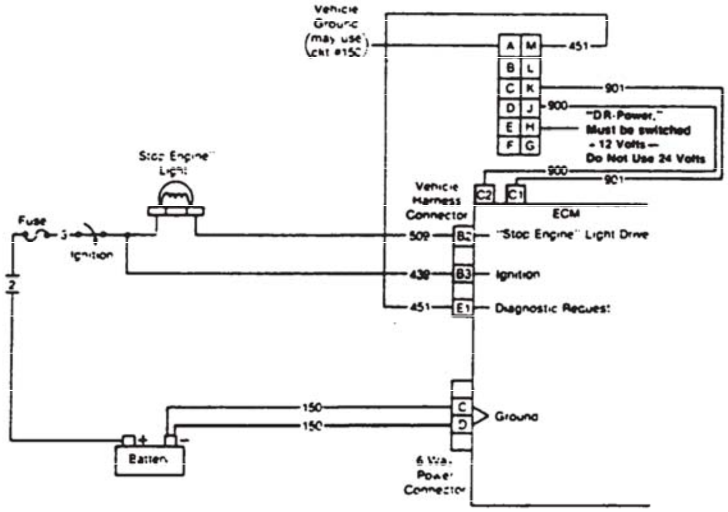
Stop Engine Light, Diagnostic Request, and Ignition Circuits

D. CHART 9 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK

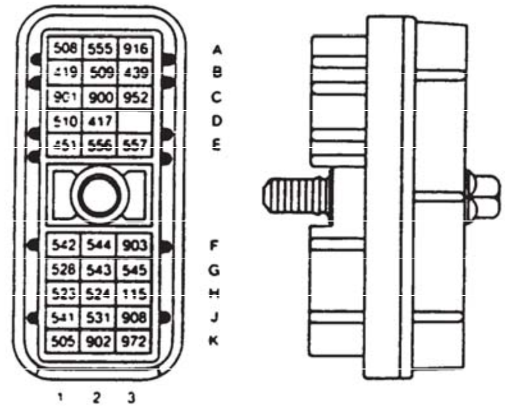
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

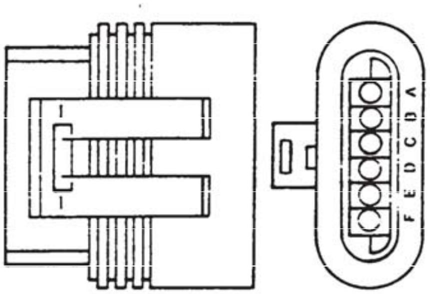
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C9-1 Try to Force SEL On		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between socket B2 on the vehicle harness connector and a good ground. • Turn the ignition on (engine not running). • Note the "Stop Engine" light status.	"Stop Engine" light is still off. →	Go to C9-2.
	"Stop Engine" light is on. →	Go to C9-4.
C9-2 Check for Short		
• Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 to a good ground.	Less than 23.0 volts. →	The 5 Amp ignition fuse is blown, and/or the ignition line (ckt #439) is open or shorted to ground. Contact Direct Support. Then go to C9-30.
	Greater than 23.0 volts if using a 24 volt ignition. →	Go to C9-3.
C9-3 Bulb Check		
• Remove SEL bulb and check whether it's burned out or otherwise damaged.	Bulb is okay. →	SEL Driver line (ckt #509) is open. Contact Direct Support. Then go to C9-30.
	Bulb is not okay. →	Replace bulb, page 4-193. Then go to C9-30.



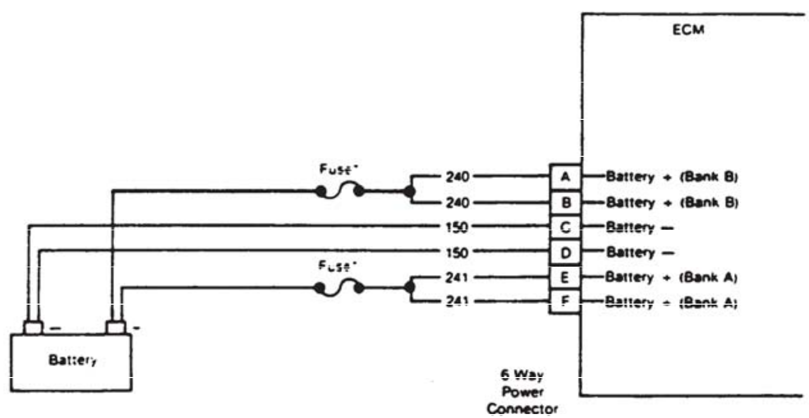
Stop Engine Light, Diagnostic Request, and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



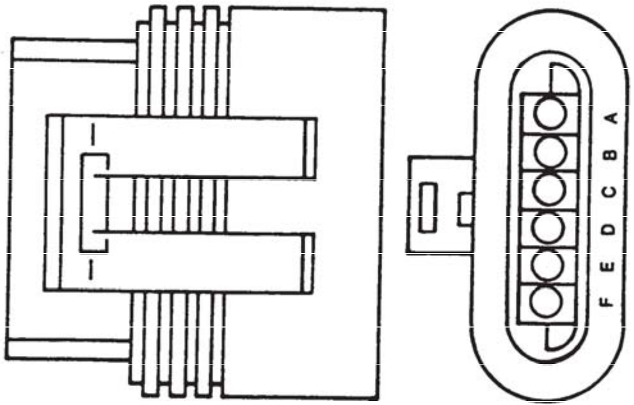
6-Way Power Harness Connector
P/N 12066317



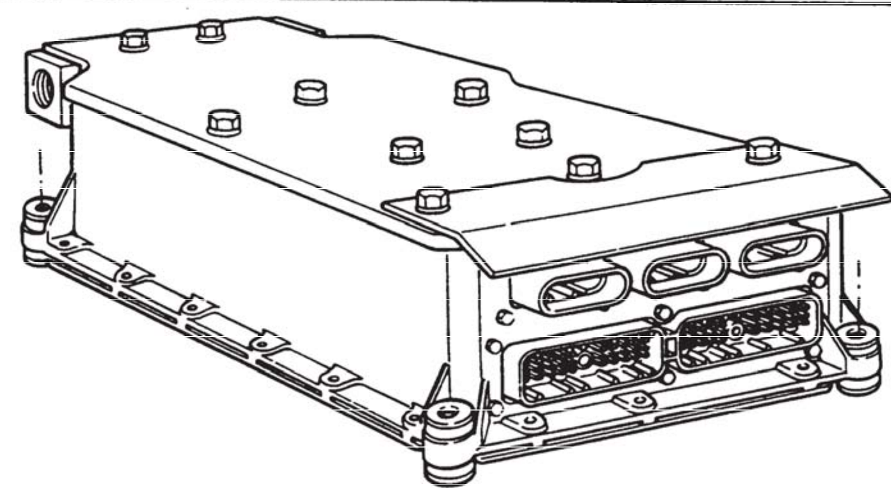
Battery Power and Ground Circuits

D. CHART 9 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK (Cont'd.)

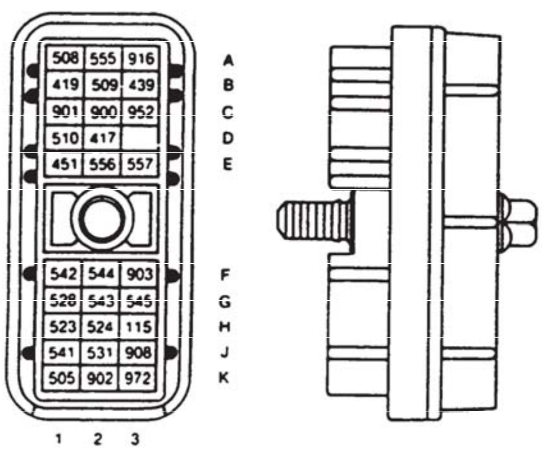
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C9-4 Check for Open		
• Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 to a good ground.	Less than 23.0 volts.	The ignition line (ckt #439) is open. Contact Direct Support. Then go to C9-30.
	Greater than or equal to 23.0 volts.	Go to C9-5.
C9-5 Check for Bat +		
• Turn ignition off. • Disconnect the 6-way power harness connector at the ECM. • Read voltage on 6-way power harness connector, socket A, to a good ground. • Also read voltage on socket E to a good ground.	Less than 11.5 volts on either reading.	Either a ECM fuse is blown, and/or the Battery Power line(s) (ckt #240 or #241) has an open or short to ground. Contact Direct Support. Then go to C9-30.
	Greater than or equal to 11.5 volts on both readings.	Go to C9-6.
C9-6 Check for Ground		
• Read voltage on 6-way power harness connector, socket A to socket C. • Also read voltage on 6-way power harness connector, socket E to socket D.	Less than 11.5 volts on either reading.	Ground line(s) (ckt #150) has an open. Contact Direct Support. Then go to C9-30.
	Greater than or equal to 11.5 volts on both readings.	Go to C9-7.



6-Way Power Harness Connector
P/N 12066317



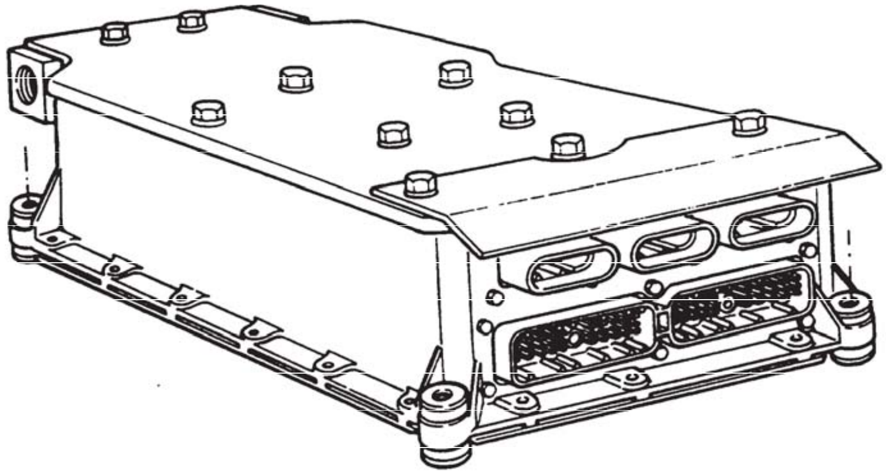
Electronic Control Module (ECM)



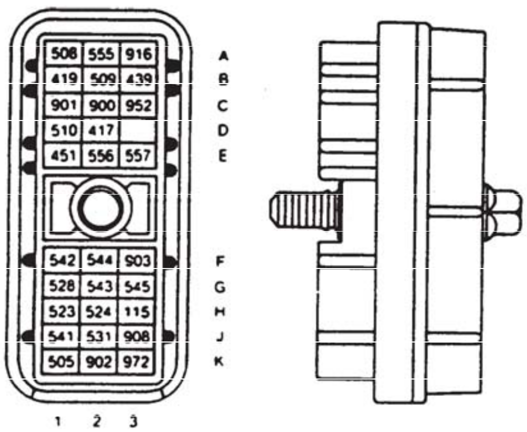
ECM Vehicle Harness Connector
P/N 12034398

D. CHART 9 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK (Cont'd.)

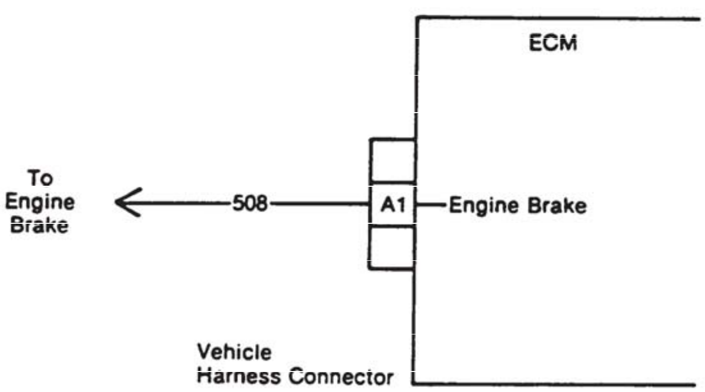
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C9-7 Check ECM Connectors		
• Check terminals at both the 6-way power harness and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Pay close attention to terminals B2 and B3 of the vehicle harness connector and C and D of the power harness.	Terminals and connectors are okay. →	Replace ECM, page 4-192. Then go to C9-30.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to C9-30.
C9-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Stop Engine" light.	"Stop Engine" light comes on for up to 5 seconds, then goes out. →	Repairs are complete. Go to START-1, page 3-121, if any other problems are present.
	"Stop Engine" light does not come on at all. →	All system diagnostics are complete. Please review this section from the first step to find the error.



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398



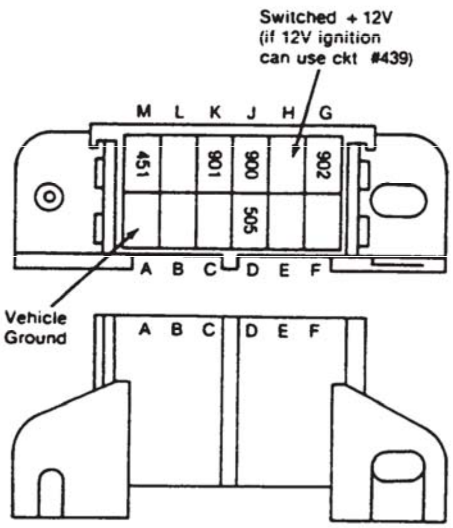
Engine Brake Circuit

D. CHART 17-ENGINE BRAKE ALWAYS ENABLES

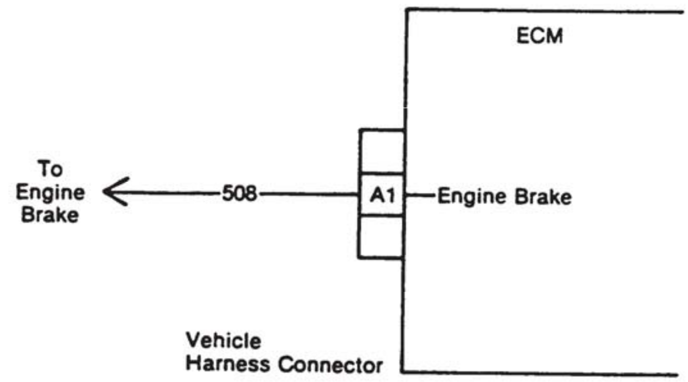
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

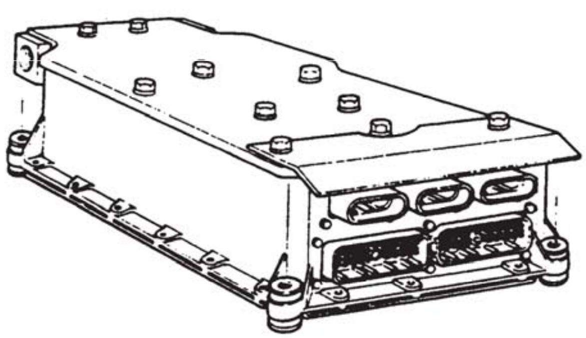
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C17-1 Identity Control Logic • Start and run engine at idle (No throttle applied). • Plug in DDR and select MISC OUTPUTS (Mode 30). • Observe DDR display line labeled ENG BRK ENBLE.	Display reads "OFF". →	Feature is programmed for engine brake control. Go to C17-3.
C17-3 Check for Short • Turn off ignition. • Disconnect the vehicle harness at the ECM connector. • Read resistance between socket A1 of the vehicle harness connector and a good ground.	Less than 100 ohms. →	A short to ground exists on ckt #508. Contact Direct Support. Then go to C17-30.
	Greater than 100 ohms or open. →	Go to C17-4.
C17-4 Check ECM Connectors • Check terminals and connectors (both ECM and harness side) for damage; bent, corroded, or unseated pins or sockets. Especially terminal A1 (ckt #508).	Terminals and connectors are okay. →	The problem may be in the engine brake. Contact Direct Support. Then go to C17-30.
	Problem found. →	Repair connectors/terminals, page 3-2. Then go to C17-30.
C17-30 Verify Repairs • Turn off ignition. • Reconnect all connectors. • Turn ignition on. • Start and run engine. • Observe ENG BRK ENBLE display on DDR (Mode 30 - MISC. OUTPUTS).	Display reads "OFF" or "ON". →	Repairs and system diagnosis are complete. Review this section from the first step to find the error.



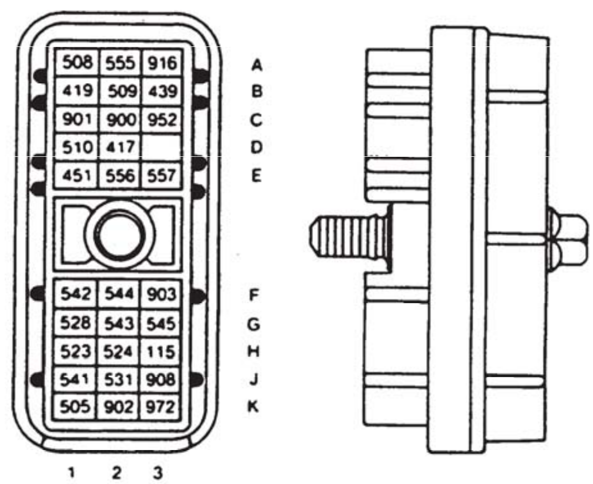
12 Pin DDL Connector P/N 12020043



Engine Brake Circuit



Electronic Control Module (ECM)



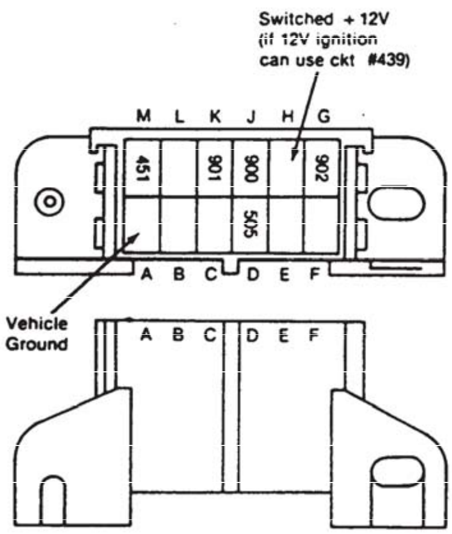
ECM Vehicle Harness Connector
P/N 12034398

D. CHART 18-ENGINE BRAKE INOPERATIVE

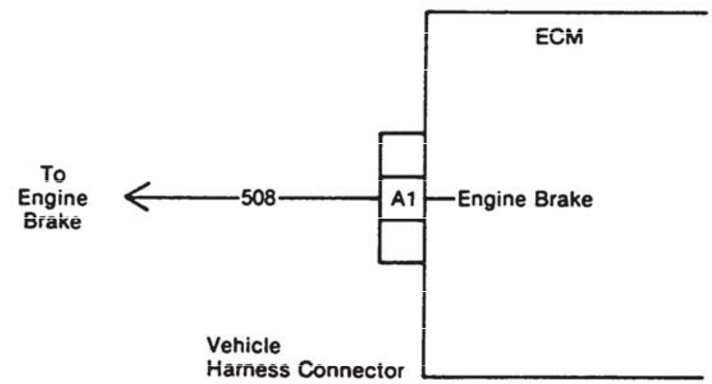
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found. and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

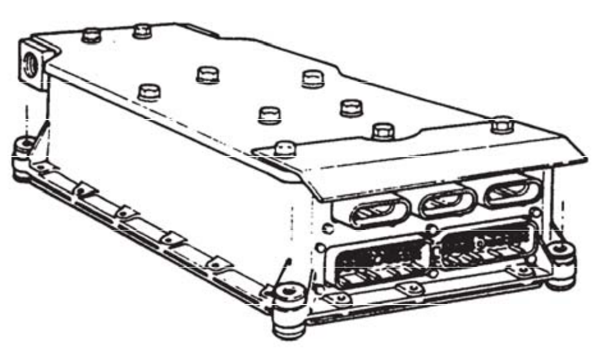
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C18-1 Verify Control Logic • Start engine and run at idle (no throttle applied). • Plug in DDR and select MISC OUTPUTS (Mode 30). • Observe DDR display on line labeled ENG BRK ENBLE.	Display read "OFF". →	Feature is programmed for engine brake control. Go to C18-2.
C18-2 Verify Engine Brake Enable Operation • Rev up the engine then quickly take your foot off the throttle while observing the DDR display line labeled ENG BRK ENBLE.	DDR is always reading "OFF". →	Replace ECM, page 4-192. Then go to C18-30.
	DDR reads "OFF" at first, then reads "ON" when foot is let off throttle. As the engine returns to idle, this display reads "OFF" once again. →	The ECM is operating properly. Check for open in engine brake enable line (ckt #508). Then go to C18-4.



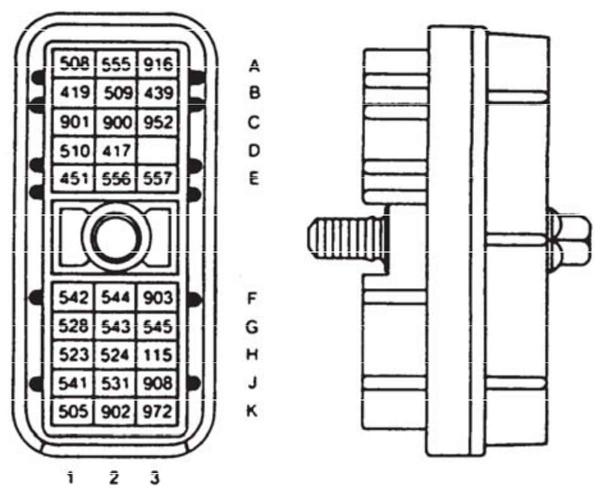
12 Pin DDL Connector P/N 12020043



Engine Brake Circuit



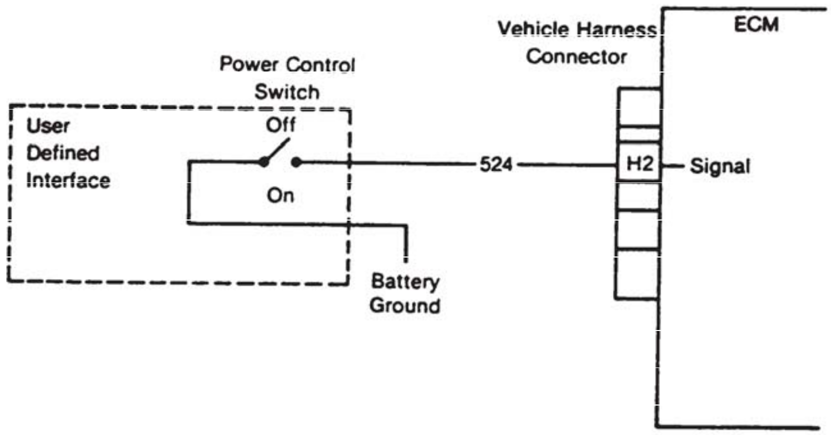
Electronic Control Module (ECM)



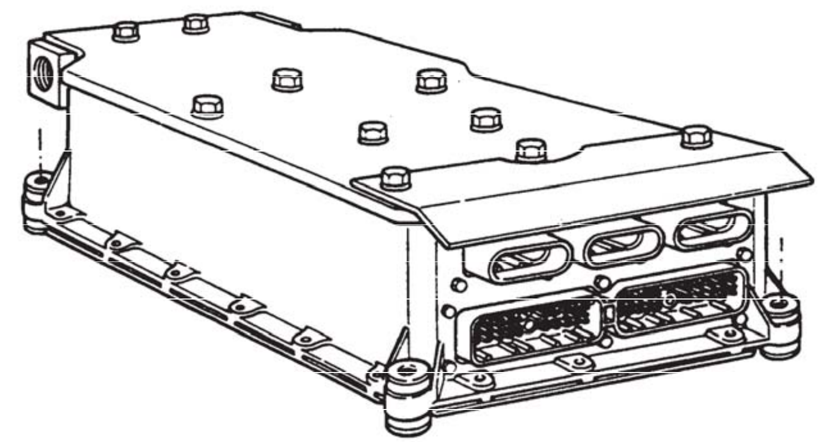
ECM Vehicle Harness Connector
P/N 12034398

D. CHART 18-ENGINE BRAKE INOPERATIVE (Cont'd.)

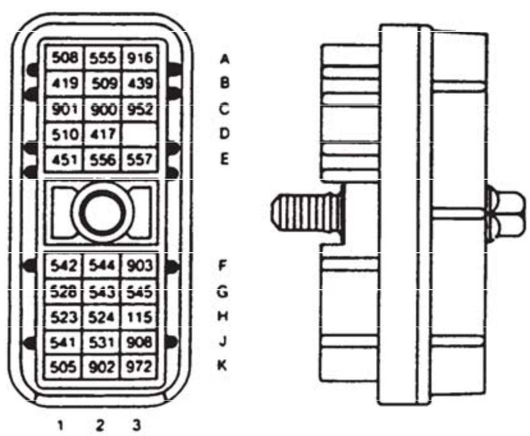
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C18-4 Check ECM Connector		
• Turn off ignition. • Disconnect vehicle harness connector at the ECM. • Check terminals at the vehicle harness connector (both the ECM and harness side) for damaged, bent, corroded, and unseated pins or sockets.	Problem found. →	Repair terminals/connectors. Then go to C18-30.
	Terminals and connectors are okay. →	If no problem is found, then the fault exists outside of the DDEC system. Contact Direct Support.
C18-30 Verify Repairs		
• Reconnect all connectors. • Start engine and check if engine brake enable/transmission retarder feature functions properly.	Feature is still inoperative →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Feature functions properly →	Repairs are complete.



Power Control Circuit



Electronic Control Module (ECM)

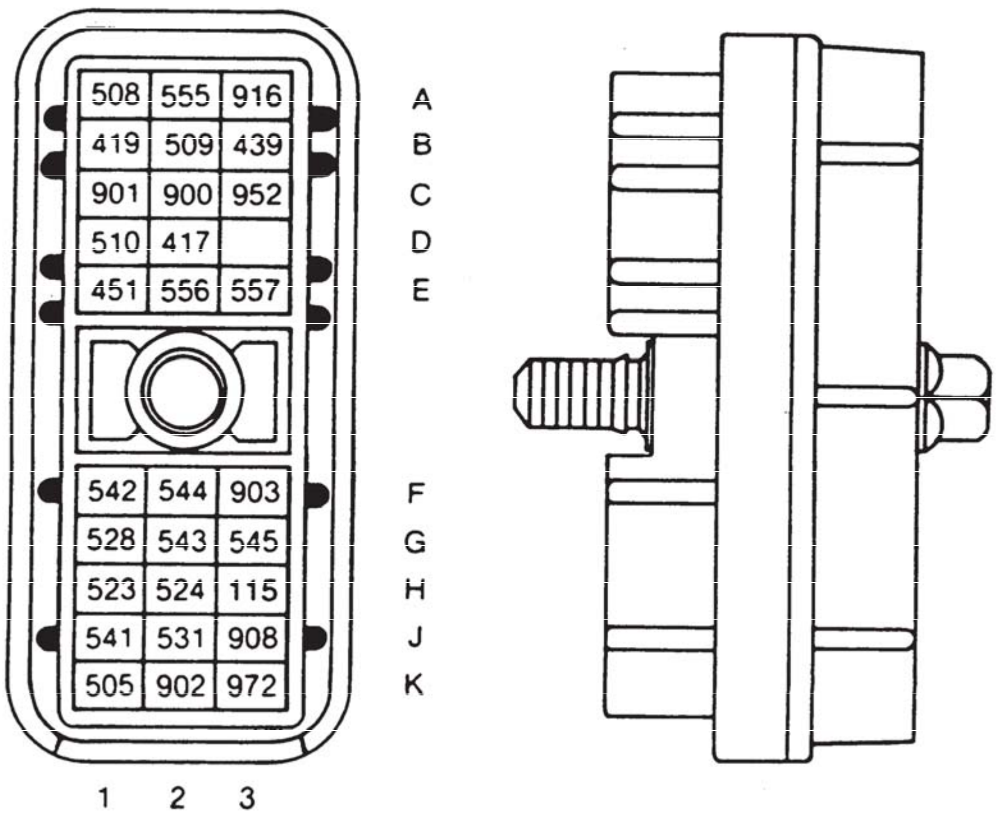


ECM Vehicle Harness Connector
P/N 12034398

D. CHART 19 - POWER CONTROL INPUT INOPERATIVE

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

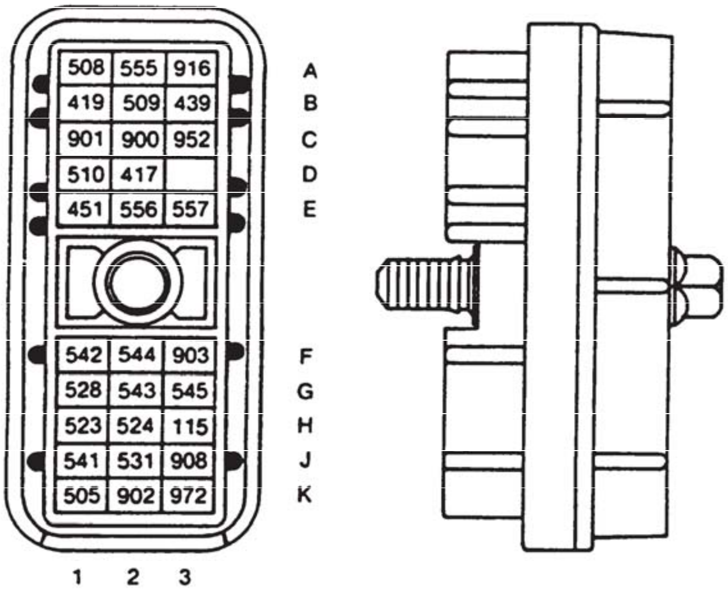
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C19-1 Identify Power Control Application		
• Determine how Power Control input (ckt #524) is being used. • Plug DDR into 12-pin DDL connector and select MODE 03 (PROM ID).	Used for throttle inhibit →	Go to C19-2.
	Used for engine protection (PC SHUT DOWN). →	Go to C19-4.
C19-2 Test Throttle Inhibit Feature		
• Start and run engine. • Plug DDR into the 12 pin DDL connector and select Mode 29 (MISC SWITCHES) for display. • Place vehicle in condition where throttle inhibit is supposed to occur and observe DDR display line labeled "POWER CTL SW" (on coaches, this occurs when a passenger door is open).	DDR display reads "ON". →	Feature appears to be operational at the moment. Problem may be intermittent. Refer to C1-2, page 3-136, for help on resolving intermittent faults.
	DDR display reads "OFF". →	An open exists in either the Power Control line (ckt #524) or the switch (or relay) in series with it. Contact Direct Support. (If an open is not found, go to C19-5).
C19-3 Check ECM Connectors		
• Turn ignition off (if still on). • Disconnect the vehicle harness connector at the ECM (if not already disconnected). • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace ECM, page 4-192. Then go to C19-30.
	Problem found. Connectors are okay. →	Repair terminals/connectors, page 3-2. Then go to C19-30.



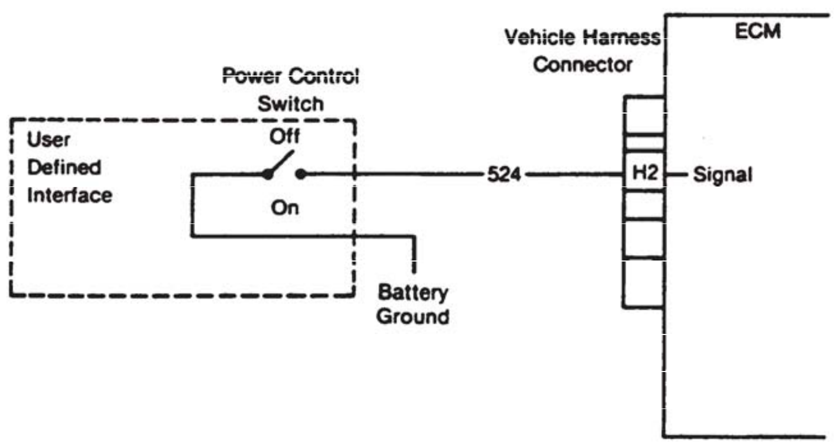
ECM Vehicle Harness Connector
P/N 12034398

D. CHART 19 - POWER CONTROL INPUT INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C19-4 Check for Open • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between socket H2 of the vehicle harness connector and the device being used to trigger the engine protection system. • Close switch (relay or triggering device).	Less than 5 ohms. →	A fault may exist in the device used to trigger engine shutdown (faulty switch or relay, etc.). If no fault can be found with the triggering device, go to C19-3.
	Greater than 5 ohms or open →	The Power Control line (ckt#524) is open. Repair open, page 3-2, and go to C19-3. If an open is not found, go to C19-5.
C19-5 Check for Ground • Read voltage on the 6-way power harness connector, socket A or B (red lead) to C (black lead). • Also read voltage on 6-way power harness connector, socket E or F (red lead) to socket D (black lead).	Less then 11.5 volts on either reading. →	Ground wire(s) (ckt #150) has open. Contact Direct Support. Then go to C19-30.
	Greater than or equal to 11.5 volts on both readings. →	Go to C19-3.
C19-30 Verify Repairs • (Note: if the Power Control input is being used for engine protection, you will not be able to confirm repair unless the engine protection function can be triggered). • Start and run engine. • Select Mode 29 MISC SWITCHES on DDR for display. • Recreate conditions under which the Power Control input should be grounded, and observe DDR display labelled "POWER CTL SW".	DDR display reads "OFF". →	All system diagnostics are complete. Please review this section from the first step to find the error.
	DDR display reads 'ON". →	Repairs are complete.



ECM Vehicle Harness Connector
P/N 12034398



Power Control Circuit

D. CHART 21 - THROTTLE INHIBIT ALWAYS ON

NOTE — This chart is only to be used if:

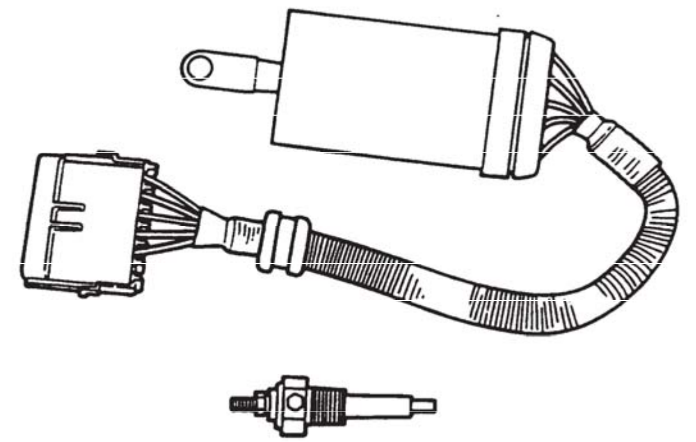
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C21-1 Test Throttle Inhibit Feature		
• Start and run engine. • Plug DDR into the 12 pin DDL connector and select Mode 29 (MISC SWITCHES) for display. • Place vehicle in condition where throttle inhibit is supposed to occur and observe DDR display line labeled "POWER CTL SW" (on coaches, this occurs when a passenger door is open). • Then place vehicle in condition where throttle inhibit is not supposed to occur and observe DDR display.	DDR display reads "ON" always. →	Go to C21-2.
	DDR display reads "ON", then "OFF". →	Go to C21-4.
C21-2 Check for Short		
• Place vehicle in condition where throttle inhibit will not occur and observe DDR display (Mode 29). • Turn ignition off. • Disconnect the vehicle harness. • Read resistance between pins H2 of the vehicle harness connector and a good ground.	Less than or equal to 5 ohms. →	Either the Power Control Switch is shorted or ckt #524 is shorted to ground. Contact Direct Support. Go to C21-30.
	Greater than 5 ohms or open. →	Go to C21-3.
C21-3 Check ECM Connectors		
• Turn ignition off (if still on). • Disconnect the vehicle harness connector at the ECM (if not already disconnected). • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets, especially H2 of the vehicle harness.	Terminals and connectors are okay. →	Replace ECM, page 4-192. Then go to C21-30.
	Problem found. Connectors are okay. →	Repair terminals/connectors, page 3-2. Then go to C21-30.

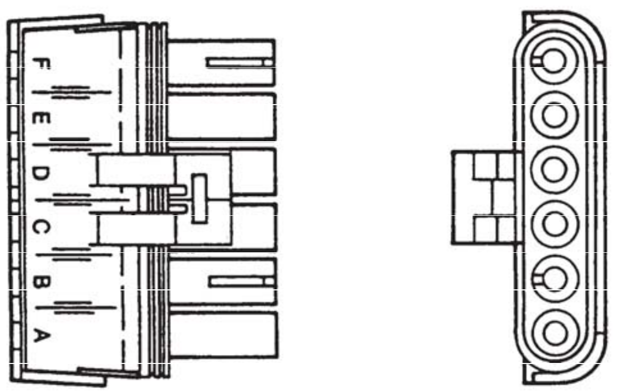
Section 4
TROUBLESHOOTING CHARTS

D. CHART 21 - THROTTLE INHIBIT ALWAYS ON (Cont'd.)

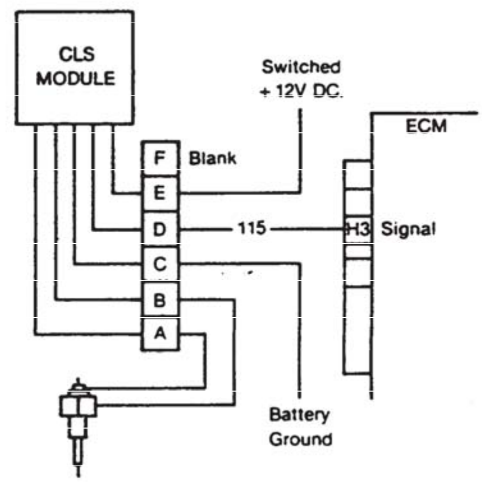
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C21-4 Check TPS		
• Replace vehicle harness connector. • Hook up DDR to the 12-pin DDL connector and select Throttle Sensor display. • Read throttle counts at both no throttle and full throttle.	Getting 20-30 counts at no throttle and 200-235 counts at full throttle.	Go to C21-3.
	Throttle counts do not change.	Replace TPS, page 4-248. Go to C21-30.
C21-30 Verify Repairs		
• (Note: if the Power Control input is being used for engine protection, you will not be able to confirm repair unless the engine protection function can be triggered). • Connect connectors to ECM. • Start and run engine. • Select Mode 29 MISC SWITCHES on DDR for display. • Recreate conditions under which the Power Control input should be grounded, and observe DDR display labelled "POWER CTL SW".	DDR display reads "OFF".	All system diagnostics are complete. Please review this section from the first step to find the error.
	DDR display reads 'ON".	Repairs are complete.



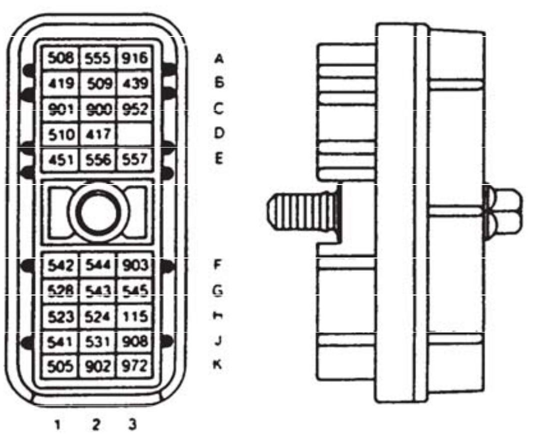
Coolant Level Sensor Module Assembly
P/N 23505265



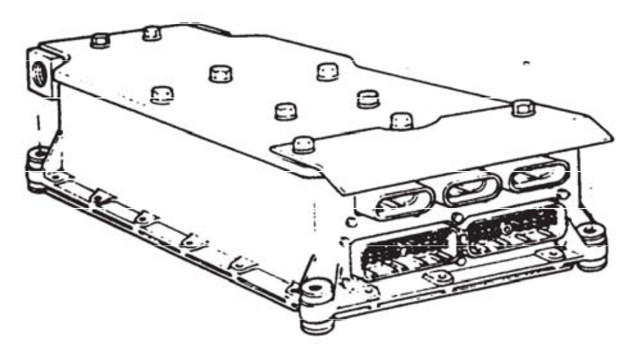
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398



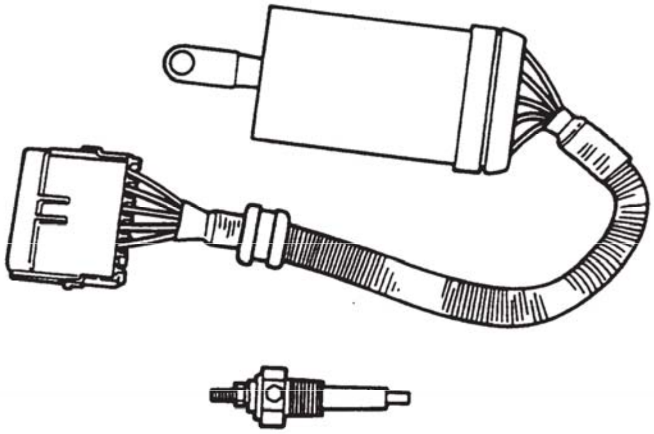
Electronic Control Module (ECM)

E. CODE 13 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE LOW

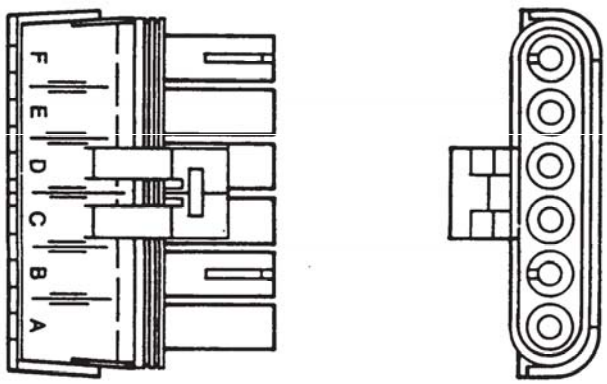
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

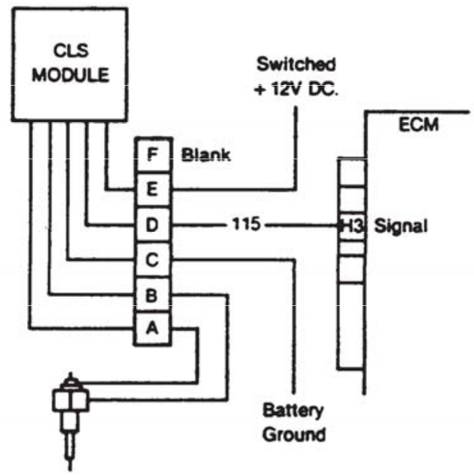
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-1 Sensor Check • Turn ignition off. • Disconnect CLS. • Turn ignition on. • Start engine. • Read active codes. • Stop engine.	Code 16 (and any other codes).	Go to 16-1, page 3-17.
	Code 13 (and any other codes).	Go to 13-3, page 3-205.
13-2 Check CLS Connectors • Inspect terminals at the CLS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace CLS module, page 4-240. Then go to 13-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 13-30.
13-3 Check for Short to Return Line • Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Read resistance between sockets C and D on the ECM side of the CLS harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #115) is shorted to the CLS return line. Contact Direct Support. Then go to 13-30.
	Greater than 10,000 ohms or open.	Go to 13-2.



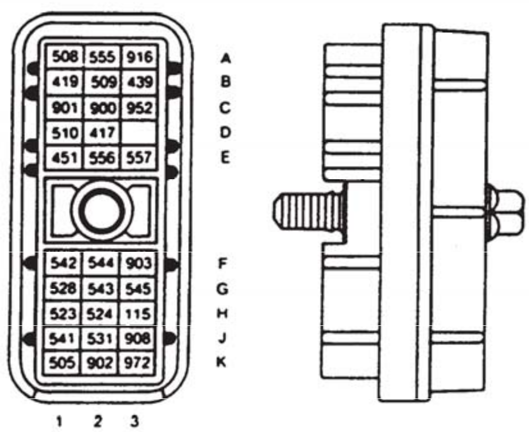
Coolant Level Sensor Module Assembly
P/N 23505265



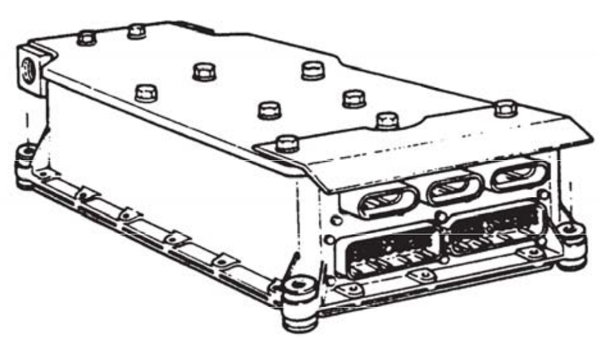
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



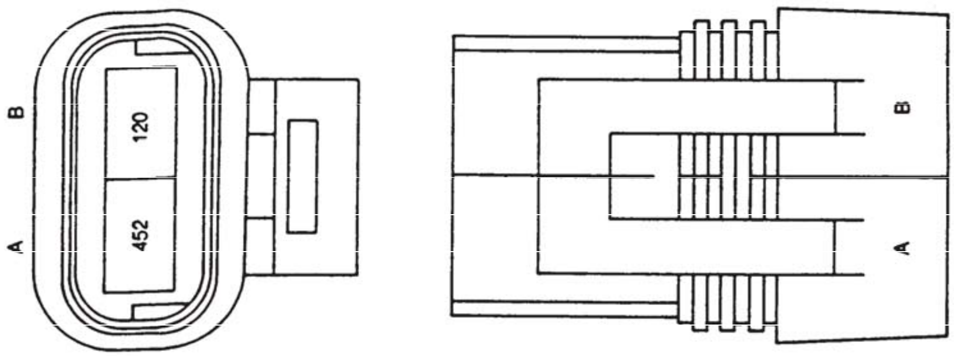
ECM Vehicle Harness Connector
P/N 12034398



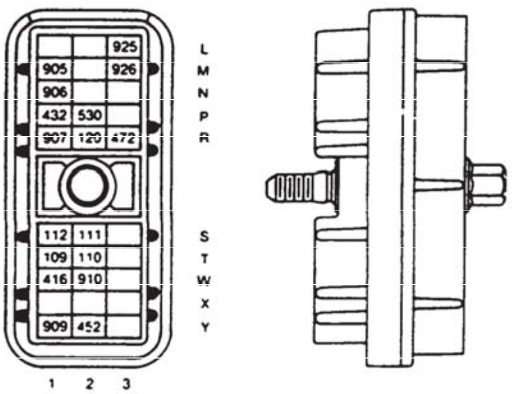
Electronic Control Module (ECM)

E. CODE 13 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE LOW (Cont'd.)

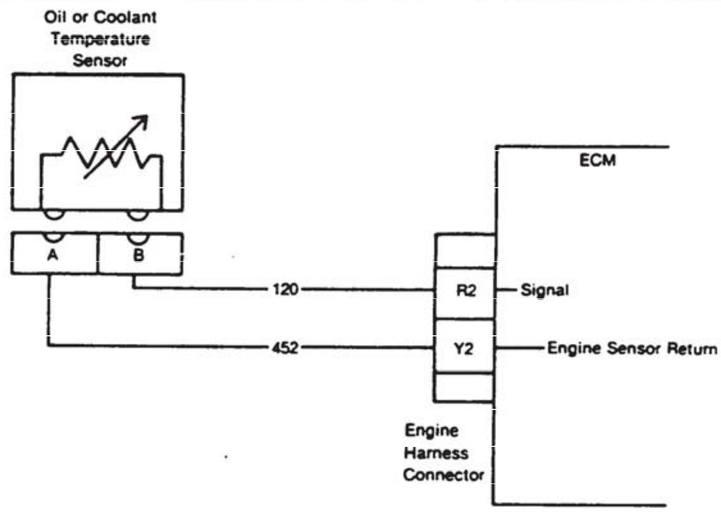
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Start engine. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read HISTORICAL CODES. • Stop engine.	Code 25 (no codes). →	Repairs are complete.
	Code 13 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 13. →	Go to START-1, page 3-121, to service other codes.



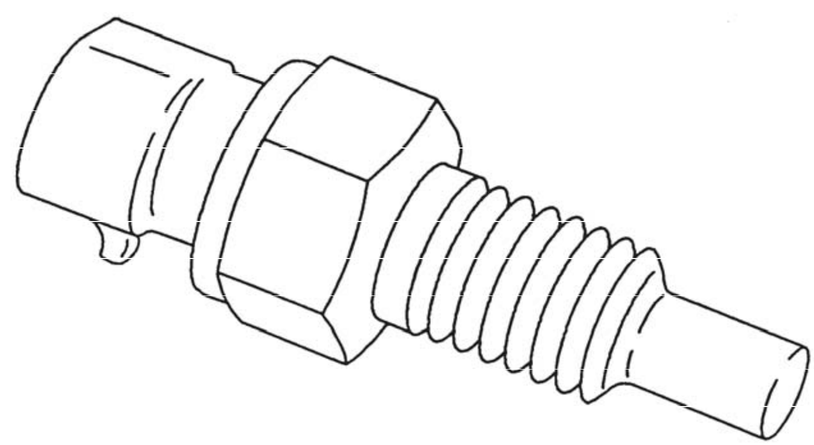
Oil or Coolant Temperature Sensor
Harness Connector
P/N 12040753



ECM Engine Harness Connector
P/N 12034400



Oil or Coolant Temperature Circuit



Oil or Coolant Temperature Sensor
(OTS/CTS)
P/N 25036693

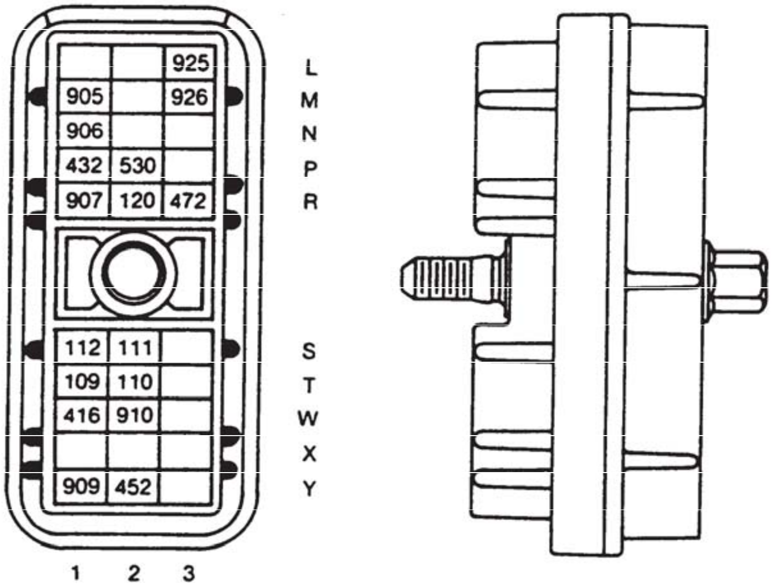
E. CODE 14 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE HIGH

NOTE — This chart is only to be used if:

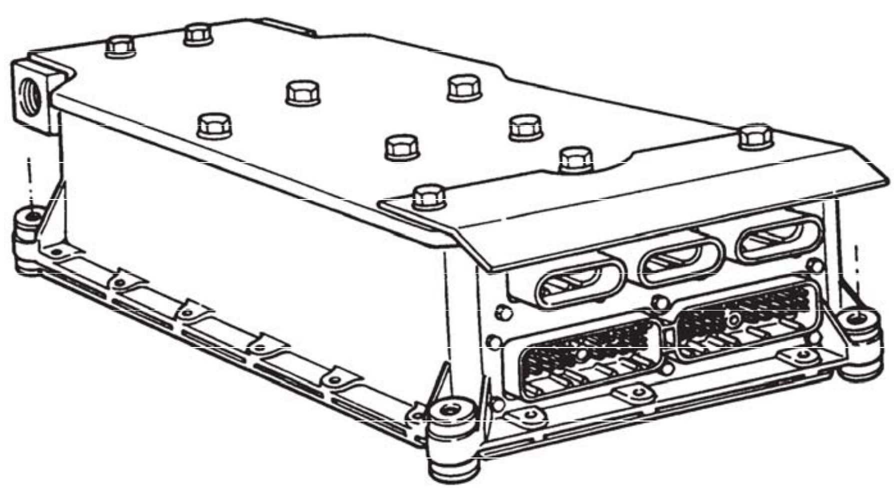
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-1 Sensor Check • Turn ignition off. • Disconnect OTS or CTS and install a jumper between the OTS or CTS connector sockets A and B. • Turn ignition on. • Read active codes.	Code 15 (or any codes except Code 14). →	Go to 14-2.
	Anything except Code 15. →	Go to 14-4.
14-2 Check for Short to +5 Volt Line • Turn ignition off. • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R2 and W1 on the engine harness connector.	Less than or equal to 10,000 ohms. →	Signal line (ckt #120) is shorted to the engine +5 Volt line (ckt #416), and/or (ckt #120) signal line is shorted to ground and/or sensor return (ckt #452). Contact Direct Support.
	Greater than 10,000 ohms or open. →	Go to 14-3.
14-3 Check OTS or CTS Connectors • Inspect terminals at the OTS or CTS connectors (both the sensor and harness side) for damage: bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace OTS, page 4-323 or CTS, page 4-238. Then go to 14-30.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to 14-30.
14-4 Open line Check • Turn inition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R2 and Y2 on the engine harness connector.	Less than or equal to 5 ohms. →	Go to 14-5.
	Greater than 5 ohms or open. →	Signal line (ckt #120) or return line (ckt #452) is open. Contact Direct Support.

vapors, and is harmful to skin



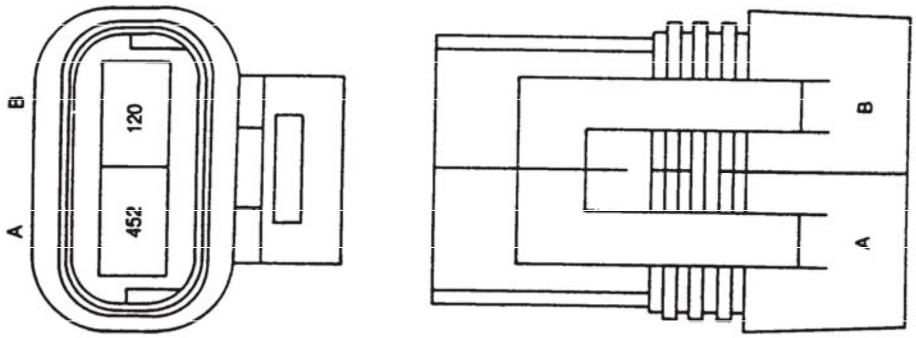
ECM Engine Harness Connector
P/N 12034400



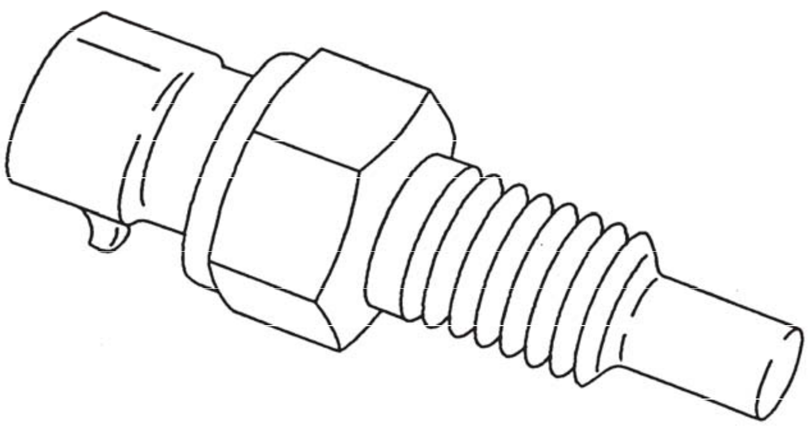
Electronic Control Module (ECM)

E. CODE 14 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE HIGH (Cont'd.)

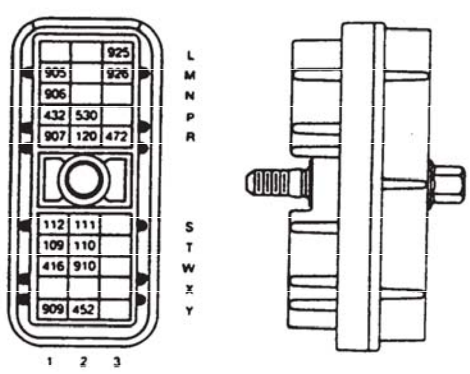
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-5 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace ECM, page 4-192. Then go to 14-30.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to 14-30.
14-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or after 8 minutes. Stop engine. • Read historical codes.	Code 25 (no codes). →	Repairs are complete.
	Code 14 (and any other codes.) →	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 14. →	Go to START-1, page 3-121, to service other codes.



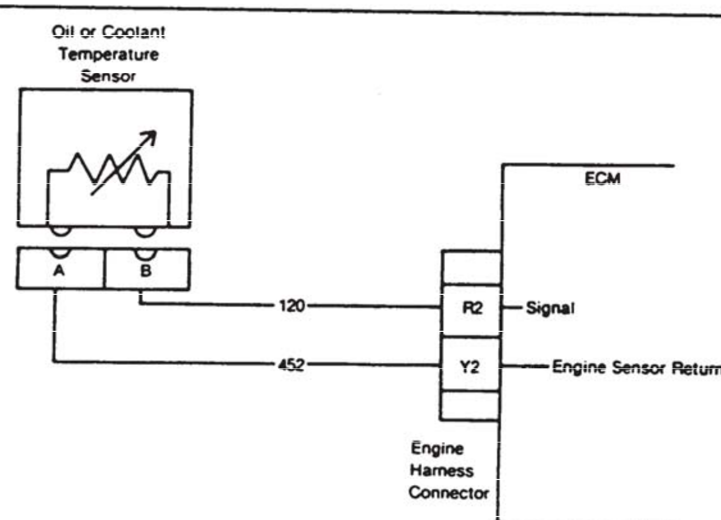
Oil or Coolant Temperature Sensor
Harness Connector
P/N 12040753



Oil or Coolant Temperature Sensor
(OTS/CTS)
P/N 25036693



ECM Engine Harness Connector
P/N 12034400

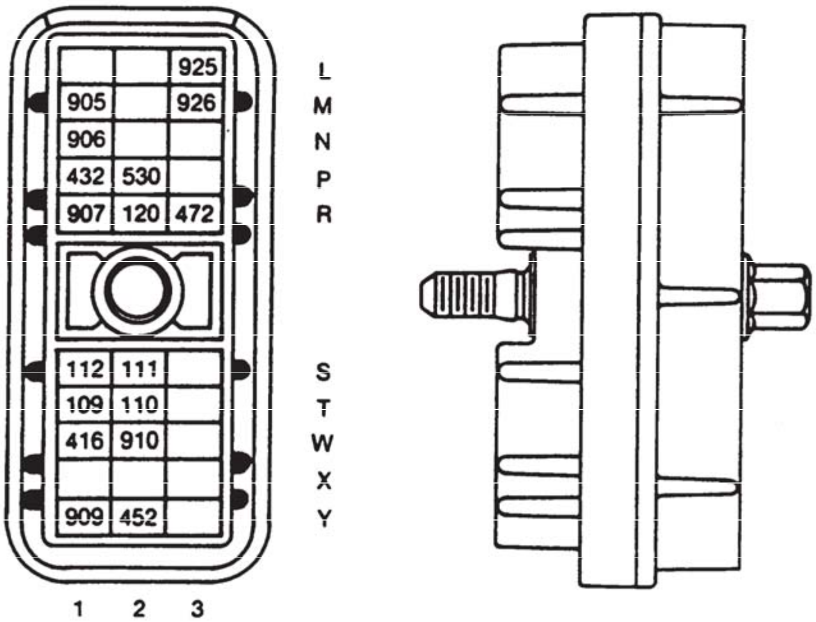


Oil or Coolant Temperature Circuit

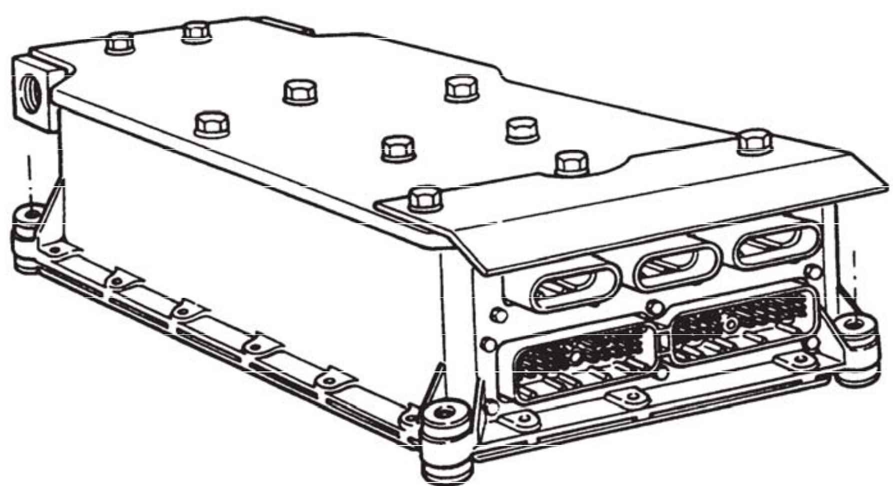
E. CODE 15 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-1 Multiple Code Check • Were there any other active codes besides Code 15?	No other codes.	Go to 15-2.
	Yes, any or all of the following codes: 14, 23, 33.	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above.	Go to 15-2.
15-2 Sensor Check • Turn ignition off. • Disconnect OTS or CTS connector. • Start engine and run until "Check Engine" light comes on or after 8 minutes. • Read active codes with engine still running.	Any codes except Code 15.	Go to 15-3.
	Code 15 (and any other codes).	Go to 15-4.
15-3 Check OTS or CTS Connectors • Inspect terminals at the OTS or CTS connectors (both the sensor and harness side) for damage: bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace OTS, page 4-323, or CTS, page 4-238. Then go to 15-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 15-30.
15-4 Check for Short • Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets R2 and Y2 on the engine harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading.	Signal line (ckt #120) is shorted to the return line (ckt #452) or battery ground. Repair short, page 3-2. Then go to 15-30.
	Greater than 10,000 ohms or open on both readings.	Go to 15-5.



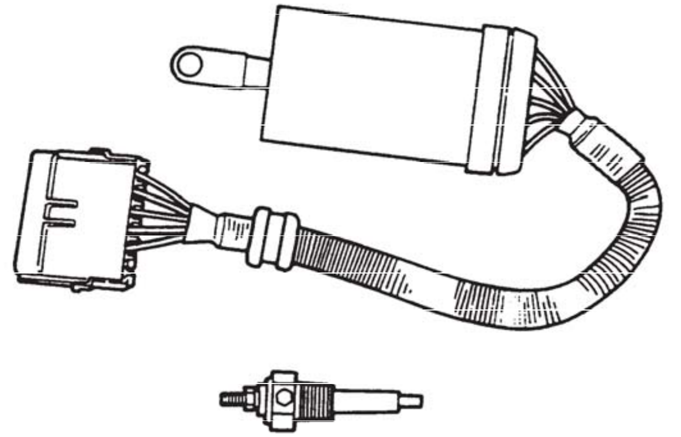
ECM Engine Harness Connector
P/N 12034400



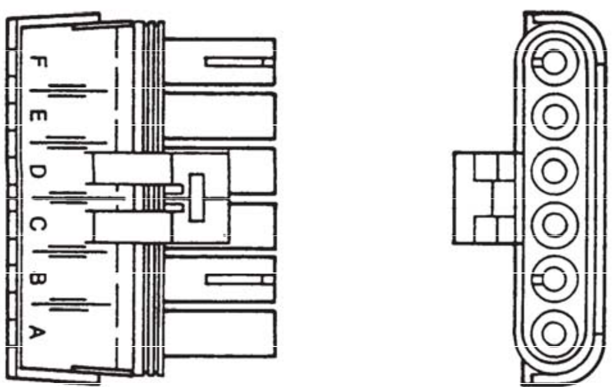
Electronic Control Module (ECM)

E. CODE 15 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE LOW (Cont'd.)

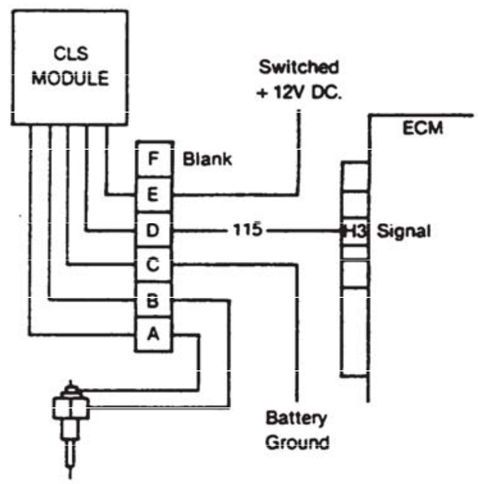
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-5 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially terminals R2 and Y2 of the ECM connector.	Terminals and connectors are okay. →	Replace ECM, page 4-192. Then go to 15-30.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to 15-30.
15-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. Stop engine. • Read historical codes.	Code 25 (no codes). →	Repairs are complete.
	Code 15 (and any other codes). →	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 15. →	Go to START-1, page 3-121, to service other codes.



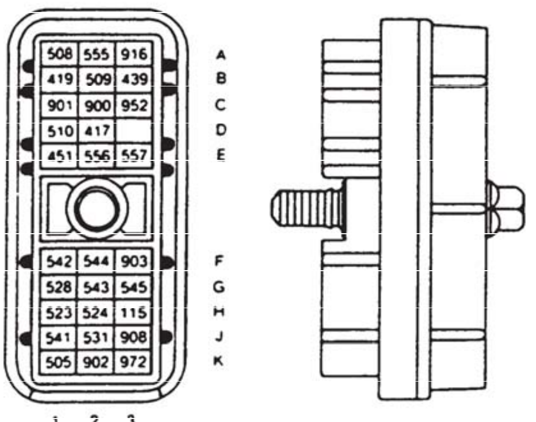
Coolant Level Sensor Module Assembly
P/N 23505265



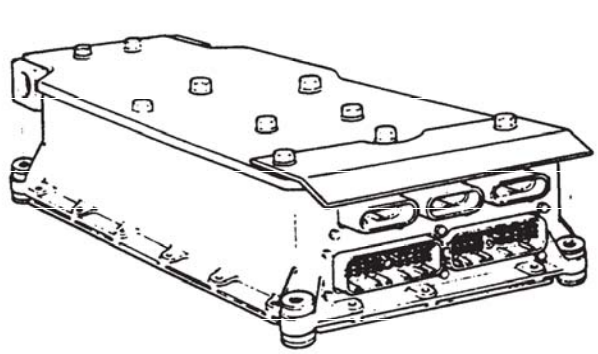
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398

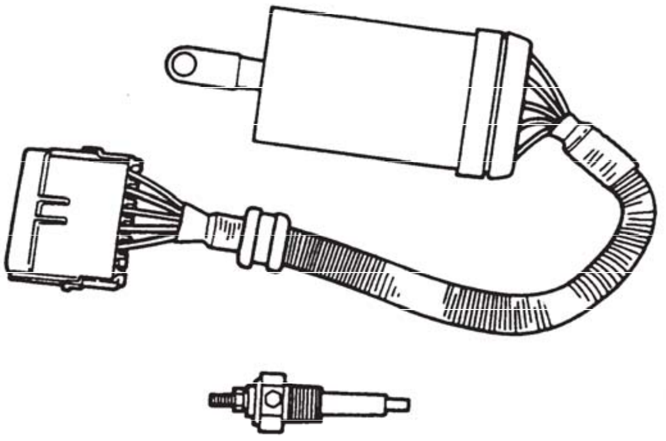


Electronic Control Module (ECM)

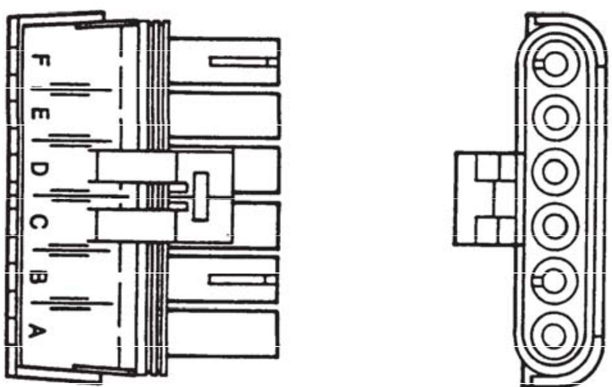
E. CODE 16 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found. and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

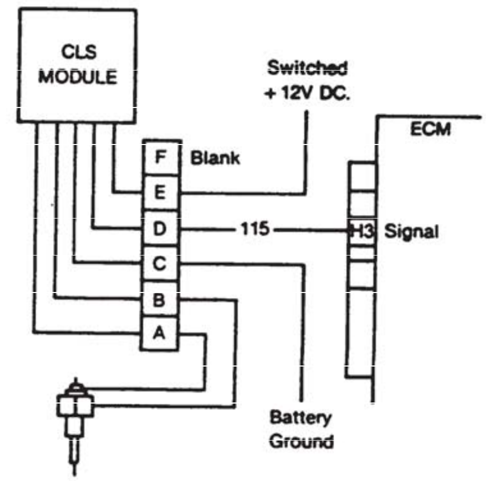
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-1 Sensor Check • Turn ignition off. • Disconnect CLS module and install a jumper between sockets D and C of the CLS harness connector. • Attempt to start and run engine at idle. • Read active codes. • Stop engine.	Engine will not start.	Go to 16-5.
	Code 16 (and any other codes except Code 13).	Go to 16-2.
	Code 13 (and any other codes).	Go to 16-3.
16-2 Signal and Ground Circuit Check • Turn ignition off. • Disconnect the vehicle harness connector. • Read resistance between socket H3 on the vehicle harness connector and a good ground.	Less than or equal to 5 ohms.	Go to 16-7.
	Greater than 5 ohms or open.	Either the CLS signal line (ckt #115) or the battery ground line is open. Contact Direct Support.
16-3 Check CLS Ignition • Remove jumper wire. • Turn ignition on. • Read voltage at the CLS connector, socket E (red lead) to socket C (black lead).	Less than or equal to 10.0 volts.	Between 4 and 6 volts, 12 volt line is wired to 5 volt supply. Else, the switched 12 volt line is open. Contact Direct Support.
	Greater than 10 volts.	Go to 16-4.
16-4 Check CLS Connectors • Inspect terminals at the CLS connectors (both the sensor and harness side) for damage: bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace CLS module, page 4-240. Then go to 16-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 16-30.



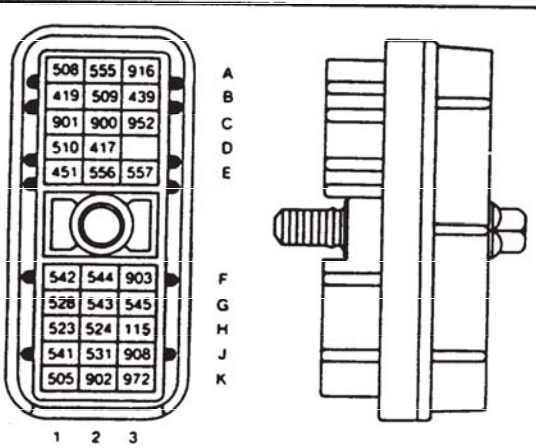
Coolant Level Sensor Module Assembly
P/N 23505265



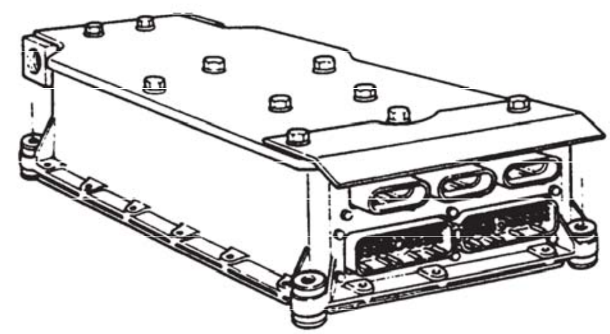
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



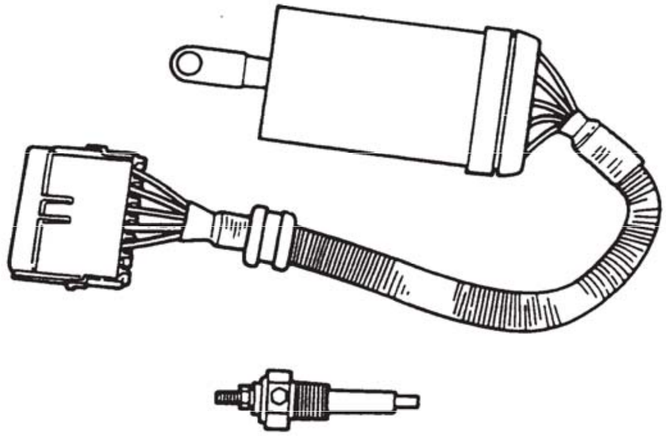
ECM Vehicle Harness Connector
P/N 12034398



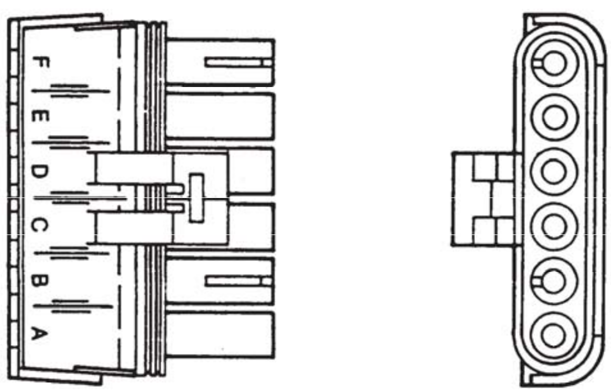
Electronic Control Module (ECM)

E. CODE 16 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH (Cont'd.)

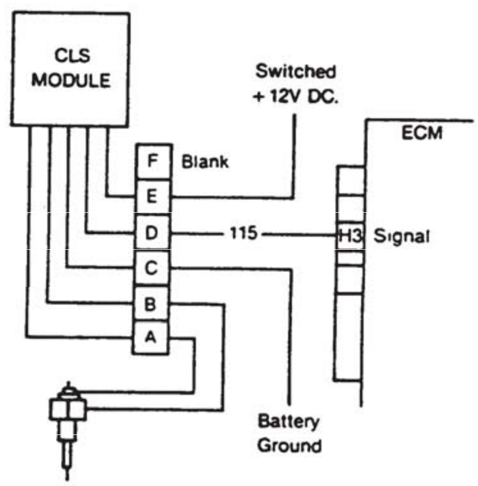
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-5 Check if Ignition Fuse Blown		
• Check if the ignition fuse is blown.	Blown fuse. →	Replace fuse, page 4-204. Then go to 16-6.
	Fuse is okay. →	Go to 16-6.
16-6 Check for Signal Short to Ignition		
• Disconnect the vehicle harness connector at the ECM. • Remove jumper wire at the CLS harness connector. • Read resistance between sockets D and E of the CLS connector on the vehicle harness.	Less than 10,000 ohms. →	The CLS signal line (ckt #115) is shorted to the switched 12 volt DC line. Contact Direct Support. Then go to 16-30.
	Greater than or equal to 10,000 ohms or open. →	Go to 16-7.
16-7 Check ECM Connectors		
• Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Check terminal and pin H3 at the ECM and all terminals and pins in the CLS module connectors.	Terminals and connectors are okay. →	Go to 16-8.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to 16-30.
16-8 Check for 12V		
• Turn ignition off. • Disconnect CLS module connector. • Place the red lead of a volt meter into terminal E of the CLS connector vehicle harness side. • Connect the black lead to terminal C of the CLS connector vehicle harness side. • Turn ignition on. • Read voltage.	Less than or equal to 10 volts. →	An open exists on the 12 volt wire. Repair open, page 3-2. Then go to 16-30.
	Greater than 10 volts. →	Replace ECM, page 4-192. Then go to 16-30.



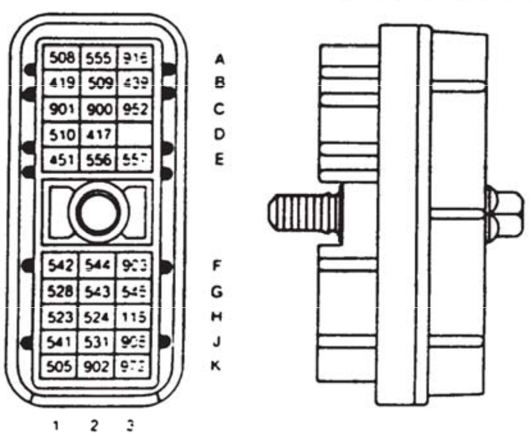
Coolant Level Sensor Module Assembly
P/N 23505265



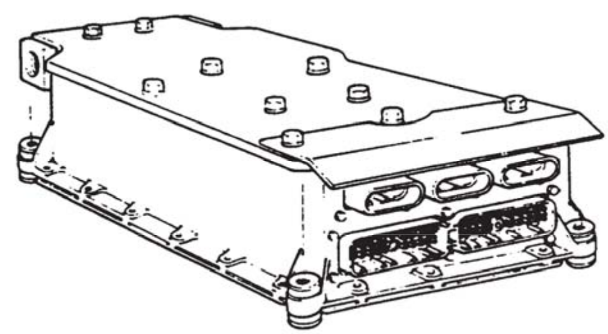
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



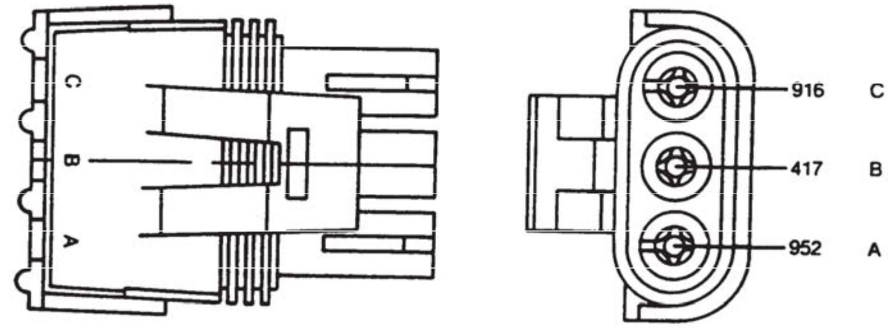
ECM Vehicle Harness Connector
P/N 12034398



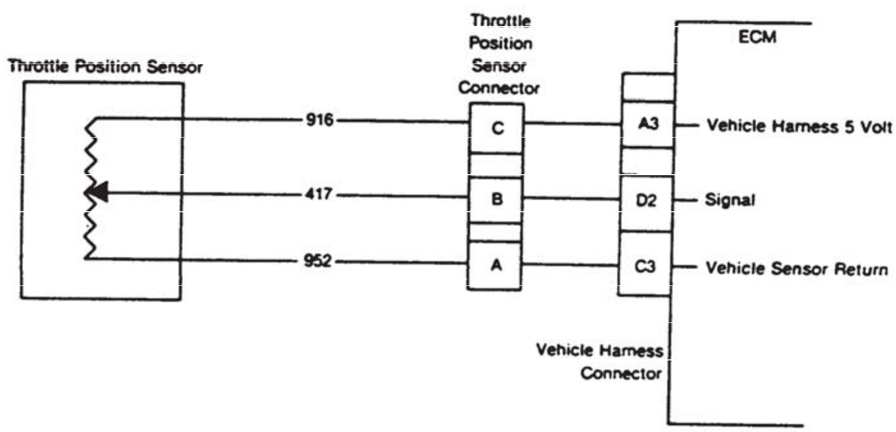
Electronic Control Module (ECM)

E. CODE 16 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH (Cont'd.)

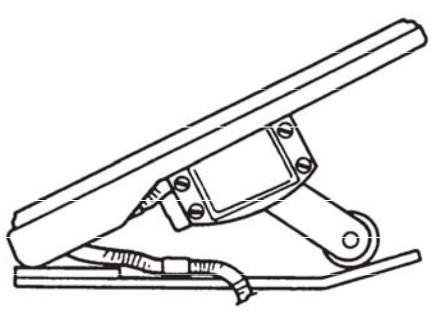
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read historical codes.	Code 25 (no codes). →	Repairs are complete.
	Code 16 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 16. →	Go to START-1, page 3-121, to service other codes.



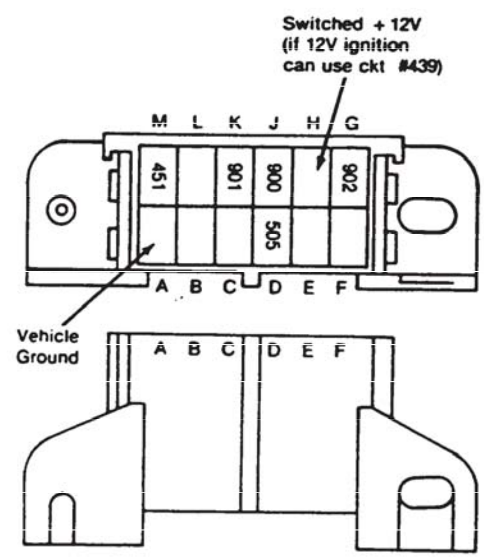
Throttle Position Sensor
Harness Connector
P/N 12015793



Throttle Position Sensor Circuit



Electronic Foot Pedal Assemblies



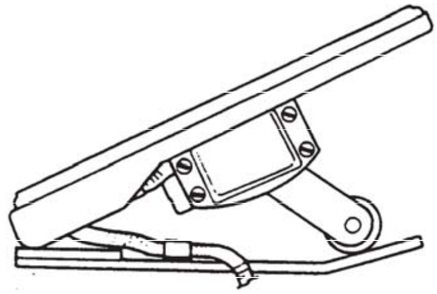
12 Pin DDL Connector P/N 12020043

E. CODE 21 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE HIGH

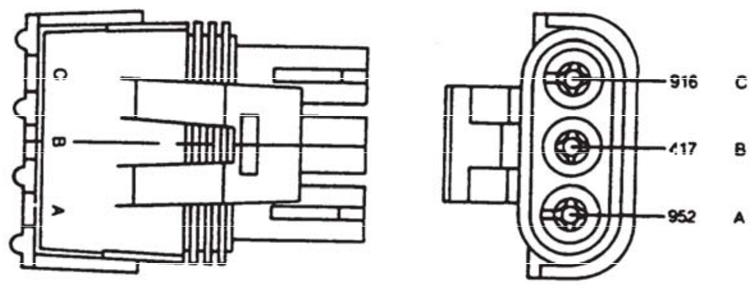
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

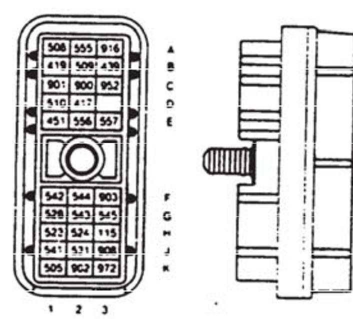
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-1 Multiple Code Check • Were there any other active codes besides Code 21?	No other active codes.	Go to 21-2.
	Yes, any or all of the following active codes: 12, 22.	Go to VEH5V-1 (page 3-333).
	Yes - but none of the above.	Go to 21-2.
21-2 Sensor Check • Turn ignition off. • Disconnect TPS connector. • Turn ignition on. • Read active codes.	Any code except Code 21.	Go to 21-3.
	Code 21 (and any other codes).	Go to 21-7.
21-3 Return Circuit Check • Turn ignition off. • Install a jumper wire between pins A and B of the TPS harness connector. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets D2 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 21-4.
	Greater than 5 ohms or open.	Return line (ckt #952) and/or signal (ckt #417) is open. Contact Direct Support.
21-4 Check TPS Adjustment • Reconnect vehicle harness connector and plug TPS back in. • Hook-up DDR to the 12 pin DDL connector and select Throttle Sensor display. • Read Throttle Counts at both no throttle and full throttle.	Getting 20-30 counts at no throttle and 200-235 counts at full throttle.	Go to 21-6.
	Not getting the above reading.	Replace throttle pedal, page 4-428.



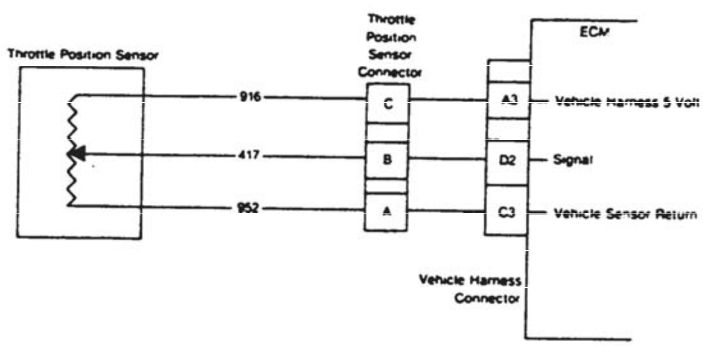
Electronic Foot Pedal Assemblies



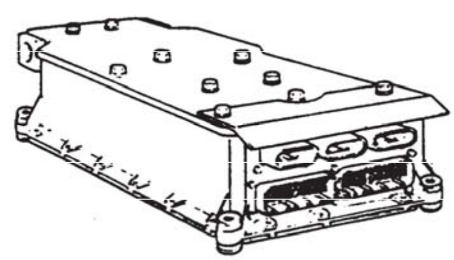
Throttle Position Sensor
Harness Connector
P/N 12015793



ECM Vehicle Harness Connector
P/N 12034398



Throttle Position Sensor Circuit



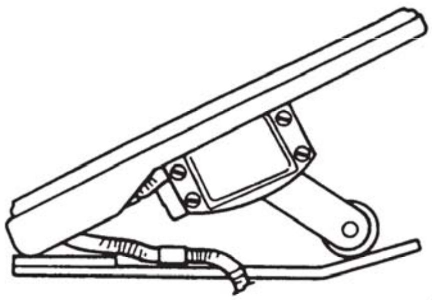
Electronic Control Module (ECM)

E. CODE 21 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE HIGH (Cont'd.)

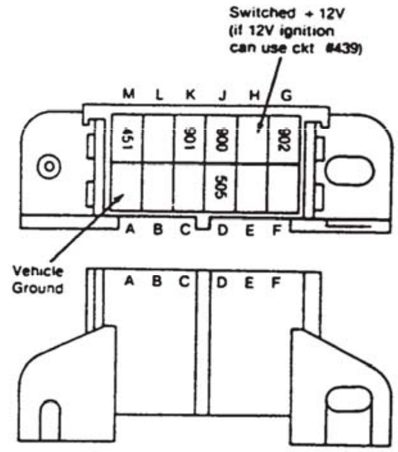
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-6 Check TPS Connectors		
• Inspect terminals at the TPS connectors (sensor side and harness side) for damage: bent. corroded. and unseated pins or sockets.	Terminals and connectors are okay. →	Replace TPS, page 4-248. Then go to 21-30.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to 21-30.
21-7 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets D2 and A3 on the vehicle harness connector.	Less than or equal to 10.000 ohms. →	Signal line (ckt #417) is shorted to the vehicle +5 Volt line (ckt #916). Contact Direct Support.
	Greater than 10.000 ohms or open. →	Go to 21-8.
21-8 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket D2 of the vehicle harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket D2 on the vehicle harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open. →	Go to 21-9.
	Any reading is less than or equal to 10.000 ohms. →	A short exists between the sockets where less than 10,000 ohms resistance was read. Contact Direct Support. Then go to 21-30.

E. CODE 21 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE HIGH (Cont'd.)

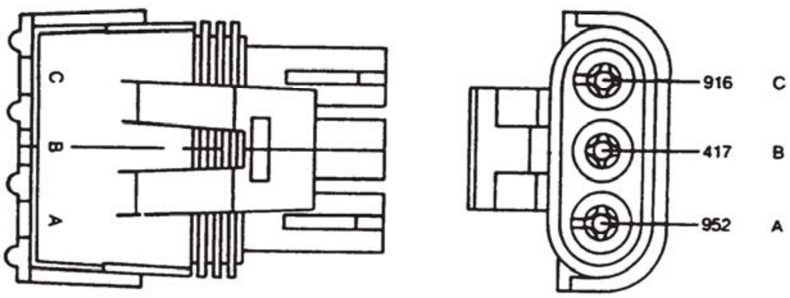
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-9 Check ECM Connectors		
• Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace ECM, page 4-192. Then go to 21-30.
	Problem found. →	Repair terminals/connectors, page 3-2. Then go to 21-30.
21-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read all codes.	Code 25 (no codes). →	Repairs are complete.
	Code 21 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 21. →	Go to START-1, page 3-121, to service other codes.



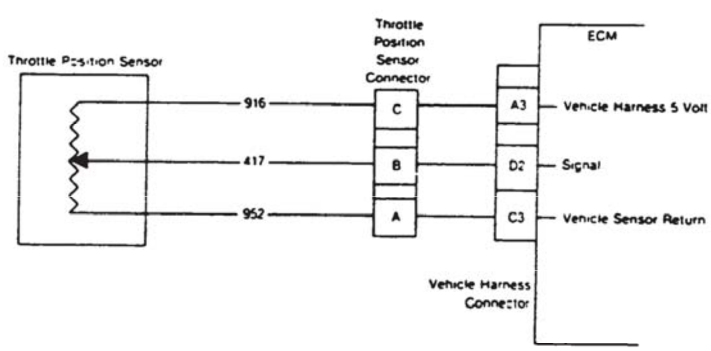
Electronic Foot Pedal Assemblies



12 Pin DDL Connector P/N 12020043



Throttle Position Sensor
Harness Connector
P/N 12015793



Throttle Position Sensor Circuit

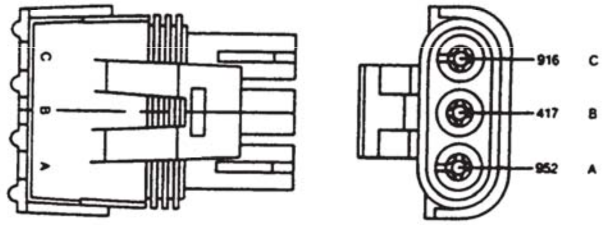
E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

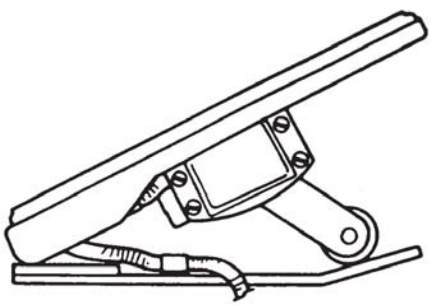
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

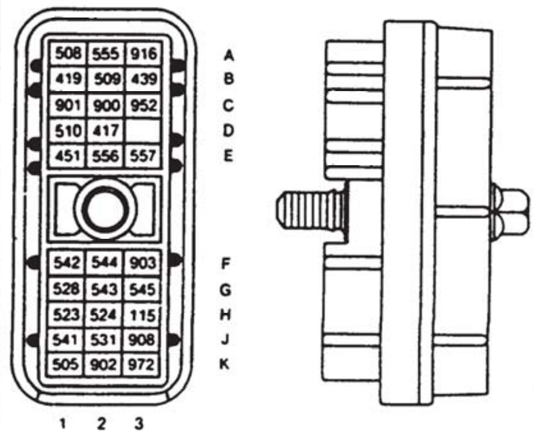
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-1 Multiple Code Check		
• Were there any other active codes besides Code 22?	No other active codes.	Go to 22-2.
	Yes, active code 21.	Go to VEH5V-1 (page 3-333).
	Yes - but none of the above.	Go to 22-2.
22-2 Sensor Check		
• Turn ignition off. • Disconnect TPS connector. • Install a jumper wire between sockets B and C of the TPS harness connector. • Turn ignition on. • Read active codes.	Code 22 and/or other codes.	Go to 22-6.
	Code 21 (and any other codes).	Go to 22-3.
22-3 Check TPS Adjustment		
• Remove jumper and reconnect TPS • Hook-up DDR to the 12 pin DDL connector and select Throttle Sensor display. • Read Throttle Counts at both no throttle and full throttle.	Getting 20-30 counts at no throttle and 200-235 counts at full throttle.	Go to 22-5.
	Not getting the above readings.	Go to 22-4.
22-4 Attempt TPS Adjustment		
• Check for pedal or linkage interferences.	Throttle Counts is correct.	Go to 22-30.
	Could not correct the problem.	Go to 22-5.



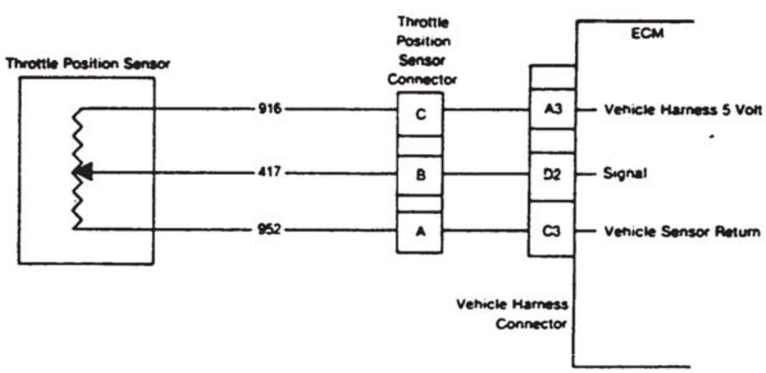
Throttle Position Sensor
Harness Connector
P/N 12015793



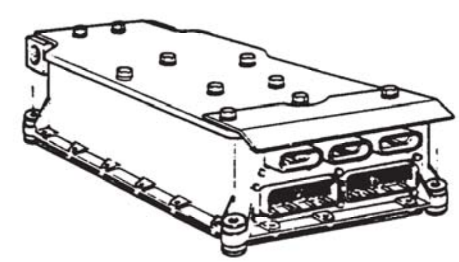
Electronic Foot Pedal Assembly



ECM Vehicle Harness Connector
P/N 12034398



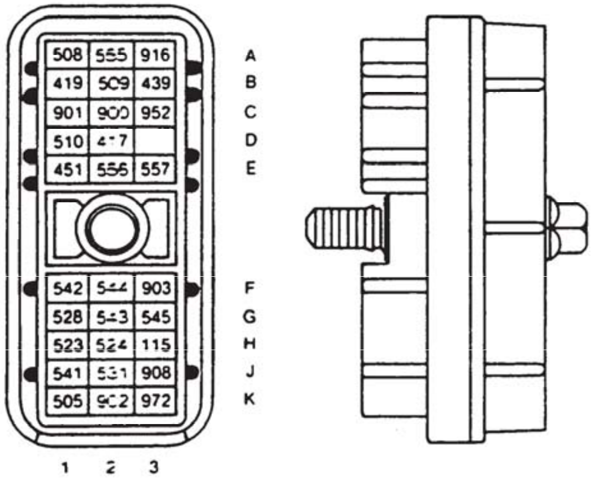
Throttle Position Sensor Circuit



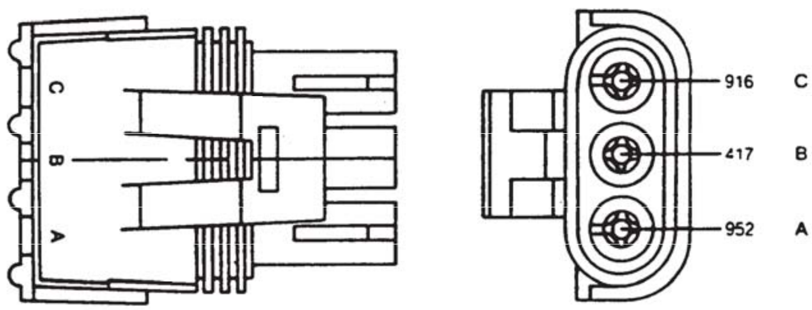
Electronic Control Module (ECM)

E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW (Cont'd.)

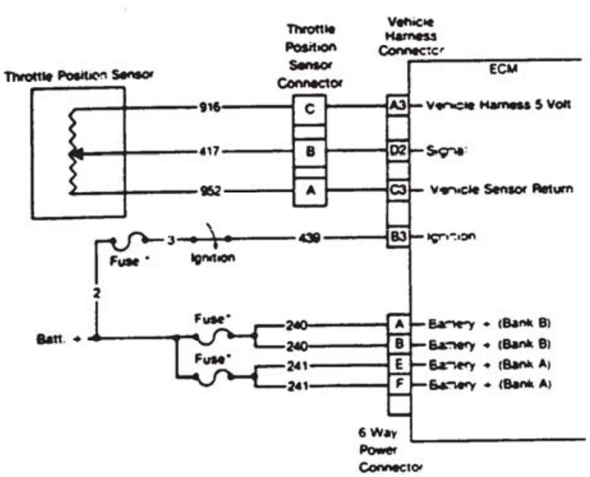
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-5 Check TPS Connectors		
• Inspect terminals at the TPS connectors (sensor side and harness side) for damage, corrosion, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace TPS, page 4-248. Then go to 22-30.
	Problem found. →	Repair terminals/connectors, Page 3-2. Then go to 22-30.
22-6 Check for +5 Volts		
• Remove jumper. • Turn ignition on. • Read voltage on TPS harness connector, socket C to socket A.	Between 4 to 6 volts. →	Go to 22-7.
	Less than 4 volts. →	Go to 22-10.
	Greater than 6 volts. →	Go to 22-12.
22-7 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at ECM. • Read resistance between sockets A and B on the TPS harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading. →	Signal line (ckt #417) is shorted to the return line (ckt #952) or battery ground. Contact Direct Support.
	Greater than 10,000 ohms or open on both readings. →	Go to 22-8.
22-8 Check for Signal Open		
• Install a jumper wire between sockets A and B of the TPS harness connector. • Read resistance between sockets D2 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms. →	Go to 22-9.
	Greater than 5 ohms or open. →	Signal line (ckt #417) is open, and/or signal return (ckt #952) is open. Repair open. If no open was found, check ECM terminals A3, D2, C3 and TPS pins. Then go to 22-30.



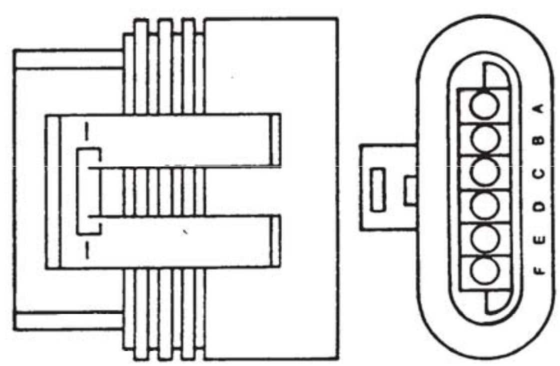
ECM Vehicle Harness Connector
P/N 12034398



Throttle Position Sensor
Harness Connector
P/N 12015793



Throttle Position Sensor, Battery +
and Ignition Circuits



6-Way Power Harness Connector
P/N 12066317

E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW (Cont'd.)

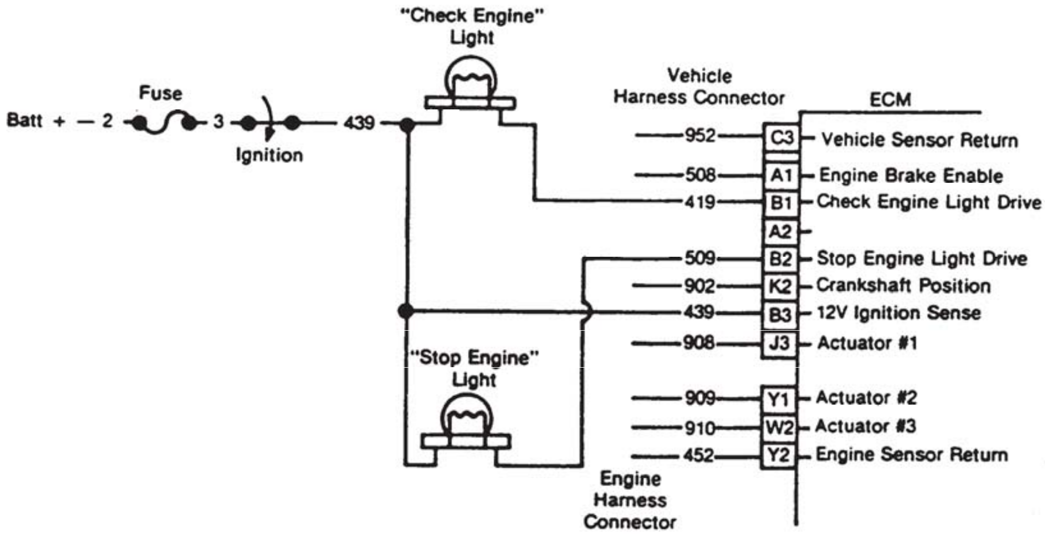
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-9 Check ECM Connectors		
• Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to 22-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 22-30.
22-10 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A and C on the TPS harness connector.	Less than or equal to 10,000 ohms.	The vehicle +5 Volt line (ckt #916) is shorted to the return line (ckt #952). Contact Direct Support.
	Greater than 10,000 ohms or open.	Go to 22-11.
22-11 Check Check for Open +5 Volt Line		
• Install a jumper wire between sockets A and C of the TPS harness connector. • Read resistance between sockets A3 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 22-9.
	Greater than 5 ohms or open.	The vehicle +5 Volt line (ckt #916) is open. Contact Direct Support.
22-12 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to the ECM. • Disconnect 6-way power connector at the ECM. • Read resistance between sockets D2 and B3 on the vehicle harness connector. • Also read resistance between socket D2 on the vehicle harness connector and the following sockets on the 6 way power connector: C, D, E and F.	All readings are greater than 10,000 ohms or open.	Go to 22-13.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short (page 3-2) and reinsert fuses. Then go to 22-30.

E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW (Cont'd.)

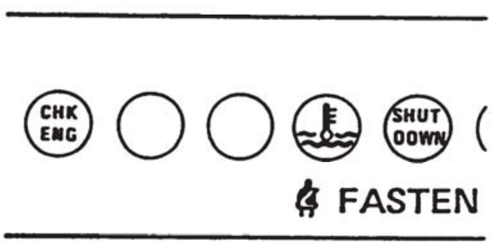
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-13 Check for Outside DDEC Battery +		
• Turn ignition off. • Remove ECM 6-pin power connector. • Remove ECM vehicle harness. • Turn ignition on. • Read voltage A3 to a good ground. • Read voltage C3 to a good ground.	All readings less than 4.0 volts. →	Go to 22-9.
	Either reading greater than or equal to 4.0 volts. →	Outside power is spliced into either (ckt #952) or (ckt #916). Remove splice. Then go to 22-30.
22-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. • Stop engine. • Read all codes.	Code 25 (no codes). →	Repairs are complete.
	Code 22 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 22. →	Go to START-1, page 3-121, to service other codes.

E. CODE 25 - NO CODES

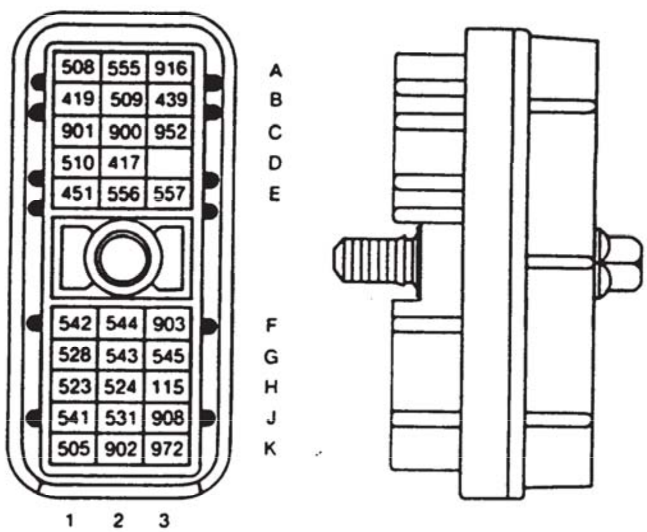
No faults have been detected by DDEC-II since the last time the codes were cleared. If symptoms remain, and all basic mechanical and visual inspections have been performed with no causes to the problem found, you can try using Chart 1 (Intermittent or Symptom Without a Code) on page 3-136.



ECM Output Circuits



Dash Lights

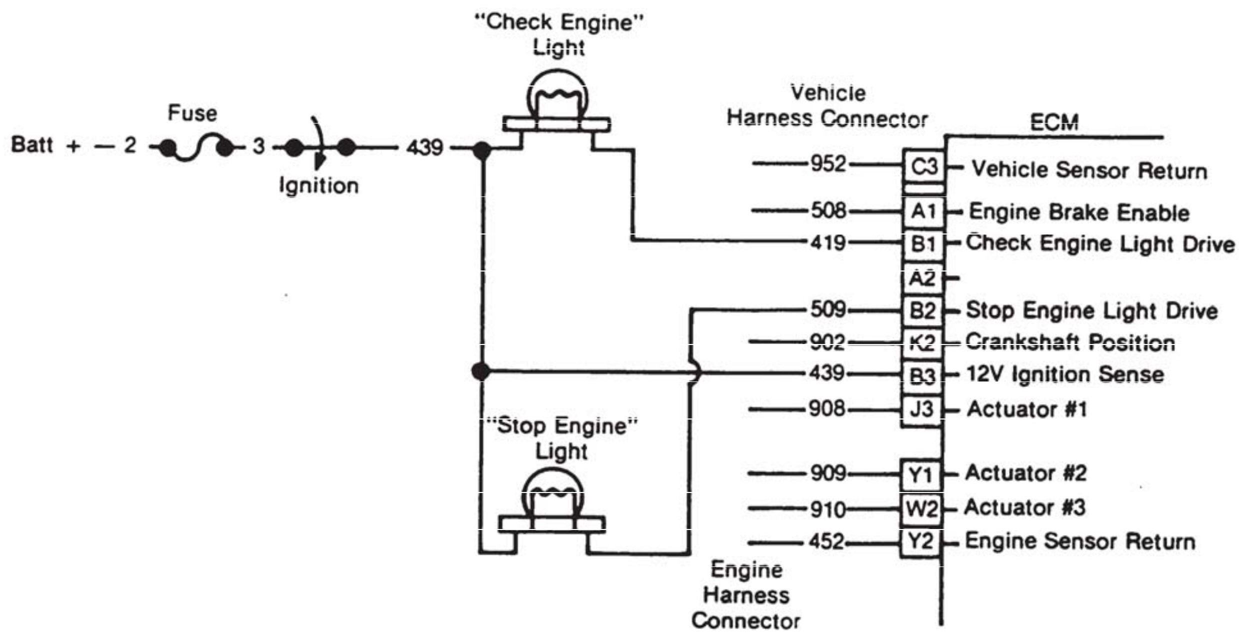


ECM Vehicle Harness Connector
P/N 12034398

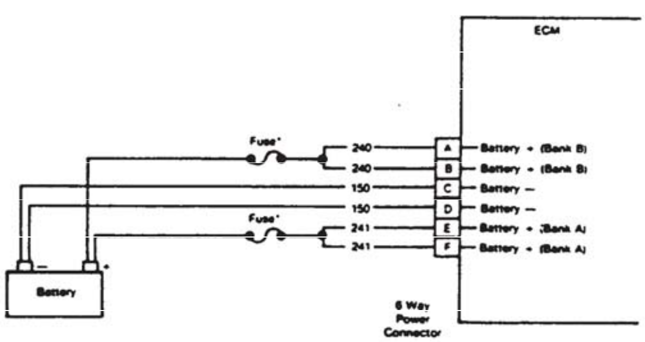
E. CODE 31 - FAULT ON AUXILIARY OUTPUT

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

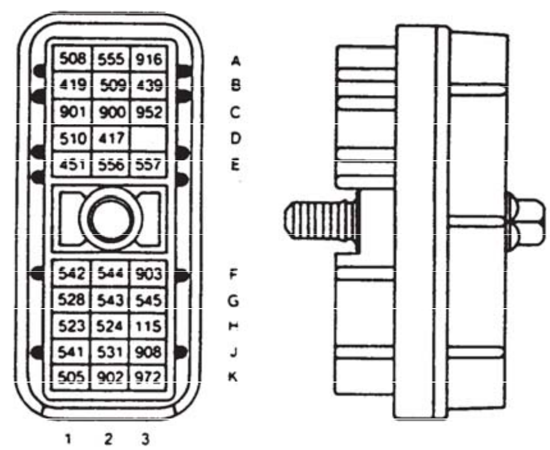
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-1 Verify Bulb Operation (*See Note Below)		
• Turn ignition off. • Turn ignition on (engine not running). • Note status of the following lights: —"Check Engine" (CEL)	All lights go on for 5 seconds and then go out.	Go to 31-7.
	At least one of the lights never turn on.	Go to 31-2.
	All lights go on for 5 seconds and at least one light stays on.	Go to 31-5.
31-2 Bulb Check		
• Turn ignition off. • Check whether bulb(s) is (are) burned out or otherwise damaged.	Bulb(s) is okay.	Go to 31-3.
	Bulb(s) is not okay.	Replace bulb(s), page 4-193. Then go to 31-30.
31-3 Check for Open		
• Disconnect the vehicle harness connector at the ECM. • Turn ignition on. • Read voltage on the vehicle harness connector, keeping the black lead on a good battery ground and probing the following sockets with the red lead: —B1 (CEL) —B2 (SEL)	Greater than 10 volts on all readings.	Go to 31-4.
	Less than 10 volts on any reading.	Open exists in wire where less than 10 volts was read. Contact Direct Support.



ECM Output Circuits



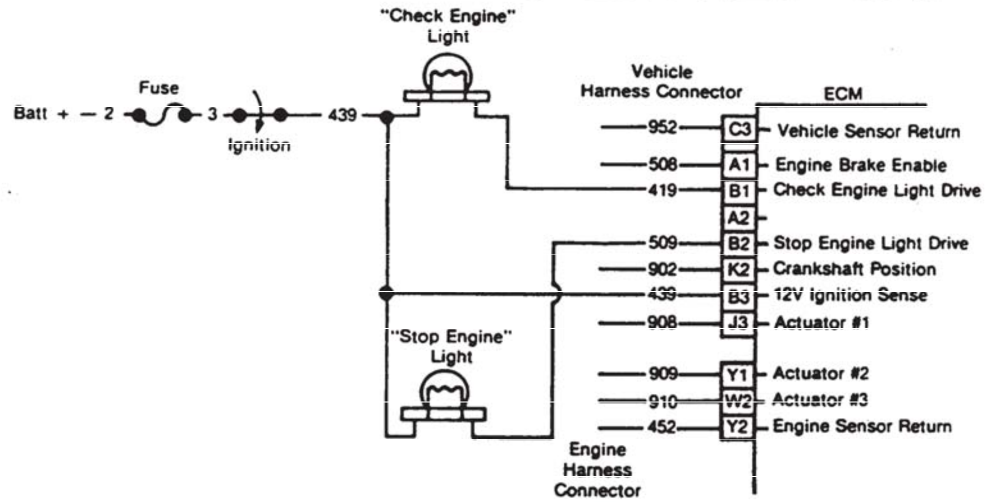
Battery Power and Ground Circuits



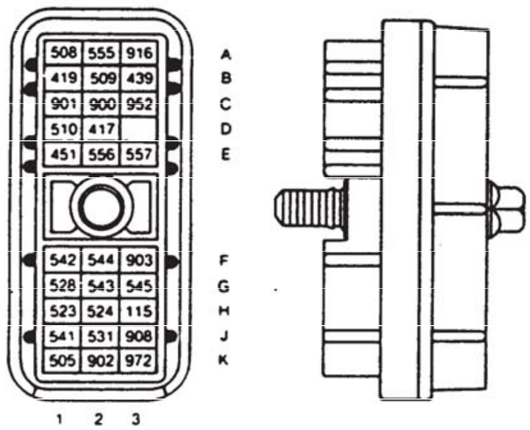
ECM Vehicle Harness Connector
P/N 12034398

E. CODE 31 - FAULT ON AUXILIARY OUTPUT (Cont'd.)

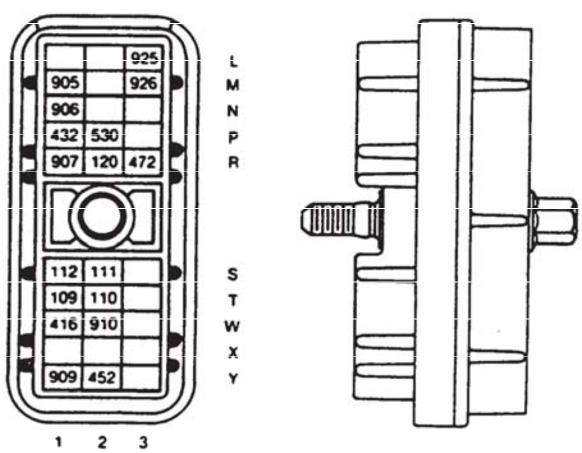
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-4 Check for Short to Ignition		
• Turn ignition off. • Disconnect 6-way power connector. • Install a jumper wire between socket F on the 6-way power connector and socket B3 on the vehicle harness connector. • Install a 2nd jumper wire between socket C on the 6-way power connector and the following socket on the vehicle harness connector: —if CEL didn't turn on => socket B1 —if SEL didn't turn on => socket B2 • Observe associated light.	Associated light now turns on. →	Remove jumpers. Check 5 amp ignition (circuit breakers) fuse. Check wires #2 and #3 for open. Check ignition switch for proper operation. Contact Direct Support.
	Associated light still does not turn on. →	Remove jumper. An open may exist on the circuit which did not light. If none turned on, check ckt #439 for open. Repair open, then go to 31-30. Else, a short to ignition may exist in the circuit tested, either the CEL (#419), or SEL (#509). Contact Direct Support.
31-5 Check if Lights Agree with DDR Display		
• Plug in DDR and select MODE 30, MISC OUTPUTS, for display. • Observe if DDR display agrees with the CEL, SEL (and CAL if applicable).	DDR display agrees with lights. →	Go to 31-7.
	DDR display does not agree with lights. →	Go to 31-6.
31-6 Check for Short to Ground		
• Unplug DDR. • Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Turn ignition on. • Observe the following lights: —"Check Engine" —"Stop Engine"	All lights stay off. →	Turn ignition off. Then go to 31-9.
	At least one light stays on. →	A short to ground exists in the circuit associated with the light that stayed on, either the CEL (#419), or SEL (#509). Contact Direct Support.



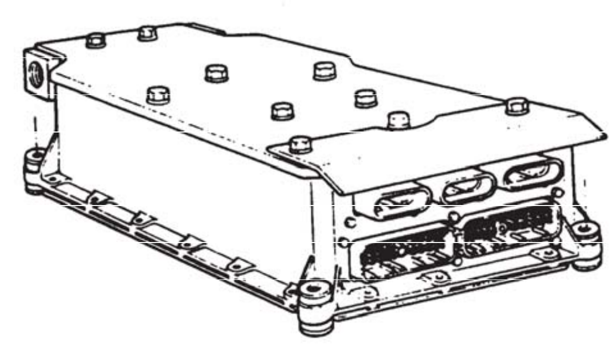
ECM Output Circuits



ECM Vehicle Harness Connector
P/N 12034398



ECM Engine Harness Connector
P/N 12034400



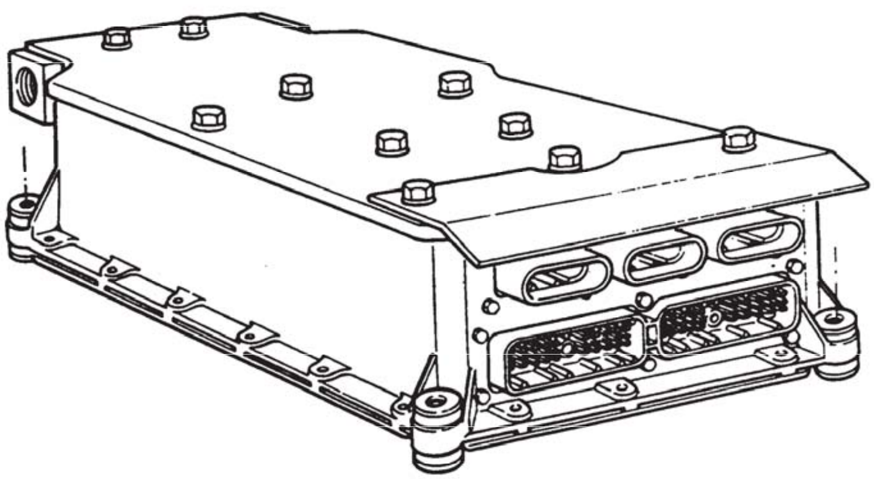
Electronic Control Module (ECM)

E. CODE 31 - FAULT ON AUXILIARY OUTPUT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-7 Check for Short in Crankshaft Position (CP), Engine Brake (EB) or Actuator #1 Wires		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between socket C3 and the following other sockets: A1, K2 and J3. (if they are in the harness). • Repeat resistance check between known good ground and sockets A1, K2, and J3.	All readings are greater than 5 ohms, or terminals not in harness.	Go to 31-8.
	Any reading less than or equal to 5 ohms.	Short to sensor return or ground exists in the circuit where less than or equal to 5 ohms reading occurred. Contact Direct Support.
31-8 Check for Short in Actuator #2 or		
• Disconnect the engine harness connector at the ECM. • Read resistance between socket Y2 and Y1. • Read resistance between known good ground and Y1. • Read resistance between known good ground and Y2. • Read resistance between socket Y2 and W2.	All readings are greater than 5 ohms.	Go to 31-9.
	Any reading is less than or equal to 5 ohms.	Short to ground or sensor return exists in the circuit where less than or equal to 5 ohms reading occurred (either ckt #909 or ckt #910,) Contact Direct Support.
31-9 Check ECM Connectors		
• Disconnect the engine harness connector (if not already disconnected). • Check terminals at the ECM vehicle harness and engine harness connectors both the ECM and harness side) for damage: bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to 31-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 31-30.

E. CODE 31 - FAULT ON AUXILIARY OUTPUT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes.	Code 25 (no codes). →	Repairs are complete.
	Code 31 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 31. →	Go to START-1, page 3-121, to service other codes.

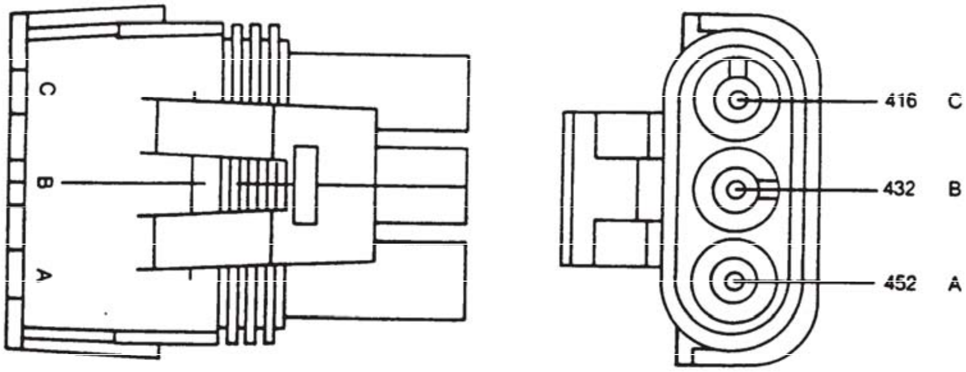


Electronic Control Module (ECM)

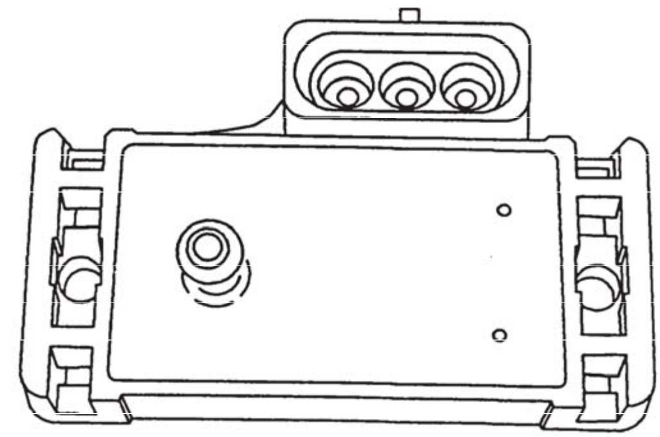
E. CODE 32 - ECM BACKUP SYSTEM FAILURE

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

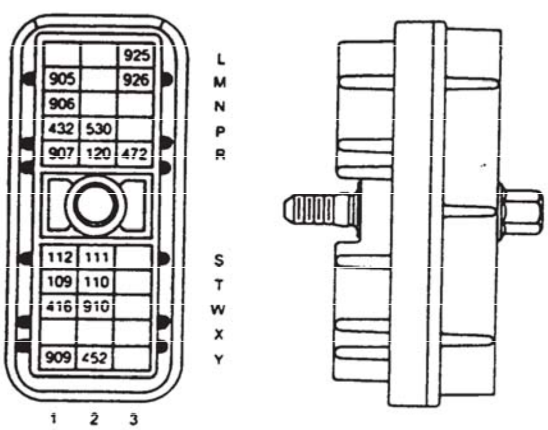
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
32-1 Ignition Check		
• Does the engine "Run-on" momentarily when the ignition is turned off?	Yes	Go to 32-2.
	No	The backup computer inside the ECM has failed. Replace the ECM, page 4-192, then go to START-1, page 3-121.
32-2 Isolate Ignition Circuit #439		
• Remove ignition supplied power to other devices such as transmitters, radios, or blower motors. • Turn ignition on. • Clear codes (Mode 40-CODES ERASE). • Restart engine. • Turn ignition off.	Engine DOES NOT "Run-on".	Go to 32-3.
	Engine "Runs-on".	Repeat Steps 32-2 to find source of supplying reverse EMF (Voltage) to circuit #439.
32-3 Verify Repairs		
• Turn ignition on. • Read ACTIVE CODES (Mode 01).	Code 25 (NO CODES) or any other codes except Code 32.	Isolate ignition circuit #439 from the device supplying reverse EMF (voltage). Go to START-1, page 3-121, to service other codes.
	Code 32.	The backup computer inside the ECM has failed. Replace the ECM, page 4-129, then go to START-1, page 3-121.



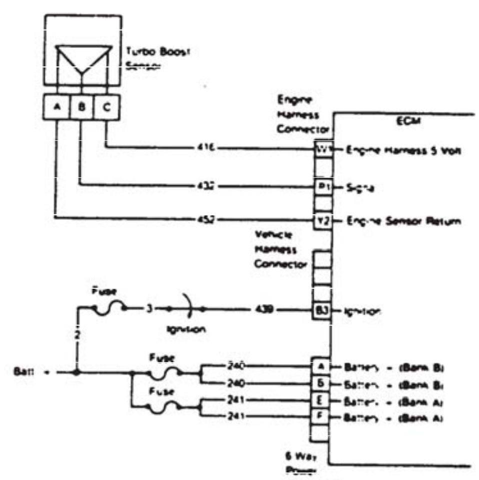
Turbo Boost Sensor
Harness Connector
12015384



Turbo Boost Sensor (TBS)
16070629



ECM Engine Harness Connector
P/N 12034400

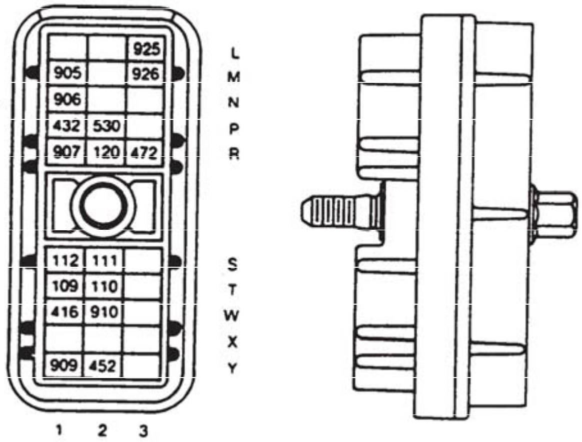


Turbo Boost, Battery + and Ignition Circuits

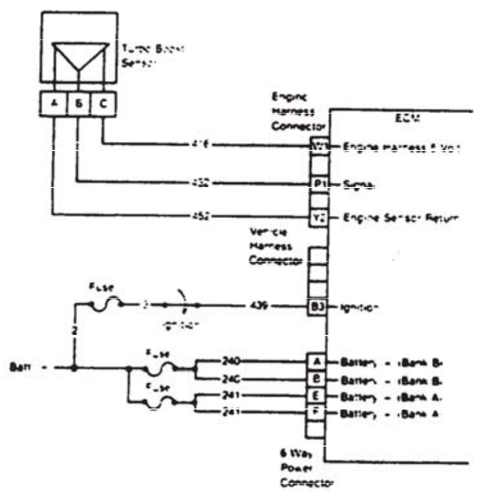
E. CODE 33 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE HIGH

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

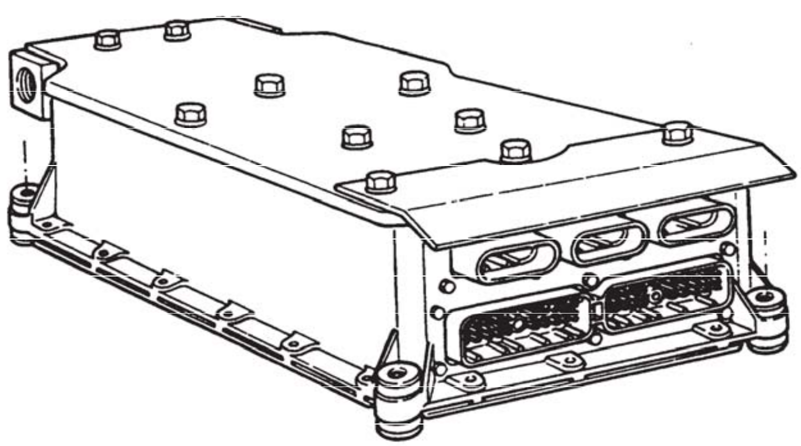
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-1 Multiple Code Check • Were there any other active codes besides code 33?	No other codes.	Go to 33-2.
	Yes, any or all of the following codes: 14-15, 23, 34-38.	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above.	Go to 33-2.
33-2 Sensor Check • Turn ignition off. • Disconnect TBS Connector. • Start and run engine at idle. • Read active codes.	Code 34 (and any codes except Code 33).	Go to 33-3.
	Code 33 (and any other codes).	Go to 33-5.
33-3 Return Circuit Check • Turn ignition off. • Install a jumper wire between pins A and B of the TBS harness connector. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets P1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 33-4.
	Greater than 5 ohms or open.	Return line (ckt #452) is open. Contact Direct Support.
33-4 Check TBS Connectors • Inspect terminals at the TBS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace TBS, page 4-328. Then go to 33-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 33-30.



ECM Engine Harness Connector
P/N 12034400



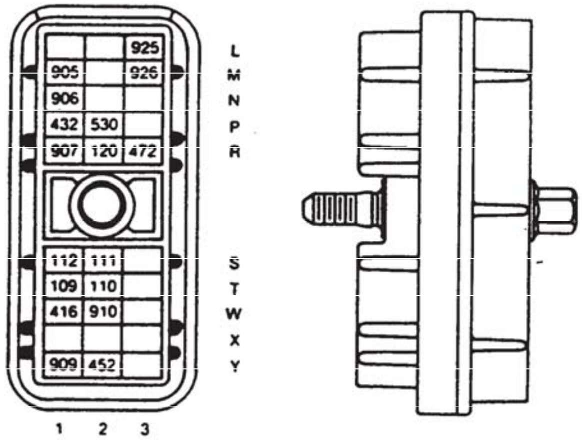
Turbo Boost, Battery + and Ignition Circuits



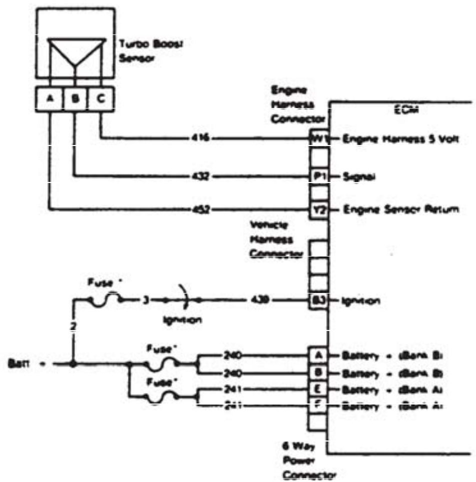
Electronic Control Module (ECM)

E. CODE 33 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE HIGH (Cont'd.)

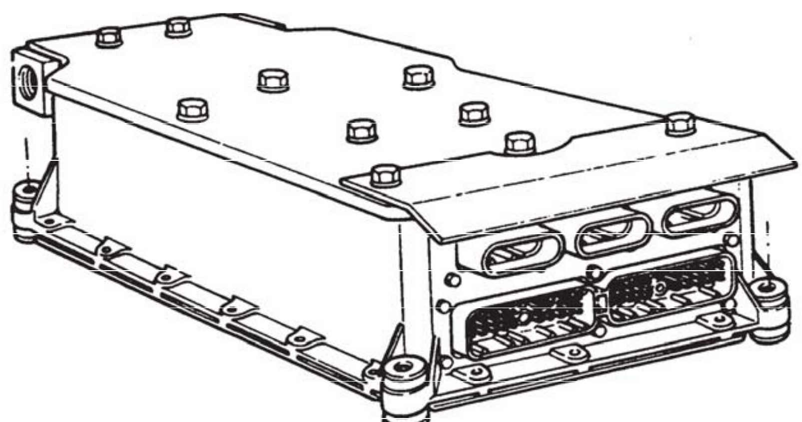
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-5 Check for Short to +5 Volt Line		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets W1 and P1 on the engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #432) is shorted to the engine +5 Volt line (ckt #416). Contact Direct Support.
	Greater than 10,000 ohms or open.	Go to 33-6.
33-6 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open.	Go to 33-7.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short, page 3-2, and insert fuses. Then go to 33-30.
33-7 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to 33-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 33-30.



ECM Engine Harness Connector
P/N 12034400



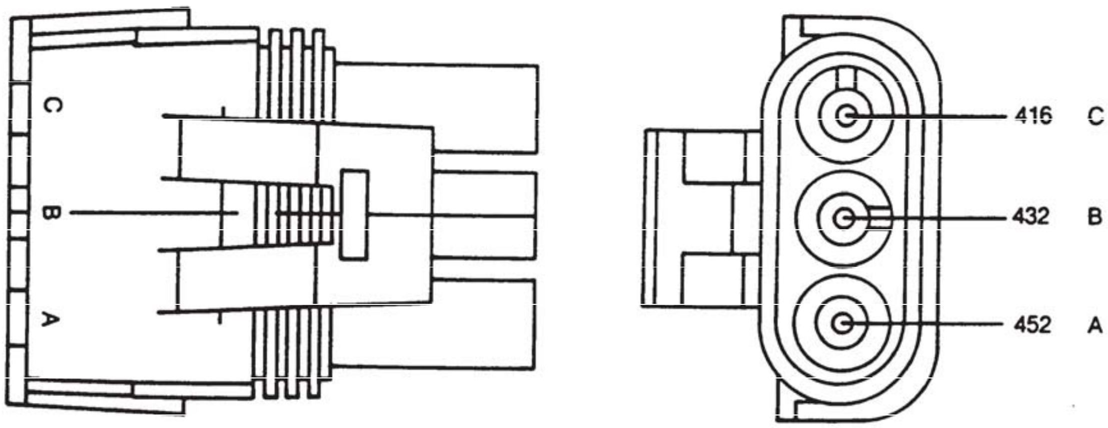
Turbo Boost, Battery + and Ignition Circuits



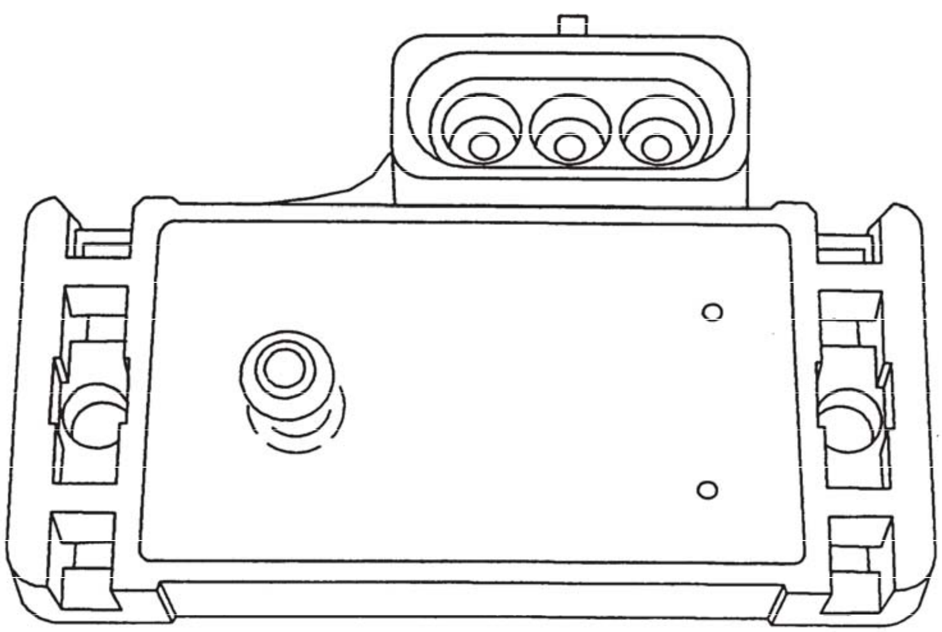
Electronic Control Module (ECM)

E. CODE 33 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read all codes.	Code 25 (no codes). →	Repairs are complete.
	Code 33 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 33. →	Go to START-1, page 3-121, to service other codes.



Turbo Boost Sensor
Harness Connector
P/N 12015384

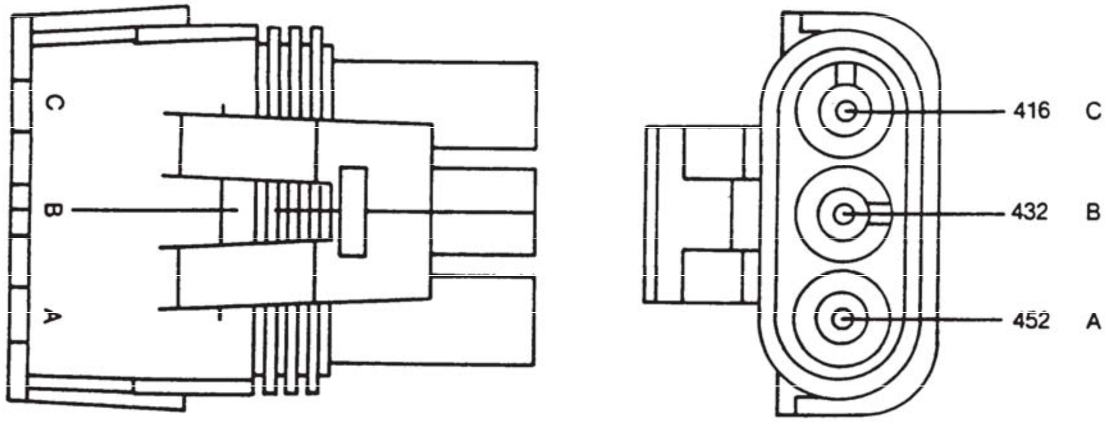


Turbo Boost Sensor (TBS)
P/N 16070629

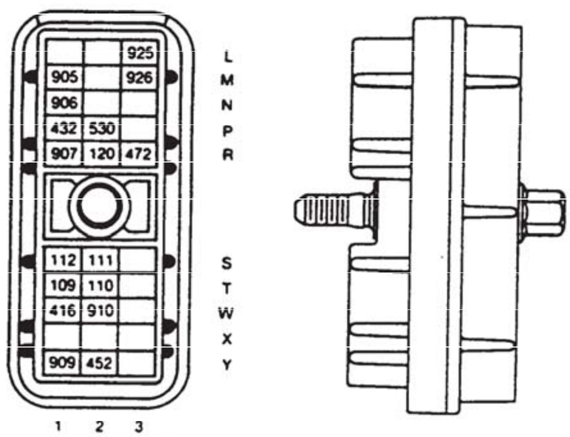
E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

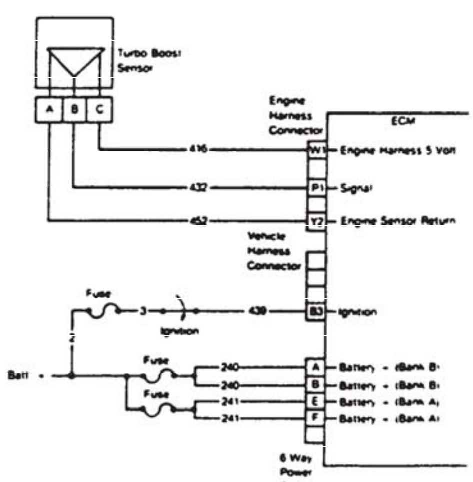
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-1 Multiple Code Check • Were there any other active codes besides Code 34?	No other codes. →	Go to 34-2.
	Yes, any or all of the following codes: 14-15, 23, 33, 35-38. →	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above. →	Go to 34-2.
34-2 Sensor Check • Turn ignition off. • Disconnect TBS connector. • Install a jumper wire between sockets B and C of the TBS harness connector. • Turn ignition on. • Read active codes. • If active Code 33 or 34 exists go to RESULT column. • If no active Code 33 or 34 exists, start engine and run until either the "Check Engine" light comes on or the engine has been running warm for at least one minute at greater than 1000 RPM. • Read active codes.	Code 33 (and any other codes except Code 34). →	Go to 34-3.
	Code 34 (and any other codes). →	Go to 34-4.
34-3 Check TBS Connectors • Inspect terminals at the TBS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace TBS, page 4-328. Then go to 34-30.
	Problem found →	Repair terminals/connectors, page 3-2. Then go to 34-30.



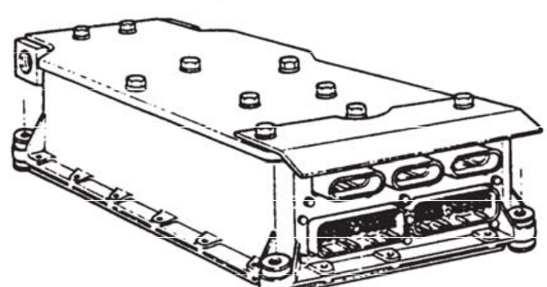
Turbo Boost Sensor
Harness Connector
P/N 12015384



ECM Engine Harness Connector
P/N 12034400



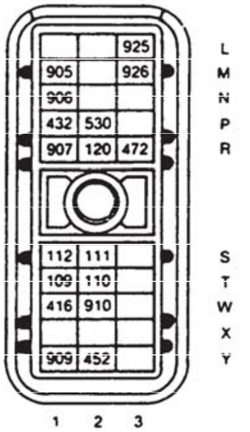
Turbo Boost, Battery + and Ignition Circuits



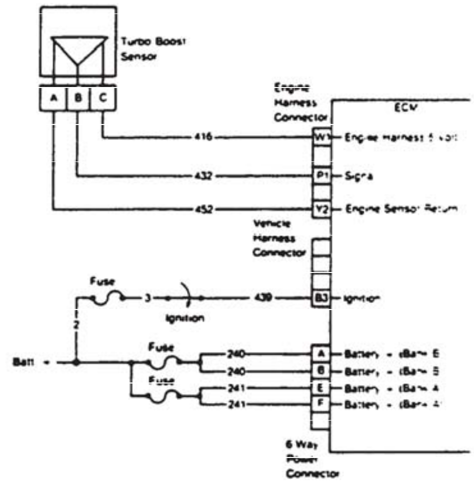
Electronic Control Module (ECM)

E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW (Cont'd.)

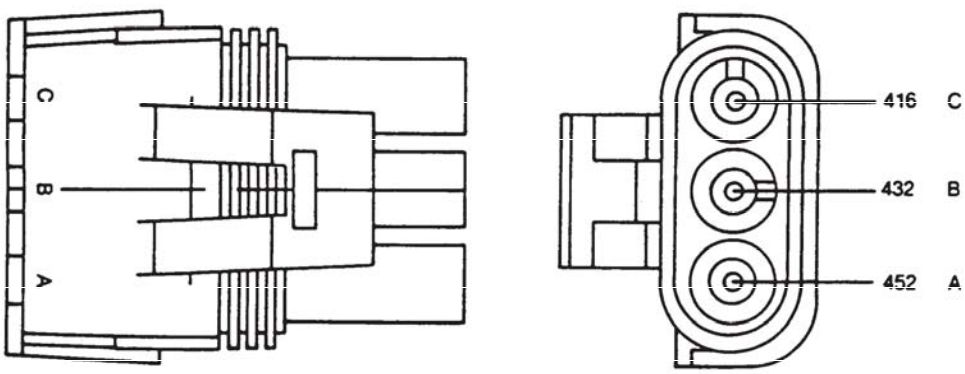
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-4 Check for +5 Volts • Remove jumper wire. • Turn ignition on. • Read voltage on TBS harness connector, pin C to pin A.	Between 4 to 6 volts. Less than 4 volts. Greater than 6 volts.	Go to 34-5. Go to 34-8. Go to 34-10.
34-5 Check for Signal Open • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between pins A and B of the TBS harness connector. • Read resistance between sockets P1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms. Greater than 5 ohms or open.	Go to 34-6. Signal line (ckt #432) or return line (ckt #452) is open. Repeat check from pin A to Y2 and pin B to P1. Contact Direct Support.
34-6 Check for Short • Remove jumper. • Read resistance between pins A and B on the TBS harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading. Greater than 10,000 ohms or open on both readings.	Signal line (ckt #432) is shorted to the return line (ckt #452). Contact Direct Support . Go to 34-7.
34-7 Check ECM Connectors • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay. Problem found.	Replace ECM, page 4-192. Then go to 34-30. Repair terminals/connectors, page 3-2. Then go to 34-30.



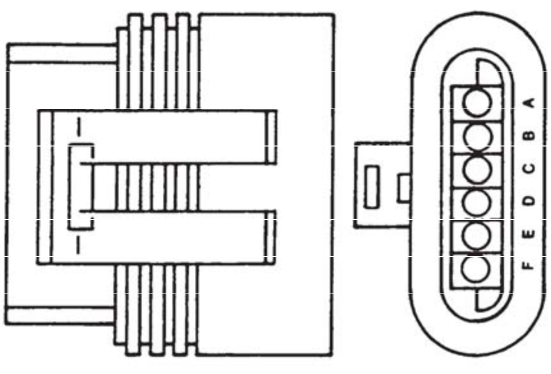
ECM Engine Harness Connector
P/N 12034400



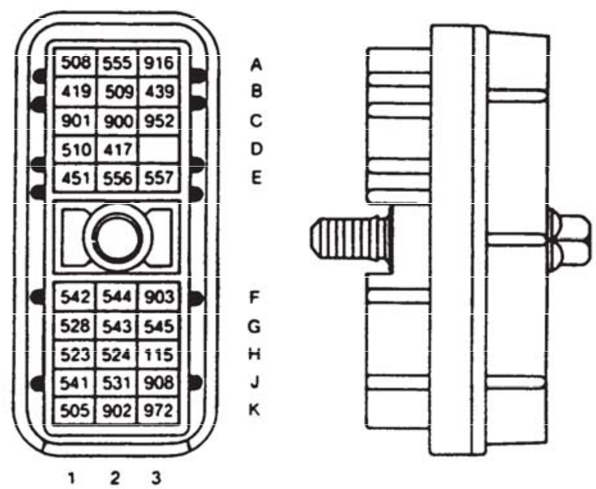
Turbo Boost, Battery + and
Ignition Circuits



Turbo Boost Sensor
Harness Connector
P/N 12015384



6-Way Power Harness Connector
P/N 12066317



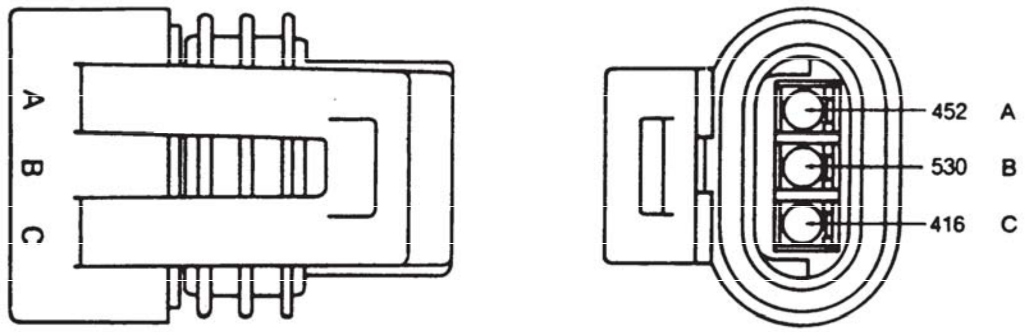
ECM Vehicle Harness Connector
P/N 12034398

E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW (Cont'd.)

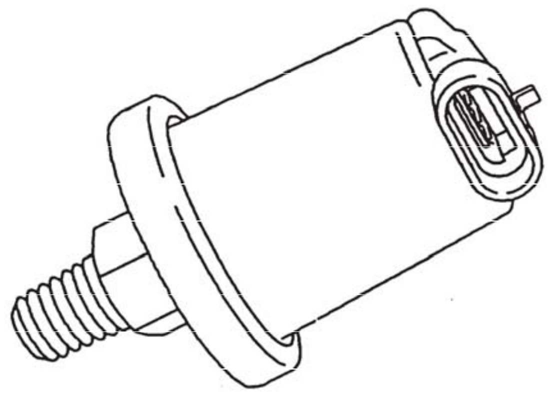
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-8 Check for Open +5 Volt Line		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between pins A and C of the TBS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 34-9.
	Greater than 5 ohms or open.	The engine +5 Volt line (ckt #416) is open. Contact Direct Support.
34-9 Check for Short		
• Remove jumper wire. • Read resistance between pins A and C on the TBS harness connector.	Less than or equal to 10,000 ohms.	The +5 Volt line (ckt #416) is shorted to the return line (ckt #452). Contact Direct Support.
	Greater than 10,000 ohms or open.	Go to 34-7.
34-10 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to the ECM. • Disconnect the engine harness, vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open.	Go to 34-7.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short, page 3-2, and reinsert fuses. Then go to 34-30.

E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW (Cont'd.)

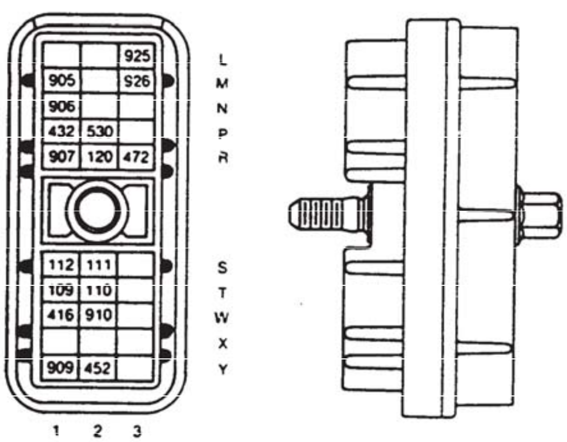
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. • Stop engine. • Read historical codes.	Code 25 (no codes). →	Repairs are complete.
	Code 34 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 34. →	Go to START-1, page 3-121, to service other codes.



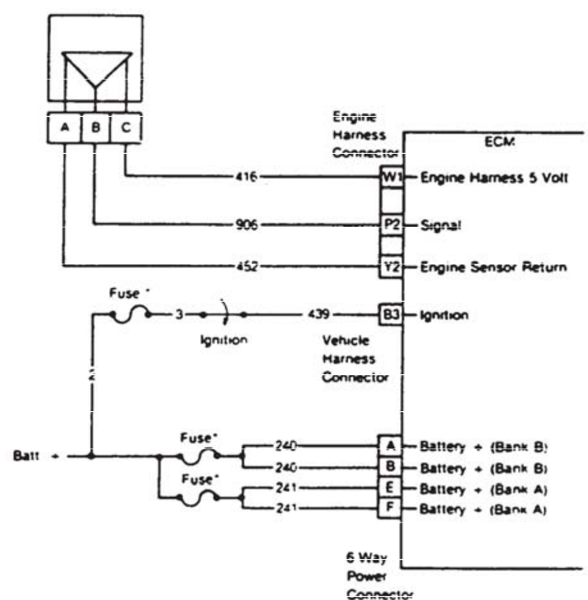
Oil Pressure Sensor
Harness Connector
P/N 12047909



Oil Pressure Sensor
P/N 8929184



ECM Engine Harness Connector
P/N 12034400



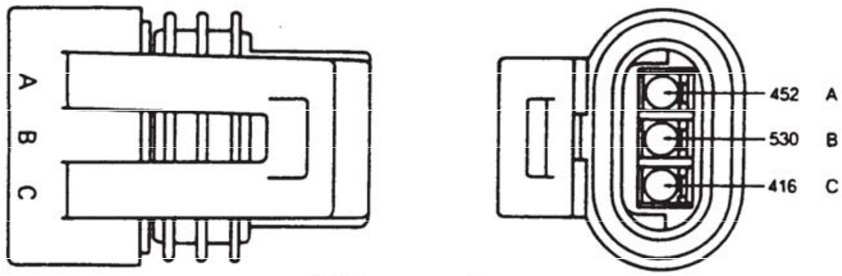
Oil Pressure, Battery + and
Ignition Circuits

E. CODE 35 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE HIGH

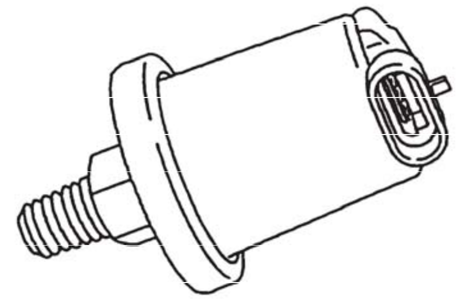
NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

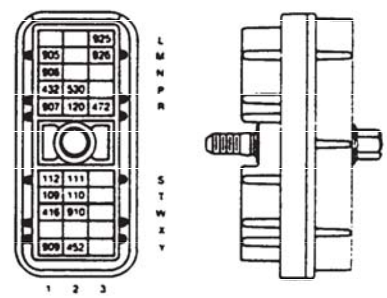
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-1 Multiple Code Check • Were there any other active codes beside Code 35?	No other codes.	Go to 35-2.
	Yes, any or all of the following codes: 14-15, 23, 33-34, 36-38.	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above.	Go to 35-2.
35-2 Sensor Check • Turn ignition off. • Disconnect OPS connector. • Turn ignition on. • Start and run engine. • Select Engine Temperature (Mode 13 COOLANT TEMP or 18 OIL TEMP) on the DDR. • Warm up engine until engine temperature reading is greater than 60 degrees C (140 degrees F). • Leave engine running at idle after warm up. • Read active codes.	Code 36 (and any codes except Code 35).	Go to 35-3.
	Code 35 (and any other codes).	Go to 35-5.
35-3 Return Circuit Check • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between pins A and B of the OPS harness connector. • Read resistance between sockets P2 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 35-4.
	Greater than 5 ohms or open.	Return line (ckt #452) is open. Contact Direct Support.



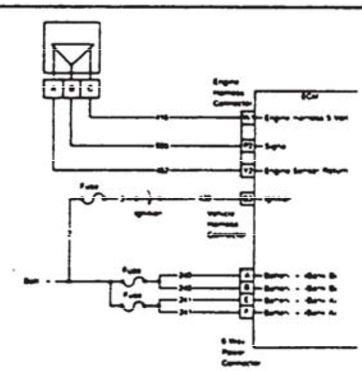
Oil Pressure Sensor
Harness Connector
P/N 12047909



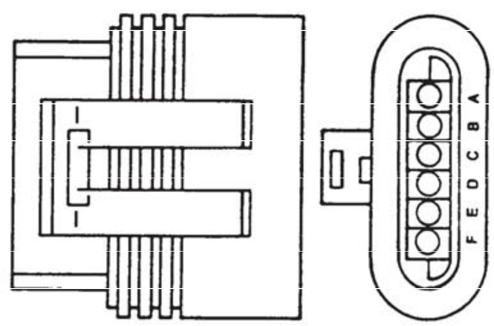
Oil Pressure Sensor (OPS)
P/N 8929184



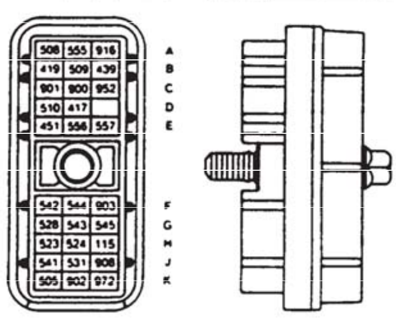
ECM Engine Harness Connector
P/N 12034400



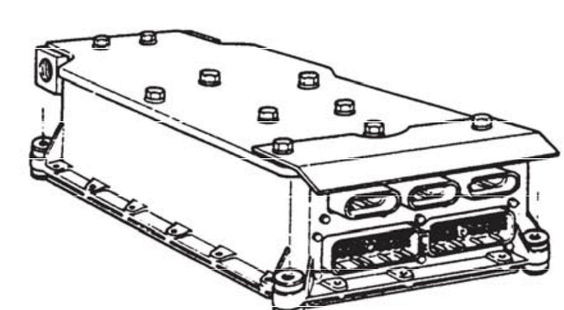
Oil Pressure, Battery + and Ignition Circuits



6-Way Power Harness Connector
P/N 12066317



ECM Vehicle Harness Connector
P/N 12034398



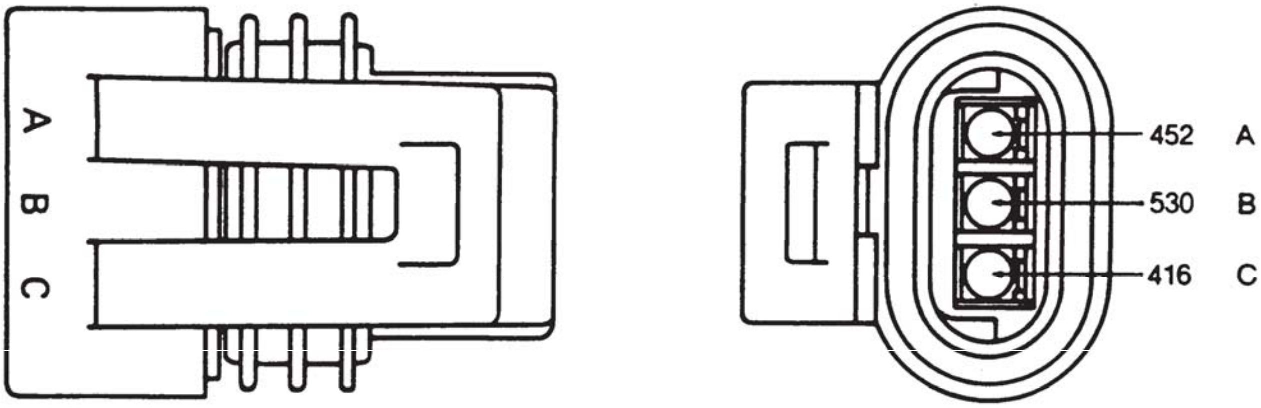
Electronic Control Module (ECM)

E. CODE 35 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE HIGH (Cont'd.)

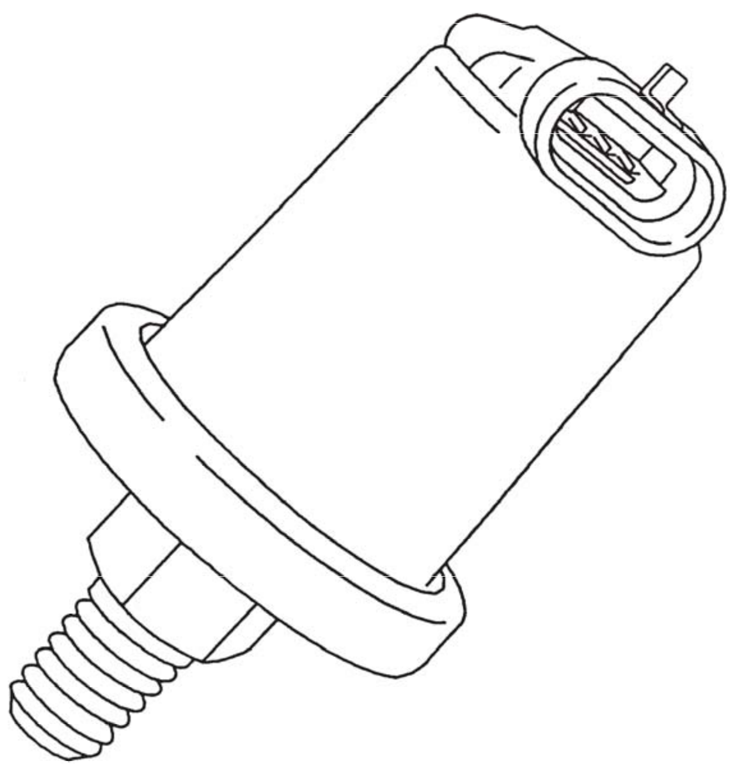
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-4 Check OPS Connectors		
• Inspect terminals at the OPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace OPS, page 4-332. Then go to 35-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 35-30.
35-5 Check for Short		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets W1 and P2 on the engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #530) is shorted to the engine +5 Volt line (ckt #416). Contact Direct Support.
	Greater than 10,000 ohms or open.	Go to 35-6.
35-6 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P2 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P2 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open.	Go to 35-8.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short, page 3-2, and reinsert fuses. Then go to 35-30.

E. CODE 35 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-7 Final Check • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run for one minute or until "Check Engine" light comes on. • Stop engine. • Check active codes.	Code 35. No codes. Any other codes except Code 35.	Replace ECM, page 4-192. Then go to 35-30. Repairs are complete. Go to START-1, page 3-121, to service other codes.
35-8 Check OPS Connectors • Inspect terminals at OPS connectors (sensor and harness sides) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay. Problem found.	Replace OPS, page 4-332. Then go to 35-7. Repair terminals/connectors, page 3-2. Then go to 35-30.
35-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 60 degrees C. 140 degrees F) for 1 minute. • Read historical codes.	Code 25 (no codes). Code 35 (and any other codes). Any other codes except Code 35.	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 3-121, to service other codes.



Oil Pressure Sensor
Harness Connector
P/N 12047909

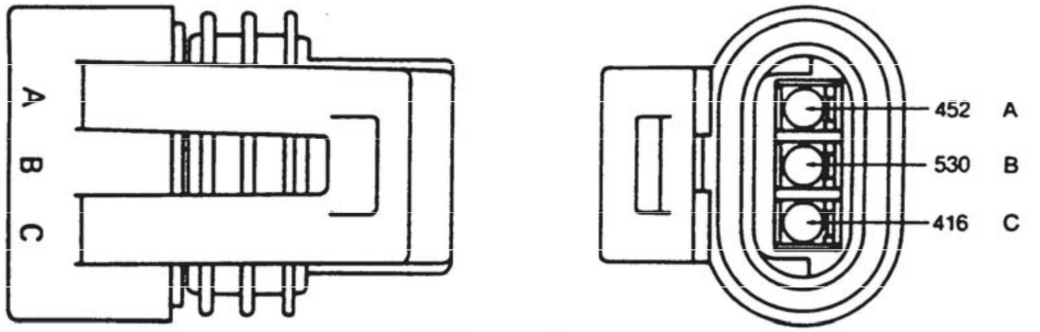


Oil Pressure Sensor (OPS)
P/N 8929184

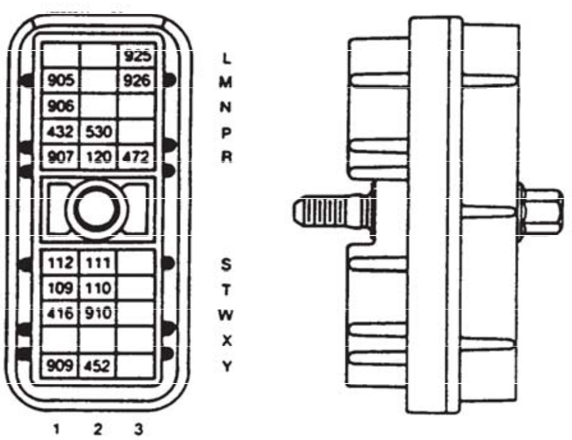
E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

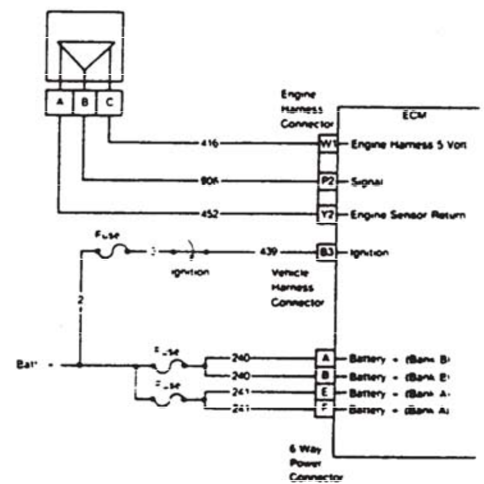
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-1 Multiple Code Check		
• Were there any other active codes beside Code 36?	No other codes.	Go to 36-2.
	Yes, any or all of the following codes: 14-15, 23, 33-35, 37-38.	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above.	Go to 36-2.
36-2 Sensor Check		
• Turn ignition off. • Disconnect OPS connector and install a jumper wire between sockets B and C of the OPS harness connector. • Turn ignition on. • Read active codes. • If active Code 35 or 36 exists, go to RESULT column. • If no active Code 35 or 36 exists, start and run engine until either active Code 35 or 36 appears or the engine temperature (Mode 13 COOLANT TEMP or 18 OIL TEMP on DDR) has been greater than 60 degrees C (140 deg F) for more than 1 minute.	Code 35 (and any codes except Code 36).	Check to be sure ECM and OPS connectors are wired properly. If wired properly then go to 36-3.
	Code 36 (and any other codes).	Go to 36-4.
	No codes.	Go to 36-4.
36-3 Check OPS Connectors		
• Turn ignition off. • Inspect terminals at the OPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets	Terminals and connectors are okay.	Replace OPS, page 4-332. Then go to 36-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 36-30.



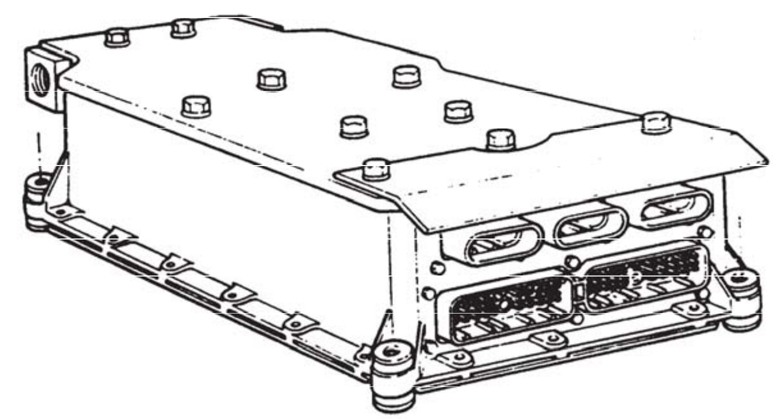
Oil Pressure Sensor
Harness Connector
P/N 12047909



ECM Engine Harness Connector
P/N 12034400



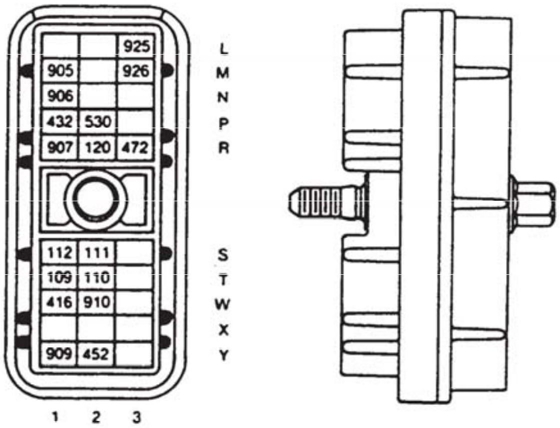
Oil Pressure, Battery + and
Ignition Circuits



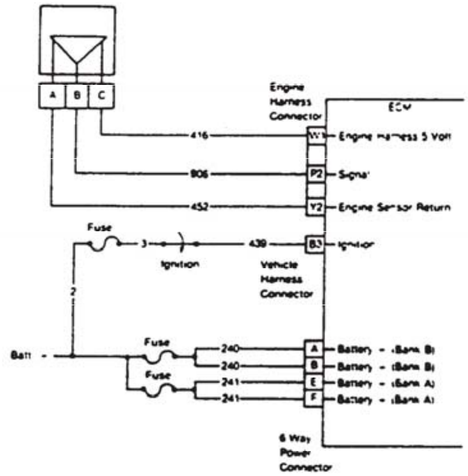
Electronic Control Module (ECM)

E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW (Cont'd.)

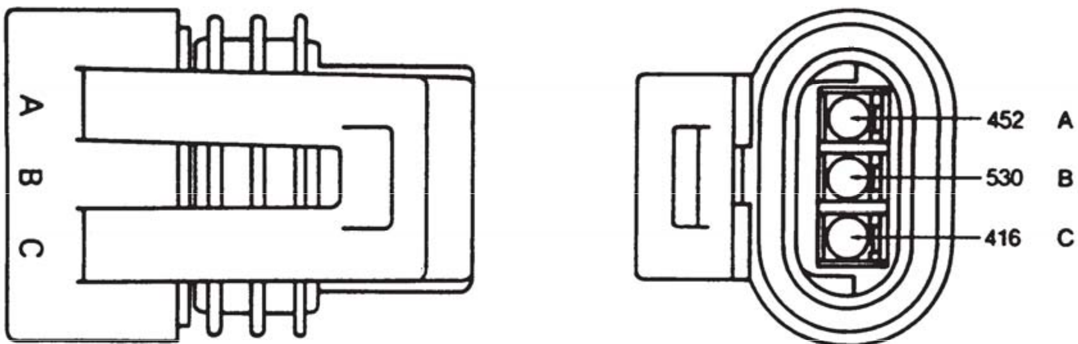
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-4 Check for +5 Volts • Turn ignition off. • Remove jumper wire. • Connect vehicle harness to ECM. • Turn ignition on. • Read voltage on OPS harness connector, socket C to socket A.	Between 4 to 6 volts.	Go to 36-5.
	Less than 4 volts.	Go to 36-8.
	Greater than 6 volts.	Go to 36-10.
36-5 Check for Signal Open • Turn ignition off. • Disconnect engine harness connector at the ECM. • Install a jumper wire between sockets A and B of the OPS harness connector. • Read resistance between sockets P2 and Y2 on the engine harness connectors.	Less than or equal to 5 ohms.	Go to 36-11.
	Greater than 5 ohms or open.	Signal line (ckt #530) is open. Contact Direct Support.
36-6 Check for Short • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets A and B on the OPS harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading	Signal line (ckt #530) is shorted to the return line (ckt #452) or battery ground. Contact Direct Support.
	Greater than 10,000 ohms or open on both readings	Go to 36-12.
36-7 Check ECM Connectors • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage: bent, corroded and unseated pins or sockets. Especially W1, P2 and Y2 terminals and pins at ECM.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to 36-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 36-30.



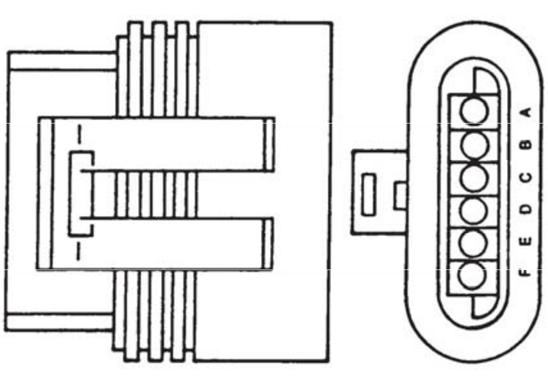
ECM Engine Harness Connector
P/N 12034400



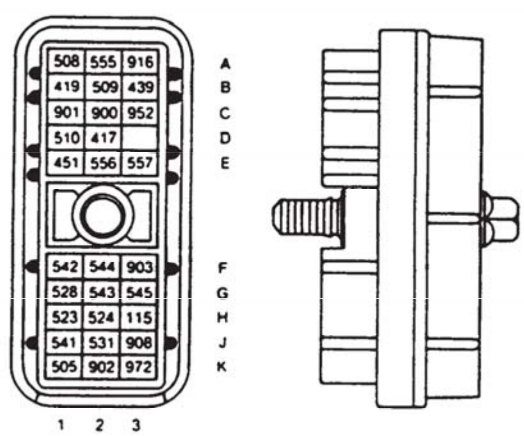
Oil Pressure, Battery + and
Ignition Circuits



Oil Pressure Sensor
Harness Connector
P/N 12047909



6-Way Power Harness Connector
P/N 12066317



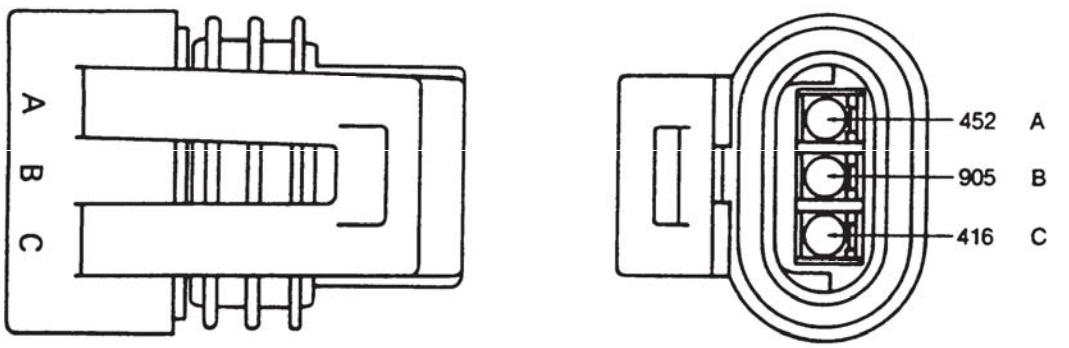
ECM Vehicle Harness Connector
P/N 12034398

E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW (Cont'd.)

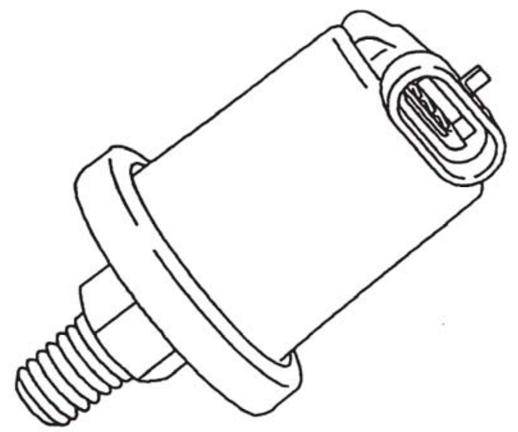
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-8 Check for Open +5 Volt Line		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between sockets A and C of the OPS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms. →	Go to 36-9.
	Greater than 5 ohms or open. →	The engine +5 Volt line (ckt #416) is open. Contact Direct Support.
36-9 Check for Short		
• Remove jumper wire. • Read resistance between sockets A and C of the OPS harness connector.	Less than or equal to 10,000 ohms. →	The engine +5 Volt line (ckt #416) is shorted to the return line (ckt #452). Contact Direct Support.
	Greater than 10,000 ohms or open. →	Go to 36-12.
36-10 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P2 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P2 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open. →	Go to 36-12.
	Any reading is less than or equal to 10,000 ohms. →	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short, page 3-2, and reinsert fuses. Then go to 36-30.

E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW (Cont'd.)

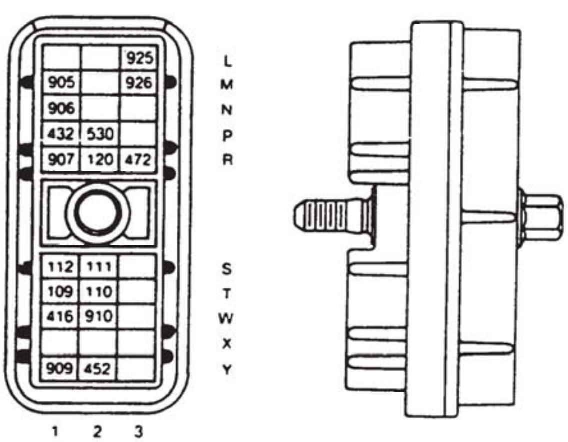
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-11 Check for Short on Ground • Turn ignition off. • Remove jumper wires. • Measure resistance between sockets P2 and Y2 on the engine harness.	Greater than 10,000 ohms.	Go to 36-6.
	Less than or equal to 10,000 ohms.	Signal line (ckt #530) and return line (ckt #452) are shorted together. Contact Direct Support.
36-12 Replace OPS • Turn ignition off. • Replace OPS. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run until check engine light comes on or for one minute.	Check engine light comes on.	Go to 36-7.
	Check engine light does not come on.	Go to 36-30.
36-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 60 degrees C, 140 degrees F) for 1 minute. • Read historical codes.	Code 25 (no codes)	Repairs are complete.
	Code 36 (and any other codes)	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 36	Go to START-1, page 3-121, to service other codes.



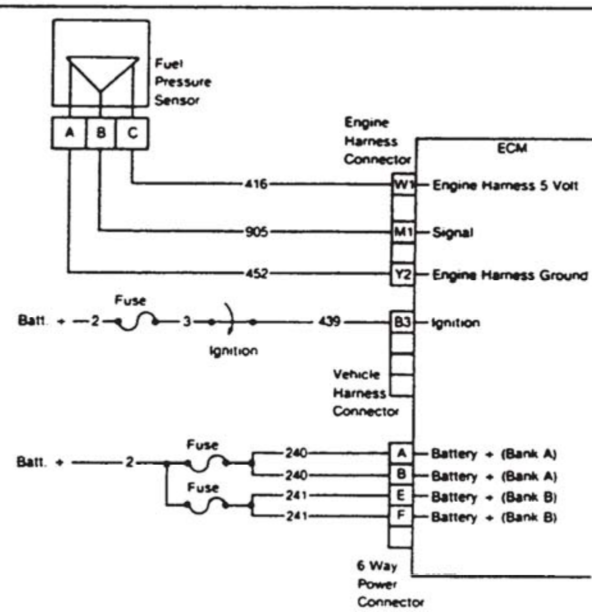
Pressure Sensor
Harness Connector
P/N 12047909



Pressure Sensor
P/N 8929184



ECM Engine Harness Connector
P/N 12034400



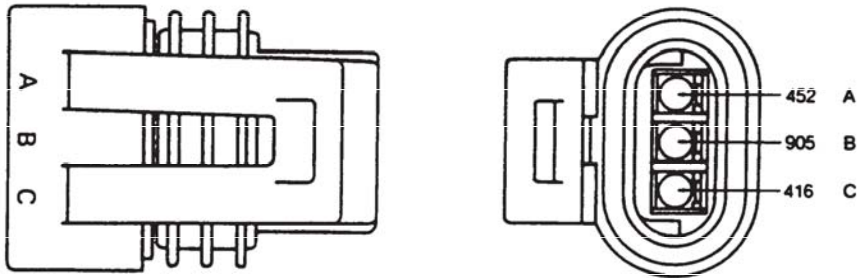
Fuel Pressure, Battery + and
Ignition Circuits

E. CODE 37 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE HIGH

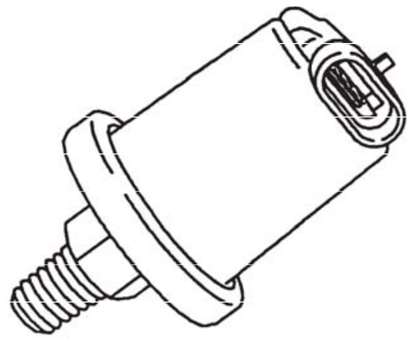
NOTE — This chart is only to be used if.

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

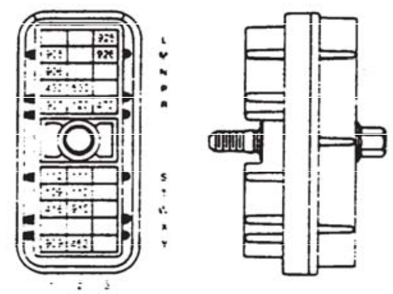
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
37-1 Multiple Code Check		
• Were there any other active codes beside Code 37?	No other codes.	Go to 37-2.
	Yes, any or all of the following codes: 14-15, 23, 33-36, 38.	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above.	Go to 37-2.
37-2 Sensor Check		
• Turn ignition off. • Disconnect FPS connector. • Turn ignition on. • Start and run engine • Select Engine Temperature (Mode 13 COOLANT TEMP or 18 OIL TEMP) on the DDR. • Warm up engine until engine temperature reading is greater than 60 degrees C (140 degrees F). • Leave engine running at idle after warm up. • Read active codes.	Code 38 (and any codes except Code 37).	Go to 37-3.
	Code 37 (and any other codes).	Go to 37-5
37-3 Return Circuit Check		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between pins A and B of the FPS harness connector. • Read resistance between sockets M1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 37-4.
	Greater than 5 ohms or open.	Return line (ckt #452) is open. Contact Direct Support.



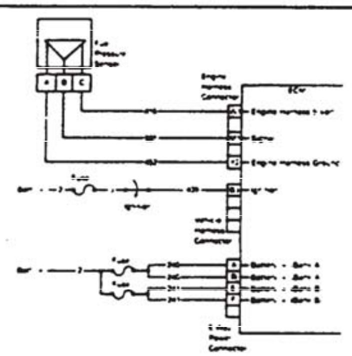
Pressure Sensor
Harness Connector
P/N 12047909



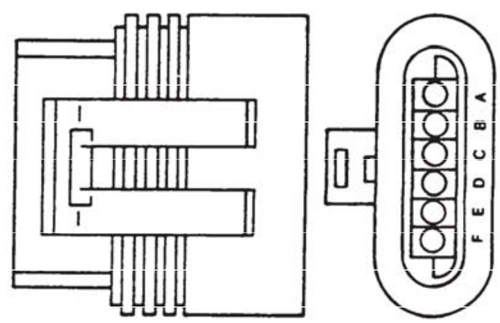
Pressure Sensor
P/N 8929184



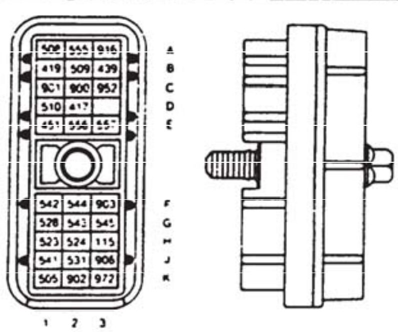
ECM Engine Harness Connector
P/N 12034400



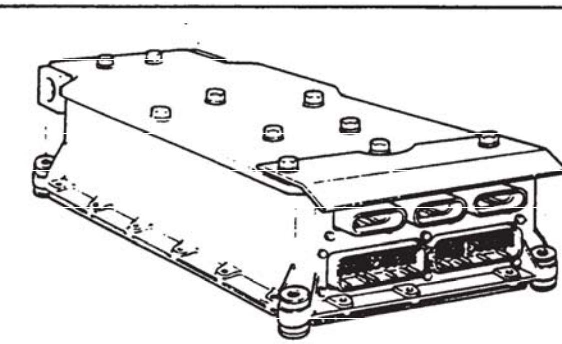
Fuel Pressure, Battery + and Ignition Circuits



6-Way Power Harness Connector
P/N 12066317



ECM Vehicle Harness Connector
P/N 12034398



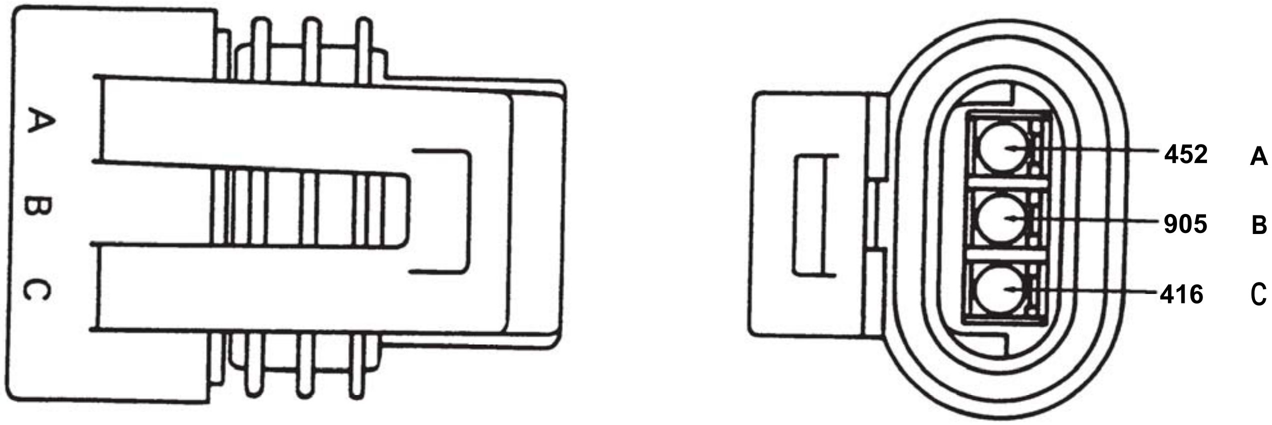
Electronic Control Module (ECM)

E. CODE 37 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE HIGH (Cont'd.)

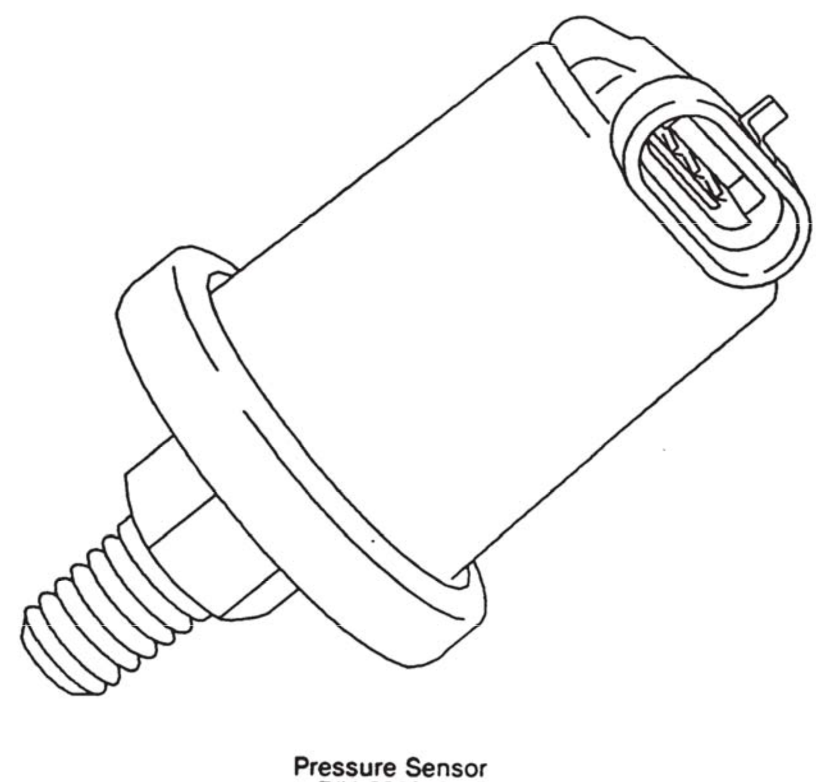
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
37-4 Check FPS Connectors • Inspect terminals at the FPS connectors (sensor side and harness side) for damage: bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace FPS. Then go to 37-30.
	Problem found.	Repair terminals/connectors. Then go to 37-30.
37-5 Check for Short • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets W1 and M1 on the engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #905) is shorted to the engine +5 Volt line (ckt #416). Contact Direct Support.
	Greater than 10,000 ohms or open.	Go to 37-6.
37-6 Check for Short to Battery + • Remove both fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket M1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket M1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open.	Go to 37-8.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short, page 3-2, and reinsert fuses. Then go to 37-30.

E. CODE37.FUEL PRESSURE SENSOR (FPS)SIGNAL VOLTAGE HIGH(Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
37.7 Final Check ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Start engine. Run for one minute or until "Check Engine" light comes on. ● Stop engine. ● Check active codes.	Code 37. No codes. Any other codes except Code 37.	Replace ECM, page 4-192. Then go to 37-30. Repairs are complete. Go to START-1, page 3-121, to service other codes
37.8 Check FPS Connectors . Inspect terminals at FPS connectors (sensor and harness sides) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay. Problem found.	Replace FPS, page 4-320. Then go to 37-7. Repair terminals/connectors, page 3-2. Then go to 37-30.
37.30 Verify Repairs ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "'check Engine'* light. ● If "check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 50 degrees C, 122 degrees F) for 1 minute. Read historical codes.	Code 25 (no codes). Code 37 (and any other codes). Any other codes except Code 37.	Repairs are complete All system diagnostics are complete. Please review this section from the stert to find the error. Go to START-1, page 3-121, to service other codes.



Pressure Sensor
Harness Connector
PIN **12047909**



Pressure Sensor
P/N 8929184

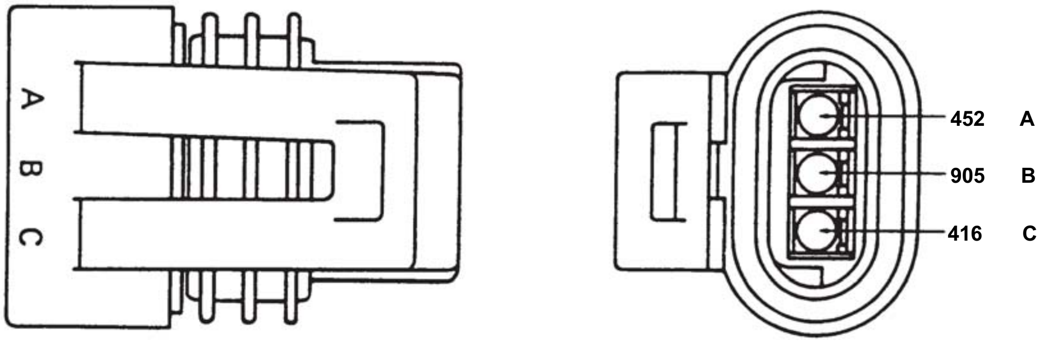
E. CODE 38. FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

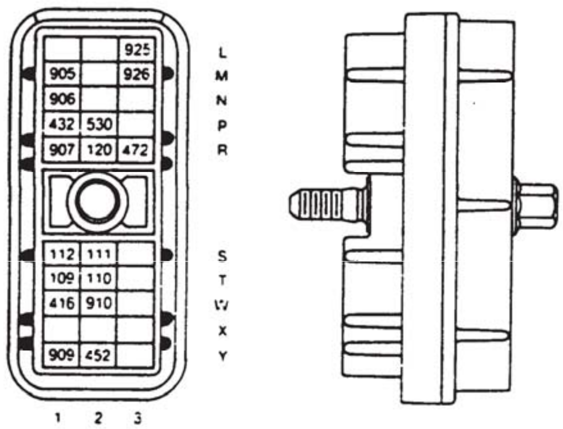
1) All basic mechanical checks and physical **inspections nave** been **performed** with **no problem found, and**

2) Diagnosis of DDEC-11 was started at step Start-1 (page 3-121) and you have now been referred here.

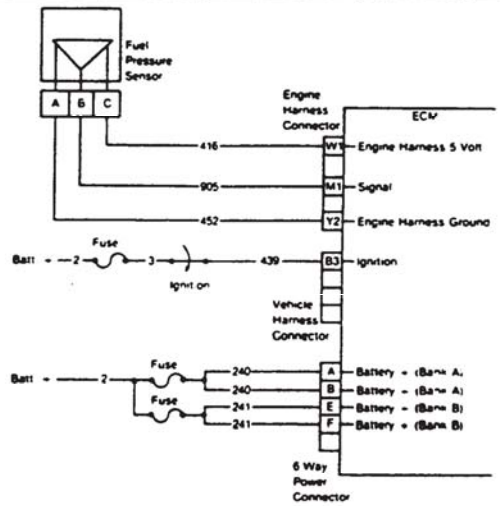
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38.0 Check Fuel Filters ● Are fuel filters plugged?	Yes.	Replace Fuel filters, page 4-44. Then go to 38-30.
	No.	Go to 38-1.
38.1 Multiple Code Check ● Were there any other active codes beside Code 38?	No other codes.	Go to 38-2.
	Yes, any or all of the following codes: 14-15,23,35-37.	Go to ENG5V-1 (page 3-333).
	Yes - but none of the above.	Go to 38-2.
38.2 Sensor Check ● Turn ignition off. ● Disconnect FPS connector and install a jumper wire between sockets B and C of the FPS harness connector. ● Turn ignition on. ● Read active codes. ● If **active** Code 37 or 38 exists, go to RESULT column. ● If no active Code 37 or 38 exists. start and run engine until either active Code 37 or 38 appears or the engine temperature (Mode 13 COOLANT TEMP **Of 18** OIL TEMP on DDR) has been greater than 60 degrees C (140 deg F) for more than 1 minute.	Code 37 (and any codes except Code 38).	Check to be sure ECM and FPS connectors are wired properly. If wired properly then go to 38-3.
	Code 38 (and any other codes).	Go to 38-4.
	No codes.	Go to 38-4.



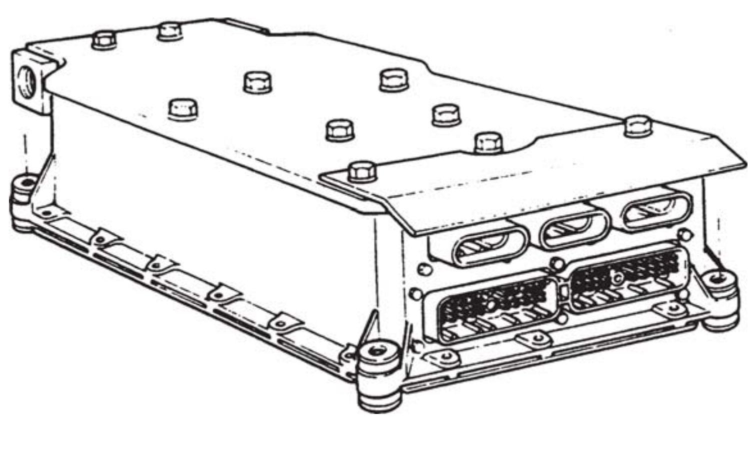
Pressure Sensor
Harness Connector
PIN 12047909



ECM Engine Harness Connector
P/N 12034400



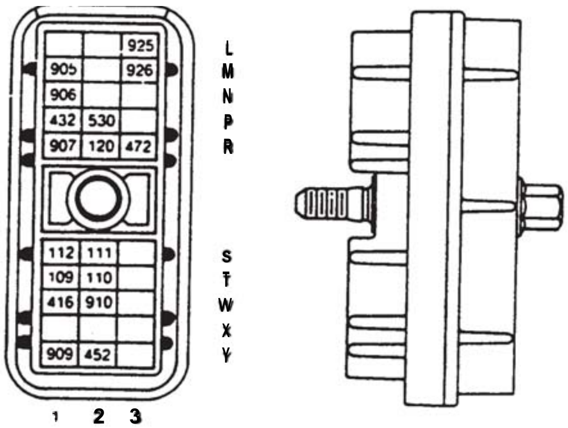
Fuel Pressure, Battery + and
Ignition Circuits



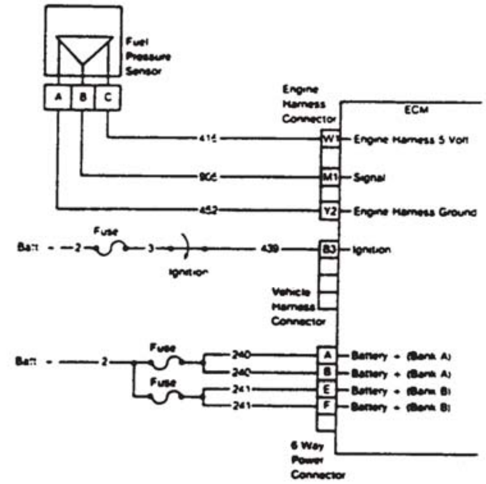
Electronic Control Module (ECM)

E. **CODE38. FUEL PRESSURE** SENSOR (FPS) **SIGNAL VOLTAGE** LOW (Cent'd.)

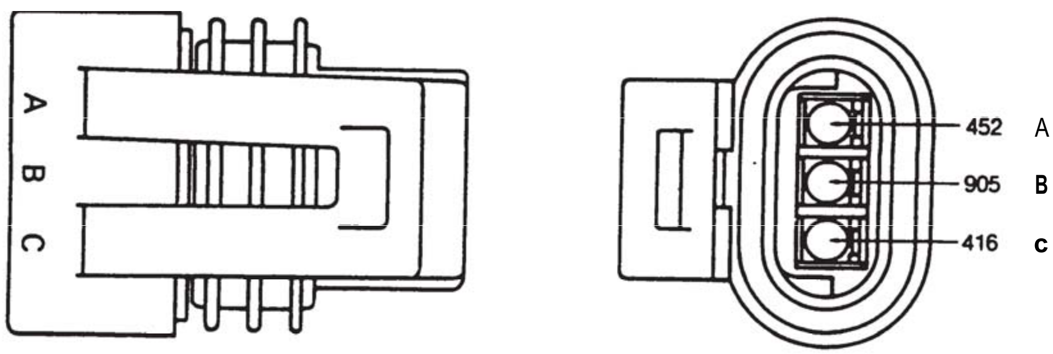
STEP/SEQUENCE	**RESULT**	WHAT TO DO NEXT
38.3 Check FPS Connectors ● Turn ignition off. . Inspect terminals at the FPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. Problem found.	Replace FPS, page 4-320. Then go to 38-30. Repair terminals/connectors, page 3-2. Then go to 38-30.
384 Check for +5 Volts ● Turn ignition **off.** ● **Remove** jumper wire. ● Connect **vehicle harness to** ECM. ● Turn ignition on. ● Read voltage on FPS harness connector, socket C to socket A.	Between 4 to 6 volts. Less than 4 volts. Greater than 6 volts.	Go to 38-5. Go to 38-8. Go to 38-10.
38.5 Check for Signal Open ● Turn ignition off. ● Disconnect engine harness connector at the ECM. . Install a jumper wire between sockets A and B of the FPS harness connector. ● Read resistance between sockets M 1 and Y2 on the engine harness connectors.	Less than or equal to 5 **ohms.** Greater than 5 ohms or open.	Go to 38-11. Signal line (ckt #905) or return line (ckt #452) is open. Contact Direct Support
38.6 Check for Short ● **Remove** jumper wire. ● Disconnect the engine harness connector at the ECM. ● Read resistance between sockets A and B on the FPS harness connector.	Less than or equal to 10,000 ohms. Greater than 10,000 **ohms** or open.	Signal line (ckt #905) is shorted to the return line (ckt #452). Contact Direct Support. Go to 38-12.



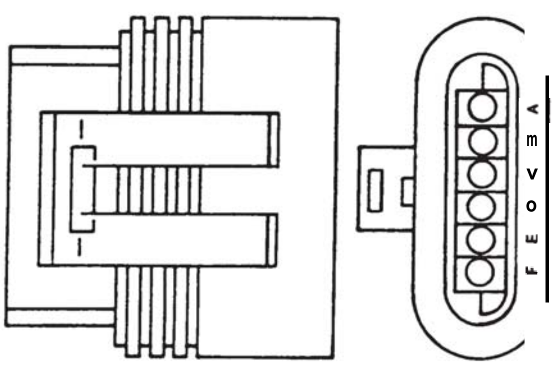
ECM Engine Harness Connector
PIN 12034400



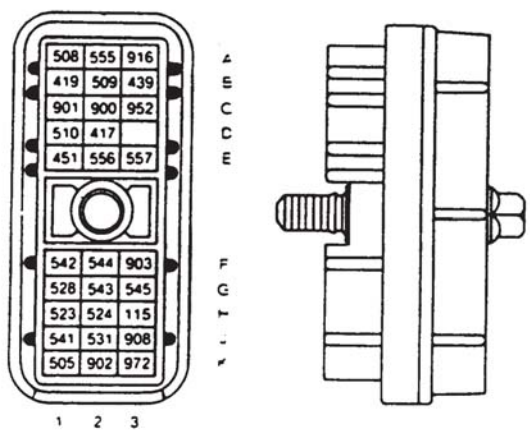
Fuel Pressure, Battery + and Ignition Circuits



Pressure Sensor
Harness Connector
P/N 12047909



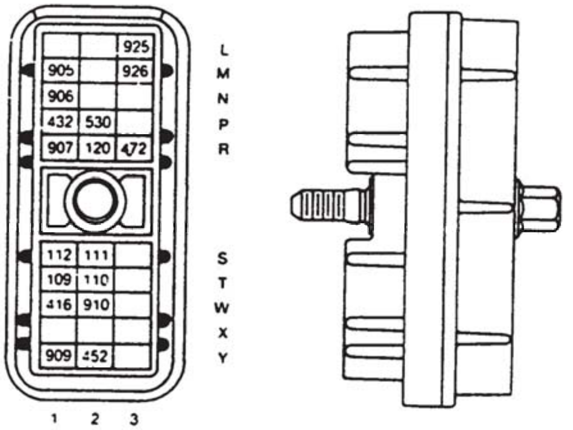
6-Way Power Harness Connector
PIN 12066317



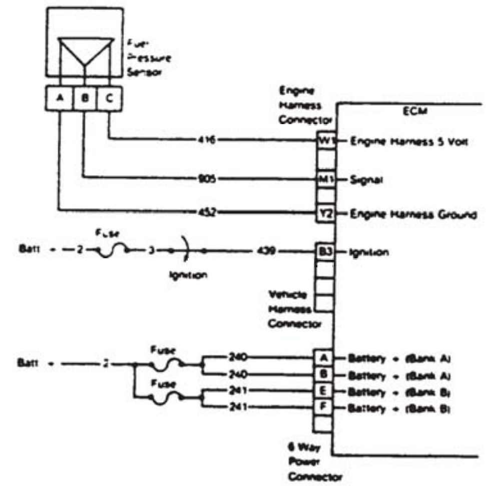
ECM Vehicle Harness Connector
P/N 12034398

E. CODE 38 -FUEL PRESSURE SENSOR (FPS) **SIGNAL VOLTAGE** LOW (Cent'd.)

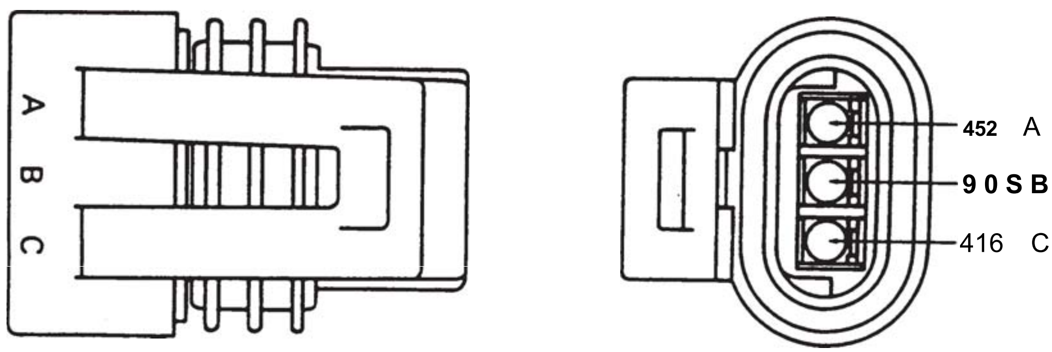
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38.7 Check ECM Connectors		
● Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage: bent, corroded and unseated pins or sockets. Especially WI, M 1 and Y2 terminals and pins at ECM.	Termnals and connecters are okay	Replace ECM, page **4-191.** Then go to 38-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to 38-30.
38.8 Check for *Open* + 5 Volt Line		
● Turn ignition off. ● Disconnect the engine harness connector at the ECM. ● Install a jumper wire between sockets A and C of the FPS harness connector. ● Read resistance between sockets WI and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 38-9.
	Greater than 5 **ohms** or open.	**The engine +5** Volt line (ckt #41 6) is open. Contact Direct support.
38.9 Check for Short		
● Remove jumper wire. ● Read resistance between sockets A and C of the FPS harness connector.	Less **than** or equal to 10.000 ohms.	The engine +5 Volt line (ckt #416) is shorted to the return line (ckt #452). Contact Direct Support.
	Greater than 10.030 ohms or open.	Go to 38-12.



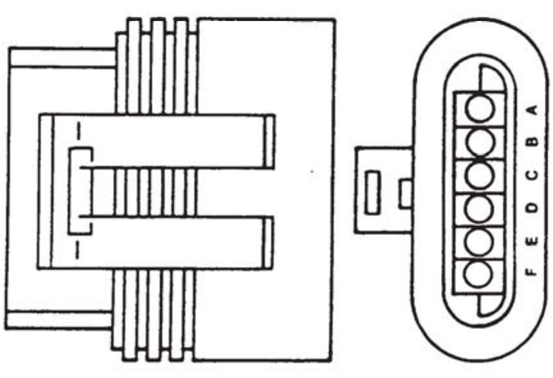
ECM Engine Harness Connector
P/N 12034400



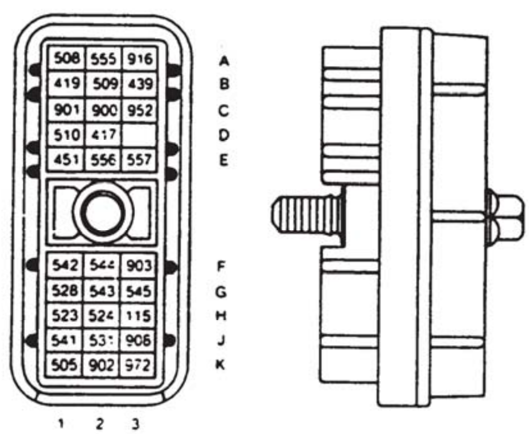
Fuel Pressure, Battery + and
Ignition Circuits



Pressure Sensor
Harness Connector
P/N 12047909



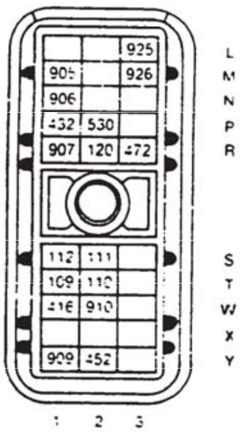
6-Way Power Harness Connector
P/N 12066317



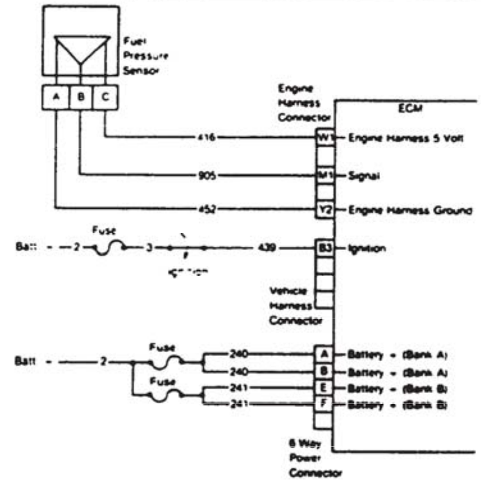
ECM Vehicle Harness Connector
P/N 12034398

E. CODE 38- FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW (Cent'd.)

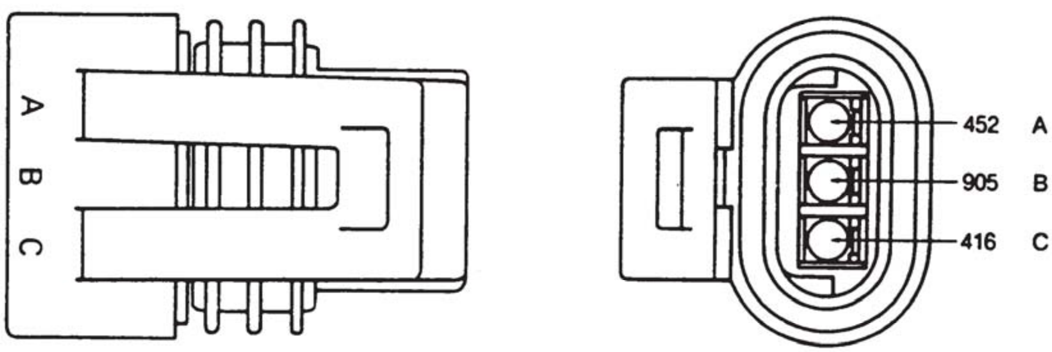
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38.1 O Check for Short to Battery +		
● Remove both fuses to the ECM. ● **Disconnect** the vehicle harness and 6-way power harness connectors at the ECM. ● Read **resistance** between socket M 1 of the engine harness connector and socket B3 of the vehicle harness connector. ● Also **read resistance between** socket M 1 on the engine harness connector and the following sockets on the 6-way power harness connector: A. B. E and F.	All readings are greater than 10,000 ohms or open.	Go to 38-12.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short, page 3-2, and reinsert fuses. Then go to 38-30.
38-11 Check for Short on Ground		
● Turn **ignition** off. ● **Remove** jumper wires. ● **Measure** resistance between sockets MI and Y2 on the engine harness.	Greater than 10.000 ohms.	Go to 38-6.
	Less than or equal to 10.000 ohms.	**Signal** line (ckt #905) and return line (ckt #952) are shorted together. Contact Direct Support.
38-12 Replace FPS		
● Turn **ignition** off. ● Replace FPS. ● Reconnect all connectors. ● Turn **ignition on.** ● **Clear Codes.** ● Start engine. Run until "Check Engine" light comes on or for one minute.	'. Check Engine" light comes on.	Go to 38-7.
	".Check Engine"' light does not come on.	Go to 38-30



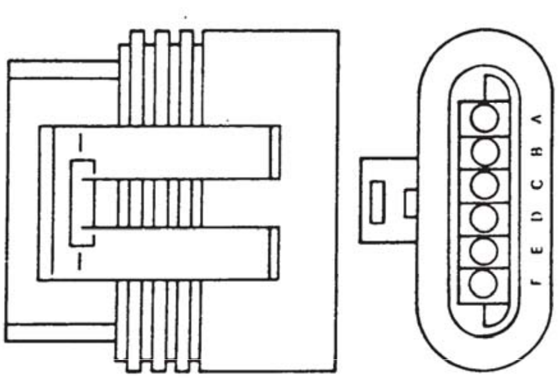
ECM Engine Harness Connector
P/N 12034400



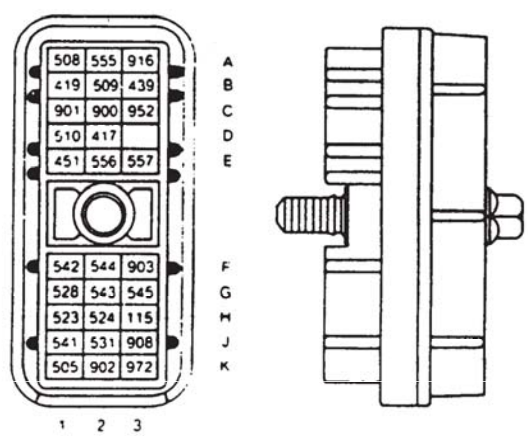
Fuel Pressure, Battery + and Ignition Circuits



Pressure Sensor
Harness Connector
P/N 12047909



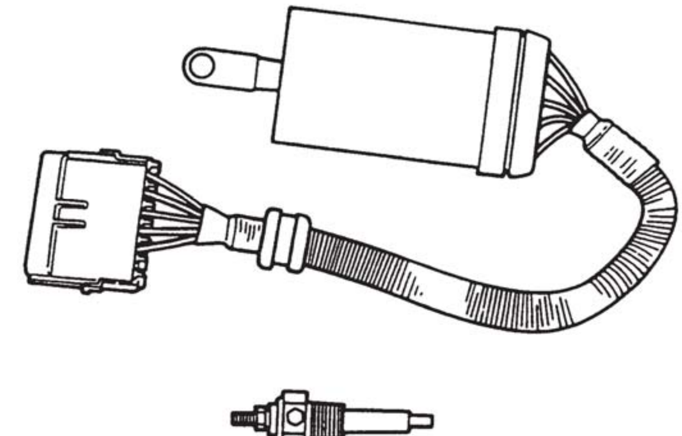
6-Way Power Harness Connector
P/N 12066317



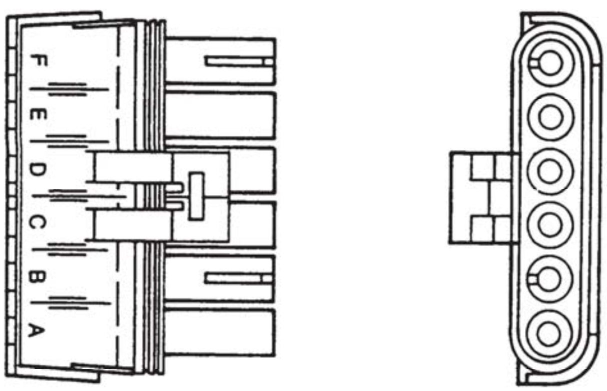
ECM Vehicle Harness Connector
P/N 12034398

E. CODE38. FUEL PRESSURE SENSOR (FPS)SIGNAL VOLTAGE LOW(Cont'd.)

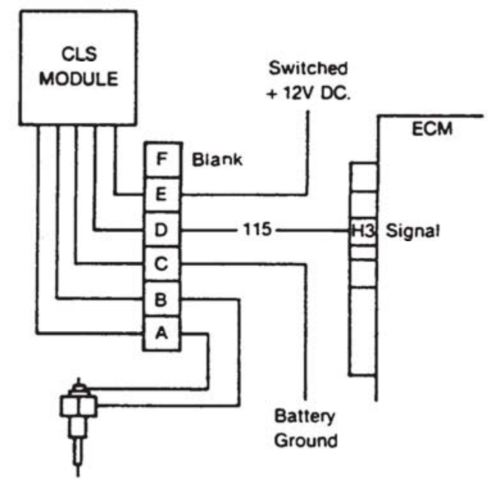
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38.30 Verify Repairs ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of “’”Check Engine light. ● If "check Engine” lIght does not stay on. start engine and run until "check Engine" light comes On or engine has run warm (greater than 60 degrees C. 140 degrees F) for 1 minute ● Read historical codes	Code 25 (no codes).	Repairs are complete.
	Code 38 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 38.	Go to START-1, page 3-121, to service other codes.



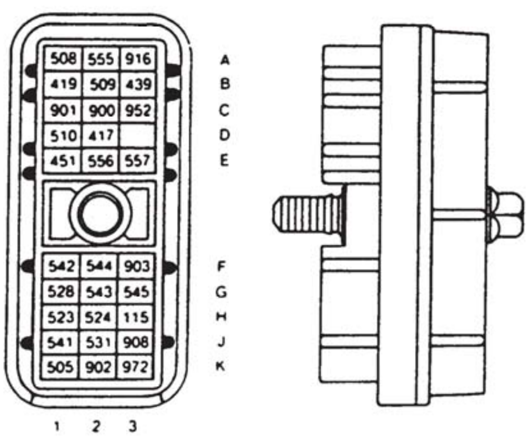
Coolant Level Sensor Module
P/N 23505265



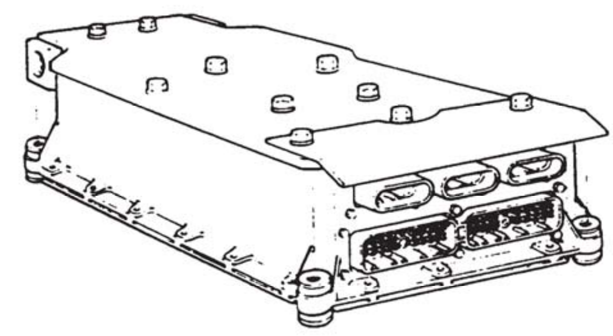
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398



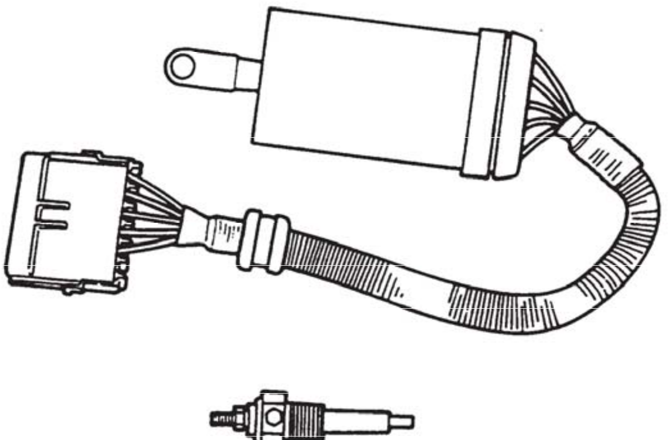
Electronic Control Module (ECM)

E. CODE43- LOW COOLANT

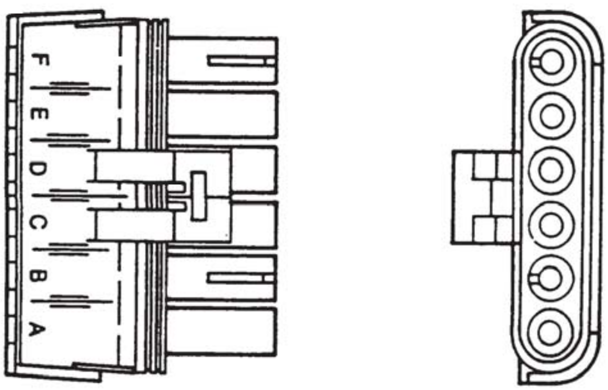
NOTE — This chart is only to be used If
1) All basic mechanical checks and physical inspections have been performed with no problem found. and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart

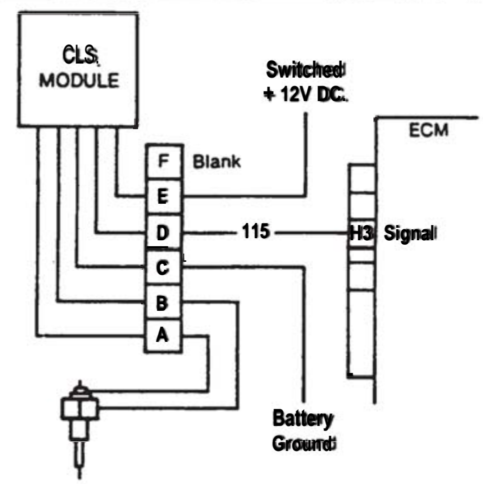
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
43.1 Multiple Code Check ● Were there any other active codes besides Code 43?	Yes.	Service other codes first.
	No.	Go to 43-2.
43-2 Check Coolant Level ● Check if coolant level is full.	Full.	Go to 43-3.
	Low	Determine causes for low coolant, page 4-98, **and refill radiator. Then go to 43-30.**
43.3 Clean Coolant Level Sensor ● Turn ignition off. ● Disconnect wires to CLS probe. ● unscrew CLS probe. ● Wipe probe clean with a clean rag. ● Reinstall probe. ● Connect wires to CLS probe. ● Turn ignition on. . Clear codes. ● Start and run engine until the "Stop Engine" light comes on or for 1 minute. ● Stop engine. ● Read historical codes.	Code 25 (no codes)	Repairs are complete.
	Code **43 (and any other code).**	Go to 43-7.
	Any other codes — except Code 43.	Go to START-1, page 3-121, to service other codes
43.6 Ground Wire Check ● Turn ignition off. ● Disconnect CLS connector. ● Read resistance between socket C of the CLS harness connector and a good battery ground (also try shaking the wire while reading resistance).	Always less than or equal to 5 ohms.	Replace CLS, module, page 4-240, Then go to 43-30.
	Greater than 5 ohms or open.	The CLS ground has a bad cmnection or is open. **Replace** wire in pin C of the CLS connector Run it to a good battery ground. Do not use chassis ground. Then go to 43-30.



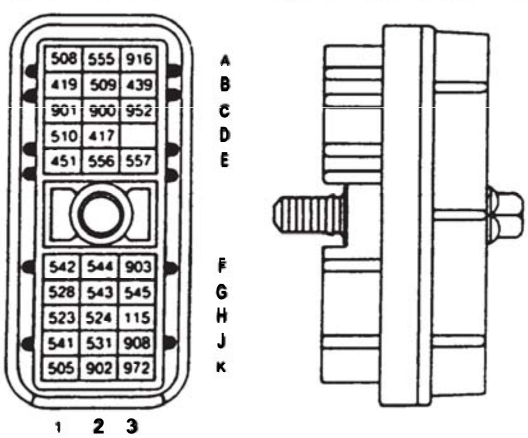
Coolant Level Sensor Module
P/N 23505265



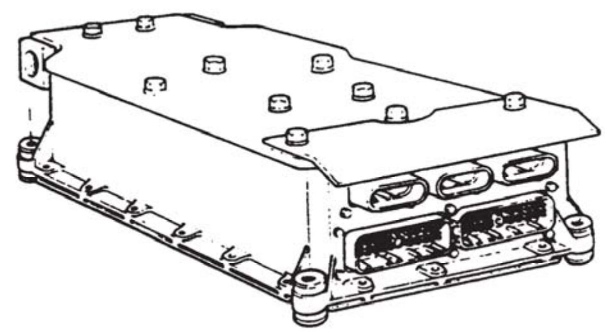
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

E. CODE 43- LOW COOLANT (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
43.7 CLS Probe Check ● Ignition off. ● Unscrew CLS probe. ● Place CLS in a cup of water. Have threads and probe in water. ● Turn ignition on. . Clear-codes. . Starl engine. Run until "Check Engine" light comes on or for 1 minute. ● If "Check Engine" light is not on. ● Remove probe from water. ● After 30 seconds, stop engine.	"Check Engine" light always on.	60 to 43-8.
	"Check Engine" light never on.	Replace CLS probe page 4-242. Then go to 43-30.
	No "Check Engine" light while in water and "Check Engine" light is ON while out of water.	Go to 43-6.
43.8 Check for Open ● Turn ignition off. . Disconnect CLS module connector. ● Measure resistance between pins A and Bon the vehicle harness side while probe is in coolant.	Less than 2M ohms.	Go to 43-30.
	Equal to or greater than 2M ohms.	Go to 43-9.
43.9 Check Probe Loads for Open ● Check the connection on the CLS probe and the terminals in the CLS connector.	Everything appears to be okay.	Go to 43-10.
	Problem found.	Repair problem, page 3-2. Then go to 43-30.
43.10 Check for Open ● Measure resistance between pin A and the center screw on the probe. ● Repeat above for pin B and the screw on the side of the probe.	Either reading is greater than 5 ohms.	Open wire. Contact Direct Support.
	Both readings are less than 5 ohms.	Replace CLS probe, page 4-242. Then go to 43-30.
43.30 Verify Repairs ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. . Clear codes. ● Start and run engine until the "Stop Engine'" light comes on or for 1 minute. ● Stop engine. ● Read historical codes.	Code 25 (no codes).	Repairs are complete.
	Code 43 (and any other code).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 43.	Go to START-1, page 3-121, to service other codes.

E. CODE44• OIL OR COOLANT OVER TEMPERATURE

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed wth no problem found and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart

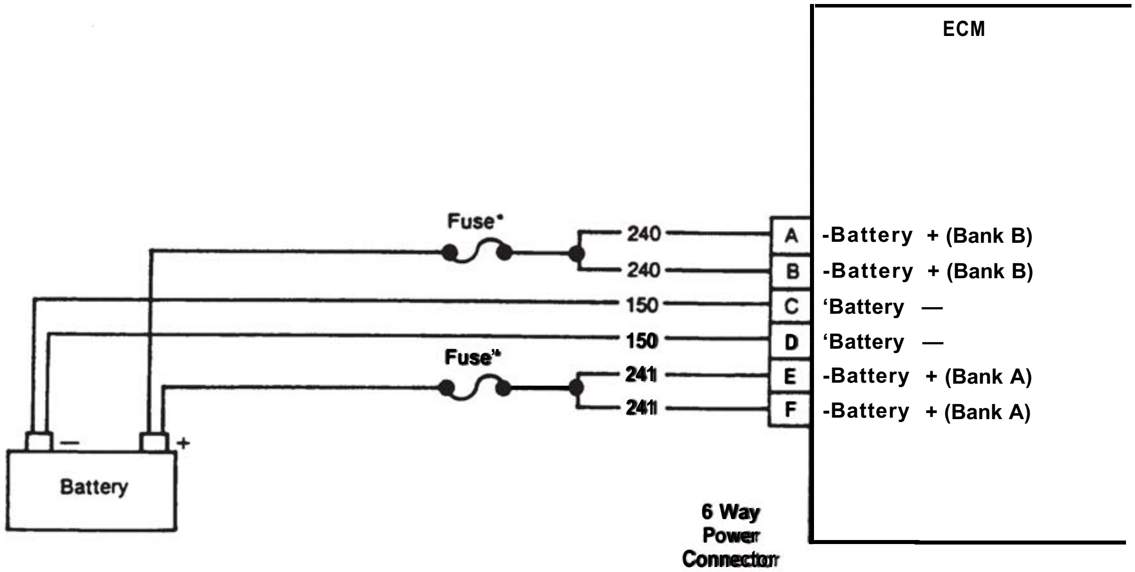
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
44.1 Multiple Code Check ● **Were there any other codes** besides Code **44?**	Yes.	- service **other** codes first.
	No.	- **Code 44** indicates that there **was an** engine running condition at which the temperature was higher than it should **have been.** Refer to page 4-98, to determine potential causes for **high oil or coolant temperature.**

E. CODE45. LOW OIL PRESSURE

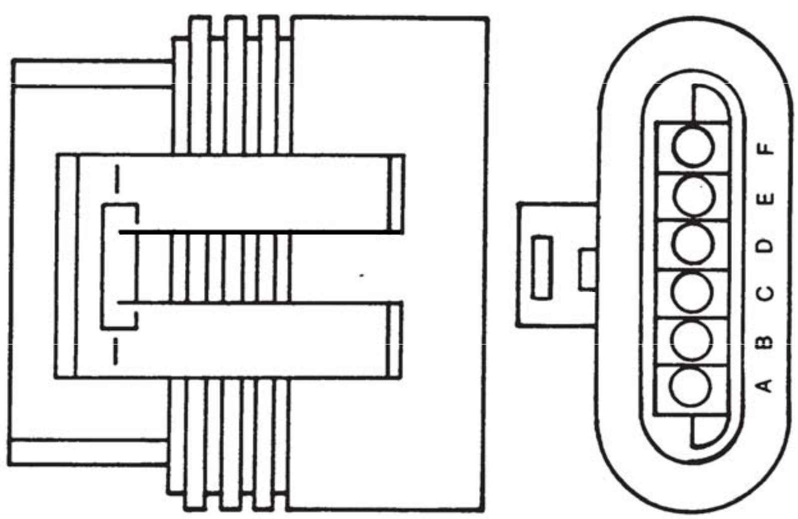
NOTE — This chart is only to be used if
1) All basic mechanical checks and physical inspections have been performed with no problem found and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR. additional audit trail reformation is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
45.1 Multiple Code Check		
● Where there any other codes **besides Code 45?**	Yes.	Service other codes first.
	No.	Code 45 indicates that there was an engine running condition at which the oil pressure was lower than it should have been. Refer to page 4-1; to determine potential causes for low oil pressure.



Battery Power and Ground Circuits

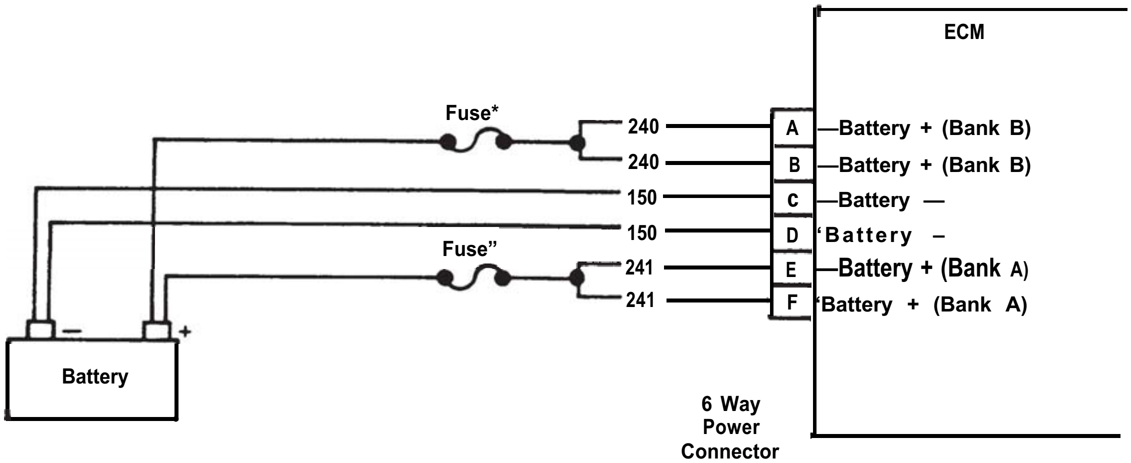


6-Way Power Harness Connector
PIN 12066317

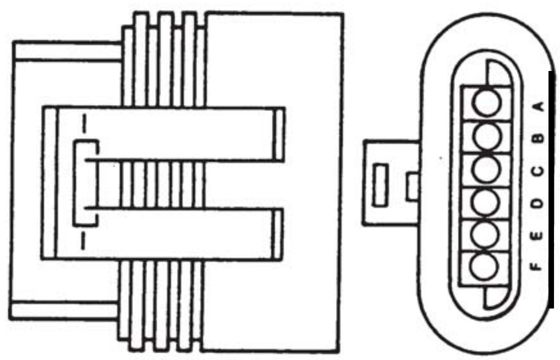
E. CODE 46 . LOW BATTERY VOLTAGE

NOTE — This chart is onfy to be used if:
1) All basic mechanical checks and physical inspections have been performed with no probtem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

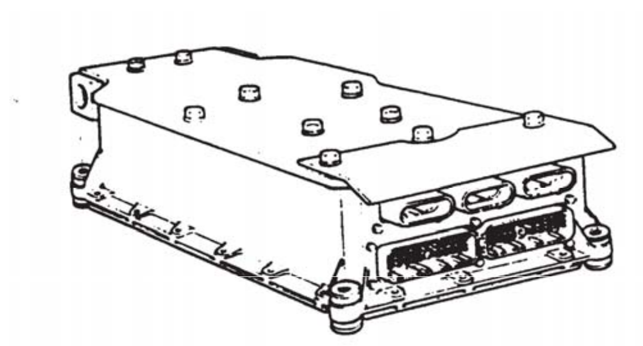
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46.1 Battery Check ● Start and run engine for 1 minute. ● Measure voltage on Battery + terminal to Battery - terminal.	Engine does not start.	- Determine cause for no-start. Start with an inspection of the battery (possibly discharged) and/or starting/charging system. Refer to Chart 2, page 3-141, as a further aid in no-start diagnosis if the battery and starting/ charging system are okay. .
	Less than or equal to 10.0 wits.	-Service discharged battery and/ or starting/charging system.
	Greater than 10.0 volts.	-Go to 46-2.
46.2 Voltage Check at ECM ● Keep engine running. ● Select ECM INPUT VOLT (Mode 5) on the DDR for display. ● observe ECM voltage reading on DDR.	Less than or equal to 10.0 volts.	-Go to 46-3.
	Greater than 10.0 volts.	-Go to 46-5.
46-3 Voltage Check at ECM Harness ● Turn ignition off. . Disconnect the 6-way power harness connector at the ECM. ● Read voltage from socket E, F, A and B of the 6-way power harness connector and a good battery ground. Don't use ckt#150 as the ground reference.	Less than or equal to 11.5 volts.	-Go to 46-4.
	Greater than 11.5 volts.	-Go to 46-5.



Battery Power and Ground Circuits



6-Way Power Harness Connector
PIN 12066317



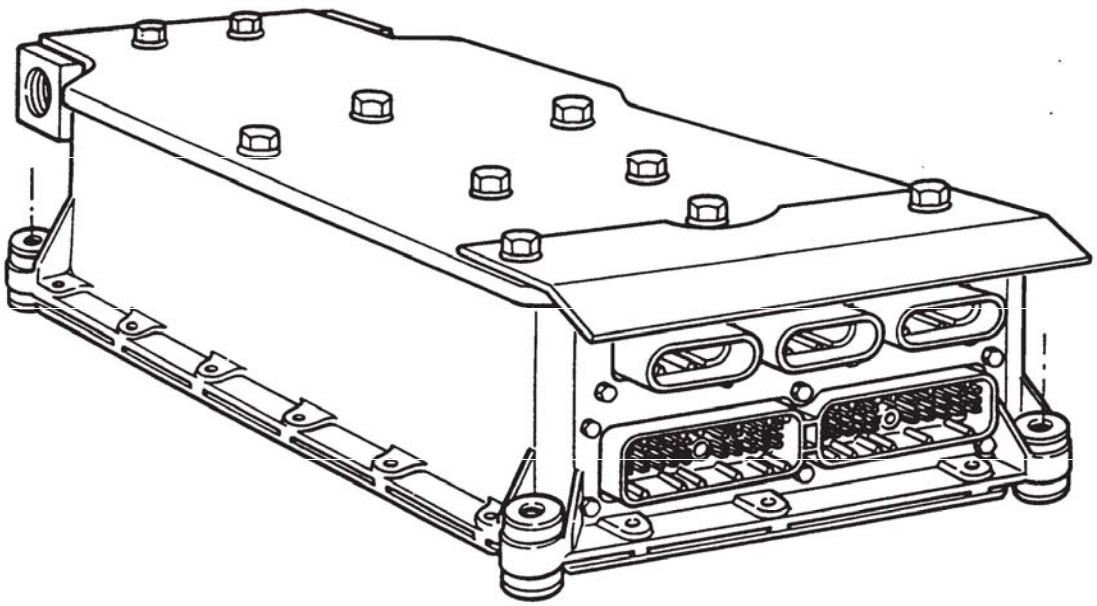
Electronic Control Module (ECM)

E. CODE46. LOW BATTERY VOLTAGE (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
464 Check for Bad Battery + Line		
● **Remove both M fuses.** ● Read voltage at socket A of one fuse holder to a good ground. ● Repeat voltage reading at the other fuseholder.	**Less than or equal to 11.5** volts on **either reading.**	**The Battery + line near the** Battery **is open, or a corroded connection exists at the Battery + terminal. Repair problem, page 4-256 .Then go to 46-30.**
	Greater than 11.5 volts on both readings.	**-The Battery + line between the fuseholder and the ECM has an open, or the ECM power connector has a corroded connection. Repair problem page 4-256. Then go to 46-30.**
46.5 Ground Check at the ECM		
● **disconnect the 6-way power harness connector at the ECM (if you have not** previously done so). ● **Read voltage on socket E of the 6-way power harness connector to socket D.** ● **Also read voltage on socket** A to socket C.	**Less than or equal to 11.5 volts on either reading.**	**- The ground wire (ckt #150) is open or has a corroded connection. Repair ground wire, page 3-2. Then go to 46-30.**
	Greater than 11.5 volts on both readings.	**Go to 46-6.**
46-6 Check **ECM** Connectors		
● Check **terminals at the ECM 6-way** power harness connector (both the ECM **and harness side) for damage; bent, corroded and unseated pins or sockets.**	Terminals and **connectors are okay.**	-Replace **ECM, page 4-192. Then go to 42-6.**
	Problem found.	**Repair terminals/connectors, page 3-2. Then go to 46-30.**

E. CODE 46- LOW **BATTERY VOLTAGE** (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO **NEXT**
46-30 Verify Repairs ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. . Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run until "check Engine" light Comes on or for 1 minute. ● Stop engine. ● Read historical codes.	Code 25 (no codes).	Repairs are complete.
	Code 46 (and any other codes).	- All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 46.	Go to START-1, page 3-121, to service other codes.

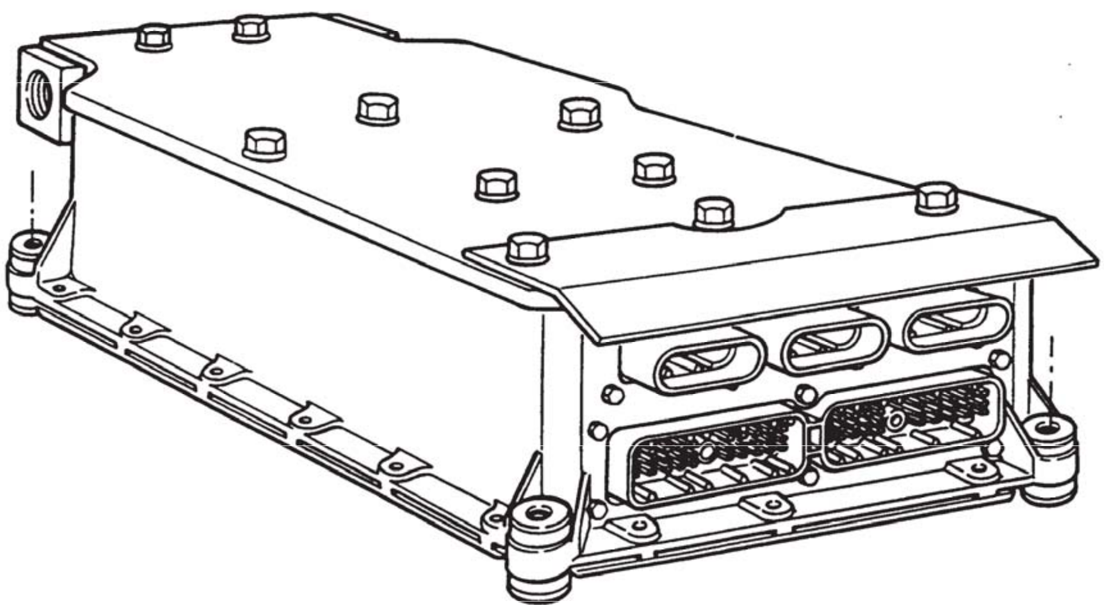


Electronic Control Module (ECM)

E. CODE47. HIGH FUEL PRESSURE

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found. and
2) Diagnosis of DDEC-II was started at step Stan-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
47-1 Multiple Code **Check**		
● Were there any other codes beside Code 47?	Yes.	Service other codes first.
	No.	*Code 47 indicates that there was an engine running condition where the fuel spill pressure was higher than it should be.

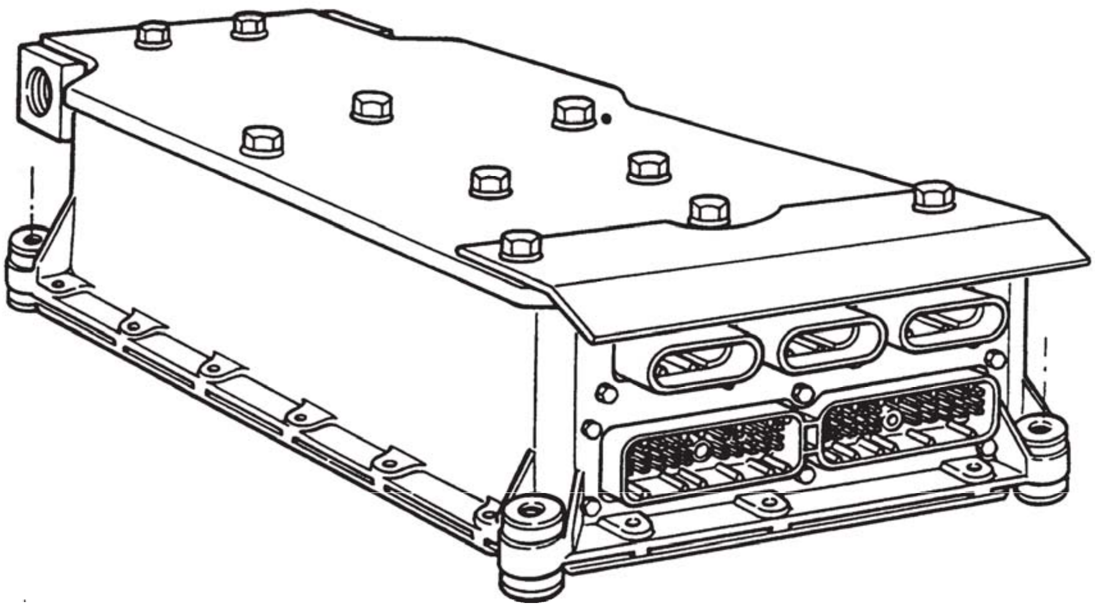


Electronic Control Module (ECM)

E. CODE 48 . LOW FUEL PRESSURE

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Dlagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48.1 Multiple Code Check		
● **Were there any other codes besides Code 48?**	Yes	**Service other codes first.**
	No	**Code 48 indicates that there was an engine running condition where the fuel spill pressure was lower than it should be.**



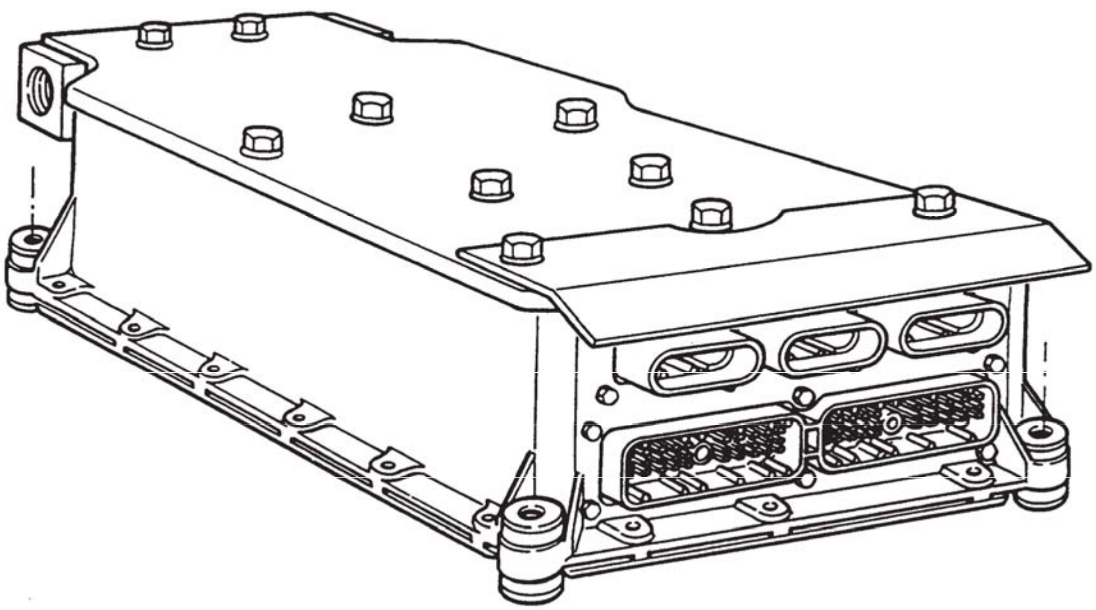
Electronic Control Module (ECM)

E. CODE 51 .EEPROM FAILURE (EEPROM = ELECTRICALLY ERASEABLE, PROGRAMMABLE READ ONLY MEMORY)

NOTE - This chart is only to be used if:
1) **All basic mechanical checks and physical inspections** have been **performed with no problem found, and**
2) **Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.**

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
. **An error has been detected in the EEPROM in the ECM.**		Replace **ECM, page 4-192.**

NOTE-This code is historical only and forces backup operation.

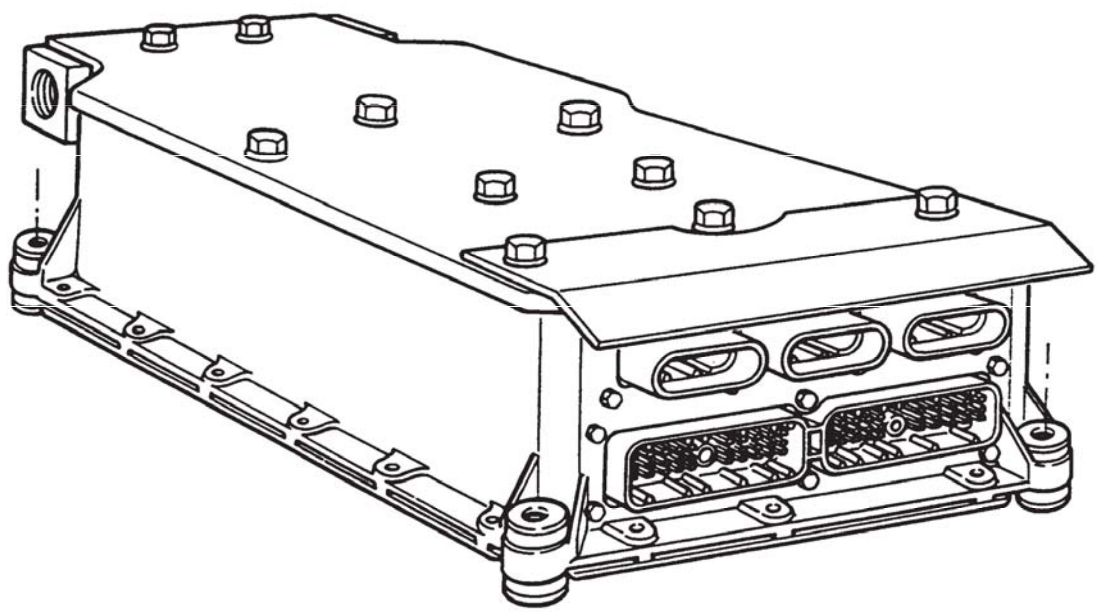


Electronic Control Module (ECM)

E. CODE52. ECM . ANALOG TO DIGITAL FAILURE

NOTE — **This chart is *onlv to be* used if**
1) All basic mechinacal checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page **3-121) and you have now been referred here.**

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
52-1 Multiple Code Check		
● **Where there any other codes besides Code 52?**	**Yes.**	***Service other codes first.**
	No.	***Replace The ECM, page 4-192. Then go to START-1, page 3-121.**

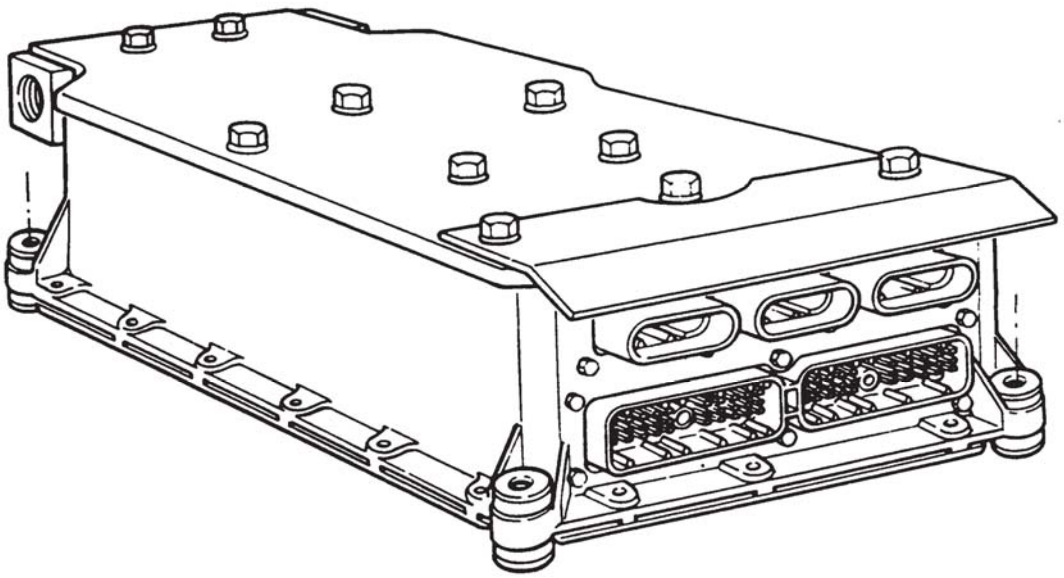


Electronic Control Module (ECM)

E. CODE 53. EEPROM FAILURE AFFECTING CODE LOGGING (EEPROM = ELECTRONICALLY ERASEABLE, PROGRAMMABLE READ ONLY MEMORY)

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
● An error has been detected in the EEPROM in the ECM which will cause it to not log codes correctly or at all.		Replace the ECM, page 4-192.



Electronic Control Module (ECM)

E. CODE 56 . ECM . ANALOG TO DIGITAL FAILURE

NOTE — This chart is only to be *used* if:

1) All base ***mechanical checks and physical inspections have been performed with no Problem found and***
2) **Diagnosis of DDEC-II *was started at* step Start-1 (page 3-121) and you have now been referred here.**

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
56.1 Multiple Code Check		
● **Were there any other codes besides Code 56?**	**Yes.**	**-Service other codes first.**
	No.	***Replace the** ECM, **page 4-192. Then go to START-1, page 3-121.**

E. CODE 6X (X=1 to 6) - INJECTOR RESPONSE TIME TOO LONG

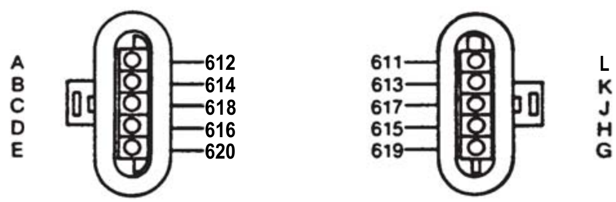
NOTE — This chart is only to be used if:

1) **All basic mechanical checks and physical inspections have** been performed with no problem found, and
2) **Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.**

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X.1 Non 6X Code Check ● Were there any other codes besides Code 6X?	Yes.	→ service other codes before proceeding to diagnose Code 6X.
	No other codes	→ **GO to** 6X-2. (Note: **in Step** 6X-2, **be sure** to verify the response times of all cylinders indicated by 6X fault codes.)
6X.2 Confirm Failure ● **Start and** warm engine cooperating **temperature (at least 86').** ● Plug **in** DDR and select INJ RESP TIMES **(Mode 10).** ● The DDR displays injector response **time** in firing order. Read the injector response times thru several cycles. The firing **sequence in relation to the code received is given in Table 6X-1 (page 000).** ● **Note response time(s) of cylinder number(s) in fault code(s).**	Response tlme(s) for code(s) received is 0.80.	→ **Failure is still** present. GO tO 6X-3.
	Response time(s) is not 0.80	→ **Failure is** no longer present (it's intermittent). If you still have a customer complaint along with Code 6X, look for the following possible problems: 1 Sticky valve 2 **Aeration in** fuel 3 Low battery 4 Broken spring or armature on the injejctor. 5 Problems in the charging system (loose alternator belt. etc.) or bad grounds. 6 Signs of insulation wear on injection harness.

E. CODE 6X (X=1 to 6) - INJECTOR RESPONSE TIME TOO LONG (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X.3 Check for Multiple 6X Codes		
● Note how many 6X Codes were logged and confirmed in step 6X-1.	Only one 6X Code.	Go to 6X-4.
	All 6X Codes were logged.	GO to 6X-1 O
	All 6X Codes for one bank of injectors (refer to Table 6X-1).	Go to 6X-12.



5-Way Injector Harness Connectors

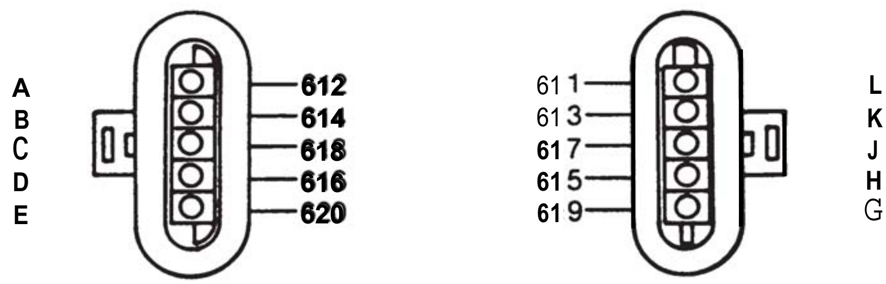
TABLE 6X.3 RIGHT HAND ENGINE

Code	Injector Harness Connector Socket	to	injector Harness Connector Socket
61	L		G
62	A		E
63	K		G
64	B		E
65	H		G
66	D		E
67	J		G
68	C		E

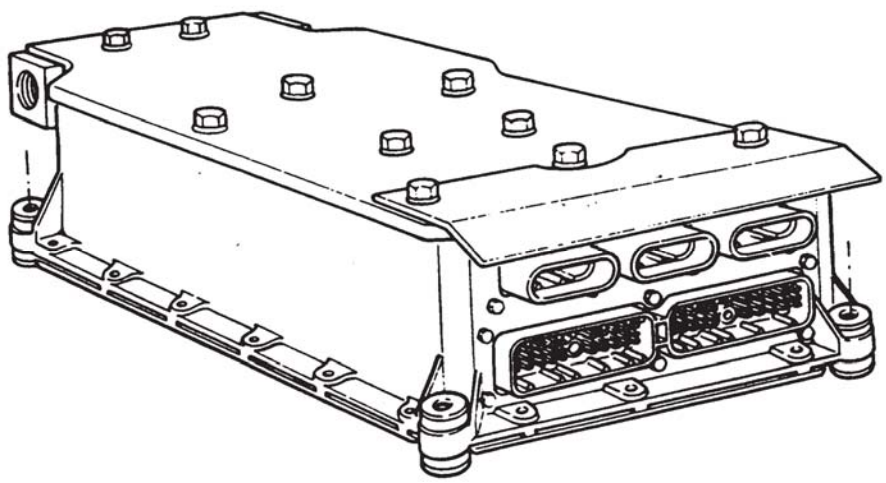
Section 4
TROUBLESHOOTING CHARTS

E. CODE 6X (X=I to 6) - INJECTOR RESPONSE TIME TOO LONG (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X.4 Injector Resistance Check		
● **Turn ignition off.** ● **Unplug** DDR. ● Disconnect both 5-way injector harness connectors at the ECM. ● **Referring to** Table 6X-3, read resistance between the 5-way injector harness connector sockets associated with the 6X Code received. (Example: read resistance between sockets G and L **for a Code 61.)**	Greater than 1 **ohm.**	► Go to 6X-~~5~~. 11
	Less than or equal **to 1 ohm.**	► Go to 6X-~~6~~. 12



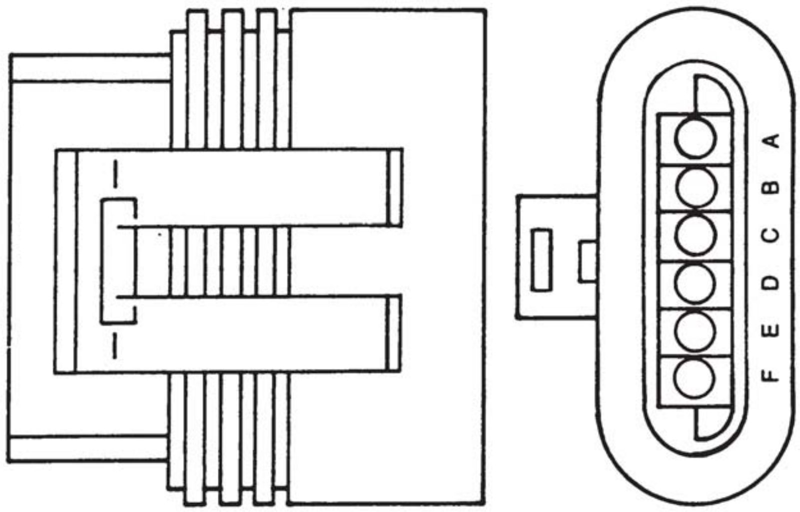
5 Way, Injector Harness Connectors



Electronic Control Module (ECM)

E. CODE 6X (X = 1 to 6) .INJECTOR RESPONSE TIME TOO LONG (Cent'd.)

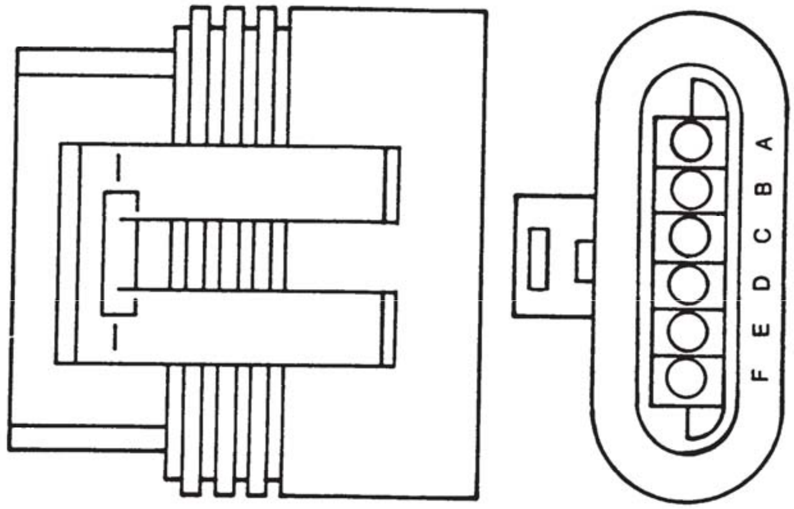
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-1 O Check ECM Connectors		
● **Check terminals at both 5-way, injector harness connectors (both the harness and the** ECM sides) for damage; bent, corroded and unseated **pins or sockets.**	Terminals and connectors are OKAY.	Go to 6X-1 1 .
	Problem found.	Repairterminals/connectors, page 3-2. Then go to 6X-30.
6X-1 1 Check for Other Possible Causes		
● Check if **any** of the following problems are evident: 1. Aerated fuel or low fuel pressure. 2. Sticky valve. 3. Cold fuel. 4. Low battery. 5. Broken spring or armature on the injector. 6. Problems in the charging system (loose alternator belt, etc.) or bad grounds. 7. Signs of insulation wear on injector harness.	Probiem found.	Repair. Then go to 6X-30.
	No problems found.	***Replace** ECM, page **4-192. Then go to 6X-30.**



6-Way Power Harness Connector

E. CODE 6X (X = 1 to 6) . INJECTOR RESPONSE TIME TOO LONG (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-12 Check ECM Fuses ● Check both fuses to the ECM.	Fuses blown. Fuses are okay.	-Go to 6X-13. -Go to 6X-15.
6X-1 3 Check for Short ● Replace fuse(s). ● Run engine to see if fuses blow again.	Fuses blown. Fuses are okay.	-Go to 6X-14. -Go to 6X-30.
6X-1 4 Check ECM Power ● Turn ignition off. ● Disconnect the 6-way, power harness connector. ● Read voltage on socket A (red lead) to a good ground (black lead). ● Also read voltage On Sockets B, E and F (red lead) to a good ground.	Greater than or equal to 11.5 volts for each reading. Less than 11.5 volts on any reading.	-Go to 6X-15. - Short exists between Bank A Power (ckt #240) or Bank B Power (ckt #241) and ground. Contact Direct Support.
6X-1 5 Check for Open ● Read voltage on socket E or F (red lead) to socket C or D (black lead) of the 6-way, power harness connector. ● Also read voltage on Socket A or B (red lead) to socket C or D (black lead) of the 6-way, power harness connector.	Both readings are greater than or equal to 11.5 volts. Either reading is less than 11.5 volts.	-GO to 6X-16. -Bank A Power (ckt #240) or Bank B Power (ckt #241) is open. Contact Direct Support.



6-Way Power Harness Connector

E. CODE 6X (X=1 to 6) - INJECTOR RESPONSE TIME TOO LONG (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-1 6 Check for Good Ground Line		
● Read **resistance between socket** C of the 6-way power harness connector and a good ground. ● Also read resistance **between socket D of the 6-way** power harness connector and a good ground.	Both readings are less than or equal to 5 ohms.	Go to 6X-17.
	Either reading is greater than 5 ohms.	Ground line (ckt **#150) is** open. Contact Direct Support.
6X-1 7 Check Return Line		
● Disconnect both 5-way injector harness connectors at the ECM. ● Read **resistance** between sockets G and L of the 5-way injector harness connector. ● Also read resistance between sockets A and E of the other 5-way, injector harness connector.	Either reading is greater than 5 ohms.	Injector Driver Return line (ckt #619 or #620) is **open. Contact Direct Support.**
	Both readings are less than or equal to 5 ohms.	GO to 6X-10.
6X-30 Verify Repairs		
● **Turn ignition off.** ● **Reconnect all connectors.** ● **Turn** ignition on. . Clear codes. ● Note status of "Check Engine" light. ● **If "Check Engine" light does not** stay on, start engine and run for 1 minute or until "Check Engine" light comes on. Stop engine. ● Read historical codes.	Code 25 (no codes).	Repairs are complete.
	Code 6X (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 6X.	Go to START-1, page 3-121, to service other codes.

E. CODE 7X (X = 1 to 6) - INJECTOR RESPONSE TIME TOO SHORT

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
7X.1 General System Checks		
. Check if any of the following problems are evident: Charging system problems (loose alternator belt, etc.) or a bad ground(s), page 4-154.	Problem found.	Repair, page 4-154. Then go to 7X-30.
	No problems found.	Go to 7X-2.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
7X-30 Verify Repairs		
● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. . Note status of "'Check Engine" light. ● If "Check Engine" light does not stay on, start and run engine until at operating temperature or until the "Check Engine" light comes on. ● Read historical codes.	Code 25 (no codes).	Repairs are complete.
	Code 7X (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 7X.	Go to START-1, page 3-121, to service other codes.

E. CODE 85 w ENGINE OVERSPEED

NOTE — This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found and
2) Diagnosis of DDEC-II was started at step Start-1 (page 3-121) and you have now been referred here.

85-1 Code 85 Information

This code is for information purposes only. It is logged whenever the engine has been operating over 2500 RPM for at least 2 seconds. To get complete information, do the following:

1) Turn ignition on and plug the DDR in
2) Select Mode 02 (Historical Codes) and 38 (Engine Hours) for display
3) At least part of the display will look like the following example (there W-Il be more display if more codes are logged in addition to Code 85):

Line 1 =	85 ENG OVERSPEED 02
Line 2 =	352 START HR 02
Line 3 =	15 SECONDS 02
Line 4 =	1 OCCUR 02
Line 5 =	368 ENG HOURS 38

<u>This is what the display means:</u>

Line 1 = A Code 85, engine overspeed was logged. It is being displayed as part of the Mode 02 display.

Line 2 = The Code 85 condition was first seen at 352 engine hours (number of hours the engine has been in use since coming off the assembly line).

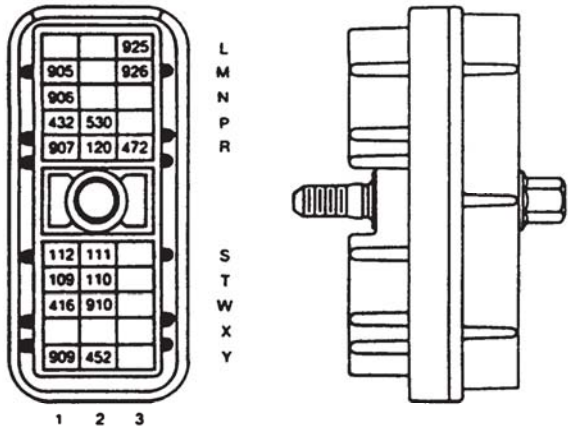
Line 3 = The total duration of Code 85 conditions logged was 15 seconds.

Line 4 = Only 1 continuous occurance of Code 85 took place.

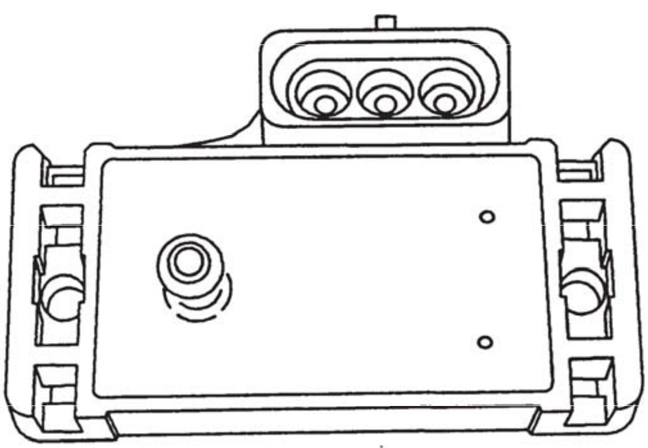
Line 5 = The total number of engine hours at this time is 368 (this is the Mode 38 display). Putting this information together with the Mode 02 display, this means that the first Code 85 condition occured 16 engine hours ago (368- 352).

- Note that this additional audit trail information is only available for:

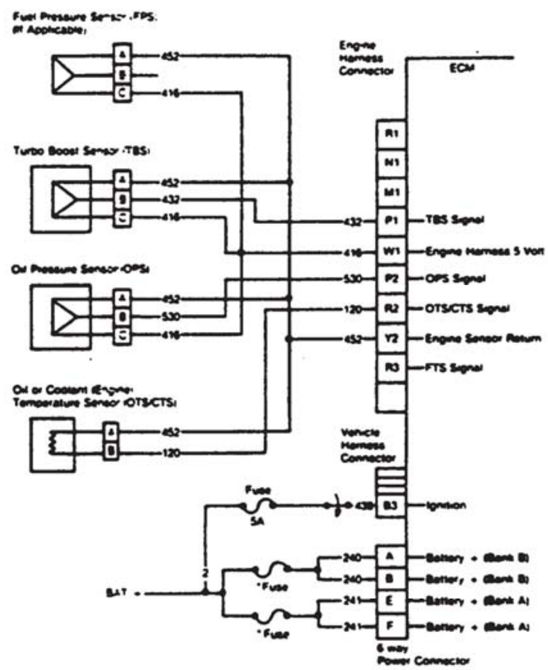
- Code 22 (Throttle Position Sensor Low)
- Code 43 (Low Coolant)
- Code 44 (Engine Over emperature)
- Code 45 (Low Oil Pressure)
- Code 85 (Engine Overspeed)



ECM Engine Harness Connector



Turbo Boost Sensor



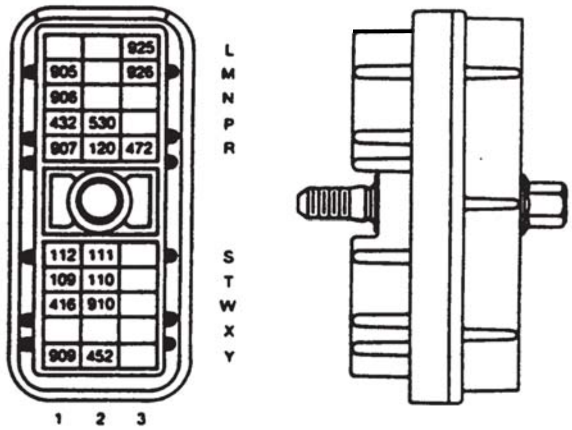
Oil/Coolant Temperature, Oil Pressure and Turbo Boost Sensor Circuits

Section 4
TROUBLESHOOTING CHARTS

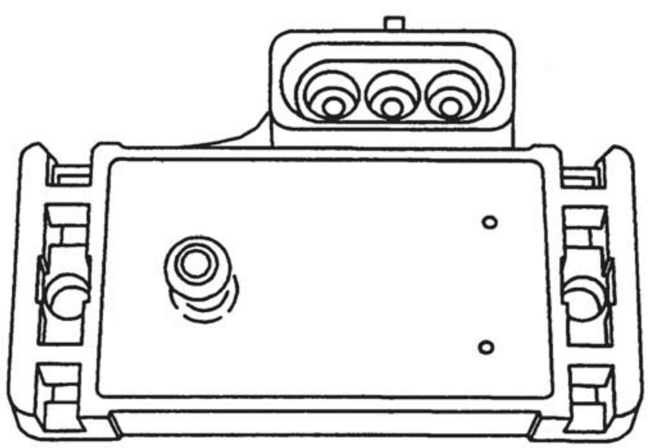
E. ENG5V=ENGINE HARNESS +5 VOLT SUPPLY

NOTE — This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-11 was started at step Start-1 (page 3-121) and you have now been referred here.

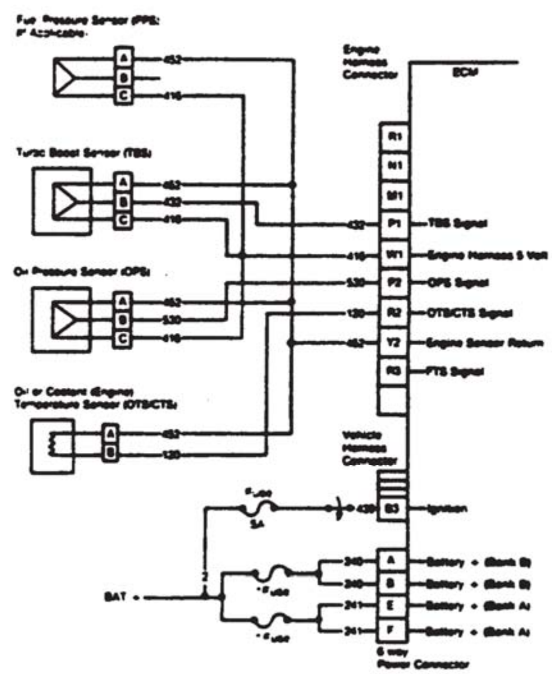
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-1 Check for Low Battery Voltage		
● Was there also a Code 46?	Yes.	Go to 46-I, page 3-301.
	No,	*Go to ENG5V-2.
ENG5V-2 Check for +5 Volts		
● Turn ignition off. ● Disconnect the Oil Pressure Sensor (OFS) and Turbo Boost Sensor (TBS) connectors. ● Turn ignition on. ● Ateach sensor harness connector, read voltage between socket C and socket A.	Between 4.7 and 5.2 volts	Voltage reading is correct. Check voltage at next connector. If all connector voltage readings are correct, go to ENG5V-3.
	Greater than 5.2 volts at all connectors.	*Go to ENG5V-6.
ENG5V=3 Check ECM Connectors		
● Check terminals at the ECM engine harness connector (both the ECM and harness side) for damaged, bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM, page 4-192. Then go to ENG5V-30.
	Problem found.	Repair terminals/connectors, page 3-2. Then go to ENG5V-30.



ECM Engine Harness Connector



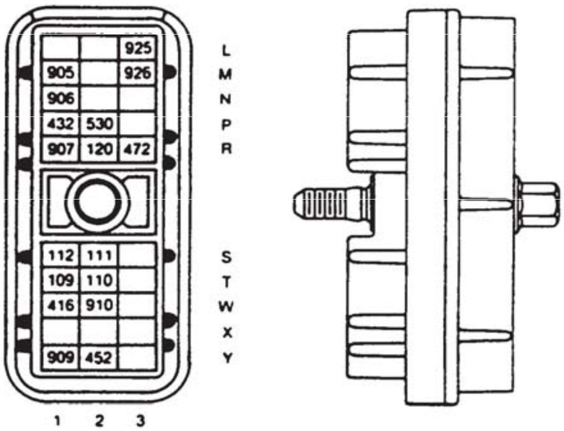
Turbo Boost Sensor



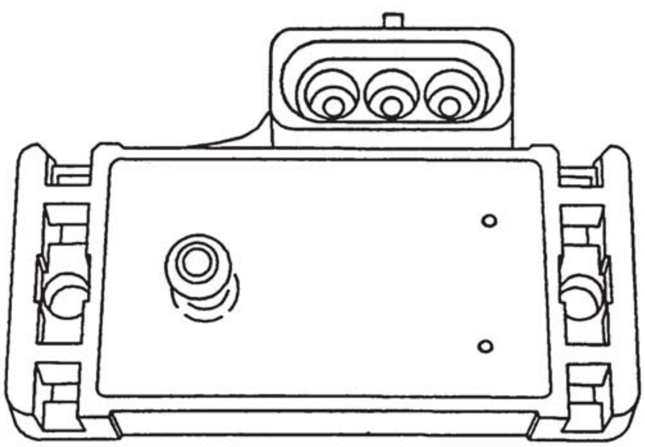
il/Coolant Temperature, Oil Pressure and
Turbo Boost Sensor Circuits

E. ENG5V - ENGINE HARNESS + 5 VOLT SUPPLY (Cent'd.)

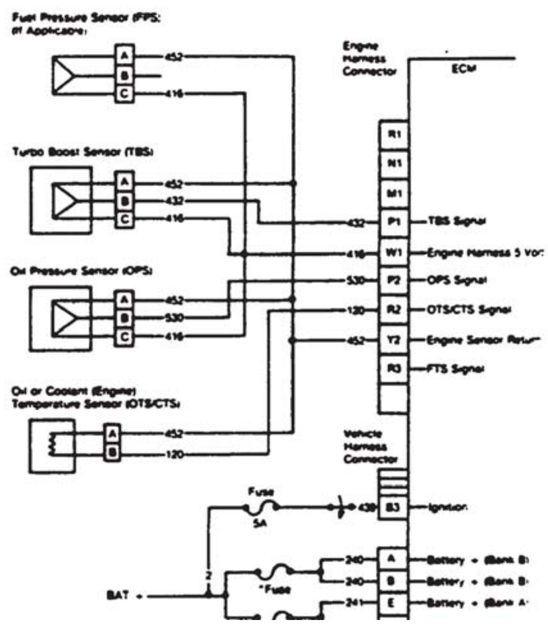
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
or Return Open ● Turn ignition OFF. ● Disconnect the engine harness connector at the ECM. ● Install a jumper wire between sockets A and C of any sensor connector that reads less than 4.7 volts in Step ENG5V-2. ● Read resistance between sockets W1 and Y2 of the engine harness connector.	Less than or equal to 5 ohms.	Go to ENG5V-5
	Greater than 5 ohms or open.	Either the engine +5 volt line (ckt #416) or the sensor return line (ckt #452) is open. Contact Direct Support.
ENG5V-5 Check for Short to Ground ● Turn ignition off. ● Remove jumper wire. ● Read resistance between sockets A and C of the sensor connector. ● Also read resistance between socket C of the sensor connector and a good ground.	Both readings are greater than 10,000 ohms or open.	Go to ENG5V-3.
	Either reading is less than or equal to 10,000 ohms.	The engine +5 volt line (ckt #41 6) is shorted to either the sensor return line (ckt #452) or to chassis ground. Contact Direct Support.
ENG5V=6 Check for Short to Battery + ● Turn ignition off. ● Remove both fuses to the ECM. . Disconnect all five connectors at the ECM. ● Read resistance between socket W1 on the engine harness connector and B3 on the vehicle harness connector. ● AIso read resistance between socket W1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F.	All readings are greater than 10,000 ohms or open.	Go to ENG5V-3.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less than 10,000 ohms resistance was read. Contact Direct Support.



ECM Engine Harness Connector



Turbo Boost Sensor



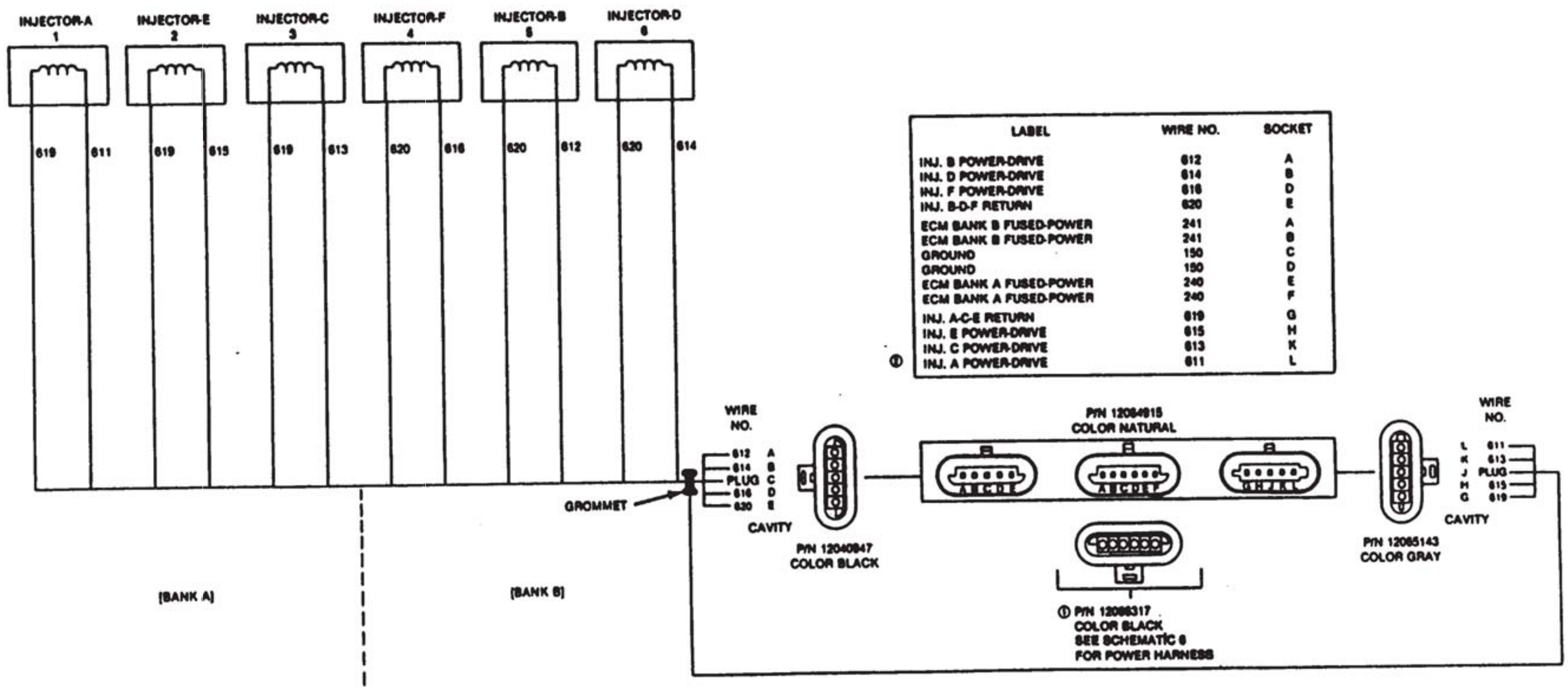
Oil/Coolant Temperature, Oil Pressure and Turbo Boost Sensor Circuits

E. ENG5V • ENGINE HARNESS + 5 VOLT SUPPLY (Cent'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-30 Verify Repairs		
• Turn ignition OFF. . Reconnect all connectors. • Reconnect fuses (or circuit breakers) if previously disconnected. • Turn ignition ON. . Clear codes. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until "CHECK ENGINE" light comes on. • Stop engine. • Read HISTORICAL CODES.	Code 25 (no codes)	► Repairs are complete.
	Codes which — brought you to Chart ENG5V are still there.	► All system diagnostics are complete. Please review this section from the first step to find the error.
	Any codes except — those which brought you to Chart ENG5V.	► Go to START-1, page 3-121, to service other codes.

SERIES 60

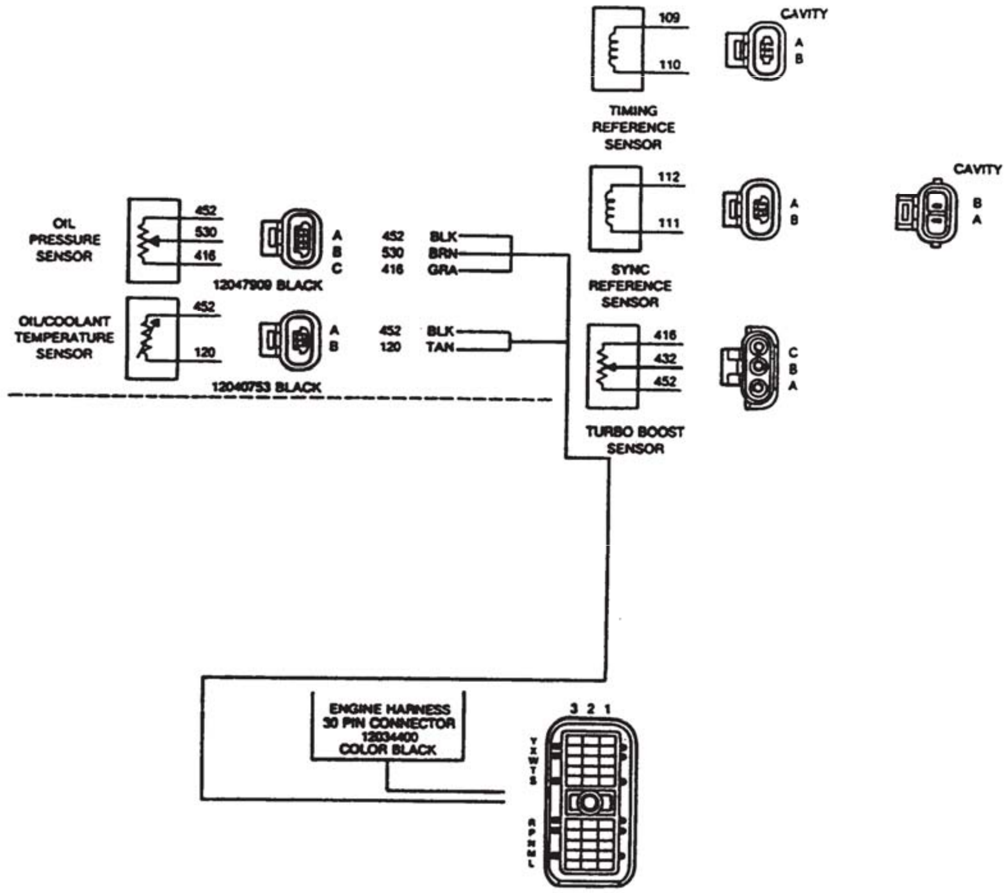
ECM/INJECTOR HARNESS



①

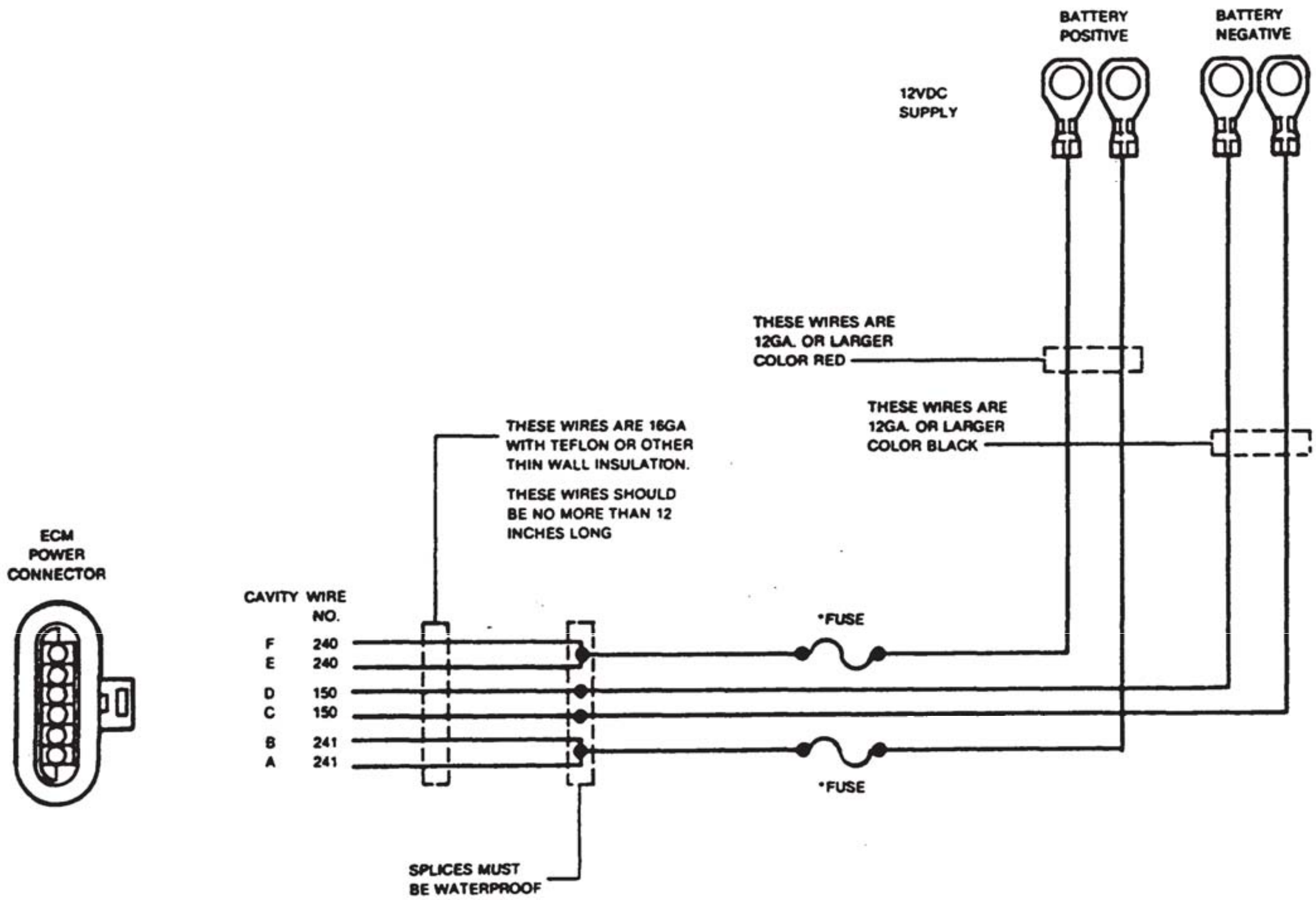
LABEL	WIRE NO.	SOCKET
INJ. B POWER-DRIVE	612	A
INJ. D POWER-DRIVE	614	B
INJ. F POWER-DRIVE	616	D
INJ. B-D-F RETURN	620	E
ECM BANK B FUSED-POWER	241	A
ECM BANK B FUSED-POWER	241	B
GROUND	150	C
GROUND	150	D
ECM BANK A FUSED-POWER	240	E
ECM BANK A FUSED-POWER	240	F
INJ. A-C-E RETURN	619	G
INJ. E POWER-DRIVE	615	H
INJ. C POWER-DRIVE	613	K
INJ. A POWER-DRIVE	611	L

ENGINE SENSORS

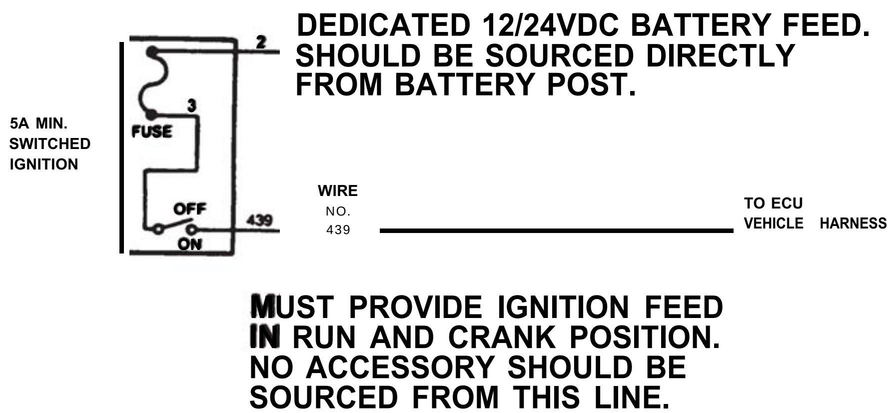


LABEL	WIRE NO.	CAVITY	COLOR
—	—	L-1	—
—	—	L-2	—
DATA LINK 2 (+)	925	L-3	—
—	—	M-2	—
DATA LINK 2 (—)	926	M-3	—
—	—	N-2	—
—	—	N-3	—
TURBO BOOST	432	P-1	—
OIL PRESSURE	530	P-2	—
—	—	P-3	—
OIL/COOLANT TEMPERATURE	120	R-2	—
SRS (—)	112	S-1	—
SRS (+)	111	S-2	—
—	—	S-3	—
TRS (—)	109	T-1	—
TRS (+)	110	T-2	—
—	—	T-3	—
SENSOR SUPPLY (5VDC)	416	W-1	—
—	—	W-3	—
—	—	X-1	—
—	—	X-2	—
—	—	X-3	—
—	—	Y-3	—

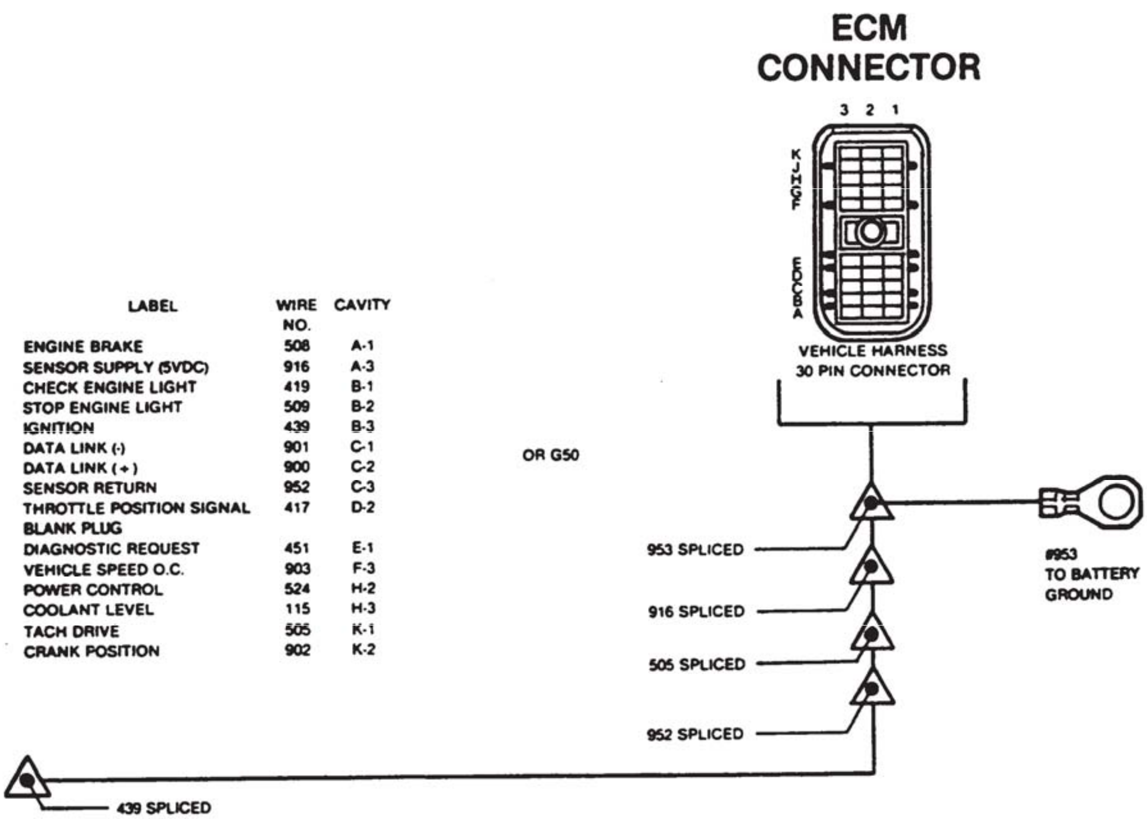
DDEC II
POWER HARNESS



VEHICLE INTERFACE HARNESS (PARTIAL)
ECM IGNITION POWER SUPPLY



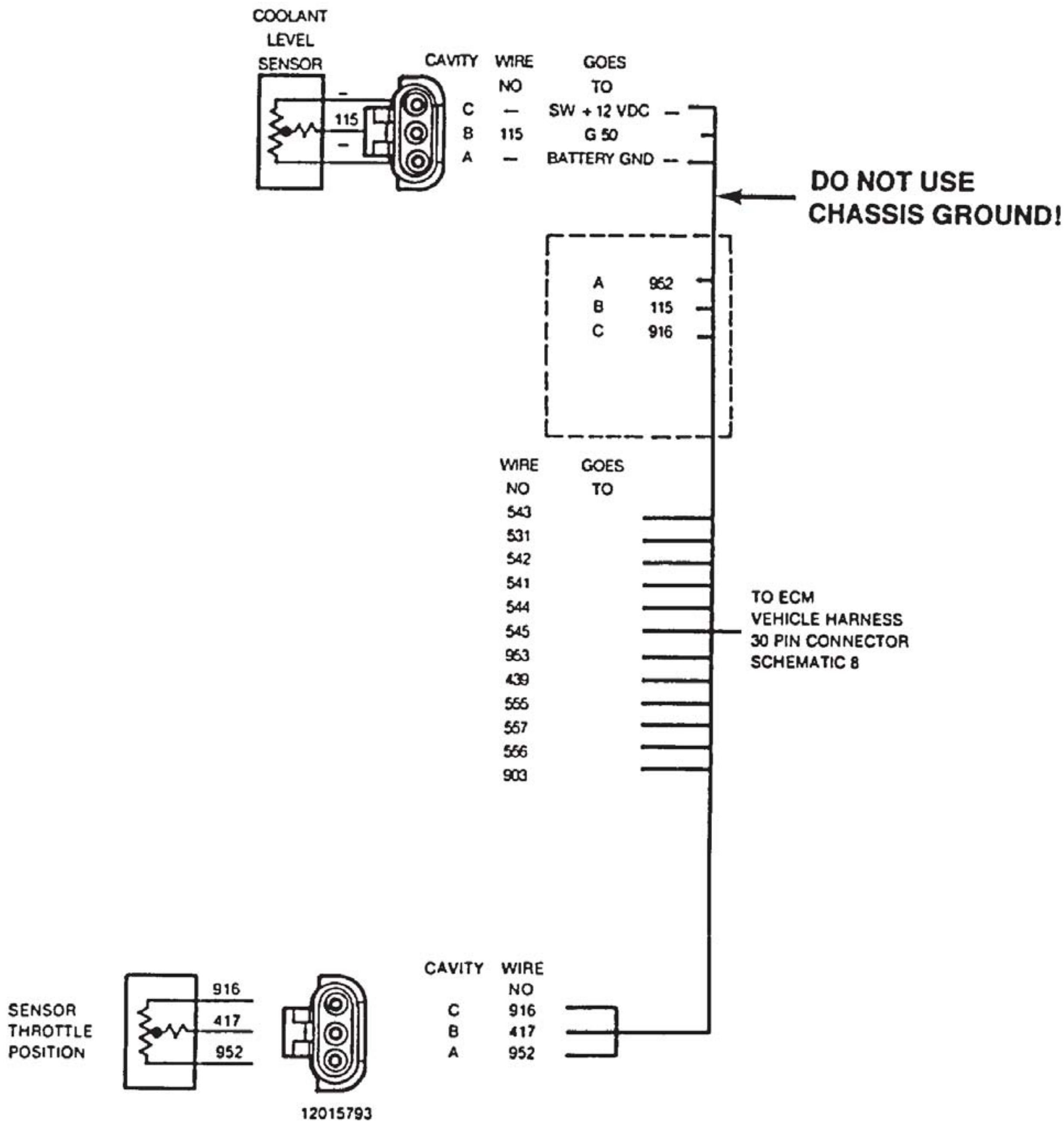
VEHICLE INTERFACE HARNESS (PARTIAL)
ECM VEHICLE HARNESS
30 PIN CONNECTOR PIN OUT



LABEL	WIRE NO.	CAVITY
ENGINE BRAKE	508	A-1
SENSOR SUPPLY (5VDC)	916	A-3
CHECK ENGINE LIGHT	419	B-1
STOP ENGINE LIGHT	509	B-2
IGNITION	439	B-3
DATA LINK (-)	901	C-1
DATA LINK (+)	900	C-2
SENSOR RETURN	952	C-3
THROTTLE POSITION SIGNAL	417	D-2
BLANK PLUG		
DIAGNOSTIC REQUEST	451	E-1
VEHICLE SPEED O.C.	903	F-3
POWER CONTROL	524	H-2
COOLANT LEVEL	115	H-3
TACH DRIVE	505	K-1
CRANK POSITION	902	K-2

VEHICLE INTERFACE HARNESS (PARTIAL)
DASH PANEL

VEHICLE INTERFACE HARNESS (PARTIAL)
COOLANT / OIL TEMPERATURE SENSOR



Section IV.1. DDEC III TROUBLESHOOTING

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Page

The listing below identifies those Troubleshooting Charts and Diagnostic Code Charts that are NOT APPLICABLE to the M915 family of vehicles.

TROUBLESHOOTING CHARTS:

10, 12, 13, 14, 15, 16, 20, 21, 22, 23, 24, and 26

DIAGNOSTIC CODE CHARTS:

17, 18, 26, 64, 67, 68, 72, 81,82, 83, 84, 86, 87, and 88

Section 1

HOW TO USE THIS BOOK

1. Sections 2 (Basic Knowledge Required) and 3 (Testing the DDEC III System) should be read and understood completely.

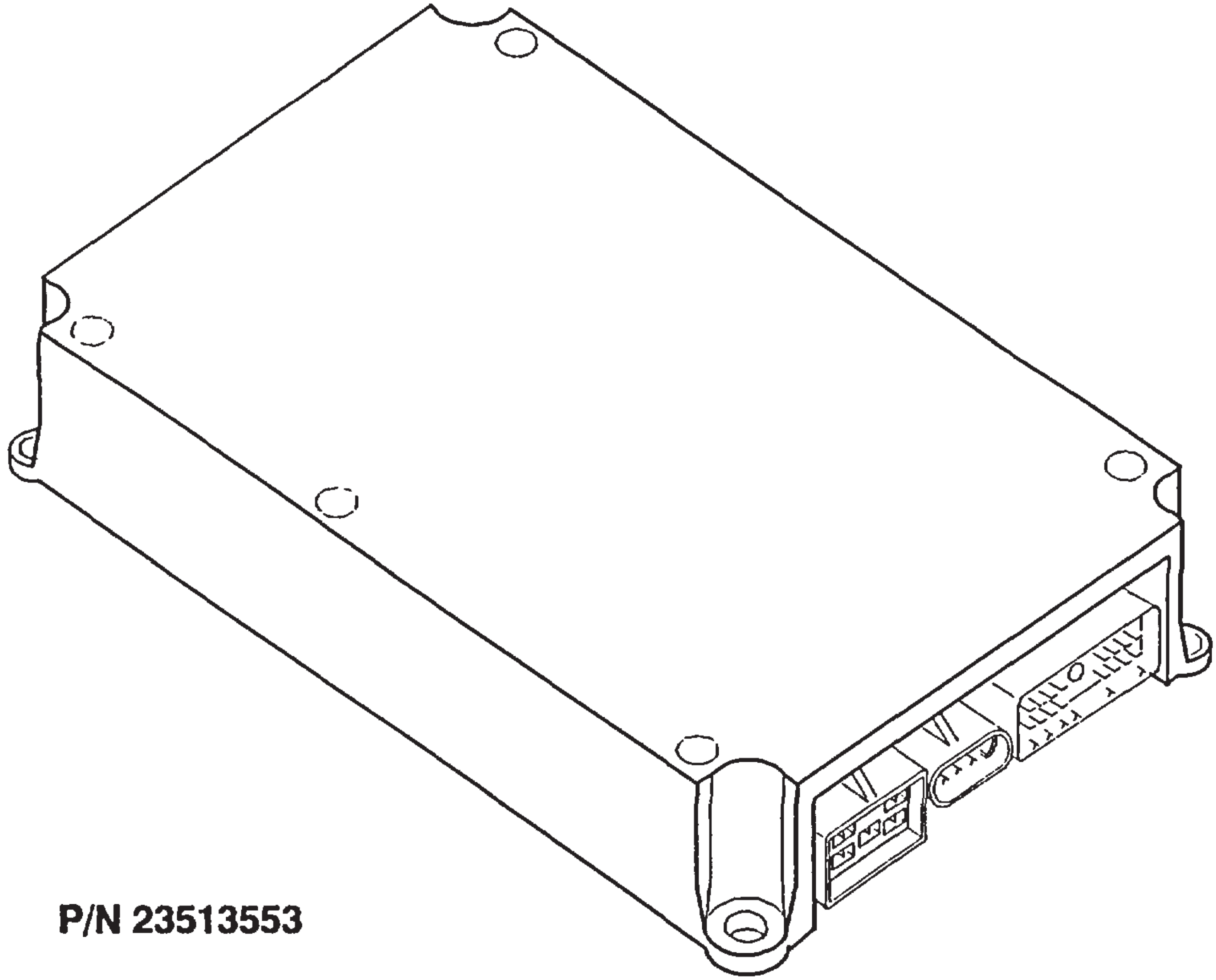
2. **If basic mechanical checks have been made, no trouble was found**, and the problem is now believed to be in the DDEC III System, turn to Section 4 - Troubleshooting Charts. Always start with the first Chart (labeled START) on Page 3-345.41. If a Diagnostic Data Reader (DDR) is not available, the chart labeled CEL (Check Engine Light) can be used.

3. Use the charts to pinpoint the problem and perform repairs. The charts are in a three-column format. The first column lists the test steps to perform and in what sequence to perform them. The second column gives the list of possible results you may obtain, based on the steps performed. The third column indicates what to do next, based on your results.

EXAMPLE

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-9 Check ECM Connectors		
• Turn ignition off. • Disconnect all connectors at the ECM. • Check terminals at all ECM connectors (both the ECM and harness side) for damage, corrosion, and unseated pins or sockets.	Terminals and connectors are okay. → Problem found. →	Reprogram ECM. Then go to C2-30. Repair terminals/connectors. Then go to C2-30.

4. The charts will always instruct you to clear the codes after all repair work is done, and confirm the repair (typically by running the engine and checking if the codes and/or symptoms have returned).



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 2
BASIC KNOWLEDGE REQUIRED

Before using this manual, there are some areas that you should be familiar with. With this basic knowledge, you will have success using the diagnostic charts.

A. ELECTRICAL CIRCUITS

- You should understand the theory of electricity and know the meaning of voltage and ohms. You should understand what happens in a circuit with an open or shorted wire. You should be able to read and understand a wiring diagram.

- You should be able to use jumper wires to make circuit checks.

B. USE OF DIGITAL VOLT-OHM METER

- You should be familiar with the digital volt-ohm meter. You should be able to measure voltage and resistance. You should be familiar with the controls of the meter and how to use it correctly. Instructions for use of a typical digital volt-ohm meter are as follows:

<u>Resistance Measurements</u>

1. Connect the red test lead to the V-Q (Volt-Ohm) input connector and the black lead to the com input connector on the

   meter.
2. Set the function/range switch to the desired Q position. If the magnitude of the resistance is not known, set the switch to the highest range, then reduce until a satisfactory reading is obtained.
3. If the resistance being measured is connected to a circuit, turn off the power to the circuit being tested (turn off ignition).
4. Connect the test leads to the circuit being measured. When measuring high resistance, be careful not to contact adjacent points, even if they are insulated. Some insulators have a relatively low insulation resistance which can affect the resulting measurement.
5. Read the resistance value on the digital display.

<u>Continuity Checks</u>

In addition to measuring the specific resistance value of a circuit, some meters will also tell if a continuous electrical path exists. If a path exists, the circuit is said to have "continuity." (This continuity check can be used in any section of the DDEC III Troubleshooting Guide where the test is looking for greater than, less than, or equal to 5 ohms.) An open circuit (broken electrical path) would have co resistance and would not have continuity. To utilize this continuity feature of certain meters:

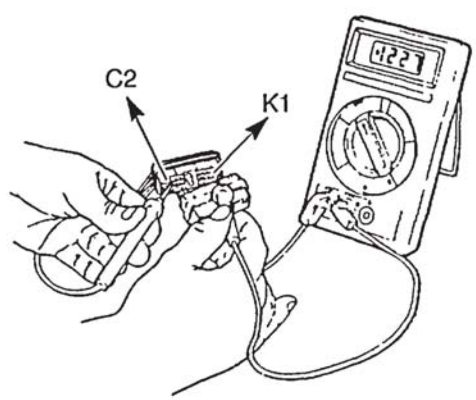
1. Place the function/range switch in any Q range.
2. Connect the red lead to the V-Q connector and the black lead to the com connector on the meter. With the test leads separated or measuring an out-of-range resistance, the digital display will indicate "OL" (overlimit; some meters show "1 +", "↑", or simply "1").

Section 2
BASIC KNOWLEDGE REQUIRED (Cont'd.)

3. Put one test probe at one end of the wire or circuit to be tested. Use the other test lead to trace the circuit. When continuity is established, an Q symbol will appear in the upper left corner of the digital display. If contact in the wire is maintained long enough (about 1/4 of a second), the OL will disappear and the resistance value of the wire or circuit will appear next to the symbol.
4. If your VOM does not work in the manner described above, you must know how your VOM operates in order to use this troubleshooting guide.

Voltage Measurements

1. Connect the red test lead to the V-n input connector and the black lead to the com input on the meter. If a DC-AC switch is present, make sure It Is switched to the DC position.
2. Set the function range switch to the desired volts position. If the magnitude of the voltage is not known, set the switch to a range which will be able to read most voltages seen on a vehicle. (Typical, a 20V range will do.) Then reduce the range until a satisfactory reading is obtained.
3. Connect the test leads to the circuit being measured. In the DDEC III diagnostic procedures, voltage measurements are always given as being taken at pins, sockets, Battery +, or ground. Following the voltage measurement point, the color test lead to be used is given In parenthesis (red is the V-Q connection, an black is the com connection). Example: If the procedure says, "Take voltage reading at socket C2 (red lead) to socket K1 (black lead)"', the hook-up would be as follows:



C. IMPORTANT INFORMATION

The following items must be read and thoroughly understood before using this manual.

1. The engine and ignition should always be off before the harness connectors are disconnected or reconnected.
2. When disconnecting harness connectors, be sure that the pulling force is applied to the connectors themselves and not the wires extending from them.
3. After harness connectors are reconnected to the DDEC III system, the codes logged should be ignored and cleared. 4. In most all areas of Repair/Troubleshooting, a diagnostic data reader will be required.

Section 2
BASIC KNOWLEDGE REQUIRED (Cont'd.)

D. EXPLANATION OF ABBREVIATIONS/TERMS

A/D - Analog to Digital: The computer inside the ECM uses an A/D converter to convert a sensor voltage into a number which the computer can work with.

ASR - Anti-Skid Regulation: Data supplied by the ECM for use with ABS (Anti-lock Braking System).

ATS - Air Temperature Sensor: Monitors engine air temperature.

BAT - Battery

BCSW - Brake/Clutch Switch: Used in Cruise Control to determine whether the brake is depressed, thus disabling cruise.

BOI - Beginning of Injection: The number of crank angle degrees, Before Top Dead Center, where the ECM is requesting the Injectors be turned on.

BPS - Bypass Position Sensor

CAL - Cruise Active Light: Typically mounted on the instrument panel. Its main function is to turn on when cruise control is operational. The CAL is no always used.

CAN Controller Area Network: J1939 High speed control data link.

CCM - Crankcase Monitor Sensor: Monitors crankcase pressure (currently on 149 engines only).

CEL - -Check Engine Light: Typically mounted on the instrument panel. It has two functions:

1. It is used as a warning lamp to tell the operator of the vehicle that a fault has occurred and the unit should be taken in for service as soon as possible.
2. It is used by the operator or technician to "flash" out inactive trouble codes to help diagnose a problem.

As a light bulb check and system check, the check engine light will come on for about 5 seconds when the ignition is turned on. If the CEL remains on, or comes back on, the self diagnostic system has detected a problem. If the problem goes away, the light will go out, but a trouble code will be stored in the ECM as an inactive code. (See general diagnostic information, section 2E for details.)

CKT - Circuit
CLS - Coolant Level Sensor: Monitors coolant level at the radiator top tank or heat exchanger.
CP- - Crankshaft Position: An ECM output generated anytime an SRS signal occurs.
CPS - Coolant Pressure Sensor: Monitors coolant temperature.
COM - Common
CTS - Coolant Temperature Sensor: Monitors coolant temperature.
DDEC III - Third generation Detroit Diesel Electronic Controls.
DDL - Diagnostic Data Link: The lines (wires) over which the ECM transmits information which can be read by a Diagnostic Data Reader.
DDL+ - Data Link, Positive side: J1587 data link.
DDL- - Data Link, Negative side: J1587 data link.

Section 2
BASIC KNOWLEDGE REQUIRED (Cont'd.)

DDR - Diagnostic Data Reader: The hand held tool used for troubleshooting the DDEC system. MPSI PRO-LINK 9000.

ECM - Engine Control Module: The controller of the DDEC III system. It reads the engine and vehicle inputs, sensors and switches, calculates injector firing time and duration, and fires injectors at appropriate times.

EEPROM - Electrically Erasable Programmable Read Only Memory

PWM - Pulsewidth Modulated: Modulated signal provided by the DDEC system.

EFPA - Electronic Foot Pedal Assembly: Contains the Throttle Position Sensor.

EUI - Electronic Unit Injector

FPS - Fuel Pressure Sensor: Monitors Fuel Pressure.

FTS - Fuel Temperature Sensor: Monitors fuel temperature.

GND - Ground

INJ - Injector (fuel)

ISD - Idle Shutdown: Programmable feature of the DDEC III system.

IVS - Idle Validation Switch: A switch used to establish the idle speed position.

LSG - Limiting Speed Governor

N/A - Not Applicable

OLS - Oil Level Sensor: Monitors oil level.

OPS - Oil Pressure Sensor: Monitors oil pressure.

OTS - Oil Temperature Sensor: Monitors oil temperature.

PGS - Pressure Governor Control: Regulates engine speed to maintain a selected external pump pressure.

PGC - Pressure Governor Control: Regulates engine speed to maintain a selected external pressure.

PW - Pulsewidth.

RES/ACCEL- Resume/Accel Switch used for cruise control.

SEL - Stop Engine Light: Typically mounted on the instrument panel. It as two functions:

1. It is used as a warning to the operator that a potential engine damaging condition has been detected. If the DDEC III system is programmed for shutdown, the engine will shut down on its own within 30 seconds. The engine should not be run until the condition is corrected.
2. It is used by the operator or technician to "flash" out active trouble codes.

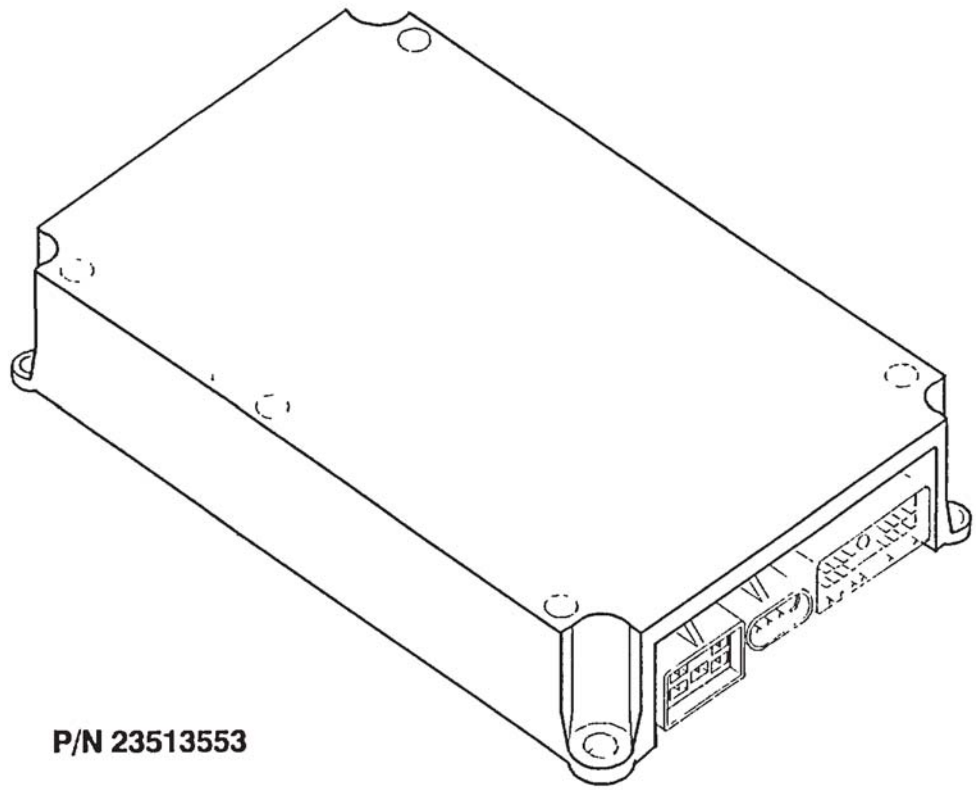
   As a light bulb check and system check, the stop engine light will come on for about 5 seconds when the ignition Is turned on.

SEO - Stop Engine Override: Allows the stop engine condition to be overridden In case it is required.

SET/COAST- Set Coast Switch: Used in cruise control.

Section 2
BASIC KNOWLEDGE REQUIRED (Cont'd.)

SRS	-	Synchronous Reference Sensor: Detects when the first cylinder in the firing order is about to be fired.
TBS	-	Turbo charged Boost Sensor: Monitors Turbo boost.
TBD	-	To be determined.
TD	-	Tachometer Driver: An output from the ECM for electronic tachometers and/or data loggers.
TPS	-	Throttle Position Sensor: Used to detect throttle request (a component of the EFPA). Also referred to as LSG.
TRS	-	Timing Reference Sensor: Used to detect whenever any cylinder is about to be fired.
TSG	-	Two Speed Governor Switch.
VIN	-	Vehicle Identification Number
VSG	-	Variable Speed Governor. Also referred to as PTO (Power take off).
VSS	-	Vehicle Speed Sensor: Used to detect vehicle speed.
VSS OC	-	Vehicle Speed Sensor Open Collector: An ECM input which must be used in addition to the VSS positive input when certain types of vehicle speed sensors are used. (Refer to the Application manual for installation.)



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 2
BASIC KNOWLEDGE REQUIRED (Cont'd.)

E. GENERAL DIAGNOSTIC INFORMATION

As a bulb and system check, the "Check Engine", and "Stop Engine" lights will come on for 5 seconds when the ignition switch is first turned on. If the unit is programmed for the cruise control feature, the "Cruise Active" light (if equipped) will also turn on for 5 seconds.

If the "Check Engine" light comes on during vehicle operation, this indicates the self diagnostic system has detected a fault.

When the diagnostic request switch is held, the diagnostic system will flash the yellow or red light located on the vehicle's dash. The light will be flashing the code(s) indicating the problem area(s). If the "Stop engine" light comes on during vehicle operation, this indicates the DDEC System has detected a potential engine damaging condition. The engine should be shutdown immediately and have the engine checked for the problem.

*Active codes will be flashed on the stop engine light in order from most recent to least recent occurrence based on engine hours. If there are no active codes, a code 25 will be flashed.

*Inactive codes will be flashed on the check engine light in order from most recent to least recent occurrence based on engine

hours. If there are no inactive codes, a code 25 will be flashed.

*FLASHING CODES SHOULD BE DONE WITH THE ENGINE NOT RUNNING AND IGNITION ON. *

A diagnostic code indicates a problem in a given circuit (i.e., diagnostic Code 14 indicates a problem in the oil or coolant temperature sensor circuit. This includes the oil or coolant temperature sensor, connector, harness, and Electronic Control Module (ECM). The procedure for finding the problem can be found in Diagnosis Chart Code 14. Similar charts are provided for each code. Remember, diagnosis should always begin at the starting chart (START). For an oil or coolant temperature sensor problem, it will quickly lead you to Chart 14 - but first it gets you to verify the code/symptom.

Since the self-diagnostics do not detect all possible faults, the absence of a code does not mean there are not problems in the system. If a DDEC III problem is suspected, even in the absence of a code, go to START anyway. This chart can lead you to other charts which can aid in the troubleshooting process - where DDEC III problems may occur but do not generate a code. **Basic mechanical checks, however, are not covered in this guide.**

Section 3
TESTING THE DDEC III SYSTEM

A. TOOLS NEEDED TO DIAGNOSE THE SYSTEM

The following tools and equipment are required to properly diagnose a complete system:

- MPSI - PROLINK Diagnostic Data Reader - J38500-750 (cartridge only).
- Voltmeter and Ohmmeter: Use a digital volt-ohmmeter J-34029 or equivalent to measure voltage and resistance where required. A digital volt-ohmmeter must be used when specified in a procedure.
- Test Light 6V: Must be used when specified in the procedure.
- Jumper Wires: To bypass a circuit and to insert between special connectors. This will permit access to the connector terminals for circuit checking.
- TRS/SRS Alignment Tool: J-39815 (Not needed on Series 60).
- 020" Feeler Gauge

In addition, the tools listed below can be of aid in properly identifying problems, but are not required for this Troubleshooting Guide:

- Kent Moore Vehicle Interface Test Module - J41005.
- Tachometer: Either a crankshaft harmonic balance revolution pickup type or electronic coil trigger signal pickup type tachometer can be used for diagnosis.
- Pressure Gauge: To monitor turbo boost pressure (for purposes of comparison with the DDEC III Turbo Boost Sensor).

B. DIFFERENCES BETWEEN DDEC III AND DDEC II

To those thoroughly familiar with DDEC II, an outline Is given of the differences in DDEC IIIl. From an installation and testing viewpoint, these differences are:

- DDEC fault codes are still able to be "flashed", but with DDEC III, a diagnostic request switch must be installed. There are no longer provisions to use a jumper wire. The DDC assigned fault codes no longer appear on the "MPSI" diagnostic data reader.
- **When using the MPSI DDR, the diagnostic codes are now displayed in a SAE J1587 format. The SAE have developed a standardized list of Parameter Identification Descriptions (PID), and a System Identification Description (SID). These PIDs and SID will define the area where the fault has occurred. Following the PID or SID will be a Failure Mode Identifier (FMI).The diagnostic codes (both DDEC and SAE) and their description can be found in Section 4 of this Troubleshooting Guide.**
- Fault codes are now referred to as active, and inactive.
- DDEC IIIl requires injector calibrations to be entered into the EEPROM with the DDR. DDEC Ill uses this information to provide proper cylinder balancing. injector Information must be programmed whenever an injector Is replaced, or changed for different cylinder location.
- DDEC Ill engines are equipped with a 36 tooth pulse wheel.
- Added information now appears for some fault codes. This data includes: the hour the code is first logged, last logged, number of occurrences, number of overrides (If applicable), and the value that caused the fault to be logged (if applicable). ' X Refer to code 85 page 3-345.395 for details.
- Engine calibrations and software levels can be programmed via DDEC IIIl programming stations.

Section 3
TESTING THE DDEC III SYSTEM (Cont'd.)

C. READING THE DIAGNOSTIC CODES - FLASH METHOD

NOTE: If you have turned here to begin diagnosis of a problem and already know how to read codes, as well as understand active and inactive codes, turn to the first chart (labeled START) on page 3-345.41.

1. Active vs. Inactive Codes:

   DDEC Ill makes use of both types of codes. As their names imply, the difference between the two are as follows:

   a. Active Codes - These are the codes which are currently keeping the "Check or Stop Engine" light on. Active codes are flashed via the Stop Engine light.
   b. Inactive Codes These are all the codes logged in the ECM (whether or not they are currently turning on the "Stop or Check Engine" light). These codes can be cleared by using the Diagnostic Data Reader. Inactive codes are flashed via the Check Engine Light.

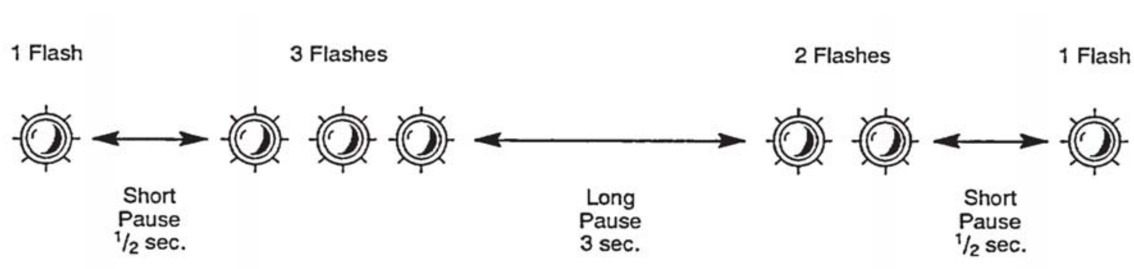
2. Using the Diagnostic Request Switch

This Troubleshooting Guide is intended to be used with a Diagnostic Data Reader (DDR). In most Instances, only the DDR can provide the information necessary for a quick diagnosis of the problem. Should you just need to read out codes, however, and not have a DDR available, the following procedure will let you read out codes on the CEL and SEL:

   a. Turn ignition on.
   b. Depress and hold the diagnostic request switch.
   c. Observe the codes flashing out on the CEL and SEL. Example: Code 13 (active) and 21 (Inactive) below.

RED - SEL

YELLOW - CEL



Code 13 Active

Code 21 Inactive

FLASHERS

This will continue as long as the diagnostic request switch is held with the ignition on

Section 3
TESTING THE DDEC III SYSTEM (Cont'd.)

3. Using the Diagnostic Data Reader (DDR) or PRO-LINK 9000.

PRO-LINK 9000

Proper use of this reader is described in the instruction manual supplied. This device is infinitely more useful in reading fault codes and diagnosing engine electronic faults than the flash code process. Section 5 of this manual provides the information obtainable with the reader.

D. CLEARING CODES

This can only be done using the Diagnostic Data Reader (DDR). Refer to the DDR Instruction Manual for details.

Note that removing the battery cables will not clear codes.

E. CALIBRATION REPROGRAMMING

The Diagnostic Data Reader is equipped with capabilities to reprogram part of the engine calibration in the ECM. Specifically, the following calibration changes can be made using the DDR:

1. Change DDR calibration configuration password
2. Add/Delete 5 minute idle shutdown
3. Change droop
4. Set the initial speed if cruise control switches are used as a power take-off option
5. Set PTO droop
6. Enable/Disable cruise control
7. Add/Delete a vehicle speed sensor
8. Change vehicle speed limit
9. Change cruise control speed limit
10. Add/Delete engine shutdown feature
11. Set PTO max speed.
12. Switch between available engine ratings.
13. Enter injector calibration

Section 3
TESTING THE DDEC III SYSTEM (Cont'd.)

For more information on how to change these features, refer to the DDR Instruction Manual..

F. CONNECTOR CHECKOUT

All system connections are environmentally protected These connectors protect the terminations form the harsh corrosive engine compartment environment. This is important since most system signals are low voltage and corrosion could make them inoperative.

Before repairing or replacing any system component (i e., harness, sensor, ECM, etc.) as indicated by the diagnostic charts, you should:

1. Disconnect the appropriate connector(s) associated with the suspected defective component and check for bent, broken, or dirty terminals or mating tabs. Clean, straighten, or replace as required.
2. If a problem was found, reconnect all connectors previously disconnected. Then recheck the system to see if the problem has been corrected.,

NOTE:

Don't probe the back of a connector or pierce the DDEC III wiring for purposes of taking measurement. This can cause intermittent faults or system failures and may affect the engine warranty.

G. DIGITAL INPUT/OUTPUT FUNCTIONS

DDEC 3 provides twelve discrete input pins on the vehicle harness which may be customized to the customer application.

A discrete input function is selected by its "function number" and assigned to a pin number on the 30-pin vehicle harness connector. When battery ground is supplied to the pin number, the ECM performs the function defined by the discrete input selected. No function should be assigned to more than one pin (except FUNCTION #0 -- No Function).

Examples:

1. Pin H2 of the ECM's 30-pin vehicle harness connector has FUNCTION #9 (Throttle Inhibit) assigned it. When battery ground is supplied to pin H2, the foot pedal input is disabled preventing engine operation above idle speed.
2. Pin K3 and K2 of the ECM's 30-pin vehicle harness connector have FUNCTION #1 (Engine Brake Low) and FUNCTION #2 (Engine Brake Medium), respectively, assigned to them. When battery ground is supplied to pin K3, the low setting of the engine brake is achieved. When battery ground is supplied to pin K2, the medium setting is achieved. If both pins are grounded simultaneously, the high setting for engine braking is achieved. (Note: In this example, Engine brakes must have been configured when the engine was ordered)

DIGITAL OUTPUTS

DDEC3 provides three discrete output pins on the vehicle harness which may be customized to the customer application. These outputs provide a ground (less than 0.8 volts with respect to DDEC ground) capable of sinking up to 1 ampere of DC current when the output Is active.

Section 3
TESTING THE DDEC III SYSTEM (Cont'd.)

The function may be selected by its "function number" found in the list below. No function should be assigned to more than on pin (except FUNCTION #0 - No Function).

Examples:

1. Pin Al of the ECM's 30-pin vehicle harness connector has FUNCTION #7 - Starter Lockout assigned to it. This function provides a low signal once the engine speed has exceeded 500 RPM and remains low until the engine speed has dropped below 60 RPM, or the DDEC system has been turned off. It may be interfaced to a relay that prevents starter operation while the engine is operating.

2. Pin H3 of the ECM's 30-pin connector has FUNCTION #9 - Transmission Retarder Enable assigned to it. The function provides a lowsignal (ground) whenever the throttle Is at O% position and cruise control is inactive. It may be used as an enable indicator to a transmission retarder.

Section 4
TROUBLESHOOTING CHARTS

A. THE DIAGNOSTIC PROCEDURE - WHERE TO START

When diagnosing the cause for engine performance, fuel economy or exhaust system complaints, perform normal checks (non DDEC-III items) before considering DDEC as the possible source of the problem.

When diagnosing the system, always start with the first chart (labeled "START) on page 3-345.41. This will ultimately lead to other diagnostic charts, even in the cases where no fault codes were logged but a symptom(s) was noted. In fact, If no faults were recorded (but a symptom remains),the "START" chart will refer you to the "Customer Complaint" chart 1 on page 3-345.57, which can identify fault trees to use based on the customer complaint.

NOTICE: Although there are many charts connected with diagnostics, only one is needed to determine that the system is operating properly. Normally, only two charts are necessary to find a problem.

B. DDEC III DIAGNOSTIC CODES/WHAT THEY MEAN

The following pages give a brief description of each diagnostic code. Basic facts about these codes are given below:

- Most problems must occur for a total of at least two (2) seconds before the "Check Engine" light comes on and a code is stored.
- If a problem goes away, the "Check Engine" light will turn off. But the code will remain stored in the ECM.
- Code 25 means no codes were stored at all.

FLASH CODE:	11
DDR DISPLAY:	VSG SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE:	PID: 187 FMI: 4

Indicates that the Variable Speed Governor (VSG) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit or to ground

FLASH CODE:	12
DDR DISPLAY.	VSG SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE:	PID: 187 FMI: 3

Indicates that the Variable Speed Governor (VSG) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 13
DDR DISPLAY: COOLANT LEVEL SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 111 FMI: 4

Indicates that the Coolant Level Sensor (CLS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) sensor signal is shorted to the sensor return circuit or to ground

(2) sensor +5 volt supply is shorted to sensor return circuit or to ground

The DDEC III ECM supplies a switched ground to the AUXILIARY OUTPUT #8 circuit to turn ON the function assigned.

FLASH CODE: 14
DDR DISPLAY: COOLANT TEMP SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 110 FMI: 3

Indicates that the engine Coolant Temperature Sensor (CTS) input to the ECM has exceeded 95% (normally 4.75 volts) of the sensor supply voltage. NOTE: This code will only be logged during warm engine operation. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor return circuit

(3) sensor signal circuit Is shorted to the sens or +5 volt supply

FLASH CODE: 14
DDR DISPLAY: OIL TEMP SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 175 FMI: 3

Indicates that the engine Oil Temperature Sensor (OTS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. NOTE: This code will only be logged during warm engine operation. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 14
DDR DISPLAY: INTER COOLER SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 052 FMI: 3

Indicates that the engine Intercooler Temperature Sensor input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. NOTE: This code will only be logged during warm engine operation. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 15
DDR DISPLAY: COOLANT TEMP SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 110 FMI: 4

Indicates that the engine Coolant Temperature Sensor (CTS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) sensor signal circuit is shorted to sensor return or to ground

(2) sensor +5 volt supply is shorted to sensor return circuit or to ground

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 15
DDR DISPLAY: OIL TEMP SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 175 FMI: 4

Indicates that the engine Oil Temperature Sensor (OTS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) sensor signal circuit is shorted to sensor return or to ground

(2) sensor +5 volt supply is shorted to sensor return circuit or to ground

FLASH CODE: 15
DDR DISPLAY: INTERCOOLER SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 052 FMI: 4

Indicates that the engine Intercooler Temperature Sensor input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) sensor signal circuit is shorted to sensor return or to ground

(2) sensor +5 volt supply is shorted to sensor return circuit or to ground

FLASH CODE: 16
DDR DISPLAY: COOLANT LEVEL SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 111 FMI: 3

Indicates that the Coolant Level Sensor (CLS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor return circuit

(3) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 17
DDR DISPLAY: BYPASS POSITION SENS INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 72 FMI: 3

Indicates that the engine Blower Bypass Position Sensor input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 18
DDR DISPLAY: BYPASS POSITION SENS INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 72 FMI: 4

Indicates that the engine Blower Bypass Position Sensor input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or ground

(4) sensor +5 volt supply is shorted to sensor return circuit or to ground

FLASH CODE: 21
DDR DISPLAY: THROTTLE SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 91 FMI: 3

Indicates that the Throttle Position Sensor (TPS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 22
DDR DISPLAY: THROTTLE SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 91 FMI: 4

Indicates that the Throttle Position Sensor (TPS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to the sensor return circuit or ground

FLASH CODE: 23
DDR DISPLAY: FUEL TEMP SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 174 FMI: 3

Indicates that the engine Fuel Temperature Sensor (FTS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. NOTE: This code will only be logged during warm engine operation. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor return circuit

(3) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 24
DDR DISPLAY: FUEL TEMP SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 174 FMI: 4

Indicates that the engine Fuel Temperature Sensor (FTS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) sensor signal circuit is shorted to sensor return or to ground

(2) sensor +5 volt supply is shorted to sensor return circuit or to ground

FLASH CODE: 26
DDR DISPLAY: AUX ENG SHUTDOWN #1 INPUT ACTIVE
SAE J1587 CODE: PID: 25 FMI: 11

Indicates that the Auxiliary Engine Shutdown #1 switch input to the ECM is active. The active switch input represents a low (grounded) external input circuit to the ECM.

FLASH CODE: 26
DDR DISPLAY: AUX ENG SHUTDOWN #2 INPUT ACTIVE
SAE J1587 CODE: PID: 61 FMI: 11

Indicates that the Auxiliary Engine Shutdown #2 switch input to the ECM is active. The active switch input represents a low (grounded) external input circuit to the ECM.

FLASH CODE: 27
DDR DISPLAY: AIR TEMP SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 172 FMI: 3

Indicates that the engine Air Temperature Sensor (ATS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. NOTE: This code will only be logged during warm engine operation. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor return circuit

(3) sensor signal circuit is shorted to the sensor +5 volt supply

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 28
DDR DISPLAY: AIR TEMP SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 172 FMI: 4

Indicates that the engine Air Temperature Sensor (ATS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) sensor signal circuit is shorted to sensor return

(2) sensor signal circuit is shorted to ground

FLASH CODE: 31
DDR DISPLAY: ENG BRK LOW OPEN CIRCUIT
SAE J1587 CODE: SID: 51 FMI: 3

Indicates that the Engine Brake Low function assigned to the Auxiliary Output #3 circuit is open or is shorted to battery (+). This diagnostic condition is detected when Engine Brake Low driver is OFF and the DDEC III ECM measures a high voltage on the circuit output.

FLASH CODE: 31
DDR DISPLAY: ENG BRK LOW SHORT TO GROUND
SAE J1587 CODE: SID: 51 FMI: 4

Indicates that the Engine Brake Low function assigned to the Auxiliary Output #3 circuit is shorted to ground. This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the Engine Brake Low driver output.

NOTE:

The Engine Brake Low output is a high side driver which means that the DDEC III ECM supplies battery (+) to the engine brake low circuit to turn ON the function.

FLASH CODE: 31
DDR DISPLAY: ENG BRK MED OPEN CIRCUIT
SAE J1587 CODE: SID: 52 FMI: 3

Indicates that the Engine Brake Medium function assigned to the Auxiliary Output #4 circuit is open or is shorted to battery (+). This diagnostic condition is detected when the Engine Brake Medium driver is OFF and the DDEC III ECM measures a high voltage on the circuit output.

FLASH CODE: 31
DDR DISPLAY: ENG BRK MED SHORT TO GROUND
SAE J1587 CODE: SID: 52 FMI: 4

Indicates that the Engine Brake Medium function assigned to the Auxiliary Output #4 circuit is shorted to ground. This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the Engine Brake Medium driver output.

NOTE: The Engine Brake Medium output is a high side driver which means that the DDEC III ECM supplies battery (+) to the engine brake low circuit to turn ON the function

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 32
DDR DISPLAY: STOP ENGINE LIGHT SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 238 FMI: 3

Indicates that the Stop Engine Light (SEL) circuit is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the stop engine light. This diagnostic code is typically:

(1) failed short SEL light bulb

(2) SEL wire in vehicle harness is shorted to battery (+)

NOTE:
The DDEC III ECM supplies a switched ground to the stop engine light circuit to turn ON the light.

FLASH CODE: 32
DDR DISPLAY: STOP ENGINE LIGHT OPEN CIRCUIT
SAE J1587 CODE: SID: 238 FMI: 4

Indicates that the Stop Engine Light (SEL) circuit is open or shorted to ground. This diagnostic condition is detected when the stop engine light is OFF and the DDEC III ECM measures a low voltage on the stop engine light circuit output. This diagnostic code is typically:

(1) failed open SEL light bulb

(2) SEL wire in vehicle harness is open or shorted to ground

FLASH CODE: 32
DDR DISPLAY: CHECK ENGINE LIGHT SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 239 FMI: 3

Indicates that the Check Engine Light (CEL) circuit is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the stop engine light. This diagnostic code is typically:

(1) failed short CEL light bulb

(2) CEL wire in vehicle harness is shorted to battery (+)

NOTE:
The DDEC III ECM supplies a switched ground to the check engine light circuit to turn ON the light.

FLASH CODE: 32
DDR DISPLAY: CHECK ENGINE LIGHT OPEN CIRCUIT
SAE J1587 CODE: SID: 239 FMI: 4

Indicates that the Check Engine Light (CEL) circuit is open or shorted to ground. This diagnostic condition is detected when the check engine light is OFF and the DDEC III ECM measures a low voltage on the check engine light circuit output. This diagnostic code is typically:

(1) failed open CEL light bulb

(2) CEL wire in vehicle harness is open or shorted to ground

FLASH CODE: 33
DDR DISPLAY: TURBO BOOST SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 102 FMI: 3

Indicates that the engine Turbo Boost Sensor (TBS) input to the ECM has exceeded 85% (normally > 4.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 34
DDR DISPLAY: TURBO BOOST SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 102 FMI: 4

Indicates that the engine Turbo Boost Sensor (TBS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

FLASH CODE: 35
DDR DISPLAY: OIL PRESSURE SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 100 FMI: 3

Indicates that the engine Oil Pressure Sensor (OPS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 36
DDR DISPLAY: OIL PRESSURE SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 100 FMI: 4

Indicates that the engine Oil Pressure Sensor (OPS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

FLASH CODE: 37
DDR DISPLAY: FUEL PRESSURE SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 94 FMI 3

Indicates that the engine Fuel Pressure Sensor (FPS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 38
DDR DISPLAY: FUEL PRESSURE SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 94 FMI: 4

Indicates that the engine Fuel Pressure Sensor (FPS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

Section 4
TROUBLESHOOTING CHARTS

FLASH CODE: 41
DDR DISPLAY: TOO MANY SRS (MISSING TRS)
SAE J1587 CODE: PID: 21 FMI: 0

Indicates that the Synchronous Reference Sensor (SRS) has detected extra pulses, or the Timing Reference Sensor (TRS) has detected missing pulses.

FLASH CODE: 42
DDR DISPLAY: TOO FEW SRS (MISSING SRS)
SAE J1587 CODE: PID: 21 FMI: 1

Indicates that the Synchronous Reference Sensor (SRS) has detected missing pulses, or the Timing Reference Sensor (TRS) has detected extra pulses.

FLASH CODE: 43
DDR DISPLAY: COOLANT LEVEL LOW
SAE J1587 CODE: PID: 111 FMI: 1

Indicates that the Coolant Level Sensor (CLS) has detected that the engine coolant level has dropped below the recommended safe operating range.

FLASH CODE: 44
DDR DISPLAY: COOLANT TEMPERATURE HIGH
SAE J1587 CODE: PID: 110 FMI: 0

Indicates that the Coolant Temperature Sensor (CTS) has detected that the engine coolant temperature has exceeded the recommended safe operating range.

FLASH CODE: 44
DDR DISPLAY: OIL TEMPERATURE HIGH
SAE J1587 CODE: PID: 175 FMI: 0

Indicates that the Oil Temperature Sensor (OTS) has detected that the engine oil temperature has exceeded the recommended safe operating range.

FLASH CODE: 44
DDR DISPLAY: INTERCOOLER TEMP HIGH
SAE J1587 CODE: PID: 052 FMI: 0

Indicates that the Intercooler Temperature Sensor has detected that the engine intercooler temperature has exceeded the recommended safe operating range.

FLASH CODE: 45
DDR DISPLAY: OIL PRESSURE LOW
SAE J1587 CODE: PID: 100 FMI: 1

Indicates that the Oil Pressure Sensor (OPS) has detected that the engine oil pressure has dropped below the recommended safe operating range.

FLASH CODE: 46
DDR DISPLAY: ECM BATTERY VOLTAGE LOW
SAE J1587 CODE: PID: 168 FMI: 1

Indicates that the DDEC III ECM has detected that the main battery supply voltage to the ECM has dropped below the recommended operating range.

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FLASH CODE: 47
DDR DISPLAY: FUEL PRESSURE HIGH
SAE J1587 CODE: PID: 94 FMI: 0

Indicates that the Fuel Pressure Sensor (FPS) has detected that the engine fuel supply pressure has exceeded the recommended safe operating range.

FLASH CODE: 48
DDR DISPLAY: FUEL PRESSURE LOW
SAE J1587 CODE: PID: 94 FMI: 1

Indicates that the Fuel Pressure Sensor (FPS) has detected that the engine fuel supply pressure has dropped below the recommended safe operating range.

FLASH CODE: 52
DDR DISPLAY: ECM A/D CONVERSION FAILURE
SAE J1587 CODE: SID: 254 FMI: 12

Indicates that the DDEC III ECMs internal Analog to Digital (A/D) Convertor device has malfunctioned. Intermittant diagnostic conditions of this type can be caused by faulty external electrical system.

FLASH CODE: 53
DDR DISPLAY: NONVOLATILE MEMORY DATA INCORRECT
SAE J1587 CODE: SID: 253 FMI: 2

Indicates that the ECM upon startup has been unable to read a valid copy of a engine data record (calibration, faults, or accumulators) stored in nonvolatile memory.

FLASH CODE: 53
DDR DISPLAY: NONVOLATILE MEMORY FAILURE
SAE J1587 CODE: SID: 253 FMI: 12

Indicates that the ECM was unable to update an engine data record (calibration, faults, or accumulators) stored in nonvolatile memory.

FLASH CODE: 54
DDR DISPLAY: VEHICLE SPEED SENSOR FAILURE
SAE J1587 CODE: SID: 084 FMI: 12

Indicates that during an ignition cycle the vehicle speed that is measured by the Vehicle Speed Sensor (VSS) is less than the expected value for the current engine RPM. This diagnostic condition is typically:

(1) open sensor signal circuit

FLASH CODE: 55
DDR DISPLAY: PROPRIETARY DATA LINK FAIL (MASTER)
SAE J1587 CODE: SID: 248 FMI: 8

Indicates that the Master ECM of a multi-ECM configuration (12, 16, or 20 cylinder engine) has stopped receiving status information from one or both receiver ECMs.

FLASH CODE: 55
DDR DISPLAY: PROPRIETARY DATA LINK FAIL (RECEIVER)
SAE J1587 CODE: SID: 248 FMI: 9

Indicates that the Receiver ECM of a multi-ECM configuration (12, 16, or 20 cylinder engine) has stopped receiving fueling information from the Mater ECM.

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TROUBLESHOOTING CHARTS

FLASH CODE: 55
DDR DISPLAY: J1939 DATA LINK FAILURE
SAE J1587 CODE: SID: 232 FMI: 12

Indicates that the J1939 (High Speed Powertrain) data link is no longer allowing the ECM to transmit data. This diagnostic code is typically:

(1) No other J1939 device is connected and/or powered up on the communications network.

(2) Either or both of the data link circuits are open at some point in the network.

(3) Either of both of the data link circuits are shorted to ground at some point in the network.

(4) Either or both of the data link circuits are shorted to battery (+) at some point in the network.

(5) The pair of data link circuits are shorted together.

(6) One or both of the network termination resistors are not connected.

FLASH CODE: 56
DDR DISPLAY: J1587 DATA LINK FAILURE
SAE J1587 CODE: SID: 250 FMI: 12

Indicates that the J1587 (diagnosiic) data link is no longer allowing the ECM to transmit data, This diagnostic condition is typically:

(1) Either or both of the data link circuits are open at some point in the network.

(2) Either or both of the data link circuits are shorted to ground at some point in the network.

(3) Either or both of the data link circuits are shorted to battery (+) at some point in the network.

(4) The pair of data link circuits are shorted together.

FLASH CODE: 57
DDR DISPLAY: J1922 DATA LINK FAILURE
SAE J1587 CODE: SID: 249 FMI: 12

Indicates that the J1922 (Low Speed Powertrain) data link is no longer allowing the ECM to transmit data. This diagnostic condition is typically:

(1) Either or both of the data link circuits are open at some point in the network.

(2) Either or both of the data link circuits are shorted to ground at some point in the network.

(3) Either or both of the data link circuits are shorted to battery (+) at some point in the network.

(4) The pair of data link circuits are shorted together.

FLASH CODE: 58
DDR DISPLAY: TORQUE OVERLOAD
SAE J1587 CODE: PID: 092 FMI: 0

Indicates that the engine operating torque has exceeded a calibratible maximum limit.

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FLASH CODE: 61
DDR DISPLAY: *XXX* INJECTOR RESPONSE TIME LONG
SAE J1587 CODE: SID: *XX* FMI: 0

Indicates that the time it takes from when the DDEC III ECM requests an injector be turned on to when the injector solenoid valve actually closes is longer than the high limit of the expected range. This diagnostic condition is typically:

(1) bad injector harness/connection (high resistance)

(2) blown fuses in the ECM battery (+) voltage supply harness

(3) sticky solenoid valve

NOTE:

The injector diagnostic SID (Subsystem Identifier) indicates which cylinder number has an injector with a long response time. The injector number describes the cylinder and/or bank which has the injector with a long response time. The DDR will display the injector text description in the table DDEC III Injector Numbering on page 3-345.366.

Injector response times generally increase with low battery supply voltage and decrease with high battery supply voltage. Although injector response times vary from injector to injector at a given RPM, each individual injector response time should remain relatively consistent from one firing to the next. Wide variations in response time (typically +/- 0.2 msec) for one injector at a steady engine RPM may indicate an electrical problem (faulty alternator or voltage regulator, poor or broken ground cables, etc.).

FLASH CODE: 62
DDR DISPLAY: (*AUXILIARY OUTPUT #1*) SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 026 FMI: 3

Indicates that the function assigned to the Auxiliary Output #1 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the configurable function.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #1.

The DDEC III ECM supplies a switched ground to the AUXILIARY OUTPUT #1 circuit to turn ON the function assigned.

FLASH CODE: 62
DDR DISPLAY: (*AUXILIARY OUTPUT #1*) OPEN CIRCUIT
SAE J1587 CODE: SID: 026 FMI: 4

Indicates that the function assigned to the Auxiliary Output #1 circuit output is open or is shorted to ground. This diagnostic condition is detected when the Auxiliary Output #1 function is OFF and the DDEC III ECM measures a low voltage on the circuit output.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #1.

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TROUBLESHOOTING CHARTS

FLASH CODE: 62
DDR DISPLAY: (*AUXILIARY OUTPUT #2*) SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 040 FMI: 3

Indicates that the function assigned to the Auxiliary Output #2 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the configurable function.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #2.

The DDEC III ECM supplies a switched ground to the AUXILIARY OUTPUT #2 circuit to turn ON the function assigned.

FLASH CODE: 62
DDR DISPLAY: (*AUXILIARY OUTPUT #2*) OPEN CIRCUIT
SAE J1587 CODE: SID: 040 FMI: 4

Indicates that the function assigned to the Auxiliary Output #2 circuit output is open or is shorted to ground. This diagnostic condition is detected when the Auxiliary Output #2 function is OFF and the DDEC III ECM measures a low voltage on the circuit output.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #2.

FLASH CODE: 62
DDR DISPLAY: (*AUXILIARY OUTPUT #5*) SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 053 FMI: 3

Indicates that the function assigned to the Auxiliary Output #5 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the configurable function.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #5.

The DDEC III ECM supplies a switched ground to the AUXILIARY OUTPUT #5 circuit to turn ON the function assigned.

FLASH CODE: 62
DDR DISPLAY: (*AUXILIARY OUTPUT #5*) OPEN CIRCUIT
SAE J1587 CODE: SID: 053 FMI: 4

Indicates that the function assigned to the Auxiliary Output #1 circuit output is open or is shorted to ground. This diagnostic condition is detected when the Auxiliary Output #5 function is OFF and the DDEC III ECM measures a low voltage on the circuit output.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #5.

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FLASH CODE: 62
DDR DISPLAY: (AUXILIARY OUTPUT #6) SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 054 FMI: 3

Indicates that the function assigned to the Auxiliary Output #6 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the configurable function.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #6.

The DDEC III ECM supplies a switched ground to the AUXILIARY OUTPUT #6 circuit to turn ON the function assigned

FLASH CODE: 62
DDR DISPLAY: (AUXILIARY OUTPUT #6) OPEN CIRCUIT
SAE J1587 CODE: SID: 054 FMI: 4

Indicates that the function assigned to the Auxiliary Output #1 circuit output is open or is shorted to ground. This diagnostic condition is detected when the Auxiliary Output #6 function Is OFF and the DDEC III ECM measures a low voltage on the circuit output.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #6.

FLASH CODE: 62
DDR DISPLAY: (AUXILIARY OUTPUT #7) SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 055 FMI: 3

Indicates that the function assigned to the Auxiliary Output #7 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the configurable function.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #7.

The DDEC III ECM supplies a switched ground to the AUXILIARY OUTPUT #7 circuit to turn ON the function assigned

FLASH CODE: 62
DDR DISPLAY: (AUXILIARY OUTPUT #7) OPEN CIRCUIT
SAE J1587 CODE: SID: 055 FMI: 4

Indicates that the function assigned to the Auxiliary Output #1 circuit output is open or is shorted to ground. This diagnostic condition is detected when the Auxiliary Output #7 function is OFF and the DDEC III ECM measures a low voltage on the circuit output.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #7.

FLASH CODE: 62
DDR DISPLAY: (AUXILIARY OUTPUT #8) SHORT TO BATTERY (+)
SAE J1587 CODE: SID. 056 FMI: 3

Indicates that the function assigned to the Auxiliary Output #8 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning ON the configurable function.

NOTE:

The DDR will display the parameter text description in TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #8.

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FLASH CODE: 62
DDR DISPLAY: (AUXILIARY OUTPUT #8) OPEN CIRCUIT
SAE J1587 CODE: SID: 056 FMI: 4

Indicates that the function assigned to the Auxiliary Output #1 circuit input is open or is shorted to ground. This diagnostic condition is detected when the Auxiliary Output #8 function is **OFF** and the DDEC **III** ECM measures a low voltage on the circuit output.

NOTE:
The DDR will display the parameter text description In TABLE 2 (ECM Output Options) to identify the function assigned to AUXILIARY OUTPUT #8.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #1 SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 057 FMI: 3

Indicates that the PWM DRIVER #1 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC **III** ECM is unsuccessful In turning **ON** the circuit function.

NOTE:
The DDEC III ECM supplies a switched ground to the PWM DRIVER #1 circuit to turn ON the circuit function.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #1 OPEN CIRCUIT
SAE J1587 CODE: SID: 057 FMI: 4

Indicates that the PWM DRIVER #1 circuit output is open or is shorted to ground. This diagnostic condition is detected when the PWM Driver #1 function is **OFF** and the DDEC **III** ECM measures a low voltage on the circuit output.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #2 SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 058 FMI: 3

Indicates that the PWM DRIVER #2 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC **III** ECM is unsuccessful in turning **ON** the circuit function.

NOTE:
The DDEC III ECM supplies a switched ground to the PWM DRIVER #2 circuit to turn ON the circuit function.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #2 OPEN CIRCUIT
SAE J1587 CODE: SID: 058 FMI: 4

Indicates that the PWM DRIVER #2 circuit output is open or is shorted to ground. This diagnostic condition is detected when the PWM Driver #2 function is **OFF** and the DDEC **III** ECM measures a low voltage on the circuit output.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #3 SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 059 FMI: 3

Indicates that the PWM DRIVER #3 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC **III** ECM is unsuccessful in turning **ON** the circuit function.

NOTE:
The DDEC III ECM supplies a switched ground to the PWM DRIVER #3 circuit to turn ON the circuit function.

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FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #3 OPEN CIRCUIT
SAE J1587 CODE: SID: 059 FMI: 4

Indicates that the PWM DRIVER #3 circuit output is open or is shorted to ground. This diagnostic condition is detected when the PWM Driver #3 function is **OFF** and the DDEC III ECM measures a low voltage on the circuit output.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #4 SHORT TO BATTERY (+)
SAE J1587 CODE: SID: 060 FMI: 3

Indicates that the PWM DRIVER #4 circuit output is shorted to battery (+). This diagnostic condition is detected when the DDEC III ECM is unsuccessful in turning **ON** the circuit function.

NOTE:

The DDEC III ECM supplies a switched ground to the PWM DRIVER #4 circuit to turn ON the circuit assigned.

FLASH CODE: 63
DDR DISPLAY: PWM DRIVER #4 OPEN CIRCUIT
SAE J1587 CODE: SID: 060 FMI: 4

Indicates that the PWM DRIVER #4 circuit output is open or is shorted to ground. This diagnostic condition is detected when the PWM Driver #4 function is **OFF** and the DDEC III ECM measures a low voltage on the circuit output.

FLASH CODE: 64
DDR DISPLAY: TURBO SPEED SENSOR INPUT FAILURE
SAE J1587 CODE: PID: 103 FMI: 8

Indicates that the DDEC III Auxiliary Timed input port has not received an expected frequency signal from the Turbo Speed Sensor.

FLASH CODE: 67
DDR DISPLAY: COOLANT PRESS SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 109 FMI: 3

Indicates that the Coolant Pressure Sensor input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 67
DDR DISPLAY: COOLANT PRESS SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 109 FMI: 4

Indicates that the Coolant Pressure Sensor input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

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FLASH CODE: 68
DDR DISPLAY: TPS IDLE VALIDATION SWITCH OPEN CIRCUIT
SAE J1587 CODE: PID: 230 FMI: 5

Indicates that the Throttle Position Sensor (TPS) Idle Validation Switch (IVS) input to the ECM is NOT grounded when the TPS input demand is less than 11.8% (120 counts).

FLASH CODE: 68
DDR DISPLAY: TPS IDLE VALIDATION SWITCH GROUNDED CIRCUIT
SAE J1587 CODE: PID: 230 FMI: 6

Indicates that the Throttle Position Sensor (TPS) Idle Validation Switch (IVS) input to the ECM IS grounded when the TPS input demand is greater than 27.5% (282 counts).

FLASH CODE: 71
DDR DISPLAY: *XXX* INJECTOR RESPONSE TIME SHORT
SAE J1587 CODE: SID: *XX* FMI: 1

Indicates that the time it takes from when the DDEC IIIl ECM requests an Injector be turned on to when the injector solenoid valve actually closes is shorter than the lower limit of the expected range. This diagnostic condition is typically:

(1) aerated fuel system

(2) high system battery (+) supply voltage

(3) failed solenoid valve

NOTE:

The injector diagnostic SID (Subsystem Identifier) indicates which cylinder number has an injector with a short response time. The injector number describes the cylinder and/or bank which has the Injector with a short response time. The DDR will display the injector text description in the table DDEC III Injector Numbering on page 3-345.344.

Injector response times generally increase with low battery supply voltage and decrease with high battery supply voltage. Although injector response times vary from injector to Injector at a given RPM, each individual injector response time should remain relatively consistent from one firing to the next. Wide variations in response time (typically +/- 0.2 msec) for one injector at a steady engine RPM may indicate an electrical problem (faulty alternator or voltage regulator, poor or broken ground cables, etc.).

FLASH CODE: 72
DDR DISPLAY: VEHICLE OVERSPEED
SAE J1587 CODE: PID: 084 FMI: 0

Indicates that the vehicle (WITH fueling to the engine) has exceeded the vehicle speed limit that is defined in the ECM calibration.

FLASH CODE: 72
DDR DISPLAY: VEHICLE OVERSPEED (ABSOLUTE)
SAE J1587 CODE: PID: 084 FMI: 11

Indicates that the vehicle (WITHOUT fueling to the engine) has exceeded a secondary vehicle speed limit that is defined in the ECM calibration.

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FLASH CODE: 75
DDR DISPLAY: ECM BATTERY VOLTAGE HIGH
SAE J1587 CODE: PID: 168 FM: 0

Indicates that the DDEC III ECM has detected that the main battery supply voltage to the ECM has exceeded the recommended operating range.

FLASH CODE: 76
DDR DISPLAY: ENGINE OVERSPEED WITH ENGINE BRAKE
SAE J1587 CODE: PID: 121 FMI: 0

Indicates that the engine RPM (while the engine brake is ON) has exceeded the recommended safe operating range.

FLASH CODE: 81
DDR DISPLAY: OIL LEVEL SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 098 FMI: 3

Indicates that the Oil Level Sensor (OLS) input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 81
DDR DISPLAY: CRNKCSE PRESS SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 101 FMI: 3

Indicates that the Crankcase Pressure Sensor input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 81
DDR DISPLAY: DUAL FUEL BOI INPUT VOLTAGE HIGH
SAE J1587 CODE: SID: 020 FMI: 3

Indicates that the Dual Fuel (Diesel/Natural Gas) ECM BOI output control signal to the DDEC III ECM has exceeded the calibratible maximum level.

FLASH CODE: 82
DDR DISPLAY: OIL LEVEL SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 98 FMI: 4

Indicates that the Oil Level Sensor (OLS) input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

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FLASH CODE: 82
DDR DISPLAY: CRNKCSE PRESS SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 101 FMI: 4

Indicates that the Crankcase Pressure Sensor input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

FLASH CODE: 82
DDR DISPLAY: DUAL FUEL BOI INPUT VOLTAGE LOW
SAE J1587 CODE: SID: 020 FMI: 4

Indicates that the Dual Fuel (Diesel/Natural Gas) ECM BOI output control signal to the DDEC III ECM has dropped below the calibratible minimum level.

FLASH CODE: 83
DDR DISPLAY: OIL LEVEL HIGH
SAE J1587 CODE: PID: 098 FMI: 0

Indicates that the Oil Level Sensor has detected that the engine oil level has exceeded the recommended safe operating range.

FLASH CODE: 83
DDR DISPLAY: CRANKCASE PRESSURE HIGH
SAE J1587 CODE: PID: 101 FMI: 0

Indicates that the Crankcase Pressure Sensor has detected that the engine crankcase pressure has exceeded the recommended safe operating range.

FLASH CODE: 84
DDR DISPLAY: OIL LEVEL LOW
SAE J1587 CODE: PID: 098 FMI: 1

Indicates that the Oil Level Sensor has detected that the engine oil level has dropped below the recommended safe operating range.

FLASH CODE: 84
DDR DISPLAY: CRANKCASE PRESSURE LOW
SAE J1587 CODE: PID: 101 FMI: 1

Indicates that the Crankcase Pressure Sensor has detected that the engine crankcase pressure has dropped below the recommended safe operating range.

FLASH CODE: 85
DDR DISPLAY: ENGINE OVERSPEED
SAE J1587 CODE: PID: 190 FMI: 0

Indicates that the engine RPM has exceeded the recommended safe operating range.

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FLASH CODE: 86
DDR DISPLAY: PUMP PRESS SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 073 FMI: 3

Indicates that the External Fire Truck Water Pressure Sensor input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 86
DDR DISPLAY: BARO PRESS SENSOR INPUT VOLTAGE HIGH
SAE J1587 CODE: PID: 108 FMI: 3

Indicates that the Barometric Pressure Sensor input to the ECM has exceeded 95% (normally > 4.75 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor return circuit

(2) sensor signal circuit is shorted to the sensor +5 volt supply

FLASH CODE: 87
DDR DISPLAY: PUMP PRESS SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 073 FMI: 4

Indicates that the External Fire Truck Water Pressure Sensor input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or to ground

(4) sensor +5 volt supply is shorted to sensor return circuit

FLASH CODE: 87
DDR DISPLAY: BARO PRESS SENSOR INPUT VOLTAGE LOW
SAE J1587 CODE: PID: 108 FMI: 4

Indicates that the Barometric Pressure Sensor input to the ECM has dropped below 5% (normally < 0.25 volts) of the sensor supply voltage. This diagnostic condition is typically:

(1) open sensor signal circuit

(2) open sensor +5 volt supply circuit

(3) sensor signal is shorted to the sensor return circuit or ground

(4) sensor +5 volt supply is shorted to sensor return circuit

FLASH CODE: 88
DDR DISPLAY: COOLANT PRESSURE LOW
SAE J1587 CODE: PID: 109 FMI: 1

Indicates that the Coolant Pressure Sensor has detected that the engine coolant pressure has dropped below the recommended safe operating range.

FLASH CODE: --
DDR DISPLAY: FRAM CHECKSUM INCORRECT
SAE J1587 CODE: SID: 240 FMI: 2

Indicates that the ECM system operation software has been corrupted and is unable to operate. This diagnostic condition is typically:

(1) The ECM system programming operation failed to run to completion

Section 4
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FLASH CODE: --
DDR DISPLAY: INCOMPATIBLE CALIBRATION VERSION
SAE J1587 CODE: SID: 253 FMI: 13

Indicates that the current ECM system operation software is not compatible with the engine calibration loaded in the ECM. This diagnostic condition is typically:

(1) The ECM programming process was performed in the incorrect order or did not run to completion.

FLASH CODE: --
DDR DISPLAY: CALIBRATION CHECKSUM INCORRECT
SAE J1587 CODE: SID: 253 FMI: 2

Indicates that the engine calibration loaded in the ECM has been corrupted and is unable to operate. This diagnostic condition is typically:

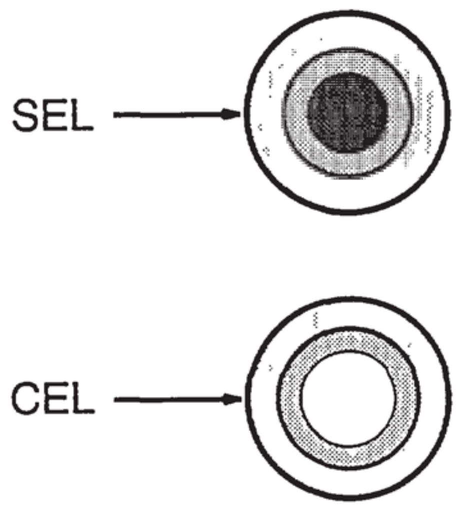
(1) The engine calibration programming operation failed to run to completion.

FLASH CODE: --
DDR DISPLAY: FAILED EXTERNAL RAM
SAE J1587 CODE: SID: 254 FMI: 0

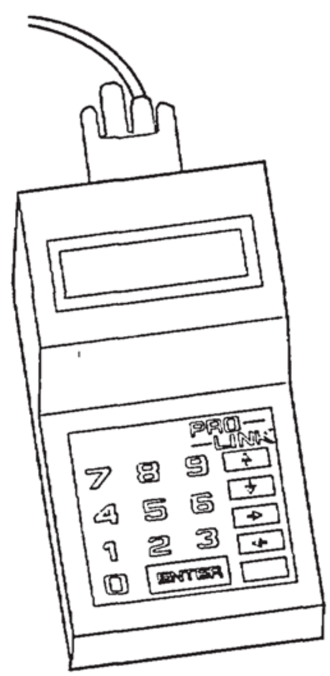
Indicates that some or all of the memory circuitry that is external to the ECM microprocessor has failed and is unable to operate.

FLASH CODE: --
DDR DISPLAY: FAILED INTERNAL RAM
SAE J1587 CODE: SID: 254 FMI: 1

Indicates that some or all of the memory circuitry that is internal to the ECM microprocessor has failed and is unable to operate.



DASH LIGHTS

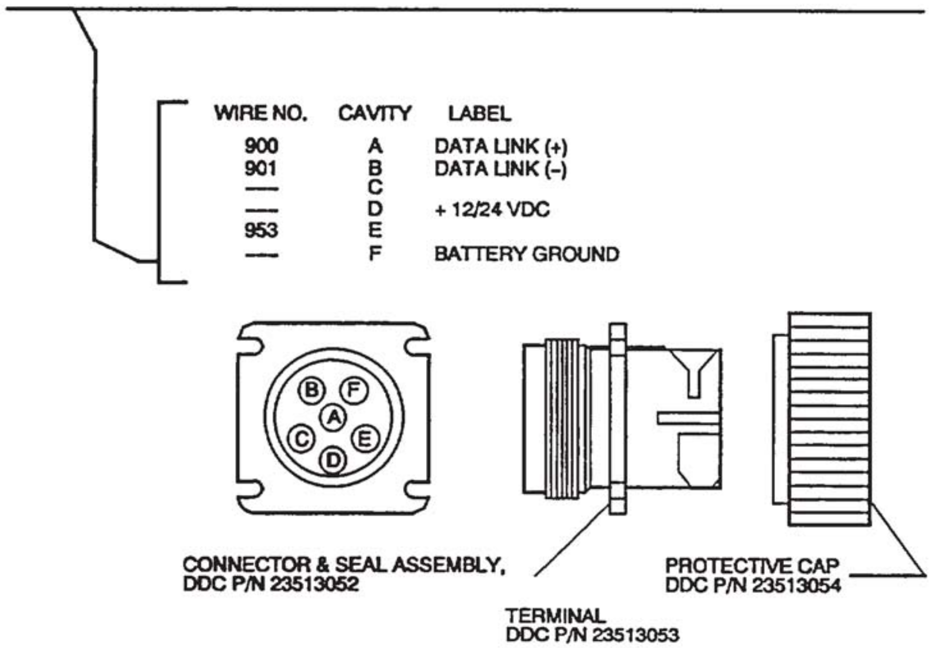


Pro-Link 9000

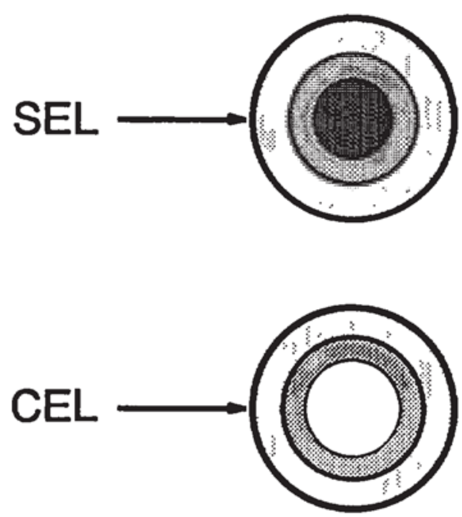
Section 4
TROUBLESHOOTING CHARTS

C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-III USING DDR

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START 1 NOTE "Check Engine" Light		
• Turn ignition on while at the same time observing the "Check/Stop Engine" light (engine not running)	Light or lights comes on and stays on.	Go to START-2.
	Lights come on for up to 5 seconds, then goes out.	Go to START-3.
	Lights are off.	Go to Chart 4, page 3-345.85.
	Erratic or intermittent light.	Go to START-7.
START-2 Read Active codes Using DDR		
• Plug DDR into the DDL connector.	Active codes (other than "NO CODES") on DDR.	Follow appropriate diagnostic charts for code(s) received. (See Index).
• Read active codes by selecting the DIAGNOSTIC CODE MENU (ACTIVE CODES) on the DDR.	No active code.	Go to Chart 5, page 3-345.91,
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" OF "DDEC SYSTEM NOT RESPONDING".	Go to START-6 .
	DDR display is, blank or random.	Go to START-9.



DIAGNOSTIC CONNECTOR



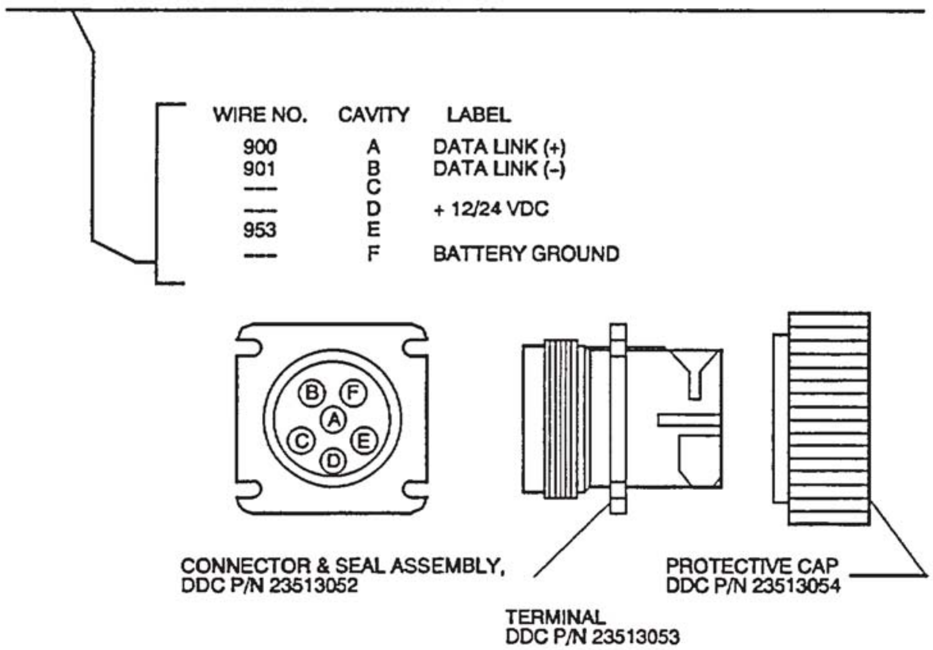
DASH LIGHTS

Section 4
TROUBLESHOOTING CHARTS

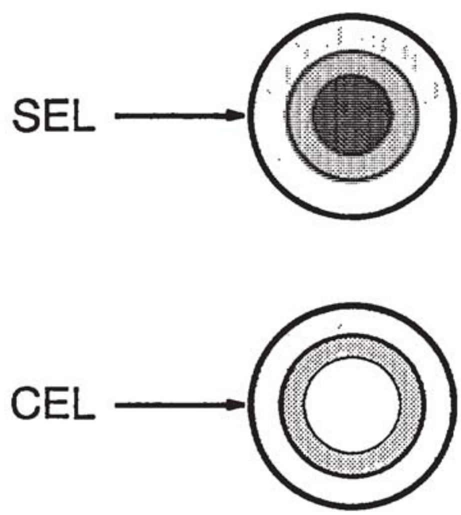
C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-III USING DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-3 Read All Codes Using DDR		
• Plug DDR into DDL Connector.	Codes 52, 110, 175/3, 174/3, or 190/0	Follow appropriate diagnostic charts for code(s) received. (See Table of Contents)
• Read all inactive codes by selecting inactive codes on DDR.	Any codes except 52,110,175/3, 174/3, or 190/0.	Go to START-4.
	No Codes.	Go to Chart 1, page 3-345.57.
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".	Go to Chart 7, page 3-345.99.
	DDR display is blank or random.	Go to START-9.
START-4 Attempt to Make Codes Active *SEE NOTE BELOW*		
• Clear codes by selecting CODE ERASE on the DDR. • Attempt to start and run the engine.	Engine will not start.	Go to Chart 2, page 3-345.63
• Try to get the "Check Engine" light on by: -warming up the engine. -slowly changing the RPM from idle to no load speed.	"Check Engine" light is on.	Read Active Codes on DDR while light is on and follow The appropriate diagnostic Chart on page 3-345.1.
• Run engine for 1 minute or until "Check Engine" light comes on.	"Check Engine", light is off. Check	Problem may be Intermittent - See Chart 1, page 3-345.61, Step
	engine flashes briefly.	C1-2. Go to START-5.

***NOTE: If a potential engine damaging Code (ie. 100/1) exists monitor that parameter when running engine.**



DIAGNOSTIC CONNECTOR

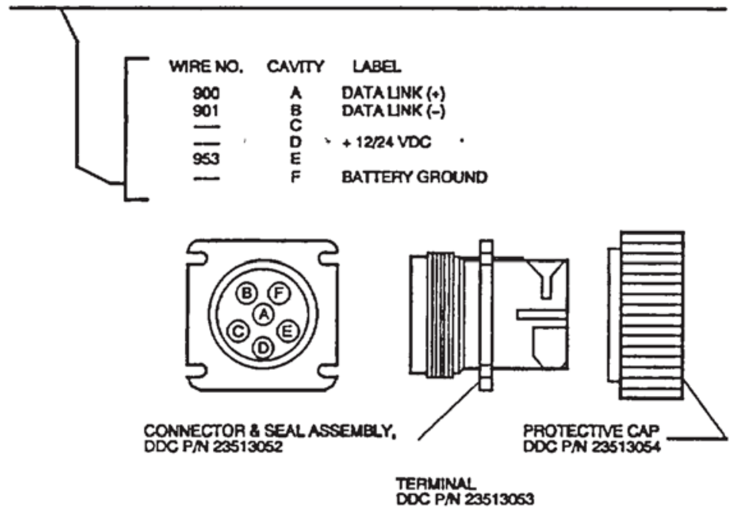


DASH LIGHTS

Section 4
TROUBLESHOOTING CHARTS

C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-III USING DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-5 Read All Codes Again		
• Read inactive codes on DDR	Any codes. →	Follow appropriate diagnostic chart for codes received. (See Table of Contents).
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING". →	Go to Chart 7, page 3-345.99.
	DDR display is blank or random. →	Go to START-9.
START-6 Read Codes on the "Check Engine" Light		
• Unplug the DDR. • Ignition on. Engine not running. Depress and Hold. Diagnostic Request Switch. • Read codes flashing out on the "Check Engine" Light.	Flashes out codes. →	To diagnose codes, follow appropriate diagnostic chart for codes received. To service DDR system, go to C7-4, page 3-345.101.
	Does not flash out codes. →	Go to Chart 9, page 3-345.111.
START-7 Intermittent Check Engine Light		
• Note whether flashing "Check Engine" Light Is reading a valid code or if it's just erratic.	Flashing a valid code. →	Go to START-8 .
	Erratic or intermittent "Check Engine" light. →	Go to Chart 1, page 3-345.57.



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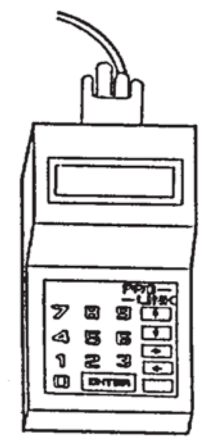
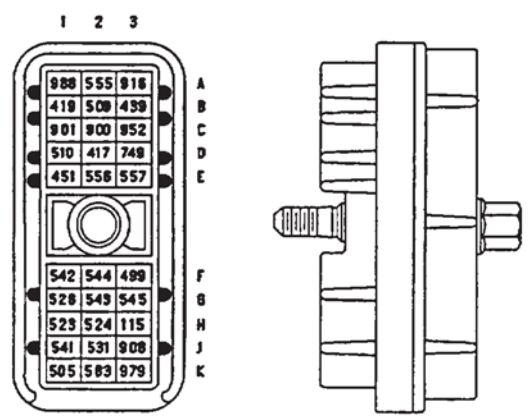
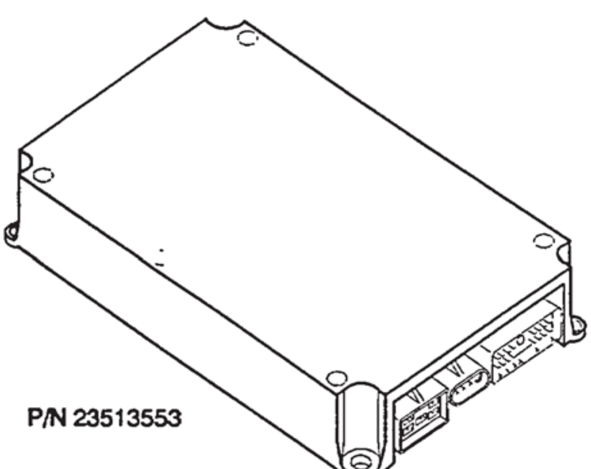


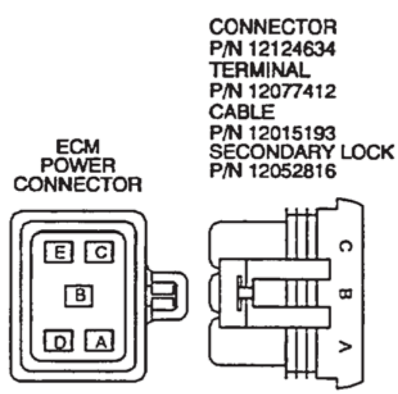
Pro-Link 9000



ECM VEHICLE HARNESS CONNECTOR



THE ELECTRONIC CONTROL MODULE - DDEC III



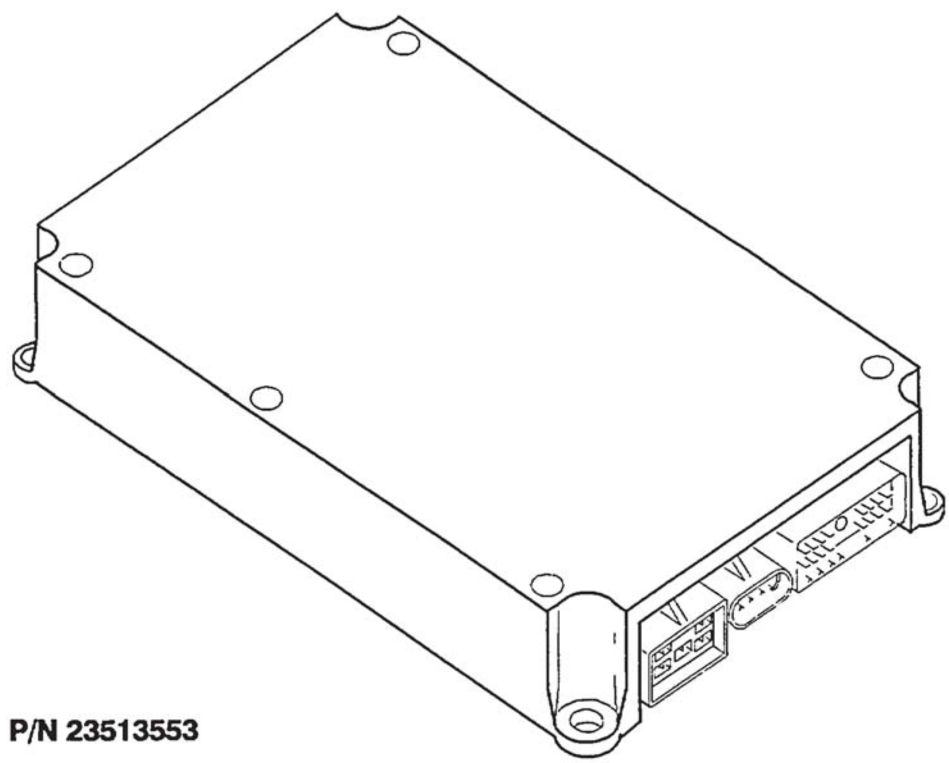
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-III USING DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-8 Check for Short		
• Plug DDR into Connector. Select Switch/Light Status. • Read Diagnostic Request SW. status.	ON.	Ckt #528 is shorted to ground. Repair short, then go to START-30
	OFF.	Go to Chart 9, page 3-345.111.
START-9 Check for +12 Volts at DDR Connector		
• Turn ignition on. • Read voltage at the DDR connector, from pin "C" (red lead) to pin "E' (black lead).	Greater than or equal to 10.0 volts.	There is a problem with either the DDR or the data link lines. Go to C7-4, page 3-345.101. (For diagnosis of DDEC-**III** without a DDR, go to CEL-1 on page 3-345.51.
	Less than 10.0 volts.	Either the switched +12 volt line or the ground line is open to the DDR connector. Repair open. Then go to START-30.
START-10 Check ECM Connectors		
• Disconnect the 5-way power harness connector at the ECM. • Check terminals at the ECM 5-way power and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM. Then go to START-30.
	Problem found.	Repair terminals/connectors. Then go to START-30.

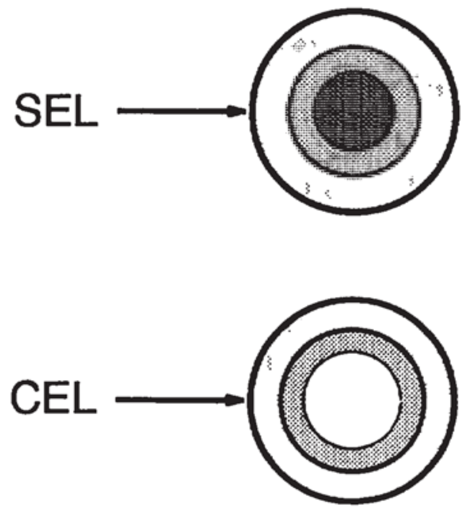


THE ELECTRONIC CONTROL MODULE - DDEC III

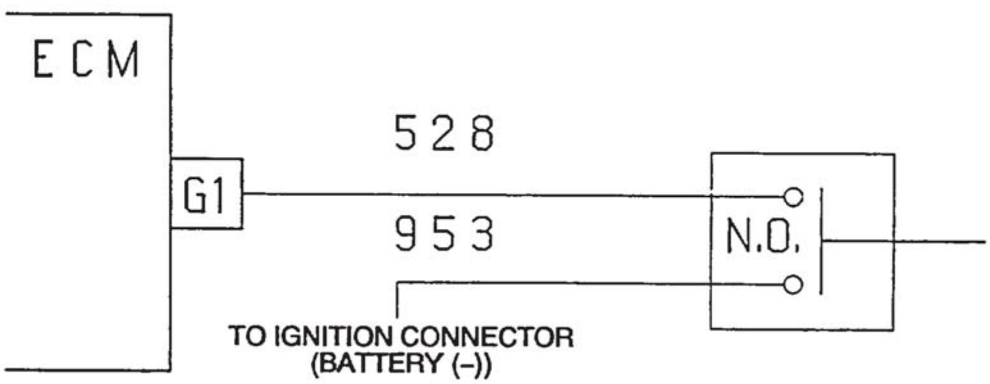
Section 4
TROUBLESHOOTING CHARTS

C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-III USING DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on. • Observe the "Check Engine" Light.	"Check Engine" Light comes on for up to 5 seconds, then goes out. →	Repairs are complete.
	"Check Engine" Light is flashing. →	All system diagnostics are complete. Please review this section from the first step to find the error.
	"Check Engine" Light comes on and stays on. →	Go to START-1, pg 3-345.41.



DASH LIGHTS



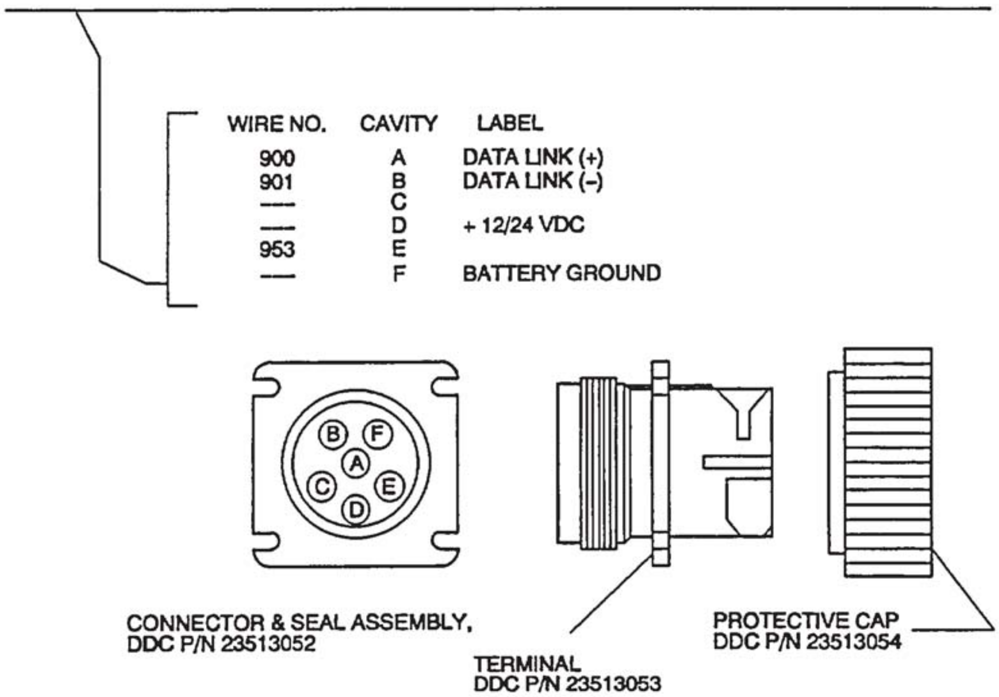
DIAGNOSTIC REQUEST SWITCH
STOP ENGINE OVERRIDE
(MOMENTARY)

Section 4
TROUBLESHOOTING CHARTS

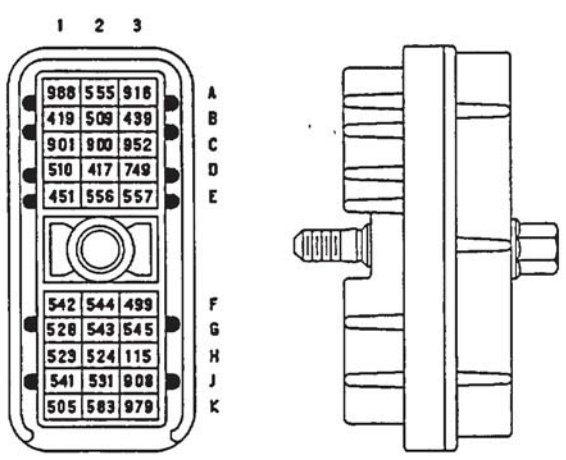
C. CEL - FIRST CHART FOR DIAGNOSIS OF DDEC-III WHEN NO DDR IS AVAILABLE

NOTE: Although this section will help you get started, later sections of the Troubleshooting Guide may require using a DDR.

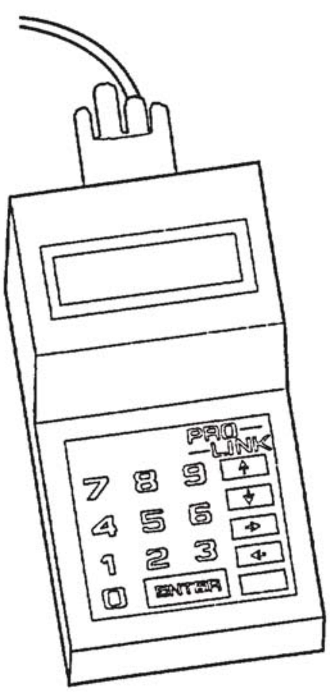
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-1 Note "Check Engine" Light		
• Turn ignition on while at the same time observing the "Check Engine" light.	Light comes on and stays on. →	Go to CEL-2.
	Light comes on for up to 5 seconds, then goes out. →	Go to CEL-2 .
	Light is off. →	Go to Chart 4, page 3-345.85.
	Flashing light. →	Go to CEL-8.
CEL-2 Read Codes		
• Turn ignition on. • Depress and hold the diagnostic request switch (or button).	Flashes out codes. →	Go to CEL-3.
	"Check Engine" light is always on but doesn't flash out codes. →	Go to Chart 6, page 3-345.95.
	"Check Engine" light never comes on. →	Go to CEL-6.
CEL-3 Follow Codes		
• Note and record code(s).	Code 52, 110, 175/3, 174/3, or 190/0. →	Follow appropriate diagnostic charts for the code(s) received. (See Index).
	Any codes except 52,110,175/3, 174/3, or 190/0. →	Go to CEL-4.
	No codes. →	If drive complaint persists, go to Chart 1, page 3-345.57.



DIAGNOSTIC CONNECTOR



ECM VEHICLE HARNESS CONNECTOR



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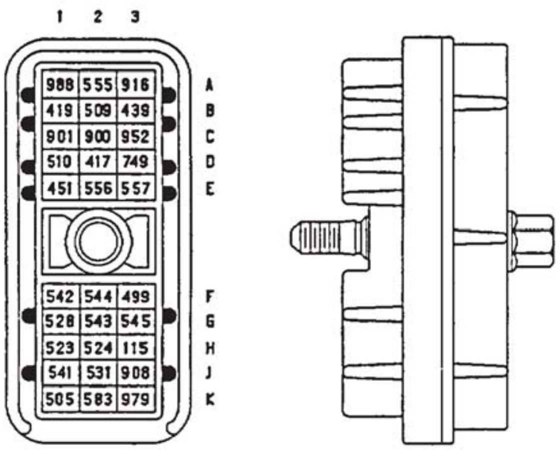
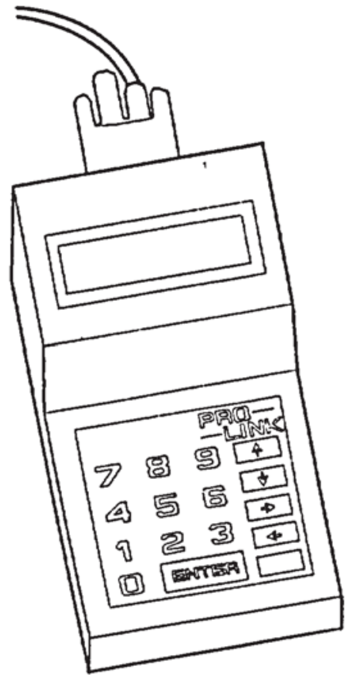
Section 4
TROUBLESHOOTING CHARTS

C. CEL - FIRST CHART FOR DIAGNOSIS OF DDEC. III WHEN NO DDR IS AVAILABLE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-4 Verify Code(s)		
• Turn ignition on. • Obtain a DDR. • Clear codes • Turn ignition off then back on. • Note status of "Check Engine" light.	"Check Engine" light stays on.	Read codes and follow appropriate diagnostic Chart.
	"Check Engine". light goes on for 5 seconds, then goes out.	Go to CEL-5.
	"Check Engine" light is erratic or intermittent.	Go to CEL-8.
CEL-5 Verify Code(s) with the Engine Running		
• Attempt to start and run the engine. • Try to get the "Check Engine" light on by: - warming up the engine - slowly changing the engine from idle to no load speed. • Run engine until the "Check Engine" light comes on or for 1 minute.	Engine will not start.	Go to Chart 2, pg 3-345.63.
	"Check Engine" light is off.	Previous codes should be regarded as intermittent. Go to Chart 1, pg 3-345.57.
	"Check Engine" light is on.	Read codes. Follow appropriate diagnostic Code Chart.
CEL-6 Check for Open		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between sockets C1 and G1 of the vehicle harness connector. • Also read resistance between pin E of DDR connector and a good ground.	Less than or equal to 5 ohms on.	Go to CEL-7.
	Greater than 5 ohms or open on either reading.	An open exists either in the Diagnostic Request line (ckt #528 or in the DDR ground line (ckt #901). Repair open. Then go to CEL-30.



ECM VEHICLE HARNESS CONNECTOR



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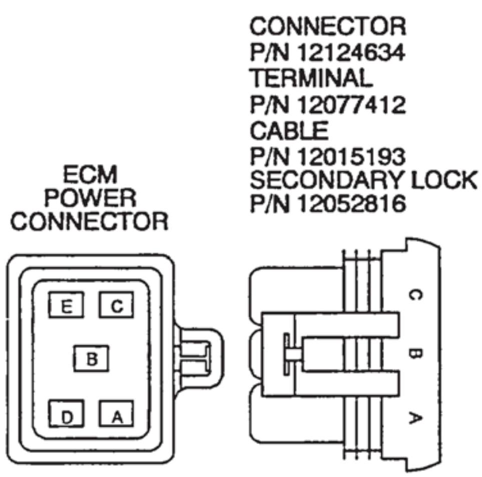


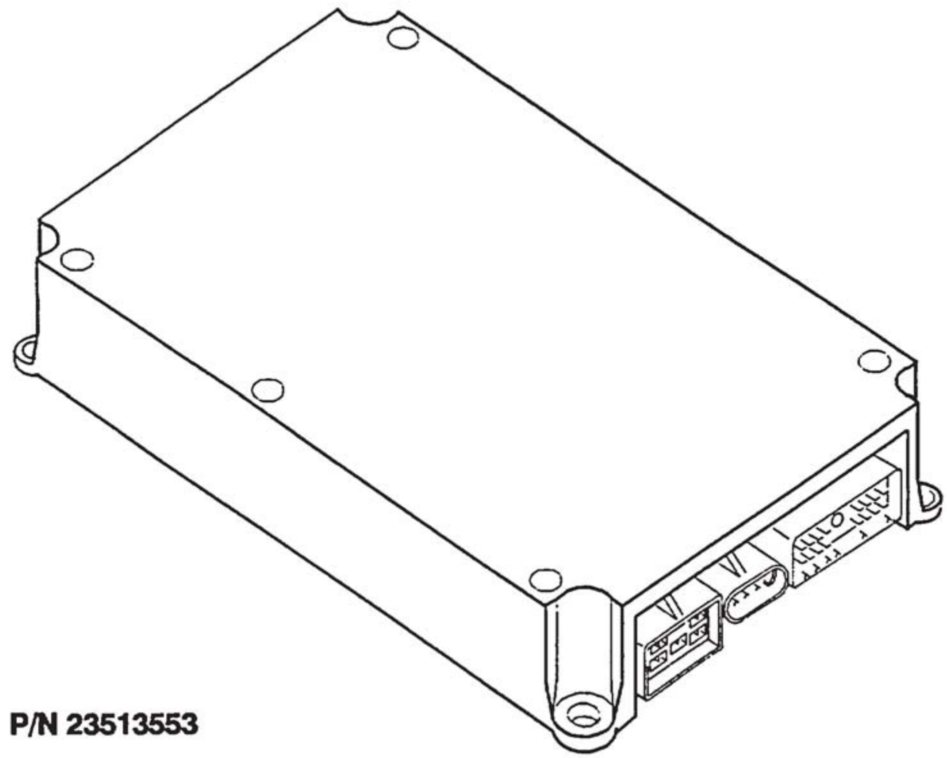
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

C. CEL - FIRST CHART FOR DIAGNOSIS OF DDEC. III WHEN NO DDR IS AVAILABLE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-7 Check ECM Connectors		
• Disconnect the power harness connector at the ECM. • Check terminals at both the 5 way power harness connector, and vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets	Terminals and connectors are okay. →	Replace ECM. The go to CEL-30.
	Problem found. →	Repair terminals/connectors. Then go to CEL-30.
CEL-8 Intermittent Check		
• Note whether flashing "Check Engine" light is reading a valid code or if it's just erratic.	Flashing a valid code. →	Go to CEL-9.
	Erratic or intermittent "Check Engine" light. →	Go to Chart 1, page 3-345.57.
CEL-9 Check for Short		
• Plug DDR into Connector. Select Switch/Light Status. • Read Diagnostic Request SW. status.	ON →	Circuit 528 is shorted to ground. Repair short, then go to CEL-30
	OFF →	Go to Chart 5, page 3-345.91
CEL-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Check Engine" Light.	"Check Engine" light comes on for up to 5 seconds, then goes out. →	Repairs are complete.
	"Check Engine" light is flashing. →	All system diagnostics are complete. Please review this section from the first step to find the error.
	"Check Engine" light comes on and stays on. →	Go to START-1, page 3-345.41.



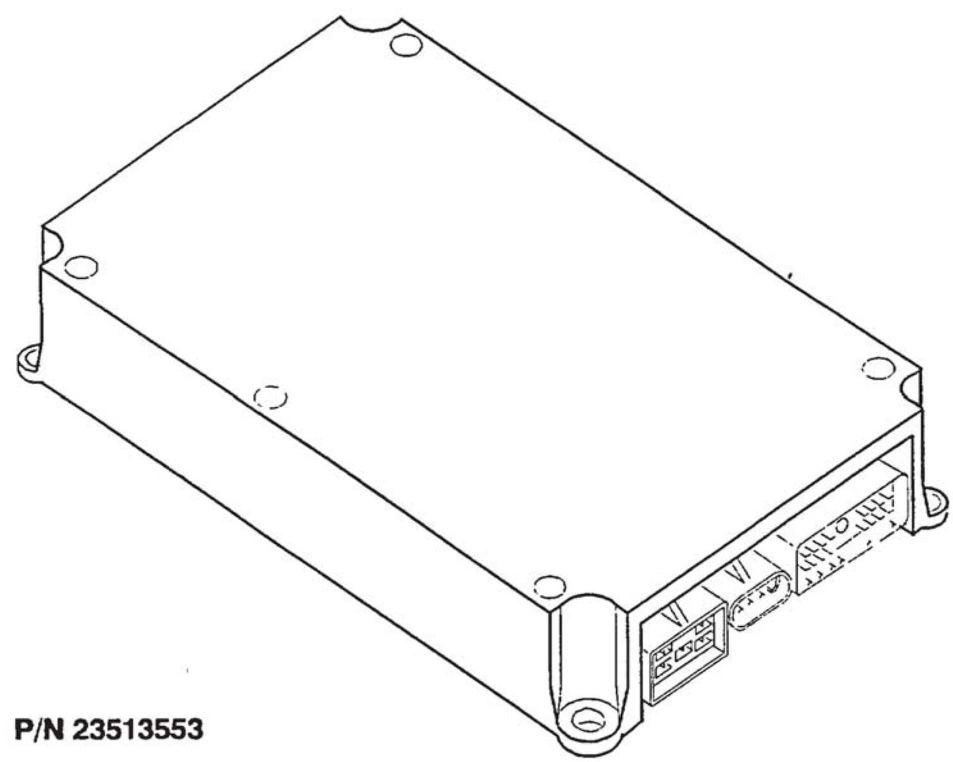
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART -1 · INTERMITIENT CODE OR A SYMPTOM AND NO CODES

NOTE: This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, page 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 1-1 Diagnosis by Symptom		
• Turn ignition off. • Go to appropriate result in the next column based on engine symptom.	Intermittent code.	Go to Chart 1, page 3-345.57.
	Engine cranks but will not start.	Go to Chart 2, page 3-345.63.
	Erratic performance and No codes.	Go to Chart 3, page 3-345.83.
	No Check Engine Light during bulb check.	Go to Chart 4, page 3-345.85.
	Check Engine Light always on and No Codes.	Go to Chart 5, page 3-345.91.
	Stop Engine Light always on, and No codes.	Go to Chart 6, page 3-345.95.
	No data to DDR	Go to Chart 7, page 3-345.99.
	No Stop Engine Light during Bulb Check.	Go to Chart 8, page 3-345.105.
	Diagnostic Request Switch Inoperative.	Go to Chart 9, page 3-345.111.
	Stop Engine Override Inoperative.	Go to Chart 10, page 3-345.115.
	Variable Speed Governor (PTO) Inoperative.	Go to Chart 11, page 3-345.117.
	Cruise Control Inoperative.	Go to Chart 12, page 3-345.127.
	Cruise Active Light always on. (if supplied)	Go to Chart 13, page 3-345.141.
	Cruise Active Light is never on. (if supplied)	Go to Chart 14, page 3-345.145.

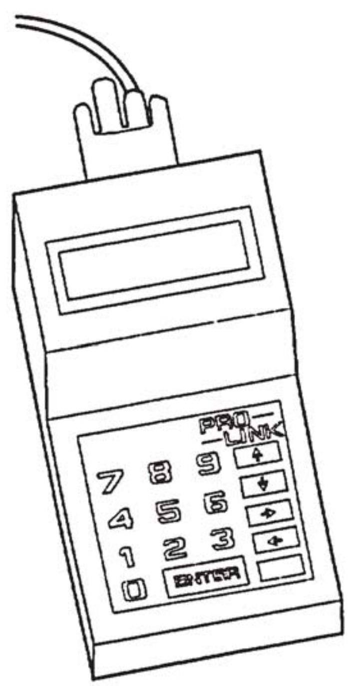


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART -1 - INTERMITTENT CODE OR A SYMPTOM AND NO CODES (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 1-1 **Diagnosis by Symptom (Cont'd)**		
	Idle Shutdown always on	Go to Chart 15, page 3-345.151.
	Idle Shutdown inoperative	Go to Chart 16, page 3-345.155.
	Engine brake always on	Go to Chart 17, page TBD .
	Engine brake inoperative	Go to Chart 18, page TBD.
	Pressure Governor Control Inoperative	Go to Chart 19, page TBD.
	Auxiliary Engine Protection #1 or #2 always on	Go to Chart 20, page 3-345.159.
	Auxiliary Engine Protection #1 or #2 inoperative	Go to Chart 21, page 3-345.161.
	Throttle Inhibit Always On	Go to Chart 22, page 3-345.163.
	Throttle Inhibit Inoperative	Go to Chart 23, page 3-345.165.
	Alternate Torque Curve Switch Inoperative	Go to Chart 24, page 3-345.167.
	Fan Control Malfunction	Go to Chart 25, page 3-345.169
	Deaccelation Light Inoperative	Go to Chart 26, page 3-345.177.
	Starter Lockout Inoperative	Go to Chart 27, page TBD.
	Transmission Retarder Always On	Go to Chart 28, page TBD.
	Transmission Retarder Inoperative	Go to Chart 29, page TBD.



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Section 4
TROUBLESHOOTING CHARTS (Cont'd)

D. CHART -1 - INTERMITTENT CODE OR A SYMPTOM AND NO CODES (Cont'd)

STEP/SEQUENCE

C 1-2 Diagnosis of an Intermittent Code or Symptom

NOTICE: Do not use any other procedures in this manual (except for the suggestions listed below) when trying to solve an intermittent problem. Use of any other procedures for this kind of problem can. result in the replacement of non-defective parts.

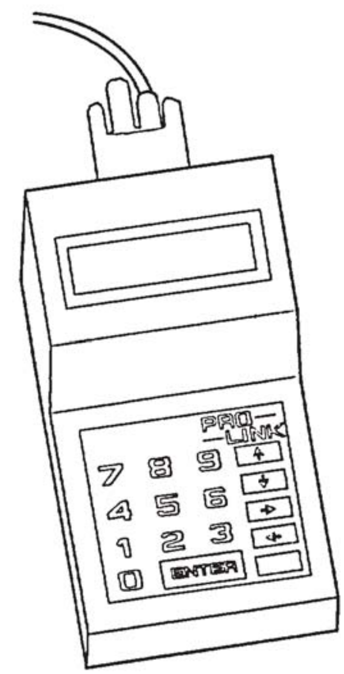
Many intermittent problems are caused by faulty electrical connectors or wiring. Diagnosis must include a careful inspection of the indicated circuit wiring and connectors. Example: an intermittent Code 35 (Oil Pressure Sensor High) should cause suspicion of a problem in the following areas associated with the Oil Pressure Sensor.

1. Wire #'s 530 (signal line), 416 (+5 Volt line) or 452 (ground line).
2. The Oil pressure Sensor connector or ECM connector.
3. An intermittent in the Oil Pressure Sensor (least likely).

A good check list to run through includes the following:

1. Check for poor mating of the connector halves or terminals not fully seated in the connector body (backed-out" terminals).
2. Look for improperly formed or damaged terminals. All connector terminals in the problem circuit should be carefully reformed to contact tension.
3. Electrical system interference caused by a defective relay, ECM driven solenoid, or a switch causing an electrical surge. Look for problems with the charging system (alternator, etc.) . In certain cases, the problem can be made to occur when the faulty component is operated (as in the case of a relay). After repairs or adjustments have been made, clear the codes and confirm that the "Check Engine" Light does not come on (except for the 5 second bulb check when the ignition is first turned on). Also run the engine to see if that problem is cured. If the "Check Engine" Light stays on, refer to the START Chart on page 3-345.41.

Refer to the DDR instructions manual. Using the "Snapshot' function may assist in isolating the cause for the problem. This function is useful in troubleshooting many areas of the DDEC System.



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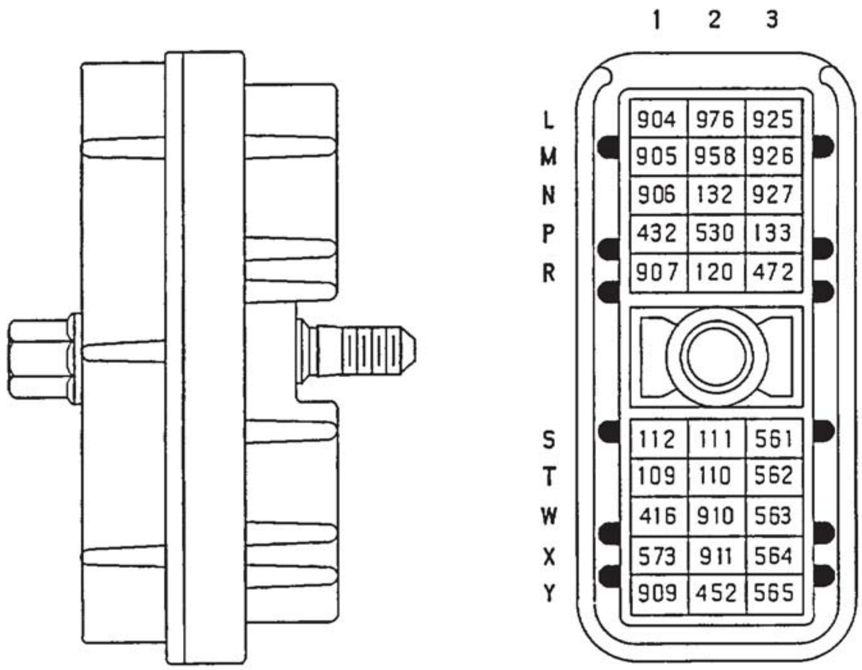
Section 4
TROUBLESHOOTING CHARTS

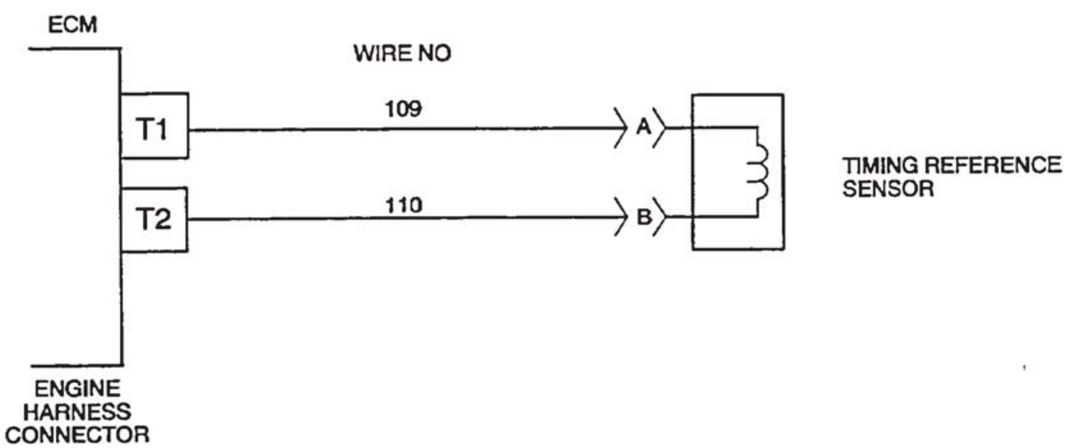
D. CHART -2 . ENGINE CRANKS BUT WILL NOT START

NOTE: This chart is only to be used if.
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here
3) Check fuel supply before starting Step C2-1.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-1 Observe "Check Engine" Light Status		
• Turn ignition on while observing the "Check Engine' Light. 5 seconds, then goes out.	"Check Engine" Light comes on for up to	Go to C2-3.
	"Check Engine" Light does not come on at all.	Go to C2-17.
	"Check Engine" Light comes on goes off and comes back on or stays on.	Go to C2-2.
C 2-2 Read Active Codes Using DDR		
• Plug DDR into the DDR connector. • Read active codes by selecting (ACTIVE CODES on the DDR.	Active codes on DDR	Follow appropriate diagnostic charts for code(s) received.(See Table of Contents).
	No codes	Go to C5-1.
	Display read "NO DATA BEING RECEIVED FROM DATA LINK" or DDEC SYSTEM NOT RESPONDING" or a blank or random display.	Go to Start-6, page 3-345.45.
C 2-3 Check if Out of Fuel		
• Check fuel supply.	Fuel supply okay.	Go to C2-4.
	No fuel.	Refuel vehicle. May have to prime system. Then go to C2-30.



ECM ENGINE HARNESS CONNECTOR

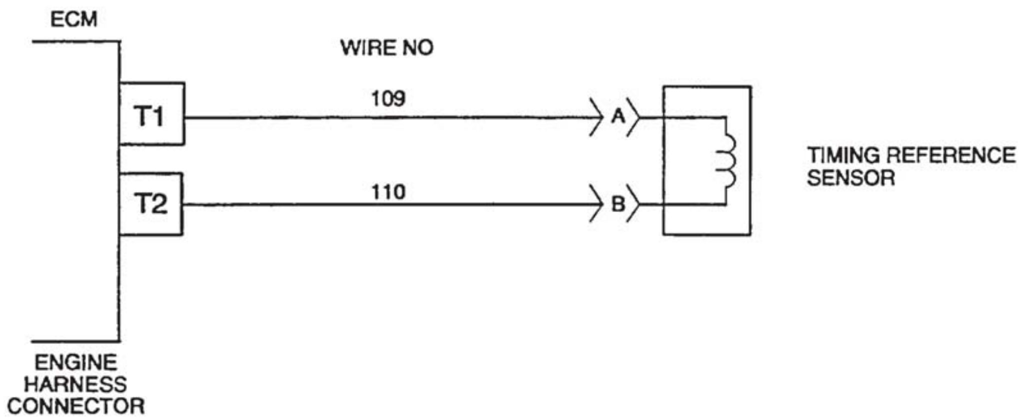


TIMING REFERENCE SENSOR CIRCUITS

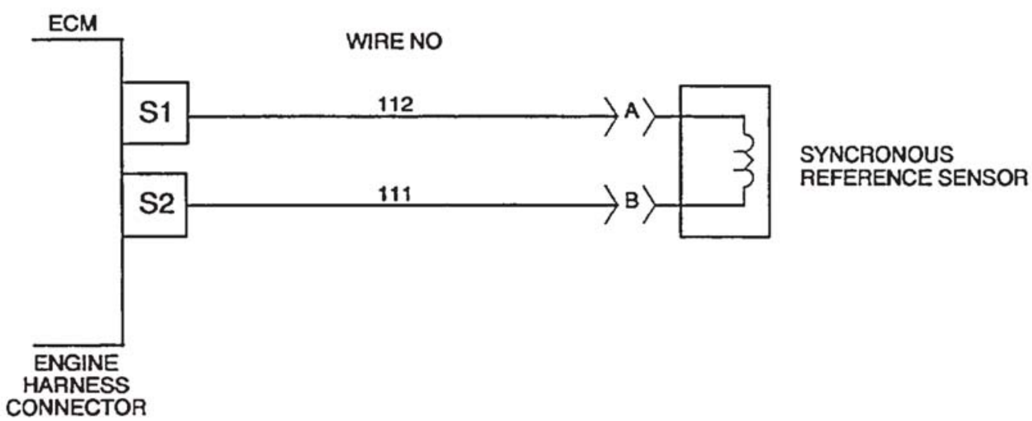
Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

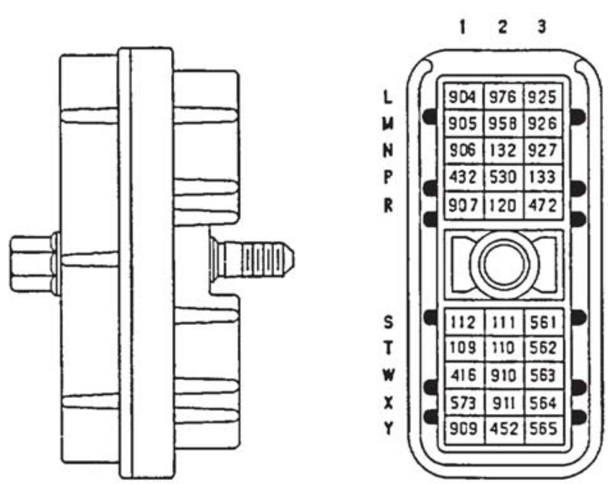
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-4 Check for Aerated Fuel		
• Loosen fuel return line. • Observe fuel flow out of line while cranking. (You can direct the fuel into a bucket.)	Flow is steady.	Go to C 2-5.
	No flow or intermittent flow.	Check fuel filter(s) and supply lines to determine cause of problem (refer to engine Service Manual for details).
C 2-5 Check for White Smoke		
• Reconnect fuel return line • Look for white smoke coming out of the exhaust stack while cranking the engine.	White smoke.	Your problem appears to be with cylinder compression or restricted air intake. Refer to the engine Service Manual for detailed troubleshooting.
	No white smoke.	Go to C2-31.
C 2-6 Check TRS Status via RPM Read out		
• Select Engine RPM on DDR. • Crank engine while observing DDR display. (Note: Battery voltage surge while cranking with electric starters may blank out or reset DDR.)	Display always reads greater than or equal to 60 RPM or cranking.	Go to C2-12.
	Display sometimes or always reads less than 60 RPM while cranking.	Go to C2-7.
C 2-7 Check TRS		
• Turn Ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets T1 and T2 at the engine harness connector.	Between 100 and 200 ohms, on a non Series 60 engine.	Go to C2-8.
	Between 100 and 200 ohms, on a Series 60 engine.	Go to C2-9.
	Less than 100 ohms.	Go to 41-2.
	Greater than 200 ohms.	Go to 41-3.



TIMING REFERENCE SENSOR CIRCUITS



SYNCRONOUS REFERENCE SENSOR CIRCUITS

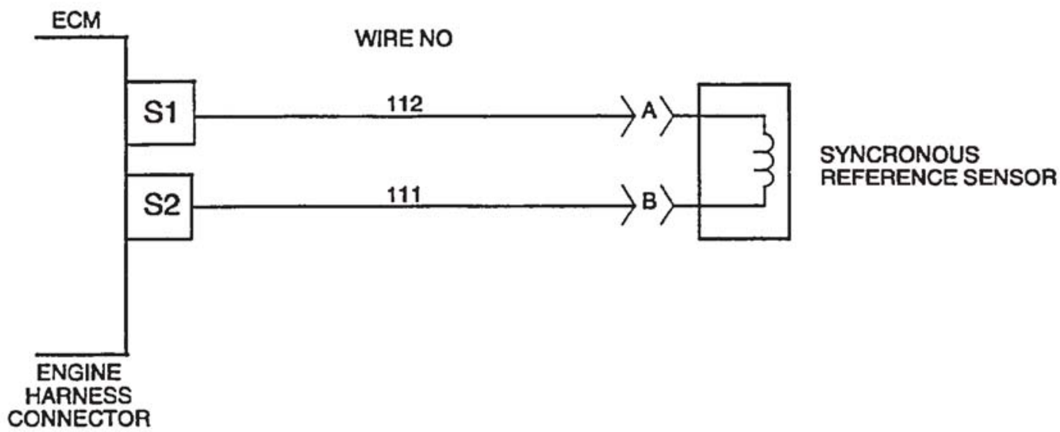


ECM ENGINE HARNESS CONNECTOR

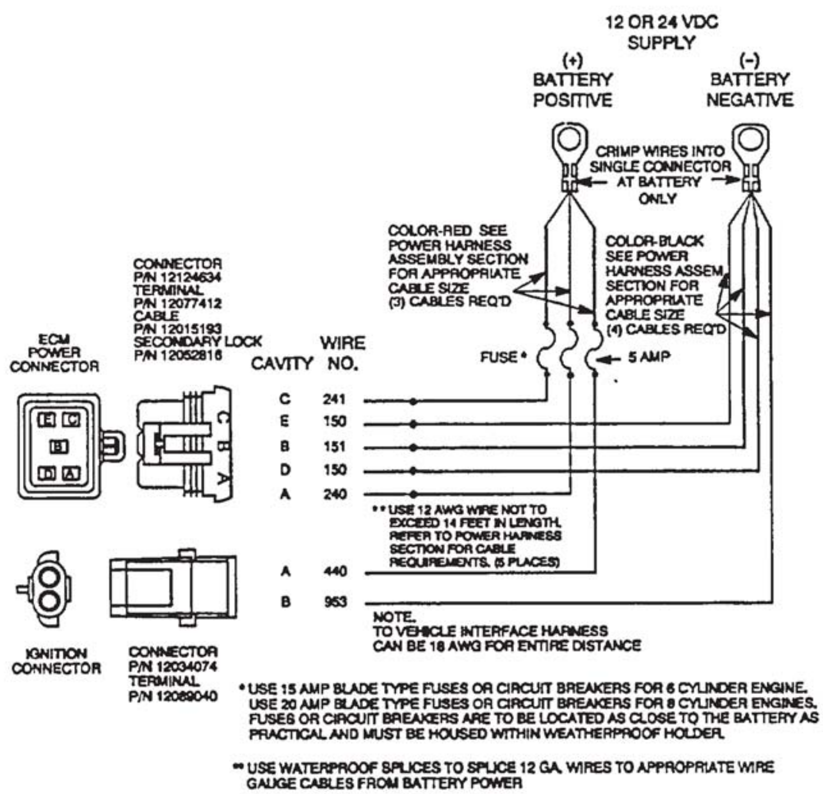
Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-8 Check SRS/TRS Gap (non Series 60)		
(Note: You'll probably have to remove the ECM to perform this check for 92's.) • Bar the engine until the TRS is over a TRS "tooth" of the pulse wheel. • Tap the front of the camshaft rearward with a soft hammer (to remove camshaft end play). • Using a feeler gauge check gap (nominal gap is 0.020" or 0.5mm).	Incorrect gap. →	Loosen the screw at the top of the TRS/SRS mounting bracket (don't touch the two screws that go into the block front end plate-they will affect engine timing). Adjust the TRS/SRS until the gap setting is correct. Tighten screw. (If problems returns, pulse wheel may be loose or bad.) Then go to C2-30.
	Gap setting is correct. →	Go to C2-10.
C 2-9 Check SRS/TRS Mounting Bracket (Series 60)		
• Inspect SRS/TRS Mounting	Loose. →	Tighten bolt (or replace if necessary). Then go to C2-30.
	Sensor is secure. →	Go to C2-10.
C 2-10 Check Pulse Wheel		
• Inspect DDEC puise wheel for: -Loose wheel. -Chipped or missing teeth.	Pulse wheel OK. →	Go to C2-11.
	Problem found. →	Repair or replace as necessary-Go to C2-30.
C 2-11 Check ECM Connectors		
• Turn Ignition off. • Disconnect all connectors at the ECM. • Check terminal at all ECM connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminal and connectors are okay. →	Replace ECM. Then go to C2-30.
	Problem found →	Repair terminals/connectors. Then go to C2-30.



SYNCRONOUS REFERENCE SENSOR CIRCUITS

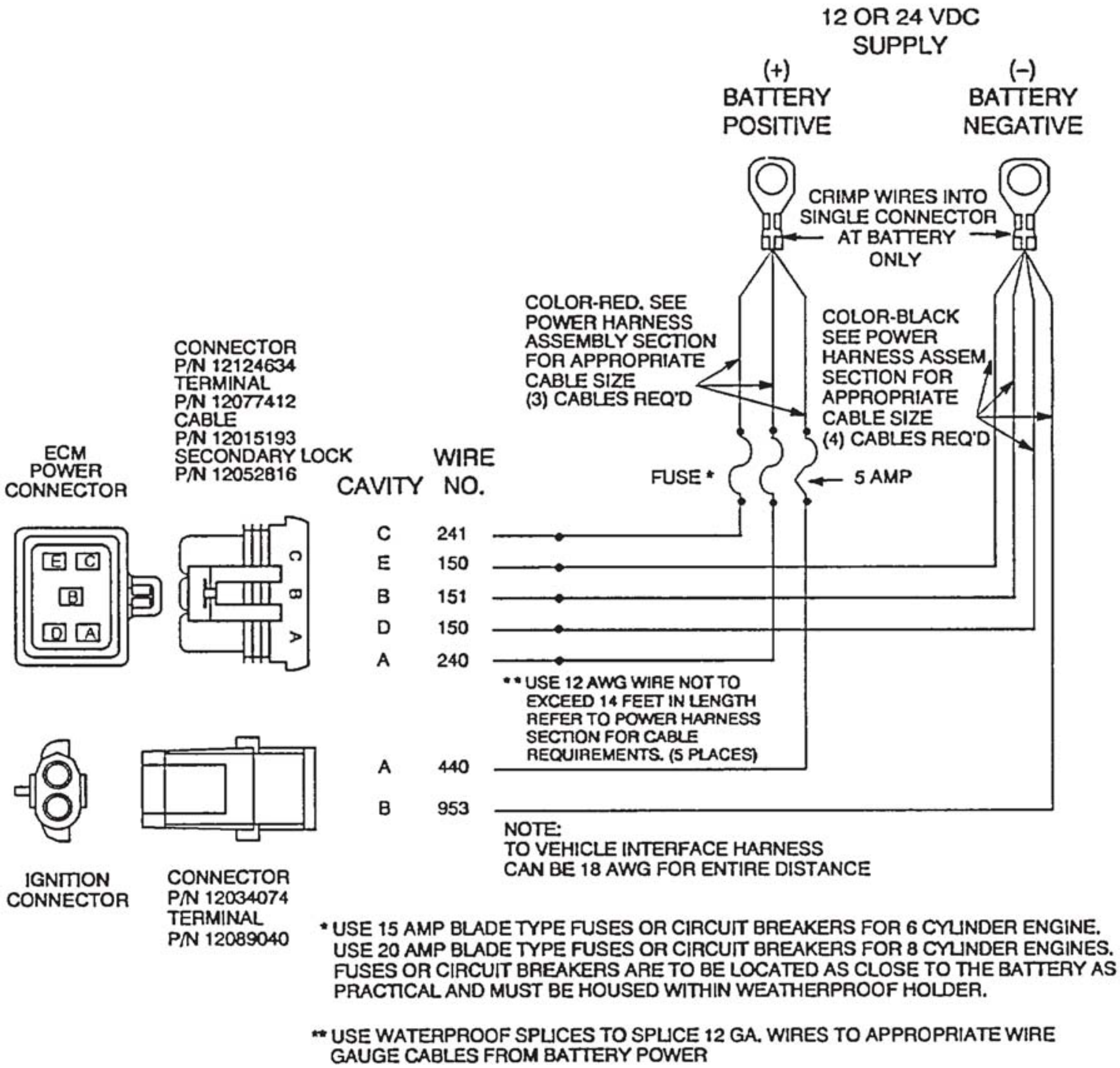


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-12 Check for Good SRS Signal		
• Select engine data list on DDR. • Crank engine while observing DDR display of "SRS RECEIVED". (NOTE: Battery voltage surges while cranking with electric starters may blank out or reset DDR.) while cranking.	Display reads SRS RECEIVED while cranking.	Go to C2-14. Yes.
	Display reads SRS RECEIVED	Go to C2-13. No.
C 2-13 Check SRS		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets S1 and S2 at the engine harness connector.	Between 100 and 200 ohms, on a non Series 60 engine.	Go to C2-8.
	Between 100, and 200 ohms, on a Series 60 engine.	Go to C2-9.
	Less than 100 ohms.	Go to 41-2, page 3-345.313.
	Greater than 200 ohms.	Go to 41-2, page 3-345.313.
C 2-14 Check If Injector Return Wires are Open		
• Turn Ignition off. • Disconnect both 5-way Injector harness connectors at the ECM. • Read resistance between the injector return pin and all the power driver pins on both harness connectors (example: G to L, and to E to A).	Less than or equal to 5 ohms for any reading.	Go to C2-15.
	Greater than 5 ohms on any reading. C2-30.	An open exists in one of the injector power driver or return wires. Repair open. Then go

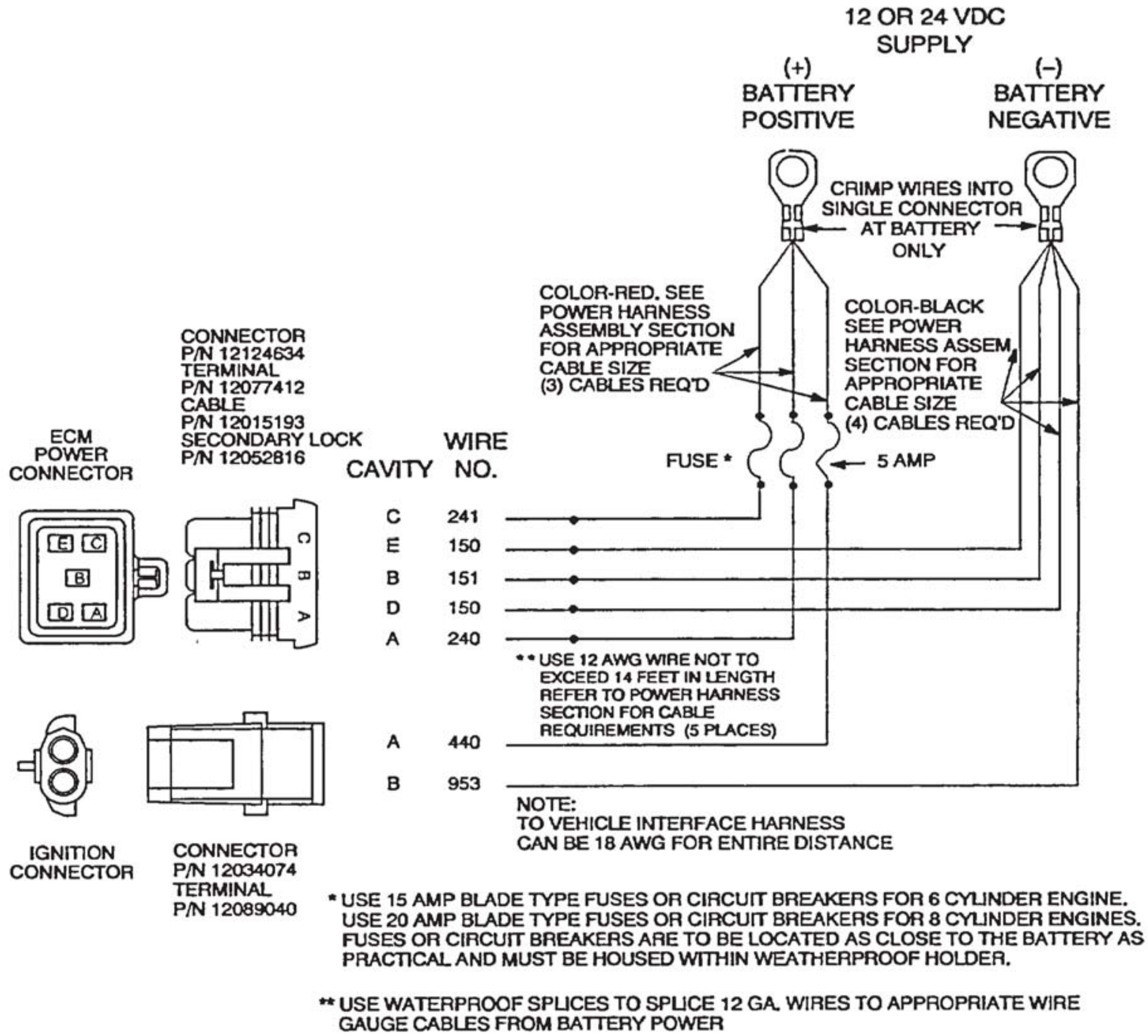


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-15 Check if Injector Drive or Return Lines are Shorted to Ground		
• Disconnect the 5-way power harness connector at the ECM. • Read resistance between socket D of the 5-way, power harness connector to the following sockets on the injector harness connectors: A, B, C, D, E, G, H, J, K, and L. to C2-30.	Greater than or equal to 10,000 ohms or open on all readings. → Less than 10,000 ohms -A on any reading. ohms. Repair short. Then go →	Go to C2-16. short to ground on wire where resistance was less than 10,000
C 2-16 Injector Drive Pulses		
• Turn ignition off. • Reconnect all ECM connectors. • Remove rocket arm cover (s). • Disconnect return wire from one injector (return wire #619 or #620). • Place a 6 Volt test light across the injector return side (where wire was just removed) and a good ground. • Crank engine and note both the test light and whether start of plunger motion coincides with light. • Reconnect the return wire. • Repeat the above procedure with all other injectors until all have been tested or until one test fails (no light or light and start of plunger motion don't coincide).	All tests pass. → to be in the DDEC system. Refer to the engine Service Manual for other possible causes of a no-start condition. Light not flashing for one or more tests. → Light and start of plunger motion don't coincide. → or assembly/installation section of this manual.	The problem does not appear Go to C2-11. Mechanical timing problem exists (may be a TRS/SRS timing adjustment). Refer to the engine Service Manual for details.
C 2-17 Check DDEC Fuses		
• Check both ECM power fuses or circuit breakers.	Blown fuse(s) , or open circuit breaker(s). → Both fuses or circuit breakers are okay. →	Go to C2-28. Go to C2-18.



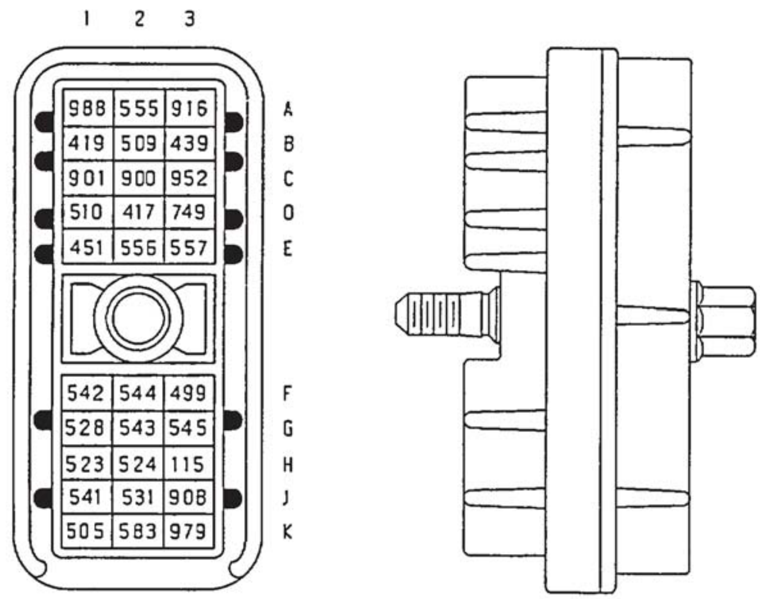
POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

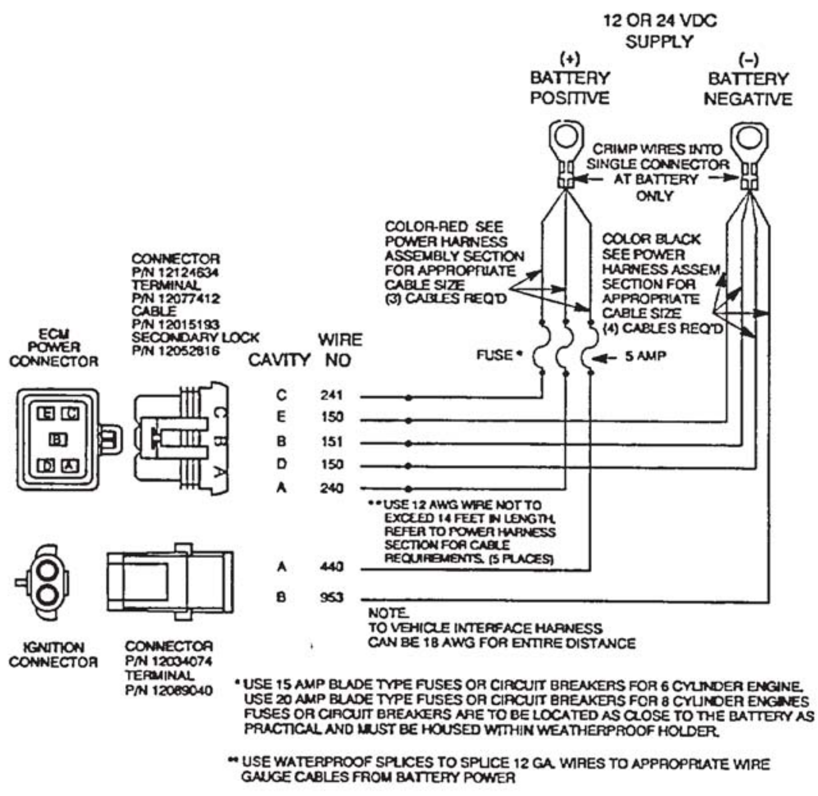
D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-18 Check for Battery Volts at the 5-way, Power Harness Connector • Turn ignition off. • Disconnect the 5-way power harness connector. • Read voltage from socket A (red lead) of 5-way power harness connector to a good ground (black lead). • Also read voltage from socket C (red lead) to a good ground (black lead).	Less than *11.5 volts on any reading. →	Go to C2-19.
	Greater than *11.5 volts on all readings. →	Go to C2-21.
C 2-19 Check if ECM Power Line(s) are Open. • Read voltage between battery side of one ECM fuse or circuit breaker (red lead) and a good ground (black lead). • Read voltage reading at the other ECM fuse or circuit breaker. (Note: battery side does not contain #240 or #241 wires.)	Less than *11.5 volts on either reading. →	Go to C2-20.
	Greater than *11.5 volts on both readings. →	An open exists in either Power (ckt#240) or (ckt#241).Repair open. Then go to C2-30.
C 2-20 Check Battery • Connect all connectors. • Turn ignition on. • Try to start engine • Read voltage at battery + terminal (red lead) to the battery - terminal (black lead).	Less than 10.0 volts.** →	Service discharged battery. (Note: If a short to ground exists anywhere in a battery + circuit, the engine will shut down again if not repaired). Voltage equalizer may be bad. Then go to C2-30.
	Greater than or equal to 10.0** volts. →	An open or short to ground exists in the Batt + line. Repair open or short to ground. Then go to C2-30.

*23 Volts on a 24V System.
**20 Volts on a 24V System.



ECM VEHICLE HARNESS CONNECTOR

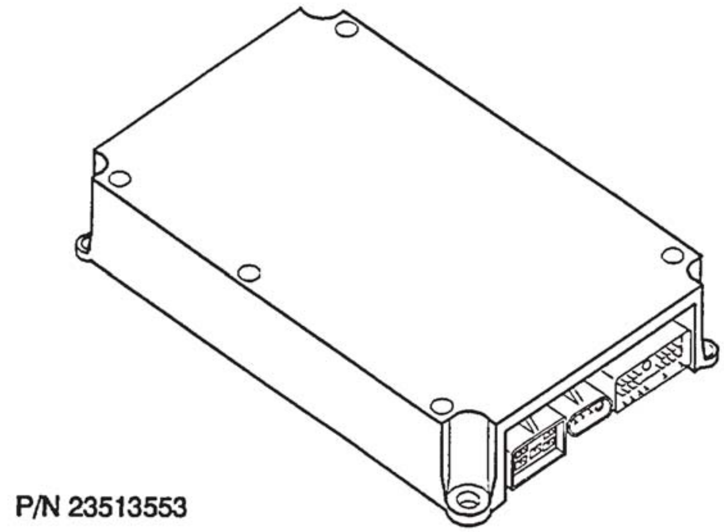


POWER HARNESS

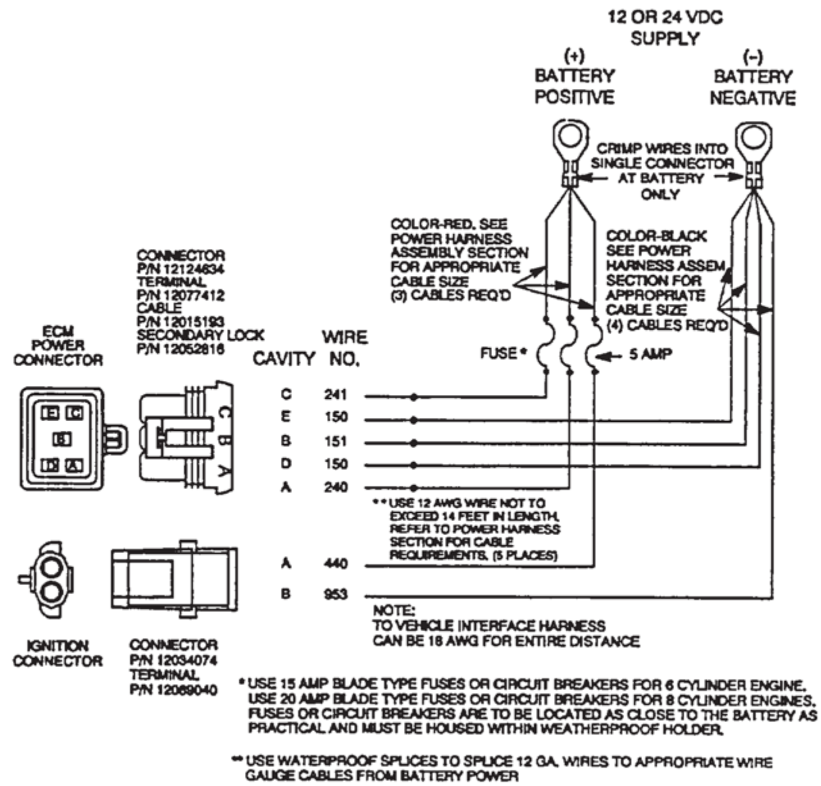
Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-21 Check for +12 or +24 Volts at Ignition Wire		
• Turn ignition off. • Disconnect vehicle harness connector at ECM. • Turn ignition on. • Read voltage between socket B3 on the vehicle harness connector (red lead) and a good ground (black lead). a 24 volt ignition.	Less than *11.5 volts (or 23 volts if using a 24 volt ignition.).	Go to C2-23.
	Greater than or equal to 11.5 volts (or 23 volts if using	Go to C2-22.
C 2-22 Check for Good Ground Wire		
• Read voltage between socket B3 on vehicle harness connector (red lead) and socket D and E on 5-way, power harness	Less than 11.5 volts (or 23 volts if using a 24 volt ignition.).	ECM ground wire (ckt#150 is open or has a poor connection. Repair open or poor connection Then go to C2-30.
	Greater than or equal to 11.5 volts (or 23 volts if using a 24 volt ignition).	Go to C2-11.
C 2-23 Check if Ignition Fuse or Circuit Breaker is Okay		
• Turn ignition off. • Check 5 Amp ignition fuse or circuit breaker.	Fuse or circuit breaker is okay.	Go to C2-24.
	Fuse blown or circuit breaker open.	Go to C2-25.



THE ELECTRONIC CONTROL MODULE - DDEC III

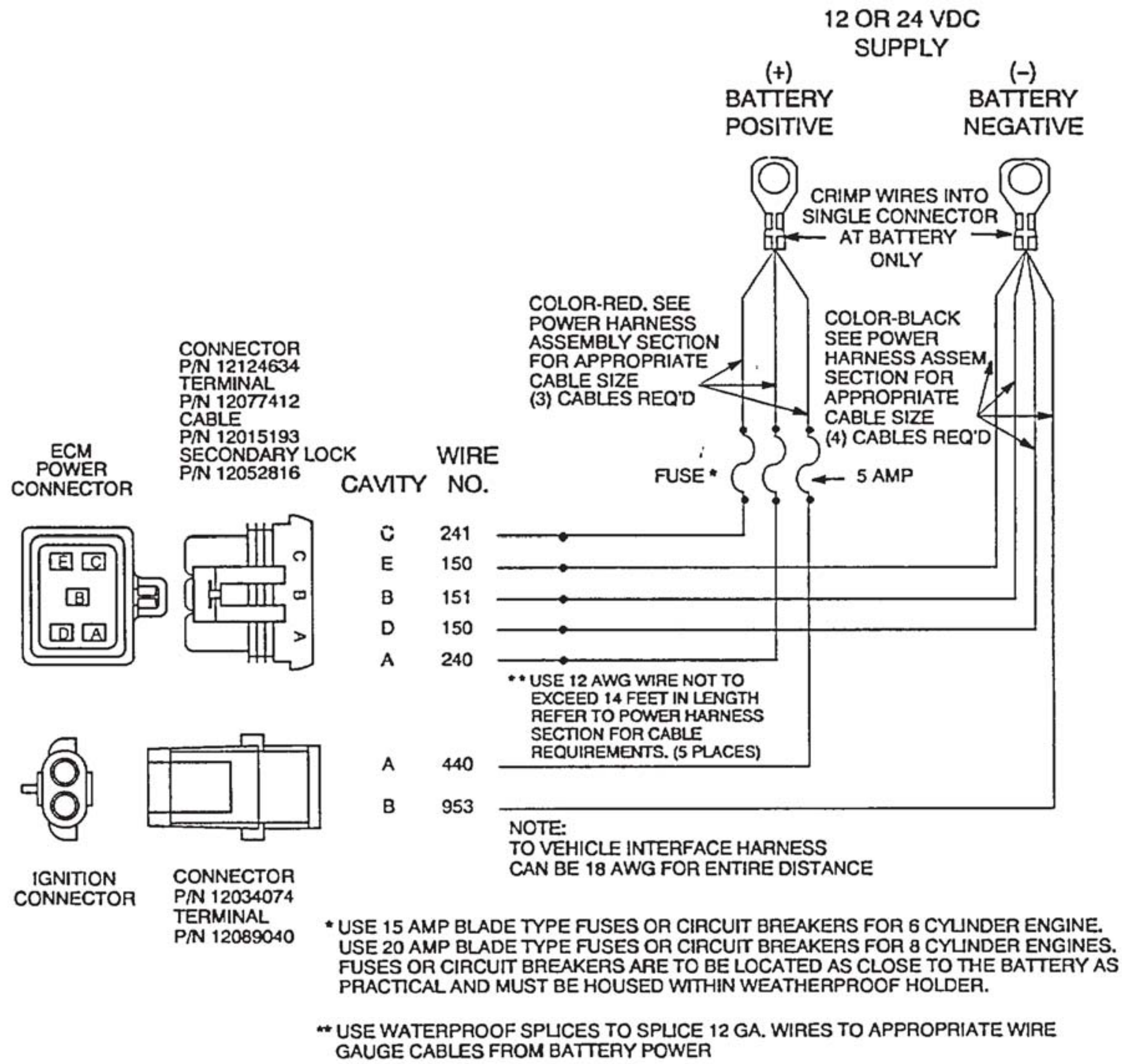


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

D. CHART –2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-24 Check if Ignition Wire (Circuit #2) is Open		
• Read voltage between battery side (hot side) of the 5 Amp ignition fuse or circuit breaker (red lead) and a good ground (black lead).	Less than 11.5 volts (or 23 volts if using a 24 volts ignition).	Go to C2-27.
	Greater than or equal to 11.5 volts (or 23 volts if using a 24 volt ignition).	Ignition line (ckt#3 or #439) is open. Repair open. Then go to C2-30.
C 2-25 Check if Ignition Wire is Shorted to Ground		
• Replace blown fuse or reset open circuit breaker. • Turn ignition on for at least 10 seconds. • Turn ignition off. • Check 5 Amp ignition fuse or circuit breaker again.	Fuse or circuit breaker is still okay.	Co to C2-26.
	Fuse blown or circuit breaker open. Then go to C2-30.	Ignition line (ckt#439) is shorted to ground. Repair short.
C 2-26 Check If Ignition Fuse or Circuit Breaker Is Okay		
• Reconnect all harness connectors at ECM. • Attempt to start • If engine starts, run engine for at least one minute. • Turn ignition off. • Check 5 Amp ignition fuse or circuit breaker.	Fuse or circuit breaker is still okay.	No short is currently present. (Warning: if there is an intermittent short, engine will shut down again if not repaired. Also note: fuse/circuit breaker may have blown due to temporary reverse voltage at the battery). Go to C2-30.
	Fuse blown or circuit breaker open.	Go to C2-11.



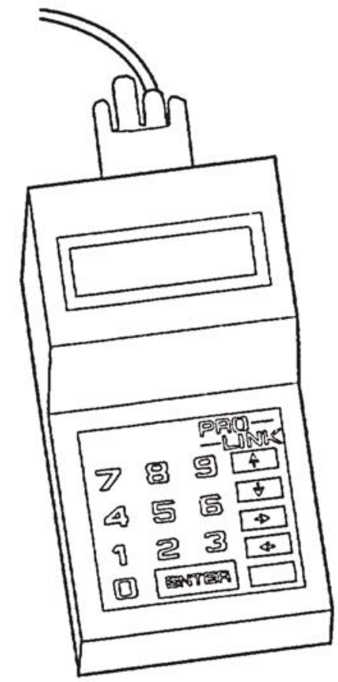
POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-27 Check Battery		
• Disconnect battery cables at battery. +11.5 volts. • Read voltage at battery + terminal (red lead) to battery - terminal (black lead).	Less than →	Service discharged battery. (Note: if a short to ground exists anywhere in battery + circuit, this vehicle will shut down again If not repaired). Then go to C2-30.
	Greater than or equal to *11.5 volts. →	An open or short to ground exists in unfused ignition line (ckt #2). Repair open or short to ground. Then go to C2-30.
C 2-28 Check if Fuses Blow Again		
• Turn ignition off. • Disconnect the 5-way power harness connector at ECM. • Replace blown fuse(s) or reset circuit breaker(s). • Wait 10 seconds. • Check If fuse(s) or circuit breaker(s) has blown or opened up again.	Fuses(s) or circuit breaker(s) are still okay. →	Go to C2-26.
	Fuse(s) or circuit breaker(s) are blown or open again. →	Go to C2-29.
C 2-29 Check for Short to Ground in Wiring		
Read resistance between (circuit #240) and a good ground. • Read resistance between (circuit #241) and a good ground.	Greater than or equal to 10,000 ohms or open on all readings. →	Go to C2-11.
	Less than 10,000 ohms on any reading. →	Short to ground exists. Repair short(s). Then go to C2-30.

*23 volts on a 24 volt system.

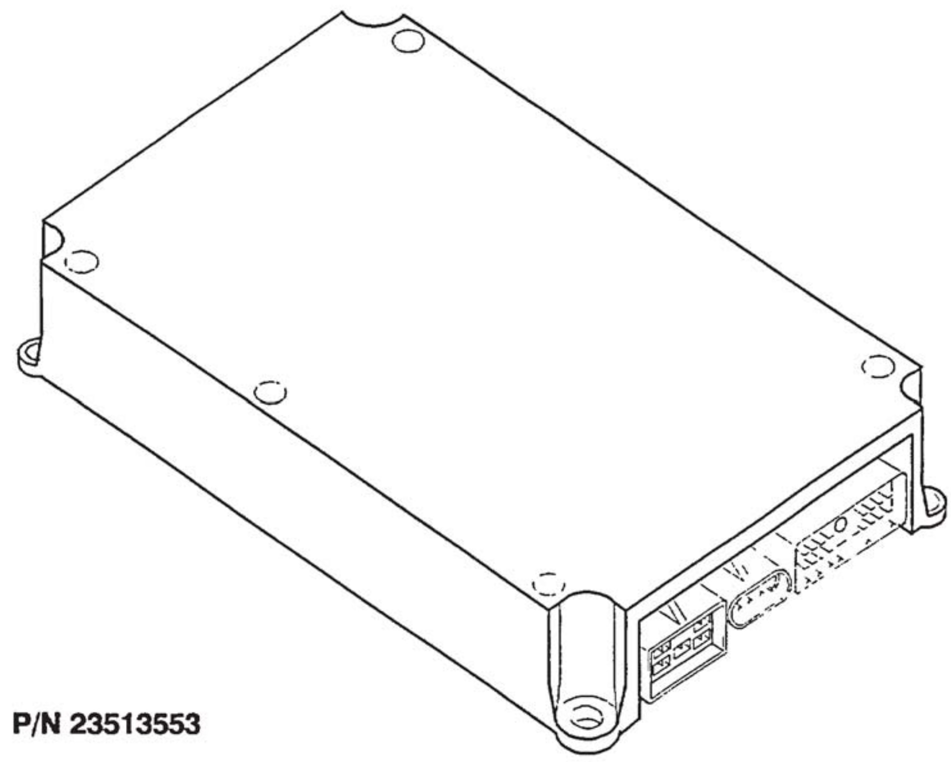


Pro-Link 9000

Section 4
TROUBLESHOOTING CHARTS

D. CHART -2 - ENGINE CRANKS BUT WILL NOT START (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 2-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" Light. • If "Check Engine" Light does not stay on, start engine and run for 1 minute or until "Check Engine: Light comes on. Stop engine. • Read inactive codes.	Engine will not start.	All system diagnostics are complete. Please review this section from the first step to find error.
	Engine starts and DDR reads (No codes).	Repairs are complete.
	Engine starts codes appear.	G-o to START-1, pg 3-345.41 to service codes.
C 2-31 Check Fuel Filters		
• Turn ignition off. • Check primary and secondary fuel filters to be sure they are not clogged and that they are full of clean fuel.	Clogged filter(s). system, if required. Then go to C2-30.	Replace filter(s). Prime
	Clean filters and no air in filters.	Go to C2-6.



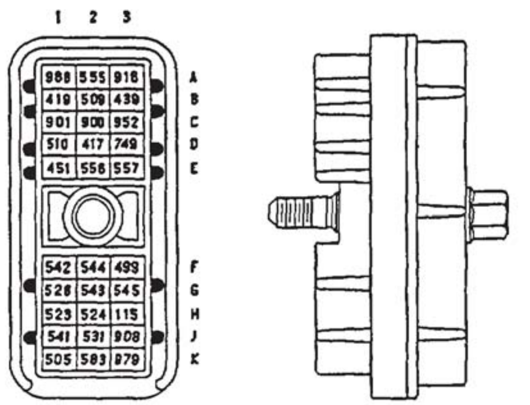
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART -3 - ERRATIC PERFORMANCE AND NO CODES

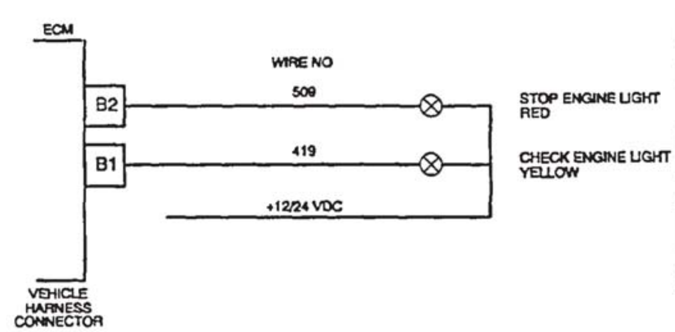
This is a helpful hints chart. It assumes that you have received no codes, made all the basic mechanical checks first, could not find the problem, and suspect the DDEC III system to be at fault. Based on the particular symptom here's what to look for:

SYMPTOM	WHAT TO LOOK FOR
• Can't get full power	Plugged fuel filters. Hose not connected to Turbo Boost Sensor (TBS). Verify injector calibration(s) are correct.
1. Can't get full throttle.	Miscalibrated Throttle Position Sensor (TPS). See Step 21-4 for TPS adjustment page 3-345.231.
2. Runs rough, misses and/or occasionally stalls.	Proper gapping of Timing Reference & Synchronous Reference Sensors (SRS and TRS). See Step C2-8 or C2-9 on how to check this. • Check for Fuel Leaks. • Loose battery power (ckt #240 or #241) ignition (ckt #439) or ground (ckt #150) wires. • Check power contribution from each cylinder using cylinder cut-out feature described in Diagnostic Data Reader (DDR) instruction manual. • Check pulse wheel: missing teeth, damaged or loose. • Check for signs of insulation wear on injector harnesses.
3. Engine idles high (after warm-up) or hangs	• Check calibration of Throttle Position Sensor (TPS) using procedure in Step 21-4 .(page 3-345.231). You may have a TPS, linkage or pedal problem. • Check PTOSA signal line (ckt #510) for short to voltage source.
4. Low road speed.	Determine road speed specifications for vehicle manufacturer data. If road speed is less than specified and all mechanical (driveline, speedometer) checks are correct, then cruise control calibration is suspect. This portion of the calibration can be reprogrammed using (calibration configuration) on Diagnostic Data Reader (DDR). Refer to DDR Instruction Manual for details.

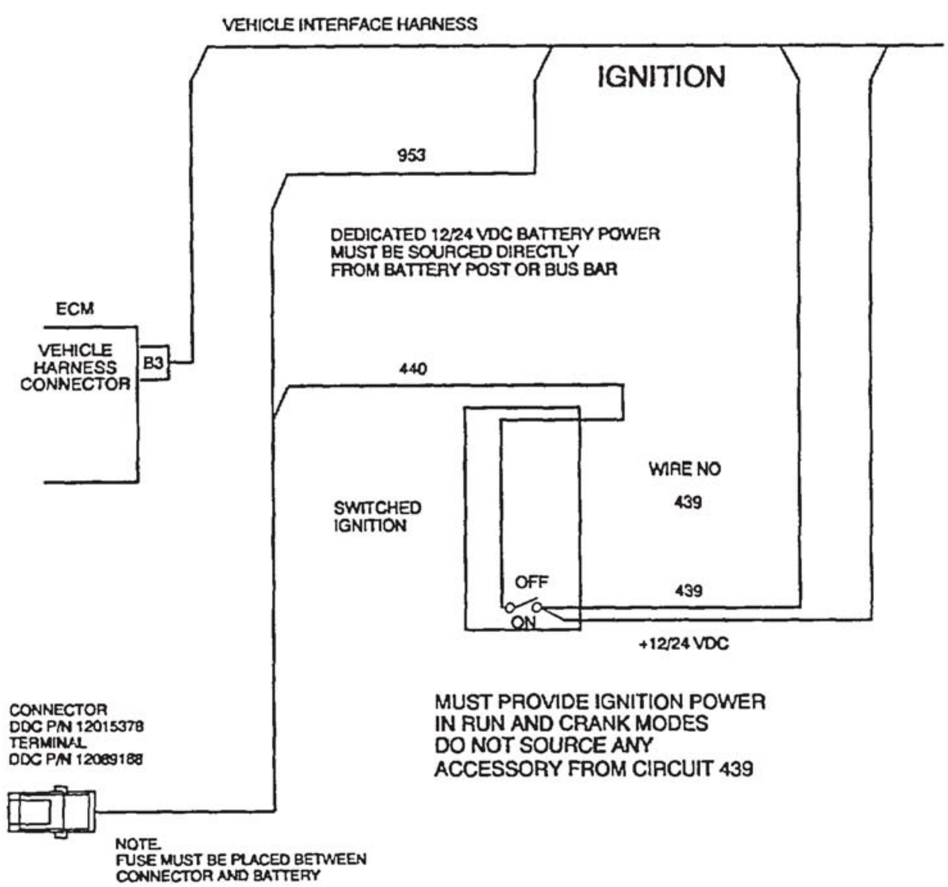


ECM VEHICLE HARNESS CONNECTOR

INSTRUMENT PANEL



STOP AND CHECK ENGINE LIGHT CIRCUITS



IGITON CIRCUIT

Section 4
TROUBLESHOOTING CHARTS

D. CHART -4 · NO "CHECK ENGINE" LIGHT DURING BULB CHECK OR CANNOT CLEAR CODES

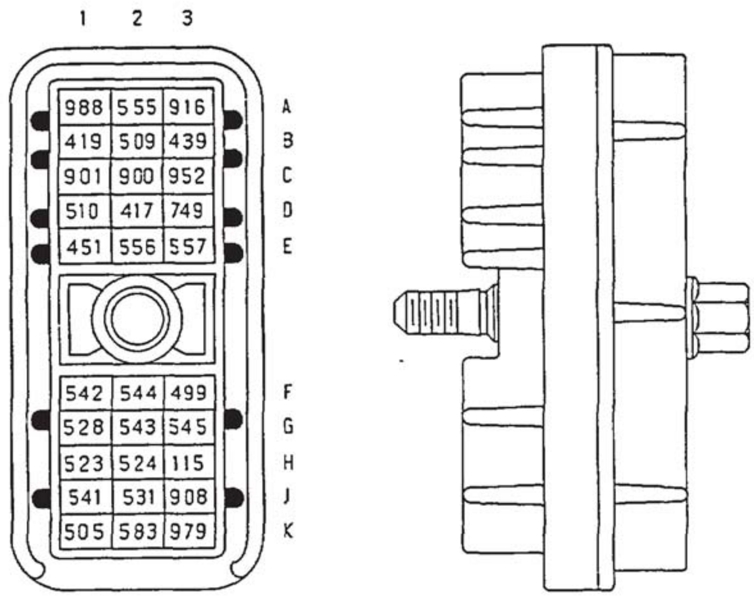
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

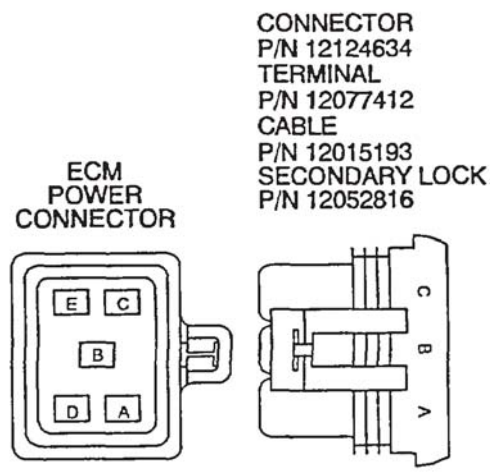
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 4-1 Try to Force CEL On		
• Plug in DDR. • Turn ignition on. • Select activate ECM outputs. • Activate Check Engine Light. light is still on.	"Check Engine" light is still off.	Go to C4-2.
	"Check Engine"	Go to C4-4.
C 4-2 Check for Ignition		
• Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead) with the ignition on and engine off.	Less than *10.0 volts	The 5 Amp, ignition fuse (or circuit breaker) is blown and/or ignition wires are open or shorted to ground, and/or the ignition line (ckt #439) is shorted to ground or is not wired to switch ignition source (See note below). Repair Problem. Then go to C4-30.
	Greater than or equal to *10.0 volts.	Go to C4-3.
C 4-3 CEL Drive line and Bulb Check		
• Turn ignition off. • Remove CEL bulb and check whether it's burned out or otherwise damaged.	Bulb is okay. Repair open. Then go to C4-30.	CEL Driver line (ckt #419) or ground line (ckt #150) is open.
	Bulb is not okay.	Replace bulb. Then go to C4-30.

*NOTE: Inactive codes will not clear and engine hours/fuel consumption values will not update if main ECM power (circuits #240 and #241) is switched off with or before ignition.

*20 volts for 24 volt system.



ECM VEHICLE HARNESS CONNECTOR



CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

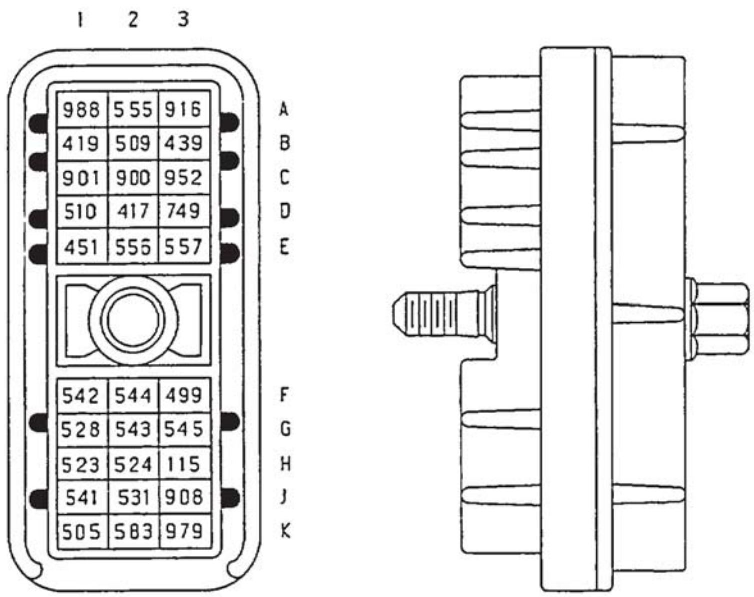
Section 4
TROUBLESHOOTING CHARTS

D. CHART 4 - NO "CHECK ENGINE" LIGHT DURING BULB CHECK OR CANNOT CLEAR CODES (Cont'd)

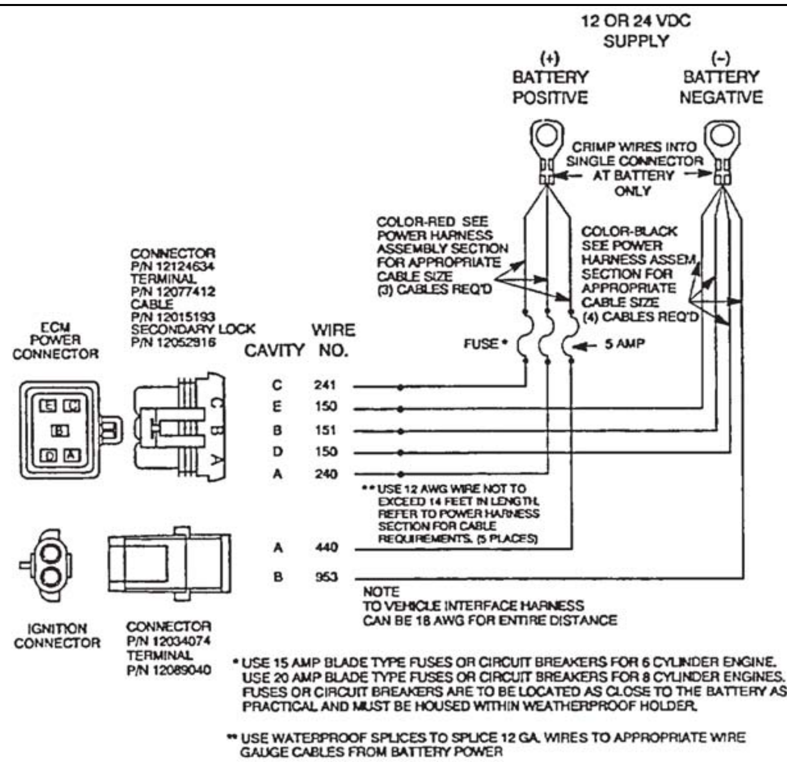
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 4-4 Check for Open		
Remove jumper wire. With ignition on, read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead).	Less than 10.0 volts. (12V system) 20.0 volts (24V system). →	The ignition line (ckt #439) is open. Repair open Then go to C4-30.
	Greater than or equal to 10.0 volts. (12V system) 20.0 (24V system). →	Go to C4-5.
C 4-5 Check for Bat +		
• Turn ignition off. • Disconnect the 5-way power harness connector. • Read voltage at the 5-way power harness connector. Socket A (red lead) to a good ground (black lead). • Repeat voltage readings on 5-way power harness connector, keeping the black lead to a good ground and the red lead to Socket C.	Less than +10.0 volts on any reading →	Either one of the 20 Amp ECM fuses (or circuit breadkers) Is blown and/or the Battery Power line (s) (ckt #240 or #241) has an open or short to ground. Check that the battery power (Circuits #240 and #241) are not switched off when the ignition Is turned off (See note below). Repair problem. Then go to C4-30.
	Greater than or equal to *10.0 volts on readings. →	Go to C4-6.

***NOTE:** Engine update information may not update if main ECM power (circuits #240 and #241) is switched off with/or before ignition.

*20 volts for 24 volt system.



ECM VEHICLE HARNESS CONNECTOR



POWER HARNESS

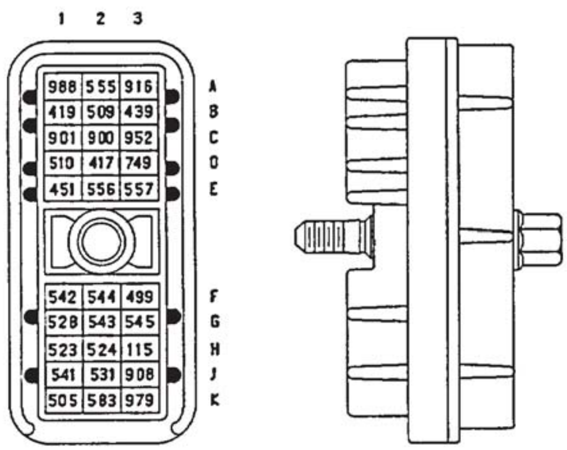
Section 4
TROUBLESHOOTING CHARTS

D. CHART 4 · NO "CHECK ENGINE" LIGHT DURING BULB CHECK OR CANNOT CLEAR CODES (Cont'd)

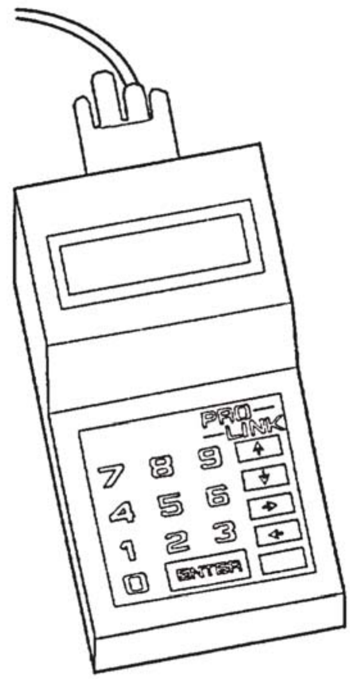
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 4-6 Check for Open		
• Move black lead of voltmeter to socket D (of the 5-way power connector). • Read voltage using red lead at sockets A and C of the 5-way power harness connector. • Move black lead of voltmeter to socket E of the 5-way power harness connector. • Again read voltage at sockets A, and C of the 5-way power harness connector. • Move black lead to socket B of 5-way. Check voltage at A and C.	Less than *10.0 volts on any reading. →	Ground line(s) (ckt #150 or 151) has an open. Repair open. Then go to C4-30.
	Greater than or equal to *10.0 volts on all readings. →	Go to C4-7.
C 4-7 Check ECM Connectors		
• Check terminals at vehicle harness (especially B3 and B1) and all the terminals in the 5-way power harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM. Then go to C4-30.
	Problem found Then go to C4-30. →	Repair terminals/connectors.
C 4-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Check Engine" light. not come on at all. find the error.	"Check Engine" light comes on for up to 5 seconds, then goes out. →	Repairs are complete.
	"Check Engine" Light does →	All system diagnostics are complete. Please review this section from the first step to
	"Check Engine" Light → comes on and stays on.	Go to START-1, pg 3-345.41.

***NOTE:** Historical codes will not clear and engine hours/fuel comsumption values will not update if main ECM power (circuits #240 and #241) Is switched off with Ignition.

*20 volts for 24 volt system.

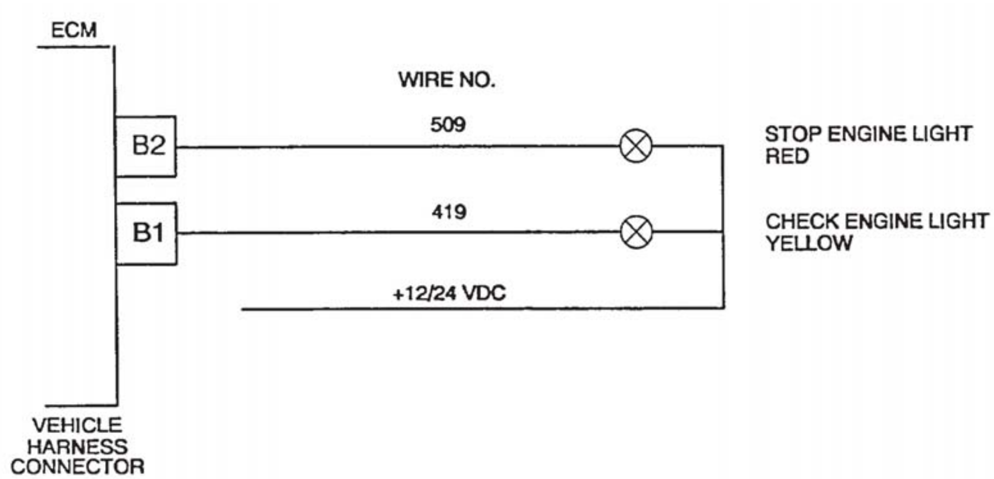


ECM VEHICLE HARNESS CONNECTOR



Pro-Link 9000

INSTRUMENT PANEL



STOP AND CHECK ENGINE LIGHT CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

D. CHART -5 - "CHECK ENGINE" LIGHT ON AND NO ACTIVE CODE ON DDR

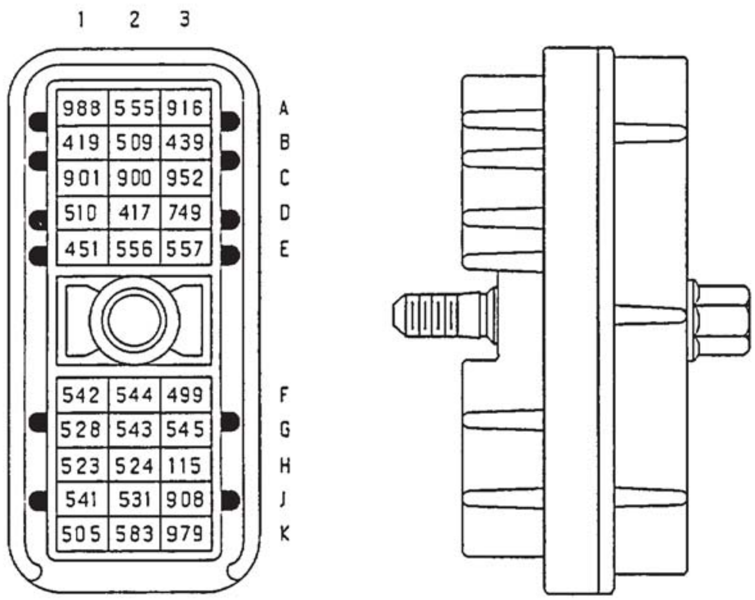
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and

2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

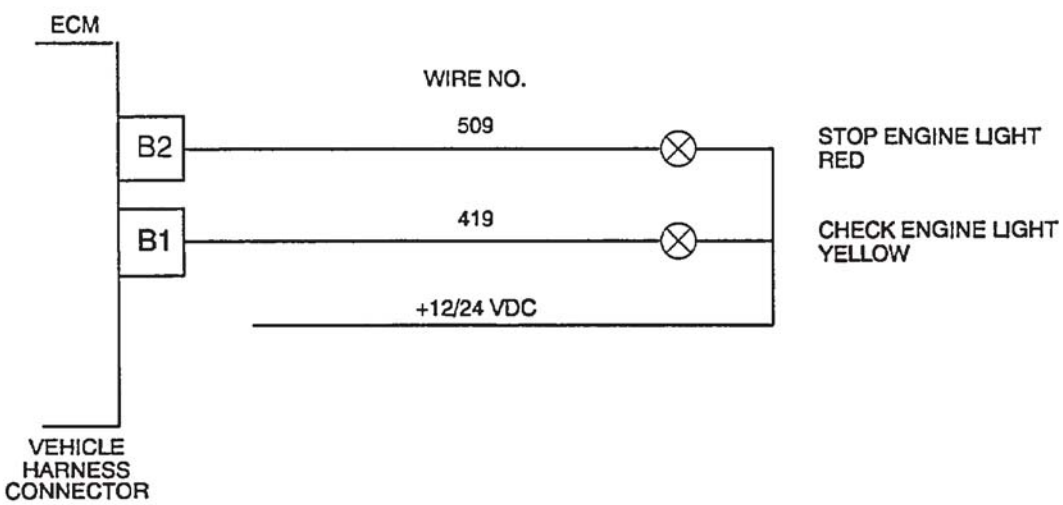
This Is a digital output function.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 5.1 Check for Short (Ckt #528)		
• Turn ignition on. Observe "Check Engine" light.	Erratic or intermittent "Check Engine" light. Then to C5-30.	Check for short to ground on Diagnostic Request (Ckt #528). Repair short.
	"Check Engine" light comes on and stays on.	Go to C5-2.
C 5.2 Check Light Status		
• Plug in DDR. • Select switch/light status.	CEL reads on.	Go to C5-4.
	CEL reads off.	Go to C5-3.
C 5.3 Check for Short (Ckt #419)		
• Turn ignition off. • Disconnect the vehicle harness connector at ECM. • Turn Ignition on (engine not running) while at same time observing "Check Engine" light.	"Check Engine" light comes on and stays on.	CEL Driver line (ckt #419) is shorted to ground. Repair short Then go to C5-30.
	"Check Engine" light stays off.	Go to C5-4.
C 5-4 Force CEL On		
• Install jumper wire between socket B1 of vehicle harness connector and a good ground. • Observe "Check Engine" light.	"Check Engine" light comes on and stays on.	Go to C5-5.
	"Check Engine" light stays off.	The ignition line (ckt #439) is not correctly wired to CEL bulb. See if bulb has been wired into ignition line (#439) instead of the proper #419 wire. Correct problem. Then go to C5-30.



ECM VEHICLE HARNESS CONNECTOR

INSTRUMENT PANEL

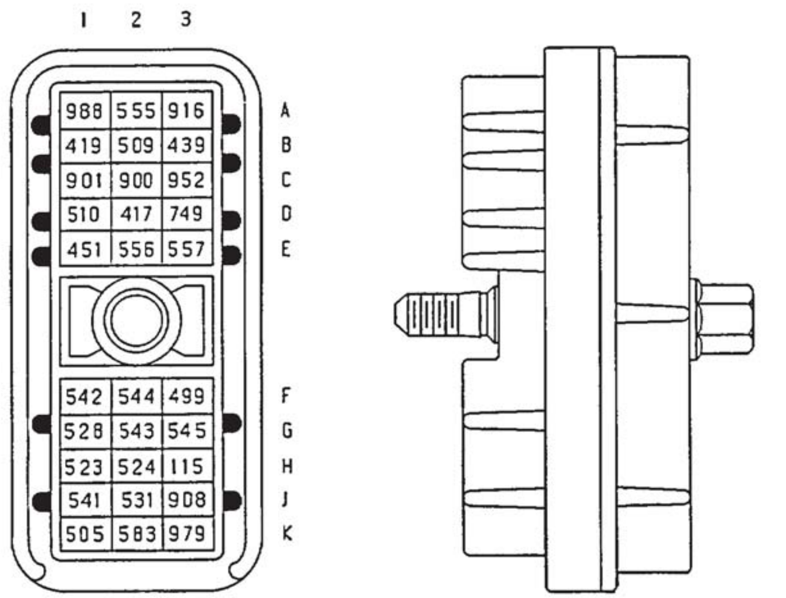


STOP AND CHECK ENGINE LIGHT CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

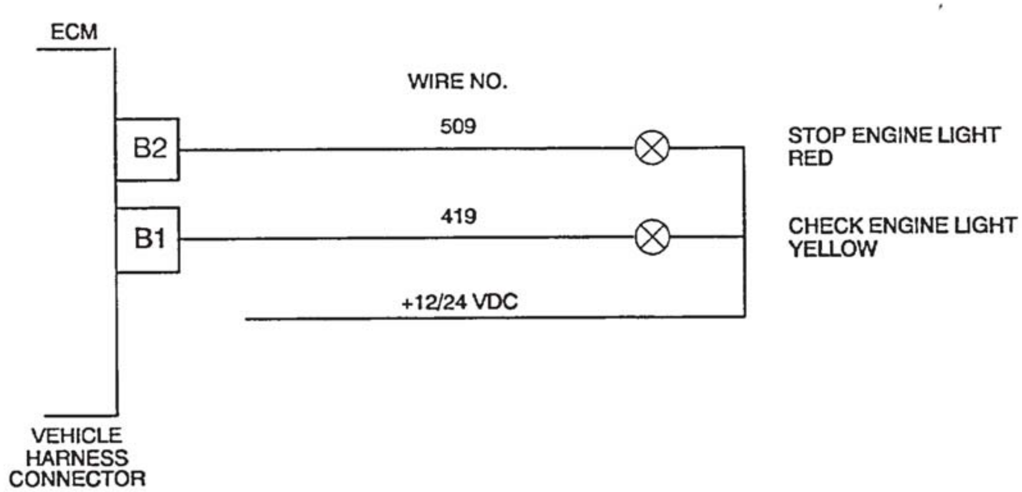
D. CHART 5 CHECK ENGINE" LIGHT ON AND NO ACTIVE CODE ON DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 5-5 Check ECM Connectors		
• Turn ignition off. • Check terminals at vehicle harness connectors (both ECM and harness side) for damage; bent, corroded and unseated pins or sockets. • Check terminals in connector to be sure B1 is wire #419 and B3 is wire #439.	Terminals and connectors are okay.	Reprogram ECM. Then to go C5-30.
	Problem found.	Repair terminals/connectors. Then go to C5-30.
C 5-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn Ignition on while at same time observing "Check Engine" light. • If "Check Engine" light stays on, read inactive code.	"Check Engine" light comes on for up to 5 seconds, then goes out.	Repairs are complete.
	"Check Engine" light does not come on at all	Go to C4-1.
	No active codes and "Check Engine" light comes on and stays on.	All system diagnostics are complete. Please review this section from first step to find
	Fault codes present.	Go to START-1, pg 3-345.41 to service other codes.



ECM VEHICLE HARNESS CONNECTOR

INSTRUMENT PANEL



STOP AND CHECK ENGINE LIGHT CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

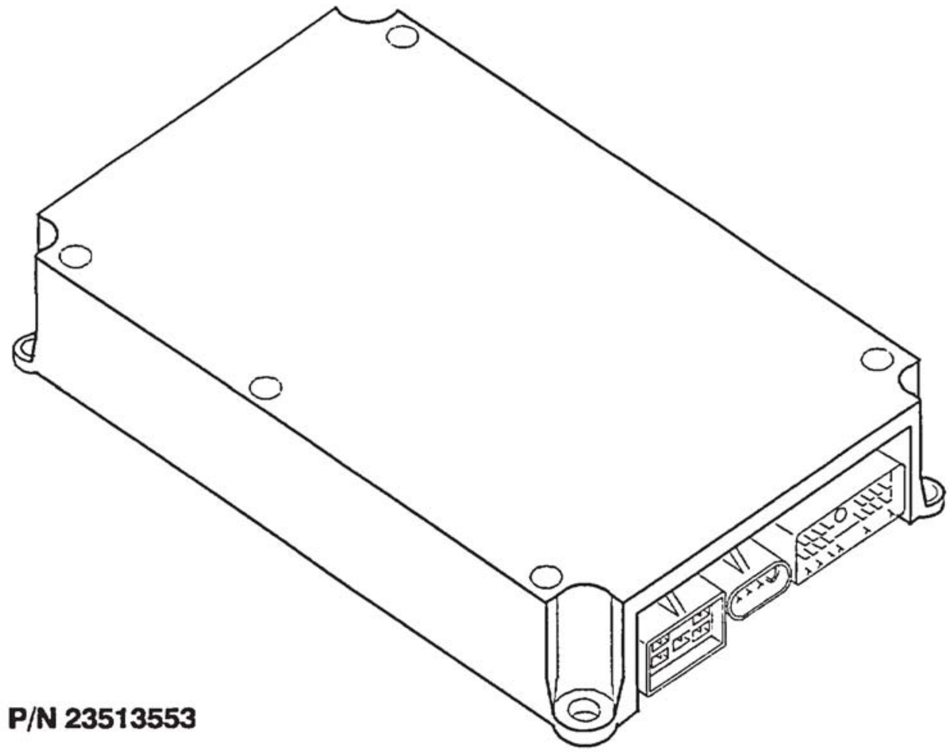
D. CHART -6 - "STOP ENGINE" LIGHT ON AND NO ACTIVE CODE ON DDR

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

This is a Digital output function.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 6-1 Determine "Stop Engine" Light Status		
• Turn ignition on (engine not running) while at the same time observing "Stop Engine" light. then goes out.	"Stop Engine" light comes on for up to 5 seconds,	This is the normal operation. Unless other problems exist, return to service.
	"Stop Engine"	Go to C6-2.
C 6-2 Light Status - DDR		
• Plug in DDR. • Select switch/light status. • Read SEL.	SEL reads on. SEL reads off.	Go to C6-4. Go to C6-3.
C 6-3 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at ECM. • Turn ignition on (engine not running while at same time observing "Stop Engine" light.	"Stop Engine"" light comes on and stays on.	Stop Engine" light driver line (ckt #509) is shorted to ground. Repair short. Then go to C6-30.
	"Check Engine" light stays off.	Go to C6-4.
C 6.4 Check ECM Connectors		
• Check terminals at vehicle harness connector (both ECM and harness side) for damage bent, corroded, and unseated pins or sockets Pay close attention to B2 and B3.	Terminals and connectors are okay.	Replace ECM, then go to C6-30.
	Problem found Then go to C8-30.	Repair terminals/connectors.

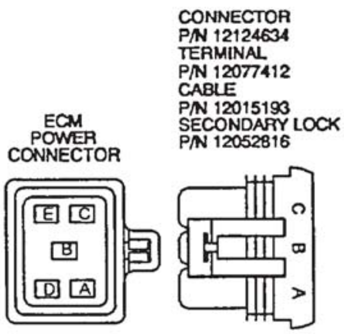


THE ELECTRONIC CONTROL MODULE - DDEC III

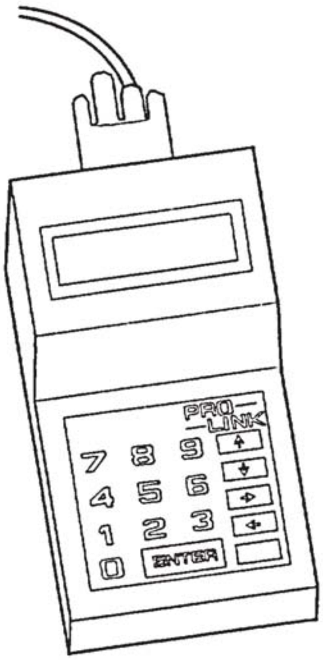
Section 4
TROUBLESHOOTING CHARTS

D. CHART 6 - "STOP ENGINE" LIGHT ON AND NO ACTIVE CODE ON DDR (Cont'd)

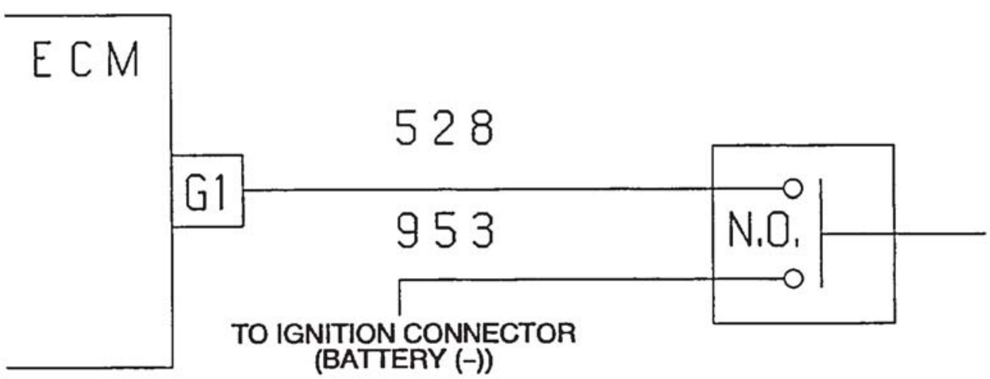
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 6-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at same time observing "Stop Engine" light.	"Stop Engine" light comes on for up to 5 seconds then goes out.	Repairs are complete.
	"Stop Engine" light come on and stays on.	All system diagnostics are complete. Please review this section from the first step to find error.



5-WAY ECM POWER CONNECTOR



Pro-Link 9000



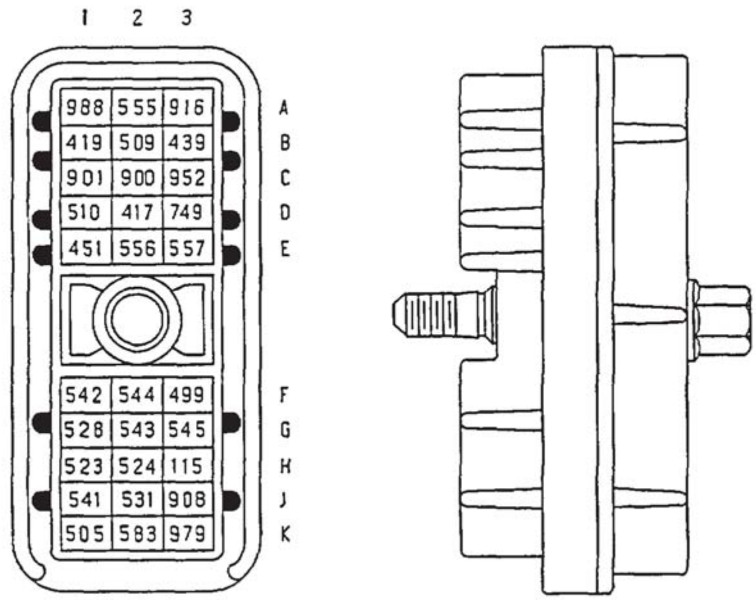
DIAGNOSTIC REQUEST SWITCH
STOP ENGINE OVERRIDE
(MOMENTARY)

Section 4
TROUBLESHOOTING CHARTS

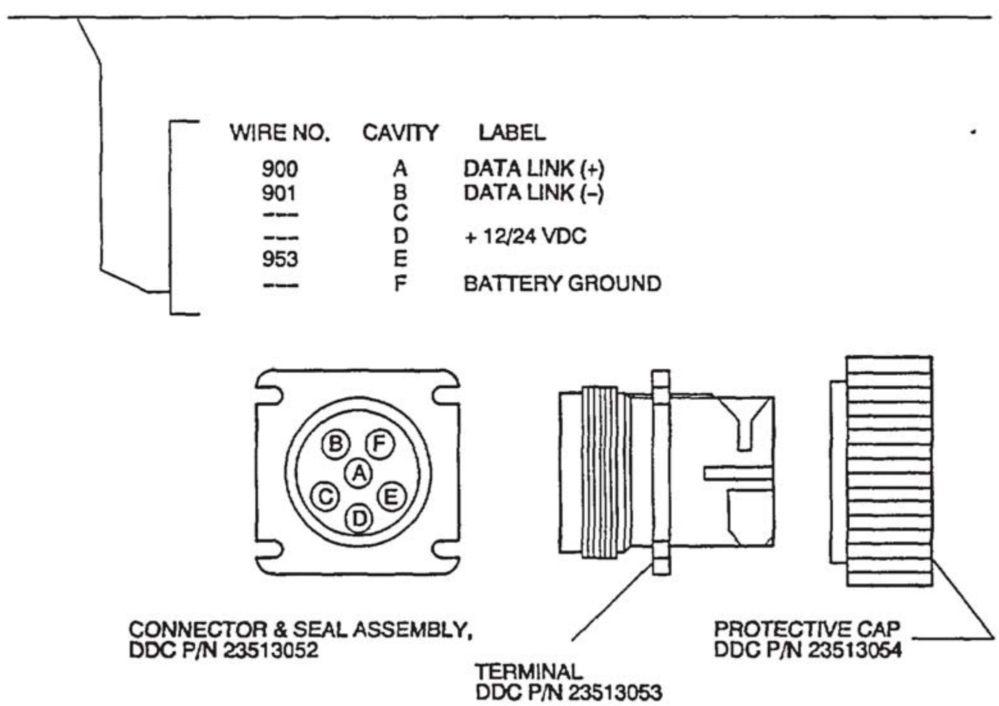
D. CHART - 7 - NO DATA TO DDR

NOTE - This chart is only to be used If:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 7-1 Read Codes on the "Check Engine"Light		
• Unplug DDR. • Ignition on. Engine not running. • Enable diagnostic request switch. • Read codes flashing out on "Check Engine" light.	Flashes out codes. →	Go to C 7-4 (note: if you wish to bypass diagnosis of a potential data line of DDR problem for now, go to CEL-3).
	Does not flash out codes. →	Go to C7-2.
C 7-2 Check Diagnostic Request Circuit		
• Ignition on. • Plug in DDR. • Select Calibration Configuration. • (ECM input switches) determine port assigned to "Diagnostic Request" (i e. G1 - #528) • Go to switch light status. • Depress and hold Diagnostic Request switch. • Read status of Diagnostic Request.	Switch reads off. →	The Diagnostic Request circuit (#528) is open or ground is poor or open. Repair open wire or bad ground. Then go to C7-30.
	Switch reads on. →	Go to C7-3.
C 7-3 Check ECM Connectors		
• Check terminals at vehicle harness and 5-way power harness connectors (both ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay. →	Replace ECM, then go to C7-30.
	Problem found. →	Repair terminals/connectors. Then go to C7-30.



ECM VEHICLE HARNESS CONNECTOR

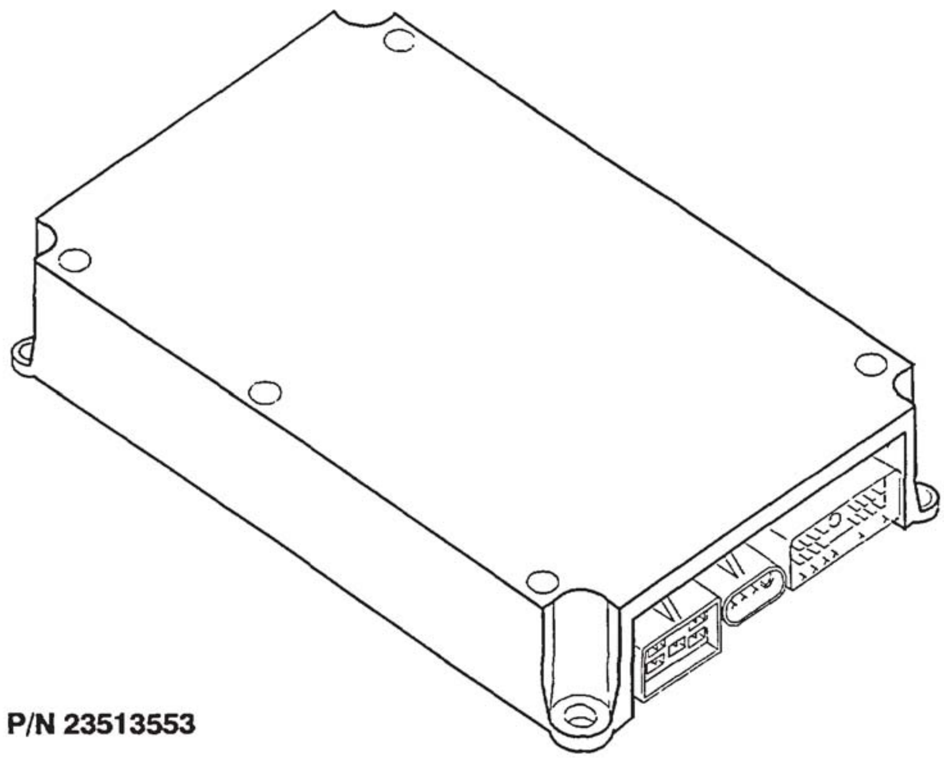


DIAGNOSTIC CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART - 7 - NO DATA TO DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 7-4 Check for Open Light		
• Turn off ignition. • Place a jumper wire across pins - A (#900) and B (#901) of DDL connector. • Unplug vehicle harness connector and measure resistance between sockets C1 and C2.	Greater than 5 ohms.	One or both data wires (ckt #900 or #901) is open. Repair open and go to C7-30.
	Less than 5 ohms.	Go to C7-5.
C 7-5 Check for Short		
• Remove jumper wire from DDL connector. • Read resistance between sockets C1 (#901) and C2 (#900) of vehicle harness connector.	Less than 5 ohms.	Two data wires are shorted together (ckt #900 and #901). Repair short and go to C7-30.
	Greater than 5 ohms.	Go to C7-6.
C 7-6 Check for Short to Ignition and Ground		
• Remove all jumpers for the DDL connector. • Measure resistance between socket A (#900) and E (ground), A (#900) and C (sw-ign), B (#901) and E (ground), and B (#901) and C (sw-ign) of DDL connector.	Less than 5 ohms on any reading.	A short exists between a data wires and ignition or ground. Repair short and go to C7-30.
	Greater than 5 ohms on any reading.	Go to C7-7.
C 7-7 Check DDR on Another Engine		
• Connect DDR to another engine and read any parameter in menu.	Works okay.	Go to C7-30.
	Does not work	DDR is probably defective. See DDR instruction manual for repair.

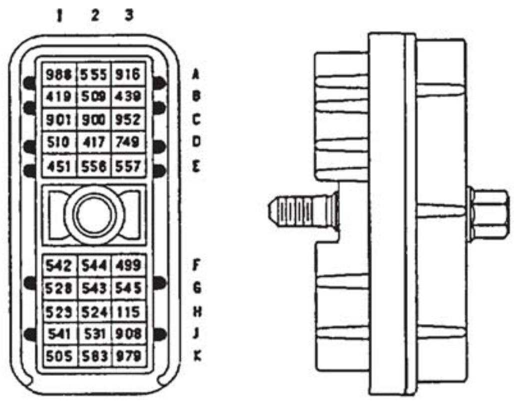


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

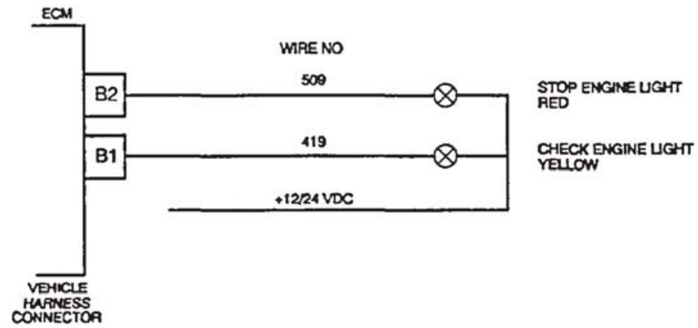
D. CHART - 7 - NO DATA TO DDR (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 7-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn Ignition on. • Clear codes. • Turn Ignition off. • Turn ignition on. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until "Check Engine" light comes on • Read inactive codes.	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK' or "DDEC SYSTEM NOT RESPONDING". Engine starts. and DDR reads (no codes). Engine starts, Stop engine.	All system diagnostics are complete. Review this section from first step to find error. Repairs are complete. Go to START-1, pg 3-345.41. and code appears.

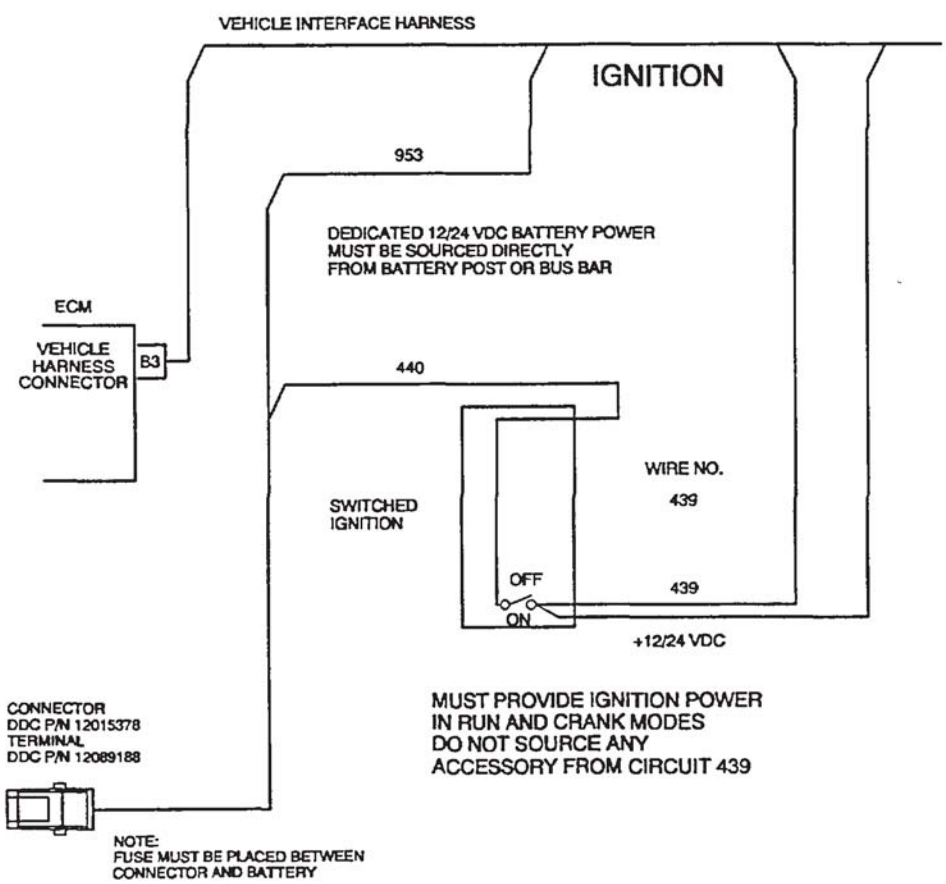


ECM VEHICLE HARNESS CONNECTOR

INSTRUMENT PANEL



STOP AND CHECK ENGINE LIGHT CIRCUITS



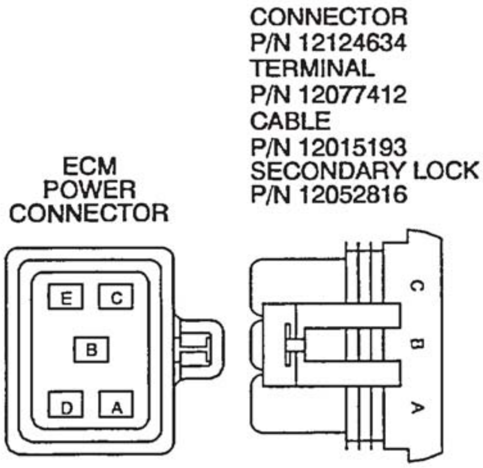
IGNITION CIRCUIT

Section 4
TROUBLESHOOTING CHARTS

D. CHART - 8 - NO “STOP ENGINE” LIGHT (SEL) DURING BULB CHECK

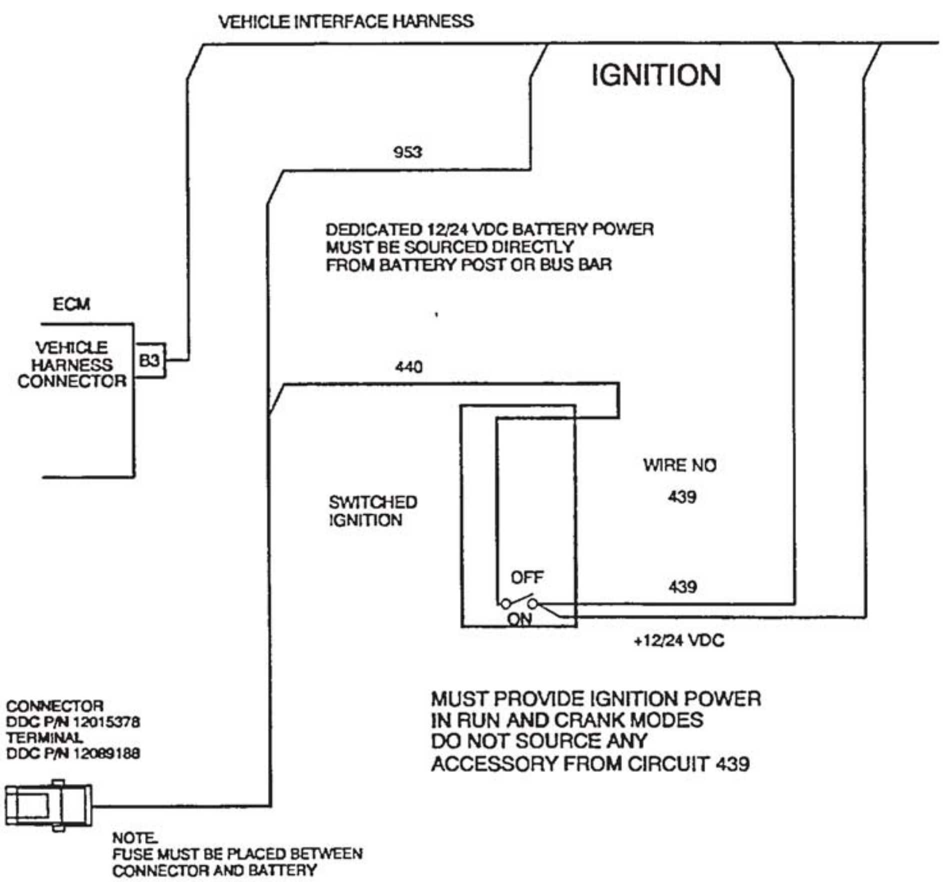
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 8-1 Try to Force SEL on		
• Plug in DDR. • Turn ignition on. • Select activate outputs • Activate SEL with DDR.	SEL is still off →	Go to C8-2
	SEL is on →	Go to C8-4.
C 8-2 Check for Short		
• Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead).	Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition). →	5 Amp ignition fuse (or circuit breaker) is blown, and/or ignition line (ckt #439) is open or shorted to ground. Repair problem. Then go to C8-30.
	Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition. →	Go to C8-3.
C 8-3 Bulb Check		
• Remove SEL bulb and check whether it's burned out or otherwise damaged.	Bulb is okay. →	SEL Driver line (ckt #509) is open. Repair open. Then go to C8-30.
	Bulb is not okay. →	Replace bulb. Then go to C8-30.



CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

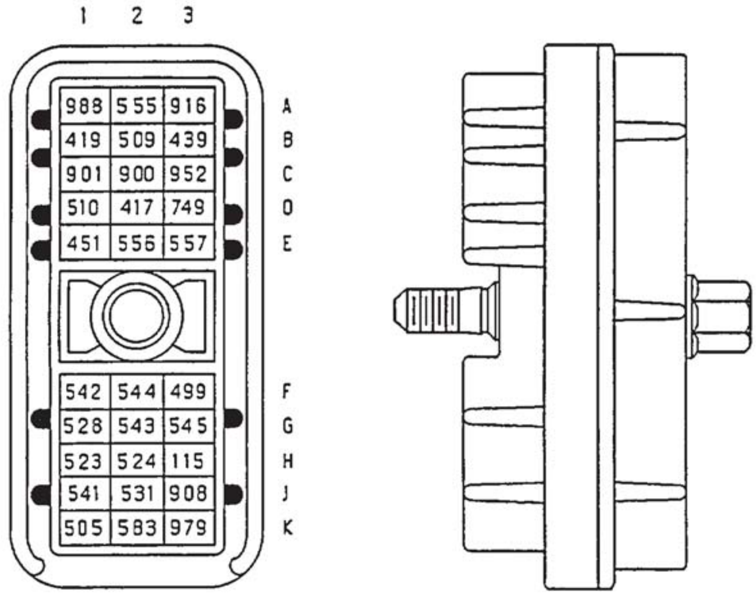


IGNITION CIRCUIT

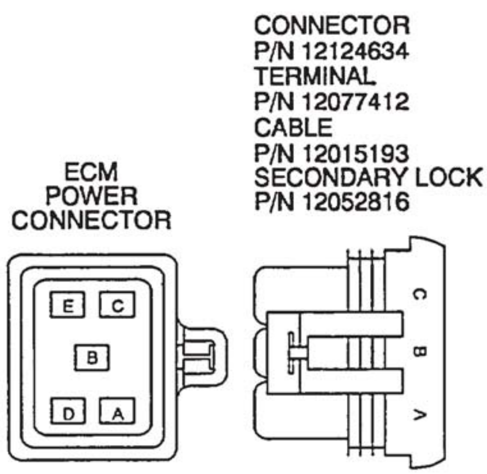
Section 4
TROUBLESHOOTING CHARTS

D. CHART - 8 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 8-4 Check for Open		
• Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead).	Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition). →	Ignition line (ckt #439) open. Repair open. Then go to C8-30.
	Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition. →	Go to C8-5.
C 8-5 Check for Battery +		
• Turn ignition off. • Disconnect 5-way power harness connector at ECM. • Read voltage on 5-way power harness connector, socket A (red lead), to a good ground (black lead). • Also read voltage on socket C (red lead) to a good ground (black lead). on both readings.	Less than 11.5 volts or 23.0 (24 volt system) on either reading. →	Either a ECM fuse (or circuit breaker) is blown, and/or Battery Power line(s) (ckt #240 or #241) has an open or short to ground Repair problem. Then go to C8-30.
	Greater than or equal to 11.5 volts or 23.0 (24 volt system) →	Go to C8-6.
C 8-6 Check for Ground		
• Read voltage on 5-way power harness connector, socket A (red lead) to socket D (black lead). • Also read voltage on 5-way power harness connector, socket C (#240) (red lead) to socket E (#150) (black lead).	Less than 11.5 volts or 23.0 (24 volt system) on either reading. →	Ground line(s) (ckt #150) has an open. Repair open. Then go to C8-30.
	Greater than or equal to 11.5 volts or 23.0 (24 volt system) on both readings. →	Go to C8-7.



ECM VEHICLE HARNESS CONNECTOR



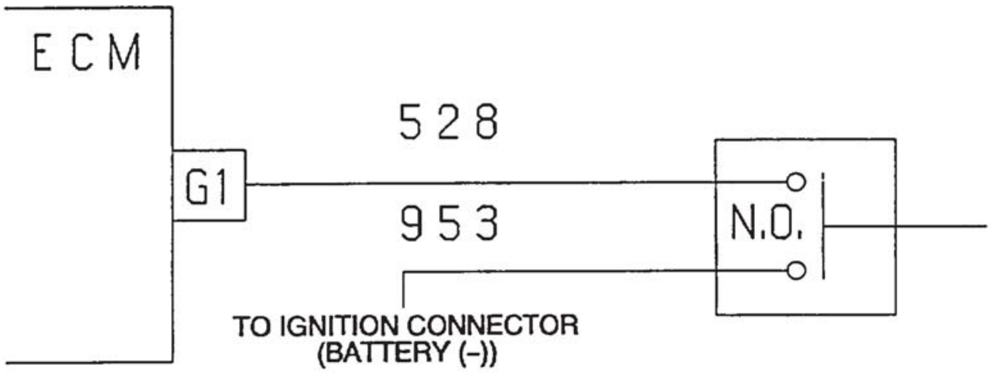
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

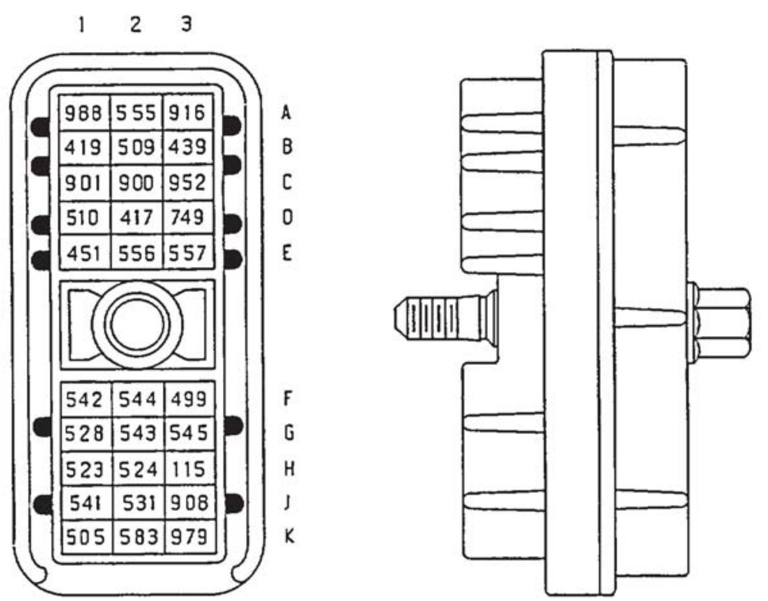
Section 4
TROUBLESHOOTING CHARTS

D. CHART - 8 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 8-7 Check ECM Connectors		
• Check terminals at both 5-way power harness and vehicle harness connectors (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Pay close attention to terminals 82 and B3 of vehicle harness connector and D and E power harness.	Terminals and connectors are okay. →	Reprogram ECM Then go to C8-30
	Problem found. →	Repair terminals/connectors. Then go to C8-30.
C 8-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at same time observing "Stop Engine" light. error.	"Stop Engine" light comes on for up to 5 seconds then goes out. →	Repairs are complete.
	"Stop Engine" light come on and stays on. →	All system diagnostics are complete. Please review this section from the first step to find



DIAGNOSTIC REQUEST SWITCH
STOP ENGINE OVERRIDE
(MOMENTARY)



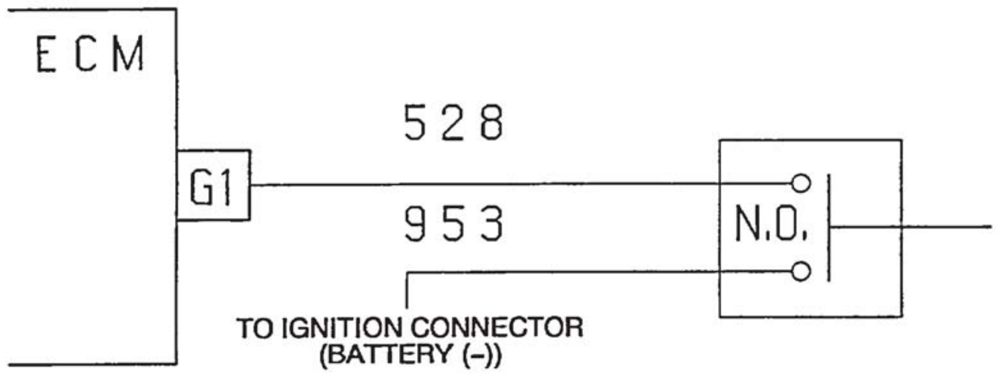
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART - 9 - DIAGNOSTIC REQUEST SWITCH INOPERATIVE

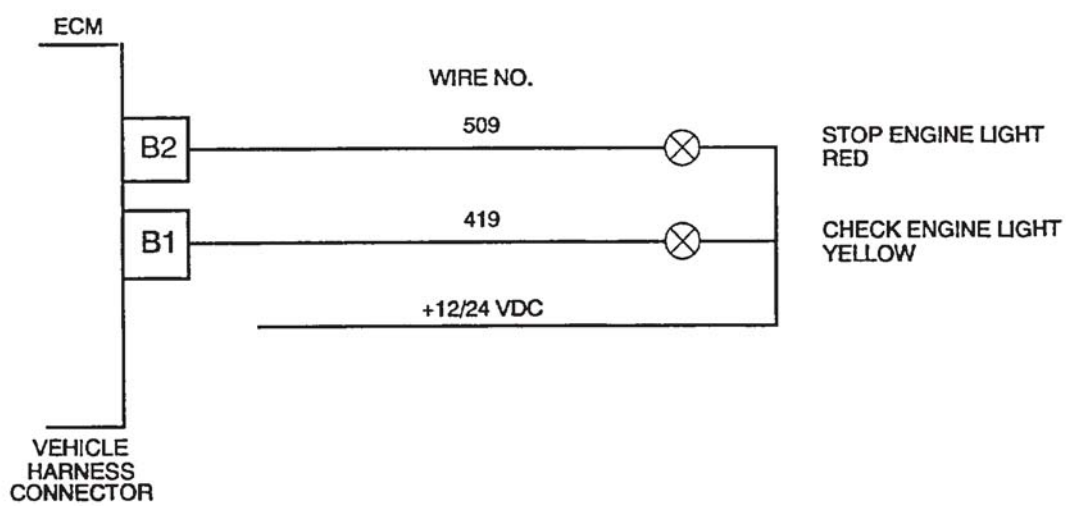
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-**III** was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 9-1 Check Diagnostic Request Circuit		
• Turn ignition on/engine not running. • Plug in DDR. • Select "Switch/Light STATUS"	Display reads "ON".	Go to C9-2.
• Depress and hold diagnostic request switch.	Display reads "OFF".	Diagnostic Request Line (#528) is open, or is not being grounded when switch is depressed. Check #528 wire and ground for diagnostic request switch. Repair problem then go to C9-30.
• Observe "Diagnostic Request" Status on DDR.	Display reads "N/A".	ECM is not configured for diagnostic request operation. Refer to Application Manual.
C 9-2 Check SEL/CEL Bulb		
• Turn ignition off. • Remove CEL and SEL Bulb, check to see if it is burned out or damaged.	Bulb is okay.	Go to C9-3.
	Bulb is not okay.	Replace bulb(s) then go to C9-30.
C 9-3 Check 12124V Ignition Line		
• Turn ignition off. • Disconnect vehicle harness connector at ECM. • Read voltage at cavity B3 (#439).	Less than 11.5V (12V system) or 23V (24V system).	5 Amp fuse (or circuit breaker) is blown and/or ignition line is open or shorted to ground.
	Greater than 11.5V (12V system) or 23V (24V system).	Ckt #419 or #509 is open. Repair open and go to C9-30.



DIAGNOSTIC REQUEST SWITCH
STOP ENGINE OVERRIDE
(MOMENTARY)

INSTRUMENT PANEL

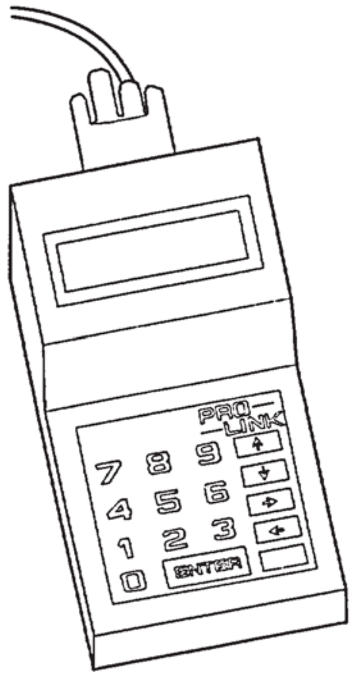


STOP AND CHECK ENGINE LIGHT CIRCUITS

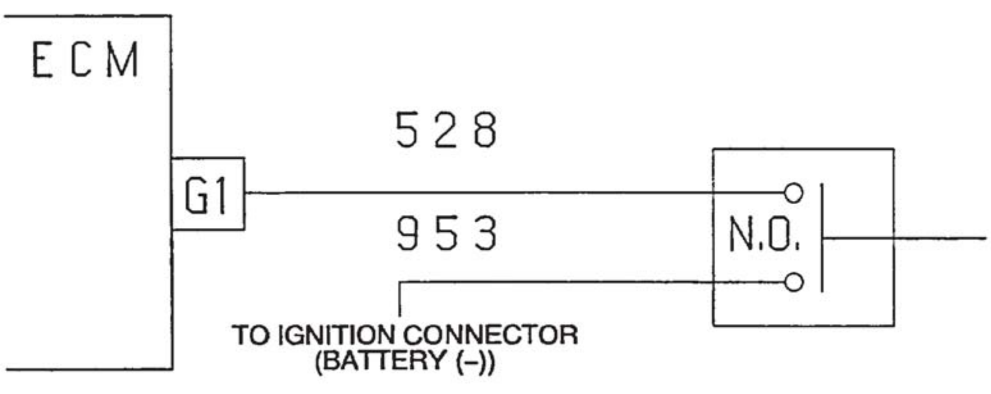
Section 4
TROUBLESHOOTING CHARTS

D. CHART - 9 - DIAGNOSTIC REQUEST SWITCH INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 9-30 Verify Repairs		
• Reconnect all connectors. • Turn ignition on. • Press diagnostic request switch.	Flashes codes (works). →	Repairs are complete If any other problems exists, go to START-1, pg 3-345.41
	Does not function. →	a All system diagnostics are complete. Please review this section to find error.



Pro-Link 9000



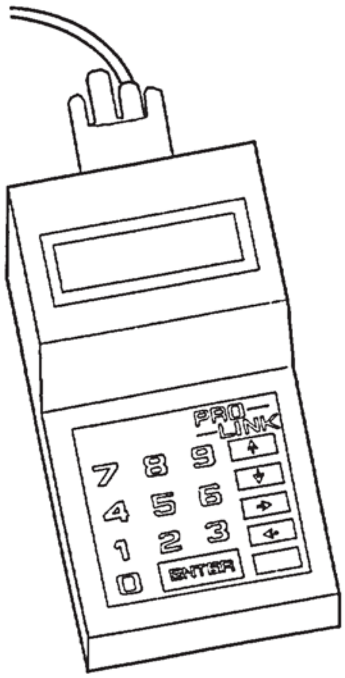
DIAGNOSTIC REQUEST SWITCH
STOP ENGINE OVERRIDE
(MOMENTARY)

Section 4
TROUBLESHOOTING CHARTS

D. CHART -10 - STOP ENGINE OVERRIDE (SEO) INOPERATIVE

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 10-1 Check SEO Circuit		
• Turn ignition on. • Plug DDR into DDL connector select switch/light status for display. • Press SEO button (or switch) while observing display for ST ENG OVR SW (Stop Engine Override Switch) on DDR.	Display reads "ON" →	Go to C10-2.
	Display reads "OFF" →	Stop Engine Override line (ckt #528) or SEO button switch is open and/or SEO switch does not properly ground SEO line when pressed. Check wiring from ECM to SEO switch battery ground. Repair problem. Then go to C10-30. If no open found, go to C10-2.
C 10-2 Check Calibration Configuration		
• Select calibration configuration and observe the SHUTDOWN displays. • Also ensure SEO is configured on Digital Input Area.	Any display reads shutdown/ramp. →	Reprogram ECM then go to C10-30.
	All displays read Warning. →	Stop engine feature is not selected. Refer to DDR instruction manual, (CALIBRATION CHANGES) for information on turning on this feature.
C 10-30 Verify Repairs		
• Turn ignition on. • Press SEO button (or switch) while observing display for ST ENG OVR SW on DDR.	Display reads "ON". →	Repairs are complete. If any other DDEC-related problems remain, go to START-1, pg 3-345.41.
	Display read "OFF". →	All system diagnostics are complete. Please review this section from first step to find error.



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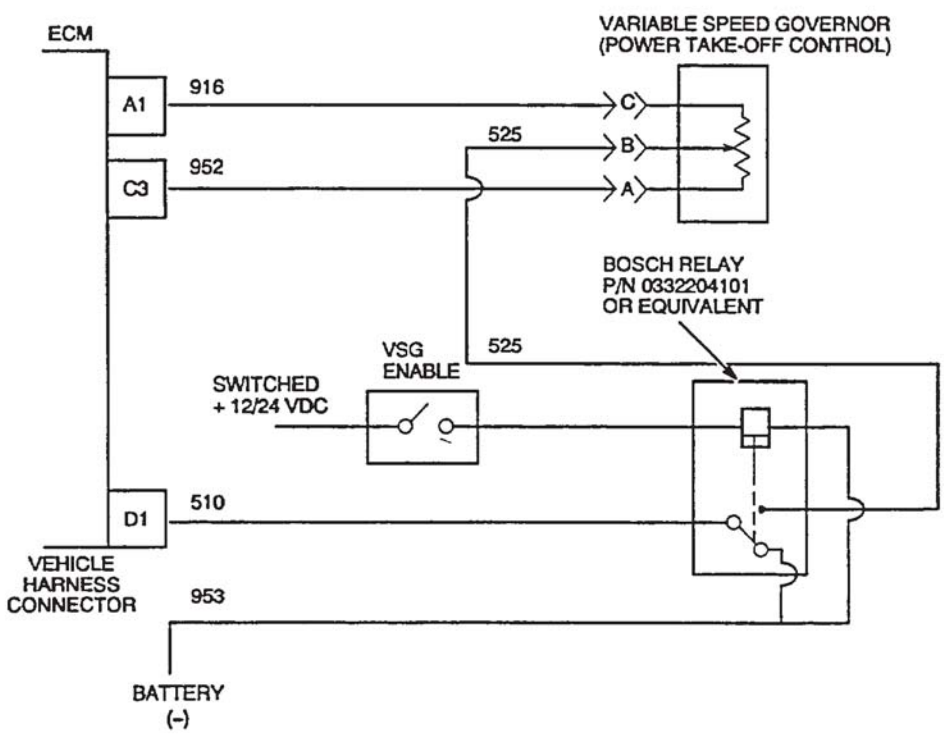


PTO (VSG) CIRCUITS

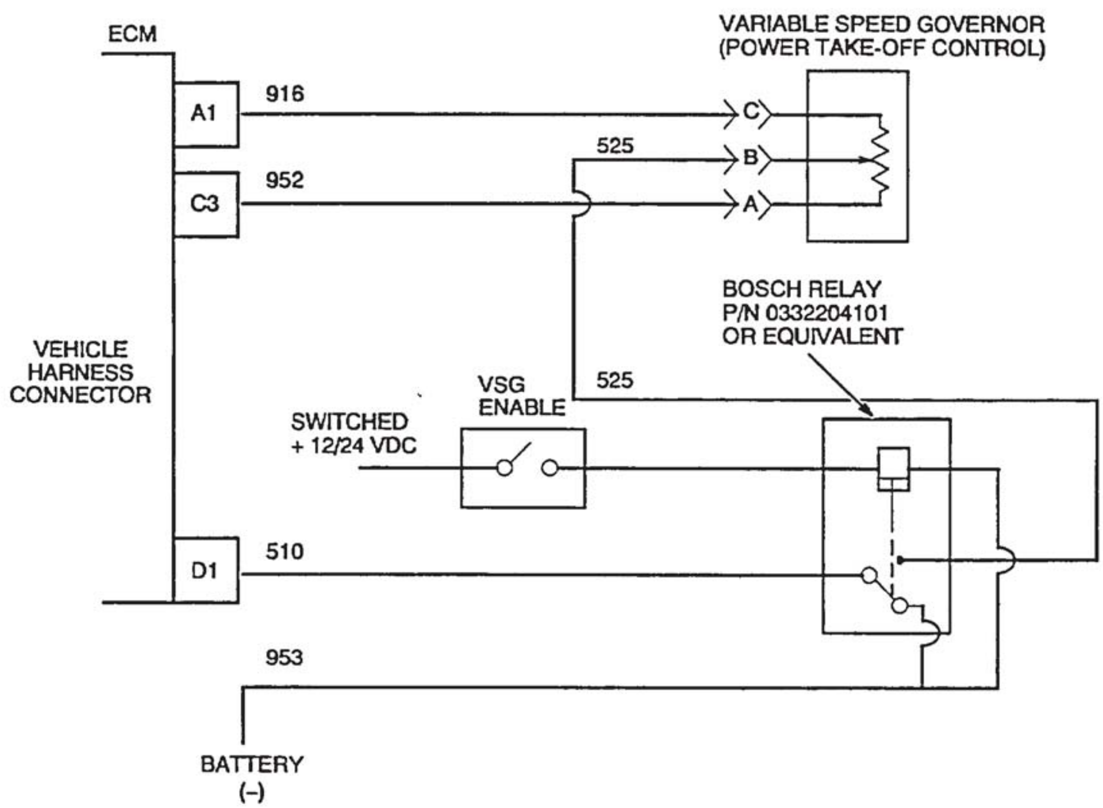
Section 4
TROUBLESHOOTING CHARTS

D. CHART -11 - VARIABLE SPEED GOVERNOR (VSG OR PTO) INOPERATIVE

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 11-1 Identify Type of VSG		
• Does DDEC system have cruise control switch VSG?	YES	Go to C11-2.
	NO	Go to C11-5.
C 11-2 Check Calibration for Cruise Control VSG		
• Turn ignition on. • Plug DDR into DDL connector. • Select calibration configuration. Does DDEC system have vehicle speed sensor and is it enabled. • Is cruise control enabled? • Is correct PTO initial speed programmed?	YES to all.	Go to C11-3.
	NO to any.	You do not have proper calibration for your application. This option was not specified at time the engine was ordered. Refer to DDR Instruction Manual, CALIBRATION CHANGES for information on enabling correct options.
C 11-3 Check Cruise Control		
• Is Cruise Control working correctly? • On DDR select VEHICLE SWITCHES LIGHT STATUS. Does DDR display respond correctly when cruise SET and brake switch is enabled for PTO?	YES.	Go to C11-4.
	NO.	Fix cruise control problem first. Go to Chart 12, page 3-345.27.
C 11-4 Check Cruise Control VSG		
• On DDR select vehicle speed on engine data list. Make sure that speed Is less than 5 MPH. • Select PTO RPM Set. Does display show correct RPM when cruise set switch Is pressed?	YES.	Problem no longer exists. Go to C1-2 for more information (page 3-345.61).
	NO.	Go to C11-8.

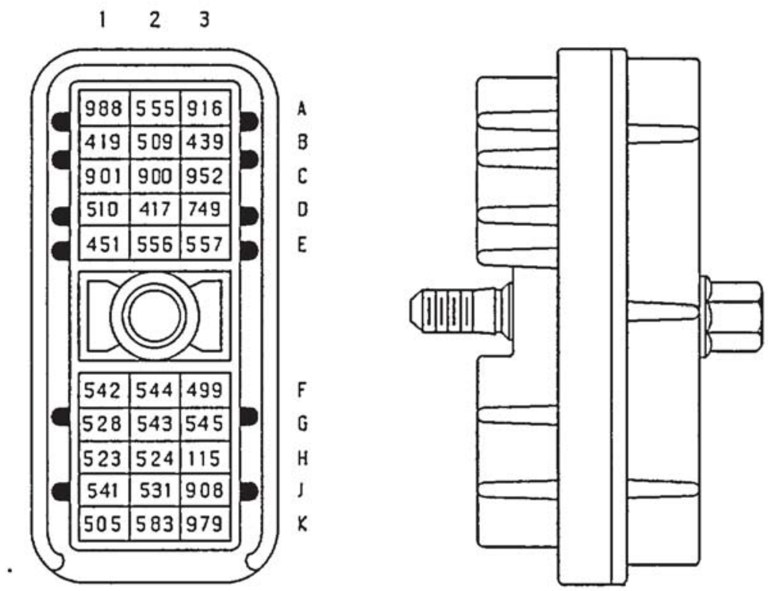


PTO (VSG) CIRCUITS

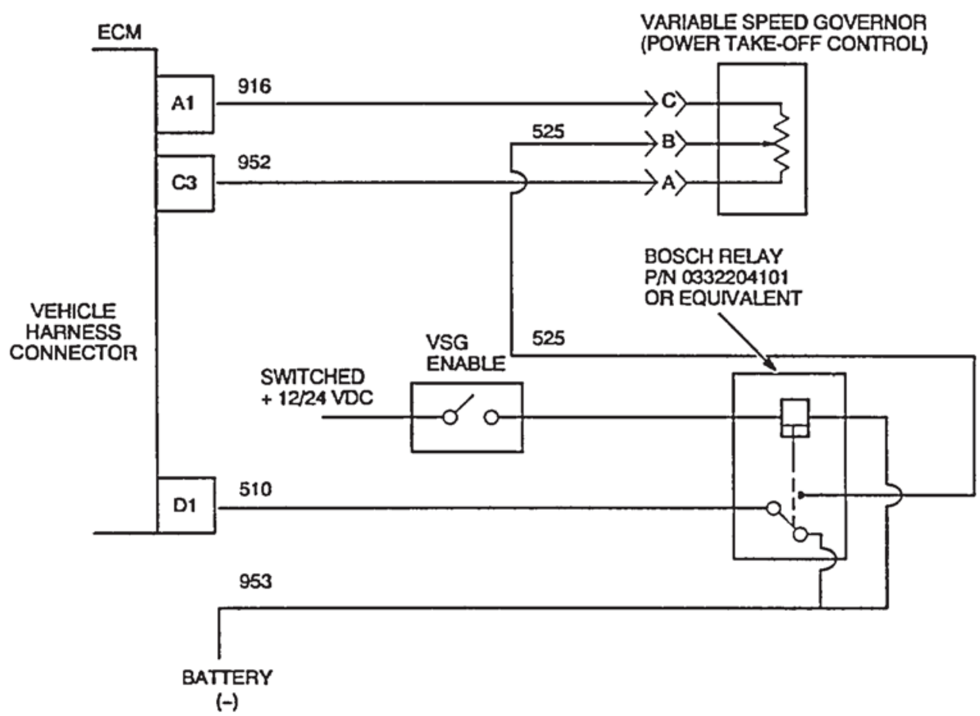
Section 4
TROUBLESHOOTING CHARTS

D. CHART - 11 - VARIABLE SPEED GOVERNOR (VSG OR PTO) INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 11-5 Check Throttle Position Sensor		
• Turn ignition on. • Plug DDR into DDL connector. • Engine at no throttle • Read THROTTLE % using DDR.	At 0% throttle.	Go to C11-6.
	Greater than 0% throttle.	Check throttle position sensor adjustment. Go to 21-4 (page 3-345.231)
C 11-6 Check if ECM is Reading VSG Speed Adjust Sensor		
• Turn ignition on (engine not running). • Select VSG RPM on DDR. • Turn PTOSA sensor from fully closed to fully open while observing DDR Reader display.	DDR display changes smoothly from idle (typically 600 RPM) to at least top speed of speed speed adjustment sensor.	Go to C11-7.
	DDR Reader does not change at all or does not change smoothly.	Go to C11-9.
C 11-7 Verify Complaint		
Turn speed adjustment sensor down (counter-clockwire). • Start and run engine at idle. • Using DDR Reader make sure that the vehicle speed is less than 5 MPH and % throttle is 0. • Slowly turn speed adjust sensor up (clockwise).	RPM is increasing.	Problem no longer exists. Go to C1-2 for more information (page 3-345.61).
	RPM does not.	Go to C11-8.



ECM VEHICLE HARNESS CONNECTOR

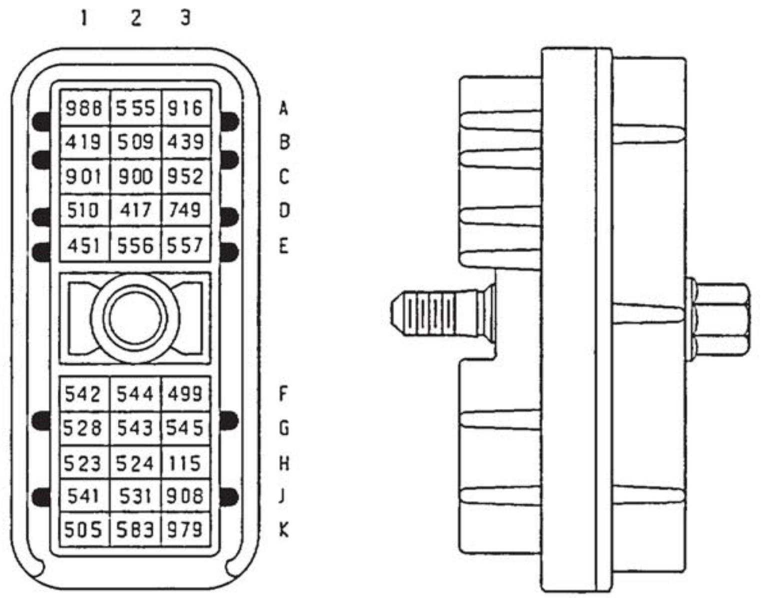


PTO (VSG) CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

D. CHART - 11 - VARIABLE SPEED GOVERNOR (VSG OR PTO) INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 11-8 Check ECM Connectors		
• Turn ignition off. • Disconnect vehicle harness connector at ECM. • Check terminals at vehicle harness connector (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM. Then go to C11-30.
	Problem found → Then go to C11-30.	Repair terminals/connectors.
C 11-9 Check for Open		
• Turn ignition off. • Make sure vehicle is In neutral/ park. • Disconnect vehicle harness connector at ECM. • Also disconnect speed adjustment sensor connector. • Install a jumper wire between pins A and B of the speed adjustment sensor harness connector. • Read resistance between sockets D (#510) and C3 (#952) on vehicle harness connector.	Greater than 5 ohms or open. →	Signal line (ckt #535 or #510). ground line (ckt #952) or the Neutral interlock switch has an open. Repair open. Then go to C11-30.
	Less than or equal to 5 ohms →	Go to C11-10.
C 11-10 Check for +5 Volt Line Open		
• Move jumper so that it is now between pins C and A of PTOSA sensor harness connector. • Read resistance between sockets A3 (#916) and C3 (#952) on vehicle harness connector.	Greater than 5 ohms or open. → to C 11-30.	The +5 Volt line (ckt #916) is open. Repair open. Then go
	Less than or equal to 5 ohms. →	Go to C11-11.



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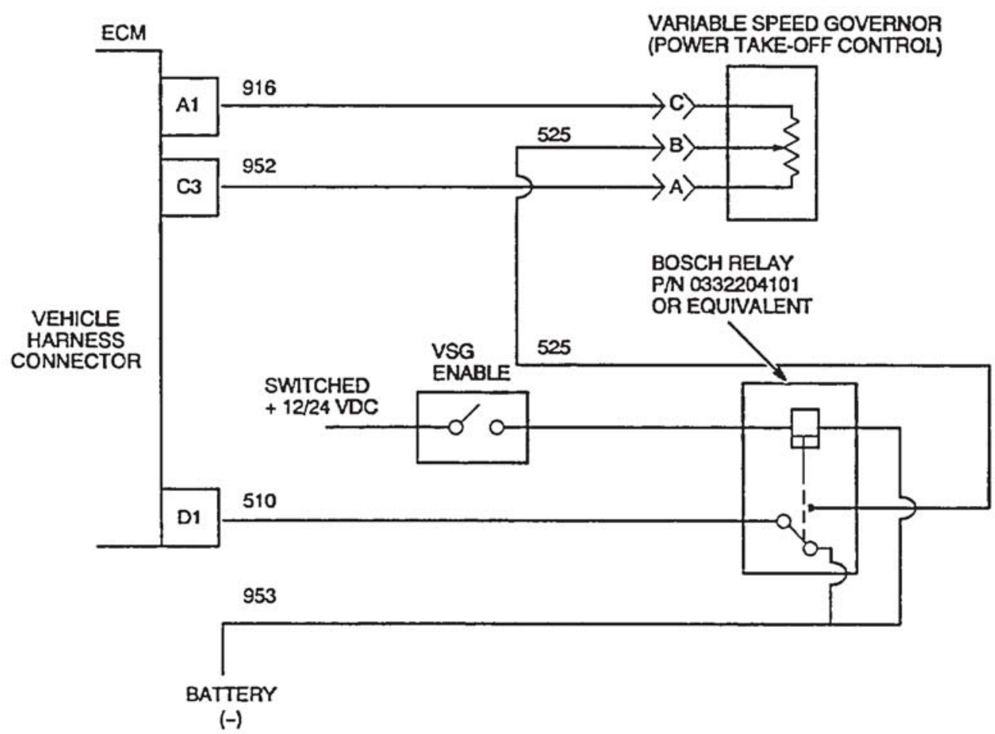
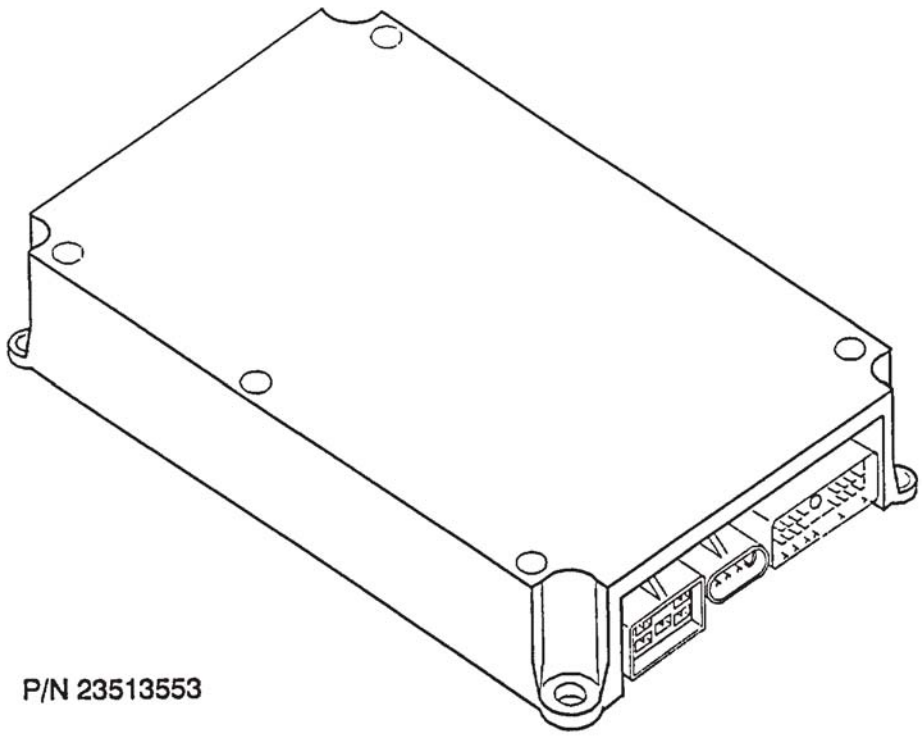


PTO (VSG) CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

D. CHART -11 - VARIABLE SPEED GOVERNOR (VSG OR PTO) INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 11-11 Check for Short Between Signal and Ground		
• Remove jumper wire. • Read resistance between sockets D (#510) and C3 (#952) on vehicle harness connector. • Also read resistance between socket D1 (#510) and a good ground.	Both readings are greater than 10,000 ohms or open. →	Go to C11-12.
	Either reading is less than equal to 10,000 ohms. →	Signal line (ckt less #525 or #510) or Neutral interlock switch is shorted to ground (either ckt #952 or chassis ground). Repair short. Then go to C11-30 or check relay if supplied.
C 11-12 Check for Short Between +5 Bolt Line and Ground		
• Disconnect speed adjust sensor. • Read resistance between sockets A3 (#916) and C3 (#952) on vehicle harness connector. • Also read resistance between socket A3 (#916) and a good ground.	Both readings are greater than 10,000 ohms or open. →	Go to C11-13.
	Either reading is less than or equal to 10,000 ohms. →	The +5 Volt line (ckt #916) is shorted to ground (either ckt #952 or chassis ground). Repair short. Then to C11-30.
C 11-13 Check PTOSA Connectors		
• Inspect terminals at PTOSA connectors (sensor side and harness side) for damaged; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace speed adjustment sensor. Then go to C11-30.
	Problem found. →	Repair terminals/connectors. Then go to C11-30.

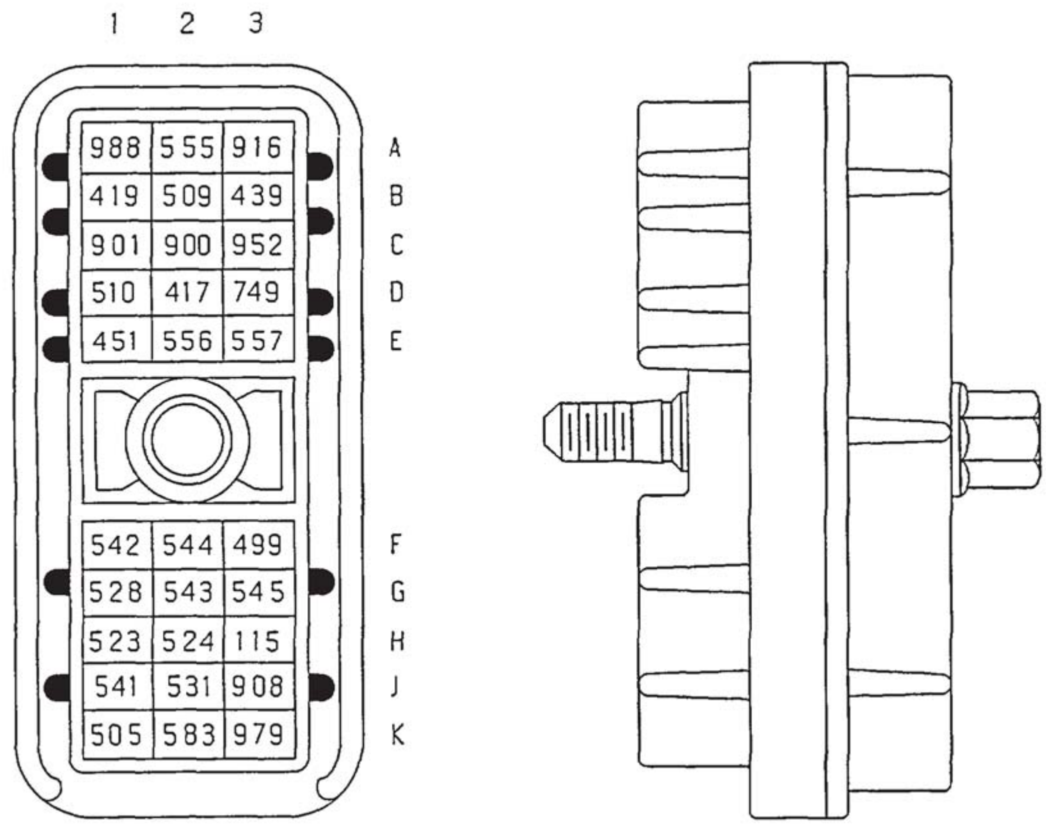


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART -11 - VARIABLE SPEED GOVERNOR (VSG OR PTO) INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 11-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn speed adjustment sensor all the way down (counter-clockwise). • Slowly turn up speed adjustment sensor and observe whether RPM changes. • Stop engine. • Read inactive codes.	Speed adjustment sensor still does not work.	All system diagnostics are complete. Please review this section from the first step to find error.
	Speed adjustment sensor works and (no codes).	Repairs are complete.
	Speed adjustment sensor. works and codes appear.	Go to START-1, pg 3-345.41, to service codes.



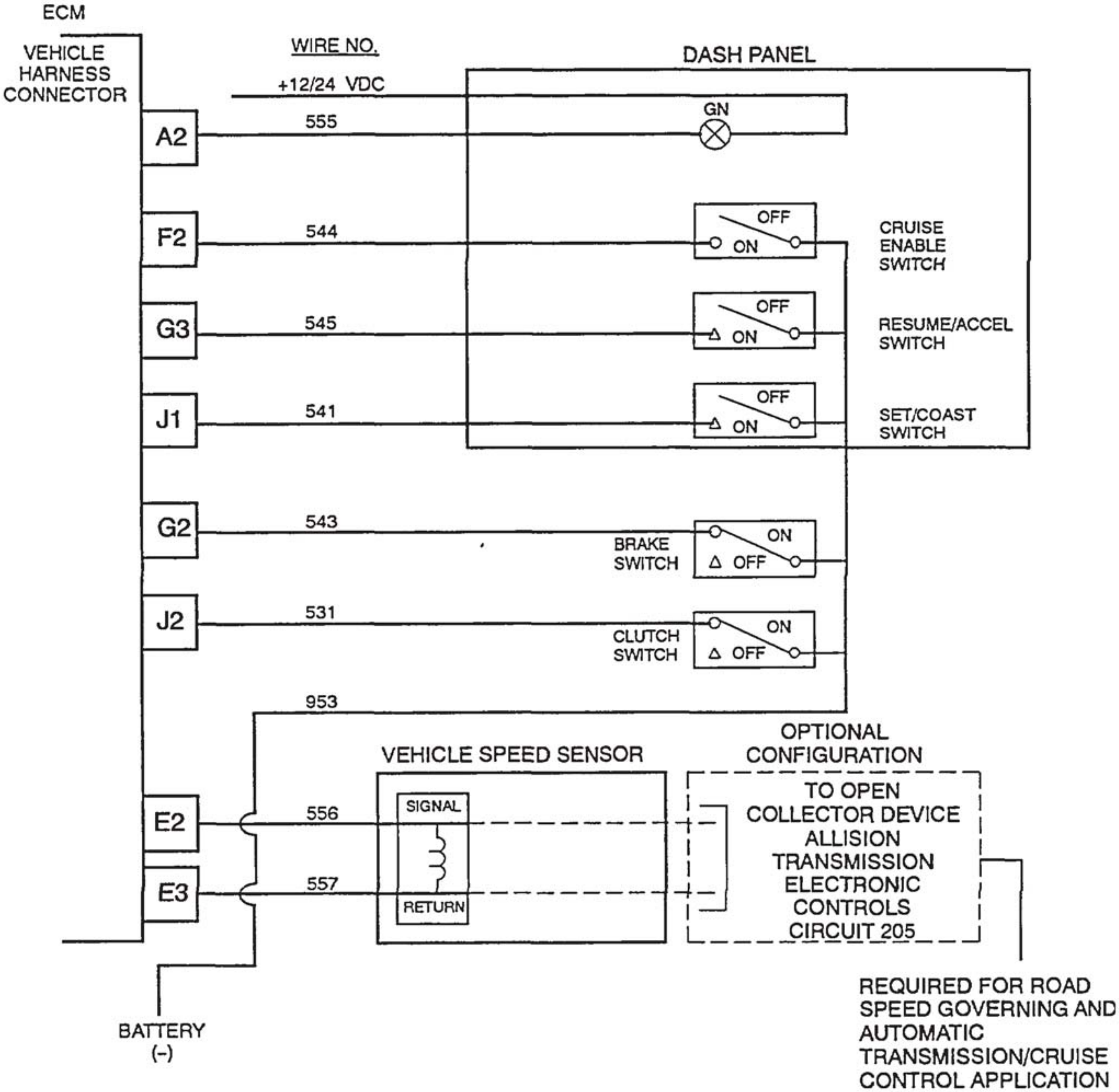
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART-12 - CRUISE CONTROL INOPERATIVE

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 12-1 Determine Type of Cruise Control System		
• Check to see that this is a DDEC cruise control system. • Turn ignition on. • Plug DDR into DDL connector. • Select calibration configuration (cruise control). • Cruise control enable?	Yes → No →	Go to C12-3. This manual only includes diagnosis of the cruise control system. Refer to vehicle manufacturer's recommendation concerning your system
C 12-2 Check ECM Connectors		
• Disconnect the vehicle harness connector at the ECM. • Check terminals at the ECM vehicle harness connector (both ECM and harness side) for damage corroded, or unseated pin or sockets.	Terminals and connectors are okay. →	Reprogram ECM then go to C12-30.
	Problem found →	Repair terminals/connectors then go to C12-30.
C 12-3 Check Pin Assignments		
• Turn ignition on. • Plug in DDR. • Select calibration configuration (ECM ins/outs).	**EXAMPLE** <u>PIN</u> <u>WIRE</u> <u>FUNCTION</u> J1 #541 set/coast on F2 #544 cruz enable G2 #543 svc brk rel J2 #531 clutch rel G3 #545 res/accel on →	Go to C12-4.
• Write/print pin assignments.	Function(s) not assigned →	Reprogram ECM then go to C12-30.



TYPICAL CRUISE CONTROL CIRCUITS

Section 4

TROUBLESHOOTING CHARTS

D. CHART 12 - CRUISE CONTROL INOPERATIVE (Cont'd)

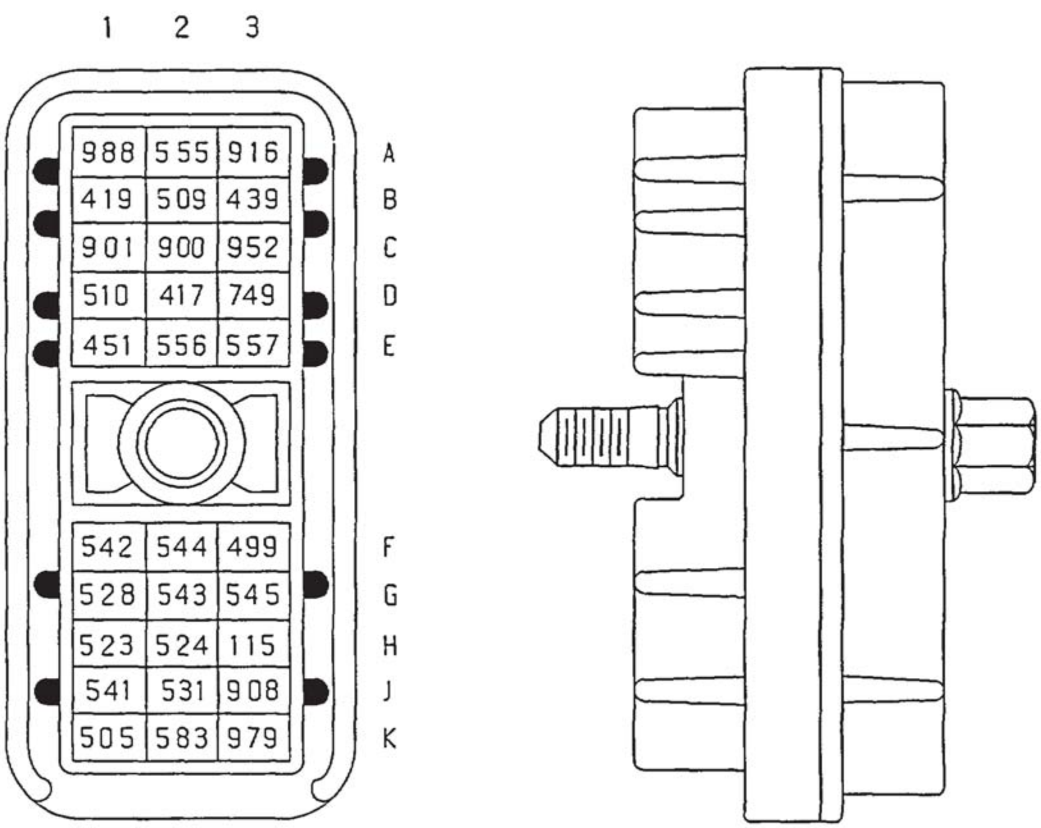
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 12-4 Checking Out of Cruise Control Switch and Wiring		

- To speed up the checkout cruise control switches, quick check tables have been developed. These tests are all to be run with the ignition on, and the engine not running. Also, a DDR must be plugged into the DDL connector. All three quick check tables must be gone through to completely check out the cruise control wiring.

Example
Taking Table I, Step 2 you would do the following:
1. Ignition on, engine not running, DDR plugged in.
2. Turn the cruise enable switch to "on".
3. Select switch/light status on DDR.
4. Note the DDR display, "on" go to Table II step 1.

Cruise Control Quick Check Tables
TABLE I
Check out of Cruise enable switch and wiring (Ignition "on" not running)

Step	Switch Status: Cruise Enable SW	Switch Status: Set/ Coast SW	Switch Status: Res/ Accel SW	DDR Readout Being LOOKED At	DDR Display	Okay?	Go to
1	Off	Off	Off	Cruise Enable	Off On N/A	Yes No No	Table 1 Step 2 C12-5 C12-3
2	On	Off	Off	Cruise Enable	Off On N/A	No Yes No	C12-6 Table 2 C12-3



ECM VEHICLE HARNESS CONNECTOR

Section 4

TROUBLESHOOTING CHARTS

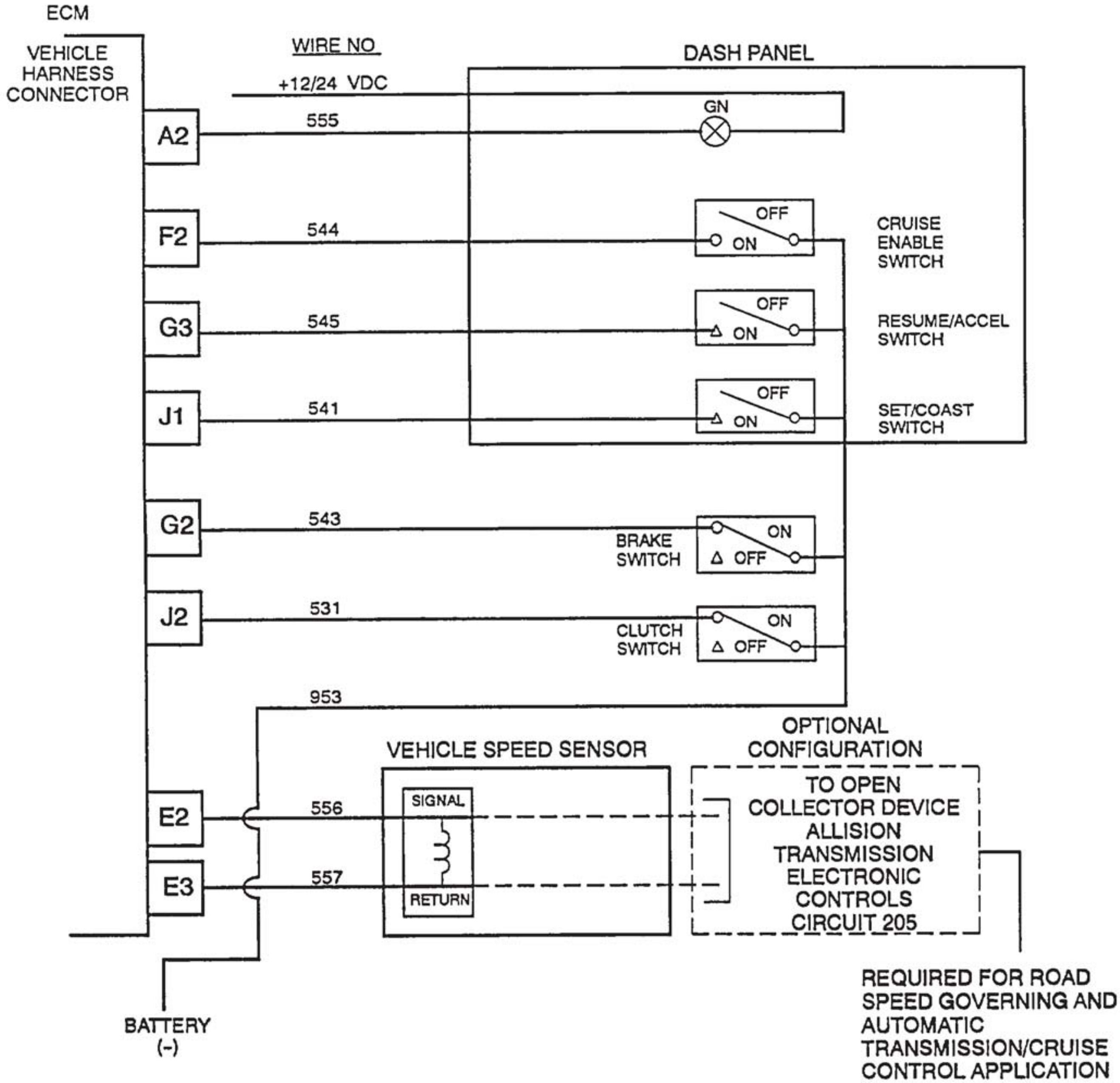
D. CHART 12 - CRUISE CONTROL INOPERATIVE (Cont'd)

Cruise Control Quick - Check Tables
TABLE II
Check out of Brake and Clutch Switch and wiring (Ignition "On" Not running)

Step	Cruise Enable SW	Brake Pedal	Clutch Pedal	DDR Readout Being Looked At	DDR Display	Okay?	Go To
1	On	Released	Released	Service Brake Release	On Off N/A	Yes No No	Table 2 Step 2 C12-7 C12-3
2	On	Depressed	Released	Service Brake Release	On Off N/A	No Yes No	C12-8 Table 2 Step 3 C12-3
3	On	Released	Released	Clutch Release	On Off N/A	Yes No No	Table 2 Step 4 C12-9 C12-3
4	On	Released	Depressed	Clutch Release	On Off N/A	No Yes No	C12-10 Table 3 C12-3

Cruise Control Quick - Check Tables
TABLE III
Check out of Set/Coast and Resume/Accel Switches and wiring (Ignition "On" Not running)

Step	Switch Status			DDR Readout Being Looked At	DDR Display	Okay?	Go To
	Cruise Enable SW	Set/ Coast SW	Res/ Accel SW				
1	On	Off	Off	Set Coast On	Off Off N/A	Yes No No	Step 2 C12-11 C12-3
2	On	On	Off	Set/ Coast On	Off On N/A	No Yes No	C12-12 Step 3 C12-3
3	On	Off	Off	Res/ Accel On	Off On N/A	Yes No No	Step 4 C12-13 C12-3
4	On	Off	On	Res/ Accel On	Off Off N/A	No Yes No	C12-14 C12-15 C12-3



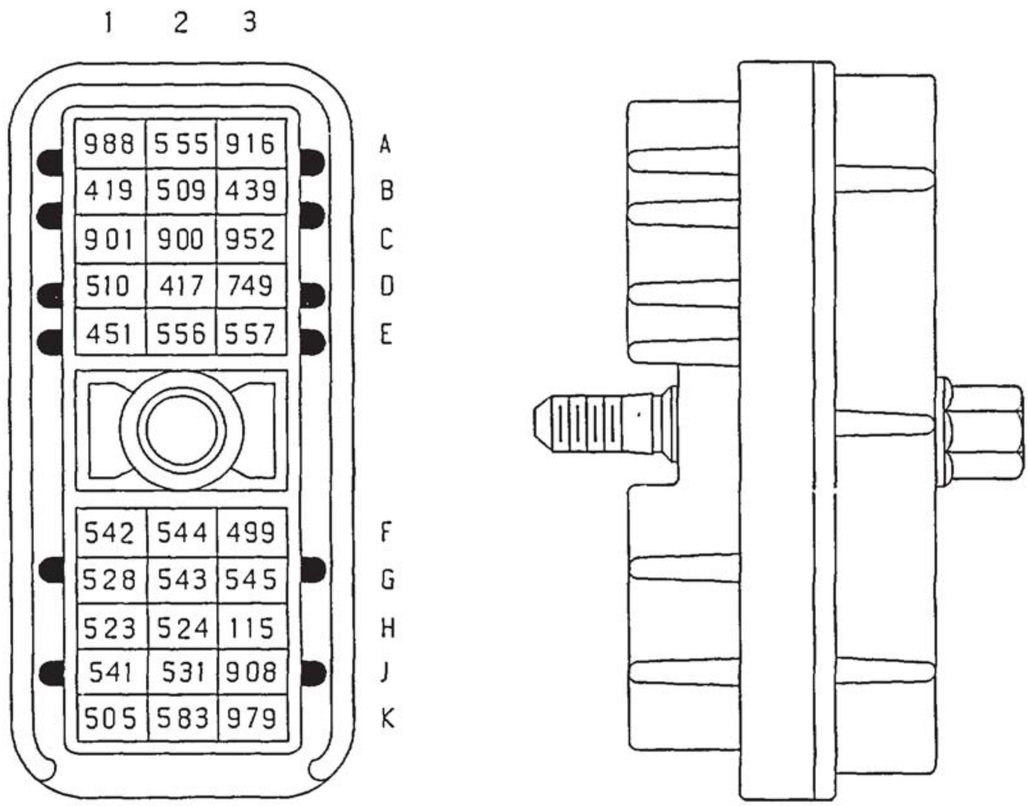
TYPICAL CRUISE CONTROL CIRCUITS

Section 4

TROUBLESHOOTING CHARTS

D. CHART 12 · CRUISE CONTROL INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 12-5 Check for Short at the Cruise Enable Circuit		
• Turn ignition on. • Turn cruise engage switch to off. • Disconnect the vehicle harness connector at the ECM. • Read Resistance between the cruise engage cavity (i.e. F2) on the vehicle harness connector and a good ground.	Less than or equal to 10,000 ohms. →	Reconnect the vehicle harness. Turn ignition on. Then run steps of Table II and III. If any DDR display received is not OK, go to the step indicated. If Table II and III pass, then the cruz engage wire is shorted to ground. Repair short, or replace switch, then go to C12-30.
	Greater than 10,000 ohms. →	Go to C12-2.
C 12-6 Check for Open at the Cruise Enable Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the cruise enable switch. • Read resistance between the cruise enable cavity (i.e. F2) on the vehicle harness connector and a good ground.	Greater than 5 ohms or open. →	Either the cruise engage switch is bad. Ckt #953 is open, cruise enable wire is open, or you have a bad battery ground. Repair open, or replace switch. Then go to C12-30.
	Less than, or equal to 5 ohms. →	Go to C12-2.
C 12.7 Check for Open or Miswired Brake Switch		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Ensure the service brake is not engaged. • Read resistance between the service brake cavity (i.e. G2) on the vehicle harness connector and a good ground.	Greater than 5 ohms or open. →	Either the Brake Switch Is miswired or faulty, Ckt# 953 is open, or you have a bad ground. Rewire/repair. Then go to C12-30.
	Less than or equal to to 5 ohms. →	Go to C12-2.



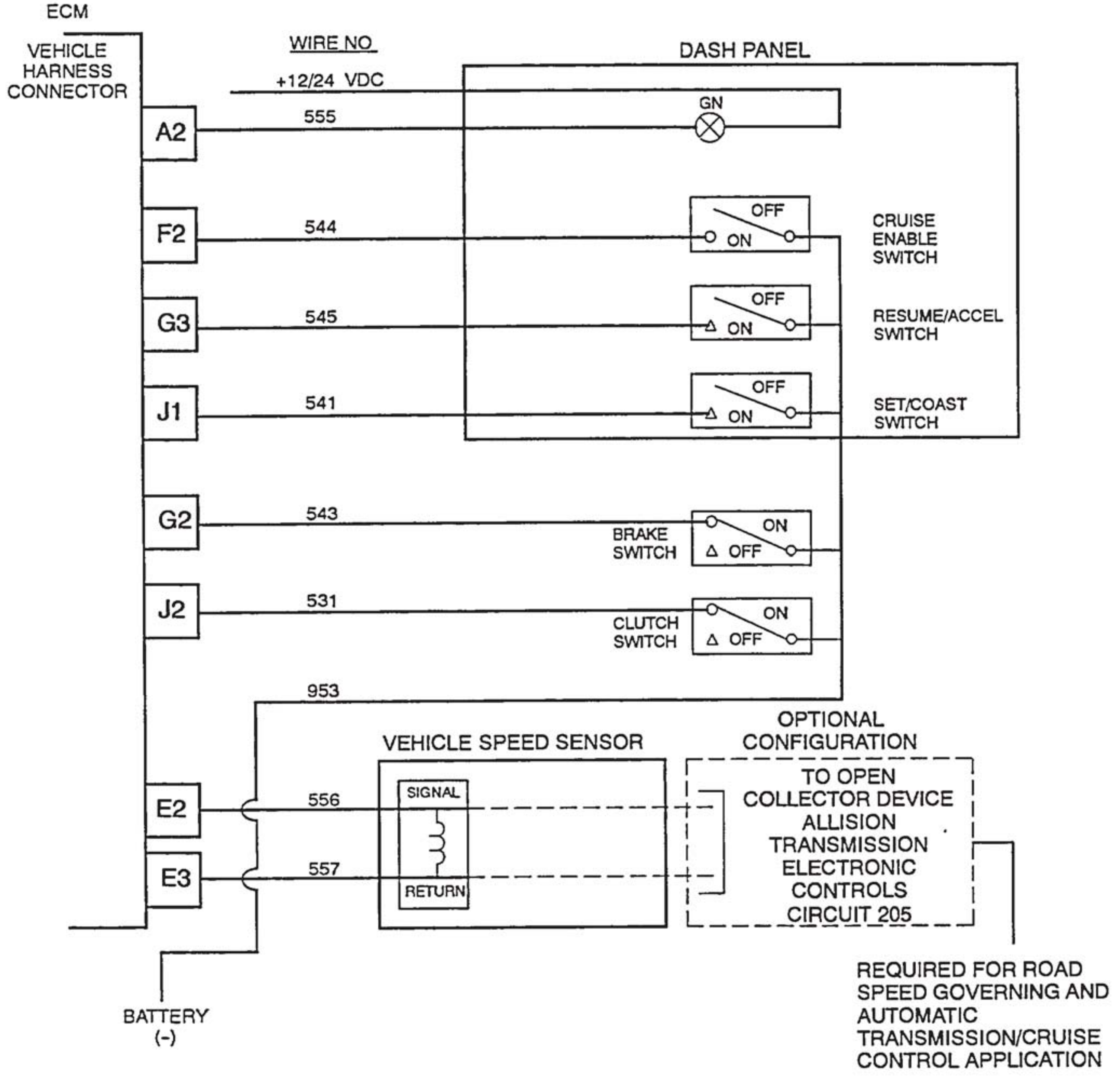
ECM VEHICLE HARNESS CONNECTOR

Section 4

TROUBLESHOOTING CHARTS

D. CHART 12 · CRUISE CONTROL INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 12-8 Check for Short at the Brake Switch/Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Engage the service brake.	Less than or equal to 10,000 ohms.	Either the brake switch is miswired or faulty, or the service brake circuit is shorted to ground. Rewire, repair short or replace switch. Then go to C12-30.
• Read Resistance between the service brake cavity (i.e. G2) on the vehicle harness connector and a good ground.	Greater than 10,000 ohms or open.	Go to C12-2.
C 12-9 Check for Open or Miswired Clutch Switch		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Ensure the clutch is not engaged.	Greater than 5 ohms or open	Either the clutch switch is miswired or faulty, ckt# 953 is open, or you have a bad battery ground. Rewire/repair/replace. Then go to C12-30.
• Read resistance between the clutch cavity (i.e. J2) on the vehicle harness connector and a good ground.	Less than or equal to 5 ohms.	Then go to C12-2.
C 12-10 Check for Short at the. Clutch Service/Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Engage the clutch.	Less than or equal to 10,000 ohms.	Either the clutch switch is miswired or faulty, or the clutch circuit is shorted to ground. Rewire/repairs/short, or replace switch. Then go to C12-30.
• Read resistance between the clutch cavity (i.e. J2) on the vehicle harness connector and a good ground.	Greater than 10,000 ohms or open.	Then go to C12-2.



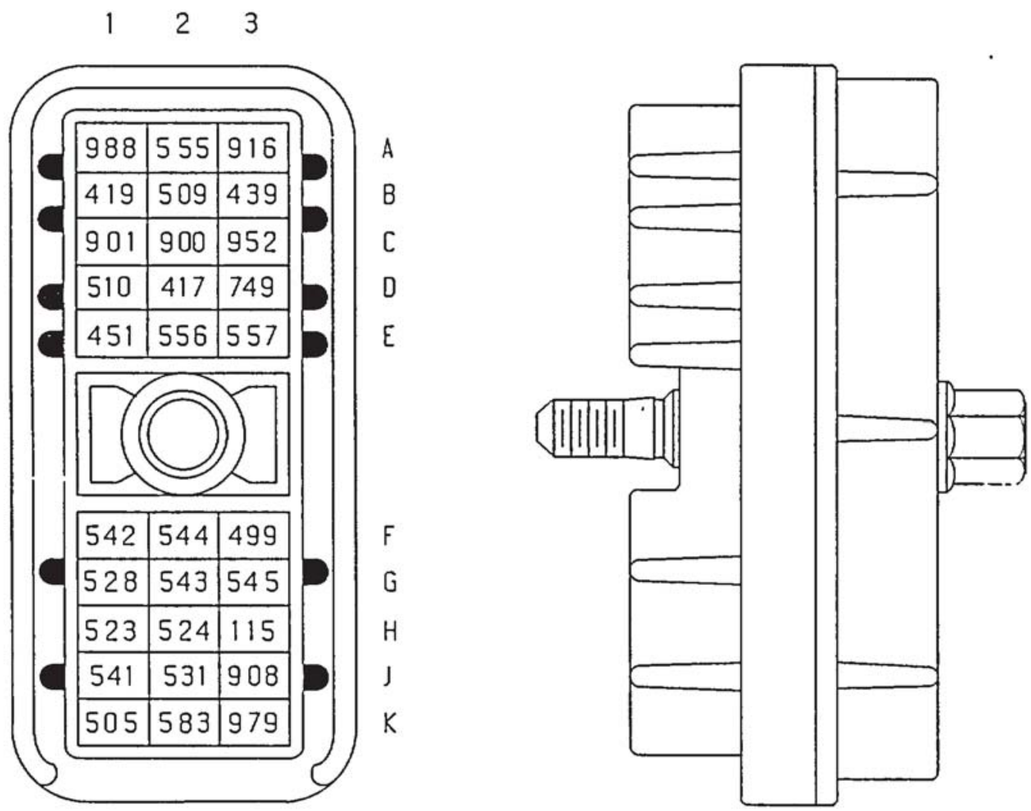
TYPICAL CRUISE CONTROL CIRCUITS

Section 4

TROUBLESHOOTING CHARTS

D. CHART 12 - CRUISE CONTROL INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 12-11 Check for Short at the Set/Coast Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read Resistance between the Set/ coast cavity and a good ground	Less than or equal to 10,000 ohms. →	Ether set/coast switch is shorted, or a short to ground exist in the set/coast circuit (i.e. #541) Repair short, or replace switch. Then go to C12-30.
	Greater than 10,000 ohms. →	Go to C12-2.
C 12-12 Check for Open at the Set/Coast Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Find a means to press and hold the set/coast switch.	Greater than 5 ohms or open. →	Either the set/coast switch is open or miswired, or #953 is open or you have a bad battery ground. Repair, replace, or rewire. Then go to C12-30.
• Read resistance between the set/coast cavity (i.e. J1) and a good ground.	Less than or equal to 5 ohms. →	Then go to C12-2.
C 12-13 Check for Short at the Res/Accel Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between the Res/Accel cavity (i.e. G3) and a good ground.	Less than or equal to 10,000 ohms. →	Either the Res/Accel switch is shorted or a short to ground exist in the Res/Accel circuit (i.e. #541). Repair short, or replace switch. Then go to C12-30.
	Greater than or equal to 10,000 ohms. →	Then go to C12-2.



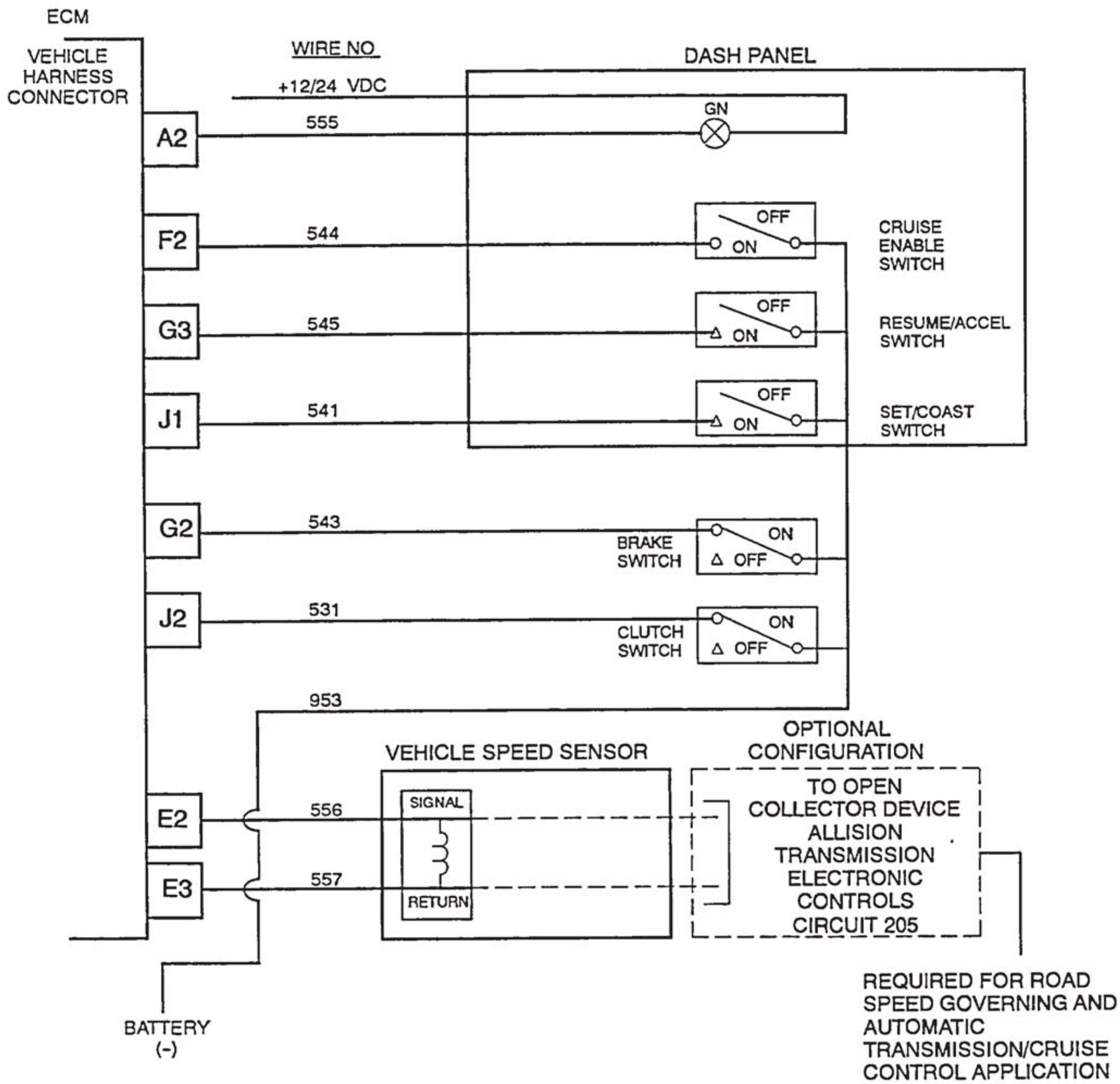
ECM VEHICLE HARNESS CONNECTOR

Section 4

TROUBLESHOOTING CHARTS

D. CHART 12 · CRUISE CONTROL INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 12-14 Check for Open at the Res/Accel Circuit		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Find a means to press and hold the Res/Accel switch. • Read resistance between the Res/Accel cavity (i.e. G3) and a good ground.	Greater than 5 ohms or open. →	Either Res/Accel switch is open or miswired, or Ckt #953 is open or you have a bad battery ground. Repair replace, or rewire. Then go to C12-30.
	Less than or equal 5 ohms. →	Go to C12-2.
C 12-15 Verify Problem Still Exists		
• If you were referred to this step. You have completed the switch checkout process without detecting a fault. • Take the vehicle for a road test and check the cruise control operation.	Operates OK. →	Problem no longer exists. Go to Start-1, pg 3-345.41 if other problem exists.
	Does not operate correctly. →	Go to C12-4 and retrace through the quick check.
C 12-30		
• Turn ignition off. • Reconnect all connectors. • Take vehicle for a road test.	Cruise operates okay. →	Repairs are complete.
	Cruise control does not operate correctly. →	All system diagnostic are complete. Please review this section from the start and find the error.



TYPICAL CRUISE CONTROL CIRCUITS

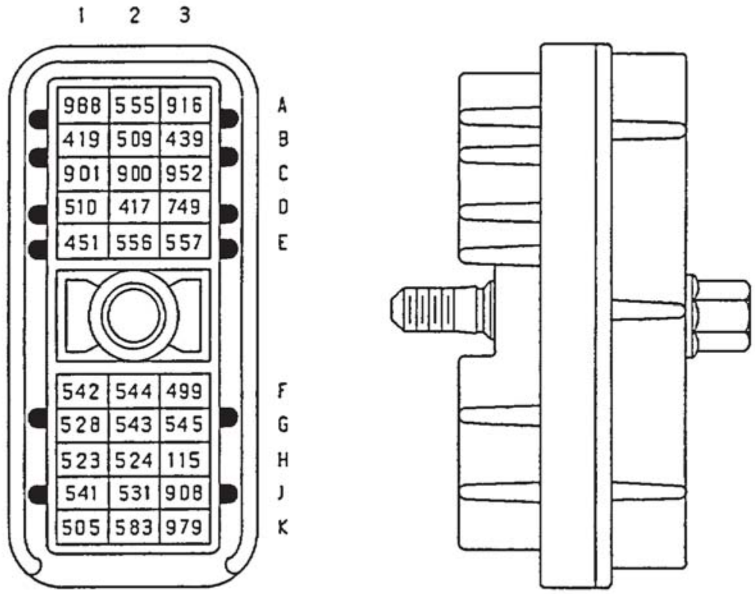
Section 4
TROUBLESHOOTING CHARTS

D. CHART -13 - "CRUISE ACTIVE" LIGHT ALWAYS ON IF SUPPLIED ON VEHICLE

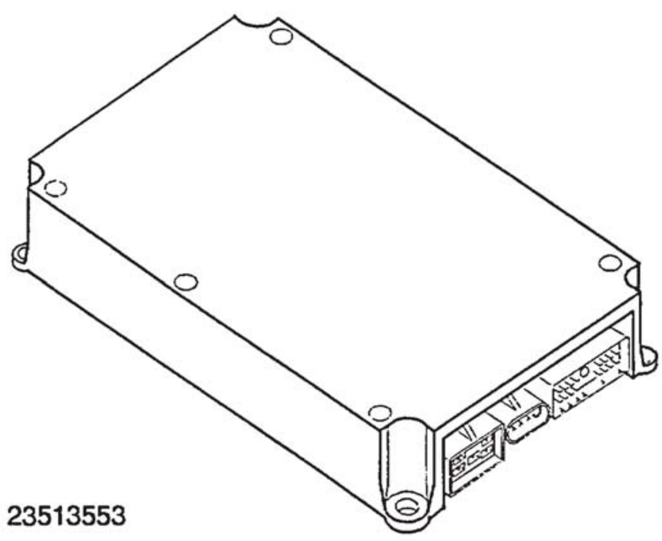
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

This is a digital output function.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 13-1 Determine "Cruise Active" Light Status		
• Turn ignition off. • Turn ignition on while at the same time observing the "Cruise Active" light.	"Cruise Active" light comes on and stays on.	Go to C13-2.
	"Cruise Active" light comes on for up to 5 seconds then goes out.	Light is operational. If cruise control is inoperative, go to C12-3.
	"Cruise Active" light does not come on at all.	Go to 14-2.
C 13-2 Check Calibration configuration		
• Plug in DDR. • Turn Ignition on. • Determine which port CAL is programmed to.	Not programmed for CAL.	Reconfigure ECM for proper definition.
	Port programmed for CAL.	Go to C13-3.
C 13-3 Check ECM Connectors		
• Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Turn ignition on (engine not while at the same time observing the "Cruise Active" light.	"Cruise Active" light comes on and stays on.	"Cruise Active light driver line (ckt #XXX) is shorted to ground Check wiring of bulb socket. Repair short. Then go to C13-30.
	"Cruise Active" light stays off.	Go to C13-4.



ECM VEHICLE HARNESS CONNECTOR



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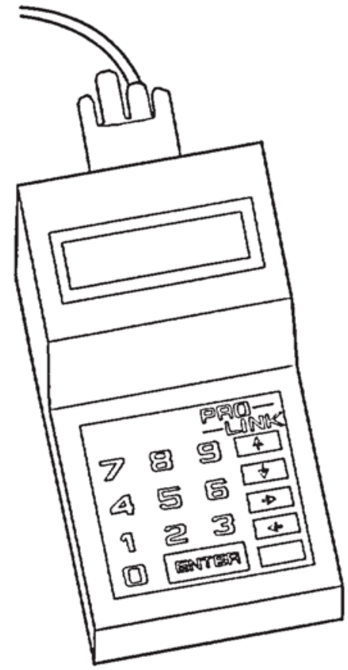
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4

TROUBLESHOOTING CHARTS

D. CHART 13 . "CRUISE ACTIVE" LIGHT ALWAYS ON IF SUPPLIED ON VEHICLE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 13.4 Check ECM Connectors		
• Turn ignition off. • Disconnect the vehicle harness connector at ECM. • Check terminals at the vehicle harness connectors (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM then go to C13-30
	Problem found Then go to C13-30. →	Repair terminals/connectors.
C 13-30 Determine "Cruise Active" Light Status		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at same time observing the "Cruise Active" light.	"Cruise Active" light comes on for up to 5 seconds. then goes out. →	C Repairs are complete. Go to START-1, pg 3-345.41, if any other problems are present.
	"Cruise Active", light is always on or does not come on at all. →	All system diagnostics are complete. Please review this section from the first step to find error.



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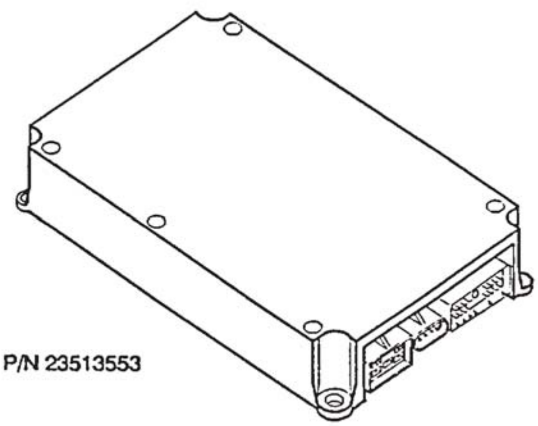
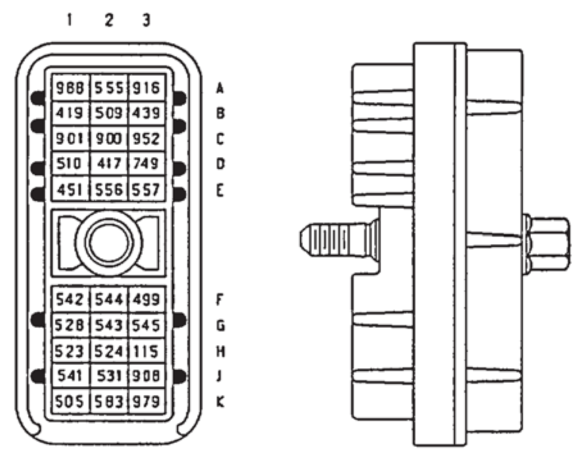


THE ELECTRONIC CONTROL MODULE - DDEC III



ECM VEHICLE HARNESS CONNECTOR

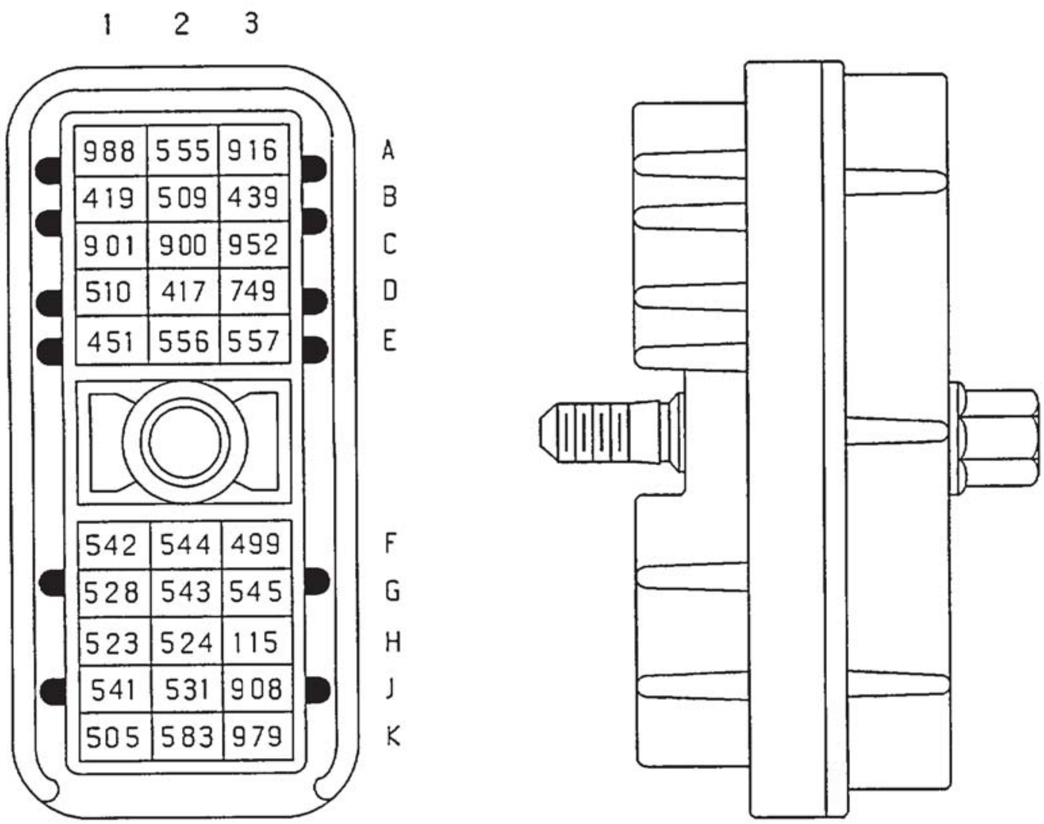
Section 4

TROUBLESHOOTING CHARTS

D. CHART -14 - "CRUISE ACTIVE" LIGHT NEVER ON

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 14-1 Determine "Cruise Active" Light Status		
• Turn ignition off. • Turn ignition on while at the same time observing the "Cruise Active" light.	"Cruise Active" light does not come on at all.	Go to C14-1-A
	"Cruise Active light comes on for up to 5 seconds, then goes out.	Light is operational. If cruise control is inoperative. Go to C12-3.
	"Cruise Active light comes on and stays on.	Go to C13-2.
C 14-1A		
• Plug in DDR. • Check calibration configuration. • Check output settings. • Verify port is configured for CAL.	Yes.	Go to 14-2.
	No	Reconfigure ECM program.
C 14-2 Activate "Cruise Active" Light		
• Using DDR reader go to activate ECM outputs. • Select cruise active light. • Activate CAL.	Light comes on	Go to C14-5.
	Light stays off.	Go to C14-3.
C 14-3 Bulb Check		
• Remove "Cruise Active " light bulb and check whether it's burned out or otherwise damaged.	Bulb is okay.	Go to C14-4.
	Bulb is not okay.	Replace bulb. Then go to C14-30.

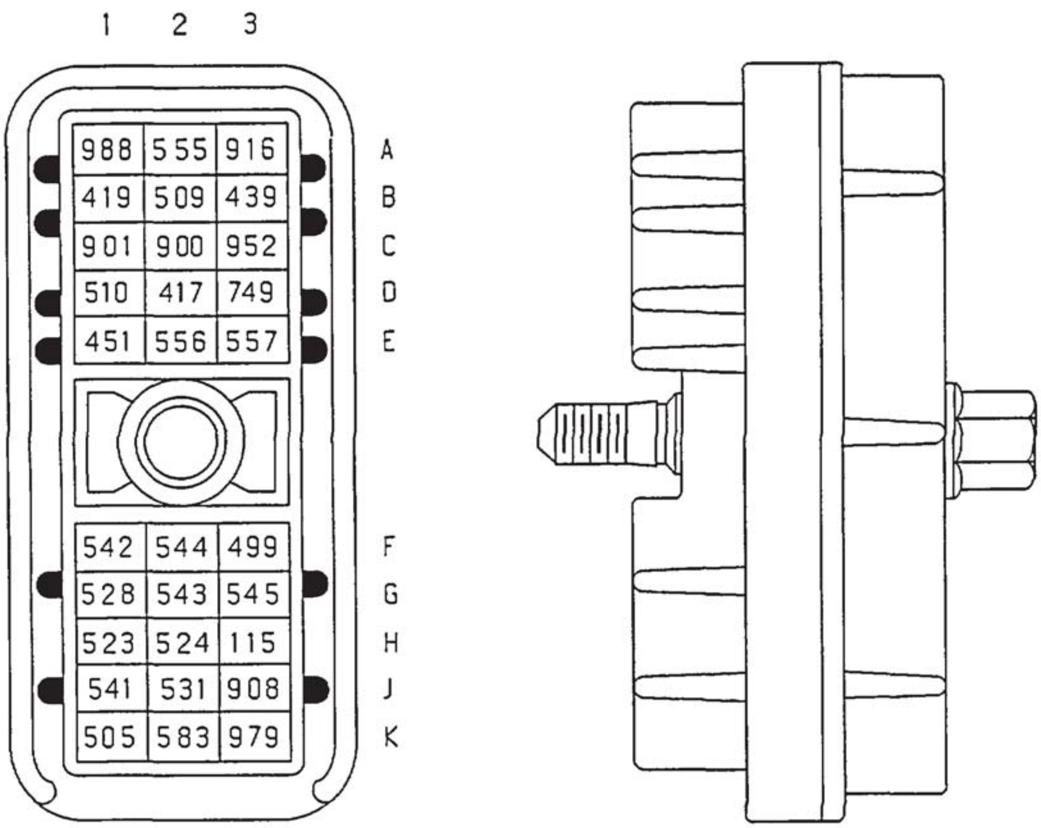


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART 14 - "CRUISE ACTIVE" LIGHT NEVER ON (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 14-4 Check for Shorts		
• Disconnect vehicle harness at the ECM. • Turn ignition on (engine not running. • Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead).	Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition).	,Either the 5 amp. ignition fuse is blown (or circuit breaker tripped) and/or the ignition line (ckt#439) is open or shorted to ground. Repair problem. Then go to C14-30.
	Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition).	"Cruise Active" light driver line (ckt #XXX) is open. Repair open between ECM (ckt #XXX) to bulb to ckt #439. Then go to C14-30. If no open is found, go to C14-5.
C 14-5 Check for battery +		
• Turn ignition off. • Disconnect the 5-way power harness connector at the ECM. • Read voltage on the 5-way power harness connector. Socket A and C (red lead) to a good ground (black lead).	Less than 11.5 volts on any reading. (or 23.0 volts if using a 24 volt ignition).	Either an ECM fuse is blown (or circuit breaker tripped) and/or the battery power lines(s) (ckt #240 or #241) has an open or short to ground. Repair problem. Then go to C14-30.
	Greater than or equal to 11.5 volts on all reading. (or 23.0 volts if using a 24 volt ignition.	Go to C14-6.
C 14-6 Check for Ground		
• Read voltage on the 5-way power harness connector, socket A or C (red lead) to socket D or E (black lead).	Less than 11.5 volts 11.5 volts on either reading (or 23 0 volts if using a 24 volt ignition.	Ground lines(s) (ckt # 150) has an open. Repair open. Then go to C 14-30.
	Greater than or equal to 11.5 volts on all reading (or 23 0 volts if using a 24 volt ignition.	Go to C14-7.

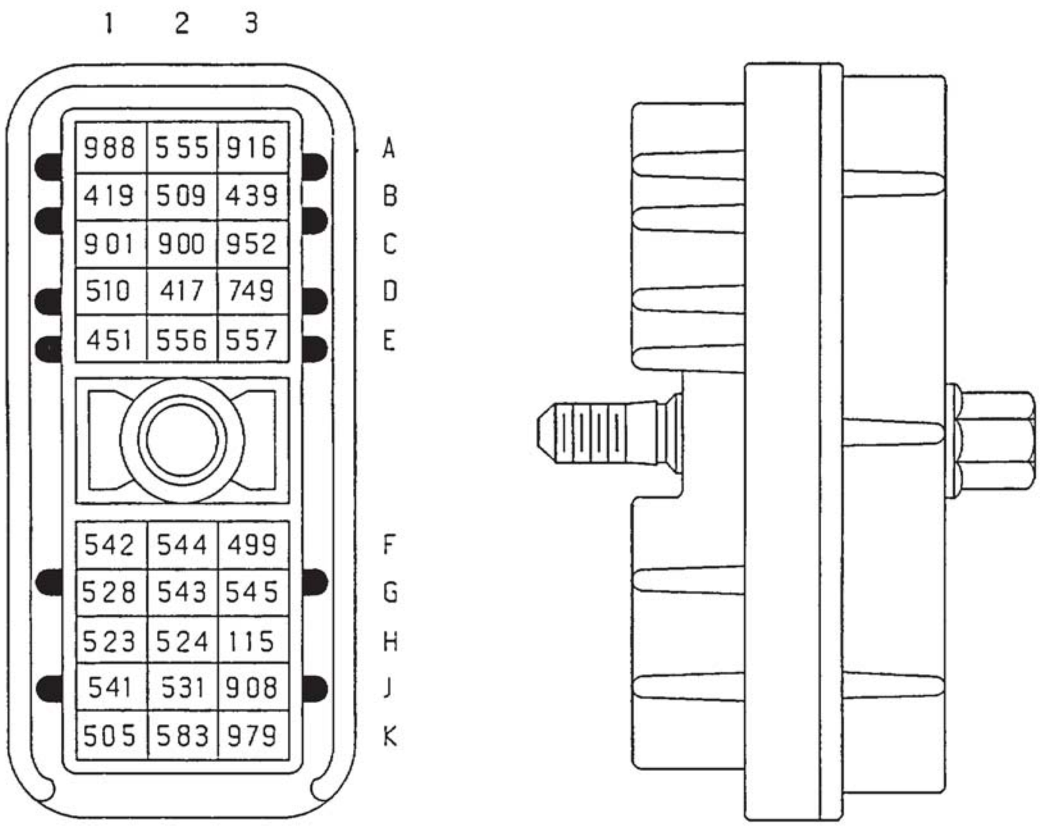


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART 14 - "CRUISE ACTIVE" LIGHT NEVER ON (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 14-7 Check ECM Connectors		
• Check terminals at both the 5-way power and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets, especially A2 and B3 of the vehicle harness.	Terminals and connectors are okay.	Reprogram ECM. Then go to C14-30.
	Problem found.	Repair terminals/connectors. Then go to C14-30.
C 14-30 Verify Repairs		
• Turn ignition off. • Reconnect all connections • Turn ignition on • Clear codes with DDR. • Turn ignition off • Turn ignition on while at the same time observing the "Cruise Active" light.	"Cruise Active light comes on for up to 5 seconds. Then goes out.	Repairs are complete. Go to START-1, pg 3-345.41, if any other problems are present.
	"Cruise Active" light does not comes on at all or is always on.	All system diagnostics are complete. Please review this section from the first step to find the error.



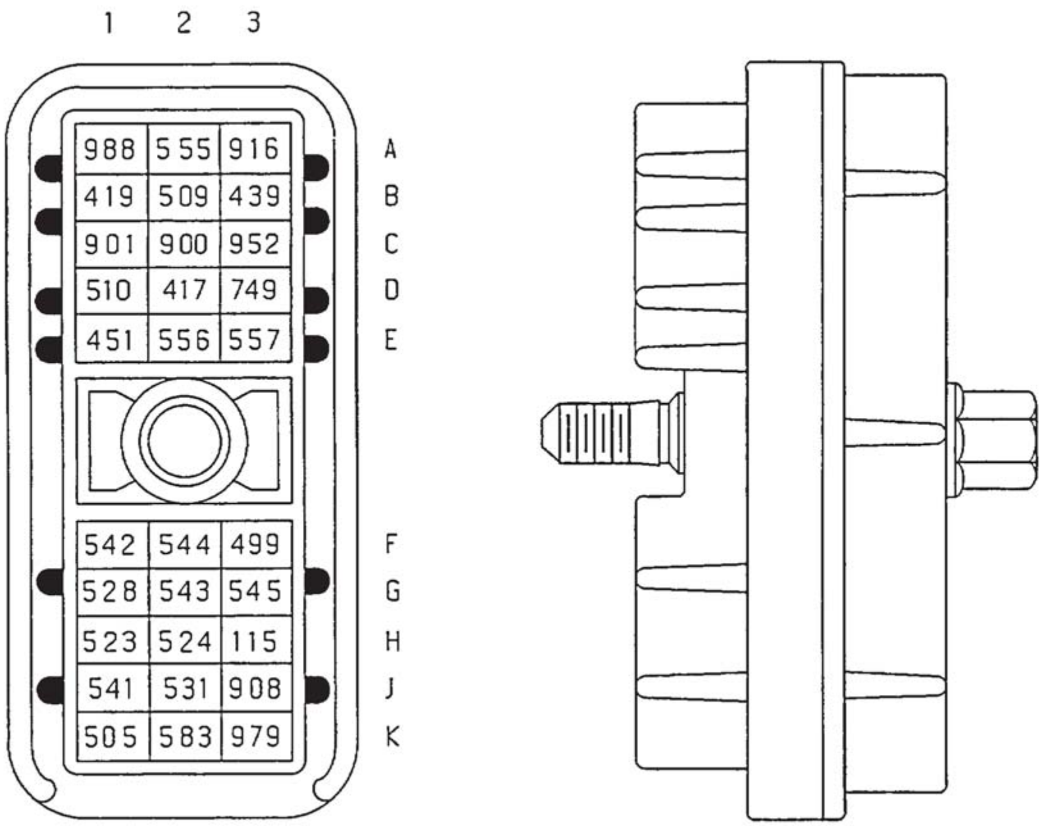
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART -15 - IDLE SHUTDOWN FEATURE ALWAYS ON

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 15-1 Verify the Idle Shutdown Timer Shut Engine Down		
• Turn ignition on. • Plug in DDR. • Select engine data list. Verify idle shutdown option is enabled and is what shut the engine down.	Enabled. →	Go to C15-2.
	Not enabled. →	Go to Start-1, pg 3-345.41. Problem is not related to idle shutdown feature.
C 15-2 Determine which Vehicle Input Switch is Configured for Idle Timer		
• Select calibration configuration (vehicle input switches). • Determine which port on the vehicle harness is configured for the idle shutdown time. • Activate (ground) the wire that operates the idle timer. • Select vehicle switch/light status determine the status of that switch	Switch reads "on". →	Go to C 15-3.
	Switch reads "off exist. →	Replace ECM if no other codes
C 15-3 Check if Switch Can be Turned Off		
• (Note: vehicle should be parked on a level surface before trying this step). • Turn ignition on (engine not running). • Place transmission in any gear. • Disengage parking brake. • Observe DDR display. Vehicle switch light status (veh input switch).	Park brake/ISD switch. off. →	Go to C 15-4.
	Park brake/ISD switch. read "on". →	A short exists in the switch input being used. Either the switch is shorted, or the wire is designed to be grounded at all times and no defect exists.

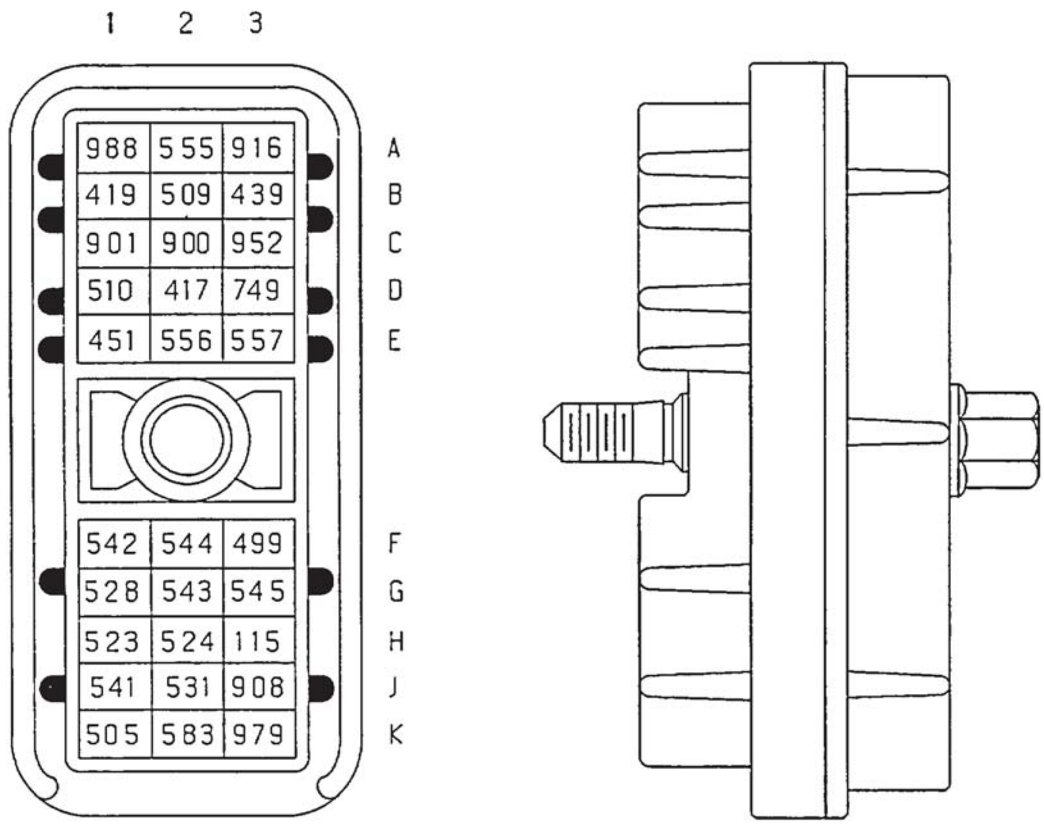


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART 15 · IDLE SHUTDOWN FEATURE ALWAYS ON (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 15-4 Check if Engine Still Shuts Down		
• Place transmission in neutral. • Start engine and drive vehicle until one of three things occur: 1) DDR reads "on" 2) engine shuts down or 3) vehicle has been driven for a period exceeding the idle shutdown time. shutdown circuit. If no code(s) are logged, follow appropriate diagnostic charts. (See Index).	Park brake/ISD switch reads "on" →	A short exists in the switch input being used. Either the switch is shorted, or the wire is shorted to ground. Repair short. Then go to C 15-30.
	Engine shuts down. →	If the DDR display never read "on" the fault is not in the idle
	Vehicle driven in excess of idle shutdown time. →	Idle shutdown problem is not present at the moment, but may be intermittent. Refer to C 1-2, pg 3-345.61, for help on intermittent diagnosis.
C 15-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine and drive vehicle for longer than programmed for ISD or engine shuts down.	Vehicle driven in excess of idle shutdown time without shutdown. →	Repairs are complete.
	Engine shuts down. →	All system diagnostics are complete. Please review this section from the first step to find the error.



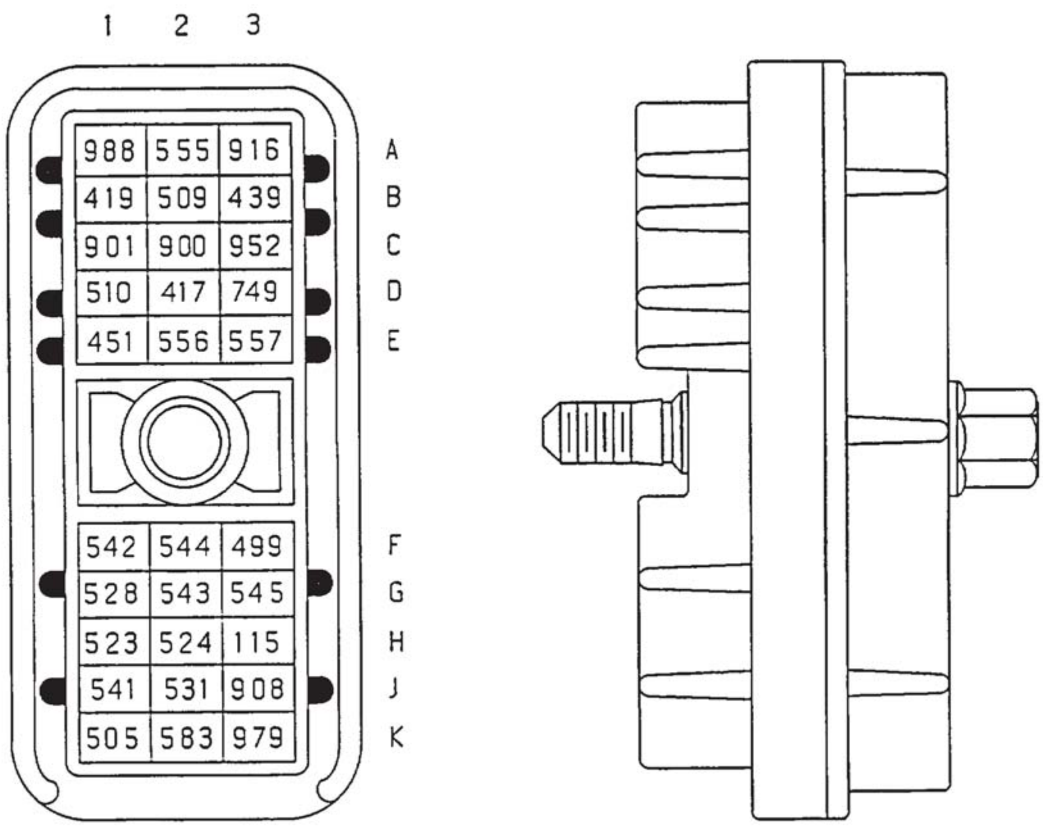
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART -16 - IDLE SHUTDOWN FEATURE INOPERATIVE

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 16-1 Check Calibration Configuration		
• Turn ignition on. • Plug in DDR in DDL connector Select calibration configuration and determine status of the idle shutdown feature. Is it enabled?	NO. →	Idle shutdown feature is not selected. Refer to the DDR instruction Manual, calibration calibration changes, for information on turning on this feature.
	YES. →	Go to C16-2.
C 16-2 Determine Idle Shutdown Status		
• Select calibration configuration (vehicle input switches). • Determine which port on the vehicle harness is configured for the idle shutdown time. • Activate (ground) the wire that operates the idle time. • Select vehicle switch/light status determine the status of that switch	ON. →	Problem no longer exists. Refer to C 1-2 for diagnosing an intermittent problem.
	OFF. →	Go to C 16-3.
C 16-3 Try to Turn Switch "ON".		
• Disconnect vehicle 30-pin harness - jumper port configured/switch and a good ground.	Park brake/lSD reads "on". →	Go to C 16-4.
	Park brake/ISD switch. read "off'. →	The switch input used for idle shutdown is open or the parking brake or neutral switch is open or not making contact. Repair open or replace switches as appropriate. (If no problem found, go to C 16-4.) Then go to C 16-30.

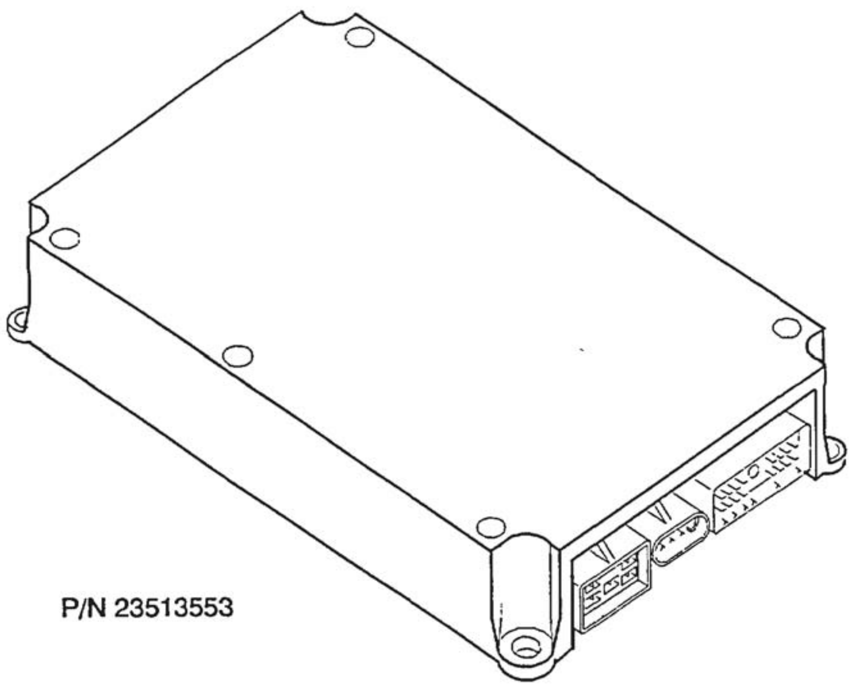


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART 16 . IDLE SHUTDOWN FEATURE INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 16-4 Check ECM Connectors		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM. Then go to to C 16-30.
	Problem found. →	Repair terminals/connectors. Then go to C 16-30.
C 16-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Make sure vehicle is in neutral, and apply parking brake. • Start and engine at idle. • Wait until engine shuts down at pre-selected idle shut down time.	Engine shuts down. →	Repairs are complete.
	Engine does not shut down at pre-selected idle shut down time. →	All system diagnostics are complete. Please review this section from the first step to find the error.



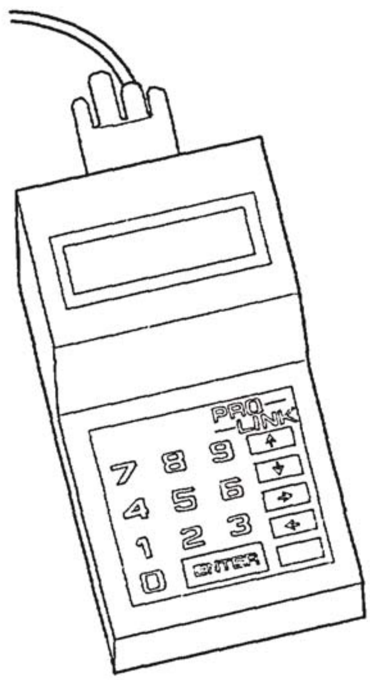
THE ELECTRONIC CONTROL MODULE - DDEC II

Section 4
TROUBLESHOOTING CHARTS

D. CHART 20 - AUXILIARY ENGINE PROTECTION #1 OR #2 ALWAYS ON

NOTE - This chart is only to be used if.
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 20-1 Check Calibration Configuration		
• Turn ignition on. Plug in DDR. • Select ECM input/output configuration. Are the correct cavities/wires configured for auxiliary engine protection?	YES. NO.	Go to Code 26, Step 1, pg 3-345.255. Reconfigure ECM for correct inputs.



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Section 4
TROUBLESHOOTING CHARTS

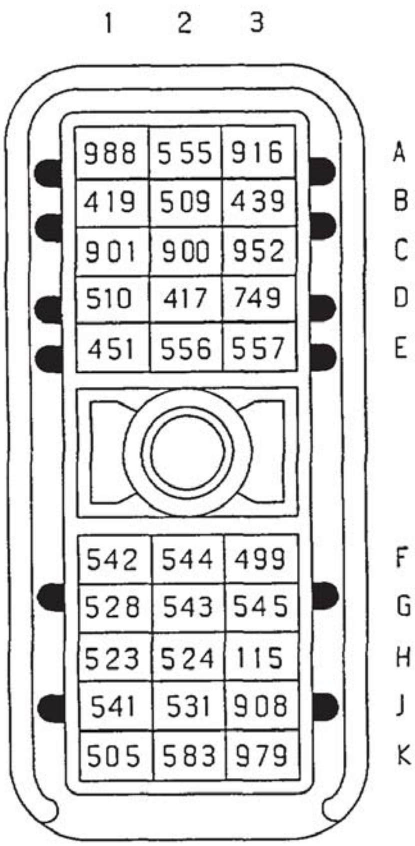
D. CHART 21 - AUXILIARY ENGINE PROTECTION #1 OR #2 INOPERATIVE

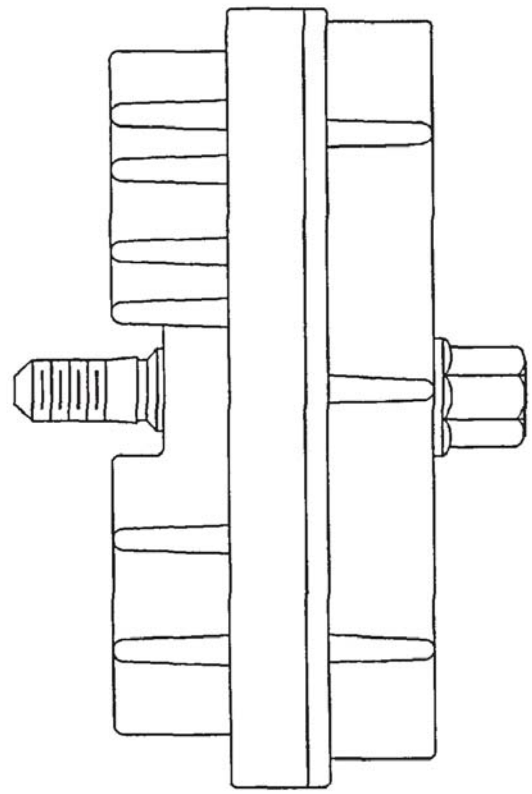
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and

2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 21-1 Check Input/Output Configuration		
• Turn ignition on. • Plug in DDR. • Select ECM input/output configuration. • Write/print pin assignments for Auxiliary #1 or #2 protection.	Not configured for auxiliary #1 or #2 protection.	Reconfigure ECM for proper input(s).
	Data obtained	Go to C 21-2.
C 21-2 Determine OEM Supplied Switch		
This input function is designed to operate when an OEM supplied switch or relay supplies battery ground to this (these) wire(s). Determine OEM supplied device then go to C 21-3.		
C 21-3 Attempt to Force "On"		
• Plug in DDR. • Select switch light status • Install a jumper wire from OEM wire, to battery ground. • Observe switch status.	Switch read on.	Switch or relay is bad. Replace, then go to C 21-30.
	Switch read off.	An open exists in the wire repair open then go to C 21-30.
C 21-30 Verify Repairs		
• Turn Ignition on. • Select switch/light status • Jumper wire to ground, or force switch/relay to ground wire.	Switch read on, and logs code.	Repairs complete clear return to service.
	Switch reads off, and no codes.	Repairs are complete. Go back to Step 1 to find the error.





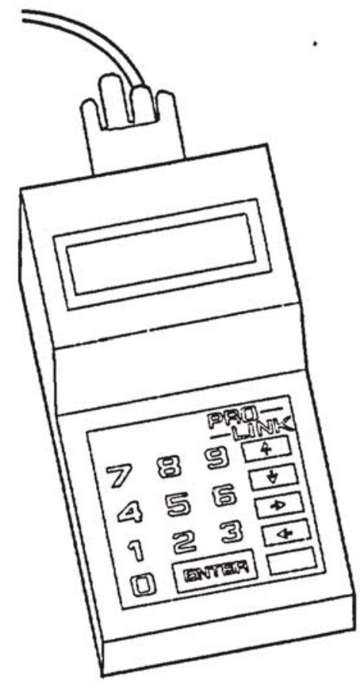
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART 22 · THROTTLE INHIBIT ALWAYS ON

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 22-1 Check Configuration		
• Turn ignition on. • Plug in DDR. to throttle • Review ECM in/outs for for wire assigned to "throttle inhibit".	Throttle inhibit not assigned. →	Problem is not related inhibit. Go to C 1-2.
	Data obtained →	Go to C 22-2.
C 22-2 Switch Status		
• Select switch/light status. • Status of throttle inhibit.	ON. →	The wire that is assigned to the throttle inhibit function is shorted to ground. Repair short, then go to C 22-30.
	OFF. →	Problem is not with throttle inhibit, or is intermittent. See C1-2 for intermittent problem.
C 22-30 Verify Repairs		
• Start engine. • Attempt to throttle engine using foot pedal.	Throttles ok. →	Repairs complete. Return to service.
	No throttle. →	Review this section or go to START-1, pg 3-345.41, as problem may not be related to throttle inhibit.



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Section 4
TROUBLESHOOTING CHARTS

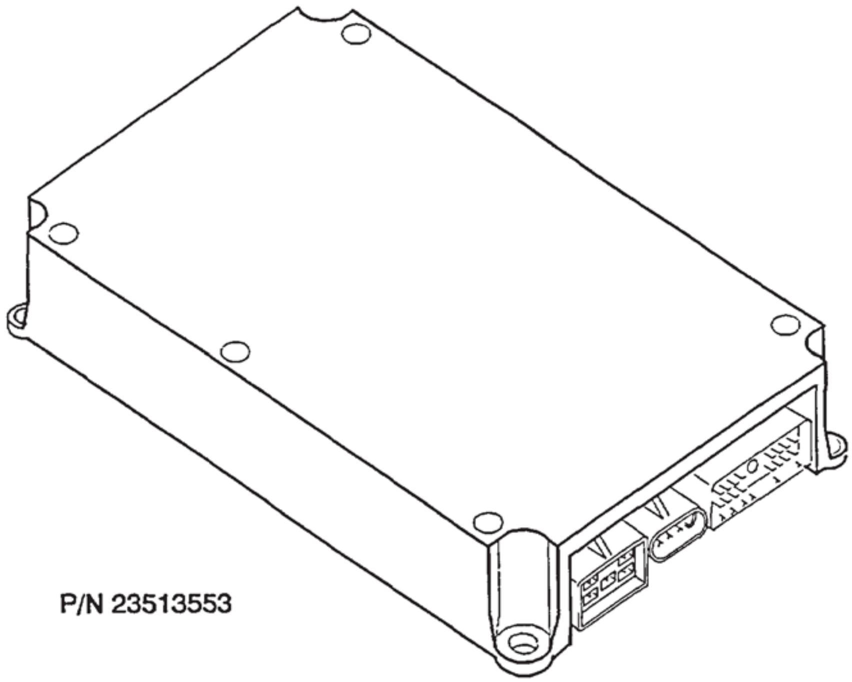
D. CHART 23 - THROTTLE INHIBIT INOPERATIVE

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and

2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 23-1 Check Configuration		
• Turn ignition on. • Plug in DDR. • Select ECM in/out configuration. • Determine which cavity/wire throttle inhibit is assigned.	Not configured for throttle inhibit. →	Reconfigure ECM to enable throttle inhibit.
	Data obtained. →	Go to C 23-2.
C 23-2 Check Switch Status		
• Determine where OEM supplied switch/relay is what operates this function. • Using a jumper wire, place between assigned wire and battery ground. • Observe switch status on DDR.	Switch reads off. →	An open exists in the wire assigned to throttle inhibit. Go to C 23-30.
	Switch reads on. →	The OEM supplied switch/relay is bad or a poor ground exists. Replace/repair then go to C 23-30.
C 23-30 Verify Repairs		
• Start engine. • Attempt to throttle engine using foot pedal. When in a condition it shouldn't be eg. bus door open.	No throttle. →	Repairs complete.
	Throttles ok. →	Review this section from the beginning to find the error.



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

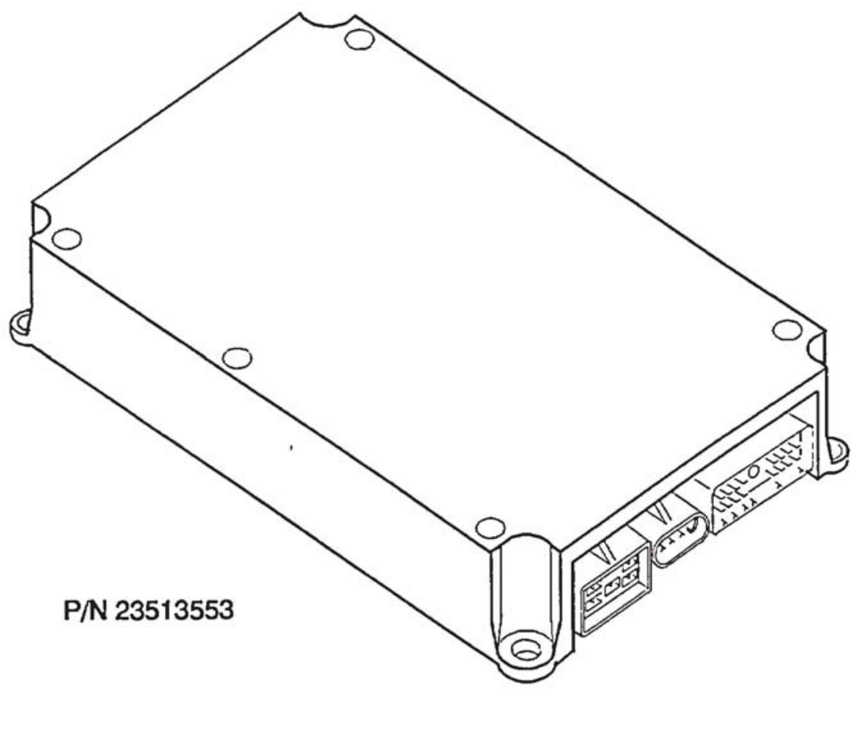
D. CHART 24 - ALTERNATE TORQUE CURVE SWITCH INOPERATIVE

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and

2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 24-1 Check Configuration		
• Turn ignition on. • Plug in DDR. • Select ECM In/out configuration. • Determine which cavity/pin assigned to act (2nd) torque curve.	Not configured for ALT torque curve. →	Reconfigure ECM to enable feature.
	Data obtained. →	Go to C 24-2.
C 24-2 Check Switch Status		
• Turn on 2nd torque curve switch.	Switch reads "on". →	Problem is no longer present. Go to C 1-2 for intermittent problems. (Also ensure calibration is set for 2nd torque curve).
• Observe status on DDR (Switch/Light Status).	Switch reads "off'. →	The OEM switch is bad, or a poor ground exists. Replace/ repair then go to C 24-30.
C 24-30 Verify Repairs		
• Start engine. • Switch to 2nd torque curve.	Switch reads "on". →	Repairs are complete go to START-1 to service any codes.
• Observe switch/light status status on DDR.	Switch reads "off'. →	Repairs are complete review this section to find the error.



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART 25 - FAN CONTROL MALFUNCTION

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE			
C 25-1	Fan Control(s) Information		

FAN CONTROLS

DDEC III provides fan controls for three different fan configurations, in accordance with the proposed Truck Maintenance Council (TMC) standards.

1. Single fan.
2. Two separate fans.
3. Two speed fans.
4. PWM control

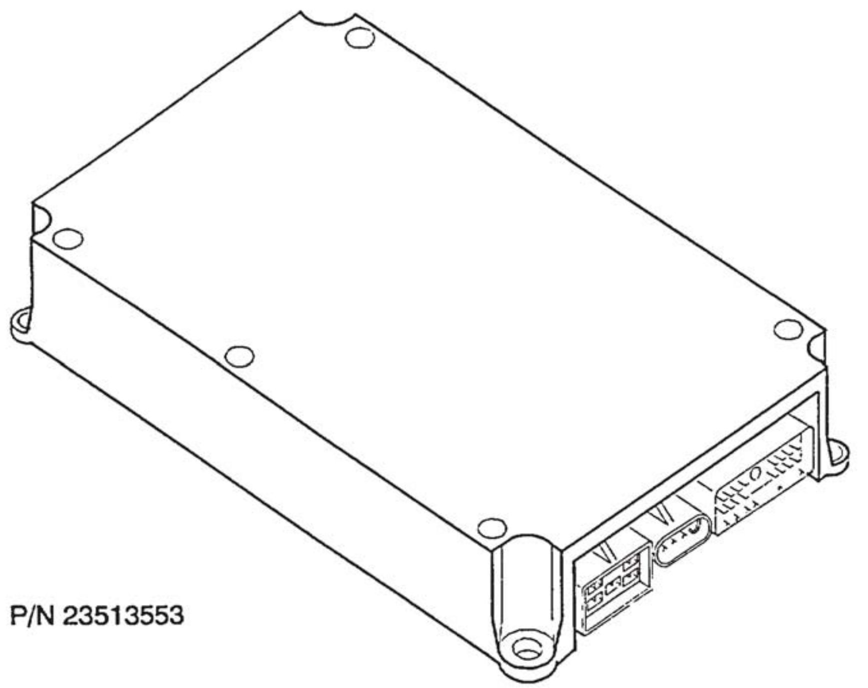
Single Fan with Digital Outputs

The single fan control uses one digital output to drive a single speed fan. Table 1 shows the input and output states during fan operation. The digital output is called Fan Control 1. Fan Control 1 is opened to turn the fan "on". Fan Control 1 is switched to battery ground to turn the fan "off'.

Fan Control 1 is enabled (opened) when at least one of the following conditions occur.

1. Oil temperature above 111° C
2. Coolant temperature above 90° C
3. Air temperature above 49° C
4. Air conditioner is active (OEM supplied A/C switch is opened)
5. Oil temperature sensor fails
6. Coolant temperature sensor fails
7. Air temperature sensor fails
8. Fan engine brake enabled and the engine brake is active at "High" level.
9. Fan control override switch is enabled.
10. Pressure governor system is active,

Note: The temperature values used above are defaults values. These values can be changed at the time of engine order.



THE ELECTRONIC CONTROL MODULE - DDEC III

D. CHART 25 - FAN CONTROL MALFUNCTION (Cont'd)

Two Separate Fans

This configuration uses two digital outputs, Fan Control 1 and Fan Control 2, to drive two separate fans. Table 1 shows the input and output states during fan operation. Fan Control 1 and Fan Control 2 are opened to turn each respective fan "on". Fan Control 1 and Fan Control 2 are switched to battery ground to turn each respective fan "off'.

Fan Control 1 is enabled (opened) when at least one of the following conditions occurs.

1. Air temperature above 49° C
2. Air conditioner is active (OEM supplied A/C switch is opened)
3. Air temperature sensor fails
4. Fan engine brake enable and the engine brake is active at "High" Level.
5. Fan control override switch is enabled.
6. Pressure governor system is active.

Fan Control 2 is enabled (switch to battery ground) when at least one of the following conditions occur.

1. Oil temperature above 114° C
2. Coolant temperature above 96° C
3. Oil temperature sensor fails
4. Coolant temperature sensor fails

Note: The temperature values used above are default values. These values can be changed at the time of engine order.

Two Speed Fan

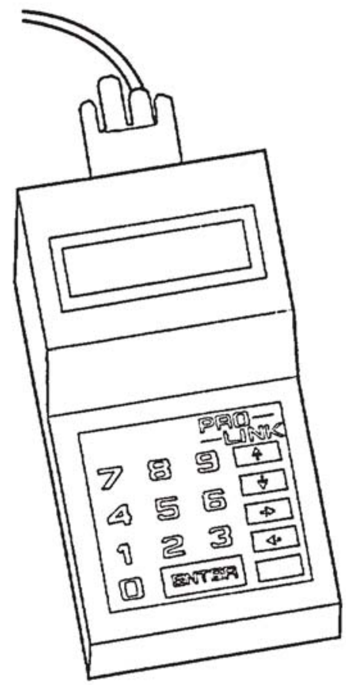
The third configuration uses two digital outputs, Fan Control 1 and Fan Control 2, to drive a two speed fan. Table 1 shows the input and output states during fan operation. When Fan Control 1 output is opened, the low speed fan mode activates. The fan operates in the high speed mode, if Fan Control 2 output is opened. When the fan is operating in the high speed mode (Fan Control 1) whenever the engine RPM is greater than 1500 RPM. Fan Control I is disabled when Fan Control 2 is enabled.

1. Oil temperature above 111° C
2. Coolant temperature above 90° C
3. Air temperature above 49° C
4. Air conditioner is active (OEM supplied A/C switch is opened)
5. Oil temperature sensor fails
6. Coolant temperature sensor fails
7. Air temperature sensor fails
8. Dynamic engine brake enable and engine brake level is "high".
9. Fan control override switch is enabled
10. Pressure governor system is active,

Fan Control 2 is enabled (opened) when at least one of the following conditions occur.

1. Oil temperature above 114° C
2. Coolant temperature above 96° C

Note: The temperature values used above are default values. These values can be changed at the time of engine order.



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Section 4
TROUBLESHOOTING CHARTS

D. CHART 25 - FAN CONTROL MALFUNCTION (Cont'd)

Variable Speed Single Fan with PWM Control

The single fan uses the PWM signal to drive a variable speed fan. The PWM signal is controlled by two of three temperature sensors. The fan can be turned "on" by either temperature sensor. The sensor requesting the highest fan speed is used. The fan is off when the duty cycle of the PWM signal is 100%. The highest speed of the fan is produced when the duty cycle is 0%. The fan speed will ramp up to the speed requested over a span of 10% Duty Cycle/sec. The decrease in fan speed will occur after a short time delay and will step down to the value dictated by a sensor or off.

The PWM when at least one of the following conditions occur.

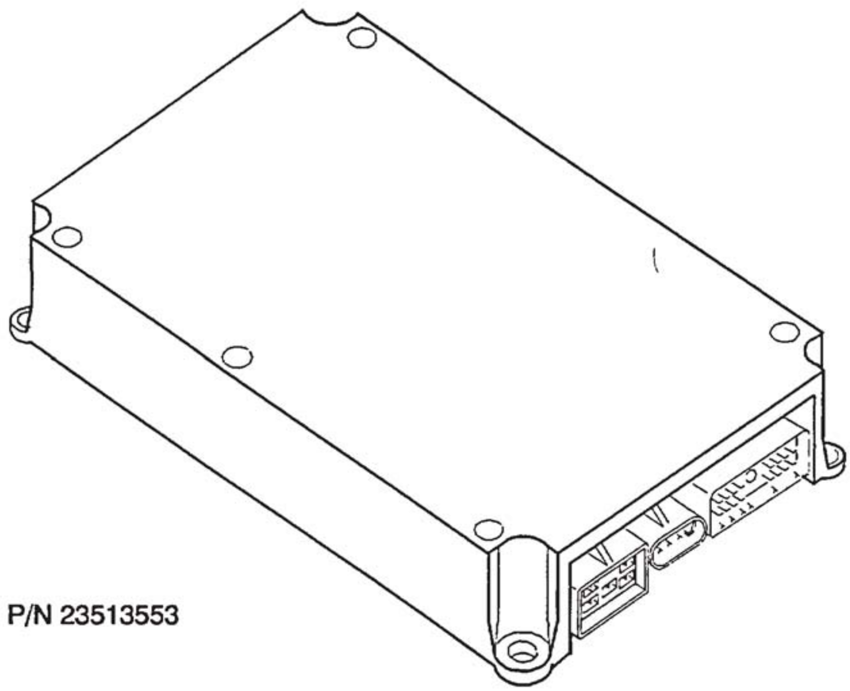
1. Coolant Temperature above 118° C
2. Intercooler Temperature above 180° C
3. Oil Temperature above 118° C
4. Air conditioner is active (OEM supplied A/C switch is opened)

Note: The temperature values used above are default values. These values can be changed at the time of engine order.

Digital Inputs and Outputs
The following is a list of digital inputs and Outputs that are used with Fan Control:

Digital Inputs:
⊕Air Conditioner Status
⊕Fan Control Override

Outputs:
⊕Fan Control 1
⊕Fan Control 2
⊕PWM Output



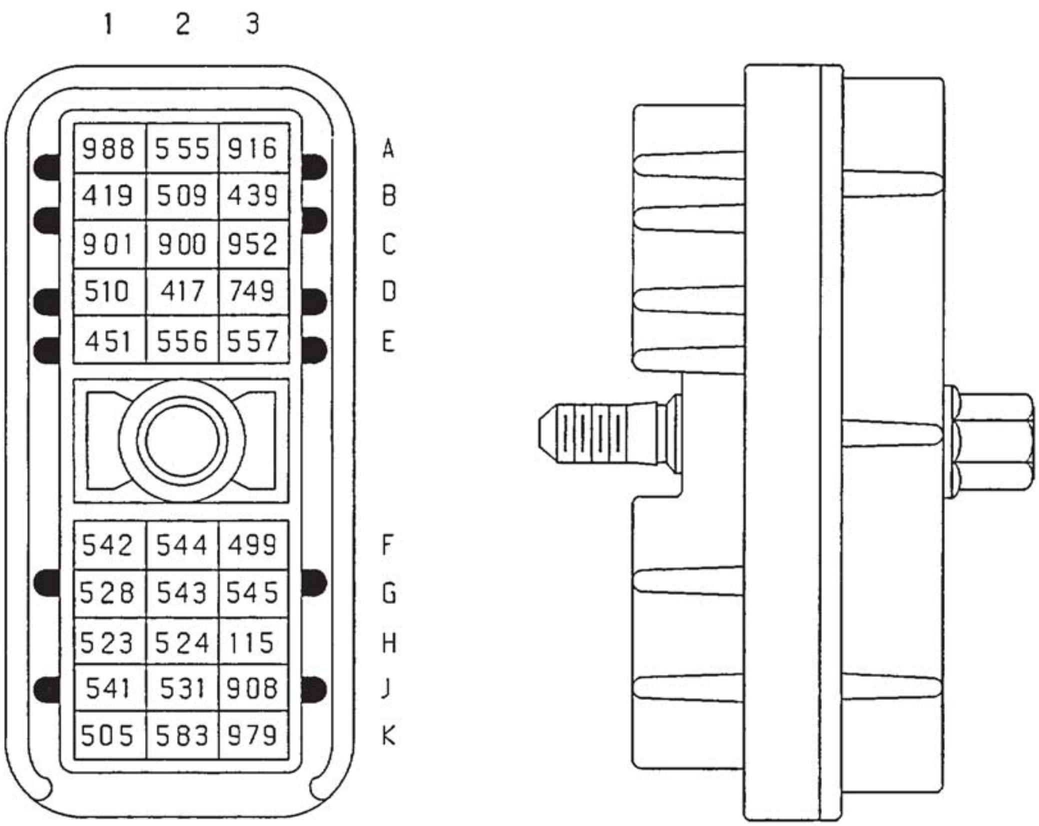
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART 25 - FAN CONTROL MALFUNCTION (Cont'd)

Table 1: Fan Control Inputs and Outputs

Fan Mode	Fan State	Fan Control Output 1	Fan Control Output 2	A/C Input	Override Input	Jake Brake Status	Primary Control
1 Fan	On	Open	-------	Grounded	Open	Not in High Mode	Engine Temp Sensors
	Off	Grounded	-------	Grounded	Open	Not in High Mode	Engine Temp Sensors
	On	Open	-------	Open	Don't Care	Not in High Mode	OEM A/C Switch
	On	Open	-------	Don't Care	Grounded	Not in High Mode	OEM override Switch
	On	Open	-------	Don’t Care	Don't Care	High Mode	Jake Brake in High Mode
2 Fans	1-On 2-On	Open	Open	Grounded	Open	Not in High Mode	Engine Temp Sensors
	1-On 2-Off	Open	Grounded	Grounded	Open	Not in High Mode	Engine Temp Sensors
	1-Off 2-On	Grounded	Open	Grounded	Open	Not in High Mode	Engine Temp Sensors
	1-Off 2-Off	Grounded	Grounded	Grounded	Open	Not in High Mode	Engine Temp Sensors
	1-On 2-Off	Open	Grounded	Open	Don't Care	Not in High Mode	OEM A/C Switch
	1-On 2-Off	Open	Grounded	Don't Care	Grounded	Not in High Mode	Override Switch
	1-On 2-Off	Open	Grounded	Don't Care	Grounded	High Mode	Jake Brake in High Mode
2 Speeds	Off	Grounded	Grounded	Grounded	Open	Not in High Mode	Engine Temp Sensors
	Low	Open	Grounded	Grounded	Open	Not in High Mode	Engine Temp Sensors
	High	Grounded	Open	Grounded	Open	Not in High Mode	Engine Temp Sensors
	Low	Open	Grounded	Open	Don't Care	Not in High Mode	OEM /C Switch
	Low	Open	Grounded	Don't Care	Grounded	Not in High Mode	Override Switch
	Low	Open	Grounded	Don't Care	Grounded	High Mode	Jake Brake in High Mode



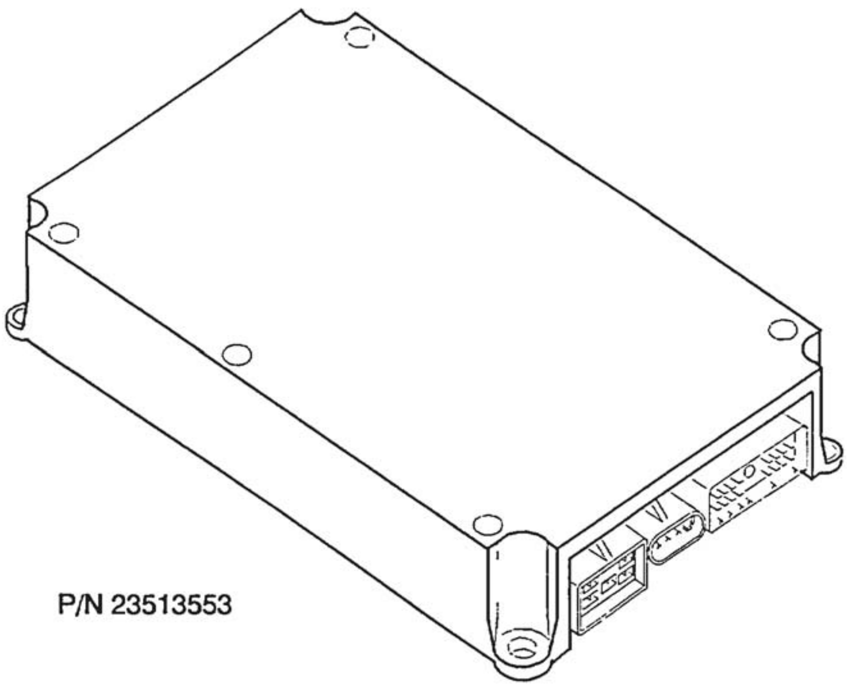
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

D. CHART 26 · DEACCELERATION LIGHT INOPERATIVE

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 26-1 Check Configuration		
• Turn ignition on. • Plug in DDR. • Review ECM in/outs configuration. • Determine cavity/wire assigned "Decel Light" (output).	Not configured for Decel Light. →	Reconfigure ECM to enable this output.
	Data obtained. →	Go to C 26-2.
C 26-2 Force Light On		
• Using DDR, select activate outputs. • Ensure TPS is at 0%. • Activate Decel Light.	Light goes "on". →	Go to C 26-3.
	Light stays "off'. →	Wire from ECM to light is open, or bulb is bad, or open exists in + side of bulb. Repair/replace. Then go to C 26-30.
C 26-3 Check ECM Connectors		
• Turn ignition off. • Check terminal at the vehicle harness connector (or the connector with this wire number) both ECM and harness side.	Terminals and connectors - ok. →	Reprogram ECM. Then go to C 26-30.
	Problem found. →	Repair terminals/connectors. Then go to C26-30.

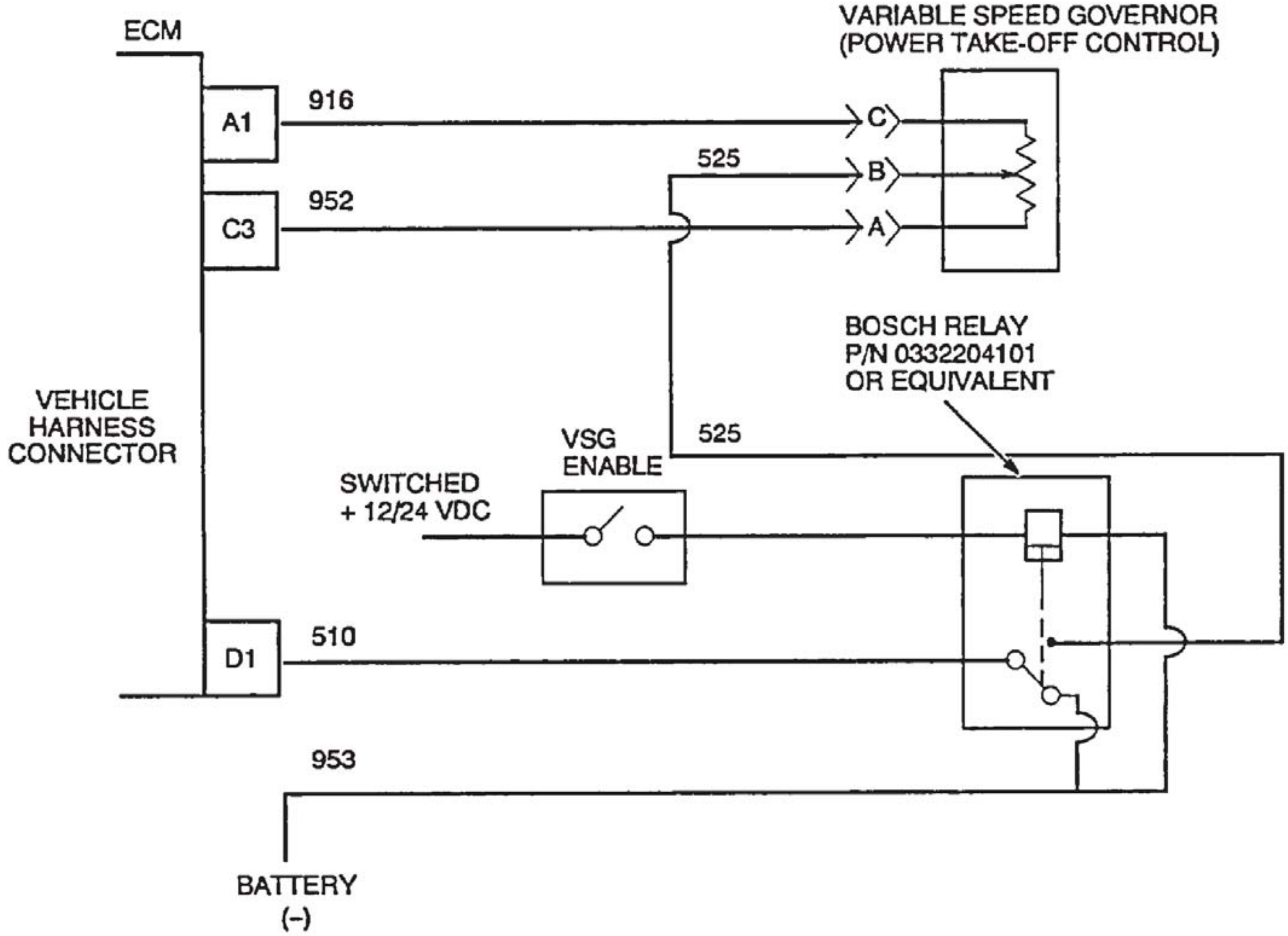


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

D. CHART 26 - DEACCELERATION LIGHT INOPERATIVE (Cont'd)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C 26-30 Verify Repairs		
• Replace wires/connectors. • Turn ignition on. • Plug in DDR. • Select activate outputs. • Activate Decel Light.	Light goes "on". →	Repairs are complete.
	Light goes "off'. →	Review this section to find the error.



PTO (VSG) CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 11
J1587 CODE: P187 4 POWER TAKE OFF INPUT FAILED LOW (VOLTAGE LOW) (ALSO CALLED VARIABLE SPEED GOVERNOR · VSG)

NOTE - This chart is only to be used if:

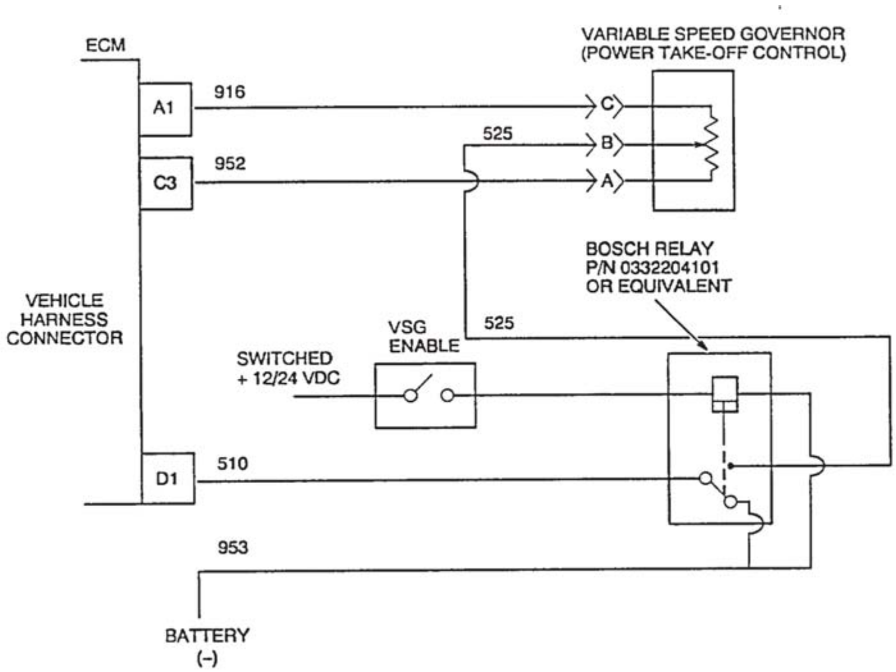
1) **All basic mechanical checks and physical inspections have been performed with no problem found, and**
2) **Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.**

NOTE: REMOVE GROUND WIRE IF FITTED FROM CIRCUIT 510 BEFORE PERFORMING THESE CHECKS!

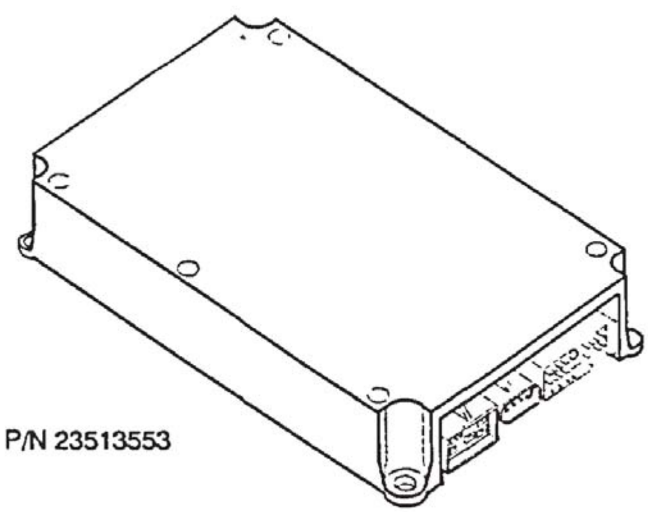
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-1 Multiple Code Check		
• Were there any other active codes besides 187/4?	No other active codes.	Go to 11-2.
	Yes, any or all of the following active codes: 187/3, 91/3 or 4	Go to VEH5V-1, page 3-345 419.
	Yes - but none of the above.	Go to 11-2.
11-2 Sensor Check		
• Turn ignition off. • Disconnect PTOSA connector • Install a jumper wire between sockets B and C of the PTO/VSG harness connector. • Turn ignition on • Read active codes.	Code 187/3 (and/or -. other codes.	Go to 11-6.
	Code 187/4 (and any-other codes).	Go to 11-3.

NOTE: If flash CODE 11, or 187/4 is present and no PTO-VSG controls are used (fit to vehicle) contact DDC with engine serial number to determine if a calibration modification is required.

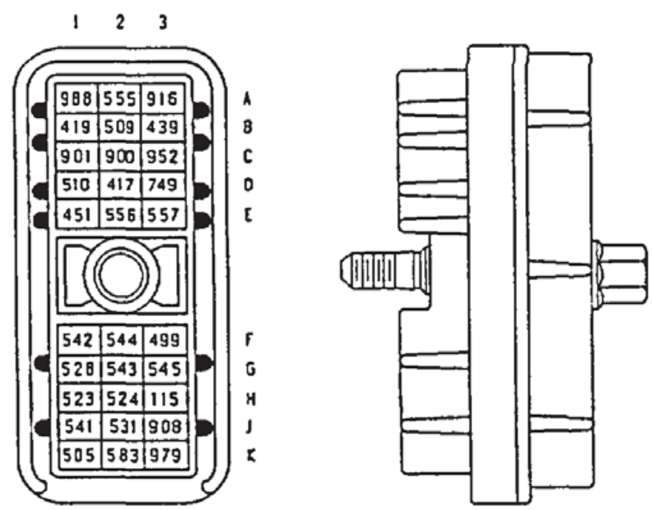
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-3 Check PTOSA Adjustment		
• Remove jumper and reconnect PTOSA. • Hook-up DDR to the DDL connector and select PTO COUNTS. • Read counts.	Getting 48 to 968 counts.	Go to 11-5.
	Not getting the above readings.	Go to 11-4.
11-4 Attempt PTOSA Adjustment		
• If a variable PTOSA is installed adjust stops on PTOSA. • If fixed resistors are Installed replace with new resistors.	Corrected problem so that Throttle Counts is now correct	Go to 11-30.
	Could not correct the problem.	Go to 11-5.



PTO (VSG) CIRCUITS



THE ELECTRONIC CONTROL MODULE - DDEC III

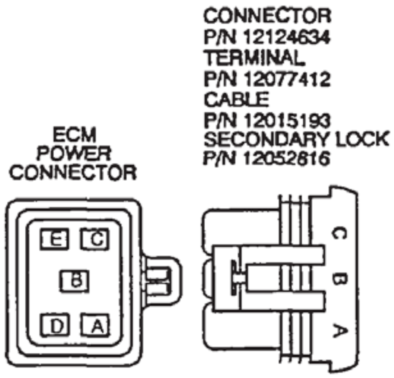


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

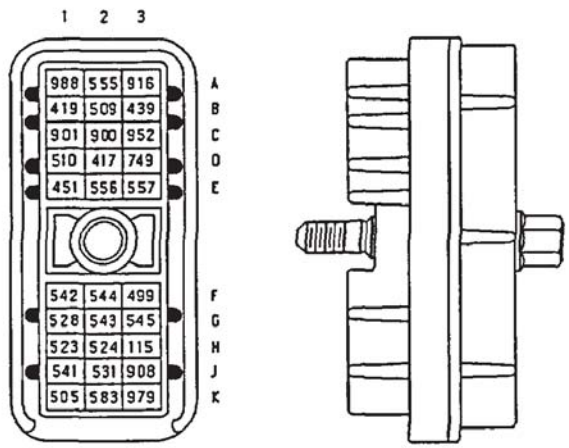
E. FLASH CODE: 11
J1587 CODE: P187 4. POWER TAKE OFF INPUT FAILED LOW (VOLTAGE LOW) (ALSO CALLED VARIABLE SPEED GOVERNOR · VSG)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-5 Check PTOSA Connectors		
• Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace PTOSA. Then go to 11-30.
	Problem found.	Repair terminals/connectors. Then go to 11-30.
11-6 Check for +5 Volts		
• Remove jumper. • Turn ignition on. • Read voltage on PTOSA harness, connector, socket C (red lead) to socket A (black lead).	Between 4 to 6 volts.	Go to 11-7.
	Less than 4 volts.	Go to 11-10.
	Greater than 6 volts	Go to 11-12.
11-7 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector ECM. • Read resistance between sockets A and B on the PTOSA harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#525) is shorted to the return line (ckt#952). Repair short. Then go to 11-30.
	Greater than 10,000 ohms or open.	Go to 11-8.
11-8 Check for Signal Open		
• Install a jumper wire between sockets A and B of the PTOSA harness connector. • Read resistance between sockets D1 (510) & C3(952) on the vehicle connector .	Less than or equal to 5 ohms.	Go to 11-9.
	Greater than 5 ohms or open.	Signal line (ckt#510) is open, and/or signal return (ckt#952) is open. Repair open. If no open was found, check ECM terminals A3, D1, C3 and PTO pins. Then go to 11-30.

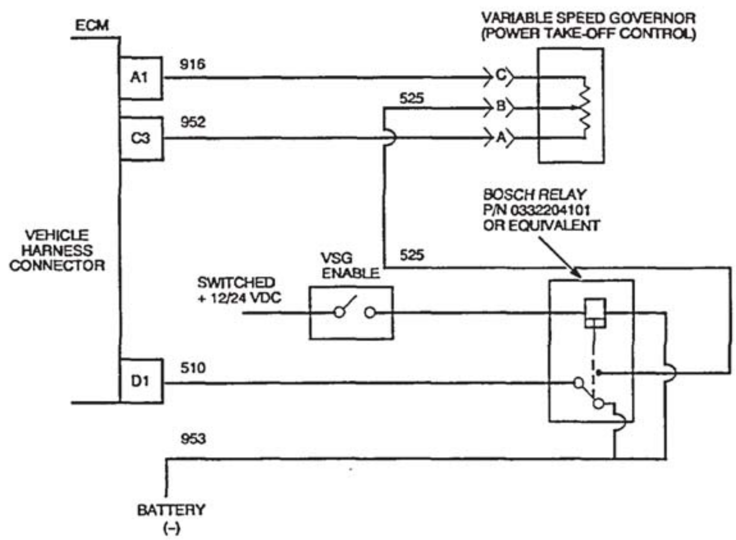


CAVITY	WIRE NO.
C	241
E	t50
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR



ECM VEHICLE HARNESS CONNECTOR

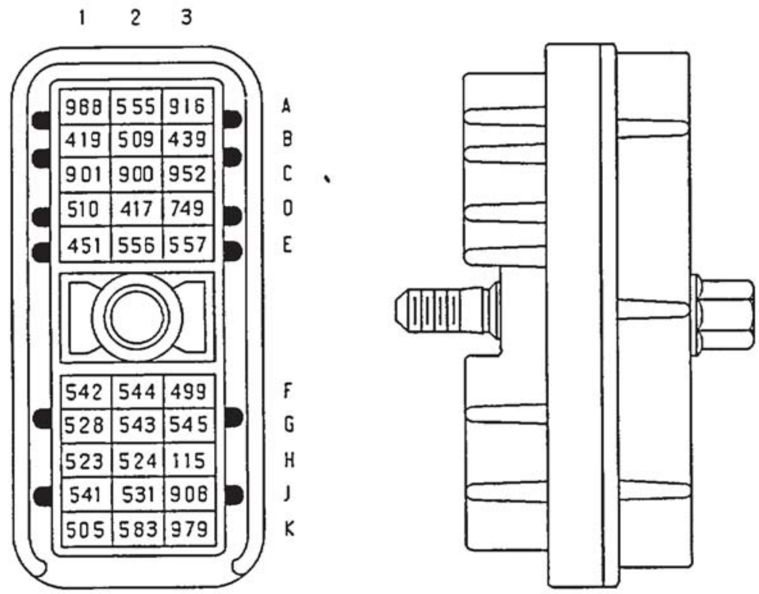


PTO (VSG) CIRCUITS

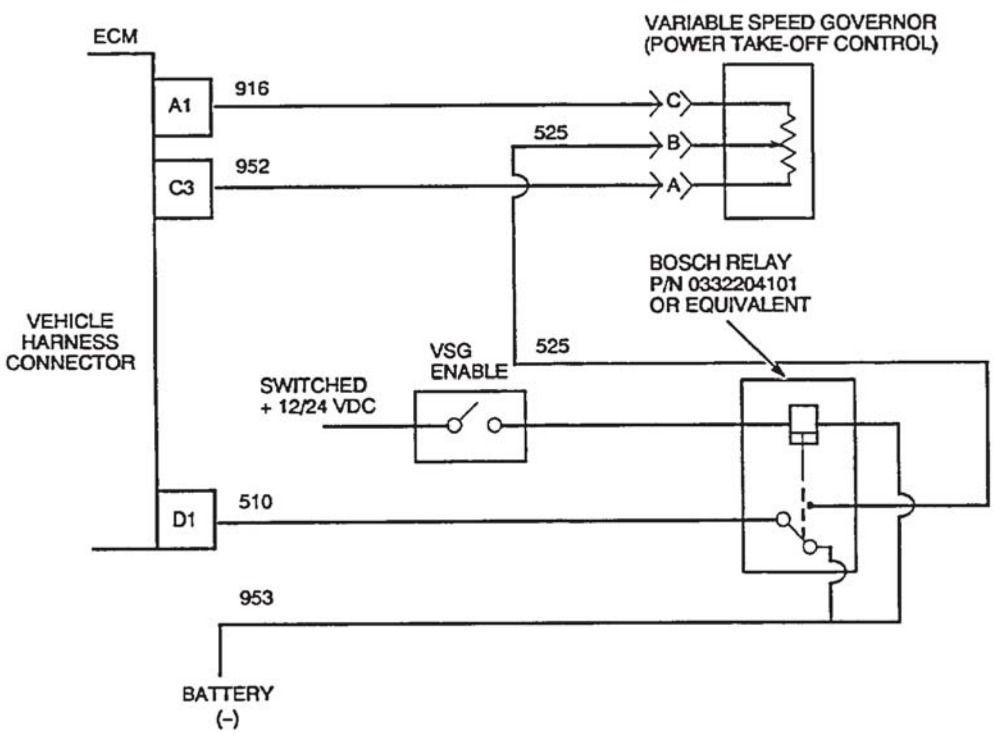
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 11
J1587 CODE: P187 4 · POWER TAKE OFF INPUT FAILED LOW (VOLTAGE LOW) (ALSO CALLED VARIABLE SPEED GOVERNOR . VSG)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-9 Check ECM Connectors		
• Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 11-30.
	Problem found Then go to 11-30.	Repair terminals/connectors.
11-10 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A and C on the PTOSA harness connector.	Less than or equal to 10,000 ohms.	The vehicle +5 Volt line (ckt#916) is shorted to the return line (ckt#952). Repair short. Then go to 11-30.
	Greater than 10,000 ohms or open.	Go to 11-11.
11-11 Check Check for Open +5 Volt line		
• Install a jumper wire between sockets A and C of the PTOSA harness connector. • Read resistance between sockets A3(916) & C3(952) on the vehicle connector.	Less than or equal to 5 ohms.	Go to 11-9.
	Greater than 5 ohms or open.	The vehicle +5 Volt line (ckt #916) is open. Repair open. Then go to 11-30.
11-12 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to ECM. • Disconnect 5 way power connector at the ECM. • Read resistance between sockets D1 (510) & B3(439) on the vehicle harness connector • Also read resistance between socket D1 (510) on the vehicle harness connector and the following sockets on the 5 way power connector: C, D, E, and B.	All readings are greater than 10,000 ohms or open.	Go to 11-13.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less the 10,000 ohms resistance was read. Repair short and reinsert fuses. Then go to 11-30.



ECM VEHICLE HARNESS CONNECTOR

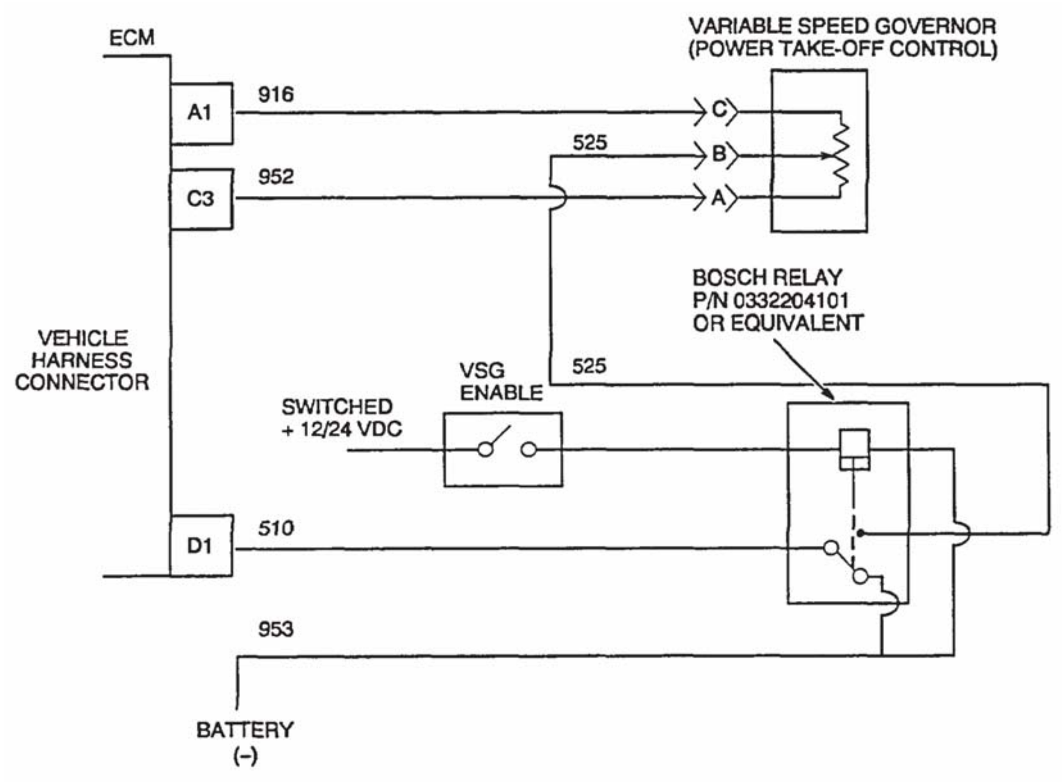


PTO (VSG) CIRCUITS

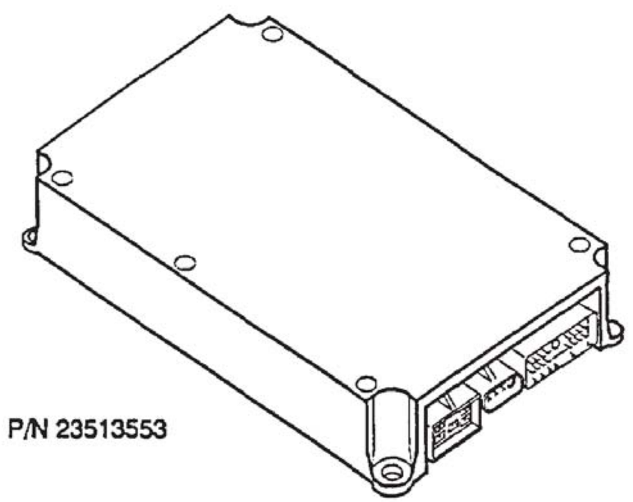
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 11
J1587 CODE: P187 4 POWER TAKE OFF INPUT FAILED LOW (VOLTAGE LOW) (ALSO CALLED VARIABLE SPEED GOVERNOR - VSG)

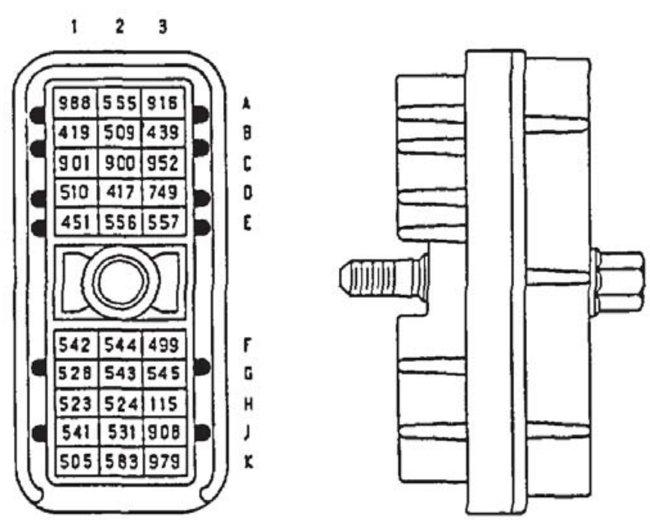
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-13 Check for Outside DDEC Battery +		
• Turn Ignition off. • Remove ECM 5-pin power connector. • Remove ECM vehicle harness. • Turn ignition on. • Read voltage A3(916) to a good ground. • Read voltage C3(952) to a good ground.	All readings less then 4.0 volts. →	Go to 11-9.
	Either reading greater than or equal to 4.0 volts. →	Outside power is spliced into either ckt#952 or ckt#916. Remove splice. Then go to 11-30.
11-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. • Stop engine. • Read all codes.	(No codes). →	Repairs are complete.
	Code 187/4 (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 187/4. →	Go to START-1, pg 3-345.41, to service other codes.



PTO (VSG) CIRCUITS



THE ELECTRONIC CONTROL MODULE DDEC III



ECM VEHICLE HARNESS CONNECTOR

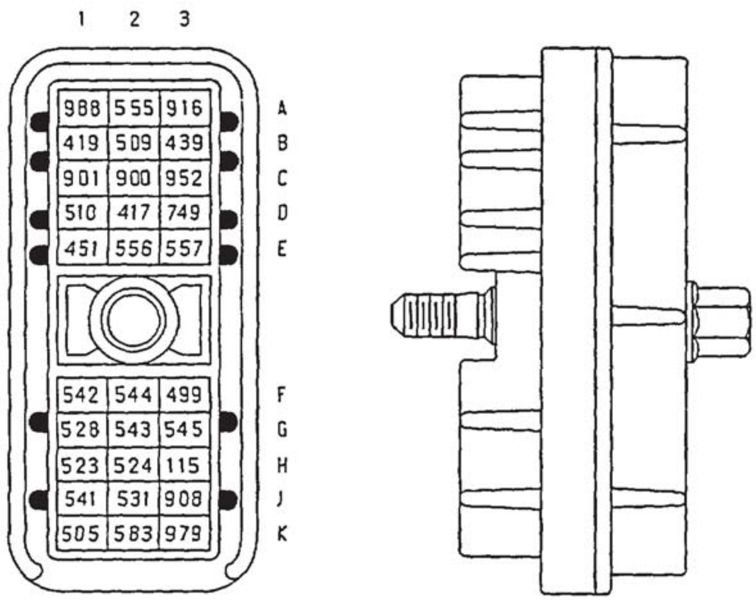
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 12
J1587 CODE: P1873 - POWER TAKE OFF (PTO) INPUT FAILED HIGH (HIGH VOLTAGE) (ALSO CALLED VARIABLE SPEED GOVERNOR - VSG)

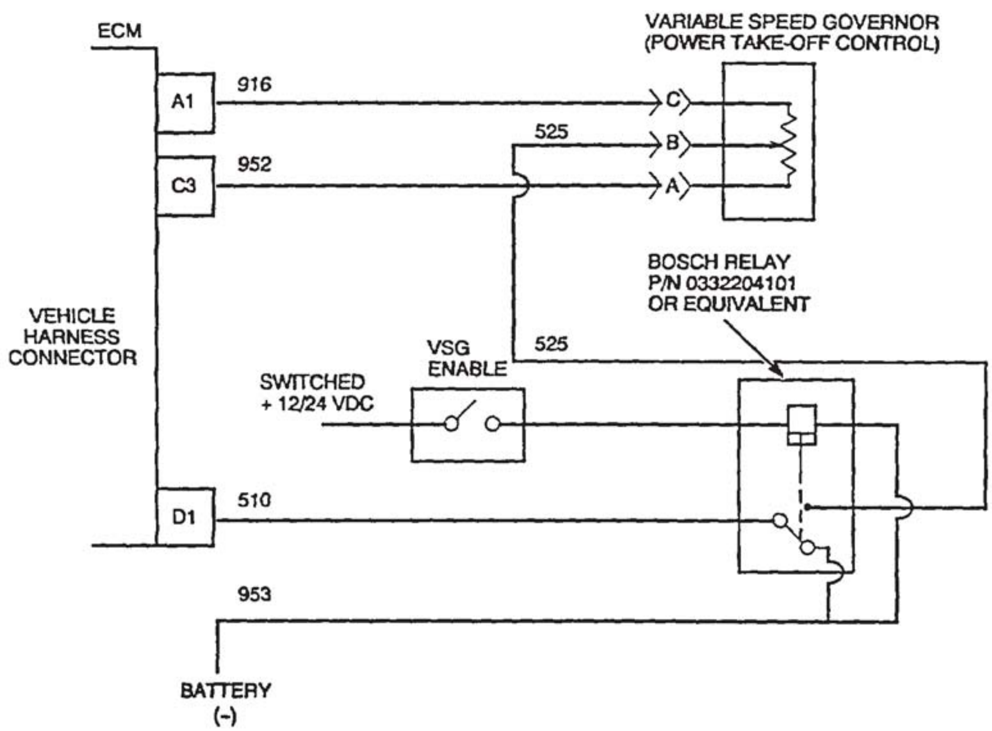
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

NOTE: REMOVE GROUND WIRE IF FITTED FROM CIRCUIT 510 BEFORE PERFORMING THESE CHECKS!

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
12-1 Multiple Code Check		
Were there any other active codes besides Code 187/3?	No other active codes	Go to 12-2.
	Yes, either code 91/3 or 4	Go to VEH5V-1, page 3-345 419.
	Yes - but none of the above.	Go to 12-2.
12-2 Sensor Check		
• Turn ignition off. • Unplug the PTOSA sensor connector. • Turn ignition on. • Read active codes.	Any codes except Code 187/3.	Go to 12-3.
	Code 187/3 (and any other codes).	Go to 12-5.
12-3 Return Circuit Check		
• Transmission in neutral. • Turn ignition off. • Install a jumper wire between pin A and pin B of the PTOSA harness connector. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets C3(952) and D1(510) on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 12-4.
	Greater than 5 ohms or open.	Return line (ckt#952) is open. Repair open. Then go to 12-30.
12-4 Check PTOSA Connectors		
• Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Recalibrate PTOSA. If not recalibratable or does not fix problem then replace PTOSA sensor. Then go to 12-30.
	Problem found.	Repair terminals/connectors. Then go to 12-30.



ECM VEHICLE HARNESS CONNECTOR

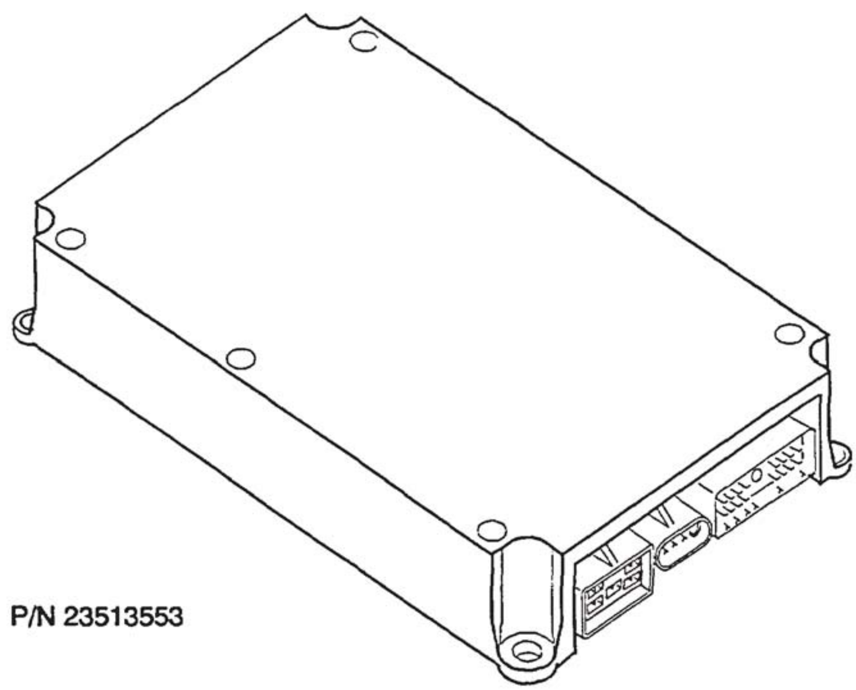


PTO (VSG) CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 12
J1587 CODE: - P187 3 - POWER TAKE OFF (PTO) INPUT FAILED HIGH (HIGH VOLTAGE) (ALSO CALLED VARIABLE SPEED GOVERNOR - VSG)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
12-5 Check for Short to +5 Volt Line		
• Connect all connectors to ECM. Turn ignition on. • Read voltage on PTOSA harness connector pin B (525) to pin A (957).	Greater than 1.0 volts	Signal line (ckt#510 or #525) is shorted to the vehicle +5 Volt line (ckt#916) or another voltage source. Repair short. Then go to 12-30.
	Less than or equal to 1.0 volts.	Go to 12-6.
12-6 Check for Open		
• Connect all connectors to ECM. • Read voltage on PTOSA harness at Pin B (525) and Pin A (952) with ignition on. and go to 12-30. If no problem was found, then go to 12-7.	Greater than 4.5 volts.	Check for open in wire #952 between PTOSA and ECM. It may be a bad terminal in the ECM connector (C3). Repair
	Less than 4.5 volts.	Go to 12-7.
12-7 Check ECM Connectors		
• Disconnect the vehicle harness connector. • Check terminals at the ECM vehicle harness connector (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 12-30.
	Problem found.	Repair terminals/connectors. Then go to 12-30.

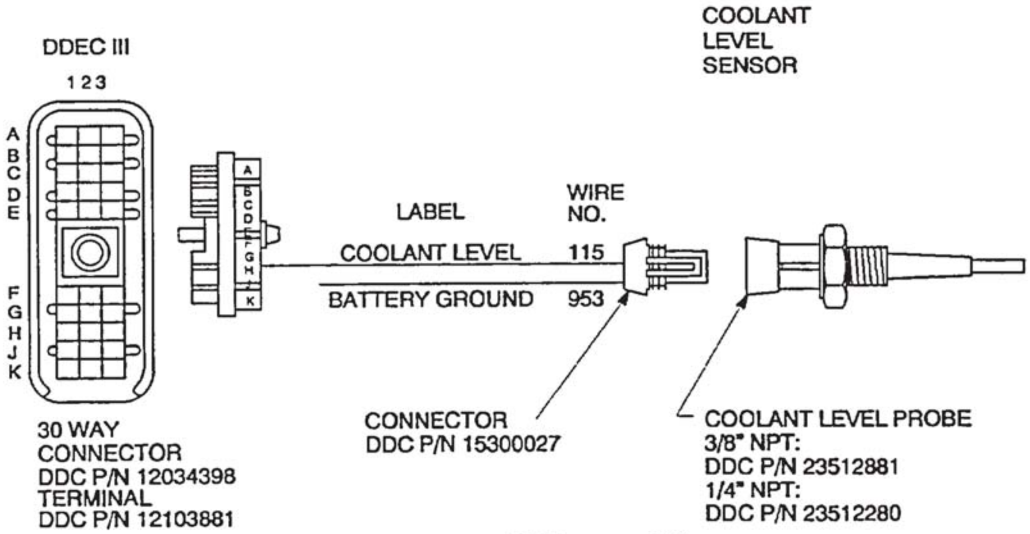


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

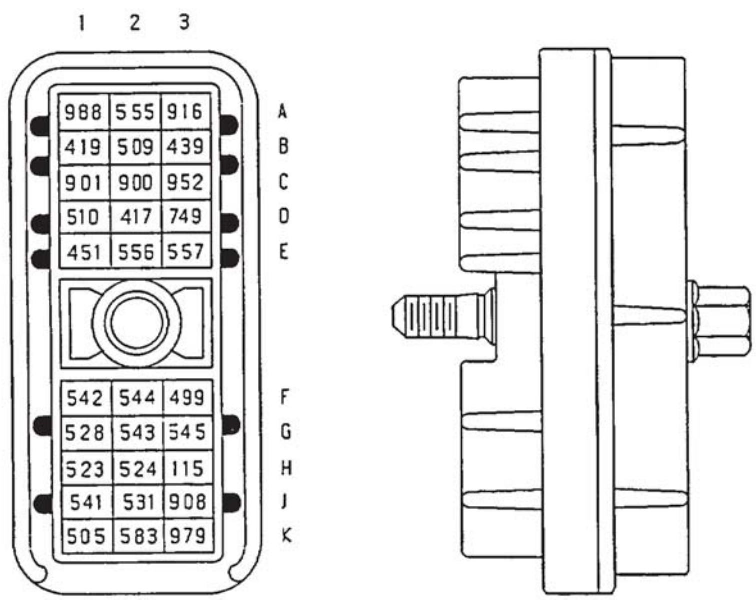
E. FLASH CODE: 12
J1587 CODE: P187 3 - POWER TAKE OFF (PTO) INPUT FAILED HIGH (HIGH VOLTAGE) (ALSO CALLED VARIABLE SPEED GOVERNOR - VSG)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
12-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read historical codes.	No codes. →	Repairs are complete.
	Code 187/3 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 187/3 →	Go to START-1, pg 3-345.41, to service other codes.



LABEL	WIRE NO.	CLS CAVITY
COOLANT LEVEL	115	A
GROUND	953	B

COOLANT LEVEL SENSOR AND CIRCUITS



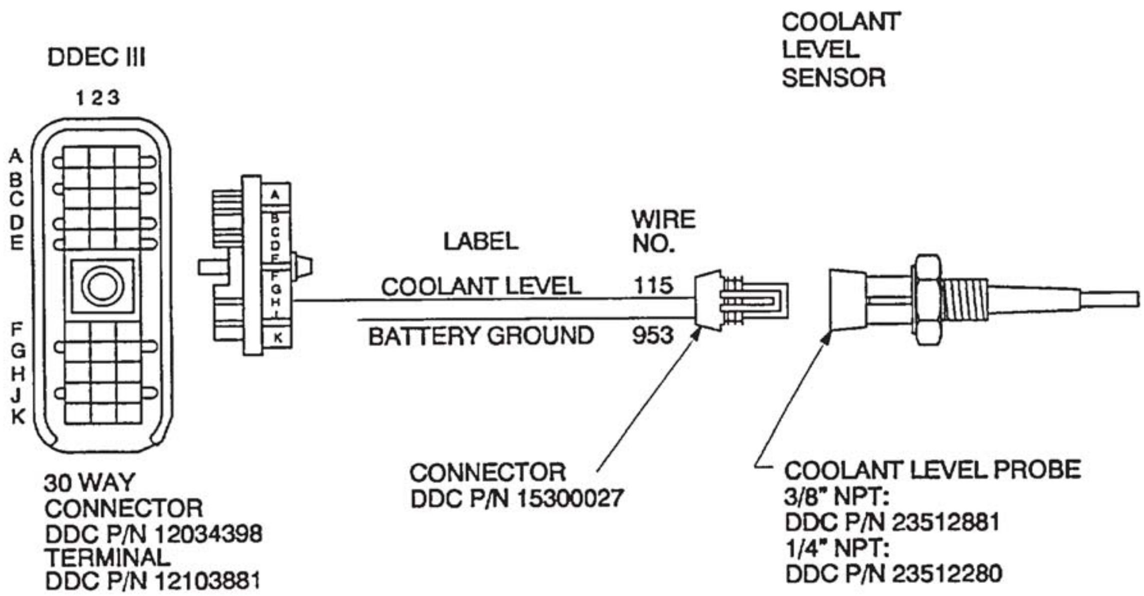
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 13
J1587 CODE: P111 4. COOLANT LEVEL CIRCUIT FAILED LOW (LOW VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-**III** was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-1 Sensor Check		
• Turn ignition off. • Disconnect CLS. • Turn ignition on. • Start engine. • Read active codes. • Stop engine.	Code P111/3 (and any other codes). →	Go to 16-1.
	Code P111/4 (and any other codes). →	Go to 13-3.
13-2 Check CLS Connectors		
• Inspect terminals at the CLS connector for damage; bent, corroded, and unseated pins or sockets. Also ensure wires are not reversed at the CLS.	Terminals and connectors are okay. →	Replace CLS. Then go to 13-30.
	Problem found. →	Repair terminals/connectors. Then go to 13-30.
13.3 Check for Short to Ground		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A & B of the CLS connector.	Less than or equal to 10,000 ohms. →	Signal line (ckt#115) is shorted to ground (953). Repair short. Then go to 13-30.
	Greater than 10,000 ohms or open. →	Go to 13-2.



LABEL	WIRE NO.	CLS CAVITY
COOLANT LEVEL	115	A
GROUND	953	B

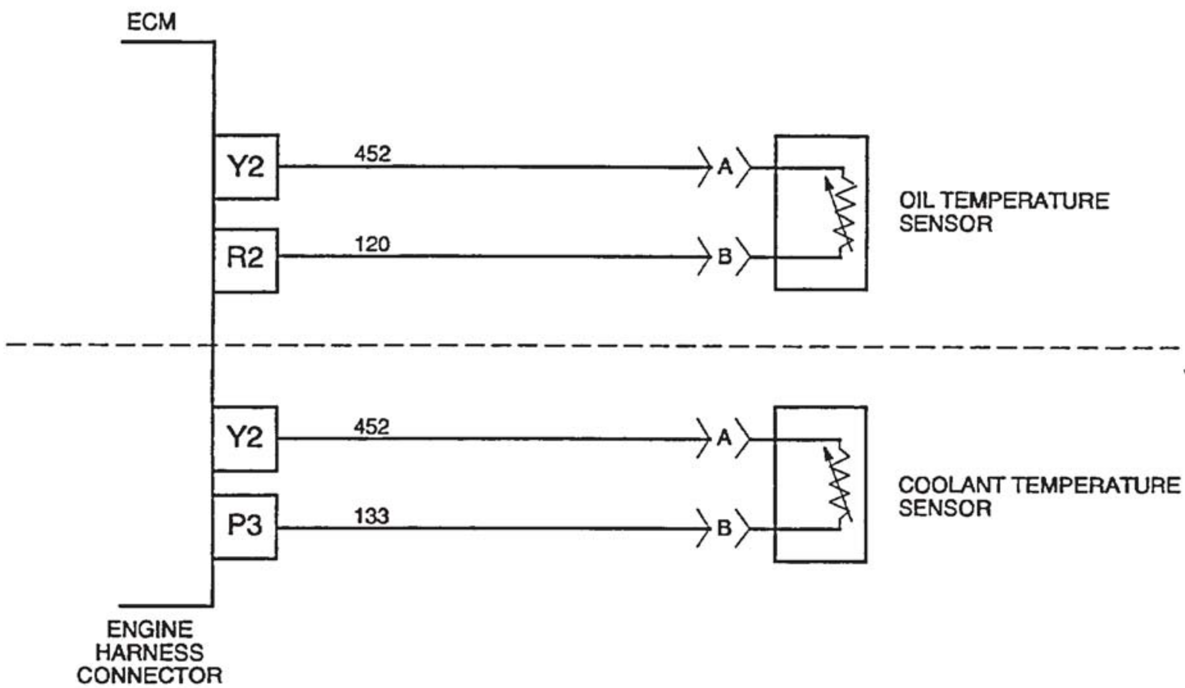
COOLANT LEVEL SENSOR AND CIRCUITS

Section 4

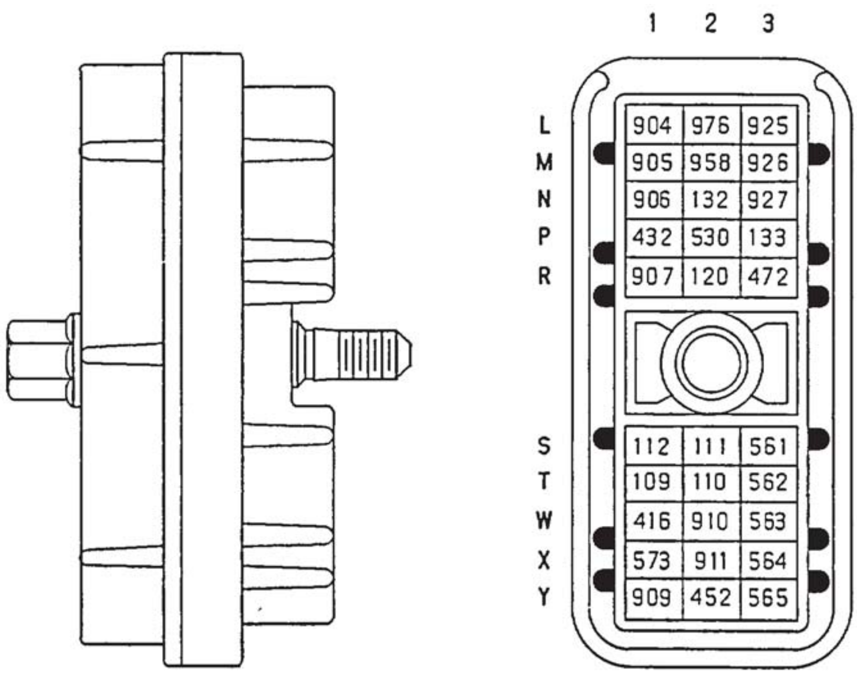
TROUBLESHOOTING CHARTS

E. FLASH CODE: 13
J1587 CODE: P111 4 · COOLANT LEVEL CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Start engine. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read INACTIVE CODES.	No codes.	Repairs are complete.
	Code 111/4 (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 111/4	Go to START-1, pg 3-345.41 to service other codes.



OIL AND COOLANT TEMPERATURE CIRCUITS



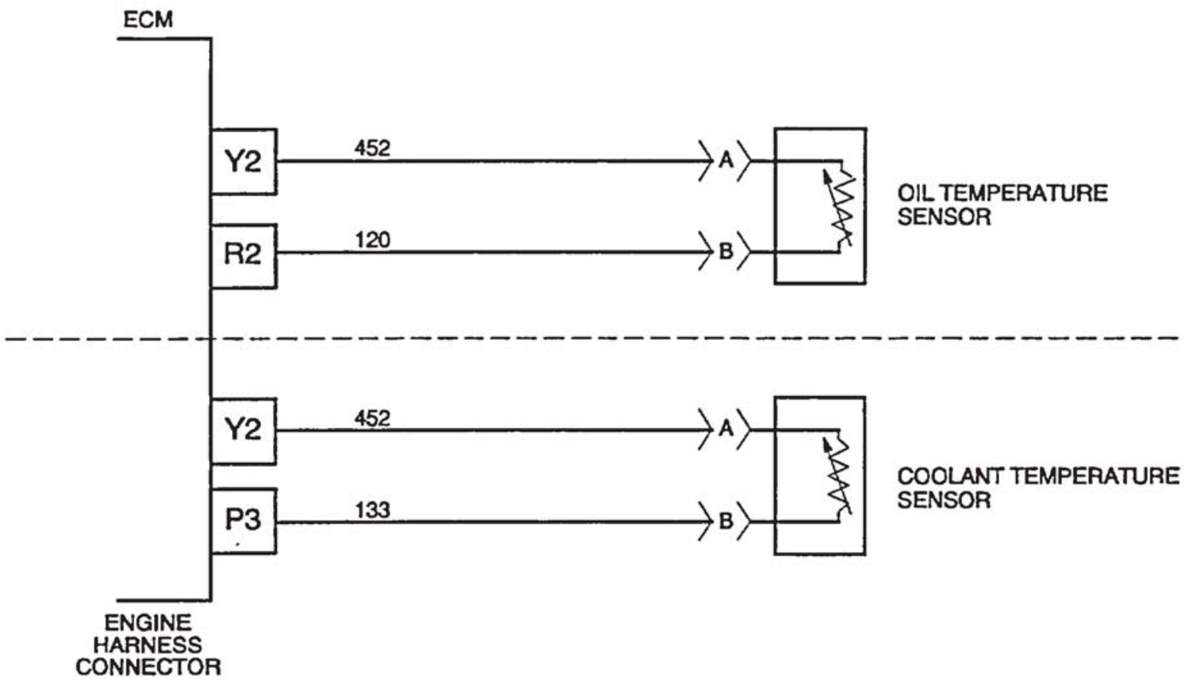
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

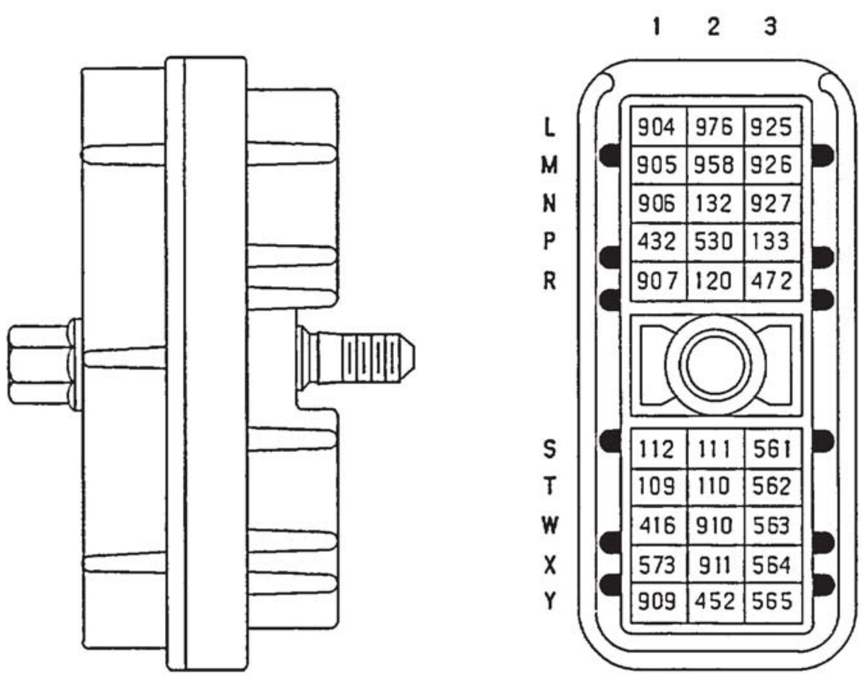
E. FLASH CODE: 14
J1587 CODE: P110 3 - COOLANT TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH) (BELOW)
OR: P175 3. OIL TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH) (BELOW)
OR: P052 3 - INTERCOOLER TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH) TBD

Note- This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problems found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-1 Code Check		
• Turn ignition on. • Plug in DDR and determine which code is present.	PID 110 - FMI 3 → PID 175 - FMI 3 →	Go to 14-2. Go to 14-3.
14-2 Coolant Temp Sensor Check		
• Turn ignition off. • Disconnect CTS and install a jumper between the CTS connector sockets A and B. • Turn ignition on • Read active codes.	Code 110/4 (or any codes. except Code 110/3). → Anything except Code 110/4. →	Go to 14-4. Go to 14-8.
14-3 Oil Temp Sensor Check		
• Turn ignition off. • Disconnect OTS and install jumper between OTS connector sockets A and B. • Turn ignition on. • Read active codes.	Code 175/4 (or any codes except Code 175/4). → Anything except Code 175/4. →	Go to 14-5. Go to 14-9.
14-4 Check for Short to +5 Volt Line		
• Turn ignition off. • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets P3 (ckt#133) and N1 (ckt#416) on the engine harness connector.	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt#133) is shorted to the engine +5 Volt line (ckt #416), and/or (ckt#133) signal line is shorted to ground and/or sensor return (ckt#452). Repair short. Then go to 14-30. Go to 14-6.



OIL AND COOLANT TEMPERATURE CIRCUITS

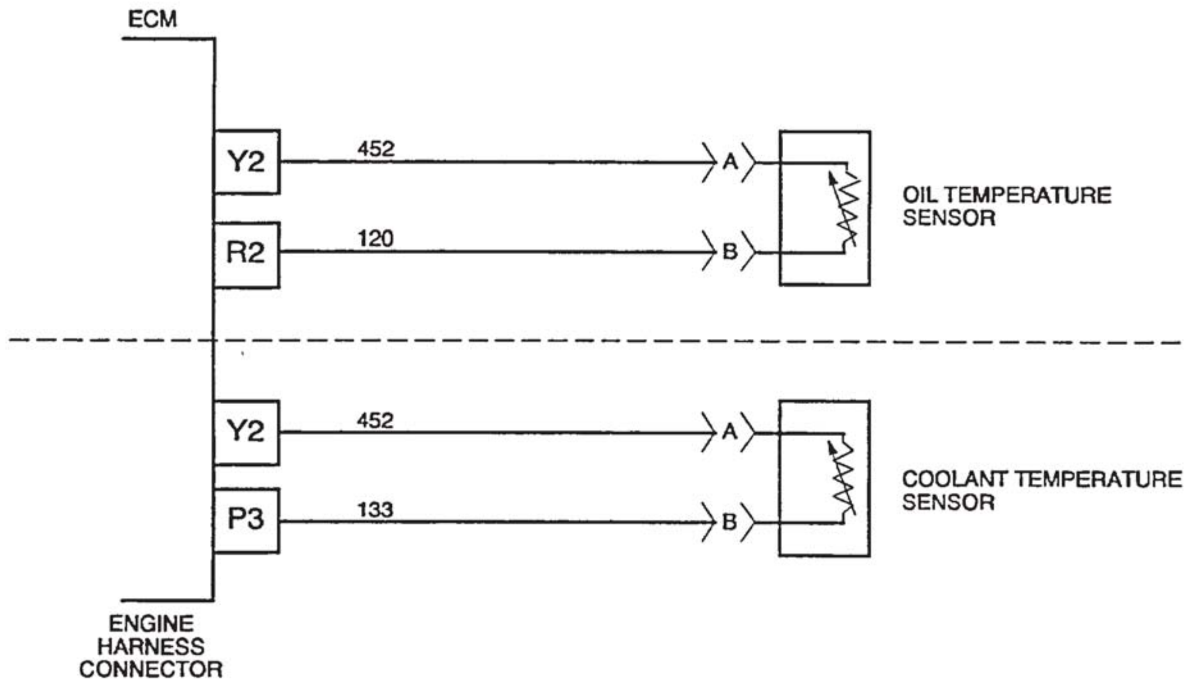


ECM ENGINE HARNESS CONNECTOR

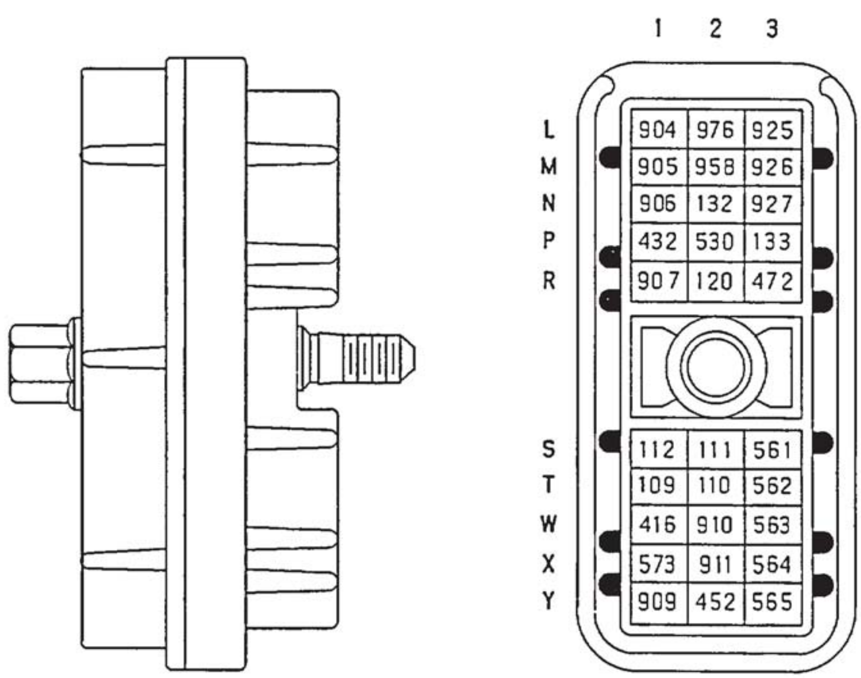
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 14
J1587 CODE: P110 3 - COOLANT TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH)
OR: P175 3 - OIL TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-5 Check for Short to +5 Volt Line		
• Turn ignition off. • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R2 (ckt#120) and W1 (ckt#416) on the engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#120) is shorted to the engine +5 Volt line (ckt#416), and/or (ckt#120) line is shorted to ground and/or signal sensor return (ckt#452). Repair short. Then go to 14-30.
	Greater than 10,000-ohms or open.	Go to 14-7.
14-6 Check CTS Connectors		
• Inspect terminals at the CTS connector (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace CTS. Then go to 14-30.
	Problem found.	Repair terminals/connectors. Then go to 14-30.
14-7 Check OTS Connectors		
• Inspect terminals at the OTS connector (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace OTS. Then go to 14-30.
	Problem found.	Repair terminals/connectors. Then go to 14-30.
14-8 Open line Check		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets P3 (ckt#133) and Y2 (ckt#452) on the engine harness connector.	Less than or equal to 5 ohms.	Go to 14-10.
	Greater than 5 ohms or open.	Signal line (ckt#133) or return line (ckt#452) is open. Repair open. Then go to 14-30.



OIL AND COOLANT TEMPERATURE CIRCUITS

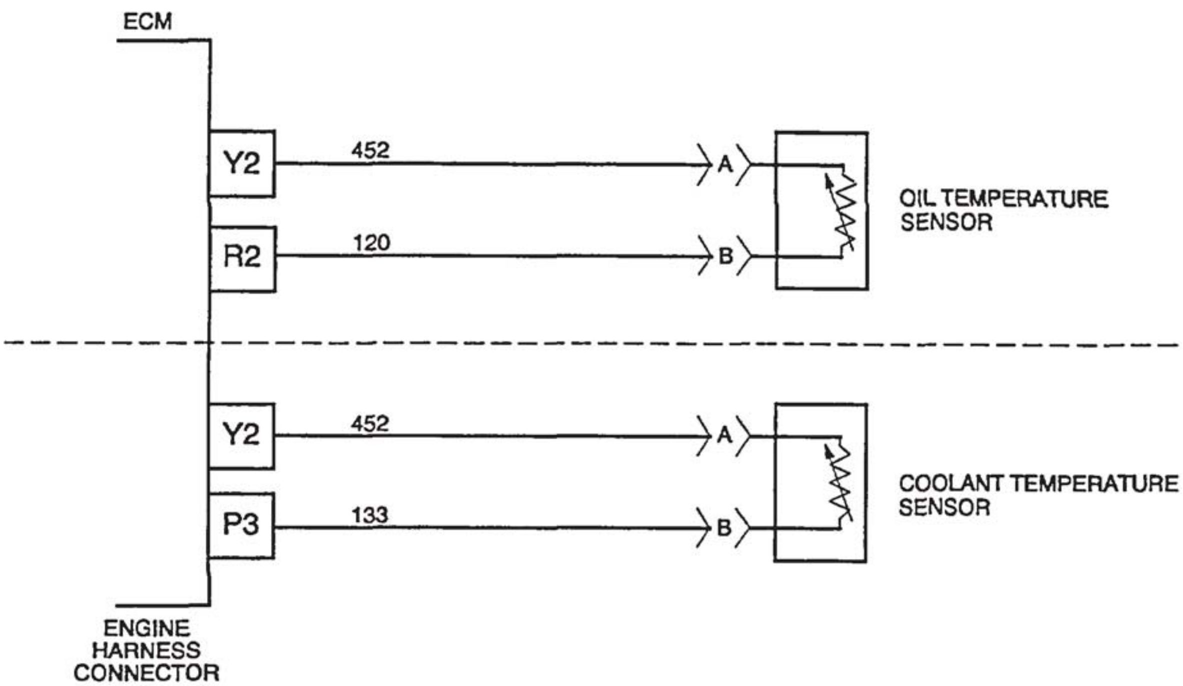


ECM ENGINE HARNESS CONNECTOR

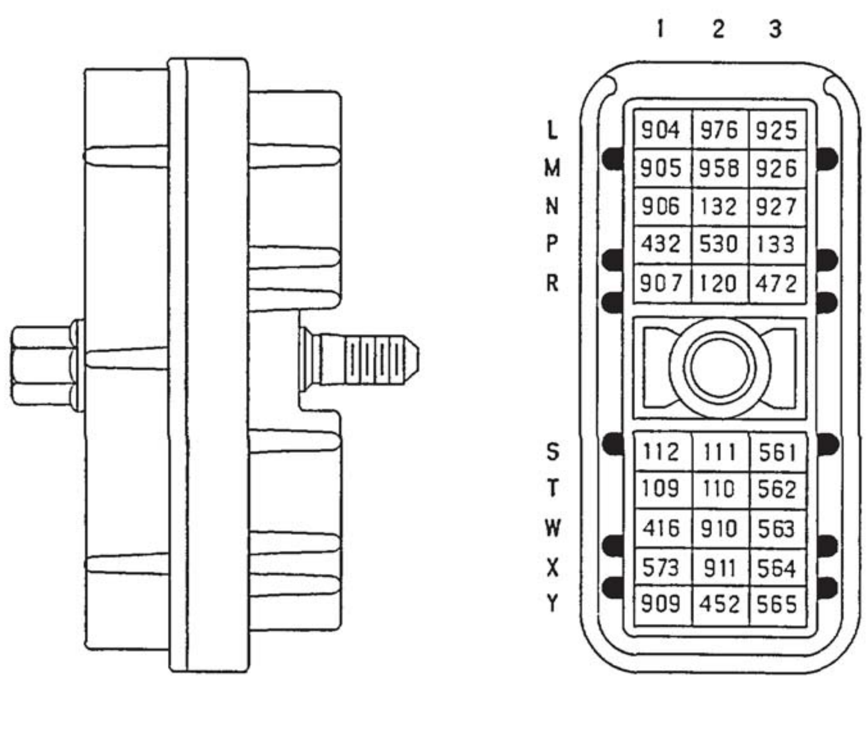
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 14
J1587 CODE: P110 3 COOLANT TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH)
OR: P175 3- OIL TEMPERATURE CIRCUIT FAILED HIGH (VOLTAGE HIGH)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-9 Open line Check		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R2 (ckt #120) and Y2 (ckt #452) on the engine harness connector.	Less than or equal to 5 ohms.	Go to 14-11.
	Greater than 5 ohms or open.	Signal line (ckt#120) or return line (ckt #452) is open. Repair open. Then go to 14-30.
14-10 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 14-30.
	Problem found.	Repair terminals/connectors. Then go to 14-30.
14-11 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 14-30.
	Problem found.	Repair terminals/connectors. Then go to 14-30.
14-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or after 8 minutes. Stop engine. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 110/3 or 175/3 any other codes.)	All system diagnostics are complete. Please review this section from the start to fin the error.
	Any other codes except Codes 110/3 or 175/3	Go to START-1, pg 3-345.41, to service other codes.



OIL AND COOLANT TEMPERATURE CIRCUITS



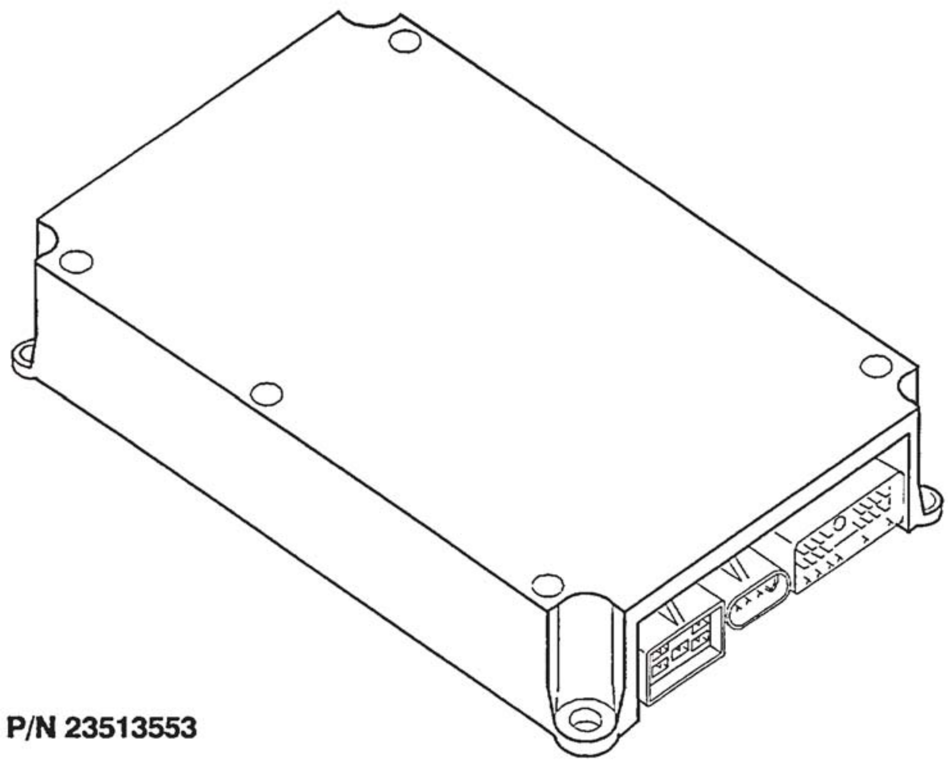
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 15
J1587 CODE: P110 4 COOLANT TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)
OR: P175 4 OIL TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-1 Code Check		
• Turn ignition on. • Plug in DDR and determine which code is present.	PID 110 - FMI 4 PID 175 - FMI 4	Go to 15-2. Go to 15-3.
NOTE: If any Flash codes(s) 14, 23, 24 or 33 are also present go to ENG5V-1 (page 3-345.413). (SAE J1587 Code 052, 110/3, 174/3, 174/4, and 102/3).		
15-2 Coolant Temp Sensor Check		
• Turn ignition off. • Disconnect CTS connector • Start engine and run until "Check Engine" light comes on or after 8 minutes. • Read active codes with engine still running.	Any codes except Code 110/4. Code 110/4 (and any other codes).	Go to 15-4. Go to 15-6.
15-3 Oil Temp Sensor Check		
• Turn ignition off. • Disconnect OTS connector. • Start engine and run until "Check Engine" light comes on or after 8 minutes. • Read active codes with engine still running.	Any codes except Code 175/4. Code 175/4 (and any other codes).	Go to 15-5. Go to 15-7.
15-4 Check CTS Connectors		
• Inspect terminals at the CTS Connector (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. Problem found.	Replace CTS. Then go to 15-30. Repair terminals/connectors. Then go to 15-30.

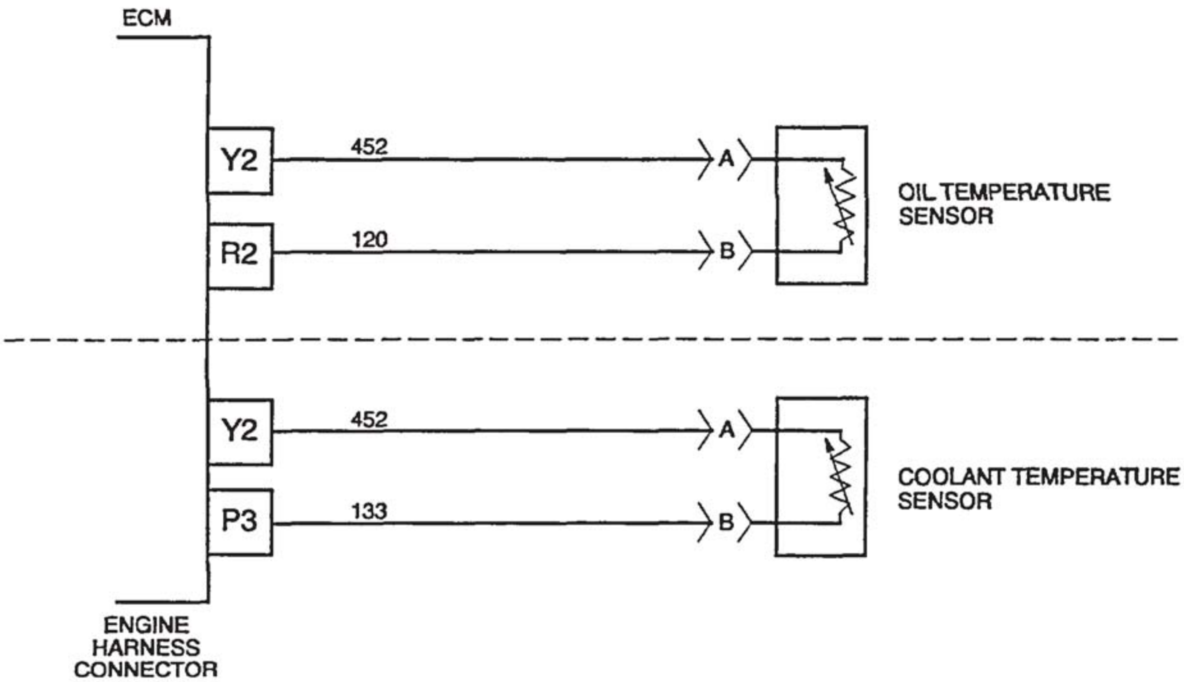


THE ELECTRONIC CONTROL MODULE - DDEC III

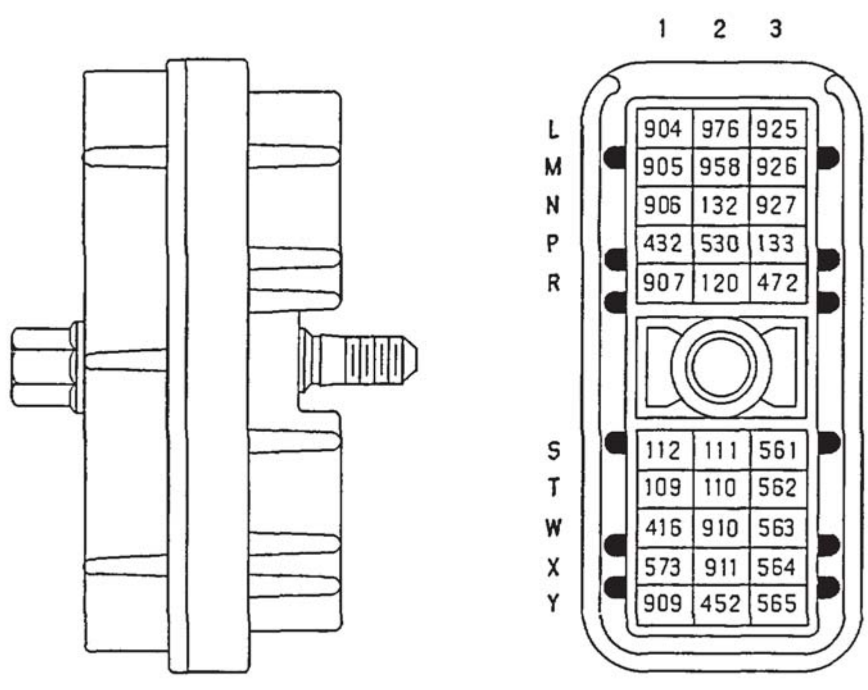
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 15
J1587 CODE: P110 4 - COOLANT TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)
OR: P175 4 . OIL TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-5 Check OTS Connectors		
• Inspect terminals at the OTS connector (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace OTS. Then go to 15-30.
	Problem found.	Repair terminals/connectors. Then go to 15-30.
15-6 Check for Short		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets P3 (ckt#133) and Y2 (ckt#452) on the engine harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading.	Signal line (ckt#133) is shorted to the return line (ckt#452) or battery ground. Repair short. Then go to 15-30.
	Greater than, 10,000 ohms or open on both readings.	Go to 15-8.
15-7 Check for Short.		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets R2 (ckt#120) and Y2 (ckt#452) on the engine harness connector. • Also read resistance between socket B and a good ground	Less than or equal to 10,000 ohms on either reading.	Signal line (ckt#120) is shorted to the return line (ckt#452) or battery ground. Repair short. Then go to 15-30.
	Greater than 10,000 ohms or open on both readings.	Go to 15-9.



OIL AND COOLANT TEMPERATURE CIRCUITS

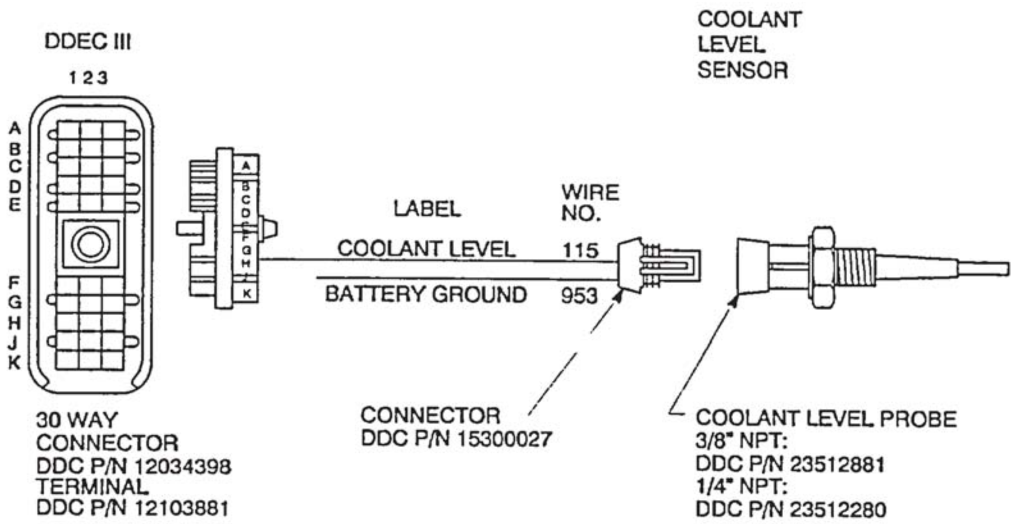


ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

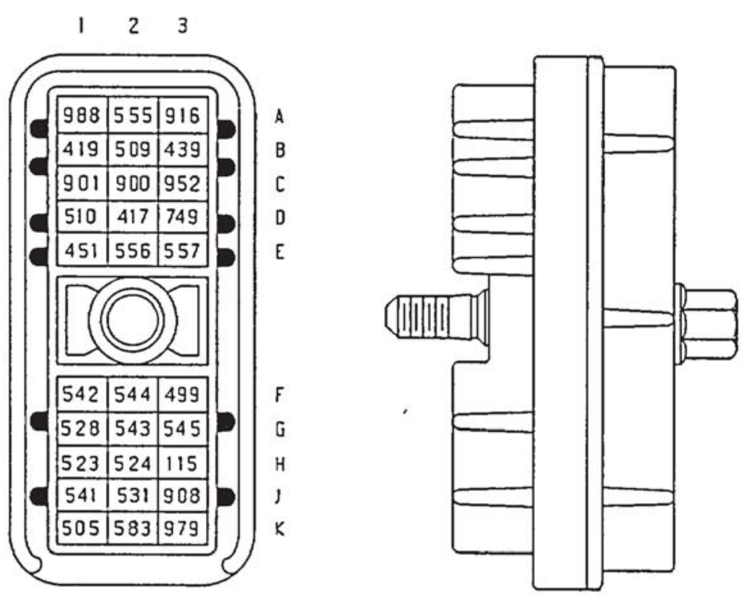
E. FLASH CODE: 15
J1587 CODE: P110 4 - COOLANT TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)
OR: P175 4 - OIL TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-8 Check ECM Connectors		
• Check terminals at the ECM harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially terminals P3 and Y2 of the ECM connector.	Terminals and connectors are okay.	Reprogram ECM. Then go to 15-30.
	Problem found.	Repair terminals/connectors. Then go to 15-30.
15-9 Check ECM Connectors		
• Check terminals at the ECM harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially terminals R2 and Y2 of the ECM connector.	Terminals and connectors are okay.	Reprogram ECM. Then go to 15-30.
	Problem found.	Repair terminals/connectors.
15-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. Stop engine. • Read inactive codes.	(No codes)	Repairs are complete.
	Code 110 or 17514 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 110 or 175/4.	Go to START-1, pg 3-345.41, to service other codes.



LABEL	WIRE NO.	CLS CAVITY
COOLANT LEVEL	115	A
GROUND	953	B

COOLANT LEVEL SENSOR AND CIRCUITS



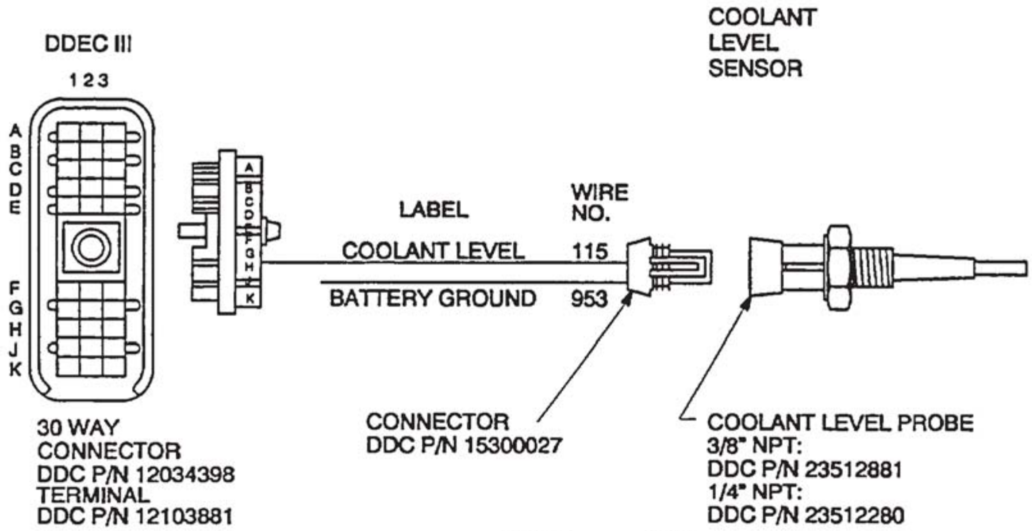
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 16
J1587 CODE: P111 3 - COOLANT LEVEL CIRCUIT FAILED HIGH (VOLTAGE HIGH)

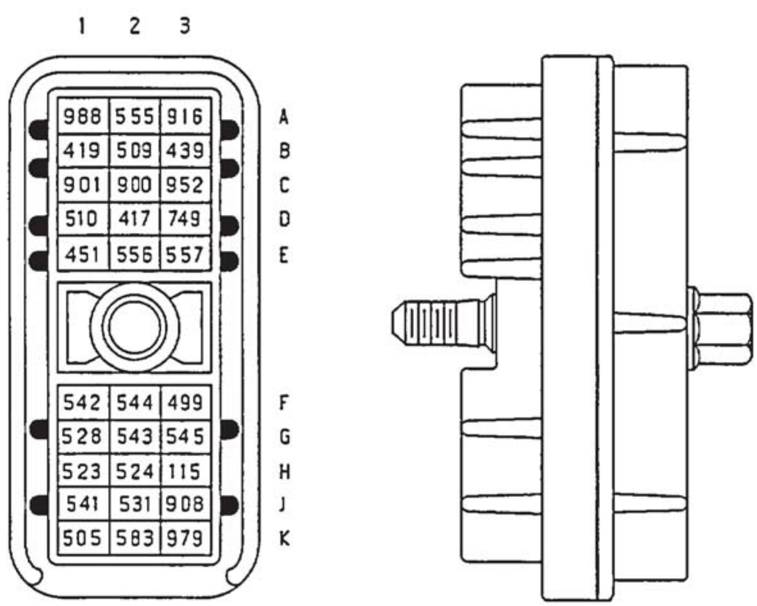
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-1 Sensor Check		
• Turn ignition off. • Disconnect CLS connector and install a jumper between sockets A and B of the CLS harness connector. • Attempt to start and run engine at idle. • Read active codes. • Stop engine.	Engine will not start.	Go to 16-3.
	Code 111/3 (and any other codes except Code 111/4.	Go to 16-2.
	Code 111/4 (and any other codes).	Go to 16-5.
16-2 Signal and Ground Circuit Check		
• Turn ignition off. • Disconnect the vehicle harness connector. • Read resistance between socket H3 (ckt#115) on the vehicle harness connector and a good ground.	Less than or equal to ohms.	Go to 16-7.
	Greater than 5 ohms or open.	Either the CLS signal line (ckt #115) or the battery ground line is open. Repair open. Then go to 16-30.
16-3 Check if Ignition Fuse Blown		
• Check if the ignition fuse/circuit breaker is blown or open.	Blown/open fuse or circuit breaker.	Replace fuse or reset circuit breaker. Then go to 16-4.
	Fuse or circuit breaker is okay.	Go to 16-4.



LABEL	WIRE NO.	CLS CAVITY
COOLANT LEVEL	115	A
GROUND	953	B

COOLANT LEVEL SENSOR AND CIRCUITS

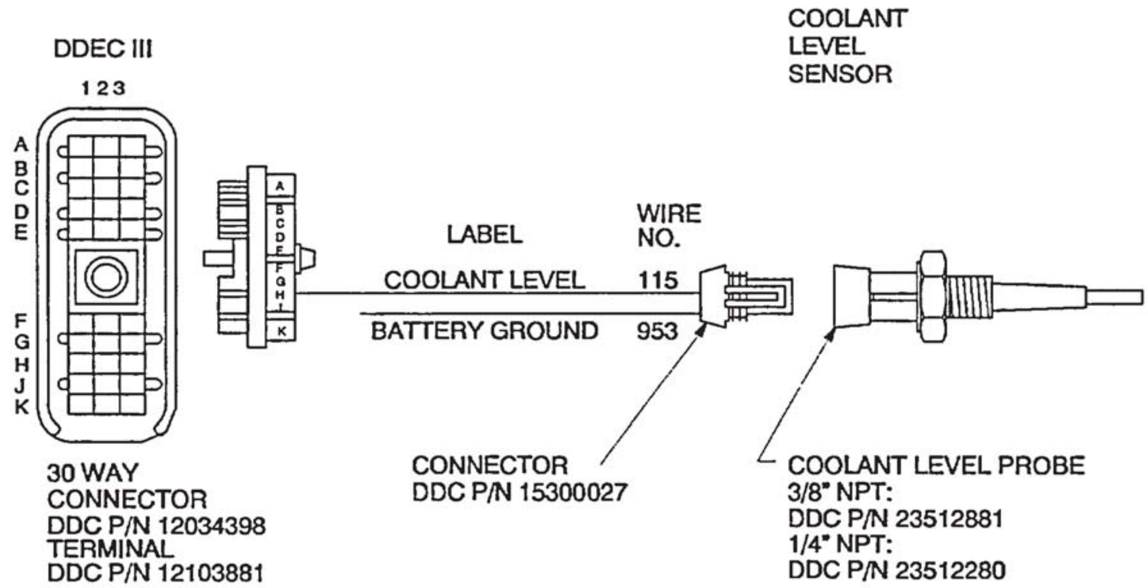


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 16
J1587 CODE: P111 3 - COOLANT LEVEL CIRCUIT FAILED HIGH (VOLTAGE HIGH)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-4 Check for Signal Short to Ignition		
• Disconnect the vehicle harness connector at the ECM. • Remove jumper wire at the CLS. harness connector. • Read resistance between sockets H3 (ckt#115) and B3 (ckt#439) of vehicle harness.	Less than 10,000 ohms.	The CLS signal line(ckt#115) is shorted to the switched 12/24 volt DC line. Repair short. Then go to 16-30.
	Greater than or equal to 10,000 ohms or open.	Go to 16-5.
16-5 Check ECM Connectors		
• Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Check terminal and pin H3 at the ECM and all terminals and pins in the CLS connector.	Terminals and, connectors are okay.	Go to 16-6.
	Problem found.	Repair terminals/connectors. Then go to 16-30.
16-6 Check for Open		
• Disconnect the vehicle harness connector at the ECM. • Place the read lead of the volt meter into cavity B-3 (439) and black lead to a good ground. • Turn ignition on. • Read voltage.	Less than or equal to 10/20 volts. (10V-12V system, 20V-24V system.)	An open exists on the 12/24 volt (ckt#439) wire. Repair open. Then go to 16-30.
	Greater than (10/20 volts (10V-12V system, 20V-24V system.)	Replace ECM Then go to 16-30.



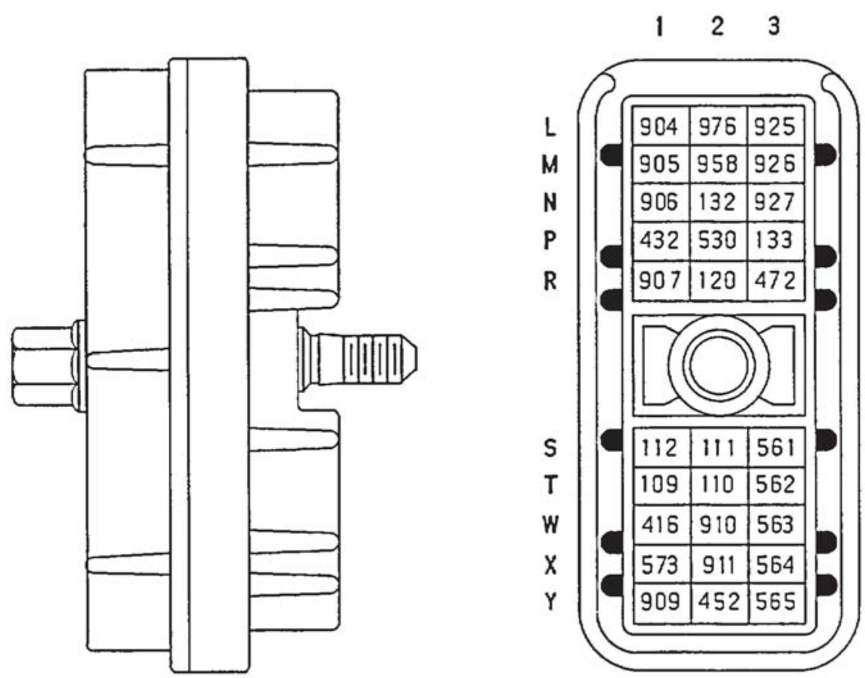
LABEL	WIRE NO.	CLS CAVITY
COOLANT LEVEL	115	A
GROUND ·	953	B

COOLANT LEVEL SENSOR AND CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 16
J1587 CODE: P111 3- COOLANT LEVEL CIRCUIT FAILED HIGH (VOLTAGE HIGH)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 111/3 (and any other codes).	All system diagnostics are complete. Please review this section from the first step find
	Any other codes except Code 111/3	Go to START-1, pg 3-345.41, to service other codes.



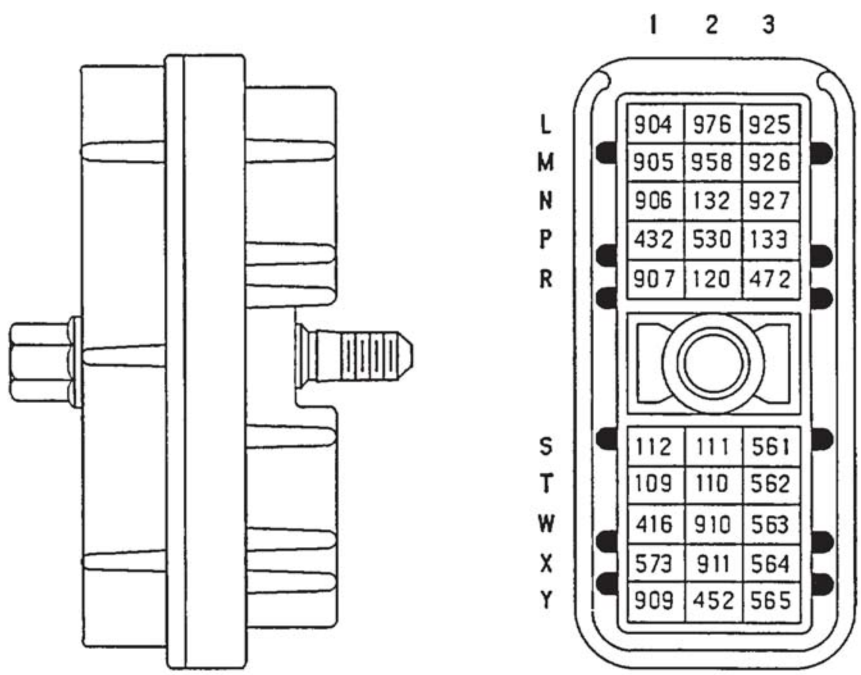
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 17
J1587 CODE: P72 3 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
17-1 Multiple Code Check		
• Were there any other active codes besides 72/3?	No other codes.	Go to 17-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4, 102/3 or 4, 100/3 or 4, 94/3 or 4, 101/3 or 4, 73/3 or 4,	Go to ENG5V-1 pg 3-345.413.
	Yes - But none of the above.	Go to 17-2.
17-2 Sensor Check		
• Turn ignition off. • Disconnect the BPS connector. • Start and Run Engine at idle • Read Active codes.	Code 72/4 (and any codes except 72/3).	Go to 17-3.
	Code 72/3 (and any other codes.	Go to 17-5.
17-3 Return Circuit Check		
• Turn ignition off. • Install a jumper wire between pins A and B of BPS connector. • Disconnect engine harness connector at the ECM. • Read Resistance between cavities R1 (902) and Y2(452) on the engine harness connector.	Less than or equal to 5 ohms.	Go to 17-4.
	Greater than 5 ohms. or open.	Return Line (ckt#452) is open. Repair open. Then go to 17-30.
17-4 Check BPS Connectors		
• Inspect terminals at BPS connectors (sensor side and harness side) for damaged; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace BPS. Then go to 17-30.
	Problem found.	Repair terminals/connectors. Then go to 17-30.

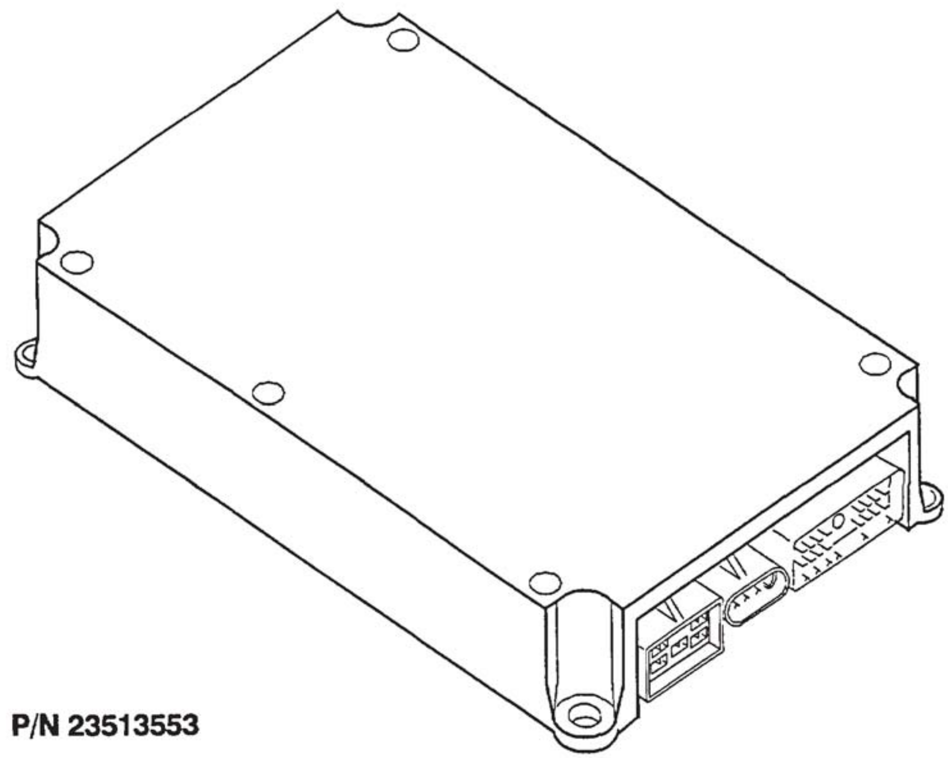


ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 17
J1587 CODE: P723 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
17-5 Check for Short to +5 Volt Line		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between cavities W1(416) and R1 (907) on the engine harness connector.	Less than or equal to 10,000 ohms. →	Signal line (ckt#907) is shorted to the +5 Volt line (ckt#416). Repair short. Then go to 17-30.
	Greater than 10,000 ohms or open. →	Go to 17-6.
17-6 Check for Short to Battery		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 5 way power harness connectors at the ECM. • Read resistance between cavity R1 (ckt#907) of the engine harness connector and cavity 83(439) of the vehicle harness connector. • Also read resistance between cavity R1 (ckt#907) of the engine harness connector and cavities A and C on the 5 way power harness connector.	All readings are greater than 10,000 ohms or open. →	Go to 17-7.
	Any reading is less than or equal to 10,000 ohms →	A short exists between the cavities where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset circuit breakers). Then go to 17-30.
17.7 Check ECM Connectors		
• Inspect terminals at ECM (sensor side and ECM side) for damaged; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM. Then go to 17-30.
	Problem found. Then go to 17-30. →	Repair terminals/connectors.

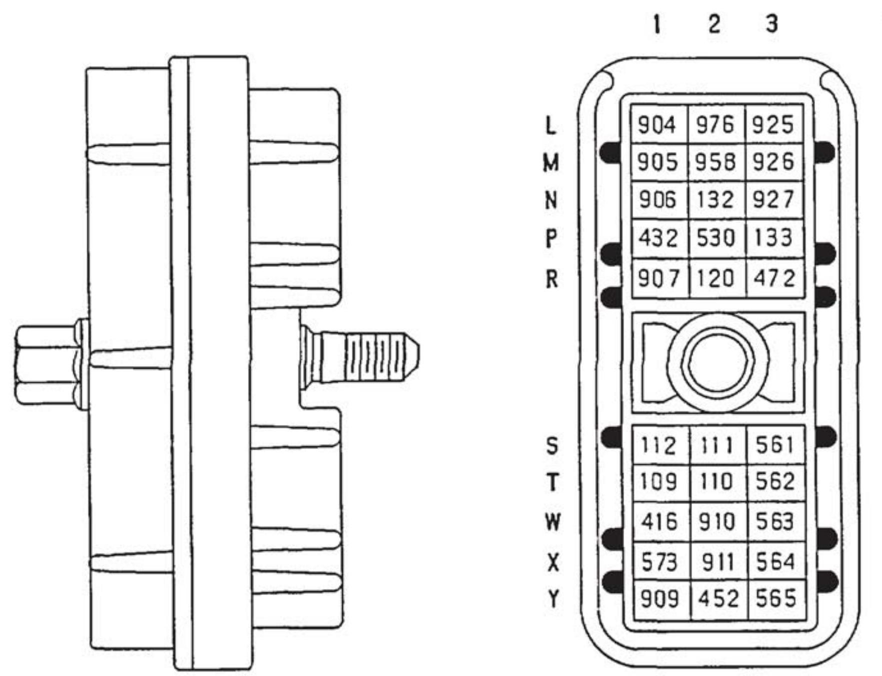


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 17
J1587 CODE: P723 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
17-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of check engine light. • If check engine light does not stay on, start engine and run until check engine light comes on or 1 minute stop engine. • Read codes.	No codes. → Code 72/3 →	Repairs are complete. All system diagnostics are complete. Please review this section from the first step to find error.



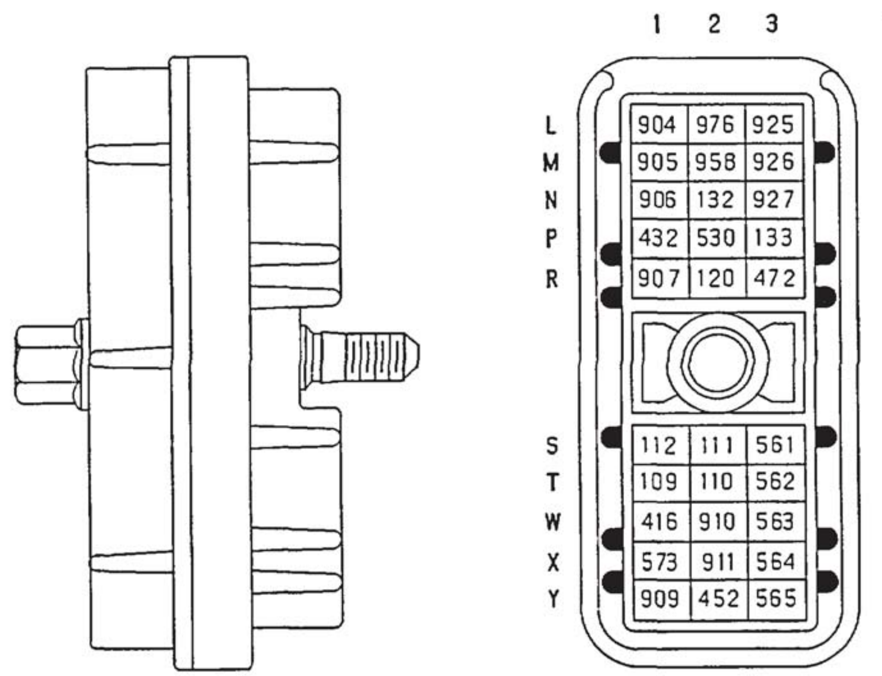
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 17
J1587 CODE: P723 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical Inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
18-1 Multiple Code Check		
• Were there any other active codes besides 72/4?	No other codes.	Go to 18-2.
	Yes, any or all of the following codes: 110/3or4, 175/3or4, 174/3or4, 72/3, 102/3or4, 100/3or4, 94/3or4, 73/3or4,	Go to ENG5V-1 pg 3-345.413.
	Yes - But none of the above.	Go to 18-2.
18-2 Sensor Check		
• Turn ignition off. • Disconnect BPS connector. • Install a jumper wire between sockets B and C of the BPS harness connector. • Turn ignition. • Read active codes. • If active Code 72/3or4 exists go to RESULT column. • If no active Codes 72/3or4 exists, start engine and run until either the "Check Engine" light comes on or the engine has been running warm for at least one minute at greater than 1000 RPM. • Read active codes.	Code 72/3 (and any other codes except 72/4).	Go to 18-3.
	Code 72/4 (and any other codes).	Go to 18-4.
18-3 Check BPS Connectors		
• Inspect terminals at BPS connectors (sensor side and ECM side) for damaged; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace BPS. Then go to 18-30.
	Problem found. Then go to 18-30.	Repair terminals/connectors.

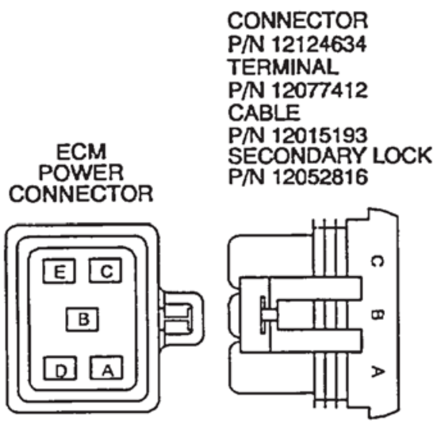


ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

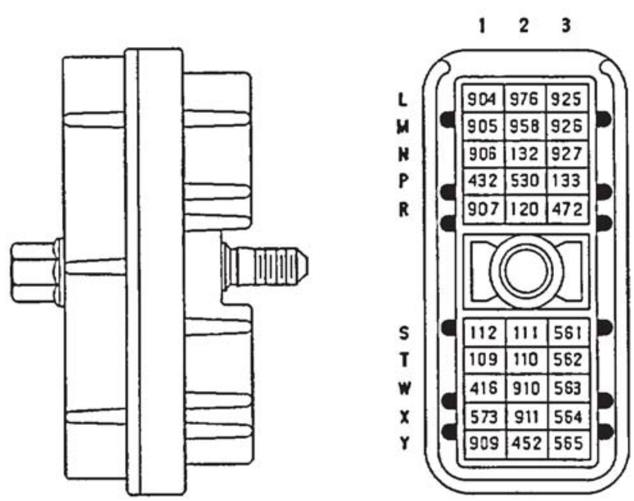
E. FLASH CODE: 18
J1587 CODE: P724 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
18-4 Check for +5 Volts		
• Remove jumper wire. • Turn ignition on. • Read voltage on BPS harness connector, pin C (red lead) to pin A (black lead).	Between 4 to 6 volts. →	Go to 18-5.
	Less than 4 volts. →	Go to 18-8.
	Greater than 6 volts. →	Go to 18-10.
18-5 Check for Signal Open		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between A and B of the BPS harness connector. • Read resistance between sockets R1 and Y2 on the engine harness connector.	Less than or equal equal to 5 ohms. →	Go to 34-6.
	Greater than 5 ohms or open. →	Signal line (ckt#907) or return line (ckt#452) is open. Repeat check from pin A to Y2 and pin B to R1. Repair open. Then go to 18-30.
18-6 Check for Short		
• Remove jumper. • Read resistance between pins A and B on the BPS harness connector. • Also read resistance between socket B and a good ground	Less than or equal to 10,000 ohms on either reading. →	Signal line (ckt#907) is shorted to the return line (ckt#452). Repair short. Then go to 18-30.
	Greater than 10,000 ohms or open on both readings. →	Go to 18-7.
18-7 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM. Then go to 18-30.
	Problem found Then go to 18-30. →	Repair terminals/connectors.



CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

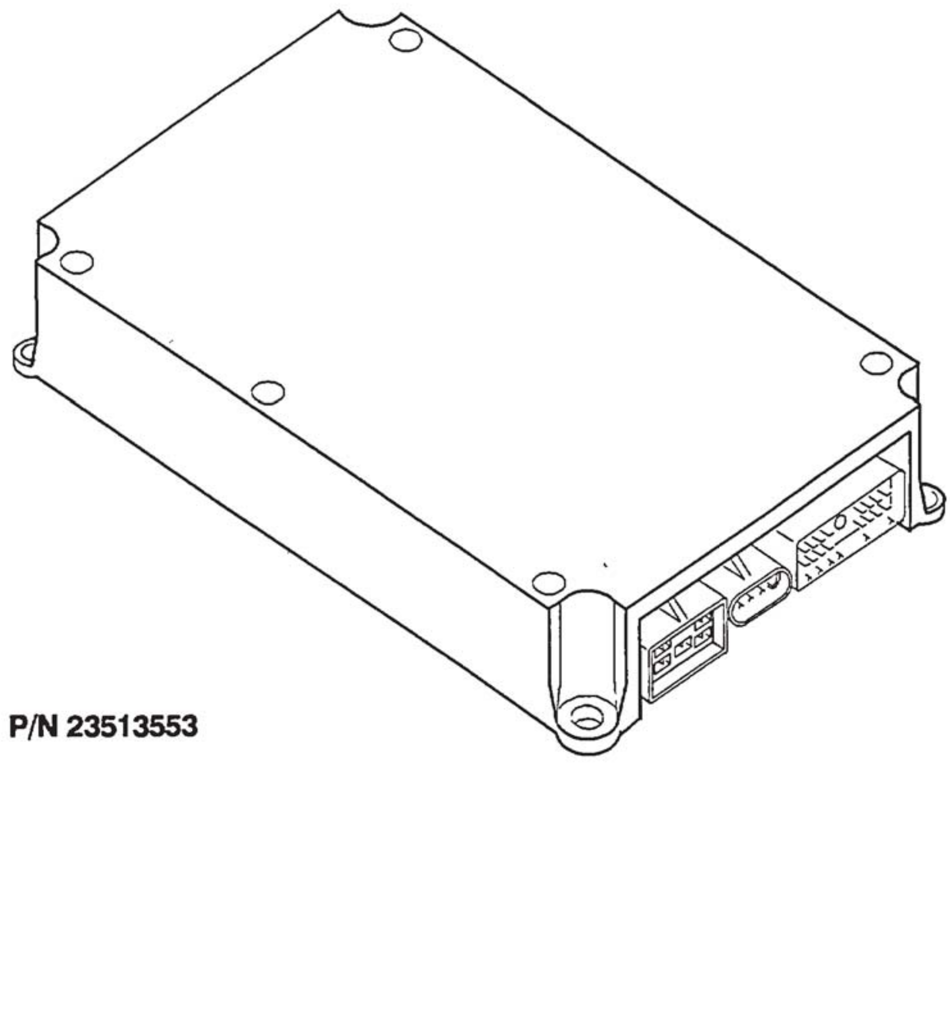


ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 18
J1587 CODE: P724 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
18-8 Check for Open +5 Volt Line		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between pins A and C of the BPS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector.	Less than or equal equal to 5 ohms.	Go to 18-9.
	Greater than 5 ohms or open. Then go to 18-30.	The engine +5 Volt line (ckt #416) is open. Repair open.
18-9 Check for Short		
• Remove jumper wire. • Read resistance between pins A and C on the BPS harness connector.	Less than or equal to 10,000 ohms.	The +5 Volt line (ckt#416) is shorted to the return line (ckt #452). Repair short. Then go to 18-30.
	Greater than 10,000 ohms or open.	Go to 18-7.
18-10 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to the ECM. • Disconnect the engine harness, vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between socket R1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket R1 on the engine harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to 18-7.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 18-30.

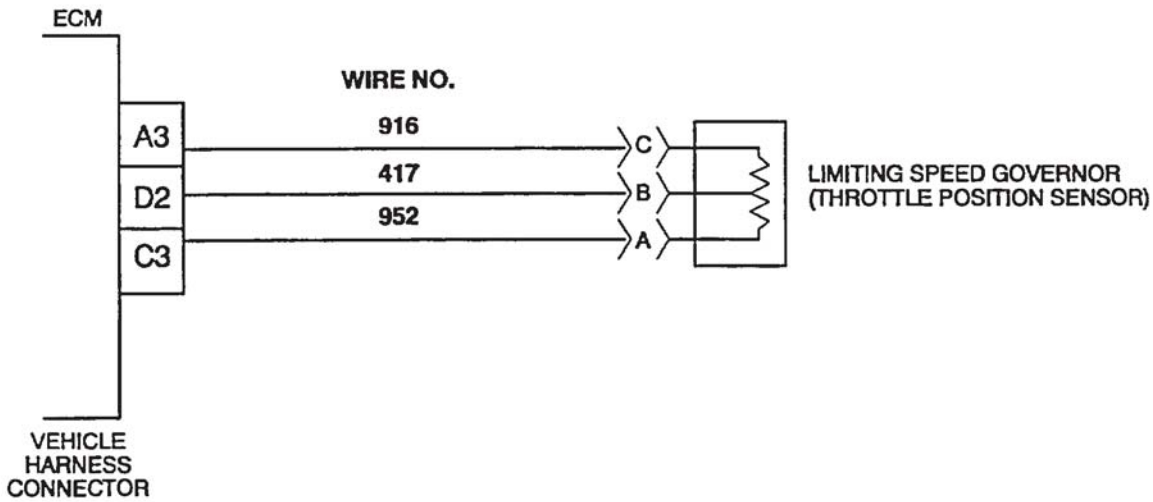


THE ELECTRONIC CONTROL MODULE - DDEC III

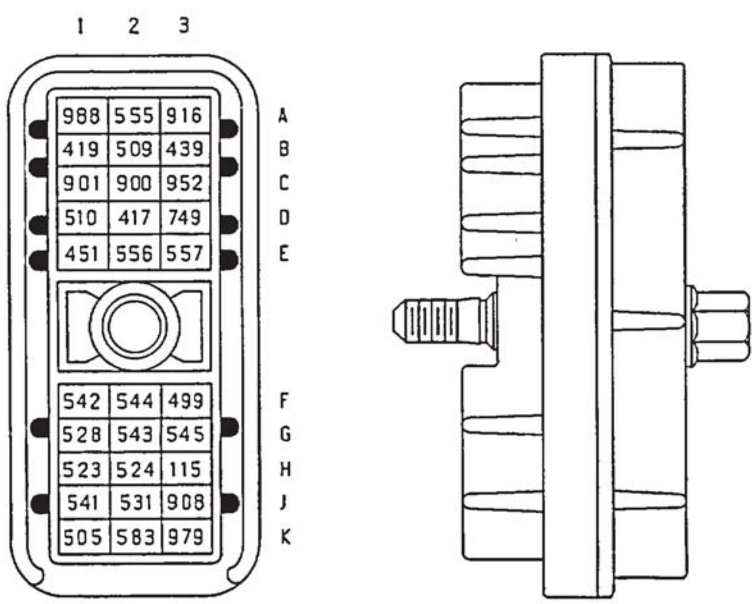
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 18
J1587 CODE: P724 - BYPASS POSITION CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
18-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. • Read inactive codes.	No codes. →	Repairs are complete.
	Code 72/4 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find error.
	Any other codes except Code 72/4. →	Go to START-1, pg 3-345.41, to service other codes.



THROTTLE POSITION (LSG) CIRCUITS



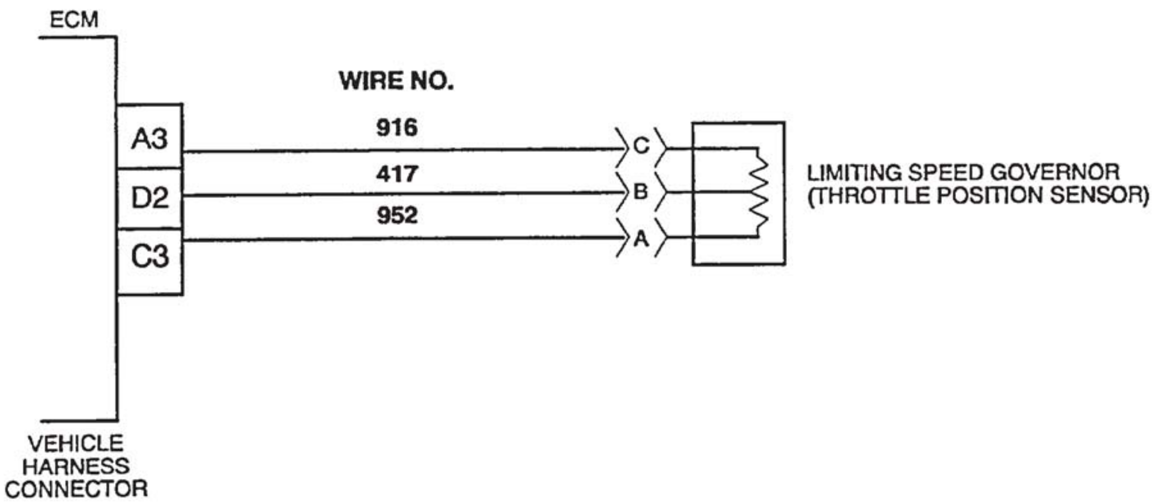
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

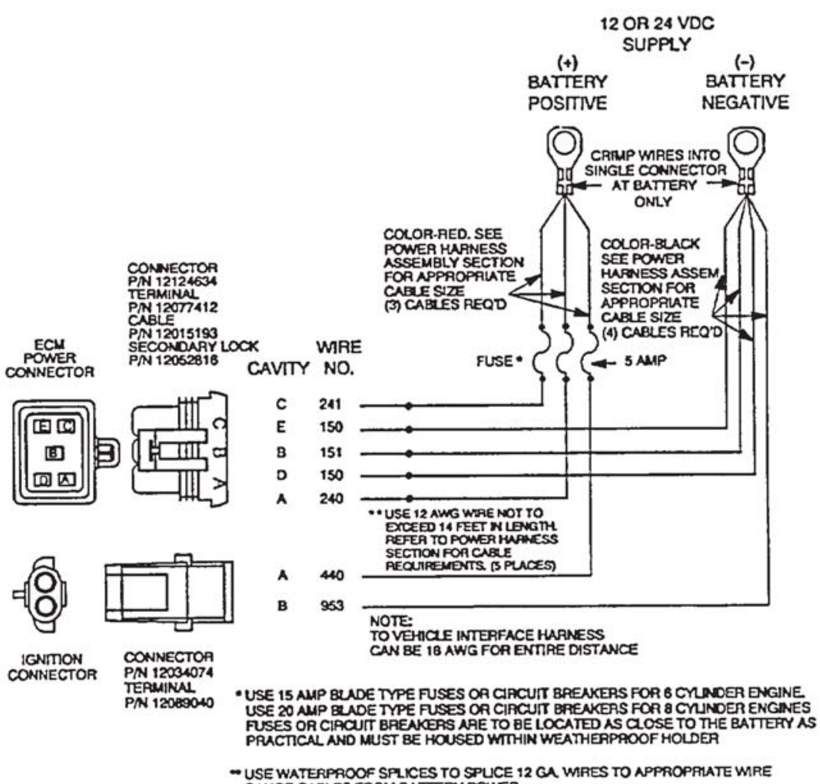
E. FLASH CODE: 21
J1587 CODE: P91 3. ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED HIGH (VOLTAGE HIGH) ALSO CALLED THROTTLE POSITION SENSOR (TPS)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-1 Multiple Code Check		
• Were there any other active codes besides 91/3?	No other codes. active codes.	Go to 21-2.
	Yes, any or all of the following active codes: 187/3, 91/4	Go to VEH5V-1 (page 3-345.419)
	Yes - But none, of the above.	Go to 21-2.
21-2 Sensor Check		
• Turn ignition off. • Disconnect TPS connector. • Turn ignition. • Read active codes.	Any code except Code 91/3).	Go to 21-3.
	Code 91/3 (and any other codes).	Go to 21-7.
21.3 Return Circuit Check		
• Turn ignition off. • Install a jumper wire between pins A and B of the TPS harness connector. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets D2 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 21-4.
	Greater than 5 ohms open.	Return line (ckt#952) and/or signal (ckt#417) is open. Repair open. Then go to 21-30.
21-4 Check TPS Adjustment		
• Reconnect vehicle harness connector and plug TPS back in. • Hook-up DDR to the DDL connector and select Throttle Sensor display. • Read Throttle Counts at both no throttle and full throttle.	Getting 48-144 counts at no throttle and 832 & 968 counts at full throttle.	Go to 21-6.
	Not getting the above reading.	Go to 21-5.



THROTTLE POSITION (LSG) CIRCUITS

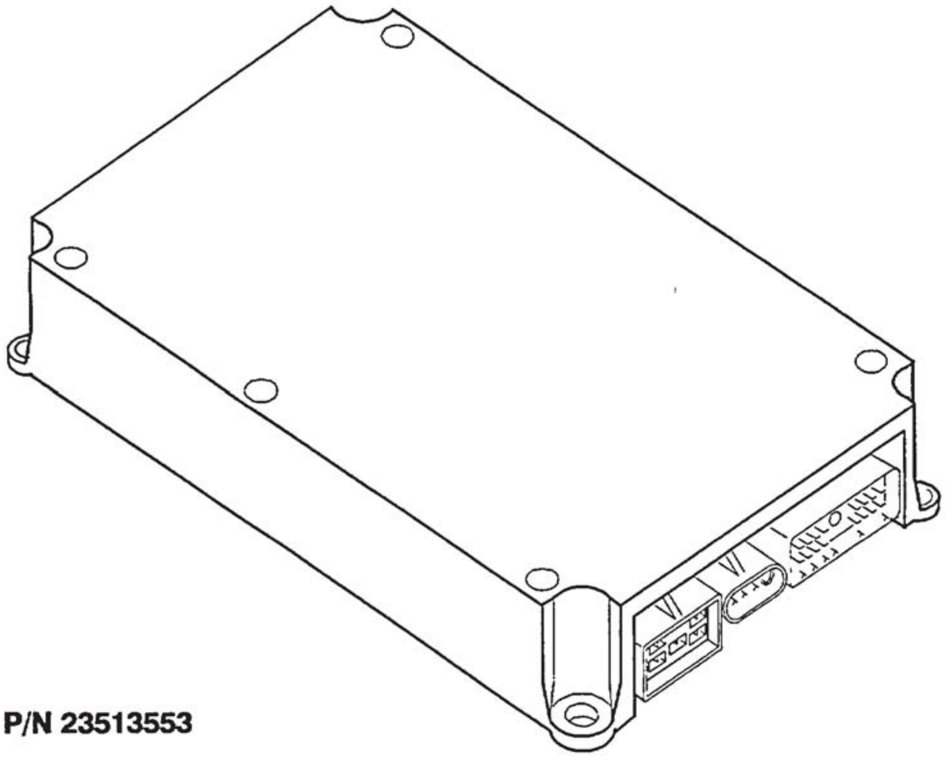


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 21
J1587 CODE: P91 3 - ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED HIGH (VOLTAGE HIGH) ALSO CALLED THROTTLE POSITION SENSOR (TPS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-5 Attempt TPS Adjustment		
• Check for pedal or linkage interferences. If linkages appear okay, loosen the TPS screws and attempt to adjust for the correct no throttle reading (48-144) counts). (NOTE: Newer version pedals are non-adjustable.) Do not attempt to adjust by bending the pedal mechanism.	Corrected problem so that Throttle Counts is now correct.	Go to 21-30.
	Could not correct the problem.	Go to 21-6.
21-6 Check TPS Connectors		
• Inspect terminals at the TPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins of sockets.	Terminals and connectors are okay.	Replace TPS. Then go to 21-30.
	Problem found. Then go to 21-30.	Repair terminals/connectors.
21.7 Check for Short		
• Turn Ignition off. • Disconnect the vehicle harness , connector at the ECM. • Read resistance between sockets D2 and A3 on the vehicle harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#417) is shorted to the vehicle + 5 Volt line (ckt #916). Repair short Then go to 21-30.
	Greater then 10,000 ohms or open.	Go to 21-8.
21-8 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between socket D2 of the vehicle harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket D2 on the vehicle harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms. or open.	Go to 21-9.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 21-30.

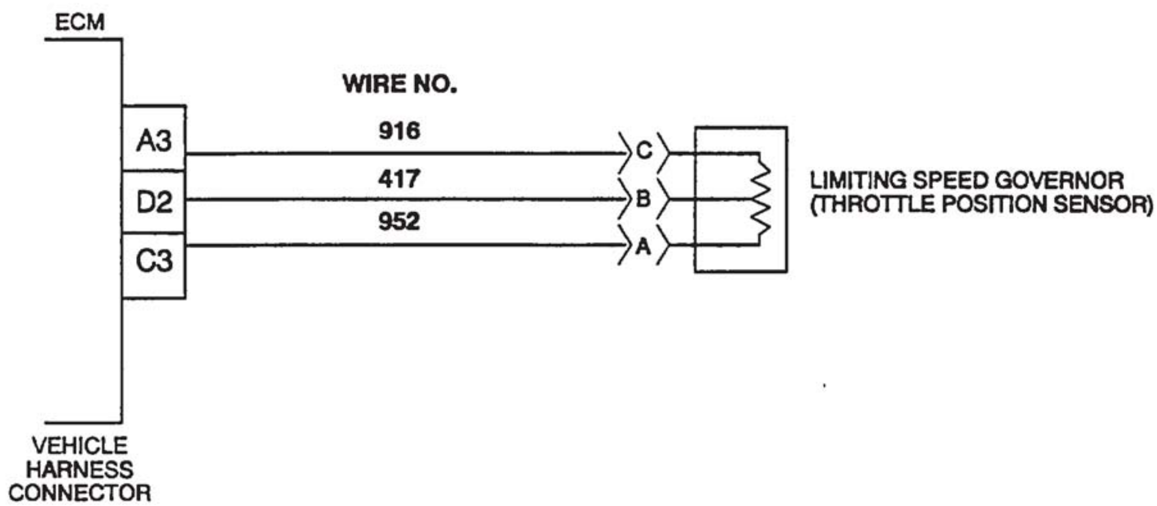


THE ELECTRONIC CONTROL MODULE - DDEC III

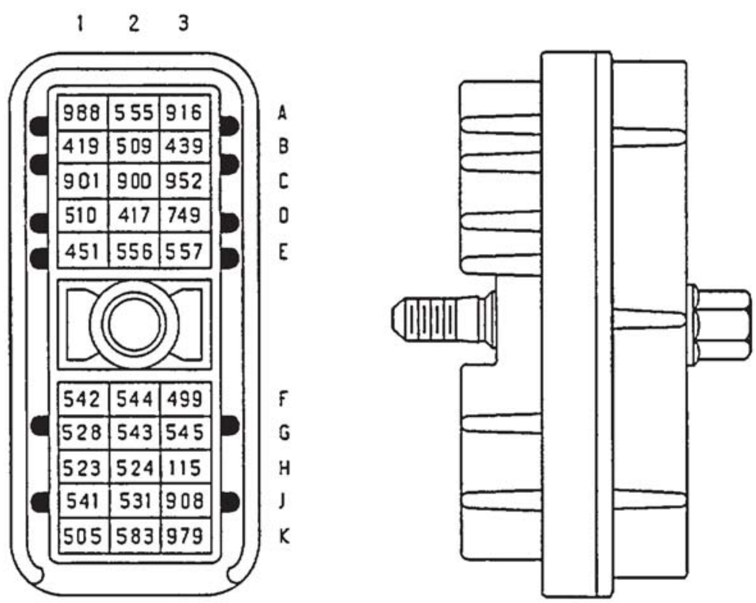
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 21
J1587 CODE: P91 3 · ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED HIGH (VOLTAGE HIGH)
ALSO CALLED THROTTLE POSITION SENSOR (TPS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-9 Check ECM Connectors		
• Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 21-30.
	Problem found. Then go to 21-30.	Repair terminals/connectors.
21-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read all codes.	(No codes).	Repairs are complete.
	Code 91/3 (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 91/3.	Go to START-1, pg 3-345.41, to service other codes.



THROTTLE POSITION (LSG) CIRCUITS



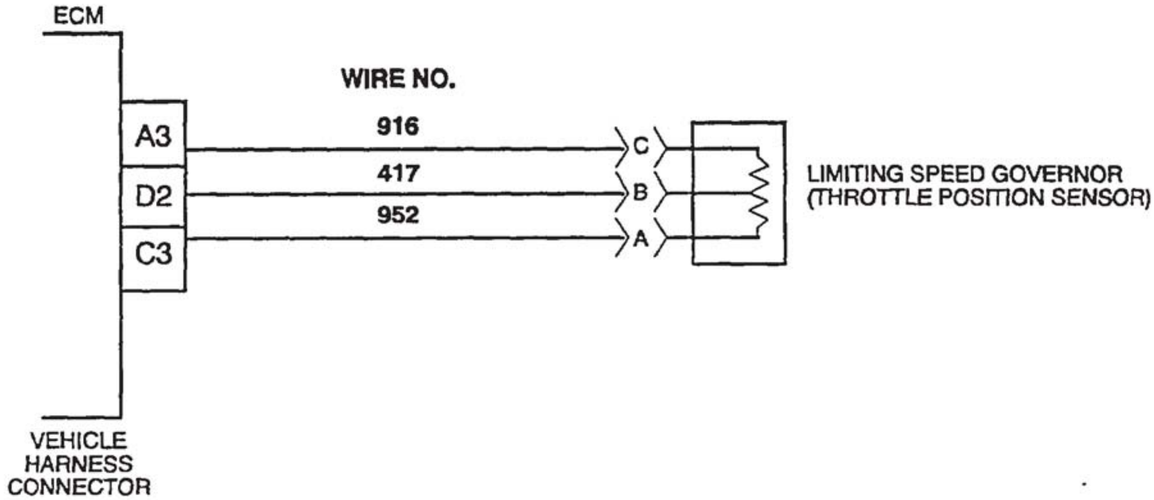
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

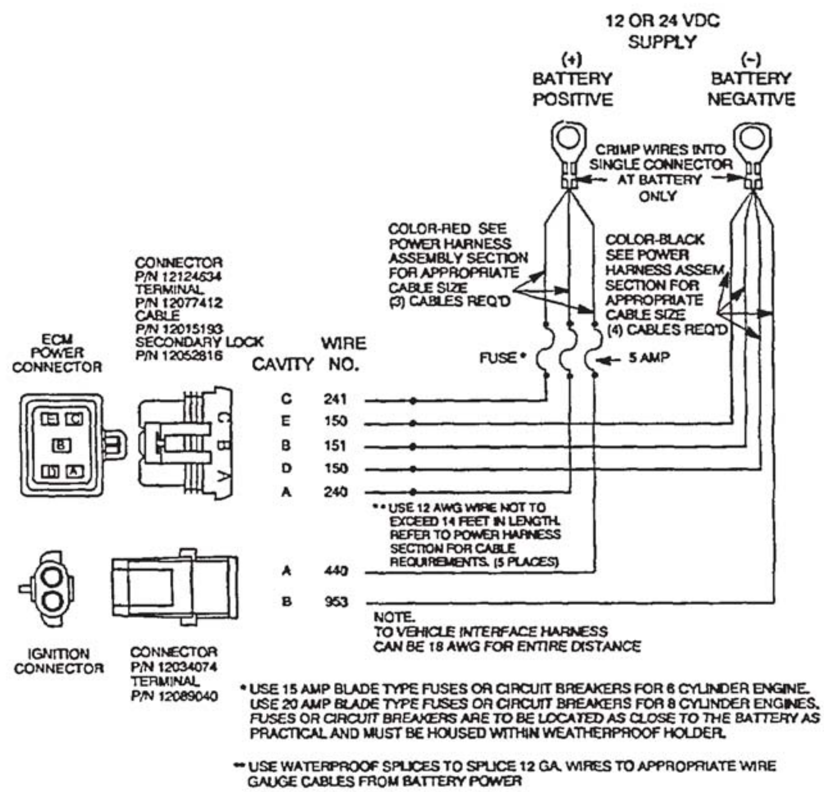
E. FLASH CODE: 22
J1587 CODE: P914 ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED LOW (VOLTAGE LOW) ALSO CALLED THROTTLE POSITION SENSOR (TPS)

NOTE - This chart is only to be used If:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-1 Multiple Code Check		
• Were there any other active codes besides 91/4?	No other codes active codes. →	Go to 22-2.
	Yes, any or all of the following codes: 187/3, 91/3. →	Go to VEH5V-1 pg 3-345.419.
	Yes - But none of the above. →	Go to 22-2.
22-2 Sensor Check		
• Turn ignition off. • Disconnect the TPS connector. • Install a jumper wire between sockets B and C of the TPS harness connector. • Turn ignition on. • Read Active codes.	Code 91/4 and/or other codes. →	Go to 22-6.
	Code 91/3 (and any other codes). →	Go to 22-3.
22-3 Check TPS Adjustment		
• Remove jumper reconnect TPS. • Hook-up DDR to the DDL connector and select Throttle Sensor display. • Read Throttle Counts at both no throttle and full throttle.	Getting 48-141 4 counts at no throttle and 832-968 counts at full throttle. →	Go to 22-5.
	Not getting the above readings. →	Go to 22-4.



THROTTLE POSITION (LSG) CIRCUITS

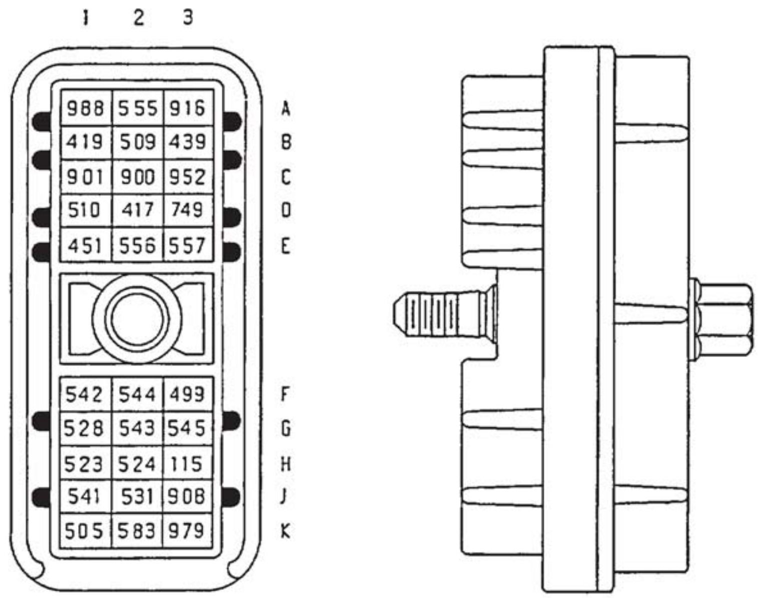


POWER HARNESS

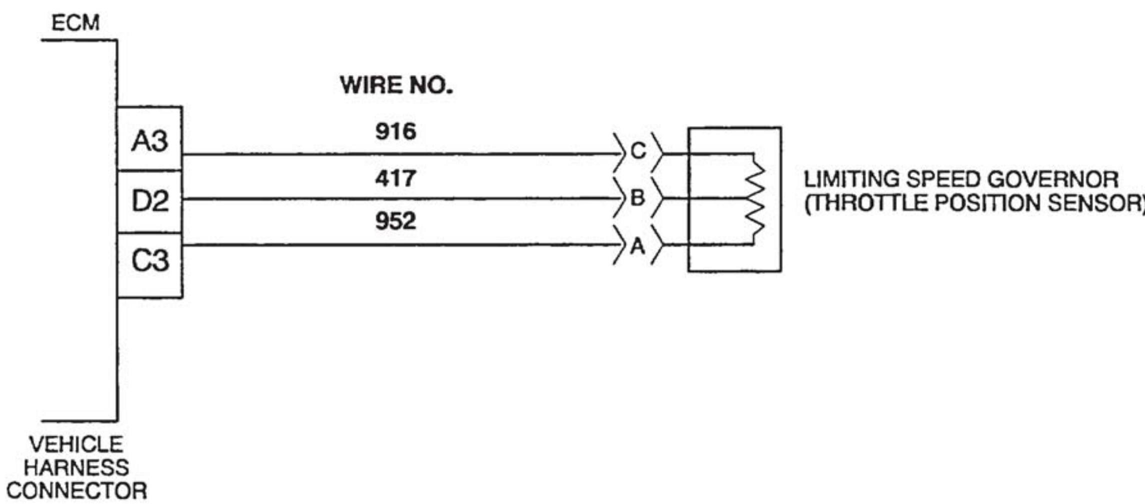
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 22 (Cont'd)
J1587 CODE: P91 4 · ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED HIGH (VOLTAGE LOW)
ALSO CALLED THROTTLE POSITION SENSOR (TPS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-4 Attempt TPS Adjustment		
• Check for pedal or linkage interferences. If linkages appear okay, loosen the TPS screws and attempt to adjust for the correct no throttle reading (48-144 counts). (NOTE: Newer version pedals are non-adjustable.) Do not attempt to adjust by bending the pedal mechanism.	Corrected problem so that Throttle Counts is now correct. →	Go to 22-30.
	Could not correct the problem. →	Go to 22-5.
22-5 Check TPS Connectors		
• Inspect terminals at the TPS connectors (sensor side and harness side) for damage, corrosion, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace TPS. Then go to 22-30.
	Problem found. →	Repair terminals/connectors. Then go to 22-30.
22-6 Check for +5 Volts		
• Remove jumper • Turn ignition on. • Read voltage on TPS harness connector, socket C (red lead) to socket A (black lead).	Between 4 to 6 volts. →	Go to 22-7.
	Less than 4 volts. →	Go to 22-10.
	Greater than 6 volts. →	Go to 22-12.
22-7 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at ECM. • Read resistance between sockets A and B on the TPS harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading →	Signal line (ckt#417 is shorted to the return line (ckt #952) or battery ground. Repair short. Then go to 22-30.
	Greater than 10,000 ohms or open on both readings. →	Go to 22-8.



ECM VEHICLE HARNESS CONNECTOR

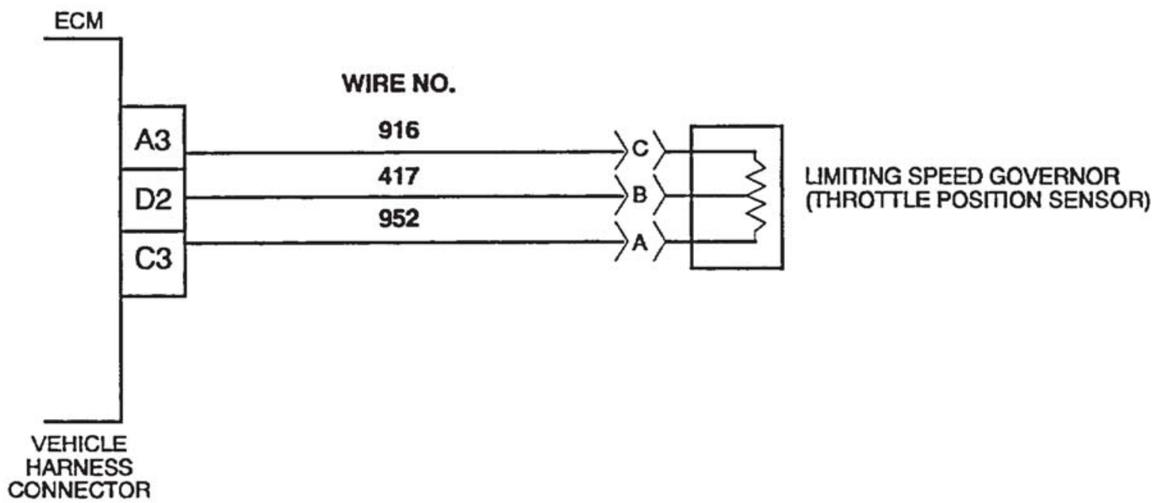


THROTTLE POSITION (LSG) CIRCUITS

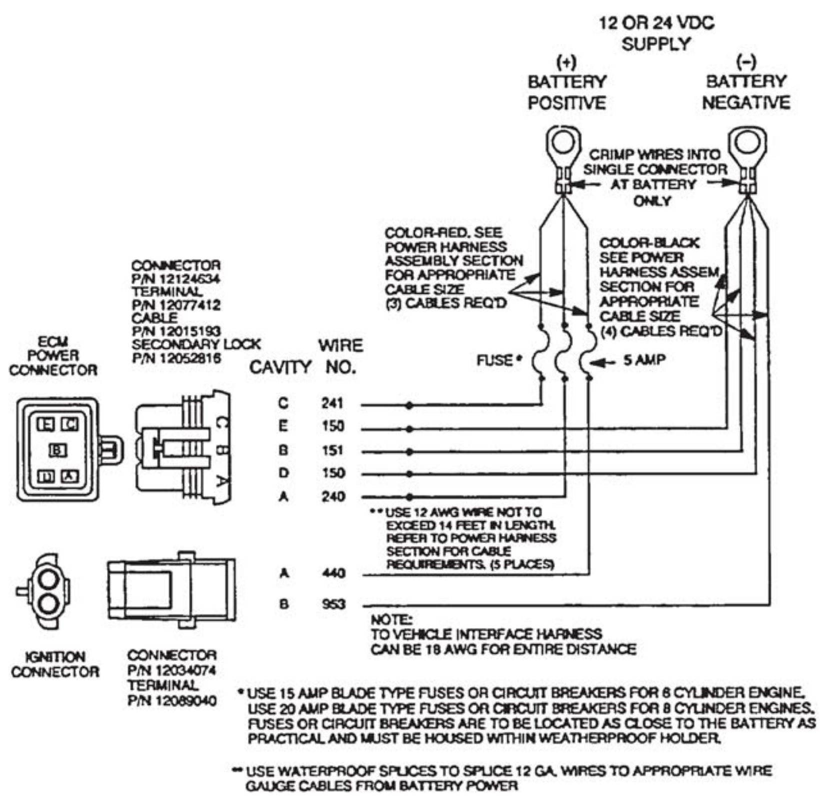
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 22 (Cont'd)
J1587 CODE: P91 4 - ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED HIGH (VOLTAGE LOW)
ALSO CALLED THROTTLE POSITION SENSOR (TPS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-8 Check for Signal Open		
• Install a jumper wire between sockets A and B of the TPS harness connector. • Read resistance between sockets D2 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 22-9.
	Greater than 5 ohms or open.	Signal line (ckt#417) is open. and/or signal return (ckt#952) is open. Repair open. If no open was found, check ECM terminals A3, D2, C3 and TPS pins. Then go to 22-30.
22-9 Check ECM Connectors		
• Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM. Then go to 22-30.
	Problem found. Then go to 22-30.	Repair terminals/connectors.
22-10 Check for Short		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A and C on the TPS harness connector.	Less than or equal to 10,000 ohms.	The vehicle +5 Volt line (ckt#916) is shorted to the return line (ckt#952). Repair short. Then go to 22-30.
	Greater than 10,000 ohms or open.	Go to 22-11.
22-11 Check for Open +5 Volt Line		
• Install a jumper wire between sockets A and C of the TPS harness connector. • Read resistance between sockets A3 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 22-9.
	Greater than 5 ohms or open.	The vehicle +5 Volt line (ckt #916) is open. Repair open. Then go to 22-30.



THROTTLE POSITION (LSG) CIRCUITS

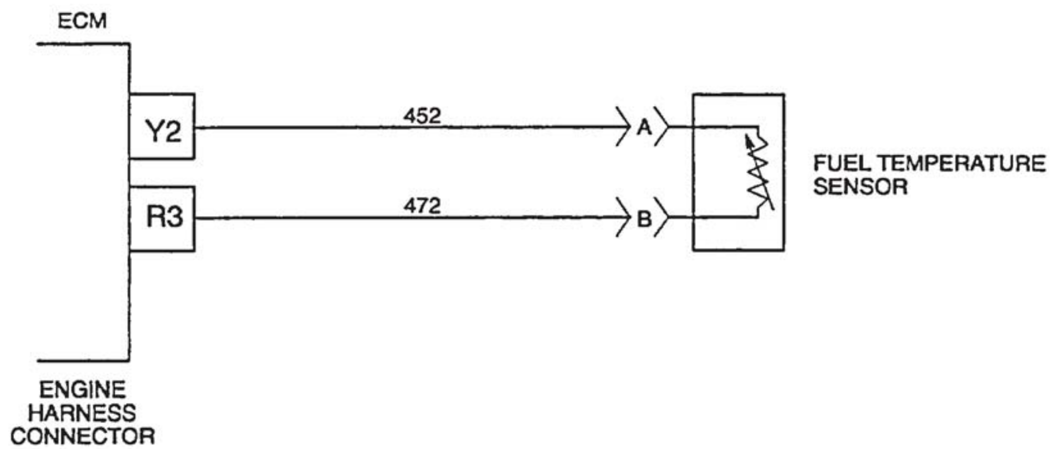


POWER HARNESS

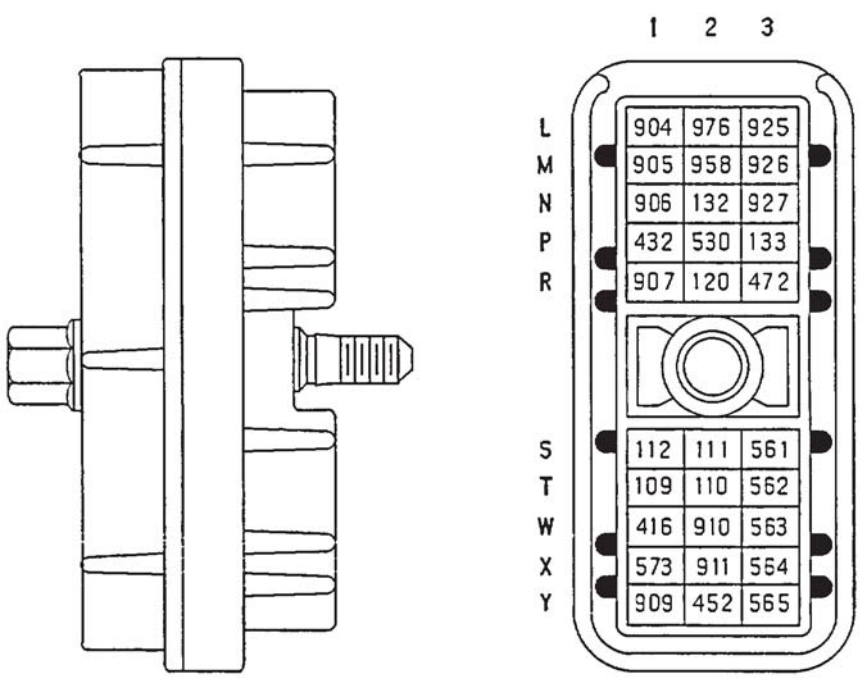
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 22 (Cont'd)
J1587 CODE: P91 4 - ELECTRONIC FOOT PEDAL ASM (EFPA) CIRCUIT FAILED HIGH (VOLTAGE LOW)
ALSO CALLED THROTTLE POSITION SENSOR (TPS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-12 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to the ECM. • Disconnect 5-way power connector at the ECM. • Read resistance between sockets D2 and B3 on the vehicle harness connector. • Also read resistance between socket D2 on the vehicle harness connector and the following sockets on the 5-way power connector: B, C, D, & E.	All readings are greater than 10,000 ohms or open.	Go to 22-13.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses. Then go to 22-30.
22-13 Check for Outside DDEC Battery +		
• Turn ignition off. • Remove ECM 5-pin power connectors. • Remove ECM vehicle harness. • Turn ignition on. • Read voltage A3 (read lead) to a good ground (black lead). • Read voltage C3 (red lead) to a good ground (black lead).	All readings less than 4.0 volts.	Go to 22-9.
	Either reading greater than or equal to 4.0 volts.	Outside power is spliced into. either (ckt#952) or (ckt#916). Remove splice. Then go to 22-30.
22-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Stop engine. • Read all codes.	(No codes).	Repairs are complete.
	Code 91/4 (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 91/4.	Go to START-1, pg 3-345.41, to service other codes.



FUEL TEMPERATURE SENSOR (FTS) CIRCUITS



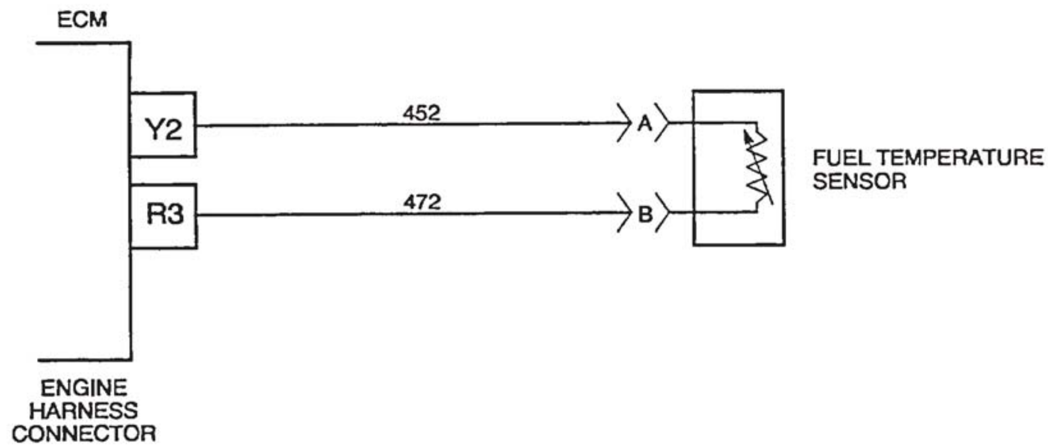
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

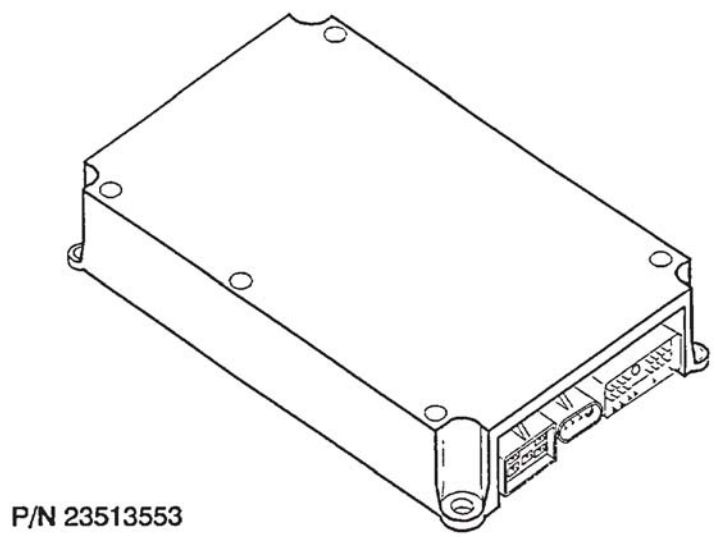
E. FLASH CODE: 23
J1587 CODE: P174 3. FUEL TEMPERATURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
23-1 Sensor Check		
• Turn ignition off. • Disconnect FTS and install a jumper wire between the FTS connector sockets A and B. • Turn ignition on. • Read Active codes.	Code 174/4 and/or any codes except Code 174/3). →	Go to 23-2.
	Anything except Code 174/4. →	Go to 23-4.
23-2 Check for Short to +5 Volt Line		
• Turn ignition off. • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R3 and W1 on the engine harness connector.	Less than or equal to 10,000 ohms. →	Signal line (ckt#472) is shorted to the engine +5 Volt line (ckt #416), and/or (ckt#472) signal is shorted to (ckt#452) sensor return and/or ground. Repair short. Then go to 23-30.
	Greater than 10,000 ohms or open. →	Go to 23-3.
23.3 Check FTS Connectors		
• Inspect terminals at the FTS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace FTS. Then go to 23-30.
	Problem found. →	Repair terminals/connectors. Then go to 23-30.
23.4 Open Line Check		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R3 and Y2 on the engine harness connector.	Less than or equal to 5 ohms →	Go to 23-5.
	Greater than 5 ohms or open. →	Signal line (ckt#472) or return line (ckt#452) is open. Repair open Then go to 23-30.



FUEL TEMPERATURE SENSOR (FTS) CIRCUITS

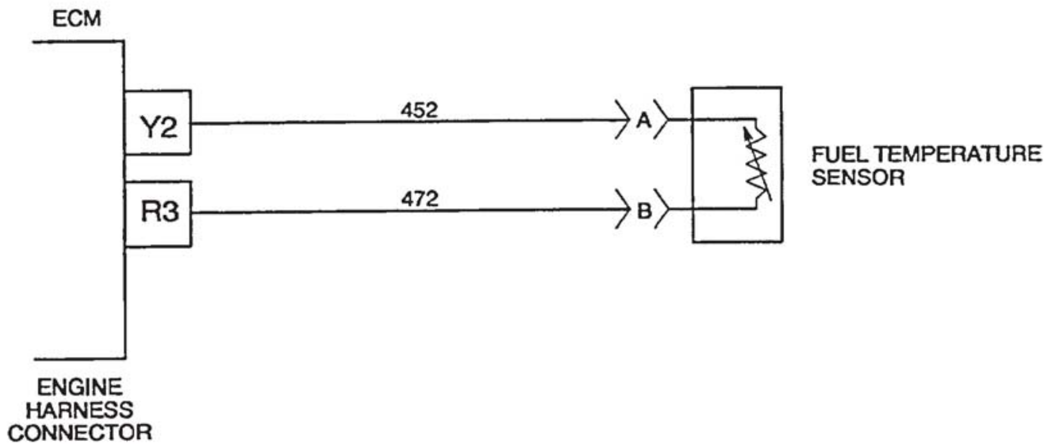


THE ELECTRONIC CONTROL MODULE - DDEC III

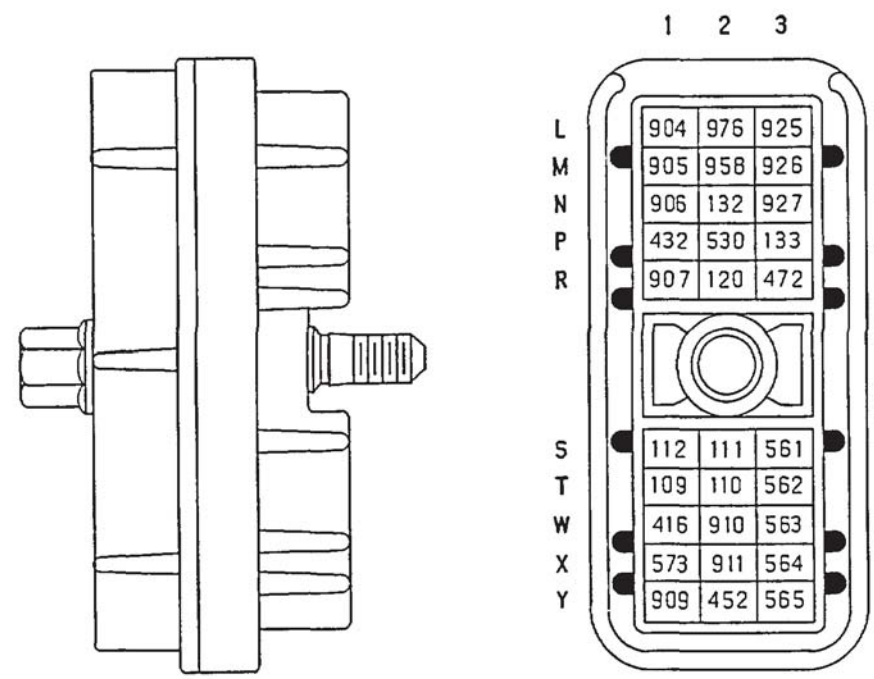
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 23
J1587 CODE: P174 3 - FUEL TEMPERATURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
23-5 Check ECM Connectors.		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace ECM. Then go to 23-30.
	Problem found. →	Repair terminals/connectors. Then go to 23-30.
23-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 8 minute. Stop engine. • Stop engine. • Read inactive codes.	(No codes). →	Repairs are complete.
	Code 174/3 (and any other codes). →	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 174/3. →	Go to START-1, pg 3-345.41, to service other codes.



FUEL TEMPERATURE SENSOR (FTS) CIRCUITS



ECM ENGINE HARNESS CONNECTOR

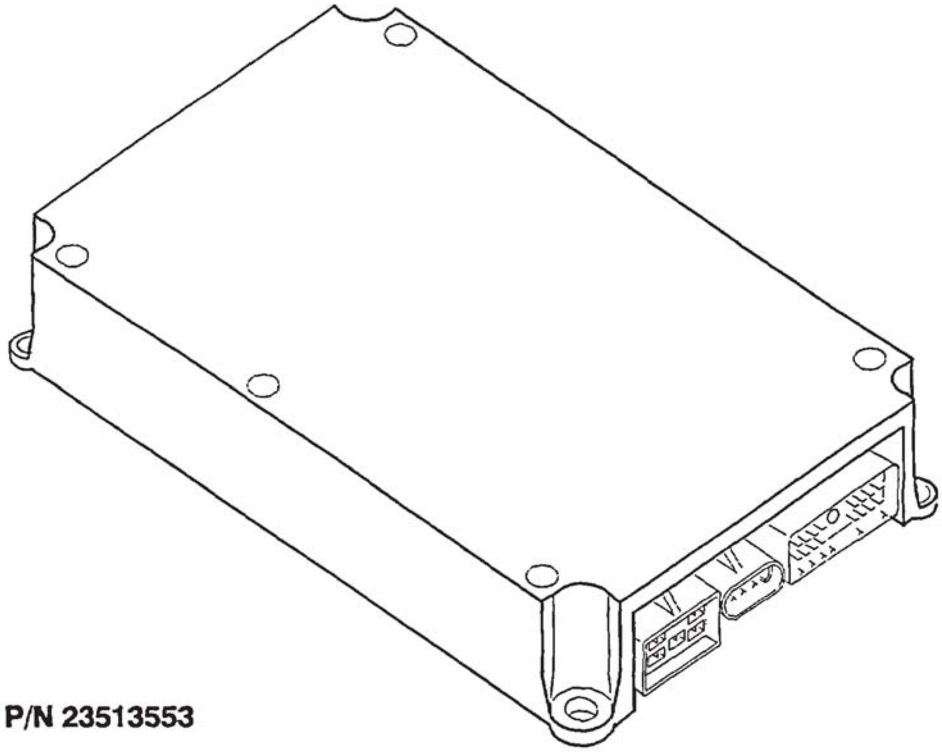
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 24
J1587 CODE: P174 4 - FUEL TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
24-1 Multiple Code Check		
• Were there any other active codes besides Code 174/4?	No other codes.	Go to 24-2.
	Yes, any or all, of the following codes: 110/3, 17513, 174/3, 102/3.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 24-2.
24-2 Sensor Check		
• Turn ignition off. • Disconnect FTS connector. • Start engine and run until "Check Engine" light comes on or for 8 minutes. • Read active codes with engine still running.	Code 174/3 (or any other codes except Code 174/4).	Go to 24-3.
	Code 174/4 (and any other codes).	Go to 24-4.
24-3 Check FTS Connectors		
• Inspect terminals at the FTS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace FTS. Then go to 24-30.
	Problem found	A Repair terminals/connectors. Then go to 24-30.
23-4 Open line Check		
• Turn ignition off. equal to 10,000 ohms • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R3 and Y2 on the engine harness connector. • Also read resistance between socket B and a good ground.	Less than or on either reading. Then go to 24-30.	Signal line (ckt#472) is shorted to the return line (ckt#452) or battery ground. Repair short.
	Greater than 10,000 ohms or open on both readings	Go to 24-5.

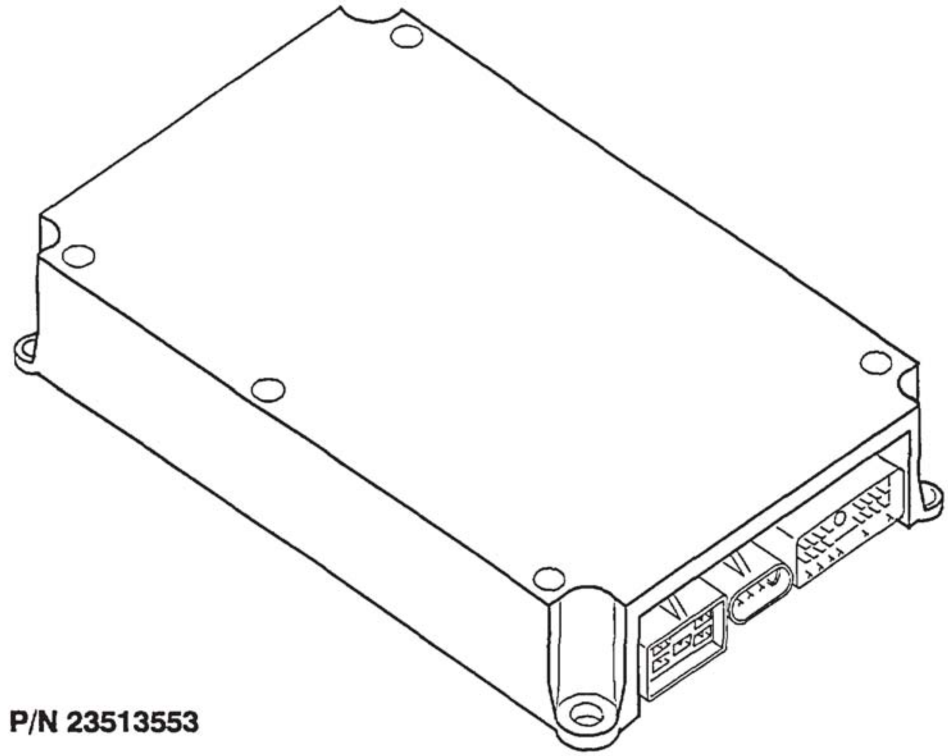


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 24
J1587 CODE: P174 4 - FUEL TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
24-5 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially R3 and Y2 of the ECM connector.	Terminals and connectors are okay. →	Reprogram ECM. Then go to 24-30.
	Problem found. →	Repair terminals/connectors. Then go to 24-30.
24-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 8 minute. Stop engine. • Read inactive codes	(No codes). →	Repairs are complete.
	Code 174/4 (and any other codes) →	Al l system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 174/4 →	Go to START-1, pg 3-345.41, to service other codes.



THE ELECTRONIC CONTROL MODULE - DDEC III

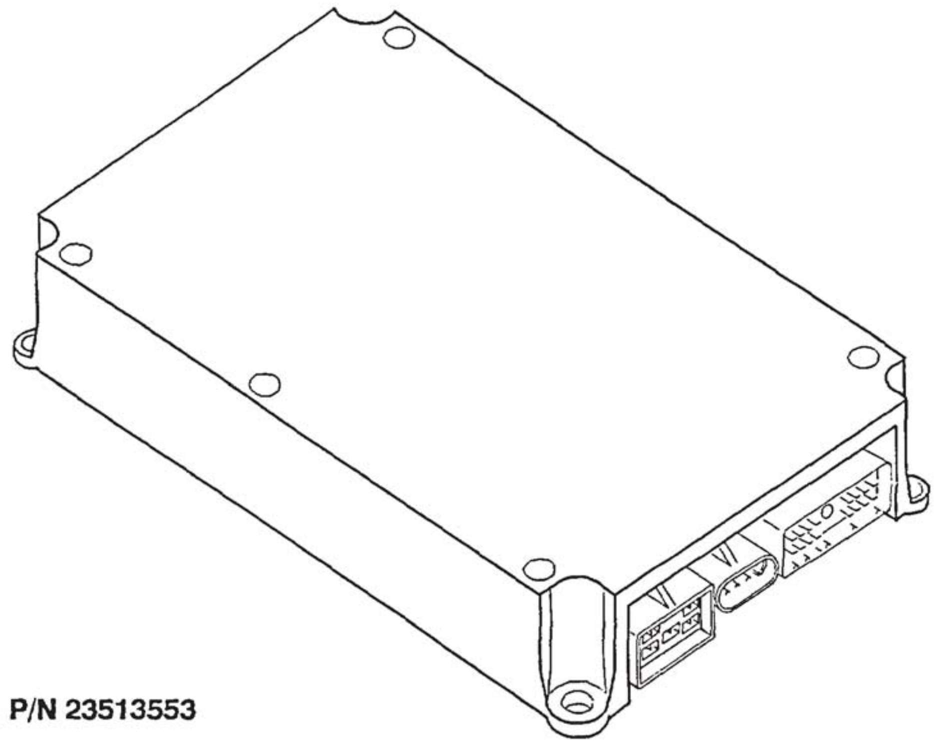
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 25
J1587 CODE: NONE NO CODES

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, 3-345.41 and you have now been referred here.

No faults have been detected by DDEC-III since the last time the codes were cleared. If symptoms remain, and all basic mechanical and visual inspections have been performed with no causes to the problem found, you can try using Chart 1 (Intermittent or Symptom Without a Code) on Page 3-345.57.



THE ELECTRONIC CONTROL MODULE - DDEC III

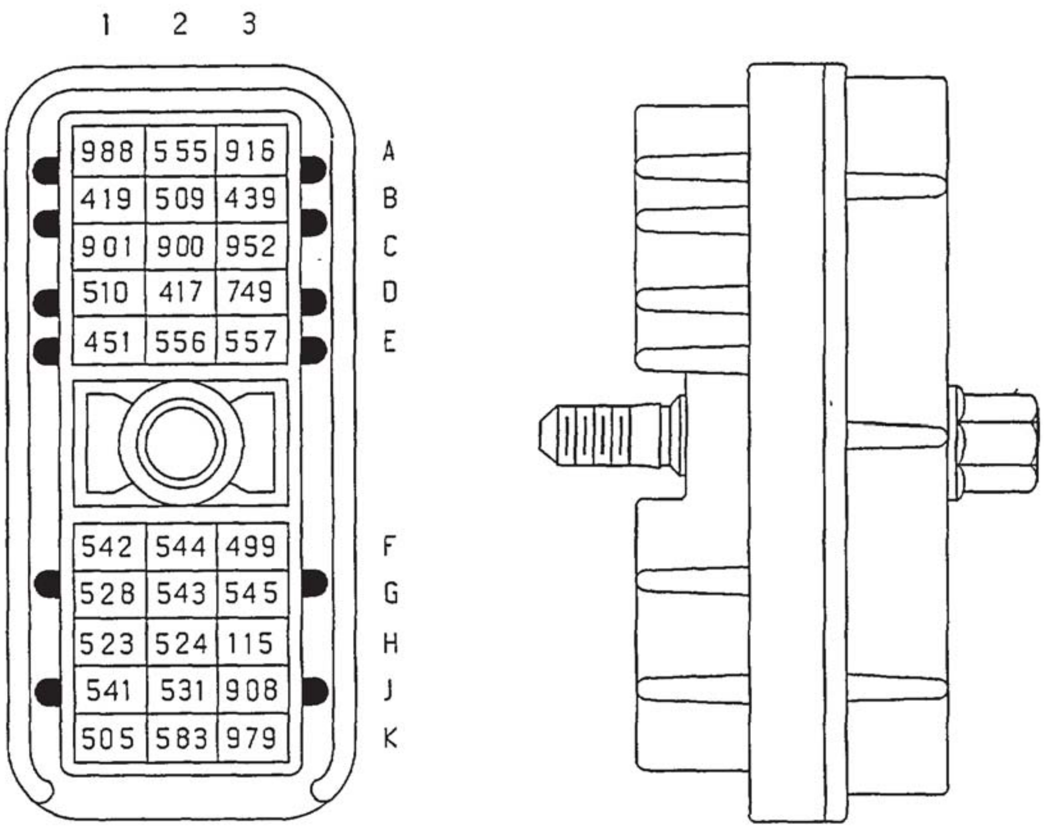
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 26
J1587 CODE S025 11 AUXILIARY SHUTDOWN #1
S061 11 AUXILIARY SHUTDOWN #2

NOTE - This chart is only to be used if.

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
26-1 Determine Code(s)		
• Turn ignition on. • Plug in DDR. • Read codes.	S 25-11 or S 61-11	Go to 26-2.
	Neither of above codes.	Go to START-1, pg 3-345.41.
26-2 Check Calibration Configuration		
• Select ECM input/output configuration. • Determine cavity and wire number that is causing code to be logged. • Select switch/light status • Determine status of that wire/cavity.	Switch reads "on" →	The OEM supplied switch/relay is grounding the wire or a short to ground exists. Determine OEM supplied device or repair short and go to 26-30.
	Switch reads "off'. →	Go to 26-3.
26-3 Try to Get Switch On.		
• Start and run engine for one minute. • Watch switch/light status.	Switch status "off'. →	Condition no longer exists Contact OEM to learn item that is wired to this cavity.
	Switch reads "on". →	OEM supplied device is grounding this wire. Contact OEM for repair procedure.

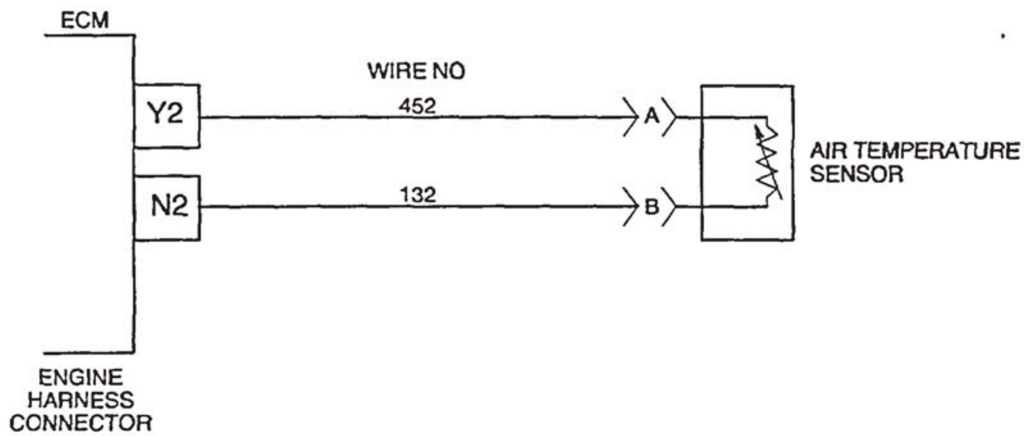


ECM VEHICLE HARNESS CONNECTOR

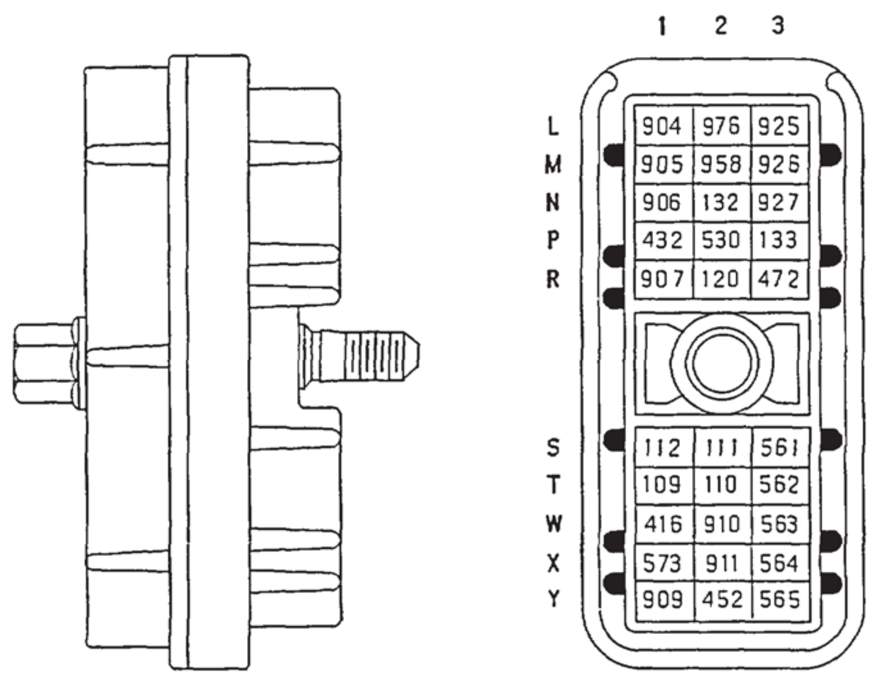
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: **26 (Cont'd)**
J1587 CODE: **025.11 AUXILIARY SHUTDOWN #1**
061-11 AUXILIARY SHUTDOWN #2

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
26-30 Verify Repairs		
• Turn ignition on. • Clear codes. • Note status of "CEL/SEL". • If "CEL/SEL" light does not stay on, start engine and run until "CEL/SEL" light comes on, or reasonable amount of time to verify repairs are completed. • Read inactive code(s).	(No codes).	Repairs are complete.
	Code 25 or 61-11 appears.	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 25 or 61-11.	Go to START-1, pg 3-345.41, to service other codes.



AIR TEMPERATURE SENSOR (ATS) CIRCUITS



ECM ENGINE HARNESS CONNECTOR

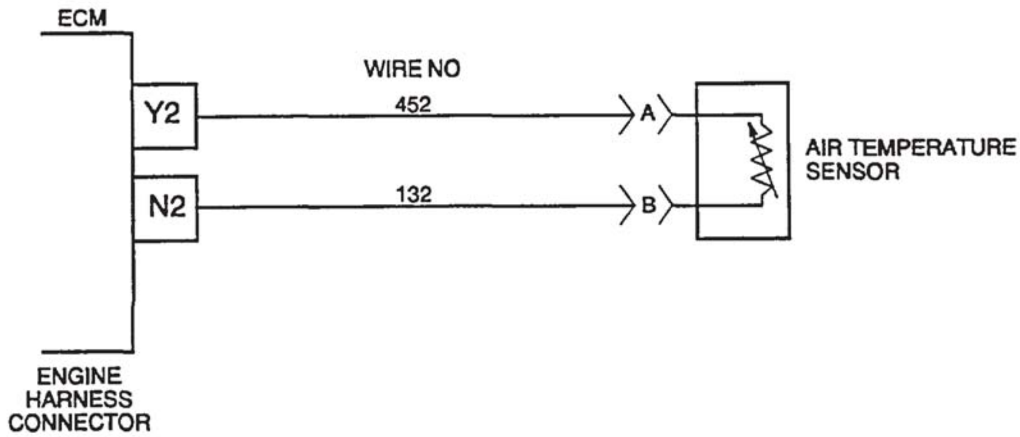
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 27
J1587 CODE: P1723 - AIR TEMPERATURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

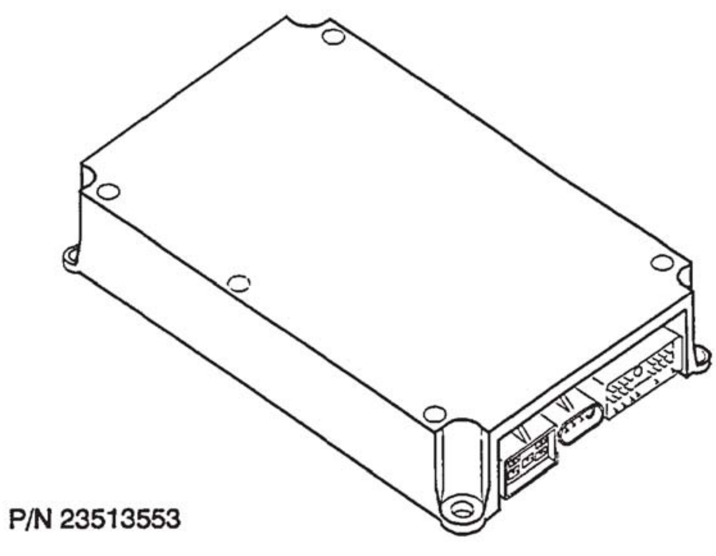
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-**III** was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
27-1 Sensor Check		
• Turn ignition off. • Disconnect ATS and install jumper. wire between the ATS connector sockets A and B. • Turn ignition on. • Read active codes	Code 172/4 (or any other codes except Code 172/3).	Go to 27-2.
	Anything except - Code 172/4.	Go to 27-4.
27-2 Check for Short to +5 Volt Line		
• Turn ignition off. • Remove jumper wire. • Disconnect engine harness connector at the ECM. • Read resistance between sockets N2 and W1 on engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#132) is shorted to the engine +5 Volt line (ckt #416), and/or (ckt#132) signal is shorted to (ckt#452) sensor return and/or ground, Repair short. Then go to 27-30.
	Greater than 10,000 ohms or open.	Go to 27-3.
27-3 Check ATS Connectors		
• Inspect terminals at the ATS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace ATS. Then go to 27-30.
	Problem found. Then go to 27-30.	Repair terminals/connectors
27-4 Open line Check		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets N2 and Y2 on the engine harness connector.	Less than or equal to 5 ohms	Go to 27-5.
	Greater than 5 ohms or open.	Signal line (ckt#132) or return line (ckt#452) is open. Repair open. Then go to 24-30.



AIR TEMPERATURE SENSOR (ATS) CIRCUITS

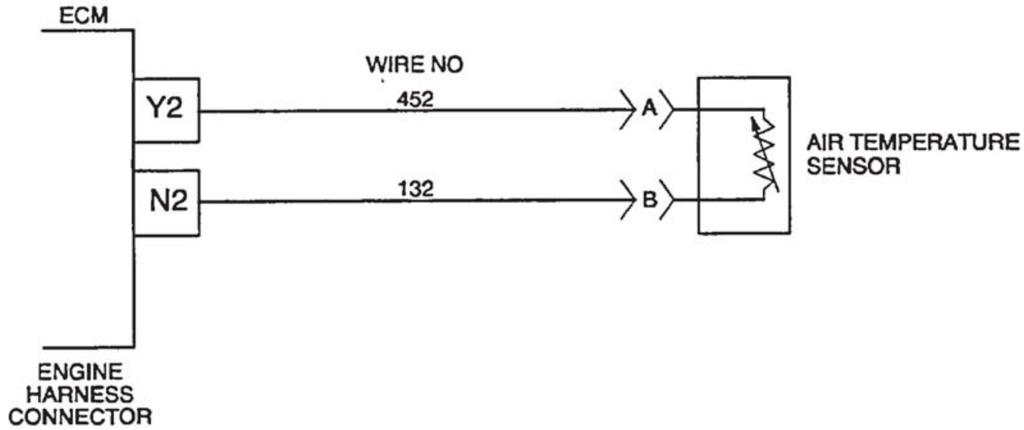


THE ELECTRONIC CONTROL MODULE - DDEC III

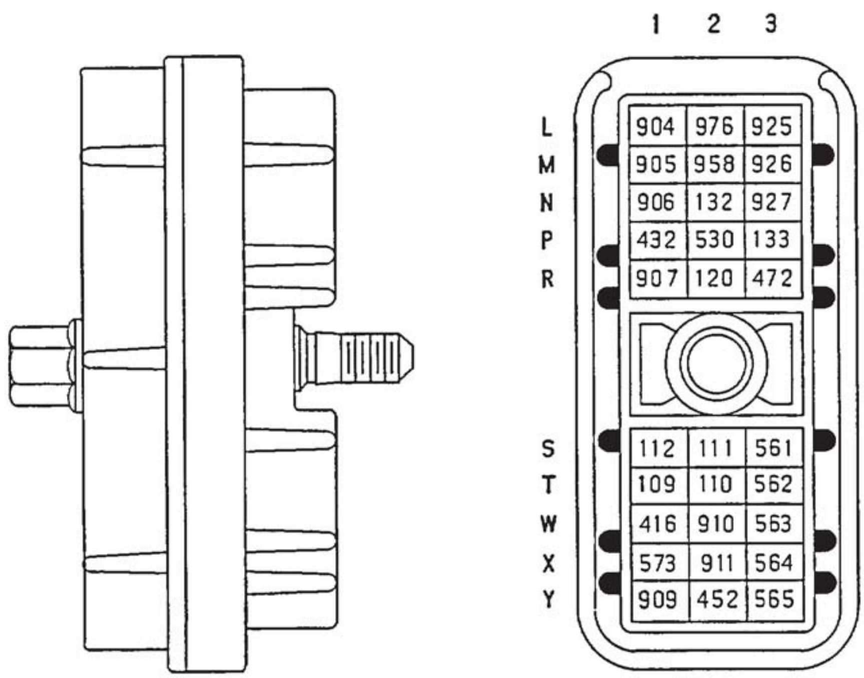
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 27
J1587 CODE: P172 3. AIR TEMPERATURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
27-5 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Reprogram ECM. Then go to 27-30.
	Problem found. →	Repair terminals/connectors. Then go to 27-30.
27.30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • `If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 8 minute. Stop engine. • Read inactive codes.	(No codes). →	Repairs are complete.
	Code 172/3 (and any other codes). →	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 172/3. →	Go to START-1, pg 3-345.41, to service other codes.



AIR TEMPERATURE SENSOR (ATS) CIRCUITS



ECM ENGINE HARNESS CONNECTOR

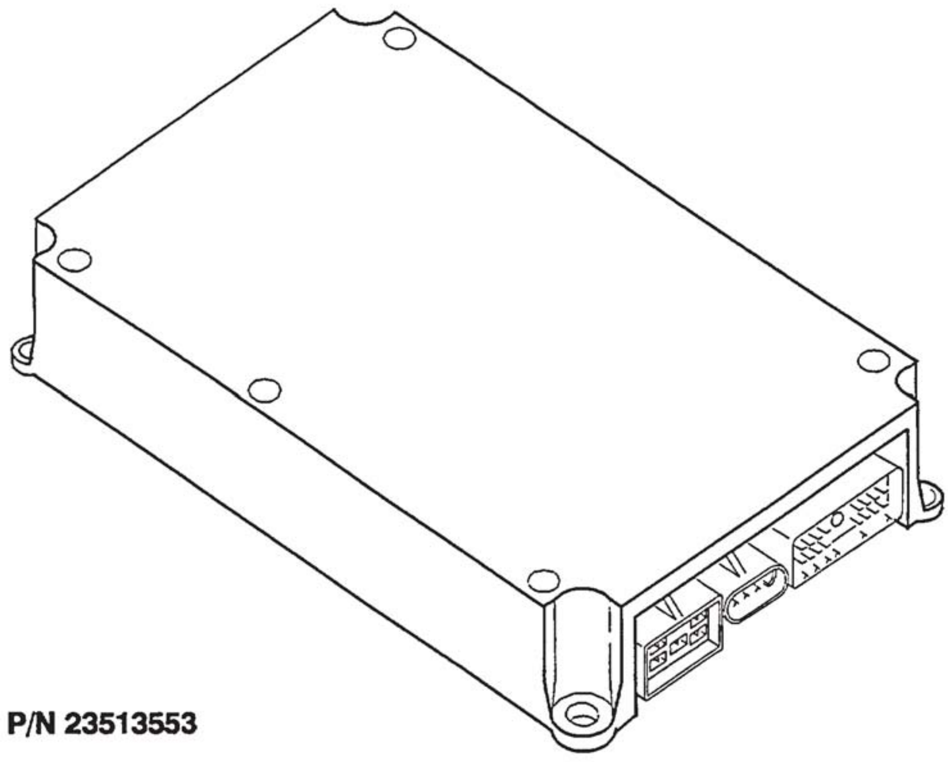
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 28
J1587 CODE: P172 4 - AIR TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

NOTE - This chart is only to be used If:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
28-1 Multiple Code Check		
• Were there any other active codes besides Code 172/4?	No other codes.	Go to 28-2.
	Yes, any or all of the following codes: 110/3,175/3,174/3, 102/3, 72/3.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 28-2.
28.2 Sensor Check		
• Turn ignition off. • Disconnect ATS connector. • Start engine and run until "Check Engine" light comes on or for 8 minutes. • Read active codes with engine still running.	Code 172/3 (or any other codes except Code 172/4).	Go to 28-2.
	Code 172/4 (and any other codes).	Go to 28-4.
28-3 Check ATS Connectors		
• Inspect terminals at the ATS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets	Terminals and connectors are okay.	Replace ATS. Then go to 28-30.
	Problem found.	Repair terminals/connectors. Then go to 28-30.
28.4 Check for Short		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets N2 and Y2 on the engine harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading.	Signal line (ckt#132) is shorted to the return line (ckt#452) or battery ground. Repair short. Then go to 28-30.
	Greater than 10,000 ohms or open on both readings.	Go to 28-5.

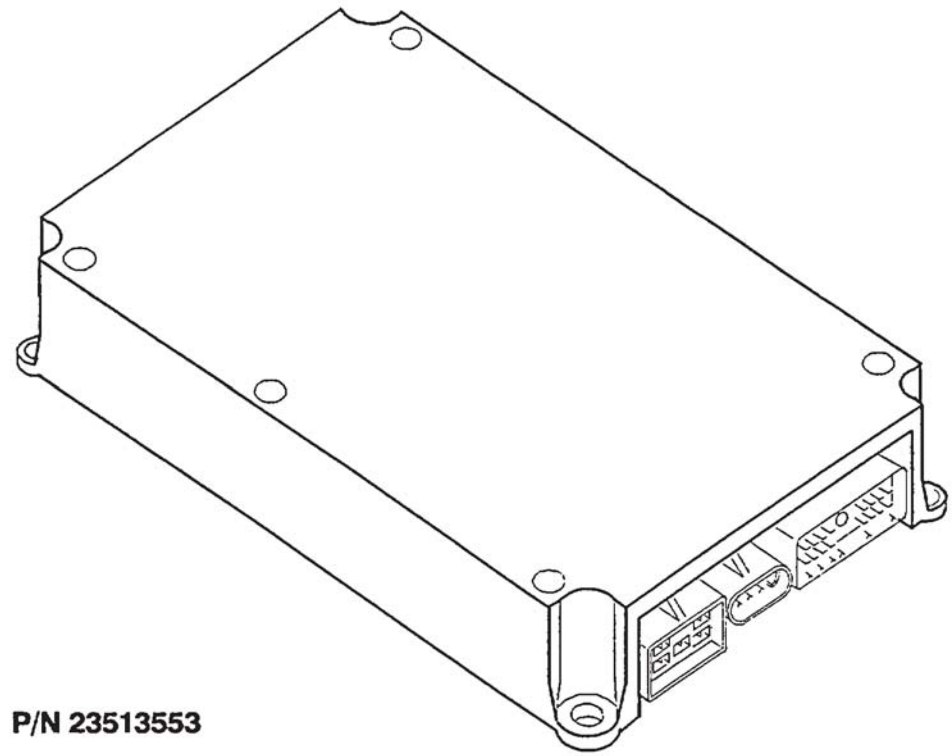


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 28
J1587 CODE: P172 4 - AIR TEMPERATURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
28-5 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially N2 and Y2 of the ECM connector	Terminals and connectors are okay →	Reprogram ECM. Then go to 28-30.
	Problem found. →	Repair terminals/connectors. Then go to 28-30.
28-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 8 minute. Stop engine. • Read inactive codes	(No codes). →	Repairs are complete.
	Code 172/4 (and any other codes)	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 172/4. →	Go to START-1, pg 3-345.41, to service other codes.



THE ELECTRONIC CONTROL MODULE - DDEC III

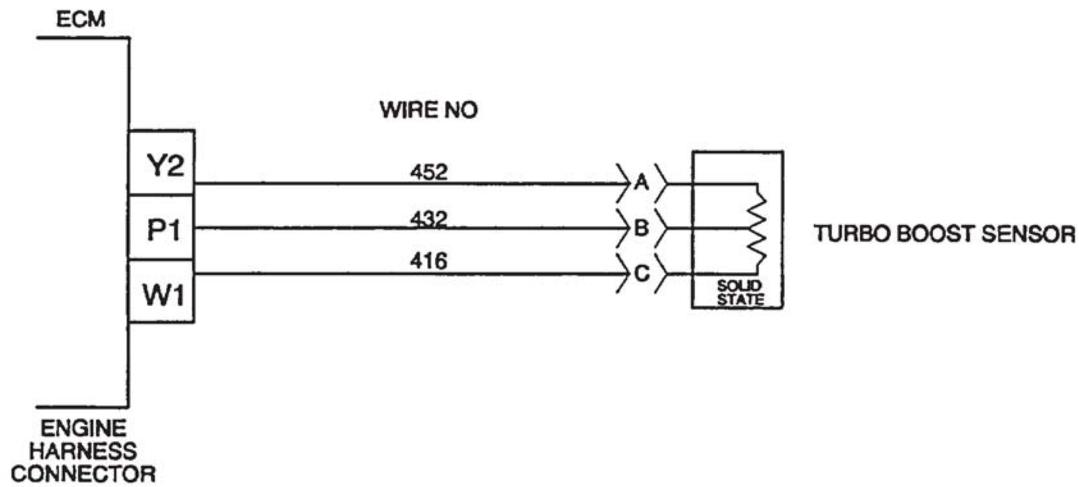
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 31
J1587 CODE: 5051 3/4 - ENGINE BRAKE LOW OPEN CKT/SHORT TO GROUND
S052 3/4 - ENGINE BRAKE MED OPEN CKT/SHORT TO GROUND

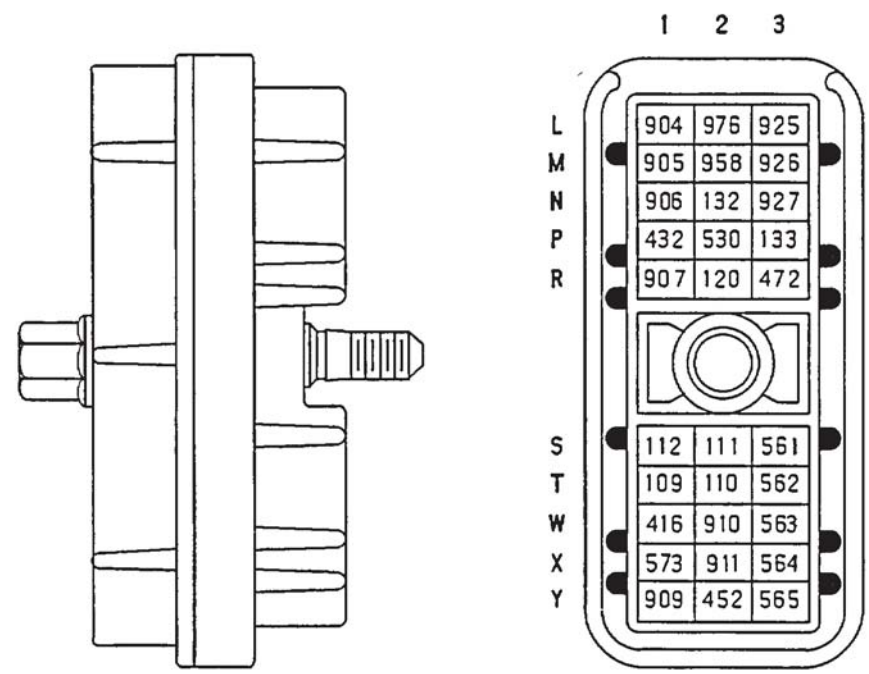
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT



TURBO BOOST SENSOR CIRCUITS



ECM ENGINE HARNESS CONNECTOR

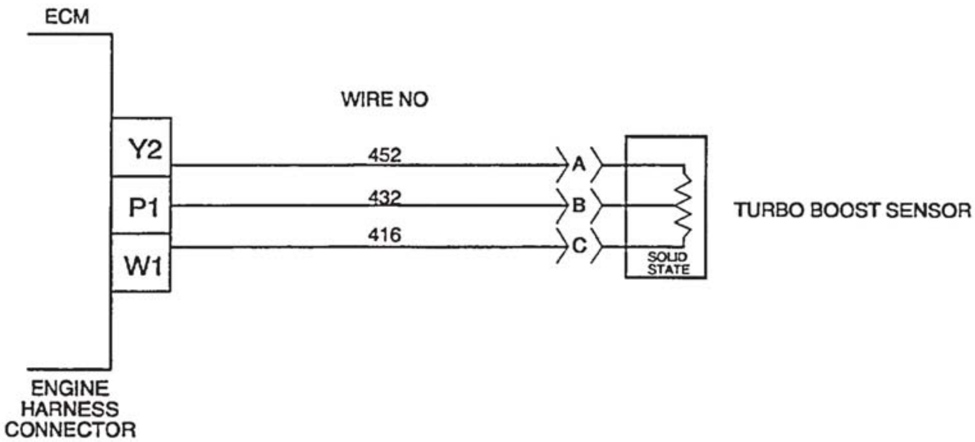
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 33
J1587 CODE: P102 3 - TURBO BOOST PRESSURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

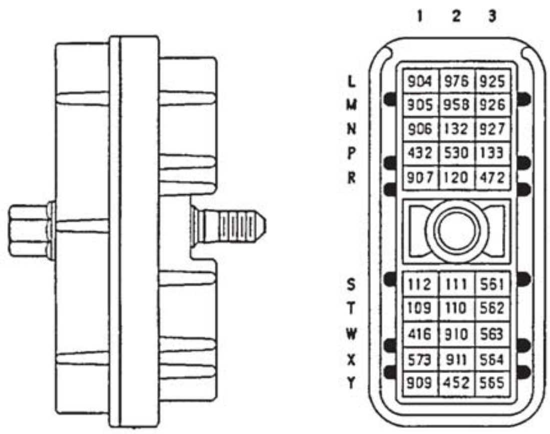
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

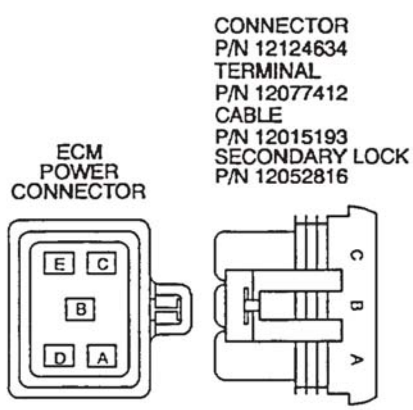
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-1 Multiple Code Check		
• Were there any other active codes besides Code 102/3?	No other codes.	Go to 33-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4, 72/3 or 4, 100/3 or 4, 94/3 or 4, 101/3 or 4, 73/3 or 4.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 33-2.
33-2 Sensor Check		
• Turn ignition off. • Disconnect TBS connector. • Start and run engine at idle. • Read active codes.	Code 102/4 (and any codes except Code 102/3).	Go to 33-3.
	Code 102/3 (and any other codes).	Go to 33-5.
33-3 Return Circuit Check		
• Turn ignition off. • Install a jumper wire between pins A and B of the TBS harness connector. • Disconnect engine harness connector at the ECM. • Read resistance between sockets P1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 33-4.
	Greater than 5 ohms or open.	Return line (ckt#452) is open. Repair open. Then go to 33-30.
33-4 Check TBS Connectors		
• Inspect terminals at the TBS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace TBS. Then go to 33-30.
	Problem found.	Repair terminals/connectors. Then go to 33-30.



TURBO BOOST SENSOR CIRCUITS



ECM ENGINE HARNESS CONNECTOR



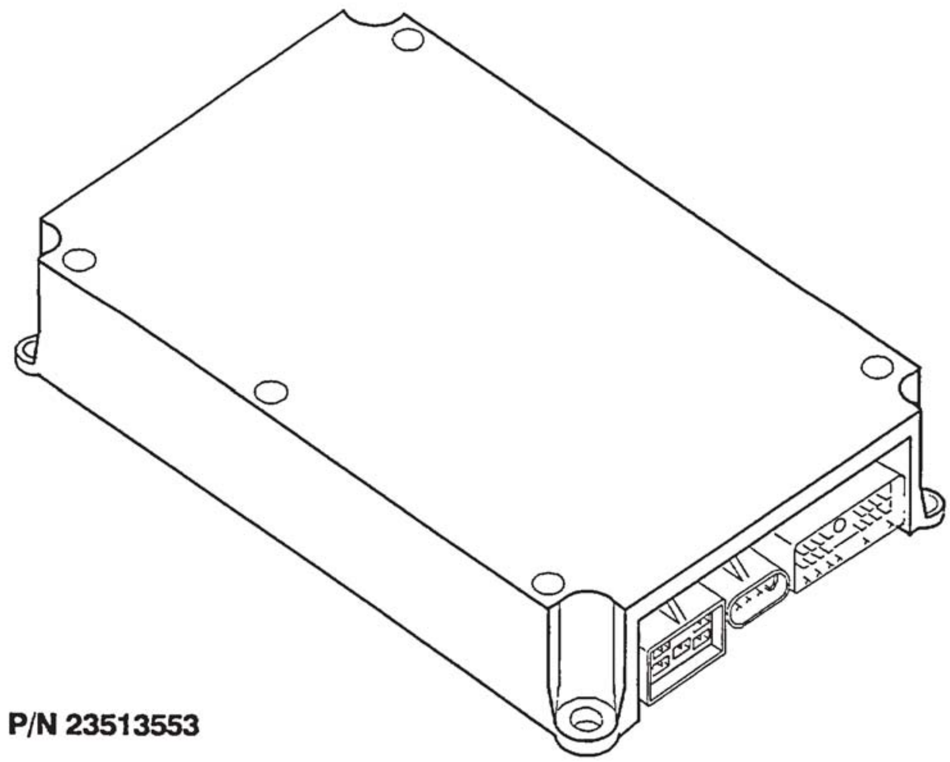
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 33
J1587 CODE: P102 3 . TURBO BOOST PRESSURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-5 Check for Short to +5 Volt Line		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets W1 and P1 on the engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#432) is shorted to the engine +5 Volt line (ckt #416). Repair short. Then go to 33-30.
	Greater than 10,000 ohms or open.	Go to 33-6.
33-6 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between socket P1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P1 on the engine harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to 33-7.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 33-30.
33-7 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 33-30.
	Problem found Then go to 33-30.	Repair terminals/connectors.

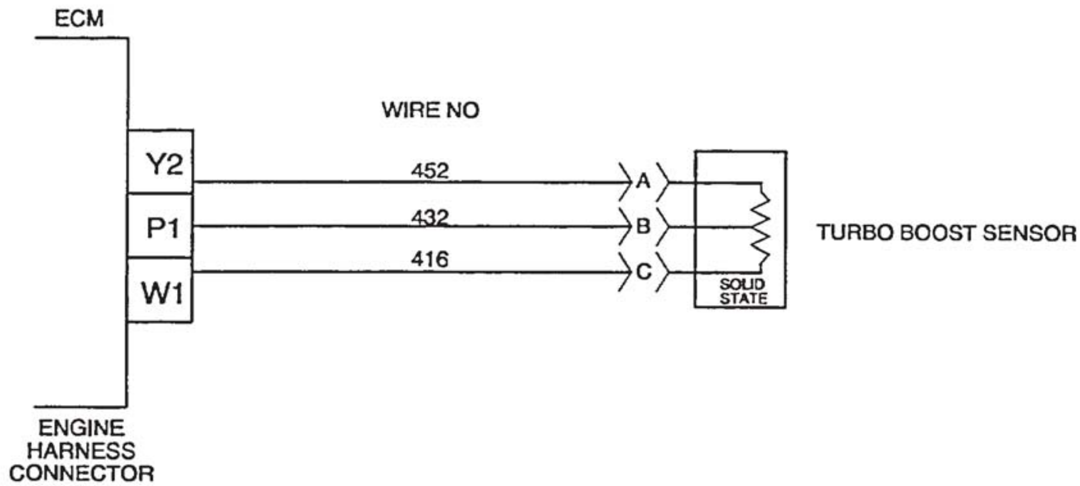


THE ELECTRONIC CONTROL MODULE - DDEC III

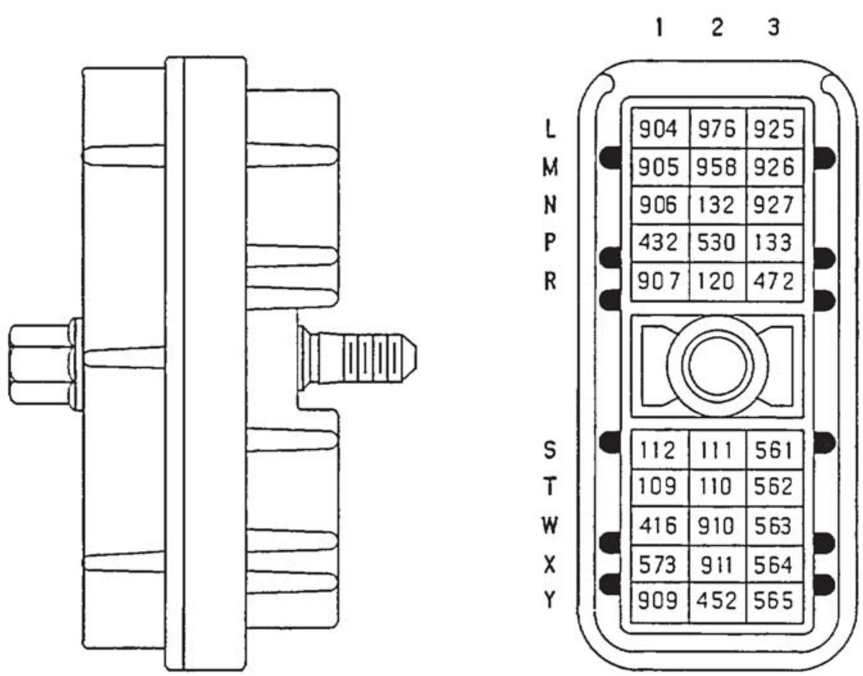
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 33
J1587 CODE:P102 3 -TURBO BOOST PRESSURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 102/3 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 102/3.	Go to START-1, pg 3-345.41, to service other codes.



TURBO BOOST SENSOR CIRCUITS



ECM ENGINE HARNESS CONNECTOR

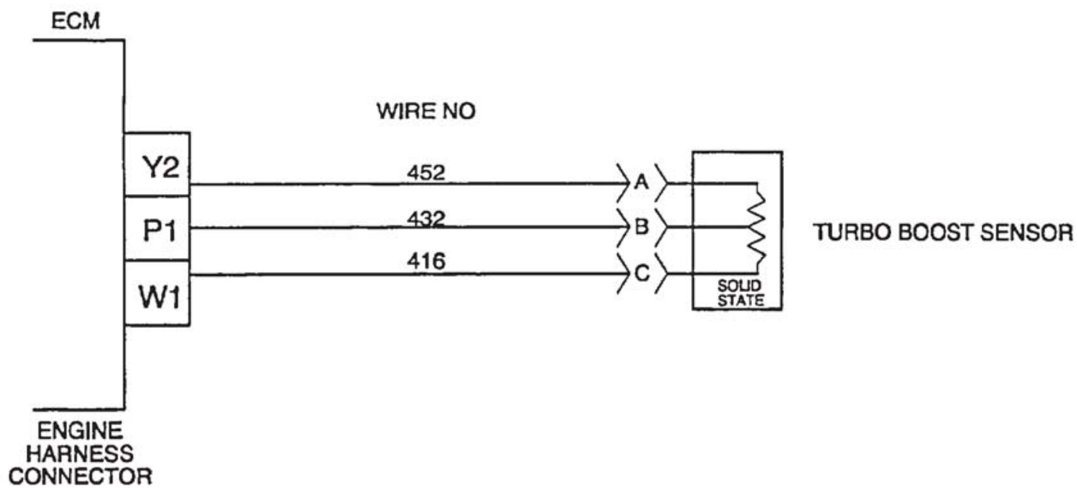
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 34
J1587 CODE: P102 4 - TURBO BOOST PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

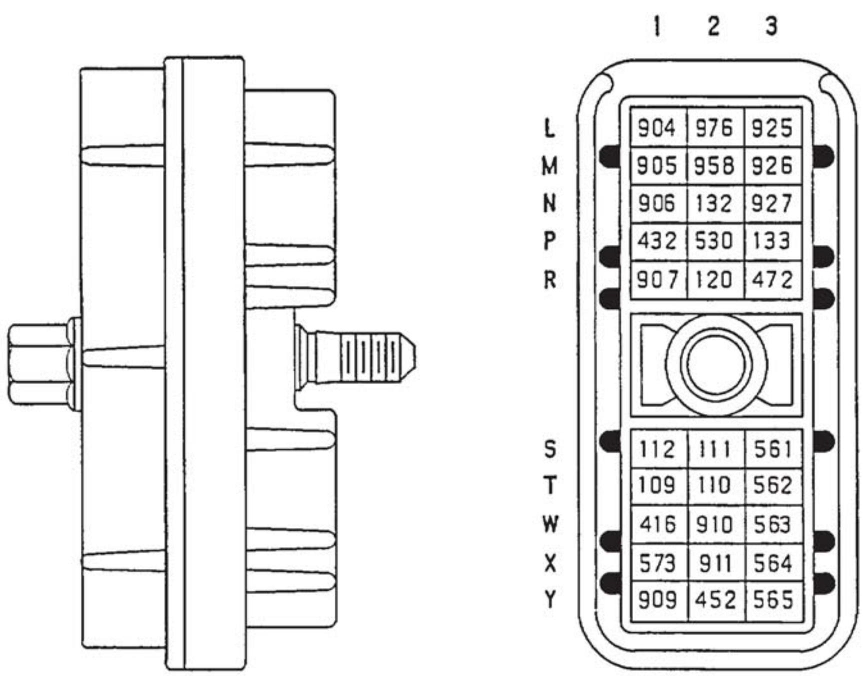
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-1 Multiple Code Check		
• Were there any other active codes besides Code 102/4?	No other codes.	Go to 34-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4,102/3, 100/3 or 4, 94/3 or 4, 101/3 or 4 73/3 or 4.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 34-2.
34-2 Sensor Check		
• Turn ignition off. • Disconnect TBS connector. • Install a jumper wire between sockets B and C of the TBS harness connector. • Turn ignition on. • Read active codes. • If active Code 102/3 or 4 exists go to RESULT column. • If no active Code 102/3 or 4 exists, start engine and run until either the "Check Engine" light comes on or the engine has been running warm for at least one minute at greater than 1000 RPM. • Read active codes.	Code 102/3 (and any codes except except Code 102/4.	Go to 34-3.
	Code 102/4 (and any other codes).	Go to 34-4.
33-4 Check TBS Connectors		
• Inspect terminals at the TBS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace TBS. Then go to 34-30.
	Problem found.	Repair terminals/connectors. Then go to 34-30.



TURBO BOOST SENSOR CIRCUITS

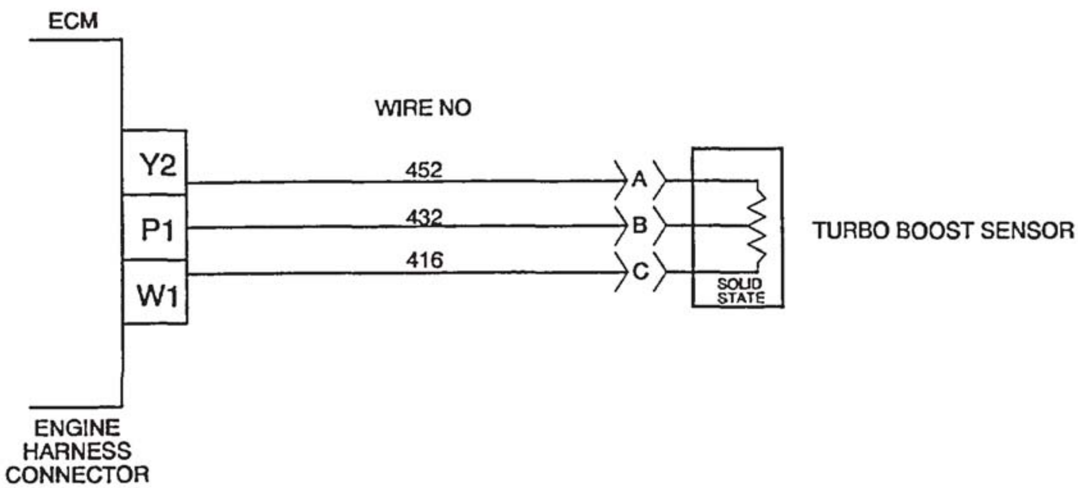


ECM ENGINE HARNESS CONNECTOR

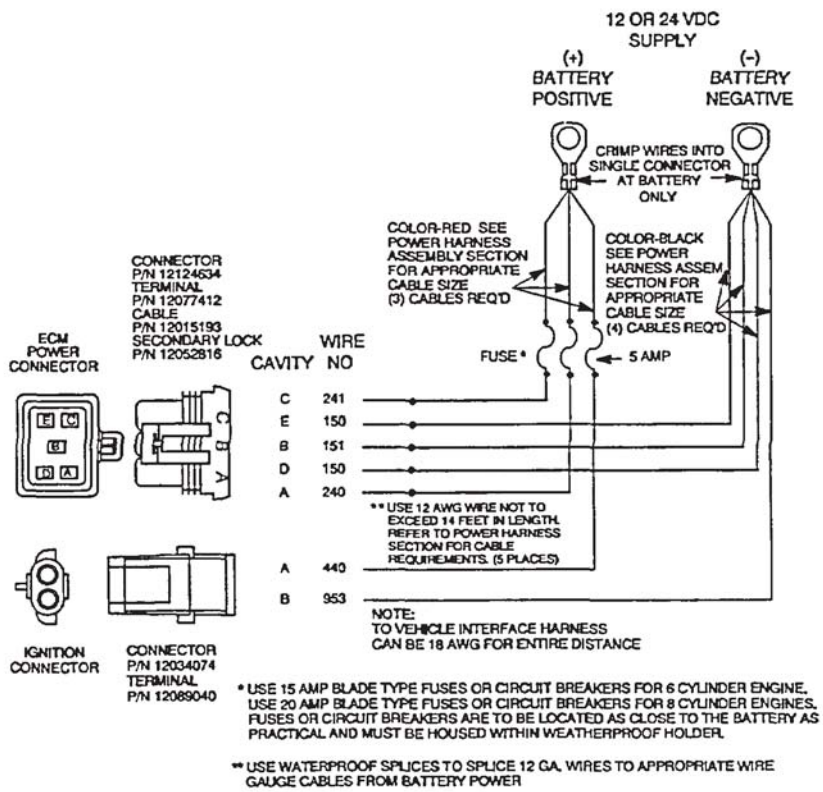
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 34
J1587 CODE: P102 4 TURBO BOOST PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-4 Check for +5 Volts		
• Remove jumper wire. • Turn ignition on. • Read voltage on TBS harness connector, pin C (red lead) to pin A (black lead).	Between 4 to 6 volts.	Go to 34-5.
	Less than 4 volts.	Go to 34-8.
	Greater than 6 volts.	Go to 34-10.
34-5 Check for Signal Open		
• Turn Ignition off. • Disconnect the vehicle harness connectors at the ECM. • Install a jumper wire between pins A and B of the TBS harness connector. • Read resistance between sockets P1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 34-6.
	Greater than 5 ohms or open.	Signal line (ckt#432) or return line (ckt#452) Is open. Repeat check from pin A to Y2 and pin B to P1. Repair open. Then go to 34-30.
34-6 Check for Short		
• Remove jumper. • Read resistance between pins A and B on the TBS harness connector. • Also read resistance between socket B and a good ground. on both readings.	Less than or equal to 10,000 ohms on either readings.	Signal line (ckt#432) is shorted to the return line (ckt#452). Repair short. Then go to 34-30.
	Greater than 10,000 ohms or open	Then go to 34-7.
34-7 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 34-30.
	Problem found Then go to 34-30.	Repair terminals/connectors



TURBO BOOST SENSOR CIRCUITS

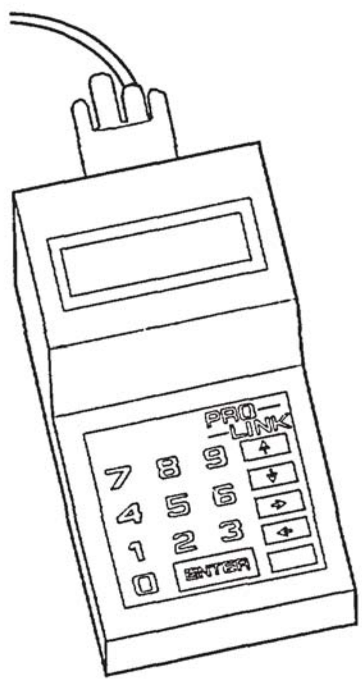


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 34
J1587 CODE: P102 4 - TURBO BOOST PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-8 Check for Open +5 Volt Line		
• Turn ignition off. • Disconnect the vehicle harness connectors at the ECM. • Install a jumper wire between pins A and C of the TBS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms	Go to 34-9.
	Greater than 5 ohms or open. Then go to 34-30.	The engine +5 Volt line (ckt #416) is open. Repair open.
34-9 Check for Short		
• Remove jumper. • Read resistance between pins A and C on the TBS harness connector	Less than or equal to 10,000 ohms.	The +5 Volt line (ckt#416) is shorted to return line(ckt#452) Repair short. Then go to 34-30.
	Greater than 10,000 ohms or open.	Go to 34-7.
34-10 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to the ECM. or open. • Disconnect the engine harness vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between socket P1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P1 on the engine harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms	Go to 34-7.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 34-30.

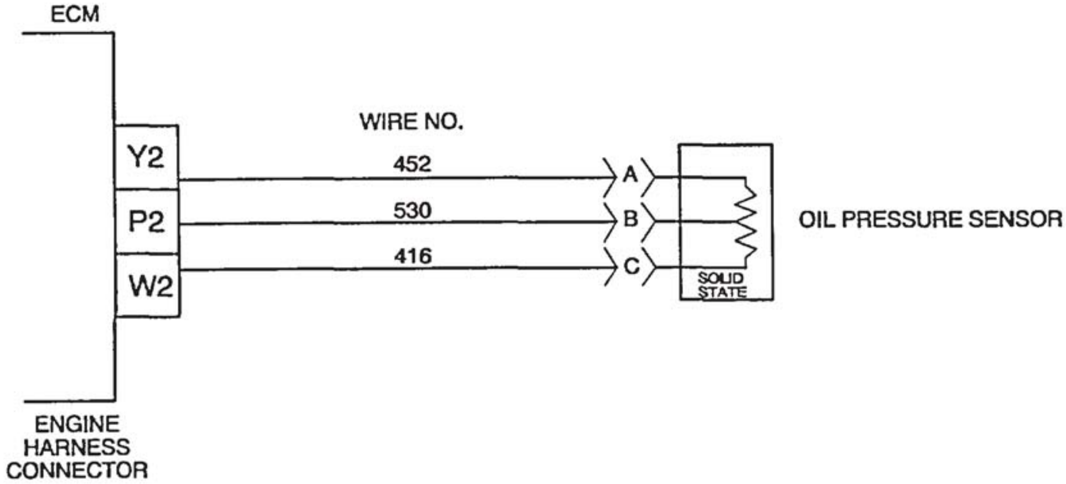


Pro-Link 9000

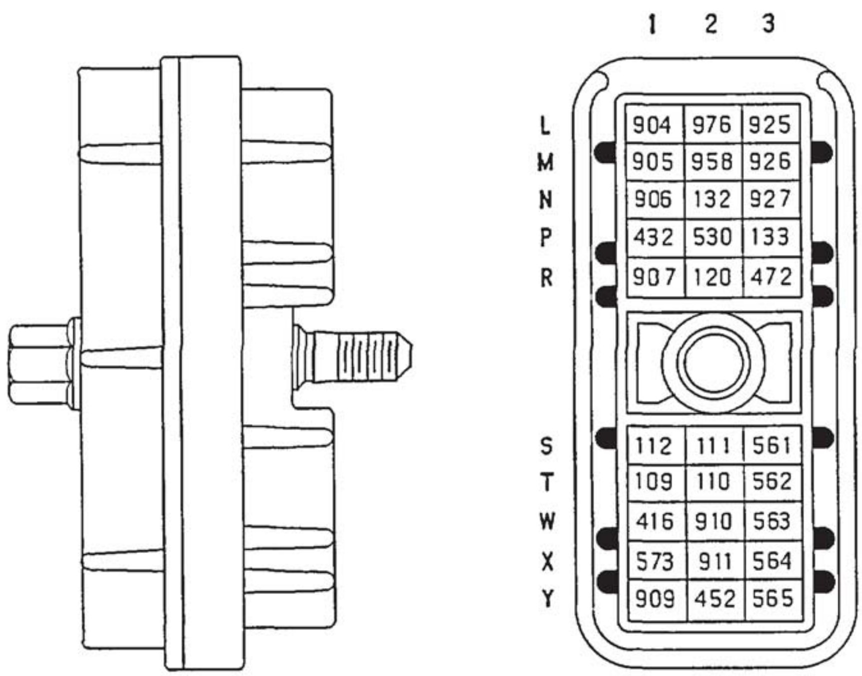
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 34
J1587 CODE: P102 4 * TURBO BOOST PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. the error. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Stop engine. • Read inactive codes.	(No codes). → Code 102/4 (and any other codes). → Any other codes except Code 102/4. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find Go to START-1, pg 3-345.41, to service other codes.



OIL PRESSURE CIRCUITS



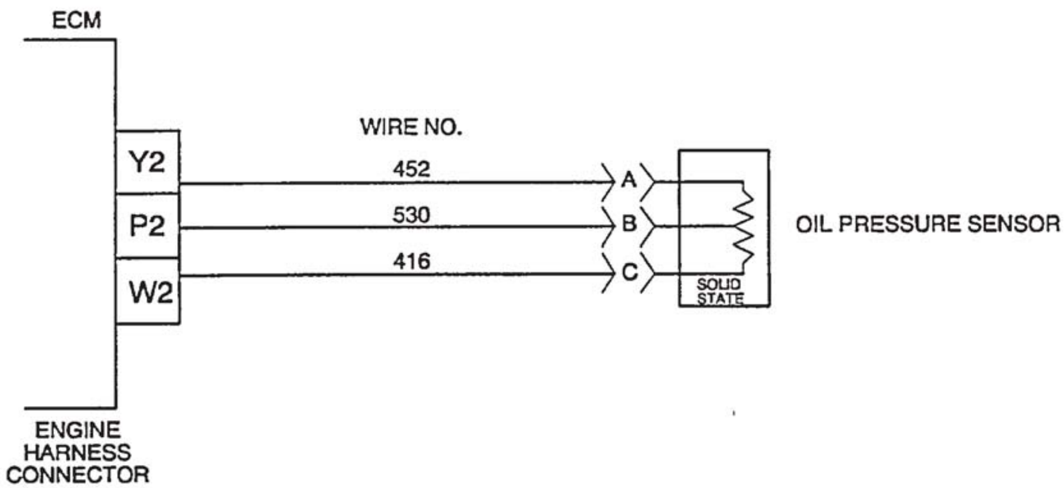
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

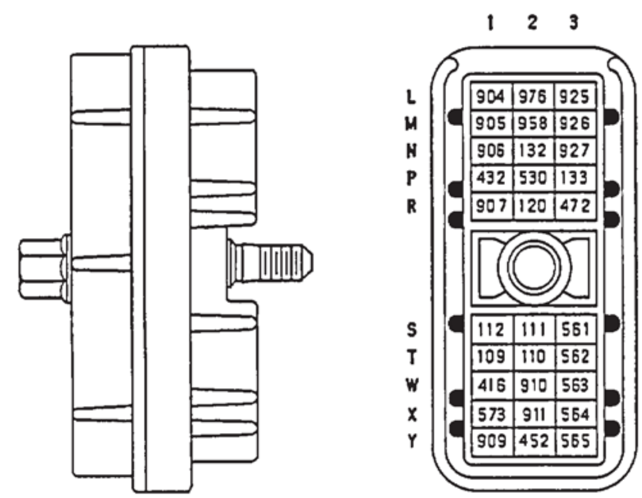
E. FLASH CODE: 35
J1587 CODE: P10 3 - OIL PRESSURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

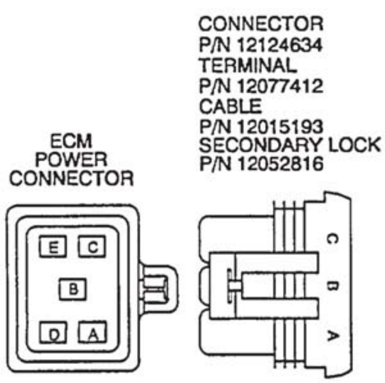
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-1 Multiple Code Check		
• Were there any other active, codes besides Code 100/39	No other codes.	Go to 35-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4, 102/3 or 4, 100/4, 94/3 or 4, 101/3 or 4, 73/3 or 4.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 35-2.
35-2 Sensor Check		
• Turn ignition off. • Disconnect OPS connector. • Turn ignition on. • Start and run engine. • Select Engine Temperature (COOLANT TEMP OR OIL TEMP) on the DDR. • Warm up engine until engine temperature reading is greater than 60 degrees C (140 degrees F). • Leave engine running at idle after warm up. • Read active codes.	Code 100/4 (and any codes except Code 100/3).	Go to 35-3.
	Code 100/3 (and any other codes).	Go to 35-5.
35-3 Return Circuit Check		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Install a jumper wire between pins A and B of the OPS harness connector. • Read resistance between sockets P2 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 35-4.
	Greater than 5 ohms or open.	Return line (ckt#452) is open. Repair open. Then go to 35-30.



OIL PRESSURE CIRCUITS



ECM ENGINE HARNESS CONNECTOR



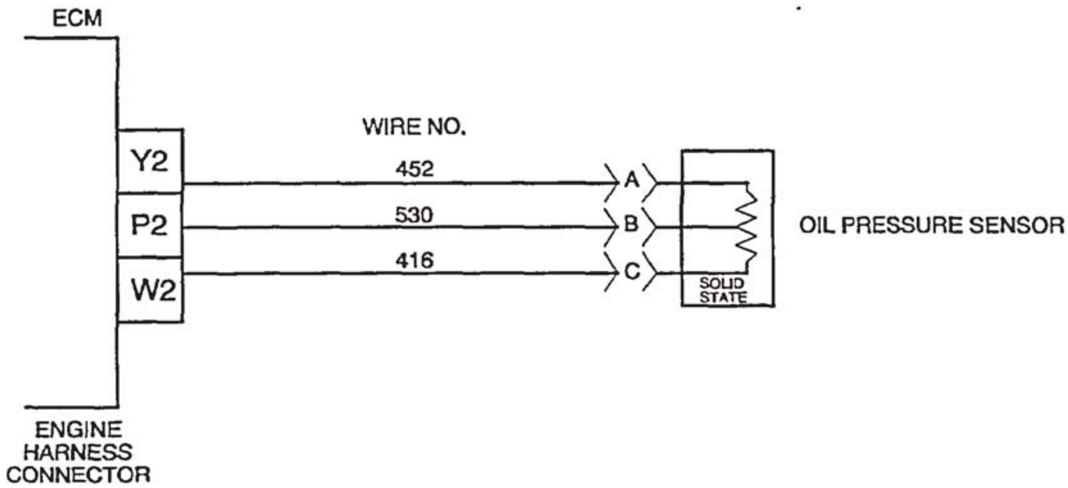
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

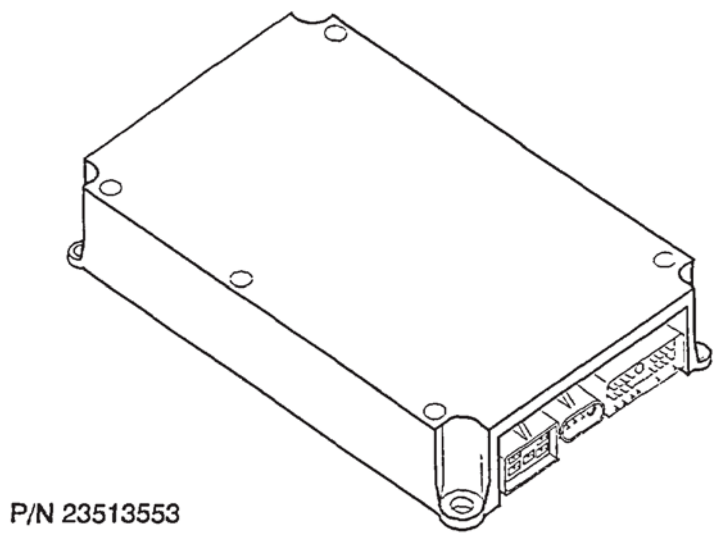
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 35
J1587 CODE: P100 3 - OIL PRESSURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-4 Check OPS Connectors		
• Inspect terminals at the OPS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace OPS. Then go to 35-30.
	Problem found.	Repair terminals/connectors. Then go to 35-30.
35-5 Check for Short		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets W1 and P2 on the engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#530) Is shorted to the engine +5 Volt line (ckt #416). Repair short. Then go to 35-30.
	Greater than 10,000 ohms or open.	Go to 35-6.
35-6 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between socket P2 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P2 on the engine harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to 35-8.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 35-30.



OIL PRESSURE CIRCUITS

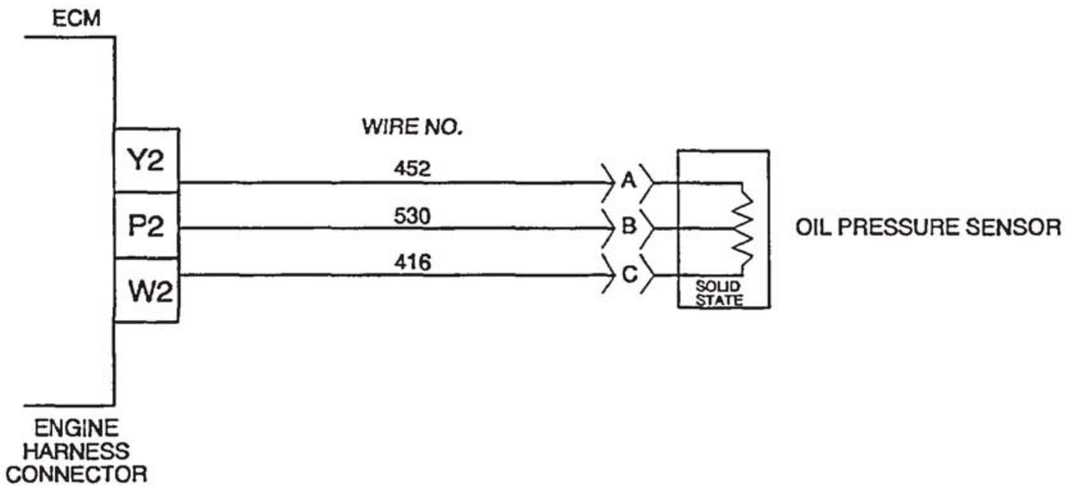


THE ELECTRONIC CONTROL MODULE - DDEC III

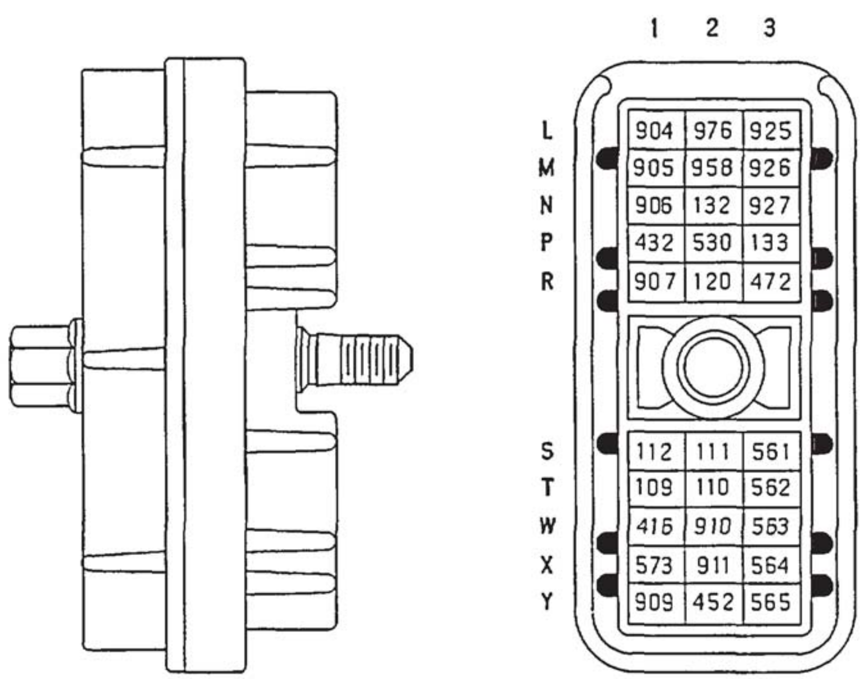
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 35
J1587 CODE: P100 3- OIL PRESSURE CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-7 Final Check		
• Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run for one or until "Check Engine" light comes on. • Stop engine. • Check active codes.	Code 100/3.	Reprogram ECM. Then go to 35-30.
	No codes.	Repairs are complete.
	Any other codes . except Code 100/3.	Go to START-1, pg 3-345.41, to service other codes.
35-8 Verify Repairs		
• Inspect terminals at OPS connectors (sensor and harness sides) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace OPS. Then go to 35-7.
	Problem found.	Repair terminals/connectors. Then go to 35-30.
35-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 60 degrees C, 140 degrees F) 1 minute. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 100/3 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 100/3	Go to START-1, pg 3-345.41, to service other codes.



OIL PRESSURE CIRCUITS



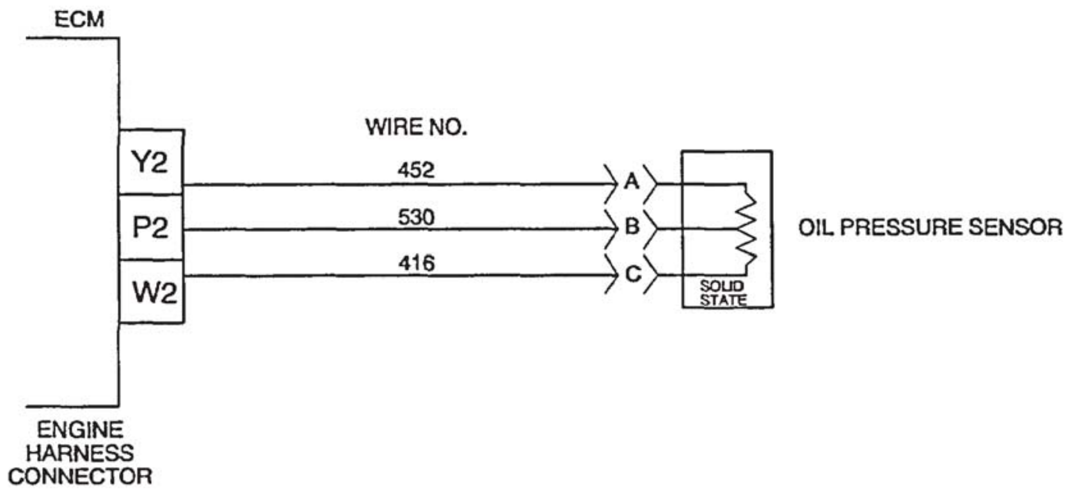
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

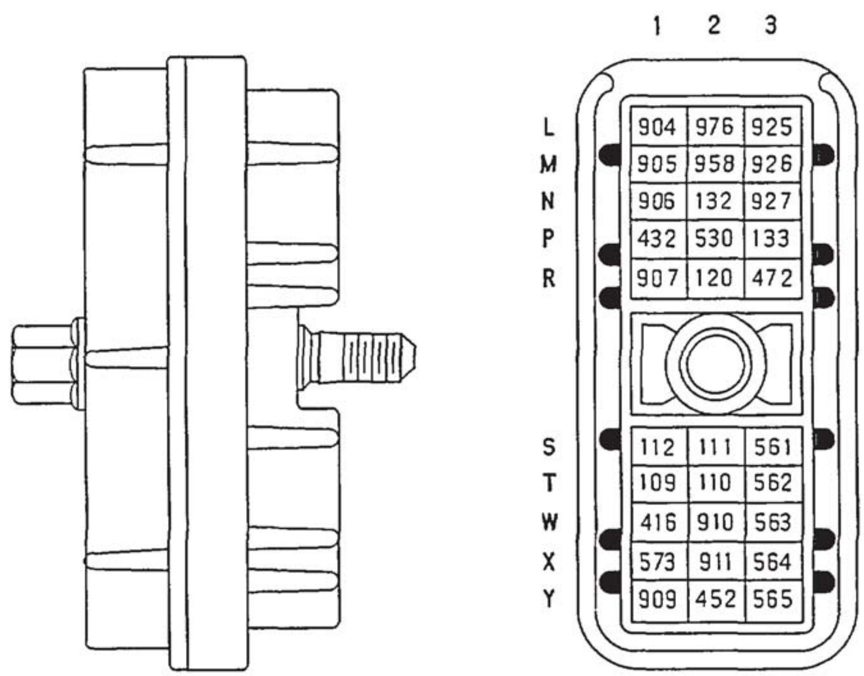
E. FLASH CODE: 36
J1587 CODE: P100 4 - OIL PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-1 Multiple Code Check		
• Were there any other active codes besides Code 100/47	No other codes.	Go to 36-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4, 102/3 or 4, 100/3, 94/3 or 4, 101/3 or 4, 73/3 or 4.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 36-2.
36-2 Sensor Check		
• Turn ignition off. • Disconnect OPS connector and install a jumper wire between sockets B and C of the OPS harness connector. • Turn ignition on. • Read active codes. • If active Code 100/3 or 4 exists, go to RESULT column. • If no active Code 100/3 or 4 exists, start and run engine until either active Code 100/3 or 4 appears of the engine temperature COOLANT TEMP or OIL TEMP or DDR) has been greater than 60 degrees C (140 deg F) for more than 1 minute.	Code 100/3 (and any codes except Code 100/4).	Check to be sure ECM and OPS connectors are wired properly. If wired properly Then go to 36-3.
	Code 100/4 (and any other codes).	Go to 36-4.
	No codes.	Go to 36-4.
36-3 Check OPS Connectors		
• Turn ignition off. • Inspect terminals at the OPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace OPS. Then go to 36-30.
	Problem found. Then go to 36-30.	Repair terminals/connectors.



OIL PRESSURE CIRCUITS

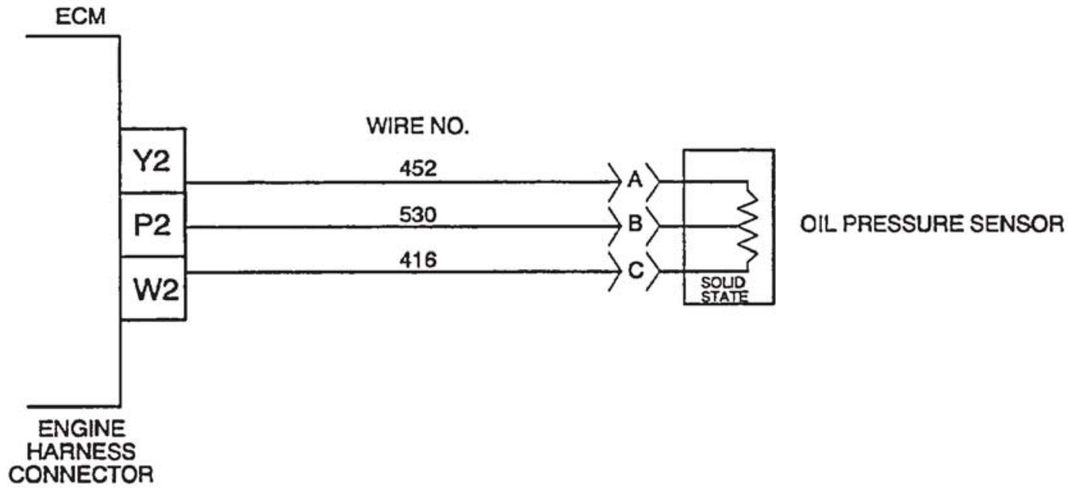


ECM ENGINE HARNESS CONNECTOR

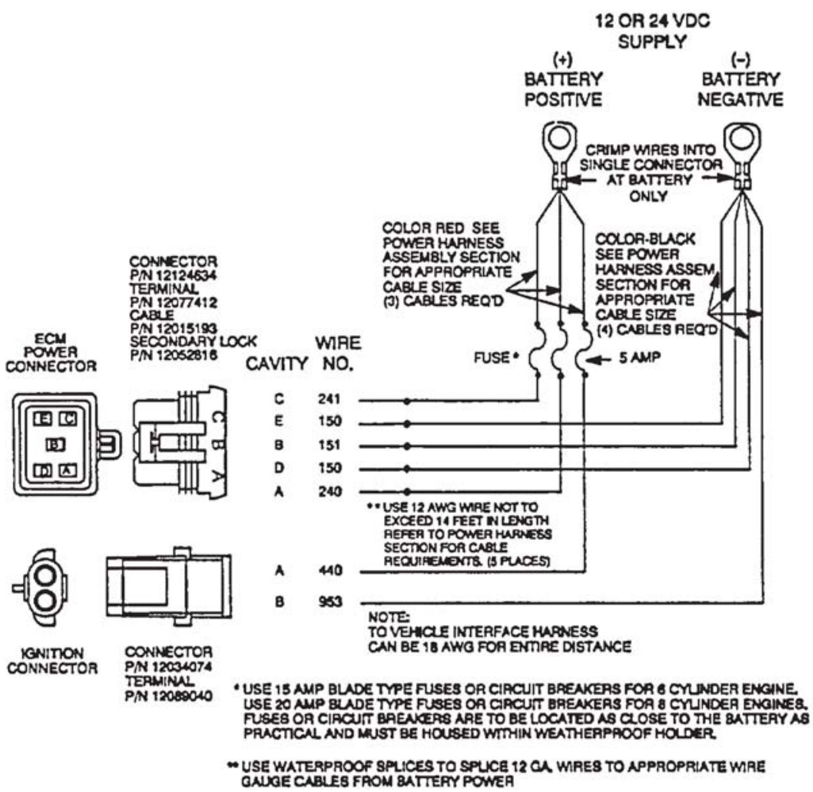
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 36
J1587 CODE: P100 4 - OIL PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-4 Check for +5 Volts		
• Turn ignition off. • Remove jumper wire. • Connect vehicle harness to ECM. • Turn ignition on. • Read voltage on OPS harness connector, socket C (red lead) to socket A (black lead). 6 volts.	Between 4 to 6 volts.	Go to 36-5.
	Less than 4 volts.	Go to 36-8.
	Greater than	Go to 36-10.
36-5 Check for Signal Open		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • install a jumper wire between sockets A and B of the OPS harness connector. • Read resistance between sockets P2 and Y2 on the engine harness connectors.	Less than or equal to 5 ohms on either reading	Go to 36-11.
	Greater than 5 ohms or open.	Signal line (ckt#530) is open. Repair open. Then go to 36-30.
36-6 Check for Short		
• Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets A and B on the OPS harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms.	Signal line (ckt#530) is shorted to the return line (ckt#452) or battery ground. Repair short. Then go to 36-30.
	Greater than 10,000 ohms or open. on both readings.	Go to 36-12.
36-7 Check ECM Connectors		
• Check terminals at the ECM harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Especially W1, P2 and Y2 terminals and pins at ECM.	Terminals and connectors are okay.	Reprogram ECM. Then go to 36-30.
	Problem found.	Repair terminals/connectors. Then go to 36-30.



OIL PRESSURE CIRCUITS

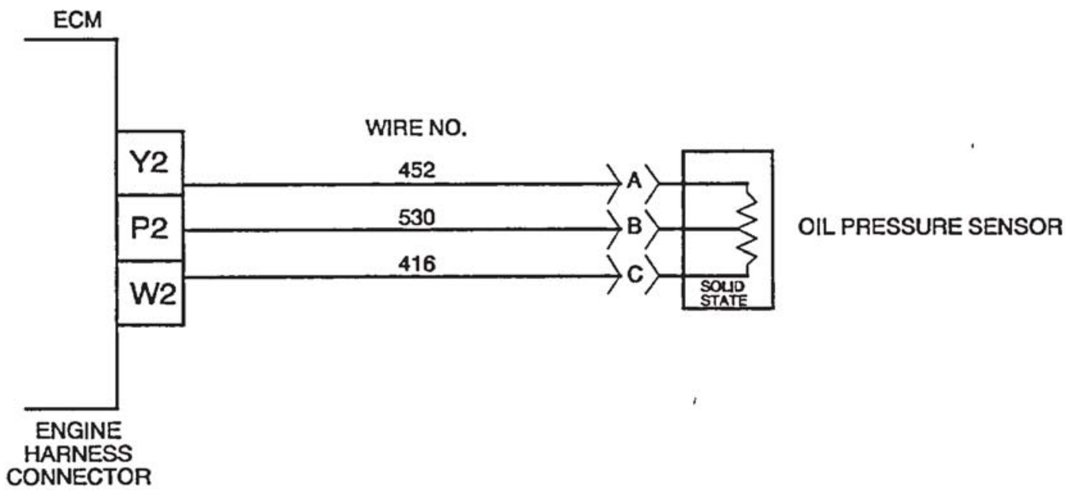


POWER HARNESS

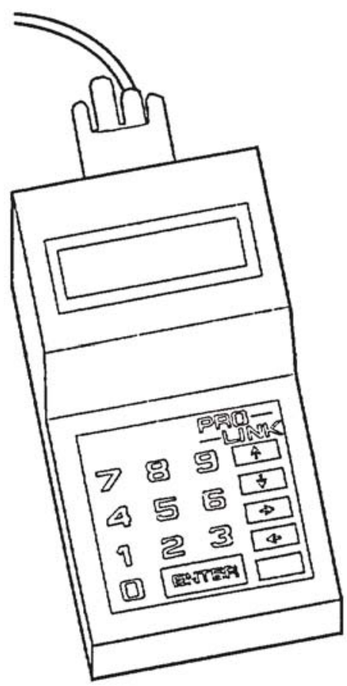
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 36
J1587 CODE: P100 4 · OIL PRESSURE CIRCUIT FAILED LOW (LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-8 Check for Open +5 Volt Line		
• Turn Ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between sockets A and C of the OPS connector. • Read resistance between sockets W1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 36-9.
	Greater than 5 ohms or open.	The engine +5 Volt line (ckt #416) is open. Repair open. Then go to 36-30.
36-9 Check for Short		
• Remove jumper wire. • Read resistance between sockets A and C of the OPS harness connector.	Less than or equal to 10,000 ohms.	The engine +5 Volt line (ckt #416) Is shorted to the return line (ckt#452). Repair short. Then go to 36-12.
	Greater than 10,000 ohms or open.	Go to 36-12.
36-10 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between socket P2 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P2 on the engine harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to 36-12.
	Any reading is less than or equal to 10,000 ohms.	A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 36-30.



OIL PRESSURE CIRCUITS

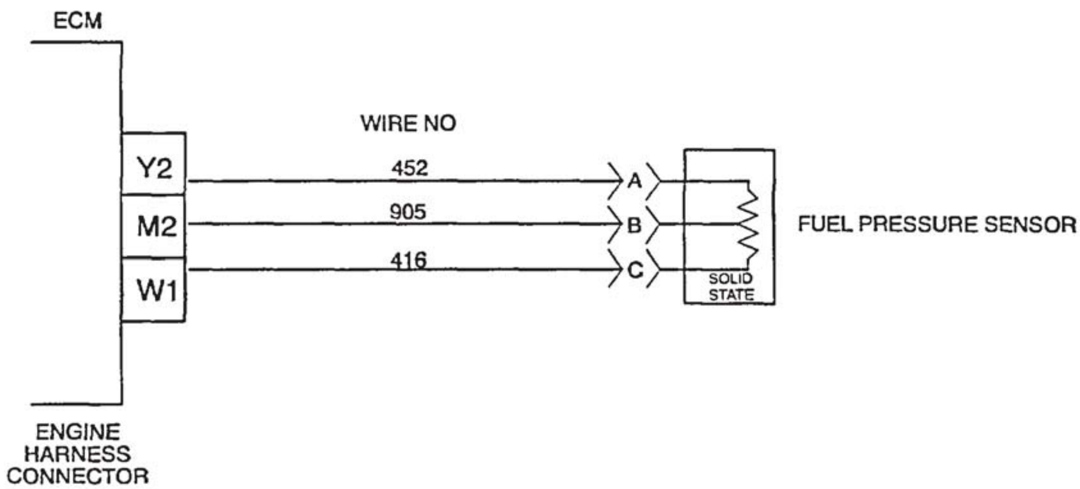


Pro-Link 9000

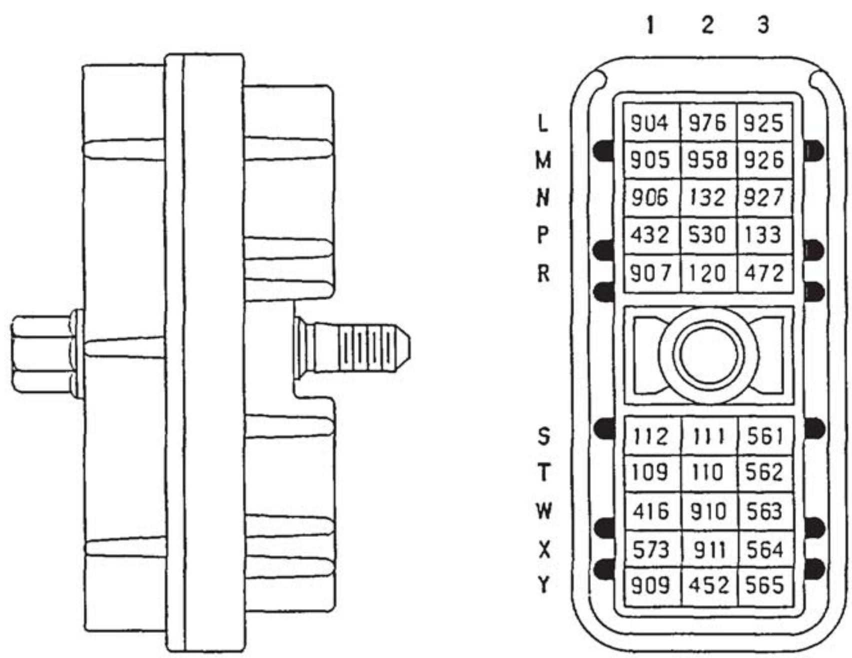
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 36
J1587 CODE: P100 4 - OIL PRESSURE CIRCUIT FAILED LOW {(LOW VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-11 Check for Short on Ground • Turn ignition off. • Remove jumper wires. • Measure resistance between sockets P2 and Y2 on the engine harness.	Greater than 10,000 ohms.	Go to 36-6.
	Less than or equal to 10,000 ohms.	Signal line (ckt#530) and return line (ckt#452) are shorted together. Repair short. Then go to 36-30.
36-12 Replace OPS • Turn ignition off. • Replace OPS. • Reconnect all connectors. • Turn ignition on. •Clear Codes. • Start engine. Run until check light comes on or for 1 minute.	Check engine light comes on.	Go to 36-7.
	Check engine light does not comes on.	Go to 36-30.
36-30 Verify Repairs • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 60 degrees C, 140 degrees F) 1 minute. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 100/4 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any other codes except Code 100/4.	Go to START-1, pg 3-345.41, to service other codes.



FUEL PRESSURE SENSOR (FPS) CIRCUITS



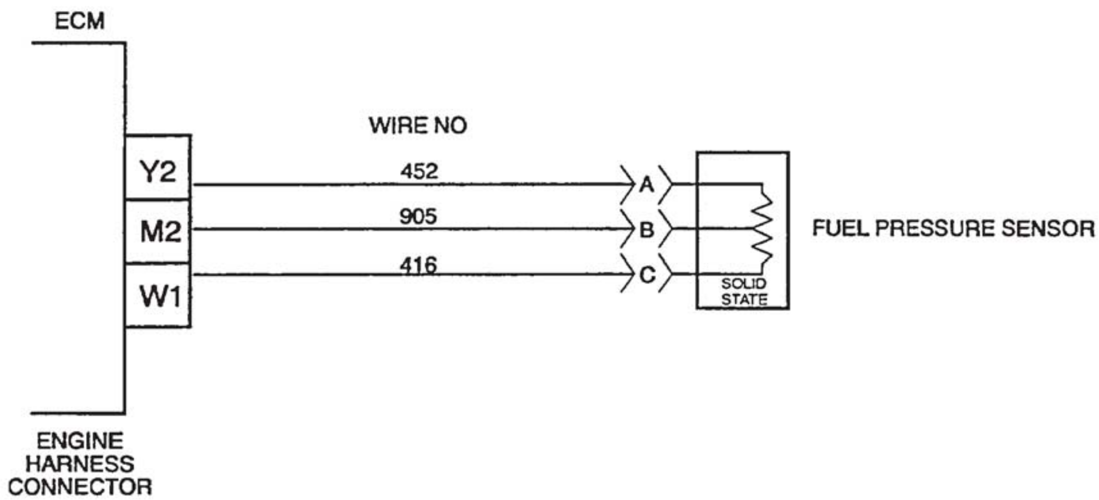
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

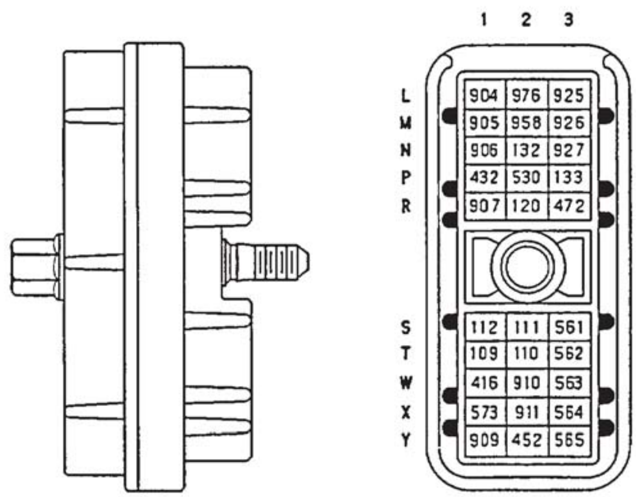
E. FLASH CODE: 37
J1587 CODE: P94 3 - FUEL PRESSURE SENSOR (FPS) CIRCUIT FAILED HIGH (HIGH VOLTAGE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

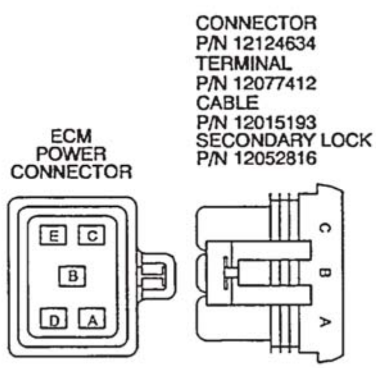
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
37-1 Multiple Code Check		
• Were there any other active codes besides Code 9413?	No other codes.	Go to 37-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4, 102/3 or 4, 100/3 or 4, 94/4, 101/3 or 4, 73/3 or 4.	Go to ENG5V-1 (page 3-345.413).
	Yes - but none of the above.	Go to 37-2.
37-2 Sensor Check		
• Turn Ignition off. • Disconnect FPS connector. • Turn ignition on. • Start and run engine. • Select Engine Temperature (COOLANT TEMP & OIL) on DDR. • Warm up engine until engine temperature reading is greater than 60 degrees C (140 degrees F). • Leave engine running at idle after warm up. • Read active codes.	Code 94/4 (and codes except Code 37).	Go to 37-3.
	Code 94/3 (and any other codes).	Go to 37-5.
37-3 Return Circuit Check		
• Turn ignition off. • Disconnect the engine harness connector at ECM. • Install a jumper wire between pins A and B of FPS harness connector. • Read resistance between sockets M1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 37-4.
	Greater than 5 ohms or open.	Return line (ckt #452) is open. Repair open. Then go to 37-30.



FUEL PRESSURE SENSOR (FPS) CIRCUITS



ECM ENGINE HARNESS CONNECTOR



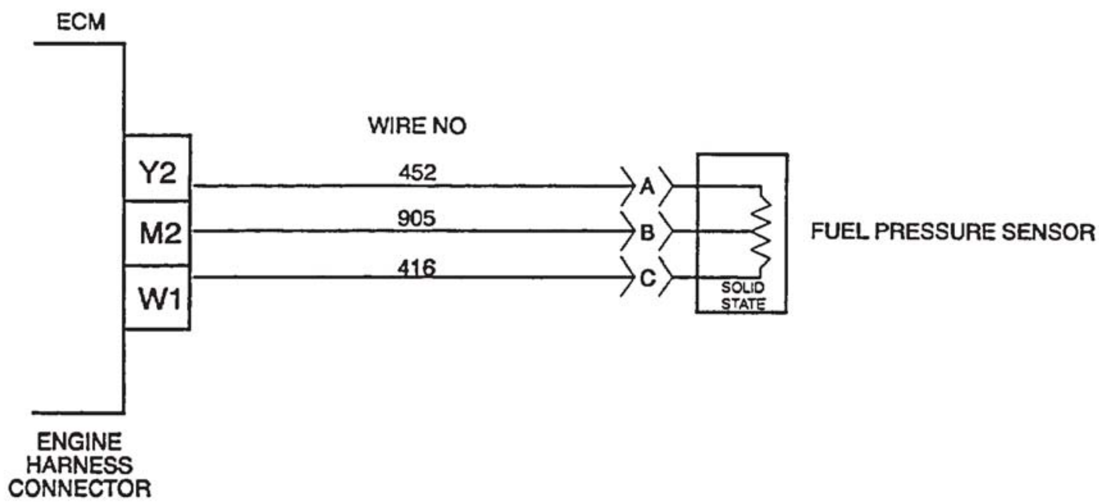
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

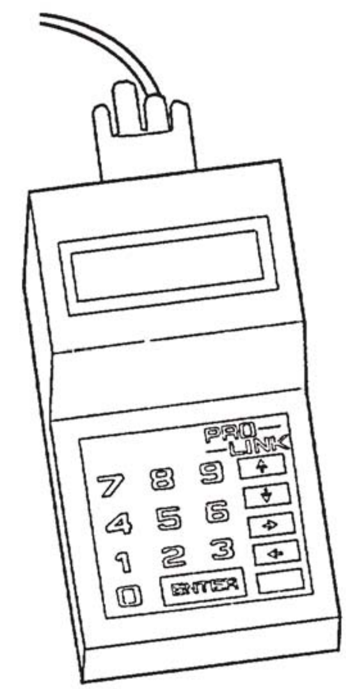
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 37
J1587 CODE: P94 3 - FUEL PRESSURE SENSOR (FPS) CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
37-4 Check FPS Connectors		
• Inspect terminals at FPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace FPS. Then go to 37-30.
	Problem found.	Repair terminals/connectors. Then go to 37-30.
37-5 Check for Short		
• Turn ignition off. • Disconnect engine harness connector at ECM. • Read resistance between sockets W1 and M1 on engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #905) is shorted to engine +5 Volt line (ckt #416). Repair short. Then go to 37-30.
	Greater than 10,000 ohms or open.	Go to 37-6.
37-6 Check for Short to Battery +		
• Remove both fuses to ECM. • Disconnect vehicle harness and 5-way power harness connectors at ECM. • Read resistance between socket M1 of engine harness connector and socket B3 of vehicle harness connector. • Also read resistance between socket M1 on engine harness connector and the following socketson 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to 37-8.
	Any reading is less than or equal to 10,000 ohms	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 37-30.



FUEL PRESSURE SENSOR (FPS) CIRCUITS

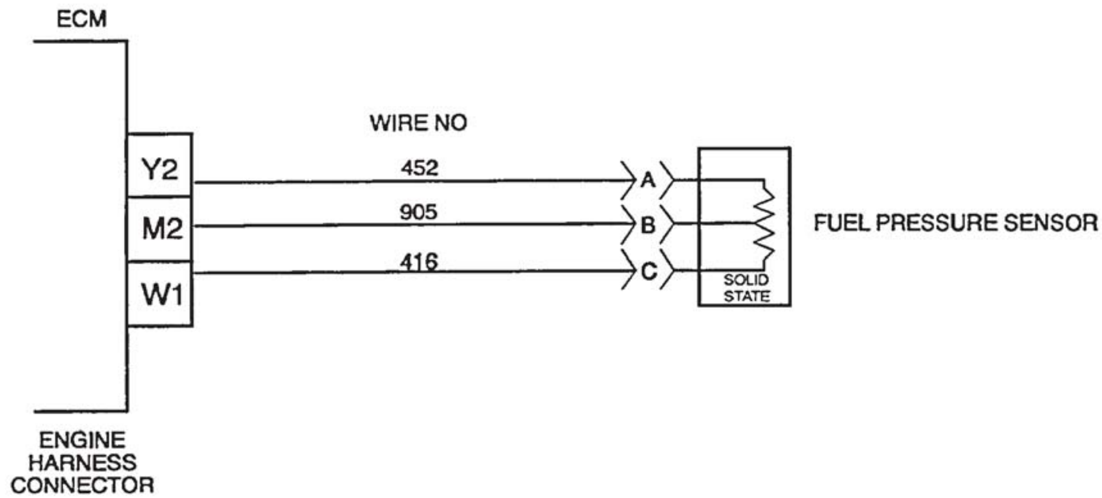


Pro-Link 9000

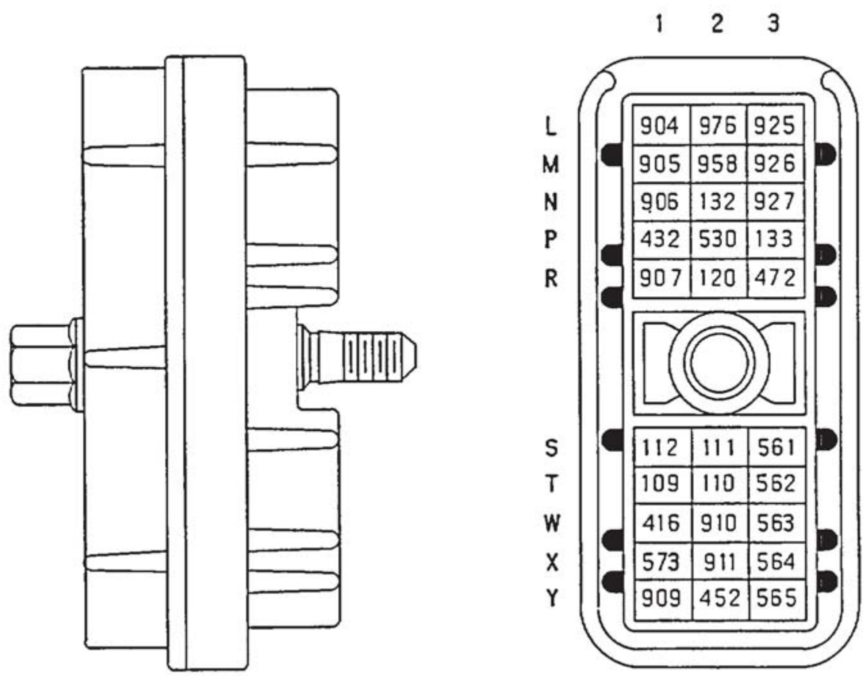
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 37
J1587 CODE: P94 3 . FUEL PRESSURE SENSOR (FPS) CIRCUIT FAILED HIGH (HIGH VOLTAGE)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
37-7 Final Check		
• Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run for one minute or until "Check Engine" light comes on. • Stop engine. • Check active codes.	Code 94/3. →	Reprogram ECM. Then go to 37-30.
	No codes. →	Repairs are complete.
	Any other codes except Code 94/3 →	Go to START-1, pg 3-345.41, to service other codes.
37-8 Check FPS Connectors		
• Inspect terminals at FPS connectors (sensor and harness sides) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay. →	Replace FPS. Then go to 37-7.
	Problem found →	Repair terminals/connectors. Then go to 37-30.
37-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warmed (greater than 60 degrees C, 140 degrees F) for 1 minute. • Read inactive codes	(No codes). →	Repairs are complete.
	Code 94/3 (and any other codes). from the start to find error. →	All system diagnostics are complete. Review this section
	Any other codes except Code 94/3. →	Go to START-1, pg 3-345.41, to service other codes.



FUEL PRESSURE SENSOR (FPS) CIRCUITS



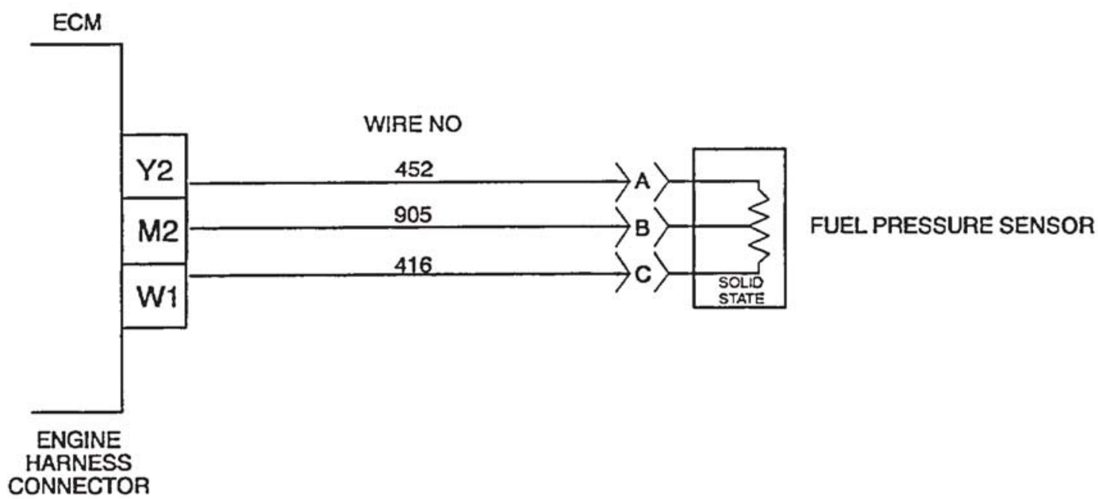
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

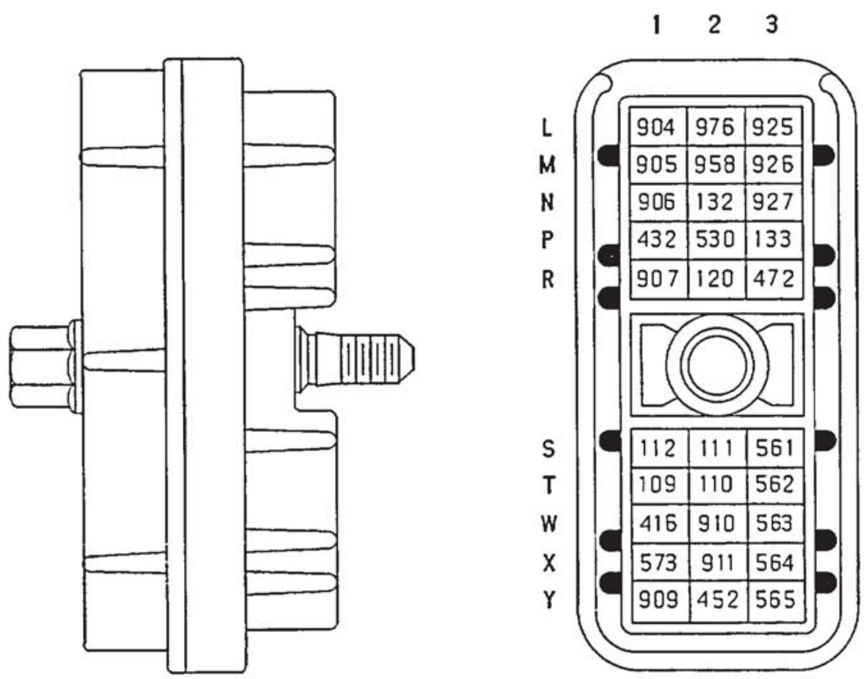
E. FLASH CODE: 38
J1587 CODE: P94 4 - FUEL PRESSURE CIRCUIT FAILED LOW

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38-0 Multiple Code Check Check Fuel Filter		
• Are fuel filters plugged? Then go to 38-30.	Yes. →	Replace Fuel Filters.
	No. →	Go to 38-1.
38-1 Multiple Code Check		
• Were there any other active codes besides Code 94/4?	No other codes. →	Go to 38-2.
	Yes, any or all of the following codes: 110/3 or 4, 175/3 or 4, 174/3 or 4, 100/3 or 4, 94/3 or 4, 101/3 or 4. →	Go to ENG5V-1, page 3-345. 413.
	Yes - but none of the above. →	Go to 38-2.
38-2 Sensor Check		
• Turn ignition off. • Disconnect FPS connector and Install a jumper wire between sockets B and C of the FPS harness connector. • Turn ignition on. • Read active codes. • If active Code 94/3 or 4 exists, go to RESULT column. • If no active Code 94/3 or 4 exists, start and run engine until either active Code 94/3 or 4 appears or engine temperature COOLANT TEMP OIL on DDR) has been greater than 60 degrees C (140 deg F) for more than 1 minute.	Code 94/3 (and any codes except Code 94/4. →	Check to be sure ECM and FPS connectors are wired properly. If wired properly then go to 38-3
	Code 94/4 (and any other codes). →	Go to 38-4.
	No codes. →	Go to 38-4.



FUEL PRESSURE SENSOR (FPS) CIRCUITS

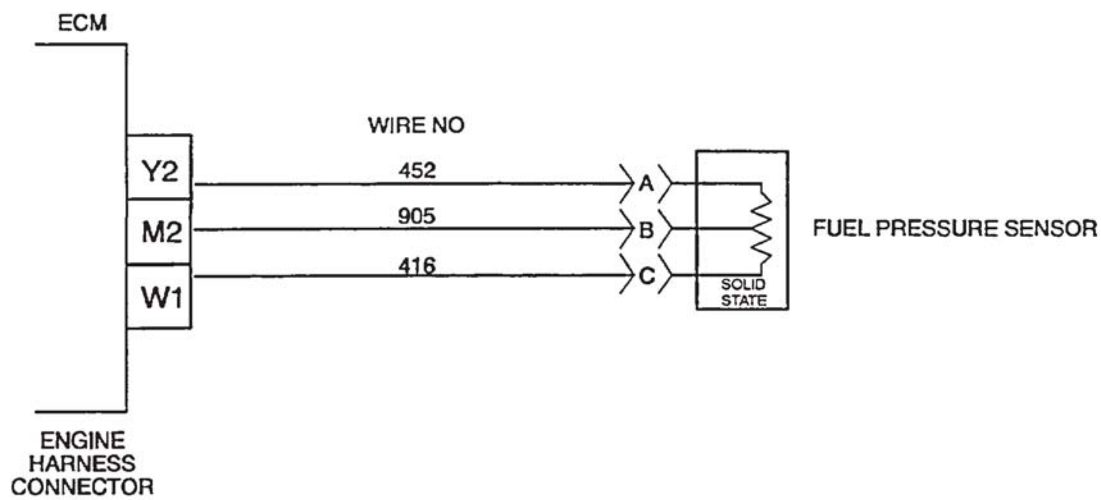


ECM ENGINE HARNESS CONNECTOR

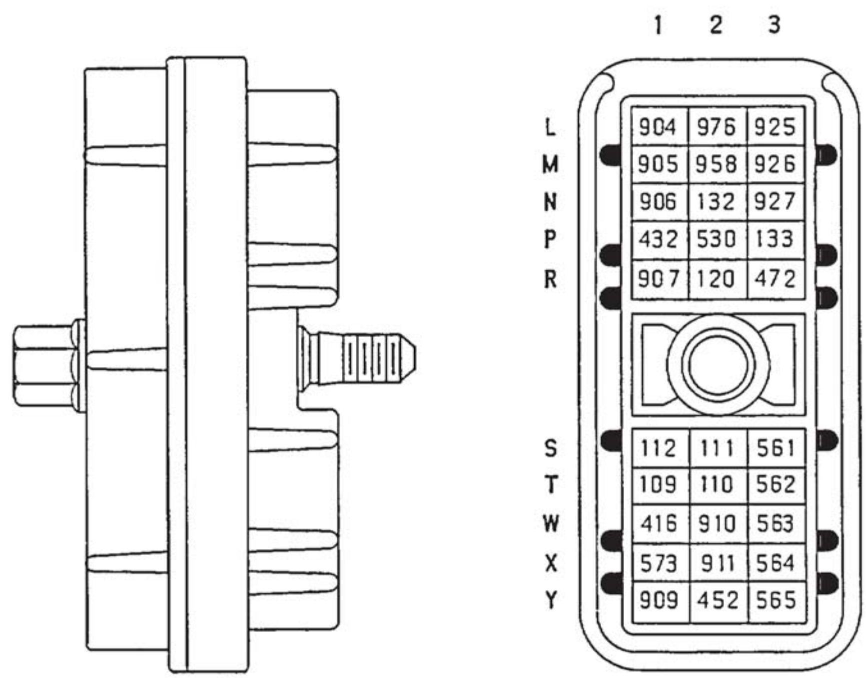
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 38
J1587 CODE: P94 4 * FUEL PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38-3 Check FPS Connectors		
• Turn Ignition off. • Inspect terminals at the FPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace FPS. Then go to 38-30.
	Problem found. Then go to 38-30.	Repair terminals/connectors.
38-4 Check for +5 Volts		
• Turn Ignition off. • Remove jumper wire. • Connect vehicle harness to ECM. • Turn ignition on. • Read voltage on FPS harness connector. socket C to socket A.	Between 4 to 6 volts.	Go to 38-5.
	Less than 4 volts.	Go to 38-8.
	Greater than 6 volts.	Go to 38-10.
38-5 Check for Signal Open		
• Turn ignition off. • Disconnect engine harness connector at ECM. • Install a jumper wire between sockets A and B of the FPS harness connector. • Read resistance between sockets M1 and Y2 on engine connectors.	Less than or equal to 5 ohms.	Go to 38-11.
	Greater than 5 ohms or open.	Signal line (ckt #905) or return line (ckt #452) Is open Repair open. Then go to 38-30.
38-6 Check for Short		
• Remove jumper ire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets A and B on FPS harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt#905) is shorted to the return line (ckt #452). Repair short. Then go to 38-30.
	Greater than 10,000 ohms or open.	Go to 38-12.



FUEL PRESSURE SENSOR (FPS) CIRCUITS

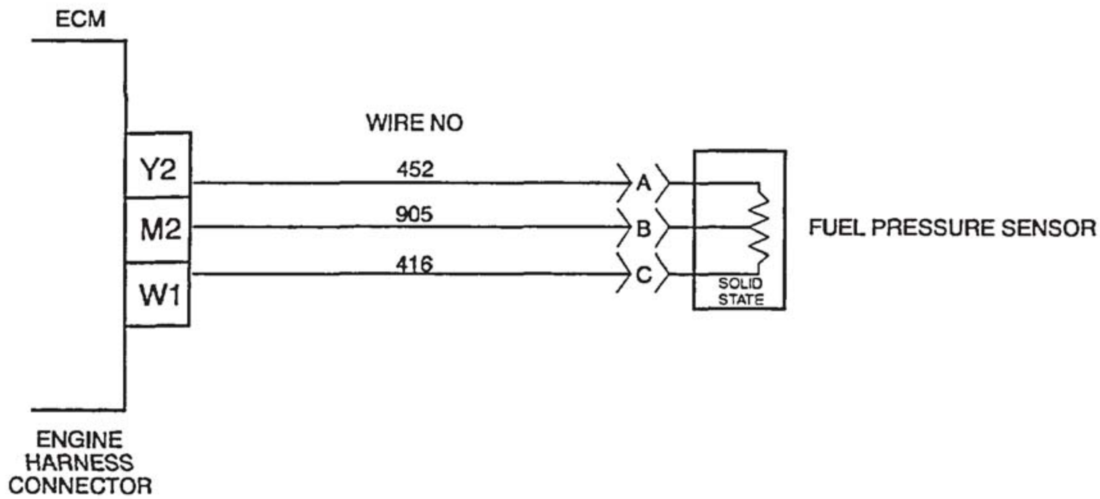


ECM ENGINE HARNESS CONNECTOR

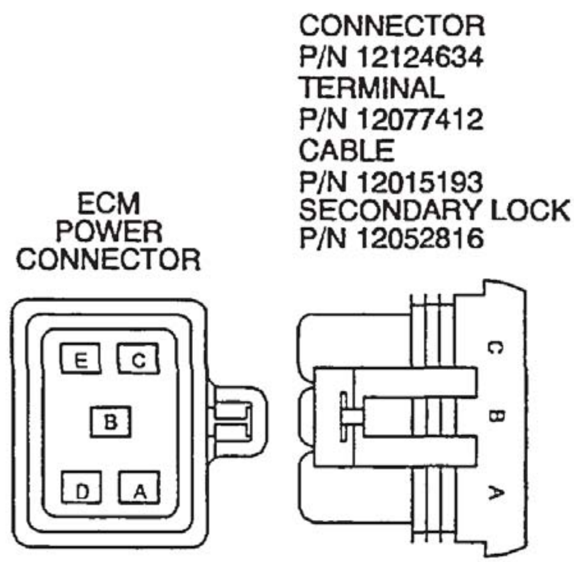
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 38
J1587 CODE: P94 4 - FUEL PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38-7 Check ECM Connectors		
• Check terminals at the ECM harness connector (Both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially WI, M1, and Y2 terminals and pins at ECM.	Terminals and connectors are okay.	Replace ECM. Then go to 38-30.
	Problem found.	Repair terminals/connectors. Then go to 38-30.
38-8 Check for Open +5 Volt Line		
• Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between sockets A and C of FPS harness connector. • Read resistance between sockets W1 and Y2 on engine harness connector.	Less than or equal to 5 ohms.	Go to 38-9.
	Greater than 5 ohms or open.	The engine +5 Volt line (ckt #416) is open. Repair open. Then go to 38-30.
38-9 Check for Short		
• Remove jumper wire. • Read resistance between sockets A and C of FPS harness connector.	Less than or equal to 10,000 ohms.	Engine +5 Volt line (ckt #416) is shorted to return line (ckt #452). Repair short. Then go to 38-30.
	Greater than 10,000 ohms or open.	Go to 38-12.



FUEL PRESSURE SENSOR (FPS) CIRCUITS



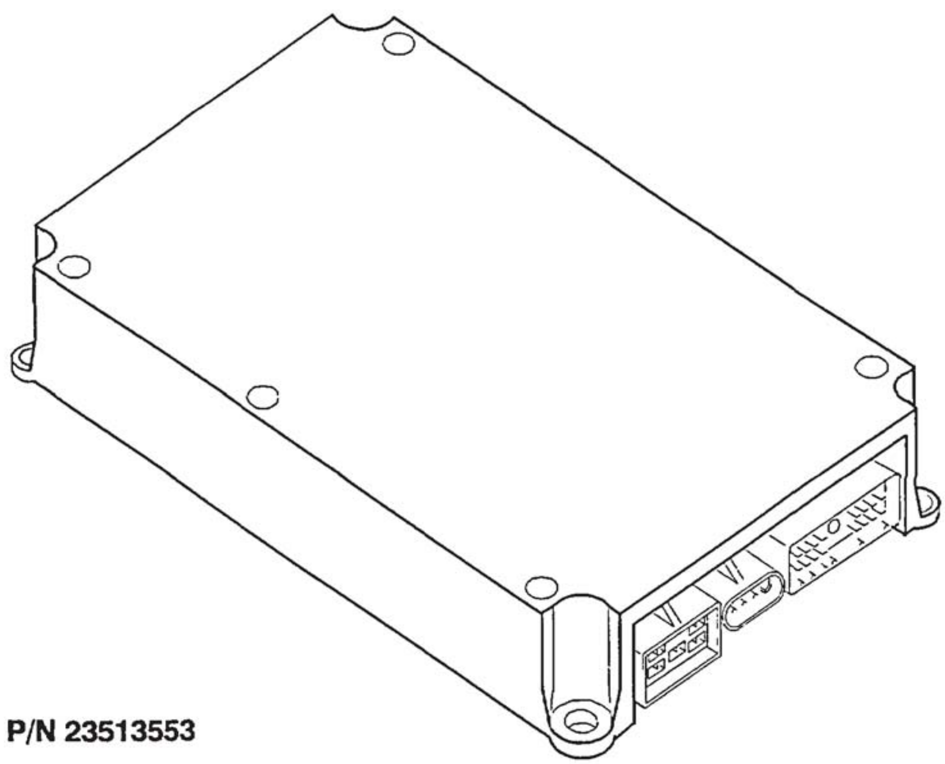
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 38
J1587 CODE: P94 4 - FUEL PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38-10 Check for Short to Battery +		
• Remove both fuses to ECM. • Disconnect the vehicle harness and 5-way power harness connectors at ECM. • Read resistance between sockets M1 of engine harness connector and socket B3 of vehicle harness connector. • Also read resistance between socket M1 on engine harness connector and the following sockets on 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open. →	Go to 38-12.
	Any reading is less than or equal to 10,000 ohms. →	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 38-30.
38-11 Check for Short on Ground		
• Turn ignition off. • Remove jumper wires. • Measure resistance between sockets M1 and Y2 on engine harness.	Greater than 10,000 ohms. →	Go to 38-6.
	Less than or equal to 10,000 ohms. →	Signal line (ckt #905) and return line (ckt #952) are shorted together. Repair short. Then go to 38-30.
38-12 Replace FPS		
• Turn ignition off. • Replace FPS. • Reconnect all connectors • Turn ignition on. • Clear codes. • Start engine. Run until "Check Engine" light comes on or for one minute.	"Check Engine" light comes on. →	Go to 38-7.
	"Check Engine" light does not come on. →	Go to 38-30.

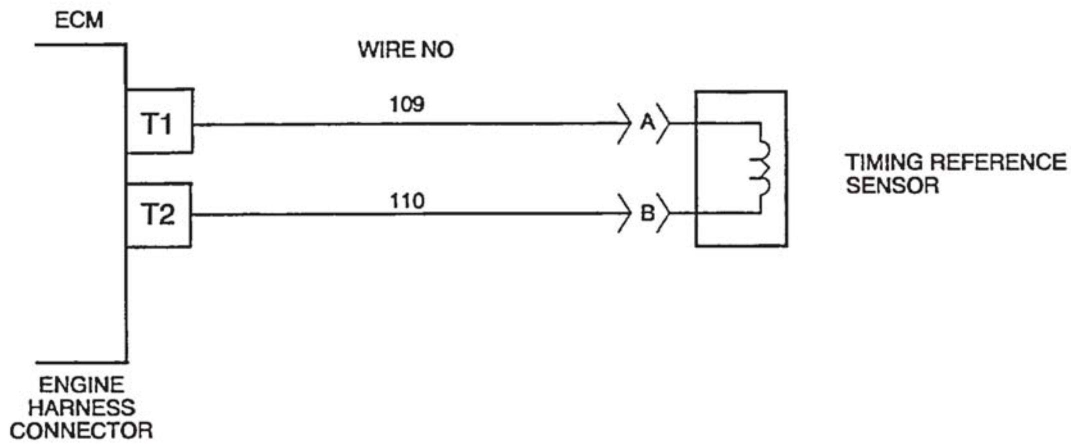


THE ELECTRONIC CONTROL MODULE - DDEC III

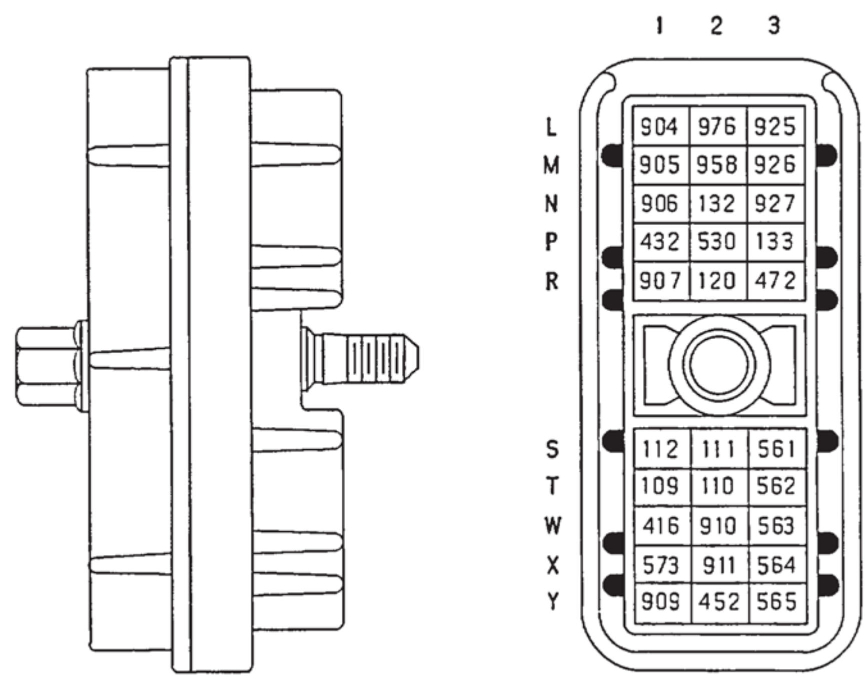
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 38
J1587 CODE: P94 4 - FUEL PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
38-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warmed (greater than 60 degrees C, 140 degrees F) for 1 minute. • Read inactive codes.	(No codes). → Code 94/4 (and any other codes). → section from start to find error. Any other codes except Code 94/4. →	Repairs are complete. All system diagnostics are complete. Please review this Go to START-1, pg 3-345.41, to service other codes.



TIMING REFERENCE SENSOR CIRCUITS



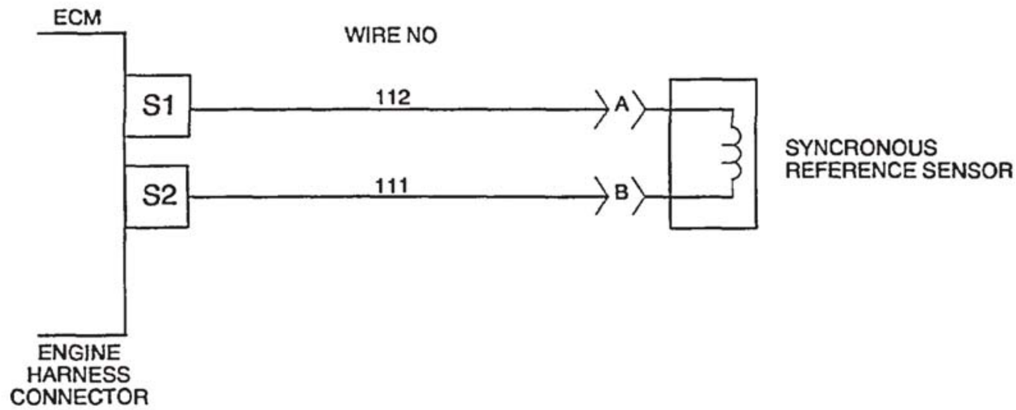
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

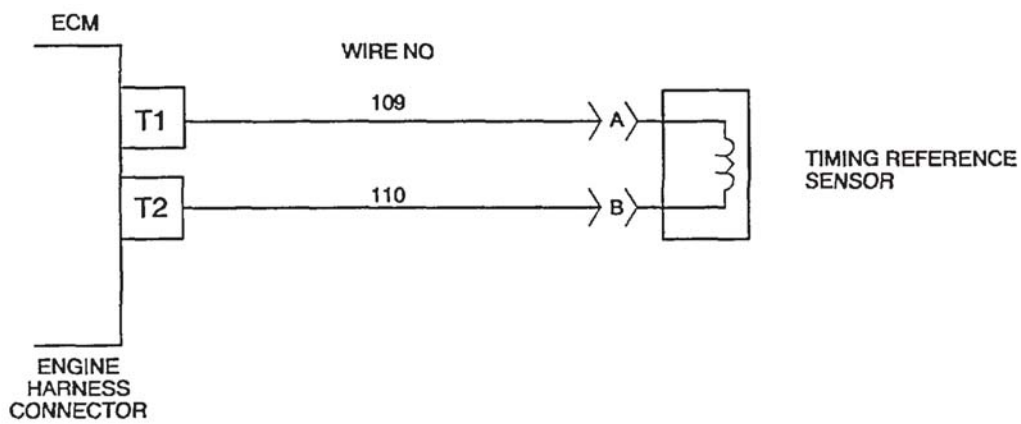
E. FLASH CODE: 41
J1587 CODE: S21 0 - TOO MANY SRS (MISSING TRS)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

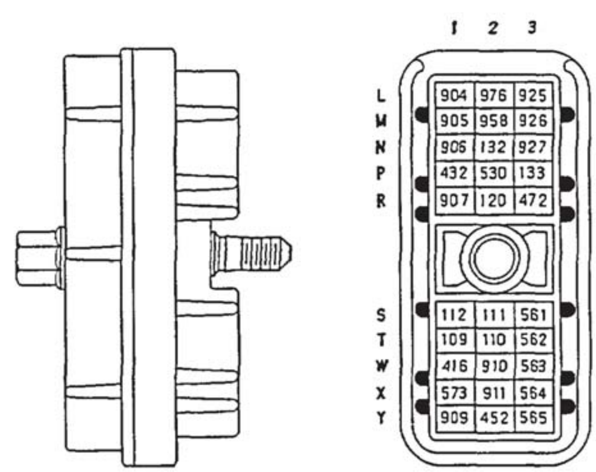
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-1 Resistance Check		
• Turn ignition off. • Disconnect engine harness connector at ECM. • Read resistance between socket T1 and T2 on engine harness connector.	Less than or equal to 200 ohms. →	Go to 41-2.
	Greater than 200 ohms or open. →	Go to 41-3.
41-2 Check for Short		
• Disconnect TRS connector. • Read resistance between sockets T1 and T2 on the engine harness connector. • Also read resistance between socket T1 and ground, then between socket T2 and ground. on all readings.	Less than or equal to 10,000 ohms on any reading Repair short. →	A short exists between (ckt #110) and (ckt #109) or where resistance was less than 10,000 ohms. Then go to 41-30.
	Greater than 10,000 ohms or open →	Go to 41-4.
41-3 Open TRS Line Check		
• Disconnect TRS connector and install a jumper wire between sockets A and B of the TRS harness connector. • Read resistance between sockets T1 and T2 on the engine harness connector.	Less than or equal to 5 ohms. →	Go to 41-4.
	Greater than 5 ohms or open. →	Signal line (ckt #110) or return and (ckt #109) is open. Repair open. Then go to 41-30.
41-4 Check TRS Resistance		
• Read resistance of TRS across sensor connector pins A and B.	Less than 100 ohms. →	Go to 41-12.
	From 100 to 200 ohms. →	Go to 41-5.
	Greater than 200 ohms. →	Go to 41-12.



SYNCRONOUS REFERENCE SENSOR CIRCUITS



TIMING REFERENCE SENSOR CIRCUITS

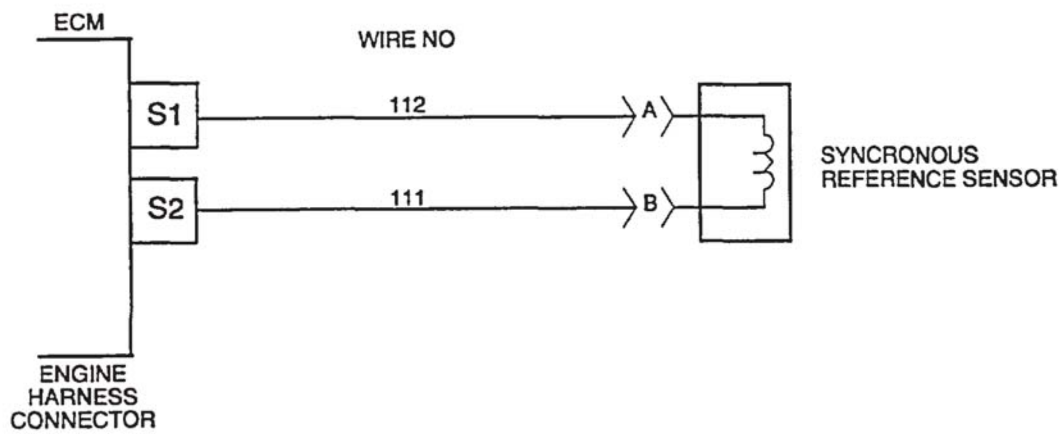


ECM ENGINE HARNESS CONNECTOR

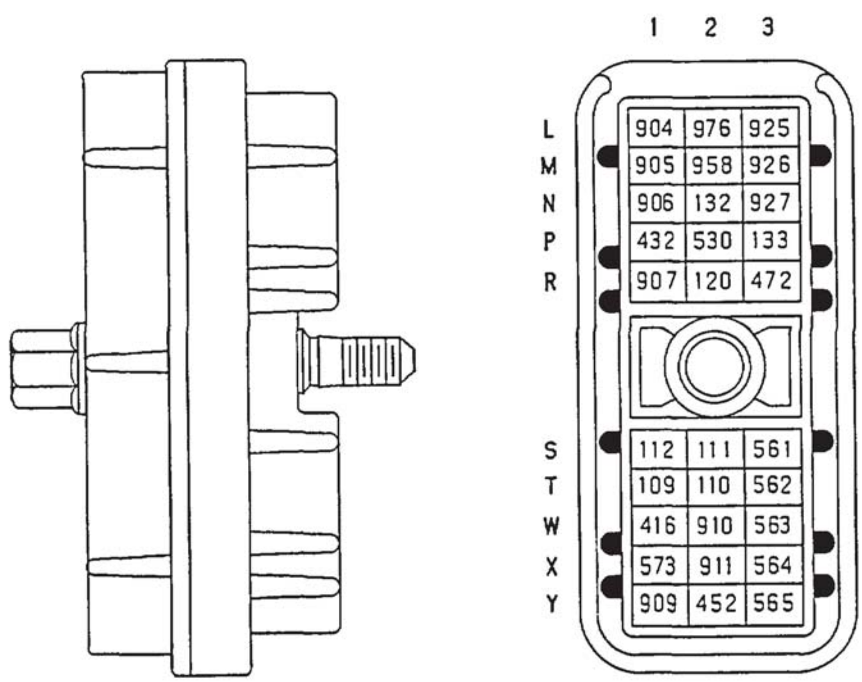
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 41
J1587 CODE: S21 0 - TOO MANY SRS (MISSING TRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-5 Check TRS/SRS Gap		
(Note: You'll probably have to remove the ECM to perform this check on 92 Series engines. • Bar engine until TRS is over a TRS "tooth" of pulse wheel. • Tap the front of pulse wheel. rearward with a soft hammer (to remove camshaft end play). • Install TRS/SRS alignment tool and check gap. (nominal gap 0.020" or 0.5 mm).	Incorrect gap.	Loosen the screw at top of TRS/SRS mounting bracket (don't touch the two screws that go into block front end plate they will affect engine timing). Adjust the TRS/SRS until gap setting is correct. Tighten screw. (If problem returns, pulse wheel may be loose or bad). Then go to 41-30.
	Gap setting is correct	Go to 41-6.
41-6 Check for SRS Code		
• Was there also a Code 21/1?	Yes.	Go to 41-8.
	No.	Go to 41-15.
41-7 Check ECM Connectors		
• Check terminals at ECM engine harness connector (both ECM and harness side) for damage, corrosion, and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM. Then go to 41-30.
	Problem found.	Repair terminals/connectors. Then go to 41-30.
41-8 SRS Resistance Check		
• Read resistance between sockets S1 and S2 on engine harness connector.	Less than or equal to 200 ohms.	Go to 41-9.
	Greater than 200 ohms or open.	Go to 41-10.



SYNCRONOUS REFERENCE SENSOR CIRCUITS

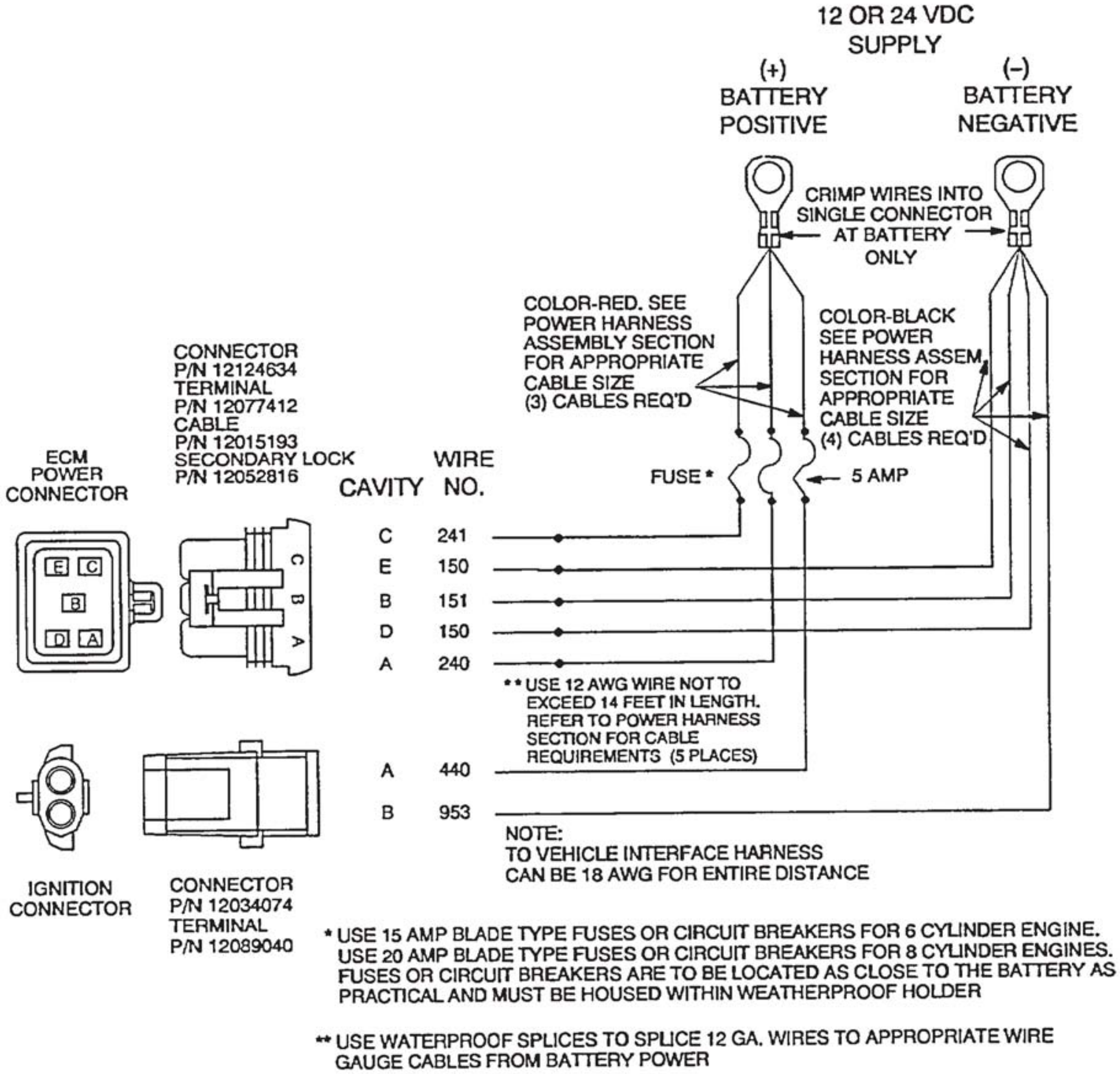


ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 41
J1587 CODE: S21 0 · TOO MANY SRS (MISSING TRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-9 Check for Short		
• Disconnect SRS connector. • Read resistance between sockets S1 and S2 on engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #111) is shorted to return line (ckt #112). Repair short. Then go to 41-30.
	Greater than 10,000 ohms or open.	Go to 41-11.
41-10 Open SRS Line Check		
• Install a jumper wire between sockets A and B of SRS harness connectors. • Read resistance between sockets S1 and S2 of engine harness connector.	Less than or equal to 5 ohms.	Go to 41-11.
	Greater than, 5 ohms or open.	Signal line (ckt #111) or return line (ckt #112) is open. Repair open Then go to 41-30.
41-11 SRS Test		
• Read resistance of the Synchronous Reference Sensor across the sensor connector pins A and B.	Less than 100 ohms.	Go to 41-13.
	From 100 to 200 ohms.	Go to 41-7.
	Greater than 200 ohms.	Go to 41-13.
41-12 Check TRS Connectors		
• Check connectors at the TRS (both the harness side and the TRS side) for damage; bent, corroded or unseated pins or sockets, or bad contacts.	Connectors are okay.	Replace TRS. Then go to 41-14.
	Problem found.	Repair terminals/connectors. Then go to 41-30.

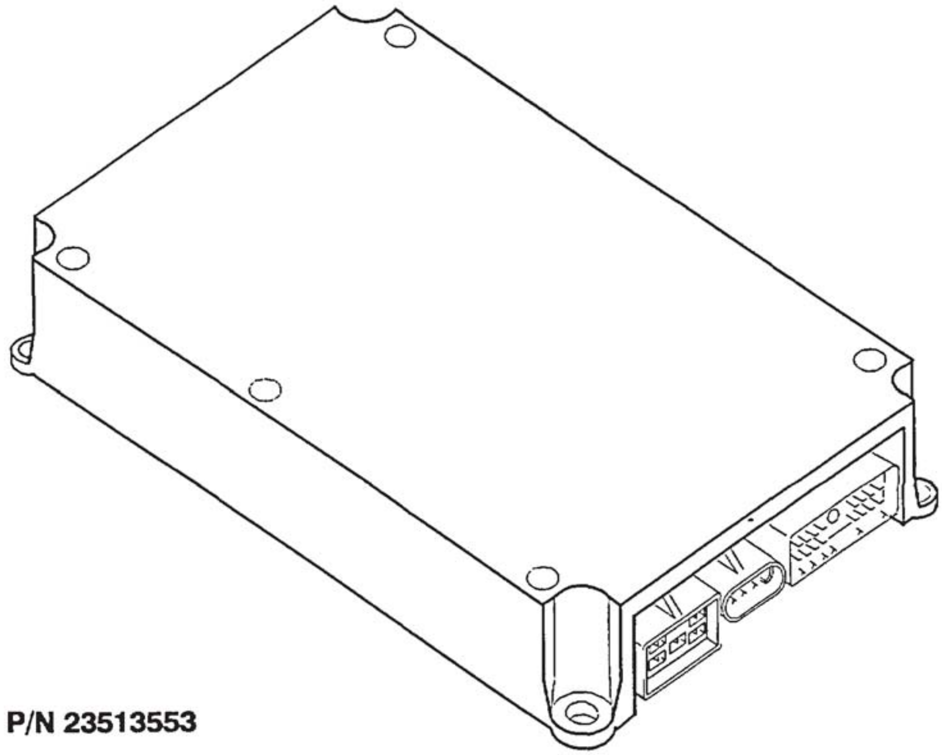


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 41
J1587 CODE: S21 0 - TOO MANY SRS (MISSING TRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-13 Check SRS Connectors		
• Check connectors at the Synchronous Reference Sensor (both the harness side and the sensor side) for damage; bent, corroded or unseated pins or sockets, or bad contacts.	Connectors are okay.	Replace Synchronous Reference Sensor. Then go to 41-14.
	Problem found.	Repair terminals/connectors. Then go to 41-30.
41-14 Verify SRS/TRS		
• Turn ignition off. • Reconnect all connectors • Turn ignition on. • Clear codes. • Start and run engine until the "Check Engine" light comes on or for 1 minute. • Stop engine. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 21/0 reappears (and any other codes).	If the SRS was just replaced, go to 41-15. If the SRS was not replaced, go to 41-6.
	Code(s) other than Code 21/0 received.	Go to START-1, pg 3-345.41, to service other codes.
41-15 Check Cranking Voltage		
• Turn ignition off. • Connect 12 volt from a fully charged battery to the 5-pin power connector. • Connect other connectors. • Turn ignition on. • Clear codes • Start engine. Run until "Check Engine" light appears or for 1 minute. • Stop engine. • Read active codes.	Engine won't start and/or Code 21/0 (and any other codes).	Go to 41-7.
	Engine starts and no Code 21/0	Either battery is dead or voltage equalizer needs to be replaced. Repair, then go to 41-30

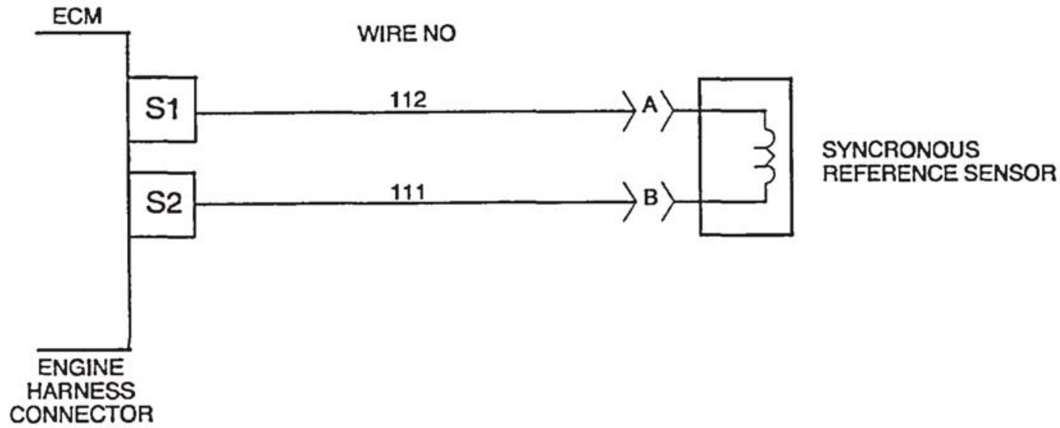


THE ELECTRONIC CONTROL MODULE - DDEC III

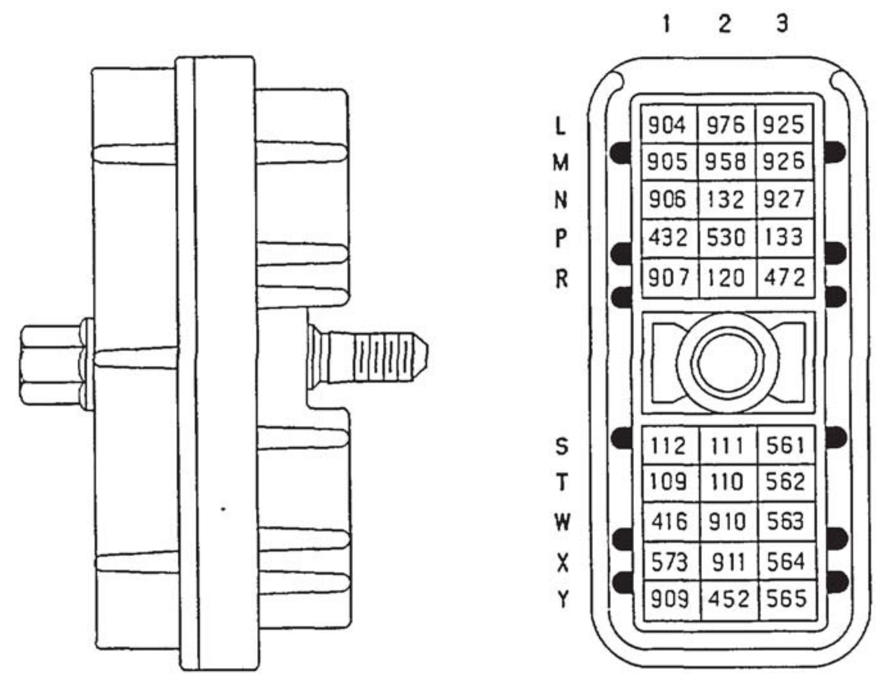
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 41
J1587 CODE: S21 0. - TOO MANY SRS {(MISSING TRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • urn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read inactive codes.	(No codes).	Repairs are complete.
	Code 21/0 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find
	Any other codes except Code 21/0	Go to START-1, pg 3-345.41, to service other codes.



SYNCRONOUS REFERENCE SENSOR CIRCUITS



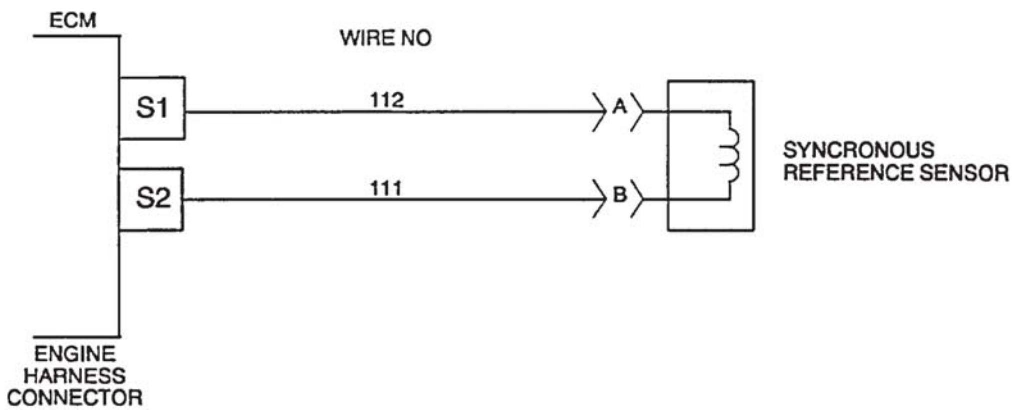
ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

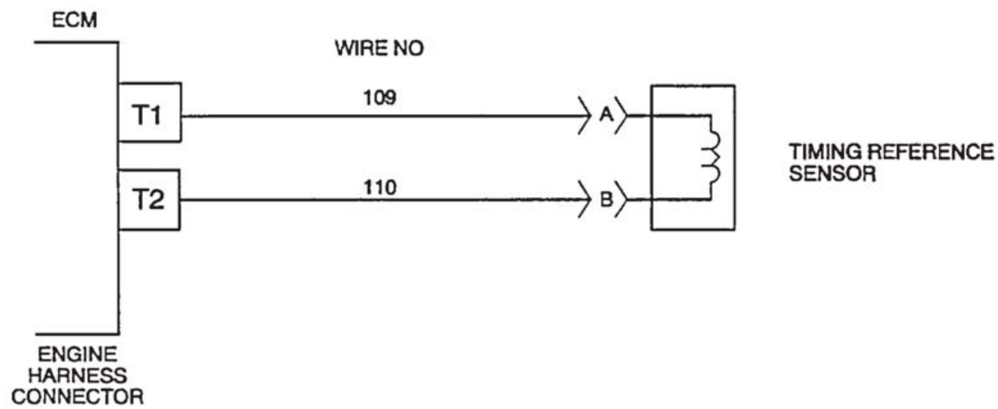
E. FLASH CODE: 42
J1587 CODE: S21 1 - TOO FEW SRS (MISSING SRS)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

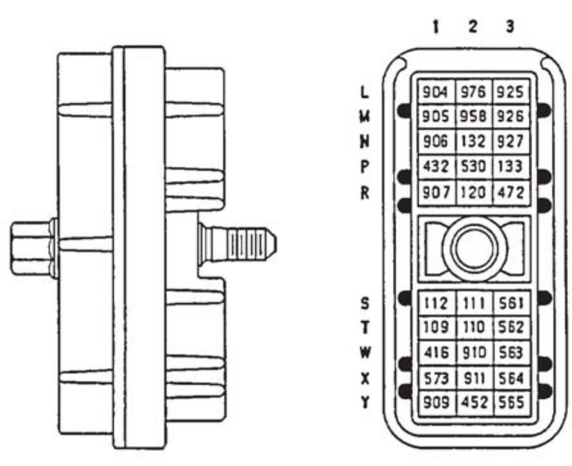
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-1 Resistance Check		
• Turn ignition off. • Disconnect engine harness connector at ECM. • Read resistance between socket S1 and S2 on engine harness connector.	Less than or equal to 200 ohms.	Go to 42-2.
	Greater than 200 ohms or open.	Go to 42-3.
42-2 Check for Short		
• Disconnect SRS connector. • Read resistance between sockets S1 and S2 on engine harness connector. • Also read resistance between socket S1 and ground, then between socket S2 and ground.	Less than or equal to 10,000 ohms on any reading	A short exists where resistance was less than 10,000 ohms. Repair short. Then go to 42-30
	Greater than 10,000 ohms or open on all readings.	Go to 42-4.
42-3 Open SRS Line Check		
• Disconnect SRS connector and install a jumper wire between sockets A and B of the SRS harness connector. • Read resistance between sockets S1 and S2 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 42-4.
	Greater than 5 ohms or open.	Signal line (ckt #111) or return line (ckt #112) is open. Repair open. Then go to 42-30.
42-4 Check SRS Resistance		
• Read resistance of SRS across sensor connector pins A and B.	Less than 100 ohms	Go to 42-12.
	From 100 to 200 ohms.	Go to 42-5.
	Greater than 200 ohms.	Go to 42-12.



SYNCRONOUS REFERENCE SENSOR CIRCUITS



TIMING REFERENCE SENSOR CIRCUITS

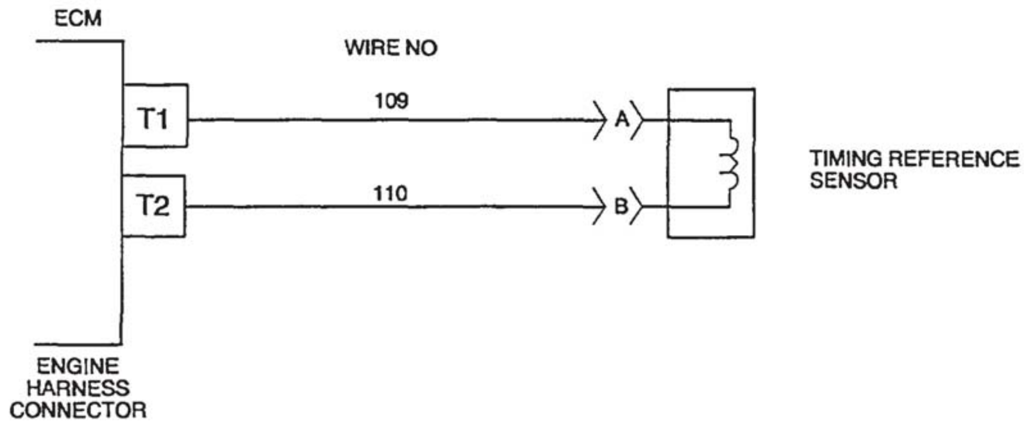


ECM ENGINE HARNESS CONNECTOR

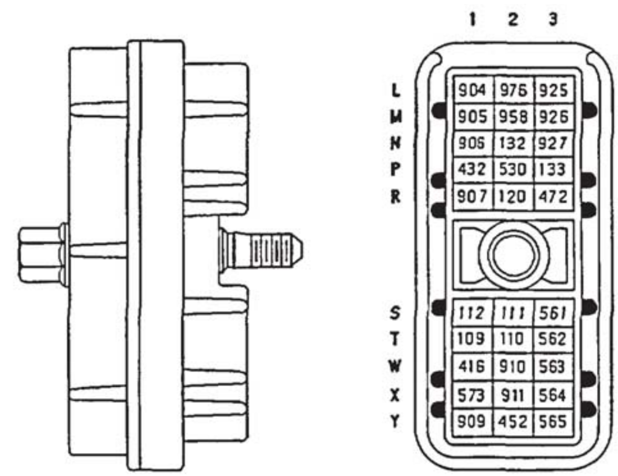
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 42
J1587 CODE: S21 1 - TOO FEW SRS (MISSING SRS)

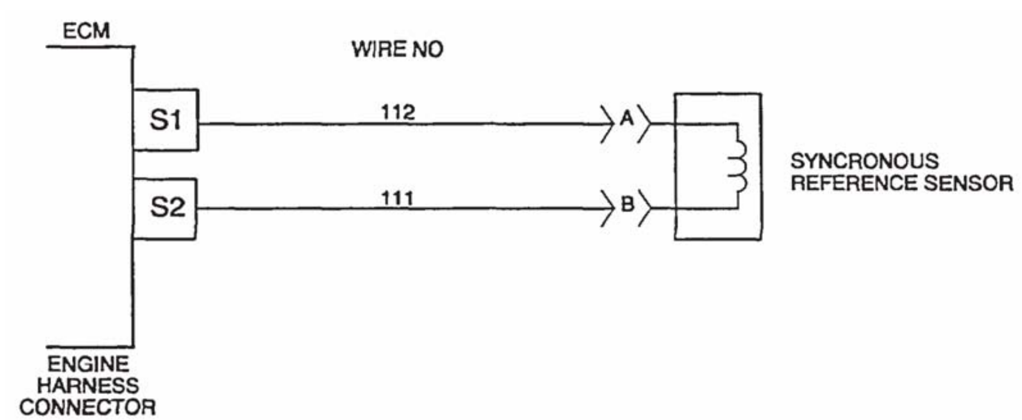
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-5 Check TRS/SRS Gap		
(Note: You'll probably have to remove the ECM to perform this check on 92 Series engines. • Bar engine until TRS is over a TRS "tooth" of pulse wheel. • Tap the front of pulse wheel. rearward with a soft hammer (to remove camshaft end play). • Install TRS/SRS alignment tool and check gap. (nominal gap 0.020" or 0.5 mm).	Incorrect gap.	Loosen the screw at top of TRS/SRS mounting bracket (don't touch the two screws that go into block front end plate they will affect engine timing). Adjust the TRS/SRS until gap setting is correct. Tighten screw. (If problem returns, pulse wheel may be loose or bad). Then go to 42-30.
	Gap setting is correct	Go to 42-6.
42-6 Check for TRS Code		
• Was there also a Code 21/0?	Yes.	Go to 42-8.
	No.	Go to 42-7.
42-7 Check ECM Connectors		
• Check terminals at ECM engine harness connector (both ECM and harness side) for damage, corrosion, and unseated pins or sockets.	Terminals and connectors are okay.	Then go to 42-15.
	Problem found.	Repair terminals/connectors. Then go to 42-30.
42-8 TRS Resistance Check		
• Read resistance between sockets T1 and T2 on engine harness connector.	Less than or equal to 200 ohms.	Go to 42-9.
	Greater than 200 ohms or open.	Go to 42-10.



TIMING REFERENCE SENSOR CIRCUITS



ECM ENGINE HARNESS CONNECTOR

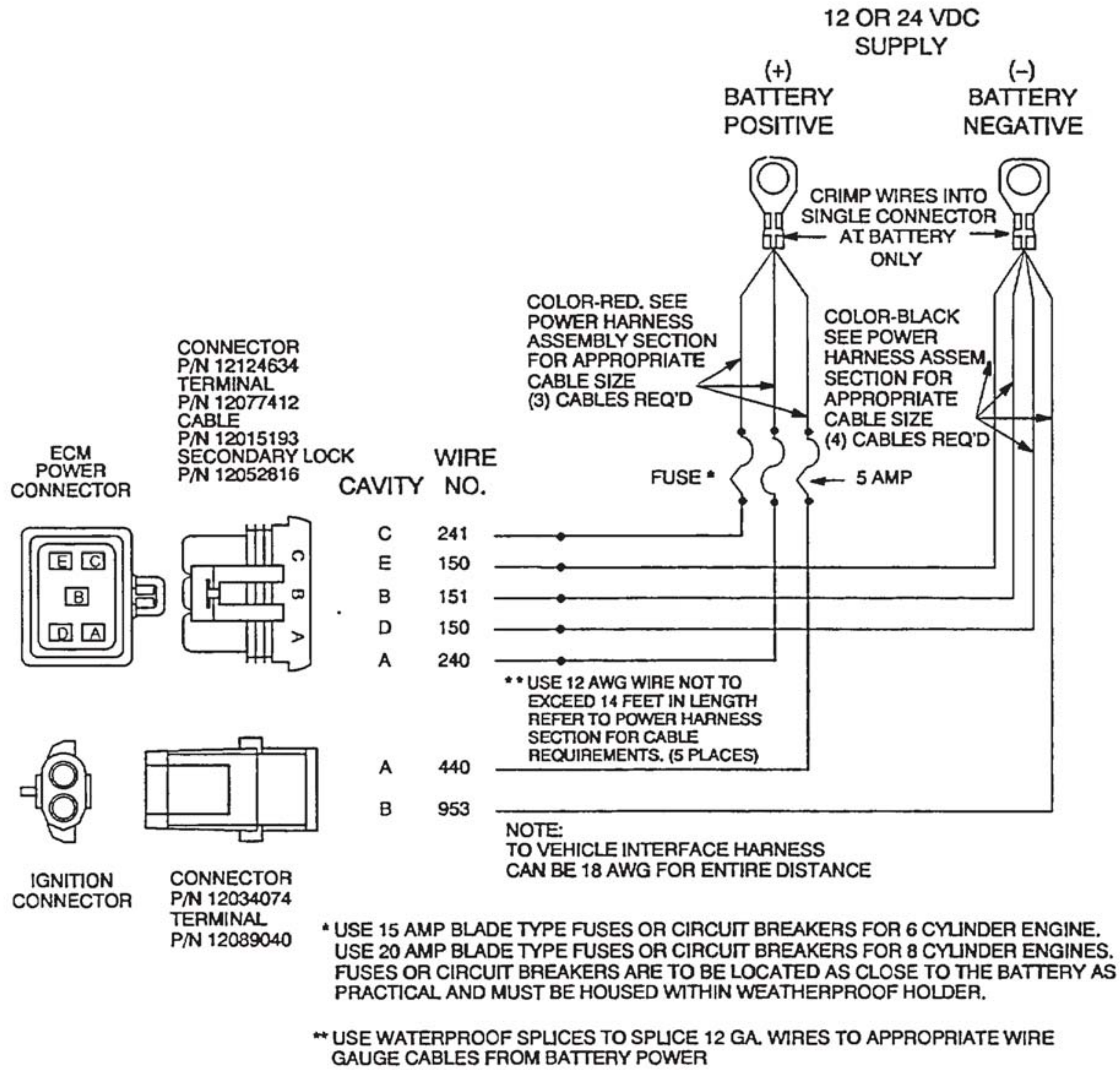


SYNCRONOUS REFERENCE SENSOR CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 42
J1587 CODE: S21 1 - TOO FEW SRS (MISSING SRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-9 Check for Short		
• Disconnect TRS connector. • Read resistance between sockets T1 and T2 on engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #110) is shorted to return line (ckt #109). Repair short. Then go to 42-30.
	Greater than 10,000 ohms or open.	Go to 42-11.
42-10 Open TRS Line Check		
• Install a jumper wire between sockets A and B of TRS harness connectors. • Read resistance between sockets T1 and T2 of engine harness connector.	Less than or equal to 5 ohms.	Go to 42-11.
	Greater than 5 ohms or open.	Signal line (ckt #110) or return line (ckt #109) is open. Repair open. Then go to 42-30.
42-11 TRS Test		
• Read resistance of Timing Reference Sensor across sensor connector pins A and B.	Less than or 100 ohms.	Go to 42-13.
	From 100 to 200 ohms.	Go to 42-7.
	Greater than 200 ohms	Go to 42-13.
42-12 Check SRS Connectors		
• Check connectors at SRS (both harness side and SRS side) for corrosion, damaged or unseated pins or sockets, or bad contacts.	Connectors are okay.	Replace SRS. Then go to 42-14.
	Problem found.	Repair terminals/connectors. Then go to 42-30.

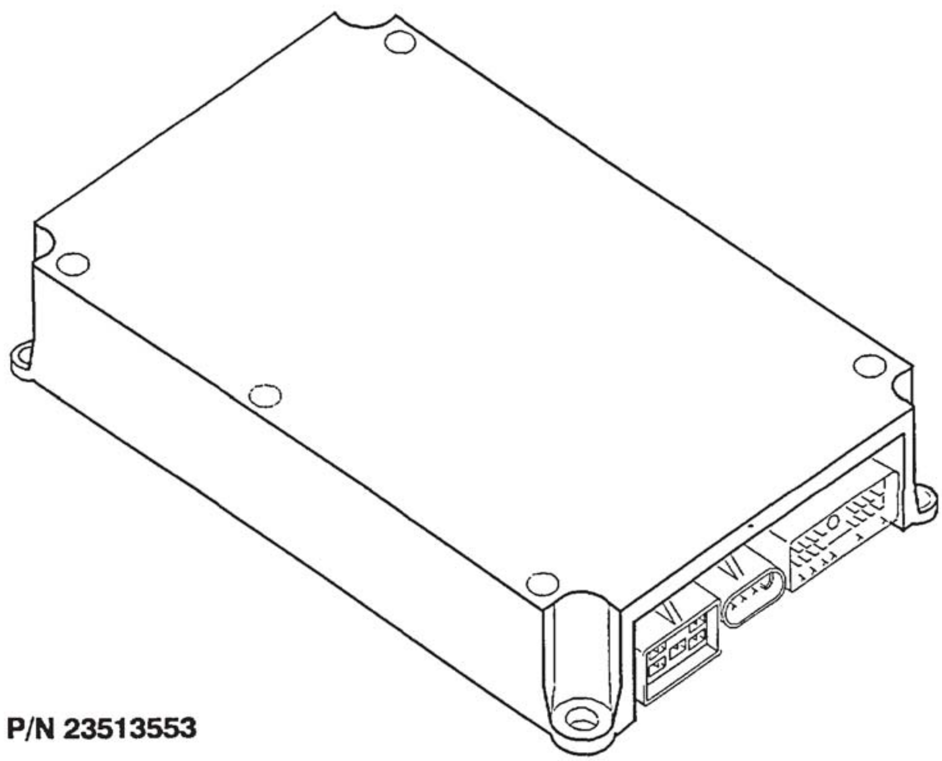


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 42
J1587 CODE: S21 1 - TOO MANY SRS (MISSING SRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-13 Check TRS Connectors		
• Check connectors at Timing Reference Sensor (both harness side and sensor side) for damage; bent, corroded or unseated pins or sockets, or bad contracts.	Connectors are okay. →	Replace Timing Reference Sensor. Then go to 42-14.
	Problem found. →	Repair terminals/connectors Then go to 42-30.
42-14 Verify SRS/TRS		
• Turn ignition off. • Reconnect all connectors. • Clear codes. • Start and run engine until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read inactive codes. than Code 21/1 received.	(No Codes). →	Repairs are complete.
	Code 21/1 reappears (and any other codes.) →	If TRS was just replaced, go to 42-7. If the TRS was not replaced, go to 42-6.
	Code(s) other to service other codes. →	Go to START-1, pg 3-345.41,
42-15 Verify Cranking Voltage		
• Connect all connectors. • Turn ignition off. • Wire a 5-pin power connector to fully charged battery (12 volt). • Connect to ECM. • Try to start engine.	Engine starts. →	Replace battery. If a voltage equalizer is installed, check operation of equalizer. Indications are equalizer is not working. Then go to 42-30.
	Engine does not start. →	Replace ECM, then go to 42-30.

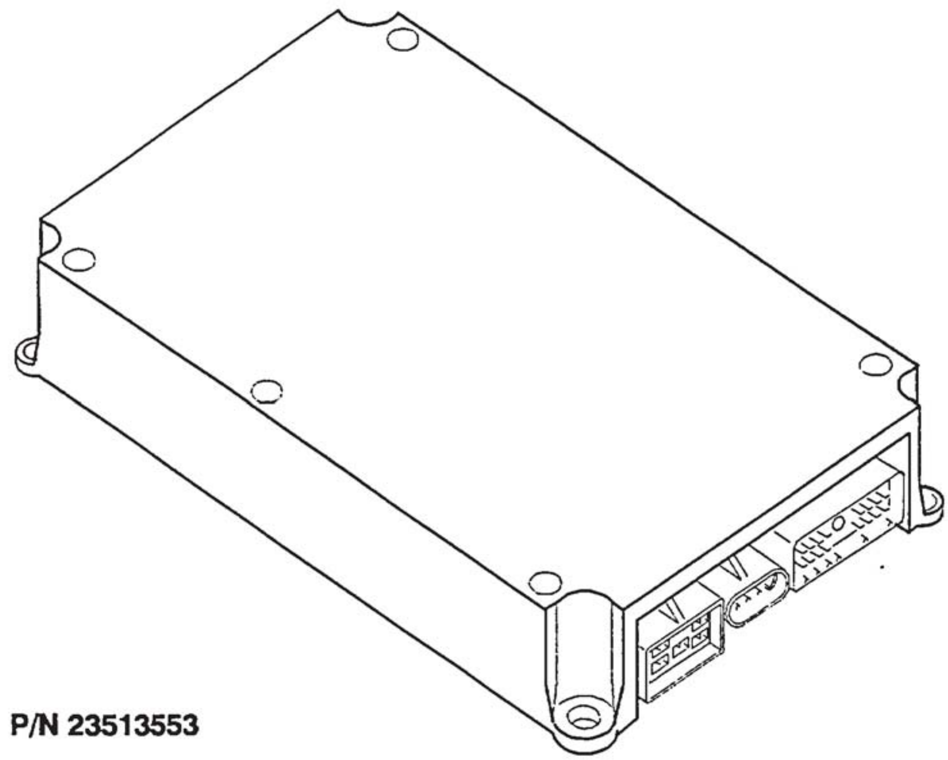


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 42
J1587 CODE: S21 1 - TOO FEW SRS (MISSING SRS)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read inactive codes.	(No Codes).	Repairs are complete.
	Code 21/1 (and any other codes).	All system diagnostics are complete. Please review this section from start to find error.
	Any other codes. except Code 21/1.	Go to START-1, pg 3-345.41, to service other codes.



THE ELECTRONIC CONTROL MODULE - DDEC III

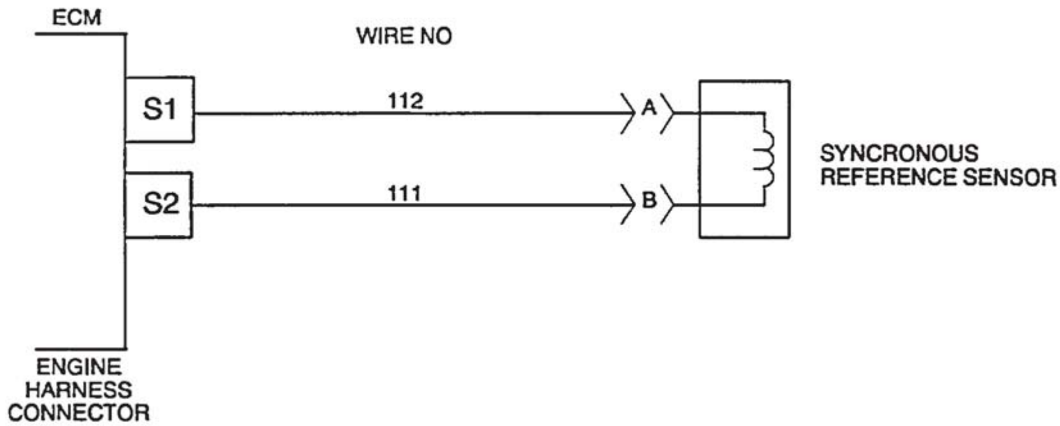
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 43
J1587 CODE: P111 1 - COOLANT LEVEL LOW

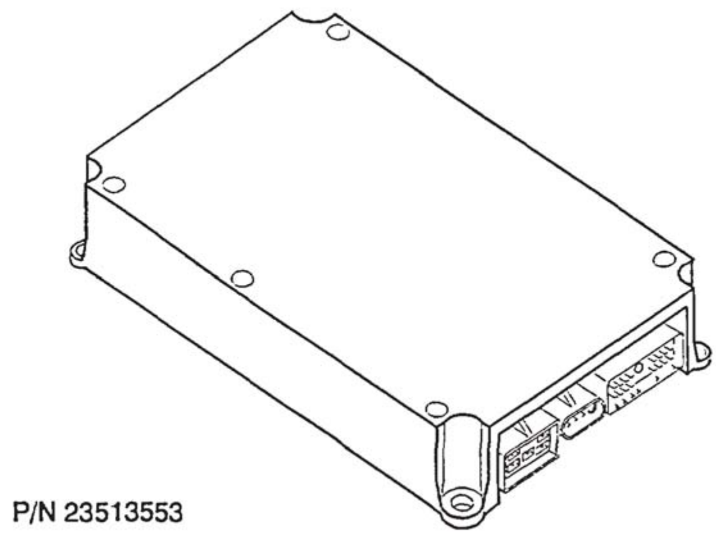
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT

Code 111-1 Indicates a low coolant level condition. Add coolant to ensure coolant level probe is immersed in coolant.



OIL AND COOLANT TEMPERATURE CIRCUITS



THE ELECTRONIC CONTROL MODULE - DDEC II

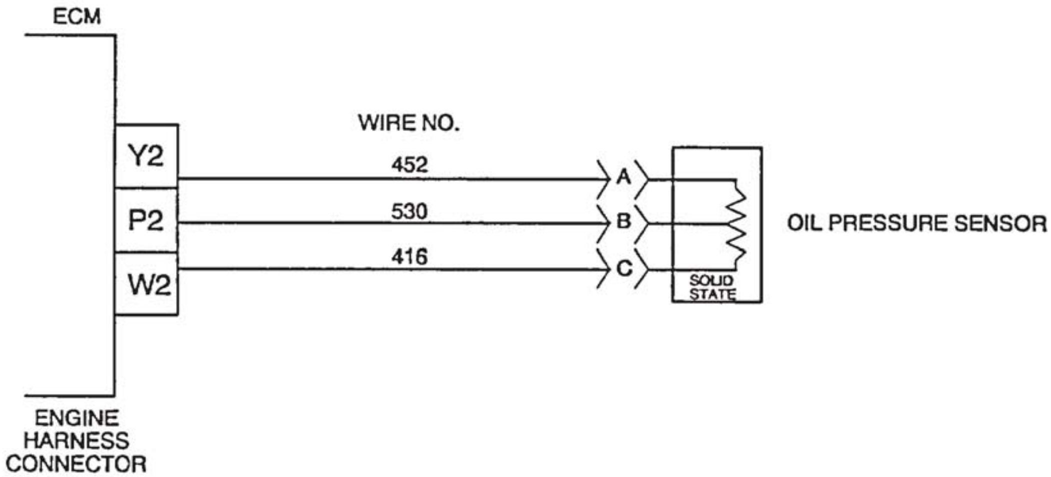
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 44
J1587 CODE: P110 0 - COOLANT TEMPERATURE HIGH OR
P175 0 - OIL TEMPERATURE HIGH
P052 0 - INTERCOOLER TEMPERATURE HIGH

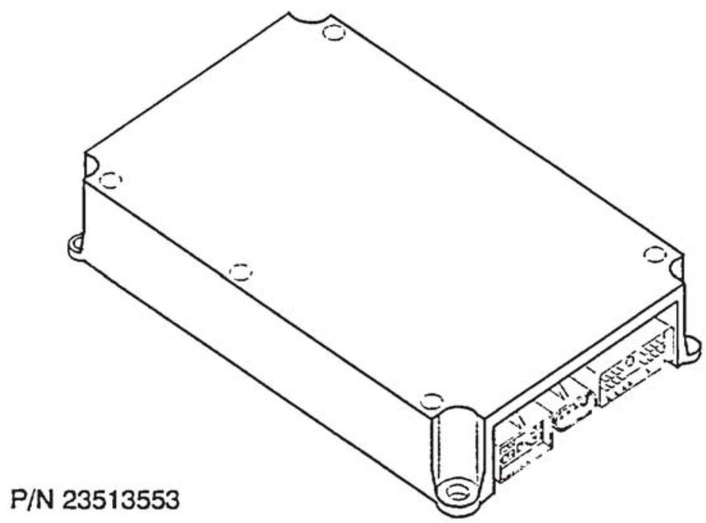
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

When (Inactive Codes) are displayed on DDR, additional audit trail information is also shown. For an understanding of this information refer to the example given in the Code 85 chart.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
44-1 Multiple Code Check		
• Were there any other codes besides 110/0, 17510, or 052/0? • Plug in reader and determine if code is coolant or oil temperature high.	Yes →	Service other codes first.
	No →	This fault codes indicates oil or coolant or intercooler temperature was higher than it should have been. Refer to engine service manual to determine potential causes for high oil or coolant or Intercooler temperatures.



OIL PRESSURE CIRCUITS



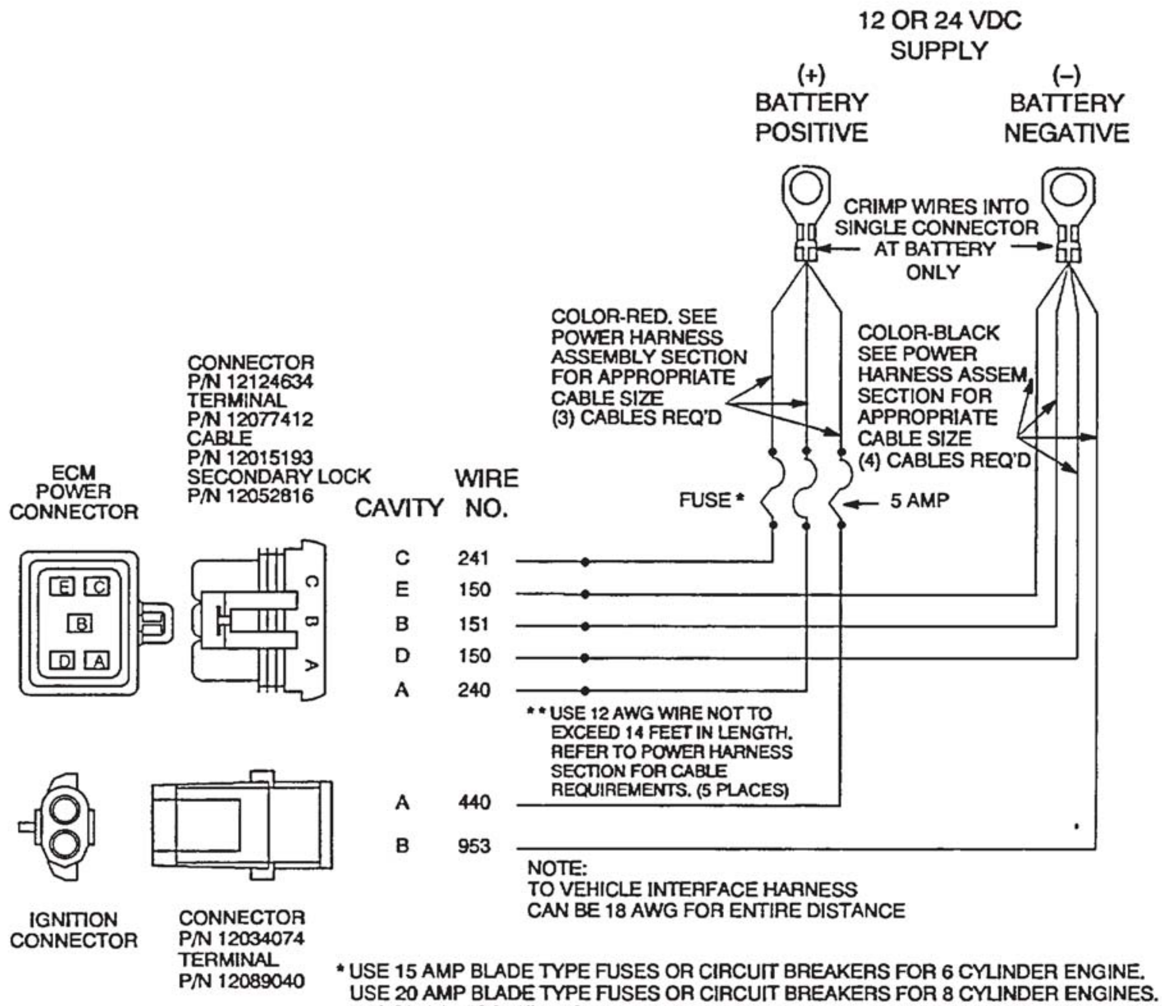
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 45
J1587 CODE: P100 1 - OIL PRESSURE LOW

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
45-1 Multiple Code Check		
• Were there any other active codes besides 11 0/1O	Yes →	Service other codes first.
	No →	This code indicates that there was an engine running condition at which oil pressure was lower than it should have been. Refer to engine service manual to determine potential causes for low oil pressure.



* USE 15 AMP BLADE TYPE FUSES OR CIRCUIT BREAKERS FOR 6 CYLINDER ENGINE.
USE 20 AMP BLADE TYPE FUSES OR CIRCUIT BREAKERS FOR 8 CYLINDER ENGINES.
FUSES OR CIRCUIT BREAKERS ARE TO BE LOCATED AS CLOSE TO THE BATTERY AS PRACTICAL AND MUST BE HOUSED WITHIN WEATHERPROOF HOLDER.

** USE WATERPROOF SPLICES TO SPLICE 12 GA. WIRES TO APPROPRIATE WIRE GAUGE CABLES FROM BATTERY POWER

POWER HARNESS

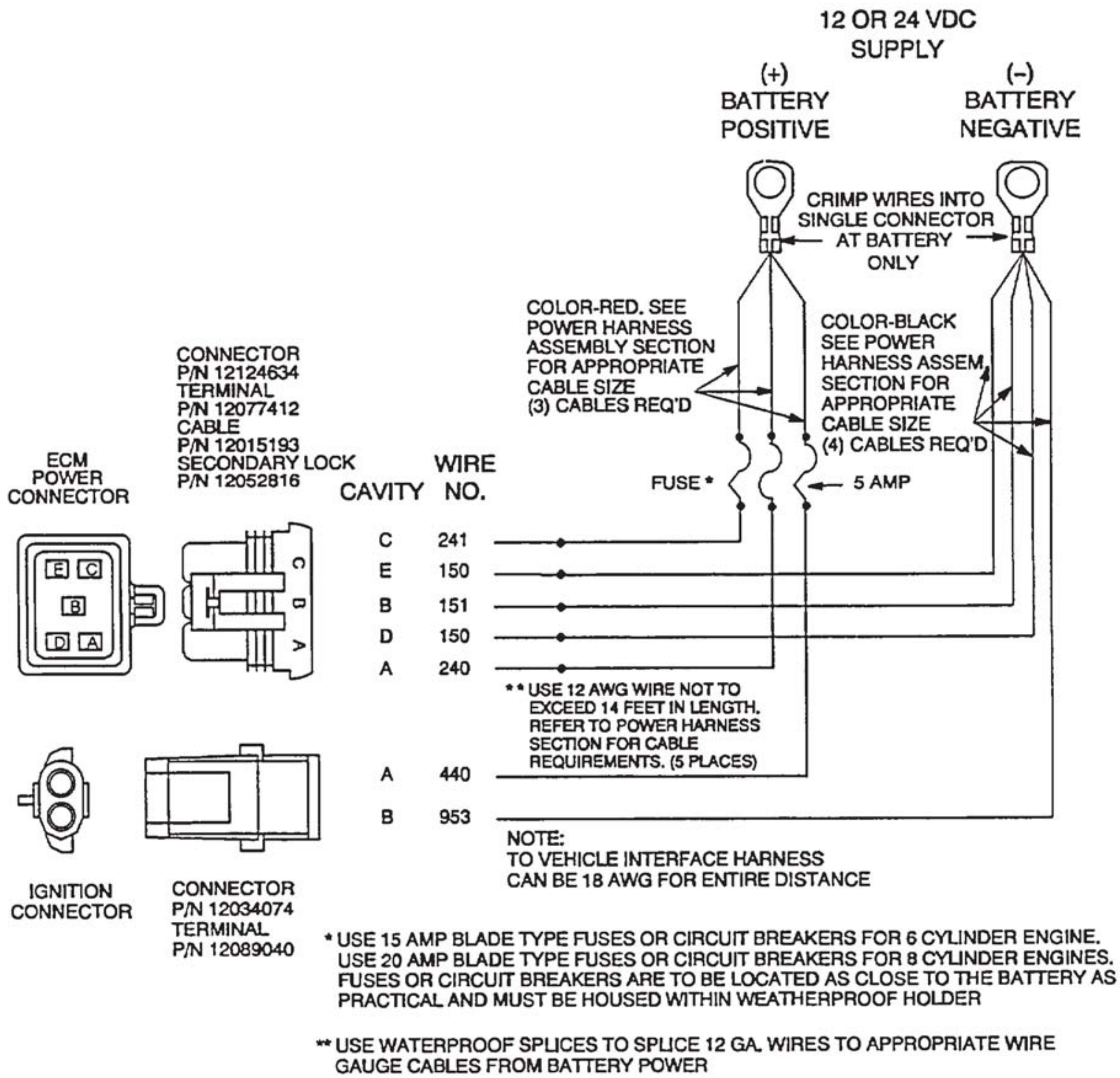
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 46
J1587 CODE: P168 1 - BATTERY VOLTAGE LOW

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46-1 Battery Check		
• Start and run engine for 1 minute. • Measure voltage on Battery + terminal (red lead) to Battery - terminal (black lead).	Engine does not start.	Determine cause for no-start. Start with an inspection of the battery (possibly discharged) and/or starting/charging system. Refer to Chart 2, page 3-345.63, as a further aid in no-start diagnosis if battery and starting/charging system are okay.
	Less than or equal to 10.0 volts.	Service discharged battery and/ or starting/charging system.
	Greater than 10.0 volts.	Go to 46-2.
46-2 Voltage Check at ECM		
• Keep engine running. • Select ECM INPUT VOLT on DDR for display. • Observe ECM voltage reading on DDR.	Less than or equal to 10.0 volts.	Go to 46-3.
	Greater than 10.0 volts.	Go to 46-5.
46-2 Voltage Check at ECM		
• Turn ignition off. • Disconnect 5-way power harness connector at the ECM. • Read voltage from socket A and C of 5-way power harness connector and a good battery ground (black lead). Don't use (ckt #150 as ground reference.	Less than or equal to 11.5 volts.	Go to 46-30.
	Greater than 11.5 volts.	Go to 46-5.

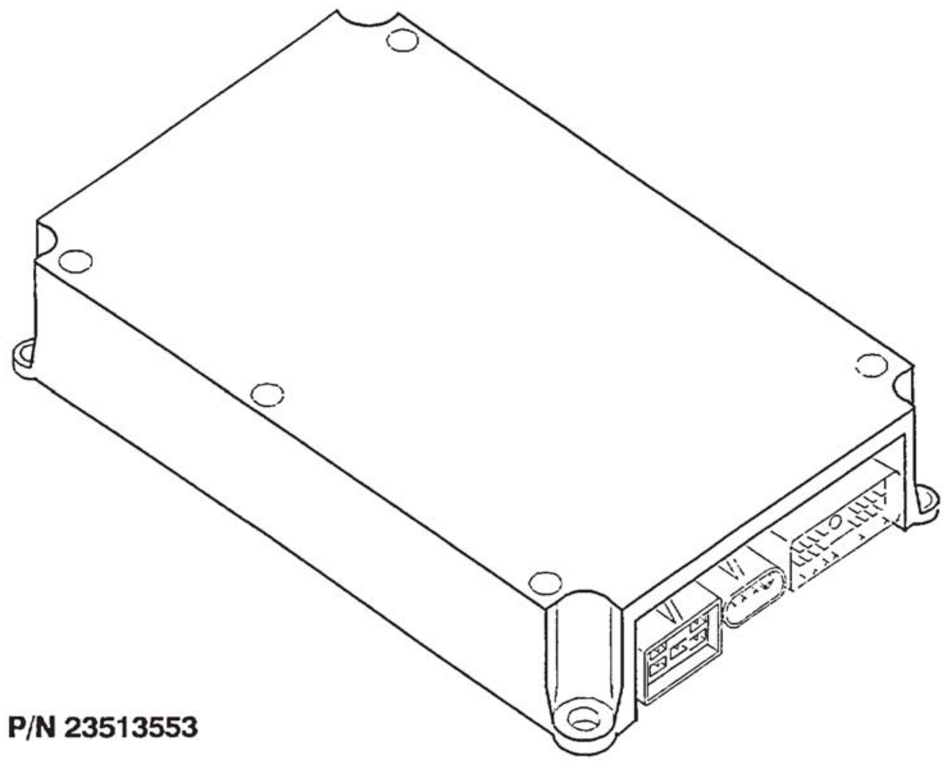


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 46
J1587 CODE: P168 1 - BATTERY VOLTAGE LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46-4 Check for Bad Battery + Line		
• Remove both ECM fuses. • Read voltage at socket A of one fuseholder (red lead) to a good ground (black lead). • Repeat voltage reading at other fuseholder.	Less than or equal to 11.5 volts on either reading.	The Battery + line near Battery is open, or a corroded connection exists at Battery + terminal. Repair problem. Then go to 46-30.
	Greater than 11.5 volts on both readings.	The Battery + line between the fuseholder and ECM has an open, or ECM power connector has a corroded connection. Repair problem. Then go to 46-30.
46-5 Ground Check at ECM		
• Disconnect the 5-way power harness connector at ECM (if you have not previously done so). • Read voltage on socket C of 5-way power harness connector (red lead) to socket (black lead). • Also read voltage on socket A (red lead) to socket D (black lead).	Less than or equal to 11.5 volts on either reading.	The ground wire (ckt #150) is open or has a corroded connection. Repair ground wire. Then go to 46-30.
	Greater than 11.5 volts on both readings.	Go to 46-6.
46-6 Check ECM Connectors		
• Check terminals at ECM 5-way power harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM Then to 42-6.
	Problem found	Repair terminals/connectors Then go to 46-30.

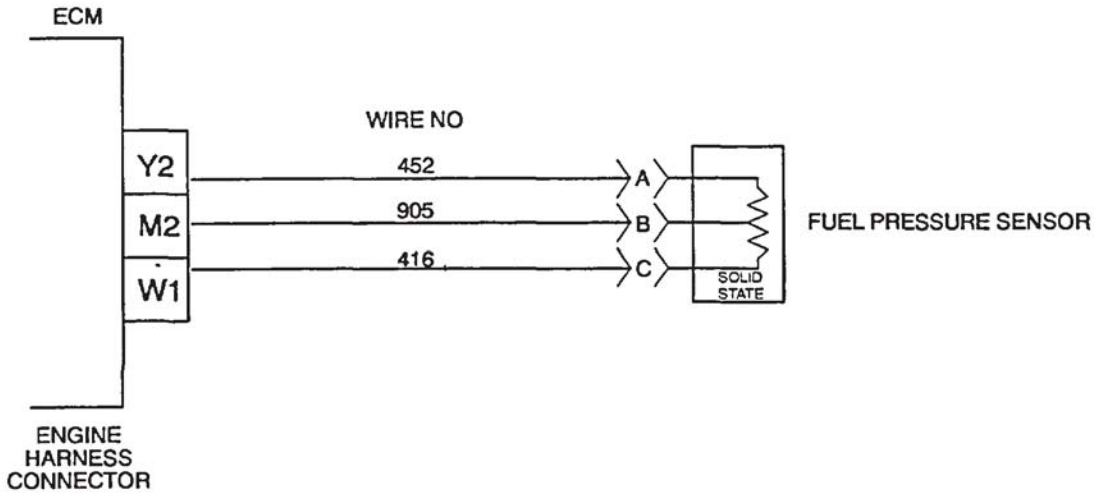


THE ELECTRONIC CONTROL MODULE - DDEC III

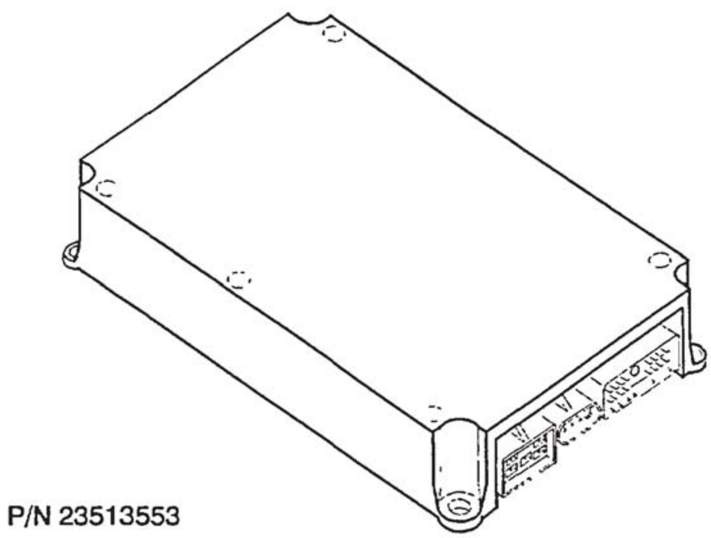
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 46
J1587 CODE: P168 1- BATTERY VOLTAGE LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read inactive codes.	(No Codes) →	Repairs are complete.
	Code 168/1 (and any other codes) →	All system diagnostics are complete. Please review this section from start to find error.
	Any other codes except Code 168/1 →	Go to START-1, pg 3-345.41, to service other codes.



FUEL PRESSURE SENSOR (FPS) CIRCUITS



THE ELECTRONIC CONTROL MODULE - DDEC III

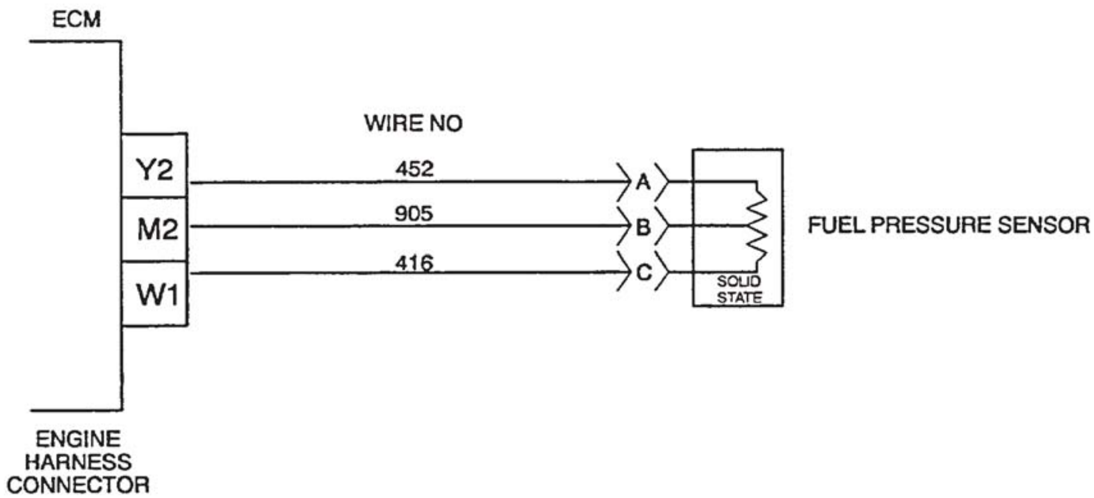
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 47
J1587 CODE: P94 O- FUEL PRESSURE HIGH

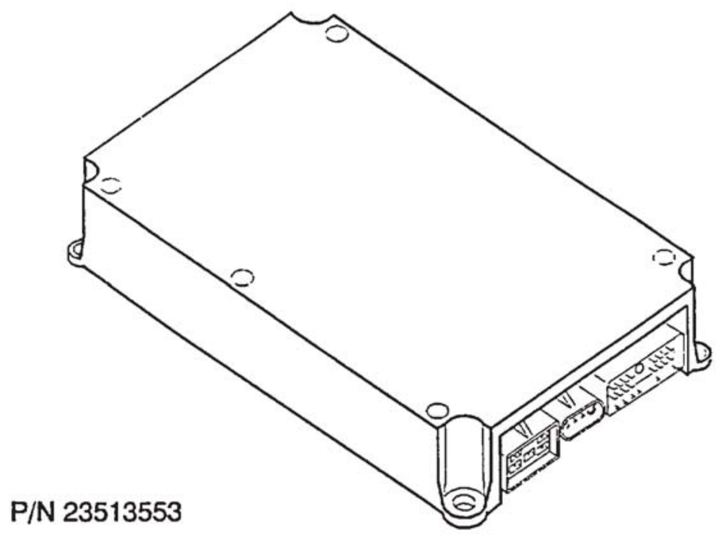
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
47-1 Multiple Code Check		
• Were there any other codes besides 94/0?	Yes	Service other codes first.
	No	Code 94/0 indicates that there Was an engine running condition where fuel spill pressure was higher than it should be. Refer to engine service manual for possible causes for high fuel pressure.



FUEL PRESSURE SENSOR (FPS) CIRCUITS



THE ELECTRONIC CONTROL MODULE - DDEC III

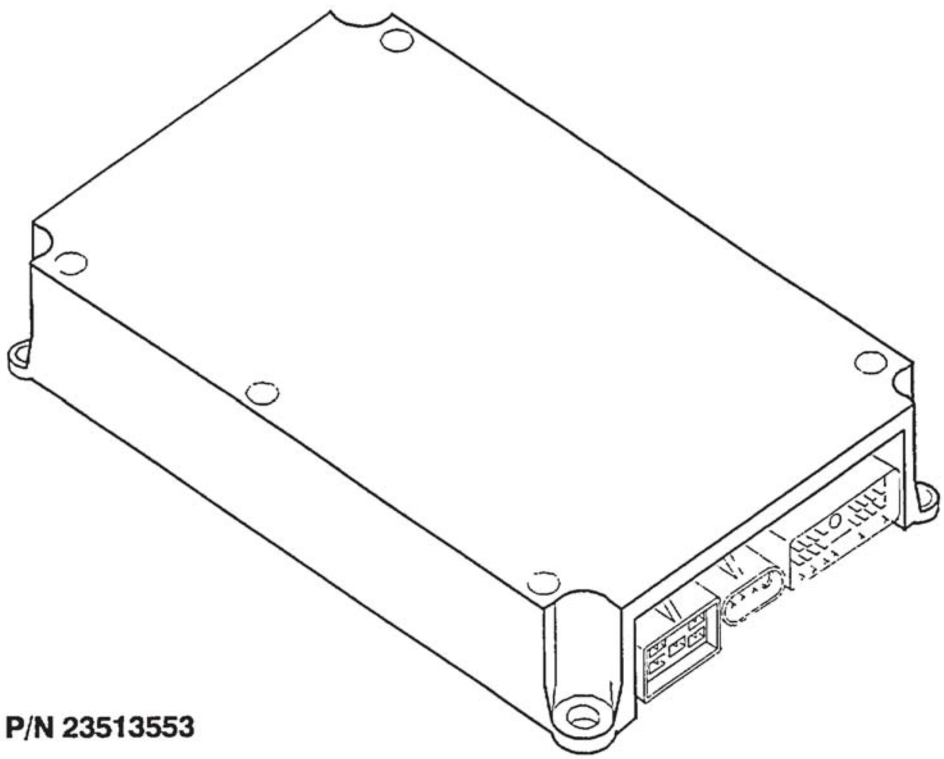
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 48
J1587 CODE: P94 1- FUEL PRESSURE LOW

NOTE - This chart is only to be used if.

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48-1 Multiple Code Check		
• Were there any other codes besides 94/1 ?	Yes.	Service other codes first.
	No.	Code 94/1 indicates that there was an engine running condition where fuel spill pressure was lower than it should be. Refer to engine service manual for possible causes for low fuel pressure such as: 1. Plugged fuel filters or lines 2. Missing restrictive fitting 3. Faulty fuel pump 4. Low fuel supply



THE ELECTRONIC CONTROL MODULE - DDEC III

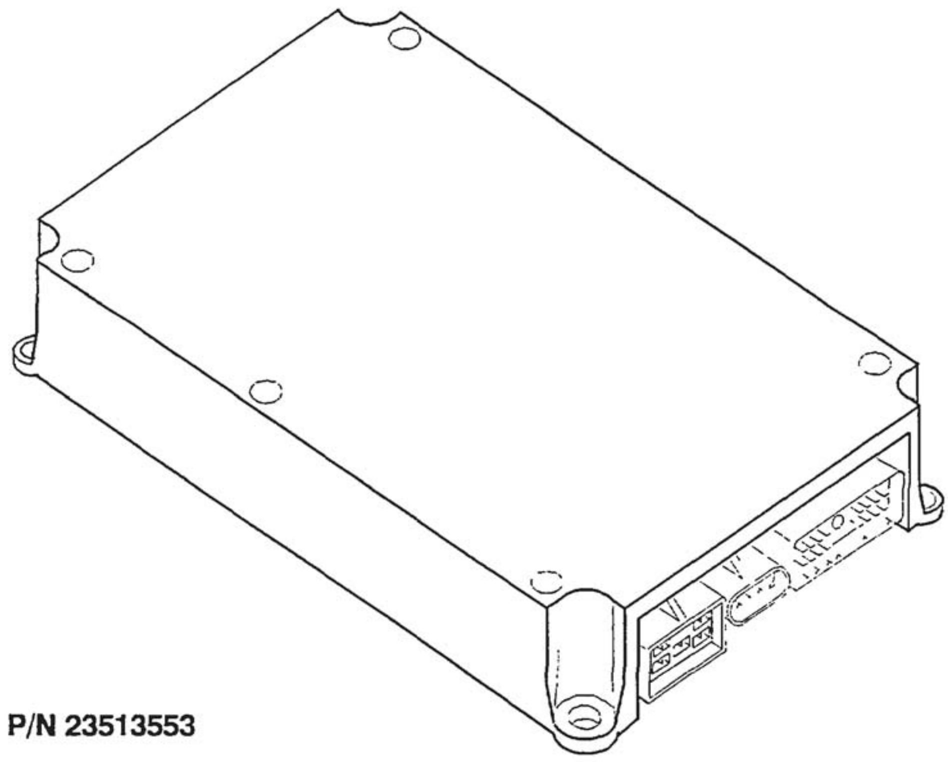
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 52
J1587 CODE: S254 12 ANALOG TO DIGITAL (A/D) CONVERSION FAILURE

NOTE - This chart is only to be used If.

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
52-1 Multiple Code Check		
• Were there any other codes besides 254/12?	Yes	Service other codes first.
	No	Replace ECM. Then go to START-1, pg 3-345.41.



THE ELECTRONIC CONTROL MODULE - DDEC 1I1

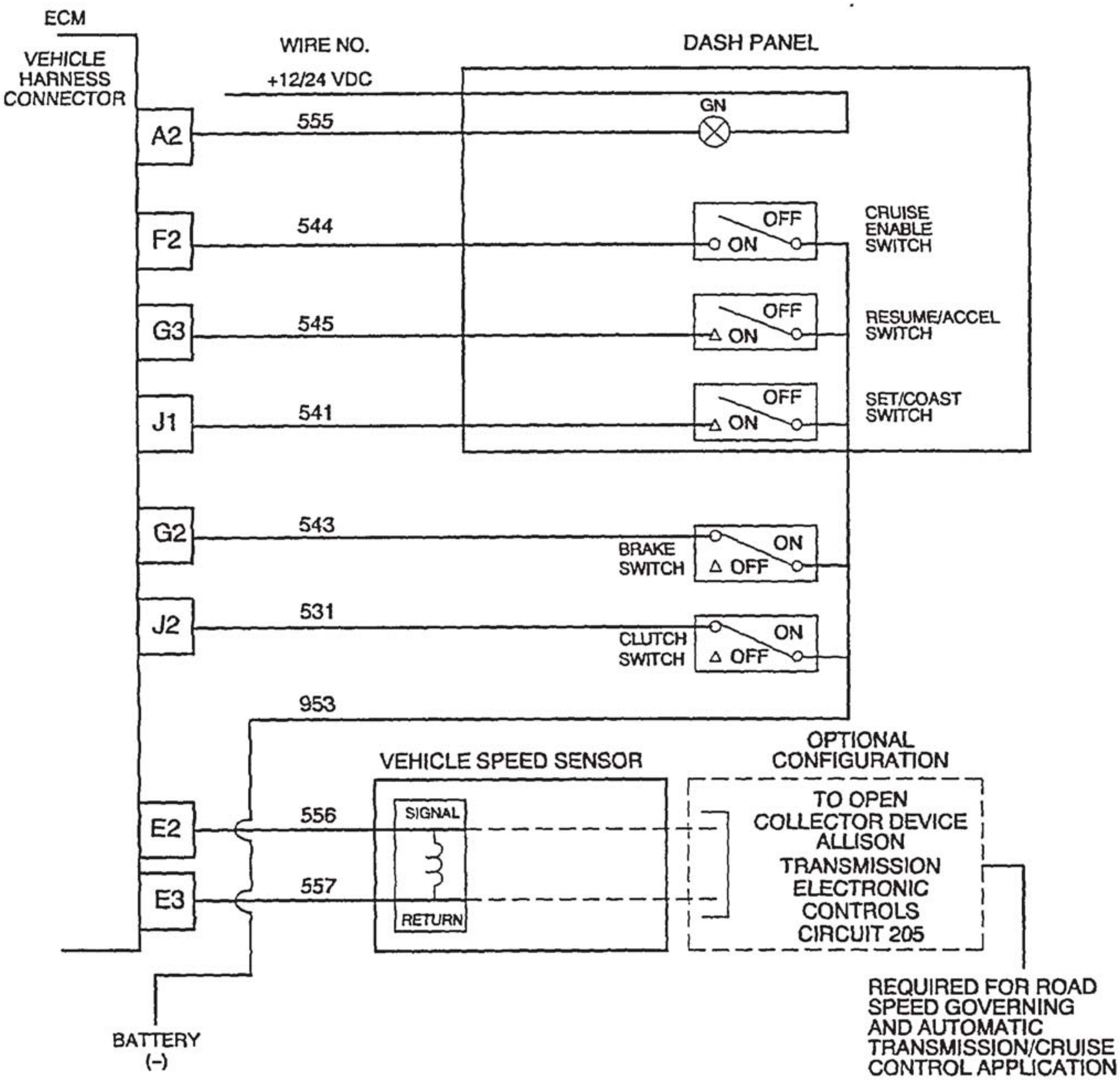
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 53
J1587 CODE: S253 12 NONVOLATILE MEMORY FAILURE

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
53-1 Replace ECM		
An error has been detected in EEPROM in the ECM which will cause it to not log codes correctly or at all.		Contact your distributor/dealer to have ECM reprogrammed and/or ECM replaced.



TYPICAL CRUISE CONTROL CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

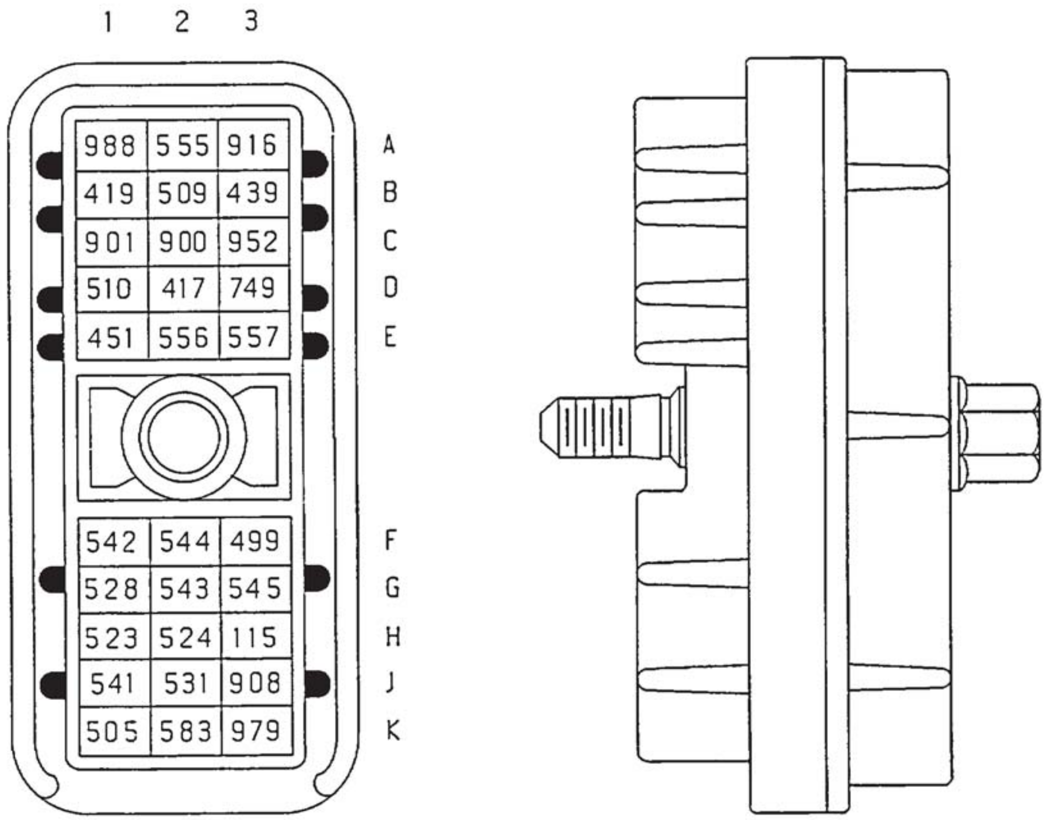
E. FLASH CODE: 54
J1587 CODE: P84 12 - VEHICLE SPEED SENSOR FAULT

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-1 Identify Type of Vehicle Speed Sensor Used		
Determine whether the VSS used is either: • Type (1) is a magnetic pick-up and may be one of the following: •• transmission tailshaft sensor • wheel rim sensor • mechanical speedometer cable adaptor sender generator OR • Type (2) which outputs a square wave signal and requires wave signal and requires the ECM to be configured for this type of signal, (see sketch), this includes the (Allison Transmission Electronic Controls) electronic speedo output.	Type (1) sensor Type (2) sensor	Go to 54-2. Go to 54-10.
NOTE: Plug in DDR and check calibration configuration to determine that the correct configuration is on for the type of signal being used.		
54-2 Check for Open		
• Disconnect ECM vehicle harness connector. • Also disconnect the VSS connector. • Install a jumper wire between sockets A and B of the VSS harness connector. • Read resistance between sockets E2 (ckt #556) and E3 (ckt #557) on ECM vehicle harness connector.	Less than or equal to 5 ohms. Greater than 5 ohms or open.	Go to 54-4. The VSS signal line (ckt #556) or return line (ckt #557) is open. Repair open. Then go to 54-30.

*Not recommended with DDEC III.

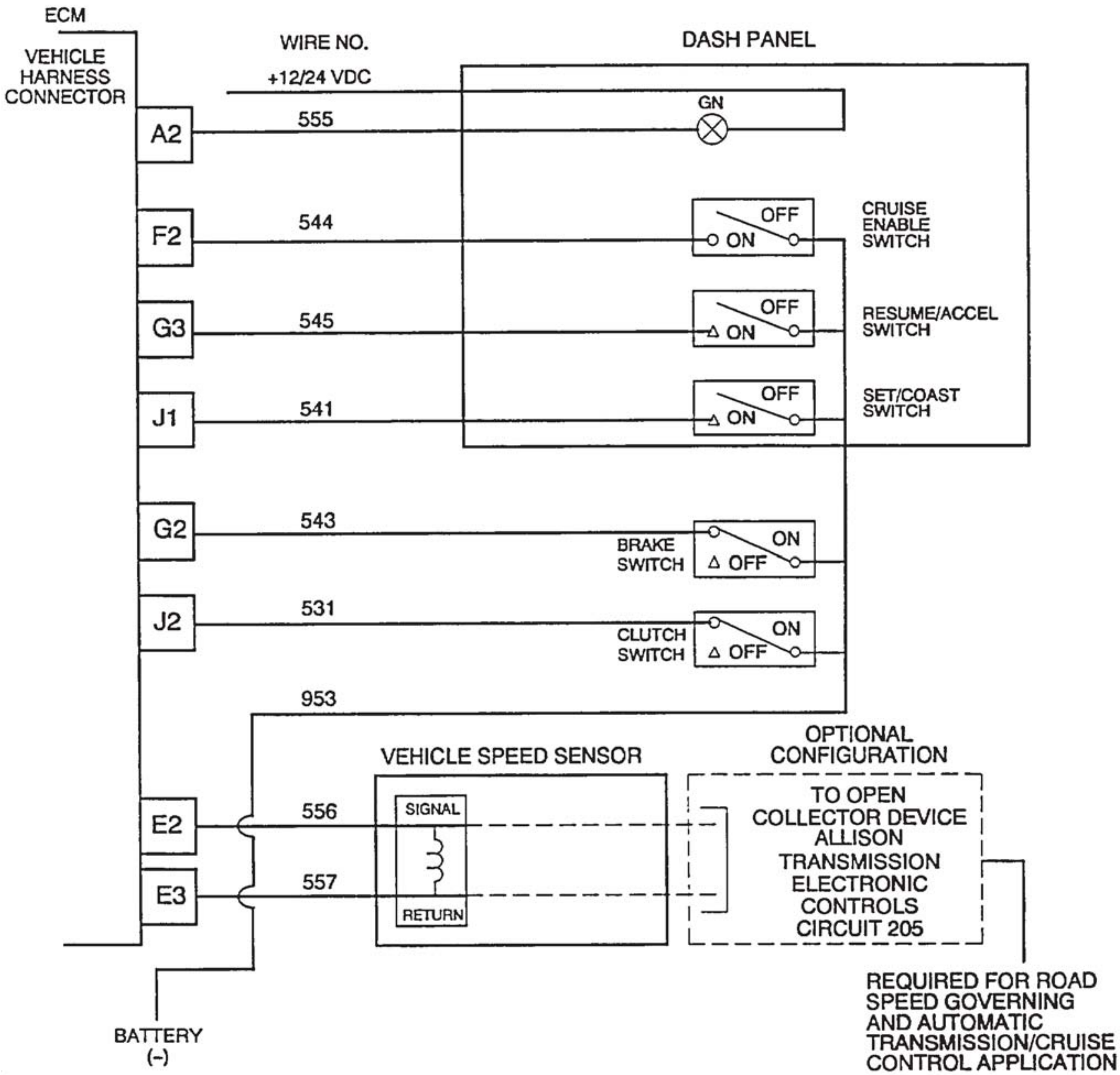


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 54
J1587 CODE: P84 12 - VEHICLE SPEED SENSOR FAULT

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-3 Check for Short to Ground		
• Turn ignition off. • Disconnect the ECM vehicle harness connector. • Read resistance between socket E2 (ckt #556) and a good ground. • Also read resistance between socket E3 (ckt #557) and a good ground.	Less than or equal to 10,000 ohms on either reading. Then go to 54-30.	Either the signal wire (ckt #556) or the return wire (ckt #557) is shorted to ground. Repair short.
	Greater than 10,000 ohms on both readings.	Go to 54-4.
54-4 Check Vehicle Speed Sensor		
• Read resistance of Vehicle Speed Sensor across the vehicle sped sensor connector pins.	Less than 50 ohms.	Go to 54-5.
	From 50 to 3,000 ohms.	Go to 54-6.
	Greater than 3,000 ohms or open.	Go to 54-5.
54-5 Check VSS Connectors		
• Inspect terminals at VSS connectors (sensor side and harness side) for damage, corrosion, and unseated pins or sockets.	Terminals and connectors are okay.	Replace VSS. Then go to 54-30.
	Problem found. Then go to 54-30	Repair terminals/connectors.
54-6 Check for Short to Power		
• Turn ignition on. • Read voltage at the ECM vehicle harness connector, socket E3 (ckt #557) to a good ground 4 volts.	Less than or equal to 4 volts.	Go to 54-7.
	Greater than	The VSS or VSS return line (ckt #557) is shorted to battery or some other source of voltage. Repair short. Then to 54-30.



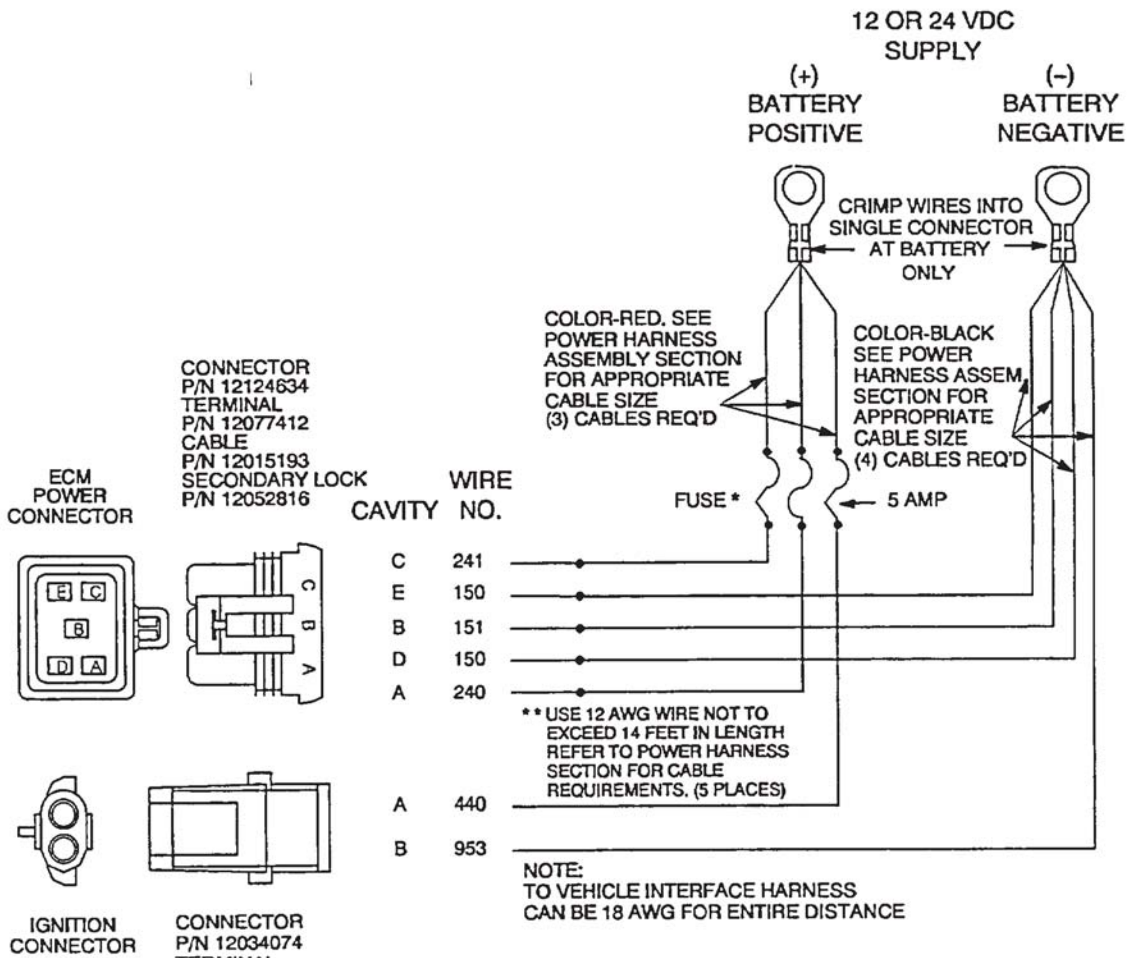
TYPICAL CRUISE CONTROL CIRCUITS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 54
J1587 CODE: P84 12 · VEHICLE SPEED SENSOR FAULT

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-7 Check ECM Connectors		
• Check terminals at ECM vehicle harness connector (both ECM and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Reprogram ECM. Then go to 54-30.
	Problem found.	Repair terminals/connectors. Then go to 54-30.
54-8 Vehicle Speed Mechanical Checks		
• Check for plugged fuel filters (See note below). • Check if any metal, etc., is lodged between the VSS and pulse wheel. • Check if sensor is loose. • Make sure VSS pulse wheel is in fixed position relative to magnetic pickup. • Check for proper air gap between magnetic pickup and pulse wheel.	Okay.	Go to 54-5.
	Not okay.	Repair. Then go to 54-30.
54-9 Check for Short to Ground		
• Turn ignition off. • Disconnect the ECM vehicle harness connector. • Read resistance between socket E2 (ckt #556) and a good ground	Less than or equal to 100 ohms Repair short.	VSS signal line (ckt #556) and/or (ckt #557) is shorted to ground. Then go to 54-30.
	Greater than 100 ohms or open.	Go to 54-10.

NOTE: Plugged fuel filters result in low fuel pressure. Under this condition, a high pulse width reading at engine speeds above 1500 rpm in a stationary vehicle can cause the logging of Code 54.



* USE 15 AMP BLADE TYPE FUSES OR CIRCUIT BREAKERS FOR 6 CYLINDER ENGINE. USE 20 AMP BLADE TYPE FUSES OR CIRCUIT BREAKERS FOR 8 CYLINDER ENGINES. FUSES OR CIRCUIT BREAKERS ARE TO BE LOCATED AS CLOSE TO THE BATTERY AS PRACTICAL AND MUST BE HOUSED WITHIN WEATHERPROOF HOLDER

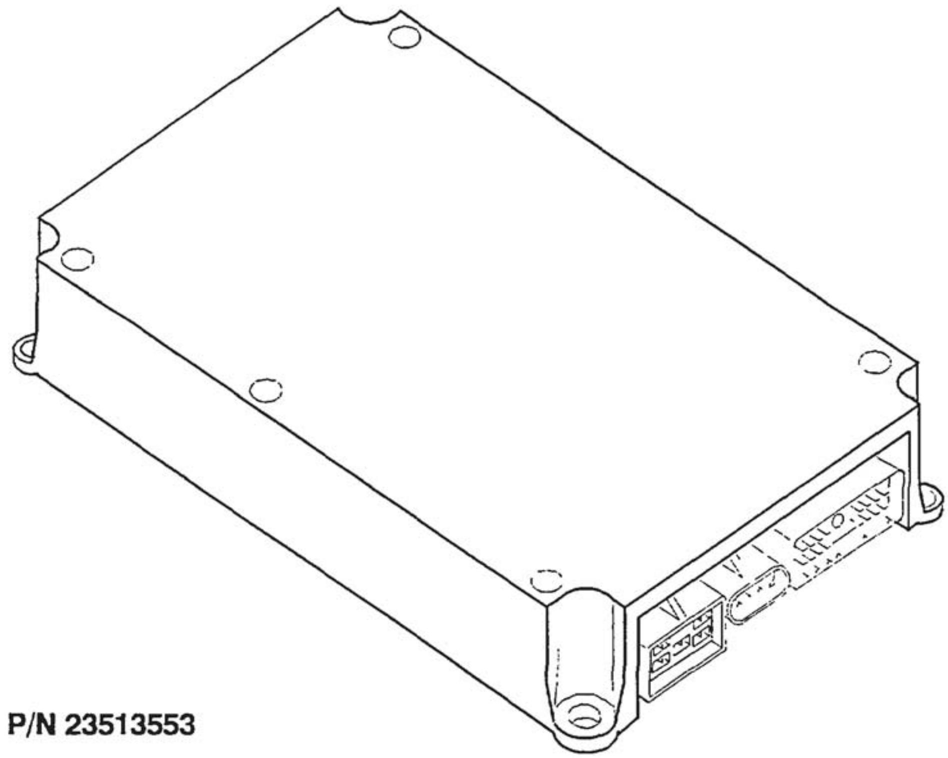
** USE WATERPROOF SPLICES TO SPLICE 12 GA. WIRES TO APPROPRIATE WIRE GAUGE CABLES FROM BATTERY POWER

POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 54
J1587 CODE: P84 12 - VEHICLE SPEED SENSOR FAULT

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-10 Check for Open		
• Disconnect the ECM 5-way power harness connector. • Install a jumper wire between socket D of 5-way connector and socket E2 of ECM vehicle harness connector. • Find VSS end (non-ECM end) of the wire for (ckt #556). • Read resistance between this other end of (ckt #556) and a good ground. • Repeat measurements with jumper between socket D of 5-way and socket E3.	Greater than 5 ohms or open. open.	→ VSS signal line (ckt #556) and/or (ckt #557) is open. Repair Then go to 54-30.
	Less than or equal to 5 ohms.	→ Problem appears to be with device generating vehicle speed signal. Refer to vehicle manufacturer's specifications/ recommendations regarding diagnosis and/or replacement of vehicle speed signal generator.
54-30 Verify Repairs		
• Turn Ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read Inactive codes.	(No Codes).	→ Repairs are complete. (Note: the only way to completely verify repair is by road testing it. If you drive it on the road and Code 84/9 returns, please review this section from first step to find error.
	Code 84/9 (and any other codes).	→ All system diagnostics are complete. Please review this section from start to find error.
	Any other codes. except Code 84/9.	→ Go to START-1, pg 3-345.41, to service other codes.



THE ELECTRONIC CONTROL MODULE - DDEC III

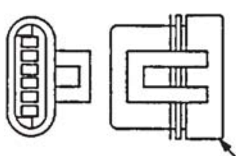
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 56
J1587 CODE: 5250 12- J1587 DATA LINK FAULT

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
56-1 Check for Codes		
• Plug in DDR. • Turn ignition on. • Read codes.	No Data Received	Go to C7-1.
	Code 250/12 only.	Go to 56-2.
	Any other codes present?	Service other codes first.
56-2 Clear Codes		
• Clear codes. • Start and run engine observe CEL/code.	CEL on w/code 250/12.	Replace ECM. Then go to 56-30.
	No CEL/code.	Go to 56-30.
56-30 Verify Repairs		
• Turn ignition off. comes on for 5 seconds and goes out. • Turn ignition on and observe check engine light.	Check engine light complete.	Repairs are
	Check engine light comes on and stays on.	All system Diagnostics are complete. Please review this section to find the error.



CAVITY	WIRE NO.	COLOR		FUNCTION
F	925	DK BLU	—	CAN_H / J1939 (+) CONTROL DATA LINK
E	926	DK BLU/WHT	—	CAN_L / J1939 (–) CONTROL DATA LINK
D	927	WHT/BLU	—	CAN_H / J1939 SHIELD
C	439	PNK	—	IGNITION
B	801	TAN	—	J1922 (–) CONTROL DATA LINK
A	800	TAN/WHT	—	J1922 (+) CONTROL DATA LINK

CONNECT DIRECTLY
INTO ECM'S
COMMUNICATION
CONNECTOR

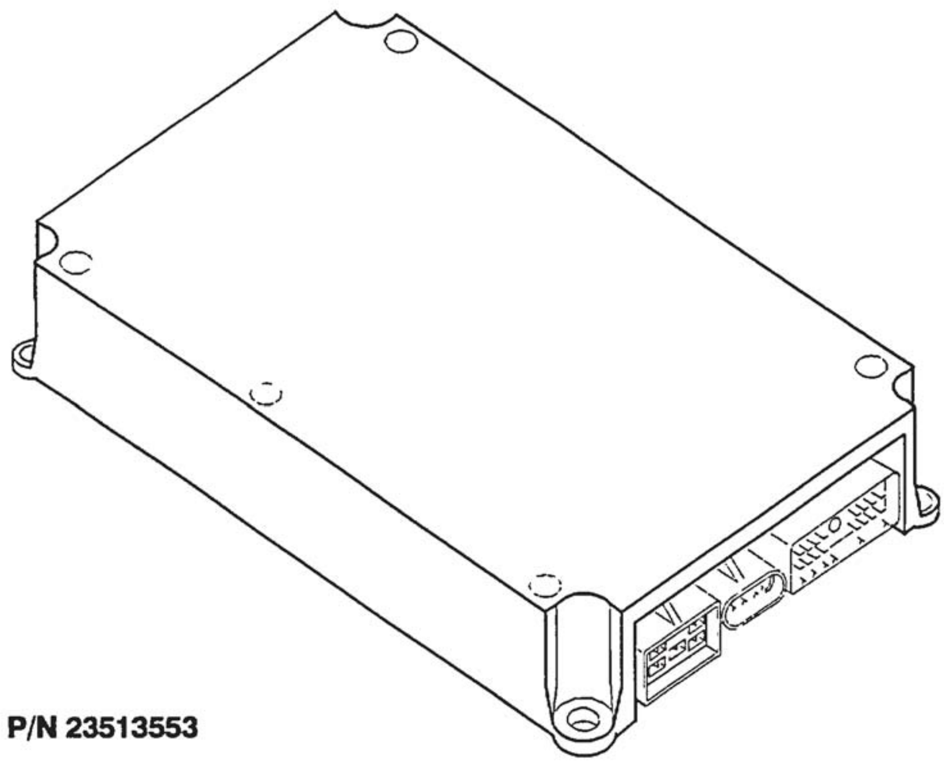
CONNECTOR
P/N 12066317
COLOR BLACK
TERMINAL
P/N 12103881
PLUG
P/N 12034413

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 57
J1587 CODE: S249 12 · J 1922 DATA LINK FAULT

NOTE - This chart is only to be used if:
1)All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDE C-**III** was started at step Start-1, pg 3-345.41 and you have now been referred here

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
57-1 Multiple code check		
• Were there any codes beside 249/12?	Yes.	Service other codes first.
	No.	Go to 57-2.
57-2 Check for open		
• Turn ignition off. • Unplug the 6 pin communications connector. • Place a jumper wire across pins. A (#800) and B (#801) • Locate other ends of wire #800 and #801 (i.e. ABS Brake system) Measure resistance between wires	Greater than 5 ohms.	One or both data lines are open. Repair open. Go to 57-30.
	Less than 5 ohms.	Go to 57-3.
57-3 Check for short		
• Remove jumper wire. shorted together repair short and go to 57-30. • Read resistance between pin A(#800) and B(#801) of the communications connector.	Less than 5 ohms.	The two data wires are
	Greater than 5 ohms. to 57-30.	Reprogram ECM then go
57-30 Verify repairs		
• Turn ignition off. • Reconnect all connections. • Turn ignition on. • Clear codes. • Start and run engine for 1 minute. • Note status of check engine light. •Check for codes.	No codes.	Repairs are complete.
	Codes appears.	Go to Start 1, pg 3-345.41. All diagnostics are complete. Review to find the error.



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 61
J1587 CODE: S XXX O- INJECTOR RESPONSE TIME LONG

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE
61-1 Determine Cylinder(s) with Fault

- Use the chart on page 3-345.366 to find the Injector location logging the codes

INJECTOR RESPONSE TIME TOO LONG (SAE: Data valid but above normal range)

If one or more codes on one bank of injectors:

CHECK ECM

o At the ECM disconnect the 5-pin injector harness connector for the injector(s) logging the code(s).

o Establish a good ECM case ground by measuring the resistance across two points on the ECM. The resistance should read less than or equal to 1 OHM.

o Once a good case ground is established, keep one of the measurement proves in place and move the other probe to one of the five exposed male injector terminals on the ECM and read the resistance. Repeat the procedures at each of the five terminals.

O A resistance value of less than 1000 OHMs (1K OHMs) at any terminal indicates a faulty injector driver circuit. Replace ECM.

NOTE: **The injector driver returns (circuit 619/pin G and circuit 620/pin A) will have a resistance reading above 100,000 OHMs (100 K OHMs) on a good ECM.**

The remaining injector drive circuits will have resistance reading above 1,000,000 OHMs (1 M OHMs) on a good ECM.

DDEC III Injector Numbering #1 (SID 1)

SAE standard diagnostics identify injector diagnostics by SID (Subsystem Identifier). DDEC assigns these numbers in electrical firing order c of each ECM, which is not always the same as the mechanical firing order. The following table defines this order.

	#1(SID1)	#2(2)	#3(3)	#4(4)	#5(5)	#6(6)	#7(7)	#8(8)	#9(9)	#10(10)	#11(11)	#12(12)	#13(13)	#14(14)	#15(15)	#16(16)	#17(47)	#18(48)	#19(4)	#20(50)
S50	1	3	2	4																
S60	1	5	3	6	2	4														
4L71 RH	4	2	1	3																
6L71 RH	3	6	2	4	1	5														
6L71 LH	2	6	3	5	1	4														
12V71 RH	1L	3R	3L	2R	2L	1R	5L	4R	4L	6R	6L	5R								
6V92RH	1L	3R	3L	2R	2L	1R														
6V92 LH	2R	3L	3R	1L	1R	2L														
8V92 RH	3R	3L	4R	4L	2R	2L	1R	1L												
12V92 RH	1L	3R	3L	2R	2L	1R	6L	5R	5L	4R	4L	6R								
16V92RH	1L	2R	2L	4R	4L	3R	3L	1R	8L	6R	6L	5R	5L	7R	7L	8R				
8V149RH	1L	3R	3L	4R	4L	2R	2L	1R												
8V149 LH	1R	2L	2R	4L	4R	3L	3R	1L												
12V149 RH	1L	3R	3L	2R	2L	1R	5L	4R	4L	6R	6L	5R								
12V149 LH	1R	2L	2R	3L	3R	1L	6L	6R	4L	4R	5L	5R								
16V149 RH	1L	2R	2L	4R	4L	3R	3L	1R	8L	6R	6L	5R	5L	7R	7L	8R				
16V149 LH	1R	3L	3R	4L	4R	2L	2R	1L	7R	5L	5R	6L	6R	8L	8R	7L				
20V149RH	5L	4R	4L	6R	6L	7R	7L	5R	1L	3R	31.	2R	2L	1R	10L	9R	9L	8R	8L	10R
20V149 LH	7L	7R	6L	6R	4L	4R	5L	5R	1R	2L	2R	3L	3R	1L	8L	8R	9L	9R	10L	10R

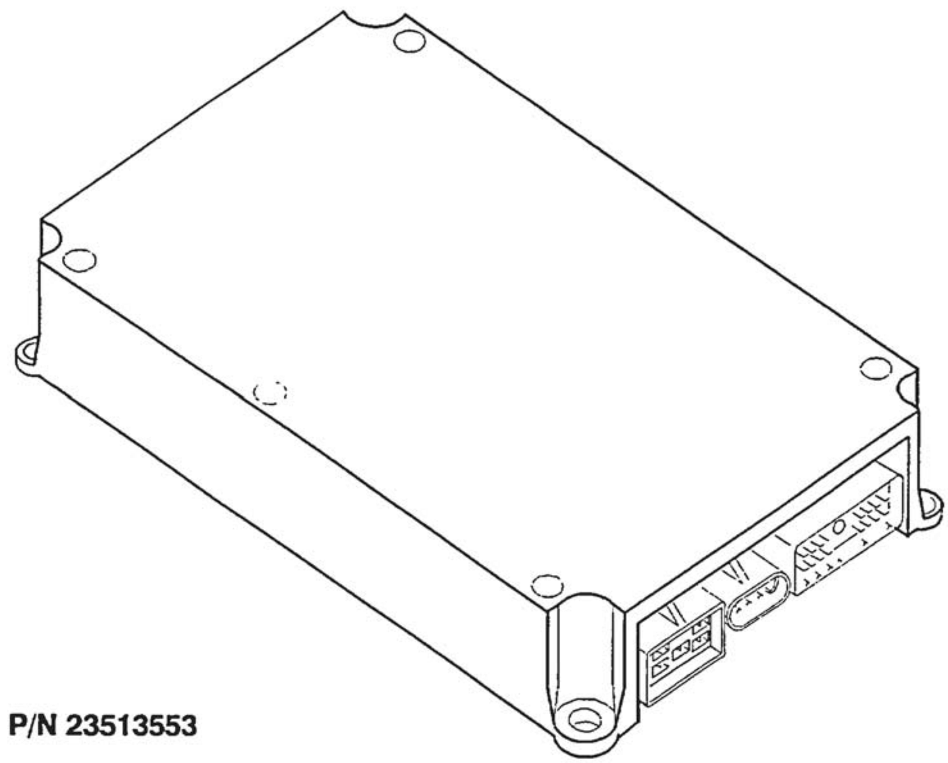
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 62
J1587 CODE: SXXX 3/4 - AUXILIARY OUTPUT SHORT TO BATTERY/ AUXILIARY OUTPUT OPEN CIRCUIT

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE		
62-1 Determine SAE Codes		
• 26-3	Auxiliary ouput	#1 short to battery.
• 26-4	Auxiliary ouput	#1 open circuit.
• 40-3	Auxiliary ouput	#2 short to battery.
• 40-4	Auxiliary ouput	#2 open circuit.
• 53-3	Auxiliary ouput	#5 short to battery.
• 53-4	Auxiliary ouput	#5 open circuit.
• 55-3	Auxiliary ouput	#7 short to battery.
• 55-4	Auxiliary ouput	#7 open circuit.
• 56-3	Auxiliary ouput	#8 short to battery.
• 56-4	Auxiliary ouput	#8 open circuit.



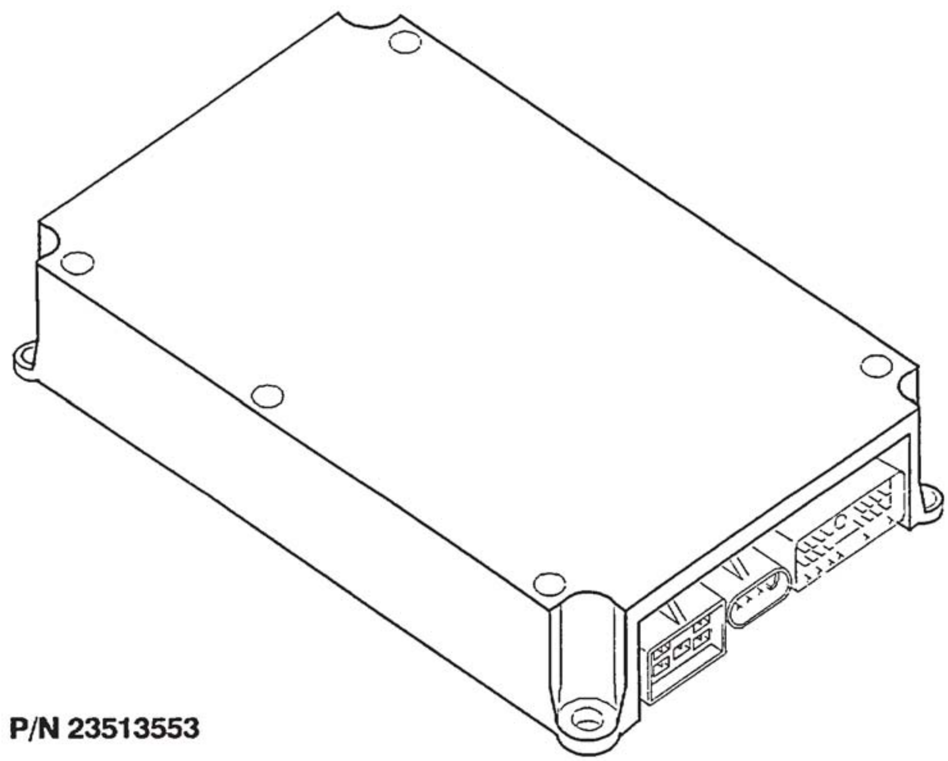
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 63
J1587 CODE: SXXX 3/4 · PWM SHORT TO BATTERY/PWM OPEN CIRCUIT

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE		
63 Determine SAE Codes		
• 57-3	PWM #1	Short to battery.
• 57-4	PWM #1	Open circuit.
• 58-3	PWM #2	Short to battery.
• 58-4	PWM #2	Open circuit.
• 59-3	PWM #3	Short to battery.
• 59-4	PWM #3	Open circuit.
• 60-3	PWM #4	Short to battery.
• 60-4	PWM #4	Open circuit.



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 71
J1587 CODE: S XXX 1 - INJECTOR RESPONSE TIME SHORT

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
71-1 Determine Cylinder(s) with Fault		
• Use the chart on page 3-345.372 to find the injector location logging the codes.		

#1 (SID 1)

DDEC III Injector Numbering

SAE standard diagnostics identify injector diagnostics by SID (Subsystem Identifier). DDEC assigns these numbers in electrical firing order of each ECM, which is not always the same as the mechanical firing order. The following table defines this order.

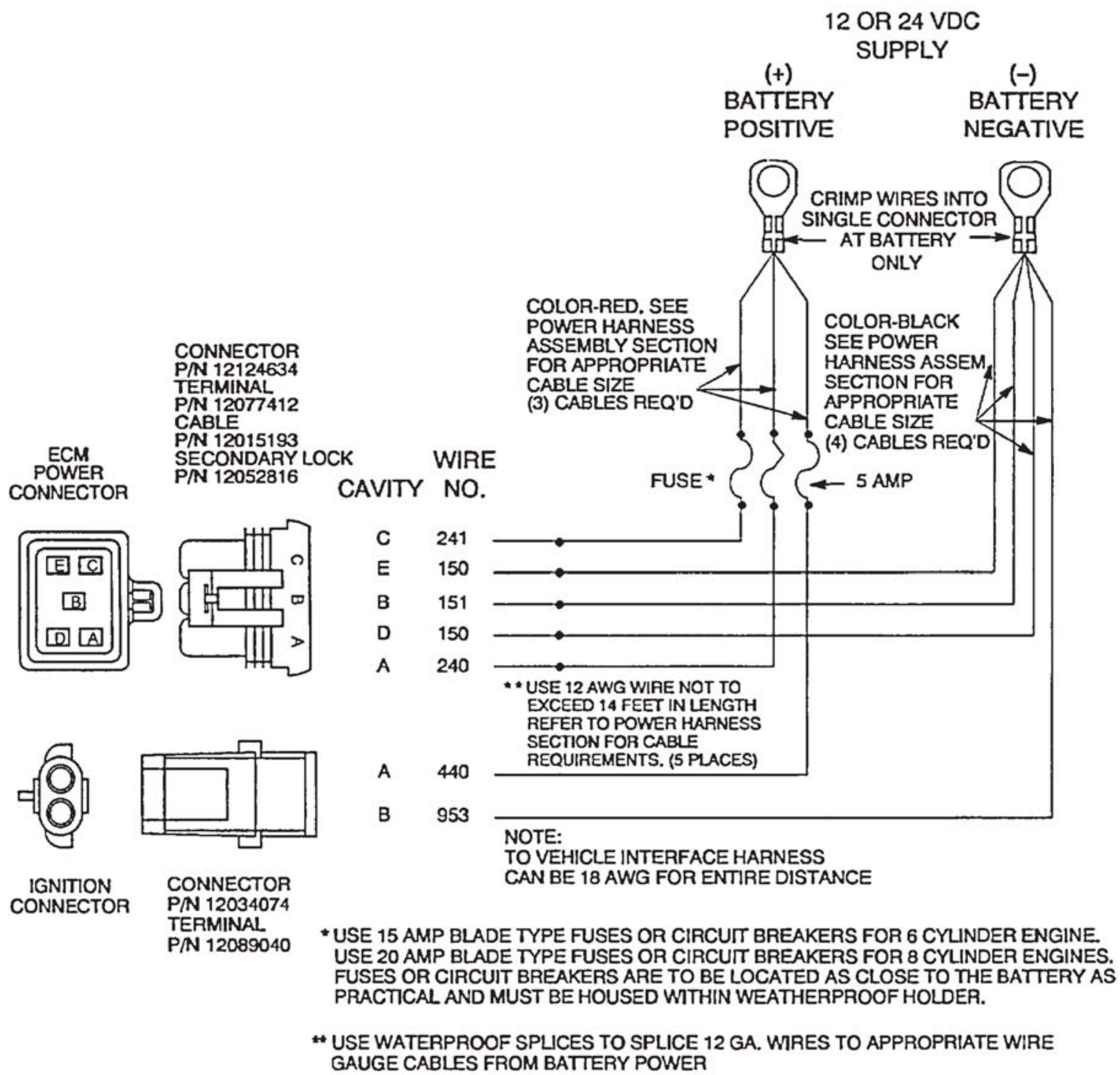
	#1(SID 1)	#2(2)	#3(3)	#4(4)	#5(5)	#6(6)	#7(7)	#8(8)	#9(9)	#10(10)	11(11)	#12(12)	#13(13)	#14(14)	#15(15)	#16(16)	#17(47)	#18(48)	#19(49)	#20(50)
S50	1	3	2	4																
S60	1	5	3	6	2	4														
4L71 RH		4	2	1	3															
6L71 RH		3	6	2	4	1	5													
6L71 LH		2	6	3	5	1	4													
12V71 RH	1L	3R	3L	2R	2L	1R	5L	4R	4L	6R	6L	5R								
6V92 RH	1L	3R	3L	2R	2L	1R														
6V92 LH		2R	3L	3R	1L	1R	2L													
8V92 RH	3R	3L	4R	4L	2R	2L	1R	1L												
12V92 RH	1L	3R	3L	2R	2L	1R	6L	5R	5L	4R	4L	6R								
16V92 RH	1L	2R	2L	4R	4L	3R	3L	1R	8L	6R	6L	5R	5L	7R	7L	8R				
8V149 RH	1L	3R	3L	4R	4L	2R	2L	1R												
8V149 LH	1R	2L	2R	4L	4R	3L	3R	1L												
12V149 RH	1L	3R	3L	2R	2L	1R	5L	4R	4L	6R	6L	5R								
12V149 LH	1R	2L	2R	3L	3R	1L	6L	6R	4L	4R	5L	5R								
16V149 RH	1L	2R	2L	4R	4L	3R	3L	1R	8L	6R	6L	5R	5L	7R	7L	8R				
16V149 LH	1R	3L	3R	4L	4R	2L	2R	1L	7R	5L	5R	6L	6R	8L	8R	7L				
20V149 RH	5L	4R	4L	6R	6L	7R	7L	5R	1L	3R	3L	2R	2L	1R	10L	9R	9L	8R	8L	10R
20V149 LH	7L	7R	6L	6R	4L	4R	5L	5R	1R	2L	2R	3L	3R	1L	8L	8R	9L	9R	10L	10R

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 72
J1587 CODE: P840 0 - VEHICLE OVERSPEED
P84 11 - VEHICLE OVERSPEED (ABSOLUTE)

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
72 Overspeed		
• These codes Indicate the vehicle speed has exceeded the limits programmed into the ECM. Verify cruise control/VSS information.		



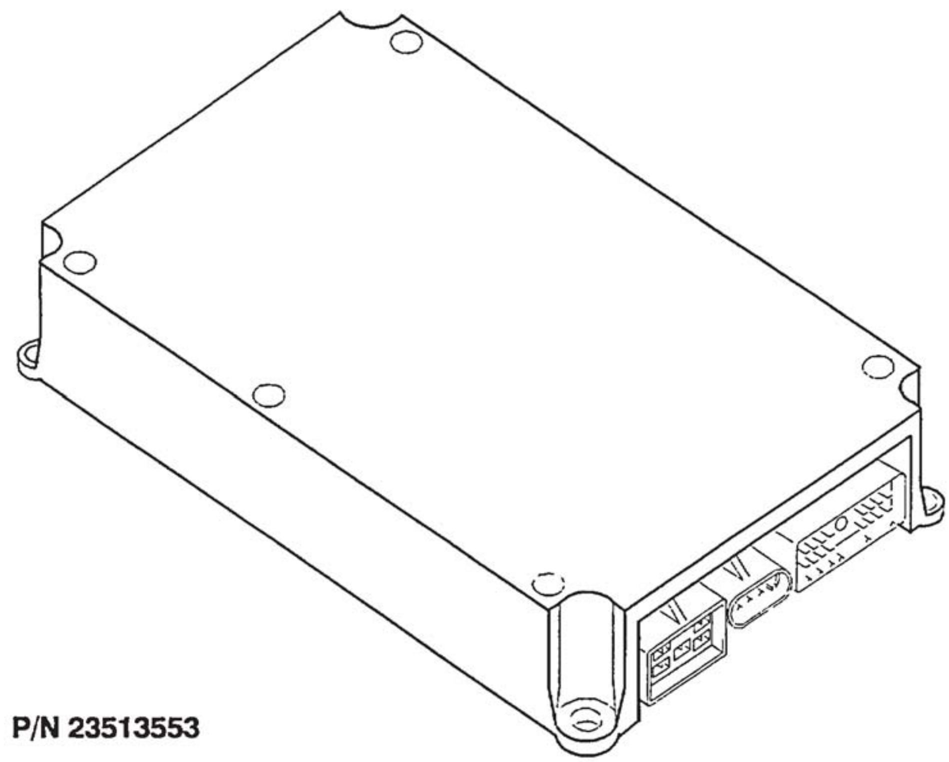
POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 75
J1587 CODE: P168 O - BATTERY VOLTAGE HIGH

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
75.1 High Voltage		
• Turn ignition on. • Plug In DDR. • Read codes.	Any code(s) other than 168/0 →	Service other codes first.
	Code 168/0. →	Code 168/0 indicates too high a voltage to the ECM. Check batteries and/or vehicle charging system.



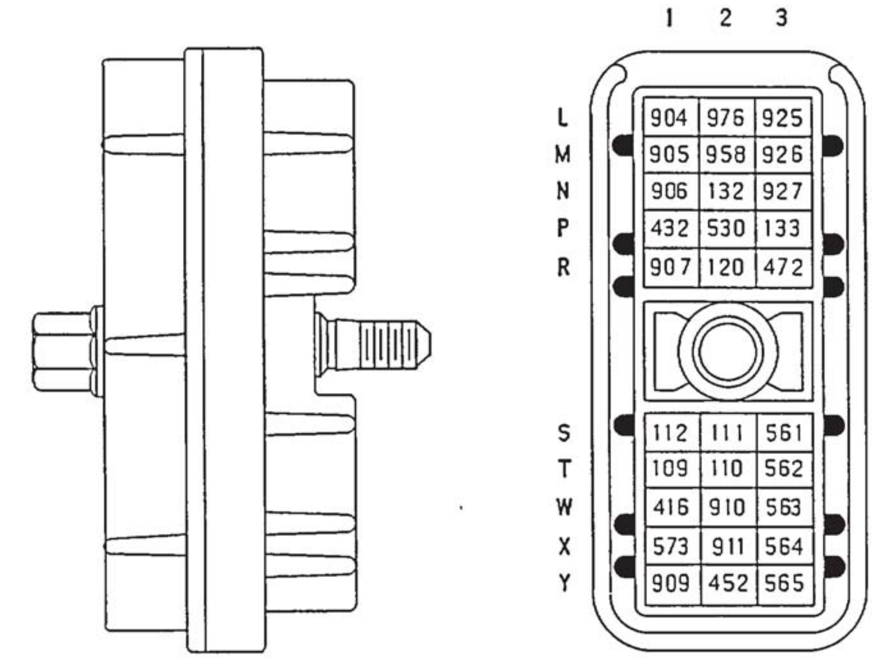
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

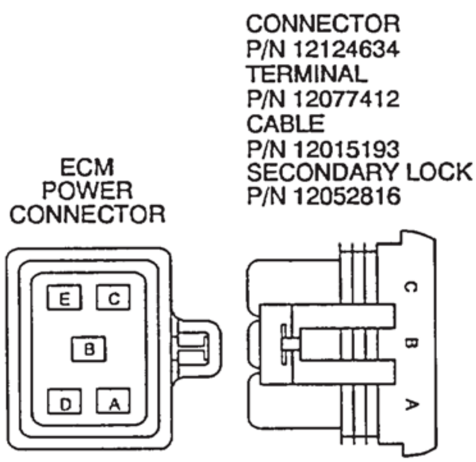
E. FLASH CODE: 81 - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE HIGH
J1587 CODE: P98 3 - OIL LEVEL CIRCUIT FAILED HIGH
P101 3 - CRANKCASE PRESSURE CIRCUIT FAILED HIGH

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
81-1 Multiple Code Check		
• Were there any other active codes beside Code 98-101/3?	No other codes. →	Go to 81-2.
	Yes, any or all of the following codes: 110, 175/3 or 4, 174/3 or 4, 102/3, 94/4. →	Go to ENG5V-1, page 3-345.413.
	Yes - but none of the above.	
81.2 Sensor Check		
• Turn ignition off. • Disconnect CCM connector. • Turn ignition on. • Start and run engine. • Read ACTIVE CODES.	Code 98:101/4 (and any codes except Code 81). →	Go to 81-3.
	Code 98-101/3 (and any other codes). →	Go to 81-5.
81-3 Return Circuit Check		
• Turn ignition off. • Disconnect the engine harness connector at ECM. • Install a jumper wire between pins A and B of CCM harness connector. • Read resistance between sockets N1 and Y2 on the engine harness connector.	Less than or equal to 5 ohms. →	Go to 81-4.
	Greater than 5 ohms. →	Return line (ckt #452) is open. Repair open. Then go to 81-30.
81.4 Check CCM Connectors		
• Inspect terminals at CCM connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or Sockets.	Terminals and connectors are okay. →	Replace CCM. Then go to 81-30.
	Problem found. →	Repair terminals/connectors. Then go to 81-30.



ECM ENGINE HARNESS CONNECTOR



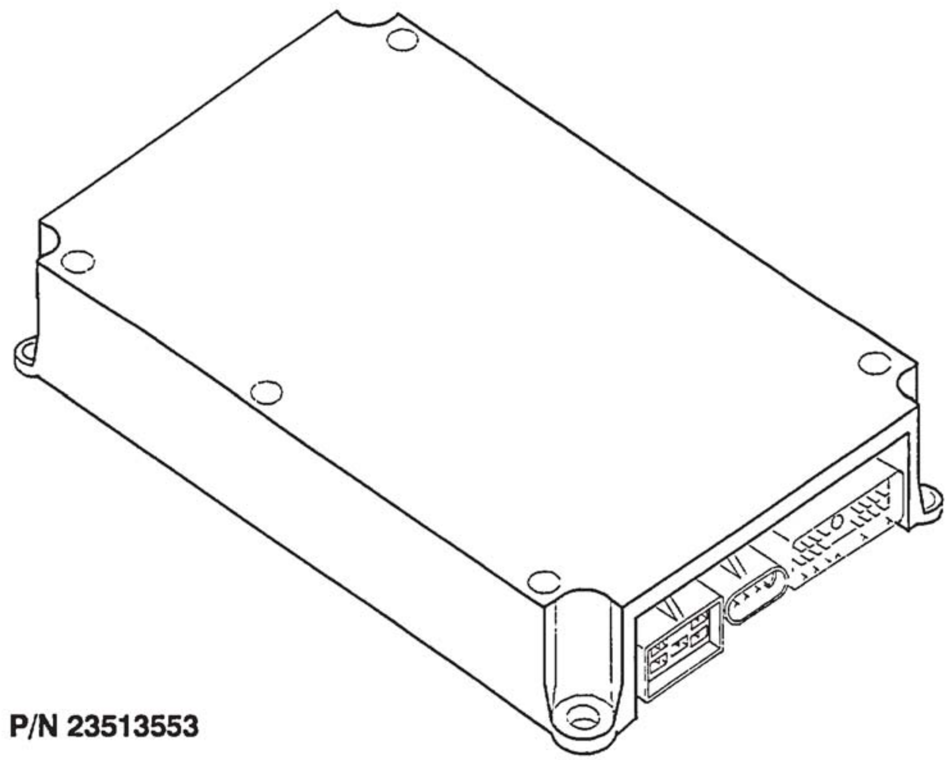
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 81 - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE HIGH (CONT'D)
J1587 CODE: P98 3 - OIL LEVEL CIRCUIT FAILED HIGH
P101 3 - CRANKCASE PRESSURE CIRCUIT FAILED HIGH

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
81.5 Check for Short		
• Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets W1 and N1 on engine harness connector.	Less than or equal to 10,000 ohms.	Signal line (ckt #906) is shorted to engine +5 Volt line (ckt #416). Repair short. Then go to 81-30.
	Greater than 10,000 ohms or open.	Go to 81-6.
81-6 Check for Short to Battery +		
• Remove both fuses to ECM. • Disconnect vehicle harness and 5-way power harness connectors at ECM. • Read resistance between sockets N1 of engine harness connector and socket B3 of vehicle harness connector. • Also read resistance between socket N1 on engine harness connector and the following sockets on the 5-way power harness connector: A, and C.	All readings are greater than 10,000 ohms or open.	Go to 81-8.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 81-30.
81-7 Final Check		
• Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run for 1 minute or until "Check Engine" light comes on. • Stop engine. • Clear ACTIVE CODES	Code 98-101/3.	Replace ECM. Then go to 81-30.
	No codes.	Repairs are complete.
	Any other codes except Code 98-101/3.	Go to START-1, pg 3-345.41, to service other codes.
81.8 Check CCM Connectors		
• Inspect terminals at CCM connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets	Terminals and connectors are okay.	Replace CCM. Then go to 81-7.
	Problem found	Repair terminals/connectors. Then go to 81-30.

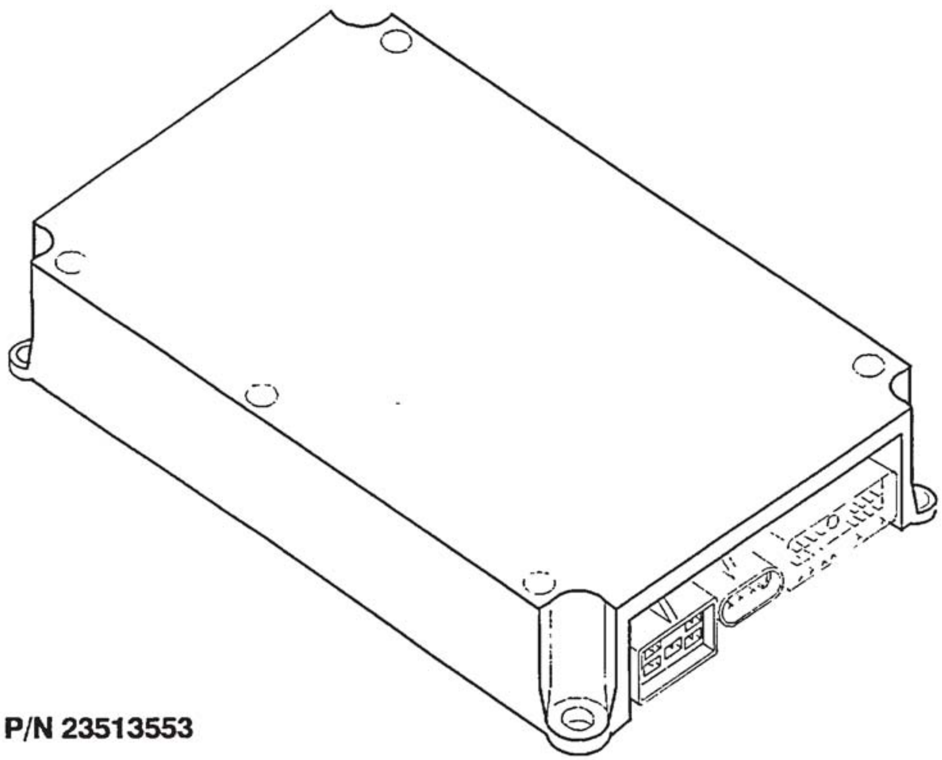


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 81 - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE HIGH (CONT'D)
J1587 CODE: P98 3 - OIL LEVEL CIRCUIT FAILED HIGH
P101 3 - CRANKCASE PRESSURE CIRCUIT FAILED HIGH

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
81-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • Read INACTIVE CODES.	(No codes).	Repairs are complete.
	Code 98-101/3 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find error.
	Any other codes. except Code 98-101/3.	Go to START-1, page 3-345.41, to service other codes.



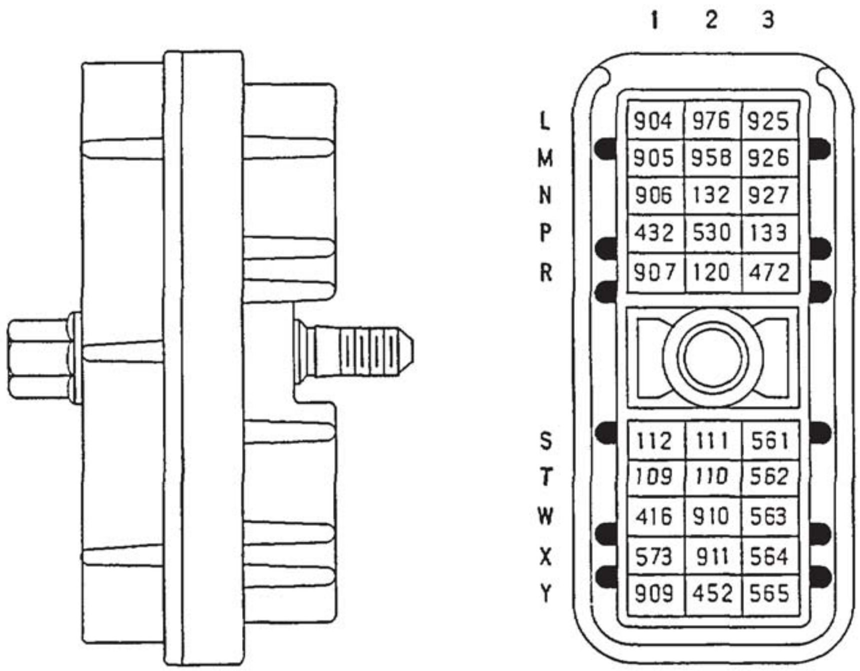
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

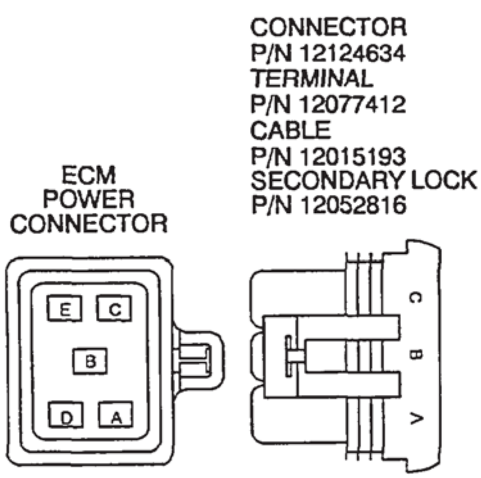
E. FLASH CODE: 82 - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE LOW
J1587 CODE: P98-4 - OIL LEVEL CIRCUIT FAILED LOW
P101.4 - CRANKCASE PRESSURE CIRCUIT FAILED LOW

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
82-1 Multiple Code Check		
• Were there any other active codes beside Code 98-101/4?	No other codes.	Go to 82-2.
	Yes, any or all of the following codes: 110, 175/3 or 4, 174/3 or 4, 102/3, 94/4.	Go to ENG5V-1, page 3-345.413.
	Yes - but none of the above.	Go to 82-2.
82-2 Sensor Check		
• Turn ignition off. • Disconnect CCM connector and install a jumper wire between sockets B and C of CCM harness connector. • Turn ignition on. • Read ACTIVE CODES. • If active Code 98-101/3 or 4 exists, go to RESULT column.	Code 98-101/3 (and any codes except Code 82).	Check to be sure ECM and CCM connectors are wired properly. If wired properly then go to 82-3.
	Code 98-101/4 (and any other codes).	Go to 82-4.
	No codes.	Go to 82-4.
82-3 Check CCM Connectors		
• Turn ignition off. • Inspect terminals at ECM connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets.	Terminals and connectors are okay.	Replace CCM sensor. Then go to 82-30.
	Problem found. Then go to 82-30.	Repair terminals/connectors.



ECM ENGINE HARNESS CONNECTOR



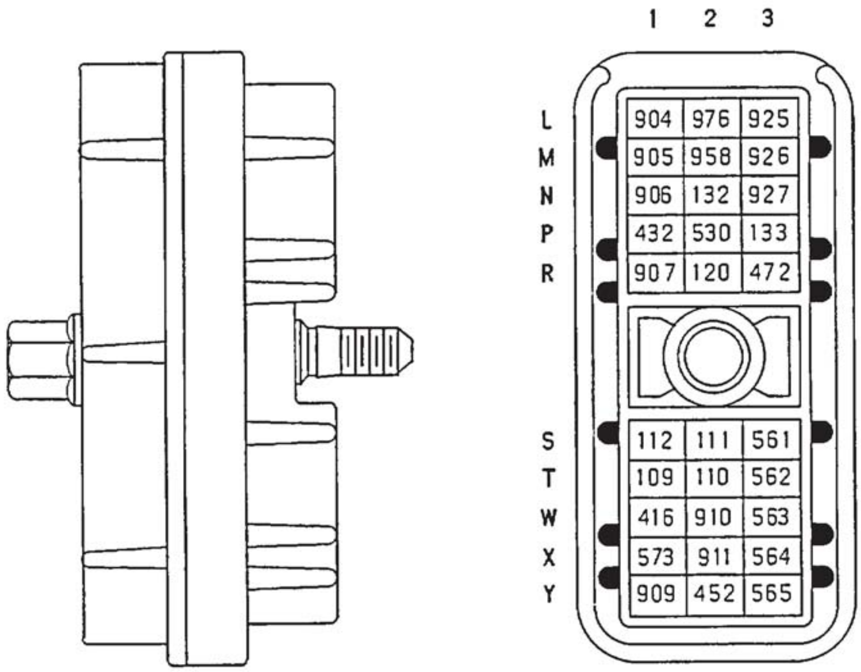
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

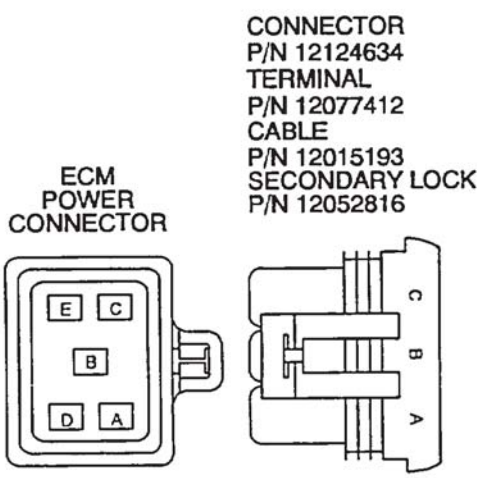
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 82 - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE LOW (CONT'D)
J1587 CODE: P98-4 - OIL LEVEL CIRCUIT FAILED LOW
P101.4 - CRANKCASE PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
82-4 Check for +5 Volts		
• Turn ignition off. • Remove jumper wire. • Connect vehicle harness to ECM. • Turn ignition on. • Read voltage on CCM harness connector, socket C (red lead) to socket A (black lead).	Between 4 to 6 volts. →	Go to 82-5.
	Less than 4 volts. →	Go to 82-8.
	Greater than →	Go to 82-10.
82-5 Check for Signal Open		
• Turn ignition off. • Disconnect engine harness connector at ECM. • Install a jumper wire between sockets A and B of CCM harness connector. • Read resistance between sockets N1 and Y2 on engine harness connectors.	Less than or equal to 5 ohms. →	Go to 82-11.
	Greater than 5 ohms or open. →	Signal line (ckt #906) is open. Repair open. Then go to 82-30.
82-6 Check for Short		
• Remove jumper wire. • Disconnect engine harness connector at ECM. • Read resistance between sockets A and B on CCM harness connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms →	Signal line (ckt #906) is shorted to return line (ckt #452) or battery ground. Repair short. Then go to 82-30.
	Greater than 10,000 ohms or open on both readings. →	Go to 82-12.
82-7 Check ECM Connectors		
• Check terminals at ECM engine harness connector (both ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Especially W1, N1 and Y2 terminals and pins at ECM.	Terminals and connectors are okay. →	Replace ECM. Then go to 82-30.
	Problem found. Then go to 82-30. →	Repair terminals/connectors.



ECM ENGINE HARNESS CONNECTOR



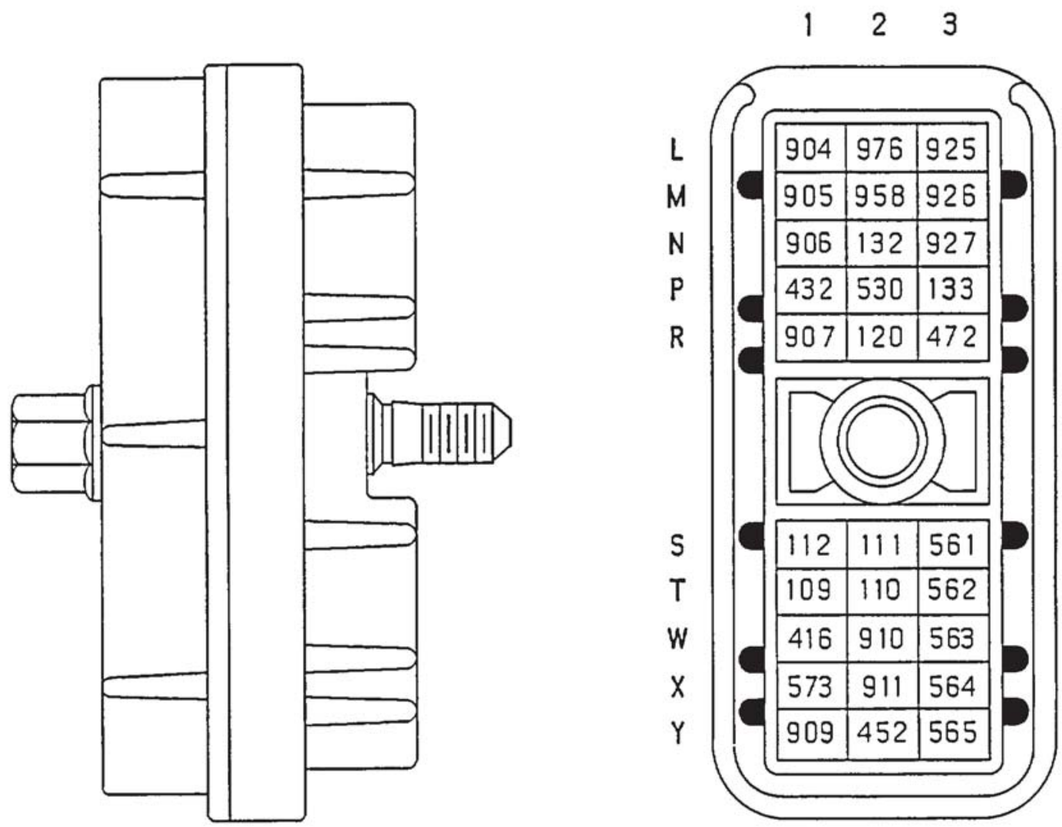
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 82. - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE LOW (CONT'D)
J1587 CODE: P984 - OIL LEVEL CIRCUIT FAILED LOW
P101 -4CRANKCASE PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
82-8 Check for Open +5 Volt Line		
• Turn ignition off. • Disconnect engine harness connector at ECM, • Install a jumper wire between sockets A and C of CCM harness connector. • Read resistance between sockets W1 and Y2 on engine harness connectors.	Less than or equal to 5 ohms.	Go to 82-9.
	Greater than 5 ohms or open. Then go to 82-30.	The engine +5 Volt line (Ckt #416) is open. Repair open.
82-9 Check for Short		
• Remove jumper wire. • Read resistance between sockets A and C on CCM harness connector.	Less than or equal to 10,000 ohms.	The engine +5 Volt line (ckt #416) is shorted to return line (ckt #452). Repair short. Then go to 82-30.
	Greater than 10,000 ohms or open.	Go to 82-12.
82-10 Check for Short to Battery		
• Remove both fuses to ECM. • Disconnect vehicle harness and 6-way power harness connectors at ECM. • Read resistance between sockets N1 of engine harness connector and socket B3 of vehicle harness connector. • Also read resistance between socket N1 on engine harness connector and the following sockets on the 5-way power harness connector: A, and C.	All readings are greater than 10,000 ohms or open.	Go to 82-12.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 82-30.

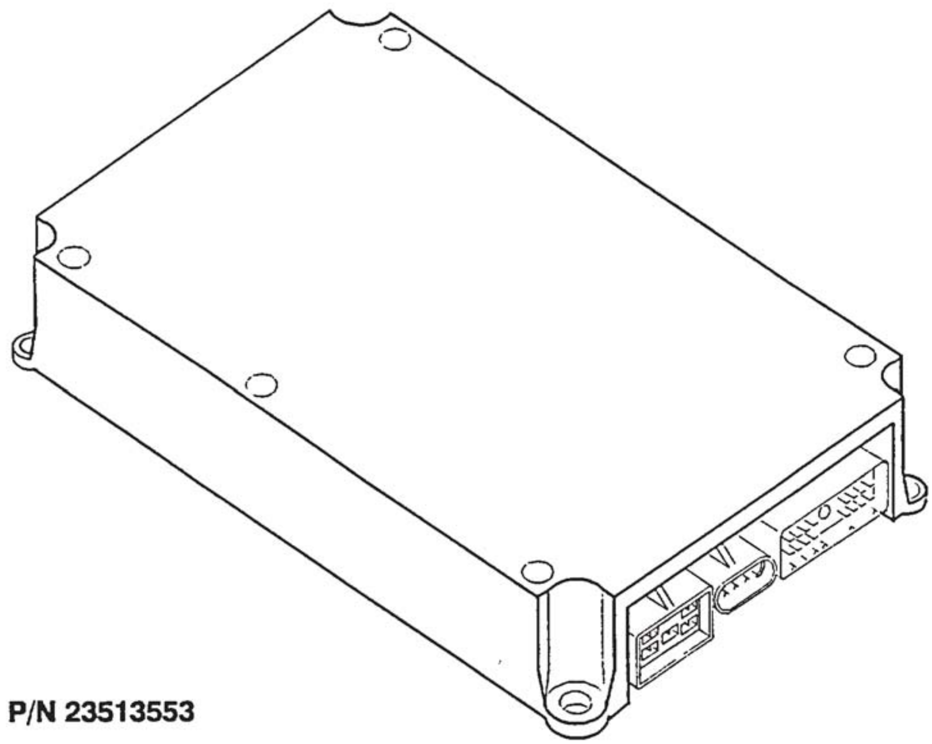


ECM ENGINE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 82 - CRANKCASE MONITOR (CCM) SIGNAL VOLTAGE LOW (CONTD)
J1587 CODE: P98-4 - OIL LEVEL CIRCUIT FAILED LOW
P101-4 - CRANKCASE PRESSURE CIRCUIT FAILED LOW

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
82-11 Check for Short on Ground		
• Turn ignition off. • Remove jumper wires. • Measure resistance between sockets N1 and Y2 on engine harness.	Greater than 10,000 ohms.	Go to 82-6.
	Less than or equal to 10,000 ohms.	Signal line (ckt #906) and return line (ckt #452) are shorted together. Repair short. Then go to 82-30.
82-12 Replace CCM		
• Turn ignition off. • Replace CCM. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run until check light comes on or for 1 minute.	Check engine light comes on.	Go to 82-7.
	Check engine light does not come on.	Go to 82-30.
82-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • Read INACTIVE CODES.	(No codes).	Repairs are complete.
	Code 98-101/4 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find error.
	Any other codes. except Code 98-101/4.	Go to START-1, page 3-345.41, to service other codes



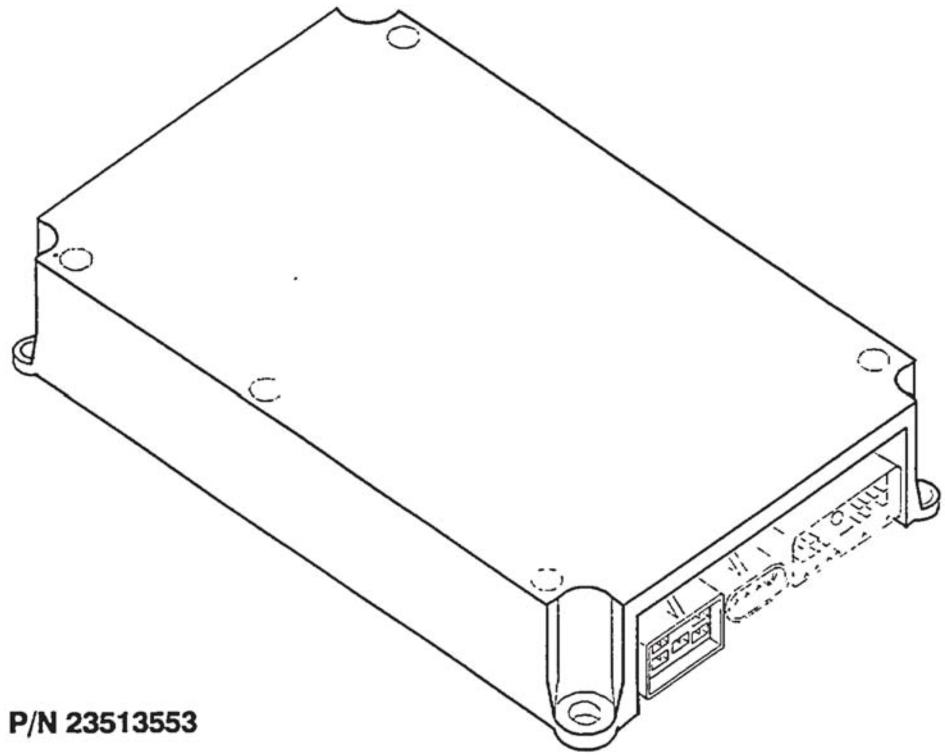
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 83
J1587 CODE: P98 0 - OIL LEVEL HIGH
P101 0 - CRANKCASE PRESSURE HIGH

NOTE - This chart is only to be used If:
1) All basic mechanical checks and physical inspections have been performed with no problem found. and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
83-1 Code Check		
• Turn ignition on. • Plug in DDR. • Read code(s).	Any code(s)other than code 98/0 or 101/0. →	Service other ones first.
	Code 98/0. →	Code 98/0 indicates the oil level sensor has sensed a high oil level. Confirm proper oil level.
	Code 101/0. →	Code 101/0 indicates the crankcase monitor has sensed a high crankcase pressure condition Refer to the engine service manual for possible causes for high crankcase pressure.



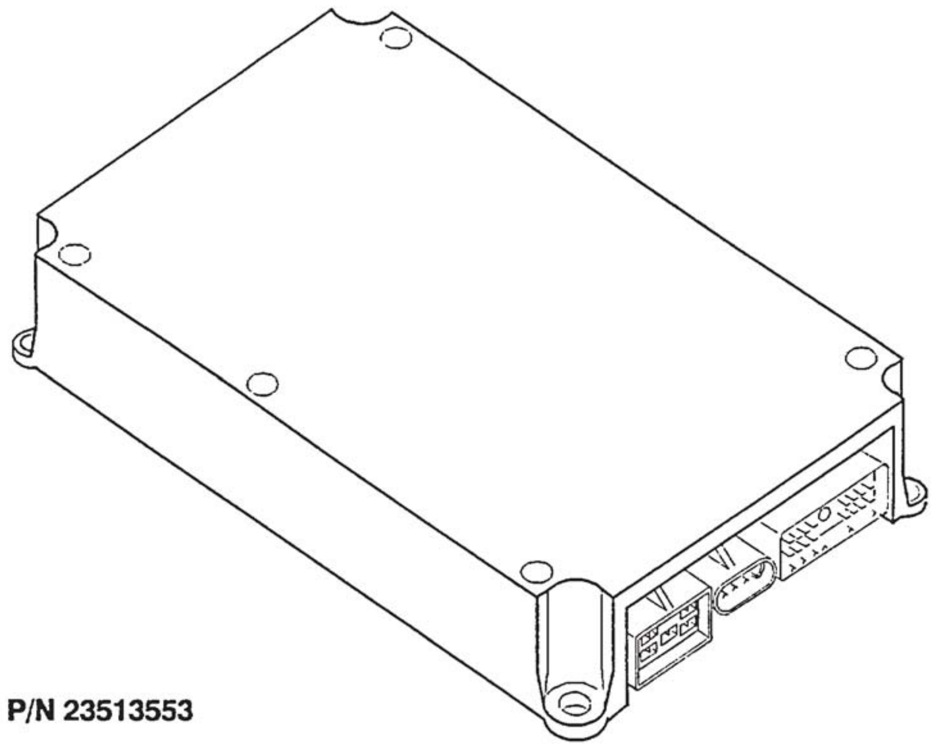
THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 84
J1587 CODE: P98 1- OIL LEVEL LOW
P101 1 - CRANKCASE PRESSURE LOW

NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
84-1 Code Check		
• Turn ignition on. • Plug in DDR. • Read code(s).	Any code(s)other than code 98/1 or 101/1. →	Service other ones first.
	Code 98/1. →	Code 98/1 indicates the oil level sensor has sensed a low oil level. Confirm proper oil level.
	Code 101/1. →	Code 101/1 indicates the crankcase monitor has sensed a low crankcase pressure condition. Refer to the engine service manual for possible causes.



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 85
J1587 CODE: P190 0 - ENGINE OVERSPEED

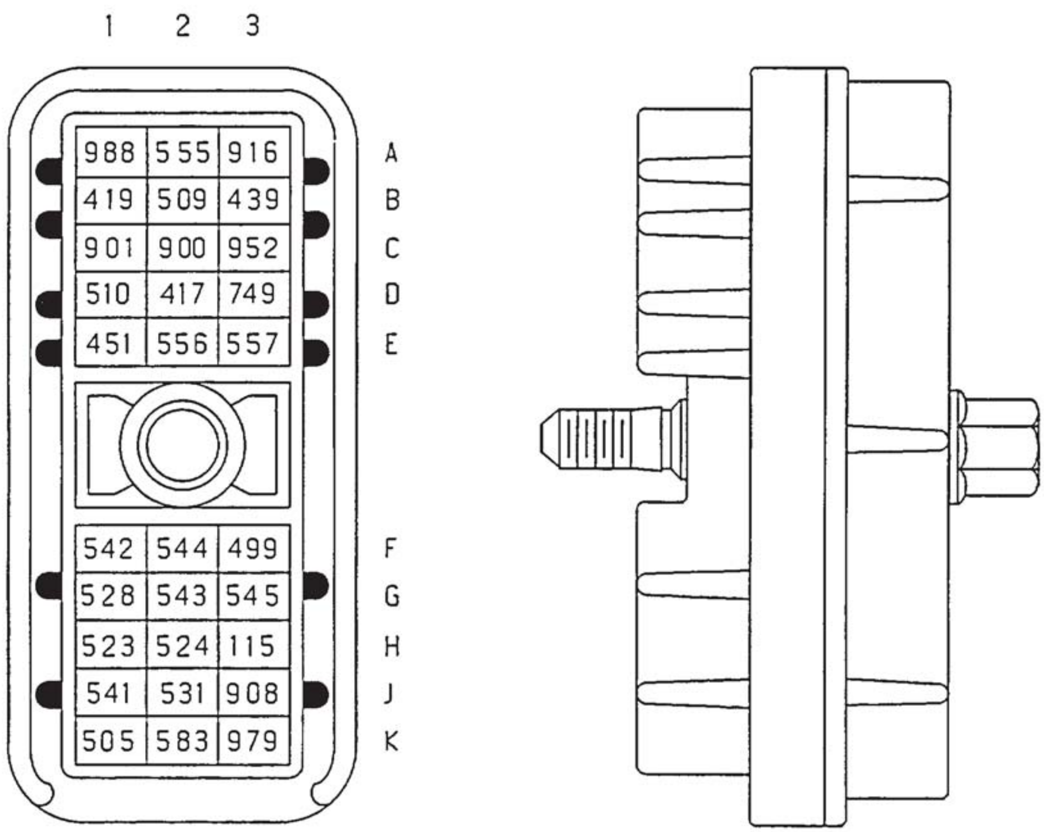
NOTE - This chart is only to be used if:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

85-1 Code Information	

This code is for information purposes only. It is logged whenever the engine has been operating over 2500 rpm for at least 2 seconds. To get complete information, do the following.

- Turn ignition on.
- Plug in DDR.
- Select inactive codes.
- At least part of the display will look like the following example:

First Occurrence
Last Occurrence
Total Number
Total Time
(For some) Min/Max Value that caused the code to be logged.



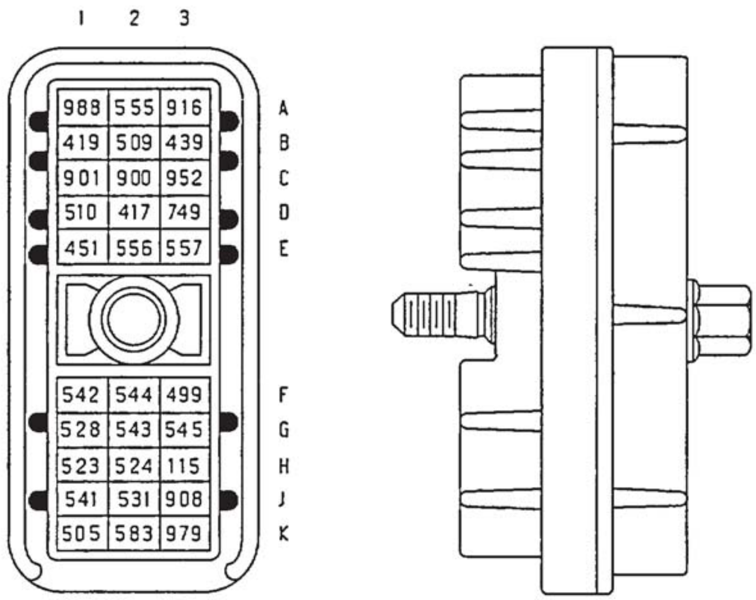
ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

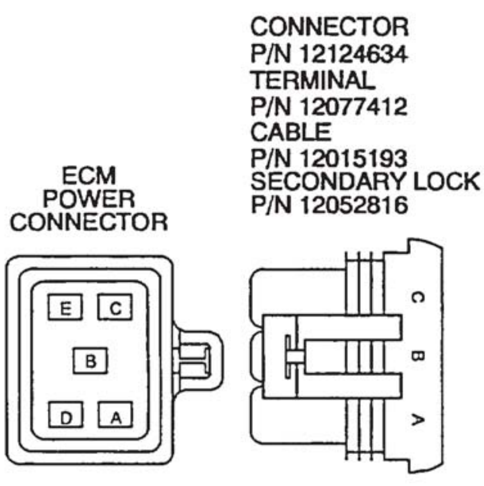
E. FLASH CODE: 86
J1587 CODE: P 73 3 - PUMP PRESSURE CIRCUIT FAILED HIGH (BELOW)
P108 3 - BAROMETRIC PRESSURE CIRCUIT FAILED HIGH · (TBD)

NOTE - This chart is only to be used If:
1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
86-1 Multiple Code Check		
• Were there any other active codes besides Code 73-3?	No other codes. →	Go to 86-2.
	Yes, 73-4. →	Go to VEH5V-1, pg 3-345.419.
	Yes - but not 73-3.	Go to 86-2.
86-2 Sensor Check		
• Turn ignition off. • Disconnect the pressure governor control sensor connector. • Turn ignition on. • Start engine and operate the pressure governor control in the "PRESSURE" mode. • Read ACTIVE CODES.	Code 73-4 (and any other codes except Code 73/3). →	Go to 86-3
	Code 73/3 (and any other codes). →	Go to 86-5.
86-3 Return Circuit Check		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between pins A and B of the PGC sensor harness connector. • Read resistance between sockets D3 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms. →	Go to 86-4.
	Greater than 5 ohms or open. →	Return line (ckt #952) is open. Repair open. Then go to 86-30.



ECM VEHICLE HARNESS CONNECTOR



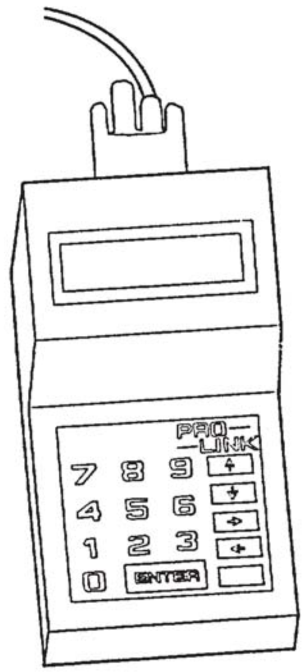
CAVITY	WIRE NO.
C	241
E	150
B	151
D	150
A	240

5-WAY ECM POWER CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 86 (Cont'd)
J1587 CODE: P73.3 PUMP PRESSURE CIRCUIT FAILED HIGH · (Below)
P108-3 BAROMETRIC PRESSURE CIRCUIT FAILED HIGH · (TBD)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
86-4 Check PGC Sensor Connectors		
• Inspect terminals at the PGC sensor connector (sensor side and harness side) for damaged, bent, corroded, and unseated pins or sockets.	Terminals and connectors okay.	Replace PGC sensor. Then go to 86-30.
	Problem found. Then go to 86-30.	Repair terminals/connectors
86-5 Check for Short to +5 Volts		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A3 and D3 on the engine harness connector. 10,000 ohms or open.	Less than or equal to 10,000 ohms.	Signal line (ckt #749) is shorted to the engine +5 volt line (ckt #916). Repair short. Then go to 86-30.
	Greater than	Go to 86-6.
86-6 Check for Short to Battery +		
• Remove both fuses to the ECM. • Disconnect the vehicle harness connector at the 5-pin power harness connector at the ECM. • Read resistance between socket D3 of the engine harness connector. • Also read resistance between socket D3 of the engine harness connector and the following sockets on the 5-pin power harness connector: A and C.	All readings are greater than	Go to 86-7.
	Any reading is less than or equal to 10,000 ohms. (or reset breakers). 86-30.	A short exists between the signal line (ckt #749) and battery +. Repair short and reinsert fuses Then go to
86-7 Check PGC Sensor Connections		
• Inspect terminals at the PGC sensor connector (sensor and harness side) for damaged, bent, corroded, and unseated pins or sockets	Terminals and connectors okay.	Replace PGC sensor. Then go to 86-8.
	Problem found.	Repair terminals/connectors. Then go to 86-30.

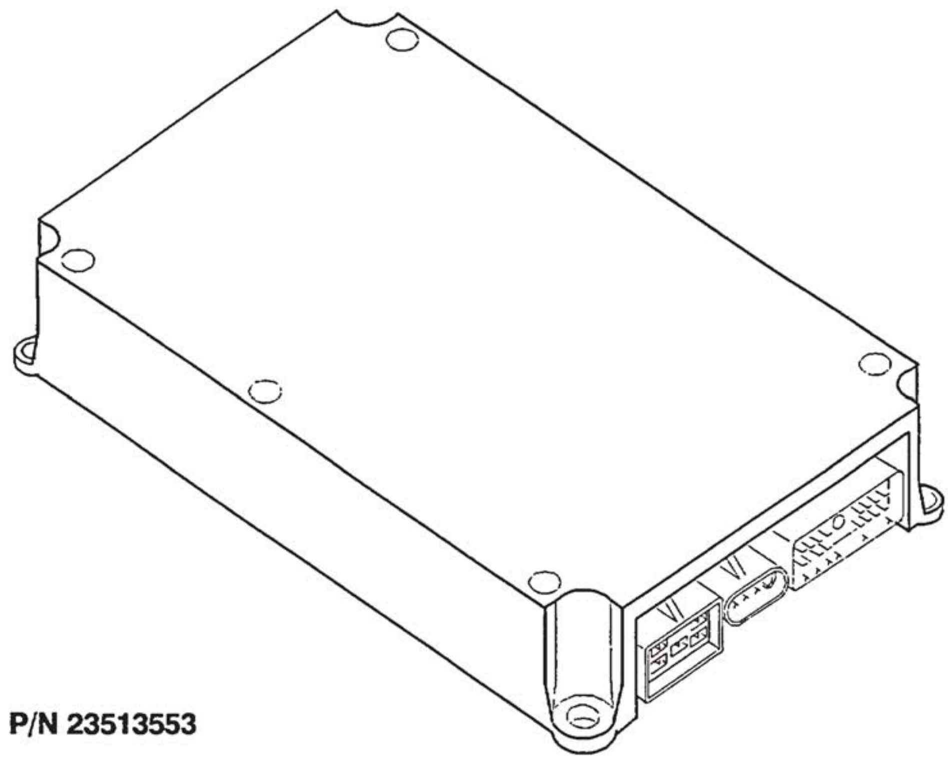


Pro-Link 9000

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 86 (Cont'd)
J1587 CODE: P73.3 PUMP PRESSURE CIRCUIT FAILED HIGH - (Below)
P108.3 BAROMETRIC PRESSURE CIRCUIT FAILED HIGH - (TBD)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
86-8 Final Check		
• Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine and run PGC in "PRESSURE" mode for one minute or until "CHECK ENGINE" light comes on. • Stop engine. • Check "ACTIVE CODES."	Code 73/3.	Reprogram ECM. Then go to 86-30.
	No codes.	Repairs are complete.
	Any codes. except Code 73/3.	Go to START-1, pg 3-345.41.
86-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. Note status of "Check Engine" light. • If "CHECK ENGINE' light does not come on, run PGC in pressure mode for 1 minute or until "CHECK ENGINE" light comes on. • Read INACTIVE codes.	(No codes).	Repairs are complete.
	Code 73/3 (and any other codes).	All system diagnostics are complete. Please review this section from the start to find the error.
	Any codes except Code 73/3.	Go to START-1, pg 3-345.41,to service other codes.



THE ELECTRONIC CONTROL MODULE - DDEC III

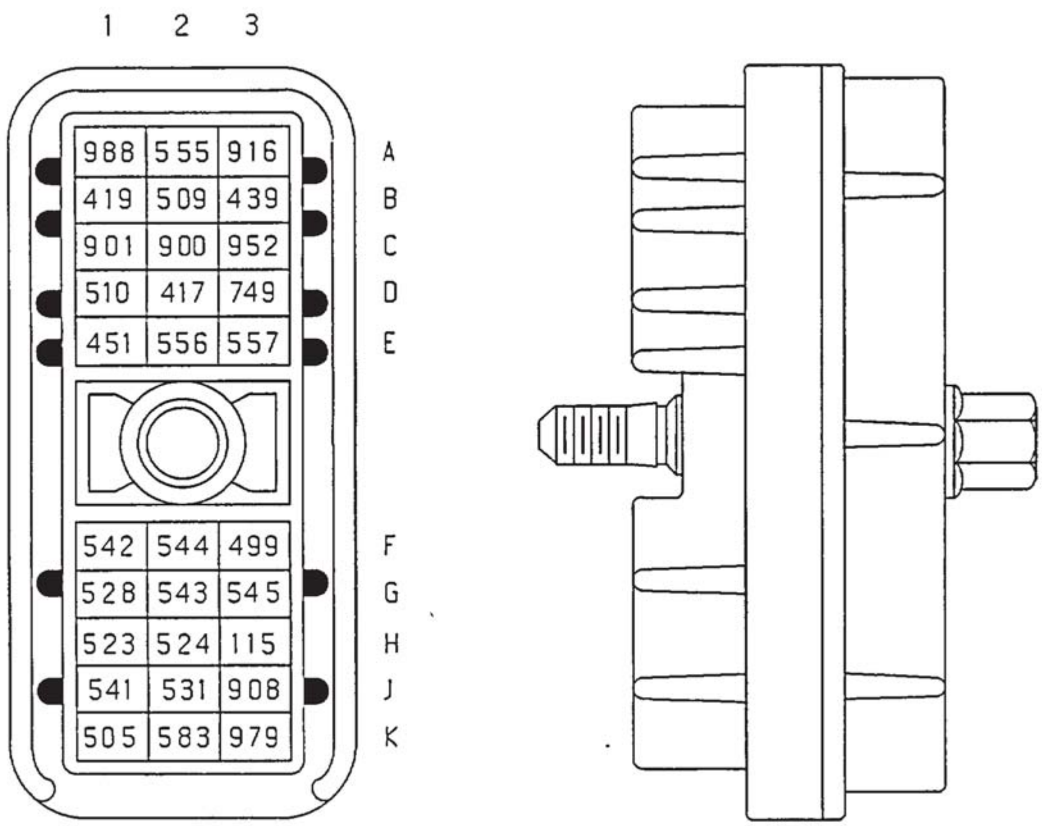
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 87
J1587 CODE: P 73 4 - PUMP PRESSURE CIRCUIT FAILED LOW. (BELOW)
P108 4 - BAROMETRIC PRESSURE CIRCUIT FAILED LOW . (TBD)

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
87-1 Multiple Code Check		
• Were there any other active codes besides Code 73-4?	No other codes.	Go to 87-2.
	Yes, 73-3.	Go to VEH5V-1, pg 3-345.419.
	Yes - but not 73-3.	Go to 87-2.
87-2 Sensor Check		
• Turn ignition off. • Disconnect the PGC sensor connector and install a jumper between sockets B and C of the PGC sensor connector. • Turn ignition on. • Start engine and operate the PGC in the "PRESSURE" mode. • Read ACTIVE CODES.	Code 73-3 (and any code except Code 73-4.	Check to be sure the ECM and PGC sensor connectors are wired properly. If wired properly, go to 87-3.
	Code 73-4 (and any other codes).	Go to 87-4.
	No codes.	Go to 87-4.
87-3 Check PGC Sensor Connectors		
• Turn ignition off. • Inspect terminals at the PGC sensor connectors (sensor and harness side) for damaged, bent, corroded, and unseated pins or sockets.	Terminals and connectors okay.	Replace PGC sensor. Then go to 87-30.
	Problem found. Then go to 87-30.	Repair terminals/connectors.

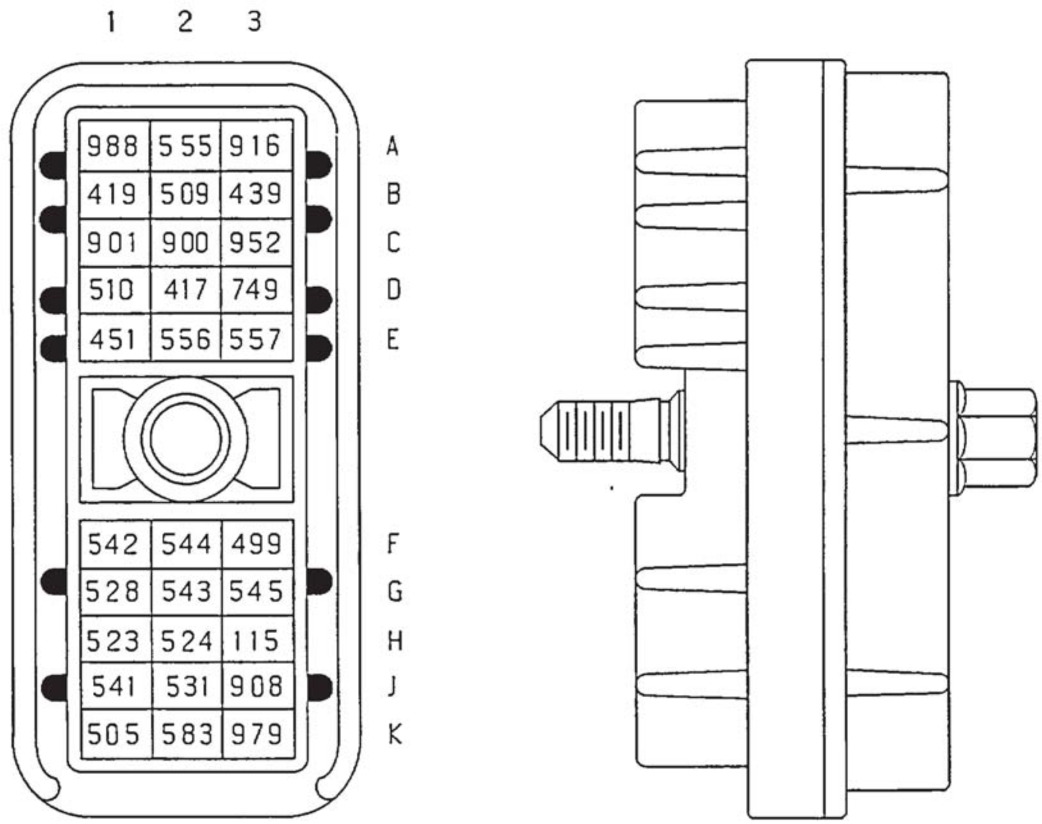


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 87 (Cont'd)
J1587 CODE: P73.4 PUMP PRESSURE CIRCUIT FAILED LOW . (Below)
P108.4 BAROMETRIC PRESSURE CIRCUIT FAILED LOW - (TBD)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
87-4 Check for Short to +5 Volts		
• Turn ignition off. • Remove jumper wire. • Turn ignition on. • Read voltage on PGC sensor harness connector socket C (red lead) and socket A (black lead).	Between 4 and 6 volts.	Go to 87-5.
	Less than 4 volts.	Go to 87-8
	Greater than 6 volts.	Go to troubleshooting chart for Code 86.
87-5 Check for Signal Open		
• Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Install a jumper wire between sockets A and B of the PGC sensor connector. • Read resistance between sockets D3 and C3 on the vehicle harness connector.	Less than or equal to 5 ohms.	Go to 87-6
	Greater than 5 ohms or open.	Signal line (ckt #749) is shorted to return line (ckt #952) or battery ground. Repair short. Then go to 87-30.
87-6 Check for Short		
• Remove jumper wire. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A and B on the PGC sensor connector. • Also read resistance between socket B and a good ground.	Less than or equal to 10,000 ohms on either reading. Then go to 87-30.	Signal line (ckt #749) is shorted to return line (ckt #952) or battery ground. Repair short.
	Greater than 10,000 ohms or open	Go to 87-10.
87-7 Check ECM Connectors		
• Check terminals at the ECM vehicle harness the ECM and harness side) for damaged, bent, corroded and unseated pins or sockets. Especially D3, C3, A3 pins and terminals.	Terminals and connector (both	Replace ECM. Then go to 87-30. connectors okay.
	Problem found. Then go to 87-30.	Repair terminals/connectors.

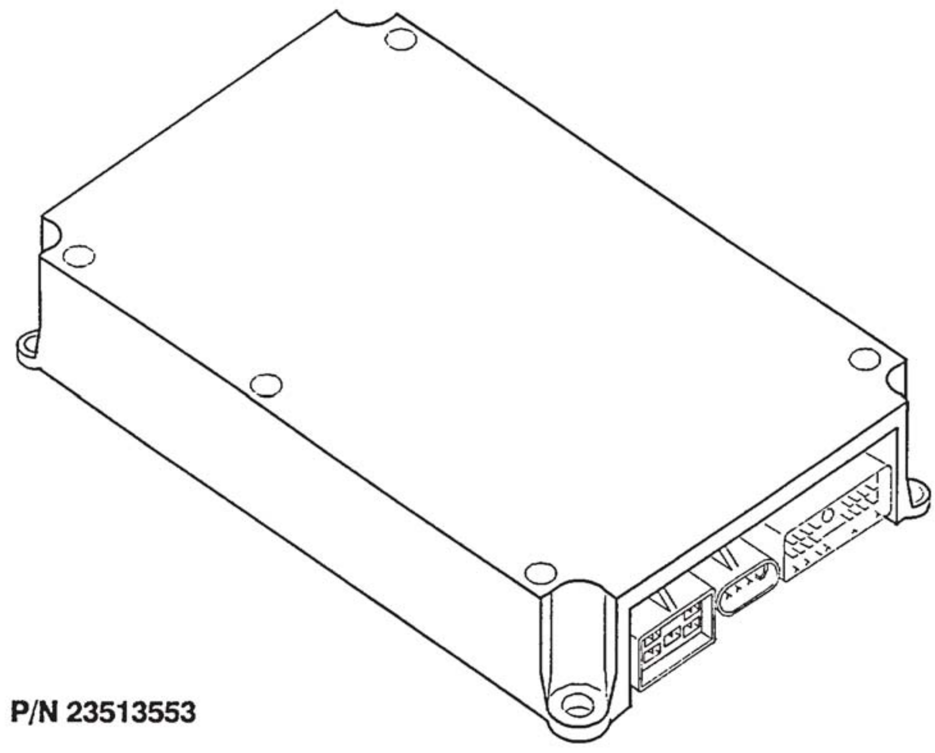


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: **87 (Cont'd)**
J1587 CODE: **P73-4 PUMP PRESSURE CIRCUIT FAILED LOW- (Below)**
P108-4 BAROMETRIC PRESSURE CIRCUIT FAILED LOW - (TBD)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
87-8 Check for Short to +5 Volts		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between sockets A and C of the PGC sensor connector. • Read resistance between sockets A3 and C3 on the engine harness connector.	Less than or equal to 5 ohms.	Go to 87-9.
	Greater than 5 ohms or open. Then go to 87-30.	The engine +5 Volt line (ckt #916) is open. Repair open.
87-9 Check for Short		
• Remove jumper wire. • Read resistance between sockets A and C of the PGC sensor connector.	Less than or equal to 10,000 ohms.	The engine +5 Volt line (ckt #916) is shorted to the return line (ckt #952). Repair short. then go to 87-30.
	Greater than 10,000 ohms or open.	Go to 87-10.
87-10 Replace PGC Sensor		
• Turn ignition off. • Replace PGC sensor. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine and attempt to run PGC in "PRESSURE" mode for one minute.	Check engine light comes on.	Go to 87-7.
	Check engine light does not come on.	Go to 87-30.

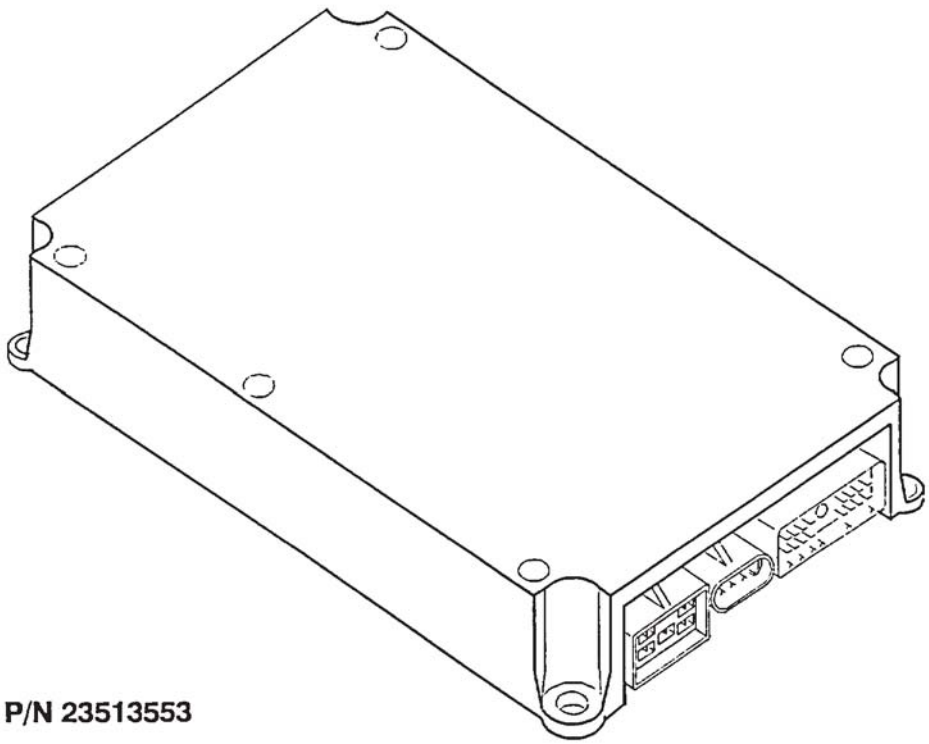


THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 87 (Cont'd)
J1587 CODE: P73.4 PUMP PRESSURE CIRCUIT FAILED LOW- (Below)
P108.4 BAROMETRIC PRESSURE CIRCUIT FAILED LOW . (TBD)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
87-30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • Run engine and attempt to operate PGC in the "PRESSURE' mode for one minute. • Read INACTIVE CODES.	(No codes).	Repairs are complete.
	Code 73-4 (and any other codes). section to find error.	All system diagnostics are complete. Please review this
	Any other codes except Code 73-4.	Go to START-1, pg 3-345.41, to service other codes.



THE ELECTRONIC CONTROL MODULE - DDEC III

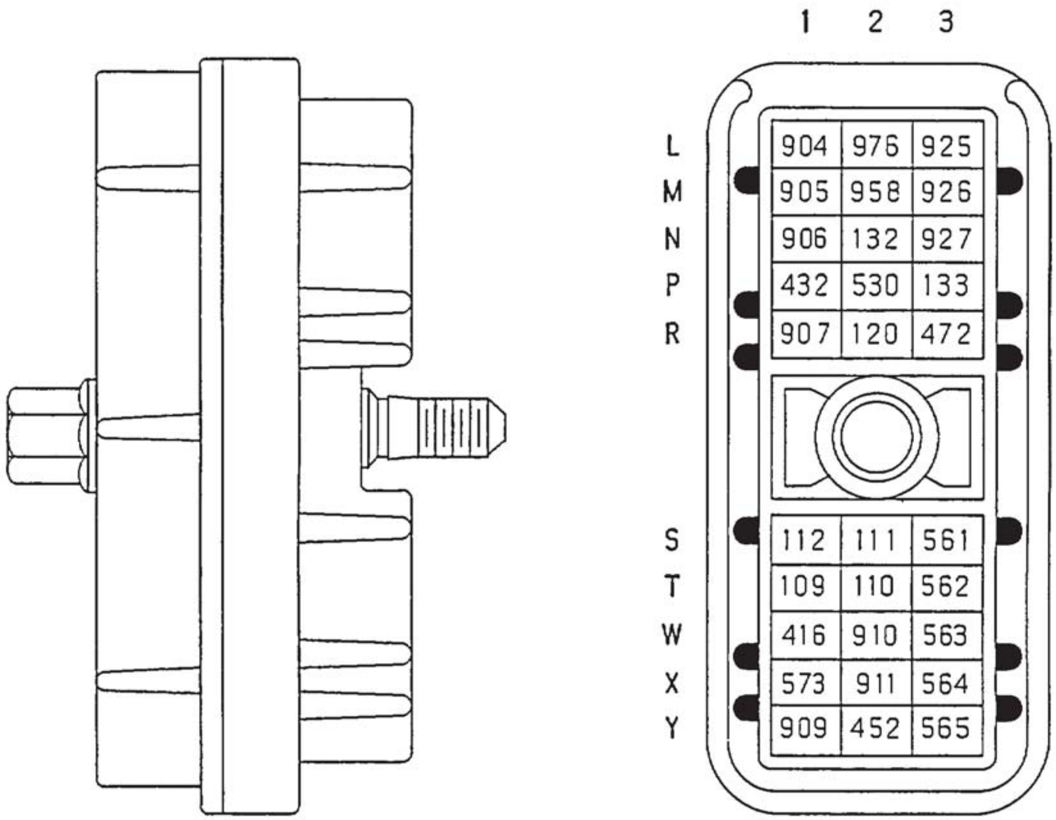
Section 4
TROUBLESHOOTING CHARTS

E. FLASH CODE: 88
J1587 CODE:P109 1 . COOLANT PRESSURE LOW

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

Code 109-1 indicates that the coolant pressure was operated lower than allowed. Check the engine service manual for possible causes of low coolant pressure.



ECM ENGINE HARNESS CONNECTOR

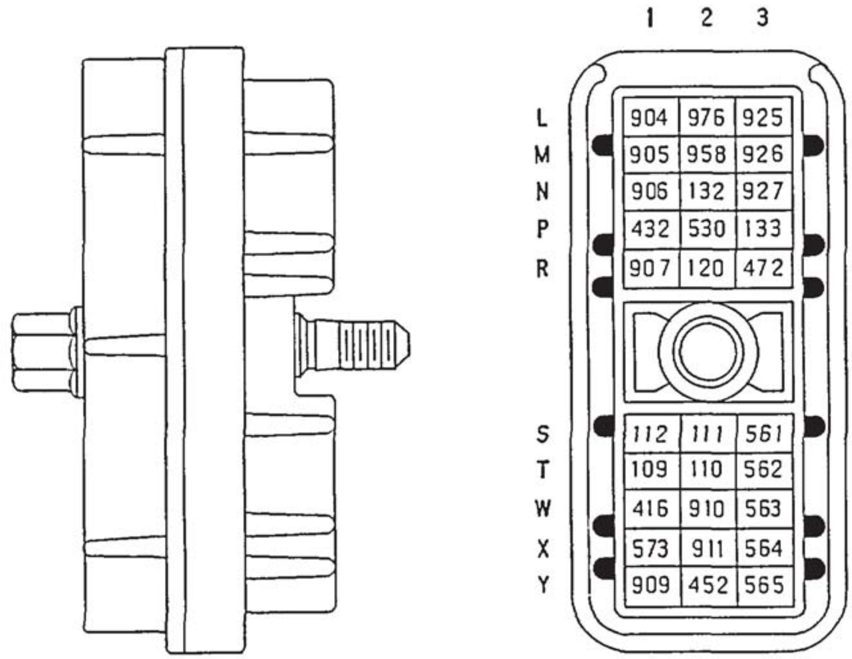
Section 4
TROUBLESHOOTING CHARTS

E. ENGSV - ENGINE HARNESS +5 VOLTS SUPPLY

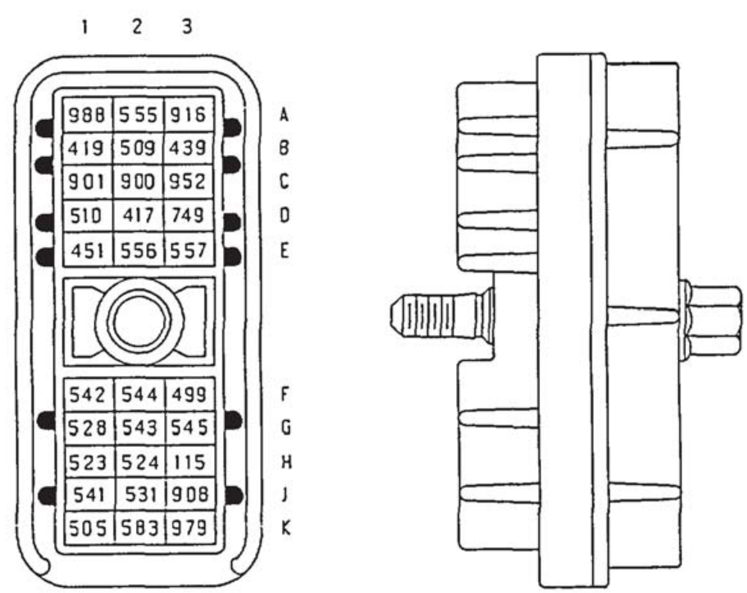
NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and
2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-1 Check for Low Battery Voltage		
• Was there also a Code 168/1.	Yes.	Go to 46-1 (page 3-345.339).
	No.	Go to ENG5V-2
ENGSV.2 Check for + 5 Volts		
• Turn ignition off. • Disconnect the Oil Pressure Sensor (OPS) and Turbo Boost Sensor (TBS) connectors. • If applicable, disconnect the Fuel Pressure Sensors (FPS), Crankcase Monitor (CCM), and Pressure Governor Control Sensor (PGC) connectors. • Turn ignition on. • At each sensors harness connector, read voltage between socket C (red lead) and sockets A (black lead).	Between 4.7 and 5.2 volts connector voltage readings are correct, go to ENG5V-3.	Voltage reading is correct. Check voltage at next connector. If all
	Less than 4.7 volts at any or all connectors.	Go to ENG5V-4.
	Greater than 5.2 volts at all connectors.	Go to ENG5V-6.
ENG5V.3 Check ECM Connectors		
• Check terminals at the ECM engine harness connector (both the ECM and harness side) for damaged, bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace ECM. Then go to ENG5V-30.
	Problems found. Then go to ENG5V-30.	Repair terminals/connectors.



ECM ENGINE HARNESS CONNECTOR

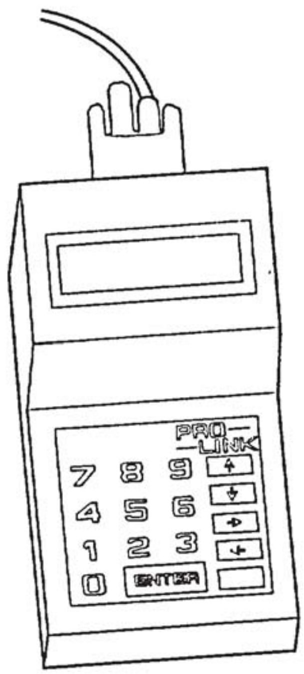


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. ENG5V - ENGINE HARNESS +5 VOLTS SUPPLY (CONT'D)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENGSV-4 Check for +5 Volts or Return Open		
• Turn ignition OFF. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between sockets A and C of any sensor connector that reads less than 4.7 volts in Step ENG5V-2. • Read resistance between sockets W1 and Y2 of the engine harness connector.	Less than or equal to 5 ohms	Go to ENG5V-5.
	Greater than 5 ohms or open.	Either the engine +5 volt line (ckt #416) or the sensor return line (ckt #452) is open. Repair open. Then go to ENG5V-30.
ENGSV-5 Check for Short to Ground		
• Turn ignition off. • Remove jumper ware. • Read resistance between sockets A and C of the sensor connector. • Also read resistance between socket C of the sensor connector and a good ground.	Both readings are greater than 10,000 ohms or open.	Go to ENG5V-3.
	Either reading Is less than or equal to 10,000 ohms.	The engine +5 volt line (ckt #416) is shorted to either the sensor return line (ckt #452) or to chassis ground. Repair short. Then go to ENG5V-30.
ENG5V-6 Check for Short to Battery +		
• Turn ignition off. • Remove both fuses to the ECM. • Disconnect all six connectors at the ECM. • Read resistance between socket W1 on the engine harness connector and B3 on the vehicle harness connector. • Also read resistance between socket W1 on the engine harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to ENG5V-3.
	Any reading is less than or equal to 10,000 ohms.	A short exists between sockets where less than 10,000 ohms resistance was read. Repair short. Then go to ENG5V-30.

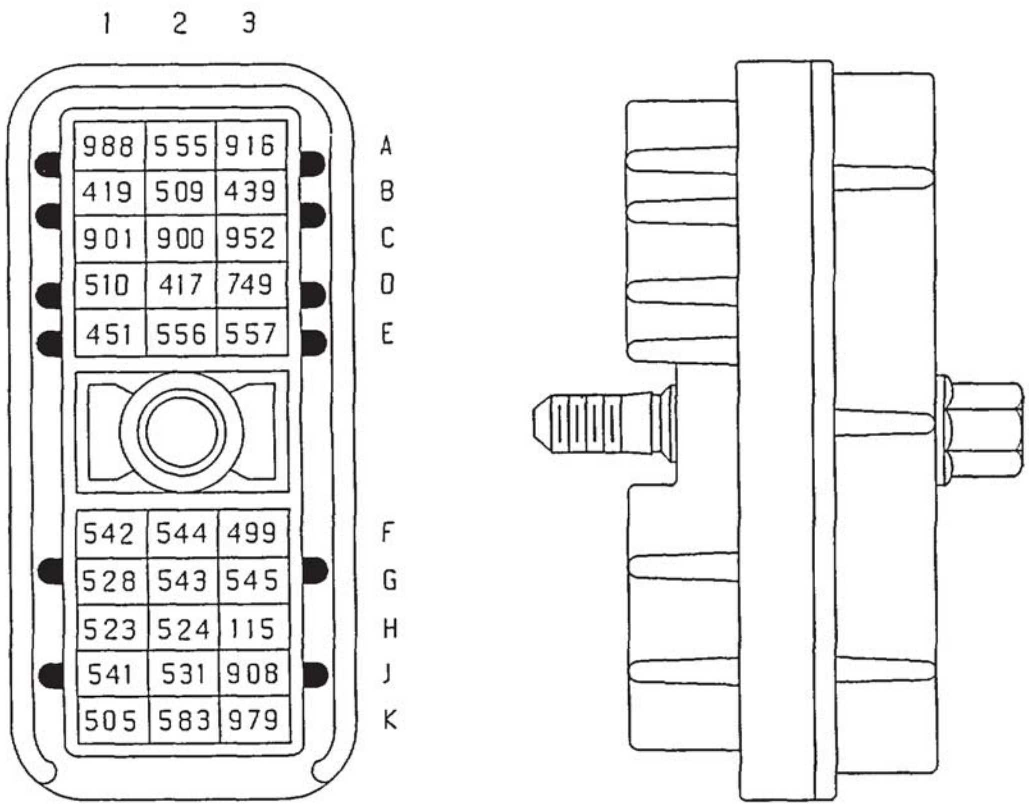


Pro-Link 9000

Section 4
TROUBLESHOOTING CHARTS

E. ENGSV - ENGINE HARNESS +5 VOLTS SUPPLY (CONT'D)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-30 Verify Repairs		
Turn ignition OFF. • Reconnect all connectors. • Reconnect fuses (or Circuit breakers) if previously disconnected. • Turn ignition ON. • Clear codes. • If "Check engine" Light does not stay on, start engine and run for 1 minute or until "CHECK ENGINE' light comes on. • Stop engine. • Read INACTIVE CODES.	(No codes). → Codes which brought you to Chart ENG5V are still there. → Any codes except those which brought you to Chart ENG5V. →	Repairs are complete. All system diagnostics are complete. Please review this section from the first step to find the error. Go to START-1, pg 3-345.41, to service other codes.



ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

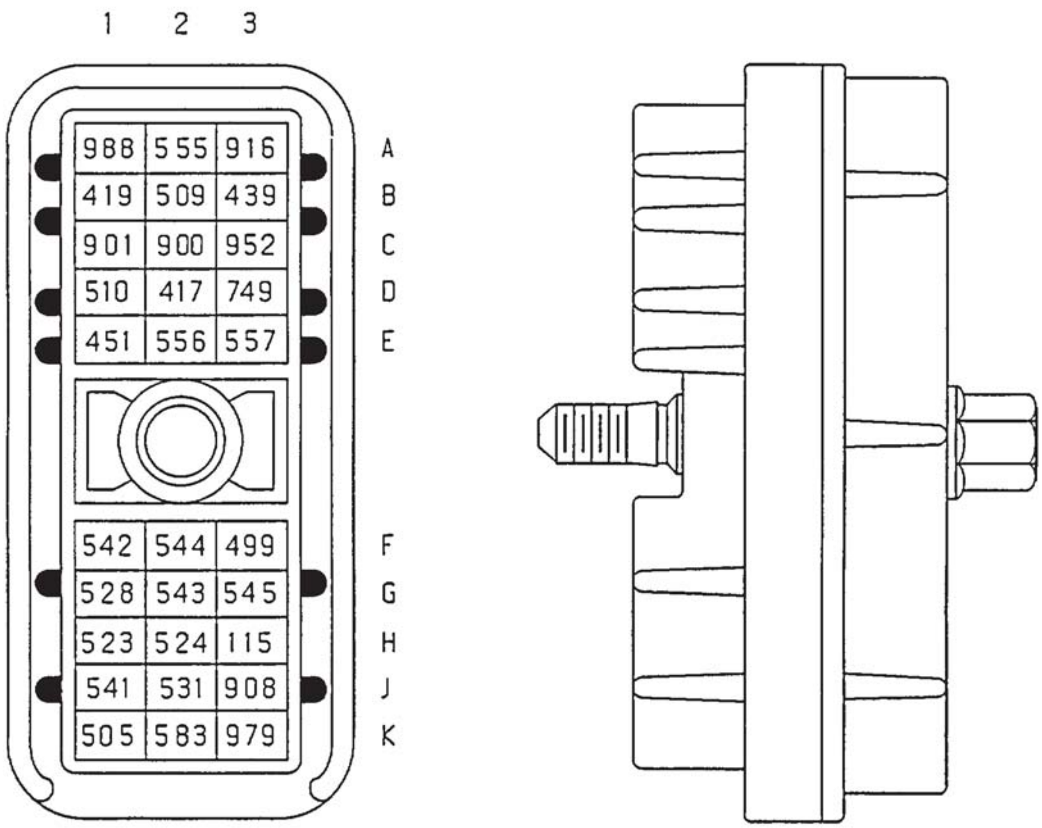
E. VEH5V - VEHICLE HARNESS +5 VOLTS SUPPLY

NOTE - This chart is only to be used if:

1) All basic mechanical checks and physical inspections have been performed with no problem found, and

2) Diagnosis of DDEC-III was started at step Start-1, pg 3-345.41 and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-1 Check for Low Battery Voltage		
• Was there also a Code 168/1?	Yes. No.	Go to 46-1 (page 3-345.339). B Go to VEH5V-2.
VEHSV-2 Check for + 5 Volts at TPS		
• Turn ignition off. • Disconnect the Throttle Position sensor (TPS). • Turn ignition on. • Read voltage on the TPS harness connector, pin C (red lead) to pin A (black lead).	Less than 4.7 volts.	Go to VEH5V-3.
	Greater than 5.2 volts.	Go to VEH5V-11.
	Between 4.7 and 5.2 volts.	Go to VEH5V-8
VEH5V.3 Check for +5 Volts or Return Open		
• Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between pins A and C of the TPS harness Connector. • Read resistance between sockets A3 and C3 of the vehicle harness connector.	Less than or equal to 5 ohms.	Go to VEH5V-4
	Greater than 5 ohms or open.	Either the engine +5 volt line (ckt #916) or the sensor return line (ckt #952) is open. Repair open. Then go to VEH5V-30.

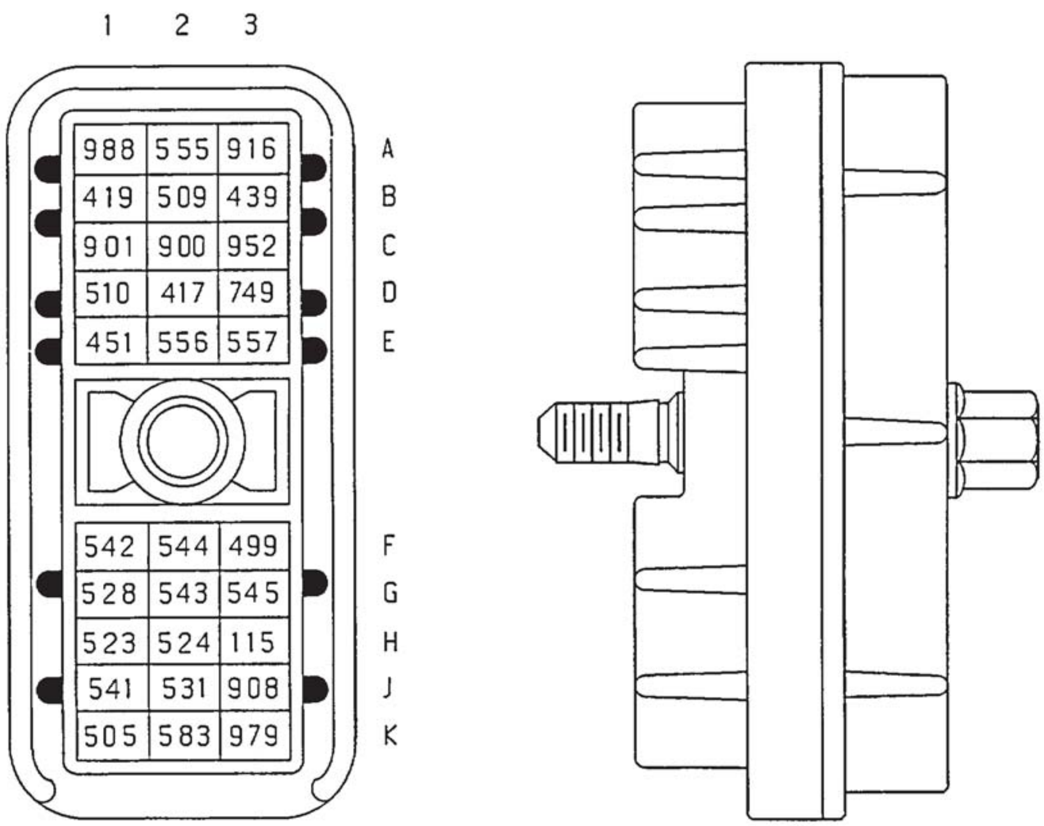


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. VEH5V · VEHICLE HARNESS +5 VOLTS SUPPLY (CONT'D)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V.4 Check for +5 Volt Short Ground		
• Remove jumper wire • Disconnect PTOSA and/or Fast idle resistor network if installed. • Read resistance between pins A and C of the TPS harness connector. • Also read resistance between pin C or the TPS harness connector and a good ground.	Both readings are greater than 10,000 ohms or open.	Go to VEH5V-10.
	Either reading is less than or equal to 10,000 ohms.	Go to VEH5V-5.
VEH5V.5 Check if There is a PTOSA Sensor		
• Does the engine have a Power Take-Off Speed Adjust (PTOSA) Sensor? ground (if there is a Fast Idle switch, the short may be at the resistor network used). Repair short. Then go to VEH5V-30.	No.	The engine +5 volt line (ckt#916) is shorted to either the sensor return line (ckt #952) or to chassis
	Yes.	Go to VEH5V-6.
VEH5V.6 +5 Volts Check Using the PTOSA		
• Turn ignition off. • Disconnect the Power Take-Off Speed Adjust (PTOSA) Sensor and/or Fast Idle resistor network. • Turn ignition on. • Read voltage on the PTOSA harness connector, socket C (red lead) to socket A (black lead).	Less than 4.7 volts.	The engine +5 volt line (ckt #916) is shorted to either the sensor return line (ckt #952) or to chassis ground. Repair short. Then go to VEH5V-30,
	Greater than or equal to 4.7 volts.	Go to VEH5V-12.

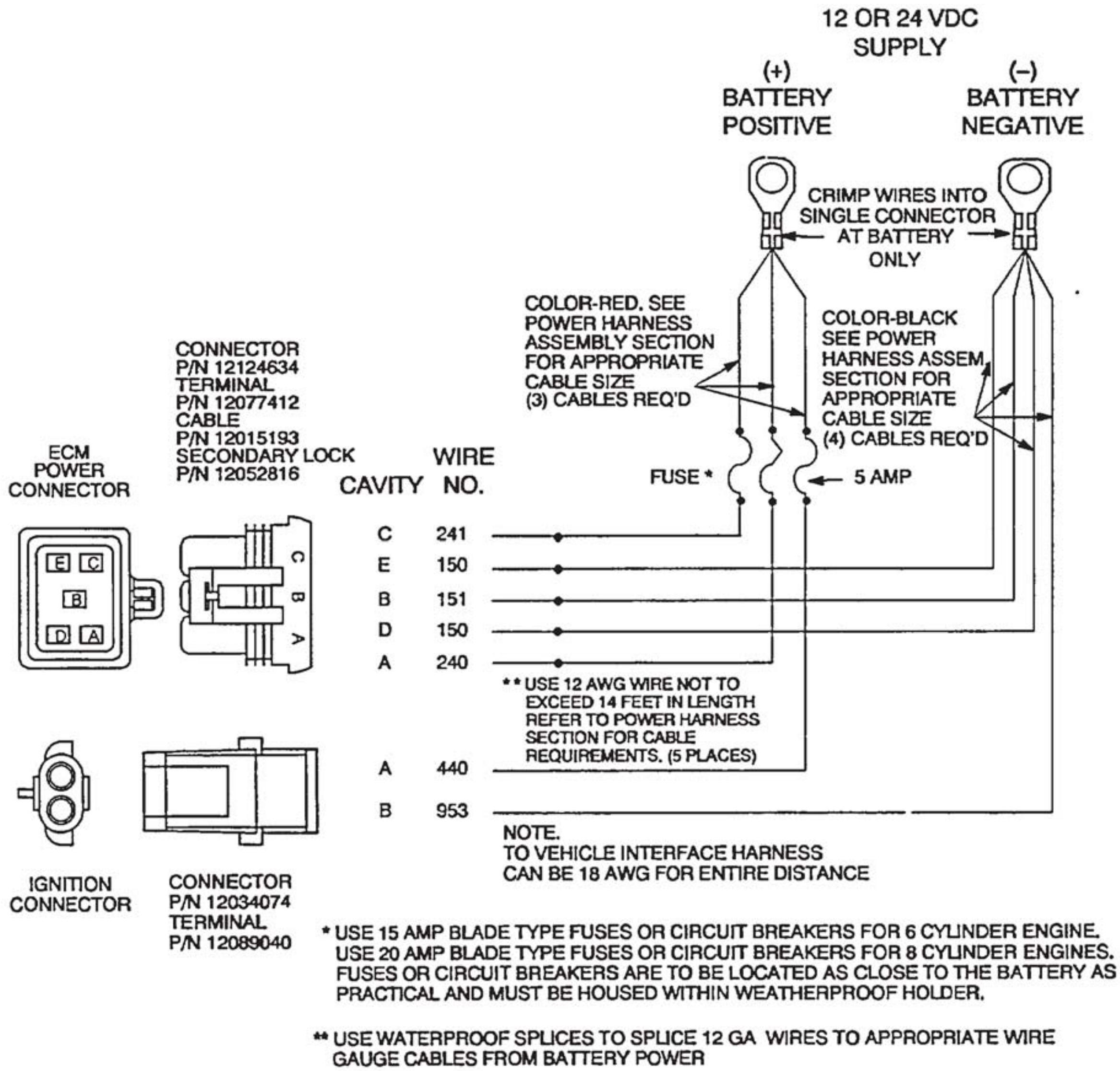


ECM VEHICLE HARNESS CONNECTOR

Section 4
TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS +5 VOLTS SUPPLY (CONT'D)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-7 Check PTOSA Sensor Connectors		
• Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace PTOSA. Then go to VEH5V-30.
	Problem found.	Repair terminals/connectors. Then go to VEH5V-30.
VEH5V-8 Check TPS		
• Turn ignition off. • Reconnect the Throttle Position Sensor (TPS) connector. • Turn ignition on. • Select Throttle Sensor for display on the DDR. • Observe throttle counts at both no throttle and full throttle (engine not running).	Getting 48-144 counts at no throttle and no more than 832-968 counts at full throttle.	Go to VEH5V-10.
	Not getting the above readings.	Go to VEH5V-9.
VEH5Vs9 Check TPS Connectors		
• Turn ignition off. • Disconnect the Throttle Position Sensor (TPS). • Inspect terminals at the TPS connectors (sensor side and harness side) for damage; bent, corroded and unseated pins or sockets.	Terminals and connectors are okay.	Replace TPS. Then go to VEH5V-30.
	Problem found. Then go to VEH5V-30.	Repair terminals/connectors.

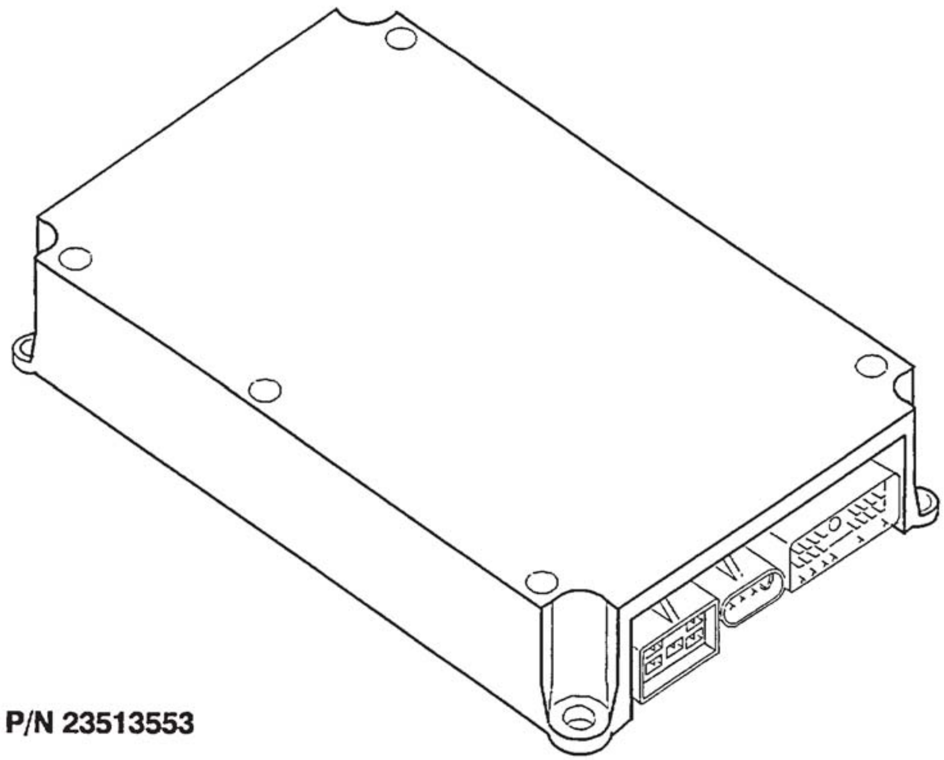


POWER HARNESS

Section 4
TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS +5 VOLTS SUPPLY (CONT'D)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEHSV-10 Check ECM Connectors		
• Turn Ignition off. • Disconnect the vehicle harness connector at the ECM (if not already disconnected). • Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Especially terminals #952, #916, #417 and #510. Install new terminal if in doubt.	Terminals and connectors are okay.	Replace ECM. Then go to VEH5V-30.
	Problem found. Then go to VEH5V-30.	Repair terminals/connectors.
VEH5V.11 Check for Short to Battery +		
• Turn ignition off. • Pull both fuses (or circuit breakers) to the ECM. • Disconnect the vehicle harness and 5-way power harness connectors at the ECM. • Read resistance between sockets A3 and B3 on the vehicle harness connector. • Also read resistance between socket A3 on the vehicle harness connector and the following sockets on the 5-way power harness connector: A and C.	All readings are greater than 10,000 ohms or open.	Go to VEH5V-10.
	Any reading is less than 10,000 ohms.	A short exists between the engine +5 volt line (ckt #916) and the line(s) where less than 10,000 ohms was read (either: ckt #240, #241 or #439). Repair short. Then go to VEH5V-30.
VEH5V-12 Open Check		
• Connect TPS • Turn ignition on. • Read voltage on PTOSA harness connector, socket C (red lead) and a good battery ground • Repeat above only place red lead is socket A of the PTOSA connector.	Both 4.7 to 5.2 volts. Repair open, then go to VEH5V-30.	Repair open from ckt #952 to ECM. (Look at ECM terminal)
	Pin C greater than 4.7 volts and Pin A is zero volts.	Go to VEH5V-7.



THE ELECTRONIC CONTROL MODULE - DDEC III

Section 4
TROUBLESHOOTING CHARTS

E. VEHSV - VEHICLE HARNESS +5 VOLTS SUPPLY (CONT'D)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V30 Verify Repairs		
• Turn ignition off. • Reconnect all connectors. • Reconnect fuses or circuit breakers is necessary. • Turn ignition on. • Clear codes. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until "Check Engine" • Stop engine. • Read inactive codes.	(No codes).	Repairs are complete.
	Codes which brought you to Chart VEH5V are still there.	All system diagnostics are complete. Please review the section from the first step to find the error.
	Any codes except those which brought you to Chart VEH5V.	Go to START-1, pg 3-345.41, to service other codes.

Section V. USING STE/ICE WITH THE TRACTOR

INTRODUCTION

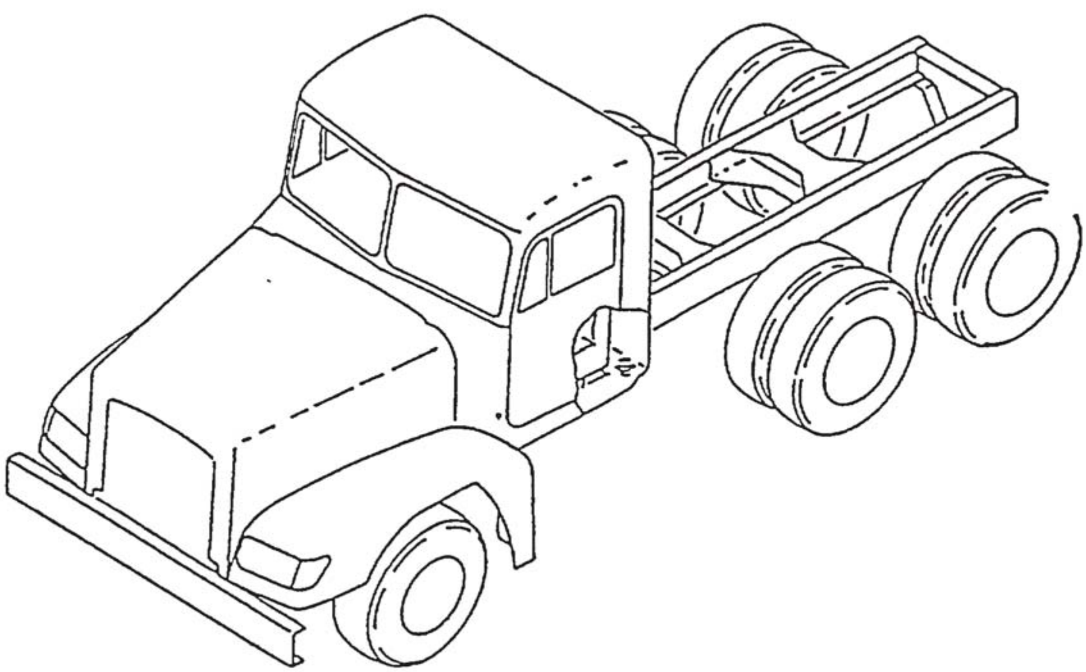
This section contains information on the use of Simplified Test Equipment for Internal Combustion Engines (STE/ICE) with the tractor. Two types of testing are performed: go and no-go. The various tests are described in Table 1. Refer to the STE/ICE Technical Manual, TM 9-4910-571-12&P when using STE/ICE.

PRE-TEST INSPECTION

Prior to performing the vehicle tests, ensure that the daily preventive maintenance inspections and procedures have been performed on the tractor.

TEST HOOKUP

Connect vehicle test meter (VTM) to diagnostic connection assembly (DCA) with DCA cable W1.



Location of DCA Connector in Tractor Cab

IN

Subject *Page*

A

B

G

IN (NT)

IN (NT)

Subject *Page*

R (n)

T

IN (NT)

Subject *Page*

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W

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

Milton H. Hamilton

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
01599

Distribution:

To be distributed in accordance with DA Form 12–38–E (Block 0904) Unit maintenance requirements for TM9–2320–363–20–1.

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ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recom mended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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illiliters	luid Ounces	0.034
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