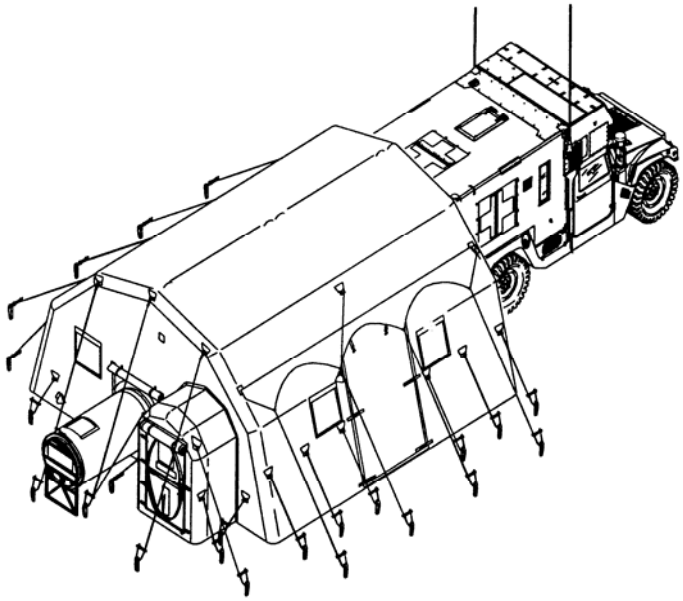
TM 10-5410-228-24

UNIT, DIRECT SUPPORT & GENERAL SUPPORT MAINTENANCE MANUAL FOR



CHEMICAL BIOLOGICAL PROTECTIVE SHELTER (CBPS) SYSTEM

NSN 5410-01-441-8054 (GREEN)
(EIC:5ZT)
NSN 5410-01-482-4633 (TAN)

HEADQUARTERS, DEPARTMENT OF THE ARMY

CHANGE 1 30 APRIL 2006 **19 MARCH 2004**

WARNING

CARBON MONOXIDE

Carbon monoxide is without color or smell, but it can kill you. Breathing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Brain damage or death can result from heavy exposure. Carbon monoxide occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines. When there is no air movement, carbon monoxide can become dangerously concentrated. Precautions must be followed to ensure crew safety when the personnel heater, main or auxiliary engine, or any vehicle is operated for any purpose. Always obey the following:

Do not operate personnel heater or engine of Extended Capacity Vehicle (ECV) in a closed place unless there is sufficient air movement.

Do not sit in modified Lightweight Multipurpose Shelter (LMS) with idle engine for long periods without operating the ventilator blower. If tactical situation permits, open hatches.

Do not drive ECV with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.

Be alert at all times during ECV operation for exhaust odors and exposure symptoms. If either is present, immediately ventilate personnel compartments. If symptoms persist, remove affected crew to fresh air; keep warm. Do not permit physical exercise. If necessary, give artificial respiration.

Be aware; the field protective masks for Chemical Biological Radiological (CBR) protection will not protect you from carbon monoxide poisoning.

For artificial respiration, refer to FM 4-25.11.

ELECTRICAL CURRENT

The Chemical Biological Protective Shelter (CBPS) System contains high electrical currents. To avoid injury during maintenance of the CBPS, adhere to the following:

Remove all jewelry.

Use electrically insulated tools where appropriate.

Take special precautions when working on or near electrical connections.

When working inside of LMS, tag power panel and ECV cab area to ensure power is not accidentally turned on.

24 Vdc from the ECV batteries is applied to specific CBPS components (e.g., rear control panel and relay box) even with the CBPS and ECV OFF, if power mode switch is in EXT position with Tactical Quiet Generator (TQG) and converter ON. Be careful not to come in contact with the battery connections or hot CBPS components when performing maintenance. If applicable, disconnect batteries and tag power cable area.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

Before applying power to the system, connect the ground cable from external 10 kW Tactical Quiet Generator (TQG) to ground rod and from LMS power panel to ground rod. Do not remove the grounding system until all system power is shut off and all power cables have been disconnected.

WARNING

Failure to observe all warnings in the referenced procedures may result in injury or death to personnel.

Personnel riding in the LMS must have their safety belts fastened during vehicular movement.

Failure to perform all maintenance setup tasks, as directed in each maintenance paragraph, can result in serious injury or death to personnel.

ELECTRICAL SHOCK

Low voltage/high current circuits can kill. The following safety steps shall be followed if someone is the victim of electrical shock:

Do not try to pull or grab the individual.

Turn off the electrical power, if possible.

Pull, push, or lift the person to safety using a dry wooden pole or a dry rope or some other insulating material if power cannot be shut off.

Give artificial respiration, refer to FM 4-25.11.

Send for help as soon as possible.

LIFTING

Improper lifting can cause injury to personnel. Use the following precautions when lifting:

Use proper number of people when called for. When in doubt, use help.

Be aware of all lifting points and follow procedures.

Obey lift restrictions and utilize mechanical aids as required.

Prevent back injury, lift with legs and not your back.

Do not attempt to lift HMT tongue alone if HMT is heavily loaded. Lifting heavy HMT tongue alone can cause back injury. Use crank on front caster to raise HMT tongue out of the way.

Do not attempt to lift High Mobility Trailer (HMT) tongue ring without first lowering rear leg since HMT could tip upwards and injure personnel.

HAZARDOUS MATERIALS

The chemicals (such as solvents, adhesives, sealant, paints, lubricants, etc.) used in maintenance procedures may present fire or chemical hazards if used without proper precautions. Observe manufacturers warning labels and the warnings and cautions contained in this manual. Ensure sufficient ventilation exists, protective clothing and equipment is used, and sources of ignition are removed.

Observe Nuclear, Biological, and Chemical (NBC) clothing and handling procedures in accordance with field manuals FM 3-11.5, FM 4-02.4, and FM 4-02.7.

Heat seal repairs may produce toxic fumes. All repairs should be performed in a well ventilated area.

Adhesive and cleaning agents are flammable and can ignite, causing burns. Perform work in a well-ventilated area away from fire.

ENTRY AND EXIT

The LMS height above the ground when mounted on the ECV and low door frame present potential hazards during entry and exit. Use extreme care when climbing or descending the ladder to avoid falling. Be alert to the low door frame to avoid hitting your head. Also use caution when climbing and descending from the roof of the LMS.

WARNING

CIRCUIT BREAKERS

If a circuit breaker does not stay in the on position when pressed, do not attempt to close (activate) repeatedly since an overload condition probably exists which could be hazardous to personnel and equipment.

R22 REFRIGERANT

Great care must be exercised to prevent contact of liquid R22 refrigerant or R22 refrigerant gas discharged under pressure with any part of body. The extremely low temperature resulting from the rapid expansion of the liquid or gas R22 refrigerant released under pressure can cause sudden and irreversible tissue damage through freezing. As a minimum, personnel must wear thermal protective gloves and face shield or goggles when working in any situation where R22 refrigerant contact with the skin or eyes is possible. Application of excessive heat to any component in a charged system will cause extreme pressure that may result in a rupture or explosion. Exposure of R22 refrigerant to an open flame or a very hot surface will cause a chemical reaction in the gas to form carbonyl chloride (phosgene), a highly poisonous and corrosive gas. In its natural state, R22 refrigerant is a colorless odorless vapor with no toxic characteristics. It is heavier than air and in a well ventilated area will disperse rapidly. However, in an unventilated area it presents a danger as a suffocant.

PRESSURIZATION

The air beams used to inflate the CBPS are pressurized. When striking, the dump caps used to remove air from the air beams may come off forcefully and strike the face or body. When removing dump caps, grip firmly and turn face away from dump cap. Under no circumstances should air beam pressure be higher than 3 psi. Injury to personnel could result if air beam pressure is higher than 3 psi.

The hydraulic system is a pressurized system attaining pressures as high as 3,000 psi. When performing maintenance on the hydraulic system, gloves and goggles are mandatory.

CHANGE
NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 30 April 2006

UNIT, DIRECT SUPPORT & GENERAL SUPPORT MAINTENANCE MANUAL FOR

CHEMICAL BIOLOGICAL PROTECTIVE SHELTER (CBPS) SYSTEM

NSN 5410-01-441-8054 (GREEN)
(EIC:5ZT)
NSN 5410-01-482-4633 (TAN)

TM 10-5410-228-24 dated 19 March 2004 is changed as follows:

1. The purpose of this change is to incorporate changes to the manual.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Remove old pages and insert new pages as follows:

Remove Pages	**Insert Pages**
a and b	a and b
none	A and B
Title	Title
iii and iv	iii and iv
1-3 thru 1-6	1-3 thru 1-6
1-21 and 1-22	1-21 and 1-22
1-33 and 1-34	1-33 and 1-34
2-11 and 2-12	2-11 and 2-12
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2-43 and 2-44	2-43 and 2-44
2-47 thru 2-50	2-47 thru 2-50
2-59 and 2-60	2-59 and 2-60
2-91 and 2-92	2-91 and 2-92
2-125 and 2-126	2-125 and 2-126
2-135 thru 2-138	2-135 thru 2-138
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2-183 and 2-184	2-183 and 2-184
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2-271 thru 2-274	2-271 thru 2-274
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2-297 thru 2-300	2-297 thru 2-300
2-303 and 2-304	2-303 and 2-304
2-325 thru 2-328	2-325 thru 2-328
3-3 thru 3-8	3-3 thru 3-8
3-19 and 3-20	3-19 and 3-20
3-27 thru 3-40	3-27 thru 3-40
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3-109 and 3-110	3-109 and 3-110
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3-135 and 3-136	3-135 and 3-136

Remove Pages	**Insert Pages**
A-1 and A-2	A-1 and A-2
B-1 thru B-22	B-1 thru B-22
C-1 thru C-4	C-1 thru C -4
D-1 thru D-14	D-1 thru D-14
D-17 thru D-20	D-17 thru D-20
E-1 thru E-3/(E-4 blank)	E-1 thru E-3/(E-4 blank)
Cover	Cover

4. File this change sheet after the Warning Page of the publication for reference purposes.

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Dates of issue for original and changed pages are:

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Change..... 1..... 30 April 2006

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Page No.	*Change No.
Front Cover	1
a	1
b and c/(d blank)	0
Title Page	1
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iv	1
v thru vii	0
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1-33	1
1-34 thru 1-66	0
2-1 thru 2-10	0
2-11	1
2-12 thru 2-29	0
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2-31 thru 2-42	0
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2-304 thru 2-324	0
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3-110 thru 3-126	0
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B-3	0
B-4 thru B-22	1
C-1 thru C-4	1
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D-2	0
D-3	1
D-4	0
D-5 thru D-9	1
D-10	0

Page No.	*Change No.
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D-12	0
D-13	1
D-14 thru D-16	0
D-17	1
D-18	0
D-19	1
D-20 thru D-36	0
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F-1 thru F-15/(F-16 blank)	0
G-1 thru G-4	0
Index 1 thru Index 7/(Index blank)	0
Auth Page	1
Instruction Sheet	0
DA Form 2028	0
FO-1/(FO-2 blank) thru FO-51/(FO-52 blank)	0

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TECHNICAL MANUAL
NO. 10-5410-228-24

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 19 MARCH 2004

UNIT, DIRECT SUPPORT & GENERAL SUPPORT MAINTENANCE MANUAL FOR

CHEMICAL BIOLOGICAL PROTECTIVE SHELTER (CBPS) SYSTEM

NSN 5410-01-441-8054 (GREEN)
(EIC:5ZT)
NSN 5410-01-482-4633 (TAN)

DISTRIBUTION STATEMENT A – Approved for public release; distribution is unlimited.

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. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), located in the back of this manual, directly to: Commander, U.S. Army Tank-automotive and Armament Command, ATTN: AMSTA–LC-R, 15 Kansas St., Natick, MA 01760-5052. You may also submit your recommended changes by E-mail directly to amssbriml@natick.army.mil. A reply will be furnished directly to you. Instructions for sending electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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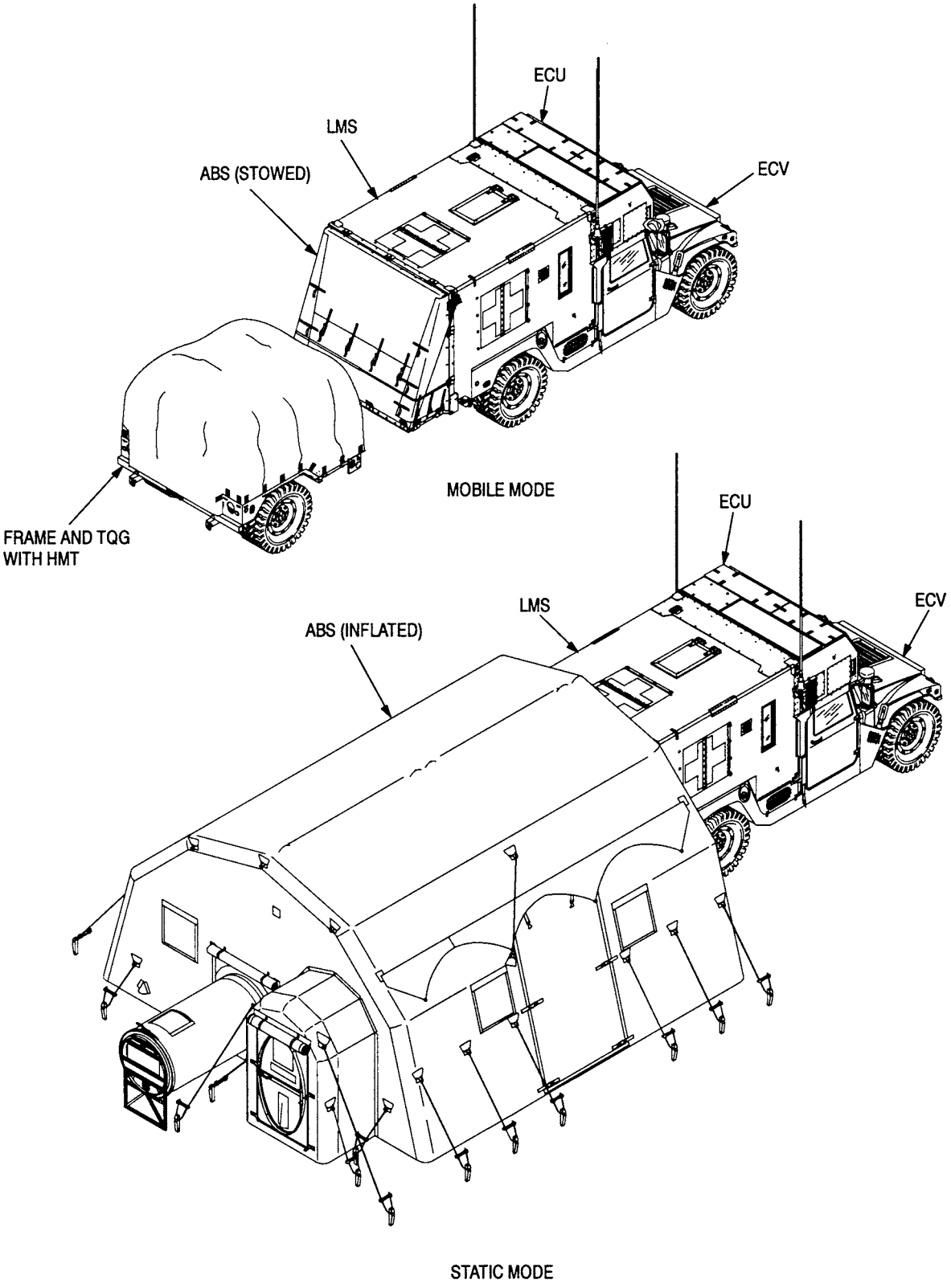
HOW TO USE THIS MANUAL

SCOPE. This manual contains three chapters, identified as follows:

- **Chapter - 1.** Introduction. This chapter is to introduce you to the Chemical Biological Protective Shelter (CBPS) System and its major assemblies and components. It also provides general information on maintenance forms, storage and shipment, warranty, and corrosion control. Since many terms may be new to you, a list of abbreviations and commonly used terms associated with the CBPS is provided.
- **Chapter - 2.** Unit Maintenance Instructions. Identifies preventive maintenance procedures which must be accomplished by unit level maintainers and explains what actions the unit maintainer must take when he receives a CBPS which is not operating properly. A brief operational description of the CBPS is also provided so that the unit level maintainer can better understand and troubleshoot the system. To aid the maintainer in quickly locating a problem, typical operational malfunctions and corrective troubleshooting steps are provided as well as an index of the malfunctions. Once a bad component or assembly is identified, repair or replacement procedures which fall within the scope of unit level maintainer are provided.
- **Chapter - 3.** Direct Support Maintenance Instructions. Information provided in this section identifies the troubleshooting and maintenance procedures which are beyond the scope of unit level maintainer and which fall within the scope of direct support.
- **Chapter - 4.** General Support Maintenance Instructions. Any component coded for General Support Maintenance should be returned to manufacturer.
- **Appendixes.** The various appendixes contain supplemental information related to the CBPS.

INDEXES. This manual contains indexes to help you quickly locate subject matter. Since it is realized that certain portions of the manual will be used more than the rest, an index of these key subject areas has been provided on the cover and includes such topics as preventive maintenance checks and services, troubleshooting procedures, and maintenance procedures for each level of repair. To quickly page to the subject matter on the cover index, a heavy black block has been provided at the edge of the page for each indexed item and a corresponding black edge can be found on the page which contains the information. Key subject matter is also highlighted in the table of contents. Subject matter may also be researched using the alphabetical index located at the rear of the manual.


ECU
LMS
ABS (STOWED)
ECV
FRAME AND TQG
WITH HMT
MOBILE MODE
ECU
LMS
ECV
ABS (INFLATED)
STATIC MODE

79-1-M

CHAPTER 1
INTRODUCTION

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Section I. GENERAL INFORMATION

1.1 SCOPE.

a. Type of Manual. Unit and Direct Support.

b. Equipment Name and Model Number. Chemical Biological Protective Shelter (CBPS) System, Model CBPS 2000.

c. Purpose of Equipment. The CBPS is a highly mobile, chemically-hardened shelter system, designed to provide medical personnel protection from chemical and biological agents.

d. Modes of Operation. The CBPS is designed to operate in two modes of operation. In the mobile mode, the Air Beam Shelter (ABS) is rolled up and secured to back of Lightweight Multipurpose Shelter (LMS) and the High Mobility Trailer (HMT) is attached to the Expanded Capacity Vehicle (ECV) pintle and ready for movement. In the static mode, the ABS is inflated, secured and ready for operation.

e. Loading Plans. Reference TM 10-5410-228-10 for HMT and LMS loading plan.

1.2 MAINTENANCE FORMS AND PROCEDURES.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750 as contained in the Maintenance Management Update.

1.3 DESTRUCTION OF EQUIPMENT TO PREVENT ENEMY USE.

Refer to TM 750-244-3 for the destruction of the CBPS to prevent enemy use.

1.4 PREPARATION FOR STORAGE AND SHIPMENT.

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be mission ready within 24 hours or within the time factors as determined by the directing authority. During the storage period appropriate maintenance records will be kept.

b. Before placing equipment in administrative storage, current maintenance services and Equipment Serviceable Criteria (ESC) evaluations should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO) should be applied.

c. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans and other containers may be used.

1.5 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your equipment needs improvement, let us know. Send us an EIR. 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 (Product Quality Deficiency Report). Mail it directly to: Commander, U.S. Army Tank-automotive and Armament Command, ATTN: AMSTA-LC-R, 15 Kansas Street, Natick, MA 01760-5052. A reply will be furnished directly to you.

1.6 CHEMICAL BIOLOGICAL RADIOLOGICAL NUCLEAR (CBRN) EQUIPMENT HOTLINE.

Do you have a problem or question about the equipment covered in this publication and need to talk to someone? Chemical - Biological Equipment has a hotline you can contact. The phone numbers are toll free from the USA and these lines are manned during our normal duty hours. If you call during our off duty hours you can leave a voice mail message and we will get back to you. Your E-mail or facsimile (FAX) message can be sent at any time and will be handled during the next business day.

The numbers are:

Toll Free..... 1-800-831-4408
DSN.....793-7349
Commercial. ..... (309) 782-7349
FAX (DSN).....793-1919
FAX (Commercial) ..... (309) 782-1919
E-mail .....ceh@ria.army.mil

1.7 SAFETY CARE AND HANDLING.

Adhesives, cleaning solvents, bonding materials, lubricants, fuels, and other agents are used during operation and maintenance of the CBPS. The prolonged use of these materials without proper protection can cause skin irritation and the inhalation of the vapors may be toxic if inhaled in quantity. When operating or working on the CBPS, be familiar with all warnings posted in the front of this manual and follow all procedural warnings and cautions found in the maintenance sections. Refer to FM 4-25.11 for first aid information.

1.8 CORROSION PREVENTION AND CONTROL (CPC).

a. CPC of Army material is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as ABS fabric materials, rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as 'corrosion', 'rust', 'deterioration', or 'cracking' will ensure that the information is identified as a CPC problem. SF 368 should be submitted to: Commander, Natick Acquisition Center, SBCCOM, U.S. Army Natick RD&E Center, ATTN: SATNC-PB/028, Natick, MA 01760-5011.

1.9 QUALITY ASSURANCE (QA) PROCEDURES.

Critical procedures or parts of procedures in this TM which require quality assurance inspections are identified by (QA) written after the applicable step.

1.10 REFERENCE INFORMATION.

This listing includes the nomenclature cross-reference list, list of abbreviations, and explanations of terms (glossary) used in this manual.

a. Nomenclature Cross-Reference List.

Common Name	Official Nomenclature
CBPS	Chemical Biological Protective Shelter
LMS	Modified Lightweight Multipurpose Shelter
ECV	Truck, Utility, Expanded Capacity 4X4 W/E HMMWV M1113

b. List of Abbreviations and Acronyms.

Common Name	Official Nomenclature
ABS	Air Beam Shelter
AC	Alternating Current
AOAP	Army Oil Analysis Program
amp	ampere
AR	As Required
BII	Basic Issue Item
BT	Bottle
BX	Box
CAGE	Commercial and Government Entity
CAM	Chemical Agent Monitor
CB	Circuit Breaker
CBPS	Chemical Biological Protective Shelter
CBR	Chemical Biological Radiological
CBRN	Chemical Biological Radiological Nuclear
cfm	cubic feet per minute

1.10 REFERENCE INFORMATION – Continued.

Common Name	Official Nomenclature
CN	Can
COEI	Components of End Items
CPC	Corrosion Prevention and Control
CTA	Common Table of Allowance
DC	Direct Current
DCS	Direct Complexing Shelter
DMWR	Depot Maintenance Work Requirements
DS	Direct Support
EA	Each
ECU	Environmental Control Unit
ECV	Expanded Capacity Vehicle
EIR	Equipment Improvement Recommendations
EPG	Electronically Programmed Governor
ESC	Equipment Serviceability Criteria
ESS	Environmental Support System
EXT	External
F	Fahrenheit
GFE	Government Furnished Equipment
GL	Gallon
gpm	gallons per minute
GS	General Support
H	Hourly
HMT	High Mobility Trailer
hp	Horsepower
Hz	Hertz
HYD	Hydraulic
IAW	In Accordance With
in.	Inch
INT	Internal
iwg	inches of water, gage
kW	Kilo Watts
LB	Pound
LMS	Lightweight Multipurpose Shelter
MAC	Maintenance Allocation Chart
MOPP	Mission Oriented Protective Posture
MTOE	Modified Table of Equipment
MWO	Modification Work Order
NBC	Nuclear, Biological, and Chemical
NSN	National Stock Number
OC	On Condition
PMCS	Preventive Maintenance Checks and Services
PN	Part Number
psi	pounds per square inch
PT	Pint

Common Name	Official Nomenclature
QA	Quality Assurance
QT	Quart
R	Run
RCP	Rear Control Panel
RO	Roll
RPM	Revolutions per Minute
RPSTL	Repair Parts and Special Tools List
SFPM	Square Foot per Minute
SMR	Source, Maintenance and Recoverability
TALP	Tunnel Airlock Litter Patient
TAMMS	The Army Maintenance Management System
TDA	Tunnel Diode Amplifier
TFFT	Turns From Finger Tight
TMDE	Test, Measurement, and Diagnostic Equipment
TQG	Tactical Quiet Generator
TU	Tube
U/M	Unit of Measure
Vac	Volts, alternating current
Vdc	Volts, direct current
Vrms	Volts, root mean squared

c. Glossary.

Direct Complexing	The connecting of two or more CBPSs together.
Rib	Air beam.
Striking	Packing up ABS and stowing equipment.

Section II. EQUIPMENT DESCRIPTION AND DATA

1.11 EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

Characteristics.

- Integrated, self-contained system.
- Environmentally controlled.
- Transports medical and mission personnel.
- Battalion aid station for forward battle areas.
- NBC protection provided by agent-impermeable fabric and positive over pressure.
- Capabilities and features.
- Mobile.
- Expandable.
- Rapidly deployed.
- Use not limited to a particular geographic area.
- Capable of operating in temperature ranges between -25°F and 120°F.
- Capable of operating under all types of battlefield conditions, including: Electronic Countermeasures (ECM), smoke, contaminants (chemical and biological agents, including toxins and novel compounds), fallout, and dust.
- Interior of Environmental Control Unit (ECU) and all ECU components normally exposed to contaminating ambient air or environment are completely accessible and resistant to high-pressure spraying of decontaminating solutions.
- HMT and ECV tires/wheels are interchangeable.
- Powered from the ECV or from an external power source.
- Transportable by C130, C17, C141 and C5.
- Transportable externally by CH47D helicopters.
- Transportable via rail and marine transport modes.

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

The CBPS contains the following assemblies and systems:

- ECV Modification
- LMS Modification
- Electrical System
- ECU
- TQG and HMT
- ABS
- Recirculation Filter

NOTE

Pintle assembly is located on ECV rear bumper, but is part of LMS modification.

a. ECV Modification (figure 1-1).

(1) ECV. Serves as a mobile platform and as primary power source for the CBPS.

(2) Primary Hydraulic Pump P1. Provides pressurized hydraulic fluid flow to different components in ECU when CBPS is operating in internal power mode.

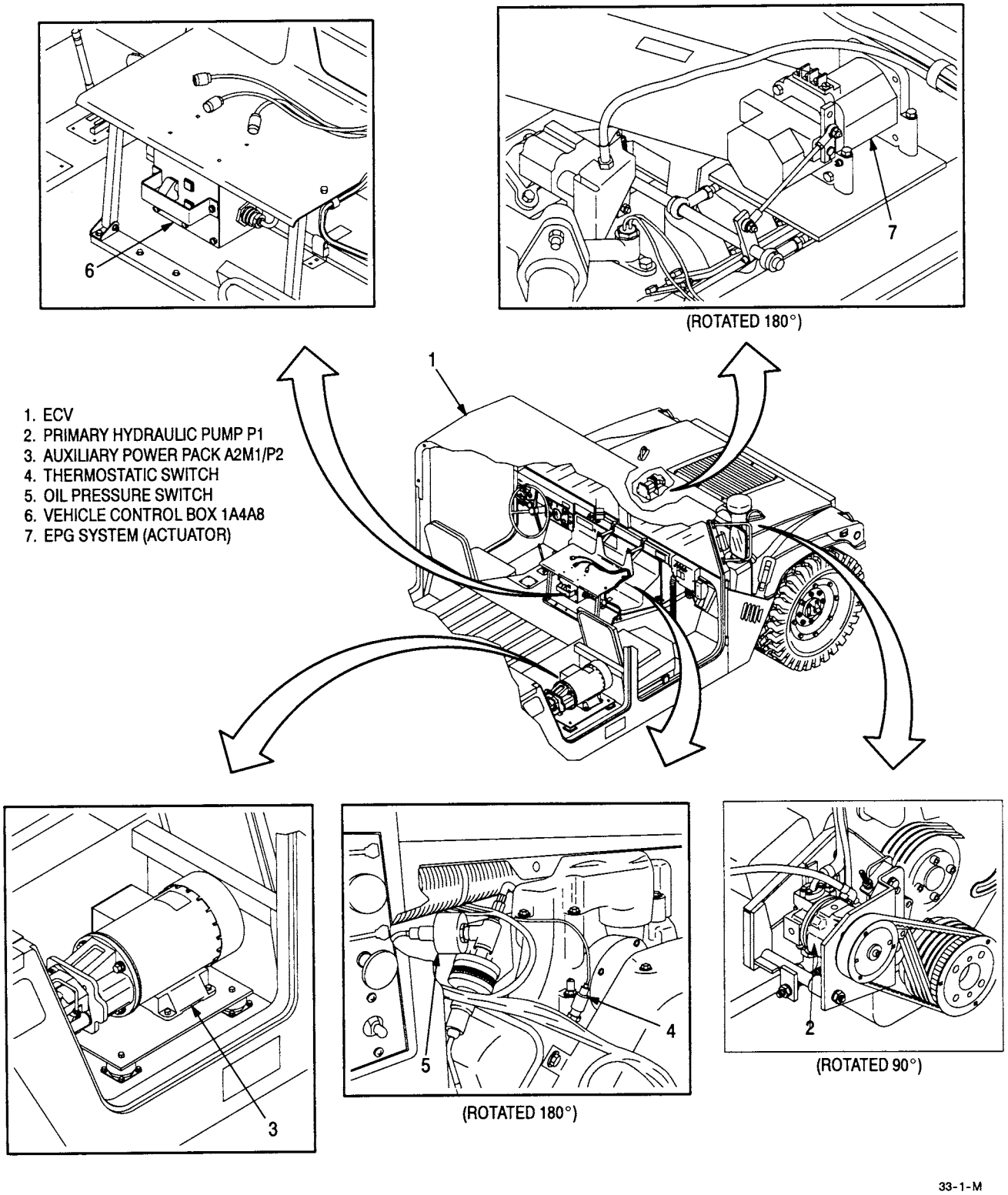

Figure 1-1. ECV Modification (Sheet 1 of 2)

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – Continued.

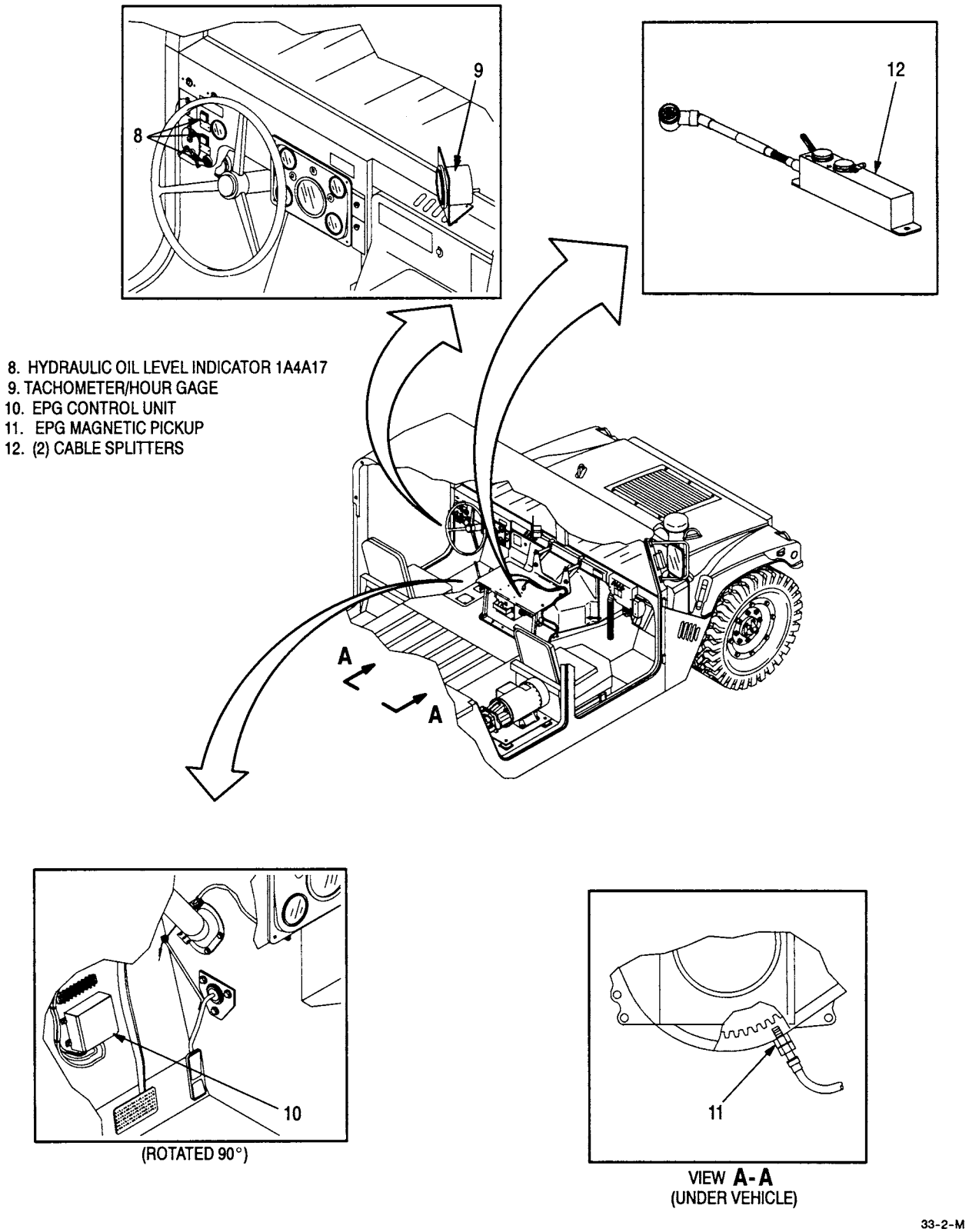

Figure 1-1. ECV Modification (Sheet 2 of 2)

(3) Auxiliary Power Pack A2M1/P2. Provides pressurized hydraulic fluid flow to different components in ECU when CBPS is operating in external power mode.

(4) Thermostatic Switch. Senses when engine coolant temperature is too high (hot) when CBPS is operating in internal power mode. Warning indicator on rear control panel lights to alert operator of this condition.

(5) Oil Pressure Switch. Senses when engine oil pressure is low when CBPS is operating in internal power mode. Warning indicator on rear control panel lights to alert operator of this condition.

(6) Vehicle Control Box 1A4A8. Allows communication between crew members inside ECV cab and crew members inside LMS. The vehicle control box also contains the switch that enables the Electronically Programmed Governor (EPG).

(7) EPG Actuator. Part of EPG system, located in ECV engine compartment. EPG actuator receives signal from EPG control unit to increase ECV engine speed.

(8) Hydraulic Oil Level Indicators. Located on dash of ECV and on rear control panel, lights and sounds buzzer when hydraulic fluid in the ECU reservoir drops to low levels. System shuts down when ECU reservoir drops to a critical level, or hydraulic fluid has a loss rate of 2 gpm or more.

(9) Tachometer/Hour Gage. Located on dash of ECV, monitors engine RPM and number of hours ECV has run.

(10) EPG Control Unit. Part of EPG system, located in ECV cab. EPG control unit monitors ECV engine speed, via EPG magnetic pickup, and sends a signal to EPG actuator to increase ECV engine speed.

(11) EPG Magnetic Pickup. Part of EPG system, located in ECV engine flywheel housing. EPG magnetic pickup compares speed of ECV engine with changes in the load.

(12) Two Cable Splitters. Located on radio mounting bracket, enables LMS crew to monitor and operate the radios during all modes of operation.

b. LMS Modification (figure 1-2).

(1) Windows (two). Provides LMS crew visibility to outside conditions.

(2) Ladder. Provides easy entrance and exit between LMS and ABS.

(3) Chairs (two). Provides seating for LMS crew. Chairs are equipped with seat belts and shoulder harnesses.

(4) Mission Oriented Protective Posture (MOPP) Gear Storage Box (two). Provides storage for crew. Passenger's side storage box contains cable interconnection box and relay box.

(5) Hose Assembly. Provides pressurized air for inflation of ABS air beams from rib fan.

(6) Relief Valves (two). Relieves air pressure in LMS during air transport.

(7) ABS Retainer. Secures ABS to LMS.

(8) Seat Belts (two). Secures shelter crew in LMS during mobile mode.

(9) Soft Air Duct. Provides filtered pressurized air to ABS and LMS. Air can also be cooled or heated.

(10) Tailgate Assembly. Holds and protects the stowed ABS.

(11) Block Wire Cable. Secures the tailgate assembly and ABS in stowed position.

(12) Emergency Exit Panel. Provides an escape route for the shelter crew.

(13) Power Panel. Provides 208 Vac, 60 Hz, 3-phase input auxiliary power connector, external chemical sensor connector, and CBPS ground terminal. The panel also contains a hose port. The hose port provides outside ambient air input to the Nuclear, Biological, Chemical (NBC) shelter pressure gage located on rear control panel.

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – Continued.

(14) Receptacle Panel. Provides six external 15A, 60Hz, 115 Vac power outlets. The top two outlets are dedicated to ABS light set. The bottom two outlets are dedicated to on-board NBC recirculating blowers. The ABS must be inflated to gain access to receptacle panel.

(15) Door. Provides entrance and exit to LMS during mobile operation.

(16) Block Assembly (each side). Allows lowering and raising of tailgate assembly and stowed ABS.

(17) Hydraulic Overflow Container. Receptacle for excess hydraulic fluid.

NOTE

Pintle assembly is located on the ECV rear bumper.

(18) Pintle Assembly. Provides connection for towing HMT.

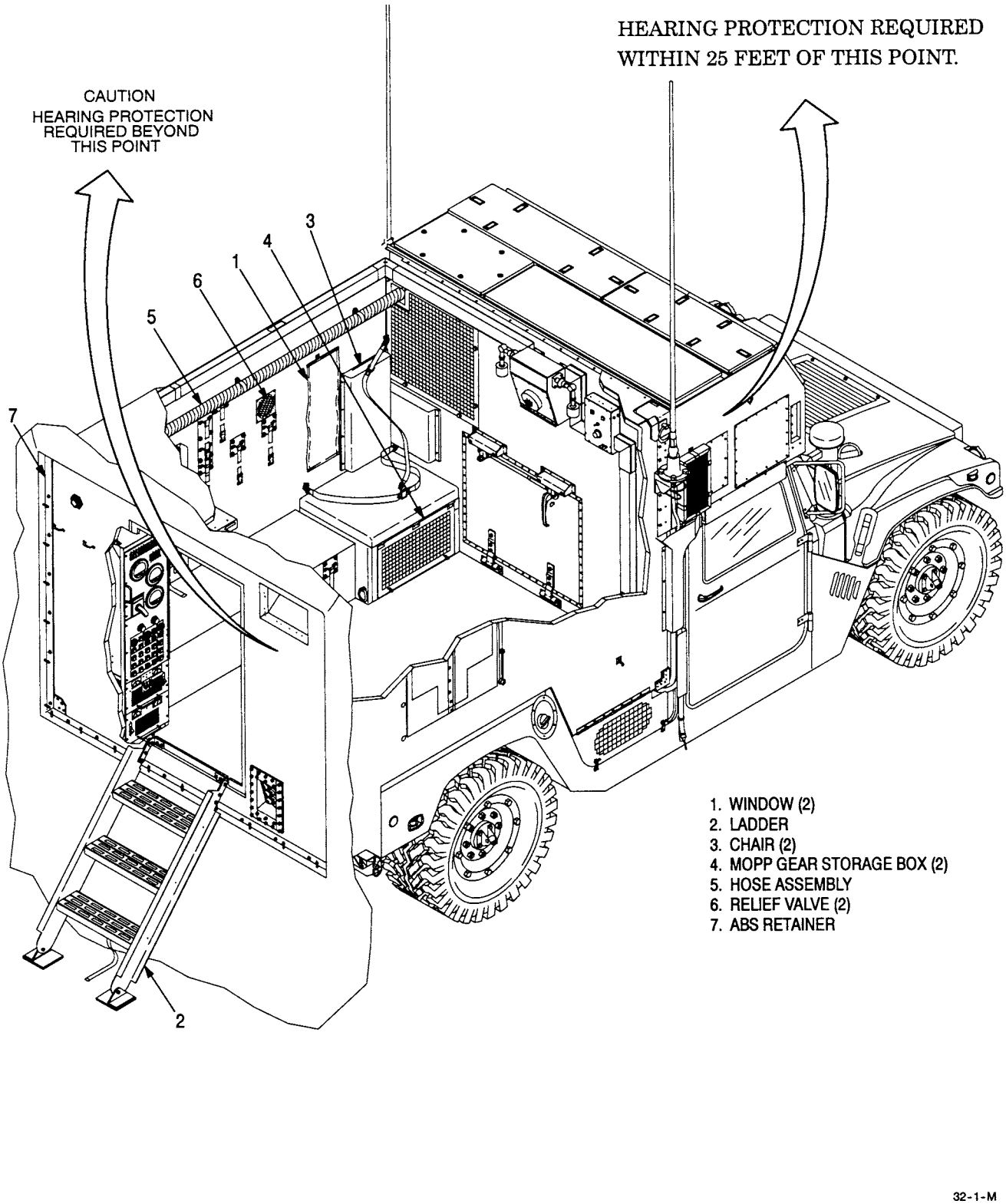

Figure 1-2. LMS Modification (Sheet 1 of 2)

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – Continued.

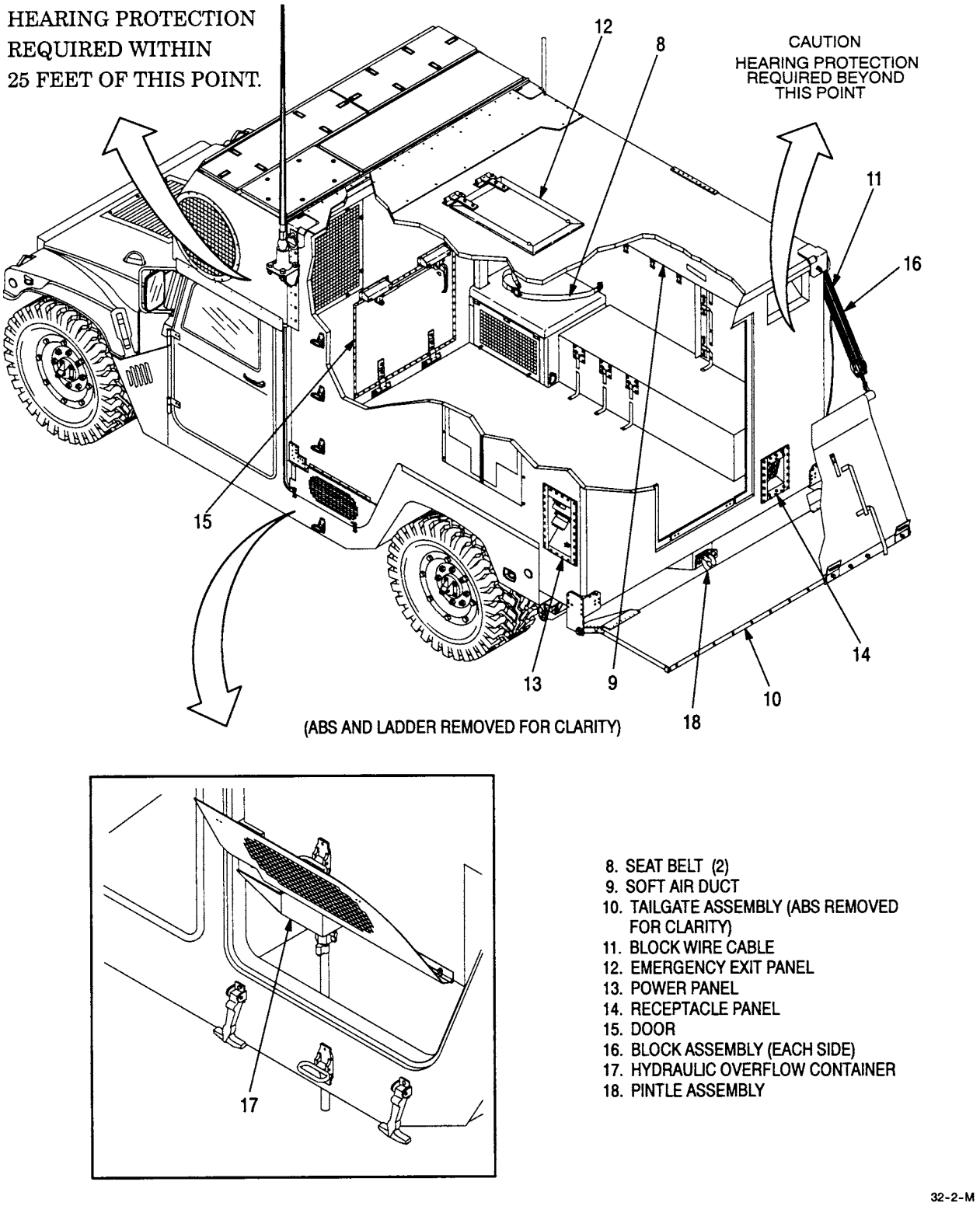

Figure 1-2. LMS Modification (Sheet 2 of 2)

c. Electrical System (figure 1-3).

(1) Raceway. Secures CBPS cable assemblies.

(2) Rear Light Box Assembly 1A4A7. Lights the aft LMS crew area.

(3) Inverter 1A4A13. Provides power to outlets on the receptacle panel. The inverter receives 24 Vdc from the ECV electrical system and outputs 115 Vac to the CBPS.

(4) Converter 1A4A14. Allows power from the 10 kW TQG to operate the CBPS. The converter receives 208 Vac from the 10 kW TQG (or other 208 Vac, 3-phase power 10 kW TQG or greater) and outputs 24 Vdc for the CBPS.

NOTE

The Electronic Control Console (ECC) comprises the rear control panel and the power mode switch.

(5) Rear Control Panel 1A4A4. Contains controls and indicators for CBPS deployment and operation. Controls heating and cooling temperatures within the CBPS through the temperature control unit.

(6) Power Mode Switch 1A4A4S1. Selects either ECV or an external power source to operate the CBPS.

(7) Forward Light Box Assembly 1A4A5. Lights the forward LMS crew area.

(8) Control Box Assembly 1A4A18. Allows communication between the LMS crew and the cab crew. Temperature control knob allows the LMS crew control of internal temperature during mobile mode.

(9) Relay Box 1A4A17. Located in passenger side MOPP gear storage box, supplies +24 Vdc to the CBPS.

d. ECU (figure 1-4).

(1) ECU. Contains the components that provide the venting, heating, cooling, and air filtration equipment. Also provides the air needed to inflate the air beams and to generate the over pressure (positive pressure) inside the CBPS.

(2) Intake Fan (Vent/NBC). Hydraulic driven fan used to draw outside air into the ECU.

(3) Condenser Fan. Hydraulic driven fan used to cool the condenser coil and hydraulic fluid when the Environmental Support System (ESS) mode selector switch on the Electronic Control Console (ECC) is set to COOL or VENT.

(4) Recirculation Fan. Draws in air from the NBC filters and from the return vent duct on the driver side of the LMS. The air is then directed towards the cooling/heating coils.

(5) Compressor. Consists of an air conditioner compressor used to cool the CBPS when the ESS mode selector switch on the ECC is set to COOL.

(6) Rib Blower. Consists of a hydraulic driven ring compressor fan used to supply air to the air beams.

(7) Manifold. Directs and controls the pressure and flow of the hydraulic fluid through ports to the components of the ECU as selected by the controls on the ECC.

(8) Hydraulic Fluid Reservoir. Holds 13 gallons of the system's 22 gallons of hydraulic fluid. A fluid level gage on the front of the reservoir provides a visual indication of the hydraulic fluid level. The reservoir also contains a strainer in the fill cap that filters the hydraulic fluid as it enters the reservoir.

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – Continued.

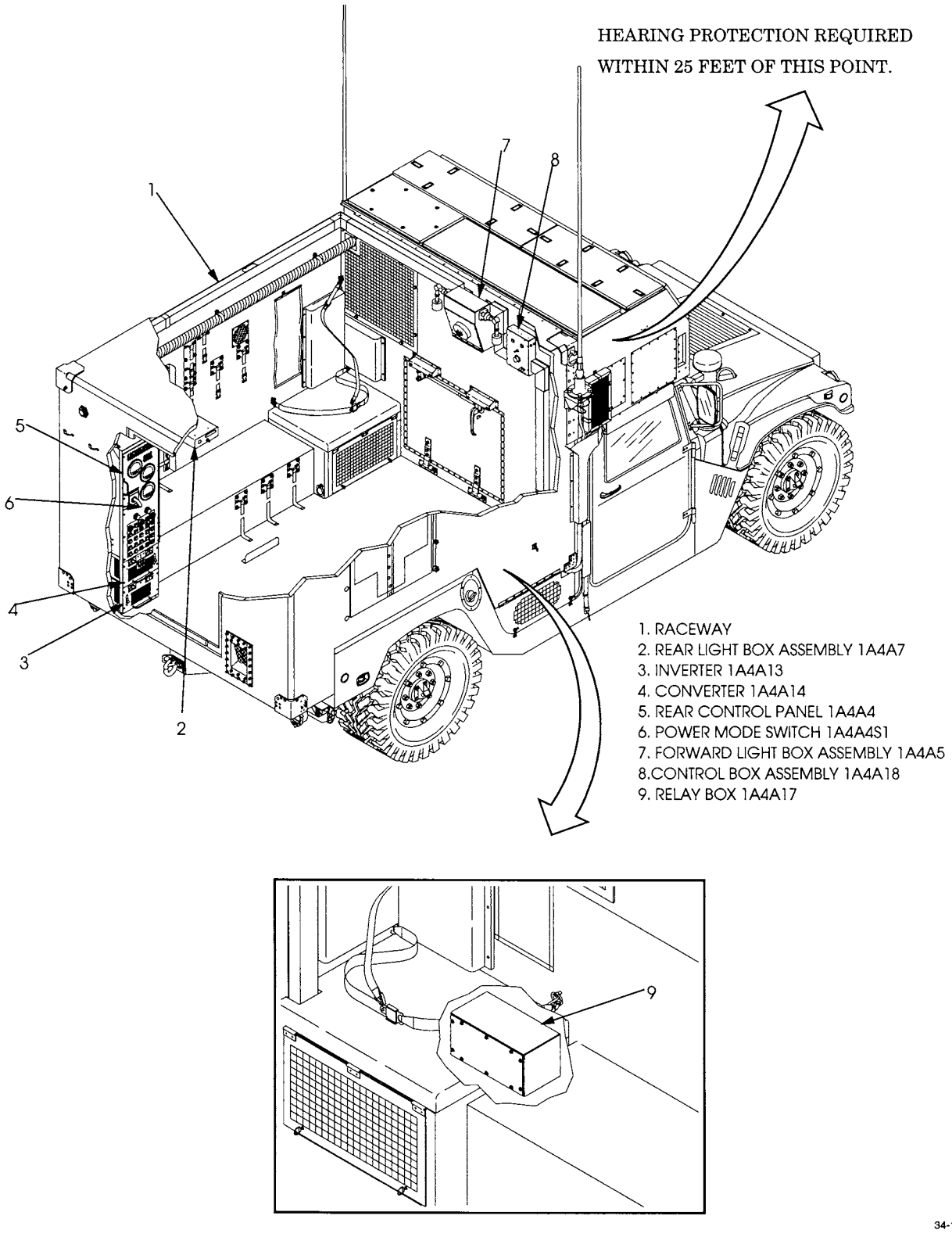

Figure 1-3. Electrical System

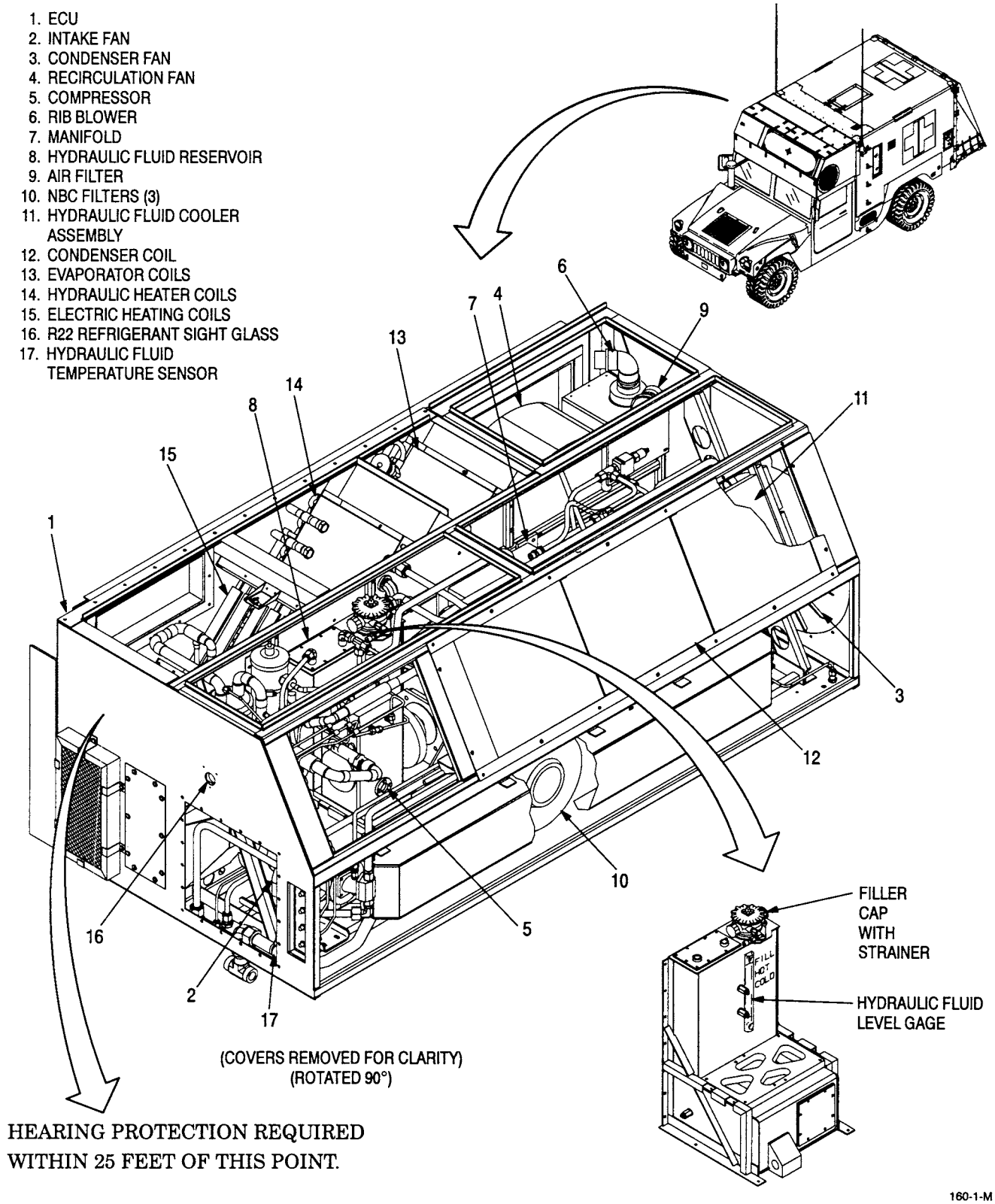

Figure 1-4. ECU

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – Continued.

(9) Air Filter. Used to filter the air beam air flow.

(10) NBC Filters (three). Chemical agent air filters used to filter contaminants during NBC conditions.

(11) Hydraulic Fluid Cooler Assembly. Cools hydraulic fluid during operation.

(12) Evaporator Coils. Area where the R22 refrigerant absorbs heat from the surrounding air, leaving cool air to be blown into the interior of the CBPS

(13) Condenser Coil. Area where heat is removed from the R22 refrigerant, changing the refrigerant back to a liquid.

(14) Hydraulic Heater Coils. Fin-tube exchanger which extracts heat from the hydraulic fluid passing through the coils. Air passing over the heated coils heats the interior of the CBPS.

(15) Electric Heating Coils. Externally powered AC electrical heating coils used to produce heat in the CBPS. The CBPS is capable of four heat stages, however, the 10 kW TQG only provides sufficient power to support stage 1 (2.5 kW).

(16) R22 Refrigerant Sight Glass. Provides visual indication of the refrigerant condition and level.

(17) Hydraulic Fluid Temperature Sensor. Senses when hydraulic fluid temperature is too high. Warning indicator on rear control panel lights to alert operator of this condition. If temperature increases an unmutable audible alarm on the rear control panel sounds.

e. TQG and HMT (figure 1-5).

(1) HMT. High mobility, 1/4 ton HMT, towed behind the ECV. Used to carry the TQG and store medical supplies, camouflage and support equipment, and repair kits.

(2) 10 kW TQG. Used to power the CBPS during static mode with power mode switch set to external power (EXT). The 10 kW TQG also supplies electrical power to the electrical heaters during extreme cold conditions with power mode switch set to internal power (INT).

(3) Frame. Supports the 10 kW TQG on the HMT.

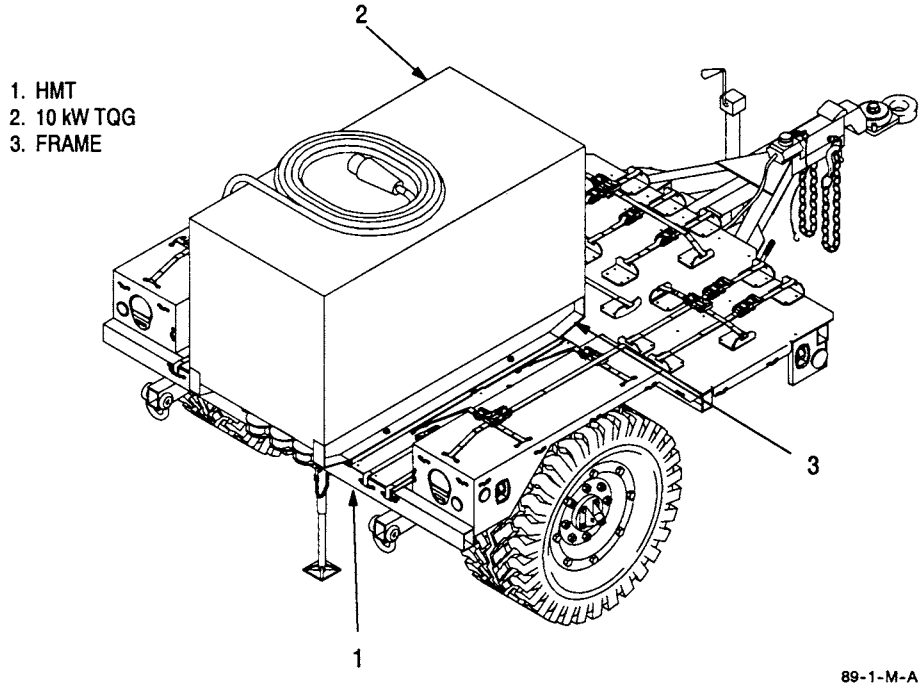

Figure 1-5. TQG and HMT

f. ABS (figure 1-6).

(1) ABS. The ABS is an 18 by 18 foot structure, made of chemical agent-resistant fabric. It is clamped to an aluminum retainer attached to the rear of the LMS.

(2) Air Beam Assembly. Inflatable air beams that support the ABS.

(3) Ambulatory Airlock Door. Airlock entrance that allows personnel access into the CBPS. Under NBC conditions, this entrance is under positive pressure to aid in personnel decontamination.

(4) Tunnel Airlock Litter Patient (TALP) Airlock Door. Airlock tunnel that allows litter patients access into the CBPS. Under NBC conditions, this entrance is under positive pressure to aid in patient decontamination.

(5) Air Inlet/Manifold. Air from ABS inflation passes through flexible hoses into air beams.

(6) Shut-Off Valves. In open position, allows air to enter the air beams.

(7) Windows. Allows visibility to outside conditions.

(8) Ambulatory Airlock Door Vents and Flaps. Used to adjust CBPS and airlock over pressure.

(9) TALP Airlock Door Vents and Flaps. Used to adjust CBPS and TALP over pressure.

(10) Pressure Gages. Measures air pressure in ambulatory door airlock and TALP compared to outside ambient air pressure.

(11) Dump Caps. When caps are removed, allows deflation of air beams.

(12) Direct Complexing Shelter (DCS) Door. Opening used when connecting to another CBPS, or for fresh air ventilation with screen installed.

(13) Insulation Panels. Attached to four sides and roof of ABS and used to insulate the ABS.

(14) Speaker Assembly. Allow LMS crew to monitor radios and communicate with other units.

g. Recirculation Filter (figure 1-7)

(1) Recirculation filter is a portable, self-contained unit to filter any residual NBC contaminants inside the ABS. The cover (1) is attached to housing (2) by four link-lock fasteners (3). The housing contains a blower, replaceable gas filter element (4), and power switch (5). The power cord (6) provides connection to a standard 110 Vac/60 Hz socket. Air enters through air inlets (7) and is forced downward through replaceable gas filter element. Filtered air exits through air outlets (8).

1.12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – Continued.

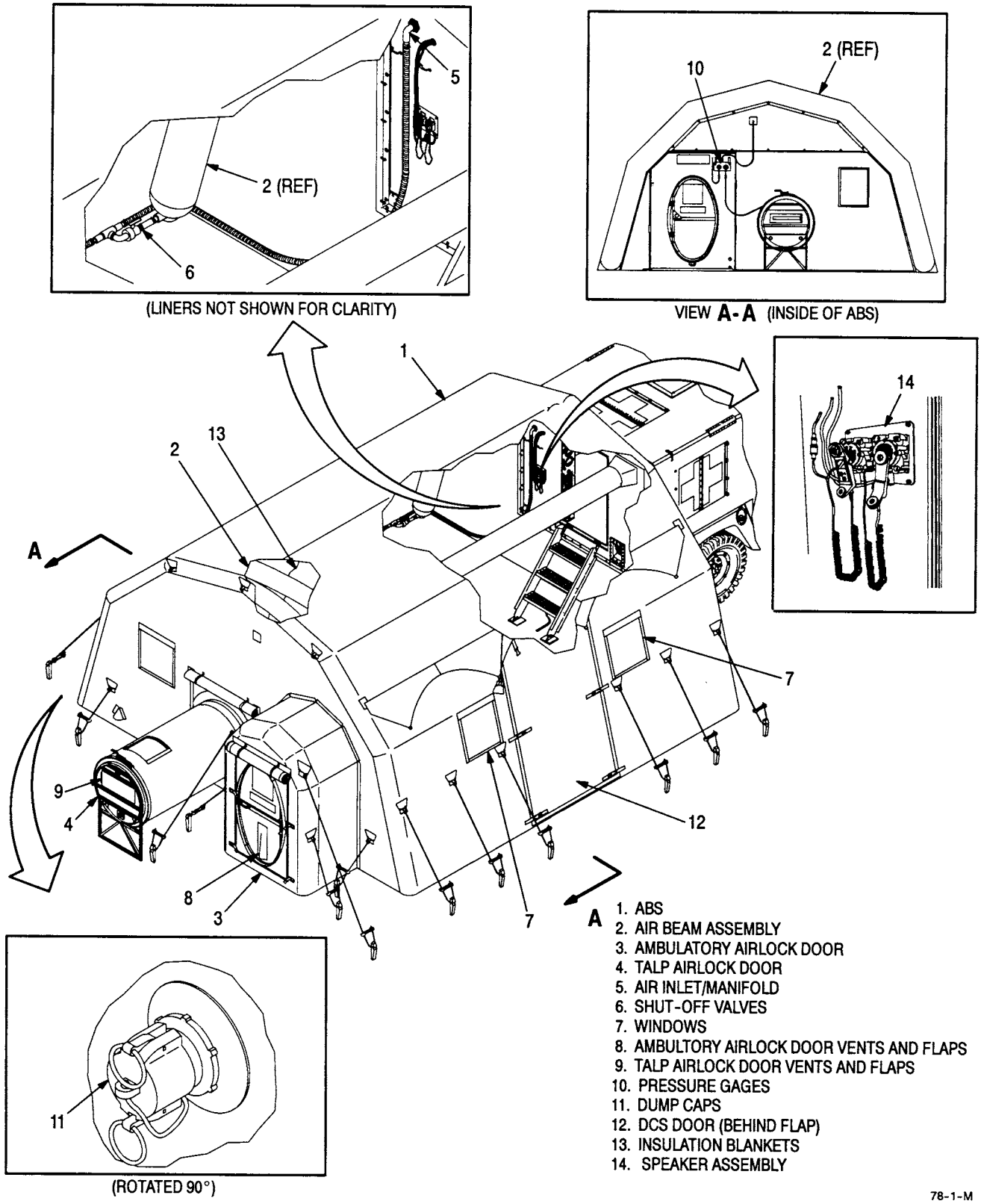

Figure 1-6. ABS

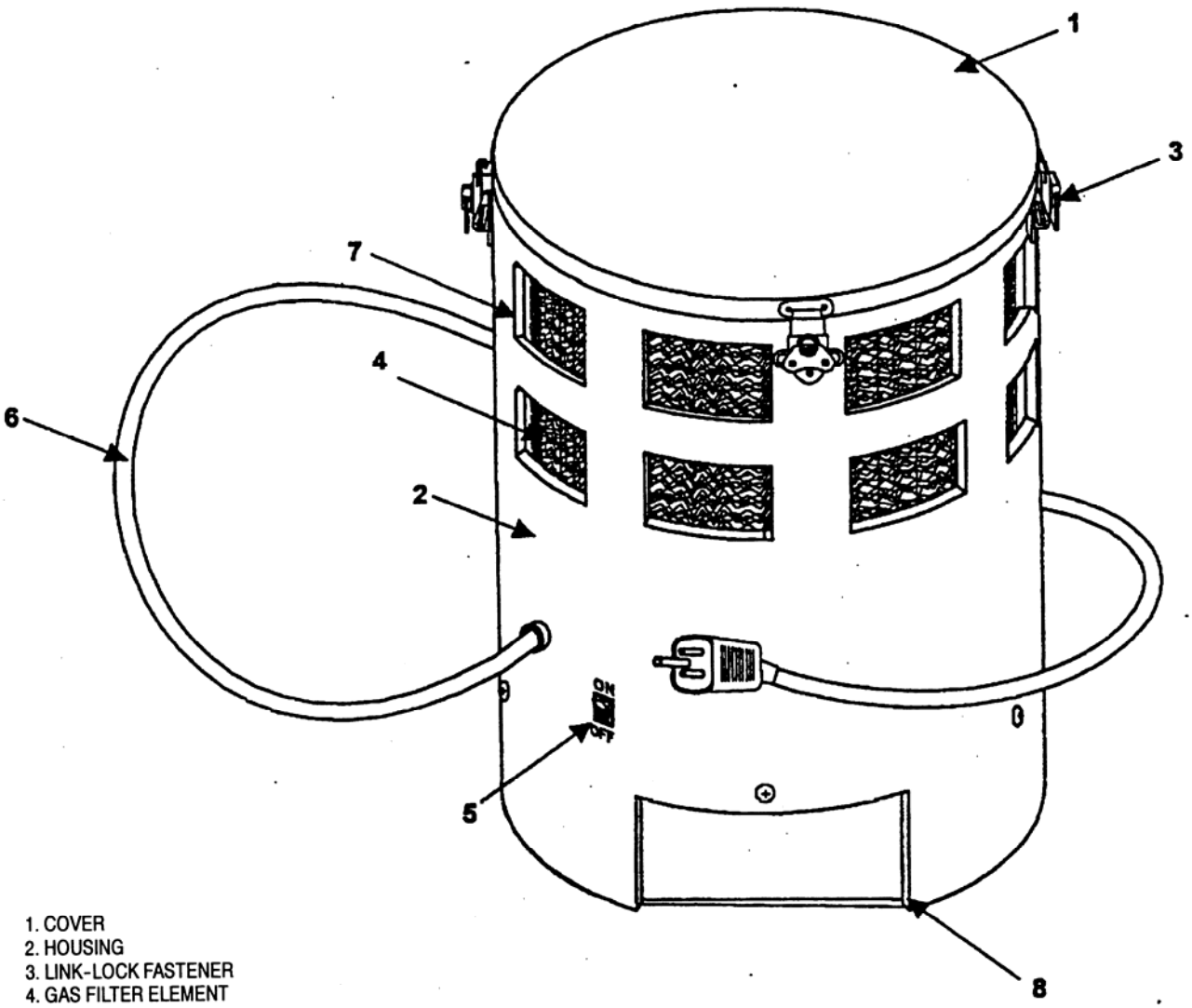

Figure 1-7. Recirculation Filter

1.13 EQUIPMENT DATA.

- CBPS (includes crew gear, medical equipment and pintle weight)
  (ECV total load includes crew, fighting gear, and pintle weight)

CBPS Total Weight:	15,700 lb
Curb Weight:	6,100 lb
Gross Weight:	11,500 lb
Payload:	5,098 lb
Front Axle:	5,750 lb
Rear Axle:	7,000 lb
ECV Total Load:	11,500 lb
HMT:	4,200 lb

Mobile Profile	Static Profile
Length: 328 in.	Length: 516 in.
Width: 87 in.	Width: 226 in.
Height: 103.5 in.	Height: 126.5 in.
Bridge Class (MLC):	Empty: 2
	Loaded: 4
Axle Weight Rating:	Front: 5,750 lb
	Rear: 7,000 lb
Ground Clearance:	16.5 in.
Fording Depth:	60 in.
Max Grade:	22°
Max Side Slope:	17°
Center of Gravity:	
Vehicle:	Vertical: 42.3 in. above ground
	Longitudinal: 51.6 in. forward of rear axle C/L
	Latitudinal: 0.85 in. right of C/L
	Vertical: 37.5 in. above ground
HMT:	Longitudinal: 6.5 in. forward of axle C/L
	Latitudinal: On HMT longitudinal C/L
Fuel Economy:	8 hrs per tank (estimated)
Range:	275 mi. (approximately)

- INVERTER

Input Voltage:	28 Vdc (22 Vdc to 29 Vdc)
Extended Range:	18 Vdc to 32 Vdc
Output Voltage:	120 Vac (117.6 Vac to 122.4 Vac)
Output Current:	11.6 amps at 120 Vac
Output Frequency:	60 Hz±2%
Output Power:	1.4 kW
Weight:	32 lb (approx.)

- CONVERTER

Input Voltage:	208 Vac (197 Vac to 208 Vac)
Extended Range:	188 Vac to 225 Vac
Input Phase:	3 phase/4 wire
Input Frequency:	47 Hz to 63 Hz
Output Voltage:	Range – 26.6 Vdc to 29.4 Vdc (28 Vdc Nominal)
Output Power:	2 kW
Weight:	25 lb (approx.)

- AC MOTOR

Input Voltage:	208 Vac, 3-phase
Power:	7.5 hp @ 3,450 RPM
Weight:	105 lb

- ECU

Weight:	1,035 lb (includes hydraulics, A/C, heat, air filtration)
Hydraulic Fluid:	13 GL in reservoir
Total Hydraulic Capacity:	22 GL
R22 Refrigerant Capacity:	11.5 lbs

- LMS

Weight:	1,295 lb (includes cables, wires, control boxes)
Length:	102 in.
Width:	84 in.
Height:	67 in.

- ABS

Weight:	730 lb (includes air beams, air manifold, insulation panels)
Length:	224 in.
Width:	226.2 in.
Height:	126.5 in.

Section III. PRINCIPLES OF OPERATION

1.14 GENERAL.

The CBPS is a highly mobile battalion aid station designed to be operational in a forward battle area in a quick time response (under 30 minutes). The CBPS is manned by a crew of four. Two crew members (LMS crew) are inside the LMS and are responsible for operating electronic controls as well as installing internal doors and equipment. The other crewmembers (cab crew) are the driver and navigator. Their responsibilities are to set ECV for static mode, unload HMT, connect 10 kW TQG to LMS power panel, install ABS stakes, install outside doors on ABS and other tasks associated with inflating the ABS. The following provides a basic operational description of CBPS, its major components and how they interface with each other.

a. Operational Power. The CBPS is operated using the ECV or external 10 kW TQG and operates off both Direct Current (DC) and Alternating Current (AC).

NOTE

When operating under ECV power, the circuit breaker on the LMS power panel is normally set to OFF. However, the 10 kW TQG can also be used (circuit breaker ON) to power AC electric heaters during low temperature conditions.

(1) ECV System (Internal) Power. When internal power is used (ECV operating), the DC power for CBPS is derived directly from vehicle's electrical system. Two warning indicators on rear control panel are used to alert crew if engine's oil pressure is low or if temperature of engine's coolant is high (hot).

To set ECV for static mode, the cab crew puts vehicle in park, sets hand brake and turns EPG switch ON. The shelter crew turns on circuit breakers and sets controls on rear control panel. The EPG controls idle speed of ECV engine under varying system load conditions by comparing engine speed (via magnetic pickup on engine flywheel) with settings on EPG control unit.

With engine running in high idle (EPG ON), the belt-driven primary hydraulic pump P1 in engine area is turning and pumping hydraulic fluid throughout selected components in ECU. The 24 Vdc, 200 amp system of ECV provides DC operating power for CBPS. The 24 Vdc voltage is applied to inverter which provides a 115 Vac output for CBPS AC components.

1.14 GENERAL – Continued.

NOTE

Under full CBPS load conditions, a maximum of 3,412 watts (142 amps) is possible. Since the system is powered by a 200 amp generator, the remaining 58 amps should be adequate for ECV systems and battery charging.

(2) External Power. External AC power is normally provided by connecting the 10 kW TQG to LMS power panel; however, any equivalent or greater 208 Vac, 3-phase external source may be used. AC input power from 10 kW TQG is applied to CBPS components including AC motor A2M1 in compartment on passenger side of ECV. The AC motor drives a hydraulic pump P2. Hydraulic pump P2 pumps hydraulic fluid through selected components of ECU. AC is also applied to converter 1A4A14 which provides DC operating power for CBPS. Because hydraulic system in external mode is incapable of providing heat required by the system, AC electric heaters located in ECU are used to heat CBPS.

b. LMS. During deployment of ABS, LMS crew operates controls and indicators for inflating and pressurizing ABS and sets environmental temperature within CBPS. LMS crew also monitors alarm indicators on rear control panel and ensures that air is supplied to ABS.

c. Environmental Control. The ECU components are powered by the hydraulic system. Venting, heating and cooling equipment housed in ECU is controlled by ESS mode selector switch located on rear control panel. Outside air is drawn into ECU via NBC fan, directed through dust/water separator (vortex generator), through a plenum in ECU, to three NBC gas particulate filters. Filtered air goes into a port where it is mixed with filtered return air from LMS. A recirculating fan directs air across heating or air conditioning coils for heating or cooling. Air is blown into the soft air duct of LMS and through cloth duct of ABS. When in cool mode, the air conditioner condenser coil is cooled by passing air over condenser coil with a condenser fan located on driver's side of ECU.

Also located in the ECU is the rib fan used to inflate air beams. Air generated by rib fan is passed through a flexible hose in LMS to rib manifold in ABS. The rib manifold connects to each air beam and contains a check valve and shut-off valve. The check valve automatically stops airflow from air beam. The shut-off valves can be used to isolate a selected air beam for maintenance purposes. A small hose from air beam manifold to a fitting on LMS is used for measuring air beam pressure.

d. ABS. The ECV tailgate is lowered and ABS is unrolled, inflated and secured with lines and stakes. Before the air beams can be inflated, it is necessary to verify that shut-off valves on air beams are opened and air beam dump caps are properly secured. Under normal conditions, rib fan will be on when air beam pressure is 1.5 psi or lower and will turn off when pressure reaches 2.9 psi.

For NBC operation, the entire CBPS should be decontaminated. (Refer to FM 3-11.5.) Ambulatory and TALP entry ways must be kept securely sealed to keep contaminated outer surfaces of ABS from contaminating interior of ABS or LMS. For protection against contaminants, ABS should not be inflated lower than 0.5 inches of water, gage (iwg).

NOTE

Over pressurization (positive pressure) is achieved by supplying a continuous, high volume of air into CBPS to maintain air pressure that is slightly higher than the outside, ambient air pressure. This results in a continuous outward flow of air to the atmosphere through vents and any leaks in ABS, thus preventing entrance of outside contaminants.

Pressure in ABS is measured on NBC shelter pressure gage. It is referenced to atmospheric pressure by use of a pressure tap mounted on power panel of LMS. A momentary drop in CBPS pressure may be experienced when door is opened. Airlock (differential) gages located at entrance of ABS are used to measure pressure in ambulatory and TALP airlocks. To pressurize ambulatory and TALP airlocks, air must flow through airlocks. This is accomplished by opening outer and inner door flaps. Opening the flaps also controls over pressurization within ABS enclosure. A connector on power panel allows for connection of an external Chemical Agent Monitor (CAM) for monitoring biological contaminants. If contaminants are detected, the NBC fan will automatically turn on. NBC recirculation filter fans, provided as on-board components of CBPS, are critical to cleansing air of contaminants in ABS enclosure when personnel enter or exit ABS and must be connected to receptacle panel. A hand-held CAM, provided with the system, can be used to measure the amount of contamination in selected areas of CBPS (e.g., ambulatory or TALP airlocks).

1.15 ELECTRICAL SYSTEM.

Refer to the CBPS system schematic Figure 1-8 and troubleshooting schematic in Appendix F when reading CBPS electrical theory of operation.

1.15.1 General Information.

The CBPS uses three main voltages for operation. 208 VAC, three phase is used to operate the electric heaters. The 208 VAC, three phase is available only when supplied by the TQG, external power source. Therefore the electric heaters may only be used when the TQG external power source is available. 115 VAC, single phase is used to power the outlet receptacle on the back of the LMS. This provides power for ABS lighting, portable recirculation fans, and medical or other miscellaneous equipment requiring 115 VAC, single phase. The main power requirement for the CBPS is +24 VDC. It is used to power the circuitry used to control the hydraulic functions and additional lighting.

The 24 VDC is distributed throughout the CBPS system from the 24 VDC bus through four main circuit breakers located on the front of the Rear Control Panel:

- HEAT/COOL circuit breaker A4CB1.
- NBC/VENT circuit breaker A4CB2.
- INSTM/CONT circuit breaker A4CB3.
- LTG/INTERCOM circuit breaker A4CB4.

NOTE

The components serviced by circuit breakers A4CB1 through A4CB4 are the same whether using ECV (internal power) or 10KW TQG (external power).

These circuit breakers protect the electrical circuits to which they distribute 24 VDC. All four of the circuit breakers must be turned on (closed) for complete CBPS electrical system operation.

1.15.2 Power Distribution, Internal Power (ECV).

When setting the CBPS for static mode, position vehicle shifter to PARK or NEUTRAL, and set parking brake. The ECV engine will start with shifter in either PARK or NEUTRAL. PARK is preferred. After ECV engine is running and engine RPM has stabilized, set EPG switch on vehicle control box to ON position. It could take several minutes for engine RPM to stabilize, especially in cold weather.

NOTE

Do not set EPG switch on vehicle control box to “ON” before starting ECV engine. Proper starting procedure is to start ECV engine and let engine rpm stabilize prior to setting EPG switch to “ON”.

+24 VDC is applied from vehicle wire 29D, through closed contacts of vehicle neutral switch, to pins X1 and X2 of relay A8K2. With A8K2 energized, setting start/stop switch to start (S) position, applies +24 VDC to starter motor. When engine starts and start/stop switch is released, it automatically returns to run (R) position. +24 VDC is also applied to diode A17D2.

Diode A17D2 conducts, energizing relay A17K1. +24 VDC from the battery pack is applied across closed contacts A1 and A2 of A17K1 to line A (hot). Ground (common) is applied to line B. +24 VDC from ECV battery pack is also applied to EPG circuit breaker A8CB1. With circuit breaker A8CB1 ON and neutral safety relay A8K2 energized, +24 VDC is applied to toggle switch A8S3 which turns on the EPG which increases ECV engine speed to 1400 - 1500 RPM. Exact engine speed is not critical as long as it is within the 1400 - 1500 RPM range. Actual engine speed is adjusted on EPG electronic controller to provide sufficient hydraulic fluid flow to spin the NBC fan at 9000 ±25 RPM during NBC operation using INTERNAL power after primary hydraulic pump adjustments have been performed.

1.15 ELECTRICAL SYSTEM – Continued.

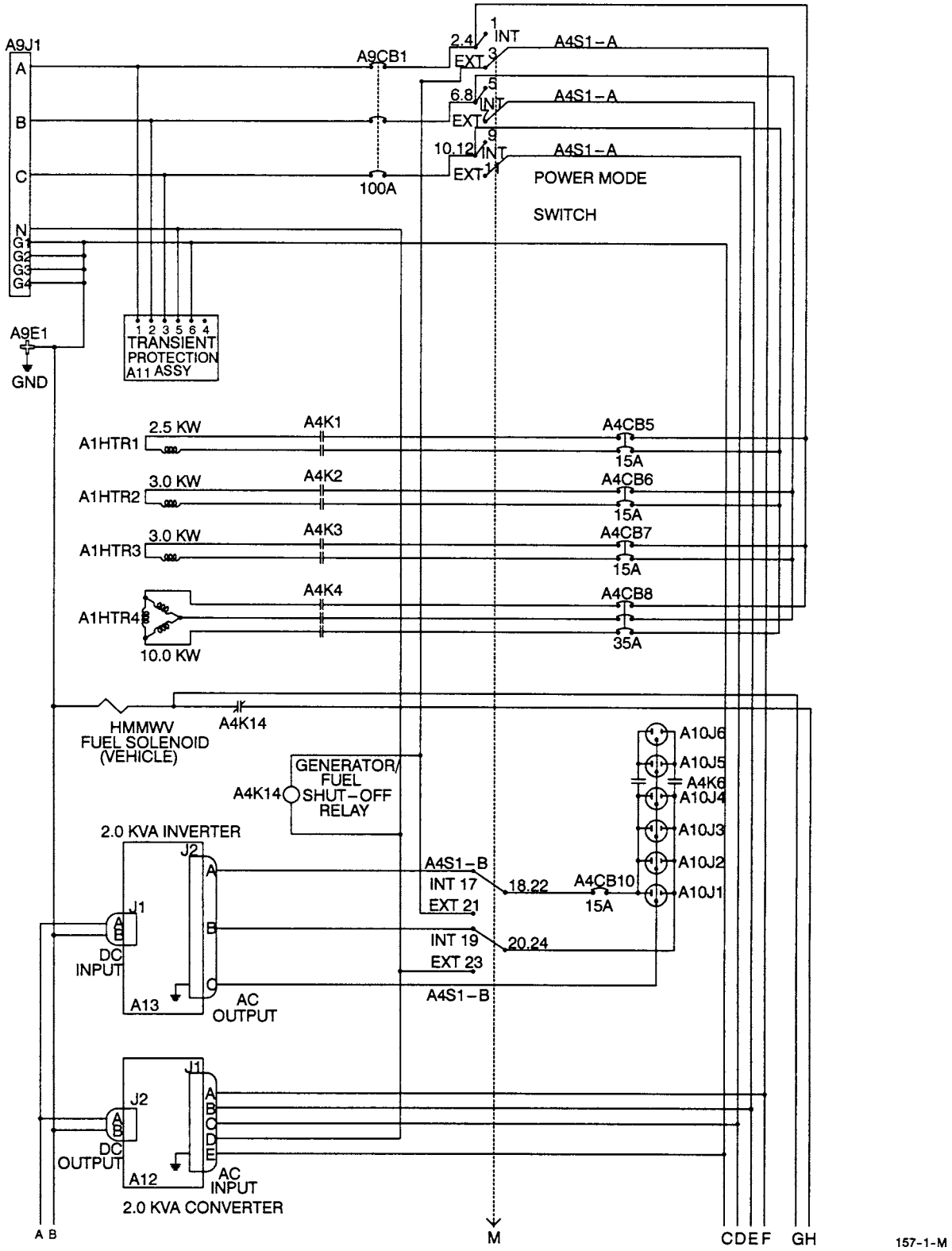

Figure 1-8. System Schematic (Sheet 1 of 5)

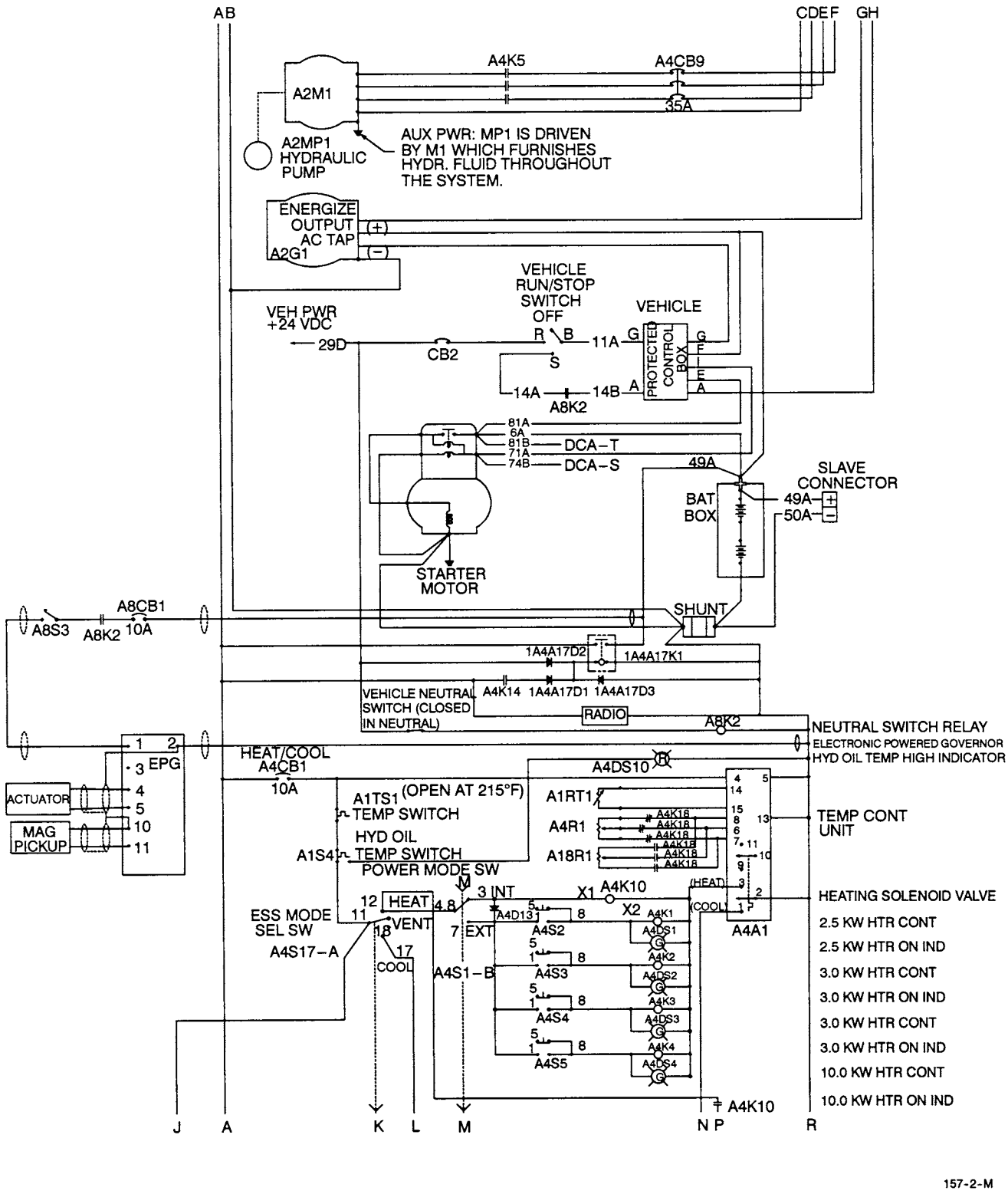

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Figure 1-8. System Schematic (Sheet 2 of 5)

1.15 ELECTRICAL SYSTEM – Continued.

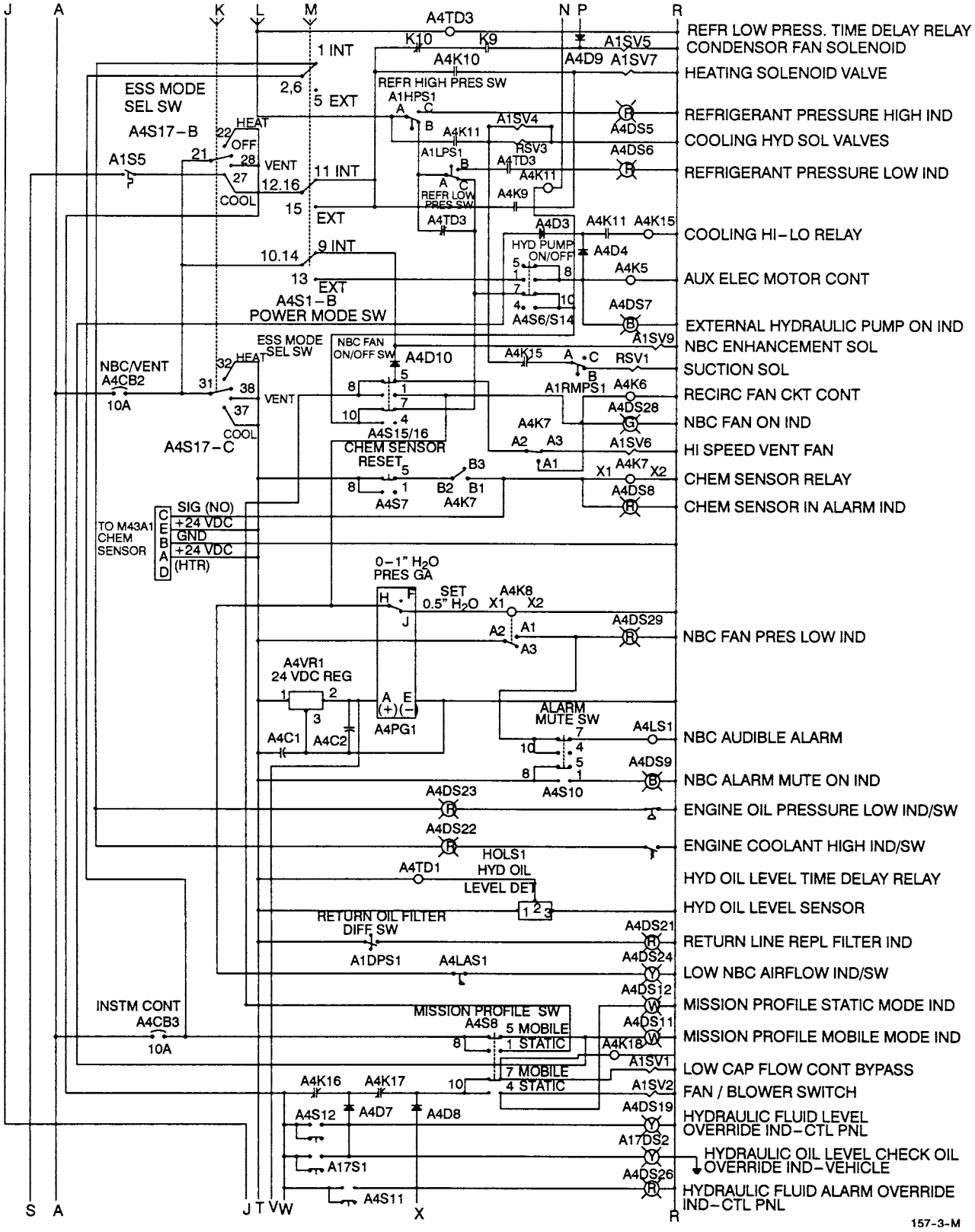


Figure 1-8. System Schematic (Sheet 3 of 5)

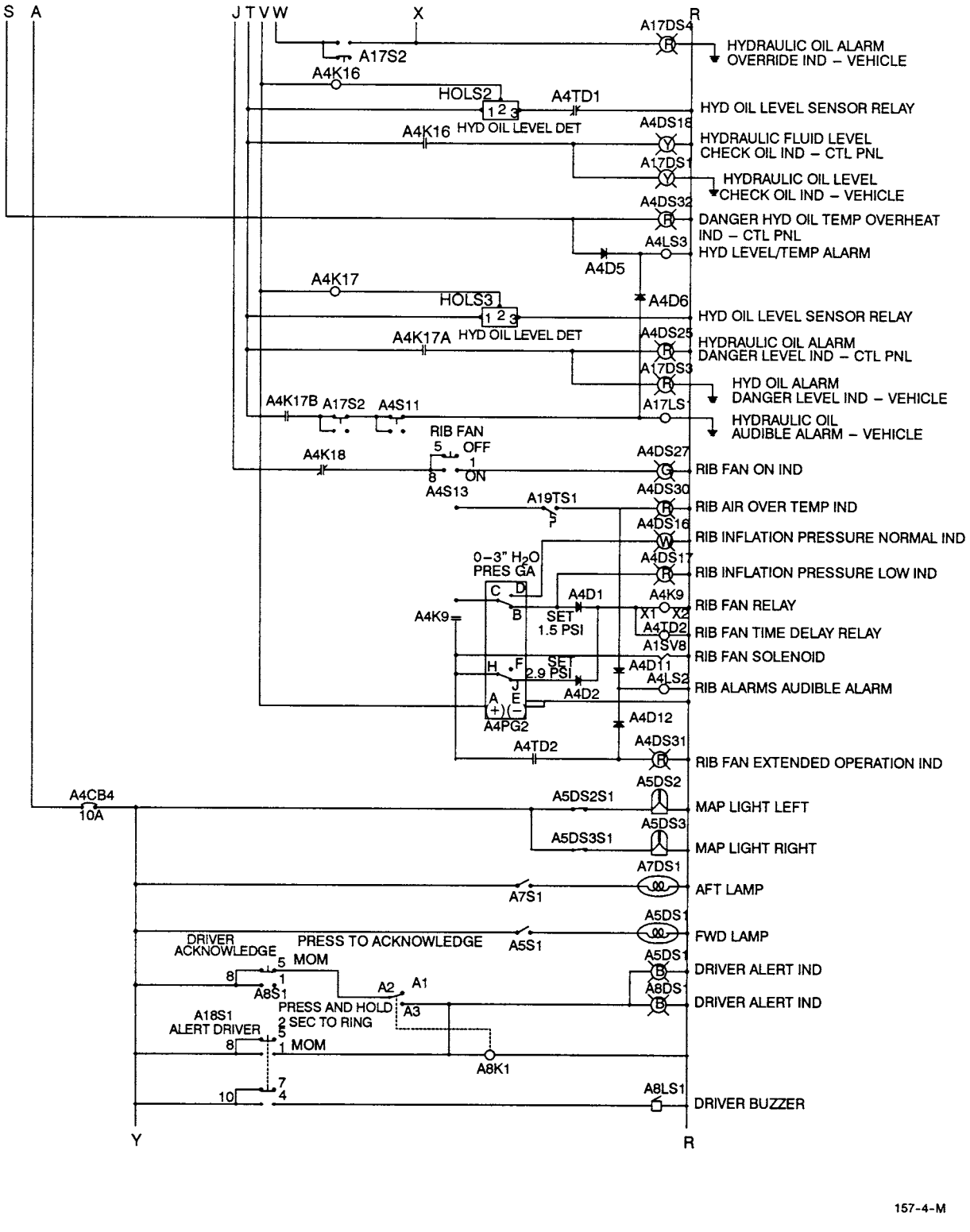


Figure 1-8. System Schematic (Sheet 4 of 5)

1.15 ELECTRICAL SYSTEM – Continued.

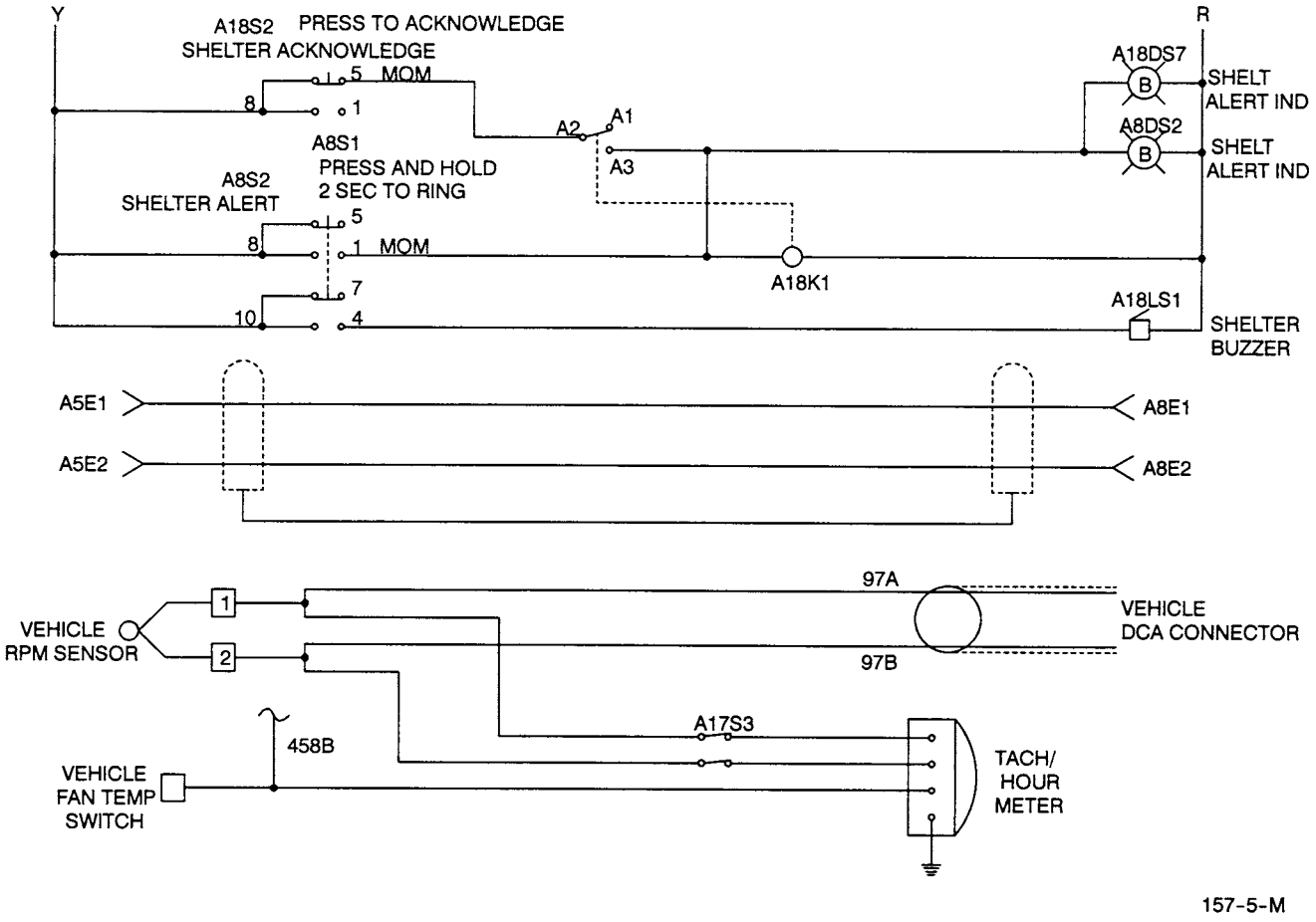


Figure 1-8. System Schematic (Sheet 5 of 5)

NOTE

The POWER MODE selector must be set to internal (INT) mode to operate CBPS using ECV power.

a. +24VDC. When the EVC OFF/RUN/START switch is set to RUN and CBPS is operating on INTERNAL power, diode A17D2 allows 24VDC vehicle power to energize main contactor relay A17K1. The +24VDC switched by A17K1 is applied to the 24VDC bus on Rear Control Panel.

b. 115 VAC, Single Phase. One of the outputs from 24 VDC bus is routed to inverter (1A4A13) through 1A4A4 J11 and cable 1A4W11 to inverter at 1A4A13 J1. The inverter converts +24 VDC to a 115 VAC output on connector 1A4A13 J2 which is routed back to the Rear Control Panel through cable 1A4W12 and 1A4A4 J6 and applied to pins 17 and 19 on the POWER MODE selector A4S1-B.

115 VAC, single phase is used for only one application in CBPS system. It provides power to 1A4A10 Receptacle Panel located on rear of the LMS. The receptacle panel provides a source of power to operate portable recirculation fans positioned on floor of Air Beam Shelter (ABS), the light sets for lighting the ABS, and miscellaneous electrical equipment as required. All applications of 115 VAC, single phase are used only when the CBPS is used in the static mode (the ABS must be inflated to access the receptacle panel.

If the OUTLET ASSEMBLY circuit breaker A4CB10 on the Rear Control Panel is set to ON position and POWER MODE switch is set for INT, 115 VAC is continuously applied to connectors A10J1 through A10J4 on receptacle panel.

NOTE

Re-circulation fan circuit control relay A4K6 is energized under NBC conditions when NBC switch is pressed or chemical sensor connected to A9J1 senses contaminants and causes chemical sense relay A4K7 to energize.

Connectors A10J5 and A10J6 are reserved for the NBC re-circulation fans positioned inside ABS during static operation. They will only receive 115 VAC when re-circulation fan circuit control relay A4K6 in the Rear Control Panel is energized. Conditions to energize relay A4K6 include 24 VDC on the 24 VDC bus, circuit breaker A4CB3 closed, MISSION PROFILE switch A4S8 positioned to STATIC, and NBC FAN switch A4S15/16 positioned to NBC ("ON"). These are the same conditions required to manually select NBC mode using INT power. If A4S15/16 is positioned to non-NBC ("OFF") position, relay A4K6 may be automatically energized by the Chemical Sensor if one is connected to LMS at A9J1 and it senses a contaminate.

1.15.3 Chemical Sensor Circuit.

If an external Chemical Sensor is connected to the LMS and it senses a contaminate, it energizes CHEMICAL SENSOR relay A4K7 which automatically energizes A4K6 and triggers the CBPS system into NBC mode. Relay A4K7 locks itself energized with 24 VDC from normally closed contacts of CHEM SENSOR switch A4S7 through its own contacts B1 and B2. Relay A4K7 can be de-energized by pressing and releasing A4S7, temporarily opening the lock-up circuit keeping A4K7 energized.

1.15.4 Heat Circuit, Internal Power (ECV).

When operating the CBPS using internal power, the electric heaters are not used unless they are powered with 208 VAC, three phase from the TQG. The ECV does not have a 208 VAC, three phase output nor does it have the facility to develop 208 VAC, three phase from 24 VDC. On internal power, the CBPS uses heated hydraulic fluid to provide heat for the LMS and ABS. Relay A4K10 energizes and de-energizes to cycle the hydraulic heat function "ON" and "OFF" as required by the temperature control circuit.

+24 VDC is normally applied to ESS MODE switch A4S17-A pin 11 (common) when A4CB1 is closed. When positioned to HEAT the 24 VDC is routed from A4S17-A pin 12 to POWER MODE selector A4S1-B pin 3. If A4S17-A is positioned to INT the 24 VDC continues on to A4TB2 pin 2 and then to A4K10-X1, positive side of the relay coil. A4K10-X2, the negative side of coil is connected to A4TCU, temperature control unit. A4TCU electrically connects/disconnects ground to A4K10. A thermistor A1RT1 is attached to air input side of the recirculation fan senses actual air temperature inside the LMS and ABS as it circulates. Its resistance varies with air temperature and is sent back to A4TCU. The temperature control unit compares thermistor output with output of heat control A4R1 or A18R1. A4R1 on the Rear Control Panel and A18R1 on the Control Box Assembly provide CBPS users a way to adjust air temperature inside the LMS and ABS. A4K18 is de-energized during static mode of operation and connects A4R1 to Temperature Control Unit. A4K18 is energized during mobile mode of operation and connects A18R1 to A1RT1 Temperature Control Unit. When actual air temperature measured by thermistor goes below desired temperature set by A4R1 during static operation, A4TCU connects A4K10-X2 to ground energizing A4K10. Contacts B1 and B2 of A4K10 close to reposition (close) A1SV7 in the hydraulic manifold. Closing A1SV7 blocks the normal hydraulic fluid return path back to the reservoir and forces the fluid at high pressure over Relief Valve RD2. As pressure drops to nearly zero, hydraulic fluid temperature rises. From RD2 the fluid is routed to heater core located in recirculation air stream on its way back to the reservoir. The heat is extracted at heater core and serves to warm the air recirculated back to the LMS and ABS. As actual air temperature increases higher than the desired, the Temperature Control Unit disconnects ground from A4K10 which opens normal fluid return path to reservoir disabling the heat function.

1.15 ELECTRICAL SYSTEM – Continued.

1.15.5 Power Distribution, External Power (TQG).

a. 208 VAC, Three Phase. When operating off the 10 kW TQG (or other external source), 208 VAC (3-phase) is applied to connector A9J2 on power panel located on rear, driver's side of LMS. Setting Power Panel circuit breaker A9CB1 "ON" applies 208 VAC, 3 phase to pin combinations 2 and 4, 6 and 8, and 10 and 12, common side, of POWER MODE selector A4S1-A in Rear Control Panel. When POWER MODE selector is set to EXT position, 208 VAC, 3 phase is applied across POWER MODE selector contacts to circuit breaker A4CB9. If A4CB9 is closed ("ON") and relay A4K5, AUX HYD PUMP relay, is energized, the 208 VAC, 3 phase is applied through cables 1A4W3 and 1A1W2 to the AUX HYD PUMP motor. The AUX HYD PUMP motor drives the auxiliary hydraulic pump providing CBPS system hydraulic fluid flow in the ECU when operating CBPS on EXTERNAL power. Relay A4K5 energizes when POWER MODE selector is positioned to EXT and A4S6, EXT HYD PUMP switch, on Rear Control Panel is closed ("ON").

b. +24 VDC. The converter (1A4A12) must be turned ON when operating the CBPS using external TQG power. It converts the 208 VAC, 3-phase input into a +24 VDC output, which is applied to the 24 VDC bus in the Rear Control Panel from connector A12J2 through cable 1A4W10 and A4J10.

   +24 VDC from the 24 VDC bus is applied to pin X1 of relay A17K1 coil via the closed contacts of A4CB3, closed contacts pins B1 and B2 of relay A4K14 in the relay box, and diode A17D1. The ground connection at pin X2 of relay coil A17K1 is connected to the negative side of the ECV battery pack through cable 1A4W1. When diode A17D1 conducts, relay A17K1 energizes and 24 VDC is applied across A17K1 contacts A1 and A2 to the positive side of the ECV battery pack. This keeps the ECV battery pack charged during CBPS operation using EXTERNAL POWER.

c. 115 VAC, Single Phase. The ECV cannot be started or run while power mode selector switch is set to EXT which allows external power to operate the CBPS.

   115 VAC is tapped off POWER MODE selector A4S1A at pin 3 and applied to the coil (X1 and X2) of relay A4K14. This energizes relay A4K14, opening its contacts A2 and A3, disabling the ECV fuel solenoid which prevents anyone from starting the ECV while operating CBPS using EXTERNAL power. A4S1A pin 3 is also connected to A4S1B pin 21. A4S1B pin 23 is connected to the NEUTRAL connection from the TQG. When A4S1 is positioned to EXT, 115 VAC is applied through closed contacts of A4CB10 to the 1A4A10 receptacle circuits. Receptacle Panel operation remains the same as described in the Power Distribution Internal Power (ECV) paragraph.

1.15.6 Electric Heater Circuits.

WARNING

The 10 kW TQG will only support heat stage 1 DURING EXTERNAL OPERATION. Turning on heaters 2 through 4 will shut down the TQG. Under NBC conditions, contamination and death may occur.

Only heat stage 1 may be used when operating the CBPS on EXTERNAL power. The 10KW generator power output is not sufficient to operate the remaining heat stages while operating CBPS on EXTERNAL POWER. If the CBPS is operating on INTERNAL POWER (ECV), the 10KW generator output is sufficient to operate any combination of the first 3 heater stages. When stage 4 heater is used in combination with any other electrical heater stage a generator with 30KW or higher output is required. The stage 4 heater can be used with the 10KW generator if it is the only heater stage selected while CBPS is operated using INTERNAL power.

NOTE

Heat stage 4 may be used only if a 30KW or larger generator set is used as the external power source while operating the CBPS on external power.

The output of the TQG and input AC power to electrical heater stages are both connected to the common side of A4S1-A. Anytime the TQG is connected to the LMS and its output transferred to the LMS, the 3 phases of 208 VAC are individually supplied to separate sections of circuit beakers A4CB5 through A4CB8 regardless of POWER MODE selector position.
Four relays, A4K1 through A4K4, and four switches, A4S2 through A4S5, control the application of AC power from circuit breakers A4CB5 through A4CB8 to the four heater elements. Each of the relay coils are grounded through Temperature Control Unit, A4TCU. The TCU decides when to apply ground to energize the selected heater stage as a result of comparing actual air temperature from thermistor A1RT1 and desired air temperature from A4R1. A heater stage is selected when its corresponding switch is positioned to ON. For example, heater stage one is selected by pressing A4S2 to ON. This applies 24 VDC from A4S17-A pins 11 and 12, HEAT selected, to A4S1-B pin 4. With EXT selected, the 24VDC is applied through A4K6 normally closed contacts 13 and 14, NBC OFF, through A4S2 contacts 1 and 8 to the X1 coil connection of A4K1.

NOTE

Re-circulation fan circuit control relay A4K6 will be energized under NBC conditions when NBC switch is pressed or chemical sensor connected to A9J2 senses contaminants and causes chemical sense relay A4K7 to energize.

Electrical heaters are disabled in NBC mode when powering the CBPS on EXTERNAL power because relay A4K6 is energized. The Temperature Control Unit provides a ground to X2 coil connection of A4K1 when actual air temperature is less than the desired setting on A4R1 energizing A4K1. This closes A4K1 contacts B1 to B2 and C1 to C2 applying AC power to the heater stage 1 element. While relay A4K1 is energized, HEATER ON lamp A4DS1 is ON. As soon as the actual air temperature reaches the desired temperature setting, the Temperature Control Unit disconnects ground to relay A4K1 and it de-energizes. HEATER ON lamp A4DS1 turns OFF and AC power is disconnected from heater stage 1 element. Circuitry for all four stages of electrical heat operate the same way.

1.15.7 Regulated 24VDC Using INTERNAL or EXTERNAL Power.

Voltage regulator A4VR1 is mounted on the Temperature Control Unit. A4VR1 provides regulated 24 VDC for the switching operations in the Rib Pressure gage A4PG2 and NBC Differential Pressure gage A4PG1. 24 VDC from A4CB2 is applied through A4S17-C, ESS Mode switch to A4VR1 pin 1. A4VR1's output at pin 2 is applied to pin A on A4PG1 and A4PG2. This is the only application of regulated 24 VDC.

1.15.8 Hydraulic Fluid Level Sensors and Warning Circuitry.

Three Hydraulic Oil Level Sensors (HOLS), HOLS1, HOLS2, and HOLS3 are mounted on the hydraulic reservoir. HOLS1 is higher on the reservoir than HOLS2 and HOLS3. HOLS3 is positioned near the bottom of the reservoir and HOLS2 is positioned between HOLS1 and HOLS3. Together, HOLS1 and HOLS2 are used to sense a CAUTIONARY level of hydraulic fluid. HOLS3 is used to sense an extremely low level of hydraulic fluid.
When sensor HOLS1 senses low hydraulic fluid level in the reservoir, 24 VDC is applied to time delay relay A4TD1. If sensor HOLS2 senses low hydraulic fluid in the reservoir, 30 seconds or less after A4TD1 is activated, relay A4K16 energizes. This opens the electrical path keeping A1SV1 (in MOBILE mode) or A1SV2 (in STATIC mode) energized (open) and the hydraulic system shuts down. 24 VDC is applied to two CAUTION fluid level indicators (A4DS19 on the Rear Control Panel and A17DS1 on the ECV dash). Indicators light yellow. Pressing an Override switch (A4S12 on the Rear Control Panel or A17S1 on the ECV dash) lights override indicators (A4DS18 on Rear Control Panel and A17DS2 on the ECV dash) and allows hydraulic functions to continue by energizing A1SV1 or A1SV2 through diode A4D7 (bypassing the open contacts A2 and A3 of relay A4K16.

WARNING

Operating the CBPS system with extremely low hydraulic fluid level in the reservoir could cause extreme damage to hydraulic equipment. The CBPS system should be operated only during emergency situation preventing death to personnel when extremely low hydraulic fluid level exists.

1.15 ELECTRICAL SYSTEM – Continued.

When sensor HOLS3 senses extremely low hydraulic fluid level in the reservoir, relay A4K17 energizes and hydraulic system shuts down. 24 VDC is applied to two DANGER LEVEL indicators (A4DS26 on the Rear Control Panel, and A17DS3 on the ECV dash). Indicators light red and two audible alarms (A4LS3 on the rear control panel and A17LS1 on the ECV dash) sound. Pressing an Override switch (A4S11 on Rear Control Panel or A17S2 on ECV dash) mutes the alarms and lights override indicators (A4DS25 on Rear Control Panel and A17DS4 on ECV dash). This allows hydraulic functions to continue by energizing A1SV1 or A1SV2 through diode A4D8 (bypassing the open contacts A2 and A3 of relay A4K16 and open contacts A2 and A3 of relay A4K17.

1.15.9 Air and Hydraulic Fluid Temperature Sensing.

Air circulated through the ECU and hydraulic fluid are sensed for overheat conditions. Air temperature switch A1TS1 senses the temperature of air as it circulates through the ECU. Hydraulic fluid temperature switches A1S4/S5 (integral switches), sense the temperature of hydraulic fluid as it circulates through the hydraulic system.

24 VDC from Heat/Cool circuit breaker A4CB1 is used as main power source for heat and cool function control. It is applied to ECU Temperature switch A1TS1 through cables 1A4W6 and 1A4A1W1. If air temperature inside the ECU is above 200°F, A1TS1 opens and 24 VDC application is interrupted. From A1TS1 24 VDC is applied to Hydraulic Oil Temperature switches A1S4/S5, If the hydraulic fluid temperature is below 212°F, A1S4 is closed and the 24 VDC is returned back to the Rear Control Panel through cables 1A4A1W3, 1A4A1W1, and 1A4W6 where it is applied to ESS Mode switch A4S17-A pin 11 (common connection). A4S17-A applies the 24 VDC to the heat or cool control functions as selected.

NOTE

Temperature switch A1S1, located above the heater elements in the ECU, remains closed as long as air temperature stays below 200°F. If air temperature rises above 200°F, the power for operating the heat or cool stages is interrupted or will oscillate ON and OFF. The temperature switch does not impact system operation when system is set for vent mode.

If the hydraulic fluid temperature is higher than 212°F, A1S4 interrupts the 24 VDC to A4S17-A pin 11 and reroutes it to light Hydraulic Oil High Temperature lamp A4DS10 on the Rear Control Panel. This will suspend the heat or cool function and allow the system to attempt to cool the hydraulic fluid below 212°F. When the hydraulic fluid cools to less than 212°F the heat or cool function resumes operation. If the hydraulic fluid temperature rises above 230°F, A1S5 closes its contacts and 24 VDC from A4CB2 is applied through A4S17-B and A1S5 to light Hydraulic Oil Overheat lamp A4DS32 and sound A4LS3 audible alarm. The only way to mute the alarm is to shut the system down by switching the ESS MODE switch A4S17 to the "OFF" position.

If A4K18 is de-energized (STATIC mode), 24 VDC from A4S17-A pin 11 is also routed through A4K18 closed contacts D2 and D3 to rib fan switch A4S13 contact 8. This provides the 24 VDC source for RIB FAN operation and control.

1.15.10 Mission Profile Selection.

There are two basic CBPS mission profiles, "MOBILE" and "STATIC". The profiles are selectable on Rear Control Panel using Mission Profile switch A4S8.

a. MOBILE Mode. When A4S8 is in the "OFF" position, 24 VDC is supplied from A4CB3 through closed A4S8 contacts 8 and 5 to light A4DS11 "MOBILE" lamp and CBPS system operates in the "MOBILE" profile mode. 24 VDC from A4S8 contact 5 is also supplied through A4TB1 pins 4 and 5, connected by diode A4D3, to cooling relay A4K11 contact B2 for cooling function control. With A4S8 in the "OFF" (MOBILE) position, contacts 10 and 7 also close and 24 VDC from A4CB2 through A4S17-B contacts 21 and 22, A4K16 contacts A2 and A3, A4K17 contacts A2 and A3 to A1SV1 through cables 1A4W6, 1A4A1W1 and 1A4A1W3. A ground is supplied to the opposite side of A1SV1's coil through the same cables. This energizes (opens) A1SV1 while A1SV2 de-energizes (closes) during mobile mode operation reducing hydraulic fluid flow through the hydraulic system. 24 VDC from A4S8 contact 7 is also applied to coil contact X1 of relay A4K18, mobile profile relay, during mobile mode operation. Relay A4K18 energizes during MOBILE mode to switch heat/cool thermostatic control from A4R1 on rear control panel to A18R1 on the Control Box Assembly.

b. STATIC Mode. When A4S8 is in the "ON" position, 24 VDC is supplied from A4CB2 through A4S17-B contacts 21 and 22, A4K16 contacts A2 and A3, A4K17 contacts A2 and A3, A4S8 closed contacts 10 and 4 to light A4DS12 "STATIC" lamp and the CBPS system operates in the "STATIC" profile mode. The same 24 VDC is routed to A1SV2 through cables 1A4W6, 1A4A1W1 and 1A4A1W3. A ground is supplied to opposite side of A1SV2's coil through the same cables. This energizes (opens) A1SV2 while A1SV1 de-energizes (closes) during static mode operation increasing hydraulic fluid flow through hydraulic system. With A4S8 in "ON" (STATIC) position, contacts 8 and 1 also close and 24 VDC from A4CB3 is applied across A4S15 contacts 8 and 5, NBC "OFF", through relay A4K7 closed contacts A2 and A3 and cables 1A4W6, 1A4A1W1 and 1A4A1W3 to A1SV6. A ground is supplied to opposite side of A1SV6's coil through the same cables. This causes A1SV6 to open (energize) to reduce NBC fan speed during static Non-NBC mode of operation.

1.15.11 Rib Fan Circuit.

24 VDC from ESS MODE switch A4S17-A pin 11 is applied to rib fan switch A4S13 through relay A4K18 closed contacts D2 and D3 if A4K18 is de-energized. A4K18 is de-energized during static mode of CBPS operation. A4K18 prevents air beam inflation during mobile mode of operation. If rib air pressure is below 1.5 psi, setting the RIB FAN switch to the ON position, applies 24 VDC through A4PG2 LO-SET switch closed contacts C and B to light RIB AIR PRESSURE LOW lamp A4DS17 (green). 24 VDC from LO-SET switch contact B is also routed through A4D1 to energize relay A4K9 and apply 24 VDC to 600 SECOND DELAY relay A4TD2. Once A4K9 is energized it keeps itself energized through a lock-up circuit consisting of A4K9 contacts A2 and A1 and A4PG2 HI-SET switch contacts H and J. A4K9 remains energized until A4PG2 contacts H and J open. 24 VDC is also applied to A1SV8 solenoid in the hydraulic manifold to reposition A1SV8 allowing hydraulic fluid to be ported through the RIB FAN motor. A4TD2 energizes only after 600 seconds of continuous RIB FAN operation. Energizing A4TD2 closes its contacts 1 and 4 and lights RIB FAN EXTENDED OPERATION lamp A4DS31 (red). It also sounds unmutable alarm A4LS2. If the RIB FAN enters EXTENDED OPERATION there is probably a leak in the air beam system or a malfunction of the electrical circuits controlling rib fan operation. Temperature sensor A19TS1 senses air temperature in rib inflation manifold. If rib manifold air temperature rises above 175°F, A19TS1 closes and connects 24 VDC from A4D1 to light RIB AIR OVERTEMP lamp A4DS30 indicator (red) and sound unmutable audible alarm A4LS2. A4D11 and A4D12 isolate the RIB FAN EXTENDED OPERATION circuit from the RIB AIR OVERTEMP circuit so either circuit can individually sound A4LS2.

NOTE

Rib air pressure must be less than the lo-set point to activate the rib air fan when switching A4S13 to "ON". One or more dump caps may be removed and then installed to achieve low rib air pressure during maintenance functions.

As pressure in the air beams and manifold rises above the 1.5 psi low set point A4PG2 LO-SET switch changes position. Contact C breaks from B and makes contact with D. This applies 24 VDC to light RIB AIR PRESSURE NORM lamp A4DS16. It also interrupts the 24 VDC to turn out the RIB AIR PRESSURE LOW lamp A4DS17. When pressure in the air beams and manifold passes the hi-set point, normally 2.9 psi, A4PG2 HI-SET changes position. This opens contacts H and J which interrupts the 24 VDC to keep A4K9 and A1SV8 energized. A4K9 and A1SV8 de-energize and the rib fan stops operation. If the RIB FAN switch A4S13 is left in the "ON" position, the sequence will automatically begin again as soon as the air pressure in the air beams and manifold drops below the low-set point.

1.15.12 NBC Operation.

CBPS system can be safely used in a contaminated area. Selecting NBC mode and closing all exits and entrances to the LMS and ABS allows the shelter to over-pressurize. During NBC mode, the NBC fan speed is increased to achieve over-pressurization.

1.15 ELECTRICAL SYSTEM – Continued.

When the NBC FAN switch A4S15/16 is first positioned to "ON", A4PG1 switch contacts H and J are closed and relay A4K8 energizes. A4K8 contacts A1 and A2 close applying 24 VDC to light NBC PRES LOW lamp A4DS29 (red), and sound NBC audible alarm A4LS1. Positioning NBC FAN switch A4S15/16 to "ON" also interrupts the 24VDC path that keeps A1SV6 energized. A1SV6 de-energizes and closes forcing all hydraulic system fluid flow through the NBC FAN motor increasing its speed to over-pressurize the ABS. When using INTERNAL power, A1SV9 remains energized (closed) and the recirculation fan remains in operation. When using EXTERNAL power, A1SV9 de-energizes (opens) and the recirculation fan is shut down to aid in keeping the NBC FAN turning fast enough to keep the ABS over-pressurized. A4DS29 remains "ON" and the alarm continues sounding until A4PG1 reaches 0.5 iwg (normal). At this point, A4PG1 switch contacts H and J break contact and relay A4K8 de-energizes opening contacts A1 and A2, turning "OFF" A4DS9 and audible alarm A4LS1. The audible alarm can be muted by pressing NBC ALARM switch A4S10 to "ON". While A4S10 is positioned to "ON", the audible alarm is turned "OFF" and the ALARM MUTE lamp A4DS9 lights (blue). A4PG1 does not have a hi-set point to reduce NBC FAN speed when over-pressurization is achieved. Over-pressurization is controlled by positioning flaps over holes on ABS ambulatory and TALP inner and outer doors.

NOTE

When using external power (10 kW TQG), under NBC conditions, cooling capabilities are locked out. Relay A4K11 de-energizes and keeps Solenoid valve A1SV4 de-energizeD (CLOSED) to enhance NBC performance.

1.15.13 Cooling.

a. INTERNAL POWER, STATIC Mode, NBC Off. When Cool is selected, A4S17-B pin 17 routes 24 VDC to the coil of 60 second time delay relay A4TD3. A4TD3 energizes after 60 seconds of COOL operation giving the Air Conditioning function time to build high side refrigerant pressure. HPS1 contacts A and B are closed until high pressure is sensed and route the 24 VDC through relay A4TD3 closed contacts 1 and 4, and A4S1-B contacts 26 and 25 to the coil of A4K11. A4TCU applies a ground to A4K11 to energize it when actual air temperature is warmer than referenced by A4R1 (static mode) or A18R1 (mobile mode). When A4K11 is energized its contacts A2 and A1 close and 24 VDC is applied to A1SV4 which reroutes hydraulic fluid through refrigeration compressor motor. The same 24 VDC is applied to RSV3 to open refrigerant line allowing refrigerant fluid to flow. If the low pressure side of refrigeration function has not built up low pressure at the end of 60 seconds of operation, LPS1 contacts A and B apply 24 VDC through A4TD3 closed contacts 8 and 5 to light REFRIGERANT PRESSURE LOW lamp A4DS6. If low pressure is normal LPS1 changes position and contacts A and C apply 24 VDC to the coil of A4K11 to keep it energized. If the high side refrigerant pressure rises too high HPS1 changes position and contacts A and C apply 24VDC to light REFRIGERANT PRESSURE HIGH lamp A4DS5. When actual air temperature is less than desired temperature, A4TCU removes ground from A4K11 and the relay de-energizes shutting down the cooling function. Operation cycles on and off to keep the temperature in the ABS relatively constant.

   If NBC operation is activated when INTERNAL power is used the cooling function operates as stated above.

b. When EXTERNAL power is used without NBC the cooling function operates as stated above with one exception. Relay A4K15 energizes and its contacts A2 and A3 open which interrupts the 24 VDC keeping RSV1 energized. When RSV1 de-energizes, the high rate of cooling changes to a lower rate (cooling is not as effective). This aids the lower capacity Auxiliary Hydraulic Pump keeping the remaining portions of the CBPS in operation. Relay A4K15 also energizes when MOBILE mode is selected to reduce the output of cooling function during MOBILE mode.

   If NBC is selected when using EXTERNAL power, the cooling function becomes inoperative since the 24 VDC path to energize cooling relay A4K11 is interrupted.

1.15.14 RETURN LINE REPL FILTER Indicator A4DS20.

Applies 24 VDC to light REPL FILTER lamp A4DS21 (red) when return oil differential switch A1DPS1 is activated.

1.15.15 Engine Oil Pressure Low Indicator.

If the ECV oil is low, the low pressure switch on the engine closes, +24 VDC is applied to engine oil pressure low A4DS23 indicator on rear control panel which will light (red).

1.15.16 Engine Coolant Temperature Indicator.

If the ECV coolant system is running hot, the engine coolant switch on the engine closes. +24 VDC is applied to the engine coolant temperature indicator A4DS22 on rear control panel, which will light (red).

1.15.17 LTG/INTERCOM Circuit Breaker A4CB4.

With LTG/INTERCOM circuit breaker A4CB4 ON, 24 VDC is applied to the following:

a. Left and right map light switches.

   Map lights will come on when the appropriate switch (A5DS2S1 or A5DS3S1) is activated.

b. Forward and aft lamps

   Forward and aft lamps light when appropriate switches (A18S3 or A7S1) are turned on. Turning on switches activate the relay which applies 24 VDC power to the lamps.

1.15.18 DRIVER ALERT and DRIVER ACKNOWLEDGE Buttons.

When DRIVER ALERT button on forward control panel is pressed, 24 VDC is applied to relay A8K1. Energizing relay A8K1 closes contacts A2 and A3. With contacts A2 and A3 closed, 24 VDC is applied to DRIVER ALERT indicator A8DS1 on vehicle control box in cab. To acknowledge, the crew in cab presses DRIVER ACKNOWLEDGE button A8S1. This removes the 24 VDC from indicator.

1.15.19 SHELTER ALERT and SHELTER ACKNOWLEDGE Buttons.

When the crew in cab presses SHELTER ALERT button A8S2, 24 VDC is applied to shelter buzzer A5S1 on forward control panel. To acknowledge and reset buzzer, the crew in LMS presses SHELTER ACKNOWLEDGE button A5S2.

1.15.20 EPG Operation.

During INTERNAL operation, the ECV engine must run faster than normal idle speed to turn primary hydraulic pump fast enough to produce adequate hydraulic fluid flow to operate CBPS hydraulic components. The CBPS uses an Electronic Programmable Governor controller to regulate engine speed at a high idle of 1400 - 1500 RPM. Actual engine high idle speed is the RPM required to produce sufficient hydraulic fluid flow to operate NBC FAN at correct speed for NBC operation.
With the ECV transmission shifter positioned to NEUTRAL or PARK and EPG switch A8S3 positioned to "ON", 24 VDC is applied to EPG controller to activate automatic regulation of EPG linkage assembly position. A magnetic pick-up speed sensor senses ECV engine speed which is converted to an electrical signal and input to EPG controller.

1.16 HYDRAULIC SYSTEM.

1.16.1 General. The engine driven pump supplies high pressure fluid to the hydraulic manifold in the ECU, and from there, fluid is distributed to each of the major components as selected by mode selection. Speeds of various components are controlled by flow control devices to minimize the impact of variations in engine speed or other operating components. During periods requiring engine maintenance, external power is required to power the system, and the hydraulic flow is developed during this mode by an electric motor driven pump located in the ECV passenger side wheel well. See table 1-1 for a brief explanation of the function of components listed on the hydraulic schematic.
For maintenance purposes, the solenoid valves located in the ECU have manual overrides (refer to figure 1-9). To activate a manual override for SV1, SV2, SV4 through SV6 and SV8, push button in, twist counterclockwise 180° and release. In this position, the valve will remain open. To return to normal operation, push button in, twist clockwise 180° and release. To activate a manual override for SV7 or SV9, push and hold override button. Activating solenoid valve SV1, SV2, SV4 through SV6, and SV8 override will open the selected port and cause hydraulic fluid to flow through the port. Activating solenoid valve SV7 and SV9 override, causes the hydraulic port to close and the fluid to stop.
Solenoid valves SV1, SV2, SV4 through SV6, and SV8 have the same part number and, under certain mal-functions such as a leaking valve, may be exchanged to rectify the problem. Solenoid valves SV7 and SV9 have different part numbers and should not be exchanged with other solenoid valves even though they look the same.

1.16 HYDRAULIC SYSTEM – Continued.

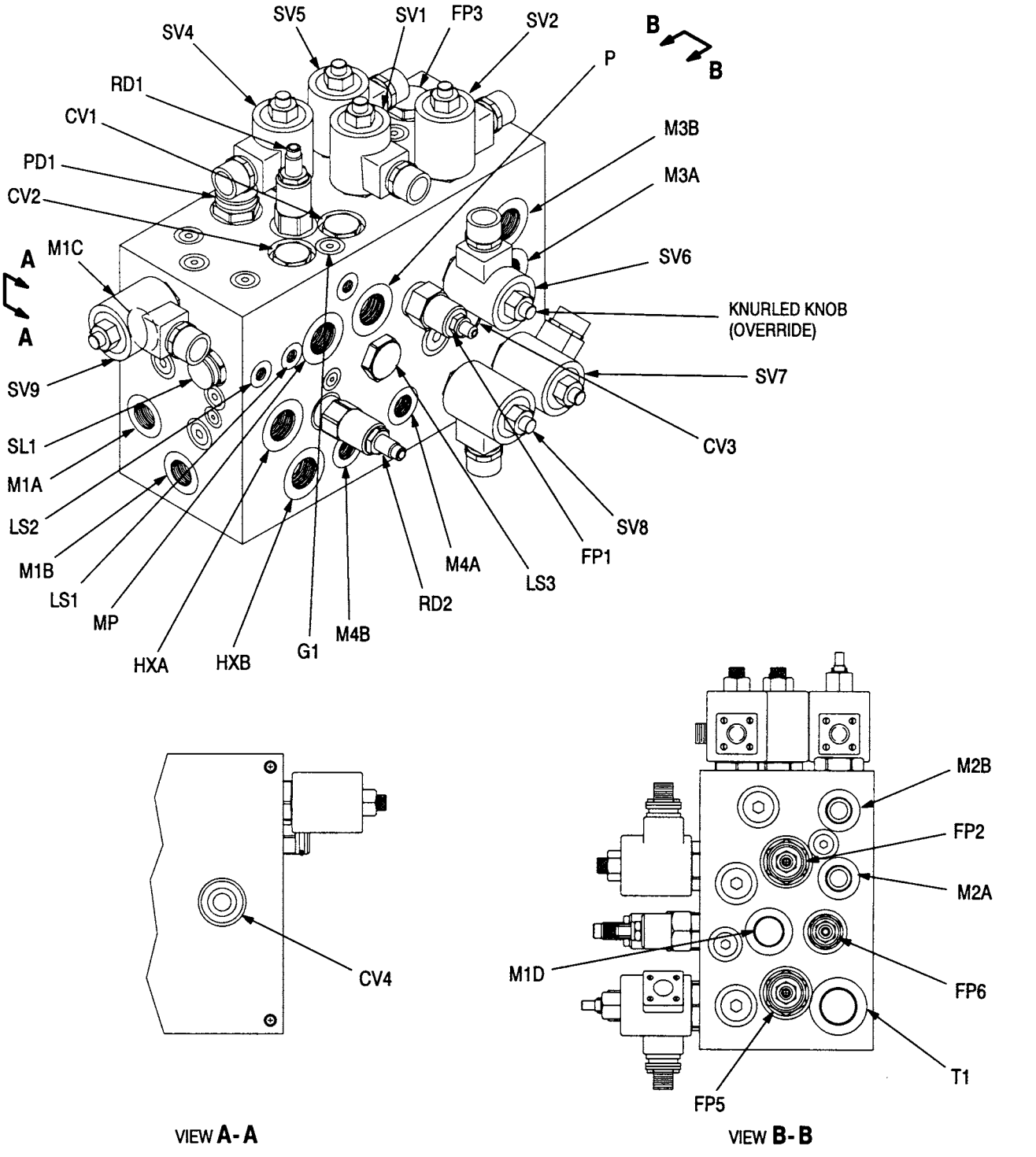


Figure 1-9. Hydraulic Manifold

Table 1-1. Hydraulic Components

Reference Designator	Function
CV1 CV2	These check valves prevent reverse hydraulic flow when the opposite pump is utilized.
CV3 CV4	These check valves prevent hydraulic fluid from being introduced into the air conditioning circuit backwards during periods when the air conditioner is not being used.
FP1	This flow control cartridge is used to limit the hydraulic pump output flow to approximately 6.5 gpm which is 1/2 the normal flow. This permits the components to operate at 1/2 normal speed.
FP2	This flow control dictates the non-NBC mode speed of the NBC fan. It is set to permit the NBC fan to operate at approximately 1/2 normal speed.
FP3	FP3 is a hydraulic flow divider used to limit the total flow to the recirculation fan. It is nonadjustable.
FP5	The speed of the air beam inflation fan is controlled by the adjustment of this flow control. Some portion of the hydraulic fluid is allowed to bypass around the rib fan motor to prevent over speeding.
FP6	This flow control shunts hydraulic fluid around the FP3 flow divider to achieve a controlled speed of the recirculation fan. Adjustment of the flow is performed to achieve a normal operation of the recirculation fan at 1,850 rpm.
M1A	This is the motor for cooling compressor.
M1C	This is the motor for condenser fan.
M2	This is the motor for recirculation fan.
M3	This is the motor for NBC fan.
M4	This is the motor for rib fan.
PD1	This is a mechanical valve that, when closed, prevents hydraulic flow to the condenser motor, M1C.
RD1	The total system pressure is protected by this pressure relief valve which is presently set at approximately 3,200 psig.
RD2	The amount of heat available for the system is controlled by this relief valve. High hydraulic fluid pressure is turned into heat as it passes across the relief valve. It is set at 2,600 psig.
RD3	This pressure relief valve reduces pressure spikes in the system when rib fan motor shuts down. This eliminates over pressurizing the recirculation fan motor. It is set at approximately 3,000 psig.
SL1	This is a differential pressure sensing device. When differential pressure across this device exceeds 3.0 psi, it causes mechanical valve PD1 to close. This differential pressure occurs when solenoid SV4 is energized (opened) and hydraulic fluid flows through compressor motor M1A, and on through condenser motor M1C.
SV1 SV2	These solenoids control fluid flow to remainder of hydraulic circuit. SV1 is used for MOBILE mode, and SV2 is used for all other modes.
SV4	On/Off operation of air conditioning compressor is controlled by this solenoid. Selection of the COOL mode energizes or opens this solenoid to introduce fluid to air conditioning compressor and condenser fan motors.

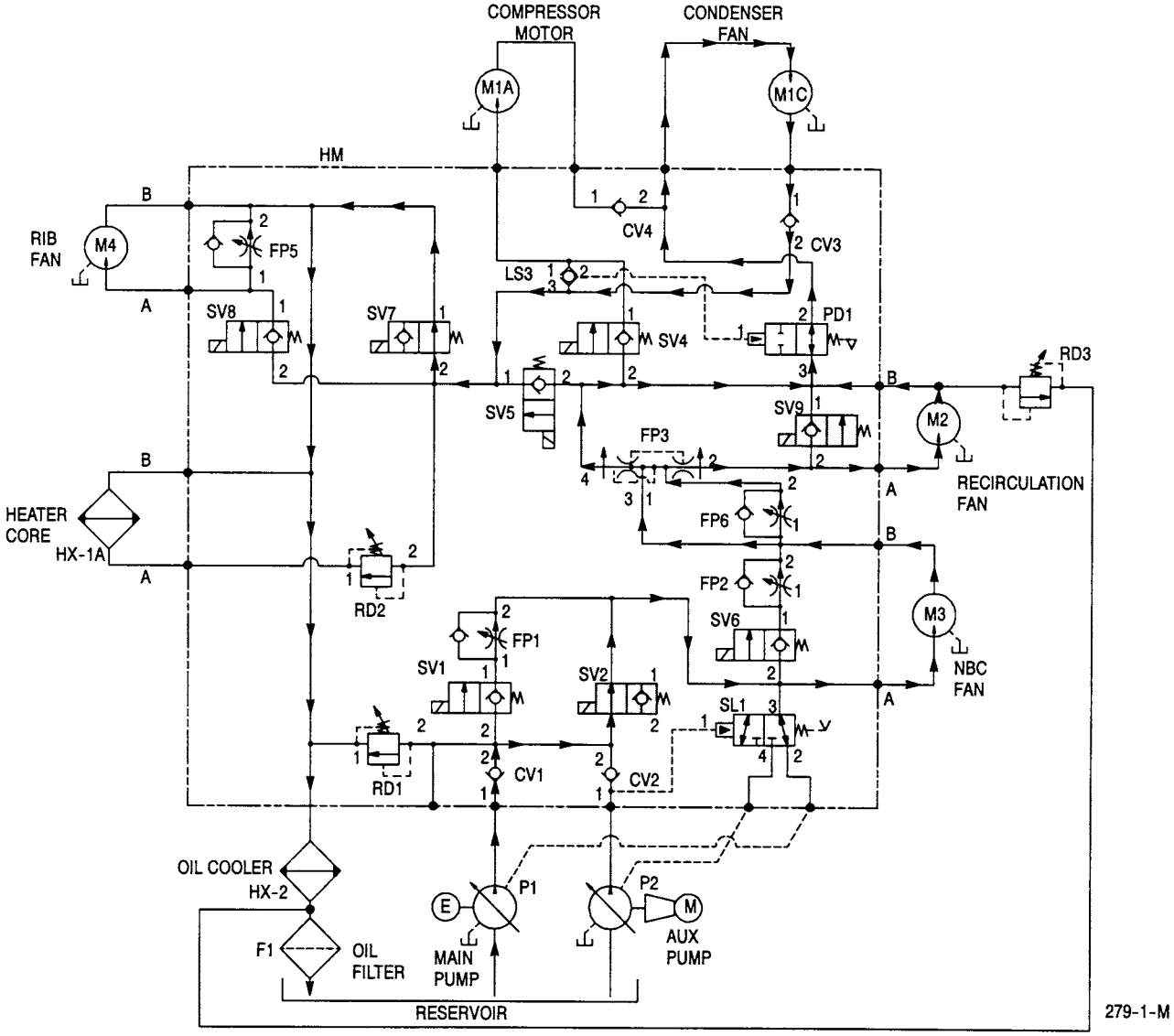
1.16 HYDRAULIC SYSTEM – Continued.

Table 1-1. Hydraulic Components – Continued

Reference Designator	Function
SV5	This solenoid is used to control operation of condenser fan circuit.
SV6	This solenoid controls speed of vent (NBC) fan. In normal vent (NBC) mode, SV6 remains unenergized or closed. SV6 becomes energized only during non-NBC mode.
SV7	Flow to heating circuit controlled by this solenoid. Under normal operation of system, this solenoid is unenergized or open which allows fluid to return to reservoir and filter. When heat is requested, SV7 is closed forcing fluid over heating relief valve, RD2.
SV8	The rib inflation fan is operated by this solenoid. It is normally closed and is energized or opened only when rib fan is needed.
SV9	Under normal operational modes this solenoid remains energized or closed to allow normal flow through the recirculation fan motor. During NBC operation using external power, this solenoid is opened to isolate recirculation fan motor which reduces the total system load or hp demand.

1.16.2 Static Mode, Internal Power, Vent Mode, Full NBC.

Placing the control switches in the positions corresponding to the above modes opens solenoid valve SV2 and closes solenoid valve SV9 by applying +24 Vdc to the coils. All remaining solenoids remain in their normal de-energized positions. The engine driven pump, through a combination of gravity and suction, draws fluid from the hydraulic reservoir in the ECU and supplies pressure to the hydraulic control manifold. Fluid flows through the manifold and is then routed to the vent (NBC) fan, M3. The fluid is returned to the manifold where it is divided by flow control, FP3. Part of the fluid is supplied to the recirculation fan, M2, and the balance is diverted around the motor in order to maintain proper speed control. The fluid flows through the condenser fan motor, M1C. The total fluid flow is routed through solenoid valve SV7, then passes through the oil cooling heat exchanger. During VENT mode, the air flow action created by the condenser fan draws air over the heat exchanger, cooling the hydraulic fluid. From there the fluid is routed to the reservoir mounted filter and returned to the reservoir.



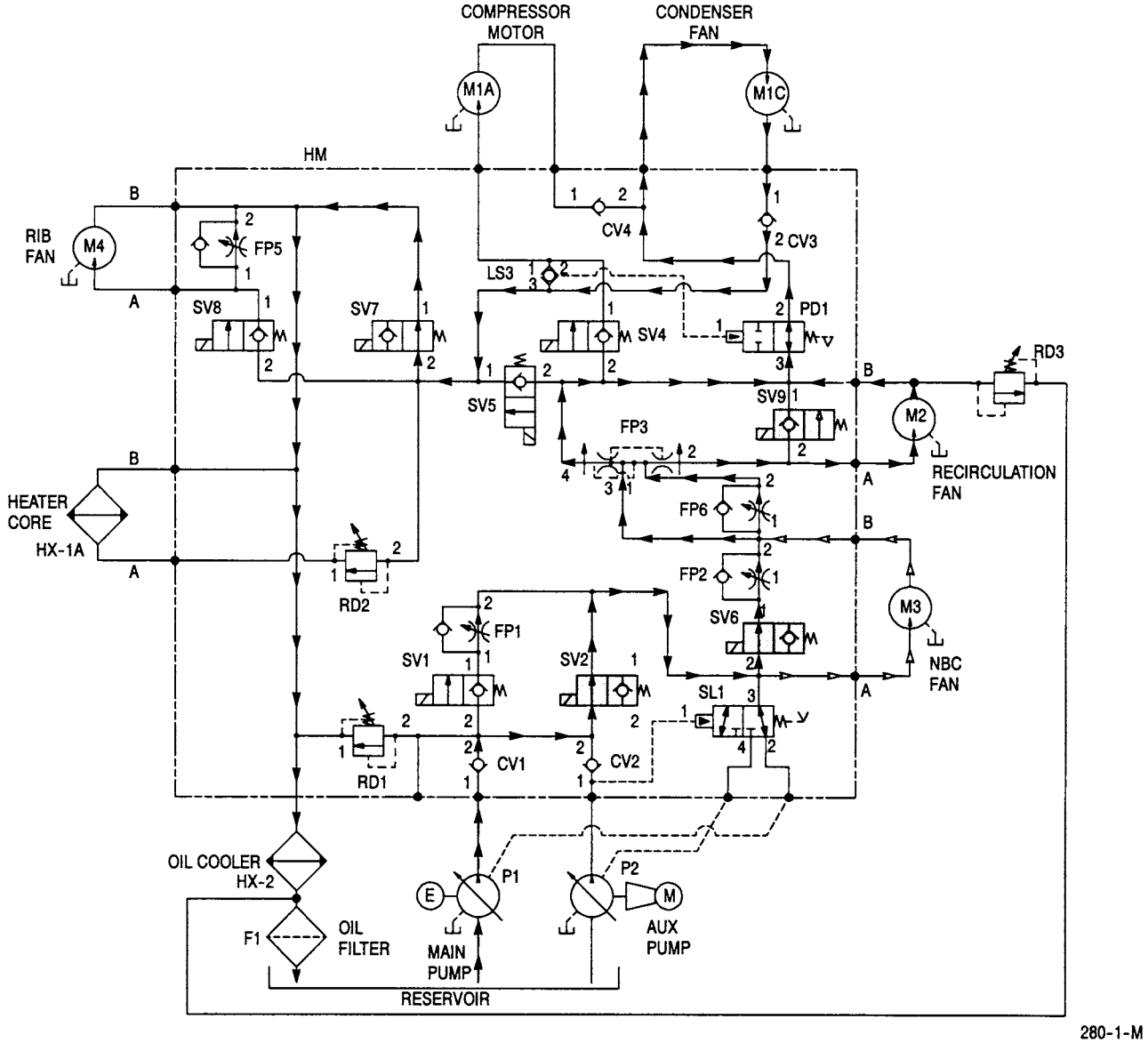
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
Position	Closed	Open	Closed	Closed	Closed	Open	Closed	Closed

Figure 1-10. Static Mode, Internal Power, Vent Mode, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.3 Static Mode, Internal Power, Vent Mode, NBC Off.

Placing the control switches in the position corresponding to the above modes opens solenoid valves SV2 and SV6, and closes solenoid valve SV9 by applying +24 Vdc to the coils. All remaining solenoids remain in their normal de-energized positions. With SV6 energized (open), some portion of the total hydraulic fluid flow is allowed to bypass the NBC fan motor (M3). Flow control valve FP2 is used to regulate the flow and hence the speed of the NBC fan motor whenever the control switches are in the non-NBC mode. All other functions are as previously described.

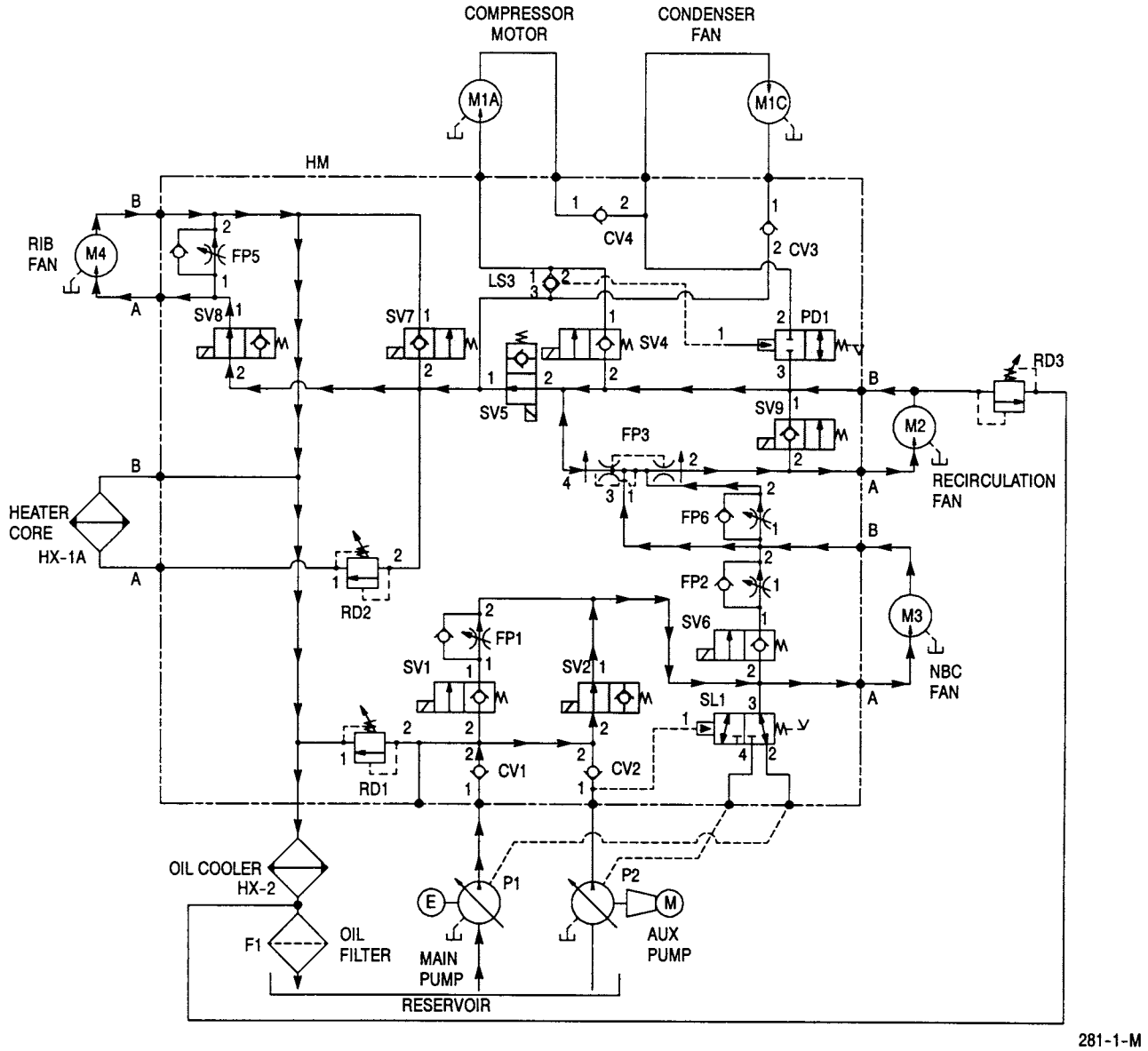


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
Position	Closed	Open	Closed	Closed	Open	Open	Closed	Closed

Figure 1-11. Static Mode, Internal Power, Vent Mode, NBC Off

1.16.4 Static Mode, Internal Power, Vent Mode, Rib Fan On, Full NBC.

When the hydraulic circuit is in vent mode (figure 1-10) and air beam pressure is reduced to below 1.5 psi for any reason, the rib fan motor, M4, is automatically turned on. This is accomplished by applying +24 Vdc to the coils of solenoid valves SV2, SV5, SV7, SV8, and SV9. SV5 and SV8 are opened and SV7 and SV9 are closed. This diverts the hydraulic fluid flow away from the condenser fan, M1C, and through the rib fan motor, M4. The speed of the rib fan is controlled by flow control FP5 which diverts hydraulic fluid flow around the rib fan motor to limit its speed and pressure for safety. When air beam pressure is increased to 2.9 psi, the system is returned to the previous condition.



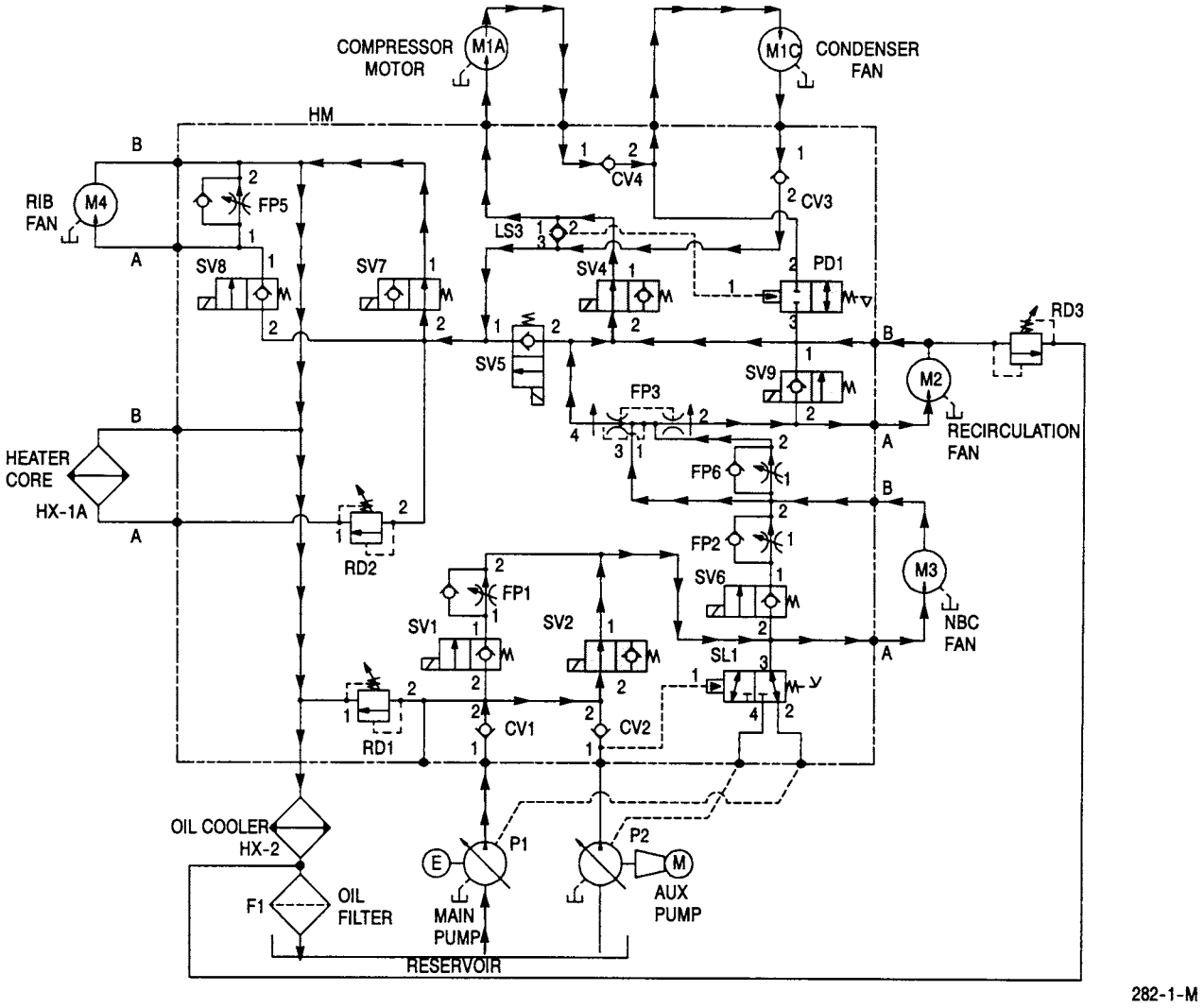
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	OFF	ON	ON	ON
Position	Closed	Open	Closed	Open	Closed	Closed	Open	Closed

Figure 1-12. Static Mode, Internal Power, Vent Mode, Rib Fan On, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.5 Static Mode, Internal Power, Cool Mode, Full NBC.

Placing the control switches in the positions corresponding to the above modes opens solenoid valves SV2 and SV4, and closes solenoid valve SV9 and valve PD1 by applying +24 Vdc to the coils. All remaining solenoids remain in their normal de-energized positions. The engine driven pump, through a combination of gravity and suction, draws fluid from the hydraulic reservoir in the ECU and supplies pressure to the hydraulic control manifold. Fluid flows through the manifold and is then routed to the vent (NBC) fan, M3. The fluid is returned to the manifold where it is divided by flow control FP3. Part of the fluid is supplied to the recirculation fan, M2, and the balance is diverted around the motor in order to maintain proper speed control. The fluid flows through the compressor drive motor, M1A, and then through the condenser fan motor, M1C. The total fluid flow is routed through solenoid valve SV7, then passes through the oil cooling heat exchanger. The air flow action created by the condenser fan draws air over the heat exchanger, cooling the hydraulic fluid. From there the fluid is routed to the reservoir mounted filter and returned to the reservoir.

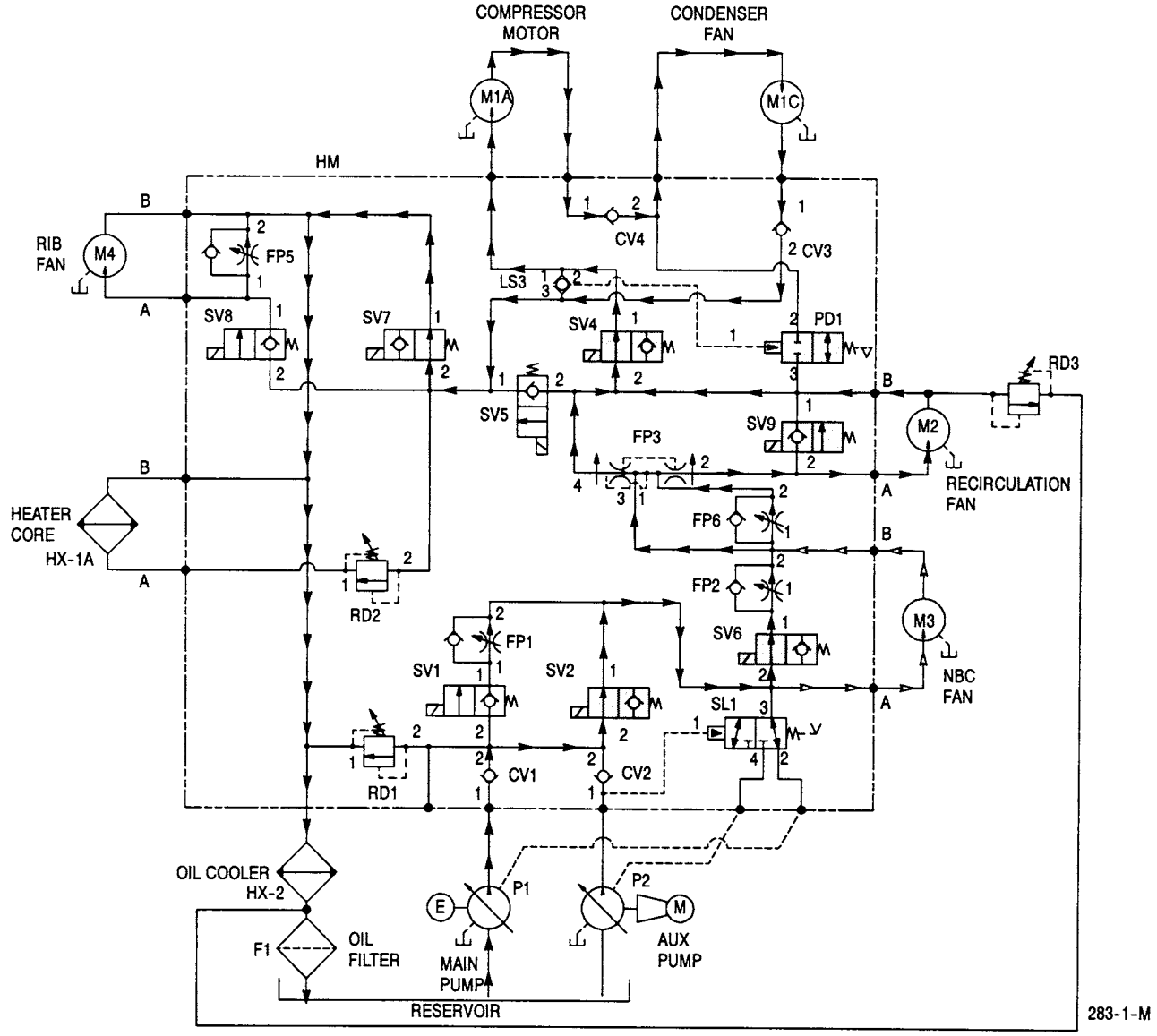


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
Position	Closed	Open	Open	Closed	Closed	Open	Closed	Closed

Figure 1-13. Static Mode, Internal Power, Cool Mode, Full NBC

1.16.6 Static Mode, Internal Power, Cool Mode, NBC Off.

Placing the control switches in the position corresponding the the above modes opens solenoid valves SV2 and SV6 and closes solenoid valve SV9 and valve PD1 by applying +24 Vdc to the coils. This allows some portion of the total hydraulic fluid flow to bypass the NBC fan motor, M3. Flow control valve FP2 is used to regulate the flow and hence the speed of the NBC fan motor whenever the control switches are in the non-NBC mode. All other functions are as previously described.



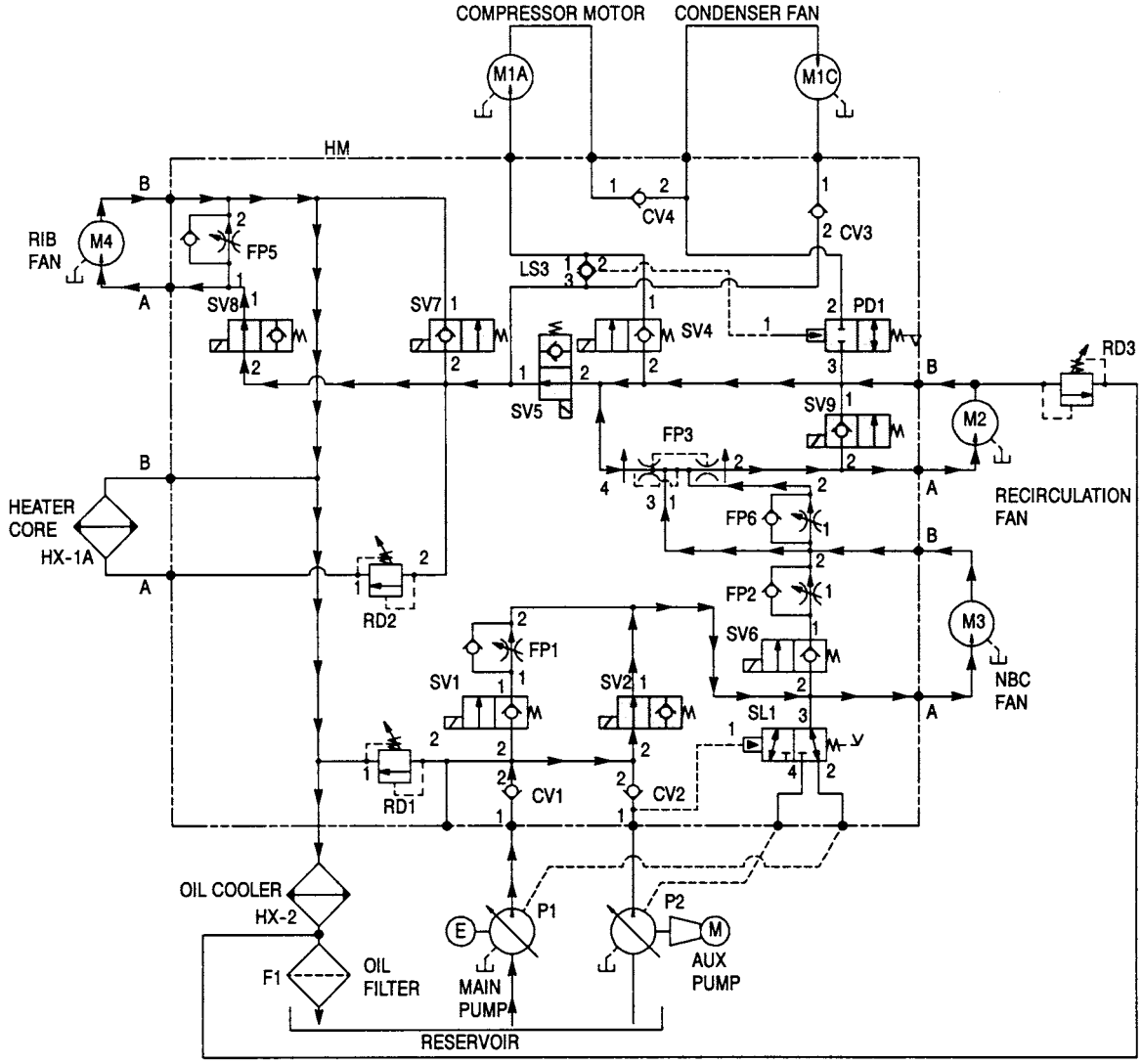
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	ON	OFF	ON	OFF	OFF	ON
Position	Closed	Open	Open	Closed	Open	Open	Closed	Closed

Figure 1-14. Static Mode, Internal Power, Cool Mode, NBC Off

1.16 HYDRAULIC SYSTEM – Continued.

1.16.7 Static Mode, Internal Power, Cool Mode, Rib Fan On, Full NBC.

When the hydraulic circuit is in cool mode (figure 1-13) and air beam pressure is reduced to 1.5 psi for any reason, the rib fan motor, M4, is automatically turned on. This is accomplished by applying +24 Vdc to the coils of solenoid valves SV2, SV5, SV7, SV8, and SV9. SV2, SV5 and SV8 are opened and SV7 and SV9 are closed. This diverts the hydraulic fluid flow away from the compressor motor M1A and condenser fan, M1C, and through the rib fan motor, M4. The increased pressure sensed at LS3 is diverted to PD1 and closes it preventing the hydraulic fluid flow to the condenser motor, M1C. SV4 remains open but the hydraulic fluid flow seeks the path of less resistance through the rib fan motor, M4. The speed of the rib fan is controlled by flow control FP5 which diverts hydraulic fluid flow around the rib fan motor to limit its speed and pressure for safety. When air beam pressure is increased to 2.9 psi, the system is returned to the previous condition.

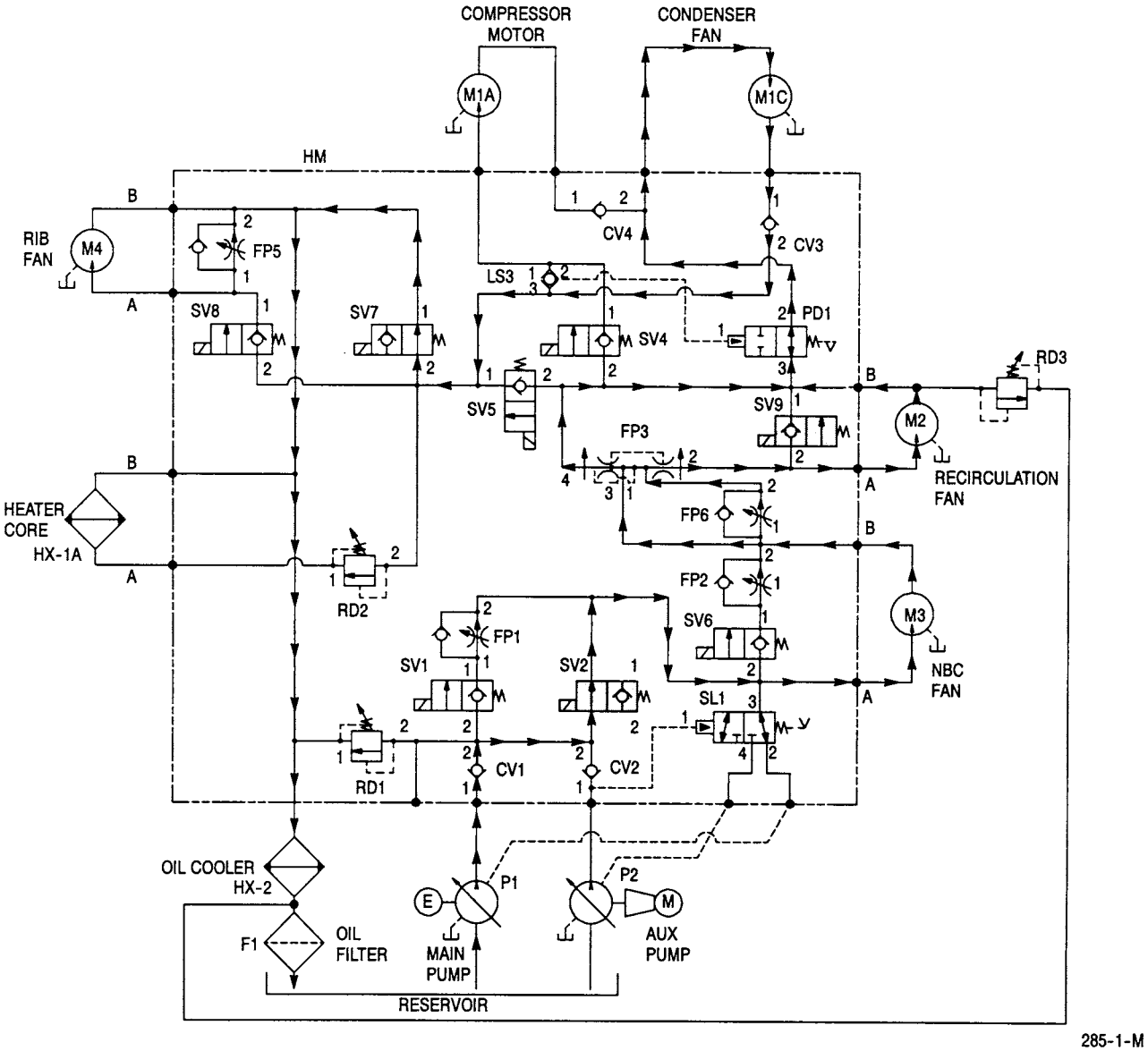


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	ON	ON	OFF	ON	ON	ON
Position	Closed	Open	Open	Open	Closed	Closed	Open	Closed

Figure 1-15. Static Mode, Internal Power, Cool Mode, Rib Fan On, Full NBC

1.16.8 Static Mode, Internal Power, Cool Mode, Thermostat Open, Full NBC.

When the thermostat opens, the cool mode is shut down. This is accomplished by de-energizing (closing) solenoid valve SV4 and stopping the compressor motor, M1A.



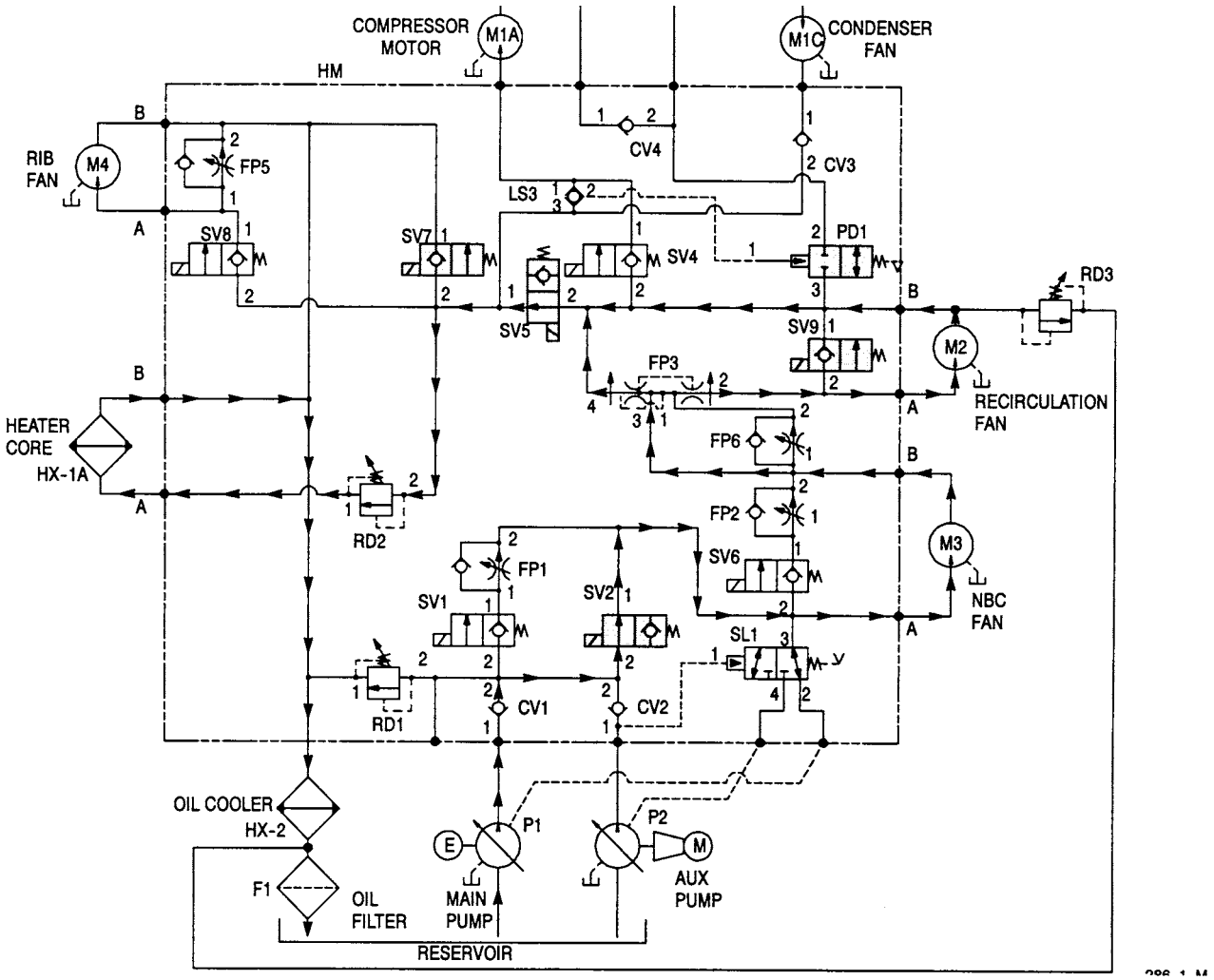
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
Position	Closed	Open	Closed	Closed	Closed	Open	Closed	Closed

Figure 1-16. Static Mode, Internal Power, Cool Mode, Thermostat Open, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.9 Static Mode, Internal Power, Heat Mode, Full NBC.

Placing the control switches in the positions corresponding to the above modes opens solenoid valves SV2 and SV5 and closes solenoid valves SV7, SV9, and valve PD1 by applying +24 Vdc to the coils. All remaining solenoids remain in their normal de-energized positions. The engine driven pump, through a combination of gravity and suction, draws fluid from the hydraulic reservoir in the ECU and supplies pressure to the hydraulic control manifold. Fluid flows through the vent (NBC) fan, M3. The fluid is returned to the manifold where it is divided by flow control, FP3. Part of the fluid is supplied to the recirculation fan, M2, and the balance is diverted around the motor in order to maintain proper speed control. With solenoid valve SV5 open and solenoid valve SV7 closed, the fluid is blocked from returning to the reservoir. This forces the fluid over the heating system relief valve, RD2. The hydraulic fluid pressure at this point is approximately 2,600 psi. As the fluid passes over the relief valve (from the high pressure side to the low pressure side) heat is generated in the fluid. The hot fluid then flows through the heating coil, HX-1A, where air flowing across the coils picks up heat from the hot hydraulic fluid to warm the interior of the CBPS. After the fluid passes through the heating coil, HX-1A, it is routed to the oil cooler, HX-2, filter, F1, and reservoir.

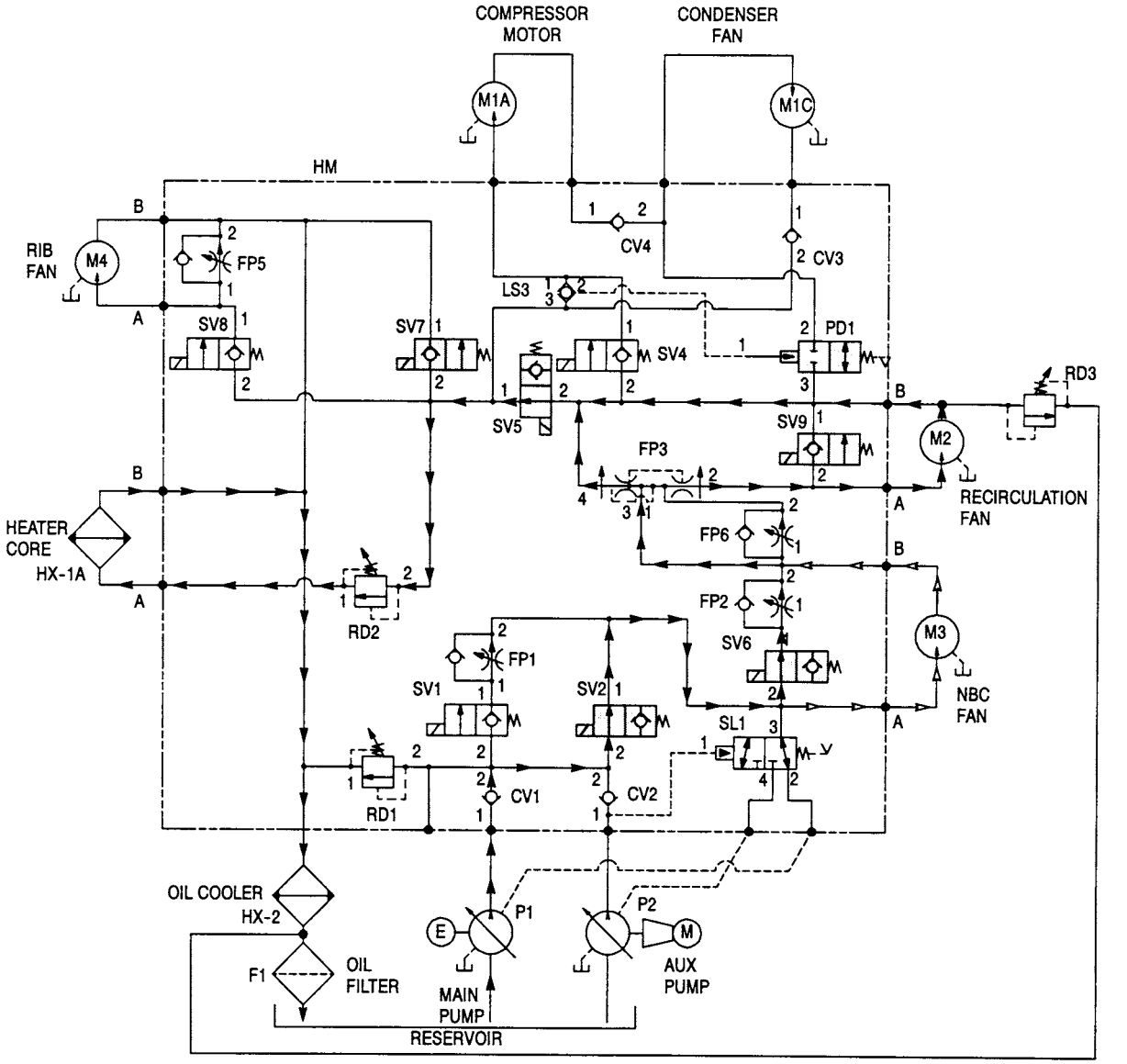


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	OFF	ON	OFF	ON
Position	Closed	Open	Closed	Open	Closed	Closed	Closed	Closed

Figure 1-17. Static Mode, Internal Power, Heat Mode, Full NBC

1.16.10 Static Mode, Internal Power, Heat Mode, NBC Off.

Placing the control switches in the positions corresponding to the above modes opens solenoid valves SV2, SV5, and SV6 and closes SV7, SV9, and valve PD1 by applying +24 Vdc to the coils. Operation of the hydraulic circuit is the same as the heat mode except that solenoid valve SV6 is energized (open). This allows some portion of the total hydraulic fluid flow to bypass the NBC fan motor, M3. Flow control valve PF2 is used to regulate the flow and hence the speed of the NBC fan motor whenever the control switches are in the non-NBC mode. All other functions are as previously described.



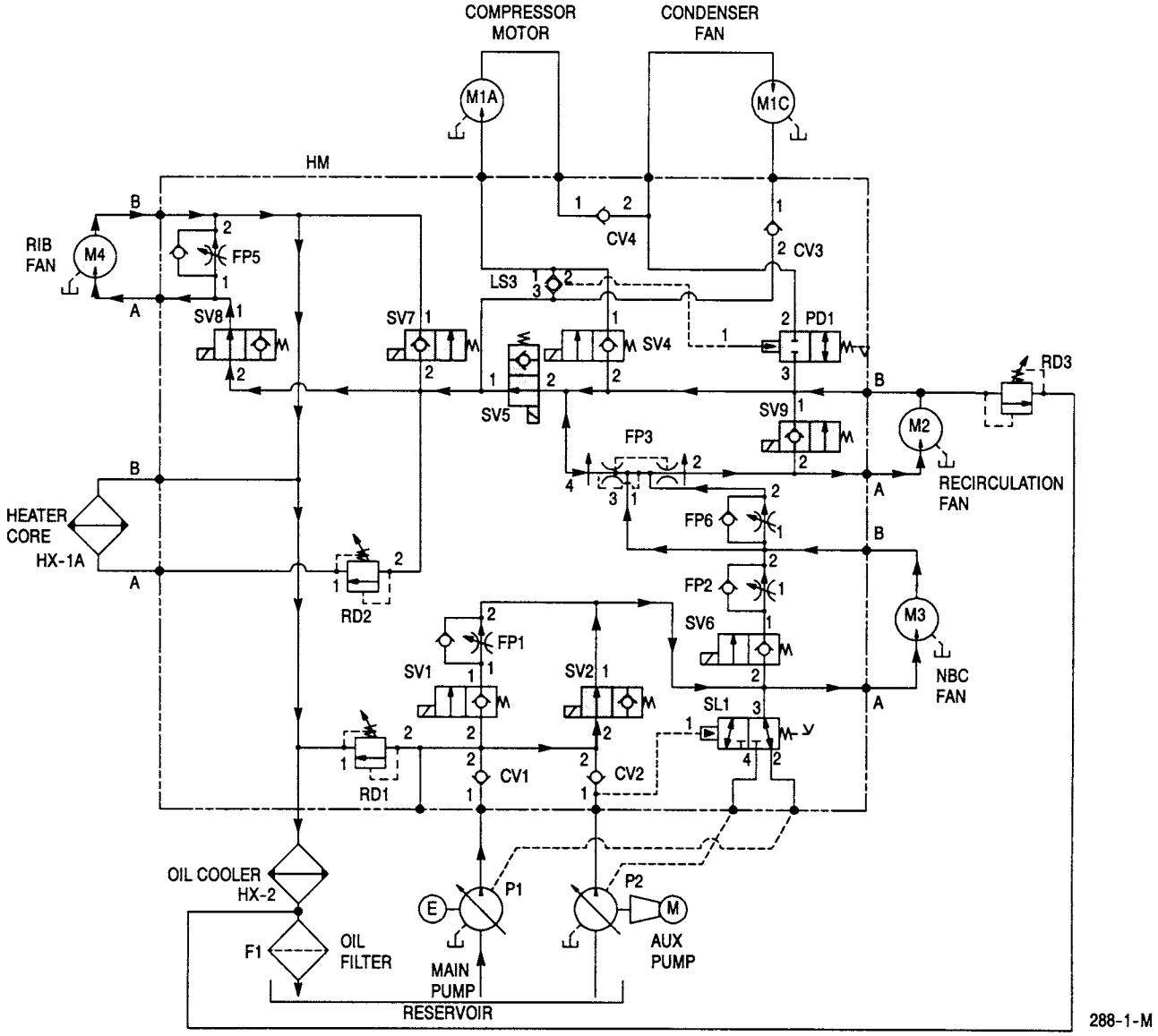
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	ON	ON	OFF	ON
Position	Closed	Open	Closed	Open	Open	Closed	Closed	Closed

Figure 1-18. Static Mode, Internal Power, Heat Mode, NBC Off

1.16 HYDRAULIC SYSTEM – Continued.

1.16.11 Static Mode, Internal Power, Heat Mode, Rib Fan On, Full NBC.

When the hydraulic circuit is in heat mode (figure 1-17) and air beam pressure is reduced to 1.5 psi for any reason, the rib fan motor, M4, is automatically turned on. This is accomplished by applying +24 Vdc to the coils of solenoid valves SV2, SV5, SV7, SV8, and SV9. SV2, SV5 and SV8 are opened and SV7 and SV9 are closed. This diverts the hydraulic fluid flow away from the heating coil, HX-1A, and takes the path of less resistance through the rib fan motor, M4. The speed of the rib fan is controlled by flow control FP5 which diverts hydraulic fluid flow around the rib fan motor to limit its speed and pressure for safety. When air beam pressure is increased to 2.9 psi, the system is returned to the previous condition.

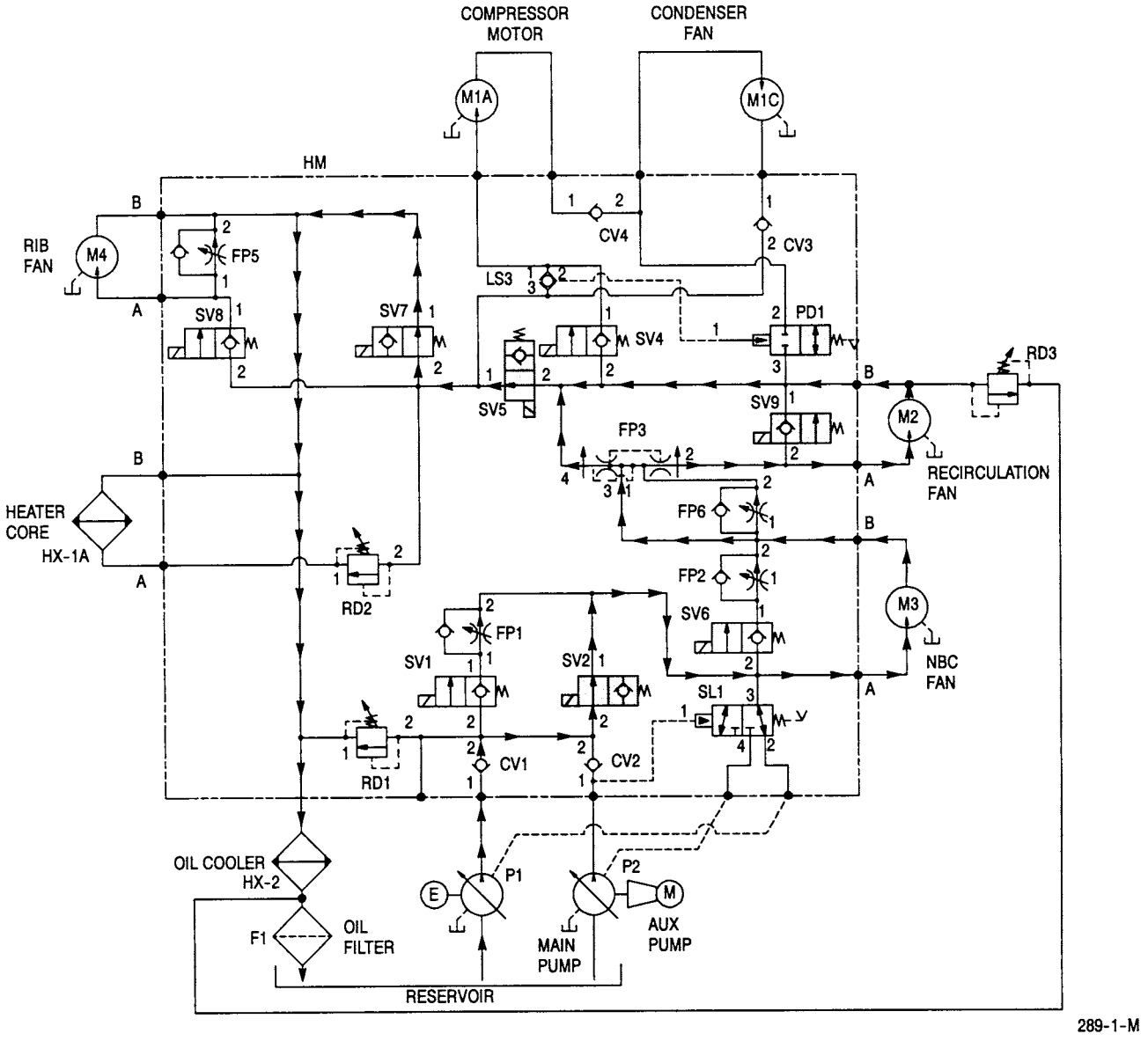


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	OFF	ON	ON	ON
Position	Closed	Open	Closed	Open	Closed	Closed	Open	Closed

Figure 1-19. Static Mode, Internal Power, Heat Mode, Rib Fan On, Full NBC

1.16.12 Static Mode, Internal Power, Heat Mode, Thermostat Open, Full NBC.

When the thermostat opens, the heat mode is shut down. This is accomplished by de-energizing solenoid valves SV5 and SV7. SV5 closes and SV7 opens. This diverts the flow of hydraulic fluid through PD1 to the condenser fan motor, M1C, from the heating coil, HX-1A, and returns it directly to the oil cooler, HX-2. At this point the hydraulic system circuit is the same as "Vent Mode" (figure 1-10).



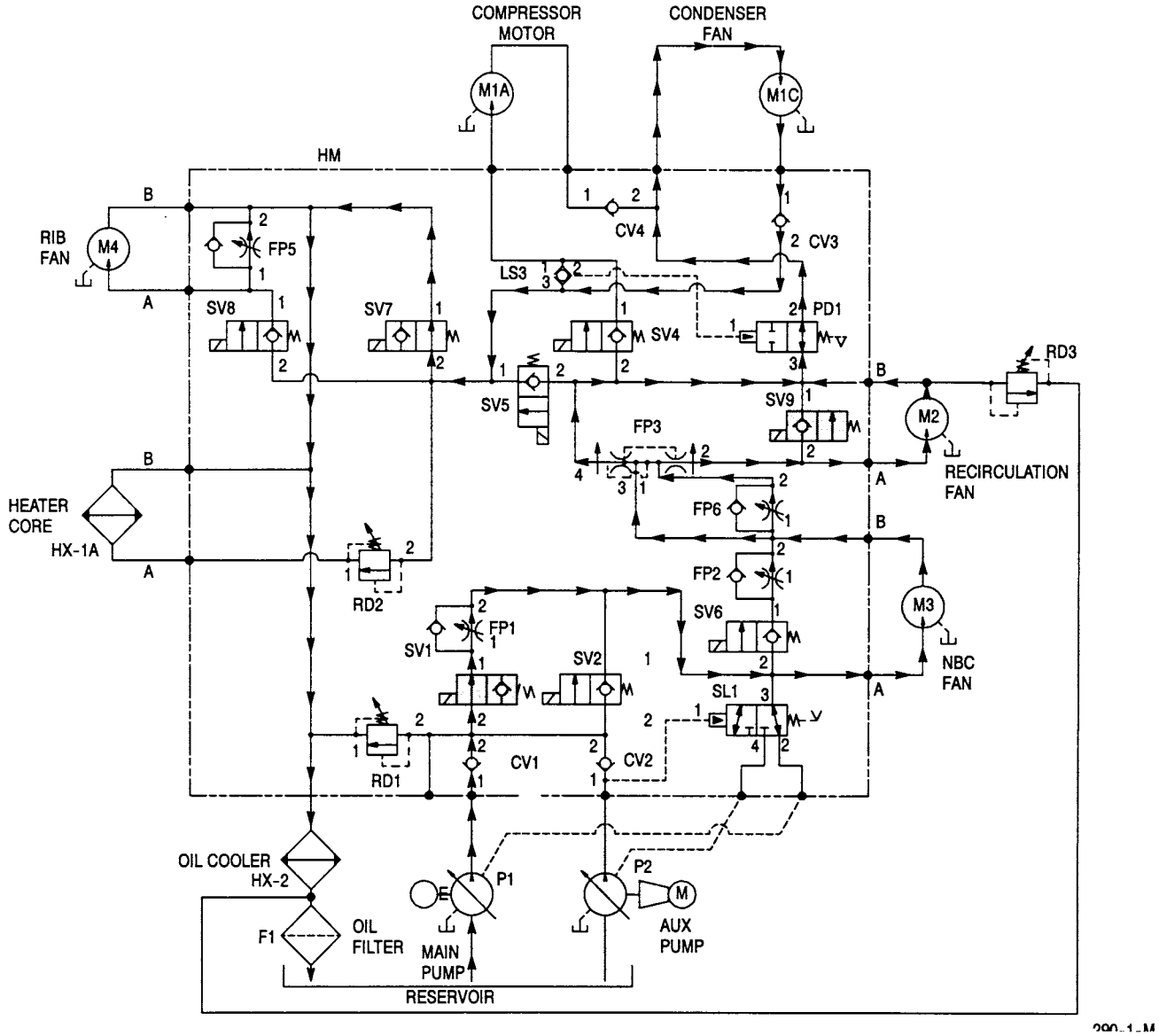
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
Position	Closed	Open	Closed	Open	Closed	Open	Closed	Closed

Figure 1-20. Static Mode, Internal Power, Heat Mode, Thermostat Open, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.13 Mobile Mode, Internal Power, Vent Mode, Full NBC.

The principle difference between the MOBILE and Static Modes is that in the Mobile Mode, the rotating ECU components, vent (NBC) and recirculation fans, compressor, etc., operate at approximately 1/2 speed. The slower speed is required because of the reduced volume that requires NBC protection or cooling. The LMS is much smaller than the combination of the LMS and the ABS that is required in the static mode. This is accomplished by the hydraulic manifold input solenoid switching from solenoid valve SV2 to solenoid valve SV1 for the mobile mode. This in turn brings flow control FP1 into the circuit which is set at approximately 1/2 flow. The balance of the hydraulic circuit remains the same as static mode.

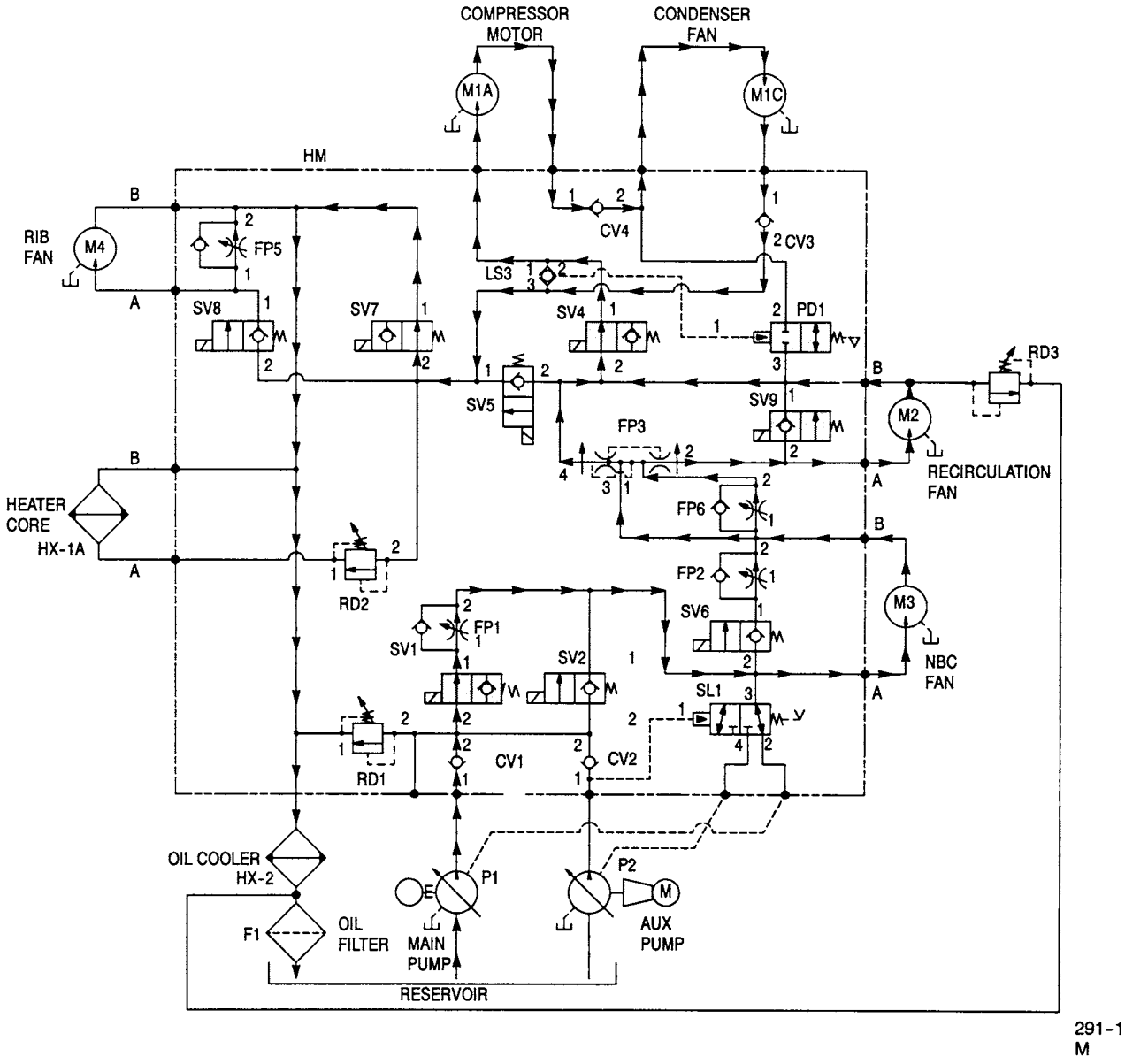


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
Position	Open	Closed	Closed	Closed	Closed	Open	Closed	Closed

Figure 1-21. Mobile Mode, Internal Power, Vent Mode, Full NBC

1.16.14 Mobile Mode, Internal Power, Cool Mode, Full NBC.

In mobile mode, solenoid valve SV1 is energized (open) which forces the hydraulic fluid through flow control, FP1. The same conditions exist in this configuration as exist in the Mobile Mode, vent mode (figure 1-21) except that solenoid valve SV4 is energized (open) allowing the compressor motor, M1A, to operate.



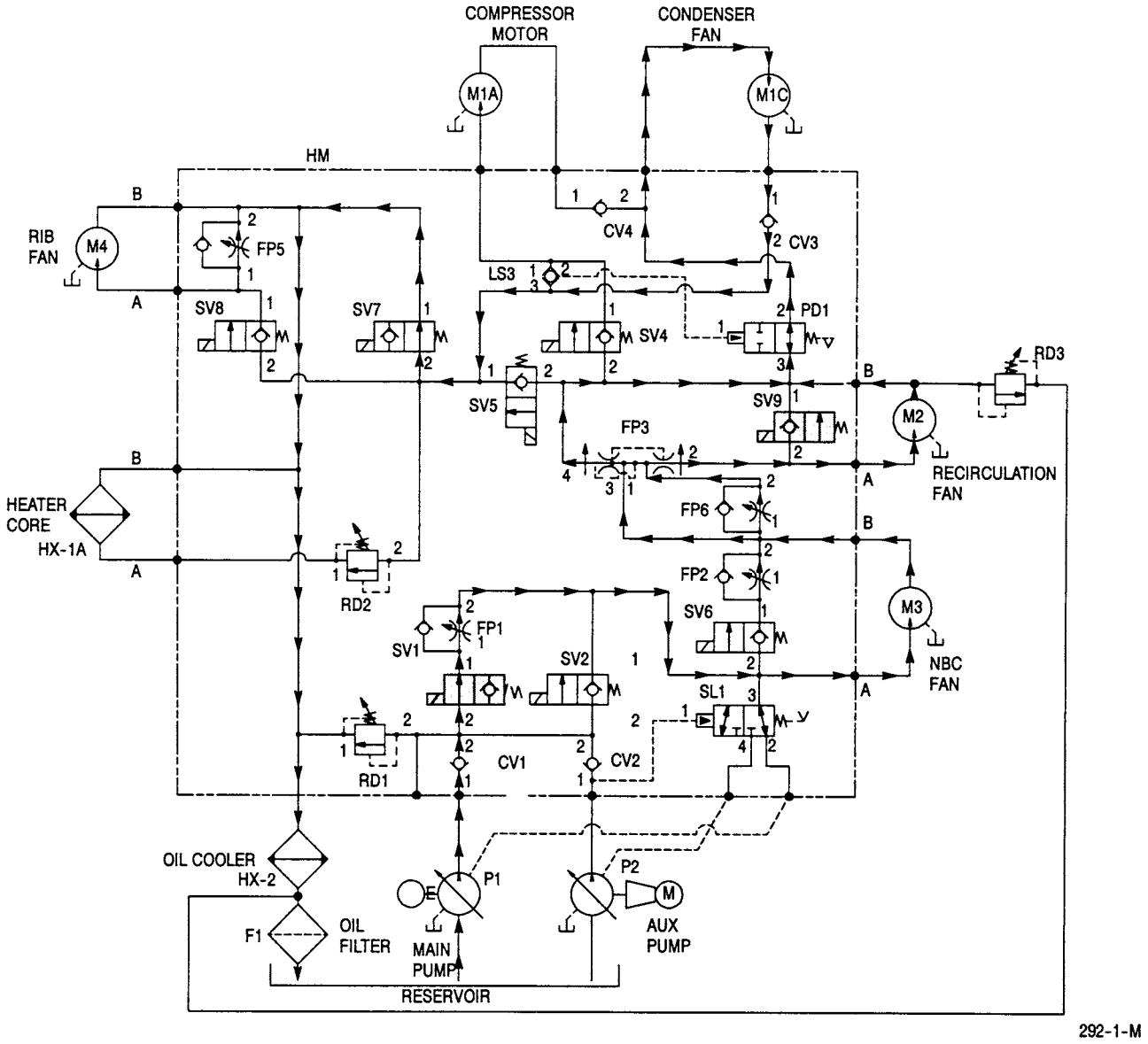
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
Position	Open	Closed	Open	Closed	Closed	Open	Closed	Closed

Figure 1-22. Mobile Mode, Internal Power, Cool Mode, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.15 Mobile Mode, Internal Power, Cool Mode, Thermostat Open, Full NBC.

When the thermostat opens, the cool mode shuts down. This is accomplished by de-energizing (closing) solenoid valve SV4. This shuts the compressor motor, M1A, off and diverts the hydraulic fluid flow through PD1 to the condenser fan motor M1C.

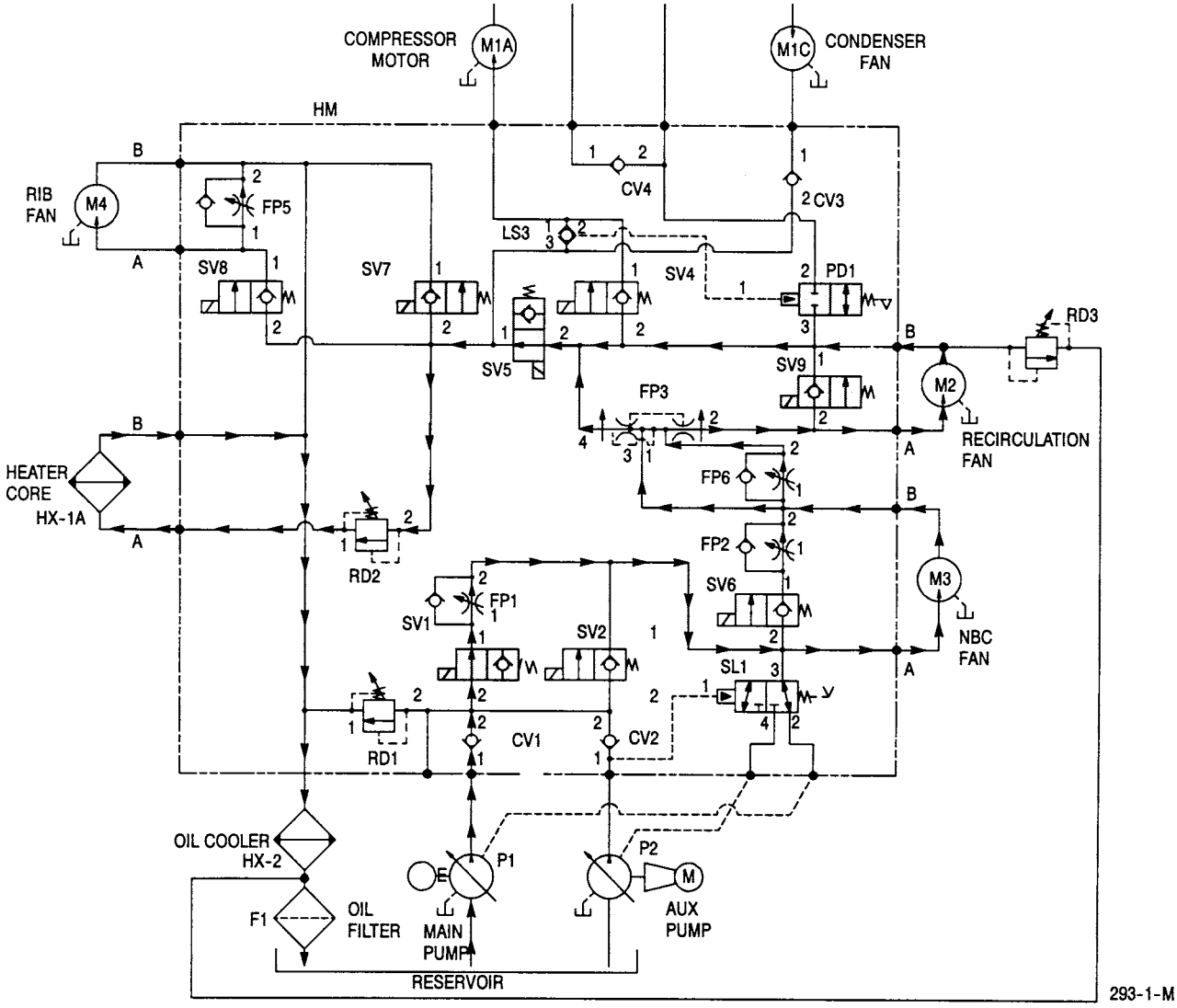


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
Position	Open	Closed	Closed	Closed	Closed	Open	Closed	Closed

Figure 1-23. Mobile Mode, Internal Power, Cool Mode, Thermostat Open, Full NBC

1.16.16 Mobile Mode, Internal Power, Heat Mode, Full NBC.

Placing the control switches in the positions corresponding to the above modes opens solenoid valves SV1 and SV5, and closes SV7, SV9, and valve PD1 by applying +24 Vdc to the coils. The same conditions exist in this configuration as exist in the Mobile Mode, vent mode (figure 1-21) except that solenoid valve SV5 is energized (open) and solenoid valve SV7 is energized (closed). This blocks flow from returning to the reservoir and forces the fluid over the heating system relief valve, RD2. The hydraulic fluid pressure at this point is approximately 2,600 psig. As the fluid passes over the relief valve from the high pressure side to the low pressure side, heat is generated in the fluid since no effective work is performed. The hot fluid then flows through the heating coil, HX-1A, where air flowing across the coil picks up heat from the hot hydraulic fluid to warm the interior of the CBPS. After the fluid passes through the heating coil, it is routed to the oil cooler, filter, and reservoir which is the same as the vent mode.



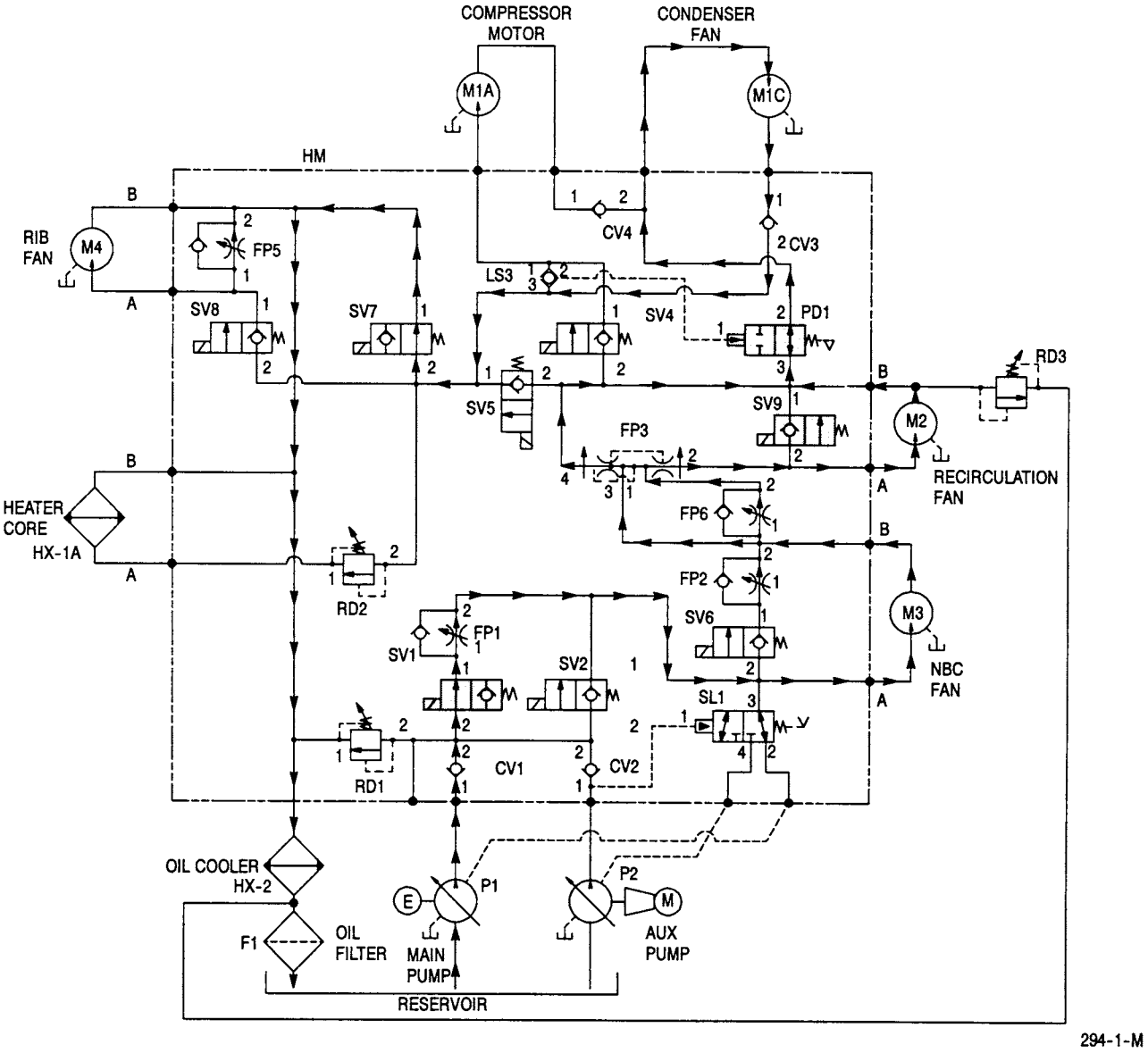
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	ON	OFF	OFF	ON	OFF	ON	OFF	ON
Position	Open	Closed	Closed	Open	Closed	Closed	Closed	Closed

Figure 1-24. Mobile Mode, Internal Power, Heat Mode, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.17 Mobile Mode, Internal Power, Heat Mode, Thermostat Open, Full NBC.

When the thermostat opens, the heat mode is shut down. This is accomplished by de-energizing (opening) solenoid valves SV5 and SV7. SV5 closes and SV7 opens. This diverts the flow of hydraulic fluid through PD1 to the condenser fan motor, M1C, from the heating coil, HX-1A, returning it directly to the oil cooler, HX-2. At this point the hydraulic system circuit is the same as "Vent Mode" (figure 1-10).

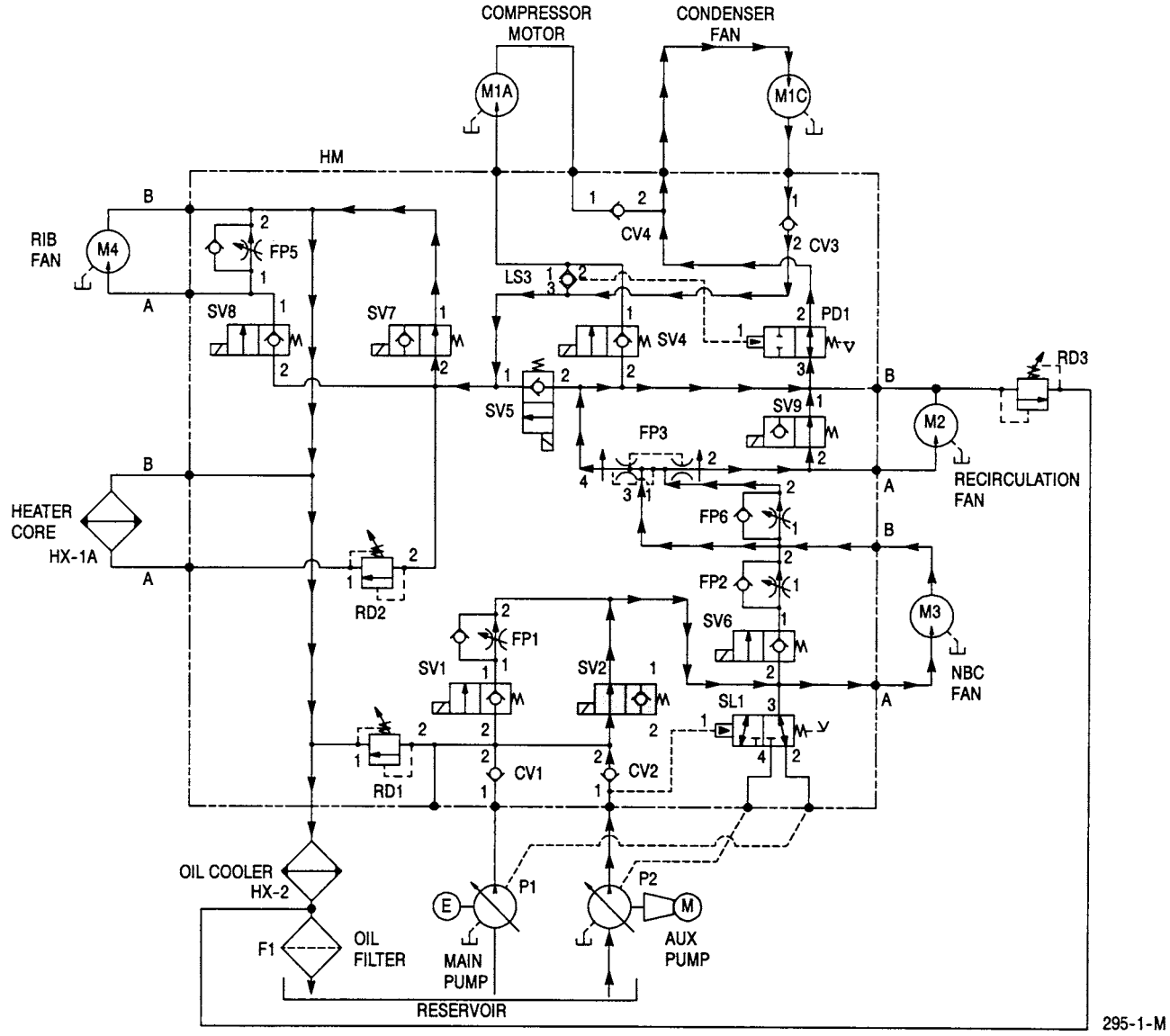


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
Position	Open	Closed	Closed	Closed	Closed	Open	Closed	Closed

Figure 1-25. Mobile Mode, Internal Power, Heat Mode, Thermostat Open, Full NBC

1.16.18 Static Mode, External Power, Vent Mode, Full NBC.

Placing the control switches in the position corresponding to the above modes opens solenoid valve SV2 by applying +24 Vdc to the coils. The principle of operation for the hydraulic system is the same for both internal power and external power (ECV engine or 10 kW TQG). The principal physical difference is that 25 hp is delivered by the engine and pump belt drive system versus 7.5 hp delivered by the external powered electric motor. This means that not all functions can be performed when using the limited external power. To ensure that operation of the NBC system remains intact, all other hydraulic power requirements are removed from the circuit. This allows the hydraulic fluid to flow through the condenser fan motor, M1C, bypass the recirculation fan motor, and to flow back to the reservoir.



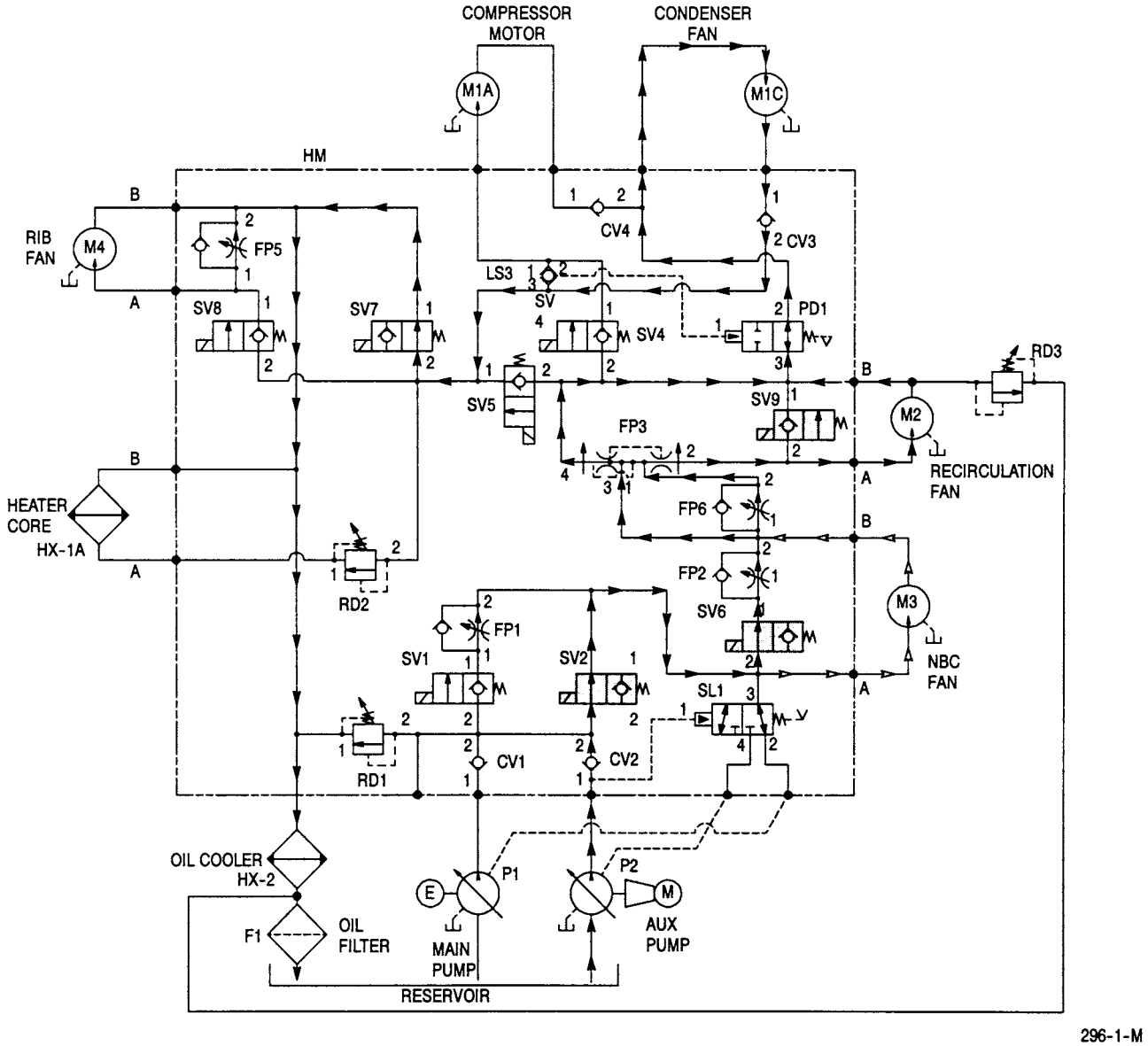
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Position	Closed	Open	Closed	Closed	Closed	Open	Closed	Open

Figure 1-26. Static Mode, External Power, Vent Mode, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.19 Static Mode, External Power, Vent Mode, NBC Off.

Placing the control switches in the position corresponding to the above modes opens solenoid valves SV2 and SV6 and closes SV9 by applying +24 Vdc to the coils. Operation of the hydraulic circuit is the same as the vent mode except that solenoid valve SV6 is energized (open). This allows some portion of the total hydraulic fluid flow to bypass the NBC fan motor, M3. Flow control valve FP2 is used to regulate the flow and hence the speed of the NBC fan motor whenever the control switches are in the non-NBC mode. All other functions are as previously described.

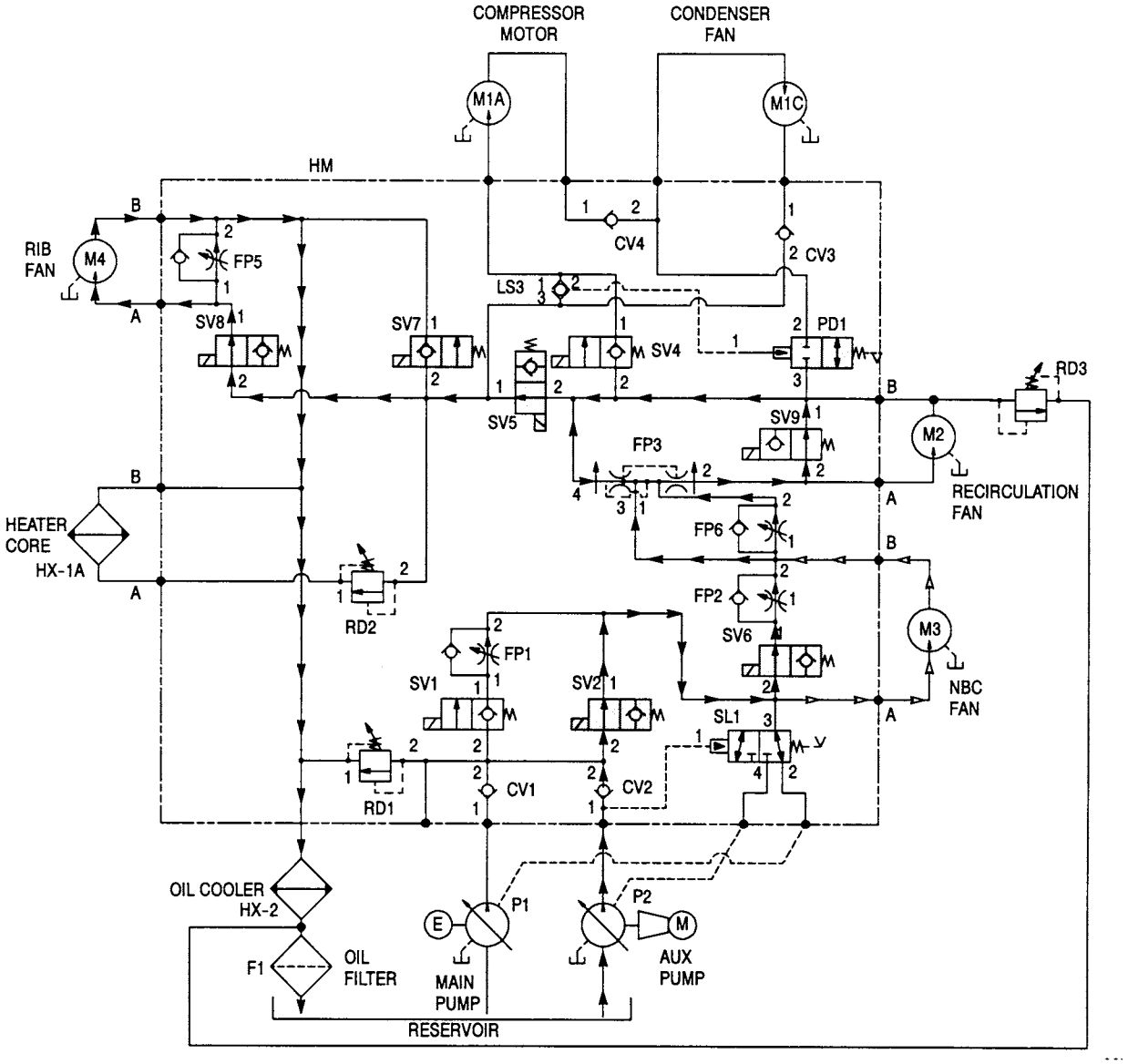


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
Position	Closed	Open	Closed	Closed	Open	Open	Closed	Closed

Figure 1-27. Static Mode, External Power, Vent Mode, NBC Off

1.16.20 Static Mode, External Power, Rib Fan On, NBC Off.

When the hydraulic circuit is in the vent mode (figure 1-25) and air beam pressure is reduced to below 1.5 psi for any reason, the rib fan motor, M4, is automatically turned on. This is accomplished by applying +24 Vdc to the coils of solenoid valves SV2, SV5, SV7, and SV8. SV2, SV5, and SV8 are opened and SV7 is closed. This diverts the hydraulic fluid flow away from the condenser fan, M1C, and through the rib fan motor, M4. The speed of the rib fan is controlled by flow control FP5 which diverts hydraulic fluid flow around the rib fan motor to limit its speed and pressure for safety. When air beam pressure is increased to 2.9 psi, the system is returned to the previous condition.



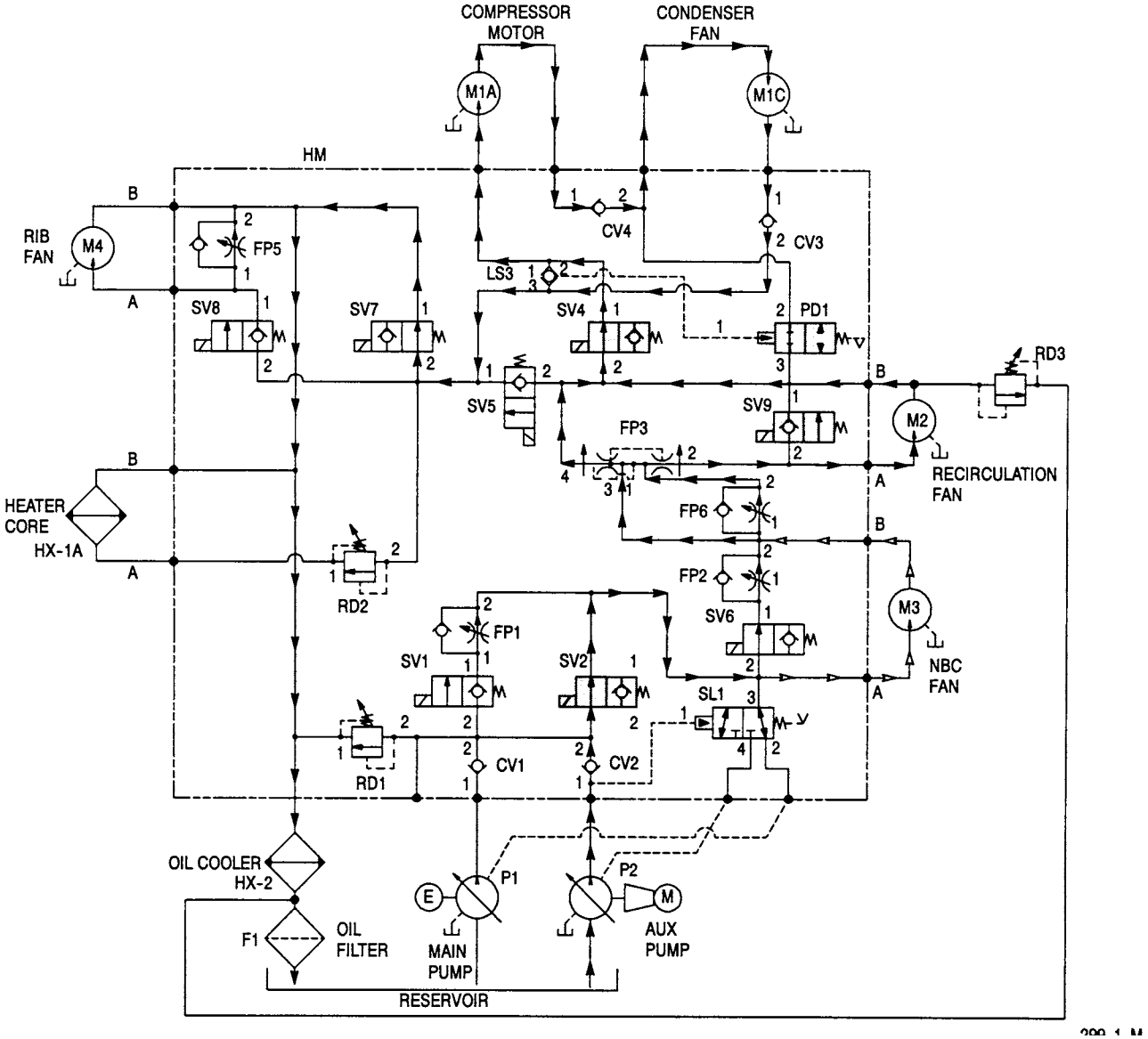
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	ON	ON	ON	OFF
Position	Closed	Open	Closed	Open	Open	Closed	Open	Open

Figure 1-28. Static Mode, External Power, Rib Fan On, NBC Off

1.16 HYDRAULIC SYSTEM – Continued.

1.16.21 Static Mode, External Power, Cool Mode, NBC Off.

Placing the control switches in position corresponding to the above modes opens solenoid valves SV2, SV4, and SV6 and closes solenoid valve SV9 and valve PD1 by applying +24 Vdc to the coils. Operation of the hydraulic circuit is the same as the cool mode except that solenoid valve SV6 is energized (open). This allows some portion of the total hydraulic fluid flow to bypass the NBC fan motor, M3. Flow control valve FP2 is used to regulate the flow and hence the speed of the NBC fan motor whenever the control switches are in the non-NBC mode. All other functions are as previously described.

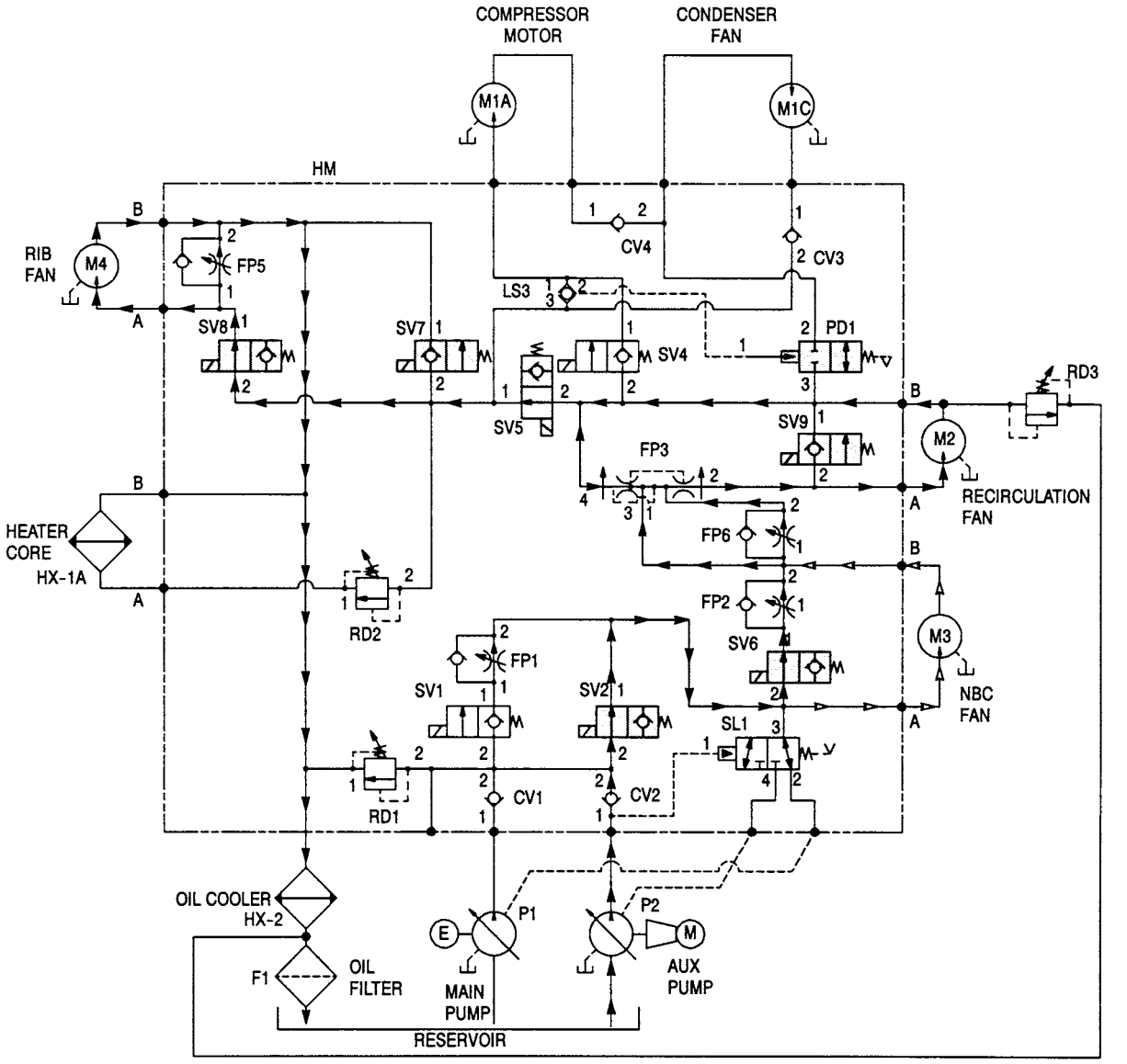


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	ON	OFF	ON	OFF	OFF	ON
Position	Closed	Open	Open	Closed	Open	Open	Closed	Closed

Figure 1-29. Static Mode, External Power, Cool Mode, NBC Off

1.16.22 Static Mode, External Power, Cool Mode, Rib Fan On, NBC Off.

When the hydraulic circuit is in the cool mode and air beam pressure is reduced to below 1.5 psi for any reason, the rib fan motor, M4, is automatically turned on. This is accomplished by applying +24 Vdc to the coils of solenoid valves SV2, SV5, SV6, SV7, SV8, and SV9. SV2, SV5, SV6, and SV8 are opened and SV7 and SV9 are closed. This diverts the hydraulic fluid flow away from the condenser fan, M1C, the compressor motor, M1A, and through the rib fan motor, M4. The speed of the rib fan is controlled by flow control FP5 which diverts hydraulic fluid flow around the rib fan motor to limit its speed and pressure for safety. When air beam pressure is increased to 2.9 psi, the system is returned to the previous condition.



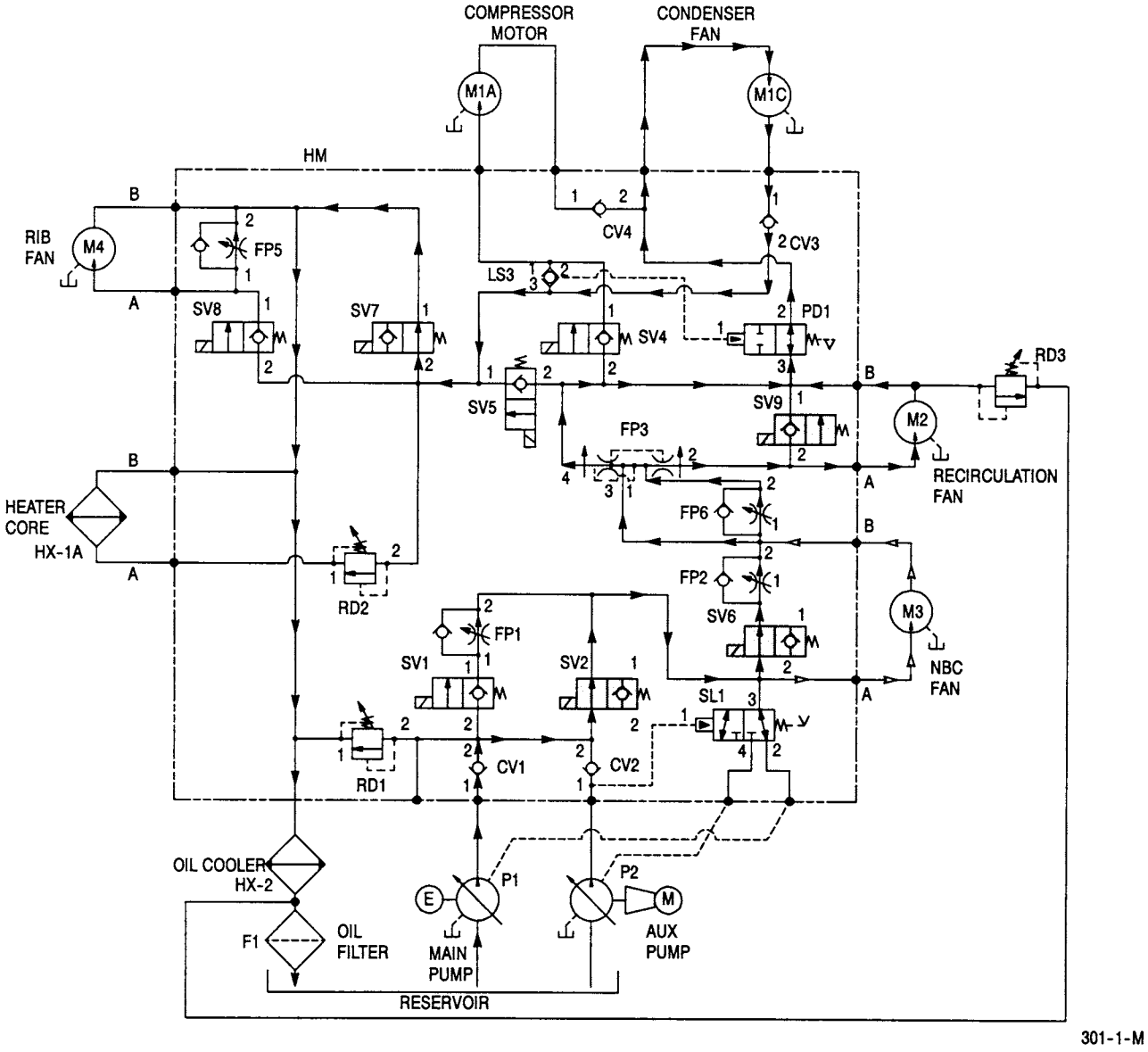
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	ON	ON	ON	ON
Position	Closed	Open	Closed	Open	Open	Closed	Open	Closed

Figure 1-30. Static Mode, External Power, Cool Mode, Rib Fan On, NBC Off

1.16 HYDRAULIC SYSTEM – Continued.

1.16.23 Static Mode, External Power, Cool Mode, Thermostat Open, NBC Off.

Placing the control switches in the position corresponding to the above modes opens solenoid valves SV2 and SV6 and closes solenoid valve SV9 by applying +24 Vdc to the coils. When the thermostat opens, the cool mode is shut down. This is accomplished by de-energizing (closing) solenoid valve SV4 and stopping the compressor motor, M1A.



Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
Position	Closed	Open	Closed	Closed	Open	Open	Closed	Closed

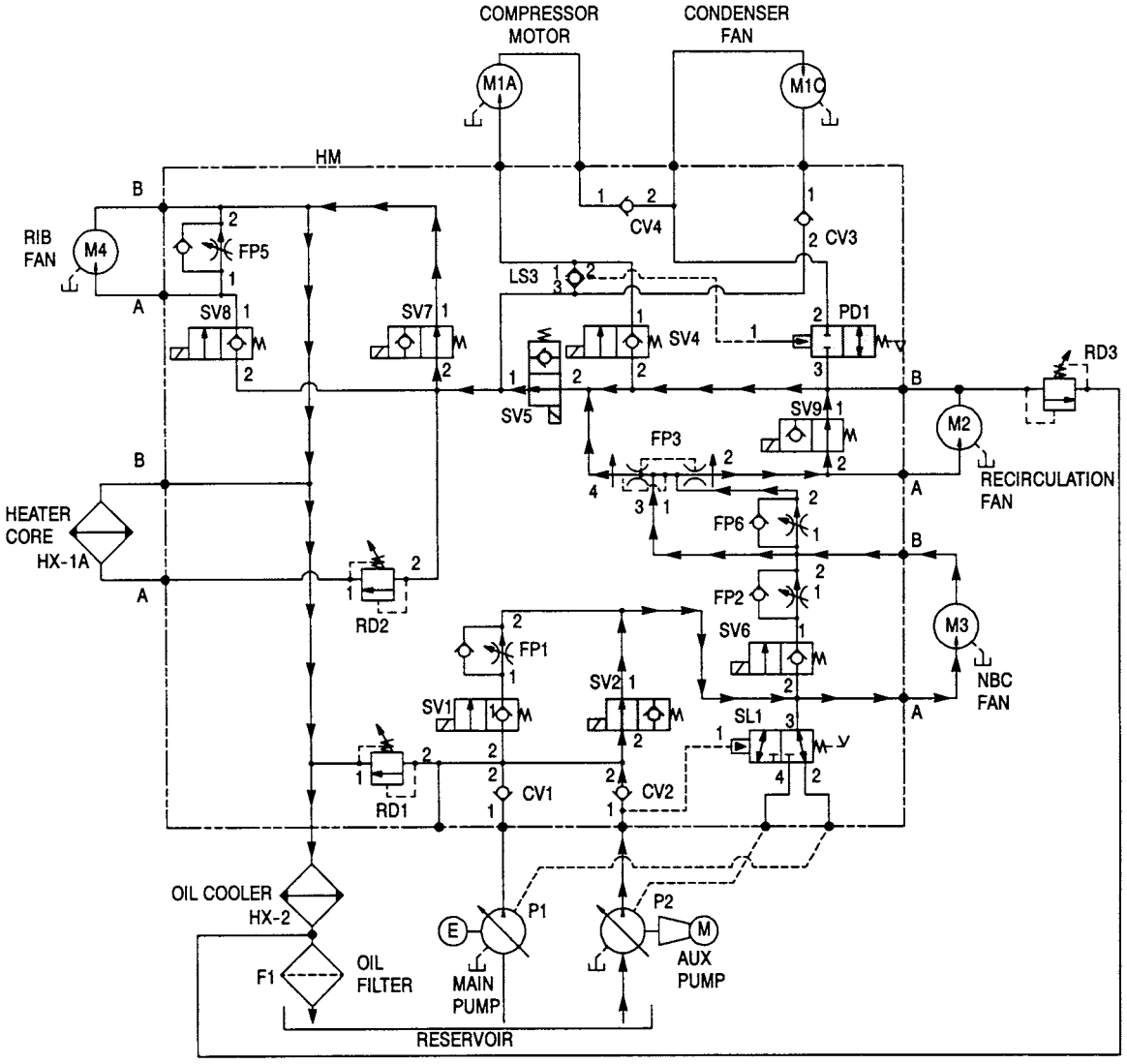
Figure 1-31. Static Mode, External Power, Cool Mode, Thermostat Open, NBC Off

1.16.24 Static Mode, External Power, Heat Mode, Full NBC.

NOTE

Heat is only supplied by electric heaters.

The heat source for Heat Mode is provided by applying 208 Vac to one or more heater elements located in the air stream of the ECU pod. When the 10 kW TQG is used as the power source, only one heater element is used. +24 Vdc is applied to the coils of solenoid valves SV2, SV5, and SV9. SV2 and SV5 open and SV9 closes. Hydraulic fluid flows through the NBC fan motor, M3, and through SV9, bypassing the recirculation fan motor, M2. It is then routed to the oil cooler, filter, and reservoir through SV5 and SV7. Air flow from the NBC fan is heated by the electrical heating element.



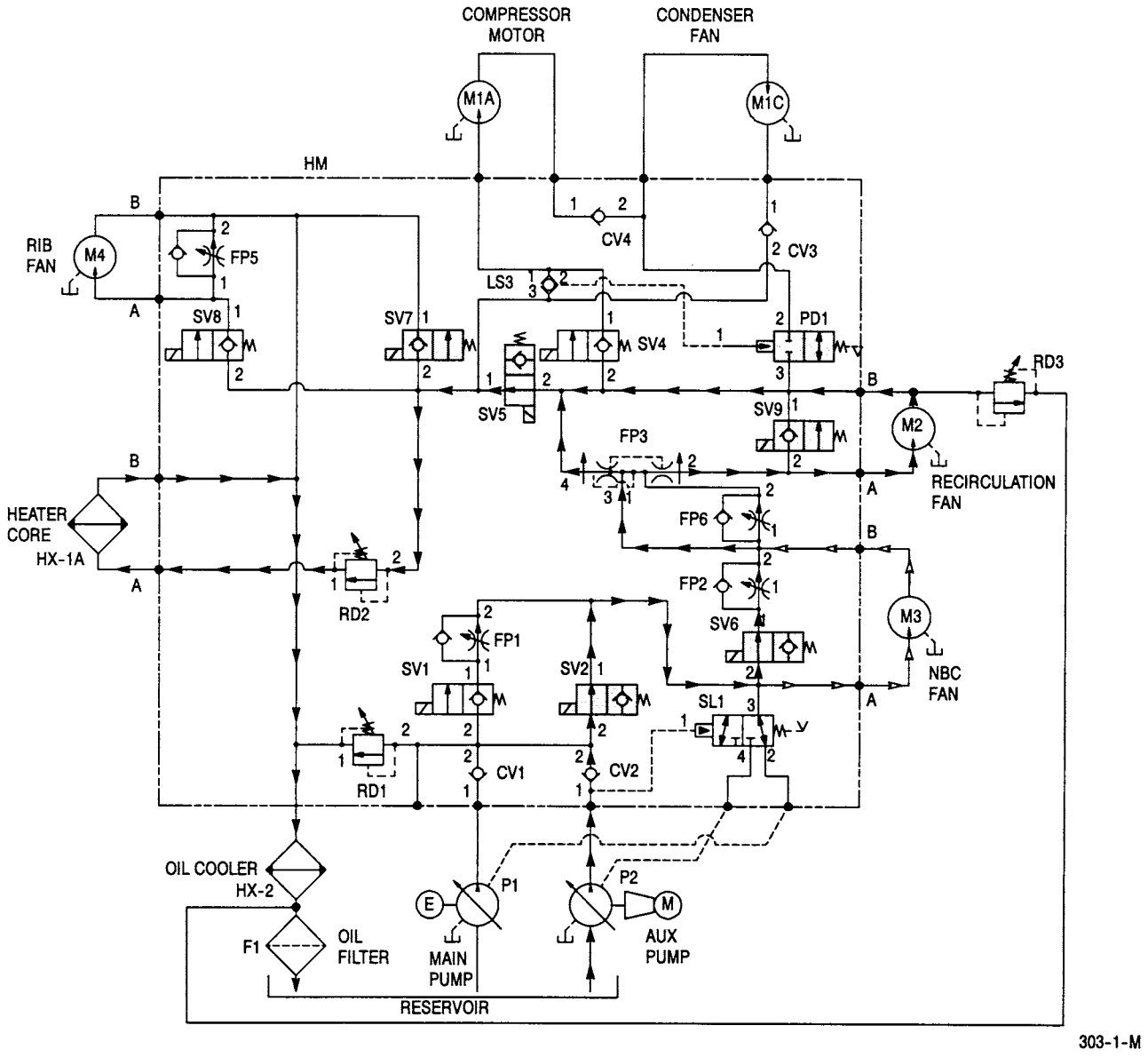
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Position	Closed	Open	Closed	Open	Closed	Open	Closed	Open

Figure 1-32. Static Mode, External Power, Heat Mode, Full NBC

1.16 HYDRAULIC SYSTEM – Continued.

1.16.25 Static Mode, External Power, Heat Mode, NBC Off.

Operation of the hydraulic circuit is the same as the NBC "ON" heat mode except that solenoid valves SV6 and SV9 are energized, SV6 open and SV9 closed. This allows some portion of the total hydraulic fluid flow to bypass the NBC fan motor, M3. Flow control valve FP2 is used to regulate the flow and hence the speed of the NBC fan motor whenever the control switches are in the non-NBC mode. Energizing SV9 closes the bypass to recirculation fan motor M2.

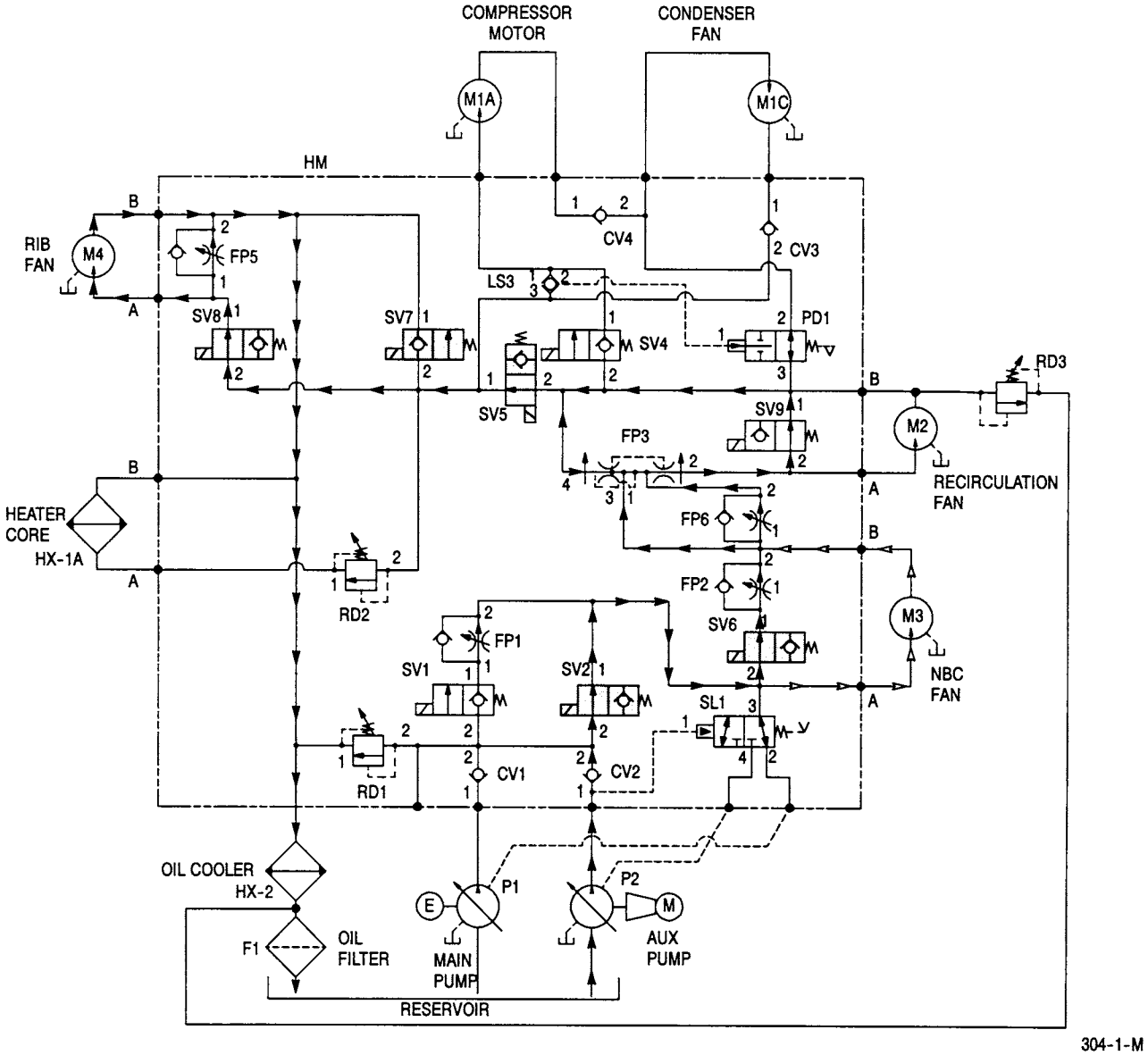


Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	ON	ON	ON	OFF	ON
Position	Closed	Open	Closed	Open	Open	Closed	Closed	Closed

Figure 1-33. Static Mode, External Power, Heat Mode, NBC Off

1.16.26 Static Mode, External Power, Heat Mode, Rib Fan On, NBC Off.

When the hydraulic circuit is in the heat mode (figure 1-32) and air beam pressure is reduced to 1.5 psi for any reason, the rib fan motor, M4, is automatically turned on. This is accomplished by applying +24 Vdc to the coils of solenoid valves SV2, SV5, SV7, SV8, and SV9. SV2, SV5, and SV8 are opened and SV7 and SV9 are closed. This diverts the hydraulic fluid flow through the rib fan motor, M4. The speed of the rib fan is controlled by flow control FP5 which diverts hydraulic fluid flow around the rib fan motor to limit its speed and pressure for safety. When air beam pressure is increased to 2.9 psi, the system is returned to the previous condition.



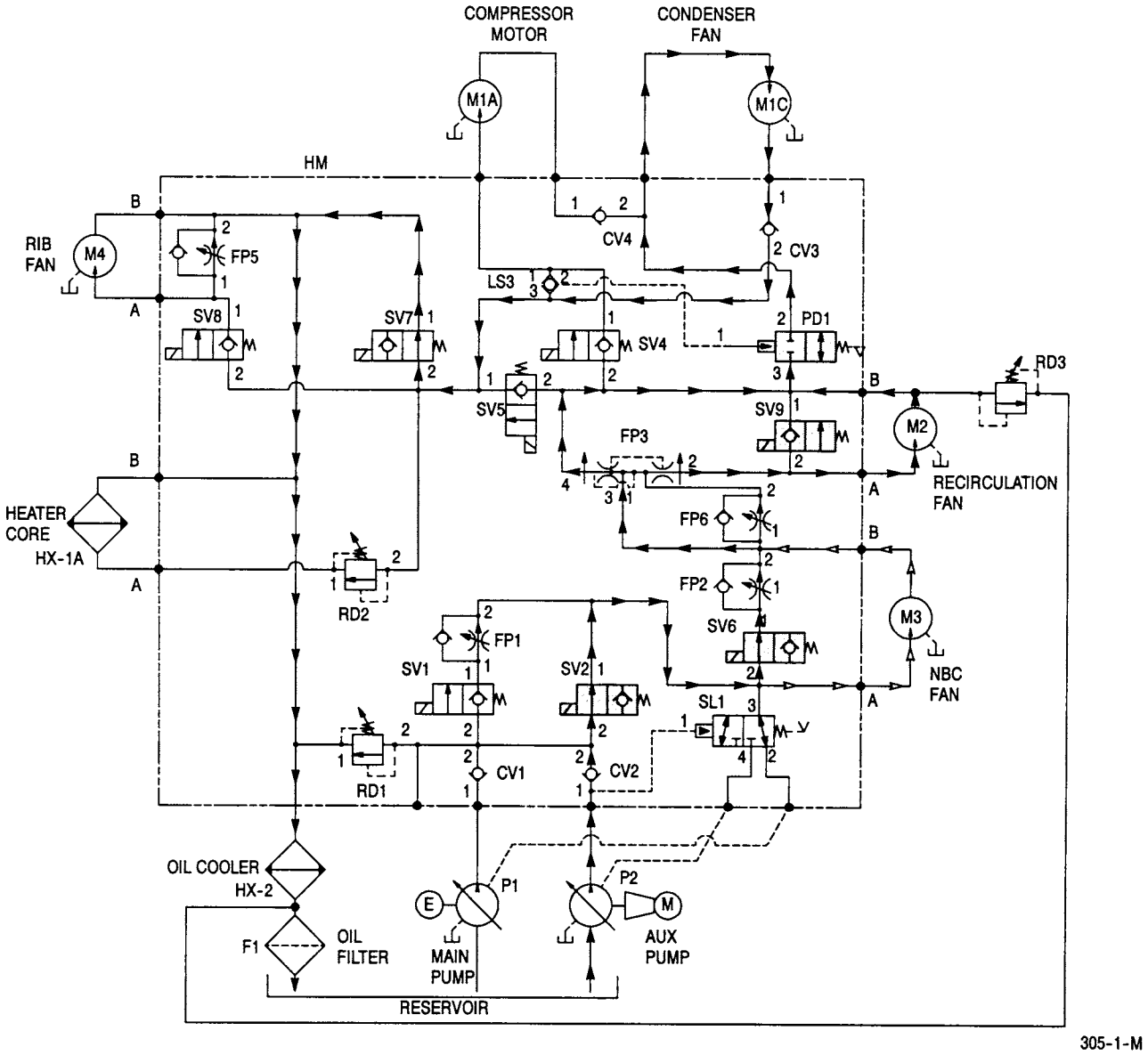
Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OPEN	ON	ON	ON	OFF
Position	Closed	Open	Closed	Open	Open	Closed	Open	Open

Figure 1-34. Static Mode, External Power, Heat Mode, Rib Fan On, NBC Off

1.16 HYDRAULIC SYSTEM – Continued.

1.16.27 Static Mode, External Power, Heat Mode, Thermostat Open, NBC Off.

When the thermostat opens, the electrical heating element turns off, no longer heating the air. The hydraulic fluid flow is diverted to the condenser fan motor, M1C, before returning to the oil cooler, filter, and reservoir. This is accomplished by de-energizing (closing) SV5 and leaving solenoid valves SV2 and SV9 energized.



Valve	SV1	SV2	SV4	SV5	SV6	SV7	SV8	SV9
Energized State	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
Position	Closed	Open	Closed	Closed	Open	Open	Closed	Closed

Figure 1-35. Static Mode, External Power, Heat Mode, Thermostat Open, NBC Off

CHAPTER 2
UNIT MAINTENANCE INSTRUCTIONS
TABLE OF CONTENTS

TABLE OF CONTENTS – Continued

TABLE OF CONTENTS – Continued

Section I. LUBRICATION INSTRUCTIONS

2.1 LUBRICATION INSTRUCTIONS.

a. Unit level lubrication instructions are a mandatory part of this manual.

b. Intervals (on-condition or hard time) and the related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all the services prescribed for a particular interval. On Condition (OC) oil sample intervals shall be applied unless changed by the Army Oil Analysis Program (AOAP) laboratory. Change the hard time interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer than usual operating hours. The hard time interval may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Hard time intervals will be applied in the event AOAP laboratory support is not available.

c. Refer to TM 9-2320-387-24-1 for lubrication of the Expanded Capacity Vehicle (ECV).

d. Refer to LO 9-6115-642-12 for lubrication of the Tactical Quiet Generator (TQG).

e. Refer to TM 9-2330-392-14&P for lubrication of the High Mobility Trailer (HMT).

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

2.2 COMMON TOOLS AND TEST EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit. Tool Kit, General, Mechanic's: Automotive (Supply Catalog Number SC 5180-90-N26) is available to unit level maintainers (MOS 63B and 52D).

2.3 SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Refer to Appendix B, Section III, Tool and Test Equipment Requirements, for additional tool and equipment requirements.

2.4 REPAIR PARTS.

Chemical Biological Protective Shelter (CBPS) System repair parts are listed and illustrated in the Repair Parts and Special Tools List Manual (TM 10-5410-228-24P) for unit, direct support and general support maintenance. Mandatory replacement parts are listed in Appendix E.

Section III. SERVICE UPON RECEIPT

2.5 SERVICE UPON RECEIPT OF MATERIAL.

The CBPS is supplied ready for use with the exception of those items that must be installed and preliminary servicing and adjustment.
Initial Inspection. Inspect the CBPS for damage, completeness and application of applicable Modification Work Orders (MWO).

a. Inspect equipment for damage incurred during shipment. If equipment has been damaged, report damage on SF 364, Report of Discrepancy.

b. Check equipment against packing slip to see if shipment is complete. Report all discrepancies in accordance with instructions of DA PAM 738-750.

c. Check ECU for dents and leaks of hydraulic fluid or R22 refrigerant.

2.6 INSTALLATION INSTRUCTIONS.

Set up and inflate Air Beam Shelter (ABS), and perform BEFORE Operator Preventive Maintenance Checks and Services (PMCS) instructions (reference TM 10-5410-228-10, Operator's Manual, for instructions). Inventory and secure Components of End Items (COEI) and Basic Issue Items (BII) Equipment and Additional Authorized Equipment.

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

2.7 GENERAL.

Unit PMCS is performed upon receipt and in accordance with table 2-1. Record all defects found during the performance of PMCS and, if applicable, the steps taken to correct them on DA Form 2404, Equipment Inspection and Maintenance Worksheet. Instructions for reporting/correcting noted deficiencies are contained in DA PAM 738-750.

Table 2-1. Unit Level Preventive Maintenance Checks and Services for CBPS

M – MONTHLY Q – QUARTERLY S – SEMIANNUALLY Y –YEARLY

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable If:
		WARNING		
		Hydraulic motors, hoses, tubing and fittings may be hot. Avoid contact to prevent injury to personnel.		
		To prevent injury to personnel, hearing protection is required when system is operating.		
		ECV		
1	M	ECV	Perform PMCS on ECV per TM 9-2320-387-24-1.	ECV fails PMCS.
2	Q	Hydraulic pump drive belt.	Check belt for cracks and fraying per TM 9-2320-387-10. Check for missing teeth. Check belt tension per para 2.12.7	Belt cracked, fraying or loose. Teeth missing. Belt doesn't tighten up.
3	S	Auxiliary power pack (in passenger side compartment)	Check current of auxiliary power pack per para 2.14.5e.	If adjustment can't be accomplished.
4	S	NBC fan	Check RPM per para 2.14.5d.	RPM can't be set to proper speed.
5	Y	ECU boots	Remove return air screen per para 2.13.5. Remove passenger side rear cover to inspect outlet air duct boot.	Leaking boots.

2.7 GENERAL – Continued.

Table 2-1. Unit Level Preventive Maintenance Checks and Services for CBPS – Continued

M – MONTHLY Q – QUARTERLY S – SEMIANNUALLY Y –YEARLY

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
6	M, S, Y	LMS	Perform PMCS on LMS per TM 10-5411-224-14.	LMS fails PMCS.
7	S	HMT	Perform PMCS on HMT per TM 9-2330-392-14&P.	HMT fails PMCS.

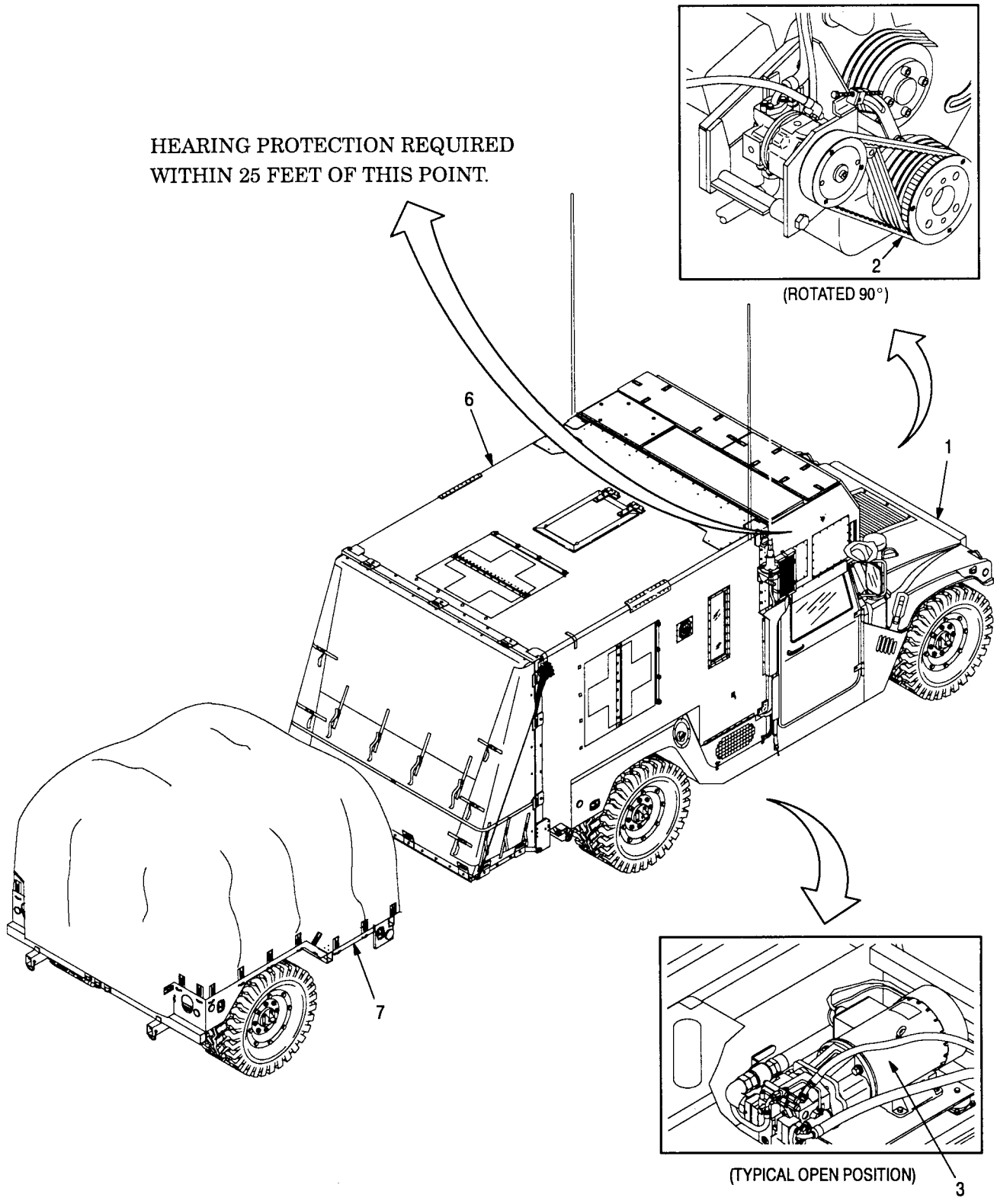


Figure 2-1. Unit PMCS Location Diagram (Sheet 1 of 2)

2.7 GENERAL – Continued.

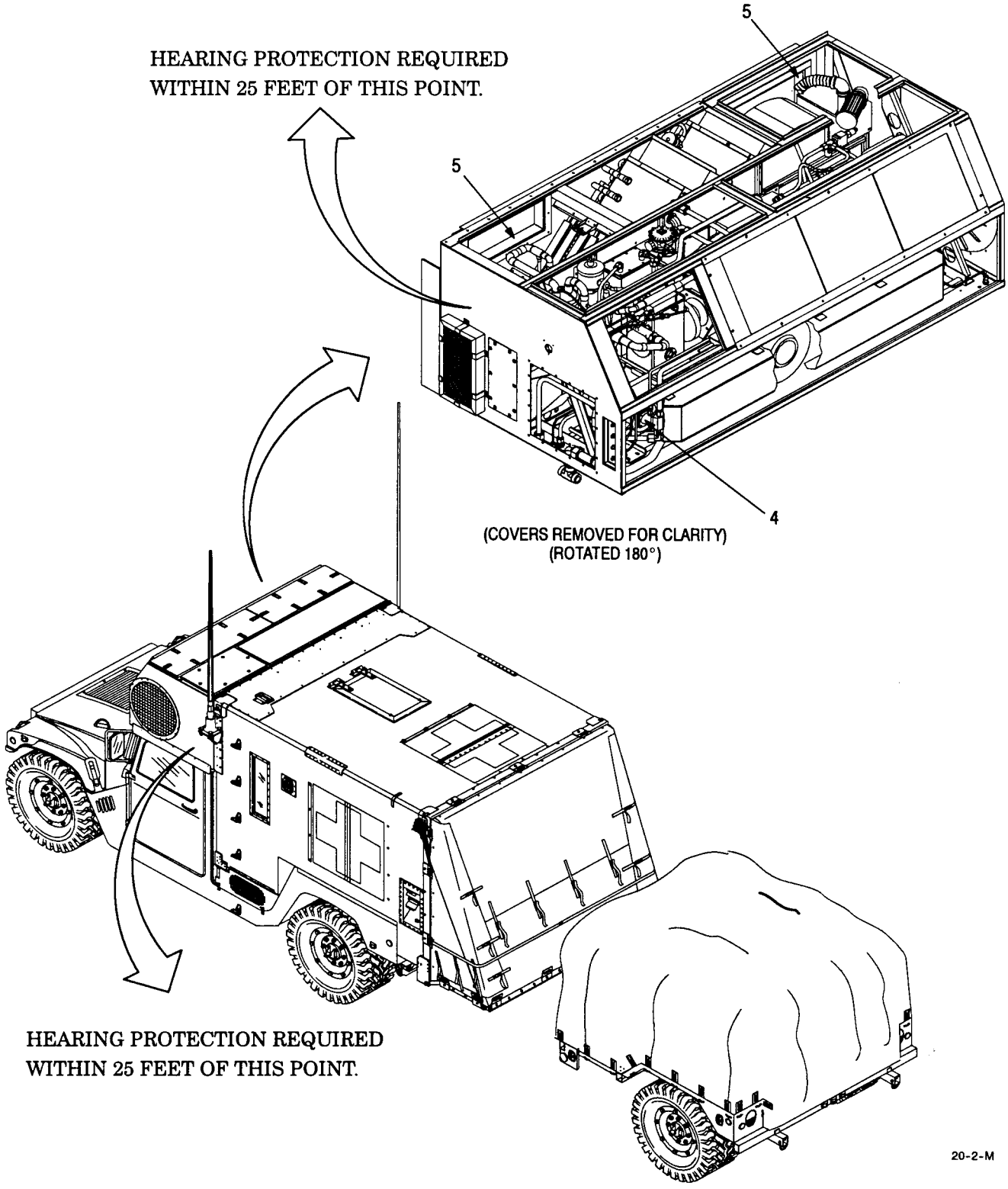


Figure 2-1. Unit PMCS Location Diagram (Sheet 2 of 2)

Section V. UNIT LEVEL TROUBLESHOOTING PROCEDURES

2.8 GENERAL.

The following section lists common equipment malfunctions and contains instructions to allow unit personnel to diagnose and correct each malfunction. Perform the indicated steps in the order listed. An index is provided to assist you in finding the troubleshooting instructions as quickly as possible. This section does not list all possible malfunctions. If a malfunction is either not listed or cannot be corrected by the prescribed procedure, notify your supervisor.

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

WARNING

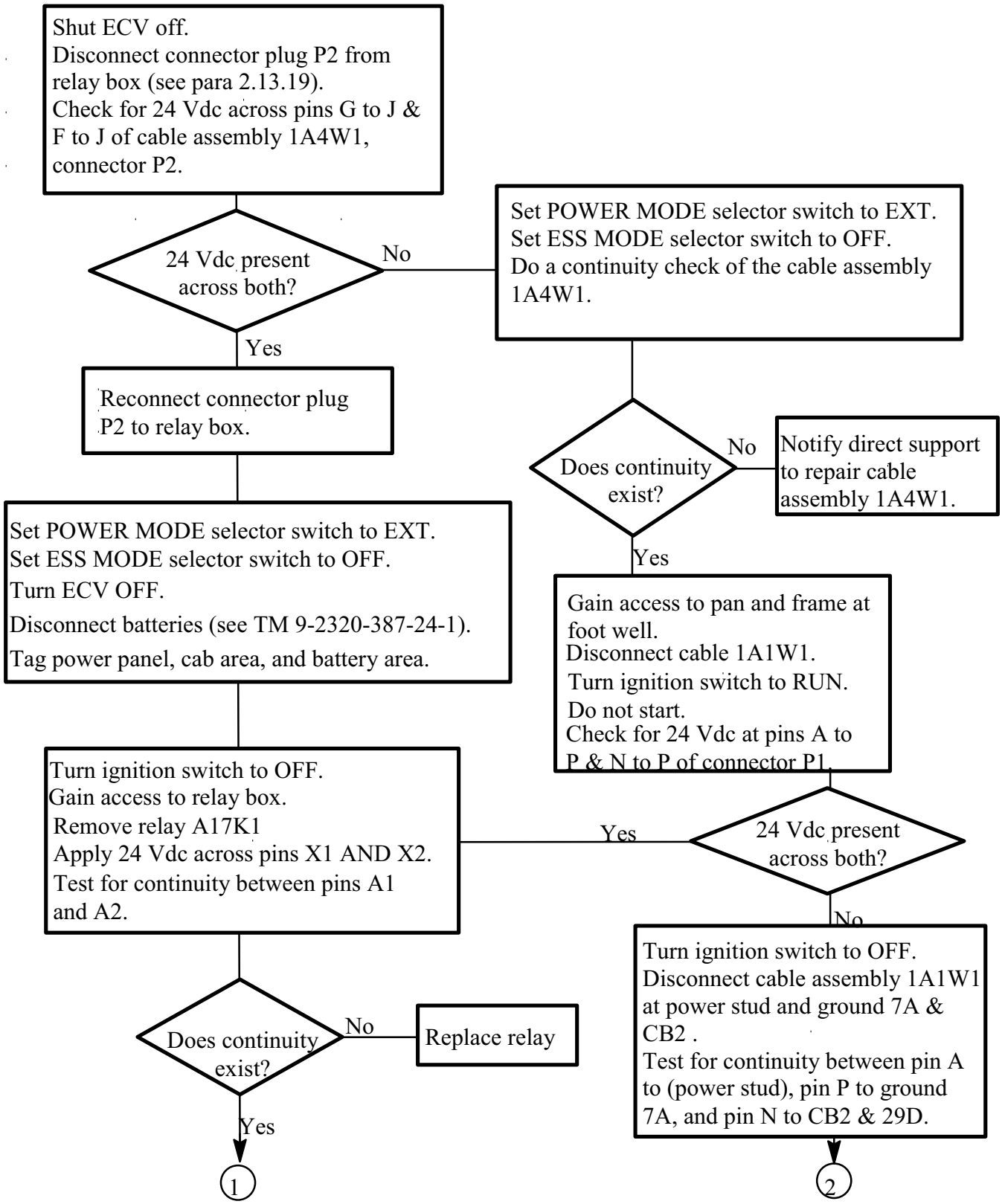
Hydraulic motors, hoses, tubing and fittings may be hot. Avoid contact to prevent injury to personnel.

To prevent injury to personnel, hearing protection is required when system is operating.

CAUTION

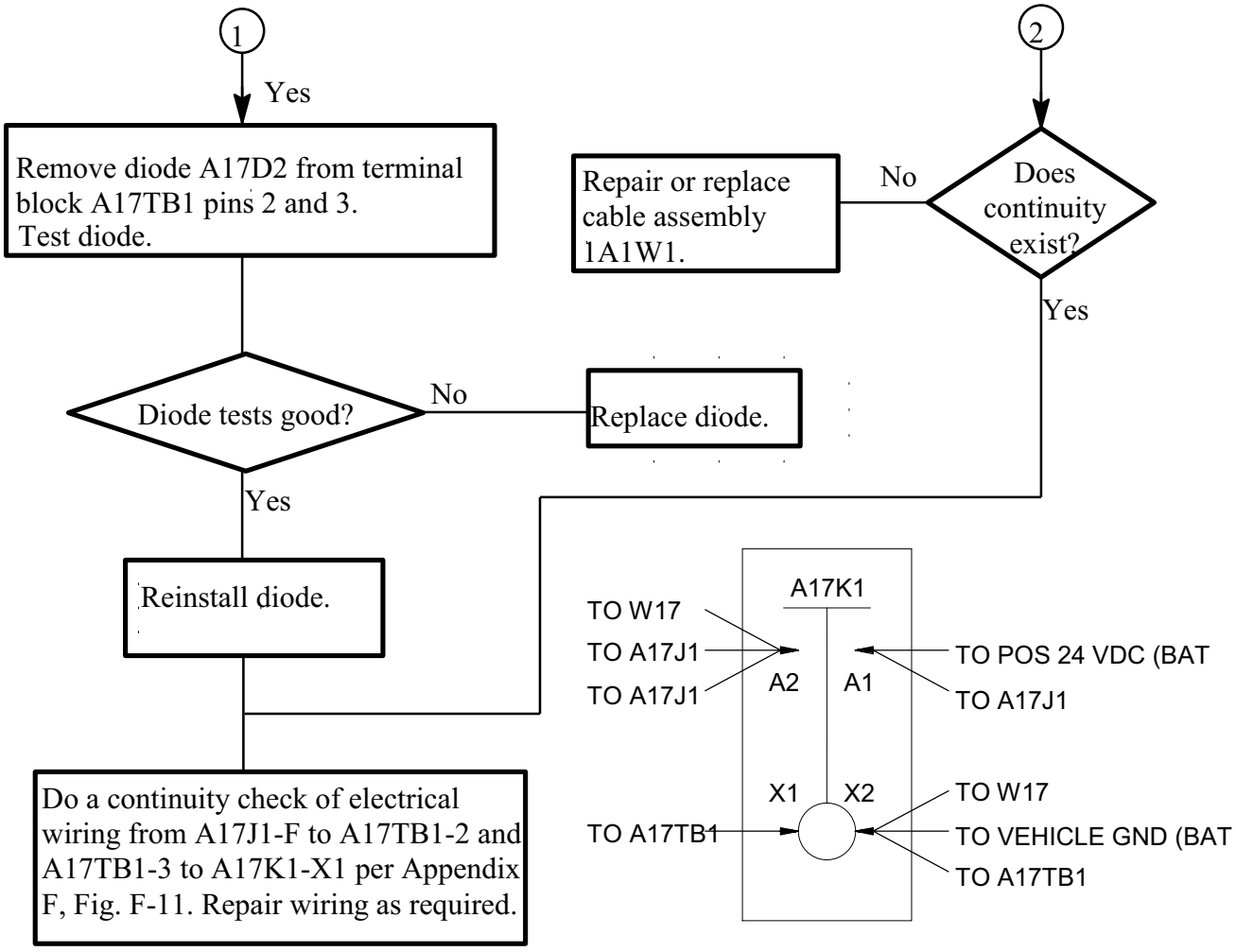
To prevent damage to hydraulic pump, EPG switch must be set to OFF before setting ESS MODE switch to OFF or any mode position.

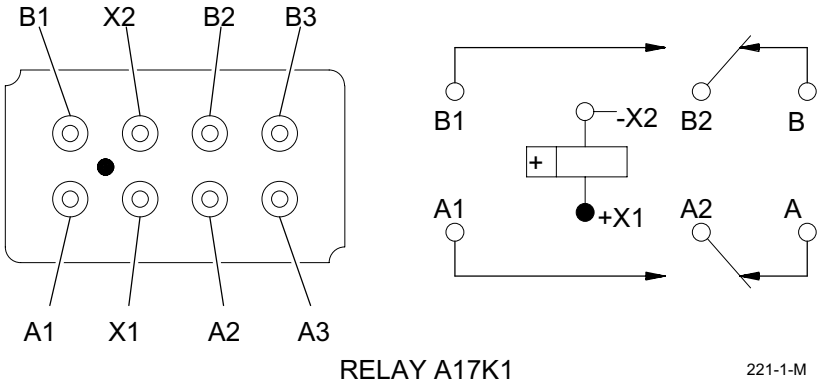
1. NO POWER TO SYSTEM WITH ECV RUNNING – NO AIR, NO LIGHTS, NO READINGS ON CONVERTER.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

1. NO POWER TO SYSTEM WITH ECV RUNNING – NO AIR, NO LIGHTS, NO READINGS ON CONVERTER – Continued.





RELAY A17K1

221-1-M

2. NO READINGS ON INVERTER – MISSION PROFILE (MOBILE/STATIC) INDICATOR AND LMS LIGHTS ON.

Turn ECV off.
Set POWER MODE selector switch to INT.
Set ESS MODE selector switch to OFF.
Tag power panel and cab area.
Remove rack guard from right side of control panel.
Disconnect connector of cable assembly 1A4W11 from J11 on rear of control panel.
Turn ECV on.
Measure 24 Vdc between pins A and B of connector J11.

24 Vdc present?

No

Do a continuity check of electrical wiring from A4J11 to A4J9 refer to Appendix F, Fig. F-9, sheet 1.
Repair wiring as required.

Yes

Turn ECV off.
Disconnect cable assembly 1A4W11 connector P2 from inverter J1.
Do a continuity check of cable assembly pins A to A, B to B.

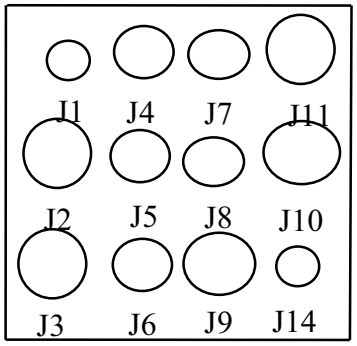
Does continuity exist?

No

Repair or replace cable (see para 2.13.27).

Yes

Replace inverter (see para 2.13.21).

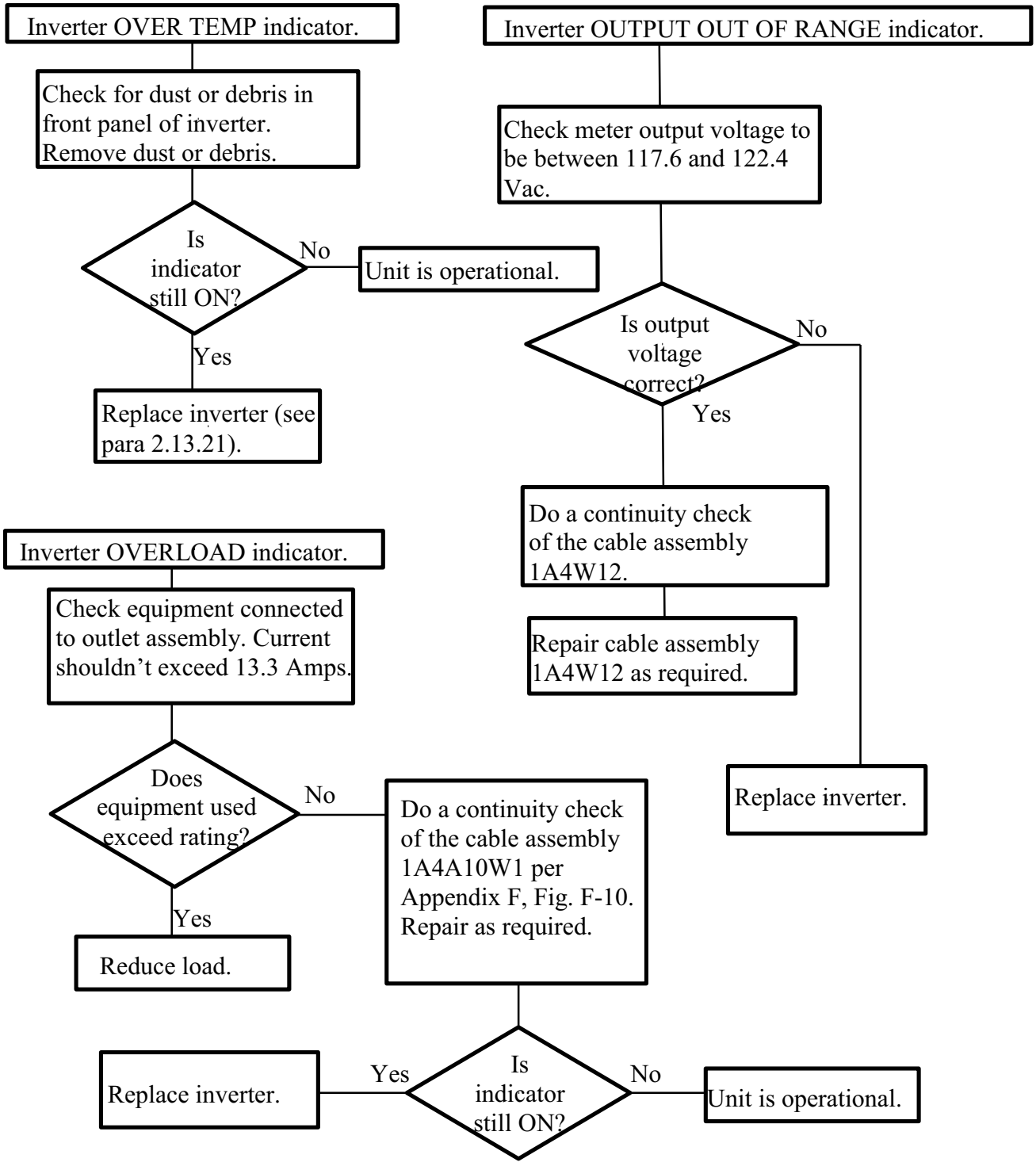


Connector Layout

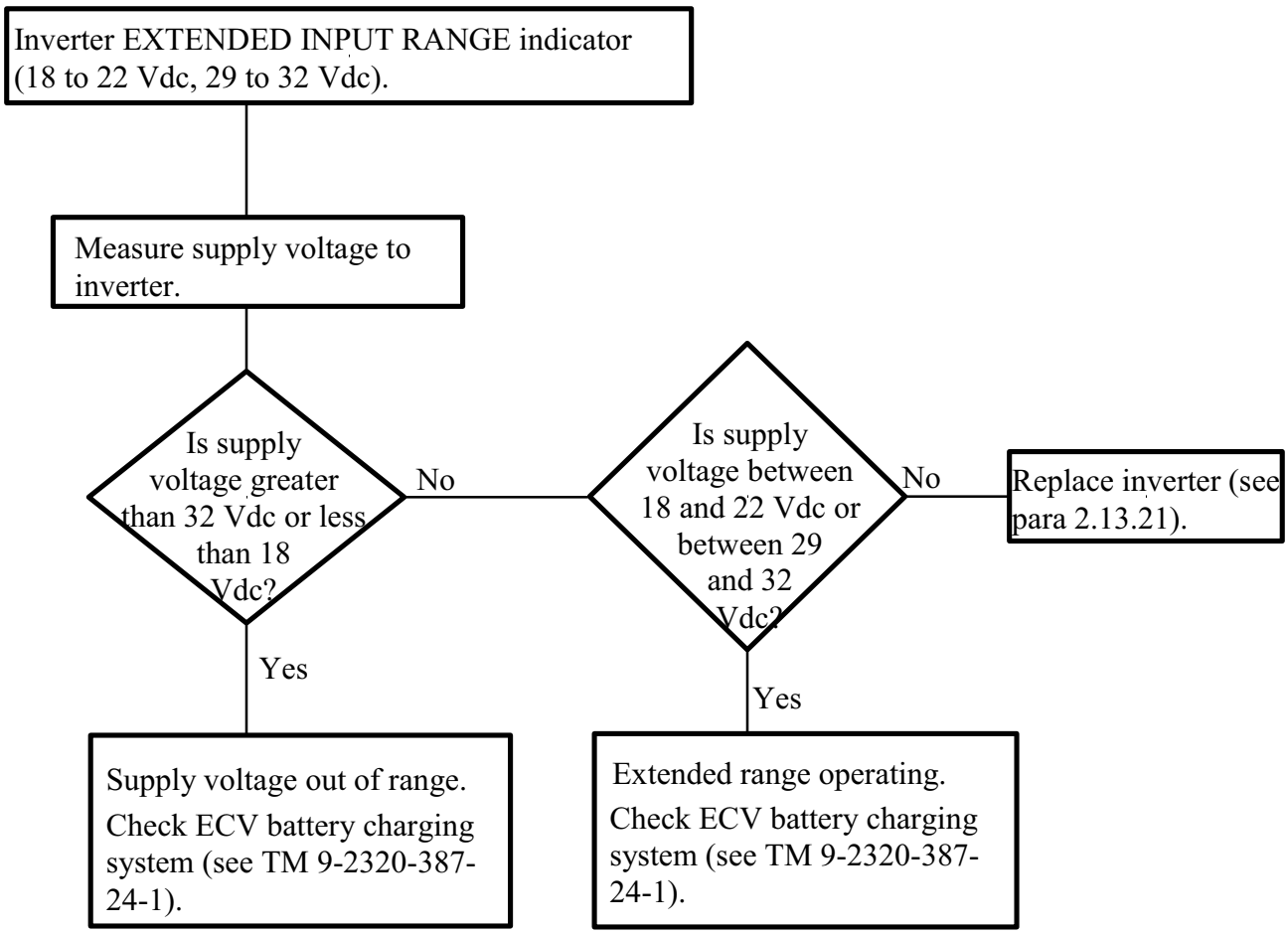
2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

3. INVERTER INDICATOR LIGHTS ON, NO VOLTAGE TO OUTLETS.

NOTE: If inverter was operated in overload, wait for temperature to go down before replacement.



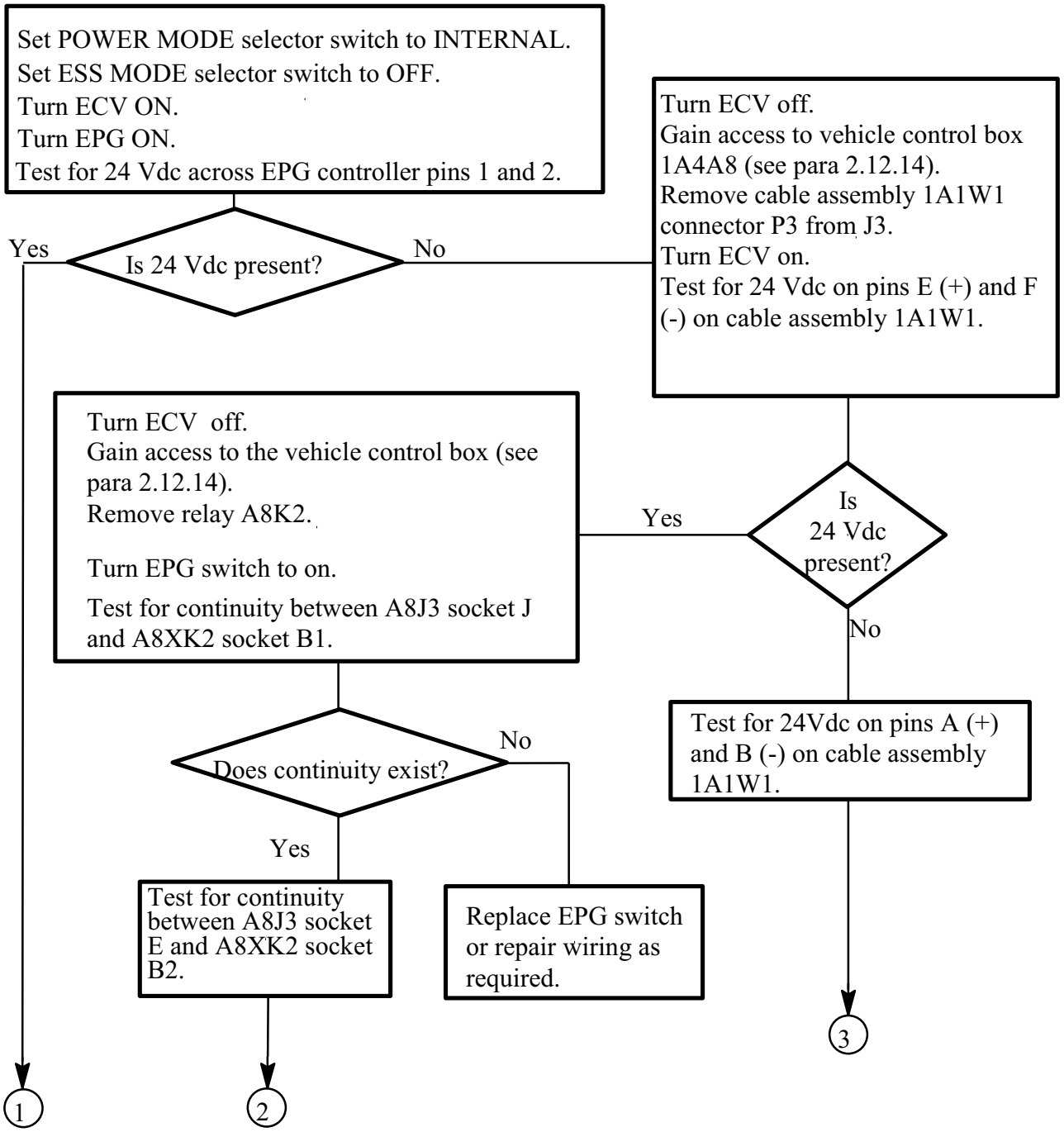
3. INVERTER INDICATOR LIGHTS ON, NO VOLTAGE TO OUTLETS – Continued.



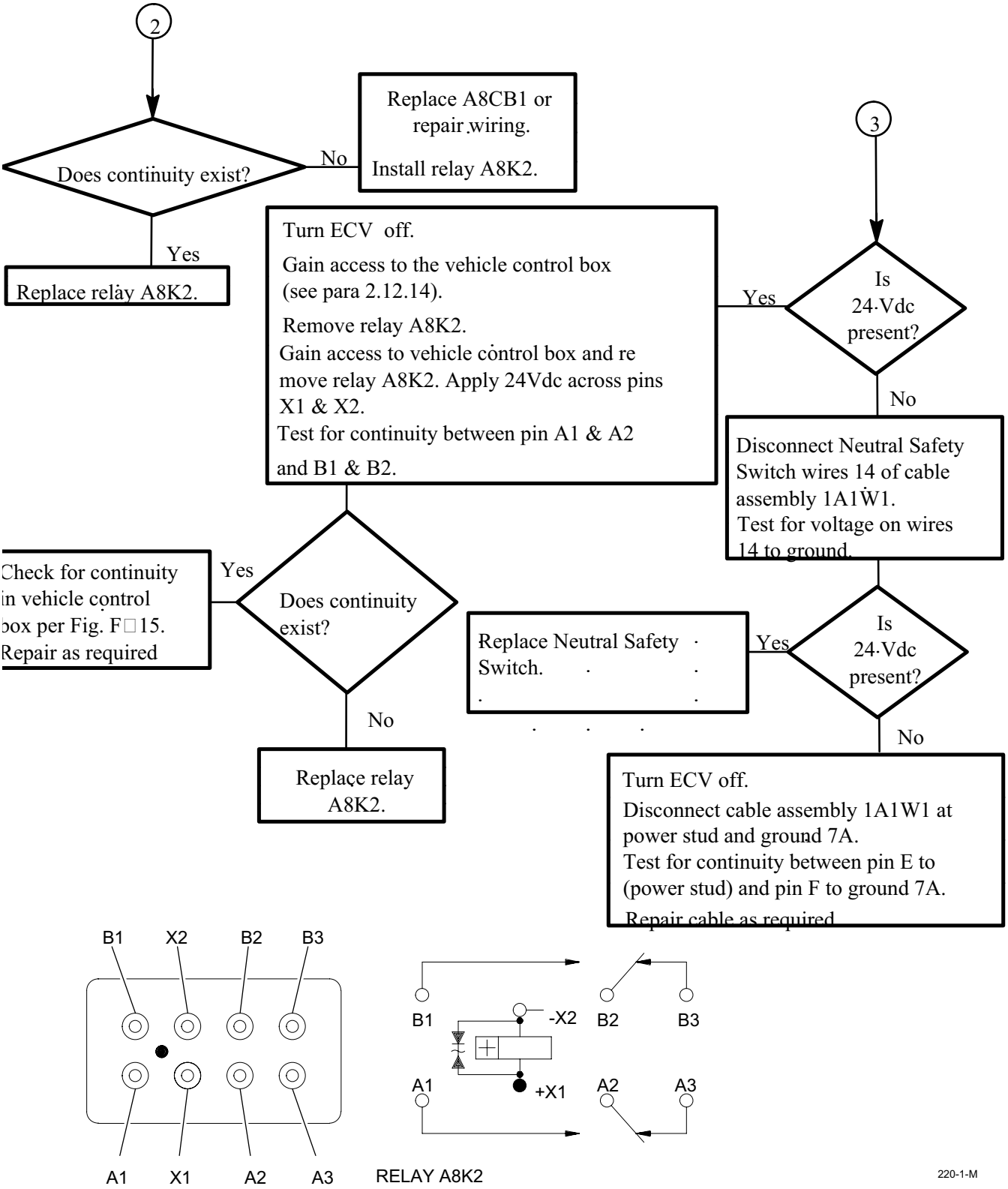
2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

4. EPG FAILURES.

4.1 ECV ENGINE IDLE SPEED DOES NOT CHANGE (EPG SYSTEM INOPERATIVE) WHEN EPG IS ENGAGED, INTERNAL POWER ONLY.

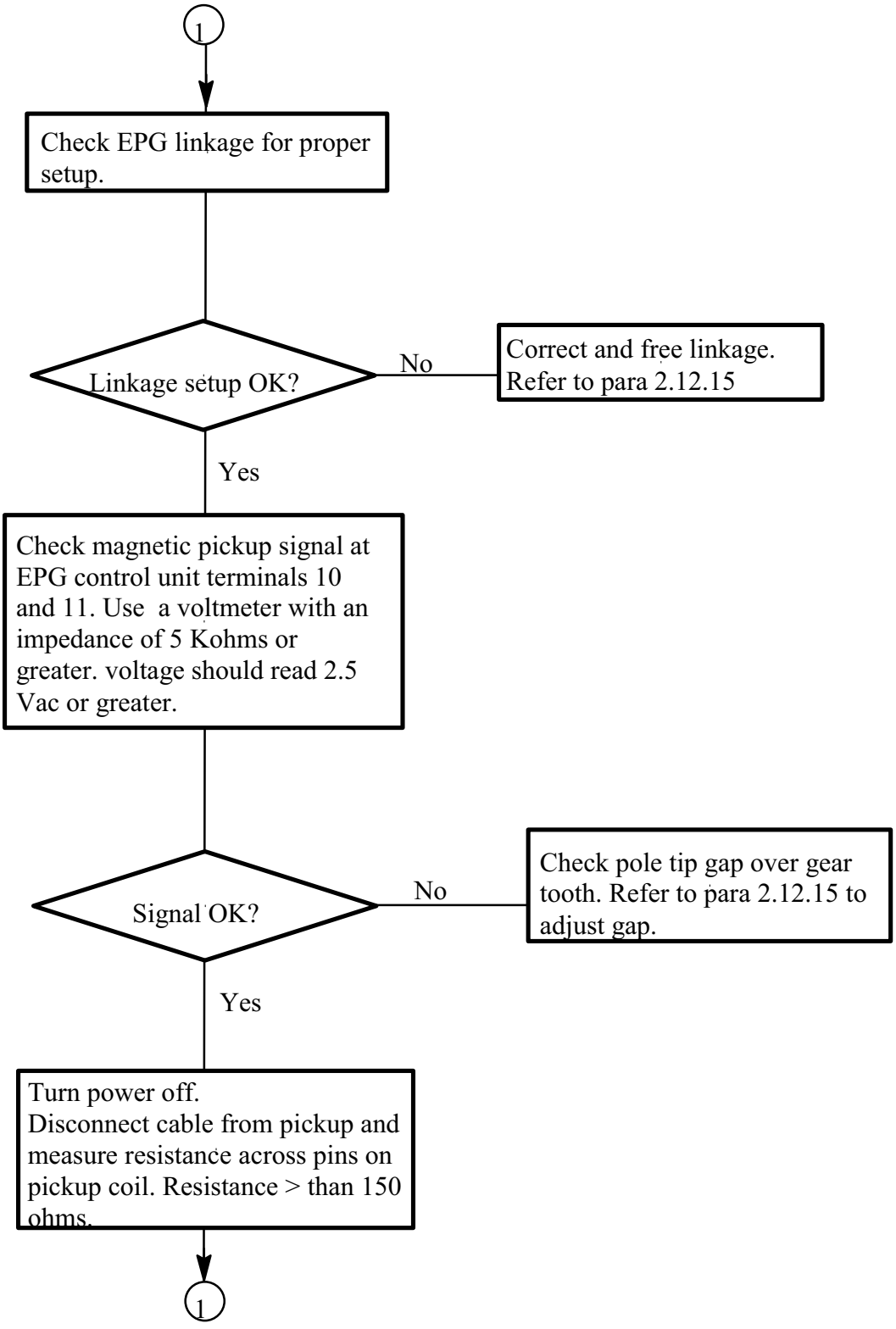


4.1 ECV ENGINE IDLE SPEED DOES NOT CHANGE (EPG SYSTEM INOPERATIVE) WHEN EPG IS ENGAGED, INTERNAL POWER ONLY – Continued.

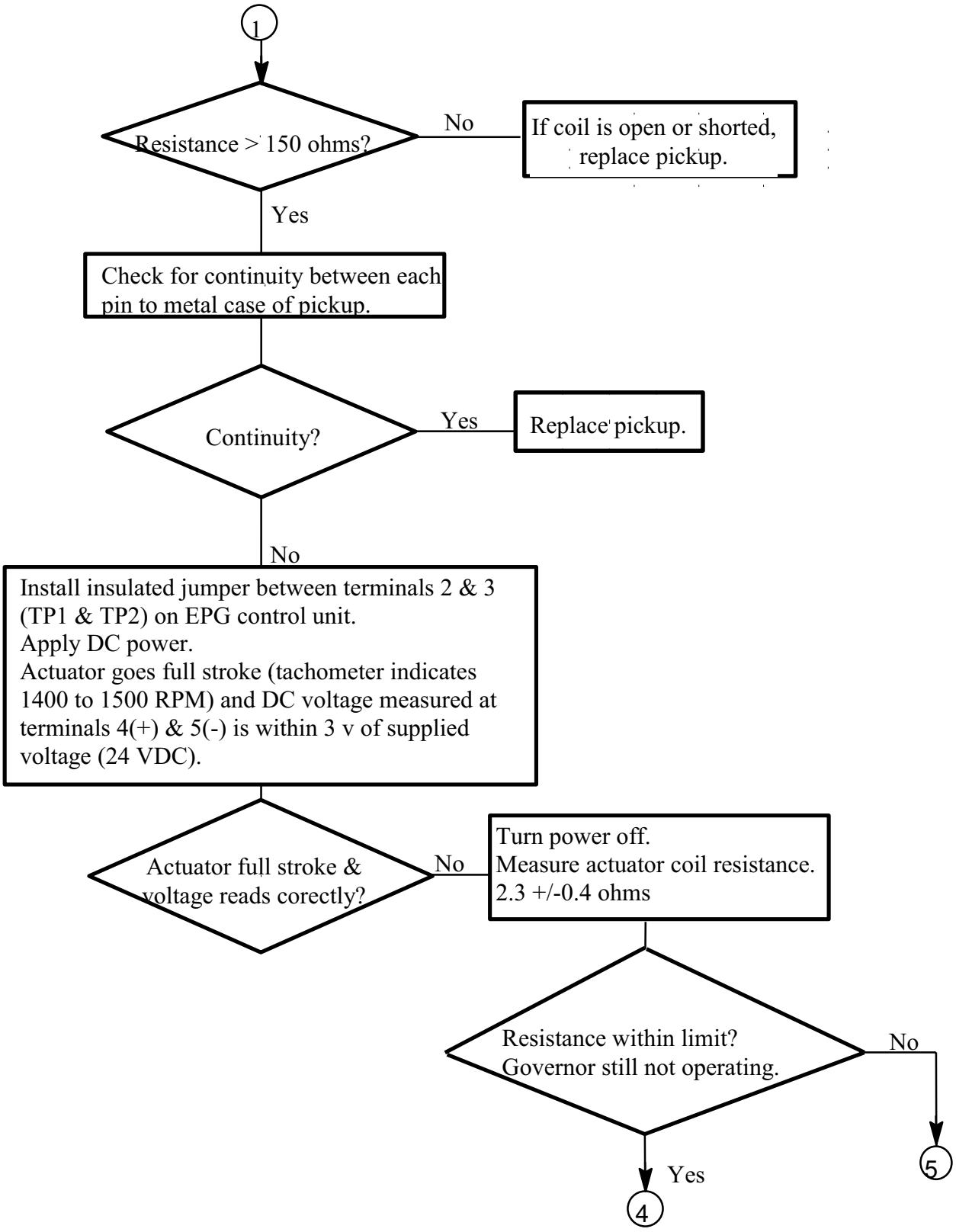


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

4.1 ECV ENGINE IDLE SPEED DOES NOT CHANGE (EPG SYSTEM INOPERATIVE) WHEN EPG IS ENGAGED, INTERNAL POWER ONLY – Continued.

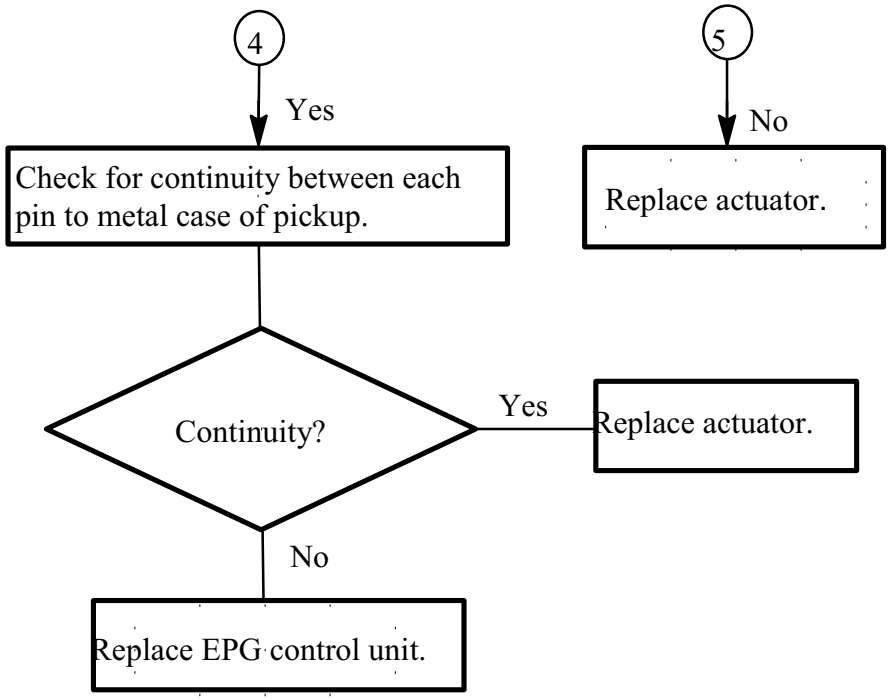


4.1 ECV ENGINE IDLE SPEED DOES NOT CHANGE (EPG SYSTEM INOPERATIVE) WHEN EPG IS ENGAGED, INTERNAL POWER ONLY – Continued.

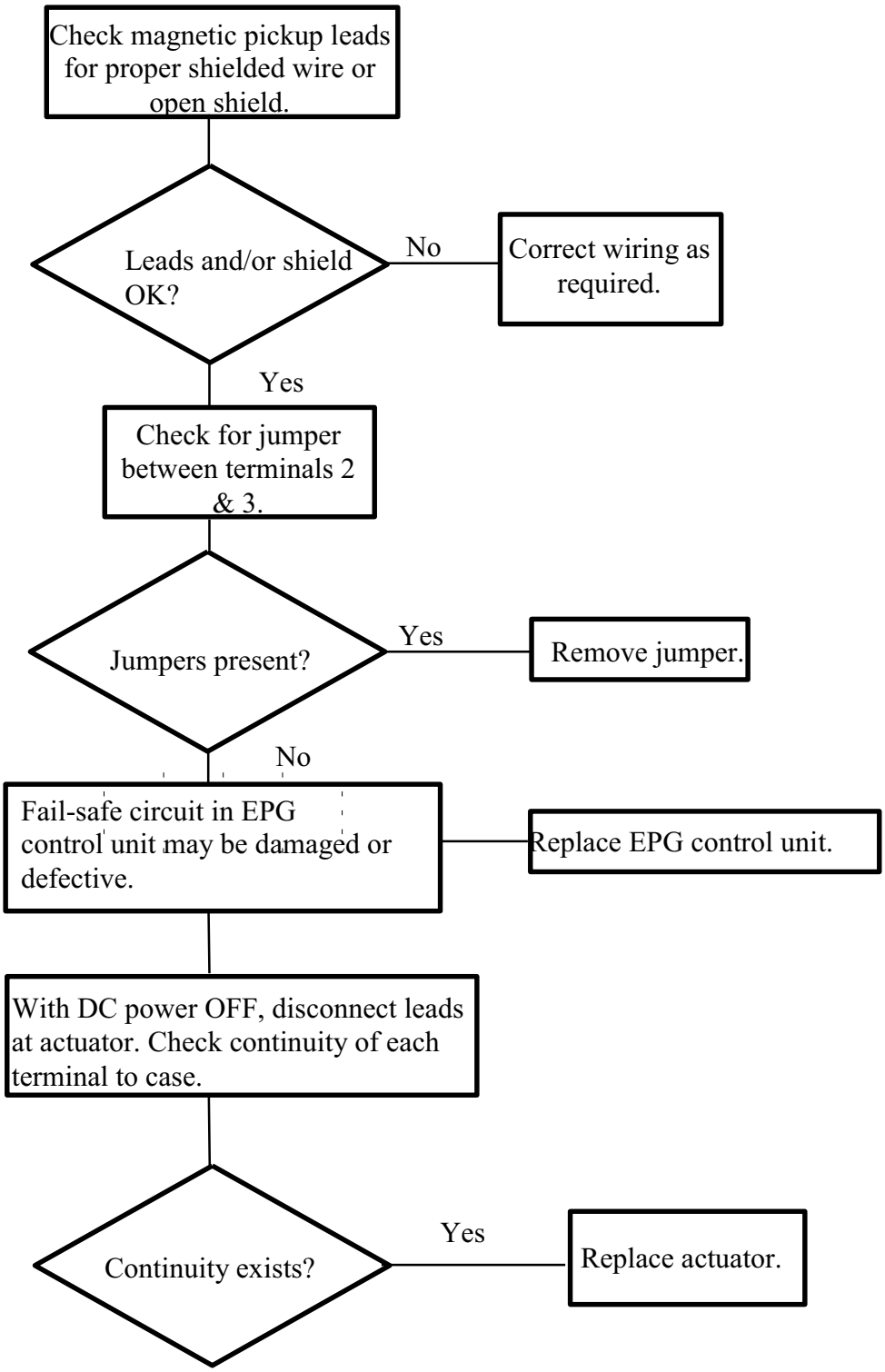


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

4.1 ECV ENGINE IDLE SPEED DOES NOT CHANGE (EPG SYSTEM INOPERATIVE) WHEN EPG IS ENGAGED, INTERNAL POWER ONLY – Continued.

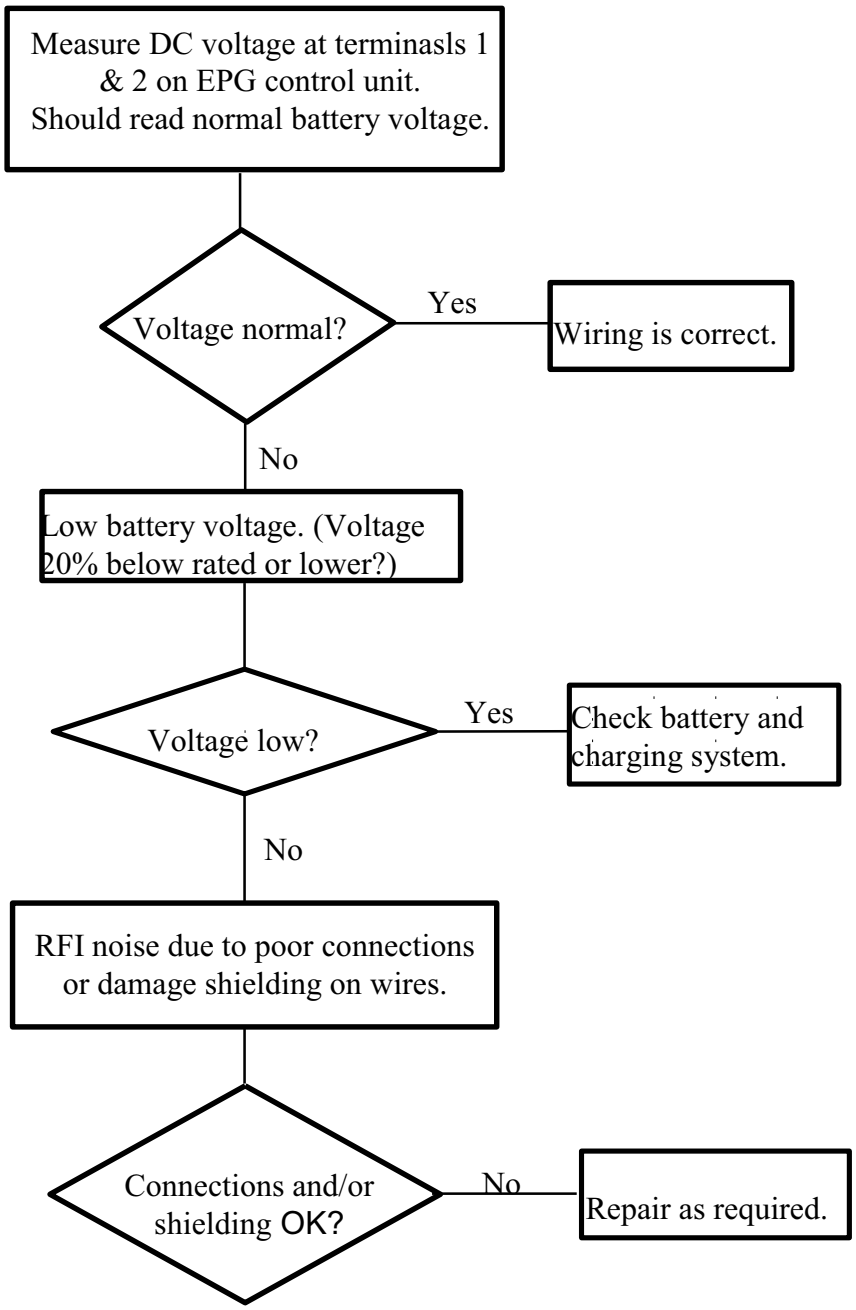


4.2 ACTUATOR GOES FULL STROKE WHEN DC POWER IS TURNED ON (ENGINE IS NOT OPERATING).

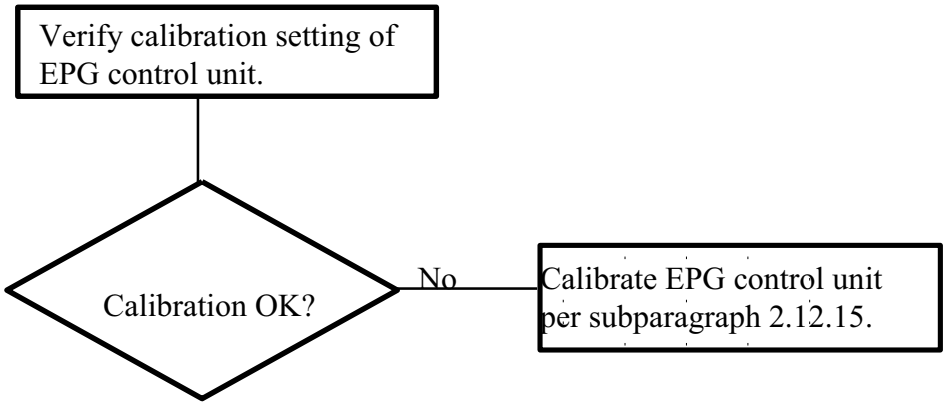


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

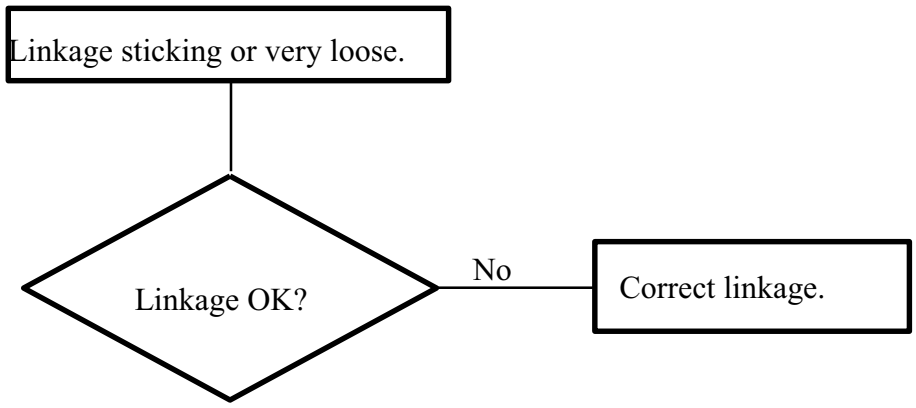
4.3 ERRATIC GOVERNOR OPERATION



4.4 FAST OSCILLATION OF GOVERNOR LINKAGE

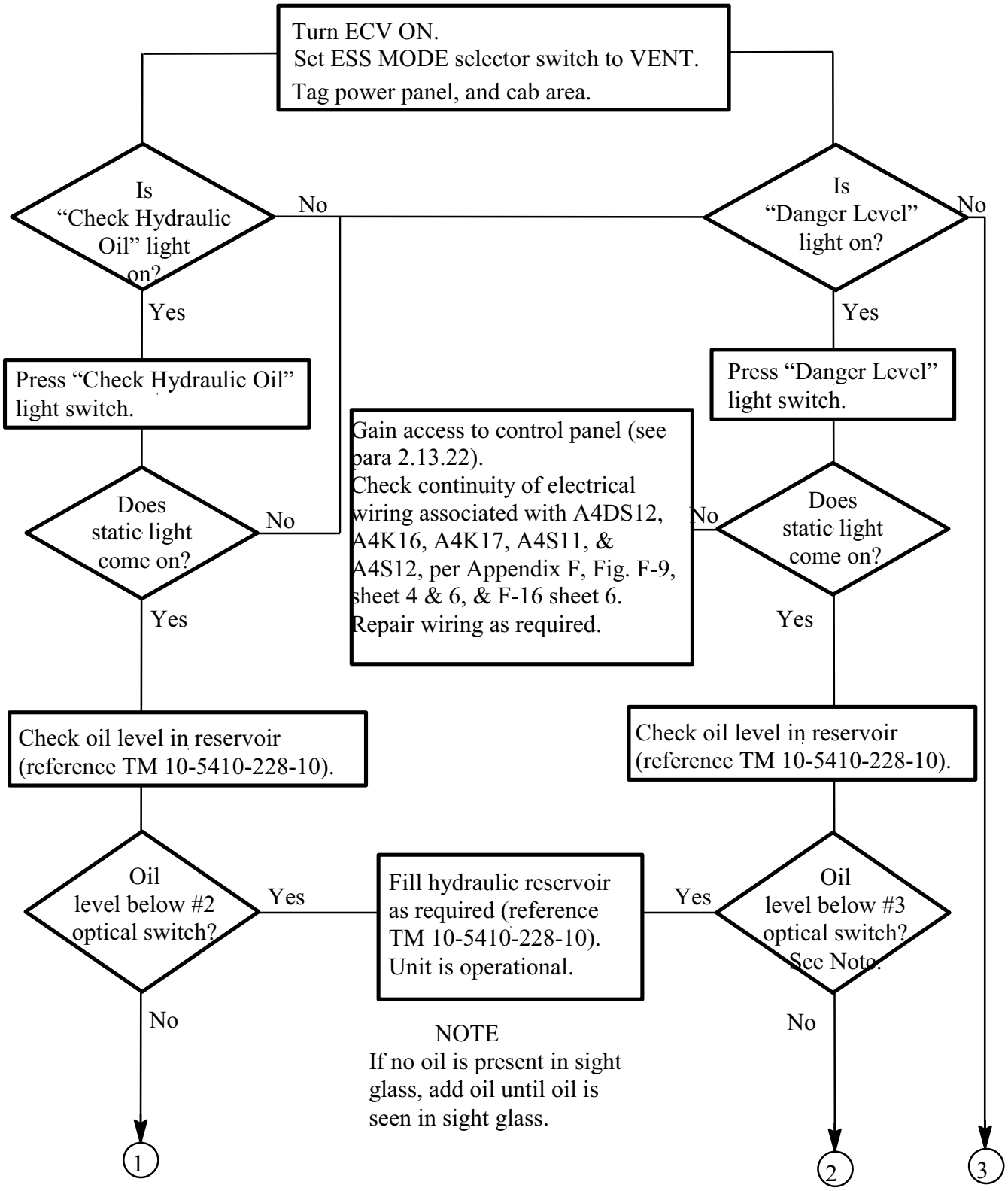


4.5 SLOW, SMALL AMPLITUDE HUNTING OF SPEED OR FREQUENCY

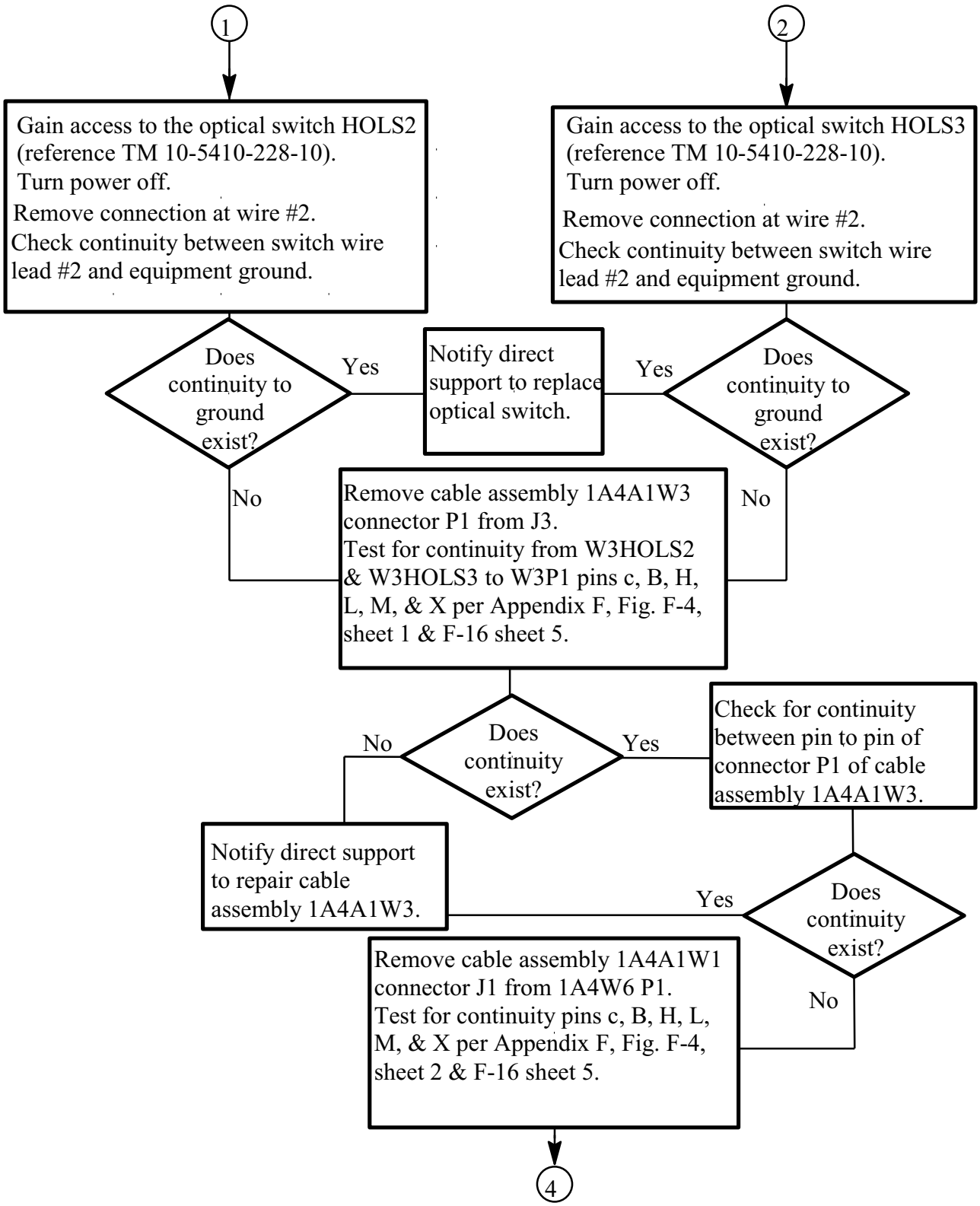


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

5. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – 'STATIC' INDICATOR OFF AND ESS MODE SWITCH ON VENT, COOL, OR HEAT, INTERNAL MODE.

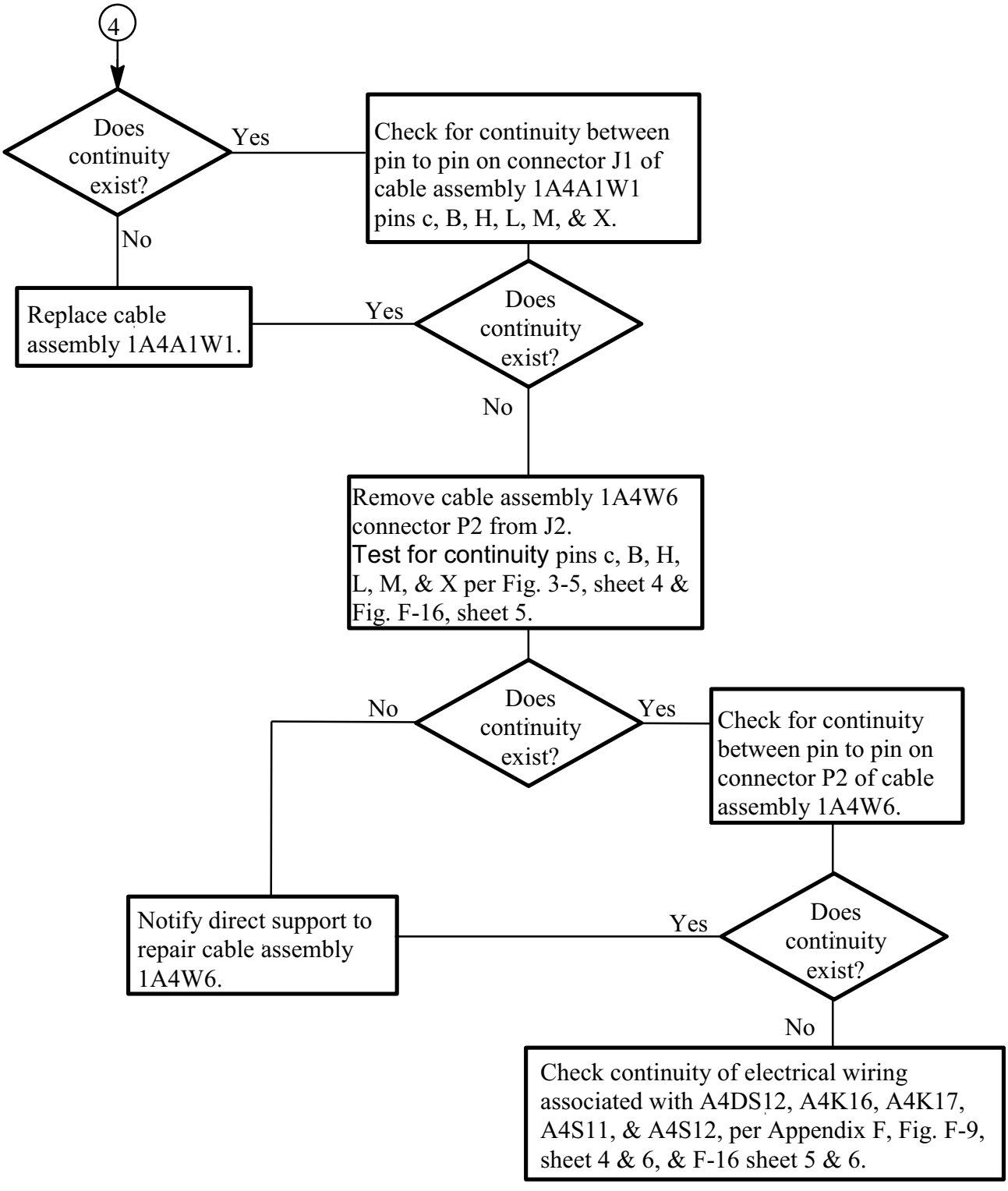


5. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – 'STATIC' INDICATOR OFF AND ESS MODE SWITCH ON VENT, COOL, OR HEAT, INTERNAL MODE – Continued.

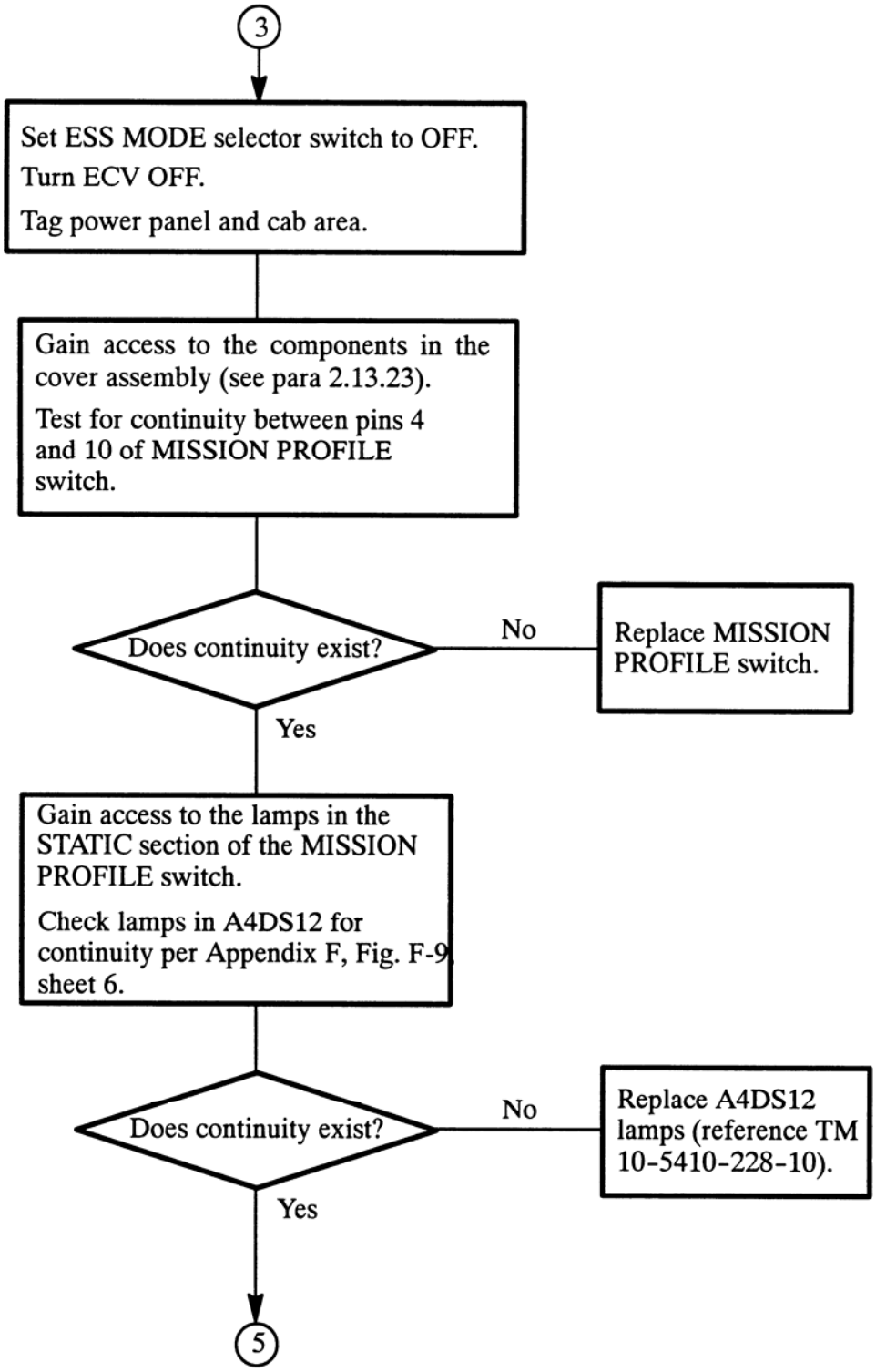


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

5. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – 'STATIC' INDICATOR OFF AND ESS MODE SWITCH ON VENT, COOL, OR HEAT, INTERNAL MODE – Continued.

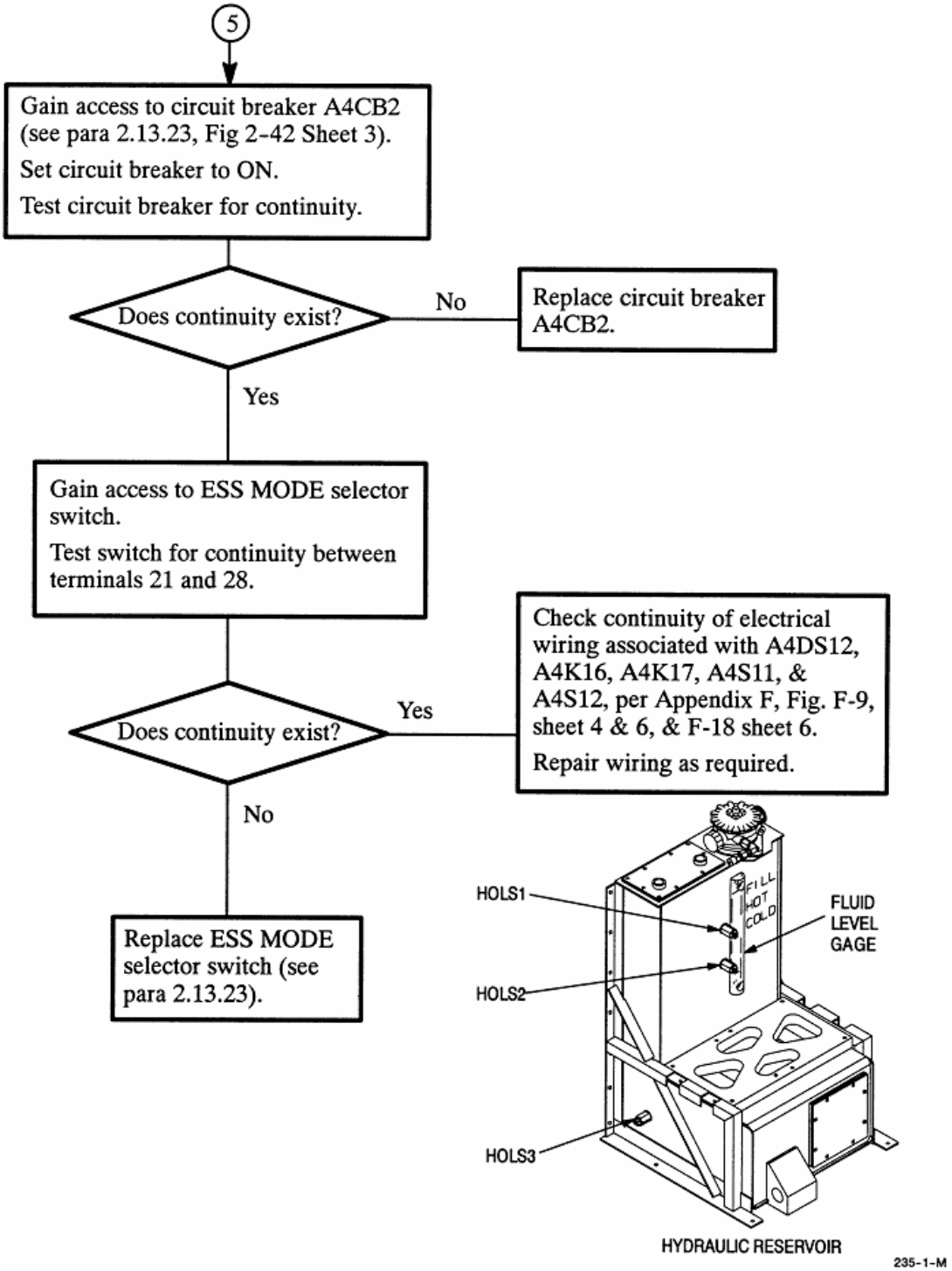


5. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – 'STATIC' INDICATOR OFF AND ESS MODE SWITCH ON VENT, COOL, OR HEAT, INTERNAL MODE – Continued.

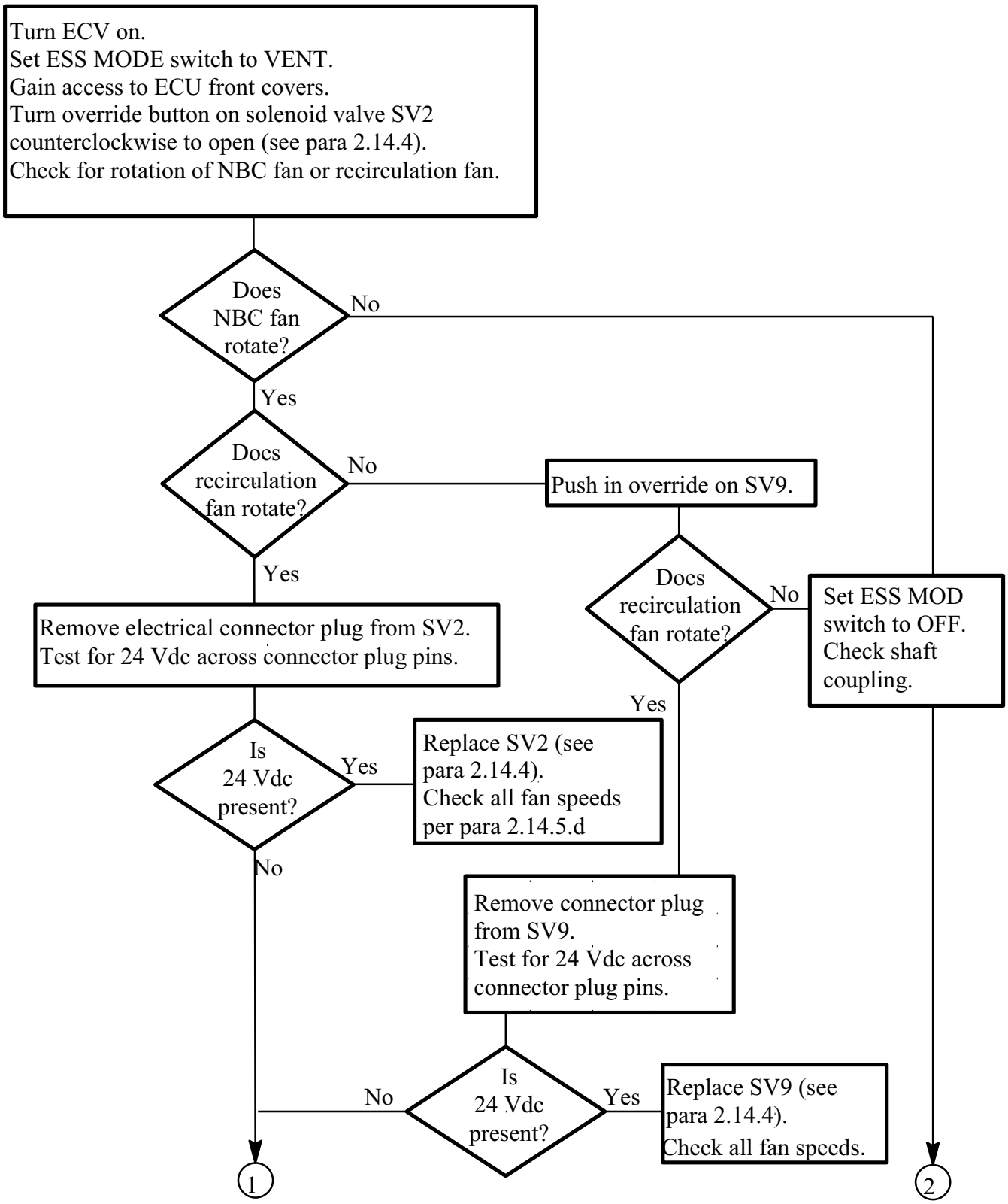


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

5. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – 'STATIC' INDICA-TOR OFF AND ESS MODE SWITCH ON VENT, COOL, OR HEAT, INTERNAL MODE – Continued.

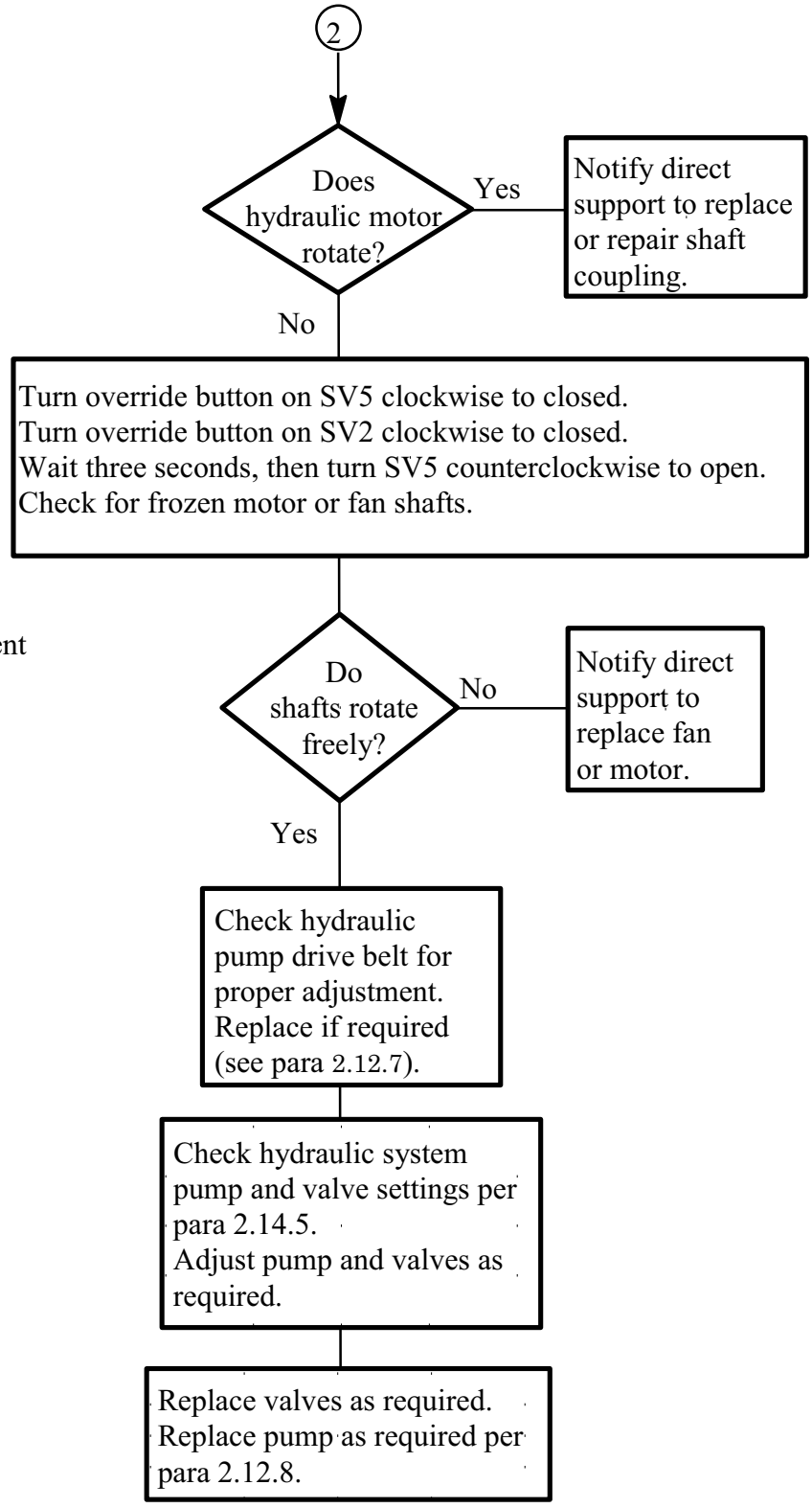


6. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – INTERNAL POWER – 'STATIC' INDICATOR ON.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

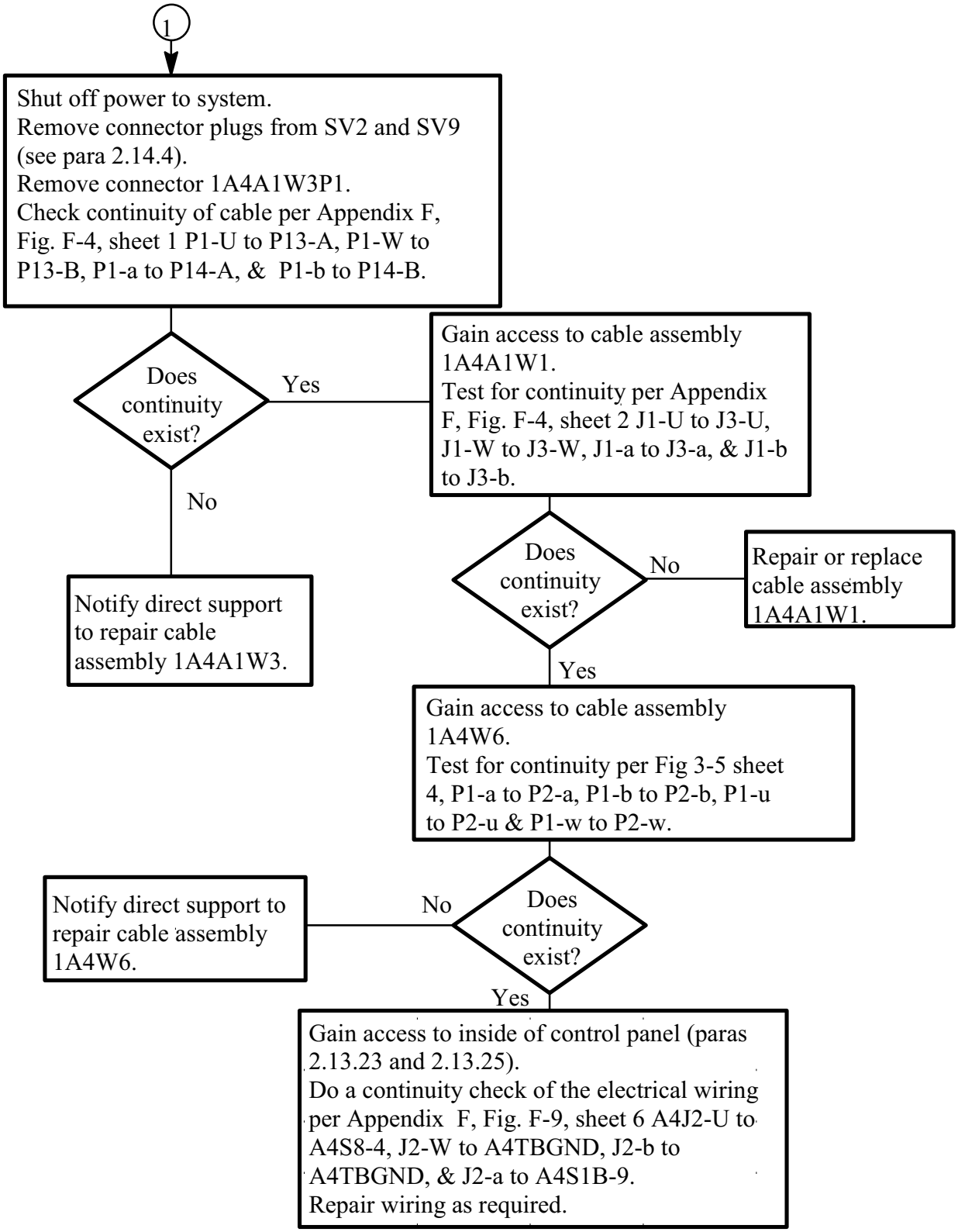
6. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – INTERNAL POWER – 'STATIC' INDICATOR ON – Continued.



CAUTION: Failure to first close SV5 will result in damage to hydraulic components.

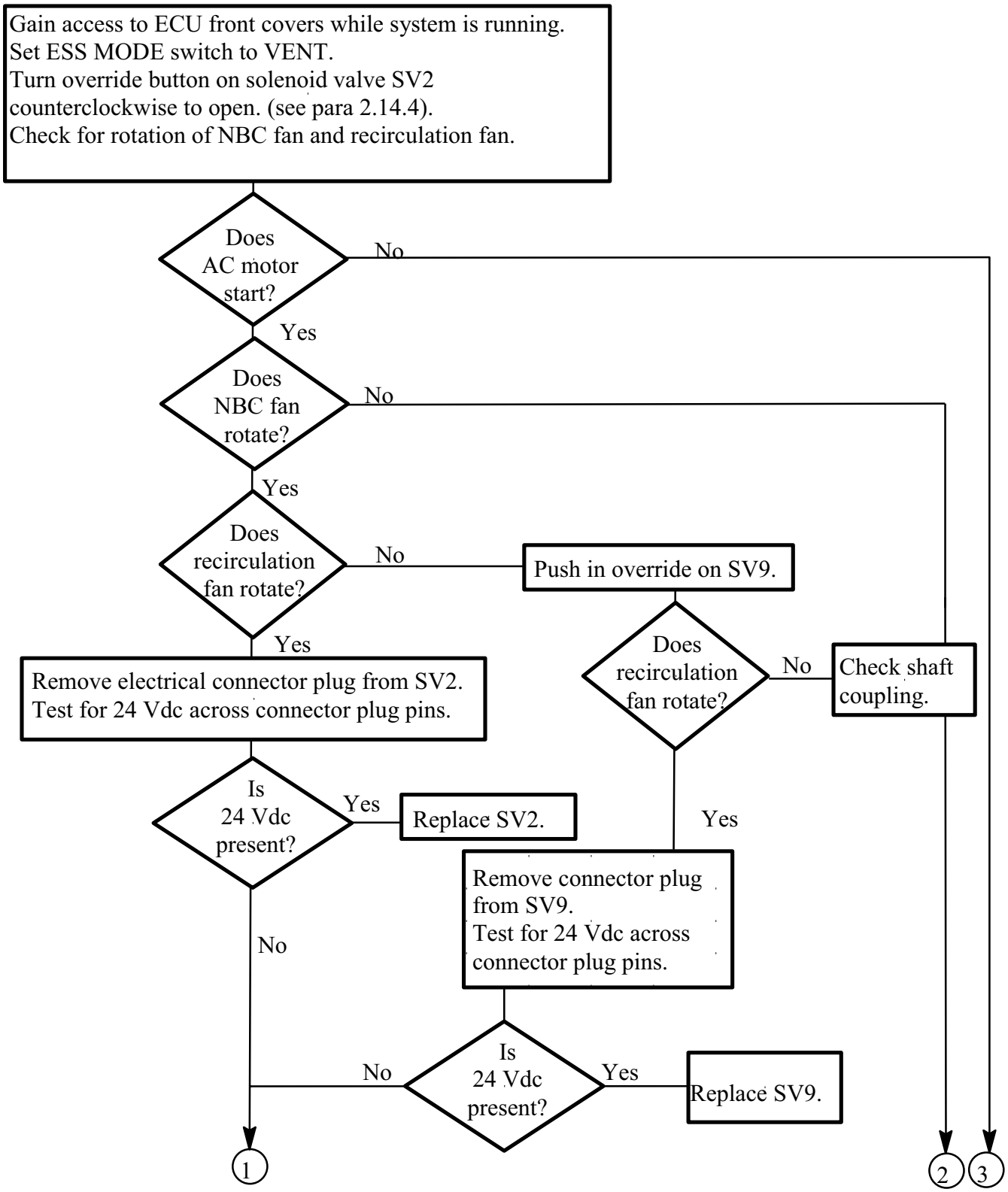
NOTE: Check fan speeds after replacement of any hydraulic component or belt adjustment per para 2.14.6.d.

6. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – INTERNAL POWER – 'STATIC' INDICATOR ON – Continued.

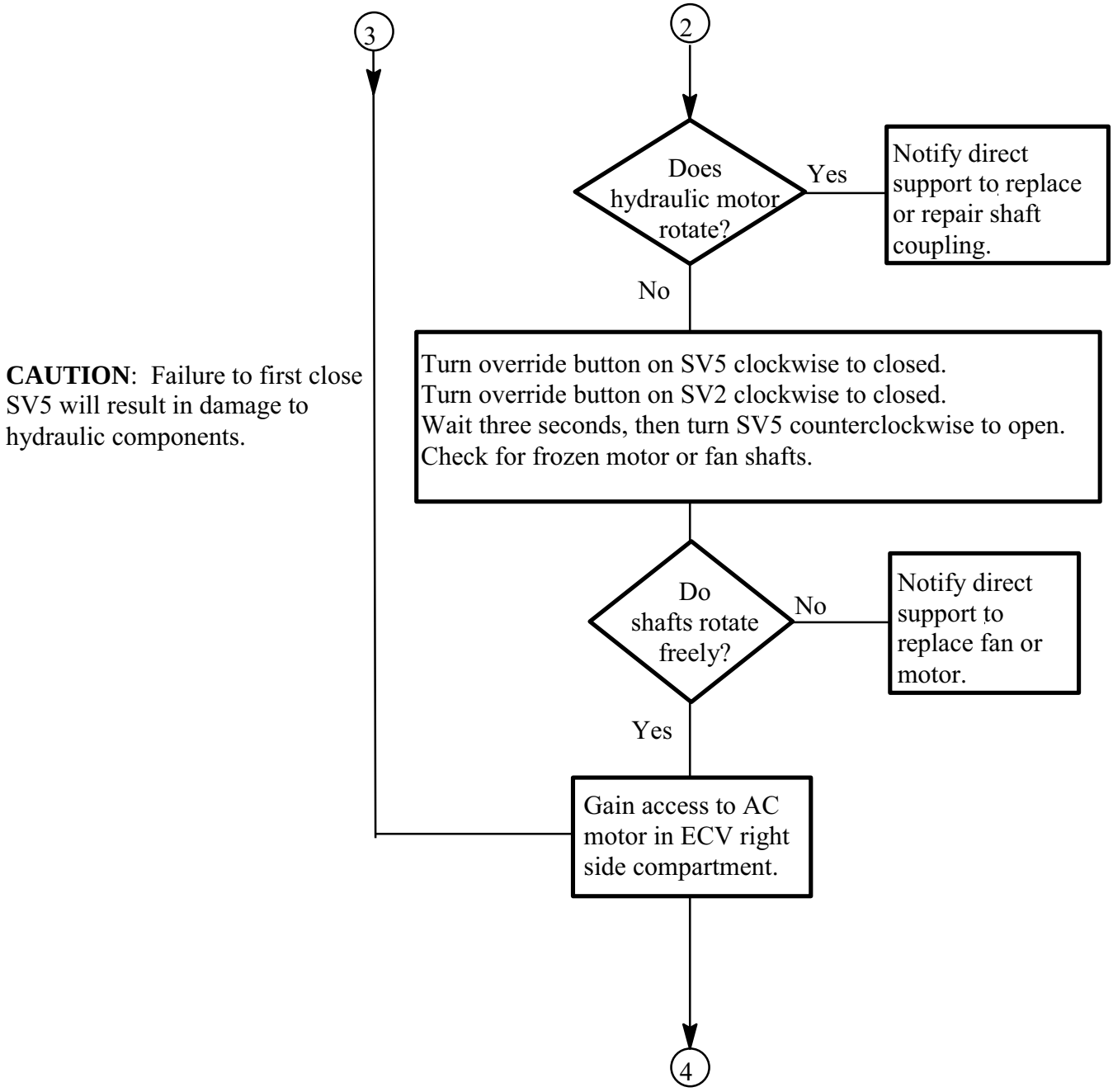


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

7. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – EXTERNAL POWER – 'STATIC' INDICATOR ON, NBC SWITCH OFF, EXTERNAL HYDRAULIC PUMP INDICATOR ON.

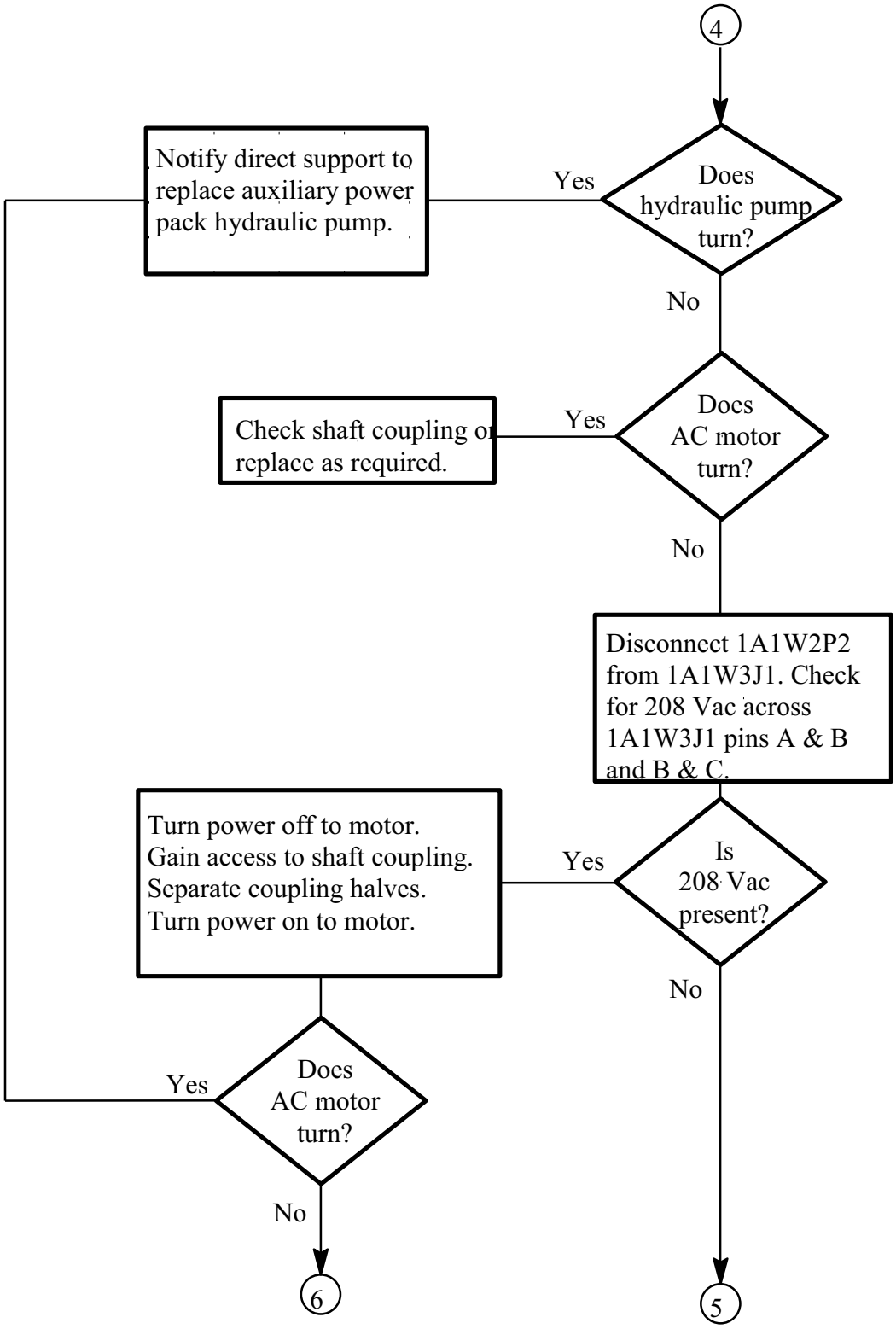


7. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – EXTERNAL POWER – 'STATIC' INDICATOR ON, NBC SWITCH OFF, EXTERNAL HYDRAULIC PUMP INDICATOR ON – Continued.

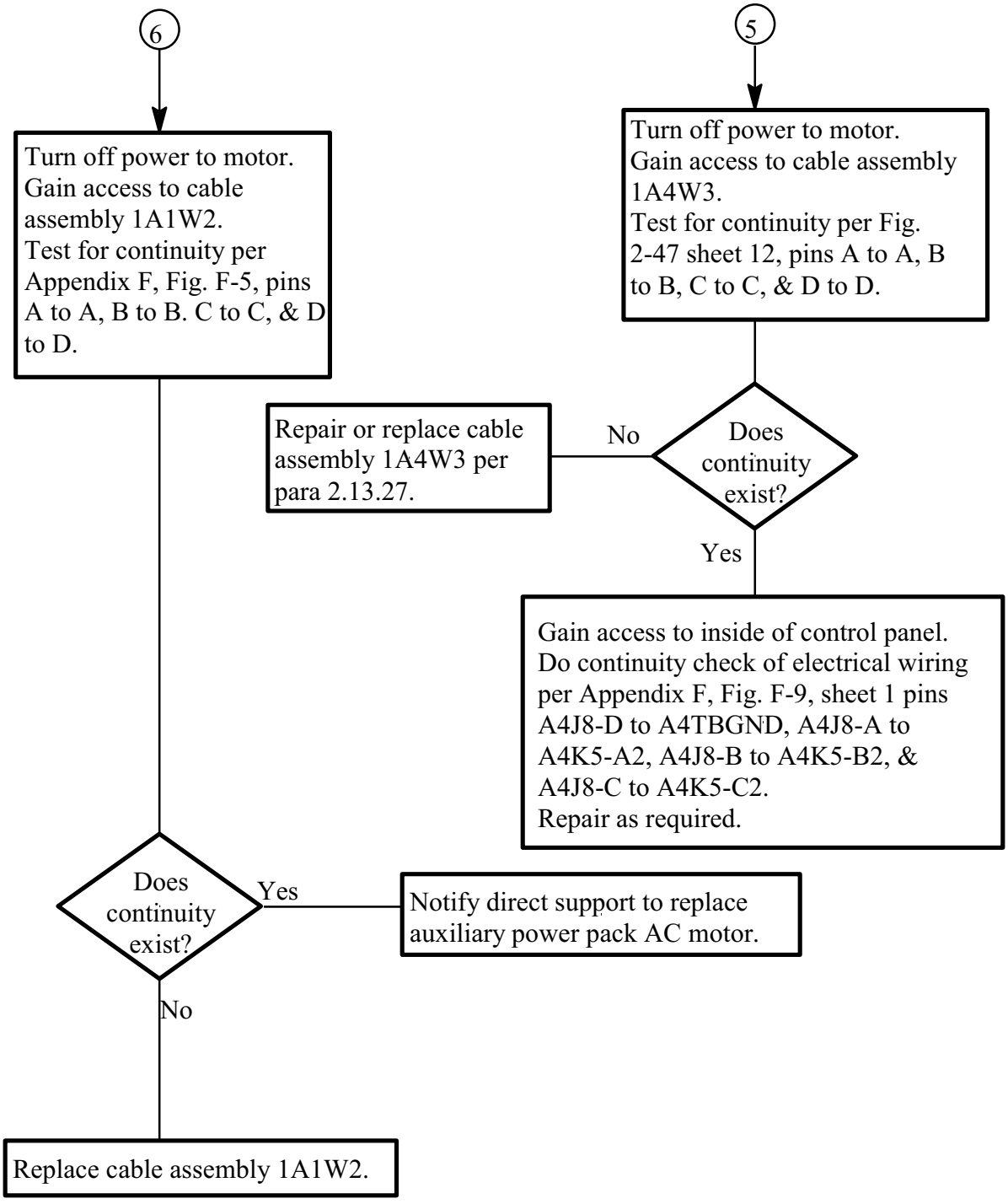


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

7. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – EXTERNAL POWER – 'STATIC' INDICATOR ON, NBC SWITCH OFF, EXTERNAL HYDRAULIC PUMP INDICATOR ON – Continued.

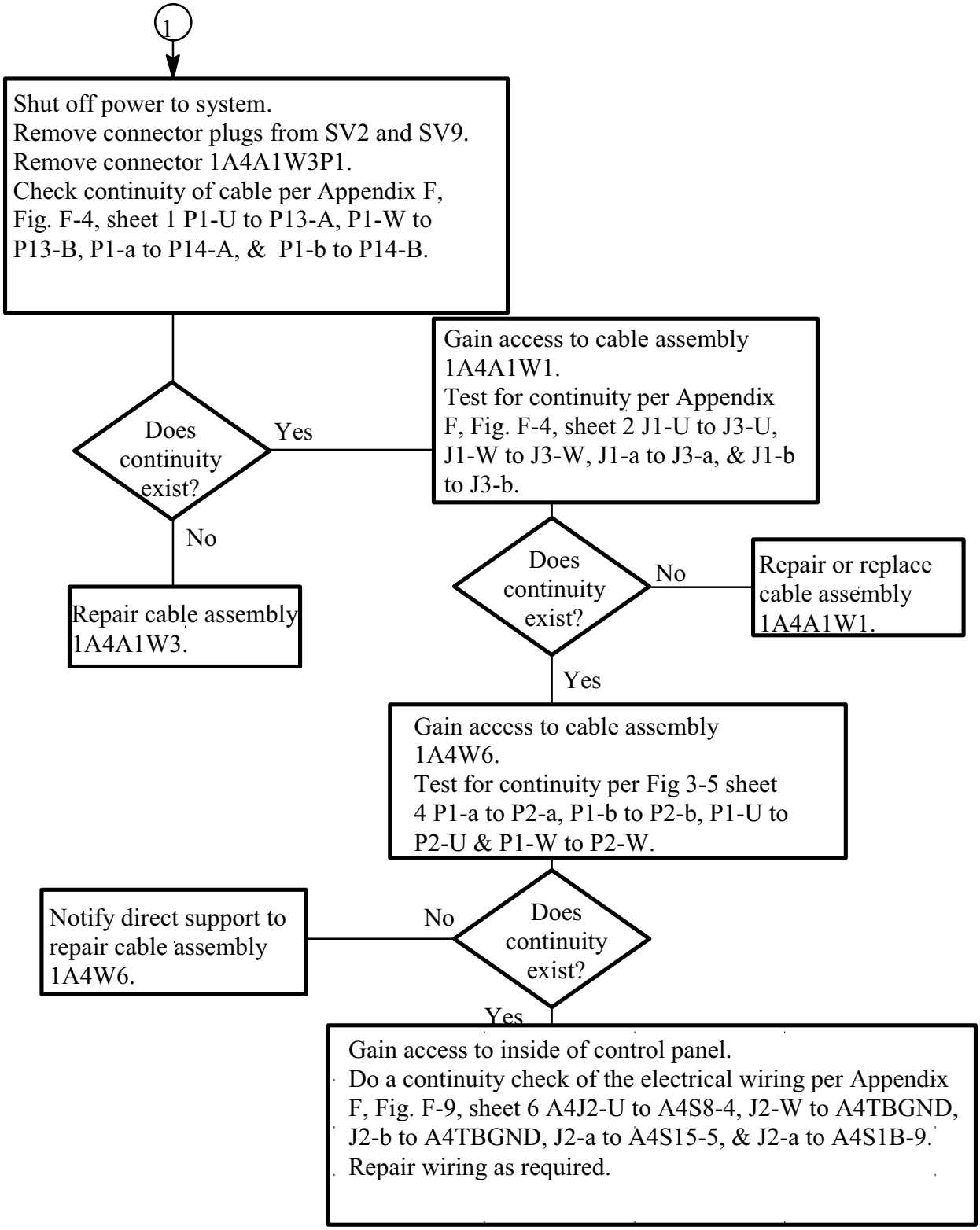


7. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – EXTERNAL POWER – 'STATIC' INDICATOR ON, NBC SWITCH OFF, EXTERNAL HYDRAULIC PUMP INDICATOR ON – Continued.

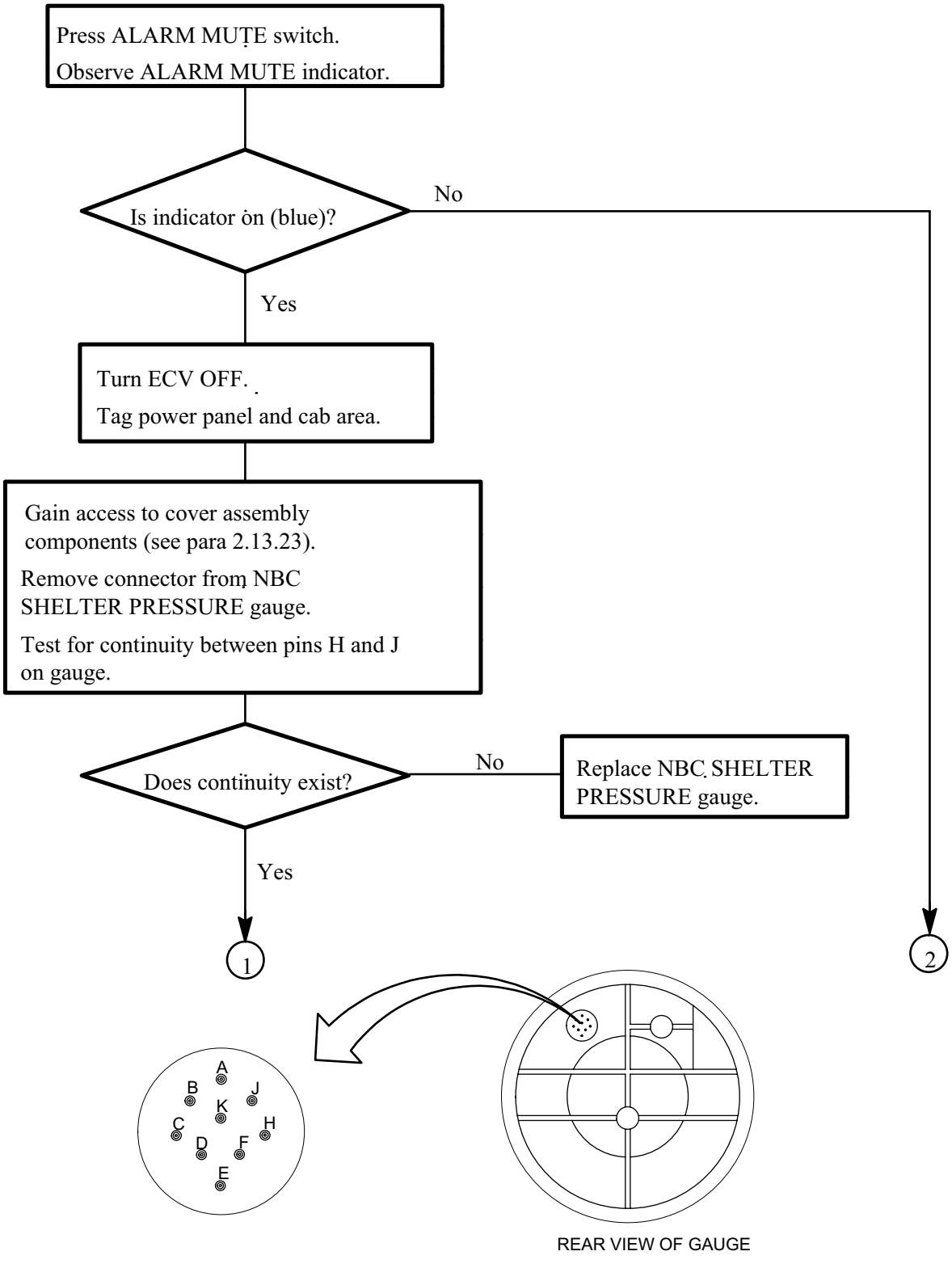


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

7. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR STATIC MODE – EXTERNAL POWER – 'STATIC' INDICATOR ON, NBC SWITCH OFF, EXTERNAL HYDRAULIC PUMP INDICATOR ON – Continued.

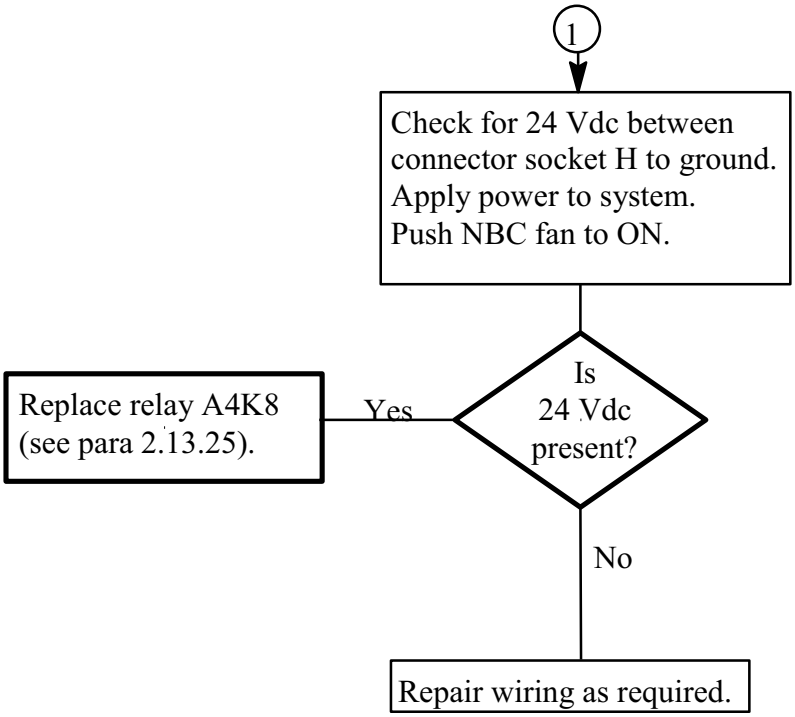


8. NBC FAN 'PRESSURE LOW' INDICATOR DOES NOT COME ON AND AUDIBLE ALARM DOES NOT SOUND WHEN NBC FAN SWITCH IS FIRST TURNED ON – MUTE SWITCH OFF, 'NBC FAN ON' INDICATOR ON.

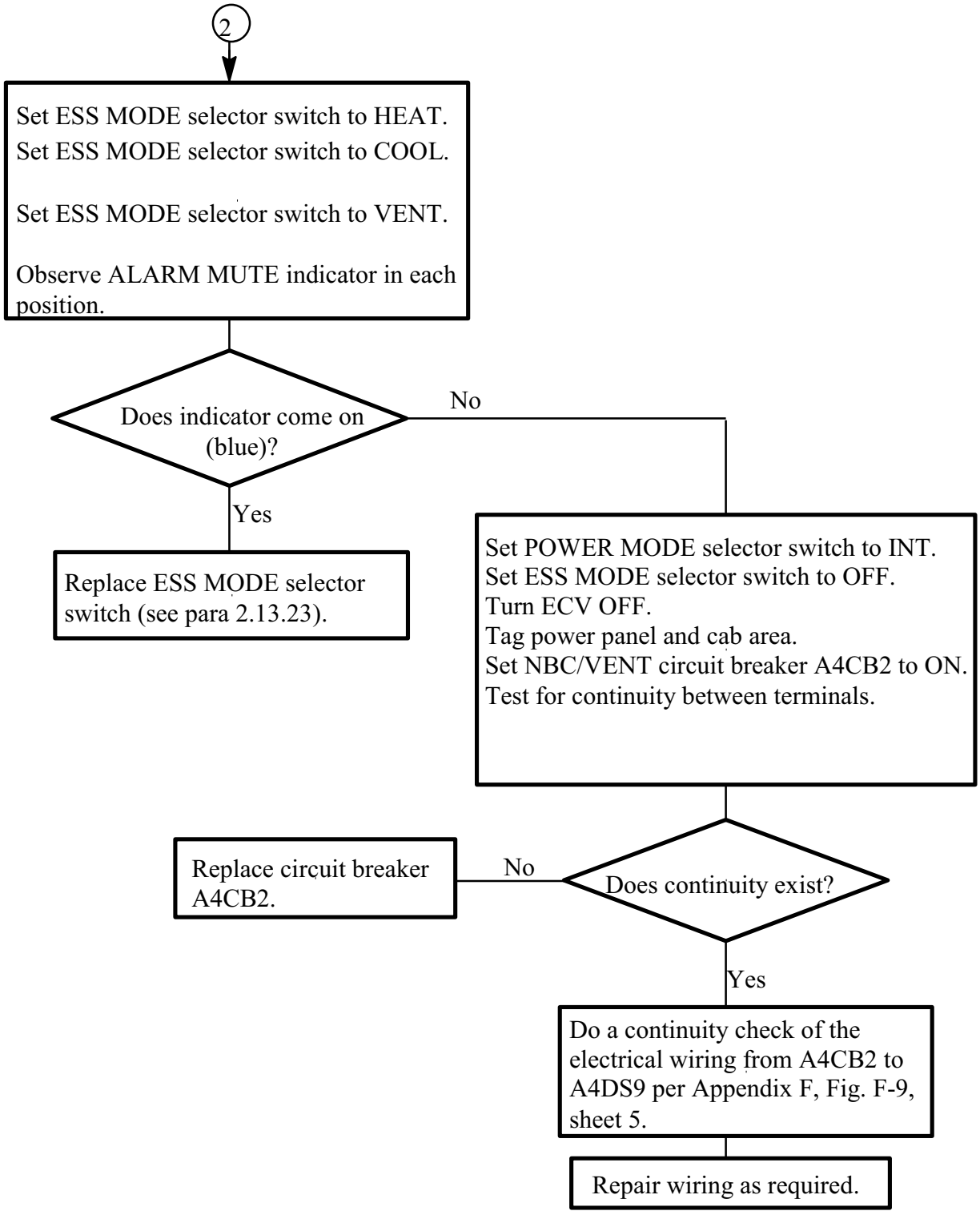


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

8. NBC FAN 'PRESSURE LOW' INDICATOR DOES NOT COME ON AND AUDIBLE ALARM DOES NOT SOUND WHEN NBC FAN SWITCH IS FIRST TURNED ON – MUTE SWITCH OFF, 'NBC FAN ON' INDICATOR ON – Continued.

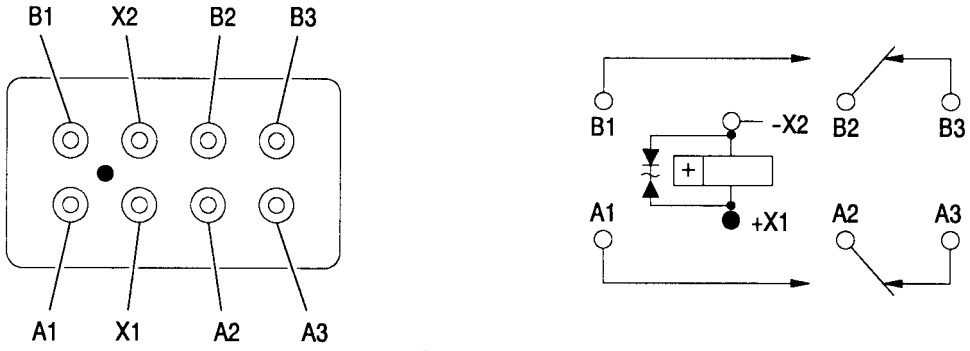


8. NBC FAN 'PRESSURE LOW' INDICATOR DOES NOT COME ON AND AUDIBLE ALARM DOES NOT SOUND WHEN NBC FAN SWITCH IS FIRST TURNED ON – MUTE SWITCH OFF, 'NBC FAN ON' INDICATOR ON – Continued.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

8. NBC FAN 'PRESSURE LOW' INDICATOR DOES NOT COME ON AND AUDIBLE ALARM DOES NOT SOUND WHEN NBC FAN SWITCH IS FIRST TURNED ON – MUTE SWITCH OFF, 'NBC FAN ON' INDICATOR ON – Continued.



RELAY A4K8

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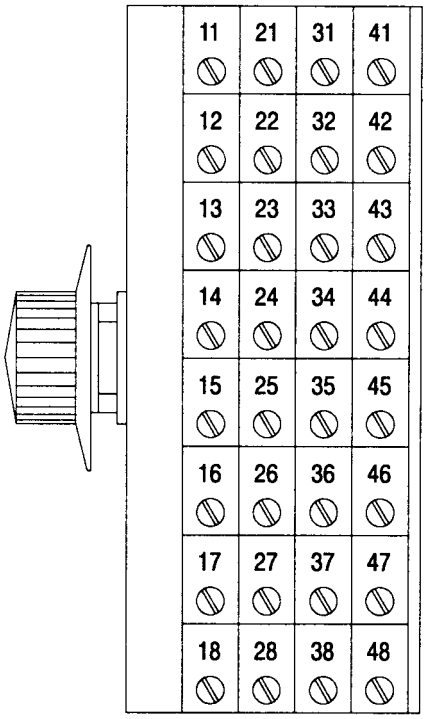

ESS MODE SELECTOR SWITCH

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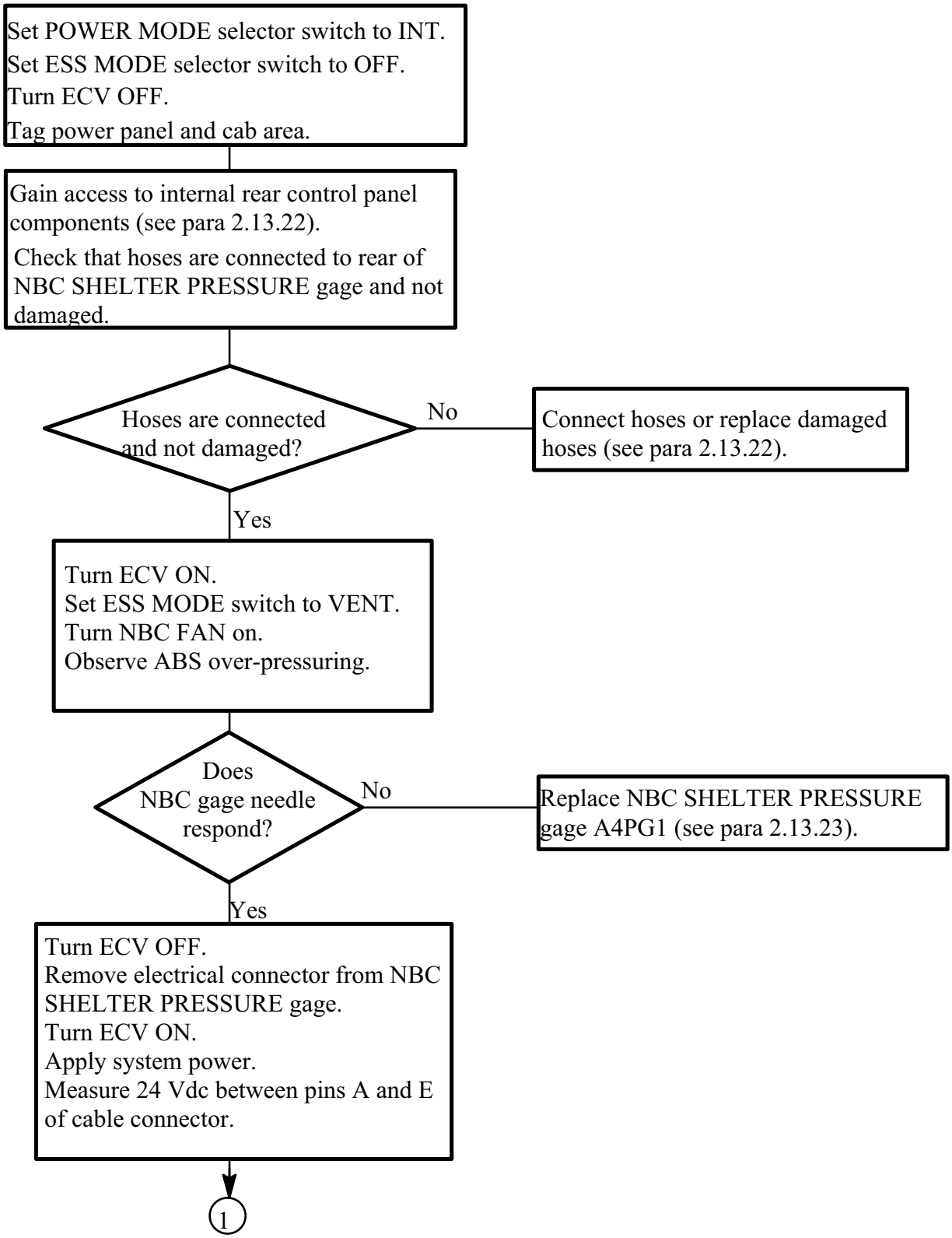
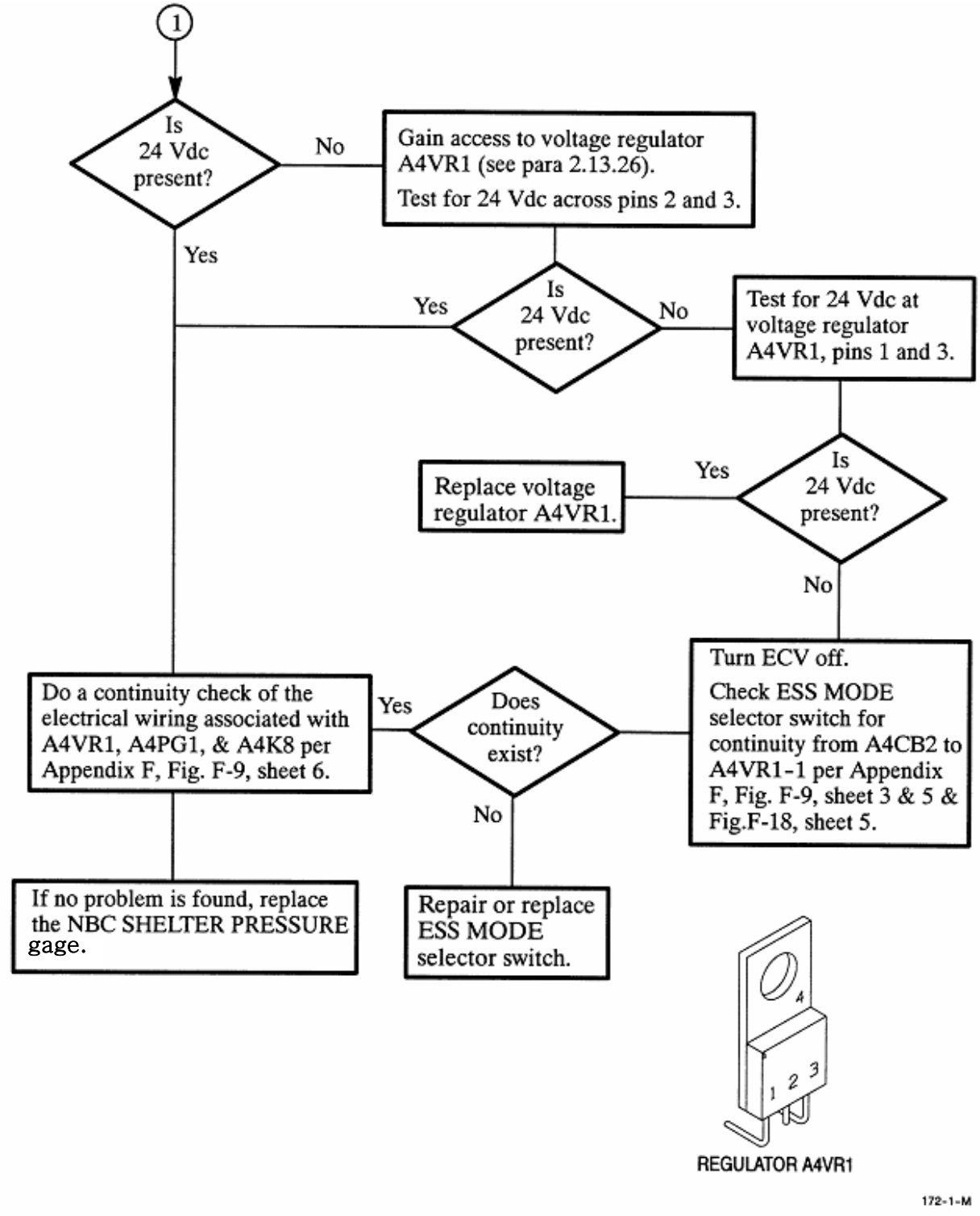
9. NBC SHELTER PRESSURE GAGE DOES NOT RESPOND (NO READING) WITH THE NBC FAN OPERATING – NBC FAN 'PRESSURE LOW' ALARM STAYS ON.

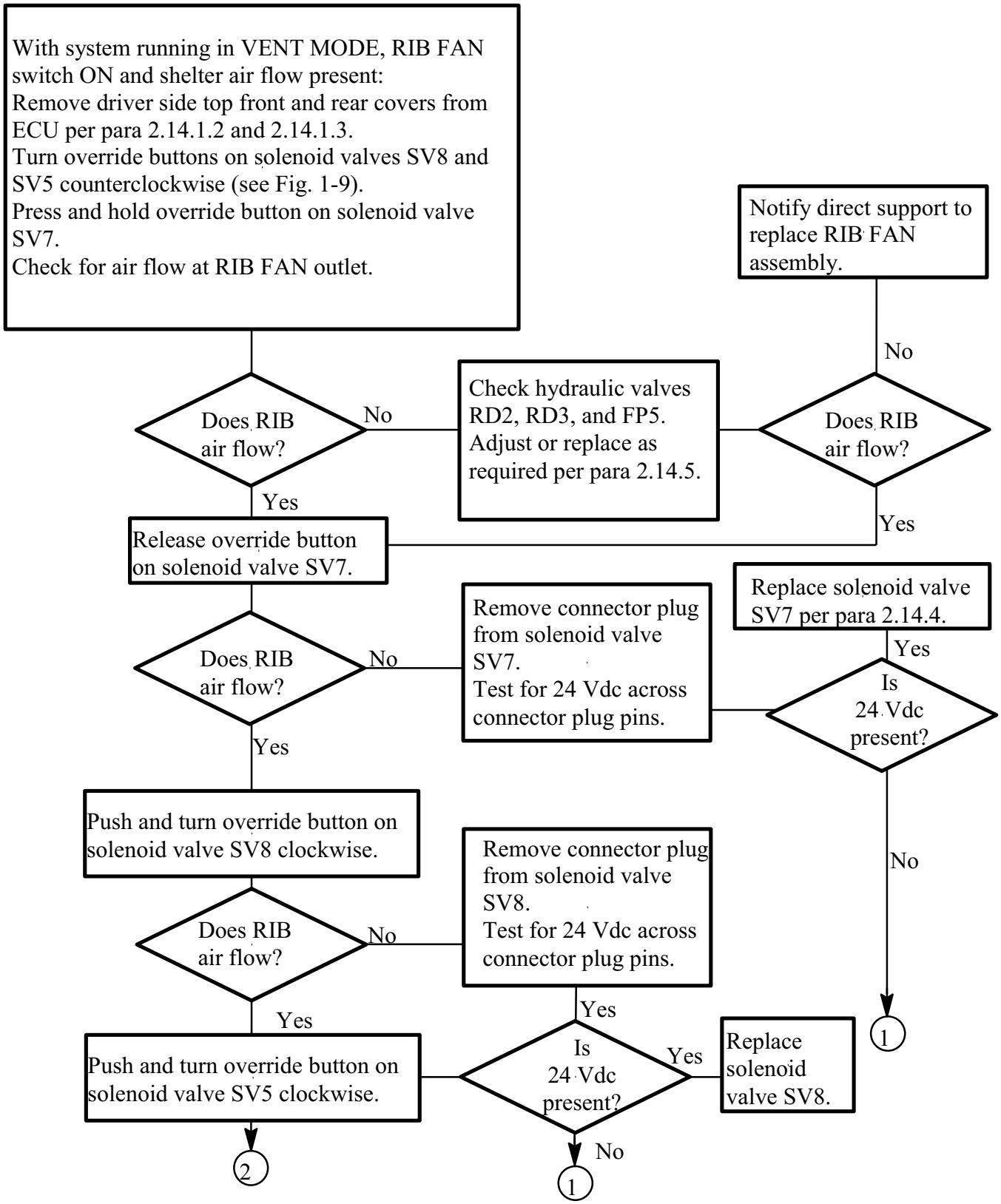


2.8 **UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.**

9. NBC SHELTER PRESSURE GAGE DOES NOT RESPOND (NO READING) WITH THE NBC FAN OPERATING – NBC FAN 'PRESSURE LOW' ALARM STAYS ON – Continued.

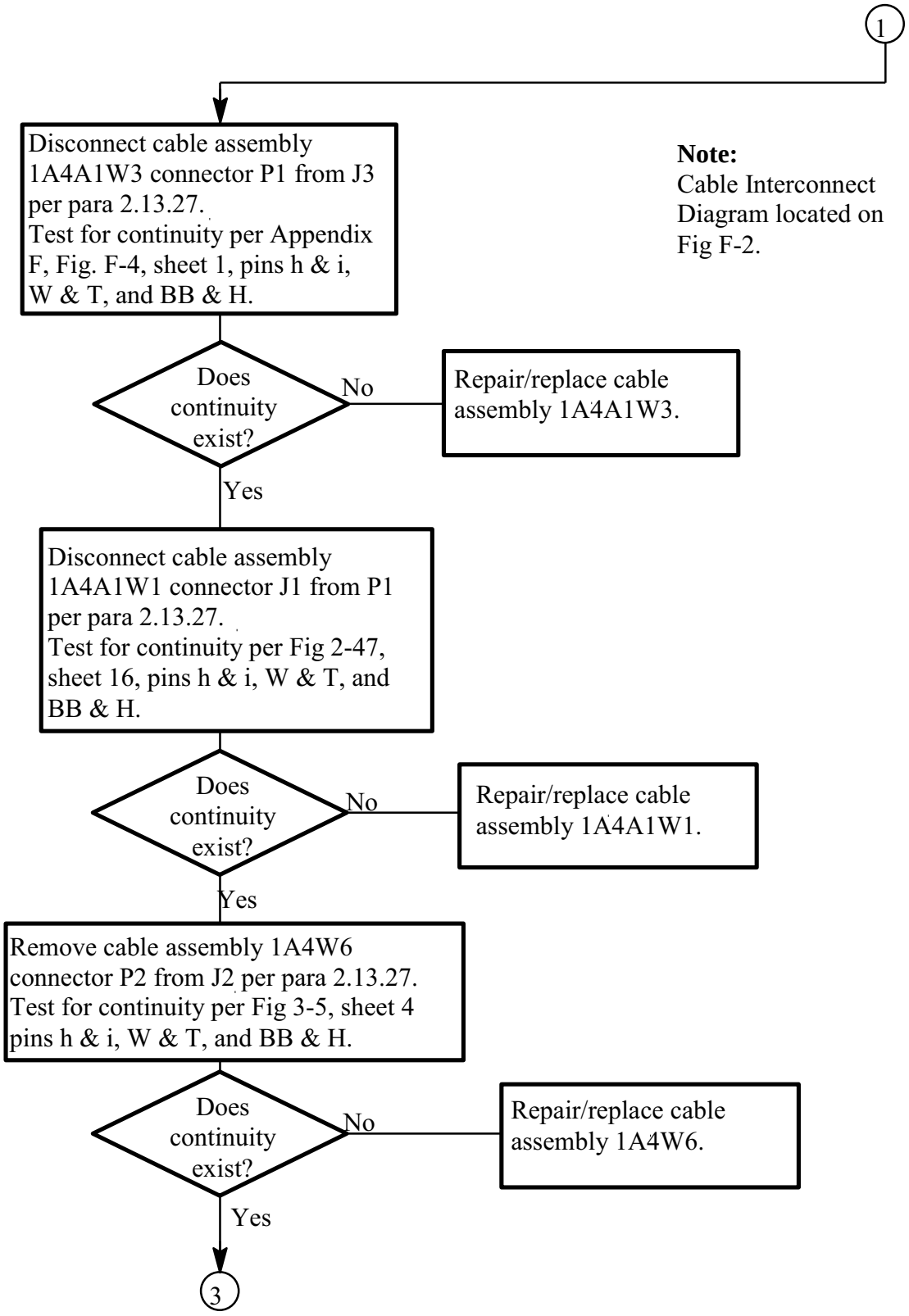


10. AIR BEAMS DO NOT INFLATE WHEN 'RIB FAN' SWITCH IS PRESSED (NO RIB AIR FLOW) – 'RIB FAN' INDICATOR ON.

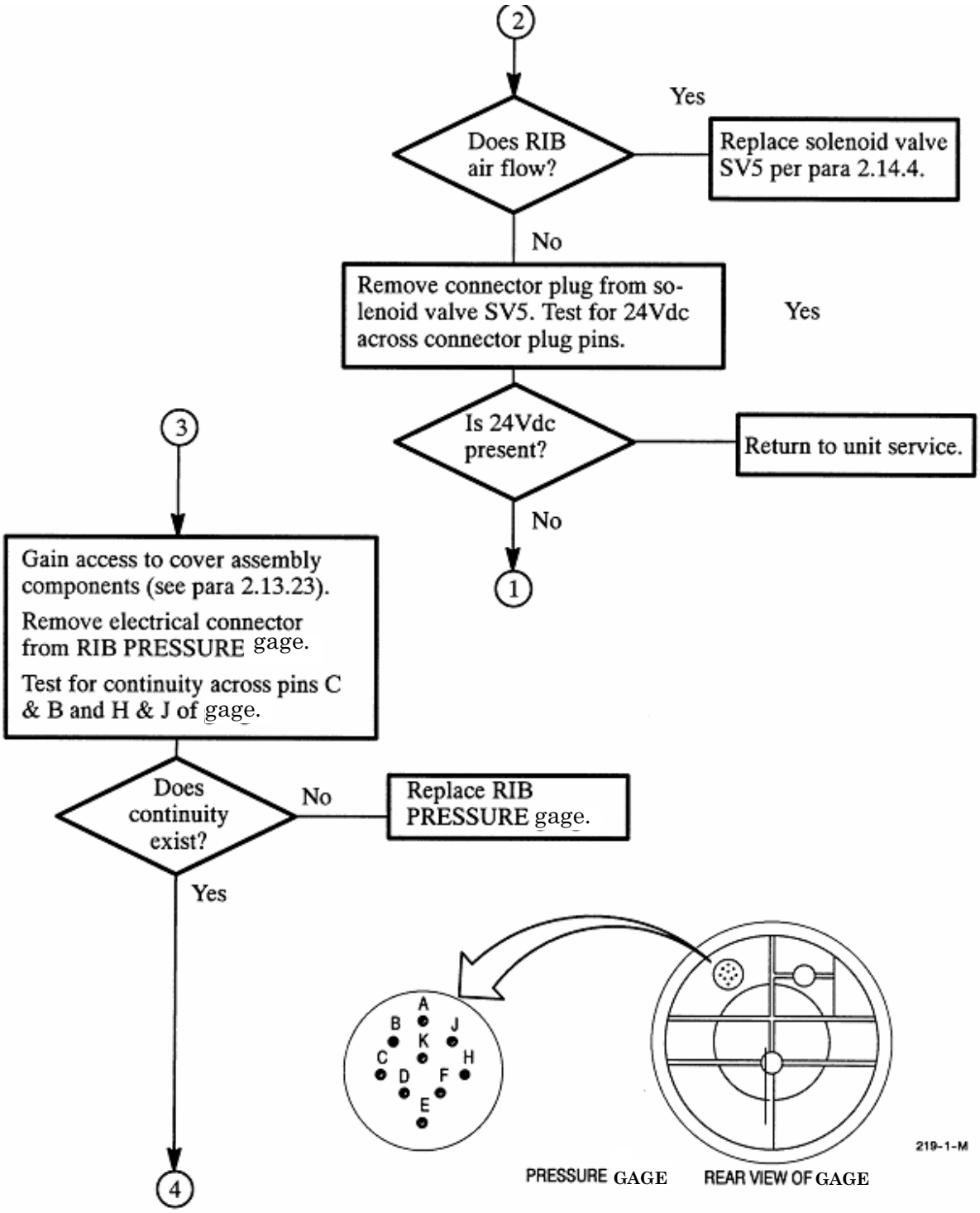


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

10. AIR BEAMS DO NOT INFLATE WHEN 'RIB FAN' SWITCH IS PRESSED (NO RIB AIR FLOW) – 'RIB FAN' INDICATOR ON – Continued.

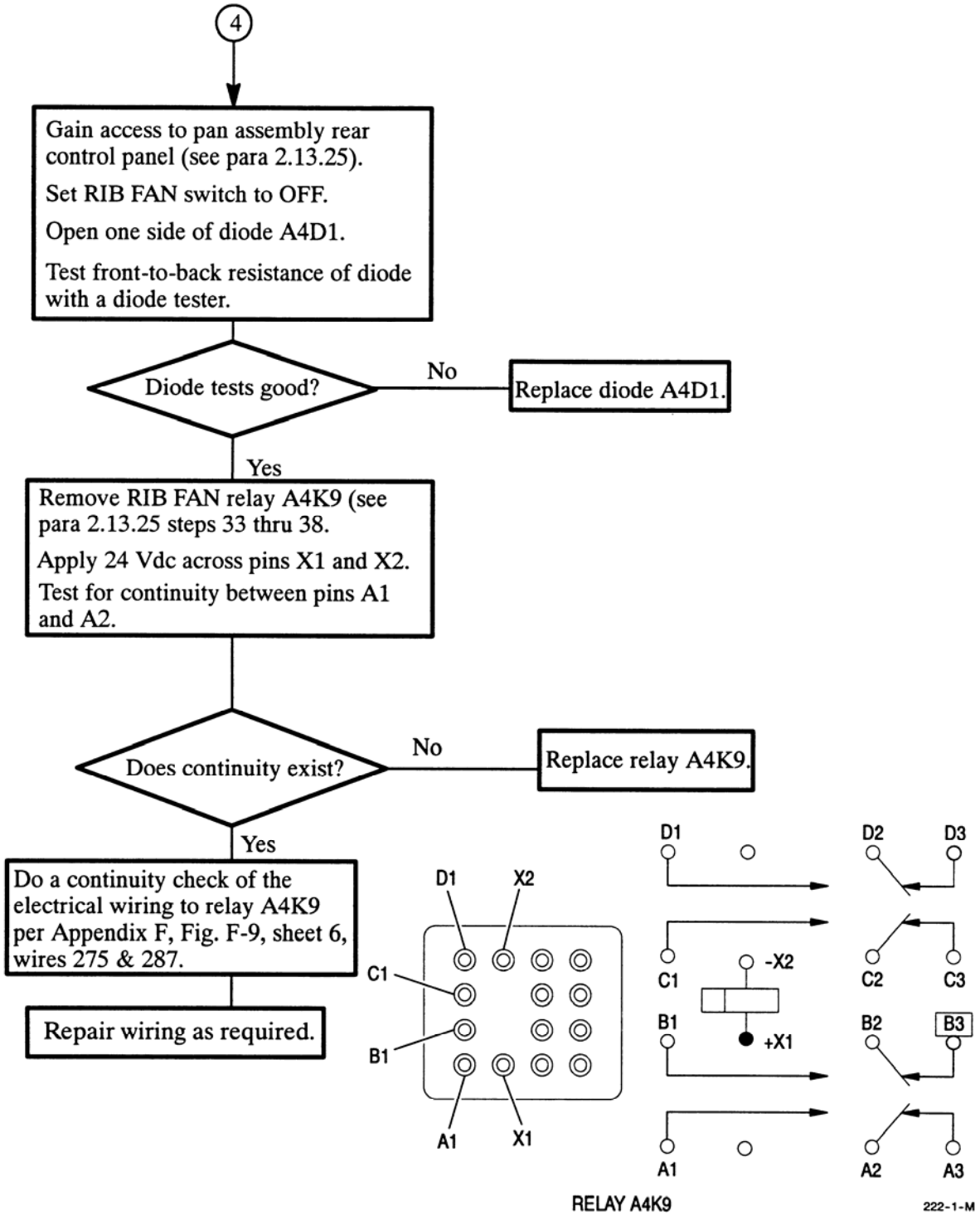


10. AIR BEAMS DO NOT INFLATE WHEN 'RIB FAN' SWITCH IS PRESSED (NO RIB AIR FLOW) – 'RIB FAN' INDICATOR ON – Continued.

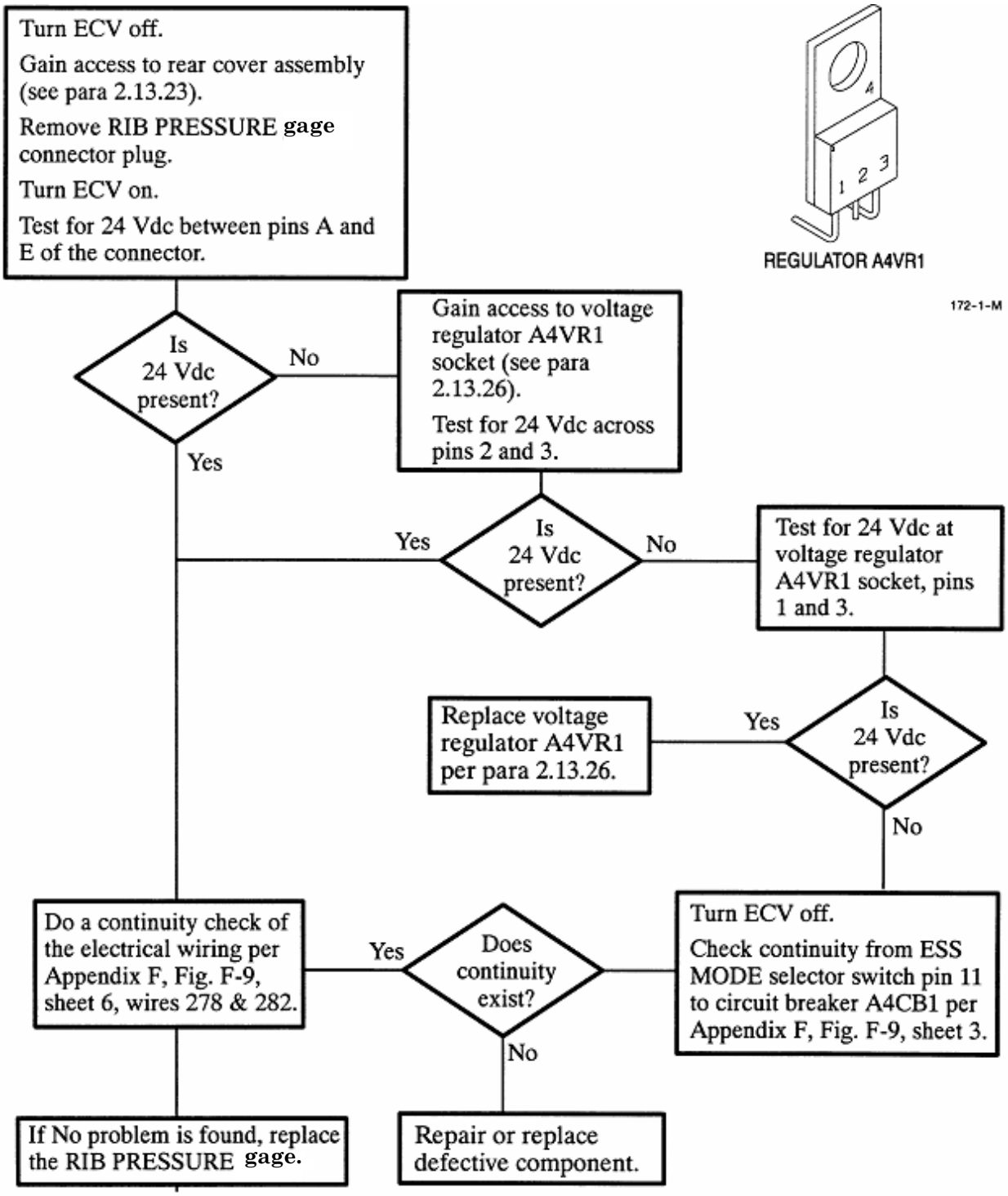


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

10. AIR BEAMS DO NOT INFLATE WHEN 'RIB FAN' SWITCH IS PRESSED (NO RIB AIR FLOW) – 'RIB FAN' INDICATOR ON – Continued.



11. RIB FAN DOES NOT TURN OFF WHEN RIB PRESSURE REACHES OR PASSES THE HIGH SET POINT OF THE GAGE.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

12. RIB PRESSURE GAGE DOES NOT RESPOND (NO READING) WITH THE RIB FAN OPERATING.

Set POWER MODE selector switch to INT.
Set ESS MODE selector switch to OFF.
Turn ECV OFF.
Tag power panel and cab area.

Gain access to rear control panel (see para 2.13.22).

Check that hoses are properly connected to rear of RIB PRESSURE gage and not damaged.

Are hoses properly connected and not damaged?

No → Connect hoses or replace damaged hoses.

Yes

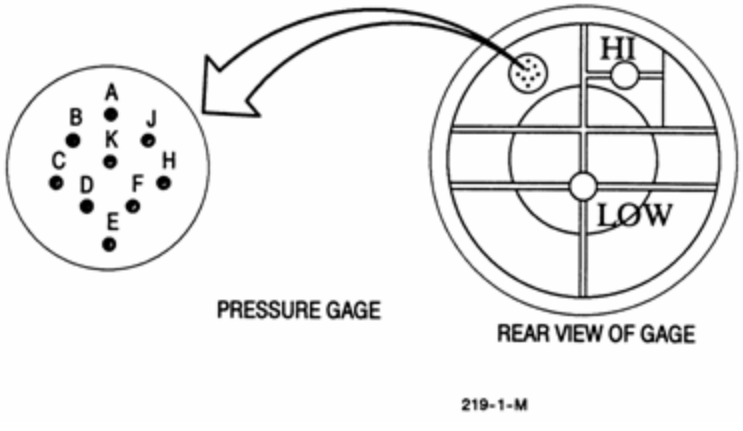
Check rib inflation manifold and check valve for leaks.

Leaks in manifold or check valve?

No → Replace RIB PRESSURE gage (see para 2.13.23).

Yes

Repair or replace as required.



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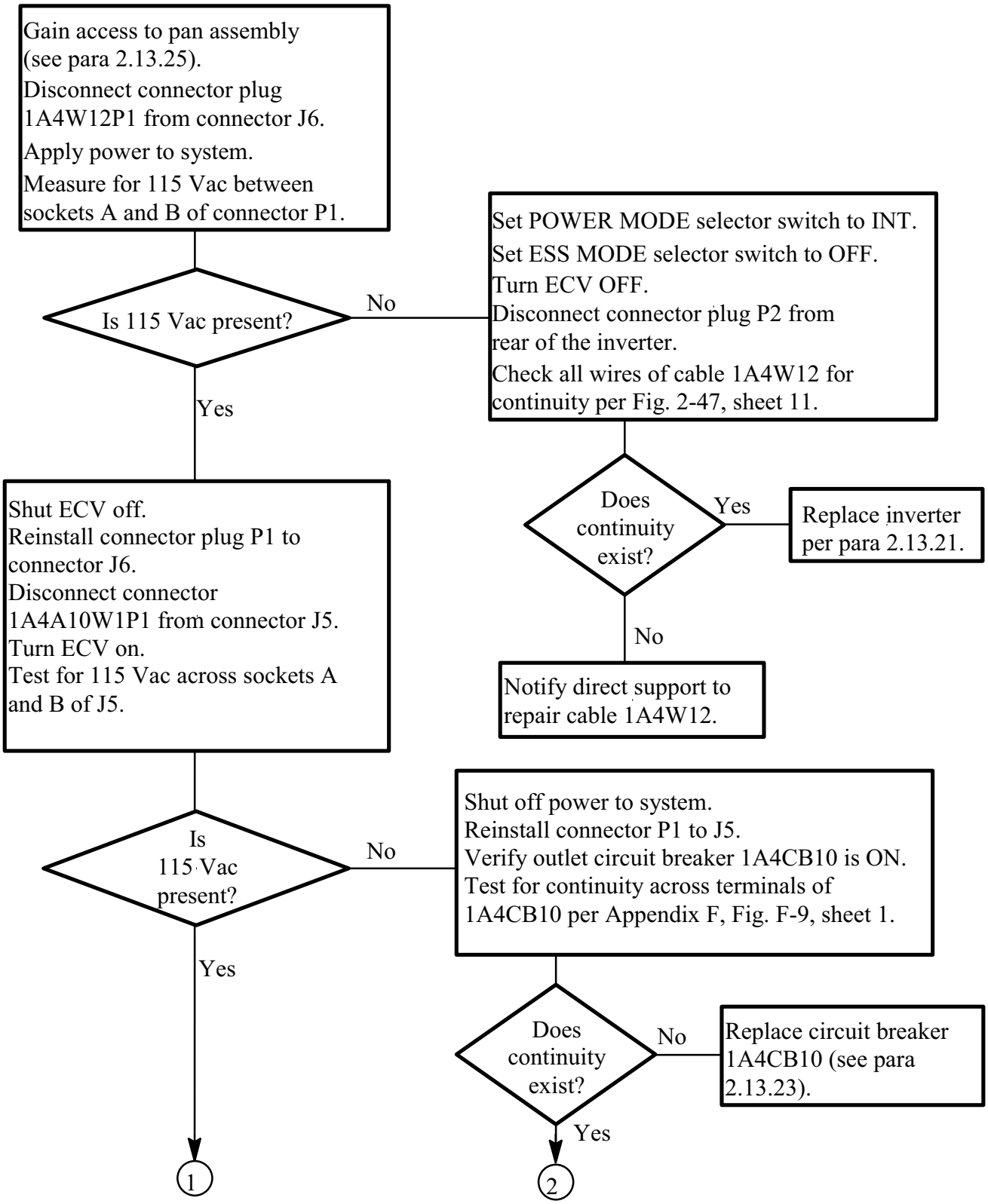
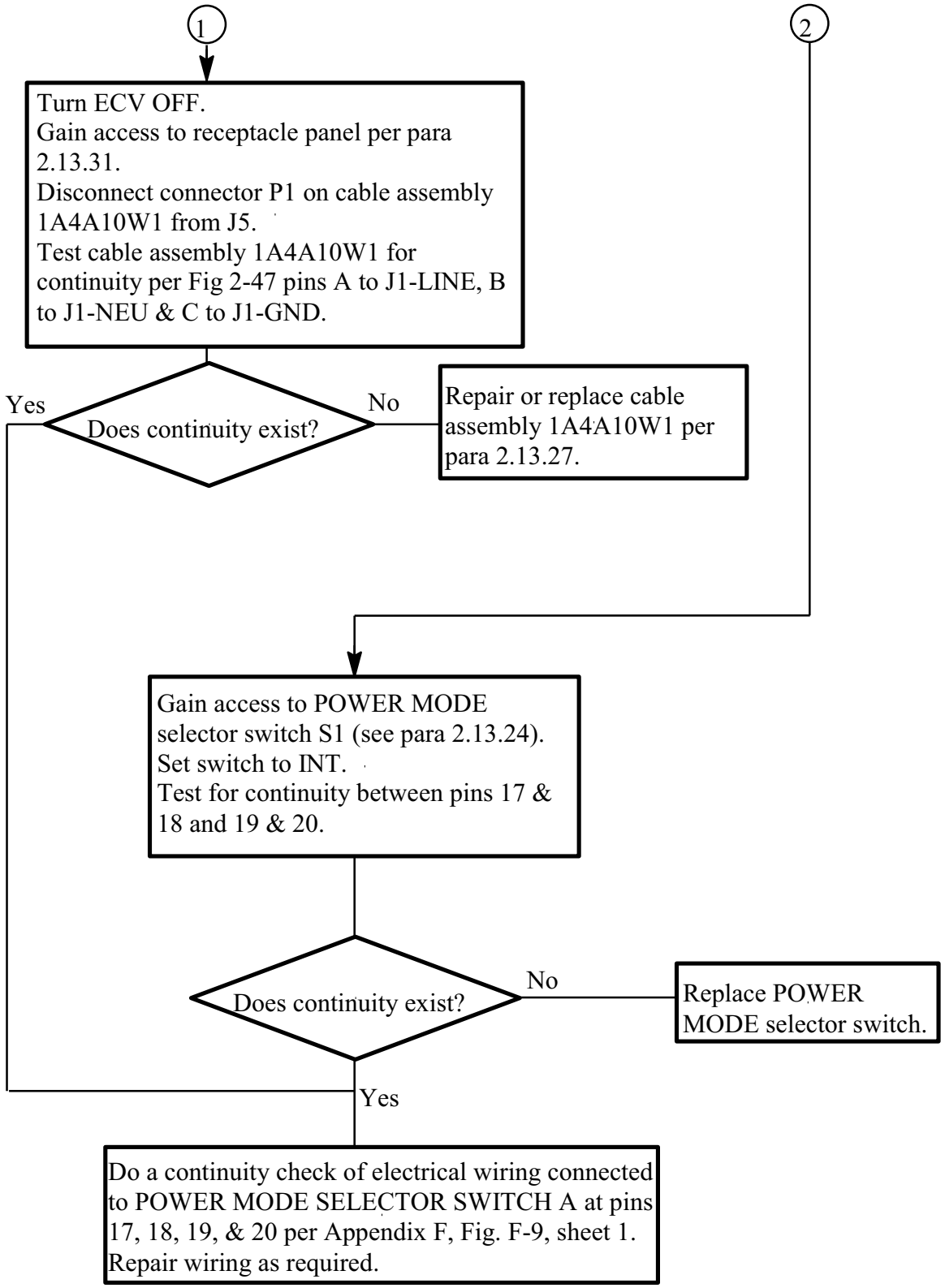
13. NO AC POWER TO PERIPHERAL OUTLETS J1 THROUGH J4 ON REAR OF LMS WITH ECV RUNNING, OUTLET CIRCUIT BREAKER 1A4CB10 ON – INVERTER ON, READINGS NORMAL.

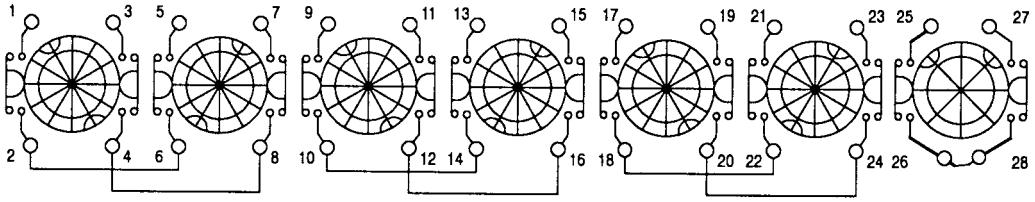


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

13. NO AC POWER TO PERIPHERAL OUTLETS J1 THROUGH J4 ON REAR OF LMS WITH ECV RUNNING – INVERTER READINGS NORMAL – Continued.



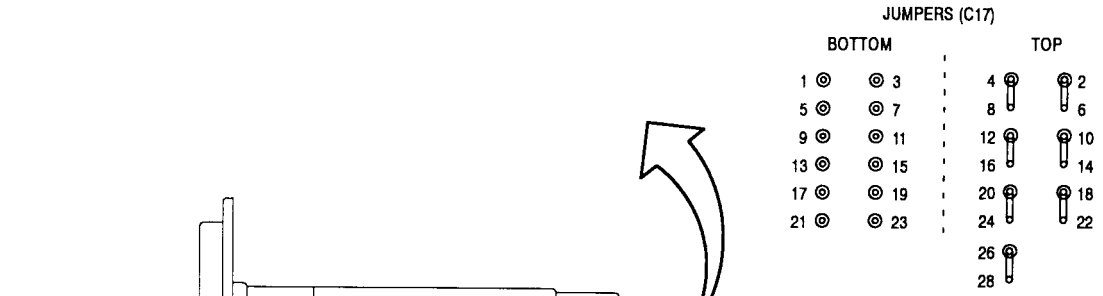
13. NO AC POWER TO PERIPHERAL OUTLETS J1 THROUGH J4 ON REAR OF LMS WITH ECV RUNNING – INVERTER READINGS NORMAL – Continued.

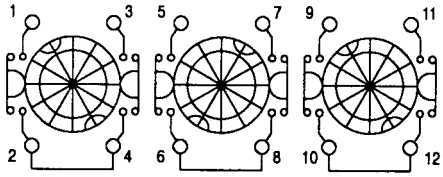


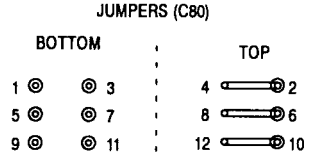
POSITION

EXT			X	X			X	X			X	X		X
INT	X	X			X	X			X	X			X	

SECTION C17







POSITION

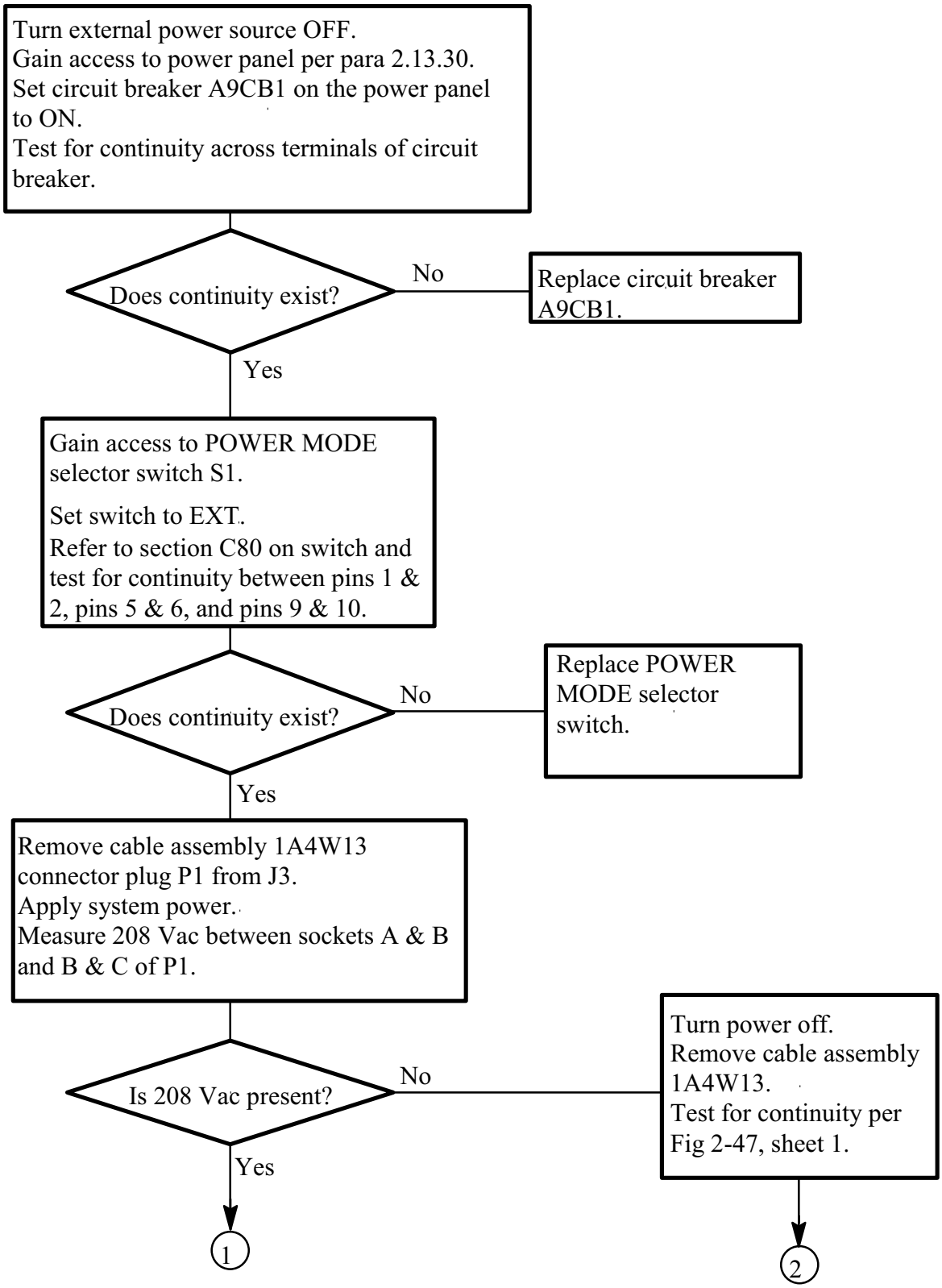
INT		X		X		X
EXT	X		X		X	

SECTION C80

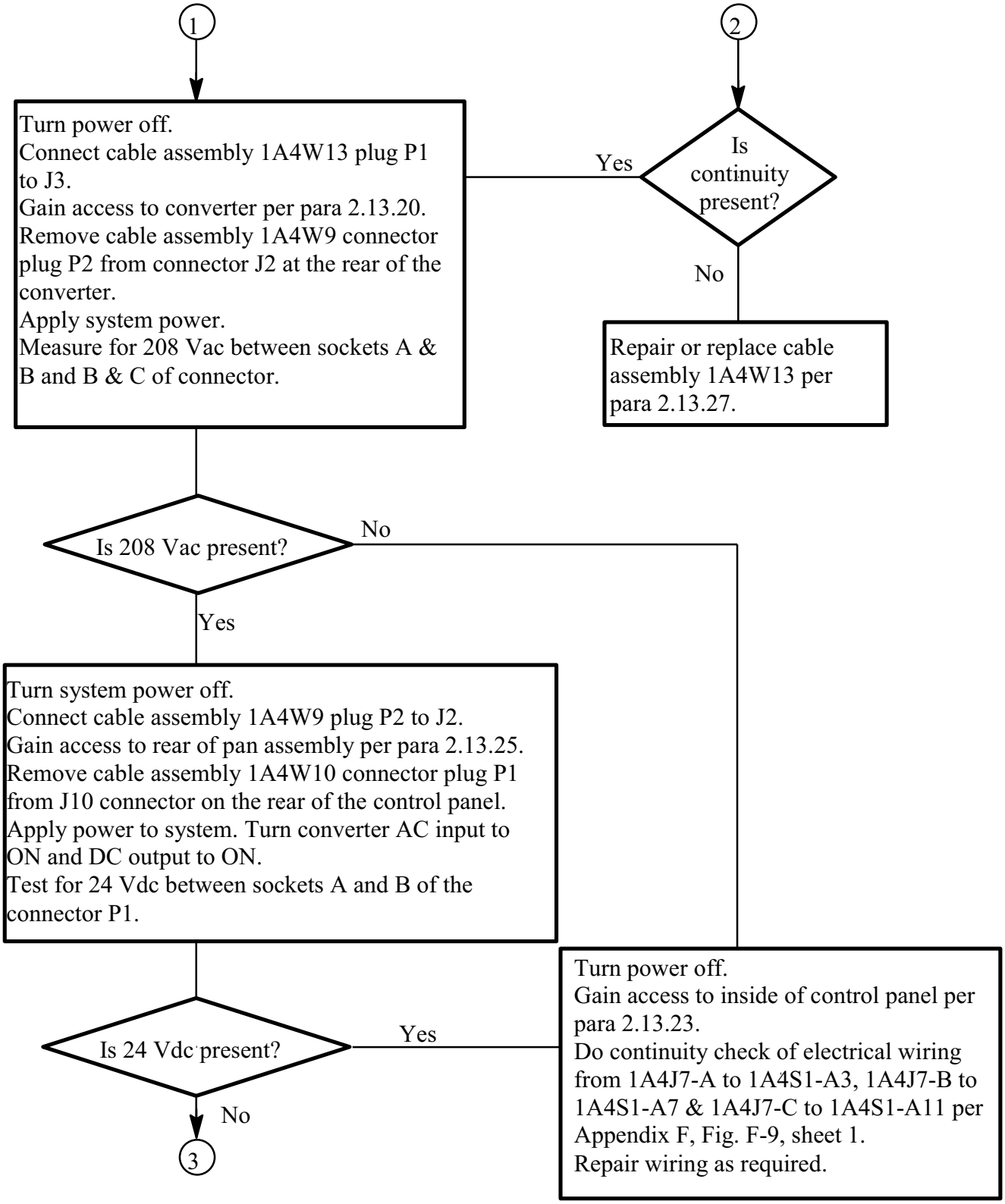
200-1-M-A

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

14. NO POWER TO SYSTEM WITH 'EXT' POWER APPLIED.

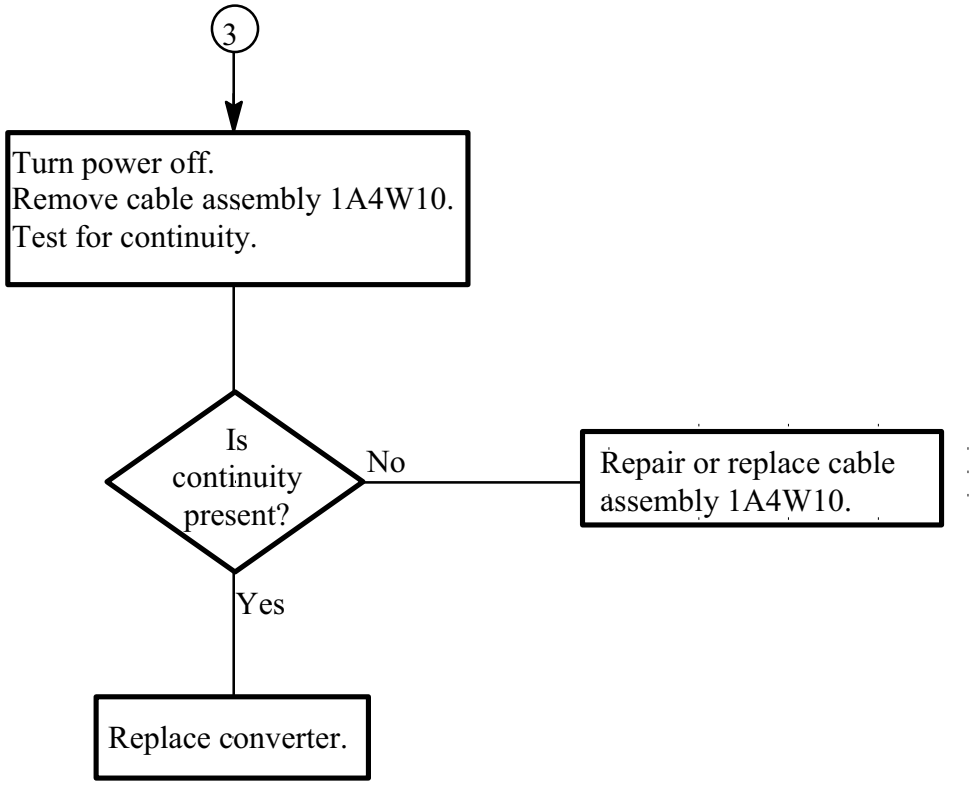


14. NO POWER TO SYSTEM WITH 'EXT' POWER APPLIED – Continued.

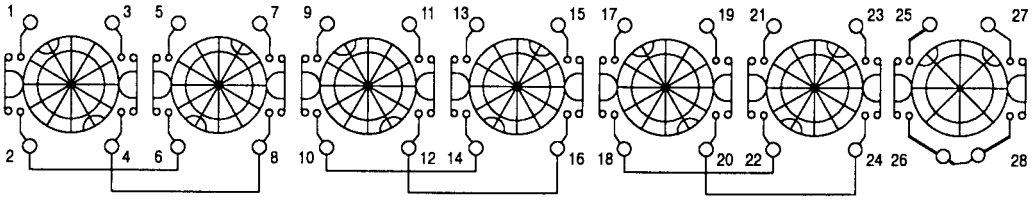


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

14. NO POWER TO SYSTEM WITH 'EXT' POWER APPLIED – Continued.



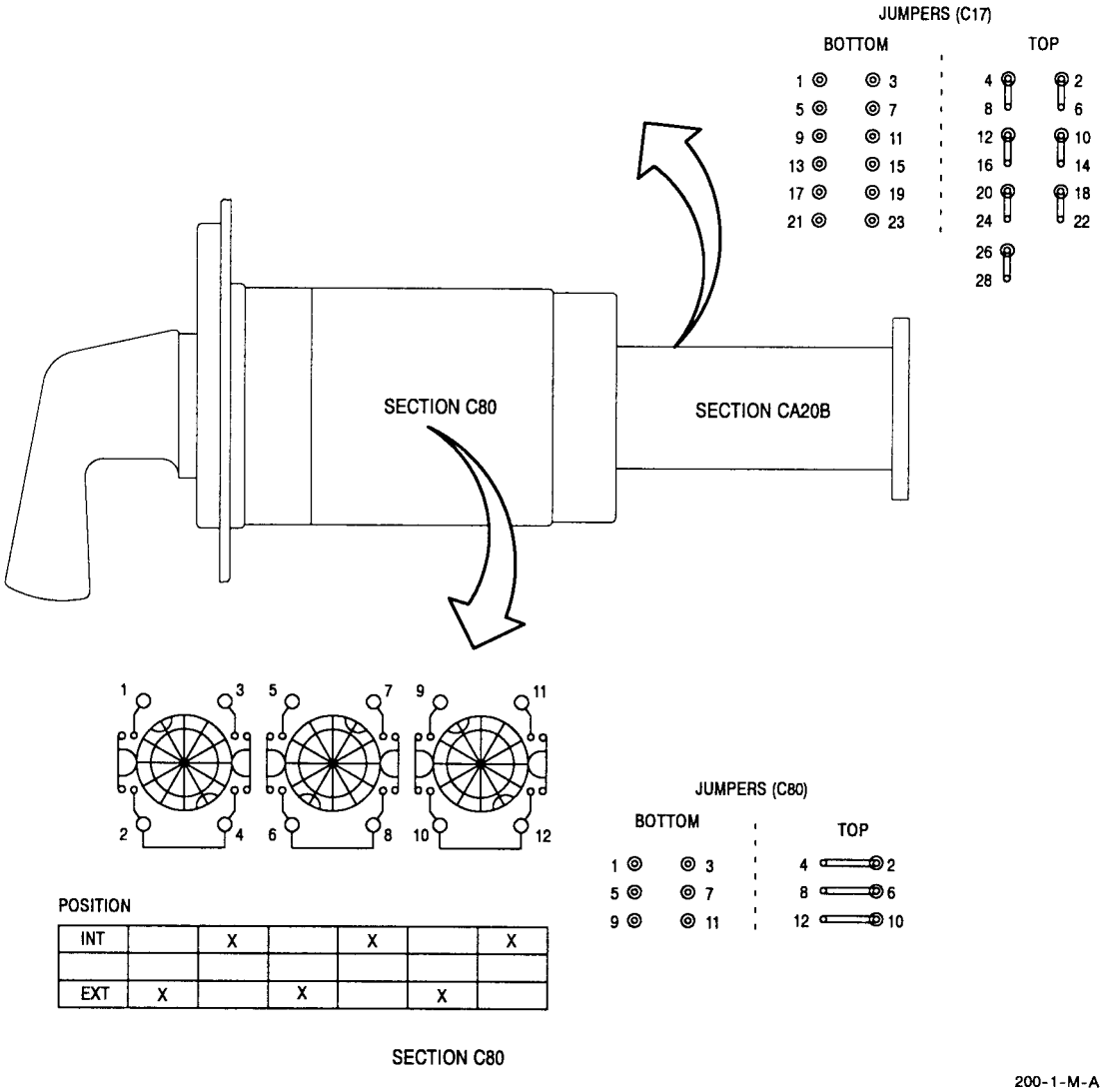
14. NO POWER TO SYSTEM WITH 'EXT' POWER APPLIED – Continued.



POSITION

EXT			X	X			X	X			X	X		X
INT	X	X			X	X			X	X			X	

SECTION C17



POSITION

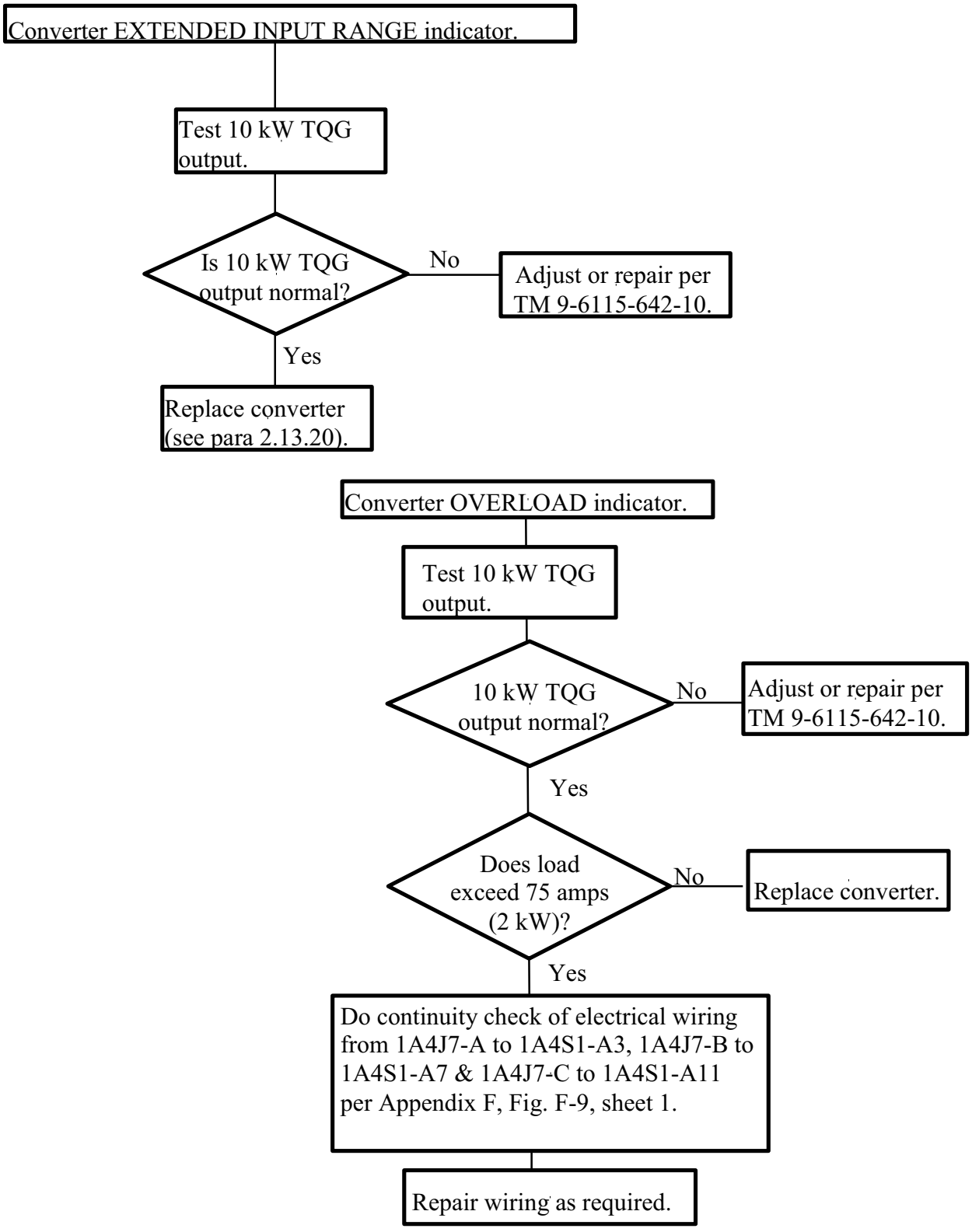
INT		X		X		X
EXT	X		X		X	

SECTION C80

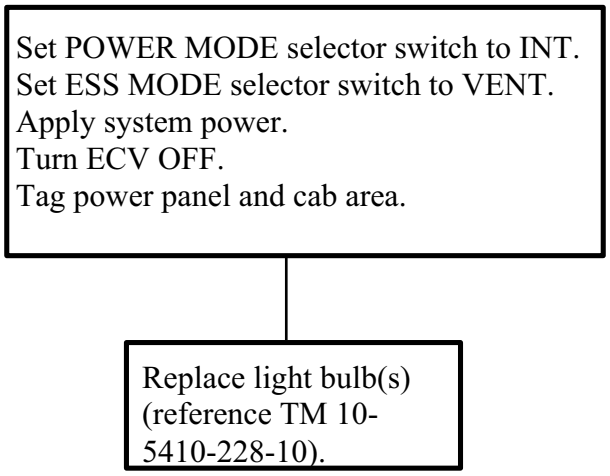
200-1-M-A

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

15. CONVERTER INDICATOR LIGHTS ON.



16. SWITCH/INDICATOR DIM.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

17. HYDRAULIC FLUID ALARM 'DANGER LEVEL' SWITCH/INDICATOR LIGHTS, 'CHECK OIL' INDICATOR REMAINS OFF.

Apply system power.
Gain access to ECU front covers (see para 2.14.1).
Open passenger side front cover.
Visually check fluid level on hydraulic reservoir (see para 2.14.3).

Is fluid level low?

Yes

Set POWER MODE selector switch to INT.
Set ESS MODE selector switch to OFF.
Turn ECV OFF.
Turn system power off.
Tag power panel and cab area.
Add hydraulic fluid to reservoir (reference TM 10-5410-228-10).
Check for hydraulic leaks.
Repair as required.

No

Gain access to sensor HOLS3 on hydraulic reservoir.
Turn system power off.
Remove connection at wire #2.
Check continuity between lead wire #2 and equipment ground.

Does continuity exist?

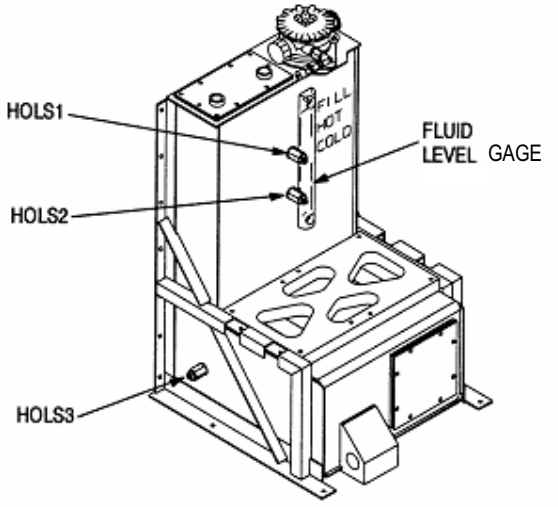
No

Set POWER MODE selector switch to INT.
Set ESS MODE selector switch to OFF.
See Operator Troubleshooting Procedures (reference TM 10-5410-228-10), Malfunction No. 5

Repair as required.

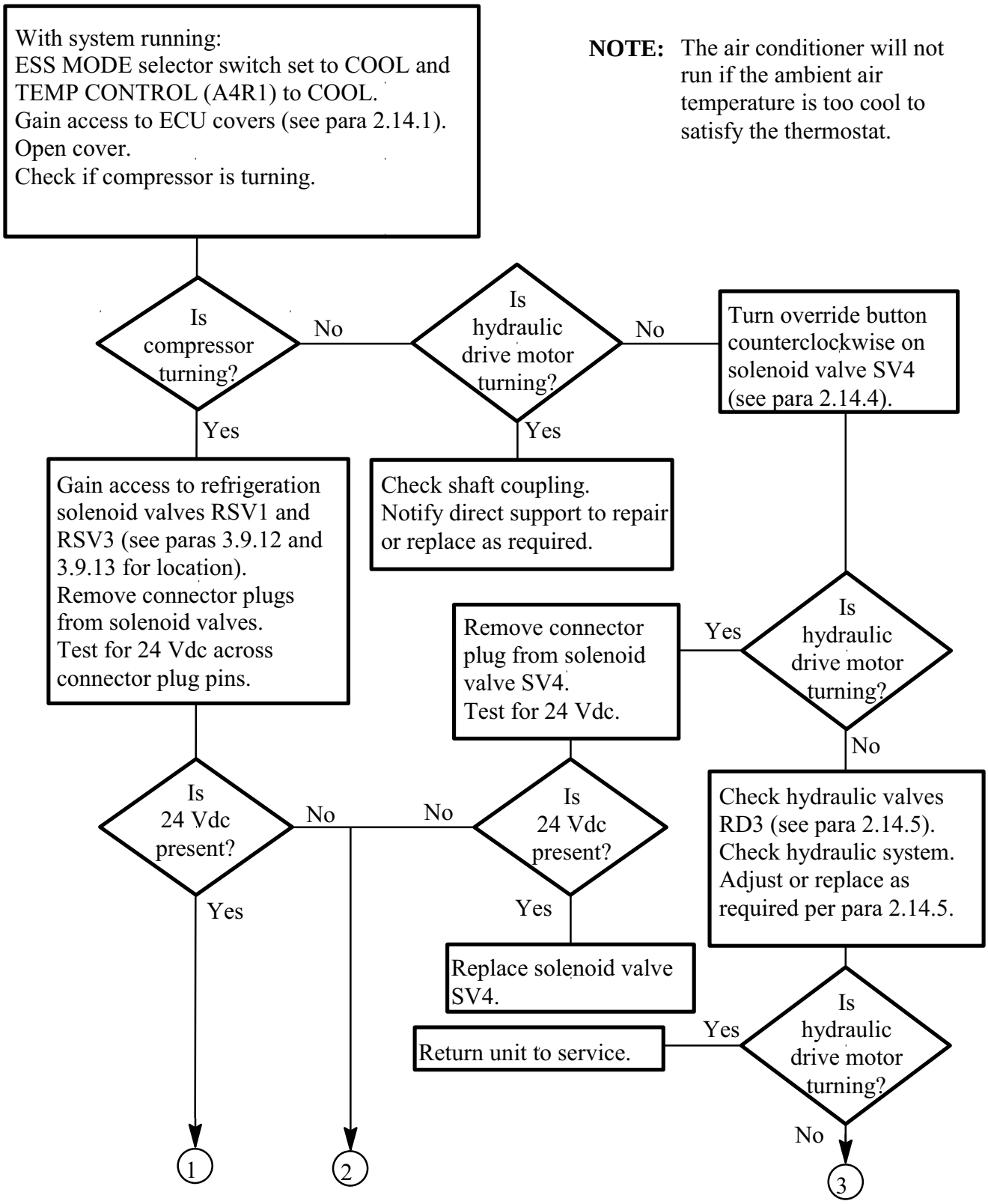
Yes

Notify direct support maintenance to replace sensor HOLS3.



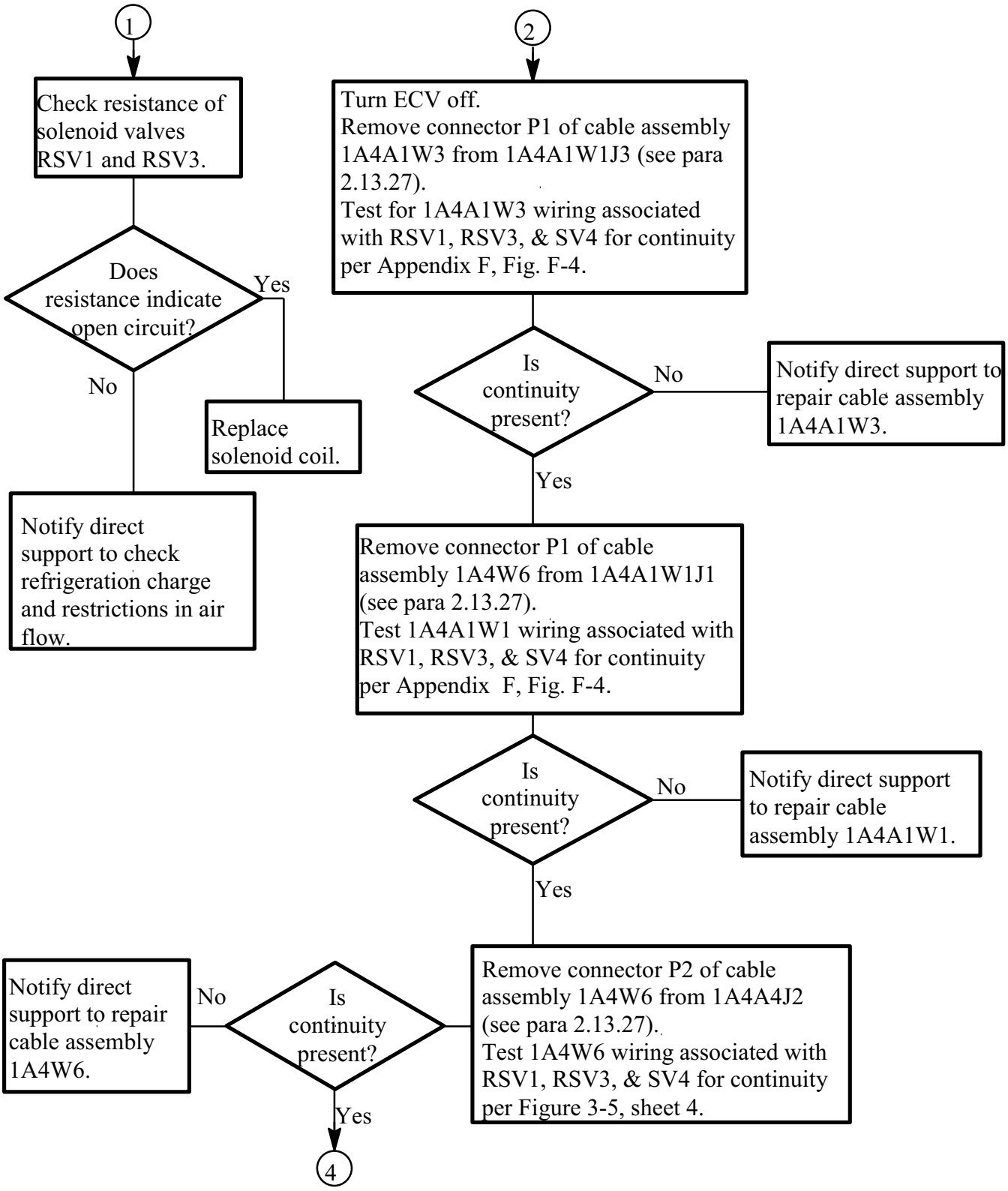
HYDRAULIC RESERVOIR 235-1-M

18. NO COOL AIR FLOW (STATIC MODE, INTERNAL POWER) – NO HIGH OR LOW PRESSURE ALARM.

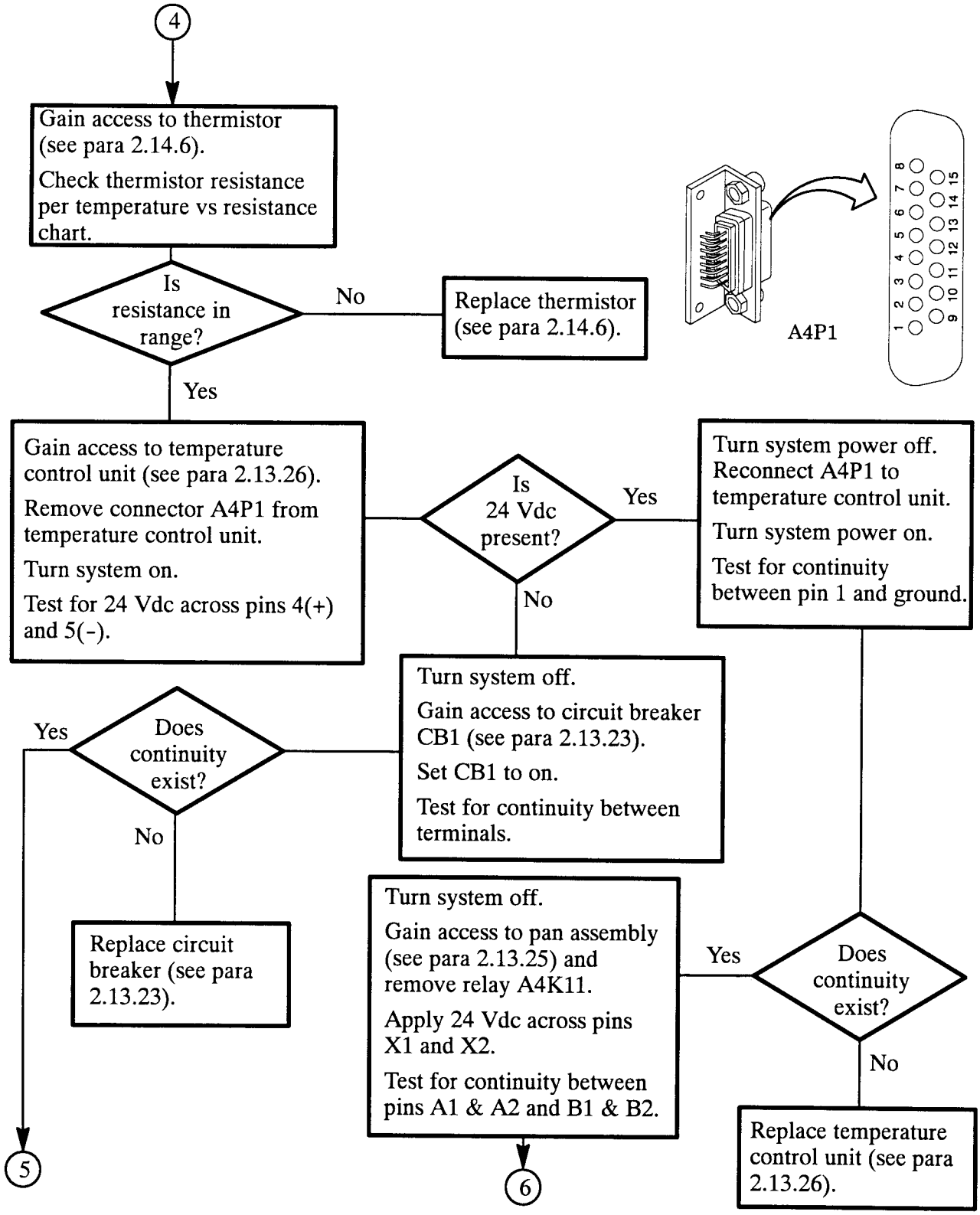


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

18. NO COOL AIR FLOW (STATIC MODE, INTERNAL POWER) – NO HIGH OR LOW PRESSURE ALARM – Continued.

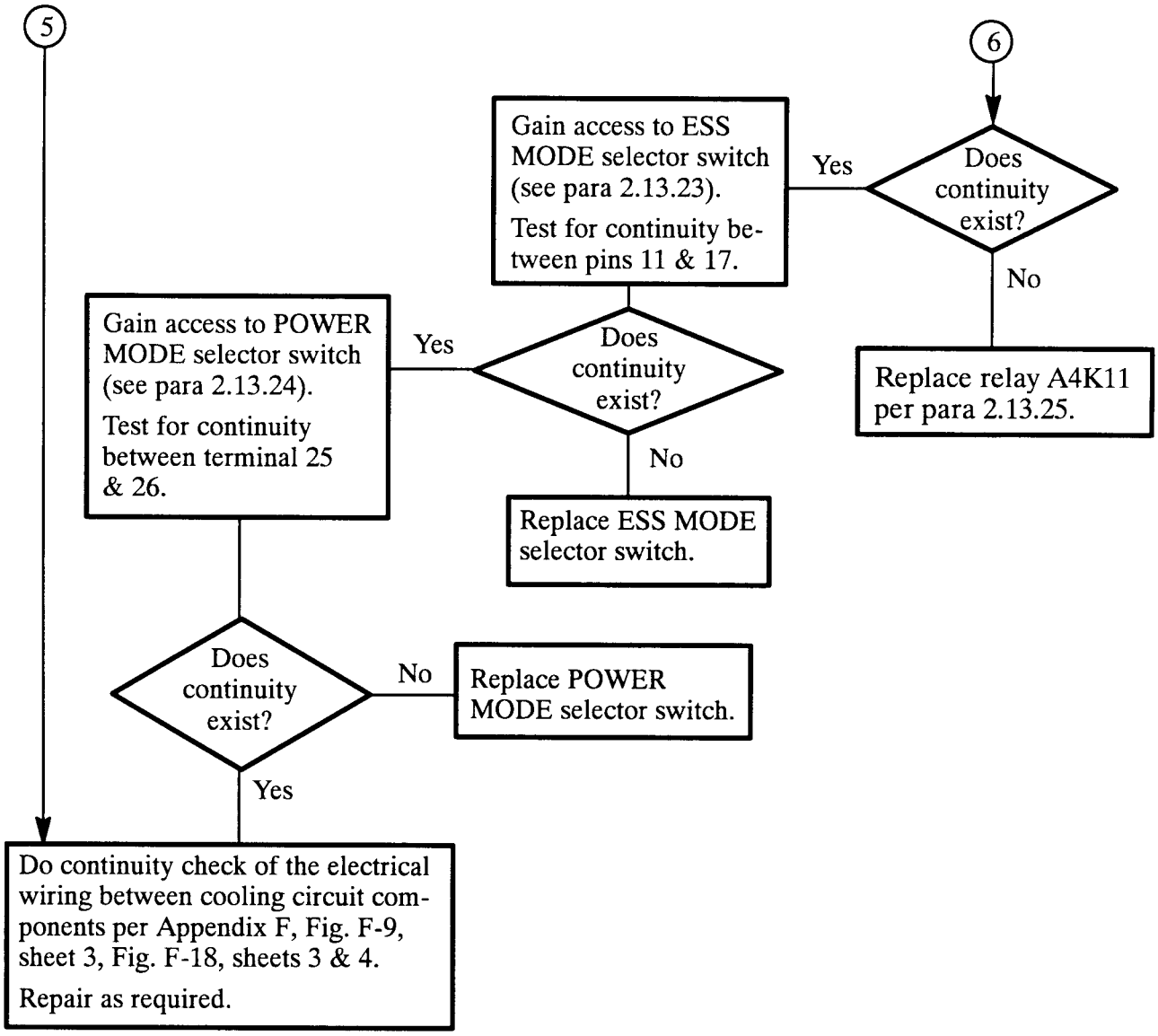


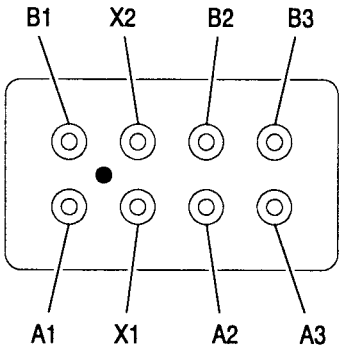
18. NO COOL AIR FLOW (STATIC MODE, INTERNAL POWER) – NO HIGH OR LOW PRESSURE ALARM – Continued.

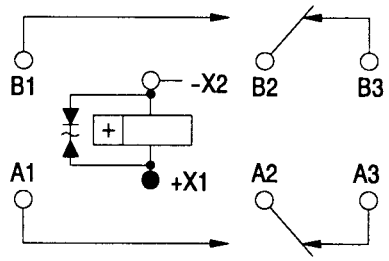


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

18. NO COOL AIR FLOW (STATIC MODE, INTERNAL POWER) – NO HIGH OR LOW PRESSURE ALARM – Continued.







RELAY A4K11

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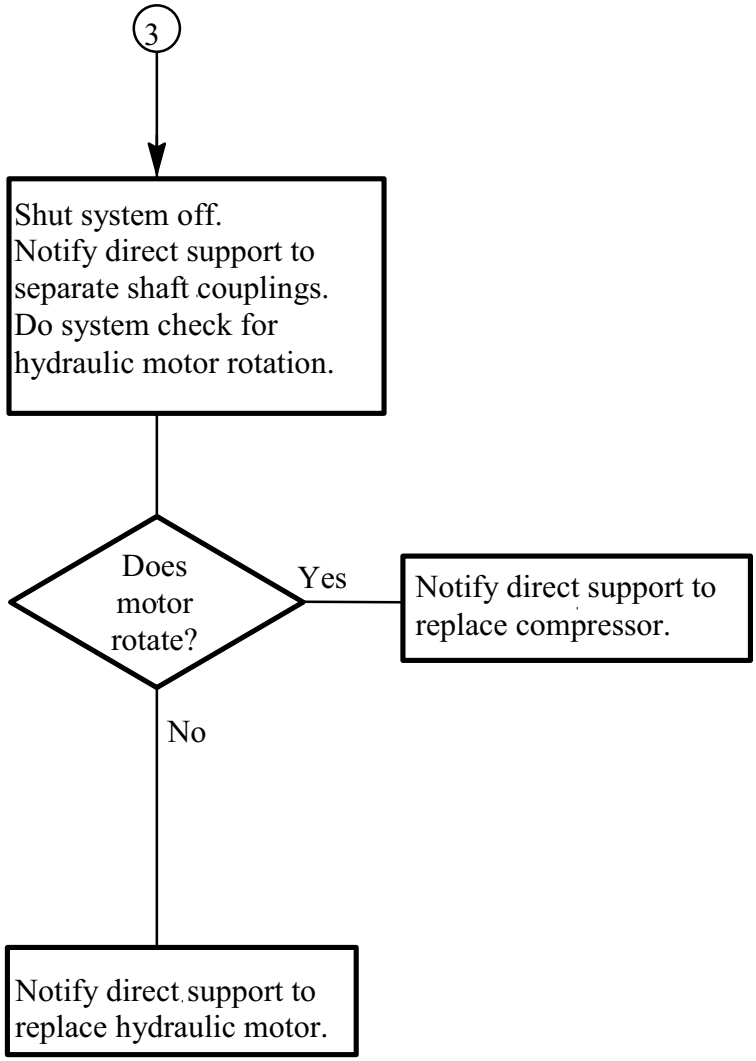
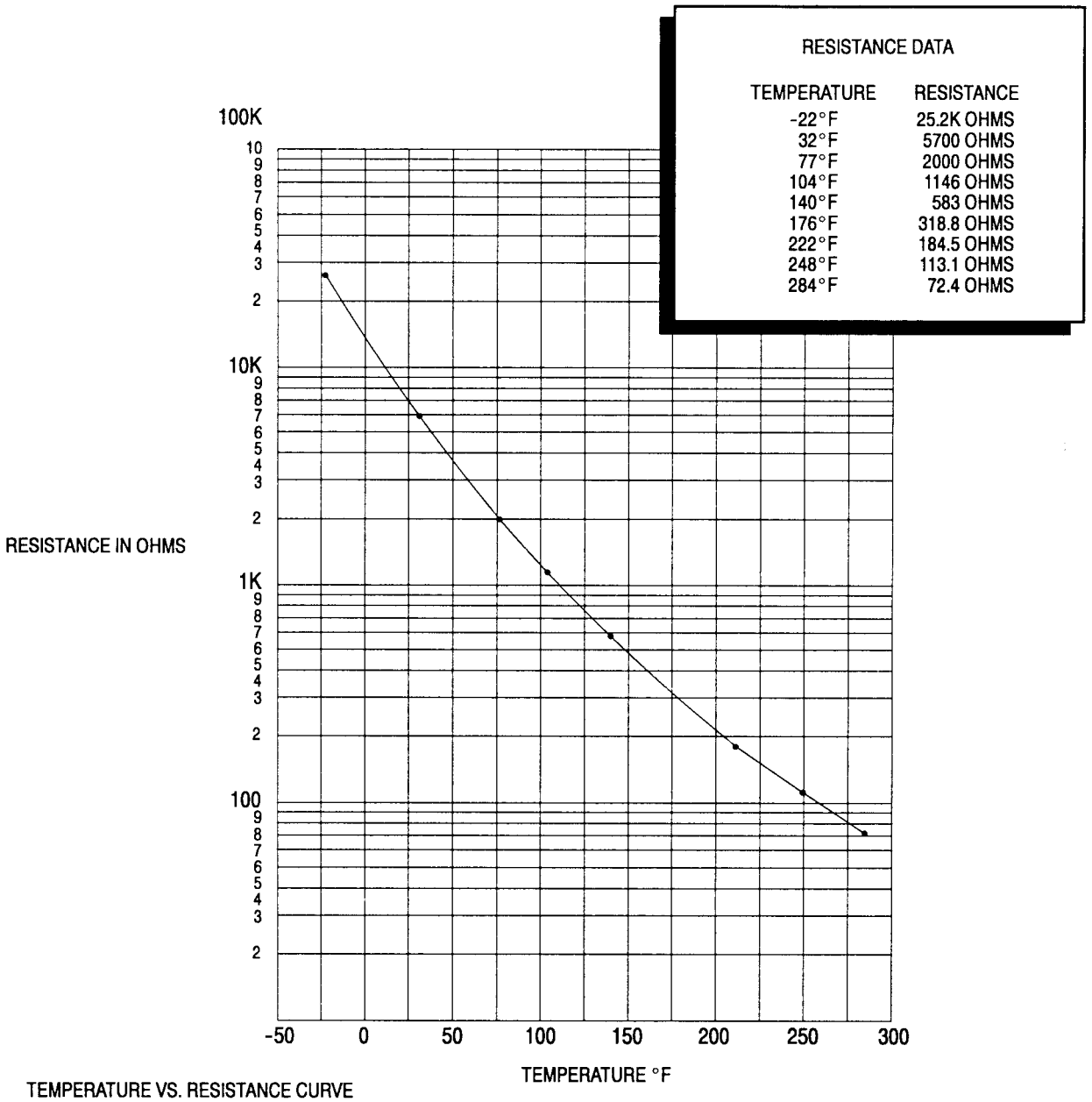
18. NO COOL AIR FLOW (STATIC MODE, INTERNAL POWER) – NO HIGH OR LOW PRESSURE ALARM – Continued.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

18. NO COOL AIR FLOW (STATIC MODE, INTERNAL POWER) – NO HIGH OR LOW PRESSURE ALARM – Continued.

THERMISTOR TEMPERATURE VS. RESISTANCE CHART



TEMPERATURE VS. RESISTANCE CURVE

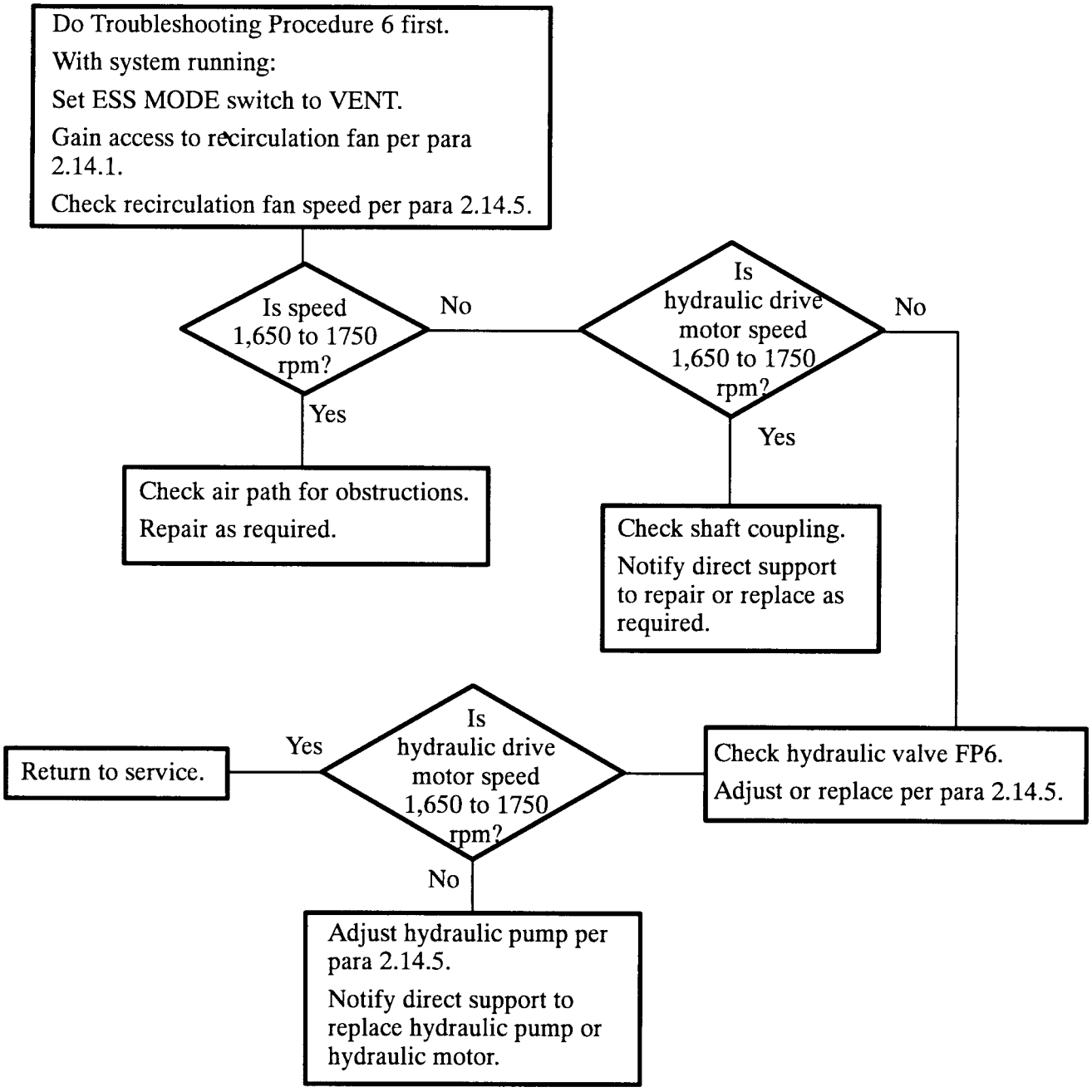
TEMPERATURE RANGE

25°F TO 250°F, 0°F TO 200°F
FENWAL THERMISTOR PART NO. 06-112786-000
"NON-CALIBRATED" 2K OHMS = 20%
FEI #GB32P2

102-1-M

Thermistor Resistance

19. LOW OR FLUCTUATING AIR FLOW IN STATIC MODE WITH INTERNAL POWER OR EXTERNAL POWER, NBC OFF.



2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

20. NO COOL AIR WHEN OPERATING IN MOBILE MODE – 'MOBILE' INDICATOR ON.

Do Troubleshooting Procedure 18 first.
Set POWER MODE selector switch to INT.
Set ESS MODE selector switch to OFF.
Turn ECV OFF.
Tag power panel and cab area.

NOTE: The air conditioner will not run if ambient air temperature is too cool to satisfy thermostat.

Gain access to the temperature control unit located on the control panel assembly (see para 2.13.26).
Test front-to-back resistance of diode A4D3 with a diode tester.

Diode tests good?

No → Replace diode A4D3 per para 2.13.26.

Yes

Gain access to pan assembly.
Remove relay A4K15.
Apply 24 Vdc across pins X1 and X2 of relay A4K15.
Test for continuity between pins A1 and A2, and Pins B1 and B2.

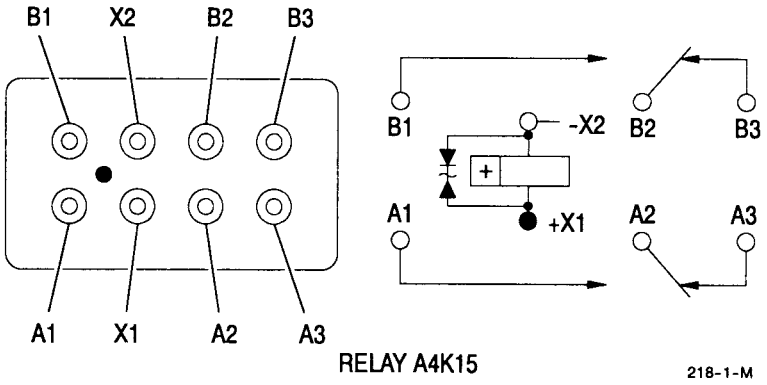
Does continuity exist?

No → Replace relay A4K15.

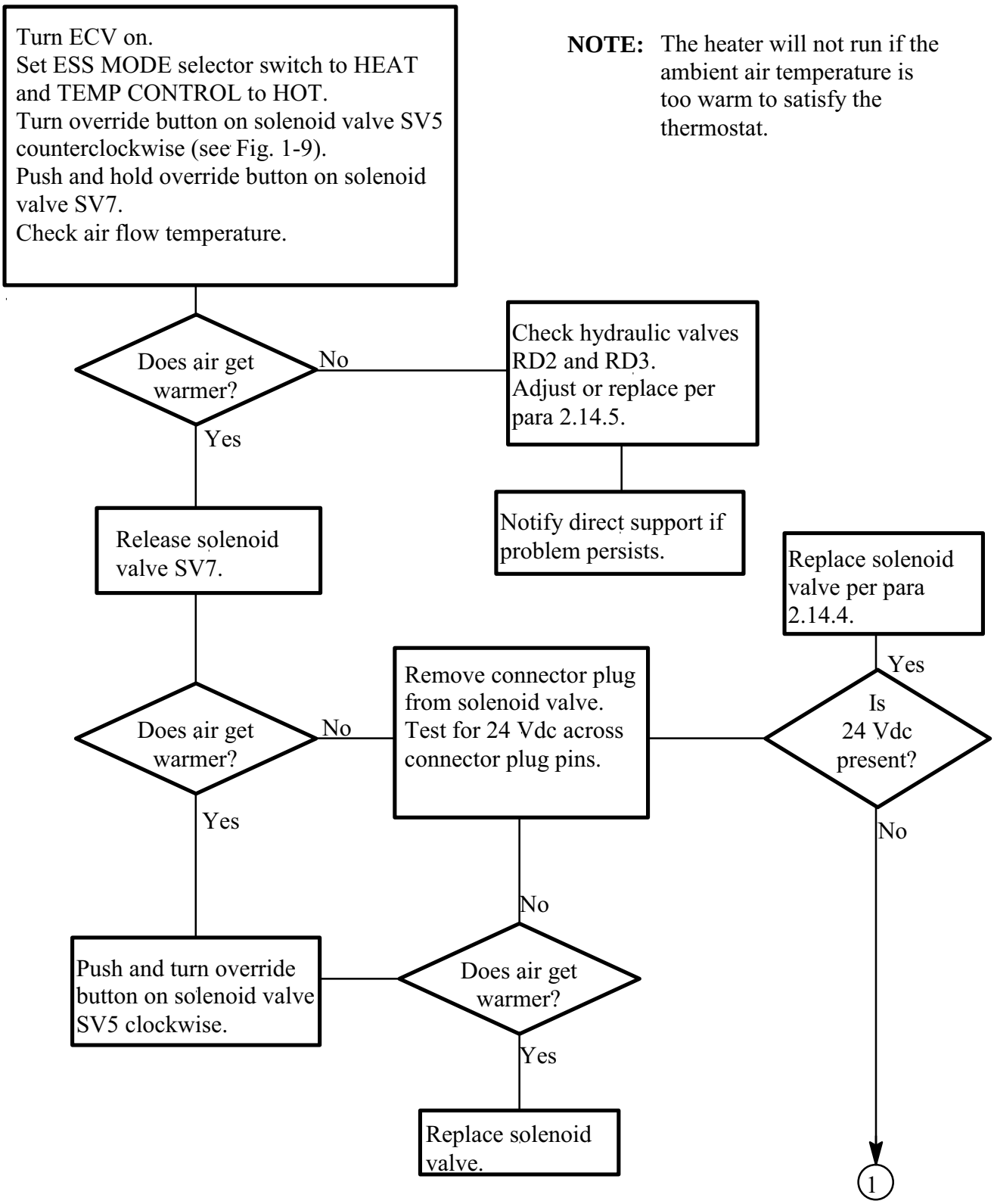
Yes

Do a continuity check of the electrical wiring per Appendix F, Fig F-9, sheet 4 wires 313 & 317.

Repair wiring as required.

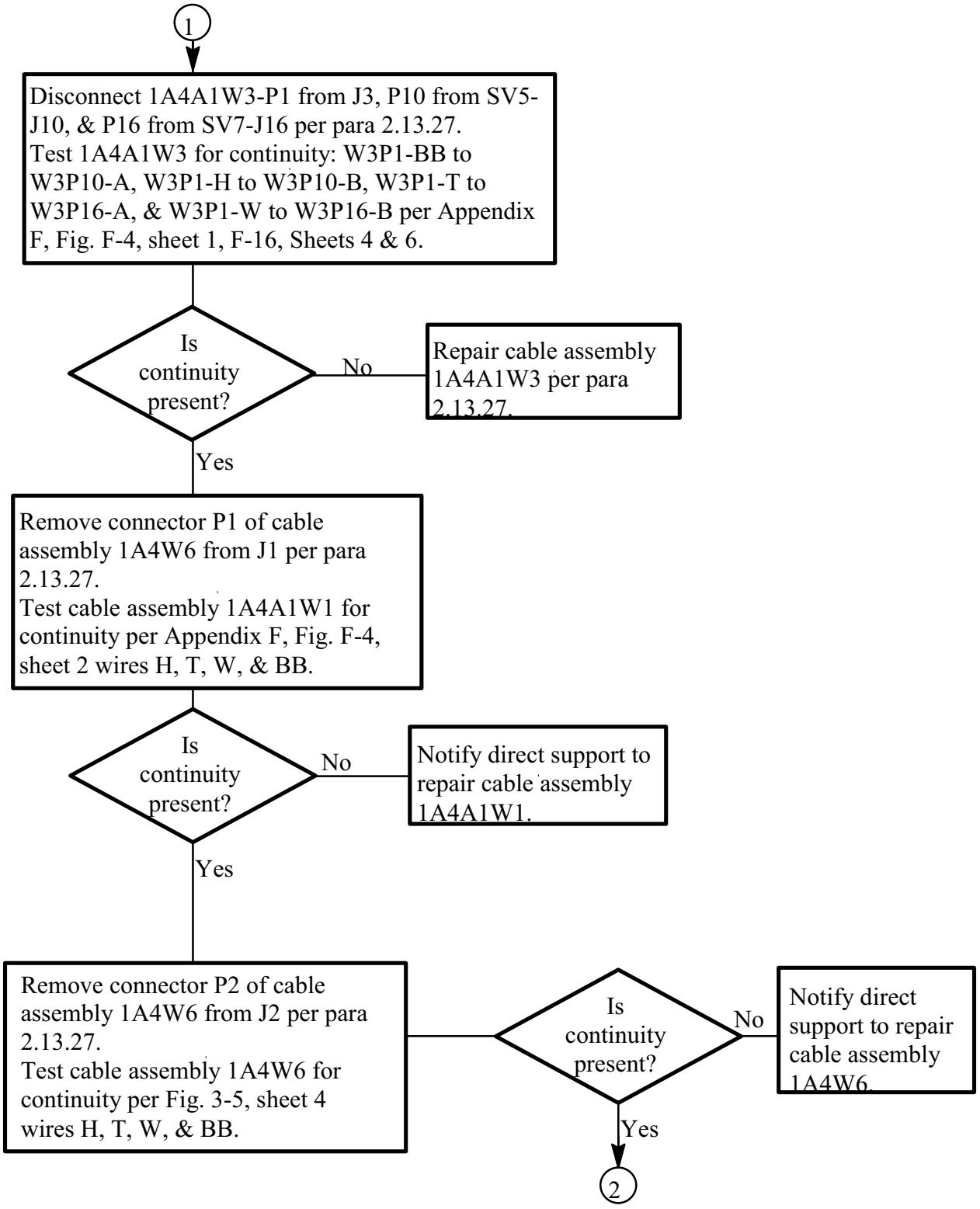


21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF.

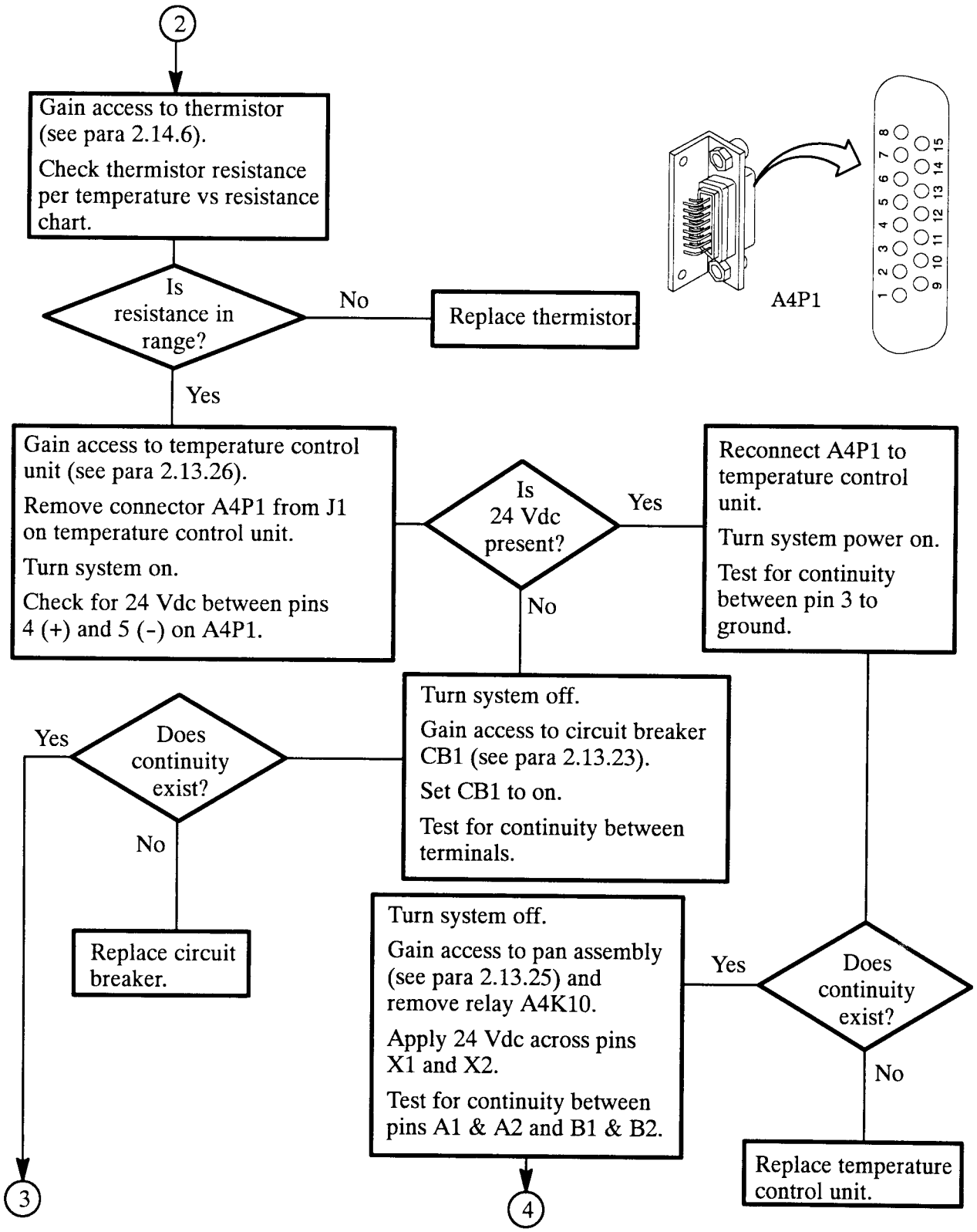


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF – Continued.

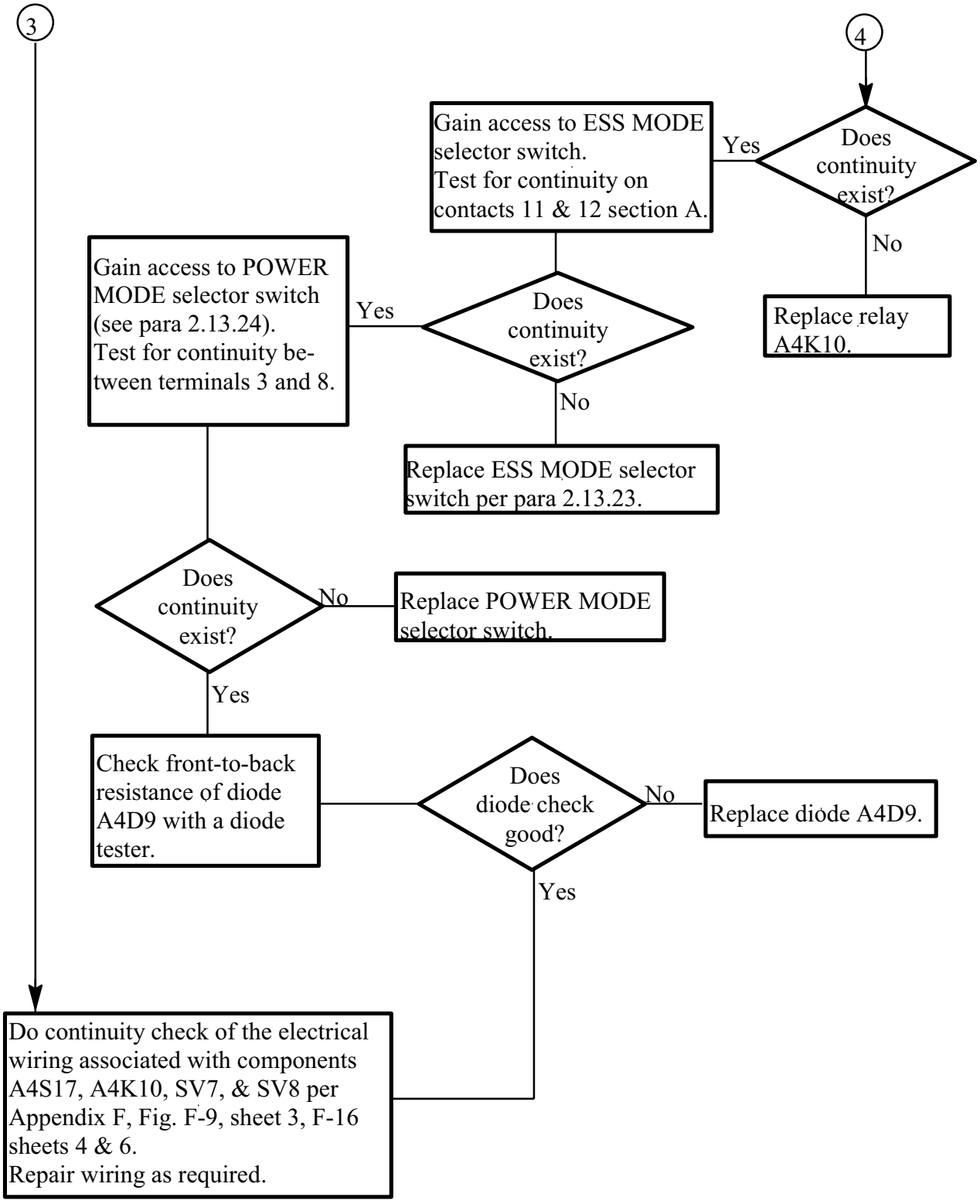


21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF – Continued.



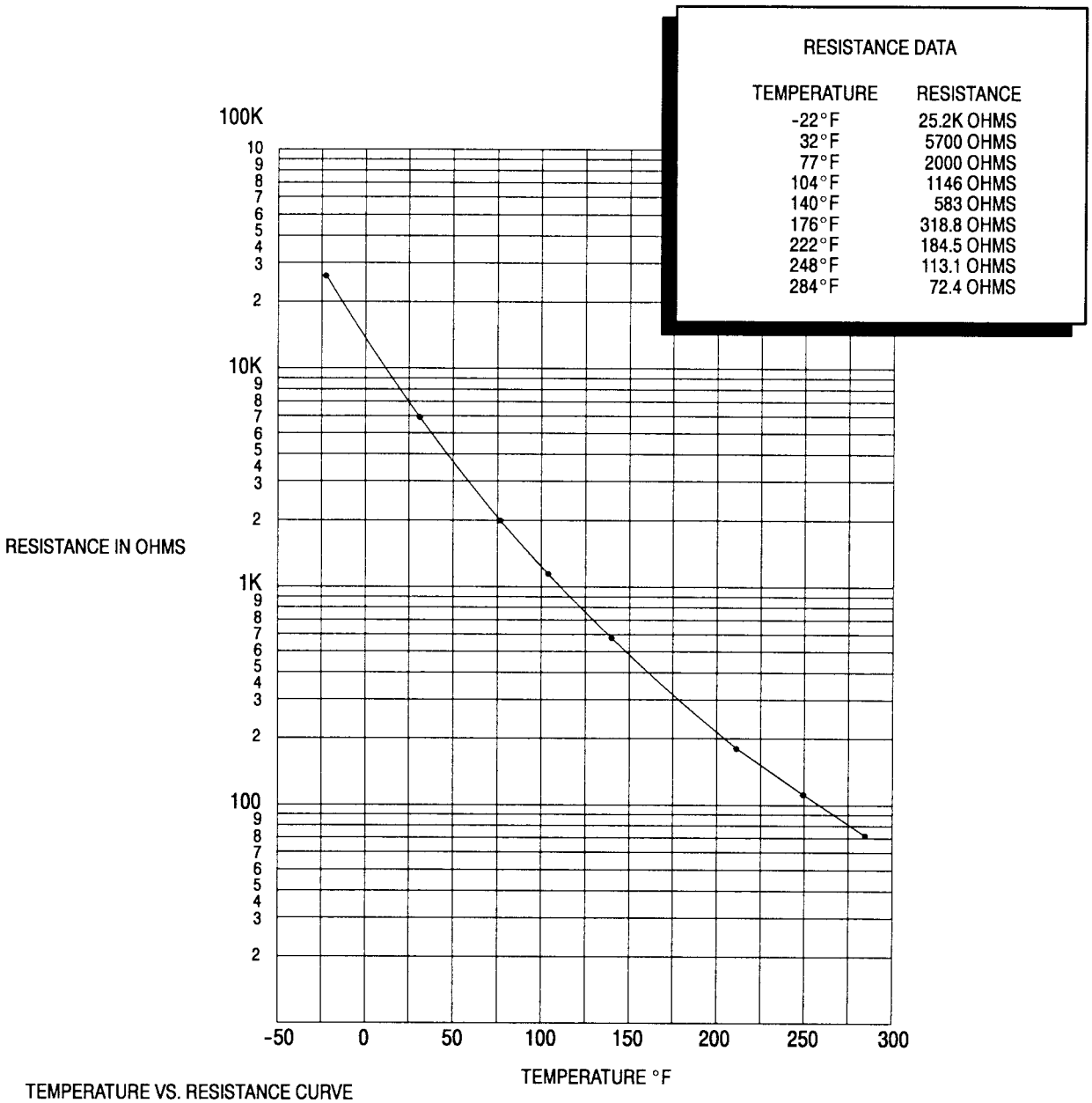
2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF – Continued.



21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF – Continued.

THERMISTOR TEMPERATURE VS. RESISTANCE CHART



TEMPERATURE VS. RESISTANCE CURVE

TEMPERATURE RANGE

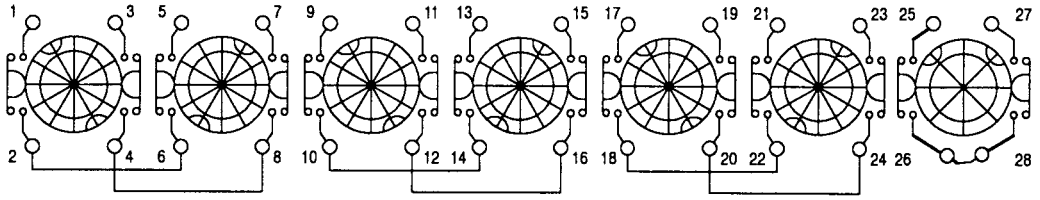
25°F TO 250°F, 0°F TO 200°F
FENWAL THERMISTOR PART NO. 06-112786-000
"NON-CALIBRATED" 2K OHMS = 20%
FEI #GB32P2

102-1-M

Thermistor Resistance

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

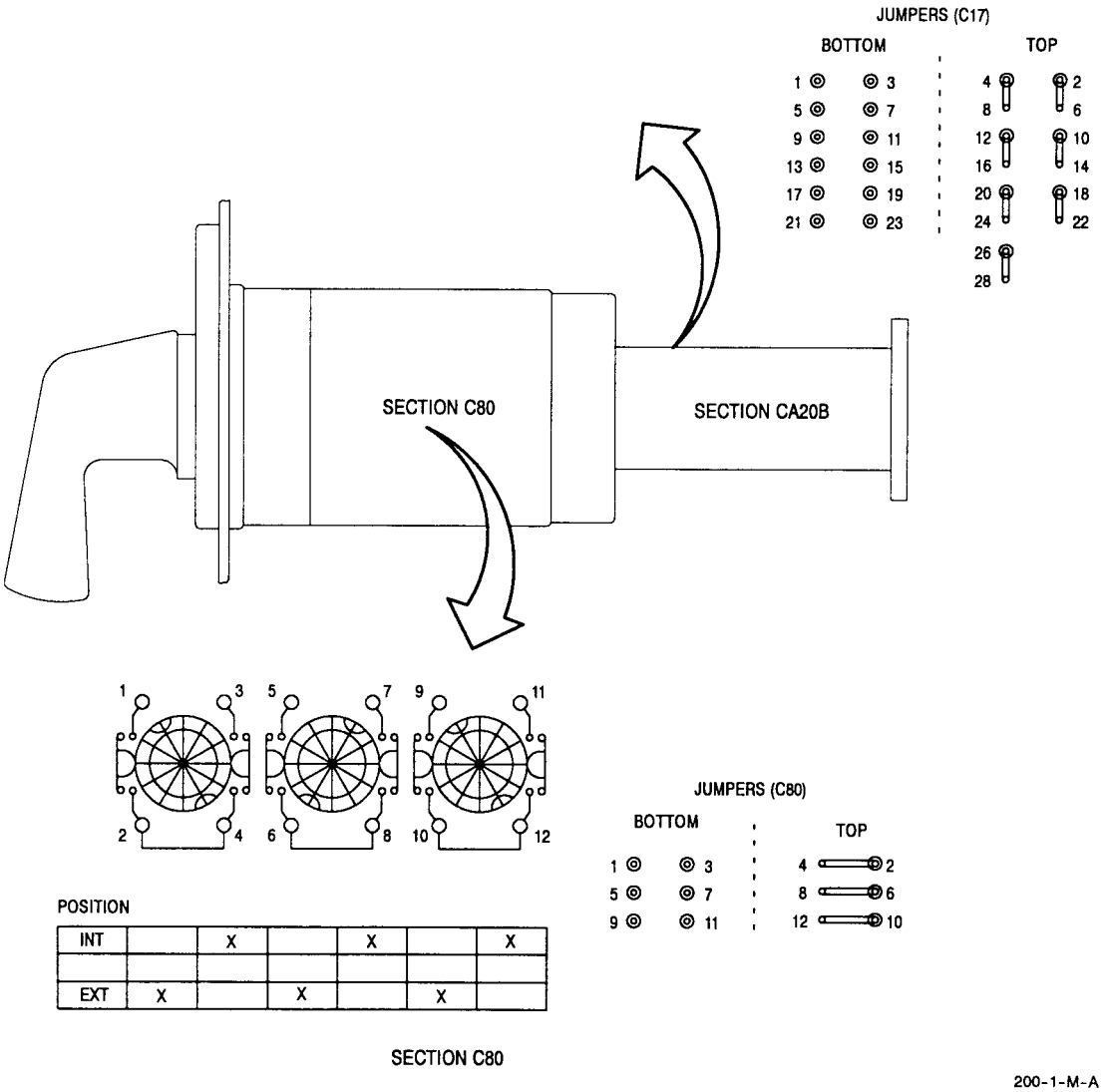
21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF – Continued.



POSITION

EXT			X	X			X	X			X	X		X
INT	X	X			X	X			X	X			X	

SECTION C17



POSITION

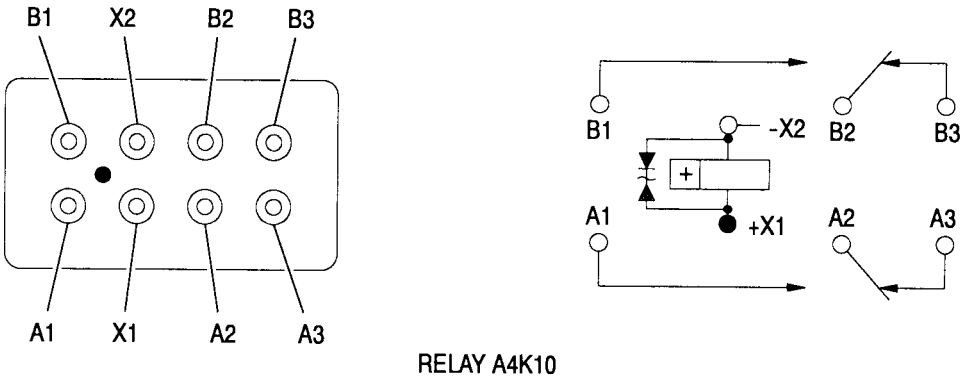
INT		X		X		X
EXT	X		X		X	

SECTION C80

200-1-M-A

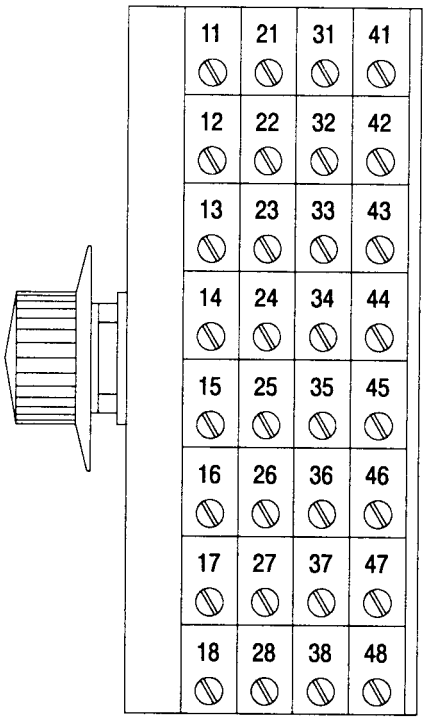
Power Mode Selector Switch

21. NO HOT AIR WITH INTERNAL (ECV) POWER – 'HYD OIL TEMP' ALARM OFF – Continued.



RELAY A4K10

213-1-M



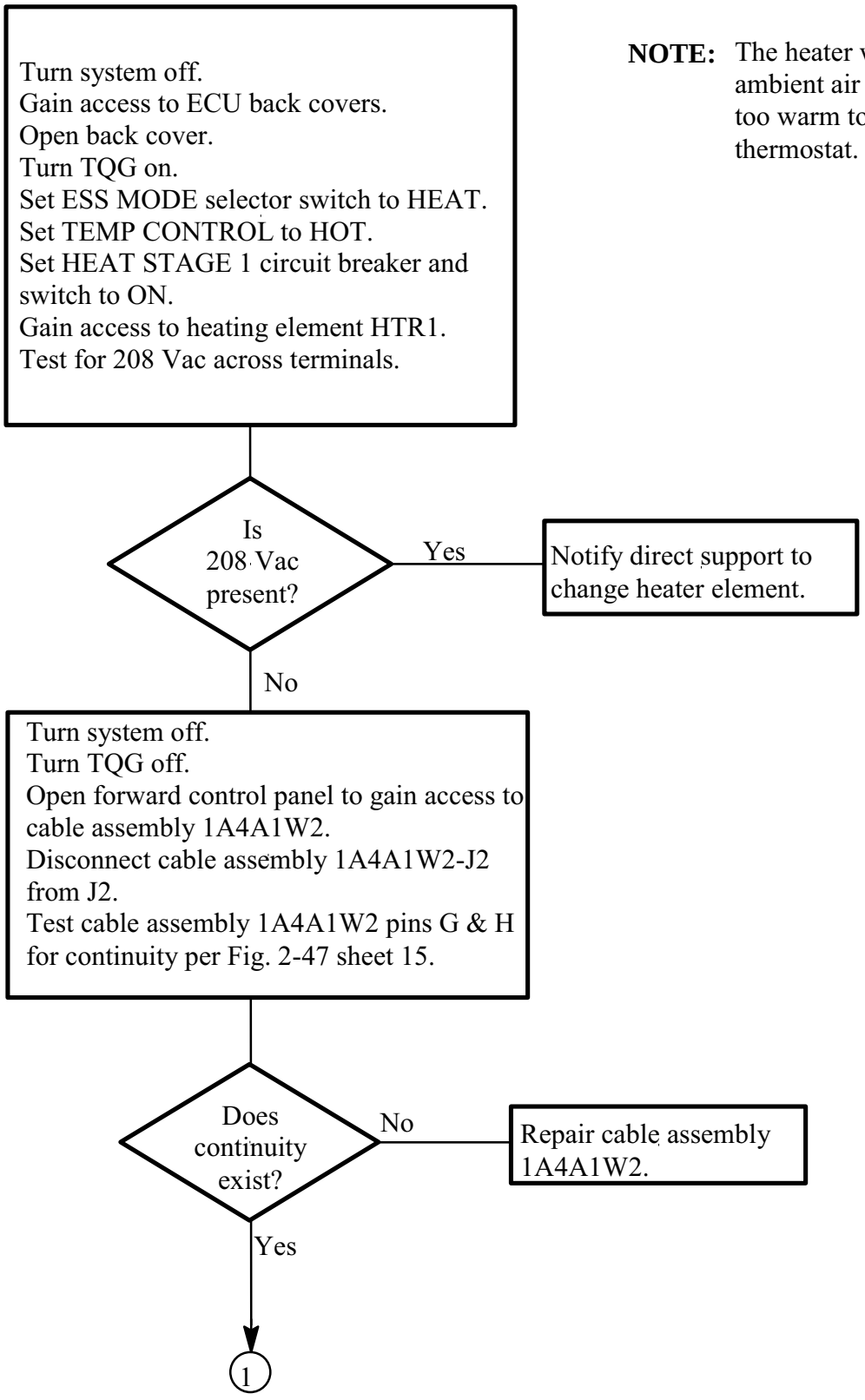
ESS MODE SELECTOR SWITCH

226-1-M

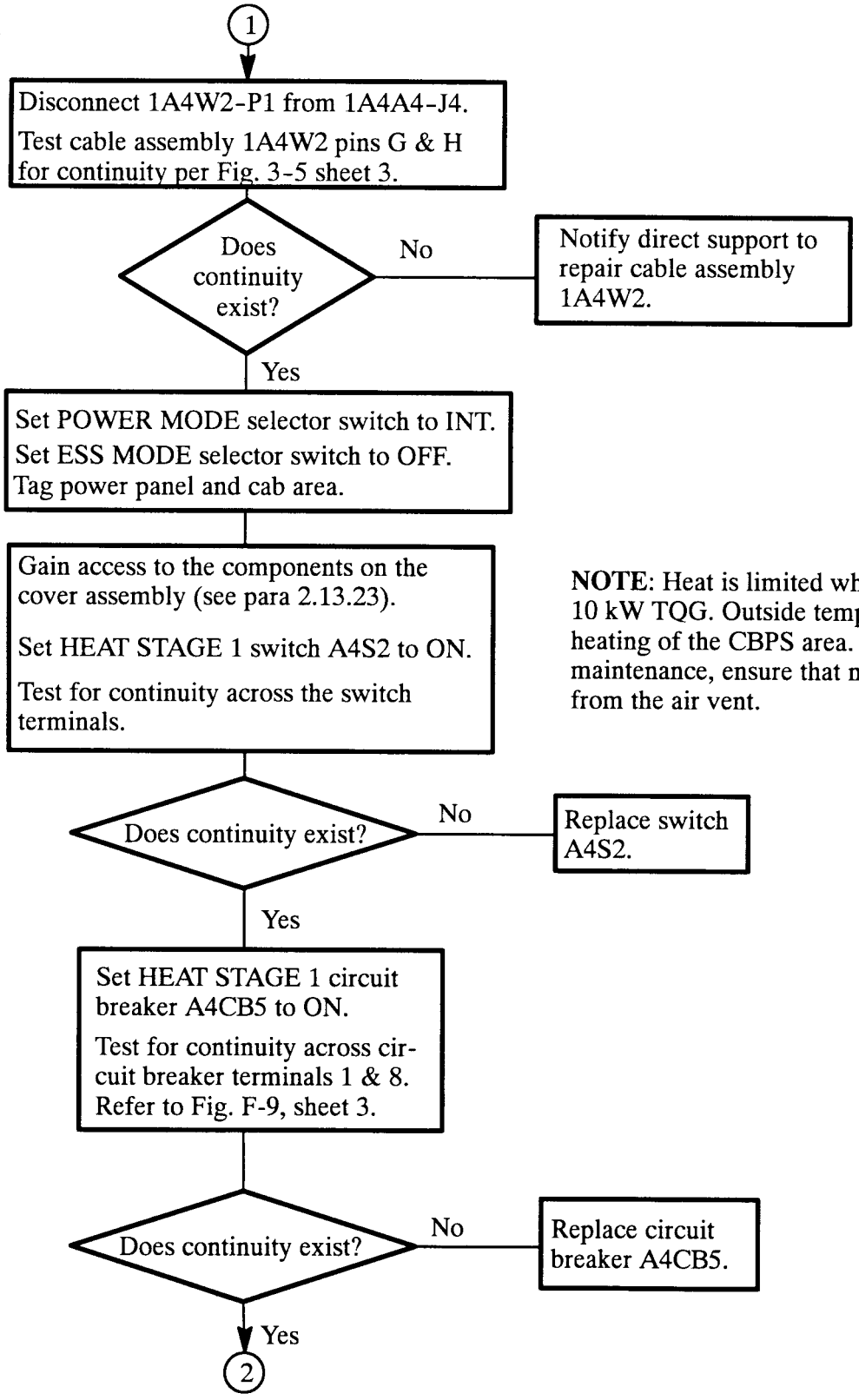
2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER.

NOTE: The heater will not run if the ambient air temperature is too warm to satisfy the thermostat.



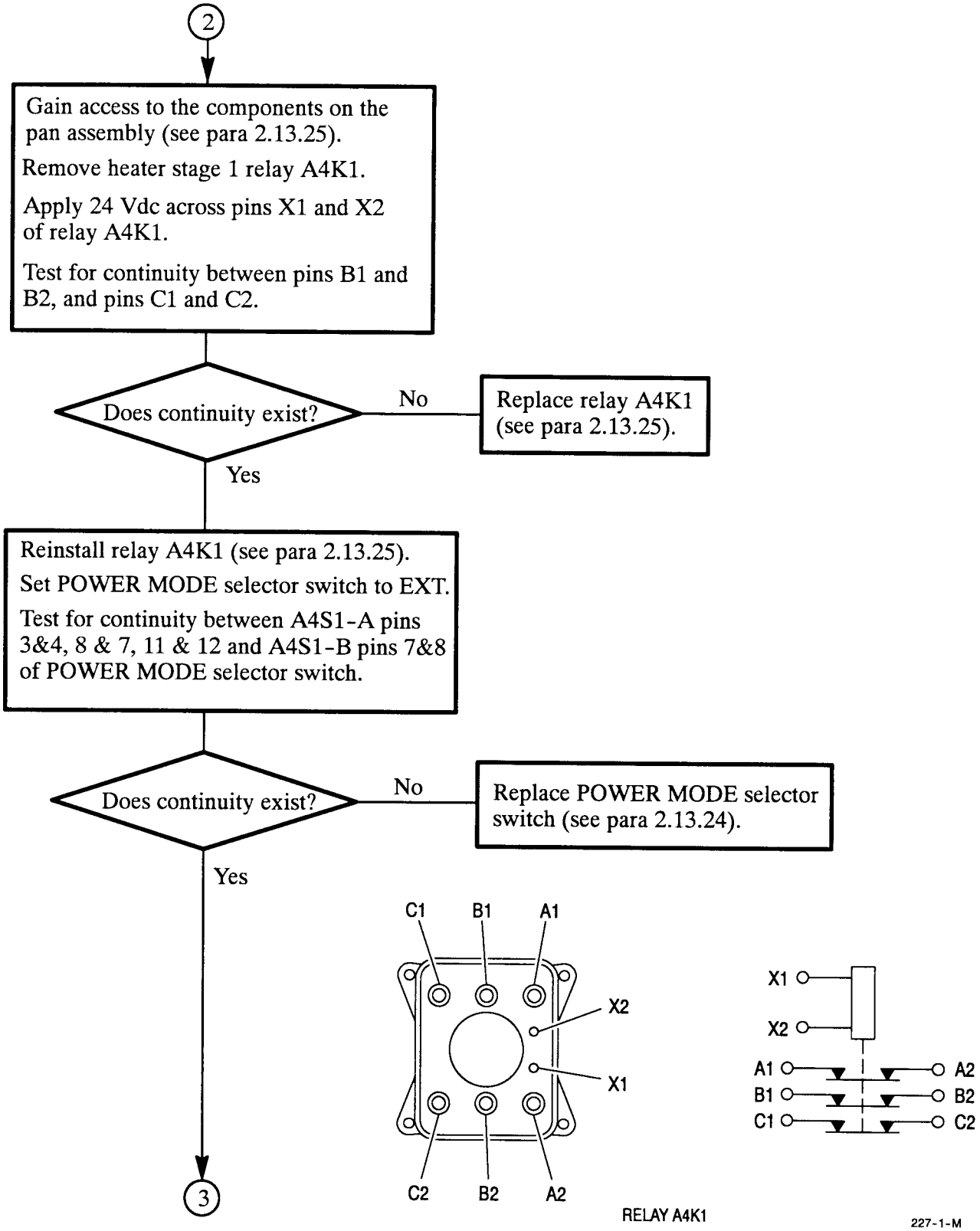
22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.



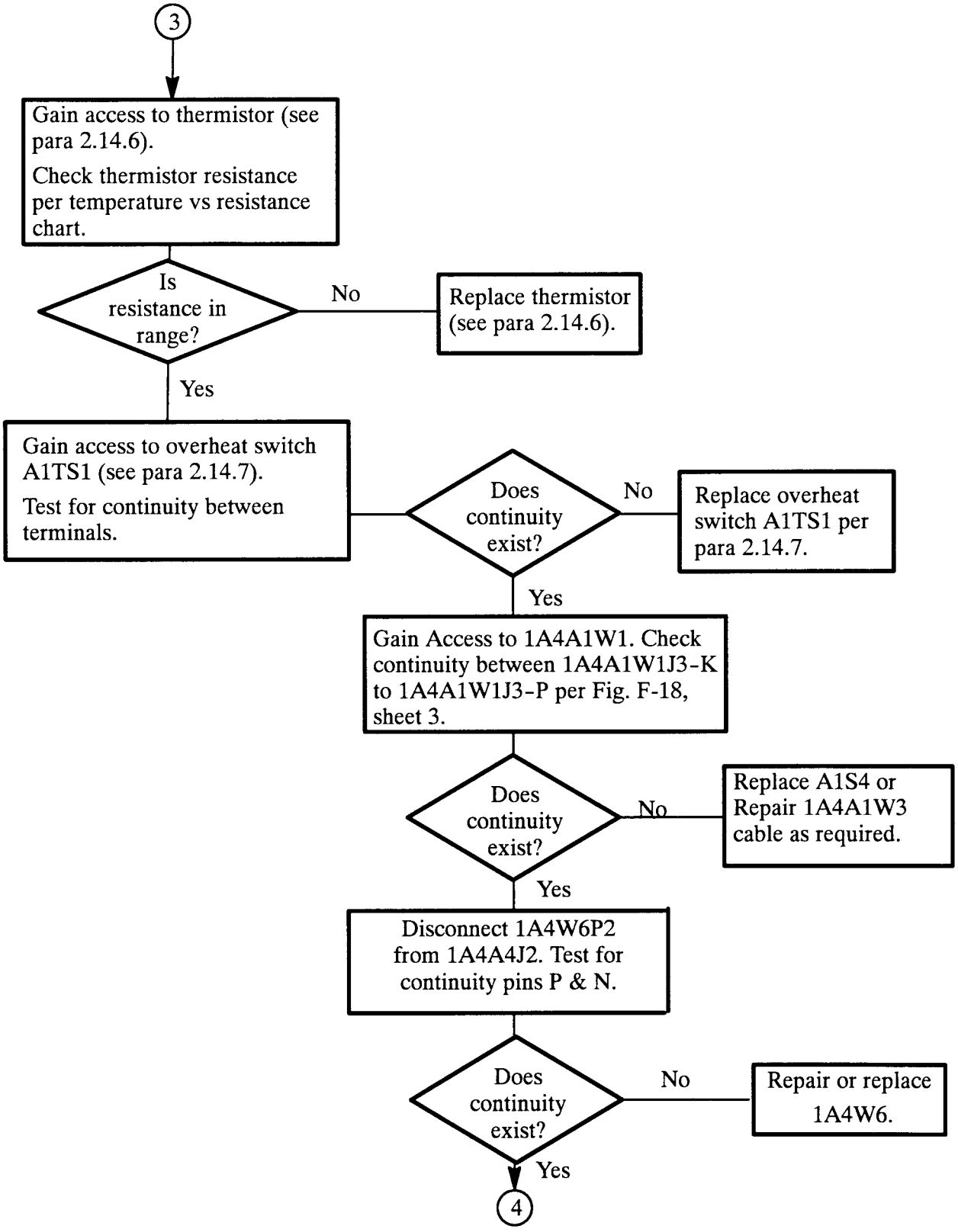
NOTE: Heat is limited when operating with the 10 kW TQG. Outside temperature also impacts heating of the CBPS area. Prior to performing maintenance, ensure that no heat is felt coming from the air vent.

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.

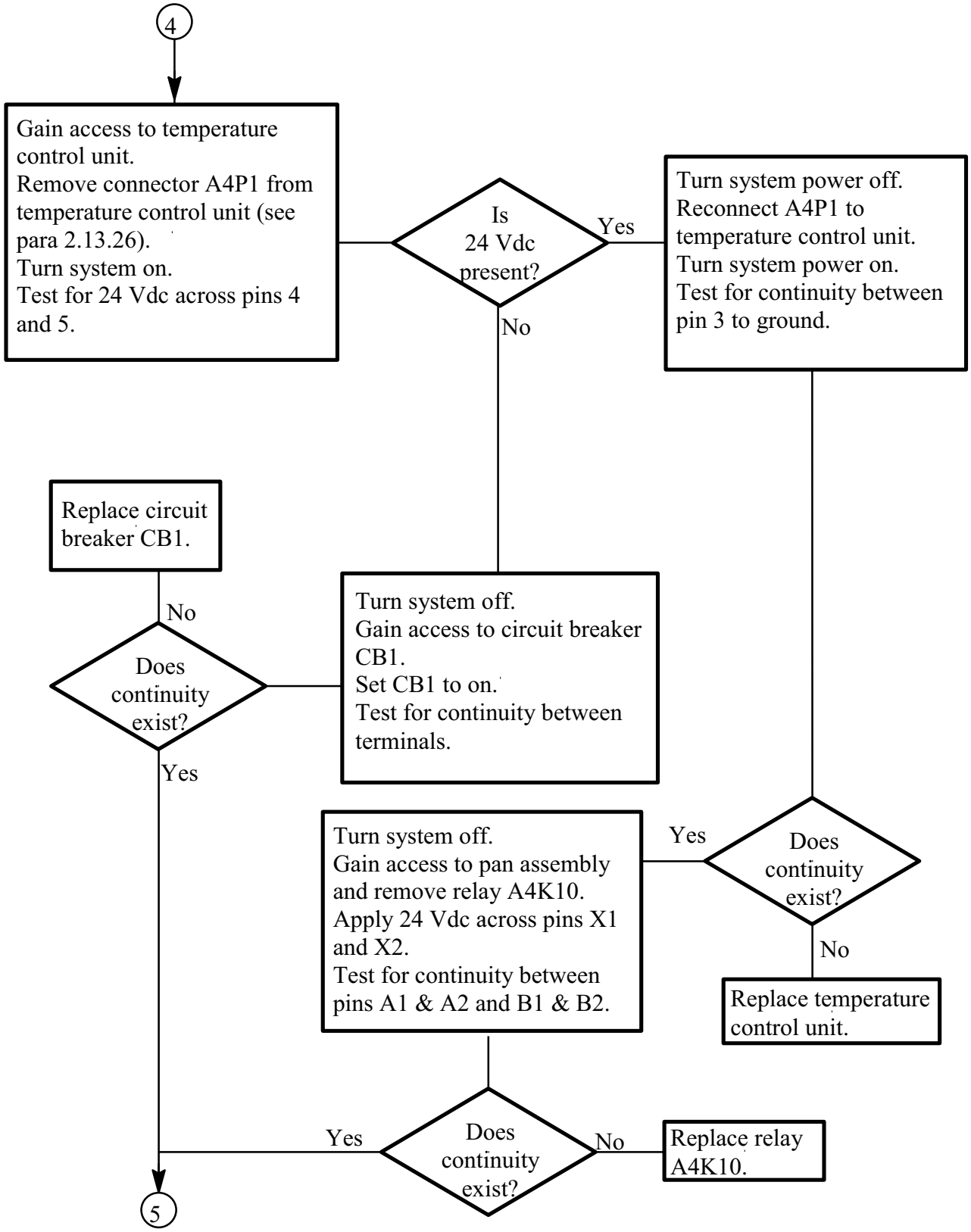


22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.

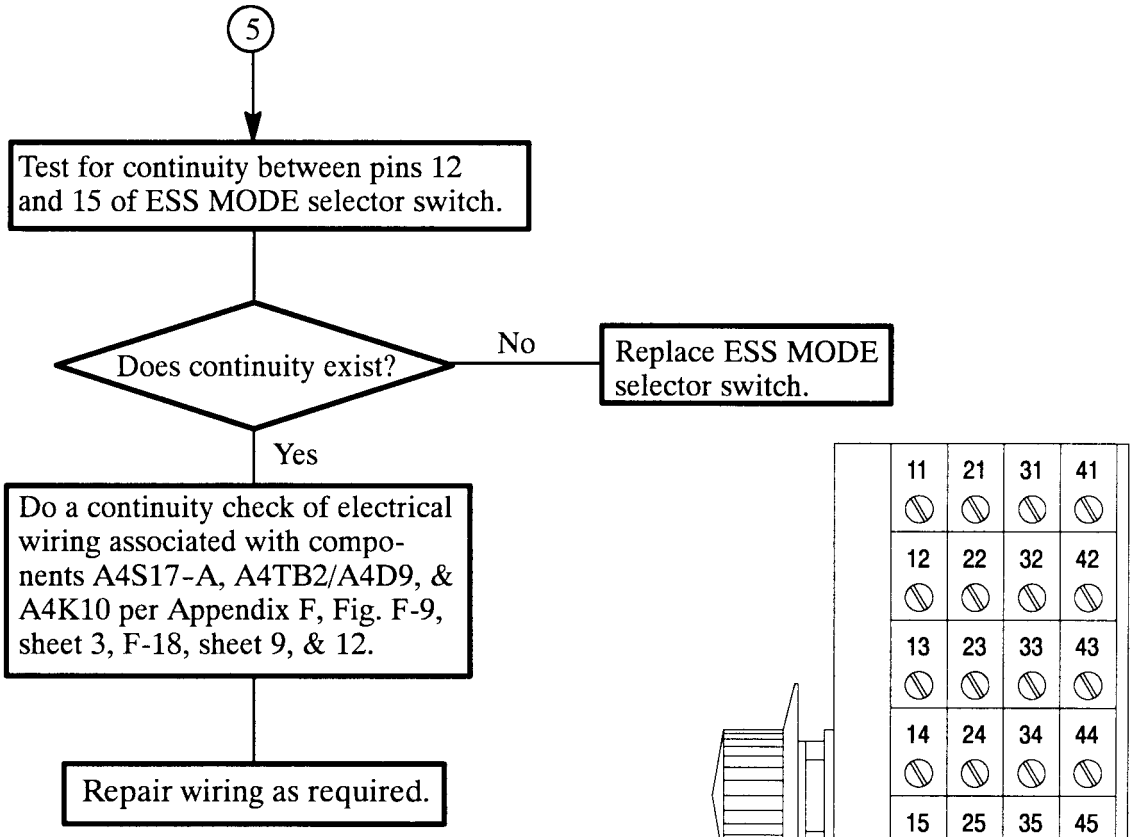


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

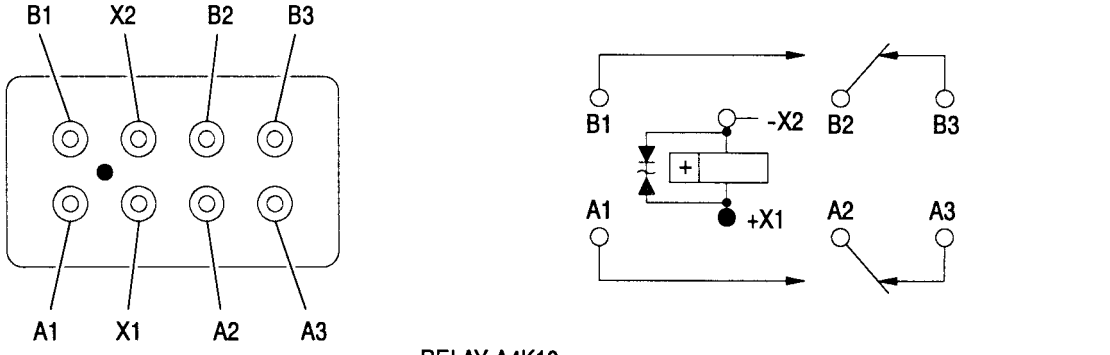
22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.



22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.



ESS MODE SELECTOR SWITCH

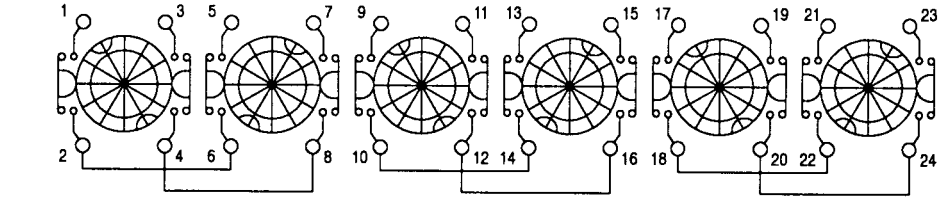


RELAY A4K10

213-1-M

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.



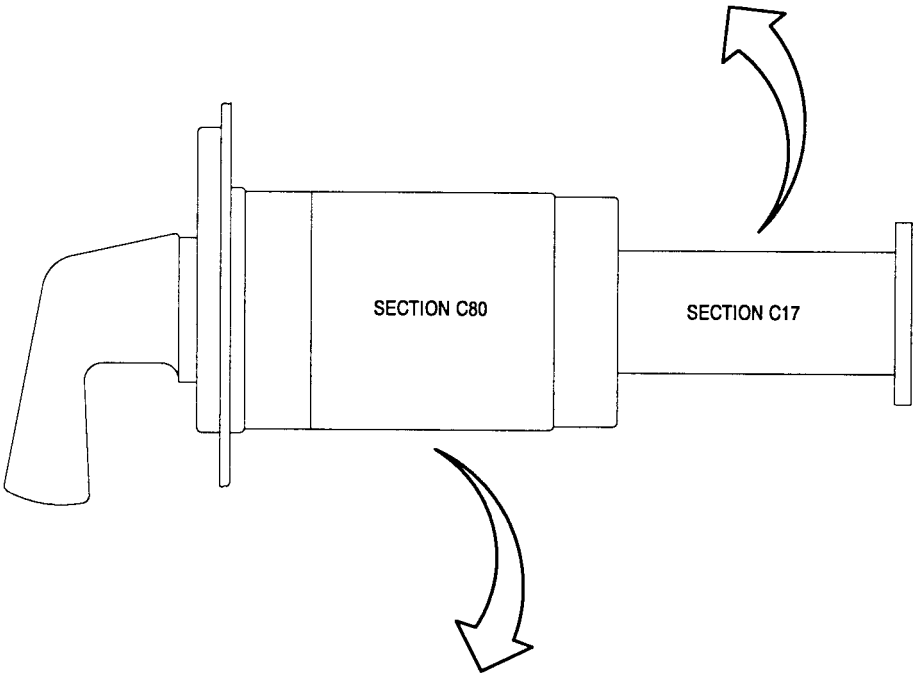
JUMPERS (C17)

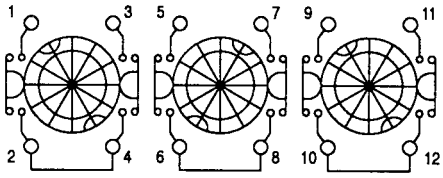
BOTTOM		TOP	
1	3	4	2
5	7	8	6
9	11	12	10
13	15	16	14
17	19	20	18
21	23	24	22

POSITION

EXT			X	X			X	X			X	X
INT	X	X			X	X			X	X		

SECTION C17





JUMPERS (C80)

BOTTOM		TOP	
1	3	4	2
5	7	8	6
9	11	12	10

POSITION

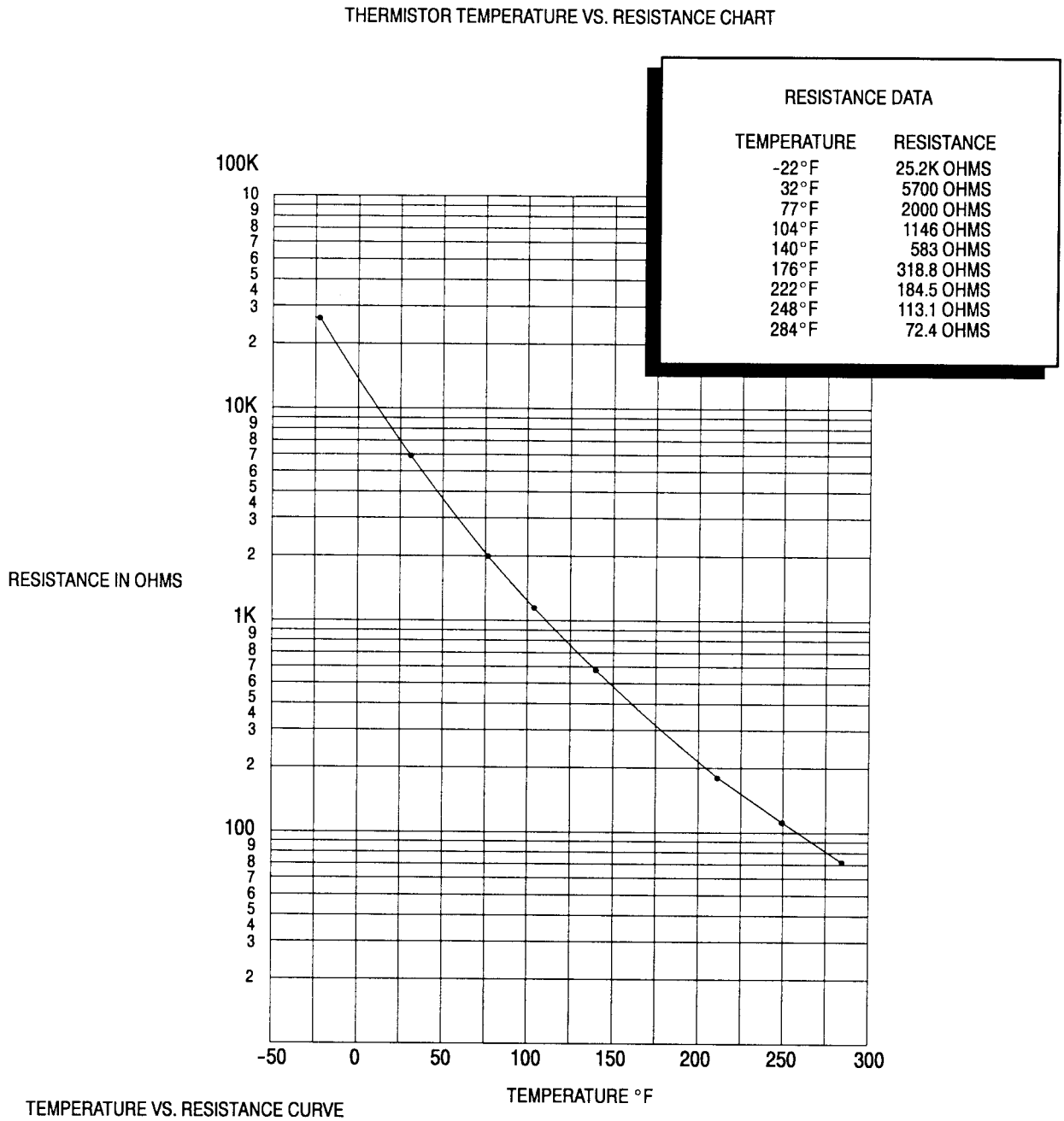
INT		X		X		X
EXT	X		X		X	

SECTION C80

200-1-M

Power Mode Selector Switch

22. NO HOT AIR WHEN OPERATING WITH 'EXT' (10 kW TQG) POWER – Continued.

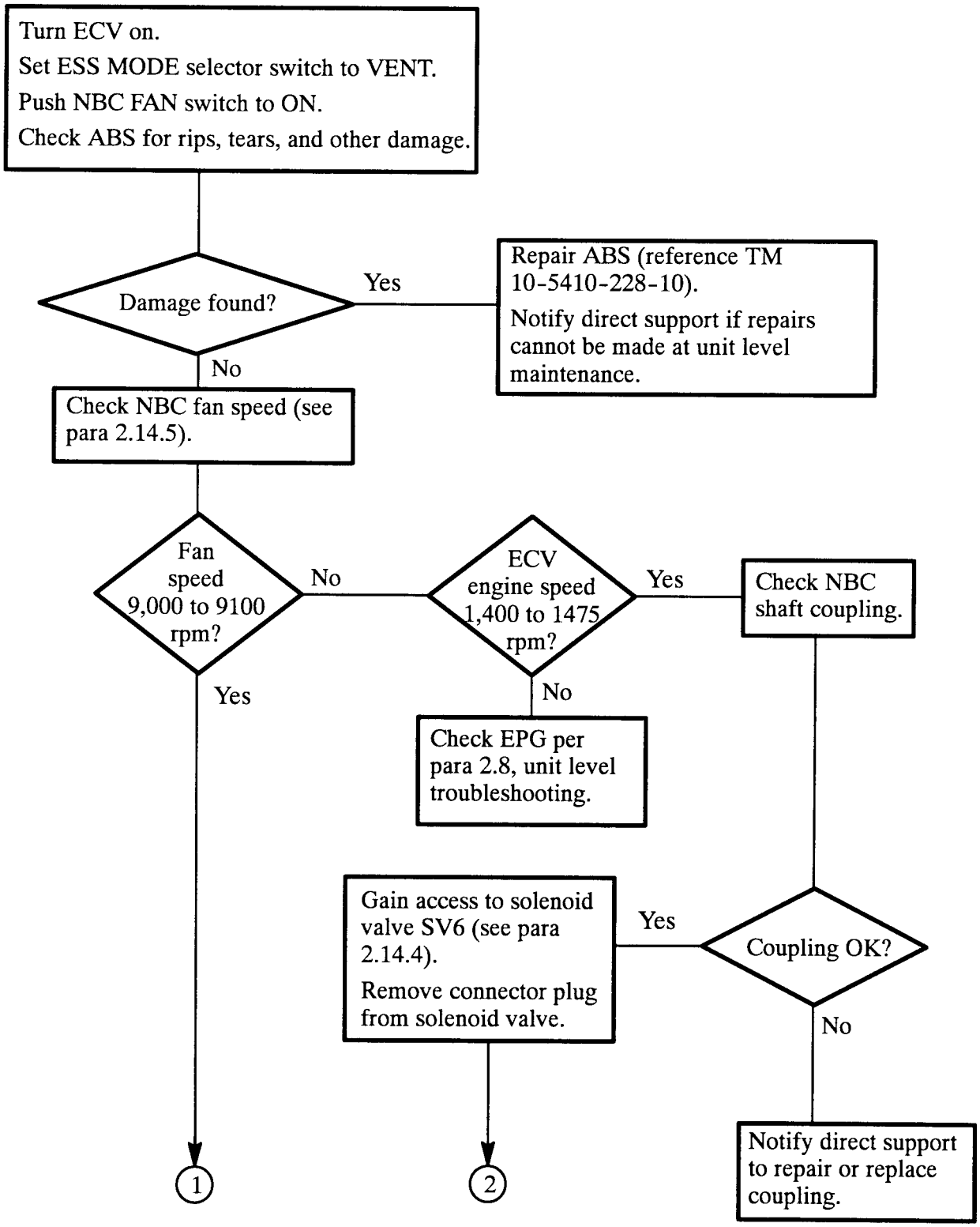


102-1-M

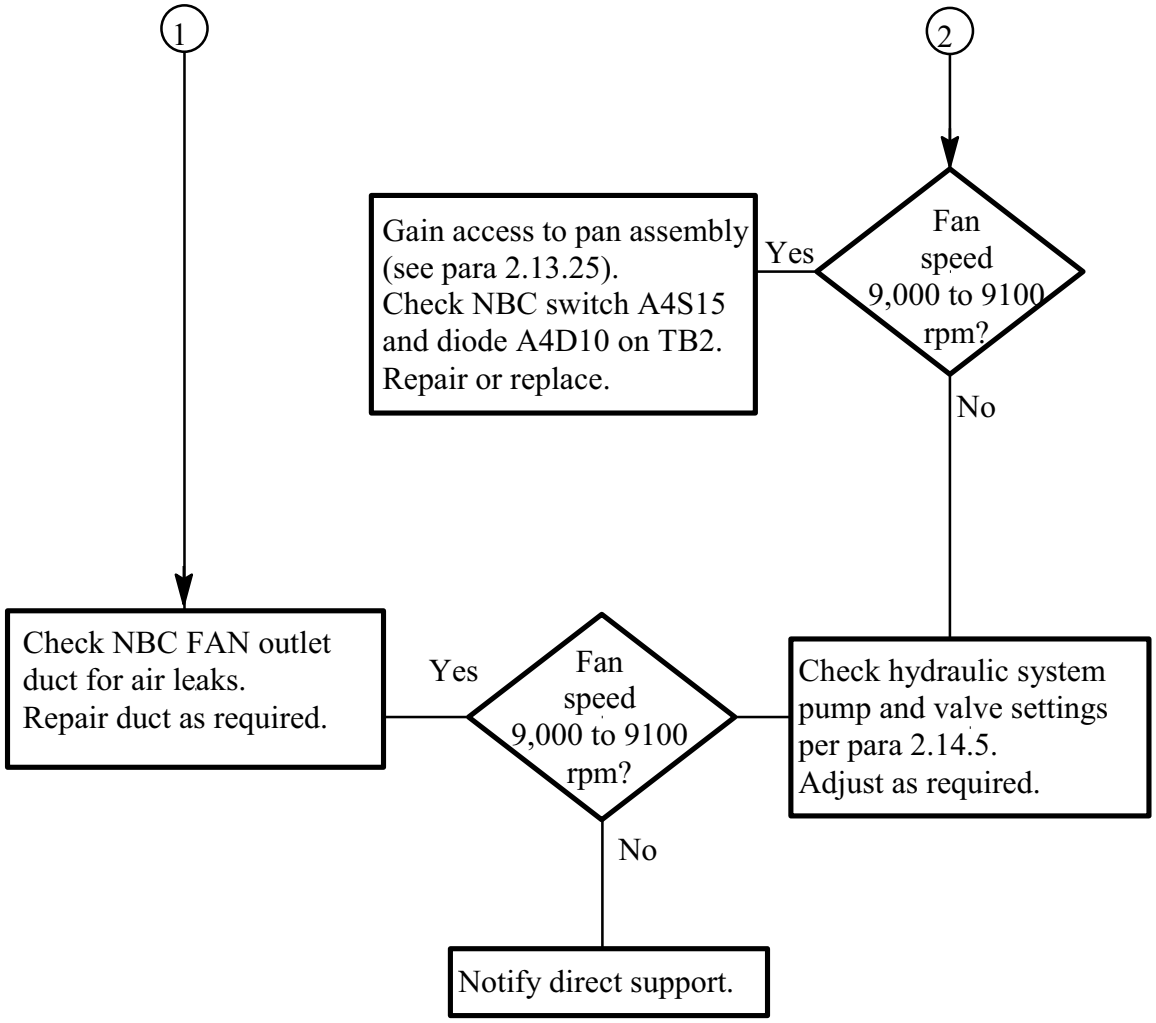
Thermistor Resistance

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

23. UNABLE TO OVER–PRESSURIZE THE ABS ENCLOSURE, INTERNAL POWER, STATIC POSITION.

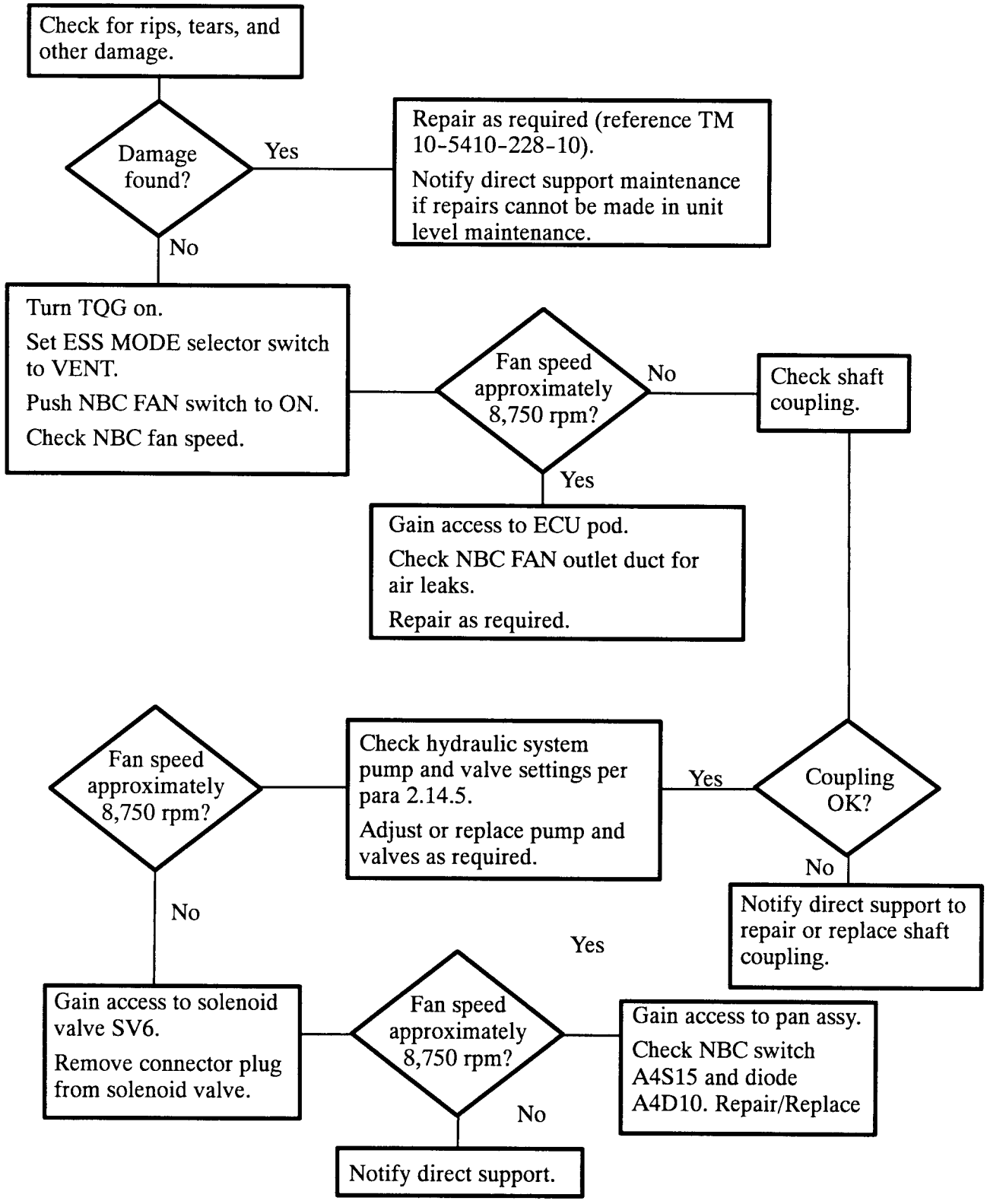


23. UNABLE TO OVER–PRESSURIZE THE ABS ENCLOSURE, INTERNAL POWER, STATIC POSITION – Continued.

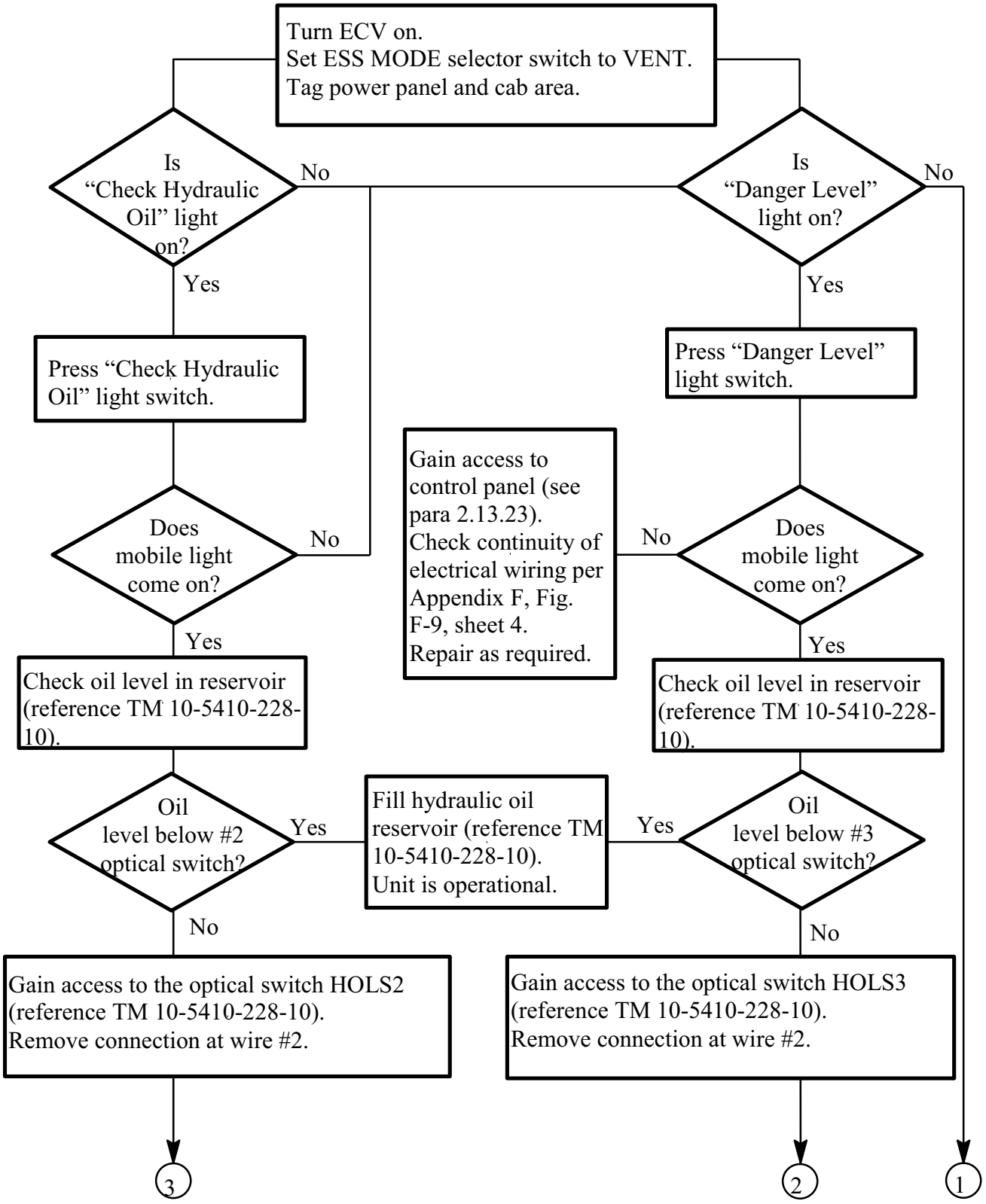


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

24. UNABLE TO OVER–PRESSURIZE THE ABS ENCLOSURE, EXTERNAL POWER, STATIC POSITION.

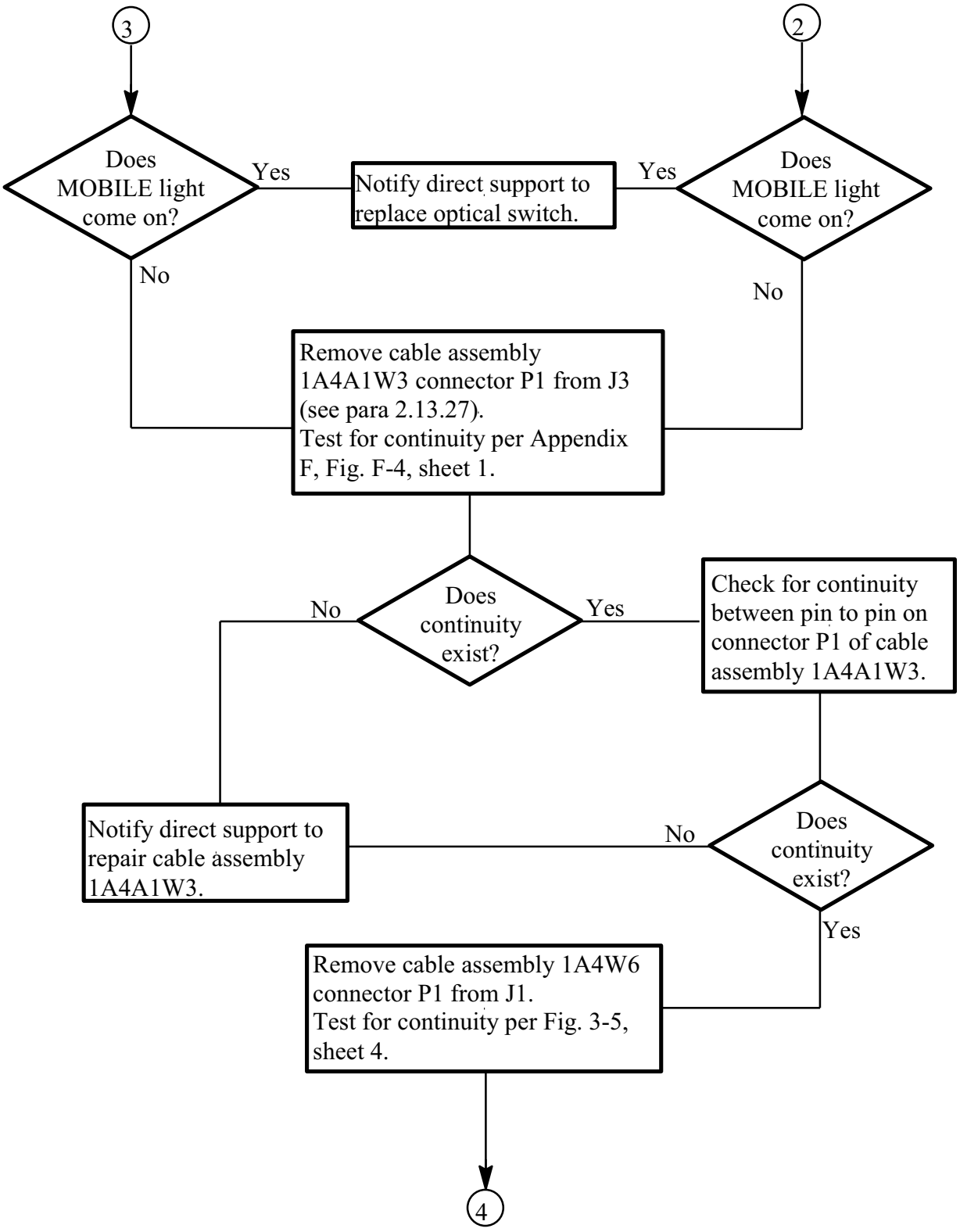


25. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR MOBILE MODE, 'MOBILE' INDICATOR OFF, AND ESS MODE SWITCH ON, INTERNAL POWER MODE.

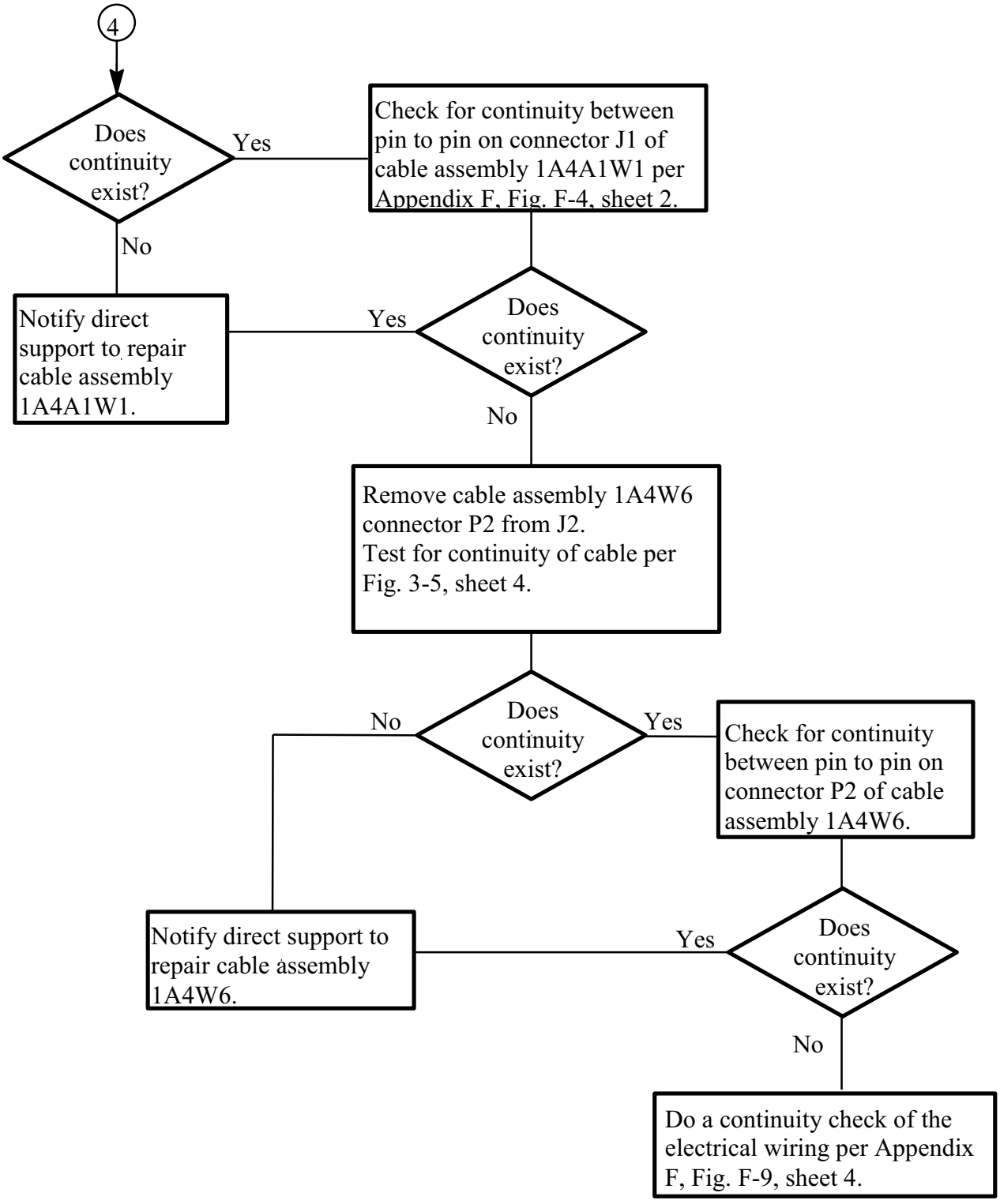


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

25. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR MOBILE MODE, 'MOBILE' INDICATOR OFF, AND ESS MODE SWITCH ON, INTERNAL POWER MODE – Continued.

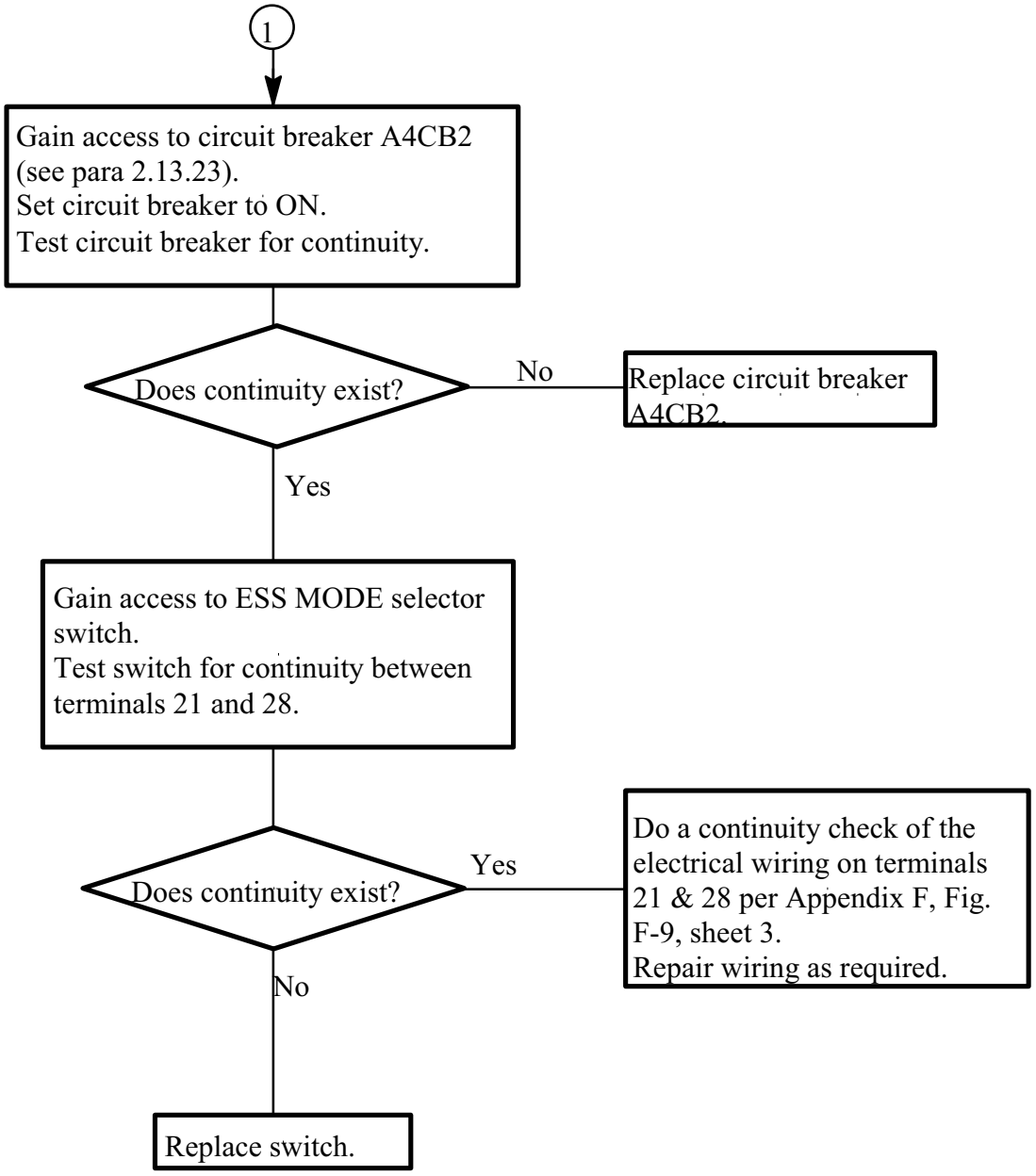


25. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR MOBILE MODE, 'MOBILE' INDICATOR OFF, AND ESS MODE SWITCH ON, INTERNAL POWER MODE – Continued.

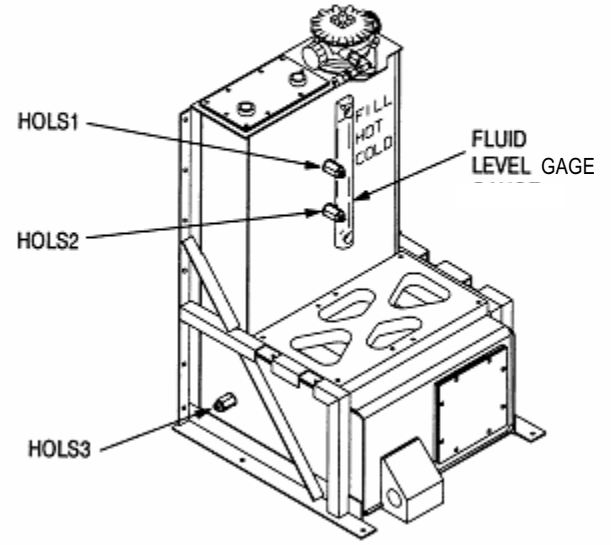


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

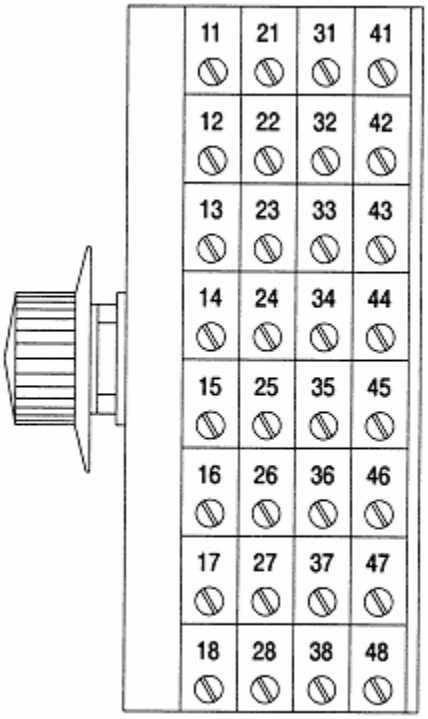
25. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR MOBILE MODE, 'MOBILE' INDICATOR OFF, AND ESS MODE SWITCH ON, INTERNAL POWER MODE – Continued.



25. NO AIR FLOW WHEN MISSION PROFILE SWITCH IS SET FOR MOBILE MODE, 'MOBILE' INDICATOR OFF, AND ESS MODE SWITCH ON, INTERNAL POWER MODE – Continued.



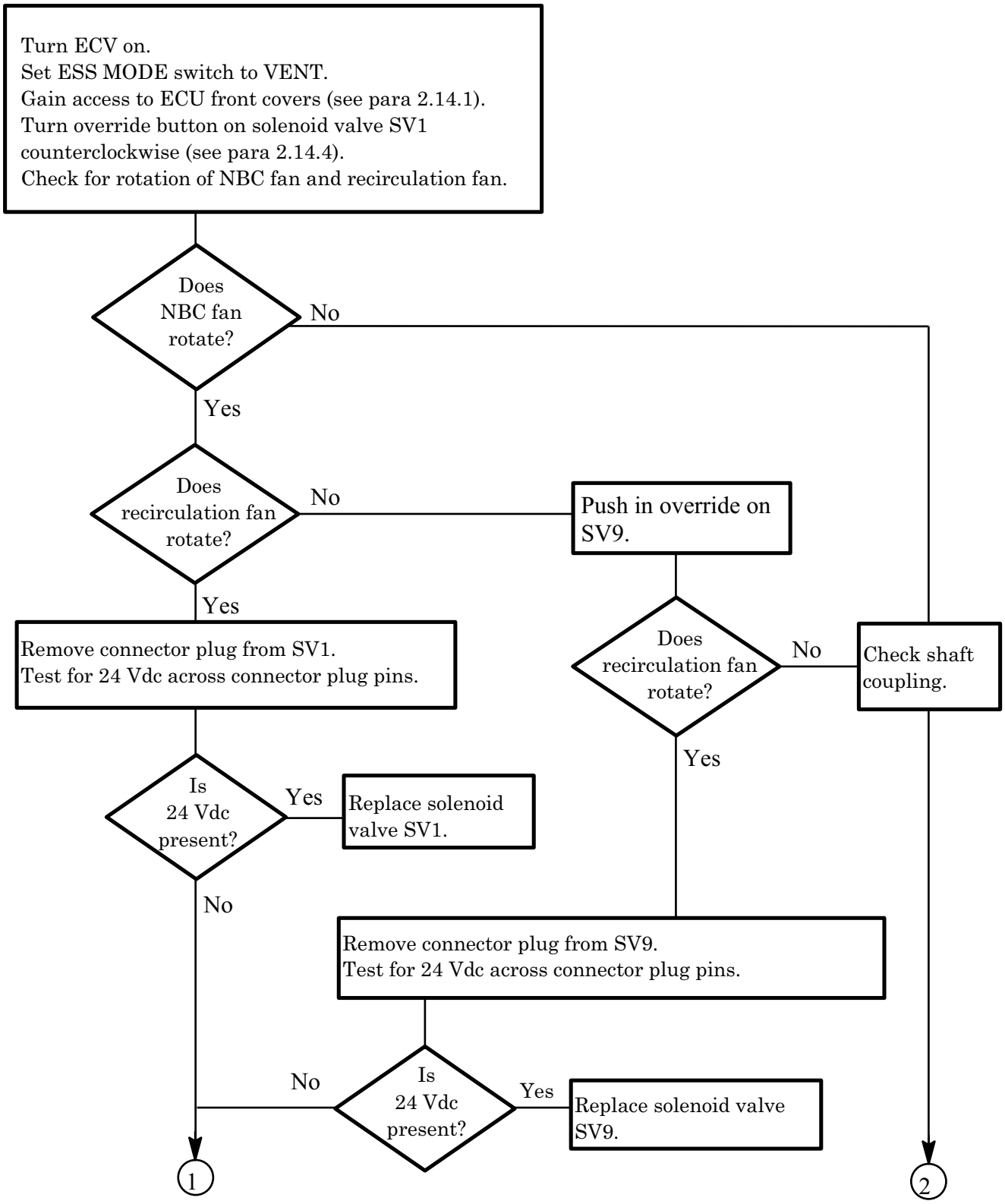
HYDRAULIC RESERVOIR 235-1-M



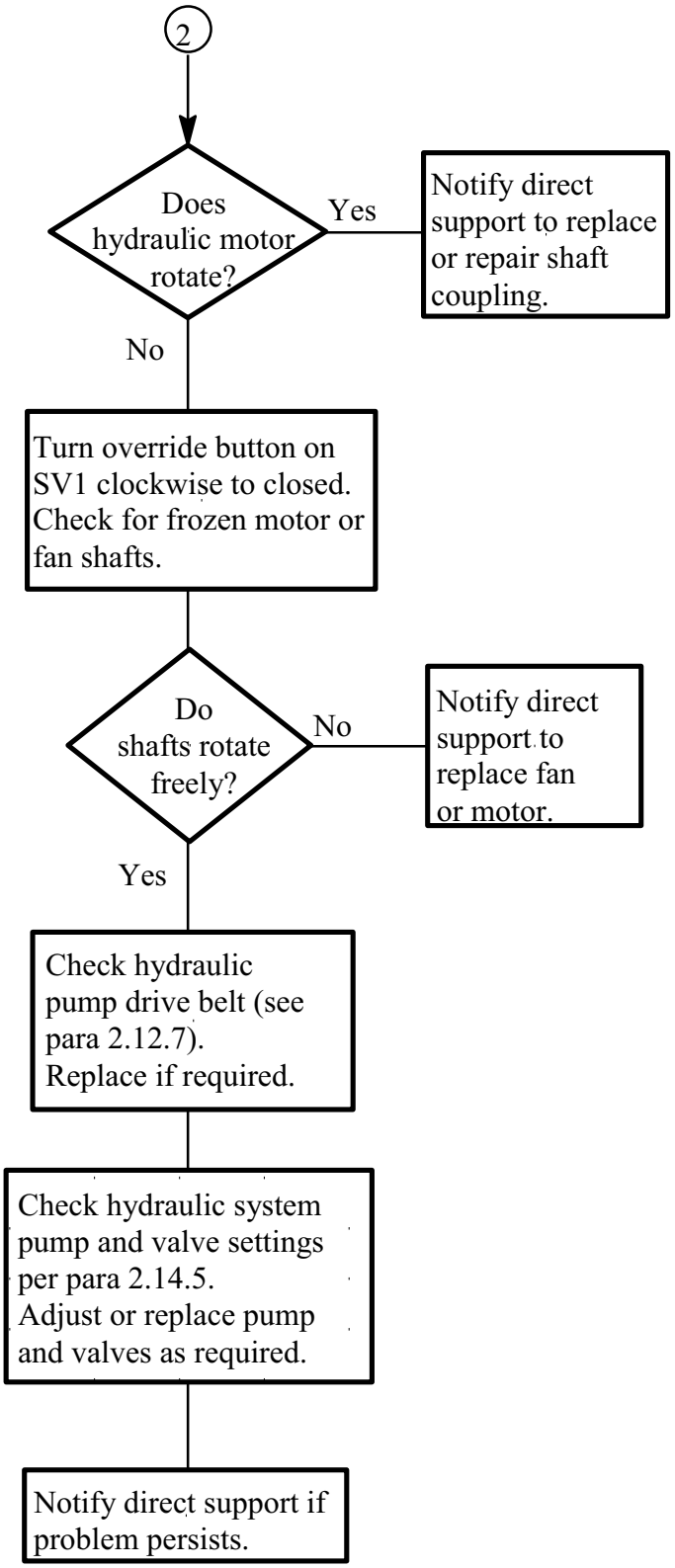
ESS MODE SELECTOR SWITCH 226-1-M

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

26. NO AIR WHEN ESS CONTROL MODULE IS SET TO THE VENT MODE, MOBILE MODE, INTERNAL POWER.

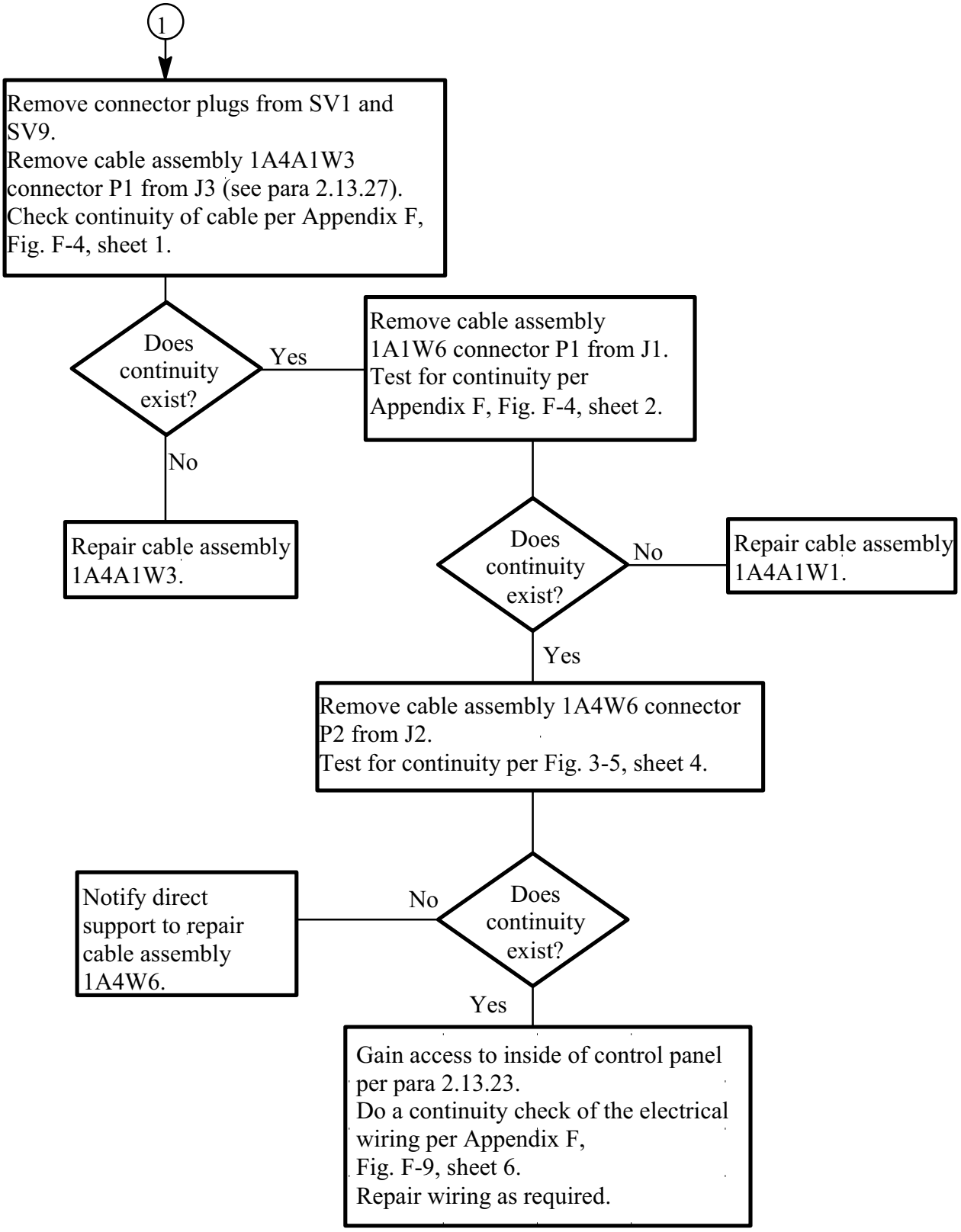


26. NO AIR WHEN ESS CONTROL MODULE IS SET TO THE VENT MODE, MOBILE MODE, INTERNAL POWER – Continued.

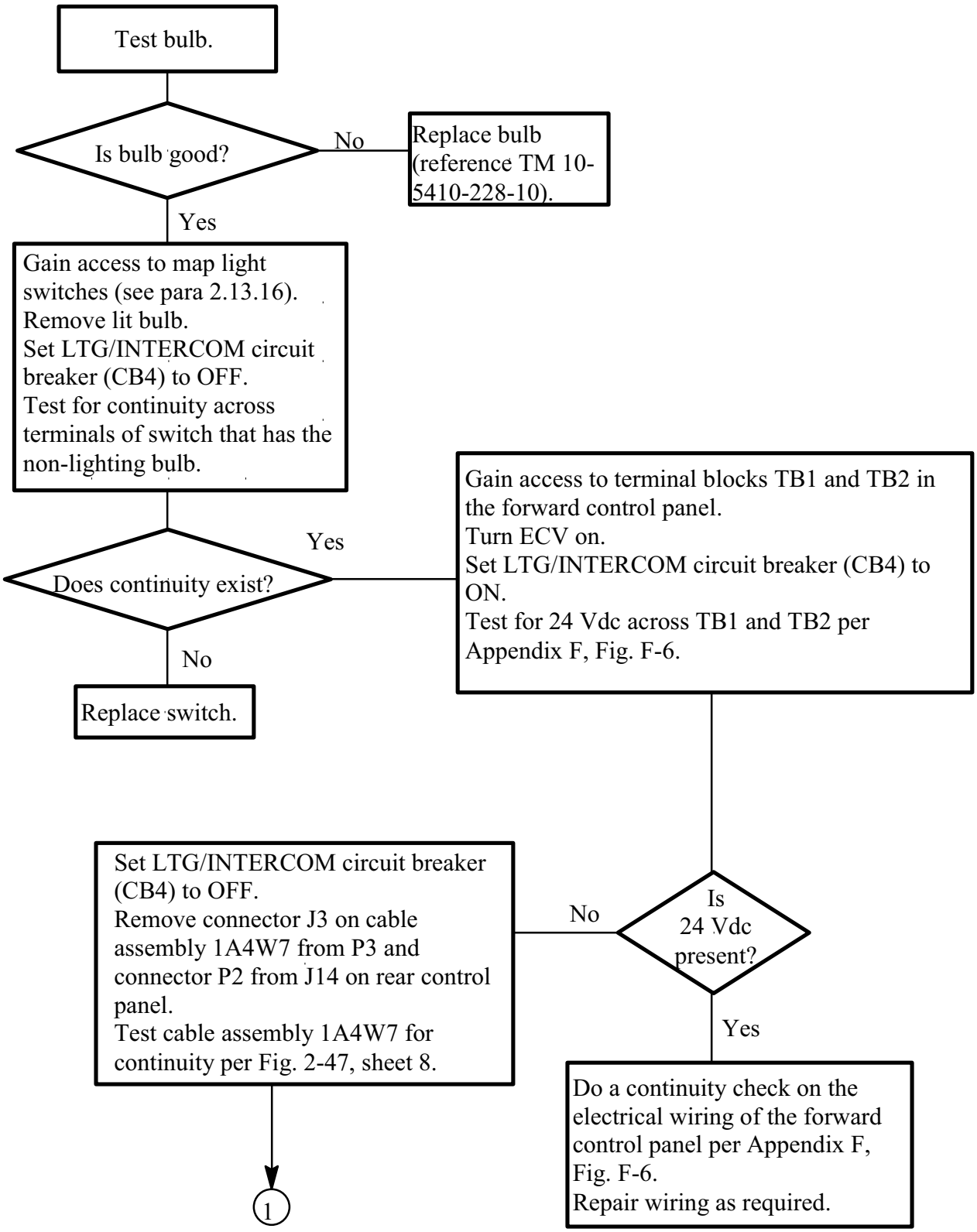


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

26. NO AIR WHEN ESS CONTROL MODULE IS SET TO THE VENT MODE, MOBILE MODE, INTERNAL POWER – Continued.

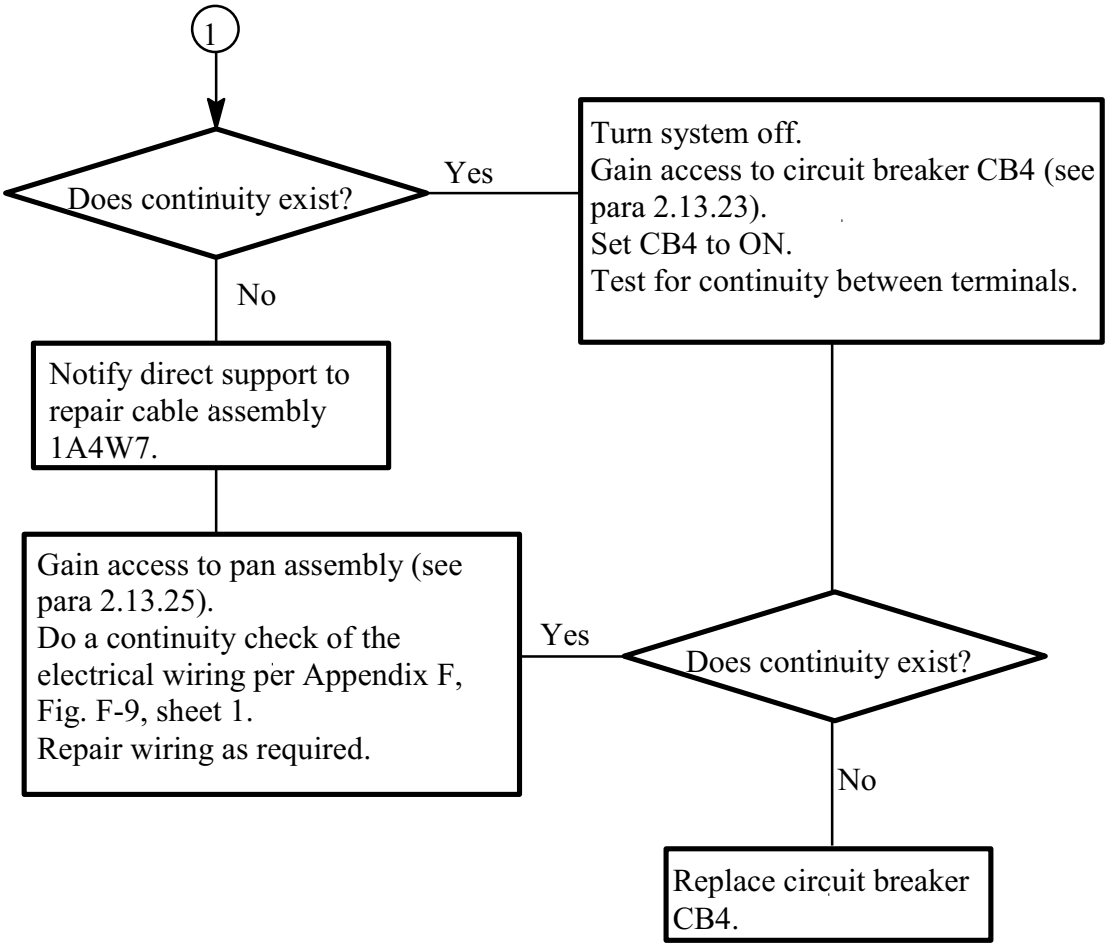


27. LEFT/RIGHT MAP LIGHT ON FORWARD CONTROL PANEL DOES NOT COME ON.

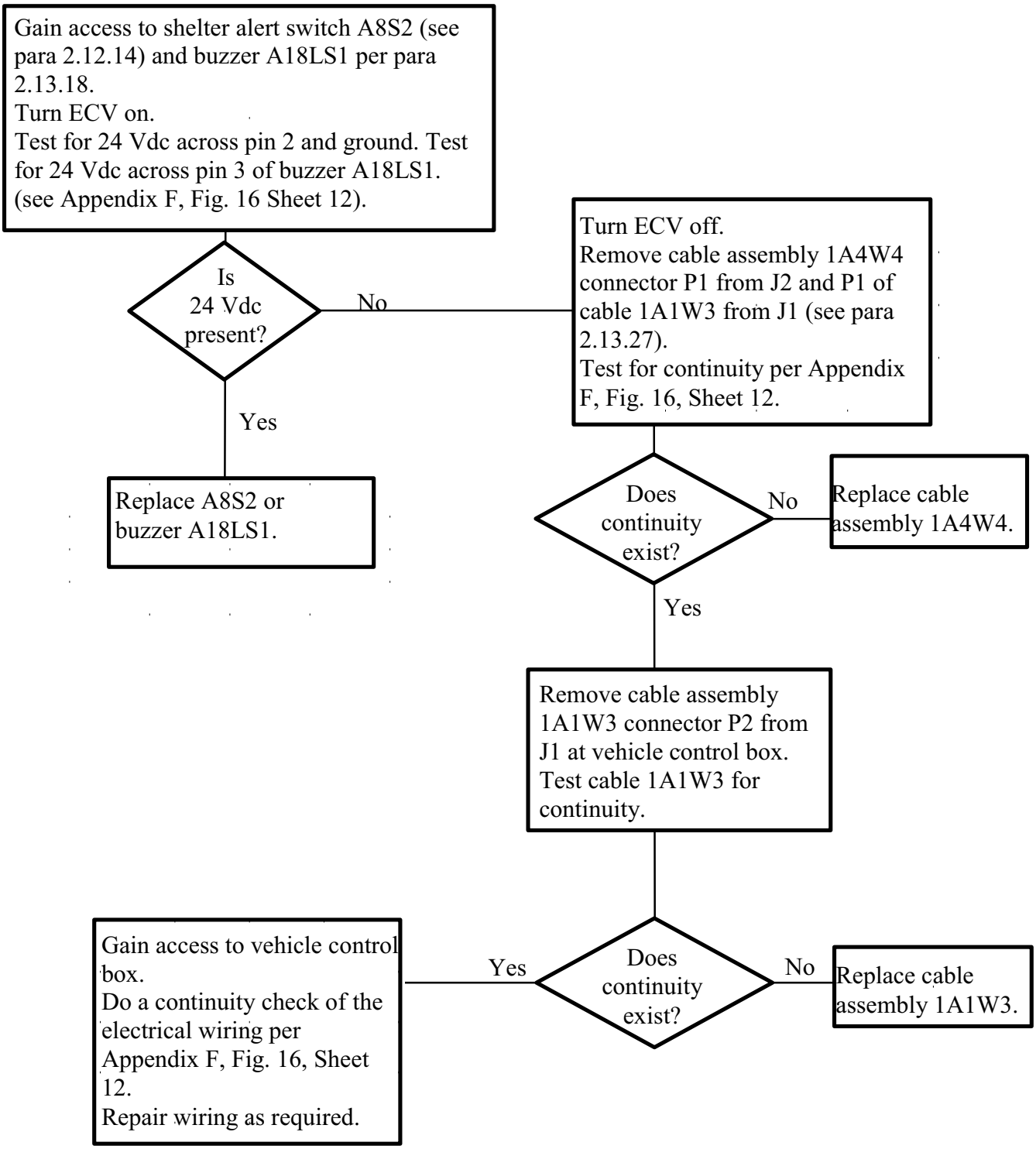


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

27. LEFT/RIGHT MAP LIGHT ON FORWARD CONTROL PANEL DOES NOT COME ON – Continued.

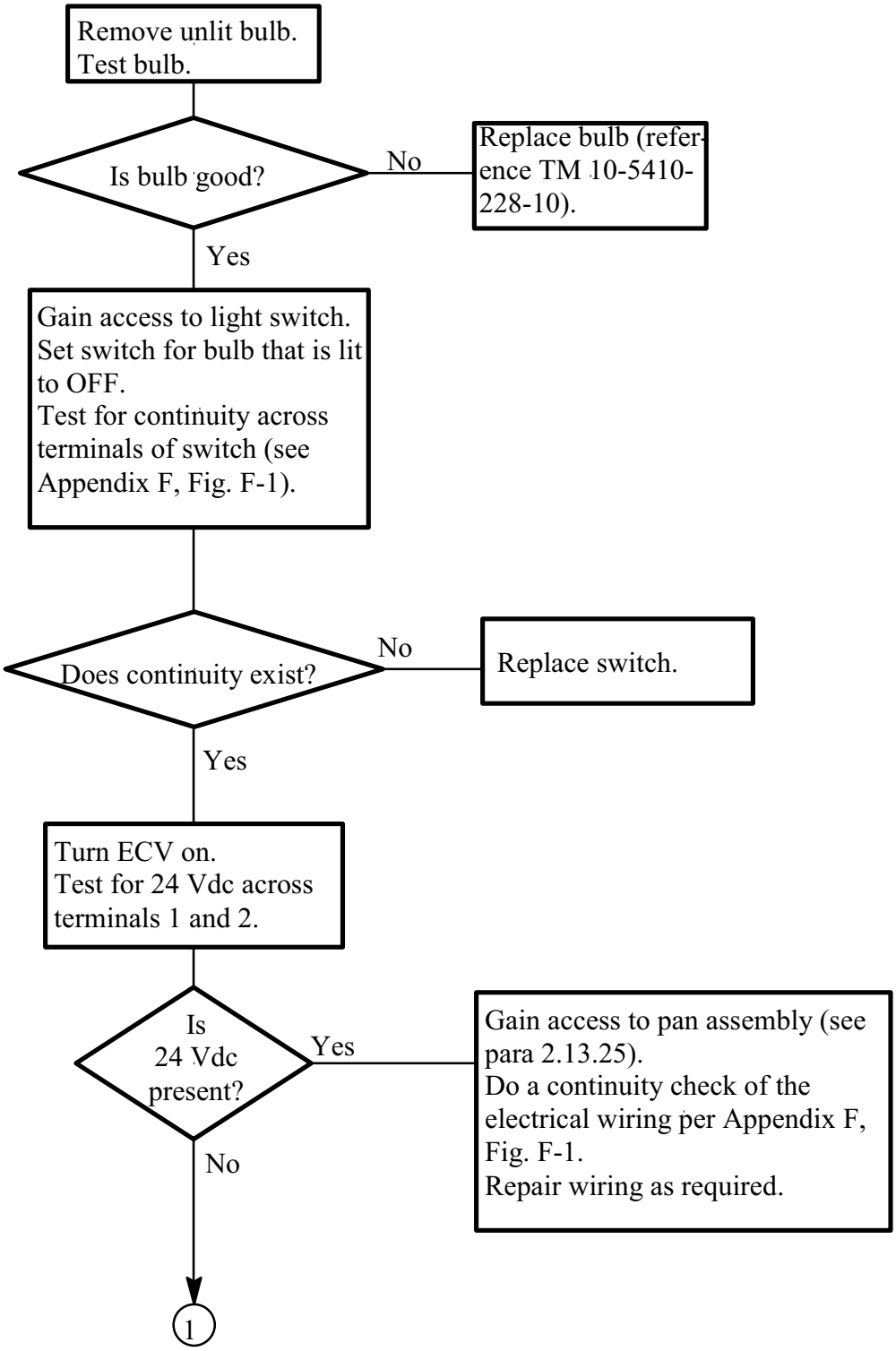


28. "SHELTER ALERT" INDICATOR DOES NOT COME ON AND BUZZER DOES NOT SOUND WHEN VEHICLE CONTROL BOX SHELTER ALERT (MOMENTARY) BUTTON IS PRESSED.

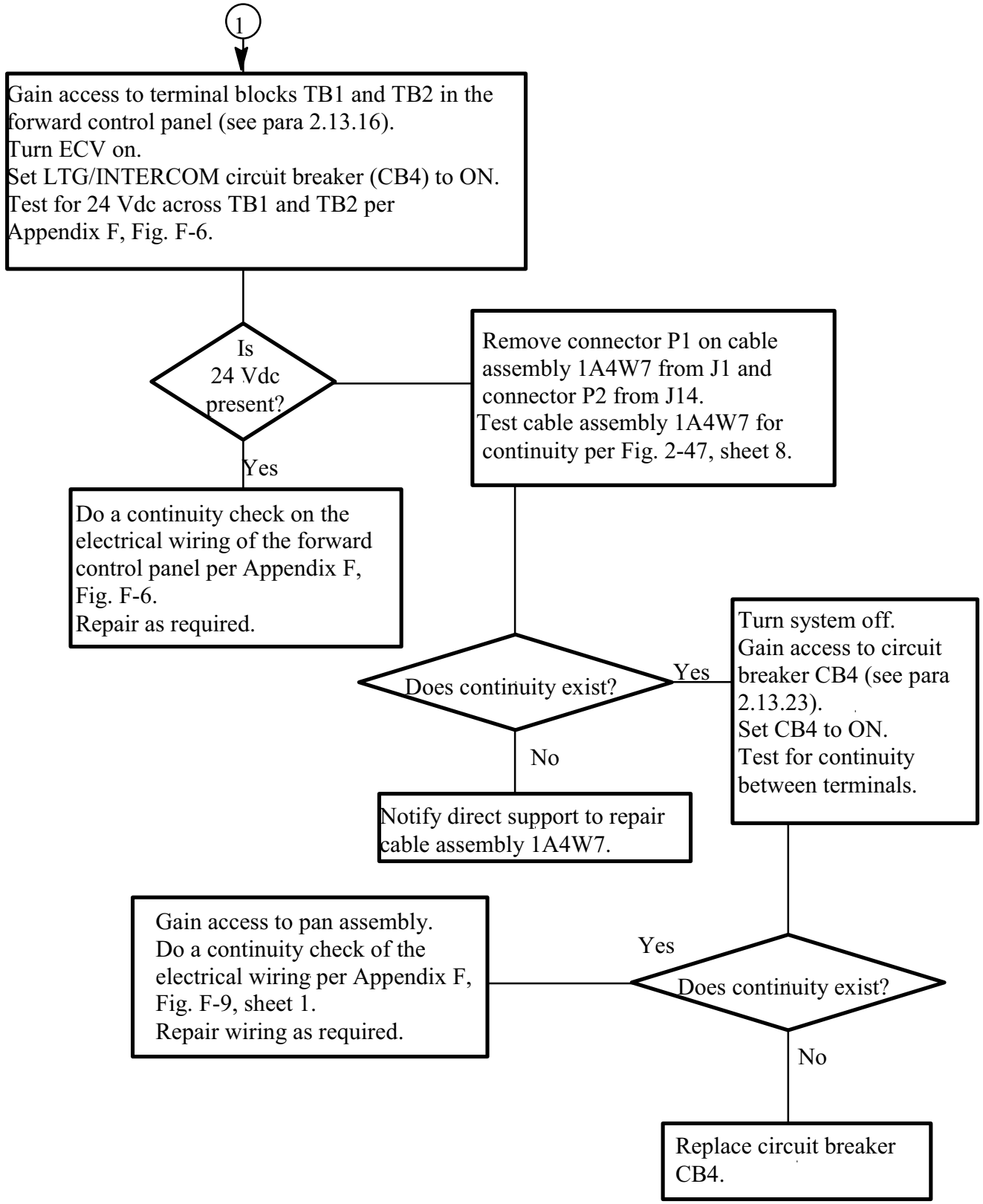


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

29. AFT LAMP DOES NOT COME ON.

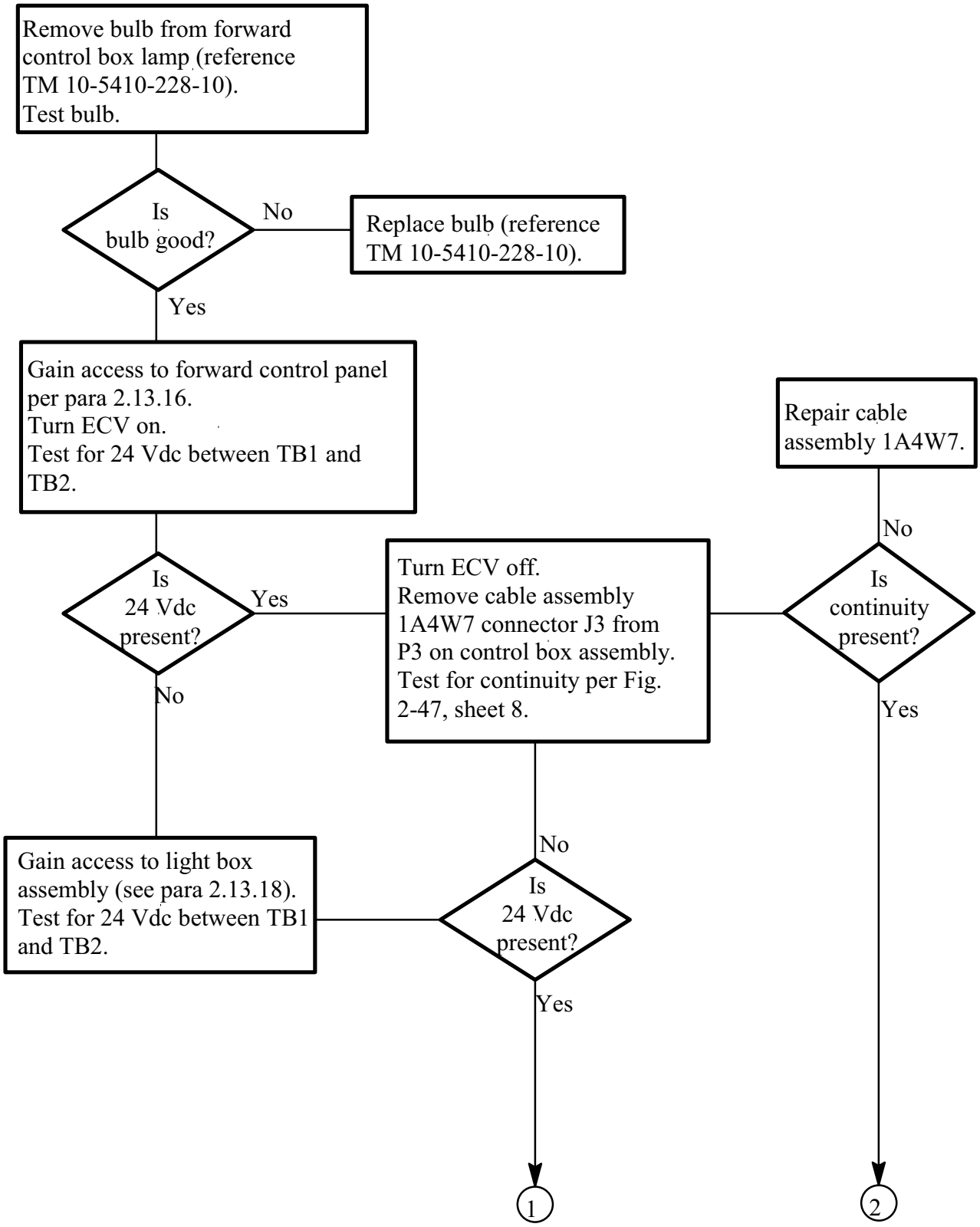


29. AFT LAMP DOES NOT COME ON – Continued.

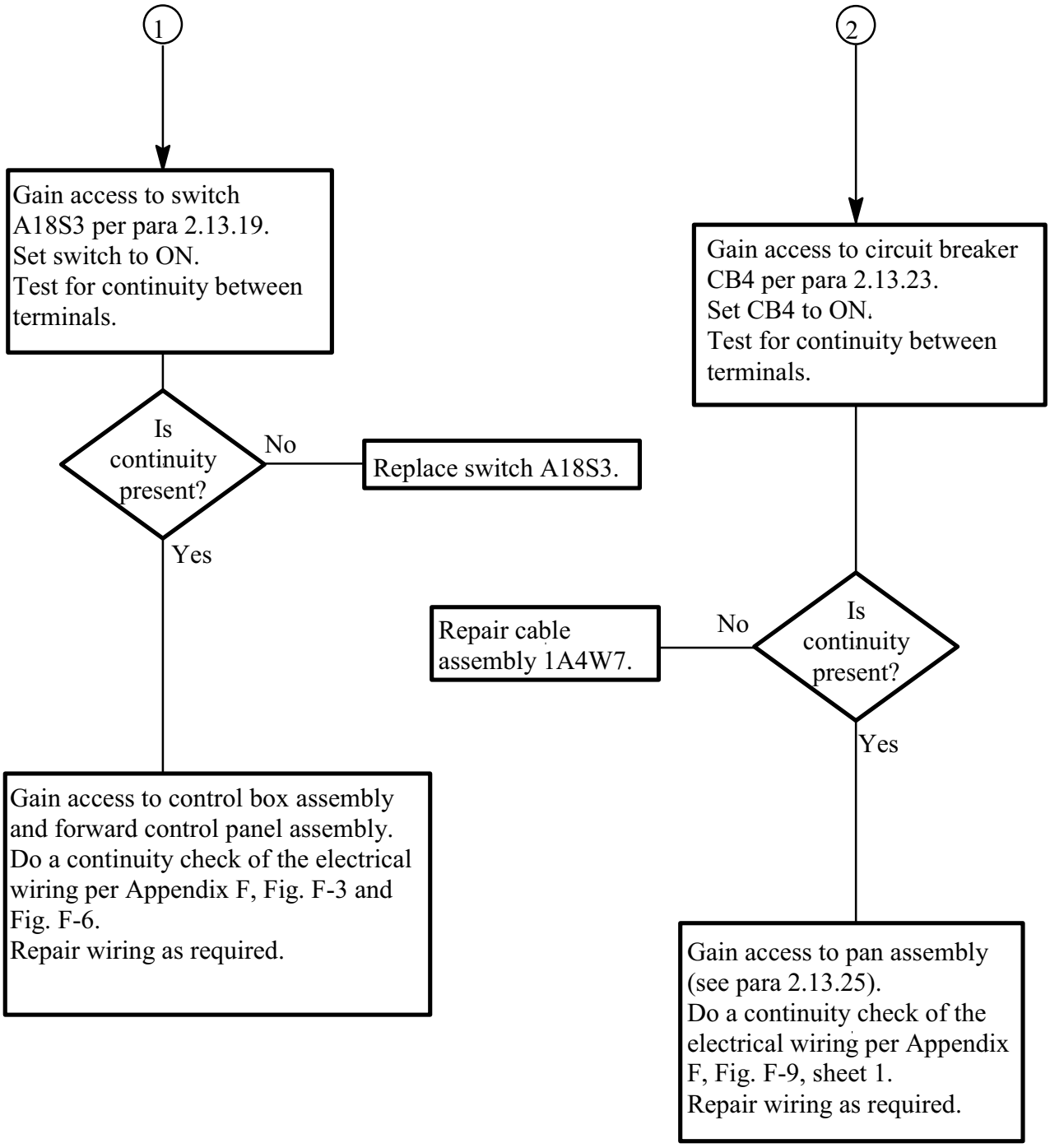


2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

30. FWD LAMP DOES NOT COME ON.

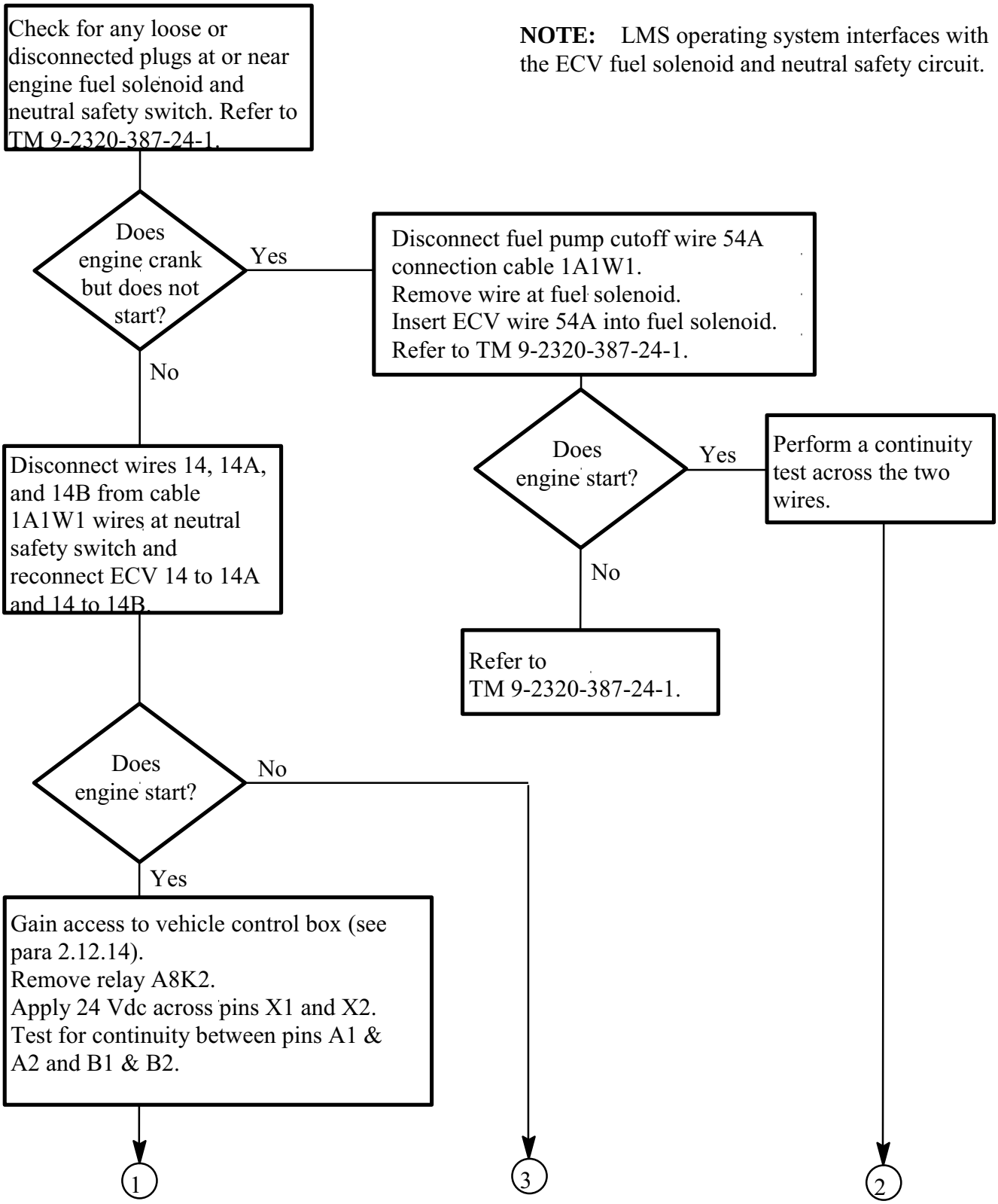


30. FWD LAMP DOES NOT COME ON – Continued.

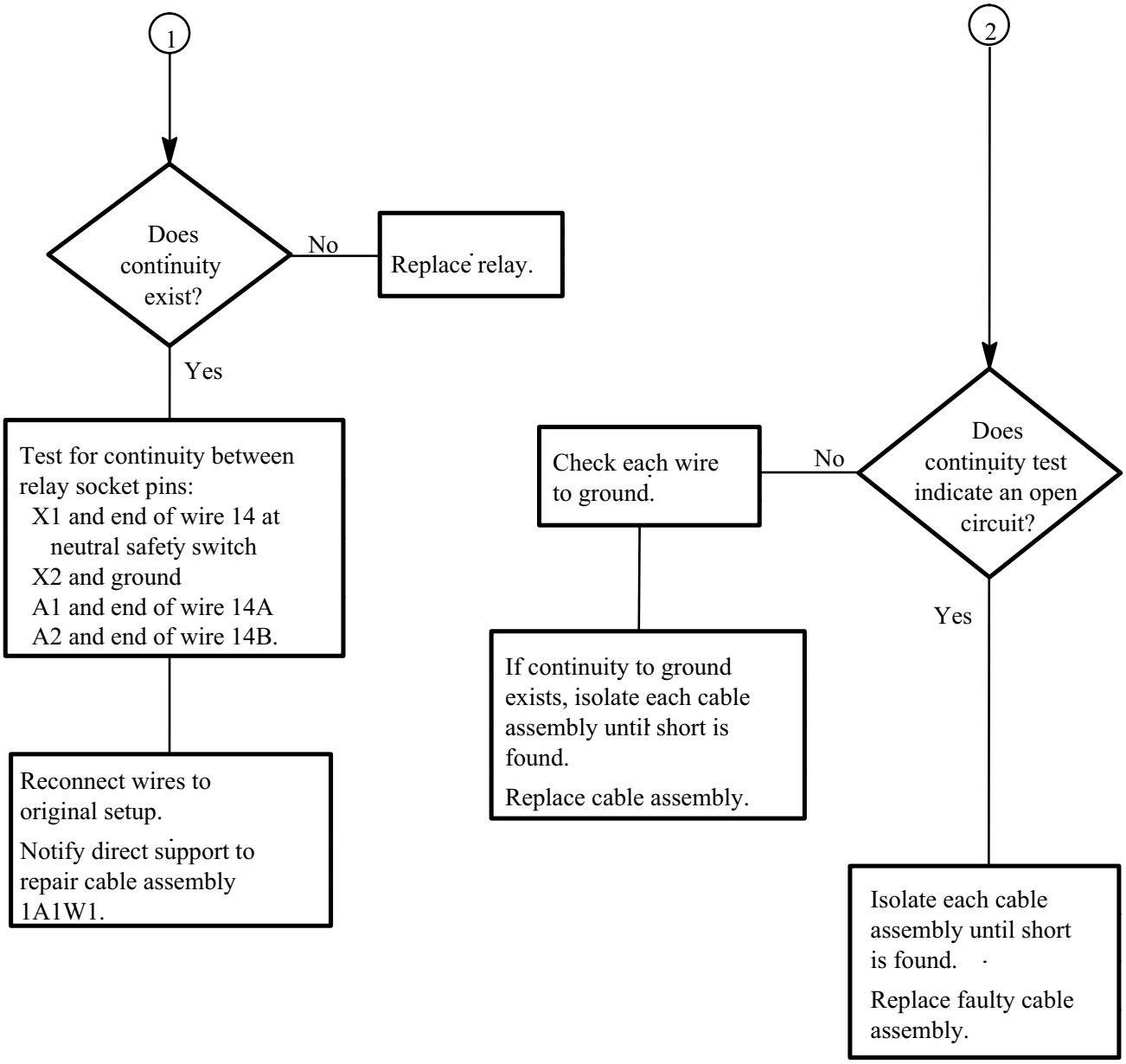


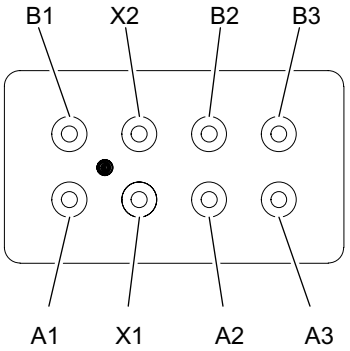
2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

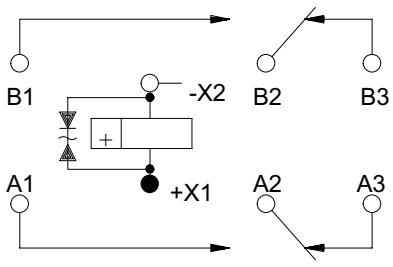
31. ECV SHUTS DOWN OR DOESN'T START.



31. ECV SHUTS DOWN OR DOESN'T START – Continued.





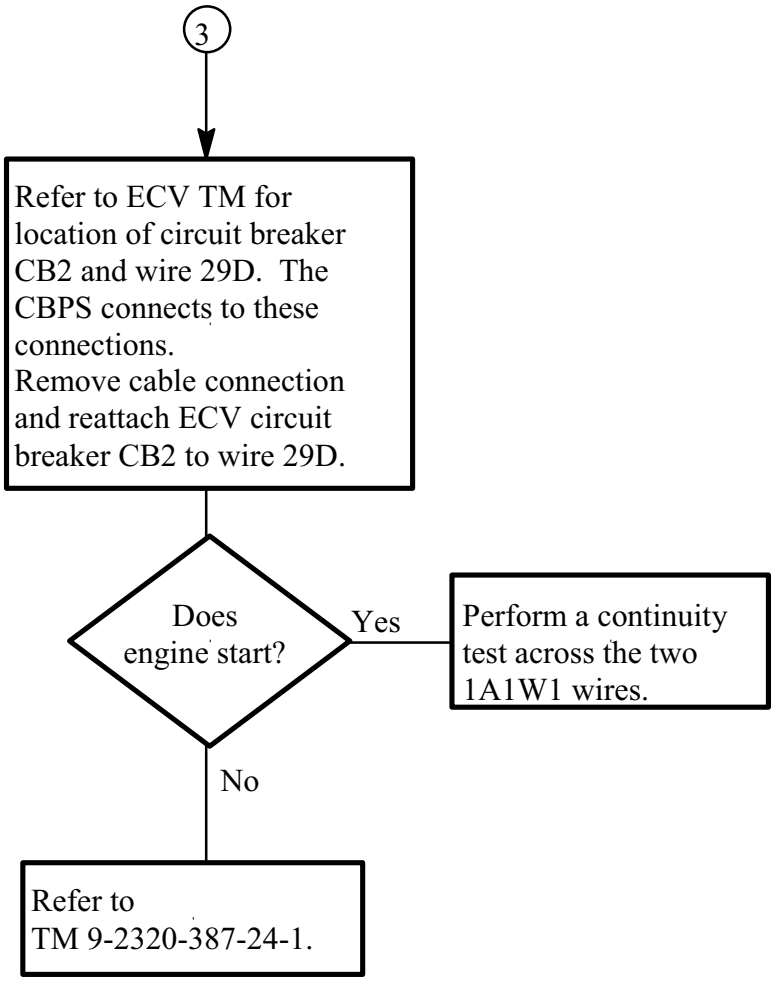


RELAY A8K2

220-1-M

2.8 UNIT LEVEL TROUBLESHOOTING PROCEDURES – Continued.

31. ECV SHUTS DOWN OR DOESN'T START – Continued.



Section VI. UNIT MAINTENANCE PROCEDURES

2.9 GENERAL.

a. This section contains unit level maintenance procedures applicable to CBPS components as authorized by the Maintenance Allocation Chart, Appendix B to this manual. Refer to TM 9-2320-387-24-1 for unit level maintenance on the ECV.

b. Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

2.10 GENERAL REPAIR PROCEDURES.

a. Unit level determines which malfunctioning Line Replaceable Unit (LRU) is causing the system to be inoperable. Unit level replaces the malfunctioning LRU with a serviceable one and makes sure that the CBPS is operational prior to return to the crew/operator. Those tasks that require excessive time (over two hours) or tools and skills not found at unit level are sent to Direct Support (DS).

b. The following maintenance actions are included as applicable: adjust, inspect, service, replace and repair.

c. Read all warnings, cautions, notes and instructions carefully before performing the procedures. In addition, read and understand all warnings at the front of this manual. The following warning should be observed whenever working on CBPS electrical equipment.

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

Hydraulic motors, hoses, tubing and fittings may be hot. Avoid contact to prevent injury to personnel.

To prevent injury to personnel, hearing protection is required when system is operating.

2.11 CHEMICAL BIOLOGICAL PROTECTIVE SHELTER (CBPS) SYSTEM.

2.11.1 Compartment Guard Replacement.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV parking brake set.
Drill, Electric (Item 6, Appendix B)	References:
Drill Set (Item 5, Appendix B)	TM 10-5411-224-14
Goggles (Item 17, Appendix B)	
Riveter, Blind, Hand (Item 34, Appendix B)	
Materials/Parts:	
Sealant (Item 47, Appendix C)	
Qty varies Lockwashers (Item 17, Appendix E)	
Self-locking Nut (Item 47, Appendix E)	
Eight Blind Rivets (Item 78, Appendix E)	

NOTE

The following procedures are for driver side access panel or passenger side access panel. Hardware quantity varies from side to side.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-2)

(1) Remove screws (1), lockwashers (2) and flat washers (3) securing guard (4) to LMS (5). Discard lockwashers (2).

b. Disassembly (Refer to Figure 2-2)

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(1) Drill out four rivets (6) securing two latches (7) to ECV (8).

(2) Remove seven rivet nuts (9) from LMS (5).

(3) Remove self-locking nut (10) and two flat washers (11), securing latch (12) to stud (13) on passenger side of LMS (5). Discard self-locking nut (10).

c. Assembly (Refer to Figure 2-2)

(1) Secure latch (12) to stud (13) on LMS (5) with two flat washers (11) and new self-locking nut (10) (Item 47, Appx E).

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(2) Install seven rivet nuts (9) on LMS (5). Apply sealant (Item 47, Appx C).

(3) Secure two latches (7) to driver side of ECV (8) with four rivets (6) (Item 78, Appx E). Secure two latches (7) to passenger side of ECV (8) with four rivets (6) (Item 78, Appx E).

d. Installation (Refer to Figure 2-2)

(1) Secure two guards (4) to LMS (5) with screws (1), new lockwashers (2) (Item 17, Appx E) and flat washers (3).

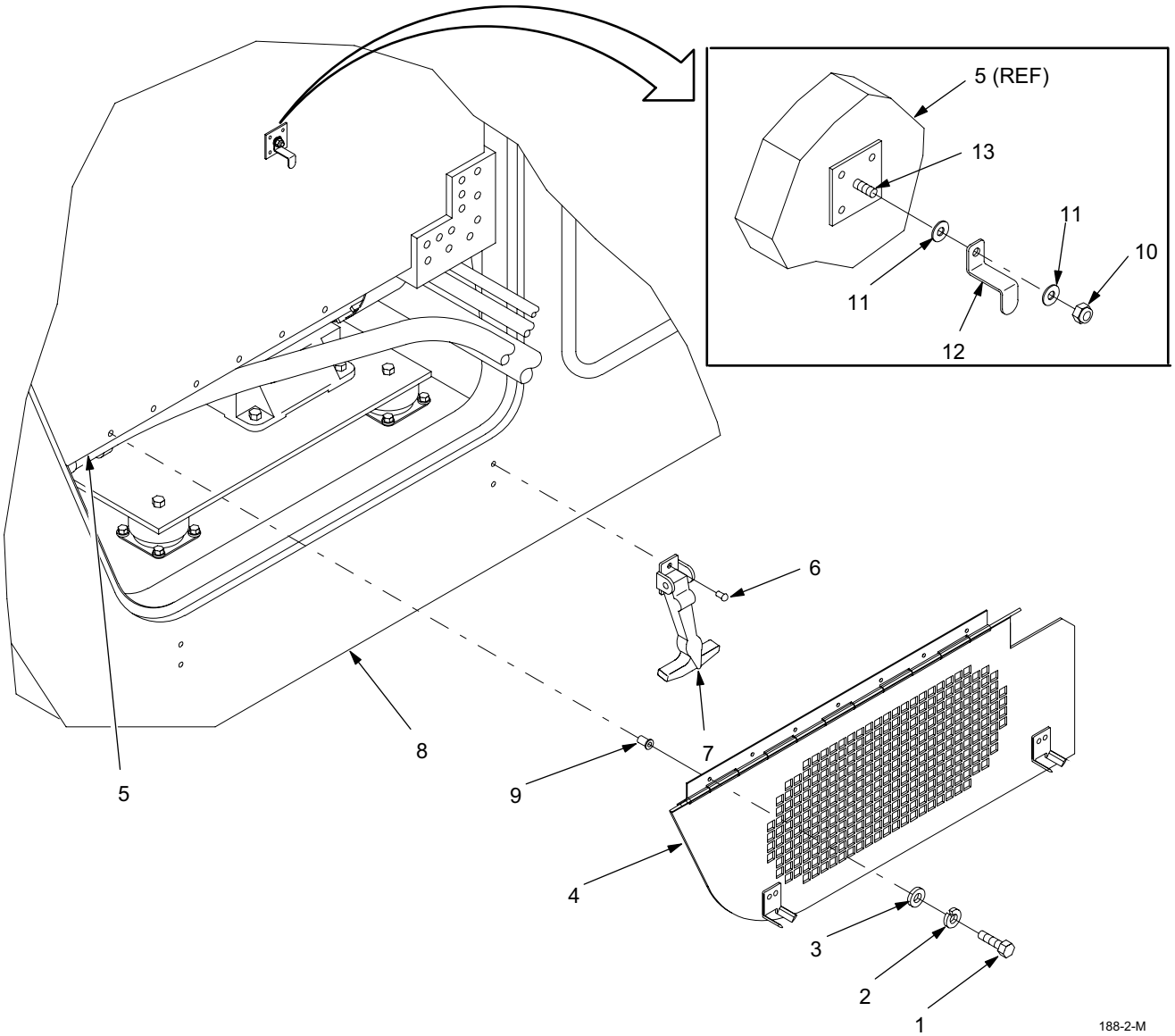


Figure 2-2. Compartment Guard Replacement

2.11.2 ECV Step Assembly Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set. Materials/Parts: Two Lockwashers (Item 19, Appendix E)

a. Removal

Remove two nuts (1), two lockwashers (2), four flat washers (3) and two screws (4) securing step assembly (5) and reinforcing plate (6) to driver side of ECV (7). Discard two lockwashers (2).

b. Installation

Secure reinforcing plate (6) and step assembly (5) to ECV (7) with two screws (4), two new lockwashers (2) , four flat washers (3) and two nuts (1).

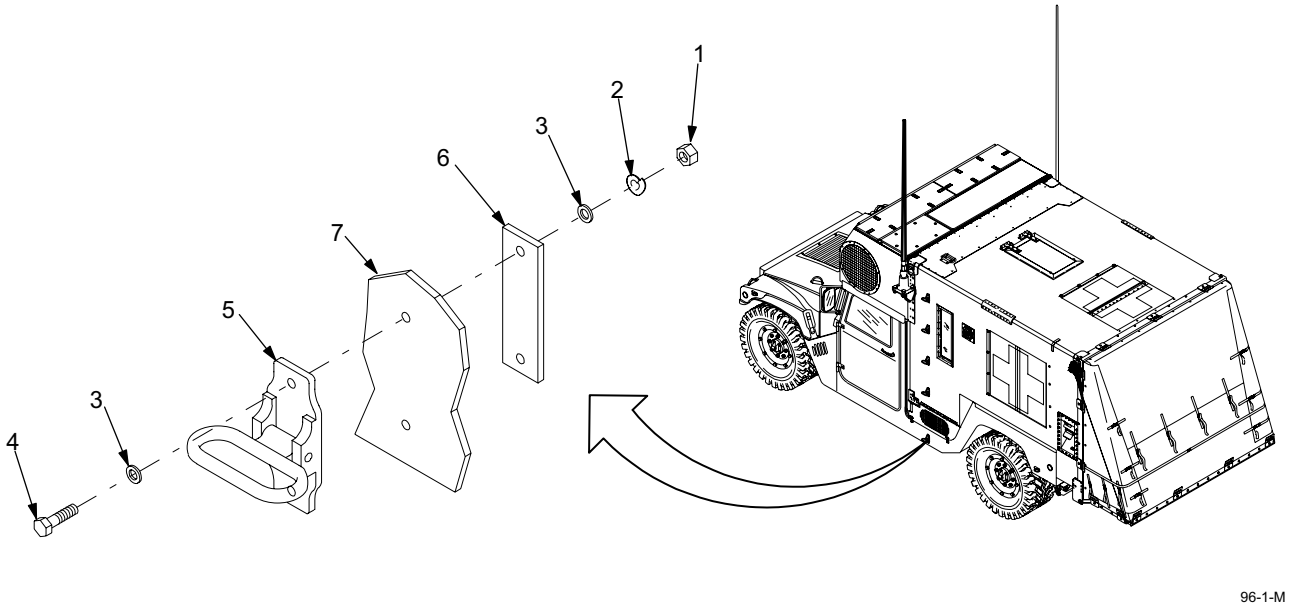


Figure 2-3. ECV Step Assembly Replacement

2.11.3 LMS Step Assembly Replacement.

This task covers: a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set. Materials/Parts: Eight Lockwashers (Item 27, Appendix E)

a. Removal

Remove eight bolts (1) and eight lockwashers (2) securing four step assemblies (3) to driver side of LMS (4). Discard eight lockwashers (2).

b. Installation

Secure four step assemblies (3) to LMS (4) with eight bolts (1) and eight new lockwashers (2).

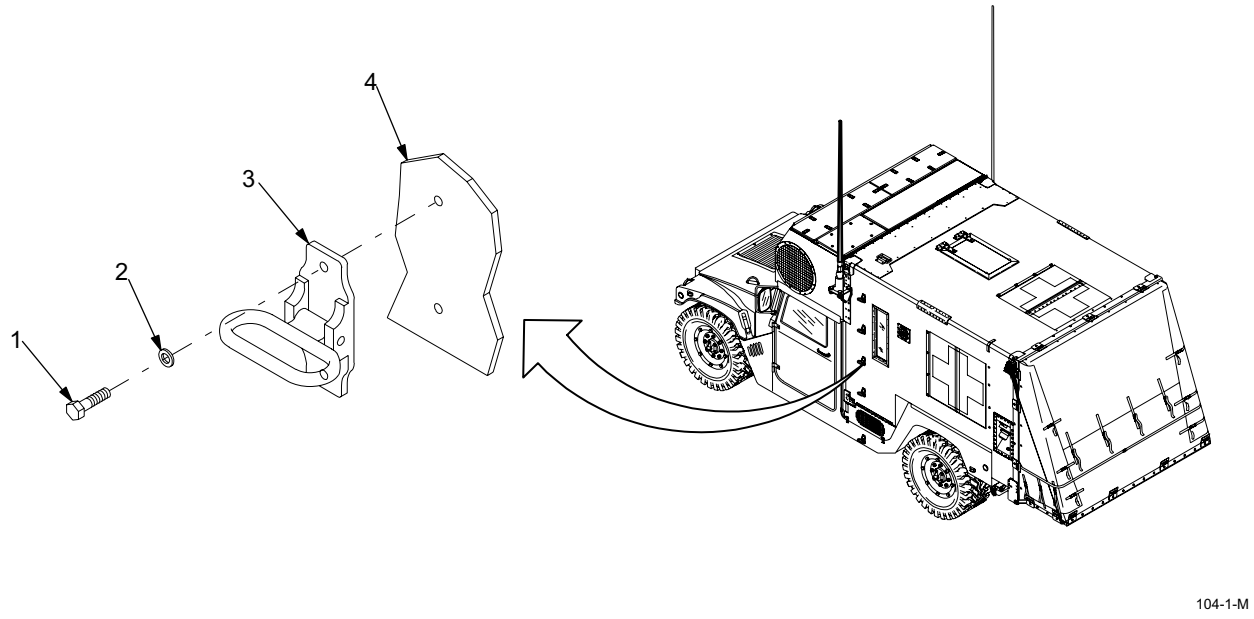


Figure 2-4. LMS Step Assembly Replacement

2.11.4 Hose Guard Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set.
Materials/Parts: Three Lockwashers (Item 17, Appendix E) Fourteen Lockwashers (Item 18, Appendix E)	References: TM 9-2320-387-24-1

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-5)

(1) Remove three screws (1), three lockwashers (2), three flat washers (3), bolt (4), lockwasher (5) and flat washer (6) securing hose guard (7) to passenger side of LMS. Discard three lockwashers (2) and lockwasher (5).

(2) Remove three bolts (8), three lockwashers (9) and three flat washers (10) securing hose guard (11) to passenger side of ECV. Discard three lockwashers (9).

(3) Remove passenger side and driver side mirror mounts from ECV per TM 9-2320-387-24-1. Remove two hose guards (12 and 13).

(4) Remove ten screws (14), ten lockwashers (15), and ten flat washers (16) securing two hose guards (17) to passenger side and driver side of ECU. Discard ten lockwashers (15).

b. Installation (Refer to Figure 2-5)

(1) Secure two hose guards (17) to passenger side and driver side of ECU with ten screws (14), ten new lockwashers (15) (Item 18, Appx E) and ten flat washers (16).

(2) Position two hose guards (12 and 13) between ECV and two mirror mounts. Install passenger side and driver side mirror mounts on ECV per TM 9-2320-387-24-1.

(3) Secure hose guard (11) to passenger side of ECV with three bolts (8), three new lockwashers (9) (Item 18, Appx E) and three flat washers (10).

(4) Secure hose guard (7) to passenger side of LMS with three screws (1), three new lockwashers (2) (Item 17, Appx E), three flat washers (3), bolt (4), new lockwasher (5) (Item 18, Appx E) and flat washer (6).

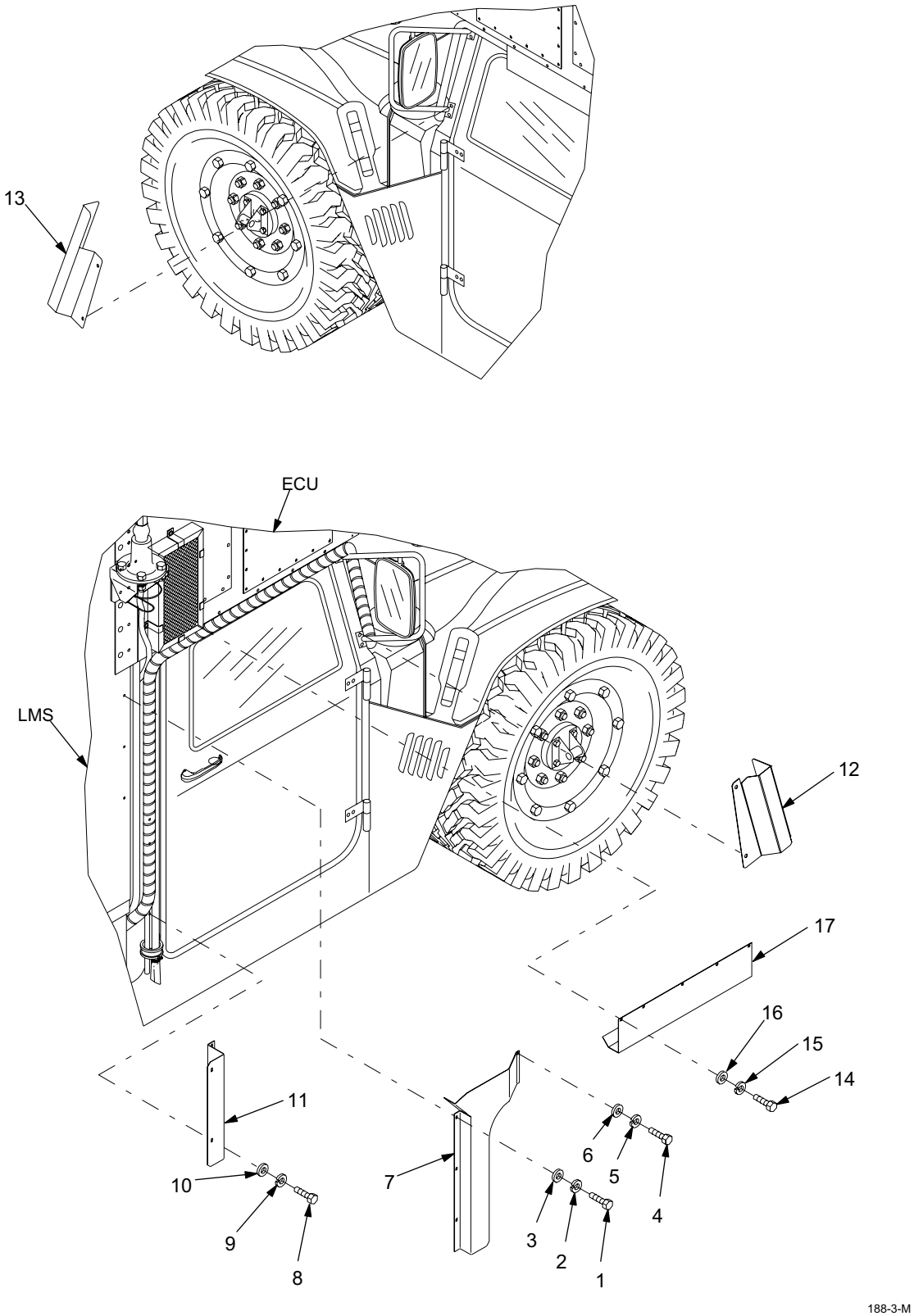


Figure 2-5. Hose Guard Replacement

2.11.5 Antenna Mount Hardware Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set.
Materials/Parts: Five Lockwashers (Item 18, Appendix E) Two Lockwashers (Item 19, Appendix E) Four Lockwashers (Item 26, Appendix E)	

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-6)

(1) Disconnect cable (1) from bottom of antenna (2).

NOTE

Antenna, antenna bracket, and attaching hardware are supplied with antenna.

(2) Remove four nuts (3), four lockwashers (4), four flat washers (5) and four screws (6) securing antenna (2) to antenna bracket (7). Discard four lockwashers (4).

(3) Remove three nuts (8), three lockwashers (9), and three flat washers (10) securing antenna bracket (7) to antenna mounting plate (11). Remove bracket (7). Discard three lockwashers (9).

(4) Remove two screws (12), two lockwashers (13), two flat washers (14), two screws (15), two lockwashers (16) and two flat washers (17) securing antenna mounting plate (11) to ECU. Discard two lockwashers (13) and two lockwashers (16). Remove antenna mounting plate (11).

b. Installation (Refer to Figure 2-6)

(1) Secure antenna mounting plate (11) to ECU with two screws (12), two new lockwashers (13) (Item 19, Appx E), two flat washers (14), two screws (15), two new lockwashers (16) (Item 18, Appx E) and two flat washers (17).

(2) Secure antenna bracket (7) to antenna mounting plate (11) with three nuts (8), three new lockwashers (9) (Item 18, Appx E) and three flat washers (10).

(3) Secure antenna (2) to antenna bracket (7) with four screws (6), four new lockwashers (4) (Item 26, Appx E), four flat washers (5) and four nuts (3).

(4) Connect cable (1) to bottom of antenna (2).

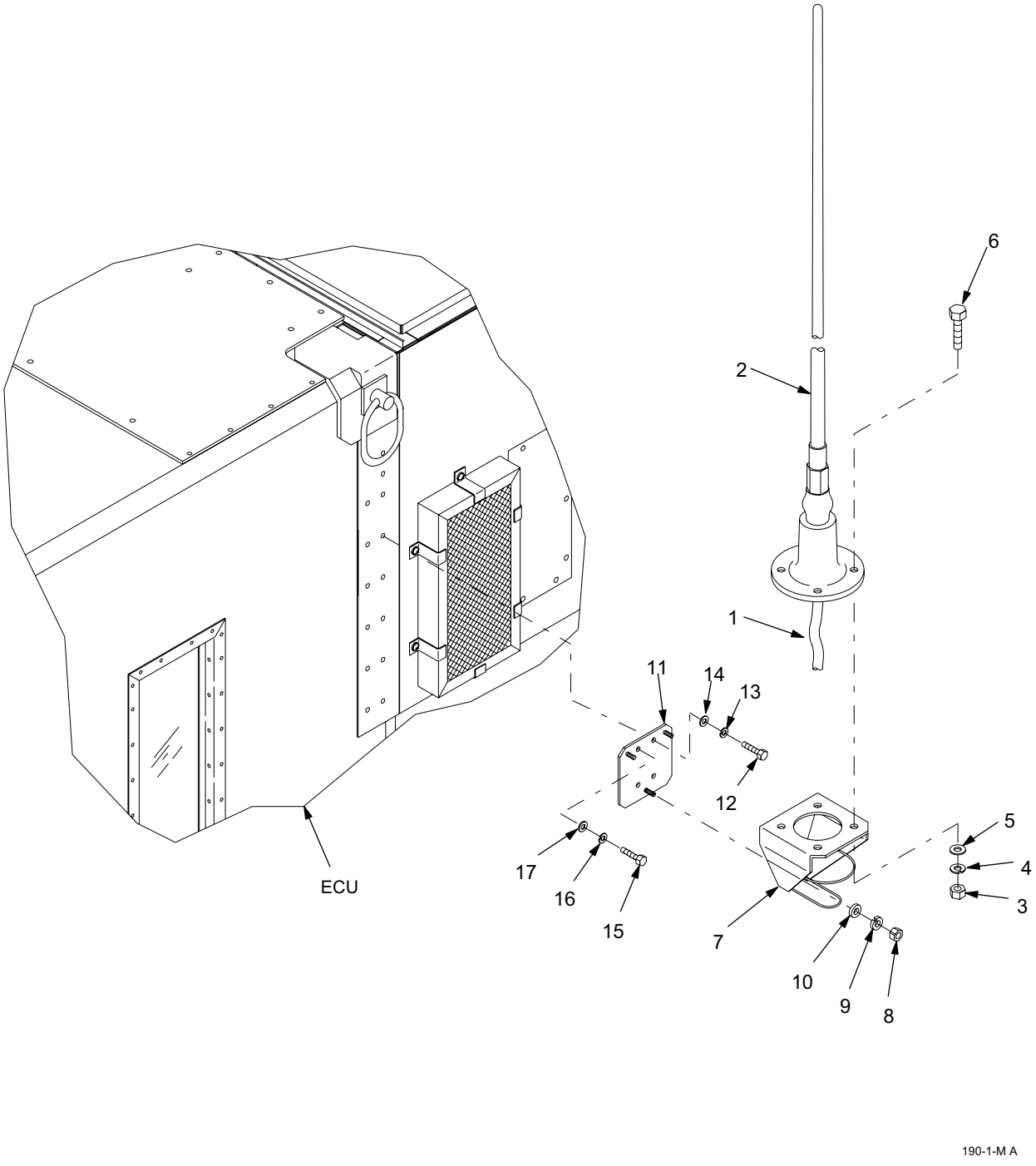


Figure 2-6. Antenna Base Hardware Replacement

2.12 ECV.

2.12.1 Thermostatic Switch Replacement.

This task covers: a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Materials/Parts: Drain Pan (Item 28, Appendix B) Rubber Gloves (Item 26, Appendix C) Hydraulic Sealant (Item 48, Appendix C) Primer (Item 37, Appendix C)	Equipment Conditions: ECV off, system power off, power panel and ECV tagged. ECV battery ground cable disconnected (see TM 9-2320-387-24). ECV parking brake set. Radio equipment removed from cab radio rack (see TM 9-2320-387-24). References: TM 9-2320-387-10 TM 9-2320-387-24-1

NOTE

Depressurize system if hot.

a. Removal (Refer to Figure 2-7)

(1) Drain approximately one gallon of antifreeze from the ECV per TM 9-2320-387-10.

(2) From inside the cab of ECV, remove two bolts (1) and two flat washers (2) securing the radio rack (3) to dash (4). If required, release tension on cable by loosening screw attaching cable clamp to radio rack (3). Move cable out of way.

(3) Loosen two bolts (5) and rotate radio rack (3) away from dash (4).

(4) Release two latches and twist-locks (6) on dash cover (7) and remove dash cover (7) from dash (4) to gain access to thermostatic switch (8).

(5) Remove connector from thermostatic switch (8).

(6) Unscrew thermostatic switch (8) from engine (9).

b. Installation (Refer to Figure 2-7)

(1) Add primer (Item 37, Appx C) to hole in engine (9).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(2) Add hydraulic sealant (Item 48, Appendix C) to thermostatic switch (8) and screw into engine (9).

(3) Install connector on thermostatic switch (8).

(4) Secure dash cover (7) using two latches and twist-locks (6).

(5) Secure radio rack (3) to dash (4) using two flat washers (2) and two bolts (1). If required, reposition cable and tighten screw attaching cable clamp to radio rack (3).

(6) Tighten two bolts (5).

(7) Add antifreeze to engine per TM 9-2320-387-10.

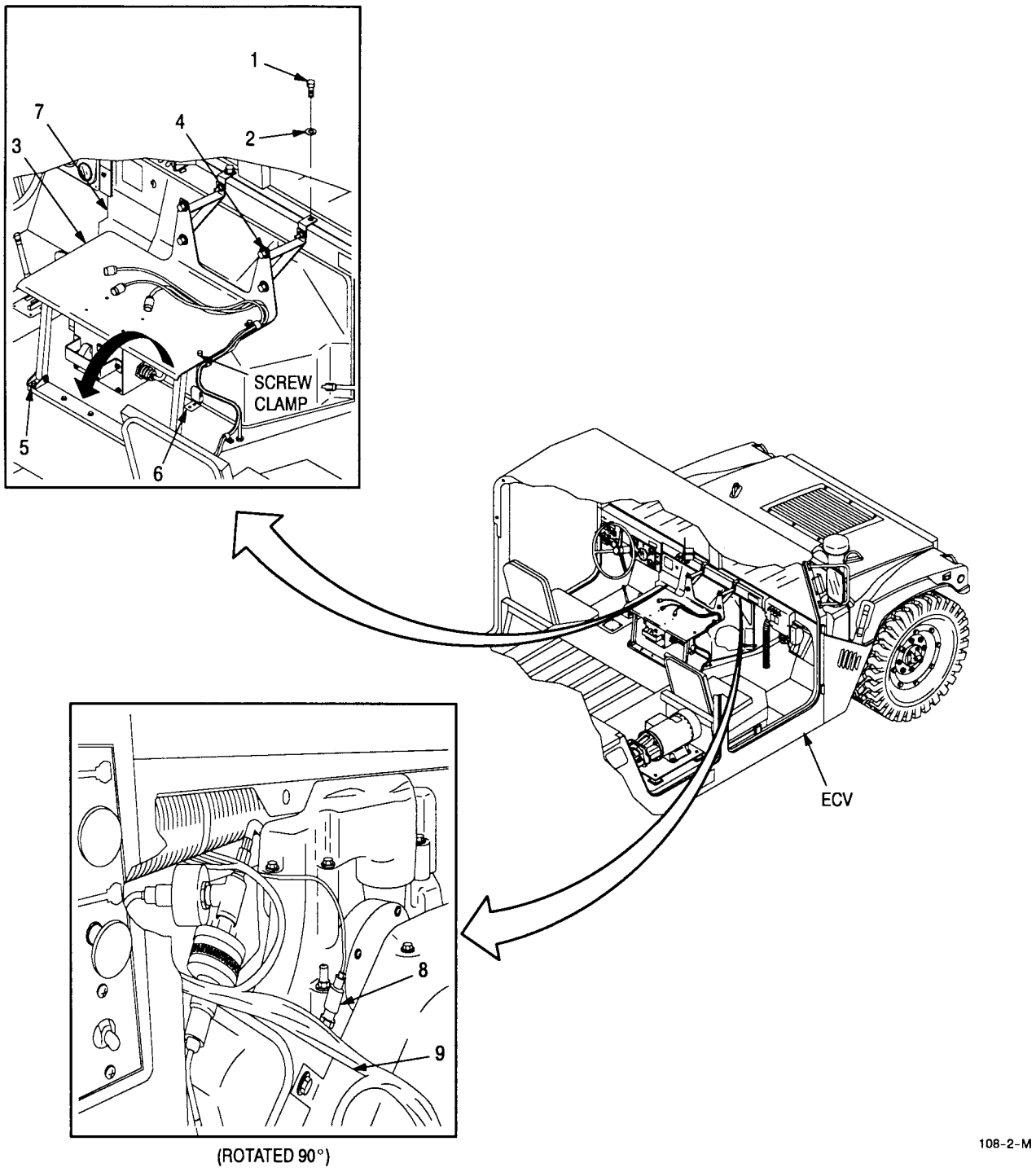


Figure 2-7. Thermostatic Switch Replacement

Follow-on maintenance: Secure radio equipment to rack and reconnect ECV battery ground cable per TM 9-2320-387-24-1, apply system power, perform operational test.

2.12.2 Oil Pressure Switch Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Materials/Parts: Hydraulic Sealant (Item 48, Appendix C) References: TM 9-2320-387-24-1	Equipment Conditions: ECV off, system power off, power panel and ECV tagged. ECV battery ground cable disconnected (see TM 9-2320-387-24). ECV parking brake set. Radio equipment removed from cab radio rack (see TM 9-2320-387-24-1).

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-8)

(1) From inside the cab of ECV, remove two bolts (1) and two flat washers (2) securing the radio rack (3) to disk (4). If required,, release tension on cable by loosening screw attaching cable clamp to radio rack (3). Move cable out of way.

(2) Loosen two bolts (5) and rotate radio rack (3) down, away from dash (4).

(3) Release four latches and two twist-locks (6) on dash cover (7) and remove dash cover (7) from dash (4) to gain access to oil pressure switch (8).

(4) Remove connector from oil pressure switch (8).

(5) Unscrew oil pressure switch (8) from tee (9).

b. Installation (Refer to Figure 2-8)

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(1) Add hydraulic sealant (Item 48, Appx C) to oil pressure switch (8) and screw into tee (9).

(2) Install connector on oil pressure switch (8).

(3) Secure dash cover (7) using four latches and two twist-locks (6).

(4) Secure radio rack (3) to dash (4) using two flat washers (2) and two bolts (1). If required, reposition cable and tighten screw attaching cable clamp to radio rack (3).

(5) Tighten two bolts (5).

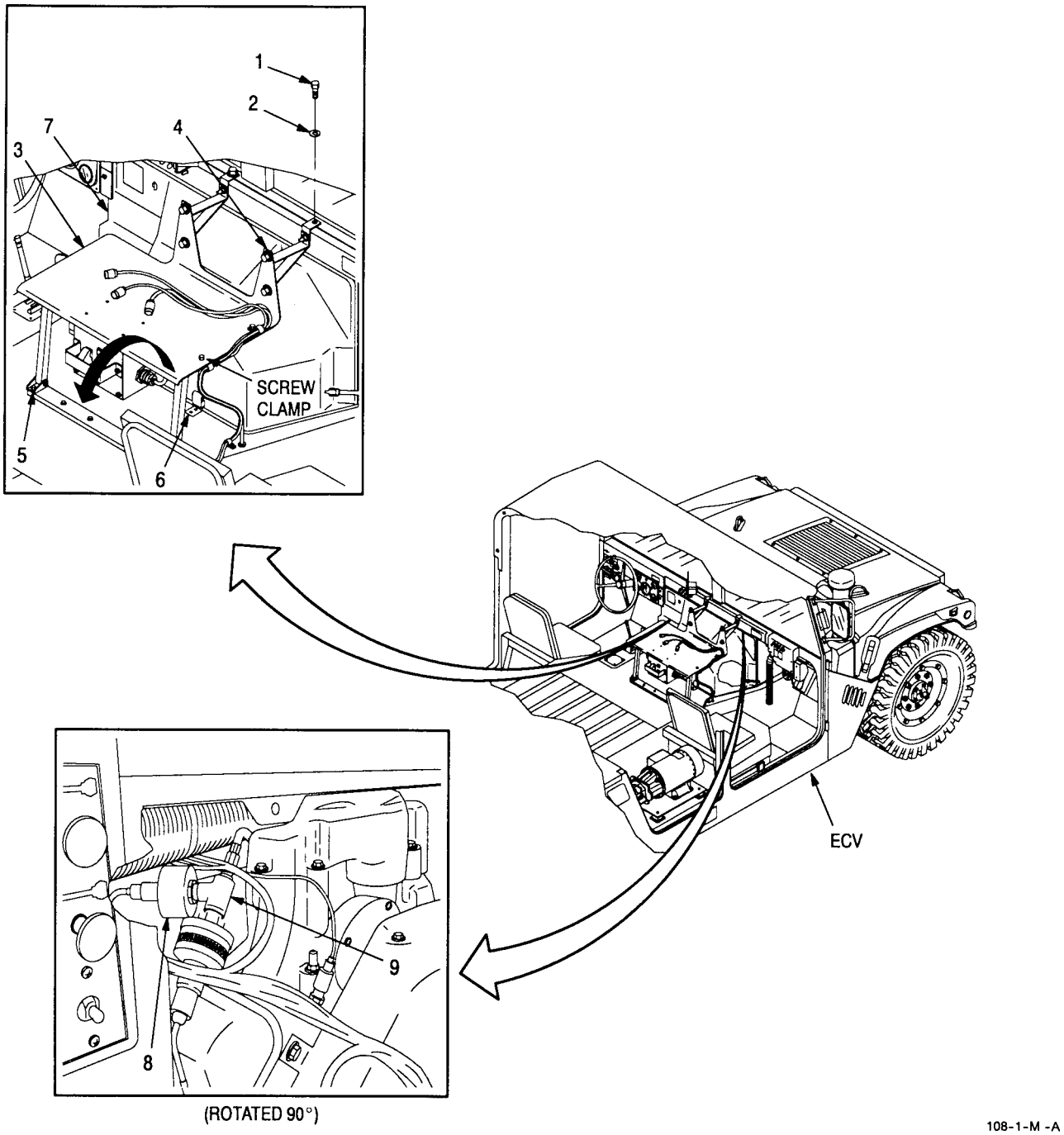


Figure 2-8. Oil Pressure Switch Replacement

Follow-on maintenance: Secure radio equipment to rack and reconnect ECV battery ground cable per TM 9-2320-387-24-1, apply system power, perform operational test.

2.12.3 Pintle Extension Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV power off, HMT removed. ECV parking brake set.
Personnel Required: (2)	Reference: TM 9-2320-387-24-1

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-9)

WARNING

The pintle extension is heavy. To prevent injury to personnel, two people are required to lift pintle extension.

Remove four bolts (1), eight flat washers (2), four lockwashers (3) and four nuts (4) securing plate (5) and pintle extension (6) to ECV rear bumper (7). Discard four lockwashers (3).

b. Installation (Refer to Figure 2-9)

Secure plate (5) and pintle extension (6) to ECV rear bumper (7) with four bolts (1), eight flat washers (2), four new lockwashers (3) and four nuts (4).

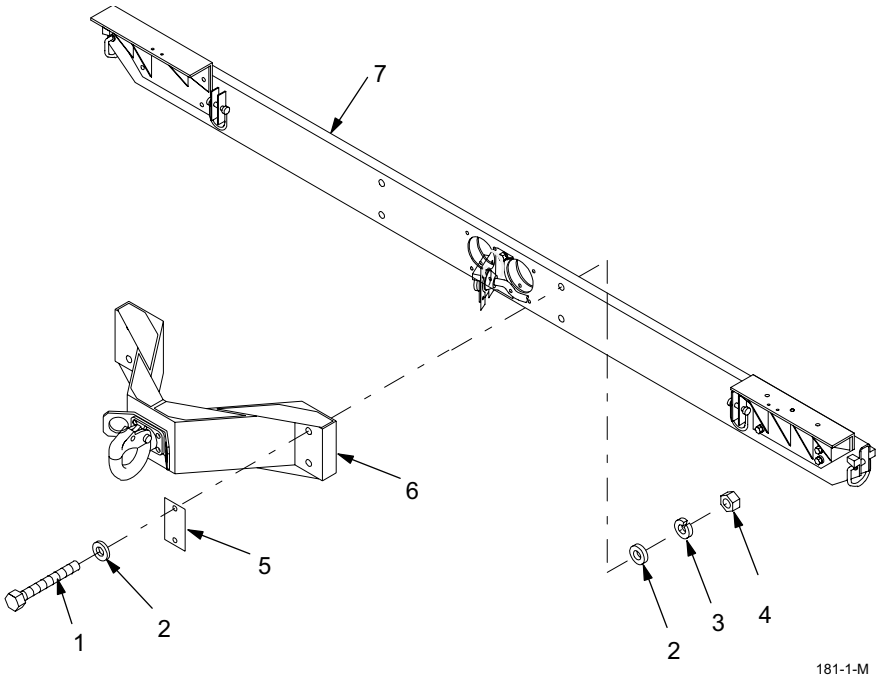


Figure 2-9. Pintle Extension Replacement

2.12.4 Taillight Bracket Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV power off, HMT removed. ECV parking brake set.
Materials/Parts: Two Lockwashers (Item 20, Appendix E)	

a. Removal

(1) Tag wires and remove two bolts (1), two locknuts (2) and two ground lugs (3) from back of two taillight assemblies (4).

(2) Remove two bolts (5) and two washers (6) securing taillight assembly (4) to driver side or passenger side taillight bracket (7).

(3) Remove two screws (8), four flat washers (9), two lockwashers (10) and two nuts (11) securing taillight bracket (7) to driver side or passenger side taillight bracket (12). Discard two lockwashers (10).

b. Installation

(1) Secure taillight bracket (7) to driver side or passenger side taillight bracket (12) with two screws (8), four flat washers (9), two new lockwashers (10) and two nuts (11).

(2) Secure taillight assembly (4) to driver side or passenger side taillight bracket (7) with two bolts (5) and two washers (6).

(3) Install two bolts (1), two locknuts (2) and two ground lugs (3) on back of two taillight assemblies (4). Remove tags from wires.

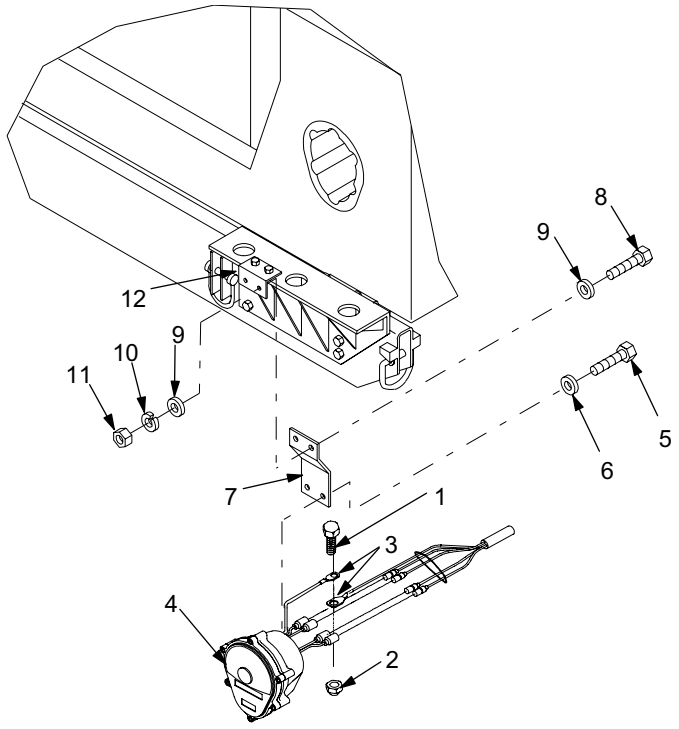


Figure 2-10. Taillight Bracket Replacement

2.12.5 Tachometer and Tachometer Isolation Switch Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)

Materials/Parts:
Two Blind Rivets (Item 74, Appendix E)
Four Blind Rivets (Item 75, Appendix E)

Equipment Conditions:
ECV power off.
ECV battery ground cable disconnected (see TM 9-2320-387-24).
ECV parking brake set.

References:
TM 9-2320-387-24-1

Personnel Required: (2)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

2.12.5.1 Tachometer.

a. Removal (Refer to Figure 2-11)

NOTE

Bracket and attaching hardware are supplied with tachometer.

(1) Remove two nuts (1), two lockwashers (2), two flat washers (3) and bracket (4) securing tachometer (5) to mounting bracket (6).

(2) Tag and remove wiring from back of tachometer (5).

(3) Remove tachometer (5) from mounting bracket (6).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(4) Drill out four rivets (7) securing mounting bracket (6) to ECV dash (8).

b. Installation (Refer to Figure 2-11)

(1) Secure mounting bracket (6) to ECV dash (8) with four rivets (7) (Item 75, Appx E).

NOTE

Bracket and attaching hardware are supplied with tachometer.

(2) Install wiring to back of tachometer (5). Remove tags from wires.

(3) Place tachometer (5) on mounting bracket (6).

(4) Secure tachometer (5) to mounting bracket (6) with bracket (4), two flat washers (3), two lockwashers (2) and two nuts (1).

2.12.5.2 ECV Cab Tachometer Isolation Switch.

a. Removal (Refer to Figure 2-11)

(1) Remove nut (9) securing toggle switch (10) in ECV cab.

(2) Tag and remove wires from toggle switch (10).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(3) Drill out two rivets (11) securing legend plate (12) to ECV cab.

b. Installation (Refer to Figure 2-11)

NOTE

Two personnel are required to install the switch. One person to hold the switch in position from under the ECV, the other person to secure the nut from inside the ECV.

(1) Attach wires to toggle switch (10). Remove tags from wires.

(2) Secure toggle switch (10) to ECV cab with nut (9).

(3) Secure legend plate (12) to ECV cab with two rivets (11) (Item 74, Appx E).

2.12.5 Tachometer and Tachometer Isolation Switch Replacement - Continued.

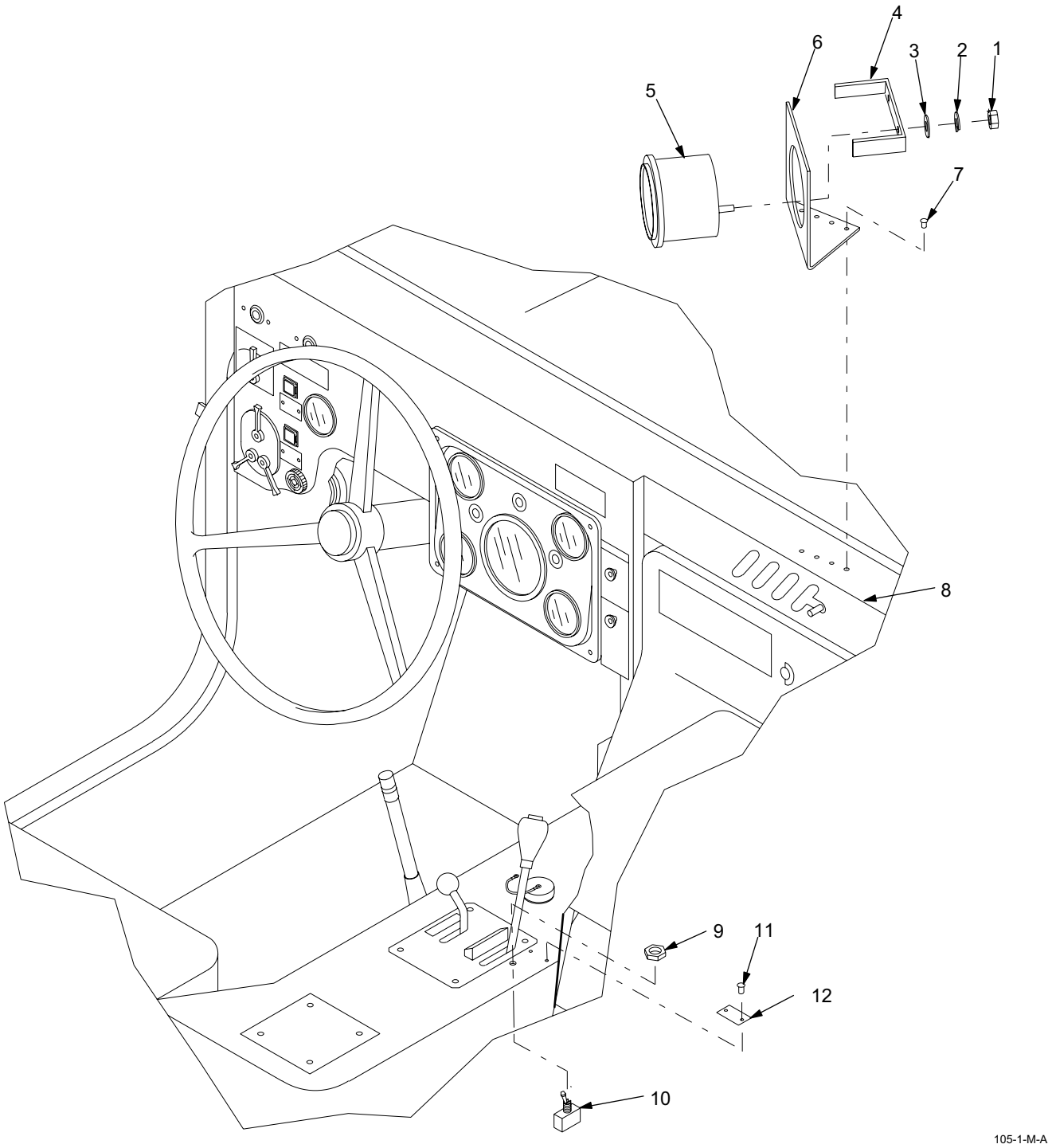


Figure 2-11. Tachometer and Tachometer Isolation Switch Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1 and perform operational test.

2.12.6 Hydraulic Fluid Level Switch and Audible Alarm Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Drill, Electric (Item 6, Appendix B) Drill Set (Item 5, Appendix B) Goggles (Item 17, Appendix B) Riveter, Blind, Hand (Item 34, Appendix B) Extraction Tool (Item 10, Appendix B)	Equipment Conditions: ECV power off. ECV battery ground cable disconnected (see TM 9-2320-387-24-1). ECV parking brake set. Materials/Parts: Four Blind Rivets (Item 74, Appendix E) Antiseize Compound (Item 13, Appendix C)
References: TM 9-2320-387-24-1	

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

2.12.6.1 Hydraulic Fluid Level Switches/Indicators.

a. Removal (Refer to Figure 2-12)

NOTE

Steps 1 through 5 apply to both switches.

(1) Using extraction tool, carefully squeeze tabs (1) and pry indicator unit (2) loose from switch housing (3).

(2) Using a small, flat head screwdriver, turn two screws (4) counterclockwise until two retaining cams (5) lay down.

(3) Pull switch housing (3) from ECV dash (6) and retainer cover (7).

(4) Tag and unsolder leads to two switches (8 and 9).

(5) Remove switch housing (3) and retainer cover (7) from ECV.

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(6) Drill out four rivets (10) securing two legend plates (11 and 12) to ECV dash (6).

2.12.6 Hydraulic Fluid Level Switch and Audible Alarm Replacement – Continued.

b. Installation (Refer to Figure 2-12)

NOTE

Steps 1 through 5 apply to both switches.

(1) Feed leads through back of ECV dash (6) and retainer cover (7).

NOTE

Indicator unit and retainer cover supplied with switch.

(2) Solder leads to back of switch housing (3). Remove tags from leads.

(3) Push switch housing (3) into ECV dash (6) and retainer cover (7).

(4) Using small, flat head screwdriver, turn two screws (4) clockwise until two retaining cams (5) stand up.

CAUTION

Do not install indicator unit without all four lamps installed or short circuit will occur when power is applied.

NOTE

If installing new switch, install lamps per TM 10-5410-228-10.

(5) Using extraction tool, carefully squeeze tabs (1) and install indicator unit (2) into switch housing (3), ensuring that aligning pin (15) engages hole in switch housing (3).

(6) Secure two legend plates (11 and 12) to ECV dash (6) with four rivets (10).

2.12.6.2 ECV Cab Audible Alarm.

a. Removal (Refer to Figure 2-12)

(1) Unscrew knurled nut (13) from alarm (14) and remove alarm (14) from ECV dash (6).

(2) Tag and remove wires on back of alarm (14).

b. Installation (Refer to Figure 2-12)

(1) Attach wires to back of alarm (14). Remove tags from wires.

(2) Install alarm (14) in ECV dash (6) and secure with knurled nut (13).

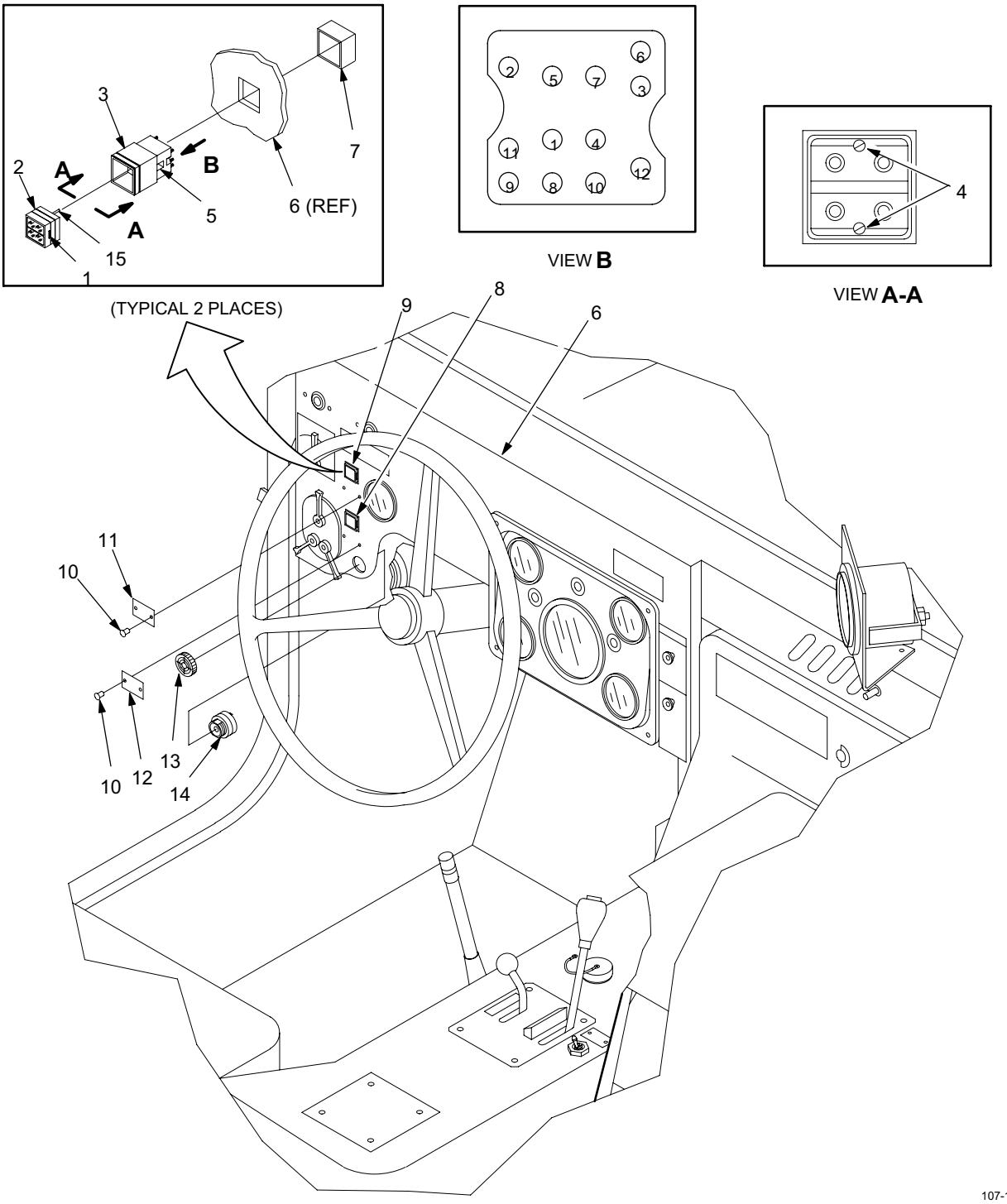


Figure 2-12. Hydraulic Fluid Level Switch and Audible Alarm Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1 and perform operational test.

2.12.7 Pump System Belt Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV off, system power off, power panel and cab area tagged.
¼ Hex Shank Bit, Size 1/8 (Item 22, Appendix B)	ECV parking brake set.
V-Belt Tensiometer (Item 1, Appendix B)	
Tension Tester Bar (Item 49, Appendix B)	

a. Removal (Refer to Figure 2-13)

(1) Loosen two bolts (1) and one nut (2) securing hydraulic pump mount (3) to hydraulic pump mount (4).

(2) Loosen nut (5) on J bolt (6) to relieve tension on belt (7).

NOTE

Note position of face plate during removal. Plate holes are not evenly spaced and will align in only one position.

(3) Remove three screws (8) and remove front pulley face plate (9) from pump pulley (10).

(4) Remove three screws (11) and remove front pulley face plate (12) from crank pulley (13).

(5) Remove belt (7) from pump pulley (10) and crank pulley (13).

b. Installation (Refer to Figure 2-13)

(1) Position belt (7) on pump pulley (10) and crank pulley (13).

NOTE

Install face plate as noted during removal.

Avoid pinching the belt to a dimension less than 5 inches of diameter. This avoids creating small belt cracks.

(2) Secure front pulley face plate (12) to crank pulley (13) with three screws (11).

(3) Secure front pulley face plate (9) to pump pulley (10) with three screws (8).

(4) Test tension at midway point of belt (7) with tensiometer. Depress belt 1/4 inch. Required pressure is 10 to 12 lbs. at 1/4 inch deflection. Adjust nut (5) until tension is correct.

(5) Tighten nut (2) and two bolts (1) securing hydraulic pump mount (3) to hydraulic pump mount (4).

(6) Tighten nut (5).

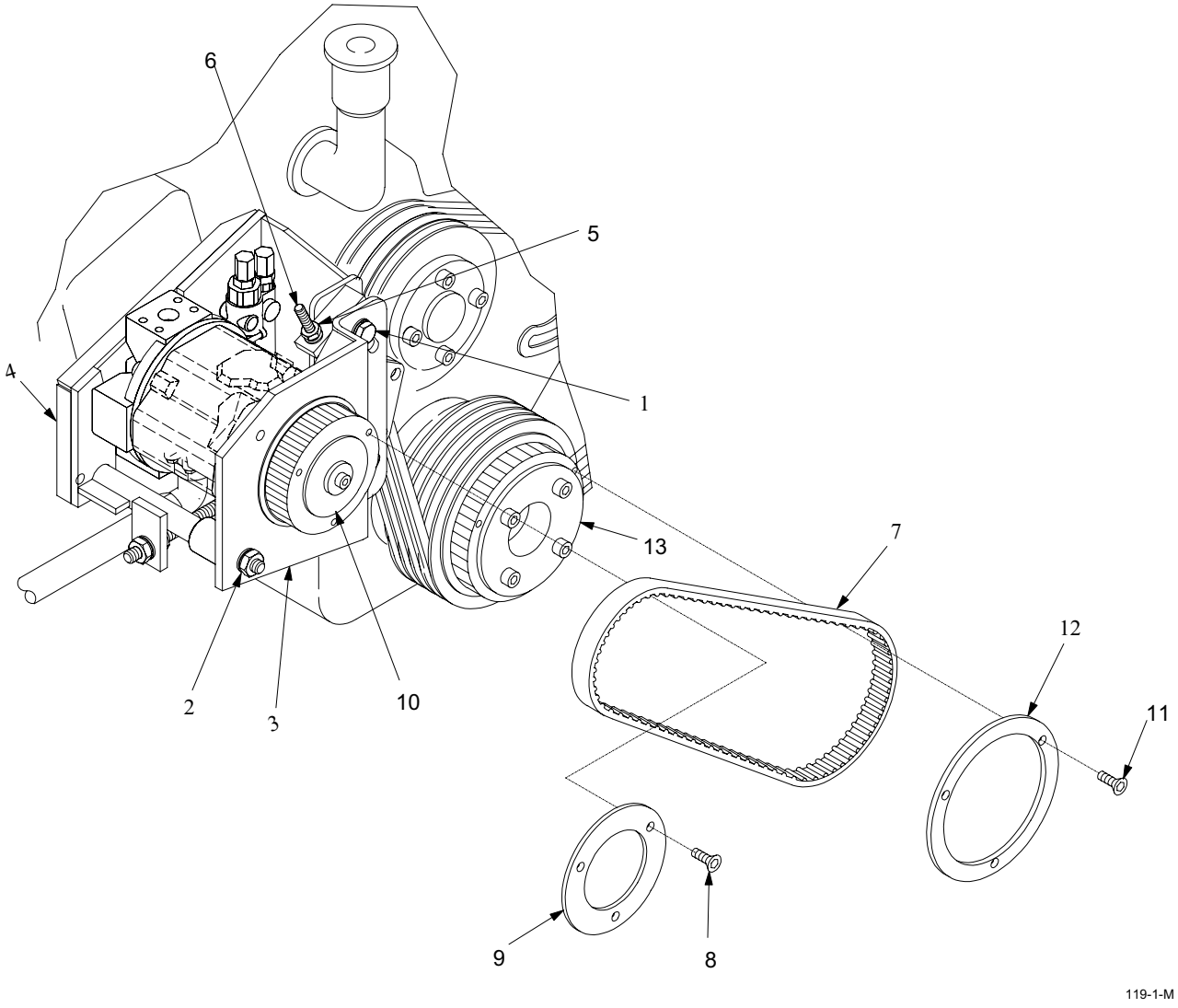


Figure 2-13. Pump System Belt Replacement (Sheet 1 of 2)

2.12.7 Pump System Belt Replacement – Continued.

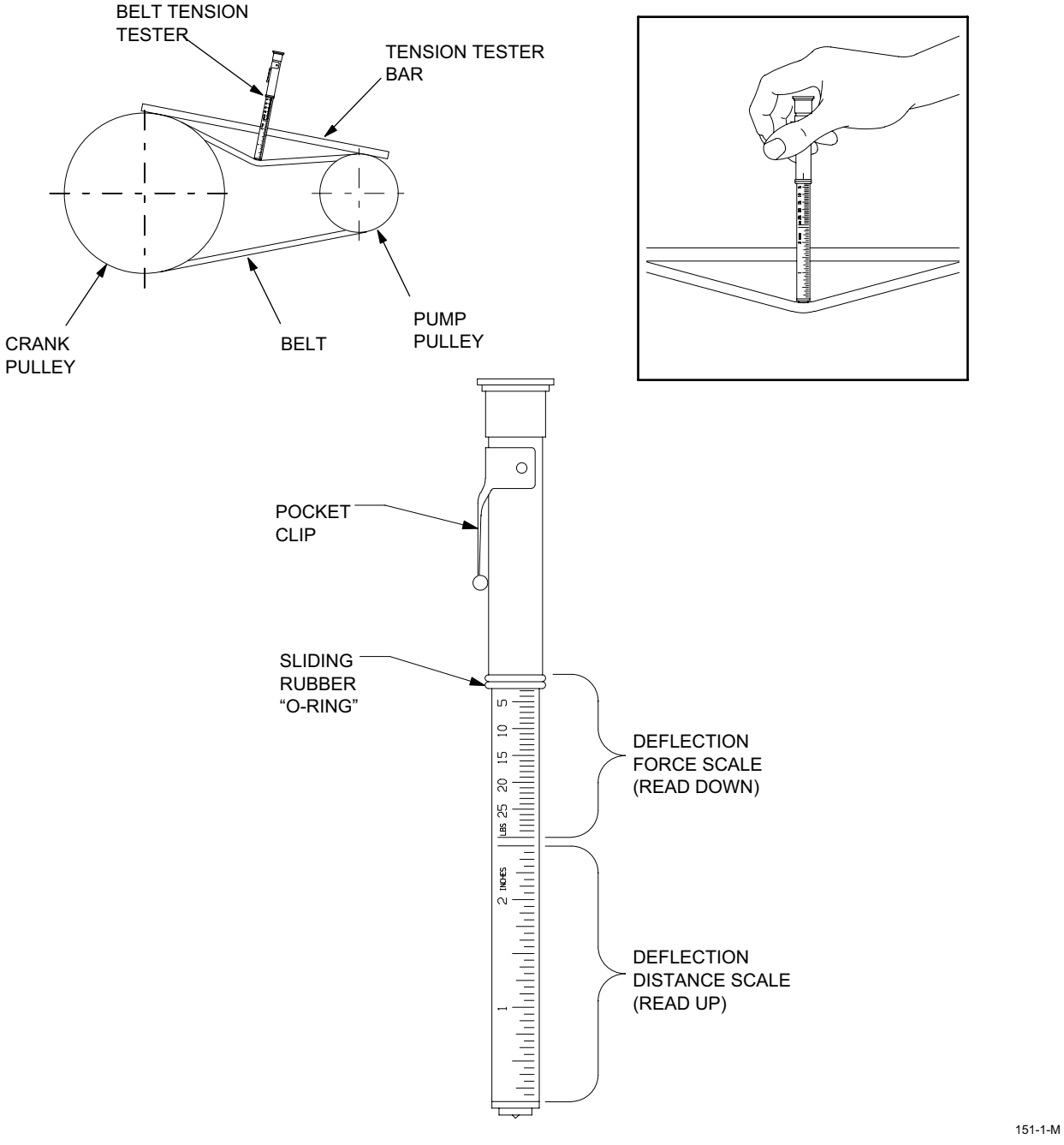


Figure 2-13. Pump System Belt Replacement (Sheet 2 of 2)

Follow-on maintenance: Turn on engine, apply system power, perform operational test.

2.12.8 Hydraulic Pump Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Alignment
f. Prime Hydraulic Pump

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
1-7/8 Inch Crowfoot Wrench (Item 63, Appendix B)
Torque Wrench (Item 66, Appendix B)
Tension Tester Bar (Item 49, Appendix B)
Mechanical Puller (Item 30, Appendix B)

Materials/Parts:
Antiseize Compound (Item 13, Appendix C)
Hydraulic Fluid (Item 24, Appendix C)
Eight Lockwashers (Item 27, Appendix E)
Three Lockwashers (Item 28, Appendix E)
Seven Lockwashers (Item 30, Appendix E)
O-ring (Item 63, Appendix E)
O-ring (Item 50, Appendix E)
O-ring (Item 53, Appendix E)
O-ring (Item 54, Appendix E)
External Tooth Lockwasher (Item 38, Appendix E)

Equipment Conditions:
ECV shut off, system off, power panel and rear control panel tagged.
ECV parking brake set.
ECV hood raised and secured (see TM 9-2320-387-24-1).
Primary hydraulic pump belt removed (see para 2.12.7).
Hydraulic system drained (see para 2.14.3) or hose assembly quick disconnects uncoupled.
Inner fender and air duct removed (see TM 9-2320-387-24).

References:
TM 9-2320-387-24-1

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in a container and clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-14)

(1) Close shut off valve (1) to hydraulic pump (2).

(2) Remove four bolts (3) and four lockwashers (4) securing two flange halves (5) and hose assembly (6) to hydraulic pump (2). Discard four lockwashers (4).

(3) Remove and discard O-ring (7) from hose assembly (6).

(4) Disconnect hose assembly (8) from hydraulic pump (2).

(5) Disconnect hose assembly (9) from elbow (10).

(6) Remove elbow (10) from hydraulic pump (2).

(7) Remove and discard O-rings (11 and 12) from elbow (10).

(8) Disconnect tube assembly (13) from elbow (14).

(9) Remove four bolts (15) and four lockwashers (16) securing two flange halves (17) and elbow (14) to hydraulic pump (2). Discard four lockwashers (16).

2.12.8 Hydraulic Pump Replacement – Continued.

(10) Remove and discard O-rings (18 and 19) from elbow (14).

(11) Remove two bolts (20), two lockwashers (21) and two flat washers (22). Discard two lockwashers (21).

(12) Remove nut (23), lockwasher (24) and two flat washers (25) from bolt (26) securing front hydraulic mount bracket (27) to hydraulic pump mount (28). Discard lockwasher (24). Pull front hydraulic mount bracket (27), with hydraulic pump (2) attached, out of ECU engine compartment.

b. Disassembly (Refer to Figure 2-14)

(1) Remove screw (29), flat washer (30) and two washer spacers (31) securing pump pulley (32) to hydraulic pump (2). Remove pump pulley (32) from hydraulic pump (2) using mechanical puller.

(2) Remove key (33) from shaft of hydraulic pump (2).

(3) Remove two screws (34), two lockwashers (35) and two flat washers (36) securing hydraulic pump (2) to hydraulic pump mount (27). Discard two lockwashers (35).

(4) Remove two screws (37), two flat washers (38), screw (39), screw (40) and external tooth lockwasher (41) securing front hydraulic mount bracket (27) to ECV engine block. Discard external tooth lockwasher (41).

(5) Remove bolt (26) from hydraulic pump mount (28).

(6) Remove nut (42), lockwasher (43), flat washer (44) and J-bolt (45) from hydraulic pump mount (28). Discard lockwasher (43).

NOTE

Further disassembly is not necessary unless replacing items 28, 46, 47, 48, 49, 50, 51 or 52. If any of these items are replaced, hydraulic pump pulley will have to be aligned.

(7) Remove two nuts (46), two lockwashers (47) and two flat washers (48) from threaded rod (52). Discard two lockwashers (47).

(8) Remove two nuts (49), two lockwashers (50), two flat washers (51) and threaded rod (52) from hydraulic mount (28). Discard two lockwashers (50).

c. Assembly (Refer to Figure 2-14)

NOTE

If items 28, 46, 47, 48, 49, 50, 51 or 52 were replaced, hydraulic pump pulley alignment will have to be accomplished.

(1) Apply anti-seize compound (Item 13, Appx C) and install threaded rod (52), two flat washers (51), two new lockwashers (50) (Item 30, Appx E) and two nuts (49) on hydraulic mount (28).

(2) Install two flat washers (48), two new lockwashers (47) (Item 30, Appx E) and two nuts (46) on threaded rod (52).

(3) Install flat washer (44), new lockwasher (43) (Item 28, Appx E), nut (42) and J-bolt (45) on hydraulic mount (28). Do not tighten nut (42).

(4) Install bolt (26) and flat washer (25) on hydraulic pump mount (28).

(5) Secure hydraulic pump mount (28) to ECV engine block with two screws (37), two flat washers (38), screw (39), screw (40) and new external tooth lockwasher (41) (Item 38, Appx E).

(6) Secure hydraulic pump (2) to hydraulic pump mount (27) with two screws (34), two new lockwashers (35) (Item 30, Appx E) and two flat washers (36).

(7) Install key (33) on shaft of hydraulic pump (2).

(8) Apply antiseize compound (Item 13, Appx C) to pump pulley (32).

(9) Secure pump pulley (32) to hydraulic pump (2) with screw (29), flat washer (30) and two washer spacers (31).

d. Installation (Refer to Figure 2-14)

(1) Install front hydraulic mount bracket (27), with hydraulic pump (2) attached, in ECV engine compartment by attaching nut (23), new lockwasher (24) (Item 30, Appx E) and two flat washers (25) to bolt (26). Slide J-bolt (45) into center hole on front hydraulic mount bracket (27).

(2) Install two new lockwashers (21) (Item 28, Appx E), two flat washers (22) and two bolts (20) securing front hydraulic mount bracket (27) to hydraulic pump (28).

(3) Install new O-rings (18 and 19) (Items 53 and 54, Appx E) on elbow (14).

(4) Lubricate O-rings (18 and 19) (Items 53 and 54, Appx E) with a small amount of hydraulic fluid (Item 24, Appx C).

(5) Secure elbow (14) to hydraulic pump (2) with two flange halves (17), four bolts (13) and four new lockwashers (16) (Item 27, Appx E). Ensure that O-ring (18) (Item 54, Appx E) is seated properly on elbow (14) and is not pinched. Hand tighten four bolts (15).

(6) Connect tube assembly (13) to elbow (14). Ensure that O-ring (19) (Item 54, Appx E) is seated properly and is not pinched.

(7) Torque four bolts (15) in diagonal sequence in small increments to 488 ± 62 in. lbs. (41 ± 5 ft. lbs.).

(8) Torque nut on tube assembly (17) to 1680 ± 90 in. lbs. (140 ± 5 ft. lbs.).

(9) Install new O-rings (11 and 12) (Items 63 and 50, Appx E) on elbow (10).

(10) Lubricate O-rings (11 and 12) (Items 63 and 50, Appx E) with a small amount of hydraulic fluid (Item 24, Appx C).

(11) Install elbow (10) on hydraulic pump (2). Ensure O-ring (12) (Item 50, Appx E) is seated properly and is not pinched. Tighten elbow (10) until finger tight.

(12) Torque elbow (10) to 190 ± 10 in. lbs. (16 ± 1 ft. lbs.).

(13) Connect hose assembly (9) to elbow (10). Ensure O-ring (11) (Item 63, Appx E) is seated properly and is not pinched. Tighten nut on hose assembly (9) until finger tight.

(14) Torque nut on hose assembly (9) to 220 ± 10 in. lbs. (18 ± 1 ft. lbs.).

(15) Install new O-ring (7) (Item 53, Appx E) on hose assembly (6).

(16) Lubricate O-ring (7) (Item 53, Appx E) with a small amount of hydraulic fluid (Item 24, Appx C).

(17) Secure hose assembly (6) to hydraulic pump (2) with two flange halves (5), four bolts (3) and four new lockwashers (4) (Item 27, Appx E). Ensure that O-ring (7) (Item 53, Appx E) is seated properly on hose assembly (6) and is not pinched. Hand tighten four bolts (3).

(18) Torque four bolts (3) in diagonal sequence in small increments to 300 ± 50 in. lbs. (25 ± 4.5 ft. lbs.).

(19) Fill hydraulic pump (2) with hydraulic oil before installing hose (8). Fill until case drain overflows.

(20) Install hose assembly (8) on hydraulic pump (2). Tighten nut on hose assembly (8) until finger tight.

(21) Torque nut on hose assembly (8) to 720 ± 25 in. lbs. (60 ± 2 ft. lbs.).

2.12.8 Hydraulic Pump Replacement – Continued.

CAUTION

Do not mix or substitute any other hydraulic fluid with MIL-H-5606.

(22) Fill hydraulic reservoir with hydraulic fluid (Item 24, Appendix C) before rotating hydraulic pump (2).

(23) Open shut off valve (1) to hydraulic pump (2).

e. Alignment

(1) Loosen two nuts (49).

(2) Place tension tester bar (Item 49, Appx B) across crank pulley and hydraulic pump pulley (32).

(3) Adjust two nuts (49) until hydraulic pump pulley (32) is aligned with crank pulley.

(4) Tighten two nuts (49).

(5) Install/adjust primary hydraulic pump belt per para 2.12.7.

f. Prime Hydraulic Pump

NOTE

Hydraulic pump must be primed when a new pump is being installed.

(1) Ensure that ESS is in OFF position.

(2) Disconnect fuel pump cut off wire 54A at fuel pump solenoid.

(3) Manually open solenoid/valve SV2.

(4) Crank the ECV until the pump is primed (the condenser fan spins).

(5) Turn ECV off.

(6) Reconnect fuel pump solenoid wire 54A.

(7) Manually close solenoid/valve SV2.

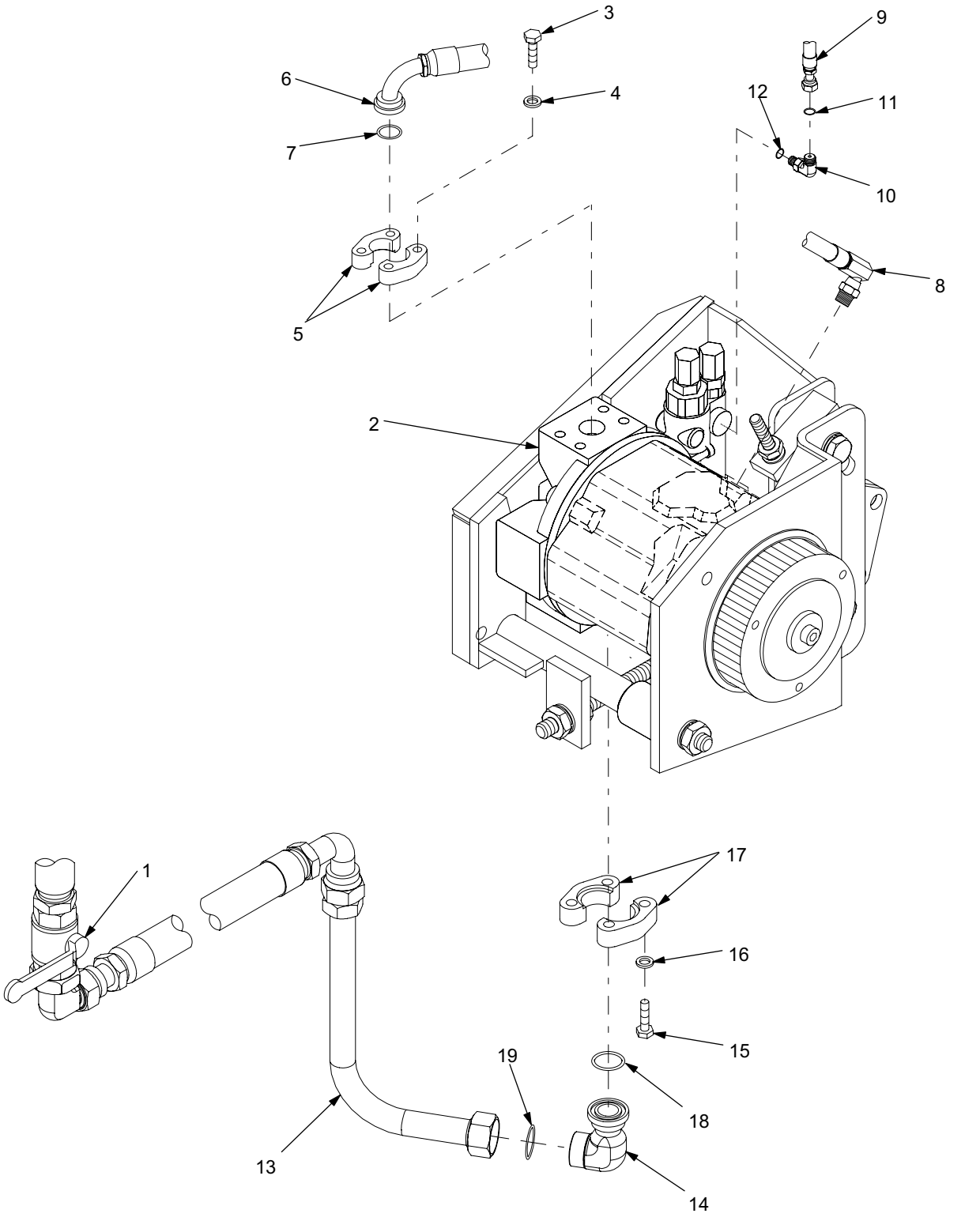


Figure 2-14. Hydraulic Pump Replacement (Sheet 1 of 3)

2.12.8 Hydraulic Pump Replacement – Continued.

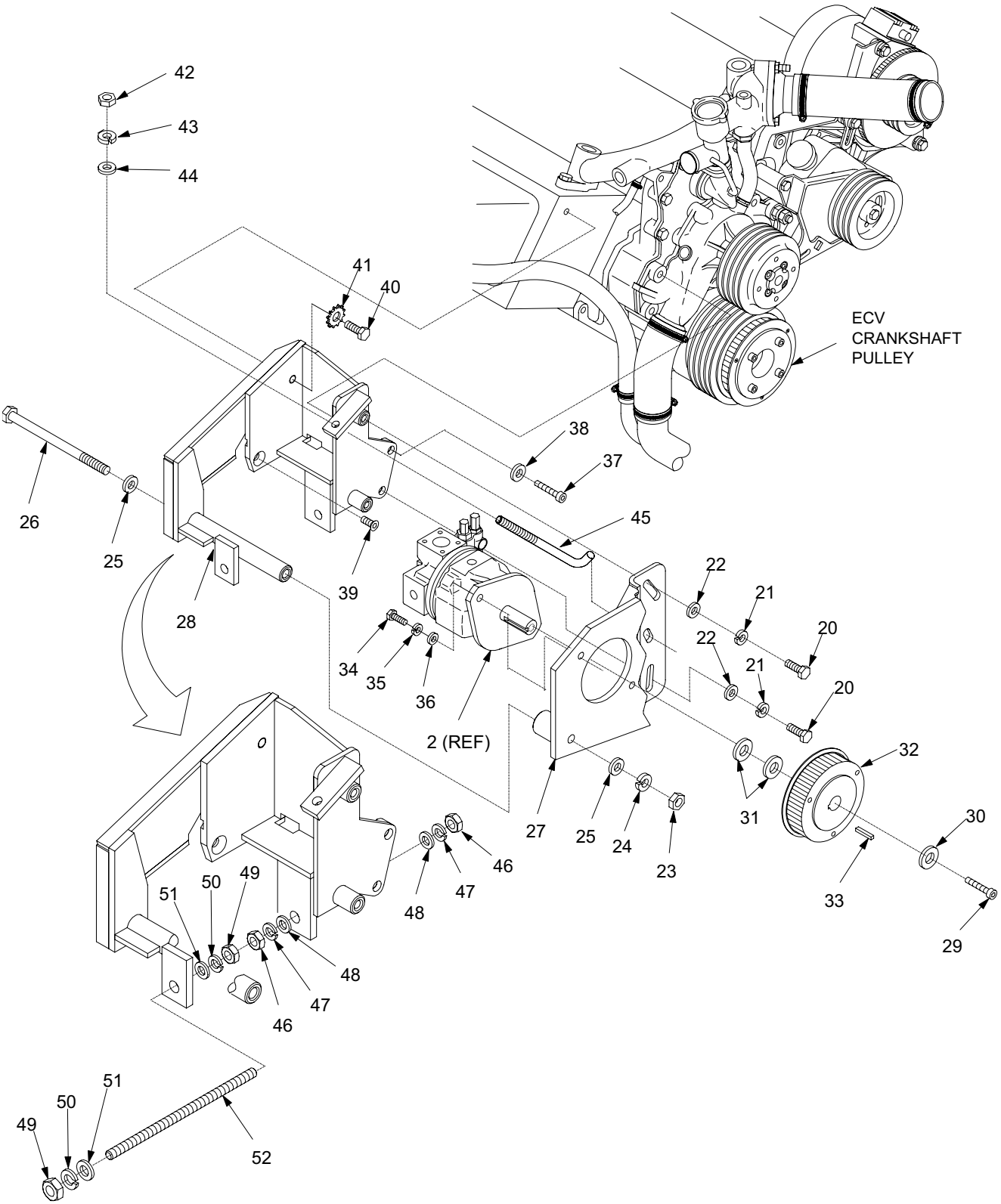


Figure 2-14. Hydraulic Pump Replacement (Sheet 2 of 3)

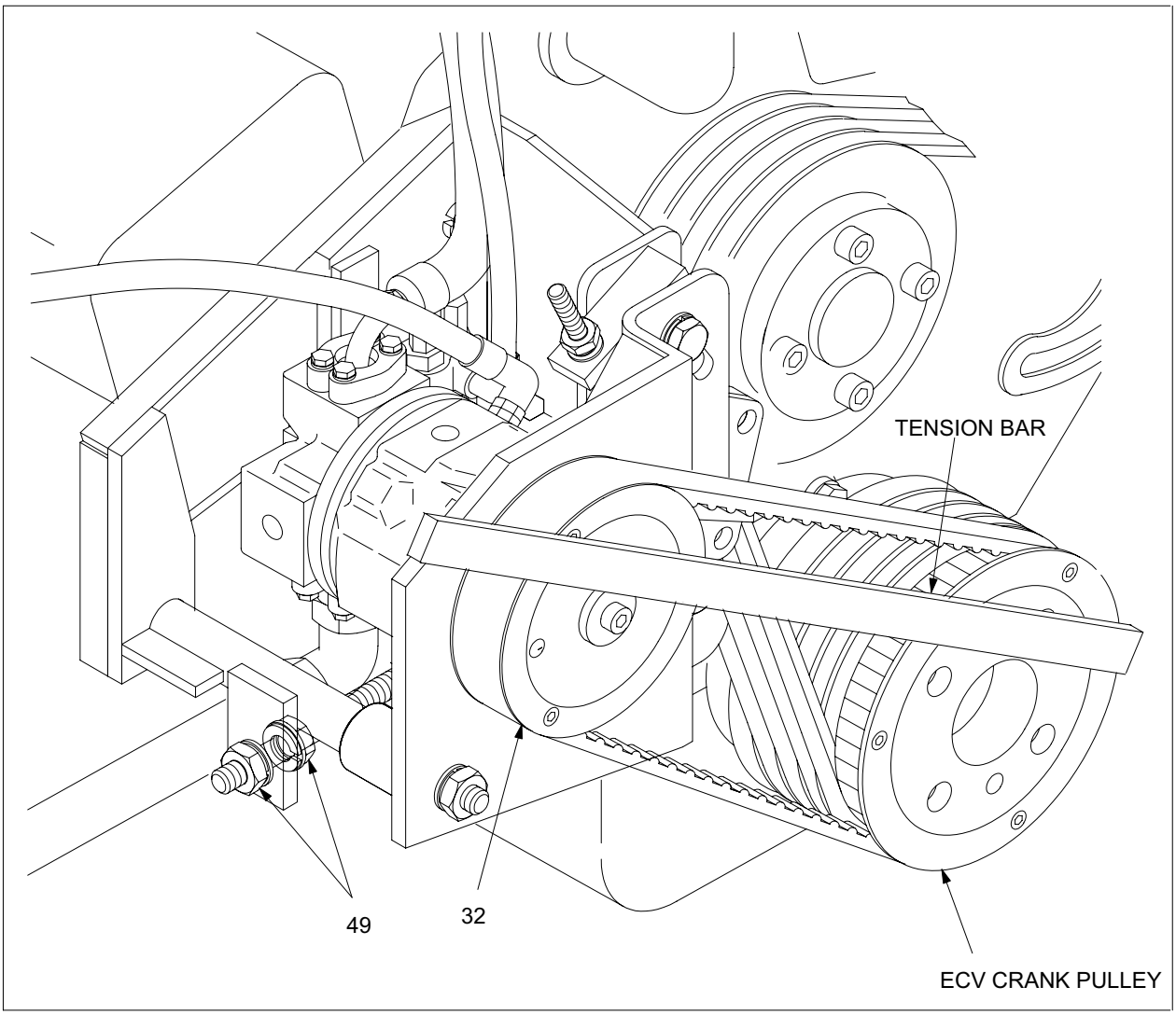


Figure 2-14. Hydraulic Pump Replacement (Sheet 3 of 3)

Follow-on maintenance: Install inner fender and air duct per TM 9-2320-387-24-1, fill hydraulic reservoir per para 2.14.3, remove tags, apply system power, perform operational test, check for leaks.

2.12.9 Alternator and Power Steering Belt Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Belt Tension Gage (Item 15, Appendix B)	Equipment Conditions: ECV shut off, system off, power panel and cab area tagged. ECV parking brake set. Pump system belt removed (see para 2.12.7). Reference: TM 9-2320-280-20-2

a. Removal (Refer to Figure 2-15)

NOTE

Replace belts as a set.

(1) Disconnect hose (1).

(2) Loosen two screws (2) on alternator.

(3) Loosen two screws (3) on alternator adjustment bracket (4).

(4) Insert .50 inch drive tool in square hole on alternator adjustment bracket (4).

(5) Turn drive tool clockwise and rotate alternator pulley (5) towards the water pump pulley (6) to release tension on the alternator drive belt set (7).

(6) Remove alternator drive belt set (7) from alternator pulley (5), water pump pulley (6), crank pulley (8), and power steering pulley (9).

(7) Loosen screws (10, 11 and 12) on power steering pump bracket (13).

(8) Insert .50 inch drive tool in square hole on power steering pump bracket (13).

(9) Turn drive tool clockwise and rotate power steering pump pulley (9) towards water pump pulley (6) to release tension on power steering pump belt (14).

(10) Remove power steering pump belt (14) from power steering pump pulley (9), water pump pulley (6), and crank pulley (8).

b. Installation (Refer to Figure 2-15)

(1) Install power steering pump belt (14) on power steering pump pulley (9), water pump pulley (6), and crank pulley (8).

(2) Turn drive tool clockwise and rotate power steering pump pulley (9) away from water pump pulley (6) until slack is removed from power steering pump belt (14).

(3) Tighten screws (10, 11 and 12) on power steering pump bracket (13).

(4) Test tension on power steering pump belt (14) with belt tension gage. Depress belt .25 inch. Required pressure for a new belt is 22.8 lb. Required pressure for a used belt is 19.9 lb. Adjust power steering pump bracket (13) as necessary until tension is correct.

(5) Install alternator drive belt set (7) on alternator pulley (5), water pump pulley (6), crank pulley (8) and power steering pump pulley (9).

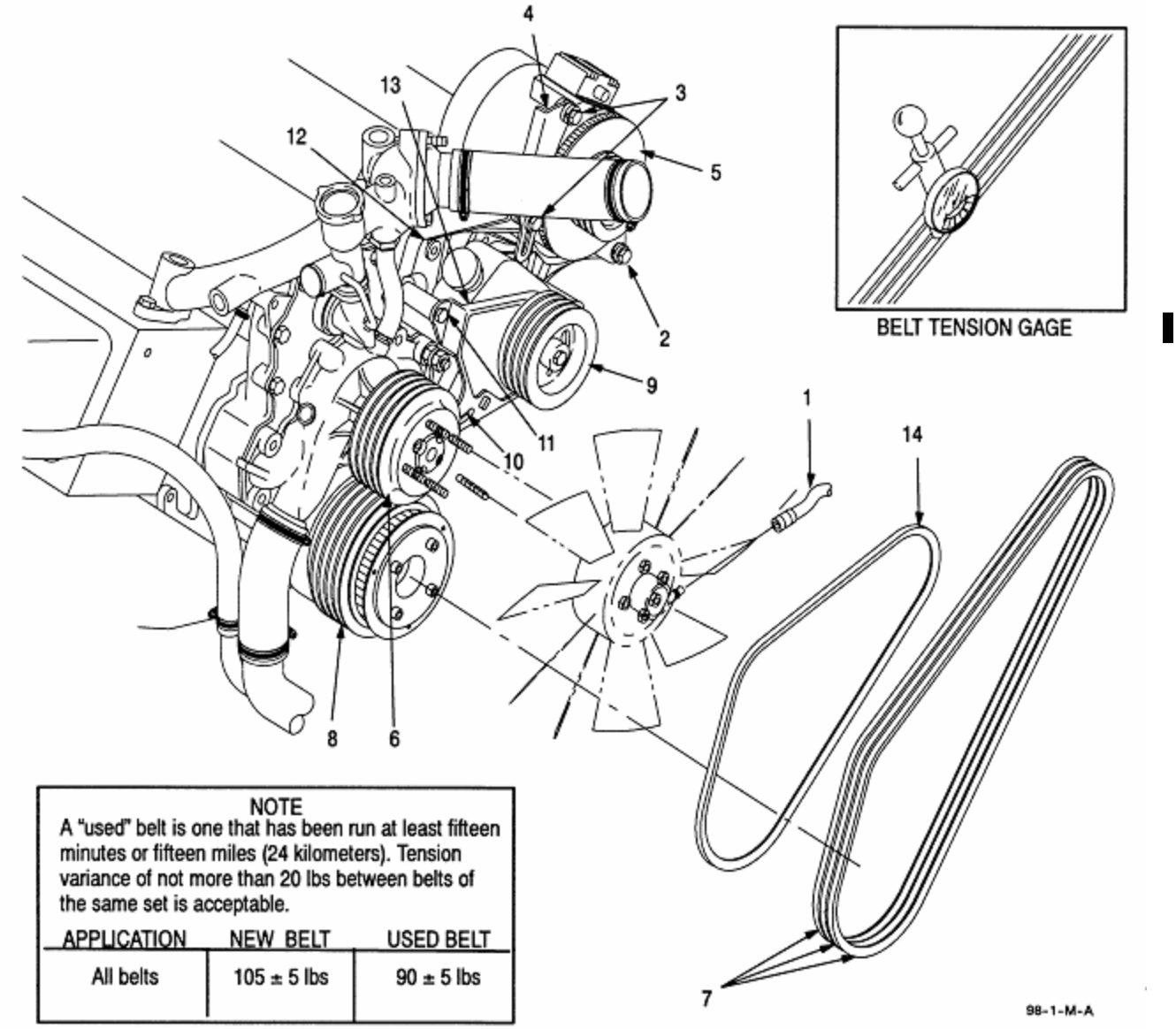
(6) Turn drive tool clockwise and rotate alternator pulley (5) away from water pump pulley (6) until slack is removed from the alternator drive belt set (7).

(7) Tighten two screws (3) on alternator.

(8) Tighten two screw (2) on alternator adjustment bracket (4).

(9) Test tension on alternator drive belt set (7) with belt tension gage. Required pressure for a new belt is 100 to 110 lbs. Required pressure for a used belt is 85 to 95 lbs. Adjust alternator adjustment bracket (4) and alternator pulley (5) as necessary until tension is correct.

(10) Connect hose (1).



NOTE
A "used" belt is one that has been run at least fifteen minutes or fifteen miles (24 kilometers). Tension variance of not more than 20 lbs between belts of the same set is acceptable.

APPLICATION	NEW BELT	USED BELT
All belts	105 ± 5 lbs	90 ± 5 lbs

Figure 2-15. Alternator and Power Steering Belt Replacement

Follow-on maintenance: Remove tags, apply system power, perform operational test.

2.12.10 Water Pump Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 39, Appendix B) Materials/Parts: High Temperature Gasket Compound (Item 25, Appendix C) Water Pump Gasket (Item 4, Appendix E) Sealing Compound (Item 18, Appendix C) References: TM 9-2320-387-24-1	Equipment Conditions: Power shut off, power panel and rear control panel tagged. Hydraulic pump removed (see para 2.12.8). Alternator and power steering belt removed (see para 2.12.9). Power steering pump removed (see TM 9 2320-387-24-1). Engine oil filler tube removed (see TM 9 2320-387-24-1). Water pump pulley removed (see TM 9 2320-387-24-1). Water pump inlet hose removed (see TM 9 2320-387-24-1). Thermostat bypass hose removed (see TM 9 2320-387-24-1). Fan drive hose disconnected (see TM 9 2320-387-24-1).

a. Removal (Refer to Figure 2-16)

(1) Remove two studs (1), seven screws (2), washers (3), and two nuts (4), water pump (5) and adapter plate (6) from timing gear cover (7).

(2) Remove one screw (8), six screws (9), adapter plate (6) and gasket (10) from water pump (5). Discard gasket (10).

(3) Clean remaining gasket material and sealing compound from sealing surfaces on adapter plate (6), water pump (5) and timing gear cover (7).

(4) Remove heater hose nipple (11), elbow (12), and bypass hose adapter (13) from water pump (5).

b. Installation (Refer to Figure 2-16)

(1) Apply sealing compound to threads of heater hose nipple (11), elbow (12), and bypass hose adapter (13) and install in water pump (5).

(2) Apply gasket compound to water pump housing (5), adapter plate (6) and gasket (10).

(3) Install gasket (10) and adapter plate (6) on water pump (5) with one screw (8) and six screws (9). Torque screws to 20-22 ft-lb.

(4) Apply gasket compound to timing gear housing (7) and adapter plate (6).

(5) Secure adapter plate (6) and water pump (5) to trimming gear housing (7) with two nuts (4), seven screw (2), washers (3) and two studs (1). Torque studs (1) and screws (2) to 20-22 ft-lb. Torque nuts (4) to 25-27 ft-lb.

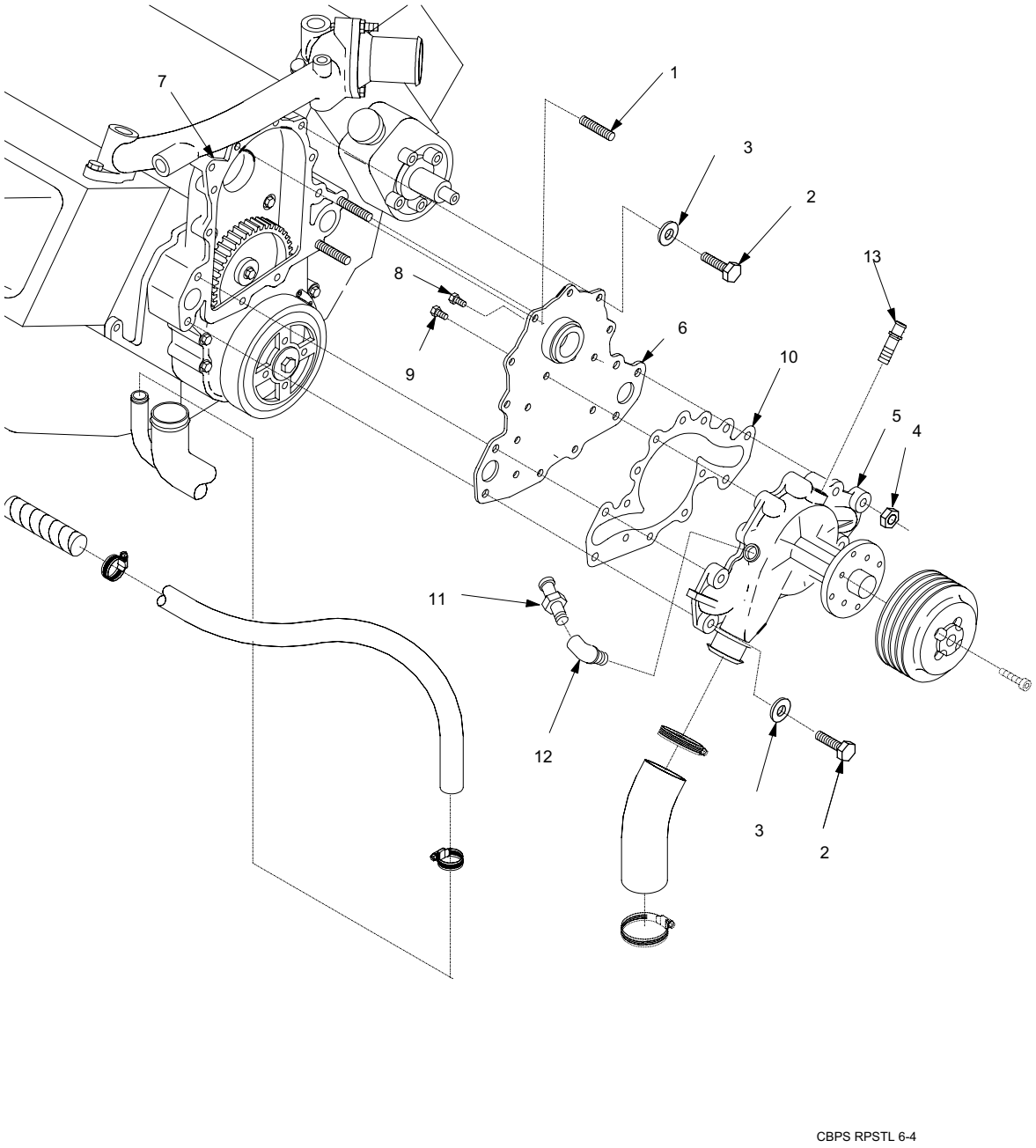


Figure 2-16. Water Pump Replacement

Follow-on maintenance: Install power steering pump, oil filler tube, water pump pulley, water pump inlet hose and thermostat bypass hose per TM 9-2320-387-24-1. Connect fan drive hose per TM 9-2320-387-24-1. Install hydraulic pump per para 2.12.8. Install alternator and power steering pump belt per para 2.12.9 Remove tags, apply system power, perform operational test.

2.12.11 Alternator Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 39, Appendix B)

Materials/Parts:
Lockwasher (Item 29 Appendix E)
Lockwasher (Item 9, Appendix E)
Two Lockwashers (Item 10, Appendix E)

Personnel Required: (2)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
Alternator and Power Steering Belts removed (see para 2.12.9).

References:
TM 9-2320-387-24-1

a. Removal (Refer to Figure 2-17)

(1) Disconnect wiring and remove voltage regulator per TM 9-2320-387-24-1.

WARNING

Alternator must be supported during removal and installation. Failure to support alternator may cause injury to personnel or damage to equipment.

(2) Remove two screws (1), two lockwashers (2) and two washers (3) from alternator (4). Discard two lockwashers (2).

(3) Remove screw (5), lockwasher (6), washer (7), and alternator (4) from bracket (8). Discard lockwasher (6).

NOTE

Perform steps 4 and 5 for alternate configuration.

(4) Remove nut (9), lockwasher (10), two washers (11), screw (12) and alternator (4) from bracket (8). Discard lockwasher (10).

(5) Remove screw (5), lockwasher (6), washer (7), and alternator (4) from bracket (8). Discard lockwasher (6).

(6) Remove pulley per para 2.12.12.

b. Installation (Refer to Figure 2-17)

(1) Install pulley per para 2.12.12.

(2) Secure alternator (4) to bracket (8) with screw (5), new lockwasher (6) (Item 9, Appendix E) and washer (7). Torque screws to 48 ft-lb.

(3) Install two screws (1), two new lockwashers (2) (Item 10, Appendix E) and two washers (3). Torque screws to 48 ft-lb.

NOTE

Perform steps 4 and 5 for alternate configuration.

(4) Secure alternator (4) to bracket (8) with screw (5), new lockwasher (6) (Item 9, Appendix E) and washer (7). Torque screw to 48 ft-lb.

(5) Install screw (12), two washers (11), new lockwasher (10) (Item 29 Appendix E) and nut (9). Torque to 48 ft-lb.

(6) Install voltage regulator and connect wiring per TM 9-2320-387-24-1.

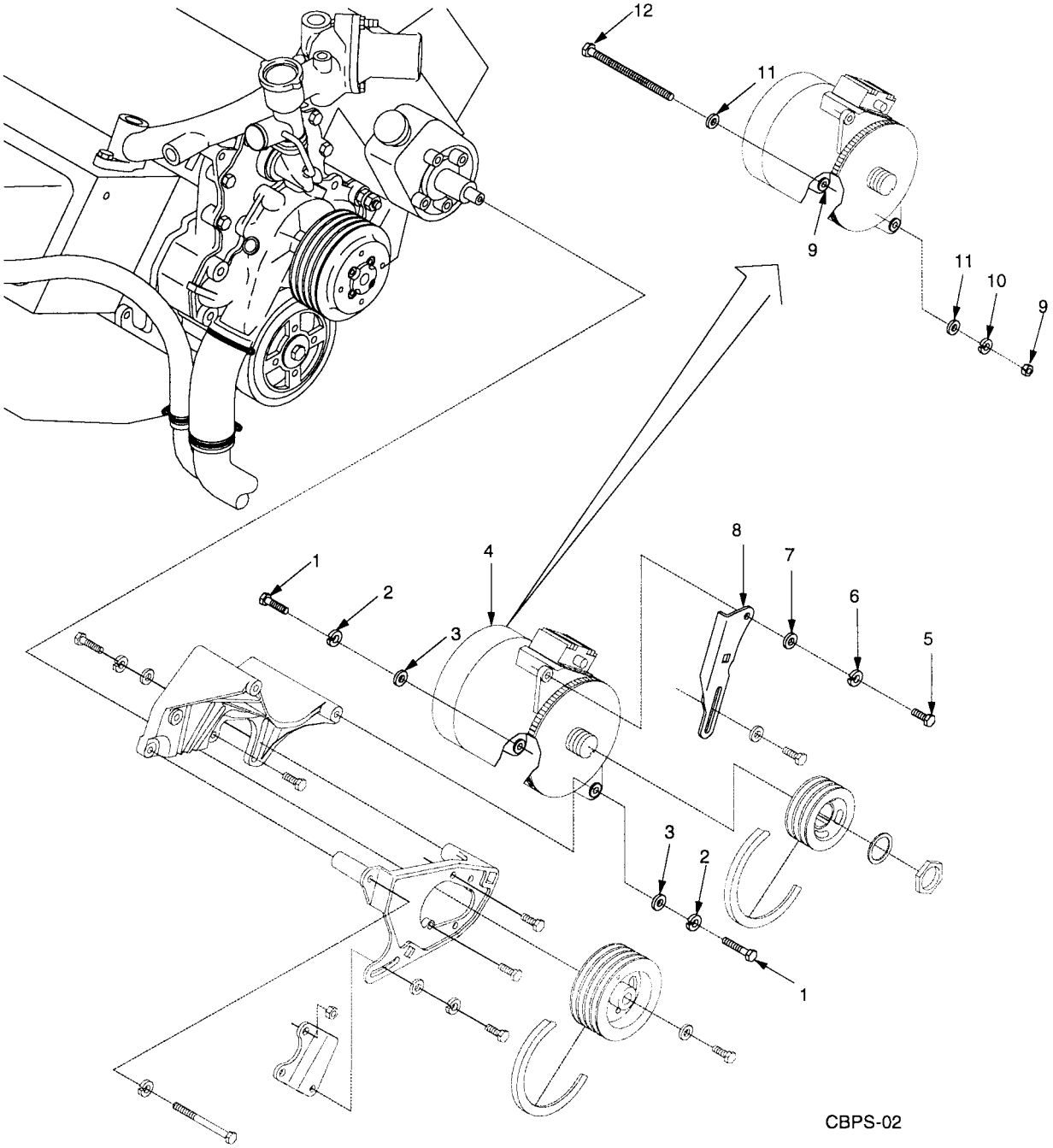


Figure 2-17. Alternator Replacement

Follow-on maintenance: Install alternator and power steering pump belt per para 2.12.9. Remove tags, apply system power, perform operational test.

2.12.12 Alternator Pulley Replacement.

This task covers: a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Mechanical Puller Kit (Item 30, Appendix B)	Equipment Conditions: ECV shut off, system off, power panel and cab area tagged. ECV parking brake set. Alternator drive belt set removed per para 2.12.9. Alternator removed (see TM 9-2320-387-24-1).

a. Removal (Refer to Figure 2-18)

(1) Remove alternator from ECV per TM 9-2320-387-24-1.

(2) Clamp pully (1) in a soft-jawed vice.

(3) Remove locknut (2) and washer (3) from shaft of alternator (4).

(4) Remove pully (1) from alternator (4) using a mechanical pully.

(5) Remove woodruff key (5) from shaft of alternator (4).

b. Installation (Refer to Figure 2-18)

(1) Install woodruff key (5) on shaft of alternator (4).

(2) Align pully keyway with woodruff key (5) in alternator shaft and tap pully onto shaft.

(3) Install washer (3) and locknut (2) on shaft. Tighten locknut (2) finger tight.

(4) Clamp pully (1) in soft-jawed vice.

(5) Tighten locknut (2) to 115-125 ft-lb (156-169 N-m).

(6) Remove pully (1) and alternator (4) from vice.

(7) Install alternator (4) in ECV per TM 9-2320-387-24-1.

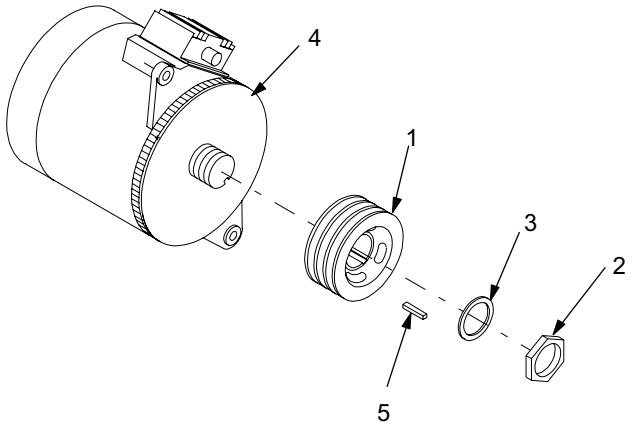


Figure 2-18. Alternator Pully Replacement

Follow-on maintenance: Install alternator drive belt set per para 2.12.9, remove tags, apply system power, perform operational test.

2.12.13 Power Steering Pump Pulley and Bracket Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV shut off, system off, power panel and cab area tagged.
Mechanical Puller Kit (Item 30, Appendix B)	ECV parking brake set.
Torque Wrench (Item 66, Appendix B)	Alternator and power steering drive belt set removed per para 2.12.9.
Materials/Parts:	Alternator removed (see TM 9-2320-387-24-1).
Lockwasher (Item 37, Appendix E)	
Lockwasher (Item 35, Appendix E)	References:
Lockwasher (Item 142, Appendix E)	TM 9-2320-387-24-1

NOTE

There are two styles of alternator brackets which are interchangeable. Refer to TM 9-2320-387-24-1 or -2 for removal and installation of the bracket not covered in this procedure.

a. Removal (Refer to Figure 2-19)

(1) Remove screw (1) and flat washer (2) securing power steering pump pulley (3) to shaft of power steering pump (4).

(2) Remove power steering pump pulley (3) from shaft of power steering pump (4) using mechanical pulley.

(3) Remove four screws (5) securing power steering pump bracket (6) to power steering pump (4).

(4) Remove two nuts (7), screw (8), lockwasher (9) and flat washer (10) securing mounting bracket (11) to power steering pump bracket (6). Discard lockwasher (9).

(5) Remove screws (15 and 18), two lockwashers (16) and two flat washers (17) securing power steering pump bracket (6) to alternator mounting bracket (14). Discard two lockwashers (16).

(6) Remove bolt (12) and lockwasher (13) securing power steering pump bracket (6) to alternator mounting bracket (14) and engine. Discard lockwasher (13).

(7) Remove power steering pump bracket (6).

b. Installation (Refer to Figure 2-19)

(1) Secure power steering pump bracket (6) to alternator mounting bracket (14) and engine with bolt (12) and new lockwasher (13) (Item 35, Appx E).

(2) Secure power steering pump bracket (6) to alternator mounting bracket (14) with screws (15 and 18), two new lockwashers (16) (Item 37, Appx E) and two flat washers (17).

(3) Secure power steering pump bracket (6) to power steering pump (4) with four screws (5).

(4) Secure mounting bracket (11) to power steering pump bracket (6) with screw (8), new lockwasher (9) (Item 142, Appx E), flat washer (10) and two nuts (7).

(5) Install power steering pump pulley (3) on shaft of power steering pump (4) with pulley installer.

(6) Secure power steering pump pulley (3) to shaft of power steering pump (4) with screw (1) and flat washer (2).

(7) Torque screw (1) to 37 ft-lbs.

2.12.13 Power Steering Pump Pulley and Bracket Replacement – Continued.

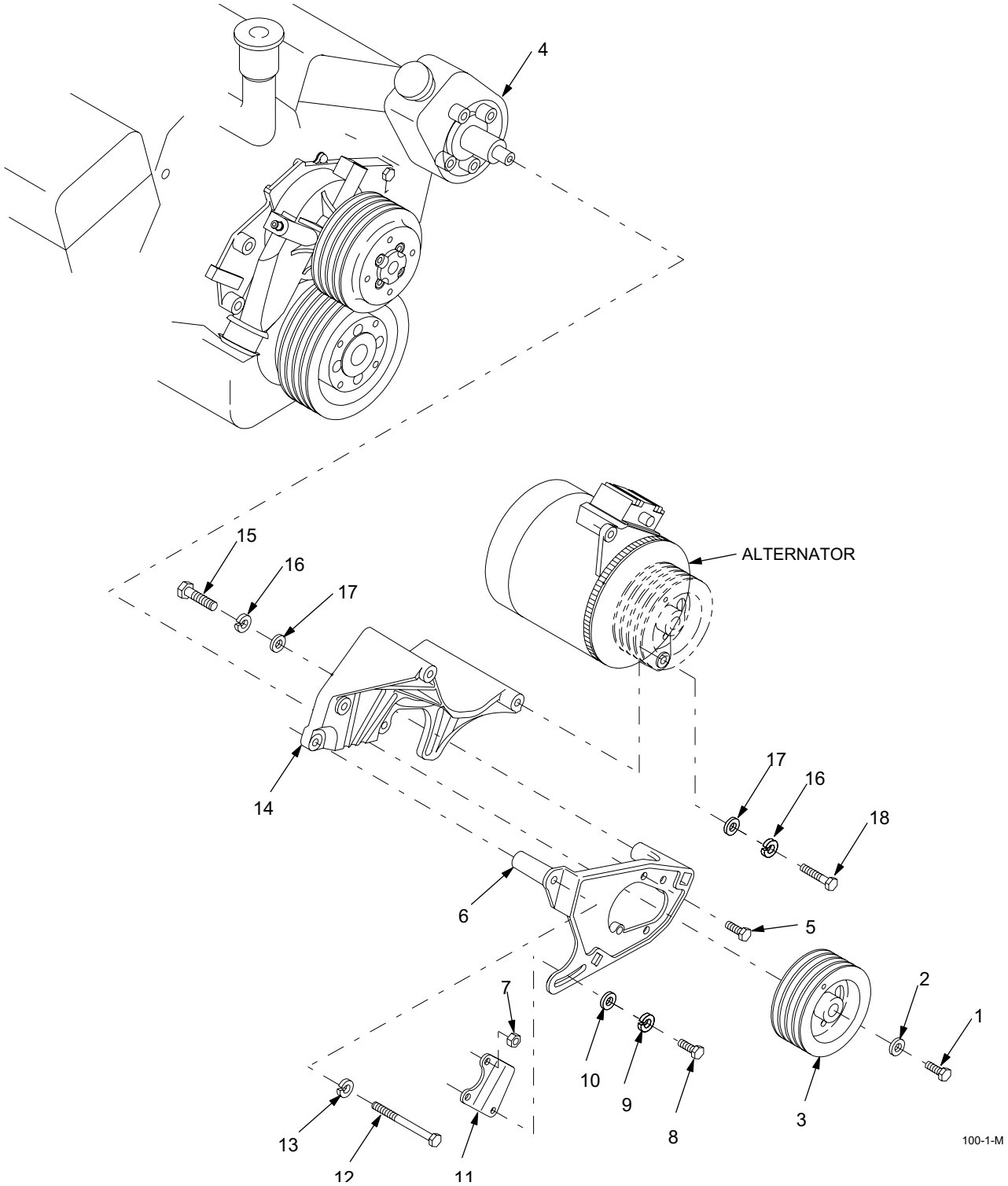


Figure 2-19. Power Steering Pump Pulley and Bracket Replacement

Follow-on maintenance: Install alternator (see TM 9-2320-387-24-1), install alternator and power steering pump belts per para 2.12.9, remove tags, apply system power, perform operational test.

2.12.14 Vehicle Control Box Replacement.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV shut off, system off, power panel and rear control panel tagged.
Extraction Tool (Item 10, Appendix B)	ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Shop Equipment: Electrical Equipment (Item 40, Appendix B)	ECV parking brake set.
Materials/Parts:	References:
Adhesive (Item 6, Appendix C)	TM 9-2320-387-24-1
Isopropyl Alcohol (Item 12, Appendix C)	
Rubber Gloves (Item 25, Appendix C)	Materials/Parts: (Cont.)
Wiping Rags (Item 39, Appendix C)	Twelve Lockwashers (Item 17, Appendix E)
Solder (Item 51, Appendix C)	Tie-down Straps (Item 87, Appendix E)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

Remove and install tie-down straps as required.

a. Removal (Refer to Figure 2-20)

(1) Disconnect two connectors from side of vehicle control box (1).

(2) Remove four screws (2) securing vehicle control box (1) to radio rack (3).

b. Disassembly (Refer to Figure 2-20)

(1) Remove two screws (4), two lockwashers (5) and two flat washers (6) securing EPG switch cover (7) to cover plate (8). Discard two lockwashers (5).

(2) Remove six screws (9), six lockwashers (10) and six flat washers (11) securing cover plate (8) to vehicle control box (1). Discard six lockwashers (10).

NOTE

Steps 3 through 6 apply to both switches (18). Note correct location of each switch before removal.

(3) Using extraction tool, carefully squeeze tabs (12) and pry indicator unit (13) loose from switch housing (14).

(4) Using a small, flat head screwdriver, turn two screws (15) counterclockwise until two retaining cams (16) lay down.

(5) Pull switch housing (14) from cover plate (8) and retainer cover (17).

(6) Tag and unsolder leads to two switches (18).

(7) Tag and remove leads from switch (19).

(8) Remove two nuts (20) and washer (21) securing switch (19) and guard (22) to cover plate (8).

2.12.14 Vehicle Control Box Replacement – Continued.

NOTE

Only remove gaskets if worn or damaged.

(9) Remove two gaskets (23) and two gaskets (24) from cover plate (8).

(10) Tag wires and remove three terminal lugs from buzzer (25).

(11) Remove two screws (26), four flat washers (27), two lockwashers (28) and two nuts (29) securing buzzer (25) to vehicle control box (1). Discard two lockwashers (28).

(12) Tag and unsolder wires from two binding posts (30).

(13) Remove two nuts (31) and four washers (32) securing two binding posts (30) to vehicle control box (1).

(14) Remove two screws (36), two lockwashers (37) and two flat washers (38) securing mounting angle (35) to vehicle control box (1). Discard two lockwashers (37).

(15) Remove two relays (34) from two relay sockets (33).

(16) Tag and remove sockets from two relay sockets (33).

(17) Remove two sockets (33) from mounting angle (35).

(18) Remove two rivet nuts (39) from mounting angle (35).

(19) Remove two connector nuts (40) securing two electrical connectors (41) to vehicle control box (1).

(20) Tag and remove leads from circuit breaker (42).

(21) Remove two screws (43) and two flat washers (44) securing circuit breaker (42) to bottom of vehicle control box (1).

c. Assembly (Refer to Figure 2-20)

(1) Install leads on circuit breaker (42). Remove tags from leads.

(2) Secure circuit breaker (42) to bottom of vehicle control box (1) with two screws (43) and two flat washers (44).

(3) Secure two electrical connectors (41) to vehicle control box (1) with two connector nuts (40).

(4) Install two rivet nuts (39) on mounting angle (35).

(5) Install two relay sockets (33) on mounting angle (35).

(6) Insert sockets into two relay sockets (33). Remove tags on wires.

(7) Install two relays (34) on two sockets (33).

(8) Secure mounting angle (35) to vehicle control box assembly (1) with two screws (36), two new lockwashers (37) and two flat washers (38).

(9) Secure two binding posts (30) to vehicle control box (1) with two nuts (31) and four washers (32).

(10) Solder wires to two binding posts (30). Remove tags on wires.

(11) If required, cut any damaged terminal lug(s) from wire and crimp new terminal lug(s) onto wire.

(12) Secure buzzer (25) to box assembly (11) with two screws (26), four flat washers (27), two new lockwashers (28) and two nuts (29).

(13) Install three terminal lugs on buzzer (25). Remove tags on wires.

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(14) Clean adhesive residue from cover plate (7) with rag dampened with alcohol.

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

(15) Using adhesive (Item 6, Appx C), install two gaskets (23) and two gaskets (24) on cover plate (8).

(16) Secure switch (19) and guard (22) to cover plate (8) with two nuts (20) and washer (21).

(17) Install leads on switch (19). Remove tags from leads.

NOTE

Steps 18 through 22 apply to both switches (18). Note correct location of each switch when installing.

(18) Push switch housing (14) through cover plate (8) and retainer cover (17).

(19) Using small, flat head screwdriver, turn two screws (15) clockwise until two retaining cams (16) stand up.

(20) Solder leads to back of switch housing (14). Remove tags from leads.

CAUTION

Do not install indicator unit without all four lamps installed or short circuit will occur when power is applied.

NOTE

If installing new switch, install lamps per TM 10-5410-228-10.

(21) Using extraction tool, carefully squeeze tabs (12) and install indicator unit (13) into switch housing (14), ensuring that aligning pin (45) enters hole in switch housing (14).

(22) Secure cover plate (8) to vehicle control box (1) with six screws (9), six new lockwashers (10) and six flat washers (11).

(23) Secure EPG switch cover (7) to cover plate (8) with two screws (4), two new lockwashers (5) and two flat washers (6).

d. Installation (Refer to Figure 2-20)

(1) Secure vehicle control box (1) to radio rack (3) with four screws (2).

(2) Connect two connectors to side of vehicle control box (10).

(3) Connect battery cable.

2.12.14 Vehicle Control Box Replacement – Continued.

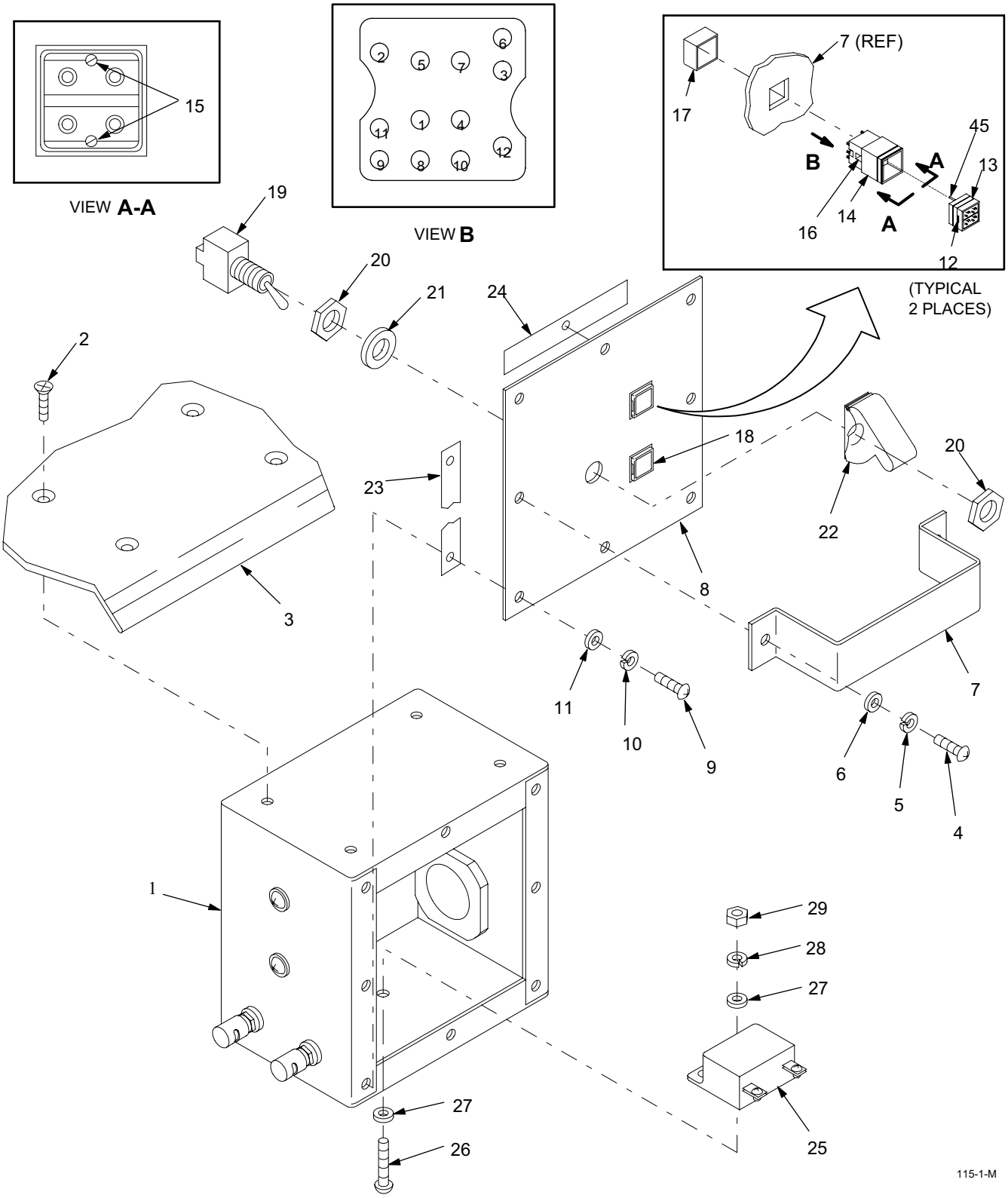


Figure 2-20. Vehicle Control Box Replacement (Sheet 1 of 2)

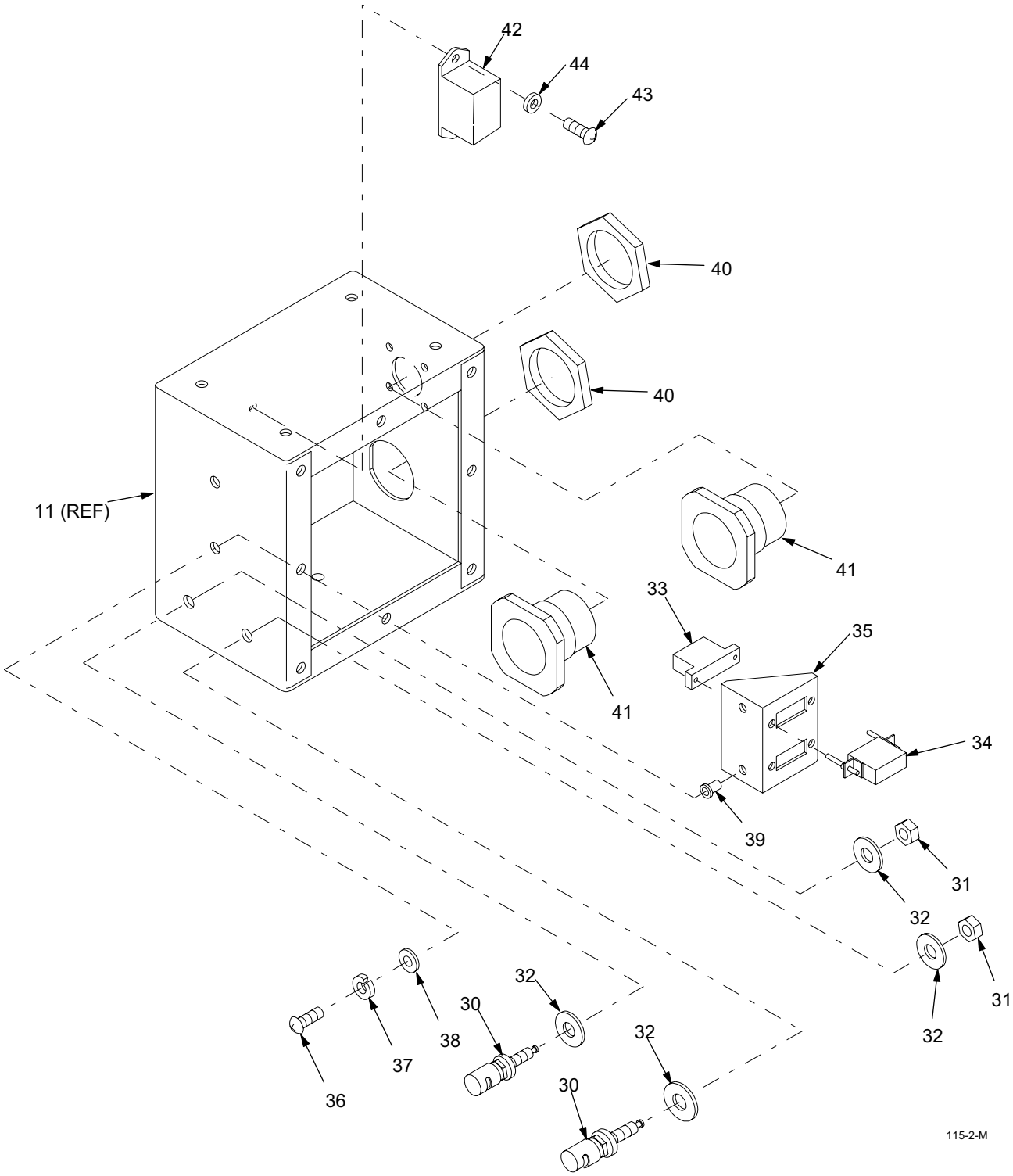


Figure 2-20. Vehicle Control Box Replacement (Sheet 2 of 2)

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24 and perform operational test.

2.12.15 EPG System Replacement.

This task covers: a. Removal b. Disassembly	c. Assembly d. Installation e. Calibration/Adjustment
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV off, system power off. Power panel and rear control panel tagged. ECV hood raised. ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Materials/Parts: Two Lockwashers (Item 11, Appendix E) Four Lockwashers (Item 17, Appendix E) Four Lockwashers (Item 33, Appendix E) Three Lockwashers (Item 35, Appendix E) Sealant (Item 44, Appendix C)	References: TM 9-2320-387-24-1

NOTE

The Electronically Programmed Governor (EPG) system consists of three major components: EPG control unit, magnetic pickup, and EPG actuator.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

2.12.15.1 EPG Control Unit.

a. Removal (Refer to Figure 2-21)

(1) Loosen four captive screws (1) and remove EPG control unit cover (2).

(2) Tag and disconnect all wires from terminal block mounted on EPG control unit (3) by loosening screws (4).

NOTE

Washers, lockwashers, and nuts are located in engine compartment.

(3) Remove four screws (5), four washers (6), four lockwashers (7) and four nuts (8) securing EPG control unit (3) to ECV fire wall. Discard four lockwashers (7).

b. Installation (Refer to Figure 2-21)

(1) Locate EPG control unit (3) and secure to ECV fire wall with four screws (5), four washers (6), four new lockwashers (7) (Item 17, Appx E) and four nuts (8).

NOTE

Washers, lockwashers, and nuts are located in engine compartment.

(2) Connect all wires to EPG control unit (3) terminal block with screws (4). Remove tags.

(3) Perform EPG System Calibration/Adjustment per para 2.12.15.3 e.

(4) Install EPG control unit cover (2) over EPG control unit by inserting and tightening four captive screws (1) into ECV fire wall threaded mount holes.

2.12.15.2 Magnetic Pickup.

a. Removal (Refer to Figure 2-21)

(1) Remove bolt (9) and clamp (10) securing magnetic pickup cable assembly (11) to engine bell housing (12).

(2) Tag and disconnect two wires (terminal 10) and shielded wire (terminal 11) connecting cable assembly (11) to EPG control (3) by loosening two screws (4).

(3) Disconnect electrical connector (13), and remove cable assembly (11) from magnetic pickup (14).

(4) Loosen jam nut (15).

(5) Unscrew magnetic pickup (14) from engine bell housing (12).

b. Installation (Refer to Figure 2-21)

(1) Position ring gear (16) under magnetic pickup (14) mounting hole in engine bell housing (12) so that a ring gear (16) tooth is in middle of mounting hole.

(2) Thread magnetic pickup (14) into its mounting hole in engine bell housing (12) until tip of magnetic pickup (14) touches the ring gear (16) tooth under mounting hole, then back off magnetic pickup (14) a quarter turn.

(3) Secure magnetic pickup (14) by tightening jam nut (15).

(4) Connect electrical connector (13) to magnetic pickup (14).

(5) Position clamp (10) around magnetic pickup cable assembly (11) and secure with bolt (9) to engine bell housing (12).

(6) Connect two wires (terminal 10) and shielded wire (terminal 11) connecting magnetic pickup cable assembly (11) to EPG control unit (3) with two screws (4). Remove tags.

(7) Perform EPG System Calibration/Adjustment per para 2.12.15.3 e.

2.12.15.3 EPG Actuator.

a. Removal (Refer to Figure 2-21)

(1) Tag and disconnect the two wires from EPG actuator (17) terminal block by removing two screws (18).

(2) Remove three screws (19) and three lockwashers (20) securing EPG actuator mounting bracket (21) to its three mounting spacers (22) on ECV engine right intake manifold. Remove EPG actuator assembly from engine compartment. Discard three lockwashers (20).

(3) Remove three mounting spacers (22) from ECV engine right intake manifold.

b. Disassembly (Refer to Figure 2-21)

(1) Remove dust cap from cam bearing (23) and remove nut (24) securing cam bearing (23) in lever (25).

(2) Loosen clamping screw on lever (25), and remove lever (25) from transfer shaft (26).

(3) Remove screw (27), washer (28), lockwasher (29) and nut (30) securing linkage rod assembly to actuator lever (31). Discard lockwasher (29).

(4) Remove screw (32), washer (33), lockwasher (34) and nut (35) securing linkage rod assembly to transfer lever (36). Discard lockwasher (34).

(5) Disassemble linkage rod assembly by removing two rod end bearings (37) and two jam nuts (38) from linkage rod (39).

(6) Loosen clamping screw on lever (31), and remove lever (31) from EPG actuator (17) shaft.

(7) Loosen setscrews on two shaft spacers (40), and remove two shaft spacers (40) from transfer shaft (26).

(8) Loosen clamping screw on lever (36), and slide out transfer shaft (26).

(9) Remove two rod end bearings (41) and two jam nuts (42) from EPG actuator mounting bracket (21) threaded studs.

(10) Remove four screws (43) and four lockwashers (44) securing EPG actuator (17) to EPG actuator mounting bracket (21). Discard four lockwashers (44).

2.12.15 EPG System Replacement - Continued.

c. Assembly (Refer to Figure 2-21)

(1) Secure EPG actuator (17) to EPG actuator mounting bracket (21) with four screws (43) and four new lockwashers (44) (Item 33, Appx E).

(2) Install one jam nut (42) and one rod end bearing (41) on each threaded stud on EPG actuator mounting bracket (21). Thread two rod end bearings (41) onto studs until there is 9/16 of an inch between shank of bearings (41) and forward edge of EPG actuator mounting bracket (21). Position two rod end bearings (41) to allow insertion of transfer shaft (26) through bearing holes. Tighten two jam nuts (42) against shanks of two rod end bearings (41).

(3) Insert transfer shaft (26) into rod end bearing (41) on linkage rod side (39), ensuring lever (36) is on transfer shaft (26), and insert transfer shaft (26) through opposite side rod end bearing (41). Do not tighten clamping screw on lever (36) at this time.

(4) Install two shaft spacers (40) on transfer shaft (26) and tighten setscrews in two shaft spacers (40).

(5) Install lever (31) on EPG actuator (17) shaft at angle shown in layout drawing (Figure 2-21, sheet 4), and tighten clamping screw on lever (31).

(6) Assemble linkage rod assembly by installing one jam nut (38) and then one rod end bearing (37) on each end of linkage rod (39). Adjust length so distance between center of two rod end bearings (37) at each end is 5-1/4 inches. Tighten two jam nuts (38) against shanks of two rod end bearings (37).

(7) Secure linkage rod assembly to lever (31) with screw (27), washer (28), new lockwasher (29) (Item 11, Appx E) and nut (30).

(8) Secure other end of linkage rod assembly to lever (36) with screw (32), washer (23), new lockwasher (34) (Item 11, Appx E) and nut (35).

(9) Slide lever (36) on transfer shaft (26) until linkage rod (39) to EPG actuator (17) is aligned. Tighten lever (36) clamping screw.

(10) On offset side of lever (25), install stud of cam bearing (23) in threaded hole in lever (25). Apply sealant (Item 44, Appendix C) to nut (24) and secure cam bearing (23) in lever (25) with nut (24). Install dust cap on cam bearing (23).

(11) Install lever (25) (with attached cam bearing (23)) on transfer shaft (26) with lever (25) pointing downwards, and tighten clamping screw on lever (25).

d. Installation (Refer to Figure 2-21)

(1) Apply sealant (Item 44, Appx C) to mounting studs and three mounting spacers (22).

(2) Secure EPG actuator mounting bracket (21) to three mounting spacers (22) with three new lockwashers (20) (Item 35, Appx E) and three screws (19).

(3) With ECV engine off and engine fuel pump throttle lever in idle position, check that cam bearing (23) on lever (25) just touches forward edge of fuel pump throttle lever. Loosen clamping screw on lever (25), and rotate lever (25) as necessary. Hold cam bearing (23) in this position and tighten clamping screw on lever (25).

(4) By hand, move lever (31) to full stroke and check that lever (25) and cam bearing (23) stay in contact with fuel pump throttle lever through full stroke. If lever (25) end of transfer shaft (26) needs to be closer to fuel pump throttle lever, inboard rod end bearing (41) should be turned farther on to its threaded stud on the EPG actuator mounting bracket (21).

(5) Connect the two EPG actuator wires to the EPG actuator (17) terminal block with two screws (18).

(6) Perform EPG System Calibration/Adjustment per para e.

e. Calibration/Adjustment (Refer to Figure 2-21)

Once all components of the EPG system are installed, calibration/adjustment of this system is accomplished by the EPG control unit (3). Remove EPG control unit cover by loosening four captive screws (1).

The EPG control unit has two switch selections (S1 and S2), and four potentiometer adjustments (DROOP, I, GAIN, and SPEED) provided on its front panel.

(1) Switch Selections
  (a) Set S1 to OFF.
  (b) Set S2 to OFF.
(2) Potentiometer Adjustments (System Calibration)
  (a) Set DROOP to 0.
  (b) Set I to 6 marks from zero.
  (c) Set GAIN to 5 marks from zero.

(3) Start engine.

(4) Set EPG switch to ON position.

(5) Adjust SPEED potentiometer on the EPG control unit until the engine is operating at desired engine RPM (approximately 1,475 RPM). Clockwise increases engine RPM.

(6) If engine RPM is unstable, adjust I and GAIN settings as described in steps 7 through 11 until engine RPM is stable, otherwise skip to step 12.

(7) Turn GAIN clockwise slowly until actuator lever oscillates.

(8) Turn GAIN setting counterclockwise until actuator lever is stable.

(9) Upset lever by hand.

(10) If lever oscillates one to three times and stops, setting is correct (on warm engine). If engine is cold, three to five times is acceptable.

(11) Reduce GAIN setting counterclockwise one division. Turn I adjustment fully clockwise while observing actuator lever. If lever does not become unstable, upset it by hand. When lever slowly oscillates, turn I adjustment counterclockwise slowly until lever is stable. Upset lever again; it should oscillate one to three times and become stable for optimum response (three to five times if engine is cold).

(12) Refer to subparagraph 2.14.5.d., steps 1 through 8, to check NBC fan speed.

(13) Install EPG control unit cover (2) by tightening four captive screws (1).

2.12.15 EPG System Replacement – Continued.

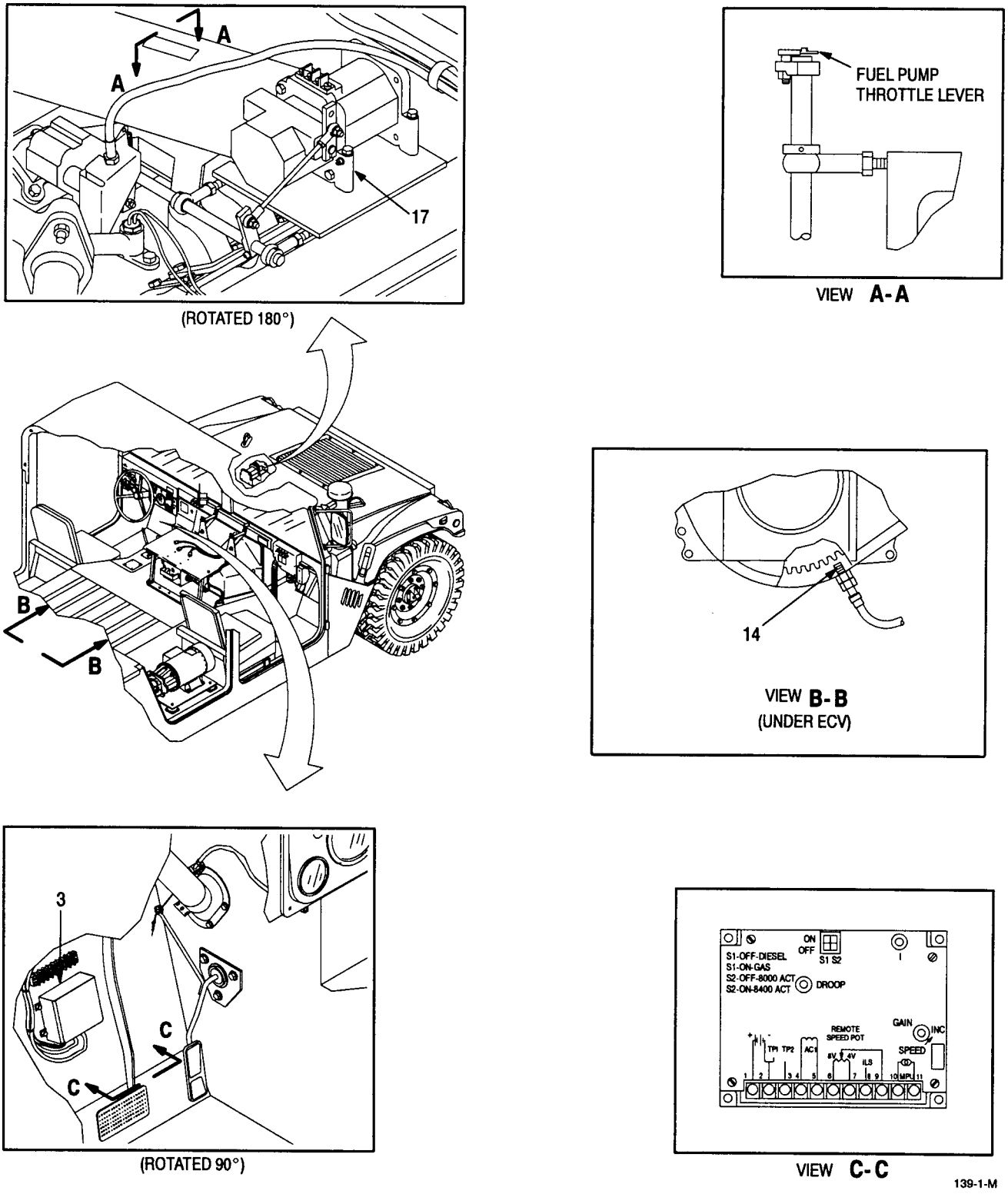


Figure 2-21. EPG System Replacement (Sheet 1 of 4)

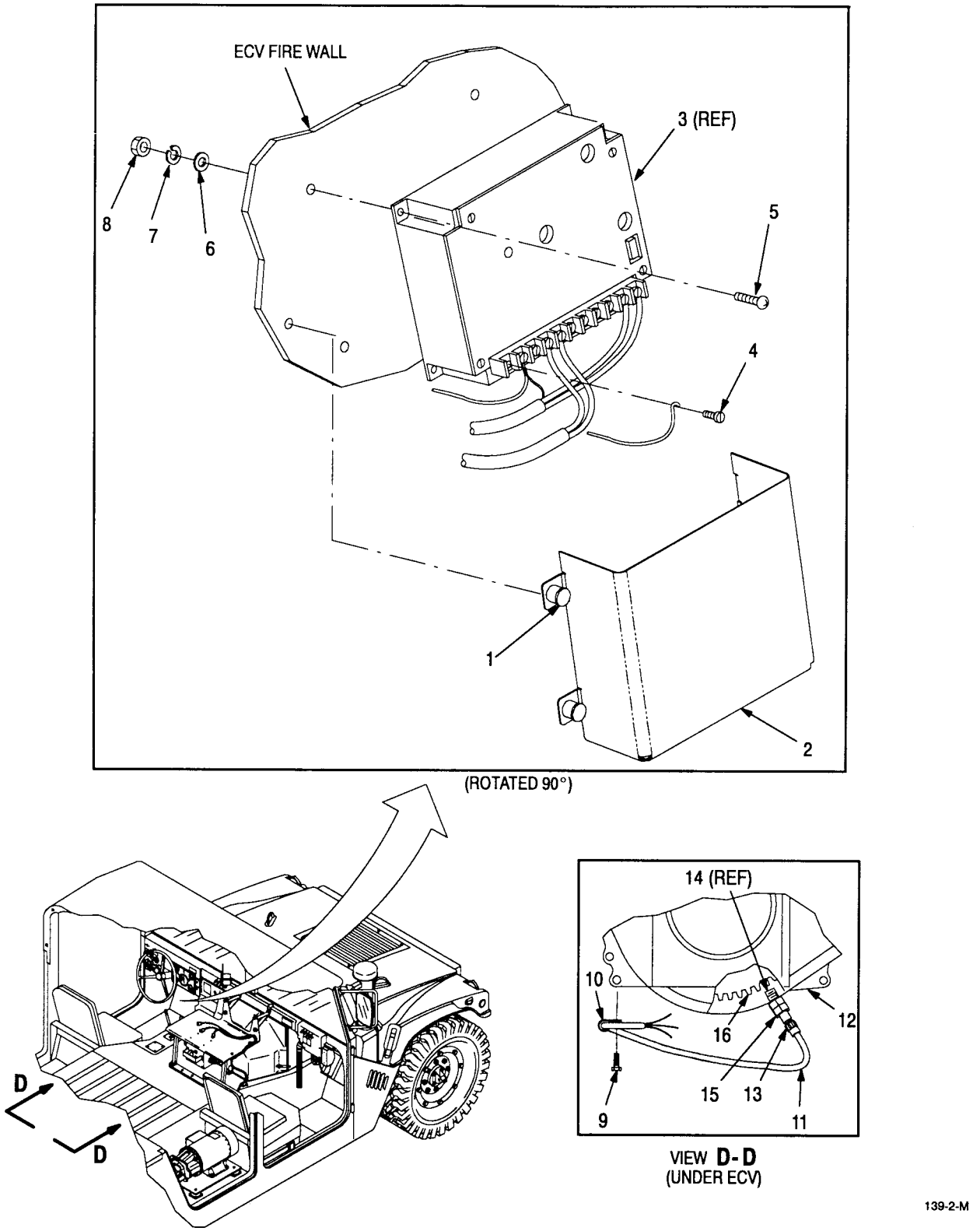


Figure 2-21. EPG System Replacement (Sheet 2 of 4)

2.12.15 EPG System Replacement – Continued.

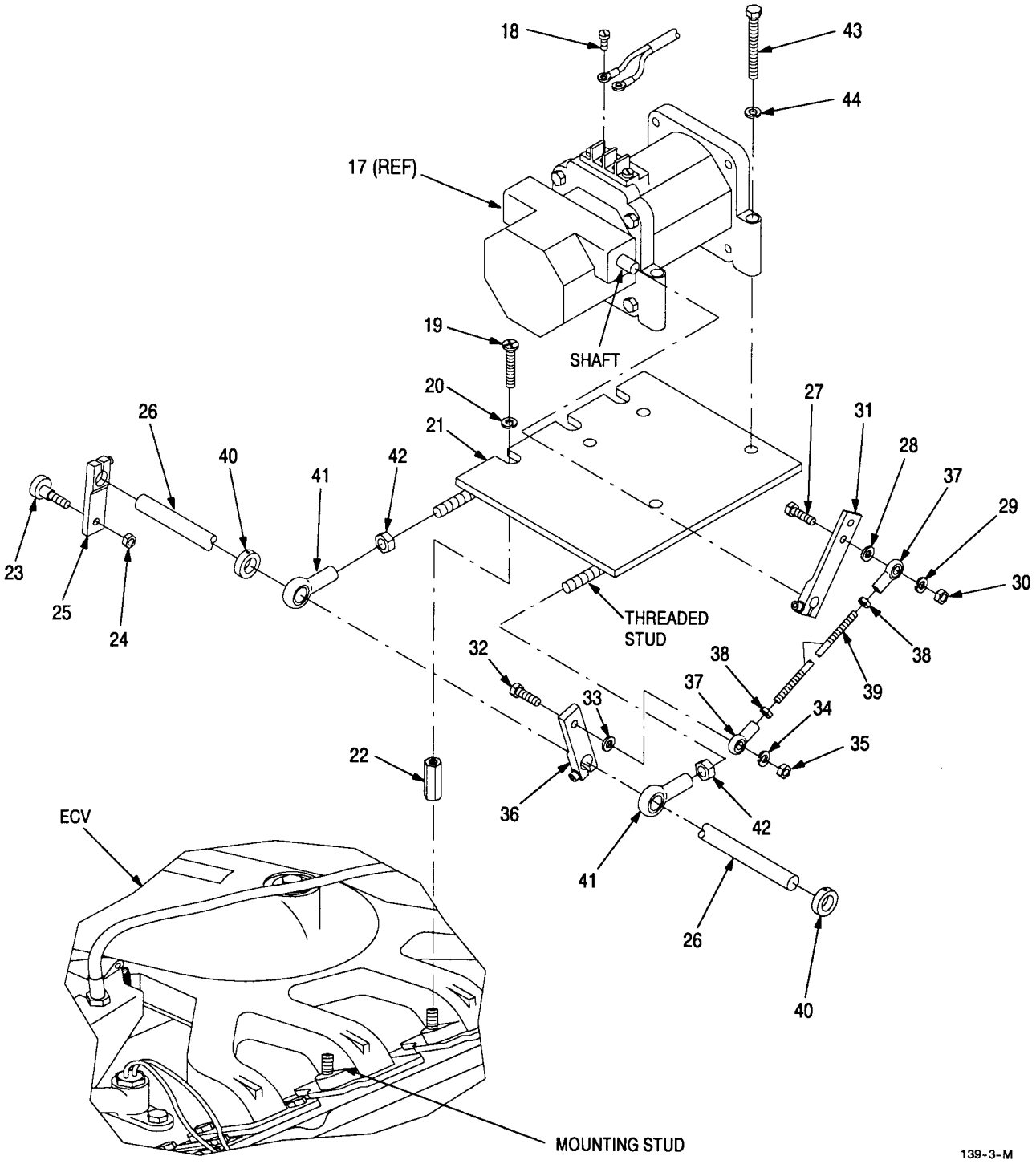


Figure 2-21. EPG System Replacement (Sheet 3 of 4)

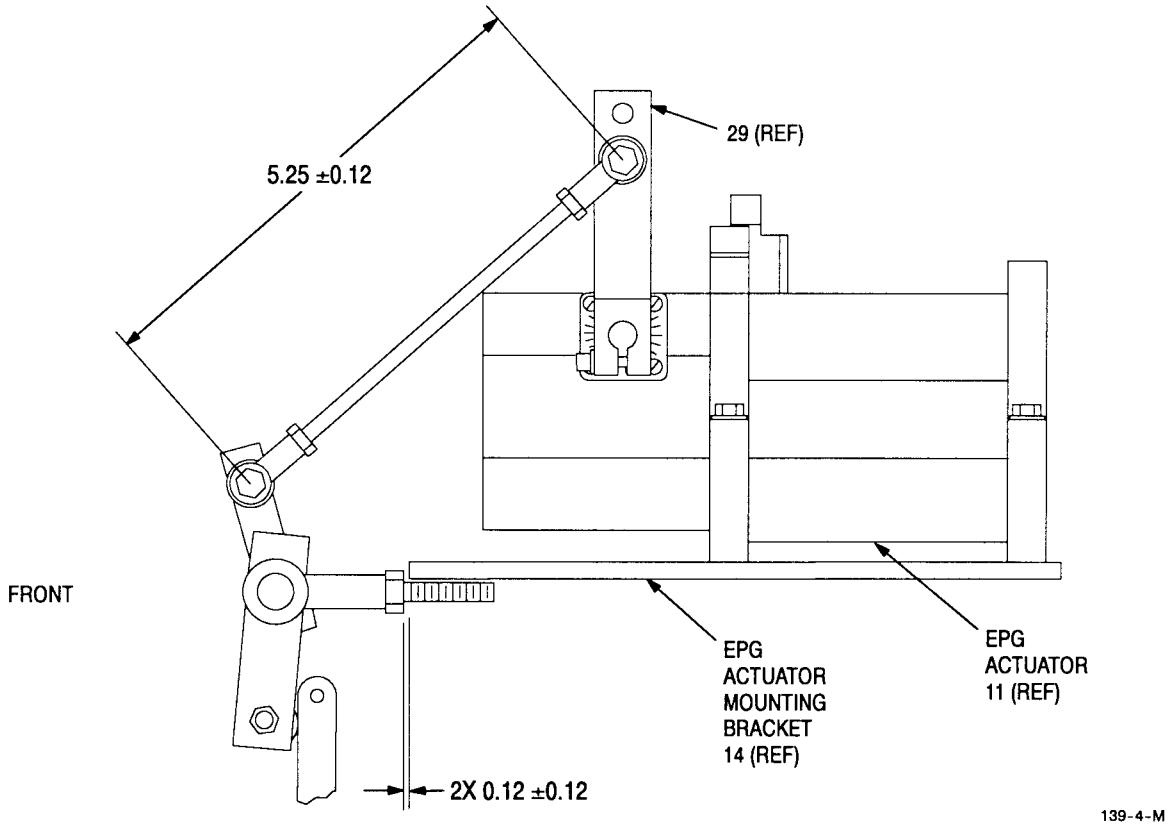


Figure 2-21. EPG System Replacement (Sheet 4 of 4)

Follow-on maintenance: Close hood, connect ECV battery ground cable per TM 9-2320-387-24-1, remove tags, apply system power and perform operational test.

2.13 LIGHTWEIGHT MULTIPURPOSE SHELTER (LMS).

2.13.1 ABS Cover Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV engine off, power off, parking brake set. ABS deflated and unrolled (reference TM 10-5410-228-10), or ABS inflated.
Materials/Parts: Thirty Lockwashers (Item 19, Appendix E)	References: TM 10-5410-228-10

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-22)

(1) Remove two block assemblies (1), two block wire cable assemblies (2) and two wire cable assemblies (3) from LMS and tailgate assembly (4).

(2) Remove two eyebolts (5) from tailgate assembly (4).

(3) Remove four eyebolts (6), four lockwashers (7) and four flat washers (8) from LMS. Discard four lockwashers (7).

(4) Remove eight screws (9), eight lockwashers (10), eight flat washers (11) and four mounting brackets (12) securing two side cover retainers (13) and two bottom side ABS covers (14) to tailgate assembly (4). Discard eight lockwashers (10).

(5) Remove tube assembly (15) from bottom ABS cover assembly (16).

(6) Remove two nuts (17), two lockwashers (18), two flat washers (19), two adapters (20) and two eyebolts (21) from tube assembly (15). Discard two lockwashers (18).

(7) Remove sixteen screws (22), sixteen lockwashers (23) and sixteen flat washers (24) securing four mounting brackets (25), bottom cover retainer (26) and bottom ABS cover assembly (16) to tailgate assembly (4). Discard sixteen lockwashers (23).

(8) Remove nine screws (27), nine lockwashers (28) and nine flat washers (29) securing nine mounting brackets (30) to top and side retainers (31). Discard nine lockwashers (28).

(9) Remove two tension relief straps (32) from two eyebolts (33).

b. Assembly (Refer to Figure 2-22)

(1) Connect two tension relief straps (32) to two eyebolts (33).

(2) Secure nine mounting brackets (30 to top and side retainers (31) with nine screws (27), nine new lockwashers (28 (Item 17, Appendix F) and nine flat washers (24).

(3) Secure four mounting brackets (25), bottom cover retainer (26) and bottom ABS cover assembly (16) to tailgate assembly (4) with sixteen screws (22), sixteen new lockwashers (23) (Item 19, Appx E) and sixteen flat washers (24).

(4) Secure two eye bolts (21) to tube assembly (15) with two adapters (20), two flat washers (19), two new lockwashers (18) (Item 19, Appx E) and two nuts (17).

(5) Install tube assembly (15) into bottom ABS cover assembly (16).

(6) Secure four mounting brackets (12), two side cover retainers (13) and two bottom side ABS covers (14) to tailgate assembly (4) with eight screws (9), eight new lockwashers (10) (Item 19, Appx E) and eight flat washers (11).

(7) Secure four eyebolts (6) to LMS with four new lockwashers (7) (Item 19, Appx E) and four flat washers (8).

(8) Install two eyebolts (5) on tailgate assembly (4).

(9) Install two block assemblies (1), two block wire cable assemblies (2) and two wire cable assemblies (3) on LMS.

(10) Install two block assemblies (1) on tailgate assembly (4), ensuring that lock block is facing forward.

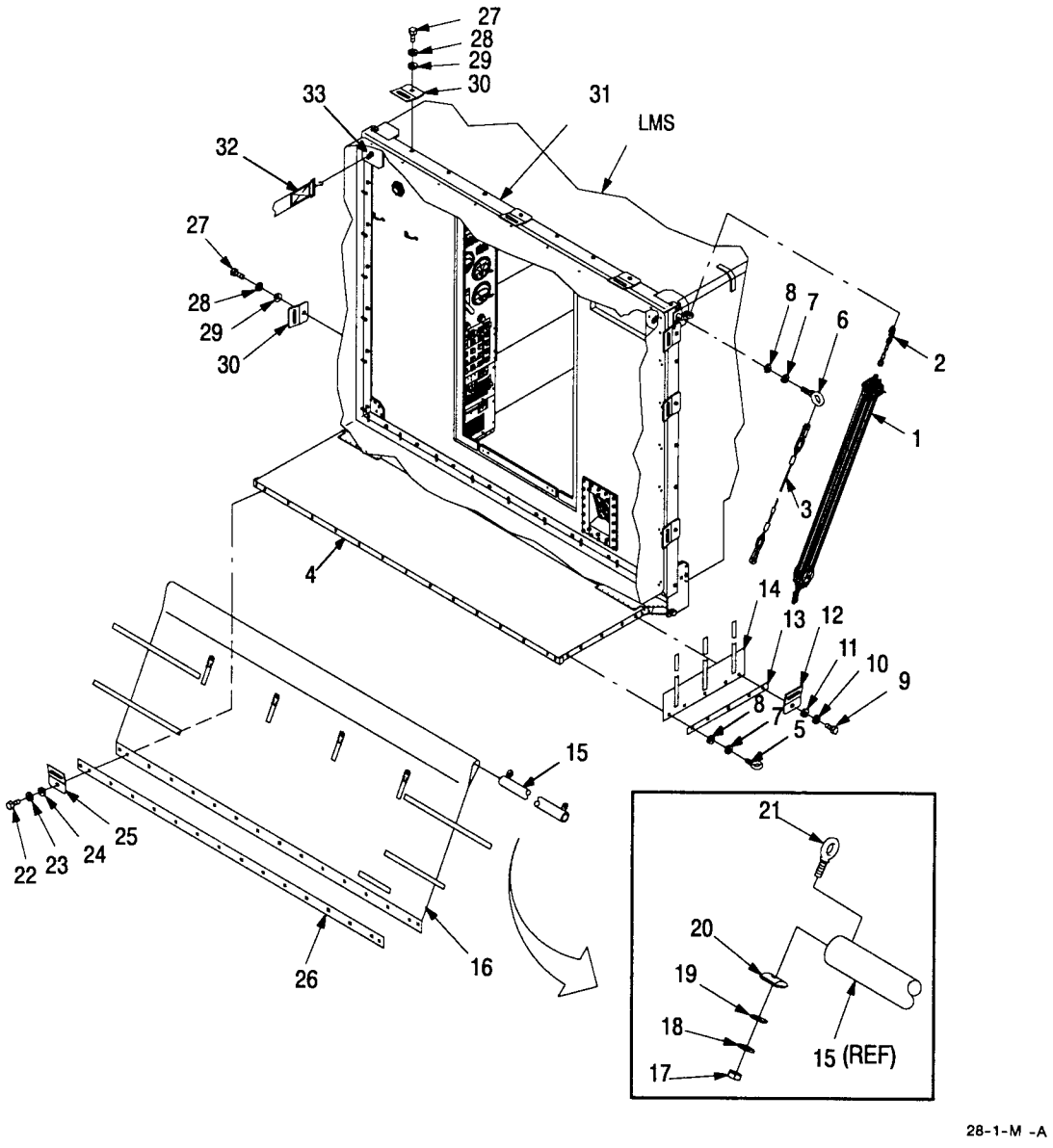


Figure 2-22. ABS Cover Replacement

2.13.2 Block Assembly Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: Block assembly removed from LMS (see para 2.13.1).
Materials/Parts: Rope (Figure D-2, Appendix D)	

a. Disassembly (Refer to Figure 2-23)

(1) Remove clamp (1) from end of rope (2).

(2) Pull rope (2) through exit block (3) and lock block (4). Discard rope (2).

b. Assembly (Refer to Figure 2-23)

(1) Cut new rope (2) to 51 feet.

NOTE

Do not cross rope.

(2) Insert end of rope (2) into clamp nut (1) and loop end through small bottom roller of lock block (4).

(3) Install clamp halves over loop and tighten clamp nut (1).

(4) Thread rope (2) through rollers as follows: Right roller on lock block (3), through right roller on lock block (4), through middle roller on lock block (3), through middle roller on exit block (4), through left roller on lock block (3), and up through left roller on exit block (4).

(5) Tie a knot at end of rope (2). Tie second knot six inches from end knot.

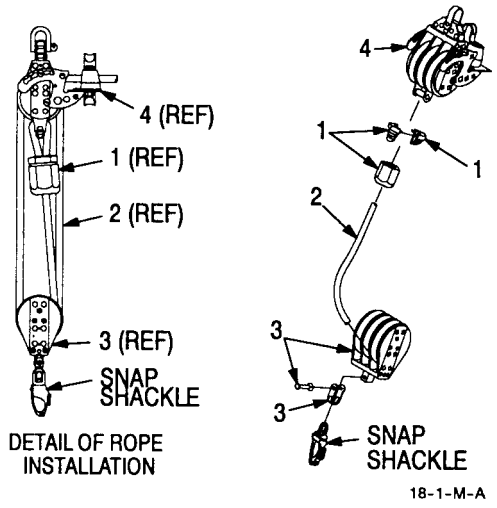


Figure 2-23. Block Assembly Replacement

2.13.3 ABS and Retainer Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Caulking Tool, Hand (Item 18, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Materials/Parts:
Isopropyl Alcohol (Item 12, Appendix C)
Rubber Gloves (Item 25, Appendix C)
Wiping Rags (Item 39, Appendix C)
Sealant (Item 47, Appendix C)

Equipment Conditions:
ECV engine off, power off, parking brake set.
ABS deflated and unrolled or ABS inflated (reference TM 10-5410-228-10).
ABS Manifold disconnected (see para 2.16.4).

References:
TM 10-5411-224-14

Materials/Parts: (Cont.)
Seventy-eight Lockwashers (Item 18, Appendix E)
Thirty-one Self-locking Nuts (Item 40, Appendix E)
Four Blind Rivets (Item 69, Appendix E)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

The ABS and retainers are easier to replace with the ABS inflated.

a. Removal (Refer to Figure 2-24)

(1) Remove eight screws (1), eight lockwashers (2), eight flat washers (3), eight self-locking nuts (4) and retaining channel (5), and remove top panel (6) from LMS. Discard eight lockwashers (2) and eight self-locking nuts (4).

(2) Remove seven screws (7), seven lockwashers (8), seven flat washers (9), seven self-locking nuts (10), retaining channel (11), side panel (12) and strap (13). Discard seven lockwashers (8) and seven self-locking nuts (10).

(3) Remove seven screws (14), seven lockwashers (15), seven flat washers (16), seven self-locking nuts (17), retaining channel (18), side panel (19) and strap (20) from LMS. Discard seven lockwashers (15) and seven self-locking nuts (17).

(4) Remove nine screws (21), nine lockwashers (22), nine flat washers (23), nine self-locking nuts (24) and retaining channel (25) from LMS. Discard nine lockwashers (22) and nine self-locking nuts (24).

(5) Remove ABS from LMS.

(6) Remove gasket (26) from LMS.

(7) Remove six screws (27), two screws (28), eight lockwashers (29) and eight flat washers (30) securing retaining bracket (31). Discard eight lockwashers (29).

(8) Remove seven screws (27), two screws (32), nine lockwashers (29), nine flat washers (30) and three mounting brackets (33) securing retaining bracket (31). Discard nine lockwashers (29).

NOTE

Bracket and shims are sealed onto LMS with sealant and might require prying.

(9) Remove retaining bracket (31) and shims (34, 35, 36 and 37) from LMS.

2.13.3 ABS and Retainer Replacement – Continued.

(10) Remove seven screws (38), seven lockwashers (39) and seven flat washers (40) securing retaining bracket (41). Discard seven lockwashers (39).

(11) Remove seven screws (42), screw (43), eight lockwashers (44), eight flat washers (45) and three mounting brackets (46) securing retaining bracket (41). Discard eight lockwashers (44).

NOTE

Bracket and shims are sealed onto LMS with sealant and might require prying.

(12) Remove retaining bracket (41) and shims (47, 48, 49 and 50) from LMS.

(13) Remove eight screws (51), eight lockwashers (52) and eight flat washers (53) securing retaining bracket (54). Discard eight lockwashers (52).

(14) Remove seven screws (55), two screws (56), nine lockwashers (57) and nine flat washers (58) securing retaining bracket (54). Discard nine lockwashers (57).

NOTE

Bracket and shims are sealed onto LMS with sealant and might require prying.

(15) Remove retaining bracket (54) and shims (59, 60 and 61) from LMS.

(16) Remove seven screws (62), seven lockwashers (63) and seven flat washers (64) securing retaining bracket (65) to LMS. Discard seven lockwashers (63).

(17) Remove five screws (66), screw (67), six lockwashers (68), six flat washers (69) and three mounting brackets (70) securing retaining bracket (65) to LMS. Discard six lockwashers (68).

NOTE

Bracket and shims are sealed onto LMS with sealant and might require prying.

(18) Remove retaining bracket (65) and shims (71, 72, 73 and 74) from LMS.

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(19) Drill out four rivets (75) and remove four shims (76 and 77) from LMS.

b. Installation (Refer to Figure 2-24)

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated areas. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(1) Clean sealant residue from LMS, shims, retaining channels, retaining brackets and screws using rag dampened with alcohol.

WARNING

Wear gloves when working with sealants. Use in well ventilated areas. Avoid prolonged contact with skin.

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets. This note applies to steps 1 and 2.

(2) Secure four shims (76 and 77) to rear of LMS with four blind rivets (75) (Item 69, Appx E).

NOTE

Apply sealant (Item 47, Appx C) to all screws prior to installation.

(3) Secure retaining bracket (65) and shims (73 and 74) to driver side of LMS with five screws (66), screw (67), six new lockwashers (68) (Item 18, Appx E), six flat washers (69) and three mounting brackets (70).

(4) Secure retaining bracket (65) and shims (71 and 72) to rear of LMS with seven screws (62), seven new lockwashers (63) (Item 18, Appx E) and seven flat washers (64).

(5) Secure retaining bracket (54) and shim (61) to bottom of LMS with seven screws (55), two screws (56), nine new lockwashers (57) (Item 18, Appx E) and nine flat washers (58).

(6) Secure retaining bracket (54) and shims (59 and 60) to rear of LMS with eight screws (51), eight new lockwashers (52) (Item 18, Appx E) and eight flat washers (53).

(7) Secure retaining bracket (41) and shims (49 and 50) to passenger side of LMS with seven screws (42), screw (43), eight new lockwashers (44) (Item 18, Appx E), eight flat washers (45) and three mounting brackets (46).

(8) Secure bracket (41) and shims (47 and 48) to rear of LMS with seven screws (38), seven new lockwashers (39) (Item 18, Appx E) and seven flat washers (40).

(9) Secure bracket (31) and shims (34 and 35) to top of LMS with seven screws (27), two screws (32), nine new lockwashers (29) (Item 18, Appx E), nine flat washers (30) and three mounting brackets (33).

(10) Secure bracket (31) and shims (36 and 37) to rear of LMS with six screws (27), two screws (28) eight new lockwashers (29) (Item 18, Appx E) and eight flat washers (30).

(11) Starting in the middle on bottom retaining bracket, press gasket (26) into place.

WARNING

Wear gloves when working with sealants. Use in well ventilated areas. Avoid prolonged contact with skin.

(12) Apply sealant (Item 47, Appx C) to seal ends of gasket (26).

(13) Align ABS and retaining channel (25) on bottom of LMS and secure with nine screws (21), nine new lockwashers (22) (Item 18, Appx E), nine flat washers (23) and nine new self-locking nuts (24) (Item 40, Appx E). Torque screws to 50 ? 5 in lbs.

(14) Align ABS, panel (19), retention strap (20) and retaining channel (18) on passenger side of LMS and secure with seven screws (14), seven new lockwashers (15) (Item 18, Appx E), seven flat washers (16) and seven new self-locking nuts (17) (Item 40, Appx E). Torque screws to 50 ? 5 in lbs.

(15) Align ABS, panel (12), retention strap (13) and retaining channel (11) on driver side of LMS and secure with four screws (7), four new lockwashers (8) (Item 18, Appx E), four flat washers (9) and four new self-locking nuts (10) (Item 40, Appx E). Torque screws to 50 ? 5 in lbs.

2.13.3 ABS and Retainer Replacement – Continued.

(16) Align ABS, panel (6) and retaining bracket (5), and secure with eight screws (1), eight new lockwashers (2) (Item 18, Appx E), eight flat washers (3) and eight new self-locking nuts (4) (Item 40, Appx E). Torque screws to 50 ± 5 in lbs.

WARNING

Use in a well ventilated area and wear gloves when working with sealers. Sealers have adverse affects on the skin, eyes and respiratory tract. Avoid prolonged contact with skin. Observe manufacturer's warning labels for handling, storage and disposal along with current safety directives.

(17) Apply sealant (Item 47, Appx C) to all corners, edges, joints, seams and attaching hardware of retaining channels, retaining brackets and shims.

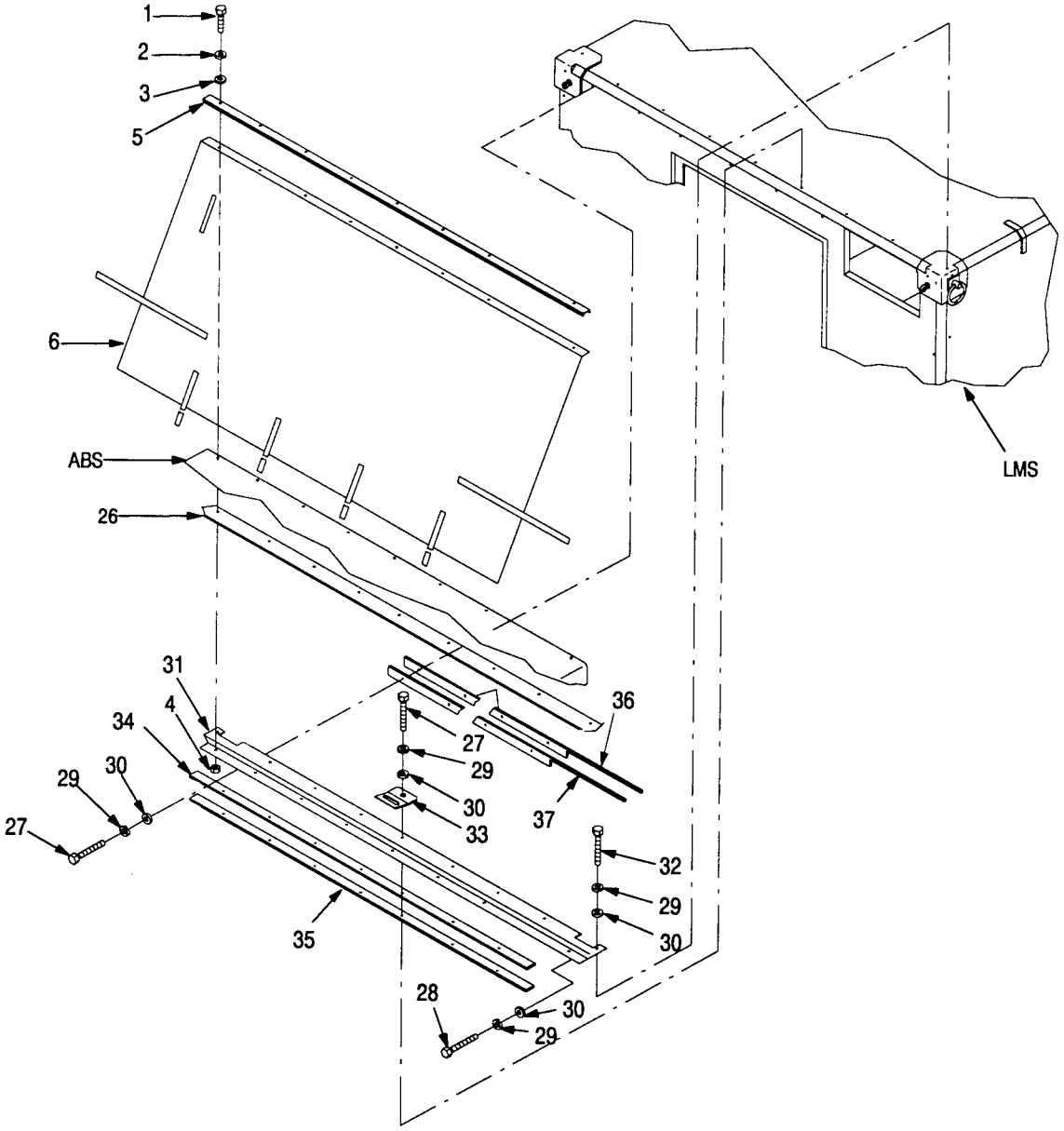


Figure 2-24. ABS and Retainer Replacement (Sheet 1 of 3)

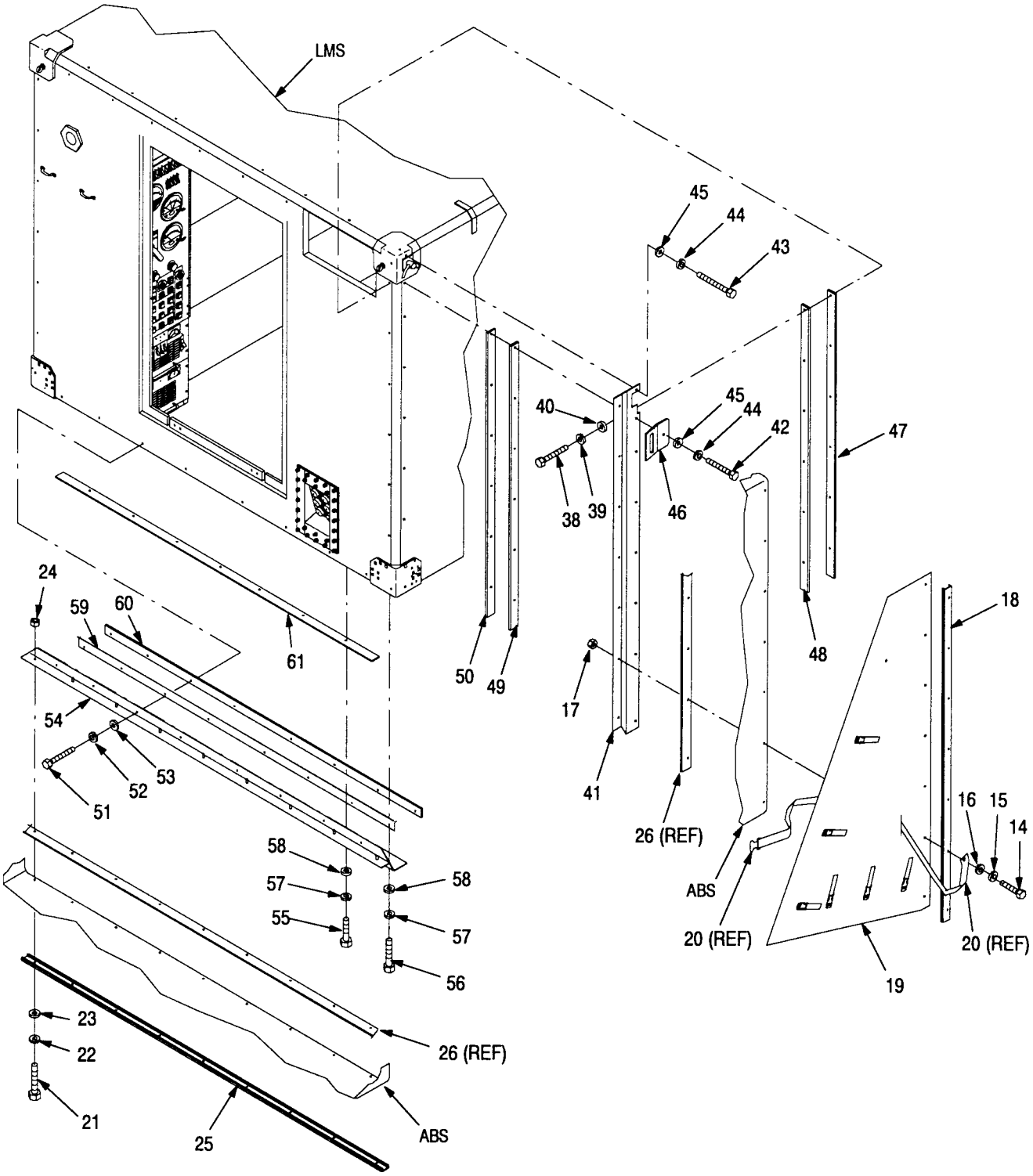


Figure 2-24. ABS and Retainer Replacement (Sheet 2 of 3)

2.13.3 ABS and Retainer Replacement – Continued.

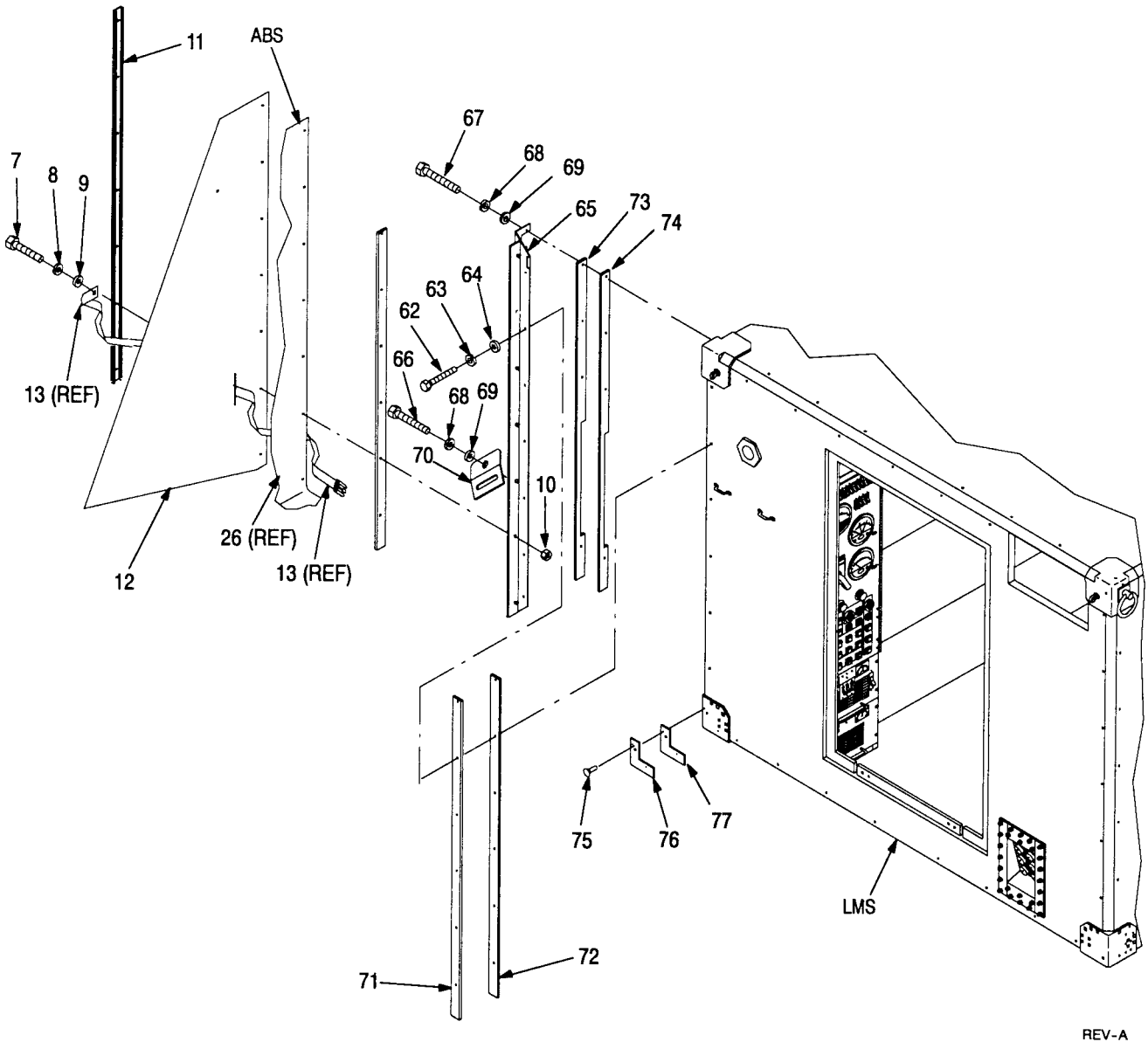


Figure 2-24. ABS and Retainer Replacement (Sheet 3 of 3)

Follow-on maintenance: Replace ABS cover per para 2.13.1.

2.13.4 Window Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV parking brake set.
Caulking Tool, Hand (Item 18, Appendix B)	References:
Drill, Electric (Item 6, Appendix B)	TM 10-5411-224-14
Drill Set (Item 5, Appendix B)	
Goggles (Item 17, Appendix B)	
Riveter, Blind, Hand (Item 34, Appendix B)	
Collar Set, Drill Stop (Item 2, Appendix B)	
Materials/Parts:	Materials/Parts: (Cont.)
Adhesive (Item 6, Appendix C)	Sealer (Item 50, Appendix C)
Isopropyl Alcohol (Item 12, Appendix C)	Twenty-eight Blind Rivets (Item 77, Appendix E)
Rubber Gloves (Item 25, Appendix C)	Twenty Blind Rivets (Item 78, Appendix E)
Wiping Rags (Item 39, Appendix C)	Twenty-eight Blind Rivets (Item 82, Appendix E)

NOTE

The following maintenance procedures can be used for both passenger side and driver side windows.

a. Disassembly (Refer to Figure 2-25)

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(1) Drill out two rivets (1) and four rivets (2) securing interior frame segment (3) to LMS.

(2) Drill out four rivets (4) and two rivets (5) securing interior frame segments (6) to LMS.

(3) Drill out twenty rivets (7) and sixteen rivets (8) securing two interior frame segments (9) to LMS.

NOTE

If the window is leaking, remove gaskets.

(4) Remove four gaskets (10), four gaskets (11) and safety glass (12) from LMS. Discard eight gaskets (10 and 11).

(5) Drill out 28 rivets (13) securing exterior frame (14) to LMS and remove exterior frame (14).

2.13.4 Window Replacement – Continued.

b. Assembly (Refer to Figure 2-25)

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Secure exterior frame (14) to LMS with 28 rivets (13) (Item 77, Appx H).

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

(2) Clean area with a rag dampened with alcohol and cut two gaskets (10) to length and secure into exterior frame (14) with adhesive (Item 7, Appx C).

(3) Clean area with a rag dampened with alcohol and cut two gaskets (11) to length and secure into exterior frame (14) with adhesive (Item 7, Appx C).

(4) Install safety glass (12) into exterior frame (14) in LMS.

(5) Clean appropriate area of two interior frame segments (3 and 6) with a rag dampened with alcohol and two cut gaskets (10) to length and secure onto two interior frame segments (3 and 6) with adhesive (Item 7, Appx C).

(6) Clean appropriate area of two interior frame segments (9) with a rag dampened with alcohol and cut two gaskets (11) to length and secure onto two interior frame segments (9) with adhesive (Item 7, Appx C).

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets. This note applies to steps 7, 8, and 9.

(7) Secure interior frame segment (6) to LMS with four rivets (4) (Item 82, Appx E) and two rivets (5) (Item 82, Appx E).

(8) Secure two interior frame segments (9) to LMS with twenty rivets (7) (Item 82, Appx E) and sixteen rivets (8) (Item 78, Appx E).

(9) Secure interior frame segment (3) to LMS with two rivets (1) (Item 78, Appx E) and four rivets (2) (Item 82, Appx E).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(10) Apply sealant (Item 7, Appx C) to joints between two interior frame segments (3 and 6), two interior frame segments (9) and LMS.

(11) Apply sealant (Item 7, Appx C) to joints between exterior frame (14) and LMS.

(12) Clean surface of interior frame segment (6) and two interior frame segments (9) with a rag dampened with alcohol.

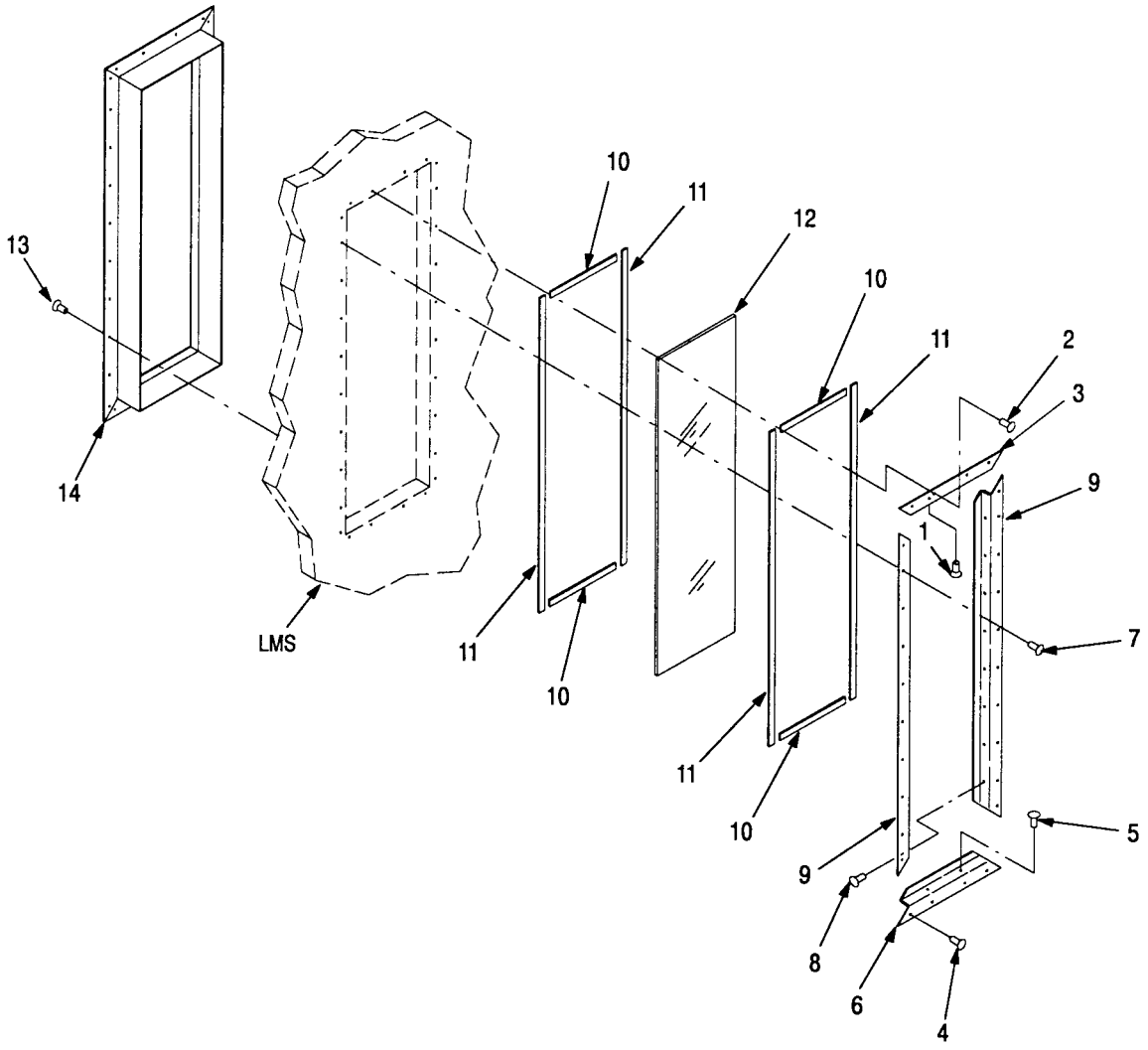


Figure 2-25. Window Replacement

2.13.5 LMS Strap and Ring Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Materials/Parts:
Two Lockwashers (Item 17, Appendix E)
One Hundred Seventy Lockwashers (Item 18, Appendix E)

Equipment Conditions:
ECV parking brake set.
Stowed equipment removed.

References:
TM 10-5411-224-14

Materials/Parts: (Cont.)
Two Lockwashers (Item 19, Appendix E)
Forty-eight Solid Rivets (Item 72, Appendix E)
Two Rivets (Item 80, Appendix E)
Two Blind Rivets (Item 81, Appendix E)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-26)

(1) Remove two screws (1), two lockwashers (2) and two flat washers (3) securing door bracket (4) to interior driver side floor of LMS. Discard two lockwashers (2).

NOTE

The following step is typical for removal of ring assemblies on both the driver side and passenger side in LMS.

(2) Remove nut (5), lockwasher (6), two flat washers (7), ring assembly (8) and flat washer (9) from LMS. Discard lockwasher (6).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(3) Drill out two rivets (10) securing strap assembly (11) to exterior of door assembly (12).

(4) Drill out two rivets (13) securing mounting strap (14) to interior of emergency exit door assembly (15).

NOTE

The following steps are typical for removal of all remaining LMS straps.

(5) Remove four screws (16), four lockwashers (17) and four flat washers (18) securing mounting plate (19) to LMS. Discard four lockwashers (17).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

(6) Drill out two rivets (20) securing strap assembly (21) to mounting plate (19).

b. Installation (Refer to Figure 2-26)

NOTE

The following steps (1 and 2) are typical for installation of most LMS straps.

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Secure strap assembly (21) to mounting plate (19) with two rivets (20) (Item 72, Appx E).

(2) Secure mounting plate (19) to LMS with four screws (16), four new lockwashers (17) (Item 18, Appx E) and four flat washers (18).

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(3) Secure mounting strap (14) to interior of emergency exit door assembly (15) with two rivets (13) (Item 81, Appx E).

(4) Secure strap assembly (11) to exterior of door assembly (12) with two rivets (10) (Item 80, Appx E).

NOTE

The following step is typical for installation of ring assemblies on both the driver side and passenger side in LMS.

(5) Secure ring assembly (8) and flat washer (9) to LMS with two flat washers (7), a new lockwasher (6) (Item 19, Appx E) and nut (5).

(6) Secure door bracket (4) to interior driver side floor of LMS with two screws (1), two new lockwashers (2) (Item 17, Appx E) and two flat washers (3).

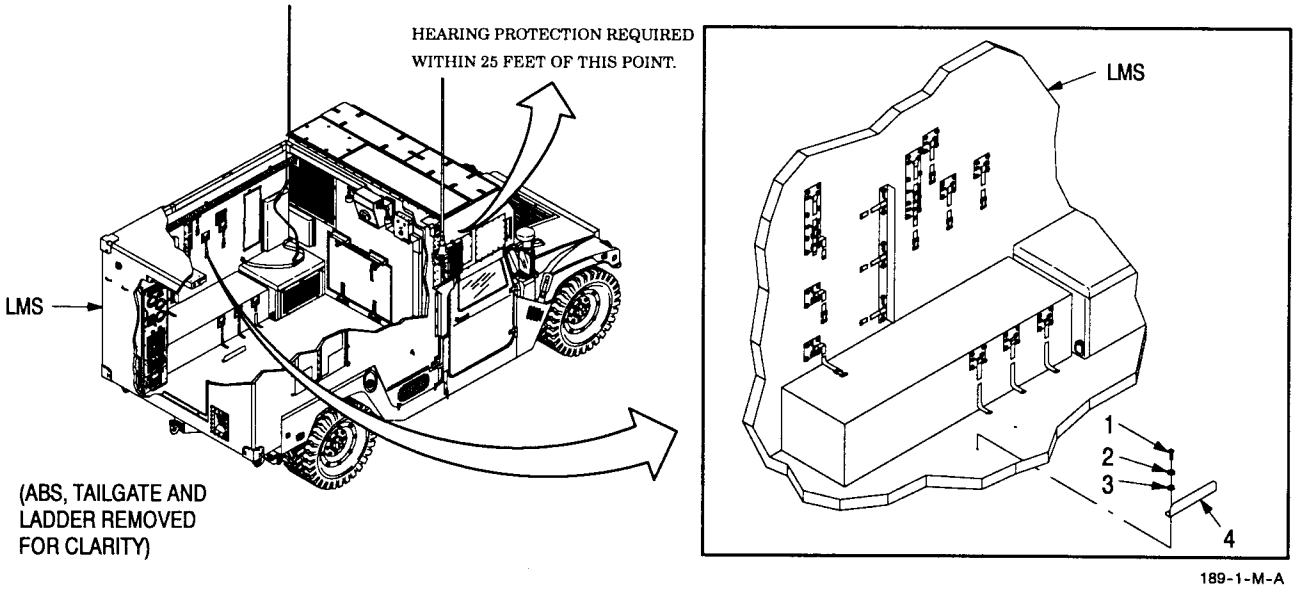
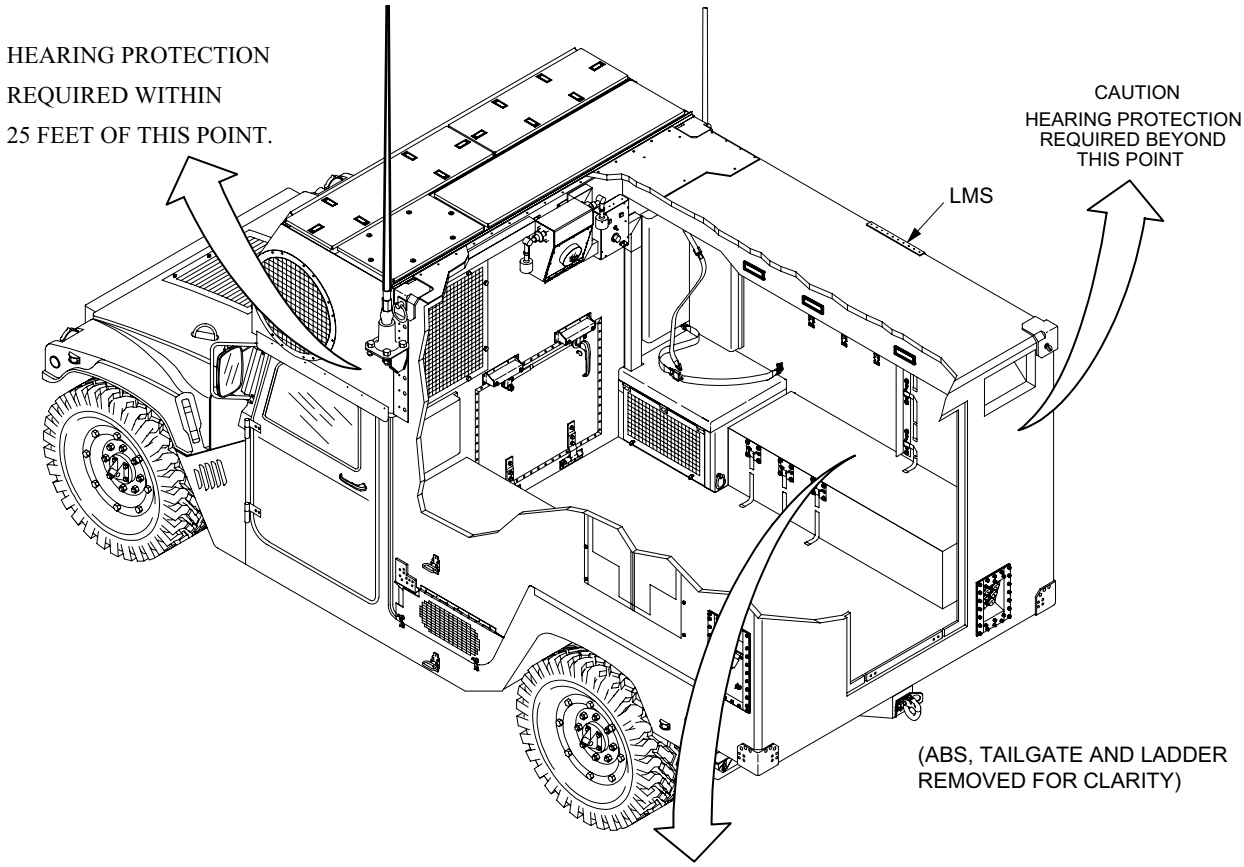


Figure 2-26. LMS Strap and Ring Replacement (Sheet 1 of 4)

2.13.5 LMS Strap and Ring Replacement – Continued.



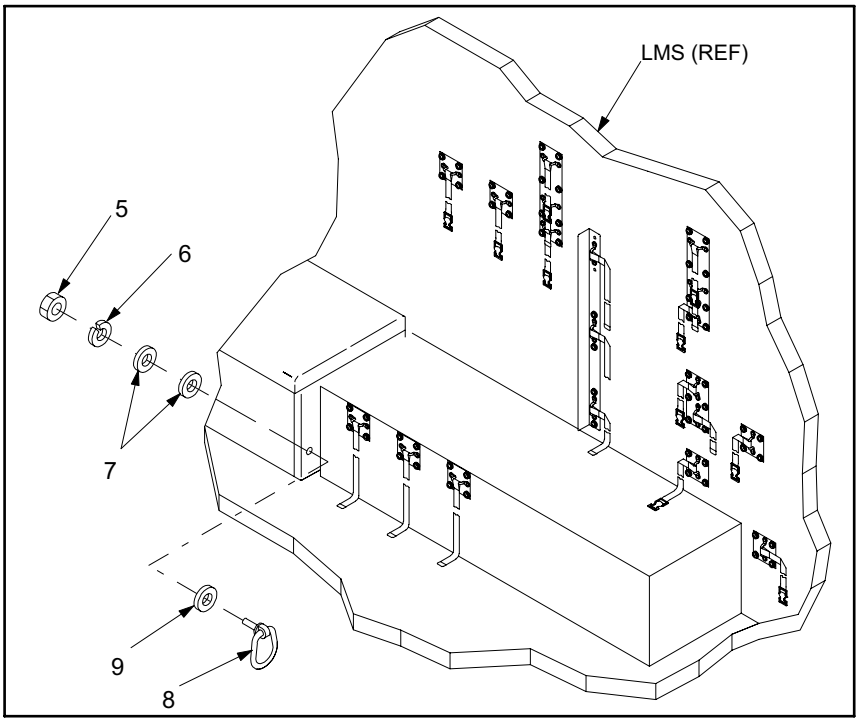


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Figure 2-26. LMS Strap and Ring Replacement (Sheet 2 of 4)

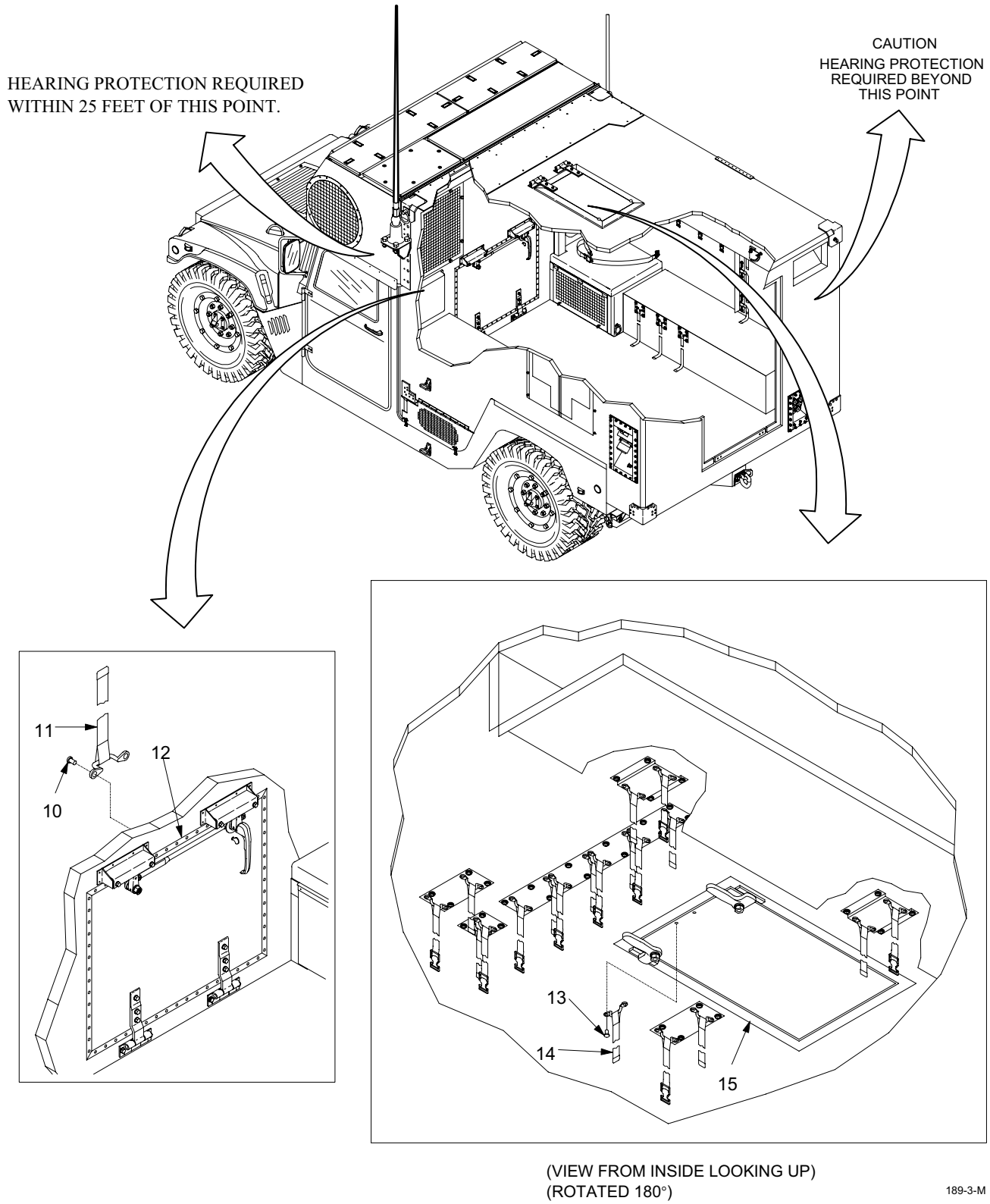
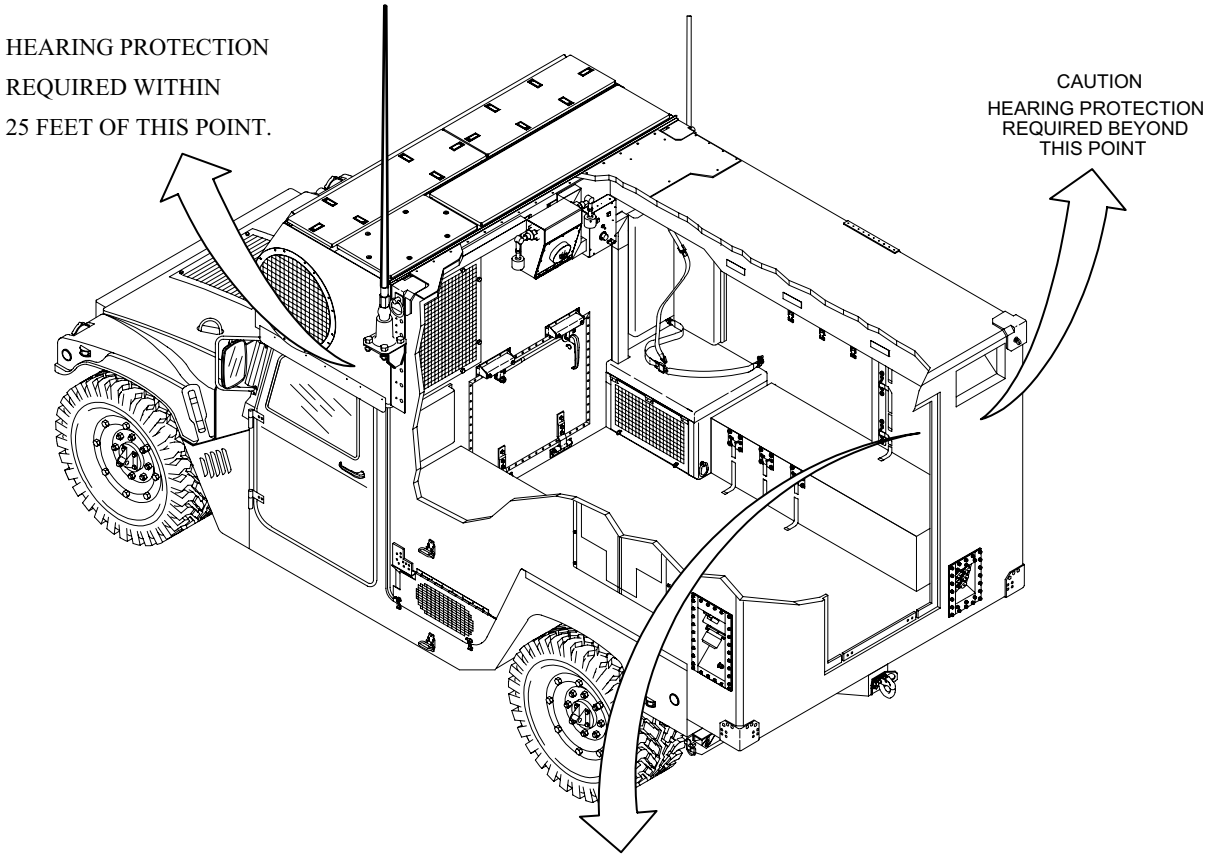


Figure 2-26. LMS Strap and Ring Replacement (Sheet 3 of 4)

2.13.5 LMS Strap and Ring Replacement – Continued.



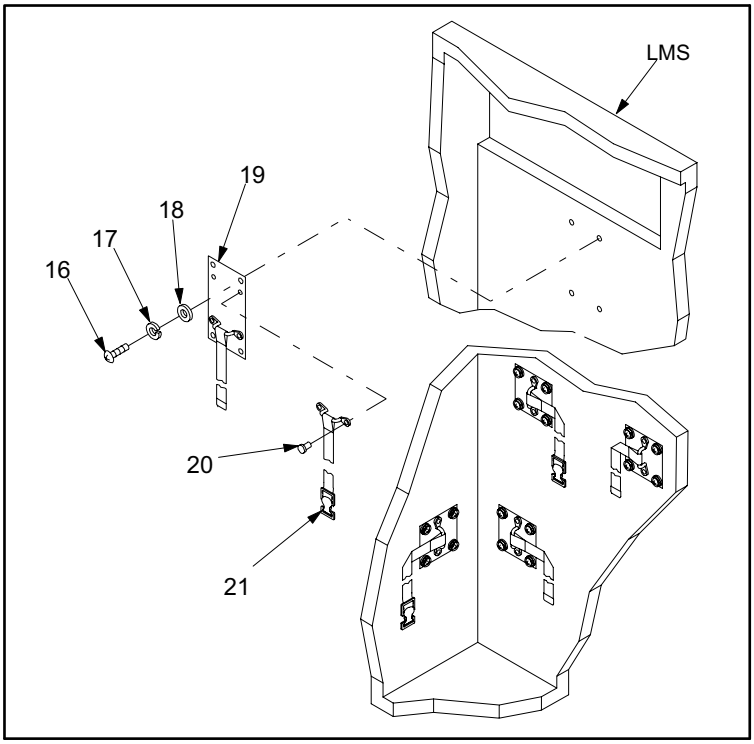


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Figure 2-26. LMS Strap and Ring Replacement (Sheet 4 of 4)

2.13.6 LMS Relief Valve Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
	Equipment Conditions:
Personnel Required: (2)	ECV parking brake set.

a. Removal (Refer to Figure 2-27)

(1) While one person on outside holds louver cover (1), person on inside unscrews RF nut (2) from wall adapter (3).

(2) Remove louver cover (1), O-ring (4) and wall adapter (3) from LMS wall.

b. Installation (Refer to Figure 2-27)

(1) Install wall adapter (3) into LMS wall with O-ring (4) and louver cover (1).

(2) While holding louver cover (1), person on inside screws RF nut (2) onto wall adapter (3) until tight.

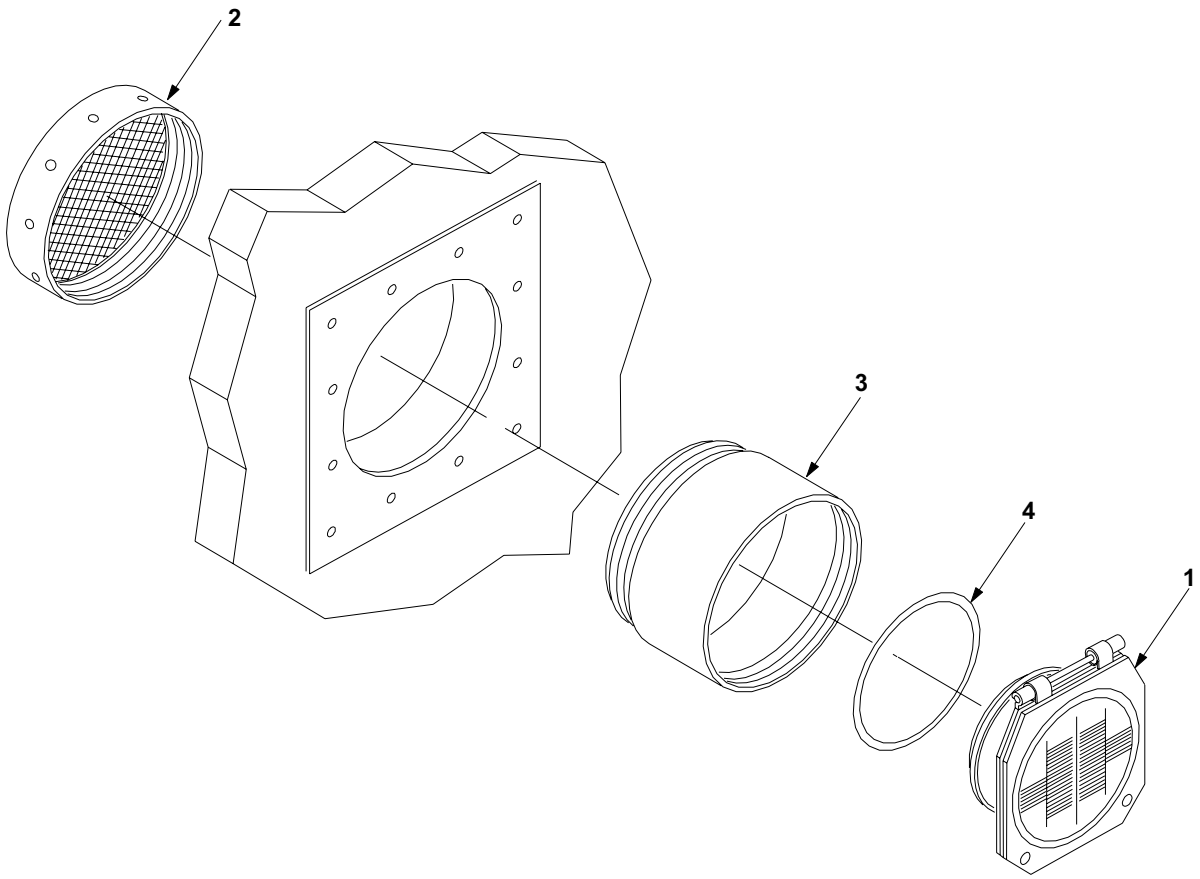


Figure 2-27. LMS Relief Valve Replacement

2.13.7 Air Beam Inflation Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set. Elbow removed (see para 2.16.4).
Materials/Parts: Rubber Gloves (Item 25, Appendix C) Sealant (Item 46, Appendix C) Eleven Lockwashers (Item 17, Appendix E)	

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-28)

(1) Remove four screws (1), four lockwashers (2), four flat washers (3) and remove guard (4) from rack assembly. Discard four lockwashers (2).

(2) Gain access through top of LMS guard. Loosen two hose clamps (5) securing air hose (6) to hose barb (7) and outlet end of rib fan assembly.

(3) Remove five screws (8), five lockwashers (9) and five flat washers (10) securing five loop clamps (11) and air hose (6) to LMS. Remove air hose (6) and five loop clamps (11). Discard five lockwashers (9).

(4) Unscrew and remove hose barb (7) and elbow (12) from reducing tee (13).

(5) Remove miniature clamp (14) and PG2-HI hose (15) from barbed connector (16).

(6) Unscrew and remove barbed connector (16) from reducing tee (13).

(7) Remove two cable ties securing rubber boot to thermal tube switch (17). Tag wires and remove screws securing terminal lugs to thermal tube switch (17).

(8) Unscrew and remove thermal tube switch (17) from bushing (18) on reducing tee (13).

(9) Unscrew and remove bushing (18) from reducing tee (13).

(10) Unscrew reducing tee (13) from close nipple (19) and remove reducing tee (13).

(11) Unscrew and remove close nipple (19) from bulkhead fitting (20).

NOTE

Nut (21) has left-hand threads.

(12) Remove nut (21) securing bulkhead fitting (20) to LMS.

b. Assembly (Refer to Figure 2-28)

NOTE

Nut (21) has left-hand threads.

(1) Install bulkhead fitting (20) through LMS and secure nut (21).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin. This warning applies to steps 2 through 7.

(2) Apply sealant (Item 46, Appx C) to male threads of close nipple (19). Install close nipple (19) on bulkhead fitting (20).

(3) Apply sealant to close nipple (19) and install reducing tee (13) on close nipple (19).

(4) Apply sealant to male threads on bushing (18). Install bushing (18) on reducing tee (13).

(5) Apply sealant to male threads on barbed connector (16). Install barbed connector (16) on reducing tee (13).

(6) Apply sealant to male threads on elbow (12) and install elbow (12) on reducing tee (13).

(7) Apply sealant to male threads on hose barb (7). Install hose barb (7) on elbow (12).

(8) Secure terminal lugs to thermal tube switch (17) with screws. Remove tags from wires.

(9) Install rubber boot onto thermal tube switch (17) and secure with two cable ties.

(10) Install thermal tube switch (17) on bushing (18).

(11) Loosely place miniature clamp (14) on end of PG2-HI hose (15).

(12) Install PG2-HI hose (15) on barbed connector (16) and secure by tightening miniature clamp (14).

(13) Place five loop clamps (11) on air hose (6).

(14) Loosely place two hose clamps (5) on either end of air hose (6).

(15) Install air hose (6) to hose barb (7) and outlet end of rib fan assembly. Tighten two hose clamps (5).

(16) Secure five loop clamps (11) to LMS with five screws (8), five new lockwashers (9) and five flat washers (10).

(17) Install guard (4) to LMS rack assembly with four screws (1), four new lockwashers (2) and four flat washers (3).

2.13.7 Air Beam Inflation Replacement – Continued.

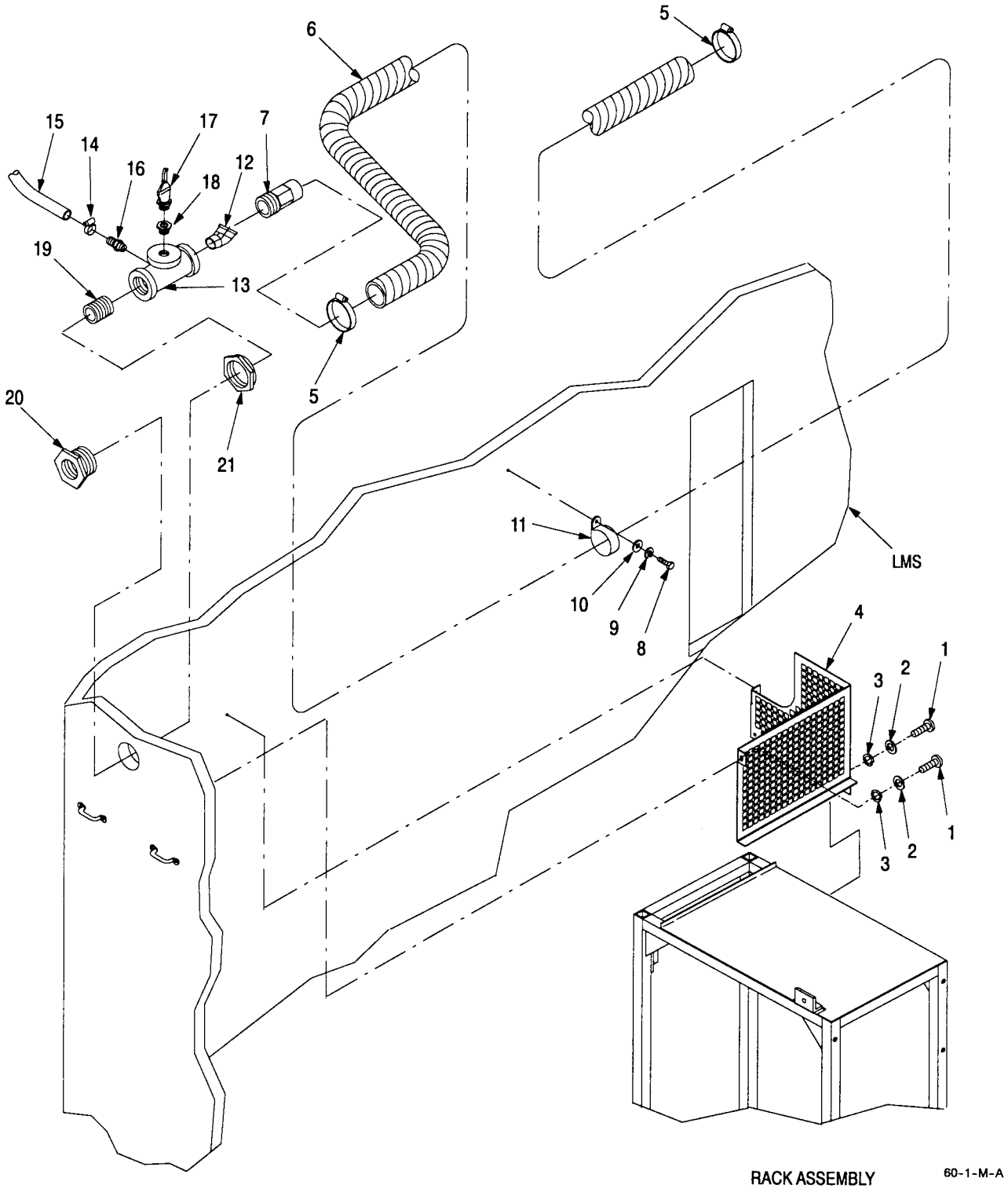


Figure 2-28. Air Beam Inflation Replacement

Follow-on maintenance: Install LMS guard per para 2.13.15, install elbow per para 2.16.4.

2.13.8 Electrical Raceway Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Drill, Electric (Item 6, Appendix B) Drill Set (Item 5, Appendix B) Goggles (Item 17, Appendix B) Riveter, Blind, Hand (Item 34, Appendix B) Collar Set, Drill Stop (Item 2, Appendix B)	Equipment Conditions: ECV parking brake set. References: TM 10-5411-224-14
Materials/Parts: Two Lockwashers (Item 17, Appendix E) Anitseize Compound (Item 13, Appendix C)	Materials/Parts: (Cont.) Twenty-two Blind Rivets (Item 77, Appendix E) Eighteen Blind Rivets (Item 78, Appendix E)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-29)

(1) Remove nine cover clips (1) from electrical raceway.

(2) Remove cover assembly (2), raceway covers (3, 4, 5 and 6), rear raceway cover (7) and three elbow covers (8).

(3) Remove eleven 3300 wire retainers (9) and three 2200 wire retainers (10).

(4) Remove cable assemblies (see para 2.13.27).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(5) Drill out five rivets (11) securing storage box raceway (12) to LMS.

(6) Remove three elbows (13).

(7) Drill out five rivets (14) securing top left front raceway (15) to LMS.

(8) Remove two screws (16) securing coupler (17) to internal elbow (18) and driver side front raceway (19). Remove internal elbow (18).

(9) Drill out seven rivets (20) and eight rivets (21) securing driver side front raceway (19) to LMS.

(10) Remove modified elbow (25).

(11) Drill out two rivets (26) securing rack raceway (27) to LMS.

(12) Drill out seven rivets (28) securing rear raceway (29) to LMS.

(13) Remove two screws (32), two lockwashers (33) and two flat washers (34) securing two pipe straps (35) and two pipe spacers (36) to LMS. Discard two lockwashers (33).

2.13.8 Electrical Raceway Replacement – Continued.

(14) Remove two connectors (37) securing conduit (38) to light box and receptacle panel.

(15) Disconnect wiring from receptacle panel per para 2.13.30.

(16) Remove conduit (38) from LMS.

b. Assembly (Refer to Figure 2-29)

(1) Install wiring in conduit (38).

(2) Connect wiring to receptacle panel per para 2.13.30.

(3) Attach conduit (38) to light box and receptacle panel with two connectors (37).

(4) Apply antiseize compound to screws (32). Secure conduit (38) to LMS with two pipe straps (35), two pipe spacers (36), two screws (32), two new lockwashers (33) (Item 17, Appx E) and two flat washers (34).

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(5) Secure rear raceway (29) to LMS with seven rivets (28) (Item 78, Appx E).

(6) Secure rack raceway (27) to LMS with two rivets (26) (Item 77, Appx E).

(7) Install modified elbow (25).

(8) Secure driver side front raceway (19) to LMS with seven rivets (20) (Item 78, Appx E) and eight rivets (21) (Item 77, Appx E).

(9) Install internal elbow (18).

(10) Secure coupler (17) to internal elbow (18) and driver side front raceway (19) with two screws (16).

(11) Secure top left front raceway (15) to LMS with five rivets (14) (Item 77, Appx E).

(12) Install three elbows (13).

(13) Secure storage box raceway (12) to LMS with five rivets (11) (Item 77, Appx E).

(14) Install cable assemblies.

(15) Install eleven 3300 wire retainers (9) and three 2200 wire retainers (10).

(16) Install cover assembly (2), raceway covers (3, 4, 5 and 6), rear raceway cover (7) and three elbow covers (8).

(17) Install nine cover clips (1) to electrical raceway.

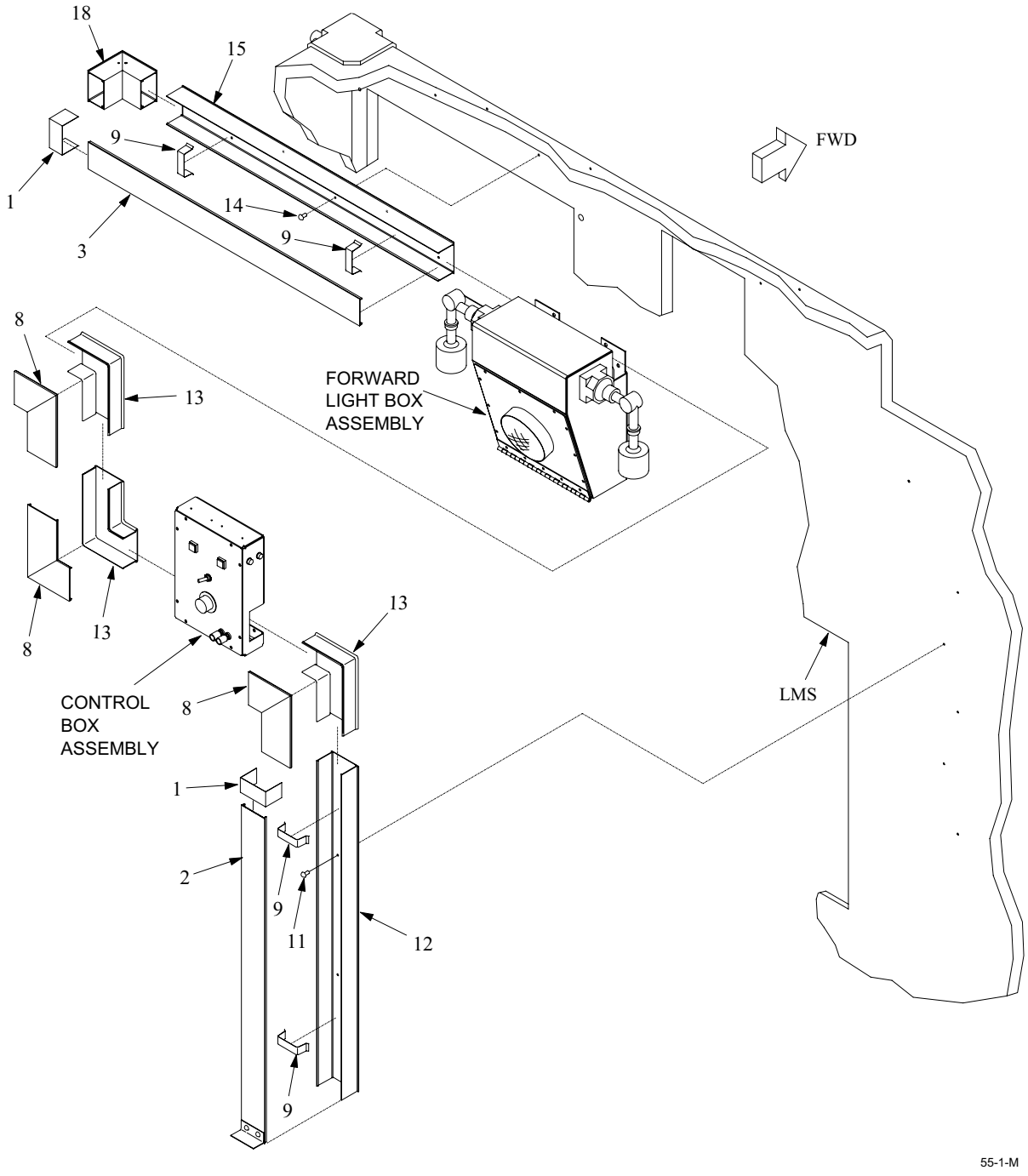


Figure 2-29. Electrical Raceway Replacement (Sheet 1 of 3)

2.13.8 Electrical Raceway Replacement – Continued.

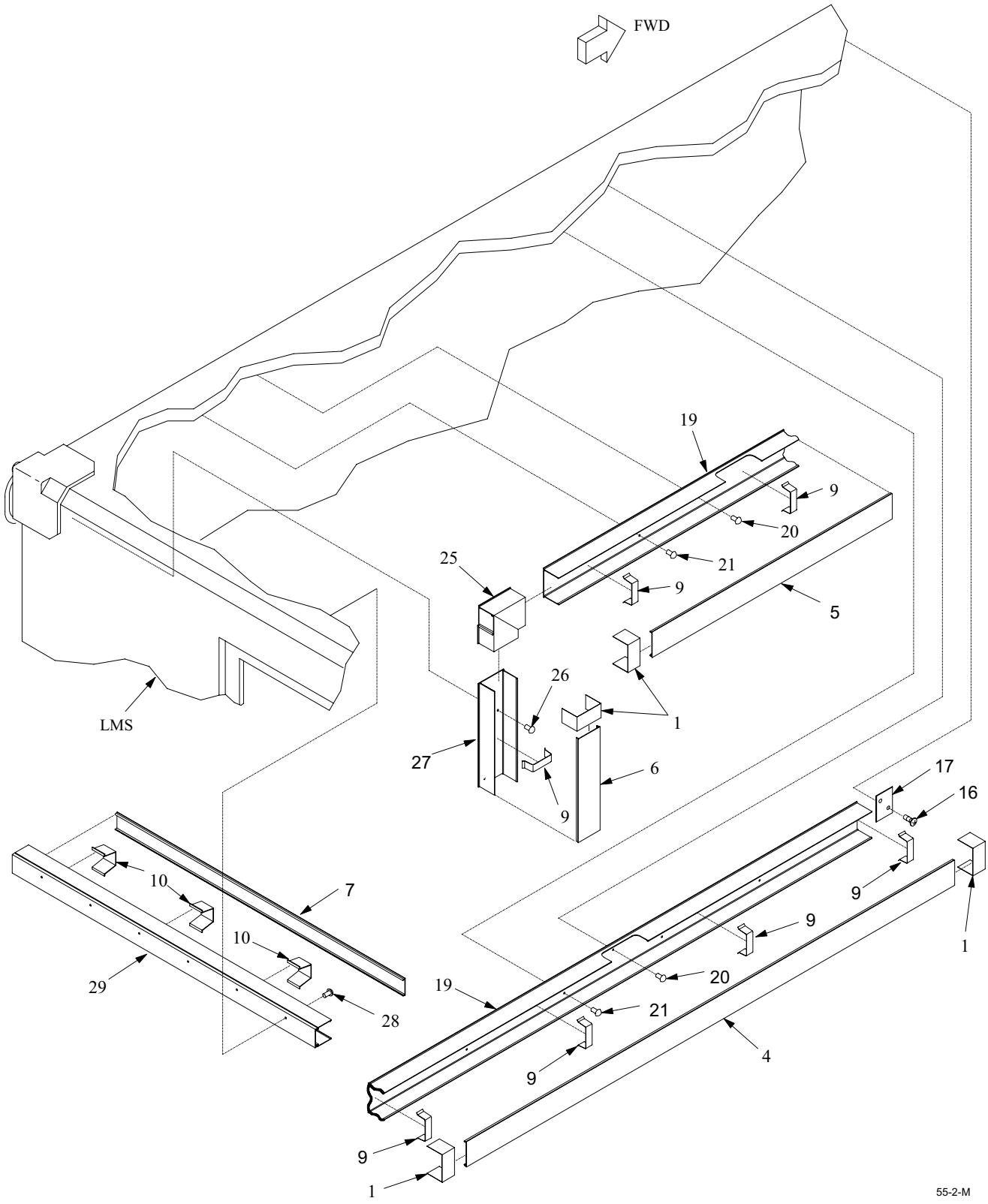


Figure 2-29. Electrical Raceway Replacement (Sheet 2 of 3)

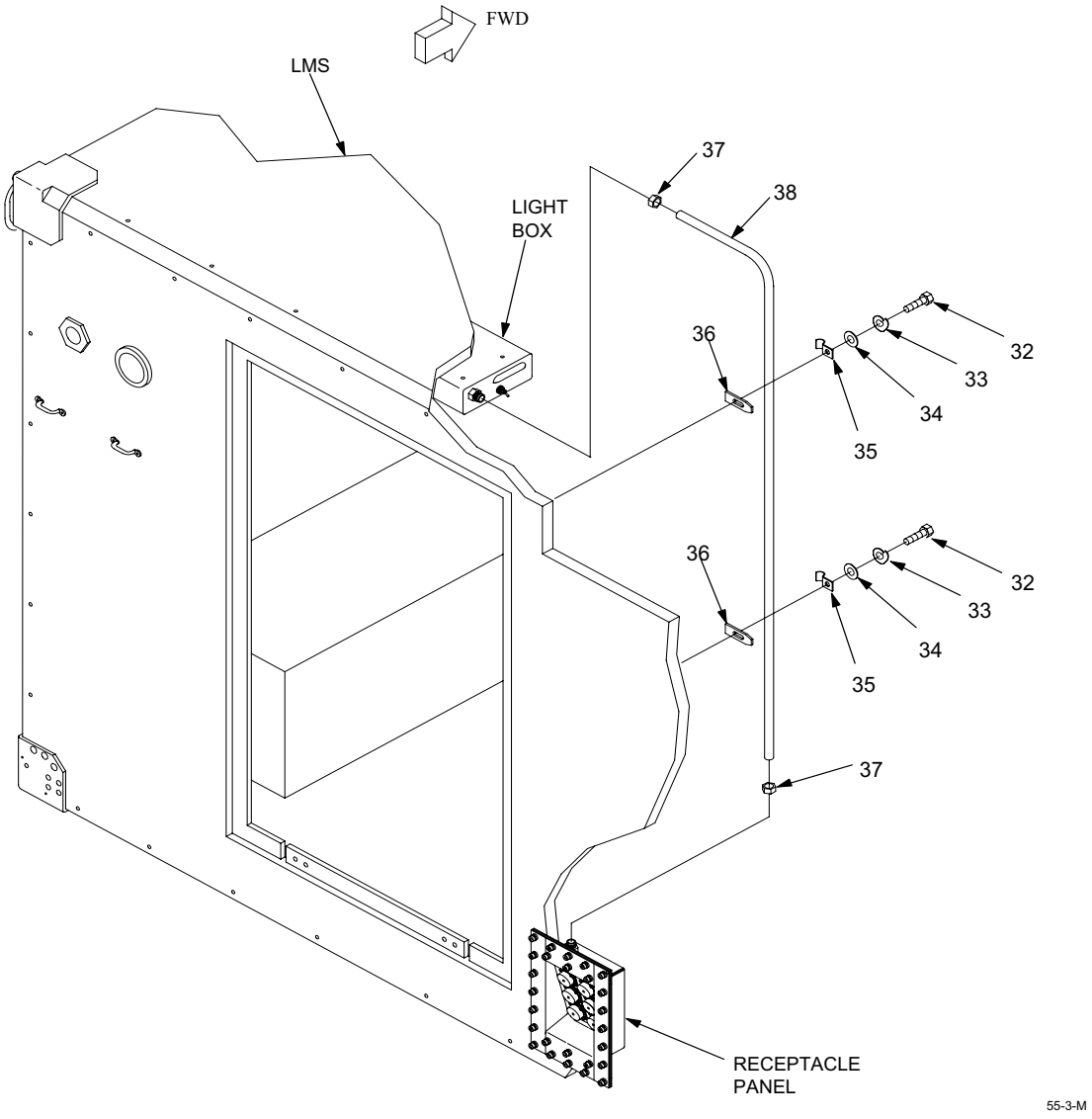


Figure 2-29. Electrical Raceway Replacement (Sheet 3 of 3)

Follow-on maintenance: Install cables per para 2.13.27.

2.13.9 Door Assembly Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Caulking Tool, Hand (Item 18, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Equipment Conditions:
ECV parking brake set.
Strap removed (see para 2.13.5).

References:
TM 10-5411-224-14

Materials/Parts:
Rubber Gloves (Item 25, Appendix C)
Sealer (Item 50, Appendix C)
Four Lockwashers (Item 18, Appendix E)
Adhesive (Item 4, Appendix C)
Wiping Rags (Item 39, Appendix C)

Materials/Parts: (Cont.)
Four Self-locking Nuts (Item 46, Appendix E)
Eight Blind Rivets (Item 78, Appendix E)
Four Blind Rivets (Item 81, Appendix E)
Isopropyl Alcohol (Item 12, Appendix C)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-30)

Remove four screws (1), four flat washers (2) and four self-locking nuts (3) securing door (4) and six shims (5) to LMS. Discard four self-locking nuts (3).

b. Disassembly (Refer to Figure 2-30)

(1) Remove four screws (6), four flat washers (7), four lockwashers (8) and four nuts (9) securing two keepers (10), two keeper shims (11) and two keeper shims (12) to two door keeper brackets (13). Discard four lockwasher (8).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(2) Drill out eight rivets (14) and four rivets (15) securing two door keeper brackets (13) and two shims (16) to LMS.

(3) Remove gasket (17) from LMS.

c. Assembly (Refer to Figure 2-30)

WARNING

Alcohol and adhesive are flammable and give off harmful vapors. Use in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flame. Wear gloves when handling.

(1) Clean adhesive residue from LMS.

(2) Secure gasket (17) to LMS with adhesive.

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(3) Secure two door keeper brackets (13) and two shims (16) to LMS with eight rivets (14) (Item 78, Appx E) and four rivets (15) (Item 81, Appx E).

(4) Secure two keepers (10), two keeper shims (11) and two keeper shims (12) to two door keeper brackets (13) with four screws (6), four flat washers (7), four new lockwashers (8) (Item 18, Appendix E) and four nuts (9).

d. Installation (Refer to Figure 2-30)

(1) Secure door (4) with gasket (17) and six shims (5) to LMS with four screws (1), four flat washers (2) and four new self-locking nuts (3) (Item 46, Appx E).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(2) Apply sealer around seam of two door hinges and door panel (4).

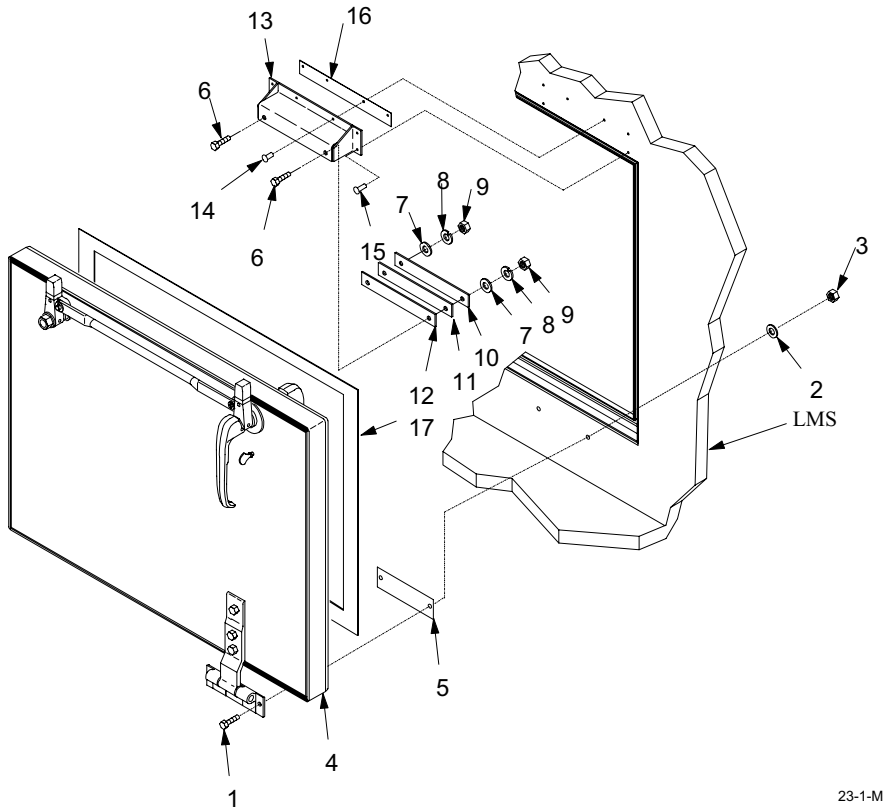


Figure 2-30. Door Assembly Replacement

2.13.10 Ladder Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Materials/Parts:
Four Lockwashers (Item 19, Appendix E)
Four Blind Rivets (Item 78, Appendix E)
Four Self-Locking Nuts (Item 43, Appendix E)

Equipment Conditions:
ECV parking brake set.
ABS inflated and ladder down or ABS removed (reference TM 10-5410-228-10 or see para 2.13.3).

References:
TM 10-5411-224-14

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-31)

(1) Remove four bolts (1), eight flat washers (2), four lockwashers (3), four nuts (4) and four self-locking nuts (5) securing two ladder brackets (6), two hold-down brackets (7) and ladder assembly (8) to LMS. Discard four lockwashers (3) and four self-locking nuts (5).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(2) Drill out four rivets (9) securing strap assemblies (10 and 11) to inside of LMS.

b. Installation (Refer to Figure 2-31)

(1) Secure strap assemblies (10 and 11) to inside of LMS with four rivets (9) (Item 78, Appx E).

(2) Secure two ladder brackets (6), two hold-down brackets (7) and ladder assembly (8) to LMS with four bolts (1), eight flat washers (2), four new lockwashers (3) (Item 19, Appx E), four nuts (4), and four new self-locking nuts (5) (Item 43, Appx E).

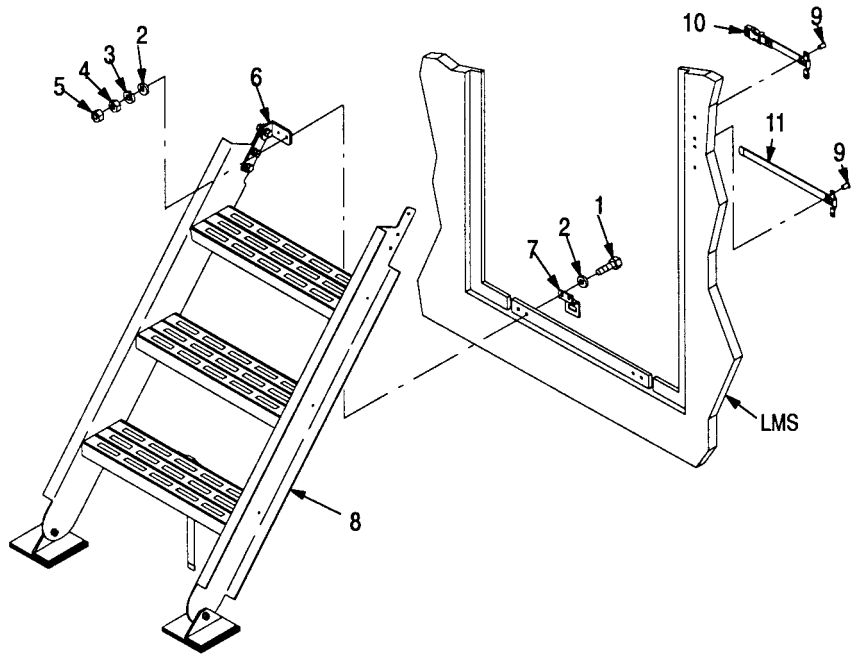


Figure 2-31. Ladder Replacement

Follow-on maintenance: If required, install ABS per para 2.13.3.

2.13.11 Tailgate Replacement.

This task covers:

a. Removal	b. Installation

INITIAL SETUP

Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Drill, Electric (Item 6, Appendix B) Drill Set (Item 5, Appendix B) Goggles (Item 17, Appendix B) Riveter, Blind, Hand (Item 34, Appendix B) Collar Set, Drill Stop (Item 2, Appendix B)	Equipment Conditions: ECV parking brake set. ABS deflated and rolled out or removed (reference TM 10-5410-228-10 or see para 2.13.3). References: TM 10-5411-224-14
Materials/Parts: Sealer (Item 50, Appendix C) Rubber Gloves (Item 25, Appendix C) Two Lockwashers (Item 22, Appendix E)	Materials/Parts: (Cont.) Four Lockwashers (Item 18, Appendix E) Sixteen Blind Rivets (Item 71, Appendix E)

a. Removal (Refer to Figure 2-32)

(1) Remove two screws (1), four flat washers (2), two lockwashers (3), two nuts (4) and two spacers (5) securing tailgate assembly (6) to tailgate mounting assemblies (7 and 8). Discard two lockwashers (3).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(2) Drill out 16 rivets (9) securing tailgate mounting assemblies (7) and (8) to LMS.

(3) Remove four screws (10), four lockwashers (11) and four washers (12) securing tailgate mounting assembly (7) and (8) to LMS. Discard lockwashers (11).

b. Installation (Refer to Figure 2-32)

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Secure tailgate mounting assemblies (7) and (8) to LMS with four screws (10), four lockwashers (11) (Item 18, Appx E) and four washers (12).

(2) Secure tailgate mounting assemblies (7) and (8) to LMS with 16 rivets (9) (Item 71, Appx E).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(3) Apply sealer on rivets (9) and screws (10).

(4) Secure tailgate assembly (6) to tailgate mounting assemblies (7 and 8) with two screws (1), four flat washers (2), two new lockwashers (3) (Item 22, Appx E), two nuts (4) and two spacers (5).

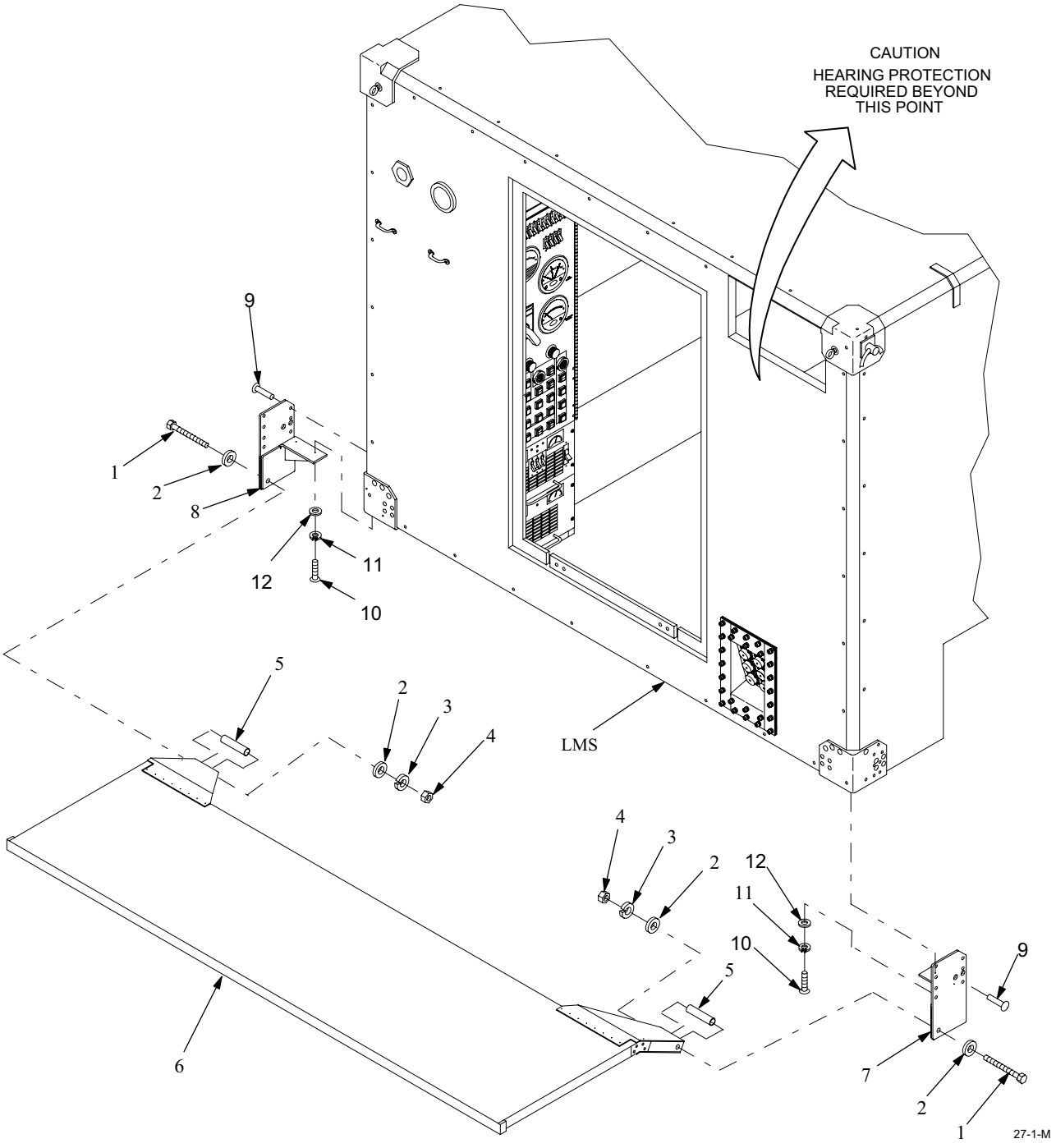


Figure 2-32. Tailgate Replacement

Follow-on maintenance: If required, install ABS per para 2.13.3.

2.13.12 Driver or Passenger Seat and Back Removal.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set.
Materials/Parts: Adhesive (Item 6, Appendix C) Isopropyl Alcohol (Item 12, Appendix C) Rubber Gloves (Item 25, Appendix C)	Materials/Parts: (Cont.) Eight Lockwashers (Item 17, Appendix E) Wiping Rags (Item 39, Appendix C)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-33)

(1) Remove eight screws (1), eight lockwashers (2) and eight flat washers (3) securing back assembly (4) to LMS. Discard eight lockwashers (2).

(2) Carefully lift seat assembly (5) from storage box assembly (6).

(3) Remove fastener hook (7) from seat assembly (5) and fastener loop (8) from top of storage box assembly (6).

b. Installation (Refer to Figure 2-33)

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, and open flames.

(1) Clean adhesive residue from top of storage box assembly (6) with rag dampened with alcohol.

(2) Secure fastener loop (8) to top of storage box (6) and fastener hook (7) to bottom of seat assembly (5) with adhesive.

(3) Position and press seat assembly (5) onto top of storage box assembly (6).

NOTE

Longer screws (1) are used on side towards front of shelter. More than one washer (3) may be required with this screw to keep it from bottoming out.

(4) Secure back assembly (4) to LMS with eight screws (1), eight new lockwashers (2) and eight flat washers (3).

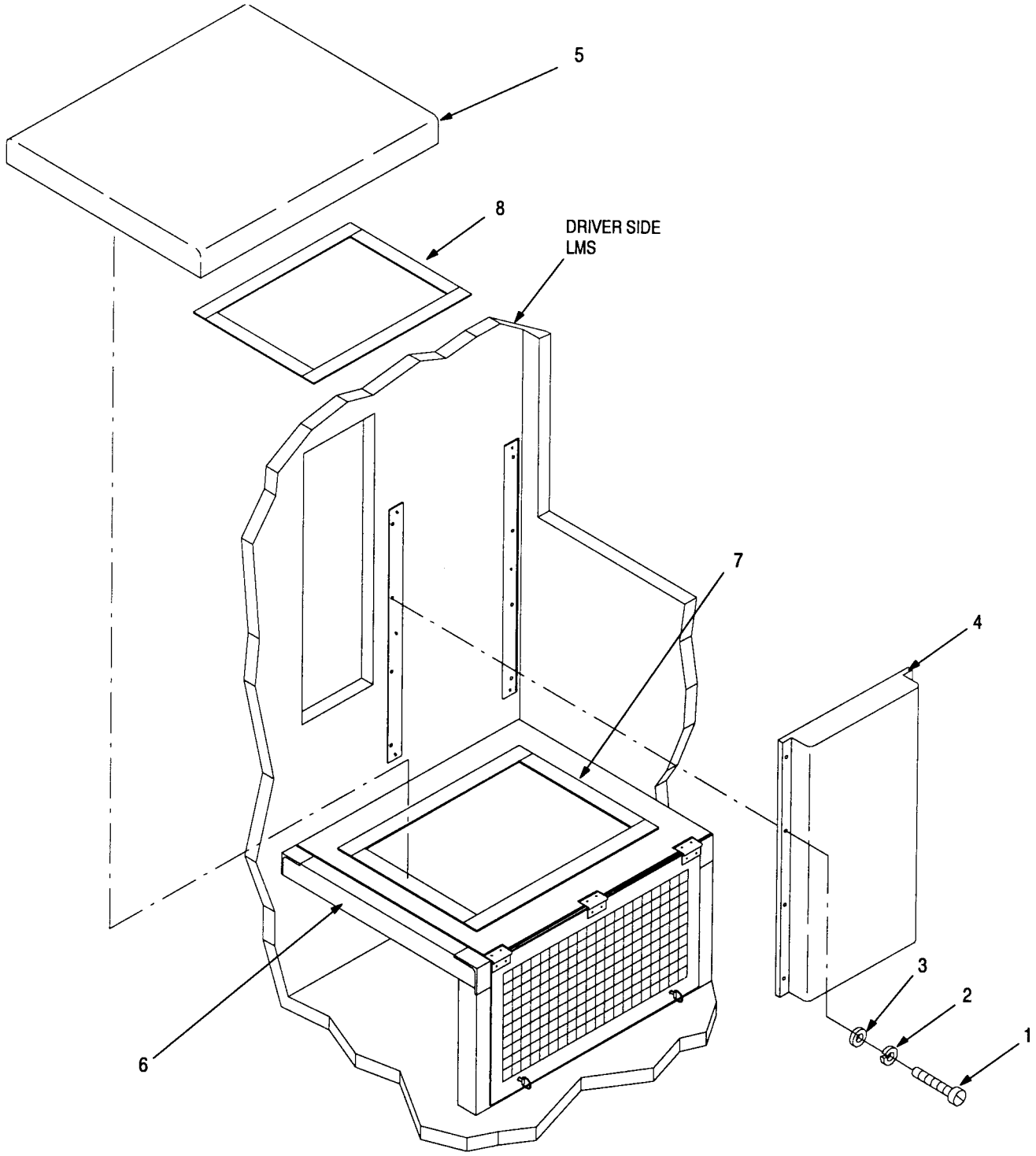


Figure 2-33. Driver or Passenger Seat and Back Removal

2.13.13 Seat Belt Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set.

NOTE

The following maintenance procedures can be used for both passenger side and driver side seat belts.

a. Removal (Refer to Figure 2-34)

(1) Disconnect three lap belt harness assembly clips (1) from three tie-down strap end fittings (2) attached to the LMS. Remove lap belt harness assembly (3).

(2) Remove three tie-down strap end fittings (2) from LMS.

b. Installation (Refer to Figure 2-34)

(1) Install three tie-down strap end fittings (2) on LMS.

(2) Install lap belt harness assembly (3) by connecting three lap belt harness assembly clips (1) on three tie-down strap end fittings (2).

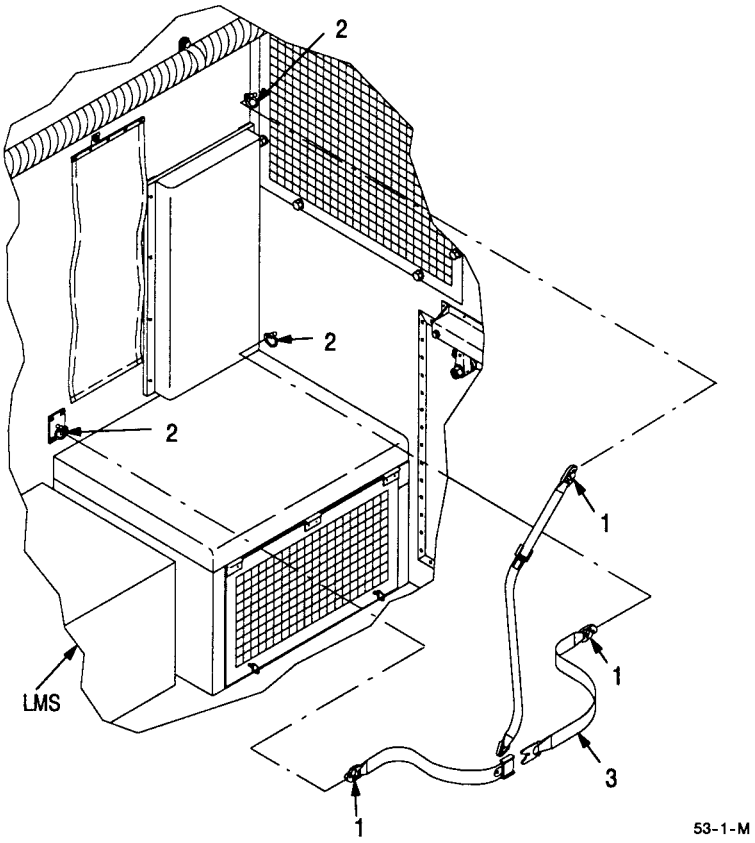


Figure 2-34. Seat Belt Replacement

2.13.14 Storage Box Repair.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Materials/Parts:
Adhesive (Item 6, Appendix C)
Isopropyl Alcohol (Item 12, Appendix C)
Rubber Gloves (Item 25, Appendix C)

Equipment Conditions:
ECV parking brake set.
Chair removed (see para 2.13.12)

References:
TM 10-5411-224-14

Materials/Parts: (Cont.)
Wiping Rags (Item 39, Appendix C)
Grommet (Item 5, Appx E)
Eight Blind Rivets (Item 78, Appendix E)

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

NOTE

The following maintenance procedures can be used for both passenger side and driver side storage box assemblies.

a. Removal (Refer to Figure 2-35)

Drill out eight rivets (1) securing storage box (2) to LMS.

NOTE

Grommet is only located on the passenger side storage box assembly.

b. Disassembly (Refer to Figure 2-35)

Remove grommet (3) from storage box (2). Discard grommet (3).

c. Assembly (Refer to Figure 2-35)

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(1) Clean appropriate area on storage box (2) with rag dampened with alcohol.

2.13.14 Storage Box Repair – Continued.

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

NOTE

Grommet is only located on the passenger side storage box assembly.

(2) Cut new grommet (3) (Item 5, Appx E) to length and secure to storage box (2) with adhesive.

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

d. Installation (Refer to Figure 2-35)

Secure storage box (2) to LMS with eight rivets (1) (Item 78, Appx E).

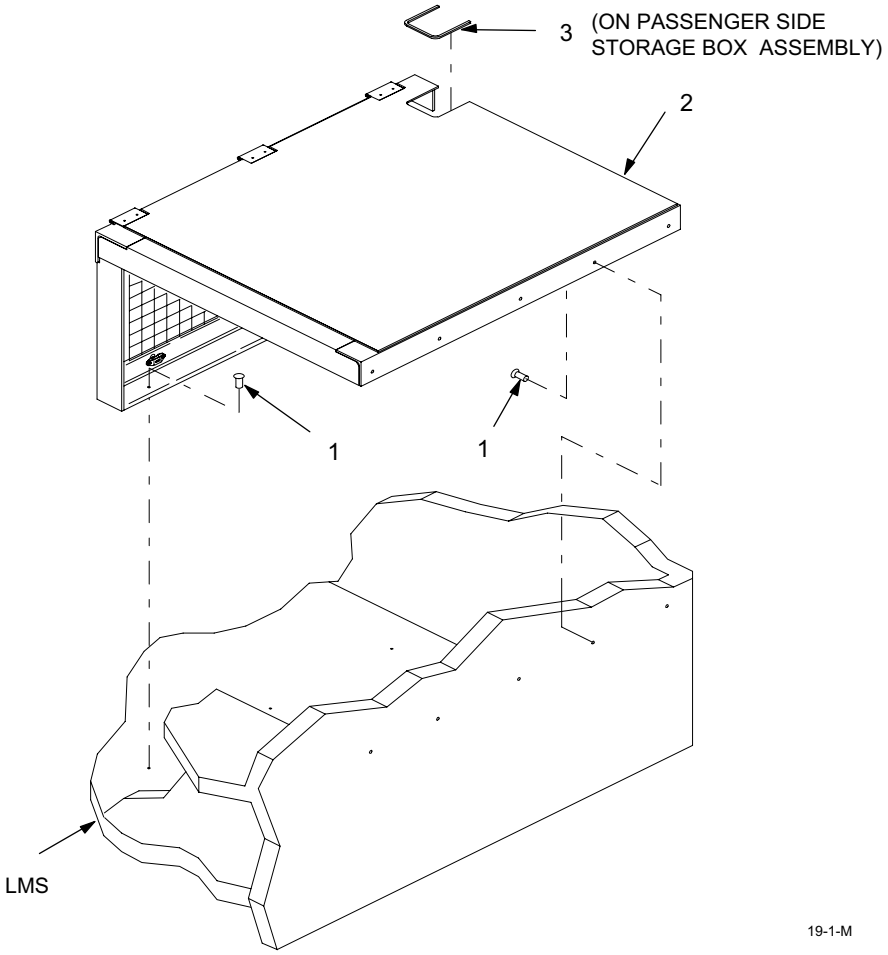


Figure 2-35. Storage Box Repair

Follow-on maintenance: Install chair per para 2.13.12.

2.13.15 Screen Replacement.

This task covers: a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set. Materials/Parts: Eight Lockwashers (Item 17, Appendix E)

a. Removal

Remove eight screws (1), eight lockwashers (2) and eight flat washers (3) securing screen (4) to LMS (5). Discard eight lockwashers (2).

b. Installation

Secure screen (4) to LMS (5) with eight screws (1), eight new lockwashers (2) (Item 17, Appx E) and eight flat washers (3).

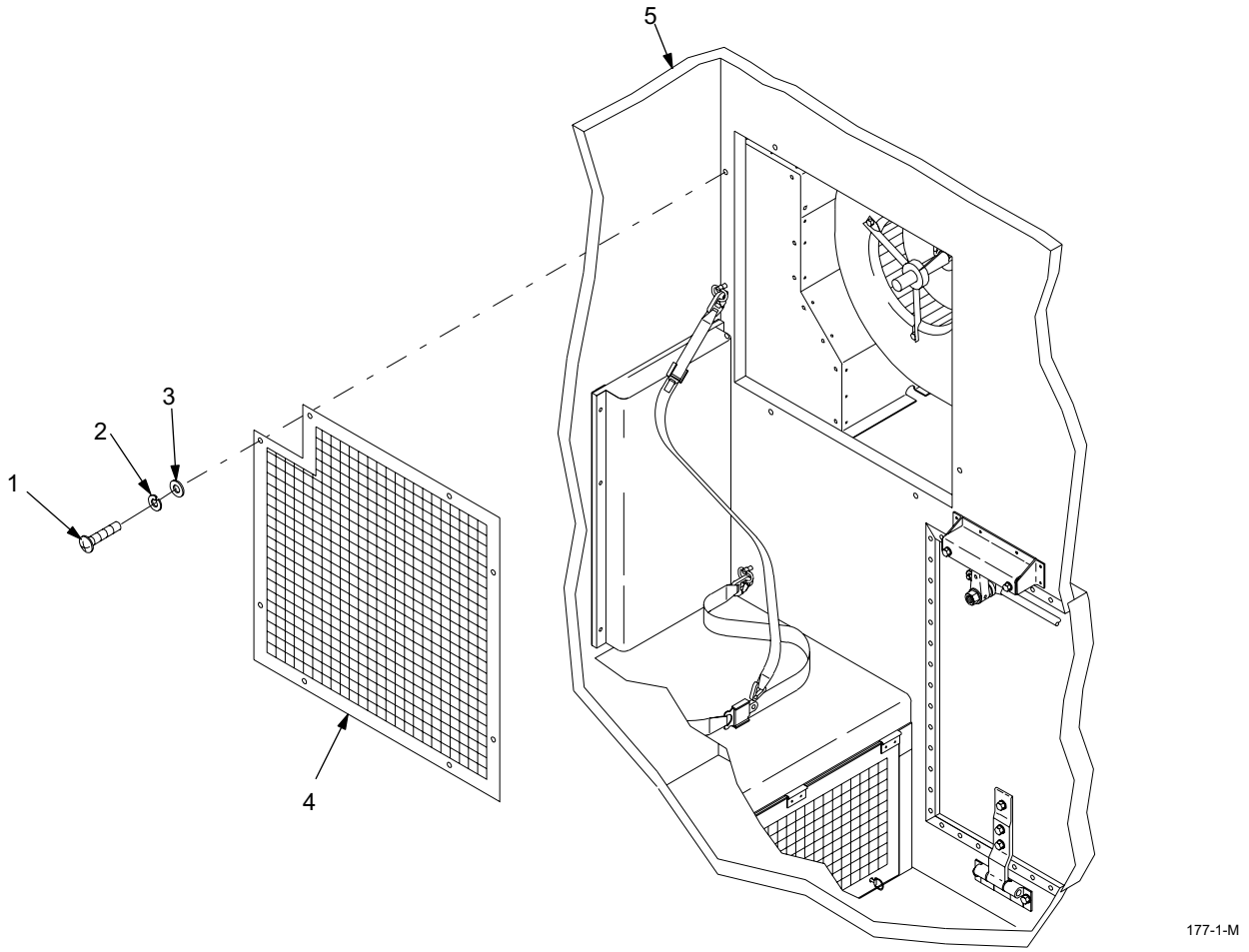


Figure 2-36. Screen Replacement

2.13.16 Forward Light Box Assembly Repair.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Materials/Parts:
Four Lockwashers (Item 14, Appendix E)
Eight Lockwashers (Item 15, Appendix E)
Seventeen Lockwashers (Item 16, Appendix E)

Equipment Conditions:
System power shut off, rear control panel and power panel tagged.
ECV parking brake set.
ECV battery ground cable disconnected (see TM 9-2320-387-24-1).

References:
TM 10-5411-224-14
TM 9-2320-387-24-1

Materials/Parts: (Cont.)
Seventeen Lockwashers (Item 17, Appendix E)
Ten Blind Rivets (Item 78, Appendix E)

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-37)

(1) Remove nine screws (1), nine lockwashers (2) and nine flat washers (3) securing front panel assembly (4) to forward light box assembly (5). Discard nine lockwashers (2).

(2) Swing front panel assembly (4) open.

(3) Disconnect cable connector 1A4W7P1 from connector J1 (6).

(4) Remove fourteen screws (7), fourteen lockwashers (8) and fourteen flat washers (9) securing forward light box assembly (5) to LMS. Discard fourteen lockwashers (8).

b. Disassembly (Refer to Figure 2-37)

(1) Pull lamp (10) and lamp retainer (11) from front panel assembly (4).

(2) Tag wires and remove two screws securing wires to lamp (10).

(3) Pull lamp (10) from lamp retainer (11).

(4) Remove cover assemblies (12) from terminal board assemblies TB1 and TB2 (13).

(5) Remove eight nuts (14), eight lockwashers (15) and eight flat washers (16) securing terminal lugs to terminal board assemblies TB1 and TB2 (13). Tag wires and remove terminal lugs from terminal board assemblies TB1 and TB2 (13). Discard eight lockwashers (15).

(6) Remove two jumpers (17) from terminal board assemblies TB1 and TB2 (13).

(7) Remove four screws (18) and four nuts (19) securing terminal board assemblies TB1 and TB2 (13) to terminal board mount channel on front panel assembly (4).

(8) Remove eight screws (20), eight flat washers (21), eight lockwashers (22) and eight nuts (23) securing two task lamp assemblies (24) to forward light box assembly (5). Tag wires and remove two task lamp assemblies (24). Discard eight lockwashers (22).

(9) Remove four screws (25), four flat washers (26), four lockwashers (27) and four nuts (28) securing connector (6) to terminal board mount channel on front panel assembly (4). Discard four lockwashers (27).

(10) Remove three nuts (29), three lockwashers (30) and three flat washers (31) securing lamp frame assembly (32) to front panel assembly (4). Discard three lockwashers (30).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(11) Drill out five rivets (33) securing hinge (34) to forward light box assembly (5) and five rivets (33) securing hinge (34) to front panel assembly (4).

c. Assembly (Refer to Figure 2-37)

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Secure hinge (34) to front panel assembly (4) with five rivets (33) (Item 78, Appx E) and to forward light box assembly (5) with five rivets (33) (Item 78, Appx E).

(2) Secure lamp frame assembly (32) to front panel assembly (4) with three flat washers (31), three new lockwashers (30) (Item 17, Appx E) and three nuts (29).

(3) Secure connector (6) to terminal board mount channel on front panel assembly (4) with four screws (25), four flat washers (26), four new lockwashers (27) (Item 14, Appx E) and four nuts (28).

(4) Secure two task lamp assemblies (24) to forward light box assembly (5) with eight screws (20), eight flat washers (21), eight new lockwashers (22) (Item 16, Appx E) and eight nuts (23). Remove tags from wires.

(5) Secure terminal board assemblies TB1 and TB2 (13) to terminal board mount channel on front panel assembly (4) with four screws (18) and four nuts (19).

(6) Install two jumpers (17) on terminal board assemblies TB1 and TB2 (13).

(7) If required, cut any damaged terminal lug(s) from wires and crimp new terminal lug(s) onto wires.

(8) Secure terminal lugs to terminal board assemblies TB1 and TB2 (13) with eight nuts (14), eight new lockwashers (15) (Item 15, Appx E) and eight flat washers (16). Remove tags from wires.

(9) Install cover assemblies (12) on terminal board assemblies TB1 and TB2 (13).

(10) Install lamp (10) in lamp retainer (11).

(11) Secure wires to lamp (10) with two screws. Remove tags from wires.

(12) Install lamp (10) and lamp retainer (11) on front panel assembly (4).

2.13.16 Forward Light Box Assembly Repair – Continued.

d. Installation (Refer to Figure 2-37)

(1) Secure forward light box assembly (5) to LMS with fourteen screws (7), fourteen new lockwashers (8) (Item 17, Appx E) and fourteen flat washers (9).

(2) Connect cable connector 1A4W7P1 to connector J1 (6).

(3) Swing front panel assembly (4) closed.

(4) Secure front panel assembly (4) to forward light box assembly (5) with nine screws (1), nine new lockwashers (2) (Item 16, Appx E) and nine flat washers (3).

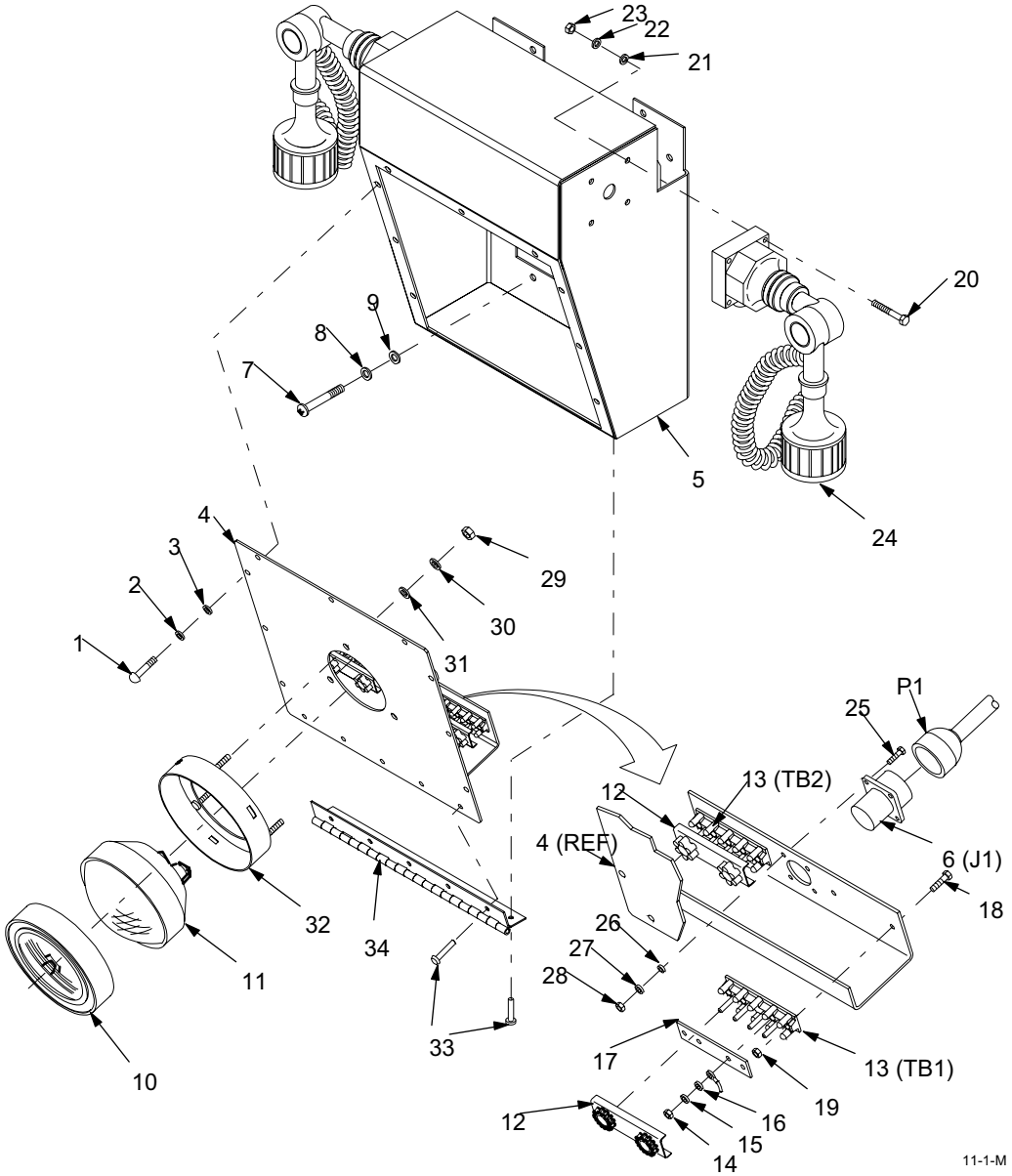


Figure 2-37. Forward Light Box Assembly Repair

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, remove tags, apply power and perform operational test.

2.13.17 Rear Light Box Assembly Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Shop Equipment: Electrical Equipment (Item 40, Appendix B)	Equipment Conditions: System power shut off, rear control panel and power panel tagged. ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Materials/Parts: Two Lockwashers (Item 15, Appendix E) Eight Lockwashers (Item 16, Appendix E) Seven Lockwashers (Item 17, Appendix E)	References: TM 9-2320-387-24-1

WARNING

The CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-38)

(1) Remove lamp (1) from lamp retainer (2).

(2) Tag leads and remove two screws (3) securing leads to lamp (1).

(3) Remove eight screws (4), eight lockwashers (5) and eight flat washers (6) securing cover (7) to box (8). Discard eight lockwashers (5).

(4) Remove three nuts (9), three lockwashers (10) and three flat washers (11) securing lamp frame assembly (12) to cover (7). Discard three lockwashers (10).

(5) Tag and remove leads from switch (13).

(6) Remove nut (14), lockwasher (15) and locating washer (16) securing switch (13) to box (8).

(7) Remove cover assembly (17) from terminal board assembly (18).

(8) Tag terminal lugs (19).

(9) Remove two nuts (20), two lockwashers (21) and two flat washers (22) securing terminal lugs (19) to terminal board assembly (18). Discard two lockwashers (21).

(10) Remove two nuts (23), two screws (24) and terminal board (18) from box (8).

2.13.17 Rear Light Box Assembly Replacement – Continued.

NOTE

Mounting hardware is supplied with switch (13).

Cable 1A4A10W1 must be removed (per para 2.13.27) before steps 11 and 12 can be performed.

(11) Remove electrical locknut (25) and electrical bushing (26) securing chase nipple (27) to box (8).

(12) Remove four screws (28), four lockwashers (29) and four flat washers (30) securing box (8) to ceiling of LMS. Discard four lockwashers (29).

b. Assembly (Refer to Figure 2-38)

(1) Secure box (8) to ceiling of LMS with four screws (28), four new lockwashers (29) (Item 17, Appx E) and four flat washers (30).

(2) Secure chase nipple (27) to box (8) with electrical bushing (26) and electrical locknut (25).

(3) Secure terminal board assembly (18) to box (8) with two screws (24) and two nuts (23).

(4) If required, cut any damaged terminal lug(s) (19) from wire and crimp new terminal lug(s) (19) onto wire.

(5) Secure terminal lugs (19) to terminal board assembly (18) with two flat washers (22), two new lockwashers (21) (Item 15, Appx E) and two nuts (20). Remove tags from terminal lugs (19).

(6) Install cover assembly (17) on terminal board assembly (18).

(7) Install leads to switch (13). Remove tags from leads.

NOTE

Attaching hardware for switch is supplied with the switch.

(8) Secure switch (13) to box (8) with locating washer (16), lockwasher (15) and nut (14).

(9) Secure lamp frame assembly (12) to cover (7) with three flat washers (11), three new lockwashers (10) (Item 17, Appx E) and three nuts (9).

(10) Secure cover (7) to box (8) with eight screws (4), eight new lockwashers (5) (Item 16, Appx E) and eight flat washers (6).

(11) Install lamp (1) onto lamp retainer (2).

(12) Secure leads to lamp (1) with two screws (3). Remove tags from leads.

(13) Install lamp (1) and lamp retainer (2) onto lamp frame assembly (12).

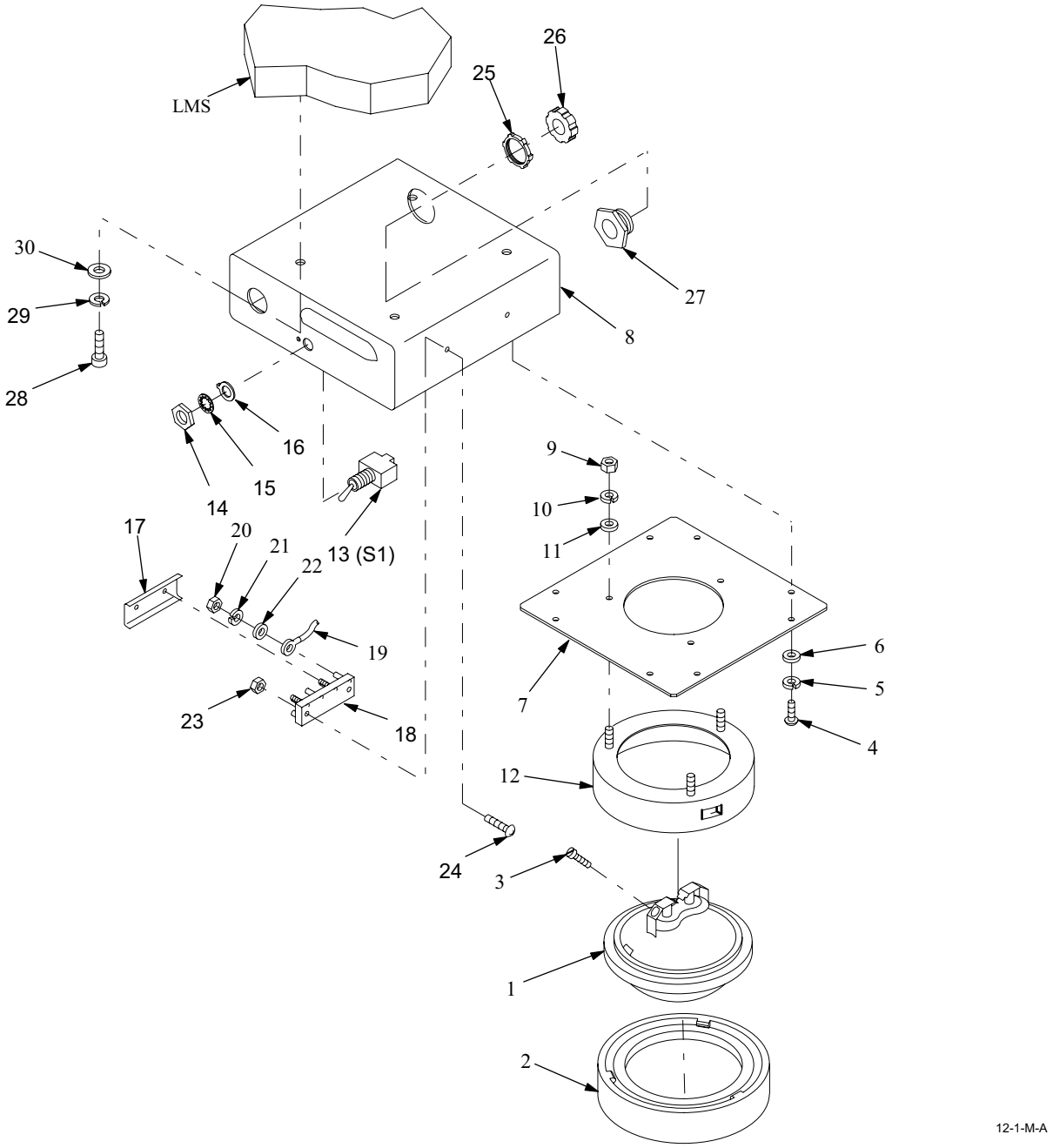


Figure 2-38. Rear Light Box Assembly Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, remove tags, apply system power and perform operational test.

2.13.18 Control Box Assembly Repair.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Multimeter (Item 27, Appendix B)	System power shut off, rear control panel and power panel tagged.
Power Supply (Item 29, Appendix B)	ECV parking brake set.
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV battery ground cable disconnected (see TM 9-2320-387-24).
Shop Equipment: Electrical Equipment (Item 40, Appendix B)	
Extraction Tool (Item 10, Appendix B)	References: TM 9-2320-387-24-1
Materials/Parts:	
Solder (Item 51, Appendix C)	Materials/Parts: (Cont.)
Eight Lockwashers (Item 14, Appendix E)	Ten Lockwashers (Item 16, Appendix E)
Eight Lockwashers (Item 15, Appendix E)	Six Lockwashers (Item 17, Appendix E)

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-39)

(1) Remove eight screws (1), eight lockwashers (2) and eight flat washers (3) securing control panel faceplate assembly (4) to control box weld assembly (5). Discard eight lockwashers (2).

(2) Disconnect cable connector 1A4W6P1 from connector J1 (6), cable connector 1A4W7J3 from connector P3 (7), and cable connector 1A4W4P2 from connector J2 (8).

(3) Remove six screws (9), six lockwashers (10) and six flat washers (11) securing control box weld assembly (5) to LMS. Discard six lockwashers (10).

b. Disassembly (Refer to Figure 2-39)

(1) Remove cover assemblies (12) from terminal board assemblies TB1 and TB2 (13).

(2) Remove eight nuts (14), eight lockwashers (15) and eight flat washers (16) securing terminal lugs (17) to terminal board assemblies TB1 and TB2 (13). Tag terminal lug wires and remove terminal lugs (17) from terminal board assemblies TB1 and TB2 (13). Discard eight lockwashers (15).

(3) Remove two jumpers (18) from terminal board assemblies TB1 and TB2 (13).

(4) Remove four screws (19) and four nuts (20) securing terminal board assemblies TB1 and TB2 (13) to control box weld assembly (5).

(5) Remove two screws securing terminal lugs to switch S3 (21). Tag terminal lug wires.

(6) Remove two nuts (22), lockwasher (23) and locking ring (24) securing switch S3 (21) to control panel faceplate assembly (4).

(7) Loosen setscrew (25) securing knob (26) to potentiometer R1 (27). Note position of knob (26) and remove knob (26) from potentiometer R1 (27).

(8) Tag and unsolder leads to potentiometer R1 (27).

(9) Remove nut (28) and lockwasher (29) securing potentiometer R1 (27) to control panel faceplate assembly (4).

(10) Tag and unsolder leads to post bindings E1 and E2 (30 and 31).

(11) Remove two nuts (32) and two washers (33) securing post bindings E1 and E2 (30 and 31) to control panel faceplate assembly (4).

NOTE

Steps 12 through 15 apply to both switches.

(12) Tag and unsolder leads to switches/indicators S1/DS1 and S2/DS2 (34).

(13) Using extraction tool, carefully squeeze tabs (36) and pry indicator unit (35) from switch housing (37).

(14) Using a small flat-head screwdriver, turn two screws (38) counterclockwise until two retaining cams (39) lay down.

(15) Pull indicator unit (35) and switch housing (37) from control panel faceplate assembly (4) and retaining cover (40).

(16) Loosen two captive screws (41) and remove relay K1 (42) from socket XK1 (43).

(17) Remove socket XK1 (43) from control box weld assembly (5). Tag and remove wires from sockets (43).

(18) Remove two screws (44), two flat washers (45), two lockwashers (46) and two nuts (47) securing buzzer (48) in control box weld assembly (5). Discard two lockwashers (46).

(19) Remove two screws securing terminal lugs to buzzer (48). Tag terminal lug wires.

(20) Remove four nuts (49), four lockwashers (50), eight flat washers (51) and four screws (52) securing connector J1 (6) in control box weld assembly (5). Discard four lockwashers (50).

(21) Remove four nuts (53), four lockwashers (54), four flat washers (55) and four screws (56) securing connector P3 (7) in control box weld assembly (5). Discard four lockwashers (54).

(22) Remove nut (57) securing connector J2 (8) in control box weld assembly (5).

c. Assembly (Refer to Figure 2-39)

NOTE

Nut supplied with connector.

(1) Secure connector J2 (8) in control box weld assembly (5) with nut (57).

(2) Secure connector P3 (7) in control box weld assembly (5) with four screws (56), four flat washers (55), four new lockwashers (54) (Item 14, Appx E) and four nuts (53).

(3) Secure connector J1 (6) in control box weld assembly (5) with four screws (52), eight flat washers (51), four new lockwashers (50) (Item 14, Appx E) and four nuts (49).

(4) Secure terminal lugs to buzzer (48) with two screws. Remove tags from terminal lug wires.

2.13.18 Control Box Assembly Repair – Continued.

(5) Secure buzzer (48) in control box weld assembly (5) with two screws (44), two flat washers (45) two new lockwashers (46) (Item 16, Appx E) and two nuts (47).

(6) Install wires on socket XK1 (43) and K1 relay (42). Remove tags from wires.

(7) Install socket XK1 (43) and relay K1 (42) in control box weld assembly (5) and secure by tightening two captive screws (41).

NOTE

Steps 8 through 15 apply to both switches.

(8) Push switch housing (37) into front of control panel faceplate assembly (4) and retainer cover (40).

(9) Using a small flat-head screwdriver, turn two screws (38) clockwise until two retaining cams (39) stand up.

CAUTION

Do not install indicator unit without all four lamps installed or short circuit will occur when power is applied.

NOTE

If installing new switch, install lamps per TM 10-5410-228-10.

(10) Using extraction tool, carefully squeeze tabs (36) and install indicator unit (35) into switch housing (37), ensuring that the aligning pin engages hole in switch housing (37).

(11) Solder leads to back of switches/indicators S1/DS1, and S2/DS2 (34). Remove tags from leads.

NOTE

Nuts supplied with post binding.

(12) Secure post bindings E2 and E1 (31 and 30) to front of control panel faceplate assembly (4) with two washers (33) and two new nuts (32).

(13) Solder leads to post bindings E2 and E1 (31 and 30). Remove tags from leads.

NOTE

Nut and lockwasher supplied with potentiometer.

(14) Secure potentiometer R1 (27) to control panel faceplate assembly (4) with new lockwasher (29) and new nut (28).

(15) Solder leads to potentiometer R1 (27). Remove tags from leads.

NOTE

Setscrew supplied with knob.

(16) Correctly position knob (26) on potentiometer R1 (27) and secure with new setscrew (25).

NOTE

Nuts and washers supplied with switch.

(17) Secure switch S3 (21) to control panel faceplate assembly (4) with locking ring (24), lockwasher (23) and two nuts (22).

(18) Secure terminal lugs to switch S3 (21) with two screws. Remove tags from terminal lug wires.

(19) Secure terminal board assemblies TB1 and TB2 (13) in control box weld assembly (5) with four screws (19) and four nuts (20).

(20) Install two jumper links (18) on terminal board assemblies TB1 and TB2 (13).

(21) Secure terminal lugs (17) on terminal board assemblies TB1 and TB2 (13) with eight flat washers (16), eight new lockwashers (15) (Item 15, Appx E) and eight nuts (14).

(22) Install cover assemblies (12) on terminal board assemblies TB1 and TB2 (13).

d. Installation (Refer to Figure 2-39)

(1) Secure control box weld assembly (5) to LMS with six screws (9), six new lockwashers (10) (Item 17, Appx E) and six flat washers (11).

(2) Connect cable connectors 1A4W6P1 to connector J1 (6), 1A4W7J3 to connector P3 (7), and 1A4W4P2 to connector J2 (8).

(3) Secure control panel faceplate assembly (4) to control box weld assembly (5) with eight screws (1), eight new lockwashers (2) (Item 16, Appx E) and eight flat washers (3).

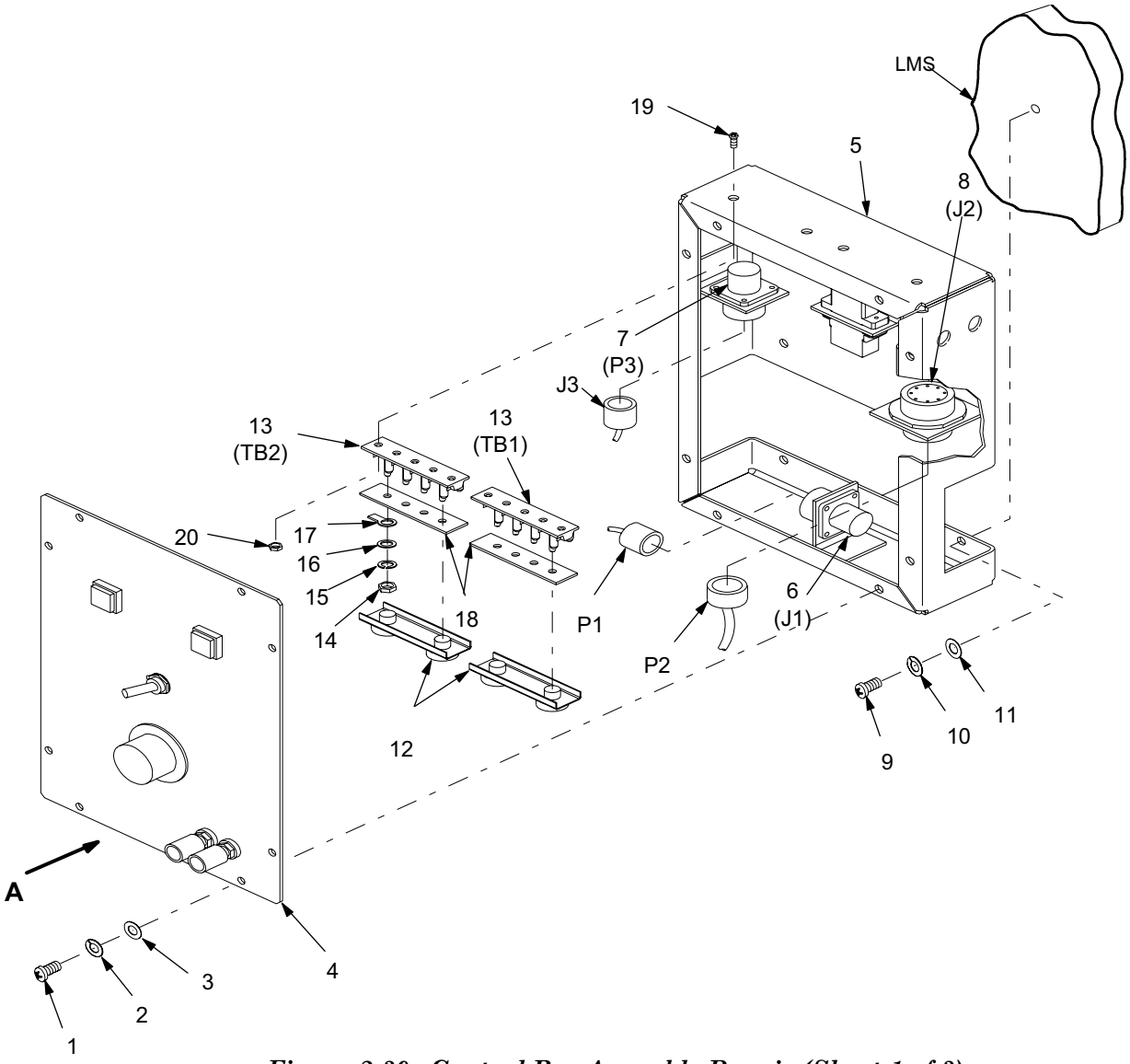


Figure 2-39. Control Box Assembly Repair (Sheet 1 of 3)

2.13.18 Control Box Assembly Repair – Continued.

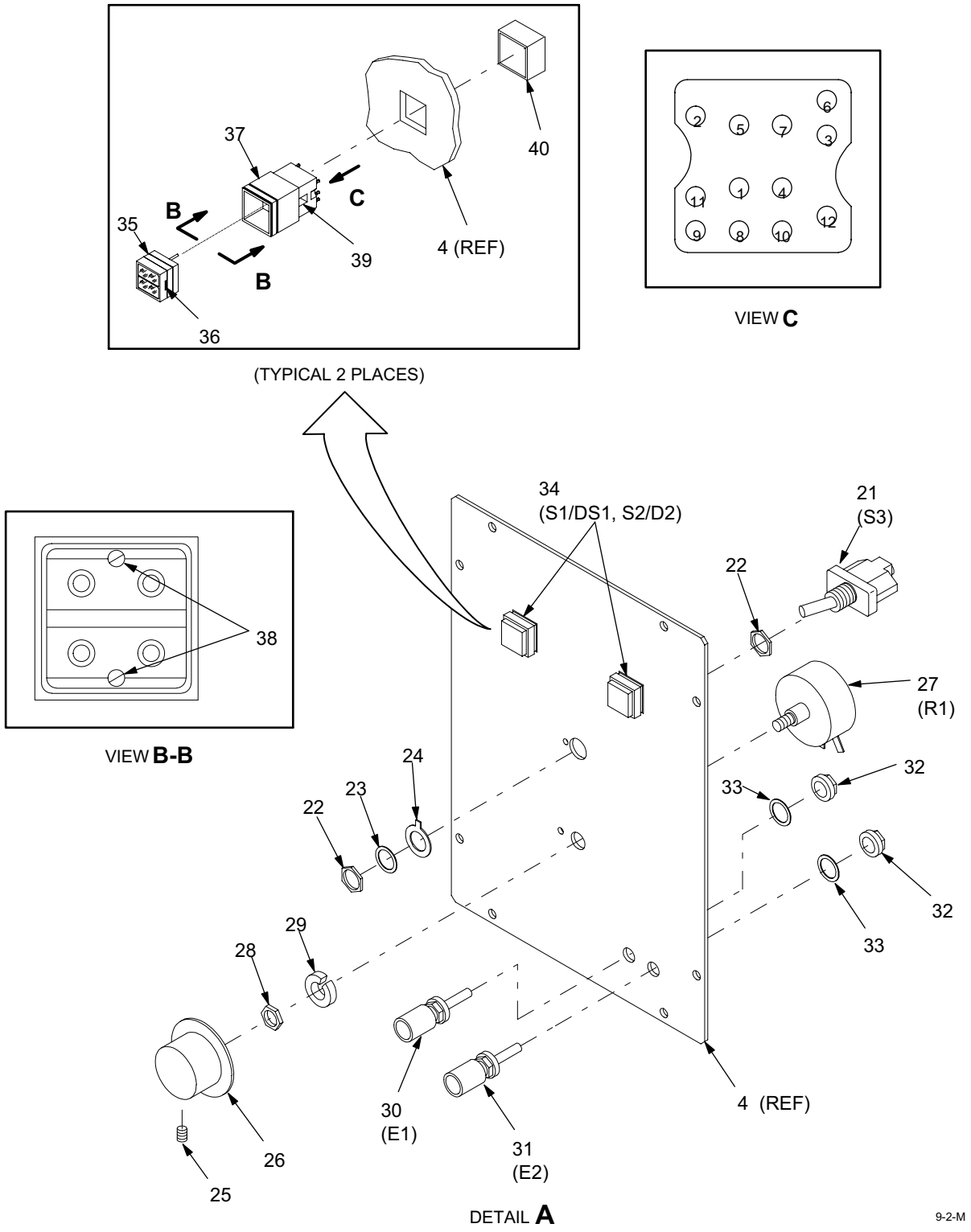


Figure 2-39. Control Box Assembly Repair (Sheet 2 of 3)

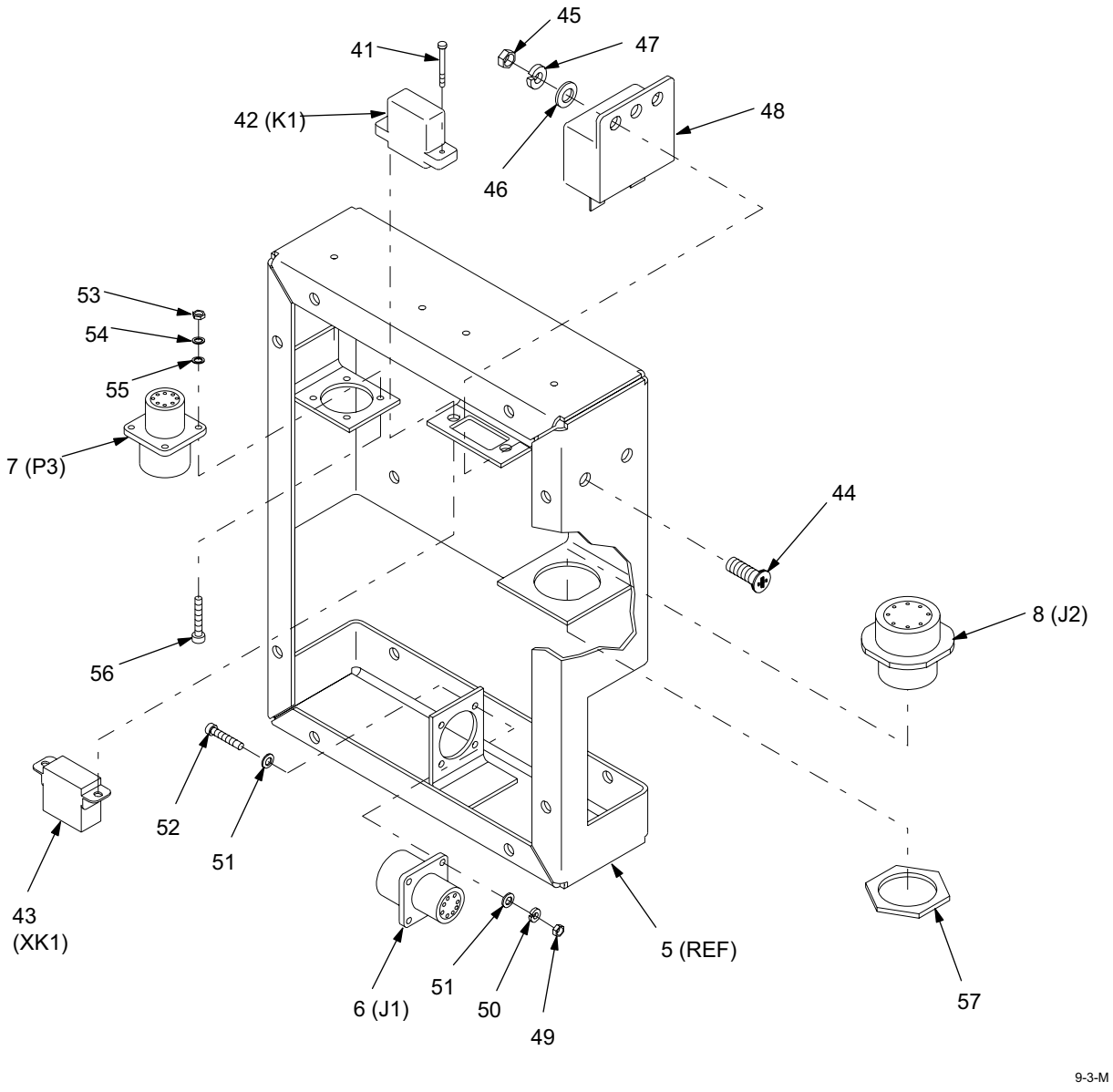


Figure 2-39. Control Box Assembly Repair (Sheet 3 of 3)

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, remove tags, apply power and perform operational test.

2.13.19 Relay Box Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Multimeter (Item 27, Appendix B)
Power Supply (Item 29, Appendix B)

Materials/Parts:
Four Lockwashers (Item 15, Appendix E)
Fourteen Lockwashers (Item 16, Appendix E)
Ten Lockwashers (Item 17, Appendix E)
Six Tie-down Straps (Item 87, Appendix E)

Equipment Conditions:
Power shut off, rear control panel and power panel tagged.
ECV parking brake set.
ECV battery ground cable disconnected (see TM 9-2320-387-24).

References:
TM 9-2320-387-24-1

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-40)

(1) Lift passenger side storage box door assembly to gain access to relay box.

(2) Disconnect connector 1A4W1P2 from electrical connector J1 (1) on relay box.

(3) Remove ten screws (2), ten lockwashers (3) and ten flat washers (4) securing cover (5) to relay box (6). Discard ten lockwashers (3).

(4) Remove eight screws (7), eight lockwashers (8) and eight flat washers (9) securing relay box (6) to LMS wall, inside of passenger side storage box. Discard eight lockwashers (8).

b. Disassembly (Refer to Figure 2-40)

(1) Tag wires and remove two nuts (10), two lockwashers (11) and two flat washers (12) securing two terminal lugs (13) and wires to relay A17K1 (14).

(2) Tag wires and remove two nuts (15), two lockwashers (16) and two flat washers (17) securing four terminal lugs (18) and wires to relay A17K1 (14).

(3) Remove two screws (19), two lockwashers (20), two flat washers (21) and two nuts (22) securing relay (14) to relay box (6). Discard two lockwashers (20).

NOTE

Make note of polarity on diodes before removing.

(4) Tag wires and remove four screws (23), four lockwashers (24) and four flat washers (25) securing three diodes (26) attached to six terminal lugs (27) and four terminal lugs (28) to terminal board A17TB1(29).

(5) Remove four screws (30), four lockwashers (31), four flat washers (32) and four nuts (33) securing terminal board (29) to relay box (6). Discard four lockwashers (31).

(6) Remove four screws (34), four lockwashers (35), four flat washers (36) and four nuts (37) securing electrical connector (1) to relay box (6). Discard four lockwashers (35).

(7) Remove electrical locknut (38) securing chase nipple (39) and electrical bushing (40) to relay box (6).

c. Assembly (Refer to Figure 2-40)

(1) Secure chase nipple (39) and electrical bushing (40) to relay box (6) with electrical locknut (38).

(2) Secure terminal board (29) to relay box (6) with four screws (30), four new lockwashers (31) (Item 16, Appx E), four flat washers (32) and four nuts (33).

(3) If required, cut any damaged terminal lug(s) (27) from diode(s) (26) and crimp new terminal lug(s) (27) onto wire.

(4) Secure electrical connector (1) to relay box (6) with four screws (34), four new lockwashers (35) (Item 15, Appx E), four flat washers (36) and four nuts (37).

(5) If required, cut any damaged terminal lug(s) (28) from wire and crimp new terminal lug(s) (28) onto wire.

NOTE

Screws, lockwashers, and flat washers supplied with terminal board.

(6) Secure three diodes (26) attached to six terminal lugs (27) and four terminal lugs (28) to terminal board (29) with four screws (23), four lockwashers (24) and four flat washers (25). Remove tags from wires.

(7) Secure relay A17K1 (14) to relay box (6) with two screws (19), two new lockwashers (20) (Item 17, Appx E), two flat washers (21) and two nuts (22).

(8) If required, cut any damaged terminal lug(s) (18) from wire and crimp new terminal lug(s) (18) onto wire.

NOTE

Nuts, lockwashers, and flat washers supplied with relay.

(9) Secure four terminal lugs (18) and wires to relay A17K1 (14) with two nuts (15), two lockwashers (16) and two flat washers (17). Remove tags from wires.

(10) If required, cut any damaged terminal lug(s) (13) from wire and crimp new terminal lug(s) (13) onto wire.

NOTE

Nuts, lockwashers, and flat washers supplied with relay.

(11) Secure two terminal lugs (13) and wires to relay K1 (14) with two nuts (10), two lockwashers (11) and two flat washers (12). Remove tags from wires.

2.13.19 Relay Box Replacement – Continued.

d. Installation (Refer to Figure 2-40)

(1) Secure relay box (6) to LMS wall, inside of passenger side storage box with eight screws (7), eight new lockwashers (8) (Item 17, Appx E) and eight flat washers (9).

(2) Secure cover (5) to relay box (6) with ten screws (2), ten new lockwashers (3) (Item 16, Appx E) and ten flat washers (4).

(3) Connect connector 1A4W1P2 to electrical connector J1 (1) on relay box.

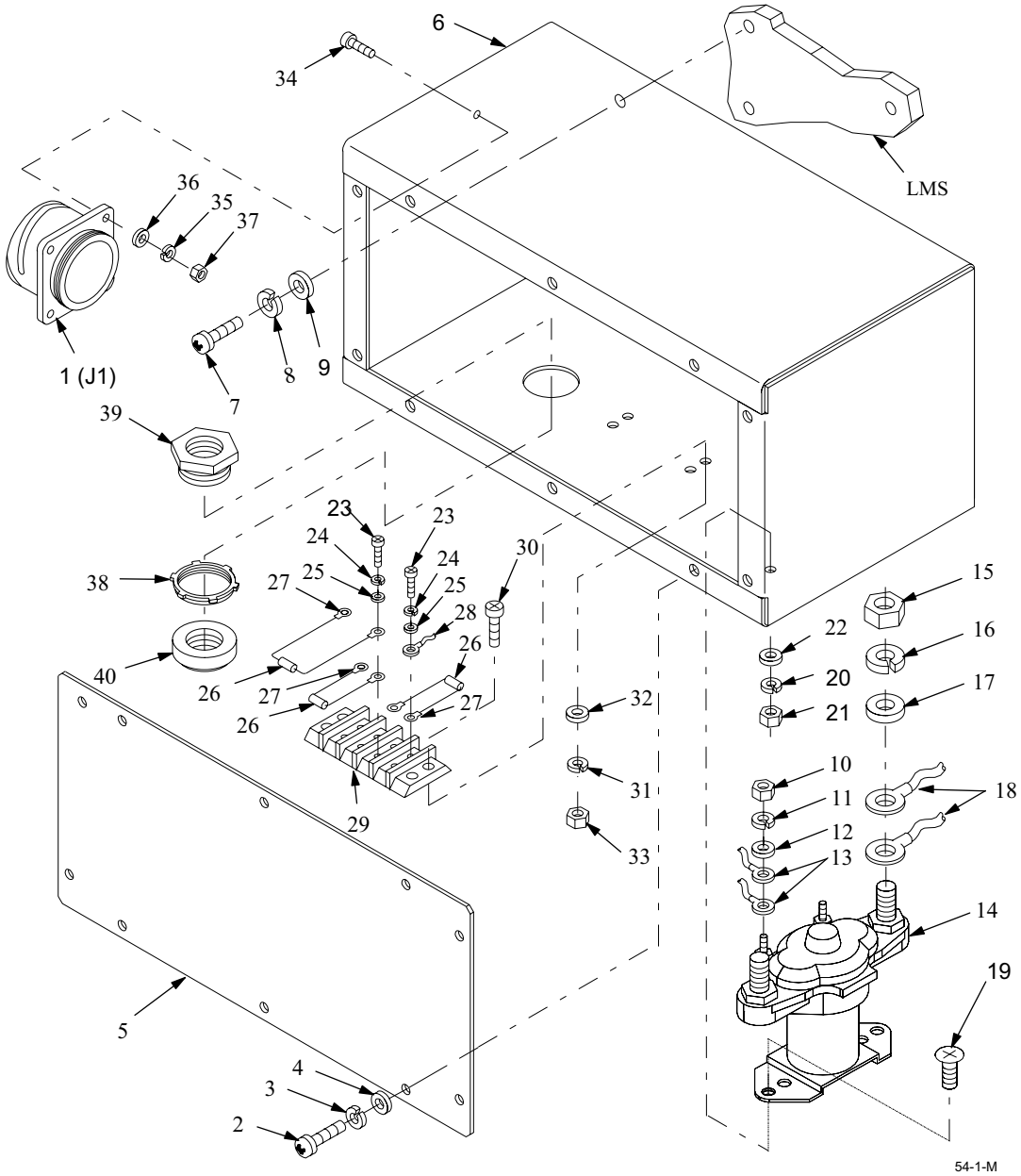


Figure 2-40. Relay Box Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, remove tags, apply power and perform operational test.

2.13.20 Converter Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)

Materials/Parts:
Sixteen Lockwashers (Item 17, Appendix E)

Personnel: (2)

Equipment Conditions:
Power shut off and power panel and cab area tagged.
ECV parking brake set.
ECV battery ground cable disconnected (see TM 9-2320-387-24-1).

References:
TM 9-2320-387-24-1

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

a. Removal (Refer to Figure 2-41)

(1) Remove eleven screws (1), eleven lockwashers (2) and eleven flat washers (3) securing guard (4) to side of rack (5). Discard eleven lockwashers (2).

(2) Remove four screws (6), four lockwashers (7) and four flat washers (8) securing converter (9) to rack (5). Discard four lockwashers (7).

(3) Pull out converter (9) far enough to gain access to back of unit.

(4) Disconnect 1A4W10 cable assembly connector P2 (10) from converter connector J1.

(5) Disconnect 1A4W9 cable assembly connector P2 (11) from converter connector J2.

(6) Remove nut (12), lockwasher (13) and flat washer (14) securing ground lead (15) to ground lug (16). Discard lockwasher (13).

WARNING

The converter is heavy. To prevent injury to personnel, two people are required to lift converter.

(7) Remove converter (9) from rack (5).

b. Installation (Refer to Figure 2-41)

WARNING

The converter is heavy. To prevent injury to personnel, two people are required to lift converter.

(1) Place converter (9) part way in rack (5), do not slide all the way back.

(2) Connect ground lead (15) to ground lug (16) and secure with nut (12), new lockwasher (13) (Item 17, Appx E) and flat washer (14).

2.13.20 Converter Replacement – Continued.

(3) Connect 1A4W10 cable assembly connector P2 (10) to converter connector J1, located on back of the unit.

(4) Connect 1A4W9 cable assembly connector P2 (11) to converter connector J2, located on back of the unit.

(5) Push converter (9) back into rack, ensuring the alignment post on the rear of the unit is seating properly.

(6) Secure converter (9) to rack (5) with four screws (6), four new lockwashers (7) (Item 17, Appx E) and four flat washers (8).

(7) Secure guard (4) to side of rack (5) with eleven screws (1), eleven new lockwashers (2) (Item 17, Appx E) and eleven flat washers (3).

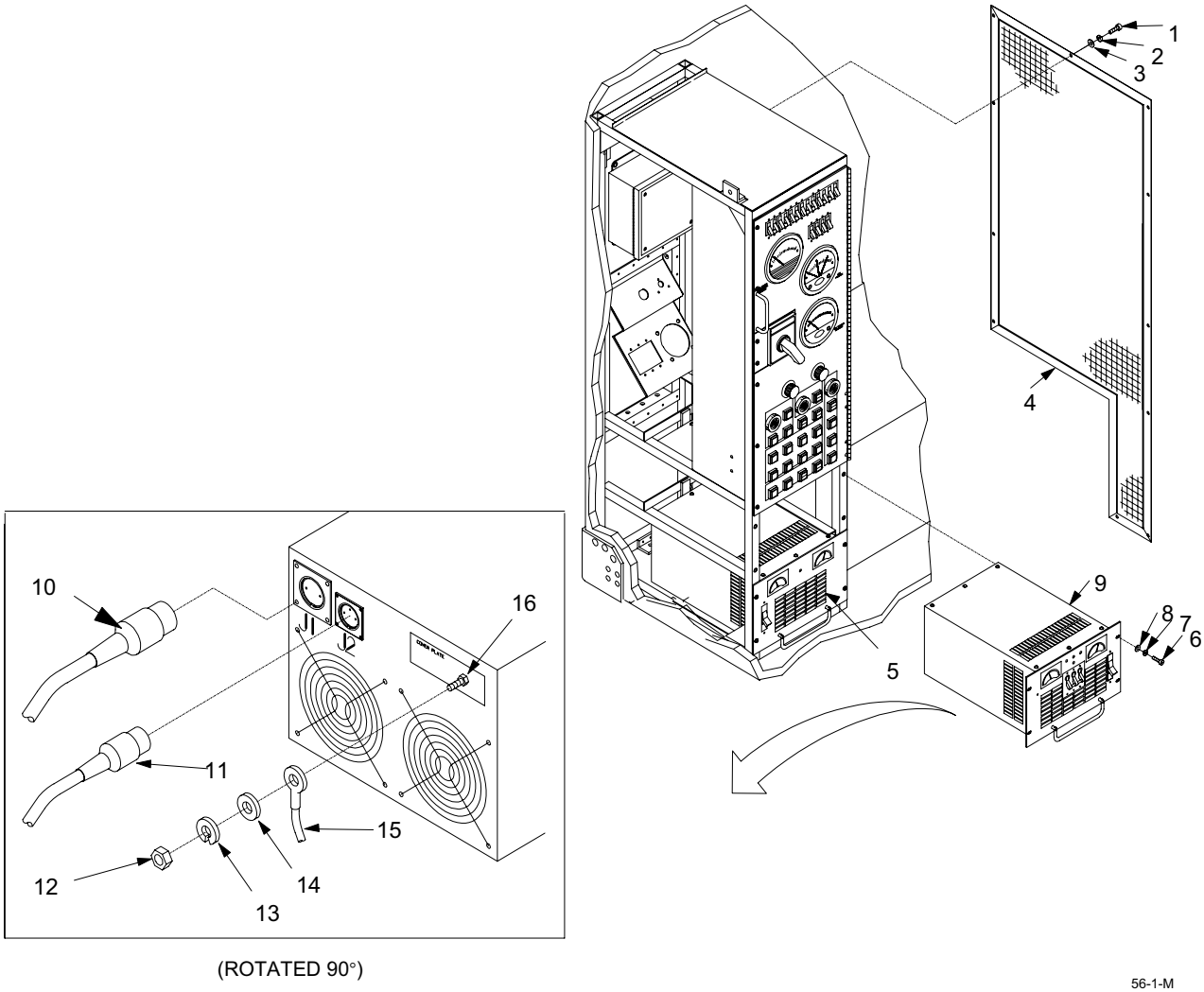


Figure 2-41. Converter Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, remove tags, apply power and perform operational test.

2.13.21 Inverter Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Shop Equipment: Electrical Equipment (Item 40, Appendix B)	Equipment Conditions: Power shut off and power panel and cab area tagged. ECV parking brake set. ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Materials/Parts: Sixteen Lockwashers (Item 17, Appendix E)	References: TM 9-2320-387-24-1
Personnel: (2)	

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

a. Removal (Refer to Figure 2-42)

(1) Remove eleven screws (1), eleven lockwashers (2) and eleven flat washers (3) securing guard (4) to side of rack (5). Discard eleven lockwashers (2).

(2) Remove four screws (6), four lockwashers (7) and four flat washers (8) securing inverter (9) to rack (5). Discard four lockwashers (7).

(3) Pull out inverter (9) far enough to gain access to back of unit.

(4) Disconnect 1A4W11 cable assembly connector P2 (10) from inverter connector J1.

(5) Disconnect 1A4W12 cable assembly connector P2 (11) from inverter connector J2.

(6) Remove nut (12), lockwasher (13) and flat washer (14) securing ground lead (15) to ground lug (16). Discard lockwasher (13).

WARNING

The inverter is heavy. To prevent injury to personnel, two people are required to lift inverter.

(7) Remove hold-down bracket on back side of ladder per paragraph 2.13.10.

(8) Remove inverter (9) from rack (5).

b. Installation (Refer to Figure 2-42)

(1) Place inverter (9) in rack (5), do not slide all the way back.

(2) Install hold-down bracket for ladder per paragraph 2.13.10.

(3) Connect ground lead (15) to ground lug (16) and secure with nut (12), new lockwasher (13) (Item 17, Appx E) and flat washer (14).

(4) Connect 1A4W11 cable assembly connector P2 (10) to inverter connector J1, located on the back of the unit.

2.13.21 Inverter Replacement – Continued.

(5) Connect 1A4W12 cable assembly connector P2 (11) to inverter connector J2, located on the back of the unit.

(6) Push inverter (9) back into rack, ensuring the alignment post on the rear of the unit is seating properly.

(7) Secure inverter (9) to rack (5) with four screws (6), four new lockwashers (7) (Item 17, Appx E) and four flat washers (8).

(8) Secure guard (4) to side of rack (5) with eleven screws (1), eleven new lockwashers (2) (Item 17, Appx E) and eleven flat washers (3).

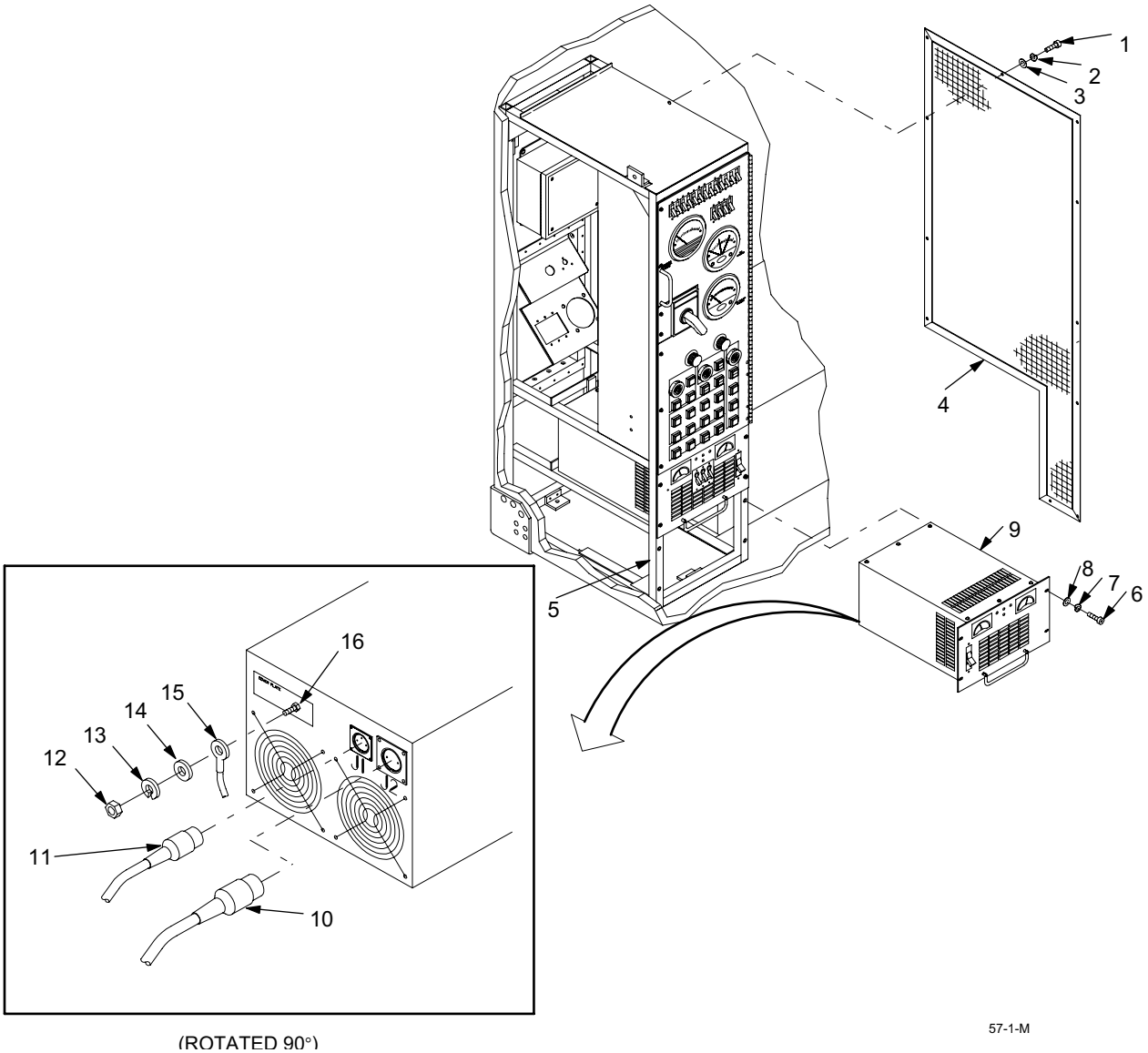


Figure 2-42. Inverter Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, apply power and perform operational test.

2.13.22 Rear Control Panel Component Replacement.

This task covers:

a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical, Equipment (Item 40, Appendix B)

Materials/Parts:
Rubber Gloves (Item 25, Appendix C)
Sealant (Item 45, Appendix C)
Five Lockwashers (Item 17, Appendix E)

Equipment Conditions:
Power shut off, power panel and cab area tagged.
ECV battery ground cable disconnected (see TM 9-2320-387-24-1).

References:
TM 9-2320-387-24-1

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-43)
   (1) Remove five screws (1), five lockwashers (2) and five flat washers (3) securing cover assembly (4) to pan assembly (5) and rack (6). Discard five lockwashers (2).
   (2) Open cover assembly (4).
b. Disassembly (Refer to Figure 2-43)
   (1) Loosen eleven miniature hose clamps (7), seven nylon clamps (8), hose fitting (18) and remove the following nine hoses:

REFERENCE DESIGNATOR	FROM	TO
PG3-HI (9)	Pan Assembly (PG3-HI)	Gage PG3-HI Port (22)
PS1-HI/PG3-LOW (10)	Pan Assembly (PS1-HI/PG3-LOW)	Side of Tee (18)
PG3-LOW (11)	Side of Tee (18)	Gage PG3-LOW Port (22)
PS1-HI (12)	PS1-HI PORT	Bottom of Tee (18)
PS1-LOW/PG1-LOW/PG2-LOW (13)	Pan Assembly (PS1-LOW/PG1-LOW/PG2-LOW)	Side of Cross (19)
PG2-LOW (14)	Top of Cross (19)	Gage PG2-LOW Port (23)
PG1-LOW (15)	Side of Cross (19)	Gage PG1-LOW Port (24)

2.13.22 Rear Control Panel Component Replacement – Continued.

PS1-LOW (16)	PS1-LOW PORT	Bottom of Cross (19)
PG2-HI (17).	Pan Assembly (PG2-HI)	Gage PG2-HI PORT (23)

(2) Remove eleven miniature hose clamps (7), seven nylon clamps (8), hose fitting (18) and hose fitting (19) from hoses.

(3) Remove two screws (20) securing handle (21) to cover assembly (4).

c. Assembly (Refer to Figure 2-43)

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(1) Apply sealant to threads of two screws (20) and secure handle (21) to cover assembly (4) with two screws (20).

(2) Place miniature hose clamp (7) on either end of hose PG3-HI (9). Attach one end of hose (9) to barbed connector PG3-Hi on back wall of pan assembly (5) and the other end to back of gage PG (22) Hi port. Secure both ends of hose (9) with miniature hose clamp (7).

(3) Place miniature hose clamp (7) on either end of hose PG2-HI (17). Attach one end of hose (17) to barbed connector PG2-HI on back wall of pan assembly (5) and the other end to back of gage PG2 (23) HI port. Secure both ends of hose (17) with miniature hose clamps (7).

(4) Attach one end of the following three hoses to Tee hose fitting (18) and secure with three nylon clamps (8):
PS1-HI/PG3-LOW (10)
PG3-LOW (11)
PS1-HI (12).

(5) Place miniature hose clamp (7) on other end of hose (10). Attach other end of hose (10) to barbed connector PS1-HI/PG3-LOW on back wall of pan assembly (5) and secure with miniature hose clamp (7).

(6) Place miniature hose clamp (7) on other end of hose (11). Attach other end of hose (11) to gage PG3 (22) LOW port and secure with miniature hose clamp (7).

(7) Place miniature hose clamp (7) on other end of hose (12). Attach other end of hose (12) to barbed connector on pressure switch PS1 HI port and secure with miniature hose clamp (7).

(8) Attach one end of the following four hoses to hose fitting (19) and secure with four nylon clamps (8):
PS1-LOW/PG1-LOW/PG2-LOW (13)
PG2-LOW (14)
PG1-LOW (15)
PS1-LOW (16).

(9) Place miniature hose clamp (7) on other end of hose (13). Attach other end of hose (13) to barbed connector PS1-LOW/PG1-LOW/PG2-LOW on back wall of pan assembly (5) and secure with miniature hose clamp (7).

(10) Place miniature hose clamp (7) on other end of hose (14). Attach other end of hose (14) to gage PG2 (23) LOW port and secure with miniature hose clamp (7).

(11) Place miniature hose clamp (7) on other end of hose (15). Attach other end of hose (15) to gage PG1 (24) LOW port and secure with miniature hose clamp (7).

(12) Place miniature hose clamp (7) on other end of hose (16). Attach other end of hose (16) to barbed connector on pressure switch PS1 LOW port and secure with miniature hose clamp (7).

d. Installation (Refer to Figure 2-43)

(1) Carefully close cover assembly (4). Ensure hoses and wires are not binding and will not be pinched between cover assembly (4) and pan assembly (5).

(2) Secure cover assembly (4) to pan assembly (5) and rack (6) with five screws (1), five new lockwashers (2) (Item 17, Appx E) and five flat washers (3).

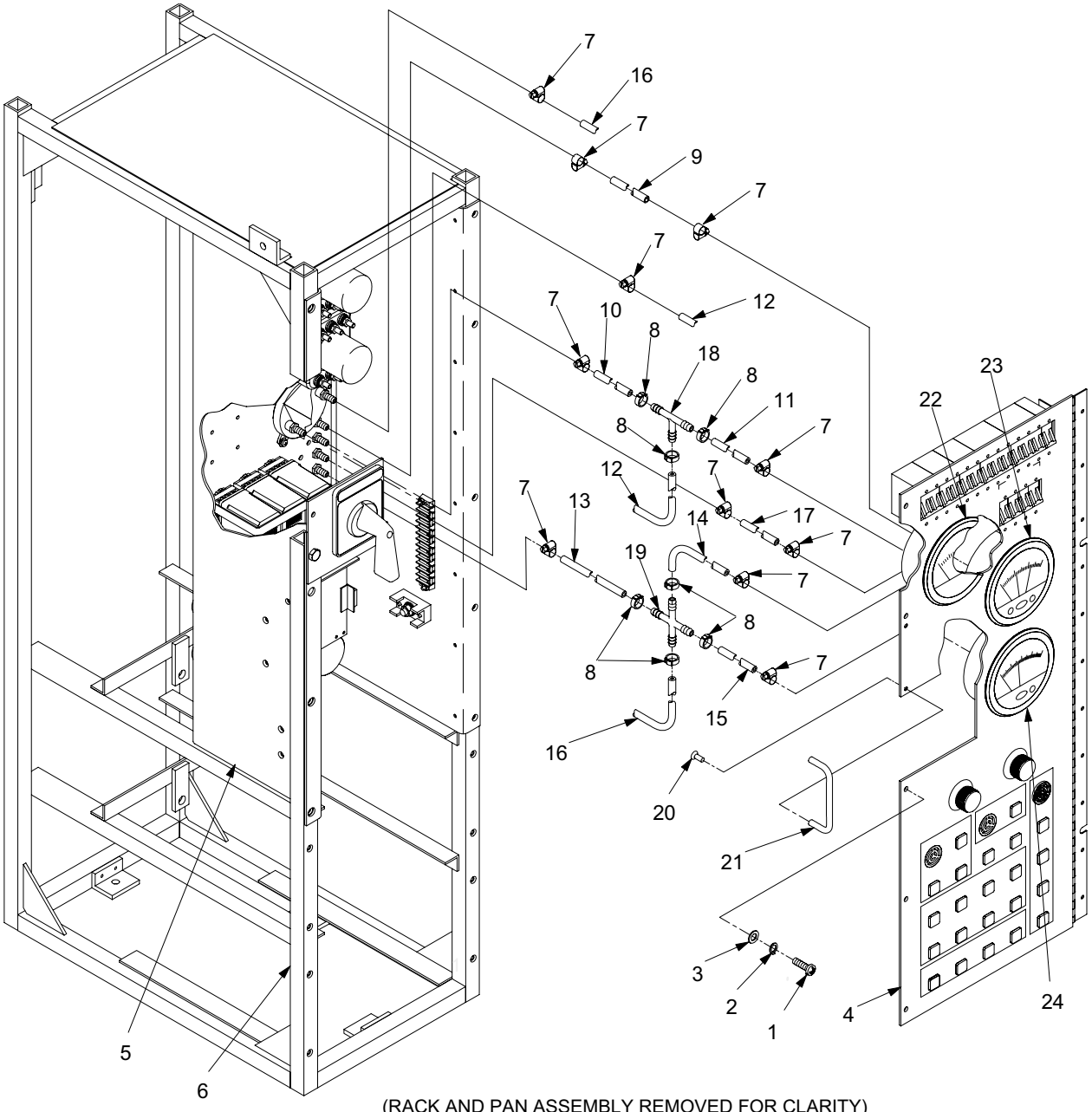


Figure 2-43. Rear Control Panel Component Replacement

Follow-on maintenance: Connect battery ground cable per TM 9-2320-387-24-1 or connect external power cable, install guard per para 2.13.21, remove tags from power panel and cab area and apply power and perform operational test.

2.13.23 Cover Assembly Repair.

This task covers:	
a. Disassembly	b. Assembly

INITIAL SETUP

Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Power shut off, power panel and cab area tagged.
Shop Equipment: Electrical, Equipment (Item 40, Appendix B)	ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Extraction Tool (Item 10, Appendix B)	Cover assembly opened and hoses removed from cover assembly (see para 2.13.22).
	Guard removed from forward side of rack (see para 2.13.21).
Materials/Parts:	
Solder (Item 51, Appendix C)	
Tape (Item 53, Appendix C)	References:
Thirty-four Lockwashers (Item 15, Appendix E)	TM 9-2320-387-24-1
Tie-down Straps (Item 86, Appendix E)	

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-44)

(1) Remove connector (1) from back of gauge PG2 (2).

(2) Remove retaining ring (3) securing gage PG2 (2) and spacer ring (4) to cover (5). Remove gage PG2 (2) from front of cover (5).

(3) Remove two plugs (6) from side of gage PG2 (2).

(4) Remove two barbed connectors (7) from back of gage PG2 (2).

(5) Remove connector (8) from back of gage PG1 (9).

(6) Remove retaining ring (10) securing gage PG1 (9) and spacer ring (11) to cover (5). Remove gage PG1 (9) from front of cover (5).

(7) Remove two plugs (12) from side of gage PG1 (9).

(8) Remove barbed connector (13) from back of gage PG1 (9).

(9) Remove vent filter plug (14) from back of gage PG1 (9).

(10) Remove four screws (14) and four retainers (15) securing gage PG3 (16) to cover (5). Remove gage PG3 (17) from front of cover (5).

(11) Remove two plugs (18) from side of gage PG3 (17).

(12) Remove two barbed connectors (19) from back of gage PG3 (17).

(13) Tag wires and remove nuts (20), lockwashers (21) and flat washers (22) securing wire lugs (23) to circuit breaker (CB10) (24).

(14) Remove two screws (25), two lockwashers (26) and two flat washers (27) securing circuit breaker (24) to cover (5) and remove circuit breaker (CB10) (24). Discard two lockwashers (26).

(15) Tag wires and remove nuts (28), lockwashers (29) and flat washers (30) securing wire lugs (31) to two circuit breakers (CB9 and CB8) (32).

(16) Remove twelve screws (33), twelve lockwashers (34) and twelve flat washers (35) securing two circuit breakers (CB9 and CB8) (32) to cover (5) and remove two circuit breakers (32). Discard twelve lockwashers (34).

(17) Tag wires and remove nuts (36), lockwashers (37) and flat washers (38) securing wire lugs (39) to four circuit breakers (CB1 thru CB4) (40).

(18) Remove eight screws (41), eight lockwashers (42) and eight flat washers (43) securing four circuit breakers (40) to cover (5) and remove four circuit breakers (CB1 thru CB4) (40). Discard eight lockwashers (42).

(19) Tag wires and remove nuts (44), lockwashers (45) and flat washers (46) securing wire lugs (47) to three circuit breakers (CB5 thru CB7) (48).

(20) Remove twelve screws (49), twelve lockwashers (50) and twelve flat washers (51) securing three circuit breakers (CB1 thru CB4) (48) and remove three circuit breakers (48). Discard twelve lockwashers (50).

(21) Tag wires and remove two screws (52) securing wire lugs (53) from audible alarm (LS1) (54).

(22) Remove knurled nut (55) securing audible alarm (LS1) (54) to cover (5) and remove audible alarm (LS1) (54).

(23) Tag wires and remove two screws (56) securing wire lugs (57) to audible alarm (LS3) (58).

(24) Remove knurled nut (59) securing audible alarm (LS3) (58) to cover (5) and remove audible alarm (LS3) (58).

(25) Tag wires and remove two screws (60) securing wire lugs (61) to audible alarm (LS2) (62).

(26) Remove knurled nut (63) securing audible alarm (LS2) (62) to cover (5) and remove audible alarm (LS2) (62).

(27) Tag wires and remove terminal lugs from potentiometer (R1) (64).

(28) Loosen setscrew (65) securing knob (66) to potentiometer (R1) (64) (note position of knob) and remove knob (R1) (66).

(29) Remove nut (67) and lockwasher (68) securing potentiometer (R1) (64) to cover (5).

(30) Tag and unsolder leads to rotary switch (S17) (69).

(31) Loosen setscrew (70) securing knob (71) to rotary switch (S17) (69) (note position of knob) and remove knob (71).

(32) Remove nut (72) and lockwasher (73) securing rotary switch (S17) (69) to cover (5).

NOTE

Steps 32 through 35 apply to 22 switches. Note correct location of each switch prior to removal.

(33) Tag and unsolder leads to 22 switch assemblies (74).

CAUTION

Exercise care when pulling indicator unit from switch housing. Nylon lanyard attaching indicator unit to switch housing is not long and breaks easily.

(34) Using extraction tool, carefully squeeze tabs (75) and pull indicator unit (76) from switch housing (77).

2.13.23 Cover Assembly Repair – Continued.

(35) Using a small flat tip screwdriver, turn two screws (78) counterclockwise until two retaining cams (79) lay down.

(36) Remove switch housing (77) and retaining cover (80).

(37) Remove eleven screws (81) securing cover (5).

b. Assembly (Refer to Figure 2-44 and Schematic Figure F-9)

NOTE

Apply tie-down straps as required.

(1) Install cover (5) with eleven screws (81).

NOTE

Steps 2 through 5 apply to 22 switches. Note correct location of each switch before installation.

(2) Push switch housing (77) into cover (5) and retaining cover (80).

(3) Using small flat tip screwdriver, turn two screws (78) clockwise until two retaining cams (79) stand up.

CAUTION

Do not install indicator unit without all four lamps installed or short circuit will occur when power is applied.

NOTE

If installing new switch, install lamps per TM 10-5410-228-10.

(4) Using extraction tool, carefully squeeze tabs (75) and install indicator unit (76) into switch housing (77), ensuring that the aligning pin engages hole in switch housing (77).

(5) Solder leads to back of switch assembly (74). Remove tags from leads.

NOTE

Nut and lockwasher supplied with rotary switch.

(6) Secure rotary switch (69) to cover (5) with lockwasher (73) and nut (72).

NOTE

Setscrew supplied with knob.

(7) Place knob (71) (in correct position) on rotary switch (69) and secure by tightening setscrew (70).

(8) Solder leads to rotary switch (69). Remove tags from leads.

NOTE

Nut and lockwasher supplied with potentiometer.

(9) Secure potentiometer (64) to cover (5) with lockwasher (68) and nut (67).

NOTE

Setscrew supplied with knob.

(10) Place knob (66) (in correct position) on potentiometer (64) and secure by tightening setscrew (65).

(11) Install terminal lugs on potentiometer (64). Remove tags from wires.

NOTE

Knurled nut and screws supplied with audible alarm. This note applies to steps 15 through 20.

(12) Secure audible alarm (62) to cover (5) with knurled nut (63).

(13) Secure wire lugs (61) to audible alarm (62) with two screws (60). Remove tags from wires.

(14) Secure audible alarm (58) to cover (5) with knurled nut (59).

(15) Secure wire lugs (57) to audible alarm (58) with two screws (56). Remove tags from wires.

(16) Secure audible alarm (54) to cover (5) with knurled nut (55).

(17) Secure wire lugs (53) to audible alarm (54) with two screws (52). Remove tags from wires.

(18) Secure three circuit breakers (48) to cover (5) with twelve flat washers (51), twelve new lockwashers (50) (Item 15, Appx E) and twelve screws (49).

NOTE

Nuts, lockwashers and flat washers supplied with circuit breaker.

(19) Secure wire lugs (47) to three circuit breakers (48) with flat washers (46), lockwashers (45) and nuts (44). Remove tags from wires.

(20) Secure four circuit breakers (40) to cover (5) with eight flat washers (43), eight new lockwashers (42) (Item 15, Appx E) and eight screws (41).

NOTE

Nuts, lockwashers and flat washers supplied with circuit breaker.

(21) Secure wire lugs (39) to four circuit breakers (40) with flat washers (38), lockwashers (37) and nuts (36). Remove tags from wires.

(22) Secure two circuit breakers (32) to cover (5) with twelve flat washers (35), twelve new lockwashers (34) (Item 15, Appx E) and twelve screws (33).

NOTE

Nuts, lockwashers and flat washers supplied with circuit breaker.

(23) Secure wire lugs (31) to two circuit breakers (32) with flat washers (30), lockwashers (29) and nuts (28). Remove tags from wires.

(24) Secure circuit breaker (24) to cover (5) with two flat washers (27), two new lockwashers (26) (Item 15, Appx E) and two screws (25).

NOTE

Nuts, lockwashers and flat washers supplied with circuit breaker.

(25) Secure wire lugs (23) to circuit breaker (24) with flat washers (22), lockwashers (21) and nuts (20). Remove tags from wires.

(26) Install two barbed connectors (19) on back of gage PG3 (17).

(27) Install two plugs (18) on side of gage PG3 (17).

(28) Install gage PG3 (17) on front of cover (5).

NOTE

Screws and retainers supplied with gage.

(29) From back of cover (5) secure gage PG3 (17) and four retainers (16) to cover (5) with four screws (15).

(30) Install barbed connector (13) into LOW port on back of gage PG1 (9).

2.13.23 Cover Assembly Repair – Continued.

(31) Install vent filter plug (14) into HI port on back of gage PG1 (9).
(32) Install two plugs (12) on side of gage PG1 (9).
(33) Install gage PG1 (9) on front of cover (5).

NOTE

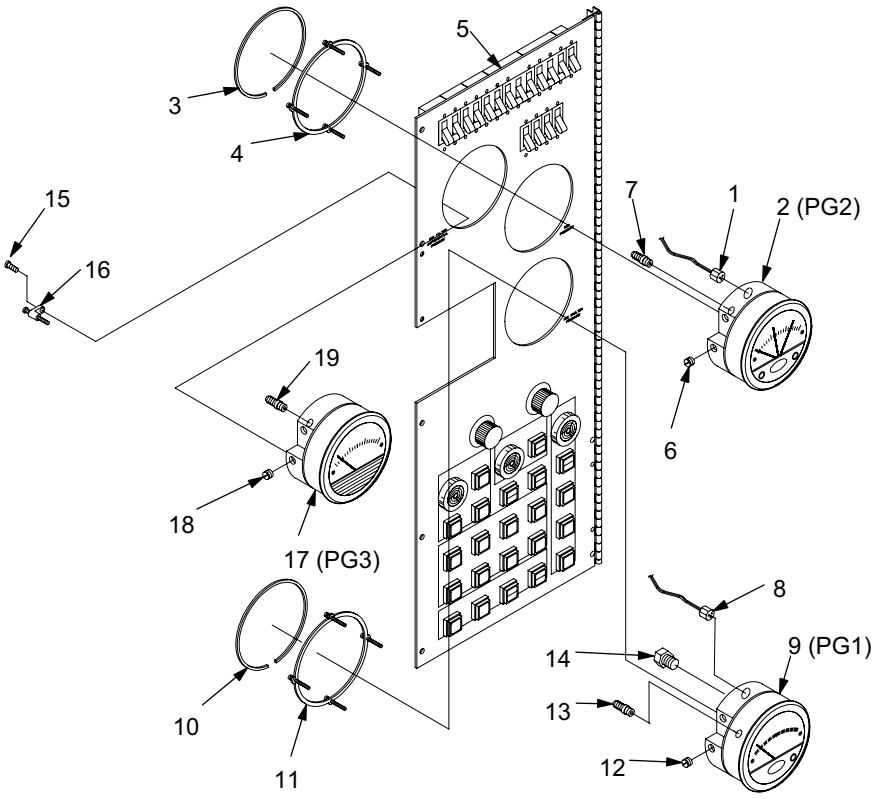
Spacer ring and retaining ring supplied with gage.

(34) From back of cover (5) secure gage PG1 (9) and spacer ring (11) to cover (5) with retaining ring (10).
(35) Install connector (8) on back of gage PG1 (9).
(36) Install two barbed connectors (7) on back of gage PG2 (2).
(37) Install two plugs (6) on side of gage PG2 (2).
(38) Install gage PG2 (2) on front of cover (5).

NOTE

Spacer ring and retaining ring supplied with gage.

(39) From back of cover (5) secure gage PG2 (2) and spacer ring (4) to cover (5) with retaining ring (3).
(40) Install connector (1) on back of gage PG2 (2).



(RACK AND PAN ASSEMBLY REMOVED FOR CLARITY)

109-1-M

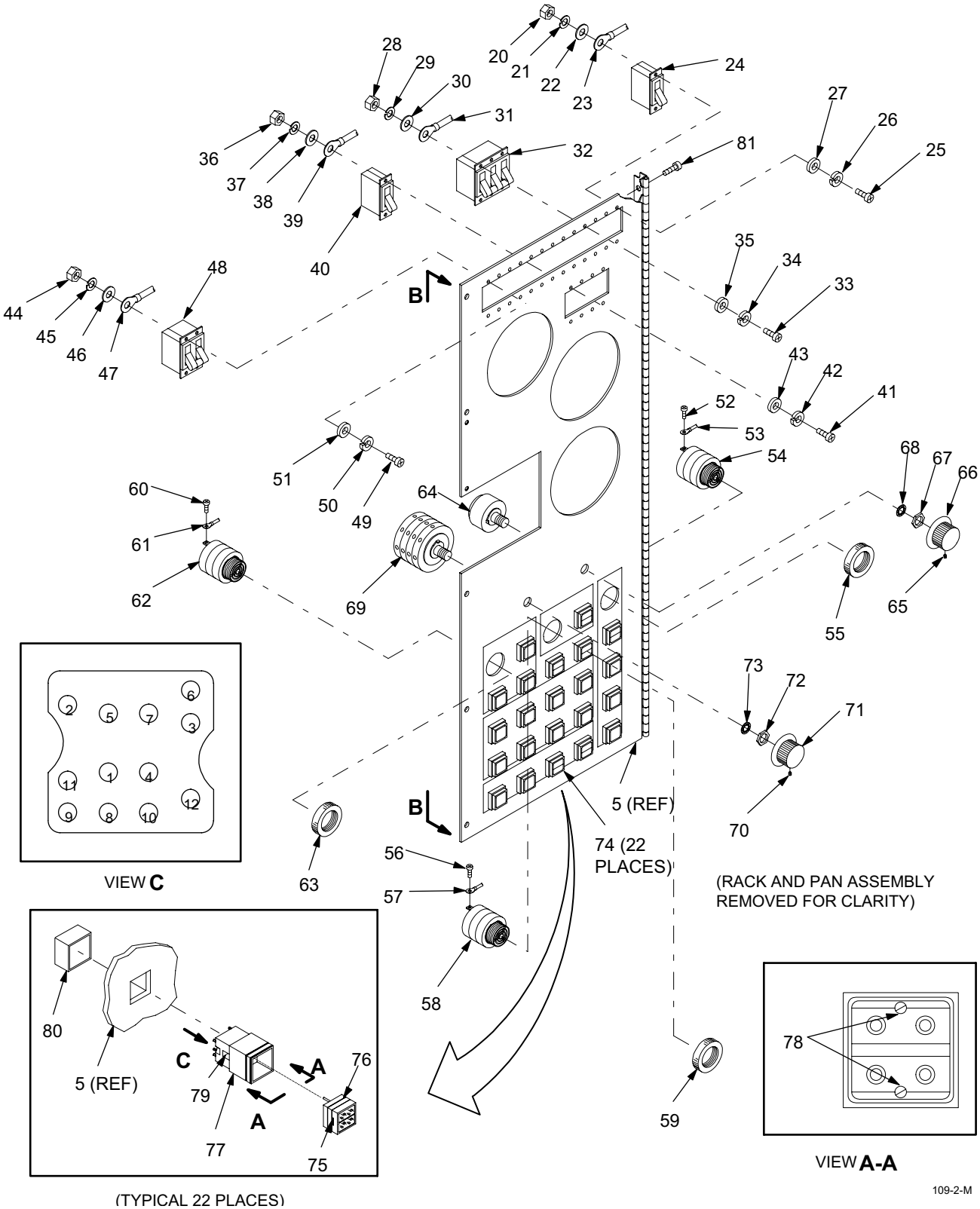


Figure 2-44. Cover Assembly Repair (Sheet 2 of 3)

2.13.23 Cover Assembly Repair – Continued.

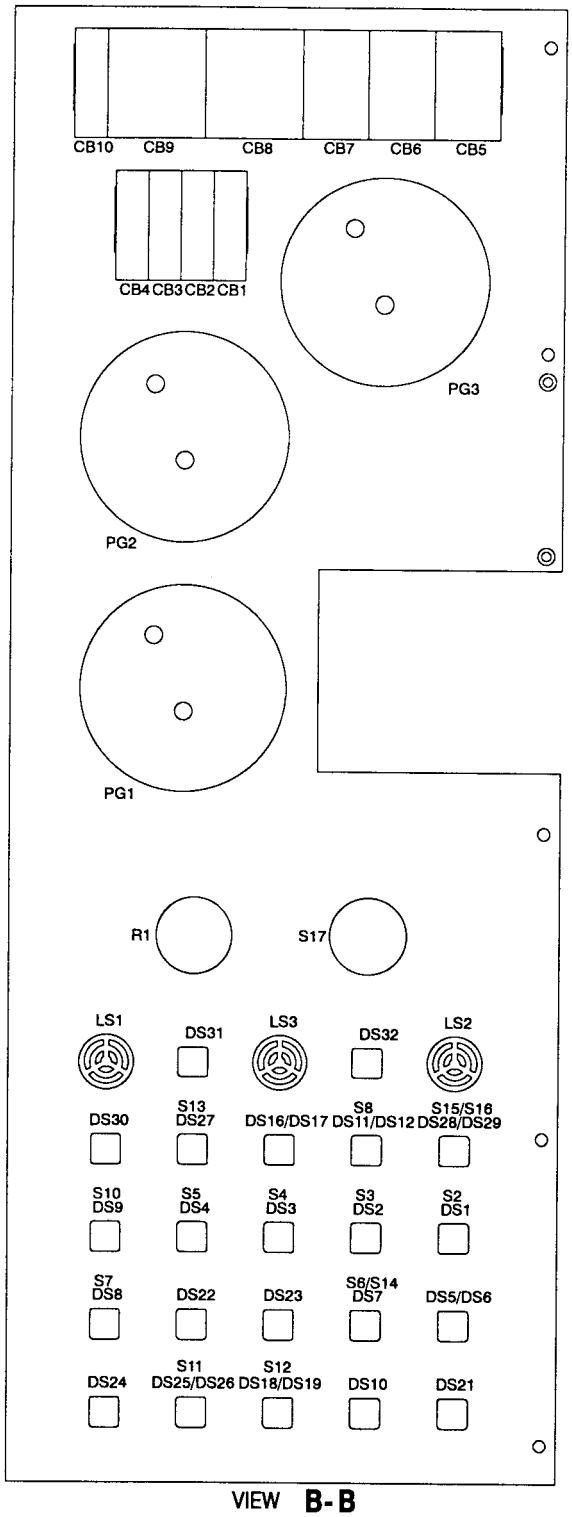


Figure 2-44. Cover Assembly Repair (Sheet 3 of 3)

Follow-on maintenance: Install panel and hoses per para 2.13.22, connect battery ground cable per TM 9-2320-387-24-1 or connect external power cable, remove tags, apply power and perform operational test.

2.13.24 Power Mode Selector Switch Replacement.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Shop Equipment: Electrical Equipment (Item 40, Appendix B)	Power shut off, power panel and cab area tagged.
	Cover assembly opened (see para 2.13.22).
	Guard removed (see para 2.13.21 or 2.13.22).
Materials/Parts:	
Four Lockwashers (Item 16, Appendix E)	References:
Six Lockwashers (Item 17, Appendix E)	TM 9-2320-387-24-1

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-45)

(1) Remove four screws (1), four flat washers (2), four lockwashers (3) and four nuts (4) securing power mode selector switch (5) to rear of pan assembly (6). Discard four lockwashers (3).

(2) Remove two screws (7), two lockwashers (8) and two flat washers (9) securing cover plate (10) to pan assembly (6). Discard two lockwashers (8).

(3) Tag and remove wires from power mode selector switch (5).

(4) Remove power mode selector switch (5) and switch bracket (11) from pan assembly (6).

b. Disassembly (Refer to Figure 2-45)

(1) Remove screw (12) securing handle (13) to power mode selector switch (5) and remove handle (13).

NOTE

Do not remove indicator panel from plate if panel is not damaged. Only peel back corners to access screw heads.

(2) Peel back indicator panel (14) to access four screws (15).

(3) Remove four screws (15), four flat washers (16), four lockwashers (17) and four nuts (18) securing plate (19) to cover plate (10). Discard four lockwashers (17).

c. Assembly (Refer to Figure 2-45)

(1) Secure plate (19) to cover plate (10) and power mode selector switch (5) with four screws (15), four flat washers (16), four new lockwashers (17) (Item 17, Appx E) and four nuts (18).

2.13.24 Power Mode Selector Switch Replacement – Continued.

NOTE

Handle and screw supplied with power mode selector switch.

(2) Secure handle (13) to power mode selector switch (5) with screw (12).

d. Installation (Refer to Figure 2-45)

(1) Secure power mode selector switch (5) with switch bracket (11) to rear of pan assembly (6) with four screws (1), four flat washers (2), four new lockwashers (3) (Item 16, Appx E) and four nuts (4).

(2) Secure cover plate (10) to pan assembly (6) with two screws (7), two new lockwashers (8) (Item 17, Appx E) and two flat washers (9).

(3) Install wires on power mode selector switch (5) and remove tags.

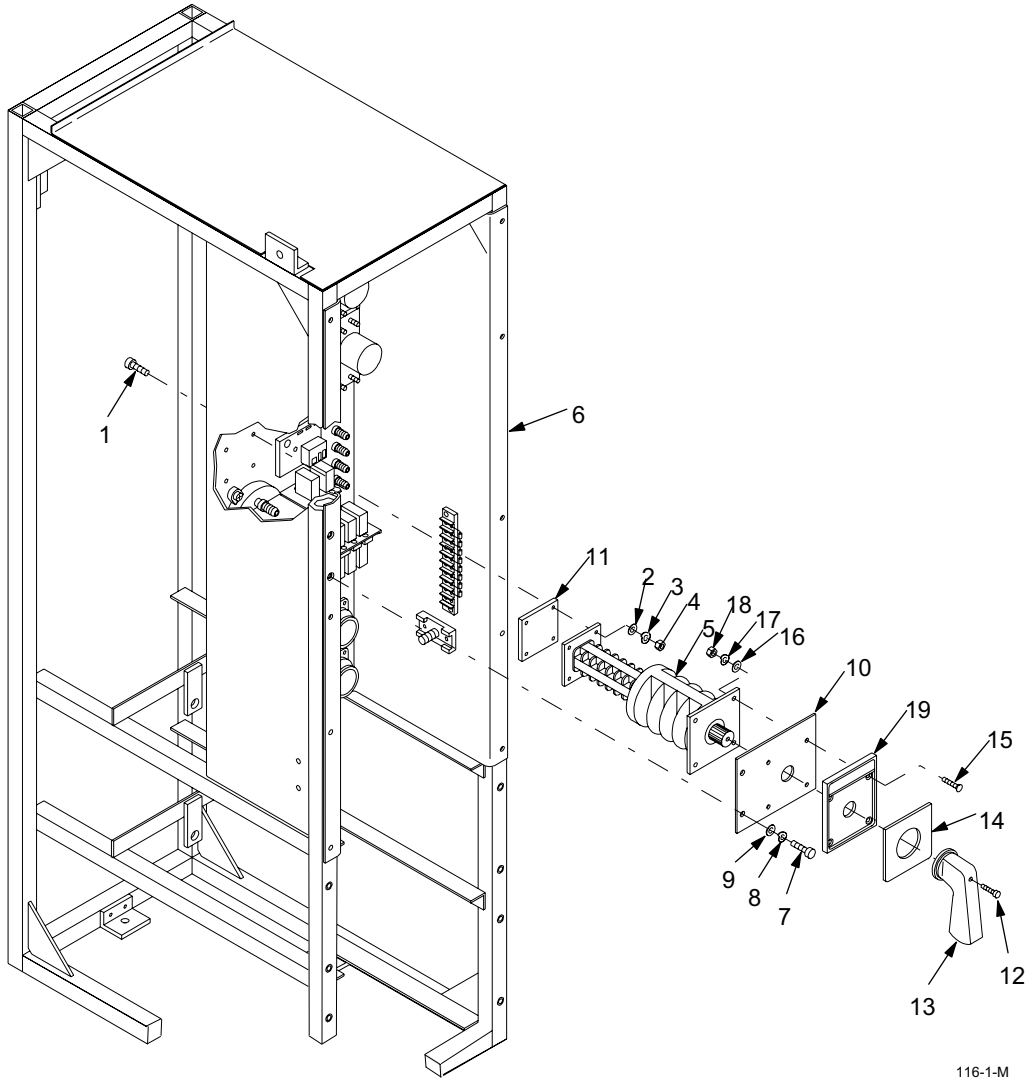


Figure 2-45. Power Mode Selector Switch Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1 or connect external power cable, install guard per para 2.13.20 or 2.13.21, close cover assembly per para 2.13.22, remove tags from power panel and cab area, apply power and perform operational test.

2.13.25 Pan Assembly Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Multimeter (Item 27, Appendix B)
Power Supply (Item 29, Appendix B)

Materials/Parts:
Sealant (Item 44, Appendix C)
Solder (Item 51, Appendix C)
Tape (Item 52, Appendix C)
Twenty-eight Lockwashers (Item 14, Appendix E)
Sixteen Lockwashers (Item 15, Appendix E)
Twelve Lockwashers (Item 16, Appendix E)
Twenty-eight Lockwashers (Item 17, Appendix E)
Five Lockwashers (Item 20, Appendix E)
Tie-down Straps (Item 86, Appendix E)

Equipment Conditions:
ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Power shut off, power panel and cab area tagged.
Cover assembly removed (see para 2.13.23).
Power mode switch removed (see para 2.13.24).
Guard removed (see para 2.13.20 or 2.13.21).
Temperature control unit removed (see para 2.13.26).

Personnel Required: (2)

References:
TM 9-2320-387-24-1

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-46)

(1) Tag and disconnect four hoses and twelve wire harness connectors from J1 thru J11, and J14 on back side of mounting pan (1).

(2) Remove wing nut (2), lockwasher (3), flat washer (4), terminal lug (5), flat washer (6), nut (7), lockwasher (8) and flat washer (9) from ground stud (10). Discard lockwashers (3 and 8).

(3) Remove five screws (11) securing mounting pan (1) to rack. Remove mounting pan (1).

b. Disassembly (Refer to Figure 2-46)

NOTE

Remove tie-down straps as required.

(1) Remove twenty nuts (12), twenty lockwashers (13) and twenty flat washers (14) securing terminal lugs (15) and wires to five relays (16). Tag and remove wires.

(2) Remove twenty screws (17), twenty lockwashers (18) and twenty flat washers (19) securing five relays (16) to mounting pan (1) and remove five relays (16). Discard twenty lockwashers (18).

2.13.25 Pan Assembly Replacement – Continued.

(3) Remove nuts (20), lockwashers (21), and washers (22) securing terminal lugs (23) and wires to relay (24). Tag and remove wires.

(4) Remove four screws (25), four lockwashers (26) and four flat washers (27) securing relay (24) to mounting pan (1) and remove relay (24). Discard four lockwashers (26).

(5) Remove nut (28), lockwasher (29), flat washers (30 and 31), nut (32), lockwasher (33) and flat washer (34) from ground stud (10). Remove ground stud (10) from mounting pan (1). Discard lockwashers (29 and 33).

(6) Remove two screws (35), two lockwashers (36) and two flat washers (37) securing bracket (38). Remove bracket (38). Discard two lockwashers (36).

(7) Remove relay (39) from socket (40).

(8) Tag and remove wires from socket (40).

(9) Remove two screws (41), two lockwashers (42) and two flat washers (43) securing socket (40) to mounting pan (1). Discard two lockwashers (42).

(10) Remove relay (44) from socket (45).

(11) Tag and remove wires from socket (45).

(12) Remove two screws (46), two lockwashers (47) and two flat washers (48) securing socket (45) to mounting pan (1). Discard two lockwashers (47).

(13) Remove relay (49) from socket (50).

(14) Tag and remove wires from socket (50).

(15) Remove two screws (51), two lockwashers (52) and two flat washers (53) securing socket (50) to mounting pan (1). Discard two lockwashers (52).

(16) Remove relay (54) from socket (55).

(17) Tag and remove wires from socket (55).

(18) Remove two screws (56), two lockwashers (57) and two flat washers (58) from socket (55). Discard two lockwashers (57).

(19) Remove four barbed connectors (59) on inside of mounting pan (1) from four barbed connectors (60) on back of mounting pan (1).

(20) Tag and remove wires from neutral and ground bars (61).

(21) Remove two nuts (62), two lockwashers (63), two flat washers (64) and two screws (65) securing neutral and ground bars (61) to mounting pan (1). Remove neutral and ground bars (61). Discard two lockwashers (63).

NOTE

Note polarity on diodes before removing (Refer to Figure 2-46, sheet 5, View B-B).

(22) Remove four diodes (66) from terminal board TB2 (67). Tag and remove wires from terminal board TB2 (67).

(23) Remove two nuts (68) and two screws (69) securing terminal board TB2 (67) to mounting pan (1) and remove terminal board TB2 (67).

NOTE

Note polarity on diodes before removing (Refer to Figure 2-46, sheet 5, View C-C).

(24) Remove eight diodes (70) from terminal board TB1 (71). Tag and remove wires from terminal board (71).

(25) Remove two nuts (72) and two screws (73) securing terminal board TB1 (71) to mounting pan (1) and remove terminal board TB1 (71).

(26) Remove nut (74), lockwasher (75) and flat washer (76) securing two terminal lugs (77) to terminal board assembly (78). Tag and remove wires. Discard lockwasher (75).

(27) Remove two nuts (79) and two screws (80) securing terminal board assembly (78) to mounting pan (1) and remove terminal board assembly (78).

(28) Remove two nuts (81), two lockwashers (82) and four flat washers (83) securing support enclosure (84) to mounting pan (1). Discard lockwashers (82).

(29) Remove two nuts (85) securing two screws (86) to mounting pan (1).

(30) Loosen six captive screws (87) securing retainer bracket (88) on relay mount bracket (89).

(31) Remove twelve nuts (90) from twelve captive screws (91) and remove six relays (92) from six sockets (93).

(32) Tag wires and remove six sockets (93) from relay mount bracket (89).

(33) Remove six nuts (94) from six captive screws (95) and remove two relays (96) from two sockets (97).

(34) Tag wires and remove two sockets (97) from relay mount bracket (89).

(35) Remove two nuts (98) from two captive screws (99) and remove relay (100) from socket (101).

(36) Tag wires and remove socket (101) from relay mount bracket (89).

(37) Remove four nuts (102) from four captive screws (103) and remove two relays (104) from two sockets (105).

(38) Tag wires and remove two sockets (105) from relay mount bracket (89).

(39) Remove four nuts (106), four lockwashers (107), four flat washers (108) and four screws (109) securing receptacle connector (110) to mounting pan (1) and remove receptacle connector (110). Discard four lockwashers (107).

(40) Remove four nuts (111), four lockwashers (112), four flat washers (113) and four screws (114) securing receptacle connector (115) to mounting pan (1) and remove receptacle connector (115). Discard four lockwashers (112).

(41) Remove four nuts (116), four lockwashers (117), four flat washers (118) and four screws (119) securing receptacle connector (120) to mounting pan (1) and remove receptacle connector (120). Discard four lockwashers (117).

(42) Remove four nuts (121), four lockwashers (122), four flat washers (123) and four screws (124) securing receptacle connector (125) to mounting pan (1) and remove receptacle connector (125). Discard four lockwashers (122).

(43) Remove four nuts (126), four lockwashers (127), four flat washers (128) and four screws (129) securing receptacle connector (130) to mounting pan (1) and remove receptacle connector (130). Discard four lockwashers (127).

(44) Remove four nuts (131), four lockwashers (132), four flat washers (133) and four screws (134) securing receptacle connector (135) to mounting pan (1) and remove receptacle connector (135). Discard four lockwashers (132).

(45) Remove four nuts (136), four lockwashers (137), four flat washers (138) and four screws (139) securing receptacle connector (140) to mounting pan (1) and remove receptacle connector (140). Discard four lockwashers (137).

(46) Remove four nuts (141), four lockwashers (142), four flat washers (143) and four screws (144) securing receptacle connector (145) to mounting pan (1) and remove receptacle connector (145). Discard four lockwashers (142).

(47) Remove four nuts (146), four lockwashers (147), four flat washers (148) and four screws (149) securing receptacle connector (150) to mounting pan (1) and remove receptacle connector (150). Discard four lockwashers (147).

2.13.25 Pan Assembly Replacement – Continued.

(48) Remove four nuts (151), four lockwashers (152), four flat washers (153) and four screws (154) securing receptacle connector (155) to mounting pan (1) and remove receptacle connector (155). Discard four lockwashers (152).

(49) Remove four nuts (156), four lockwashers (157), four flat washers (158) and four screws (159) securing receptacle connector (160) to mounting pan (1) and remove receptacle connector (160). Discard four lockwashers (157).

(50) Remove nut (161) securing receptacle connector (162) to mounting pan (1) and remove receptacle connector (162).

(51) Remove two screws (163), two lockwashers (164), and two flat washers (165) securing pressure switch (166) to mounting pan (1). Discard two lockwashers (164).

(52) Tag wires and remove from pressure switch (166).

(53) Remove two barbed connectors (167) from pressure switch (166).

c. Assembly (Refer to Figure 2-46)

NOTE

Apply tie-down straps as required.

(1) Apply anti-seize tape to threads of two barbed connectors (167) and install two barbed connectors (167) in pressure switch (166).

(2) Secure pressure switch (166) to mounting pan (1) with two screws (163), two new lockwashers (164) (Item 16, Appx E) and two flat washers (165).

(3) Install wires on pressure switch (166). Remove tags from wires.

NOTE

Nut supplied with receptacle connector.

(4) Secure receptacle connector (162) to mounting pan (1) with nut (161).

(5) Secure receptacle connector (160) to mounting pan (1) with four screws (159), four flat washers (158), four new lockwashers (157) (Item 15, Appx E) and four nuts (156).

(6) Secure receptacle connector (155) to mounting pan (1) with four screws (154), four flat washers (153), four new lockwashers (152) (Item 15, Appx E) and four nuts (151).

(7) Secure receptacle connector (150) to mounting pan (1) with four screws (149), four flat washers (148), four new lockwashers (147) (Item 14, Appx E) and four nuts (146).

(8) Secure receptacle connector (145) to mounting pan (1) with four screws (144), four flat washers (143), four new lockwashers (142) (Item 15, Appx E) and four nuts (141).

(9) Secure receptacle connector (140) to mounting pan (1) with four screws (139), four flat washers (138), four new lockwashers (137) (Item 14, Appx E) and four nuts (136).

(10) Secure receptacle connector (135) to mounting pan (1) with four screws (134), four flat washers (133), four new lockwashers (132) (Item 15, Appx E) and four nuts (131).

(11) Secure receptacle connector (130) to mounting pan (1) with four screws (129), four flat washers (128), four new lockwashers (127) (Item 14, Appx E) and four nuts (126).

(12) Secure receptacle connector (125) to mounting pan (1) with four screws (124), four flat washers (123), four new lockwashers (122) (Item 14, Appx E) and four nuts (121).

(13) Secure receptacle connector (120) to mounting pan (1) with four screws (119), four flat washers (118), four new lockwashers (117) (Item 14, Appx E) and four nuts (116).

(14) Secure receptacle connector (115) to mounting pan (1) with four screws (114), four flat washers (113), four new lockwashers (112) (Item 14, Appx E) and four nuts (111).

(15) Secure receptacle connector (110) to mounting pan (1) with four screws (109), four flat washers (108), four new lockwashers (107) (Item 14, Appx E) and four nuts (106).

(16) Install wires on two sockets (105) and install two sockets (105) on relay mount bracket (89). Remove tags from wires.

(17) Install and tighten four nuts (102) on four captive screws (103) to secure two relays (104) to two sockets (105).

(18) Install wires on socket (101) and install socket (101) on relay mount bracket (89). Remove tags from wires.

(19) Install and tighten two nuts (98) on two captive screws (99) to secure relay (100) to socket (101).

(20) Install wires on two sockets (97) and install two sockets (97) on relay mount bracket (89). Remove tags from wires.

(21) Install and tighten six nuts (94) on six captive screws (95) to secure two relays (96) to two sockets (97).

(22) Install wires on six sockets (93) and install six sockets (93) on relay mount bracket (89). Remove tags from wires.

(23) Install and tighten twelve nuts (90) on twelve captive screws (91) to secure six relays (92) to six sockets (93).

(24) Secure retainer bracket (88) on relay mount bracket (89) with six captive screws (87).

NOTE

Apply sealant to screws (86) only where the threads intersect mounting pan (1) to keep nuts (85) from coming loose.

(25) Secure two screws (86) to mounting pan (1) with two nuts (85). Apply a small amount of sealant to two screws (86).

(26) Secure support enclosure (84) to screws (86) with four flat washers (83), two new lockwashers (82) (Item 17, Appx E) and two nuts (81).

(27) Secure terminal board assembly (78) to mounting pan (1) with two screws (80) and two nuts (79).

(28) Secure two terminal lugs (77) to terminal board assembly (78) with flat washer (76), new lockwasher (75) (Item 20, Appx E) and nut (74). Remove tags from wires.

(29) Secure terminal board TB1 (71) to mounting pan (1) with two screws (73) and two nuts (72).

NOTE

Note polarity on diodes before installing. See Figure 2-46, sheet 5, View C-C.

(30) Install eight diodes (70) on terminal board TB1 (71). Install wires on terminal board TB1 (71). Remove tags from wires.

(31) Secure terminal board TB2 (67) to mounting pan (1) with two screws (69) and two nuts (68).

NOTE

Note polarity on diodes before installing. See Figure 2-46, sheet 5, View B-B.

(32) Install four diodes (66) on terminal board TB2 (67). Install wires on terminal board TB2 (67). Remove tags from wires.

(33) Secure neutral and ground bars (61) to mounting pan (1) with two screws (63), two flat washers (64), two new lockwashers (63) (Item 17, Appx E) and two nuts (62).

(34) Install wires on neutral and ground bars (61). Remove tags from wires.

(35) Apply anti-seize tape to threads of four barbed connectors (59) and install four barbed connectors (60) on four barbed connectors (59).

2.13.25 Pan Assembly Replacement – Continued.

(36) Secure socket (55) to mounting pan (1) with two screws (56), two new lockwashers (57) (Item 16, Appx E) and two flat washers (58).

(37) Install wires on socket (55). Remove tags from wires.

(38) Install relay (54) on socket (55). Refer to Figure 2-46 for setting of time delay switches located on back of relay (54).

(39) Secure socket (50) to mounting pan (1) with two screws (51), two new lockwashers (52) (Item 16, Appx E) and two flat washers (53).

(40) Install wires on socket (50). Remove tags from wires.

(41) Install relay (49) on socket (50). Refer to Figure 2-46 for setting of time delay switches located on back of relay (49).

(42) Secure socket (45) to mounting pan (1) with two screws (46), two new lockwashers (47) (Item 16, Appx E) and two flat washers (48).

(43) Install wires on socket (45). Remove tags from wires.

(44) Install relay (44) on socket (45). Refer to Figure 2-46 for setting of time delay switches located on back of relay (44).

(45) Install wires on socket (40). Remove tags from wires.

(46) Secure socket (40) to mounting pan (1) with two screws (41), two new lockwashers (42) (Item 16, Appx E) and two flat washers (43).

(47) Install relay (39) on socket (40). Refer to Figure 2-46 for setting of time delay switches located on back of relay (39).

(48) Install bracket (38) with two screws (35), two new lock washers (36) (Item 16, Appx E) and two flat washers (37).

(49) Install ground stud (10) on mounting pan (1). Install nut (28), new lockwasher (29) (Item 20, Appx E), flat washers (30 and 31), nut (32), new lockwasher (33) (Item 20, Appx E) and flat washer (34) on ground stud (10).

(50) Secure relay (24) to mounting pan (1) with four screws (25), four new lockwashers (26) (Item 17, Appx E) and four flat washers (27).

NOTE

Nuts, lockwashers, and flat washers supplied with relay.

(51) Secure terminal lugs (23) and wires to relay (24) with nuts (20), lockwashers (21) and flat washers (22). Remove tags from wires.

(52) Secure five relays (16) to mounting pan (1) with twenty screws (17), twenty new lockwashers (18) (Item 17, Appx E) and twenty flat washers (19).

(53) Secure terminal lugs (15) and wires to five relays (16) with twenty nuts (12), twenty lockwashers (13) and twenty flat washers (14). Remove tags from wires.

d. Installation (Refer to Figure 2-46)

(1) Secure mounting pan (1) to rack with five screws (11).

(2) Install hoses and connectors on back side of mounting pan (1). Remove tags.

(3) Install flat washer (9), new lockwasher (8) (Item 20, Appx E), nut (7), flat washer (6), terminal lug (5), flat washer (4), new lockwasher (3) (Item 20, Appx E) and wing nut (2) on ground stud (10).

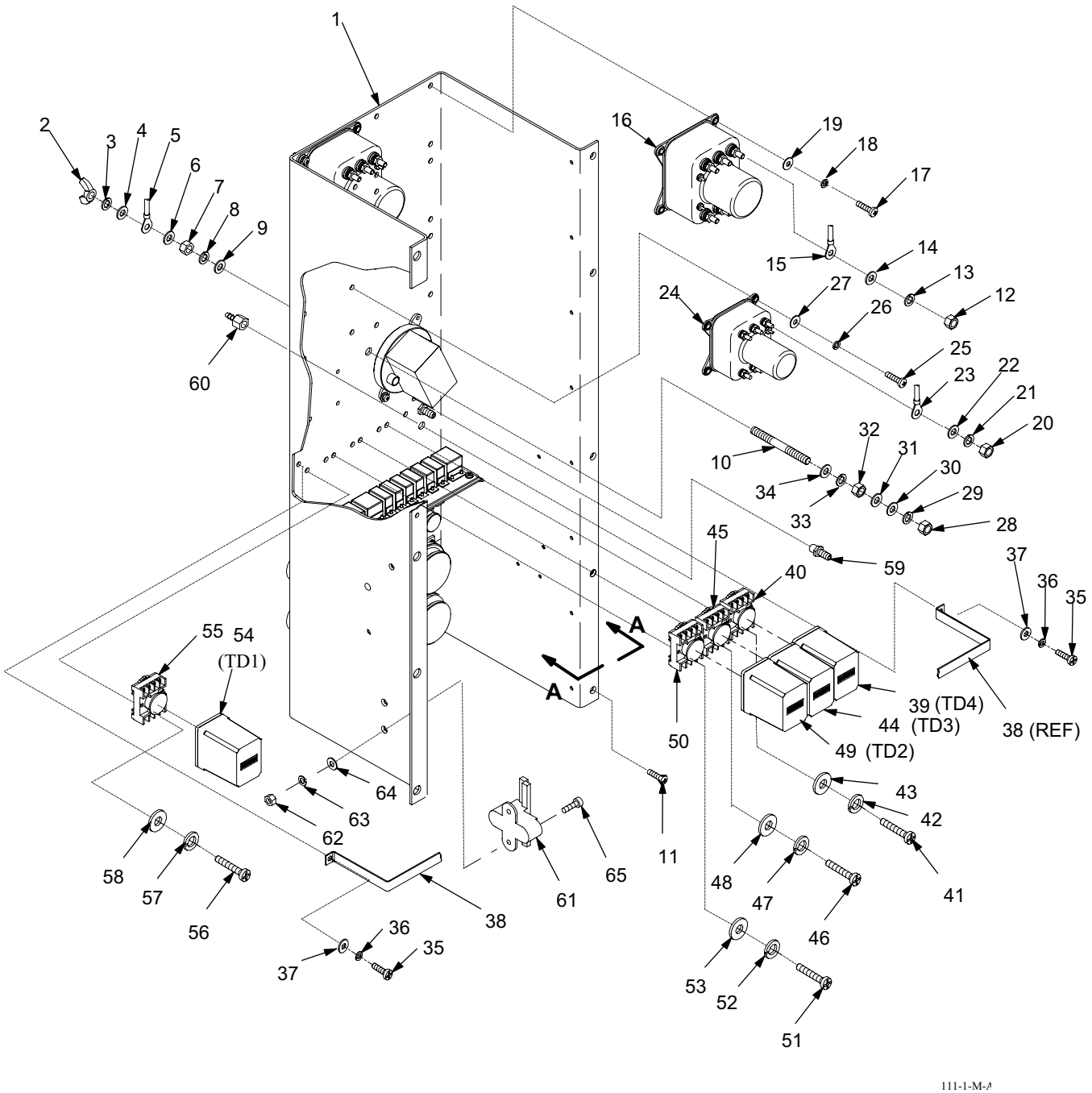


Figure 2-46. Pan Assembly Replacement (Sheet 1 of 6)

2.13.25 Pan Assembly Replacement – Continued.

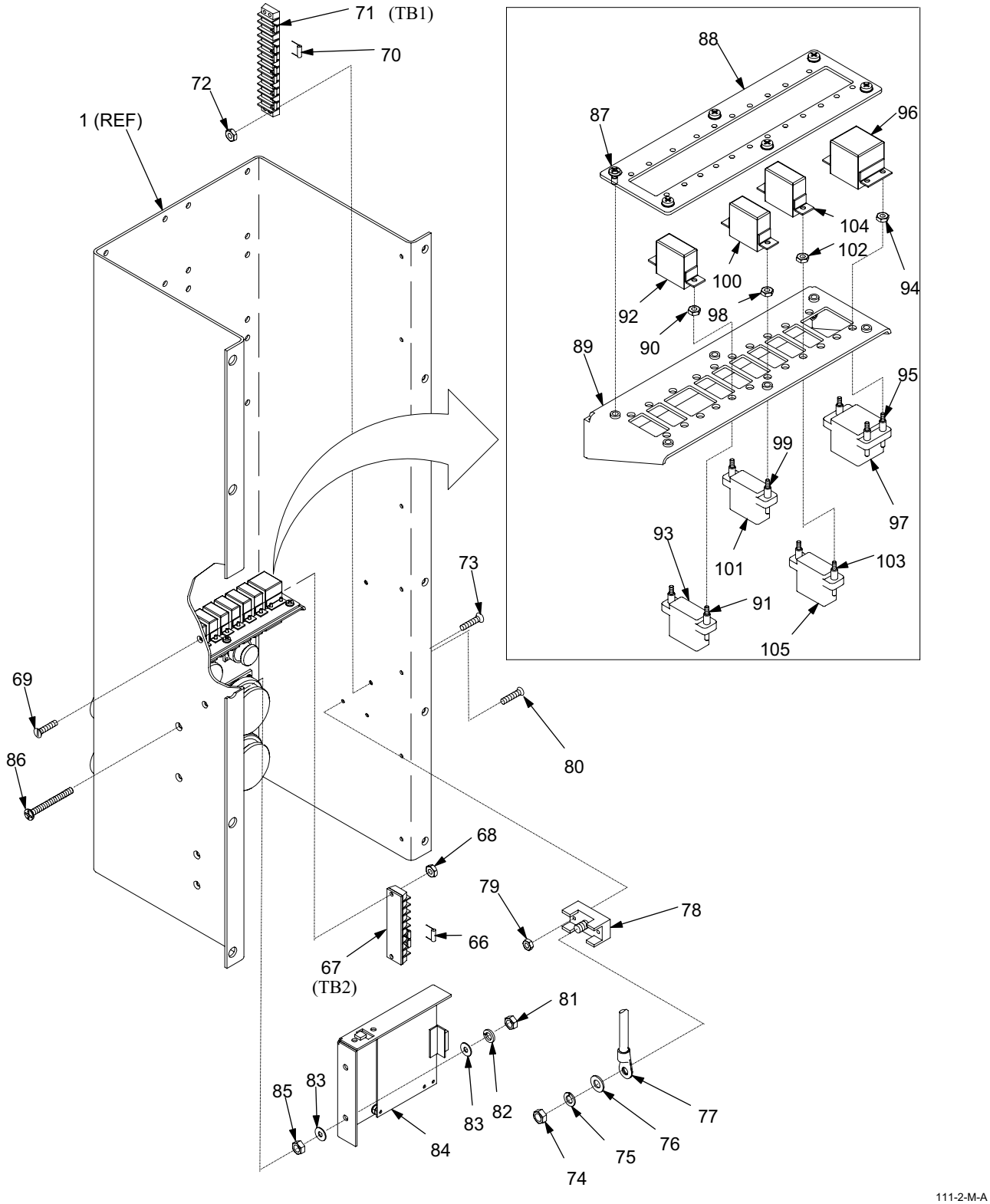


Figure 2-46. Pan Assembly Replacement (Sheet 2 of 6)

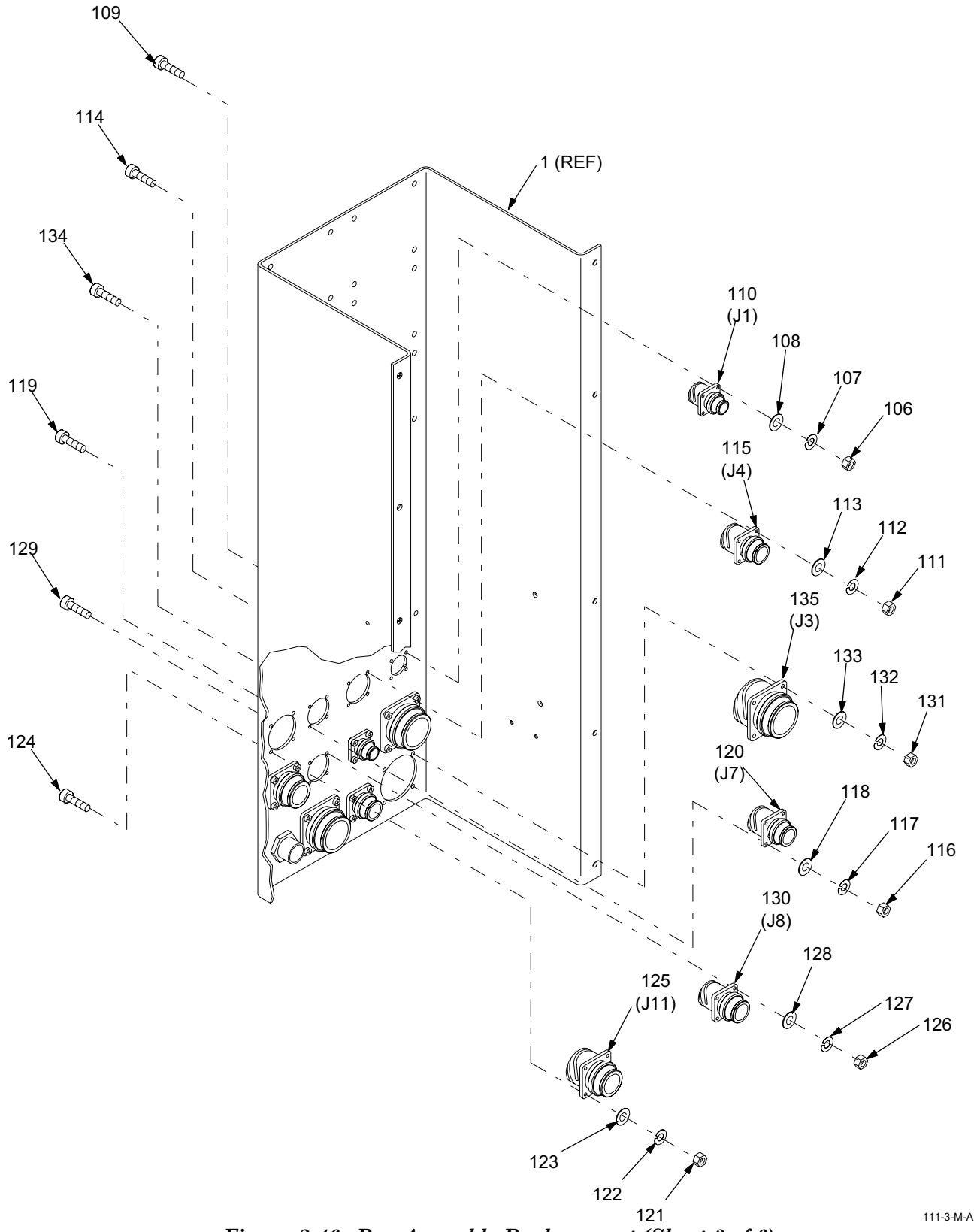


Figure 2-46. Pan Assembly Replacement (Sheet 3 of 6)

2.13.25 Pan Assembly Replacement – Continued.

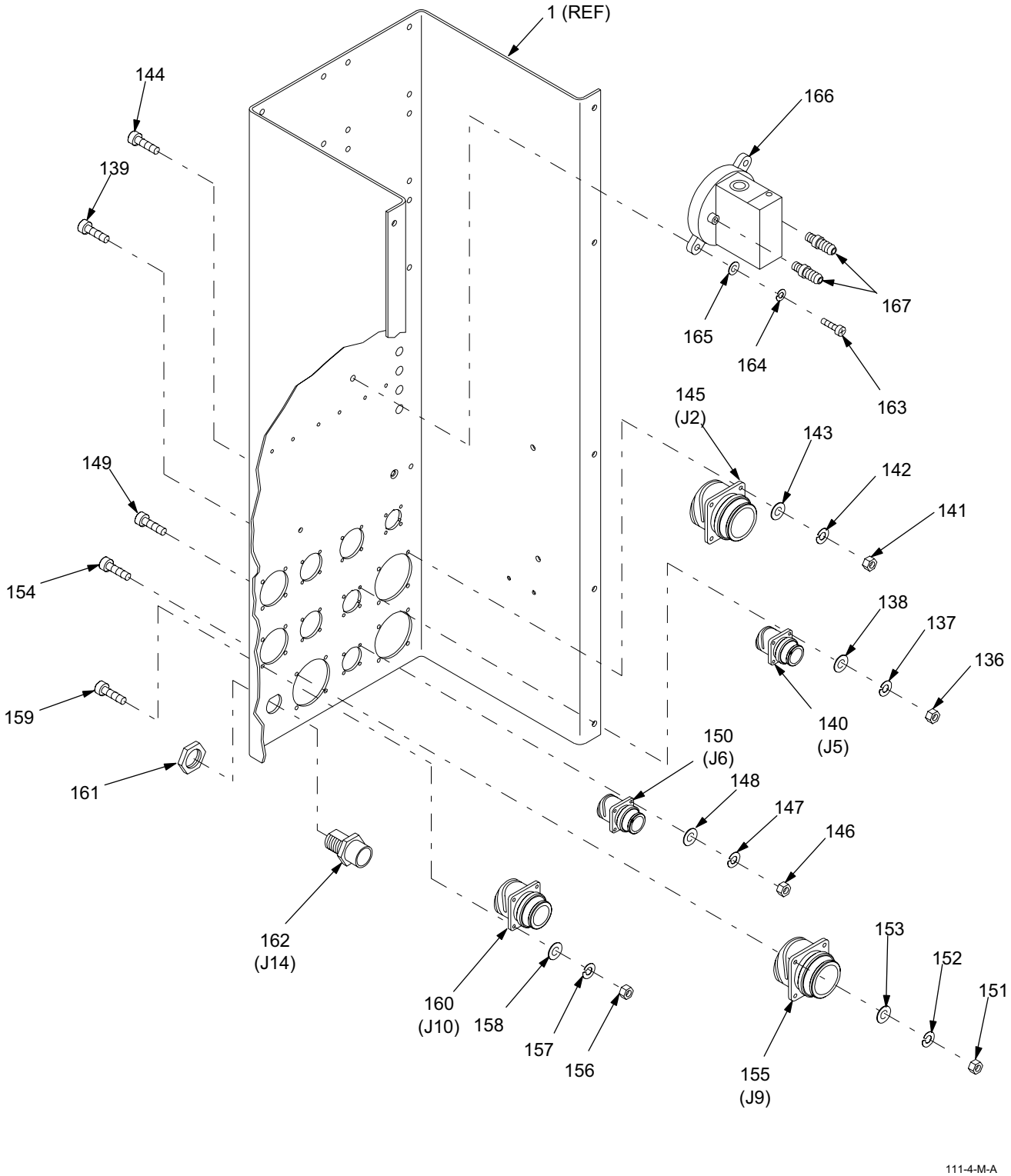


Figure 2-46. Pan Assembly Replacement (Sheet 4 of 6)

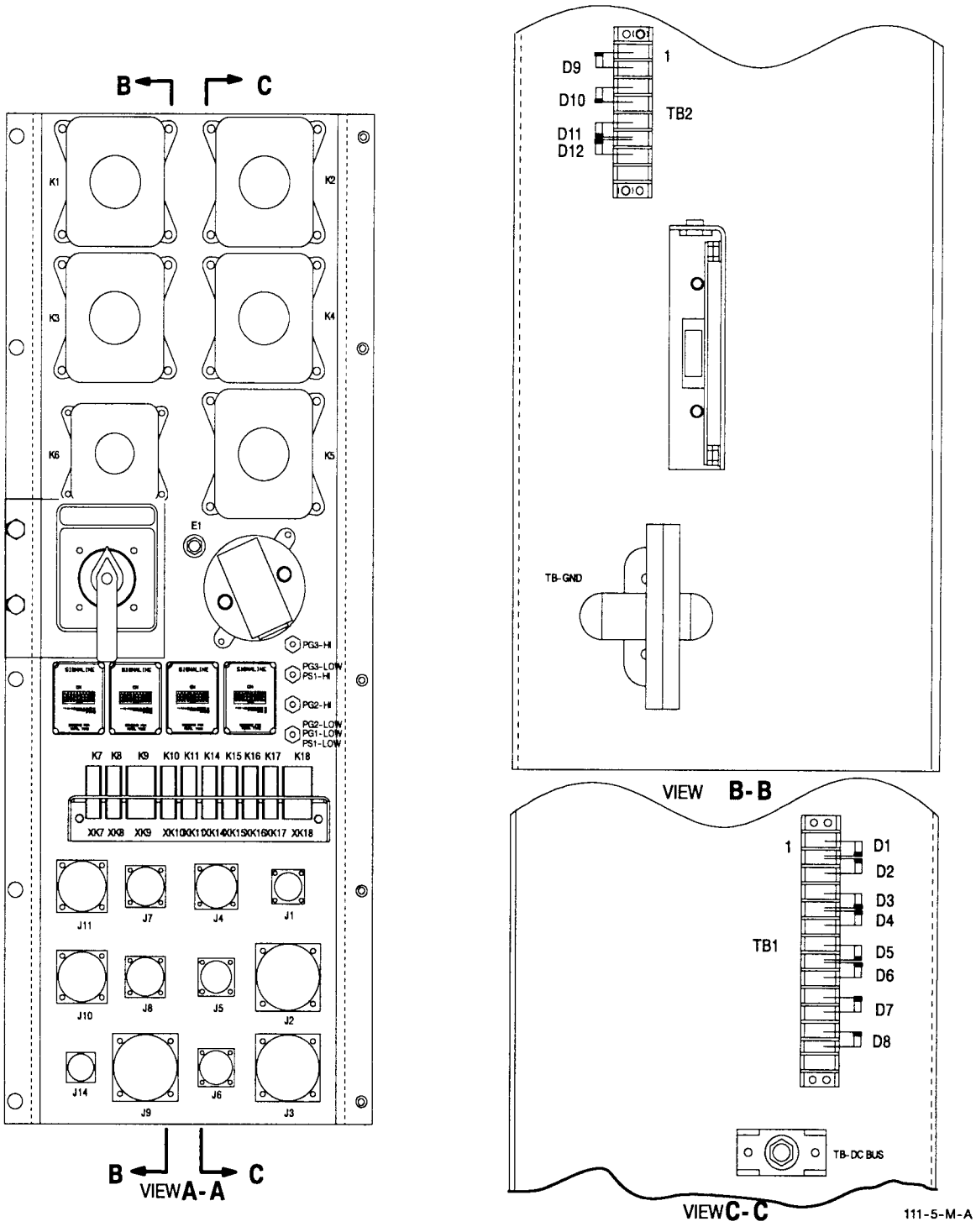
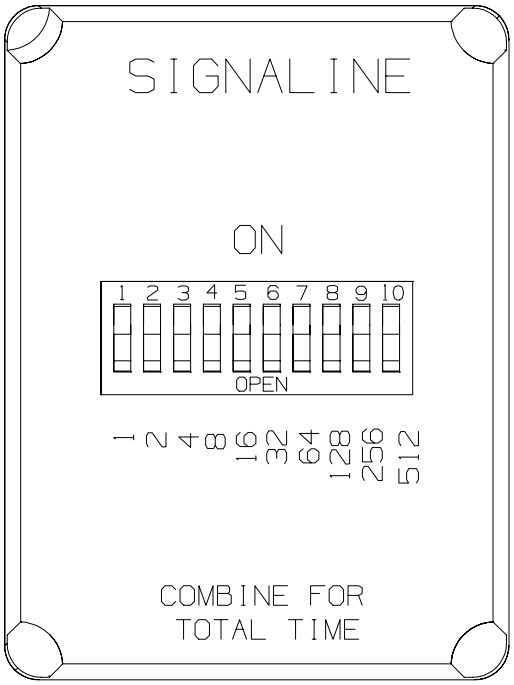


Figure 2-46. Pan Assembly Replacement (Sheet 5 of 6)

2.13.25 Pan Assembly Replacement – Continued.



Delay time and pin settings:

Item 53 TD1 (30 seconds):
Pins 2, 3, 4, and 5 to ON.
Pins 1, 6, 7, 8, 9, and 10 to OPEN.

Item 48 TD2 (600 seconds):
Pins 4, 5, 7 and 10 to ON.
Pins 1, 2, 3, 6, 8 and 9 to OPEN.

Item 43 TD3 (60 seconds):
Pins 3, 4, 5 and 6 to ON.
Pins 1, 2, 7, 8, 9 and 10 to OPEN.

Item 38 TD4 (3 seconds):
Pins 1 and 2 to ON.
Pins 3, 4, 5, 6, 7, 8, 9 and 10 to OPEN.

Figure 2-46. Pan Assembly Replacement (Sheet 6 of 6)

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1 or connect external power cable, install guard per para 2.13.20 or 2.13.21, install temperature control unit per 2.13.26, install cover assembly per para 2.13.23, install power mode switch per para 2.13.24, remove tags, apply power and perform operational test.

2.13.26 Temperature Control Unit and Support Enclosure Replacement.

This task covers:

a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Multimeter (Item 27, Appendix B)
Power Supply (Item 29, Appendix B)

Materials/Parts:
Rubber Gloves (Item 25, Appendix C)
Heat Sink Compound (Item 29, Appendix C)
Six Lockwashers (Item 15, Appendix E)

Equipment Conditions:
Power off, power panel tagged.
Cover assembly opened on electrical equipment rack (see para 2.13.23).

References:
TM 9-2320-387-24-1

2.13.26.1 Temperature Control Unit.

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-47)

(1) Loosen two screw lock assemblies (1) securing connector strain relief (2) to connector receptacle (3) and disconnect connector strain relief (2).

(2) Remove twelve nuts (4), four lockwashers (5) and twelve flat washers (6) securing temperature control unit (7) to support enclosure assembly (8). Discard four lockwashers (5).

b. Disassembly

There is no repair of the temperature control unit (7).

c. Assembly

There is no repair of the temperature control unit (7).

d. Installation (Refer to Figure 2-47)

(1) Secure temperature control unit (7) to support enclosure assembly (8) with twelve flat washers (6), four new lockwashers (5) (Item 15, Appx E) and twelve nuts (4).

(2) Secure connector strain relief (2) to connector receptacle (3) with two screw lock assemblies (1).

2.13.26 Temperature Control Unit and Support Enclosure Replacement – Continued.

2.13.26.2 Support Enclosure Replacement.

a. Disassembly (Refer to Figure 2-47)

(1) Remove two screws (9), two lockwashers (10) and one flat washer (11) securing positive regulator (12) and power transistor socket (13) to support enclosure assembly (8). Discard two lockwashers (10).

NOTE

Note position of positive regulator pins in power transistor socket before removing positive regulator.

(2) Bend positive regulator (12) up and remove from support enclosure assembly (8) with power transistor socket (13).

NOTE

Note position of capacitors before removing.

(3) Tag and remove wires and capacitors (14 and 15) connected to power transistor socket (13).

(4) Remove positive regulator (12) from power transistor socket (13). Discard positive regulator.

b. Assembly (Refer to Figure 2-47)

NOTE

Note position of capacitors before installing.

(1) Install capacitors (15 and 14) and wires on power transistor socket (9). Remove tags from wires.

(2) Cut off pin 2 of new positive regulator (12).

NOTE

Note position of positive regulator pins before installing positive regulator in power transistor socket.

(3) Insert pins 1 and 3 of positive regulator (12) into power transistor socket (13).

WARNING

Wear gloves when working with adhesives and sealers. Use in well ventilated area. Avoid prolonged breathing of vapors or repeated contact with the skin.

(4) Apply heat sink compound (Item 29, Appx C) to support enclosure assembly (8) where positive regulator (12) will mount.

(5) Insert positive regulator (12) through hole and position power transistor socket (13) on support enclosure assembly (8).

(6) Bend positive regulator (12) down as required and position positive regulator (12) on support enclosure assembly (8).

(7) Secure power transistor socket (13) to support enclosure assembly (8) and positive regulator (12) with one flat washer (11), two new lockwashers (10) (Item 15, Appx E) and two screws (9).

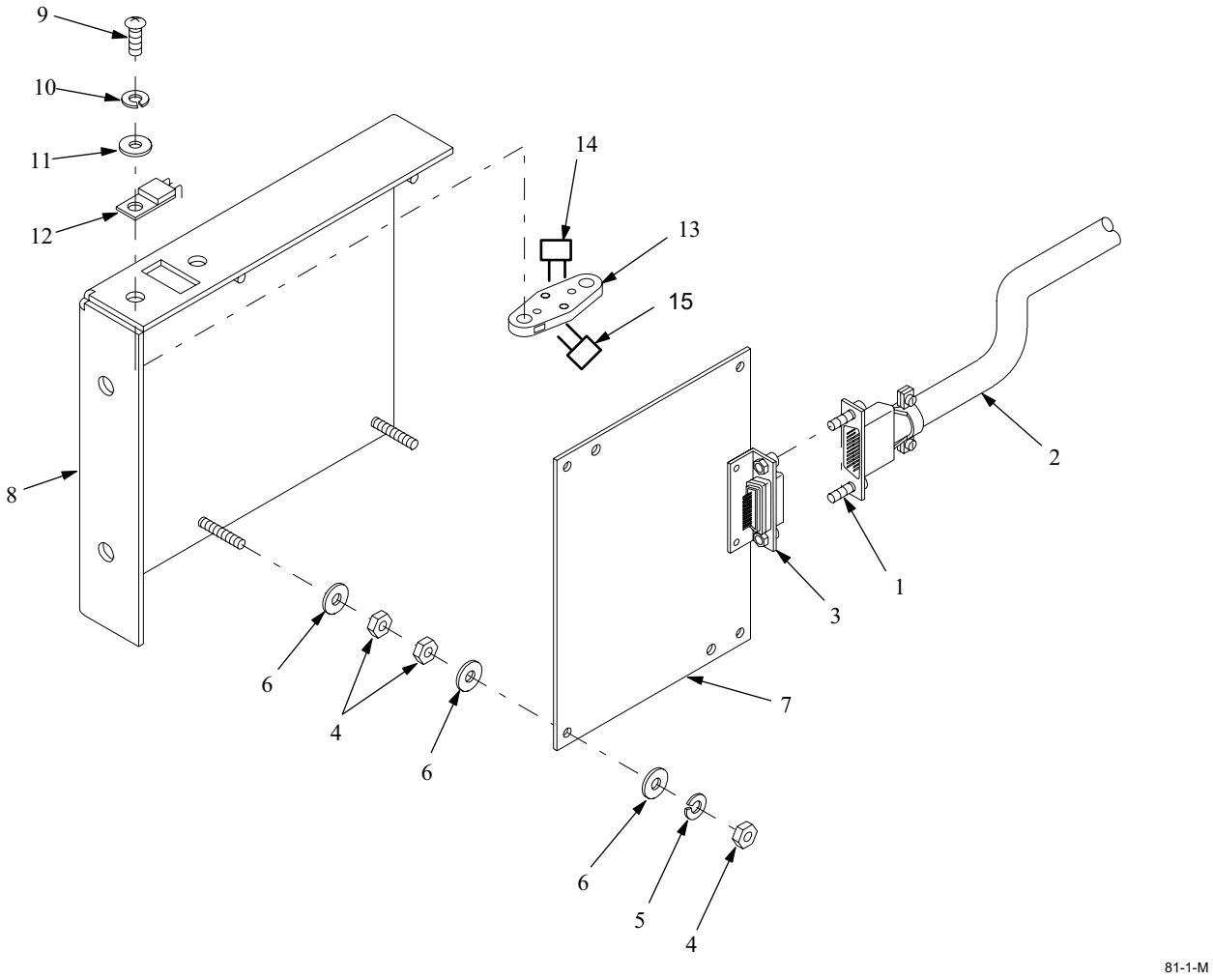


Figure 2-47. Temperature Control Unit and Support Enclosure Replacement

Follow-on maintenance: Close cover assembly per para 2.13.23, install guard per para 2.13.20 or 2.13.21, connect ECV battery ground cable per TM 9-2320-387-24-1, apply power and perform operational test.

2.13.27 Electrical Cable Replacement.

This task covers: a. General b. Removal	c. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Shop Equipment: Electrical Equipment (Item 40, Appendix B) Multimeter (Item 27, Appendix B) Power Supply (Item 29, Appendix B)	Equipment Conditions: Power shut off, power panel and rear control panel tagged. ECV battery cable disconnected (see TM 9-2320-387-24-1). External power cable disconnected. Raceway covers and retainers removed (see para 2.13.8).
Materials/Parts: Sleeve (Figure D-4, Appendix D) Twenty Lockwashers (Item 14, Appendix E) Four Lockwashers (Item 15, Appendix E) Twelve Lockwashers (Item 16, Appendix E) Eight Lockwashers (Item 17, Appendix E) Tie-down Strap (Item 87, Appendix E)	References: TM 9-2320-387-24-1 TM 55-1500-323-24

2.13.27.1 Cables in LMS.

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. General

The following table contains information necessary to remove and replace cables. The headings found in the table are described as follows:

(1) Cable No. The W number found on the cable is listed in this column.

(2) Connectors. Under the connectors column is a listing of each connector on the cable and its mating location.

(3) Comments. This column contains additional information that could help in the removal or installation of the cable.

Cable No.	No.	Mates to	Comments
1W1	P1	1A4A9J2	Connected externally from power panel to 10 kW TQG.
1A1W2	AC motor	1A4W3J1	Direct wired on AC motor (refer to para 3.7.1), connected to cable 1A4W3 connector J1 through pan and frame assembly. Routed from ECV compartment to pan and frame assembly.
1A1W3	P2 P1	1A4A8J1 1A4W4J1	Connected to vehicle control box (refer to para 2.12.14) to cable 1A4W4 connector J1 through pan and frame assembly. Routed from ECV cab to compartment to pan and frame assembly.
1A4W1	P1 P2 J1	1A4A4J9 J1 relay box 1A1W1P1	Connected to back of rear control panel (refer to para 2.13.22) to relay box (refer to para 2.13.19) to cable 1A1W1 connector P1 through pan and frame assembly. Routed from pan and frame assembly through raceway to rear control panel.
1A4W2	P1 P2	1A4A4J4 1A4A1W2J2	Direct wired from ECU electrical heaters and connected to back of rear control panel (refer to para 2.13.22). Routed from ECU through LMS (behind forward control panel, refer to para 2.13.16) through raceway to rear control panel.
1A4W3	P1 J1	1A4A4J8 1A1W2P1	Connected to back of rear control panel (refer to para 2.13.22) through raceway to cable 1A1W2 connector P1 through the pan assembly (cable 1A1W2 is direct wired to AC motor in the ECV wheel well).
1A4W4	P1 J1	1A4A18J2 1A1W3P1	Connected to back of control box assembly (refer to para 2.13.18) through raceway to cable 1A1W3 connector P1 through the pan and frame assembly.
1A4W6	P1 P2 P3	1A4A1W1J1 1A4A4J2 1A4A14J1	Connected to back of rear control panel (refer to para 2.13.22) through raceway to back of control box assembly (refer to para 2.13.18) through LMS to ECU to cable 1A4A1W1 connector J1.
1A4W7	P1 P2 J3	1A4A5J1 1A4A4J14 1A4A7 1A4A18P3	Direct wired from light box (refer to para 2.13.17) through raceway to back of rear control panel (refer to para 2.13.22) through raceway to back of control box assembly (refer to para 2.13.18).
1A4W9	P1 P2	1A4A4J7 1A4A12J2	Connected to back of rear control panel (refer to para 2.13.22) to back of converter (refer to para 2.13.20).
1A4W10	P1 P2	1A4A4J10 1A4A12J1	Connected to back of rear control panel (refer to para 2.13.22) to back of converter (refer to para 2.13.20).
1A4W11	P1 P2	1A4A4J11 1A4A13J1	Connected to back of rear control panel (refer to para 2.13.22) to back of inverter (refer to para 2.13.21).
1A4W12	P1 P2	1A4A4J6 1A4A13J2	Connected to back of rear control panel (refer to para 2.13.22) to back of inverter (refer to para 2.13.21).
1A4W13	P1	1A4A4J3 1A4A9	Direct wired to back of power panel (refer to para 2.13.30), connected to back of rear control panel (refer to para 2.13.22).
1A4W14	P1	1A4A4J1 1A4A9	Direct wired to back of power panel (refer to para 2.13.30), attached to back of rear control panel (refer to para 2.13.22).
1A4W18	P1 P2	1A4W23J1 1A4A20	Connected to cable 1A4W23 connector J1 through pan and frame assembly. Routed from cable splitter 1A4A20J1 in ECV cab to pan and frame assembly.
1A4W19	P1 P2	1A4W24J1 1A4A21	Connected to cable 1A4W24 connector J1 through pan and frame assembly. Routed from cable splitter 1A4A21J1 in ECV cab to pan and frame assembly.

2.13.27 Electrical Cable Replacement – Continued.

Cable No.	No.	Mates to	Comments
1A4W20	P1 P2	RADIO 1A4W25J1	Connected to cable 1A4W25 connector J1 through pan and frame assembly. Routed from radio in ECV cab to pan and frame assembly.
1A4W23	P1 J1	1A4W22J1 1A4W18P1	Connected to radio speaker assembly through cable clamps to cable 1A4W18 connector P1 through pan and frame assembly.
1A4W24	P1 J1	1A4W22J1 1A4W19P1	Connected to radio speaker assembly through cable clamps to cable 1A4W19 connector P1 through pan and frame assembly.
1A4W25	P1 J1	1A4W22J2 1A4W20P2	Connected to radio speaker assembly through cable clamps to cable 1A4W20 connector P2 through pan and frame assembly.
1A4A10W1	P1	1A4A4J5 1A4A10	Direct wired from receptacle panel (refer to para 2.13.31) through raceway (through light box) to back of rear control panel (refer to para 2.13.22).
A17W1			Direct wired from tachometer on ECV dash to tach isolation switch.

b. Removal (Refer to Figure 2-48)

(1) If required, cut tie-down straps to release cable. Discard tie-down straps.

(2) Prior to disconnecting cable connectors, ensure cable ends are clearly identified for later installation.

(3) For direct wired cables, remove attaching hardware securing terminal lugs and remove cables.

(4) Disconnect cable connectors 1A1W1P1, 1A1W2P1, 1A1W3P1, 1A4W18P1, 1A4W19P1, and 1A4W20P2.

(5) Remove four nuts (1), four lockwashers (2), four flat washers (3) and four screws (4) securing cable assembly 1A4W3 connector J1 to pan and frame. Discard four lockwashers (2).

(6) Disconnect 1A4W3 connector P1 from J8 on back of rear control panel.

(7) Remove four nuts (5), four lockwashers (6), four flat washers (7) and four screws (8) securing cable assembly 1A4W1 connector J1 to pan and frame. Discard four lockwashers (6).

(8) Disconnect 1A4W1 connector P1 from J9 on back of rear control panel and P2 from J1 on relay box.

(9) Remove four nuts (9), four lockwashers (10), four flat washers (11) and four screws (12) securing cable assembly 1A4W4 connector J1 to pan and frame. Discard four lockwashers (10).

(10) Disconnect 1A4W4 connector P1 from J2 on control box assembly.

(11) Remove two screws (13), two lockwashers (14) and two flat washers (15) securing two clamps (16) to ECV dash. Remove cable assembly A17W1. Discard two lockwashers (14).

(12) Remove four nuts (9), four lockwashers (10), four flat washers (11), and four screws (12) securing cable assembly 1A4W23 or 1A4W24 connector J1 to pan and frame. Discard four lockwashers (10).

(13) Disconnect 1A4W23 or 1A4W24 connector P1 from J1 on radio speaker assembly.

(14) Remove jam nut securing cable assembly 1A4W25 connector J1 to pan and frame.

(15) Disconnect 1A4W25 connector P1 from J2 on radio speaker assembly.

c. Installation (Refer to Figure 2-48)

(1) Lay out cable in approximate routing for installation. Ensure each end has correct length for connecting.

(2) Install connectors on correct mating connectors.

(3) For direct wired cables, secure terminal lugs with attaching hardware.

(4) Position cable in correct routing location using care to avoid sharp edges and areas where the cable could be damaged or pinched. Secure in place with new tie-down straps.

(5) Install two clamps (16) on cable assembly A17W1. Secure two clamps (16) to ECV dash with two screws (13), two new lockwashers (14) and two flat washers (15).

(6) Secure cable assembly 1A4W4 connector J1 to pan and frame with four nuts (9), four new lockwashers (10), four flat washers (11) and four screws (12).

(7) Connect 1A4W4 connector P1 to J2 on control box assembly.

(8) Secure cable assembly 1A4W1 connector J1 to pan and frame with four nuts (5), four new lockwashers (6), four flat washers (7) and four screws (8).

(9) Connect 1A4W1 connector P1 to J9 on back of rear control panel.

(10) Secure cable assembly 1A4W3 connector J1 to pan and frame with four nuts (1), four new lockwashers (2), four flat washers (3) and four screws (4).

(11) Connect 1A4W3 connector P1 to J8 on back of rear control panel.

(12) Connect 1A4W25 connector P1 to J2 on radio speaker assembly.

(13) Secure cable assembly 1A4W25 connector J1 to pan and frame with jam nut.

(14) Connect 1A4W23 or 1A4W24 connector P1 to J1 on radio speaker assembly.

(15) Secure cable assembly 1A4W23 or 1A4W24 connector J1 to pan and frame with four nuts (9), four new lockwashers (10), four flat washers (11), and four screws (12).

(16) Connect cable connectors 1A1W1P1, 1A1W2P1, 1A1W3P1, 1A4W18P1, 1A4W19P1, and 1A4W20P2.

(17) Turn on system power and verify system functions correctly.

2.13.27.2 Cables in ECU.

a. General

The following table contains information necessary to remove and replace cables. The headings found in the table are described as follows:

(1) Cable No. The W number found on the cable is listed in this column.

(2) Connectors. Under the connectors column is a listing of each connector on the cable and its mating location.

(3) Comments. This column contains additional information that could help in the removal or installation of the cable.

Cable No.	Connectors		Comments
	No.	Mates to	
1A4A1W1	J1 J3	1A4W6P1 1A4A1W3P1	Connected to cable 1A4A1W3 connector P1 in ECU and cable 1A4W6 connector P1 through LMS and ECU access opening (behind forward control panel, refer to para 2.13.16).
1A4A1W2	J2	1A4W2P2 ECU electric heaters	Direct wired to ECU electric heaters and connected to cable 1A4W2 connector P2 through LMS and ECU access opening (behind forward control panel, refer to para 2.13.16).
1A4A1W3	P1	1A4A1W1J3 hydraulic control	Direct wired to ECU hydraulic control and connected to cable 1A4A1W1 connector J3 in ECU.

2.13.27 Electrical Cable Replacement – Continued.

b. Removal (Refer to Figure 2-48)

(1) Prior to disconnecting cable, ensure cable end is clearly identified for later installation.

(2) Remove screw (17), lockwasher (18), two flat washers (19) and nut (20) securing clamp (21) and cable assembly 1A4A1W2 inside ECU. Discard lockwasher (18).

(3) Remove four screws (22), four flat washers (23), four lockwashers (24) and four nuts (25) securing cable assembly 1A4A1W2 connector J2 to ECU. Discard four lockwashers (23).

(4) Tag leads and remove attaching hardware securing direct wired end of cable assembly 1A4A1W2 to heater elements.

(5) Pull cable assembly 1A4A1W2 through grommet and remove from ECU.

(6) Remove spiral wrap from cable assembly 1A4A1W2.

(7) Prior to disconnecting cables, ensure cable ends are clearly identified for later installation.

(8) Disconnect cable assembly 1A4A1W1 connector P1 from thermistor assembly and connector P2 from actuator RSV1.

(9) Tag and remove leads from overheat temperature switch.

(10) Remove eight screws (26), eight flat washers (27), eight lockwashers (28) and eight nuts (29) securing cable assembly 1A4A1W1 connector J1 and connector J3 to ECU. Discard eight lockwashers (29).

(11) Pull cable assembly 1A4A1W1 through two grommets and remove from ECU.

(12) Remove three screws (30), three lockwashers (31), six flat washers (32) and three nuts (33) securing three clamps (34) and cable assembly 1A4A1W3 to ECU. Discard three lockwashers (31).

(13) If cable assembly 1A4A1W1 is installed, remove four screws (35), four flat washers (36), four lockwashers (37) and four nuts (38) securing cable assembly 1A4A1W3 connector P1 to ECU. Discard four lockwashers (36).

(14) Disconnect cable assembly 1A4A1W3 connectors P3 through P5, P8, P10 through P17 and P20 from mating connectors.

(15) Tag and remove direct wired ends of cable assembly 1A4A1W3 from their mating connections.

c. Installation (Refer to Figure 2-48)

(1) Lay out cables in approximate routing for installation. Ensure each end has correct length for connecting.

(2) Attach direct wired ends of cable assembly 1A4A1W3 to their mating connections. Remove tags.

(3) Secure cable assembly 1A4A1W3 connector P1 to ECU with four screws (35), four flat washers (36), four new lockwashers (37) and four nuts (38).

(4) Install three clamps (34) on cable assembly 1A4A1W3. Secure three clamps and cable assembly 1A4A1W3 to ECU with three screws (30), three new lockwashers (31), six flat washers (32) and three nuts (33).

(5) Connect cable assembly 1A4A1W3 connectors P3 through P5, P8, P10 through P17 and P20 on mating connectors.

(6) Pull cable assembly 1A4A1W1 through two grommets in ECU.

(7) Secure cable assembly 1A4A1W1 connector J1 and connector J3 to ECU with eight screws (26), eight new lockwashers (27), eight flat washers (28) and eight nuts (29).

(8) Attach leads to overheat temperature switch. Remove tags from leads.

(9) Connect cable assembly 1A4A1W1 connector P1 to thermistor assembly and connector P2 to actuator RSV1.

(10) Install spiral wrap on cable assembly 1A4A1W2.

(11) Pull cable assembly 1A4A1W2 through grommet in ECU.

(12) Secure direct wired end of cable assembly 1A4A1W2 to heater elements. Remove tags.

(13) Secure cable assembly 1A4A1W2 connector J2 to ECU with four screws (1), four new lockwashers (2), four flat washers (3) and four nuts (4).

(14) Install clamp (21) on cable assembly 1A4A1W2. Secure clamp (21) and cable assembly 1A4A1W2 to ECU with screw (17), new lockwasher (18), two flat washers (19) and nut (20).

(15) Install tie-down straps as required.

(16) Turn on system power and verify system functions correctly.

2.13.27 Electrical Cable Replacement – Continued.

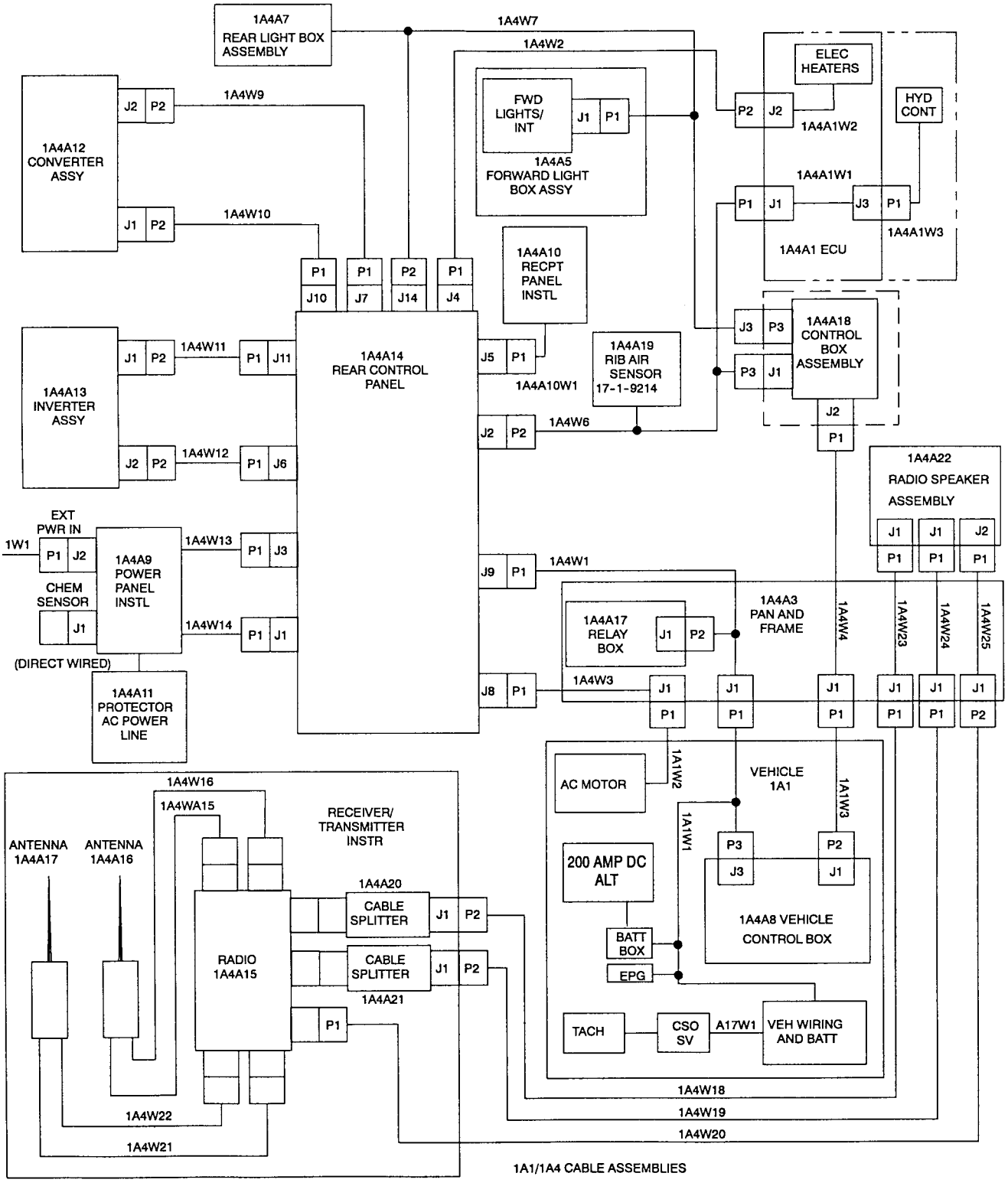


Figure 2-48. Electrical Cable Replacement (Sheet 1 of 12)

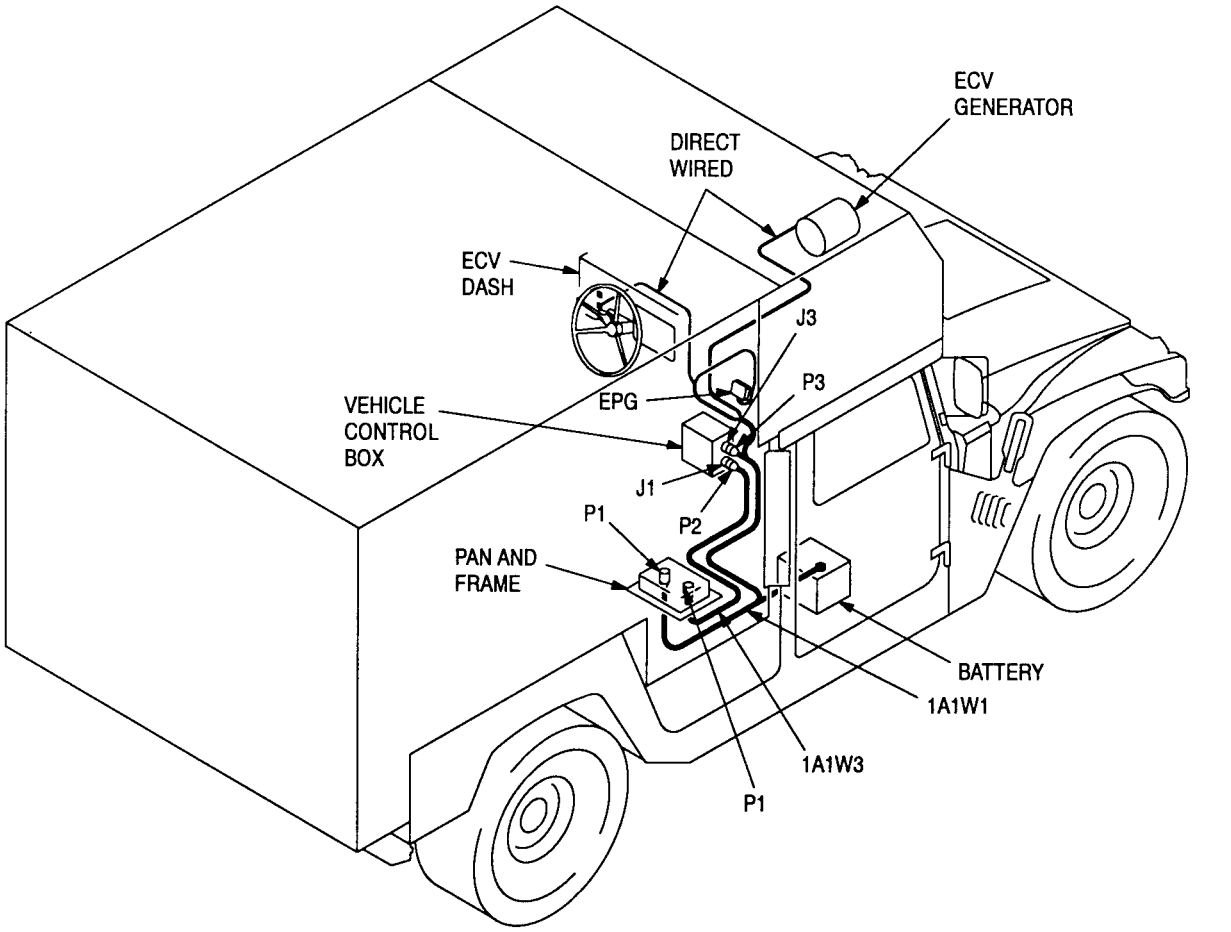
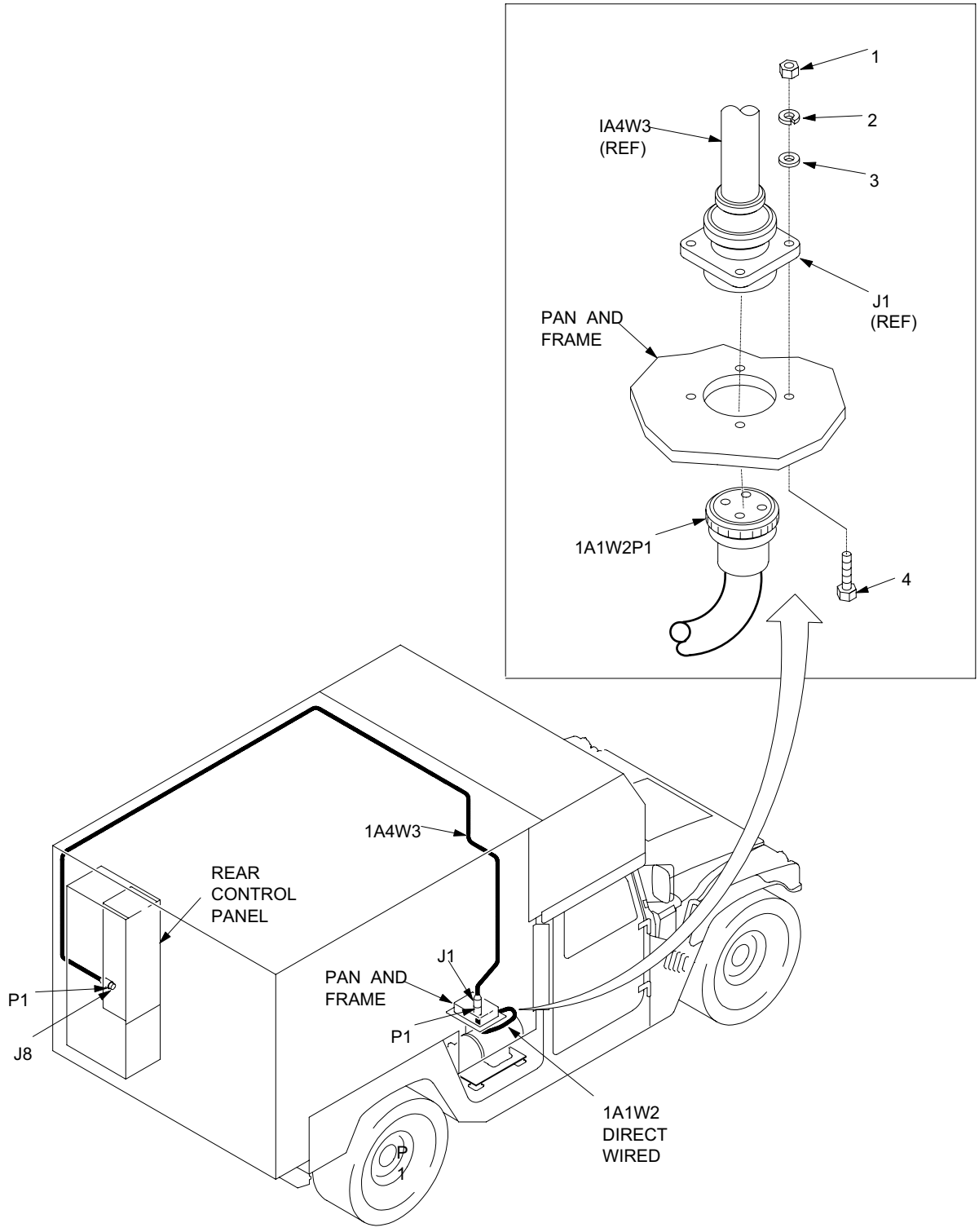


Figure 2-48. Electrical Cable Replacement (Sheet 2 of 12)

2.13.27 Electrical Cable Replacement – Continued.



CABLES 1A1W2 AND 1A4W3

208-1-M

Figure 2-48. Electrical Cable Replacement (Sheet 3 of 12)

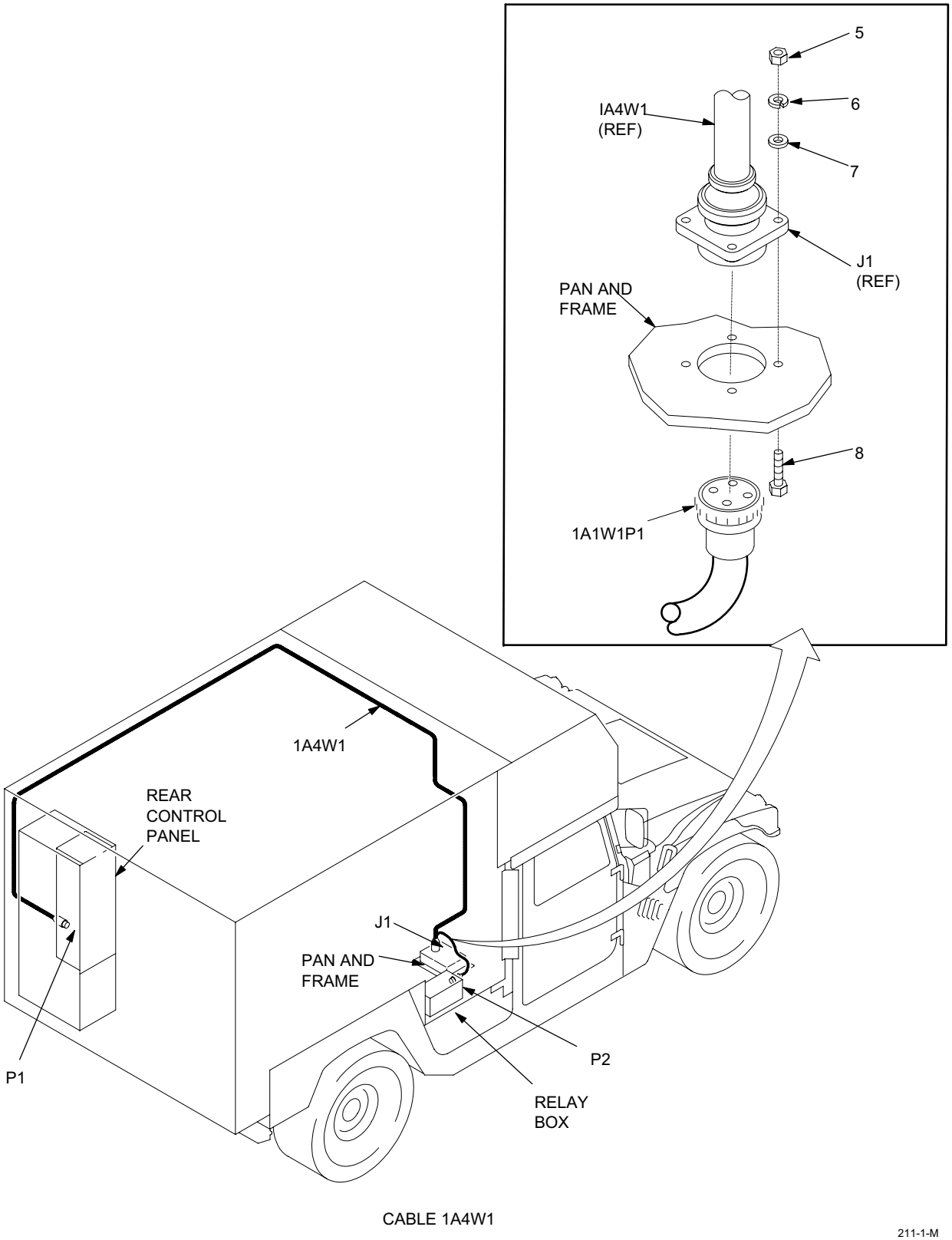


Figure 2-48. Electrical Cable Replacement (Sheet 4 of 12)

2.13.27 Electrical Cable Replacement – Continued.

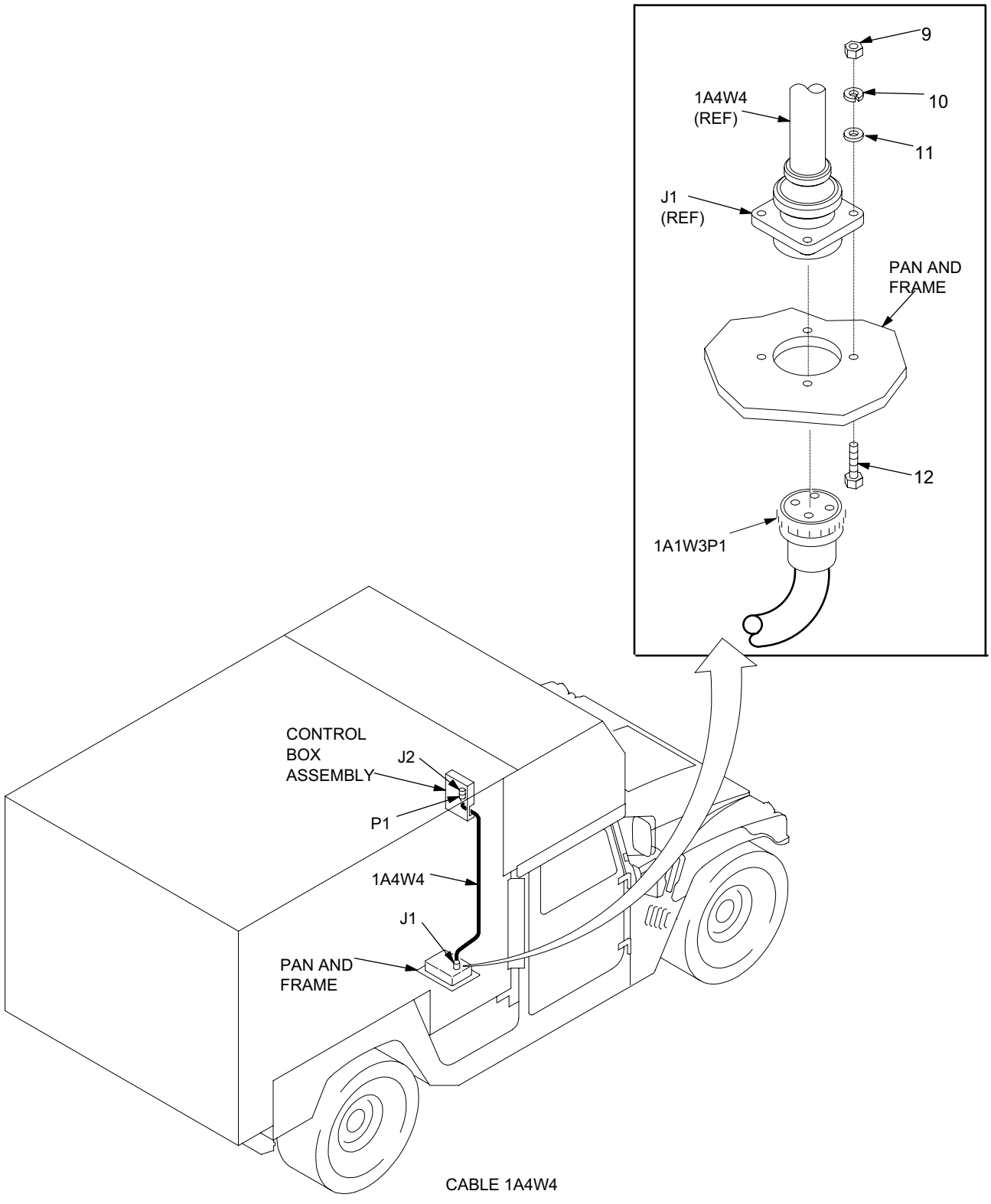


Figure 2-48. Electrical Cable Replacement (Sheet 5 of 12)

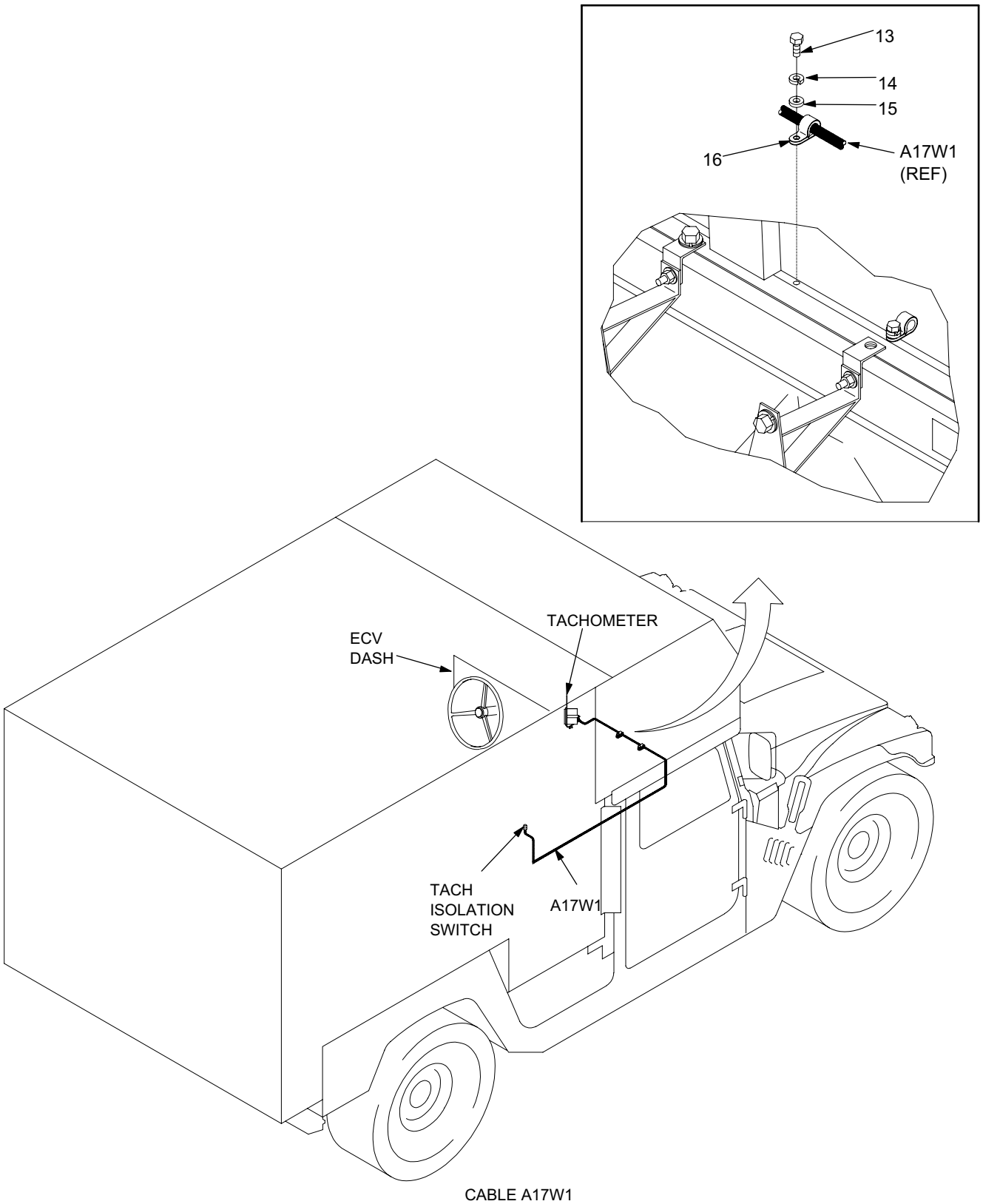
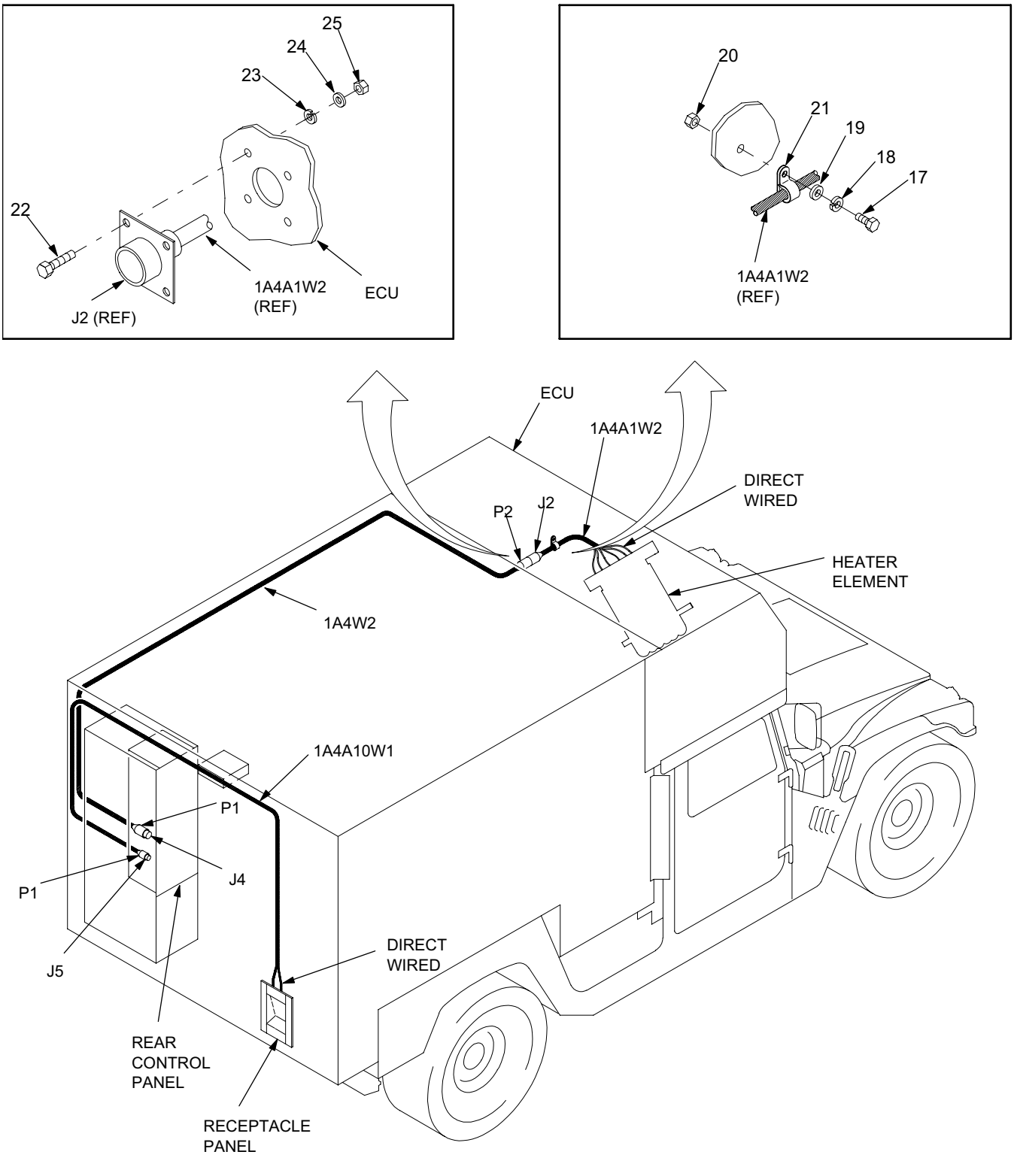


Figure 2-48. Electrical Cable Replacement (Sheet 6 of 12)

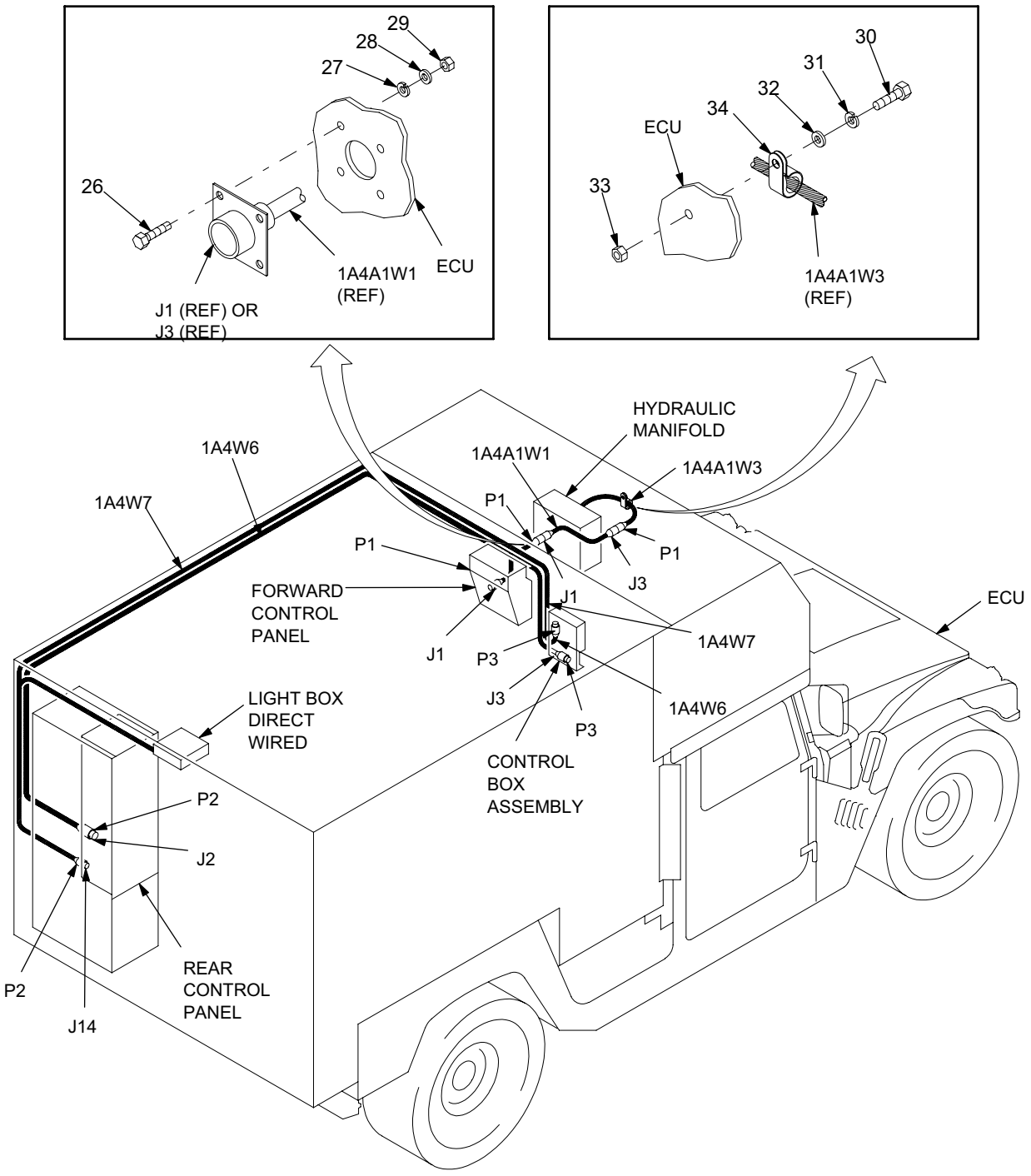
2.13.27 Electrical Cable Replacement – Continued.



CABLES 1A4W2, 1A4A10W1 AND 1A4A1W2

207-1-M

Figure 2-48. Electrical Cable Replacement (Sheet 7 of 12)



CABLES 1A4W6, 1A4W7, 1A4A1W1 AND 1A4A1W3

203-1-M

Figure 2-48. Electrical Cable Replacement (Sheet 8 of 12)

2.13.27 Electrical Cable Replacement – Continued.

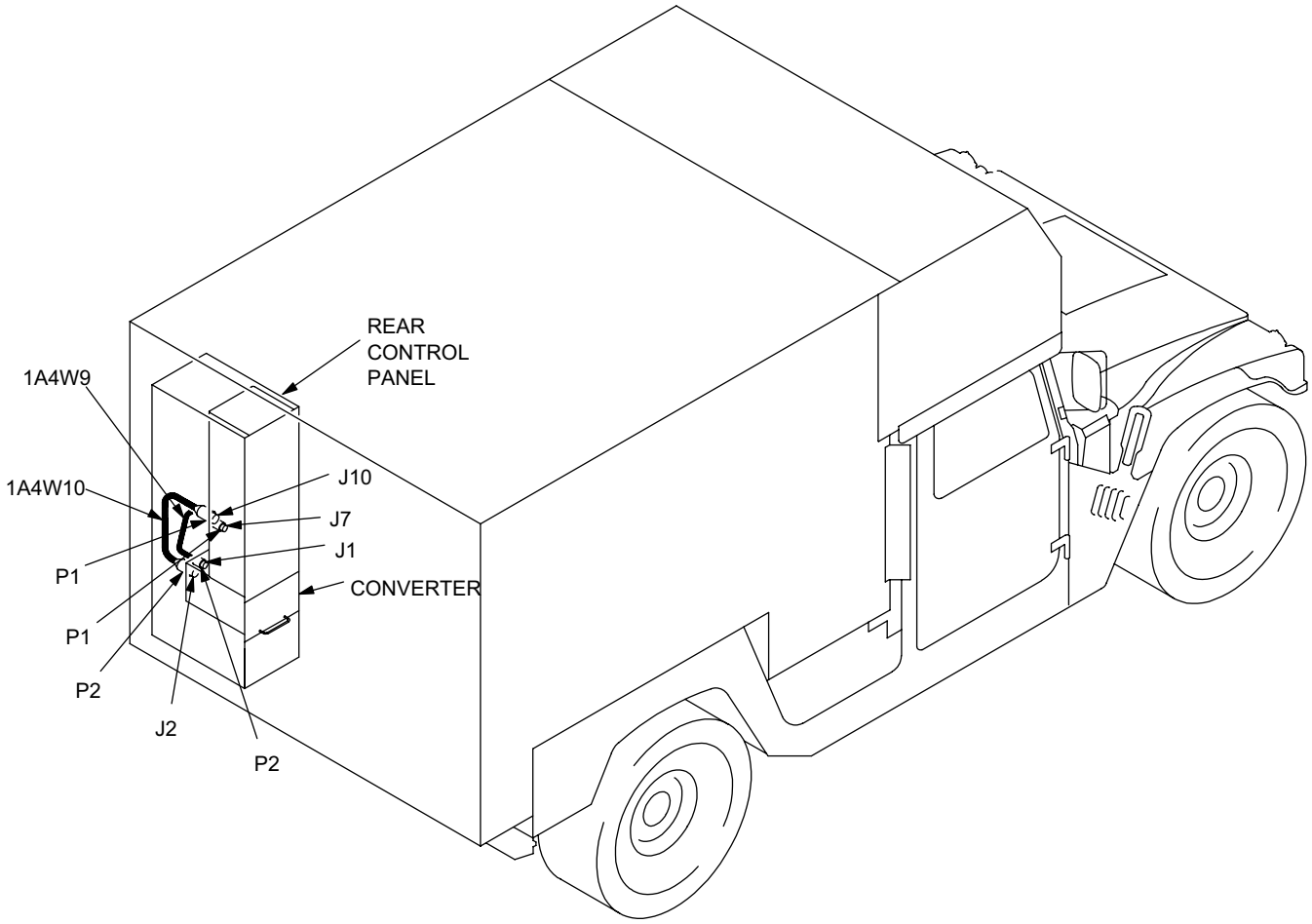
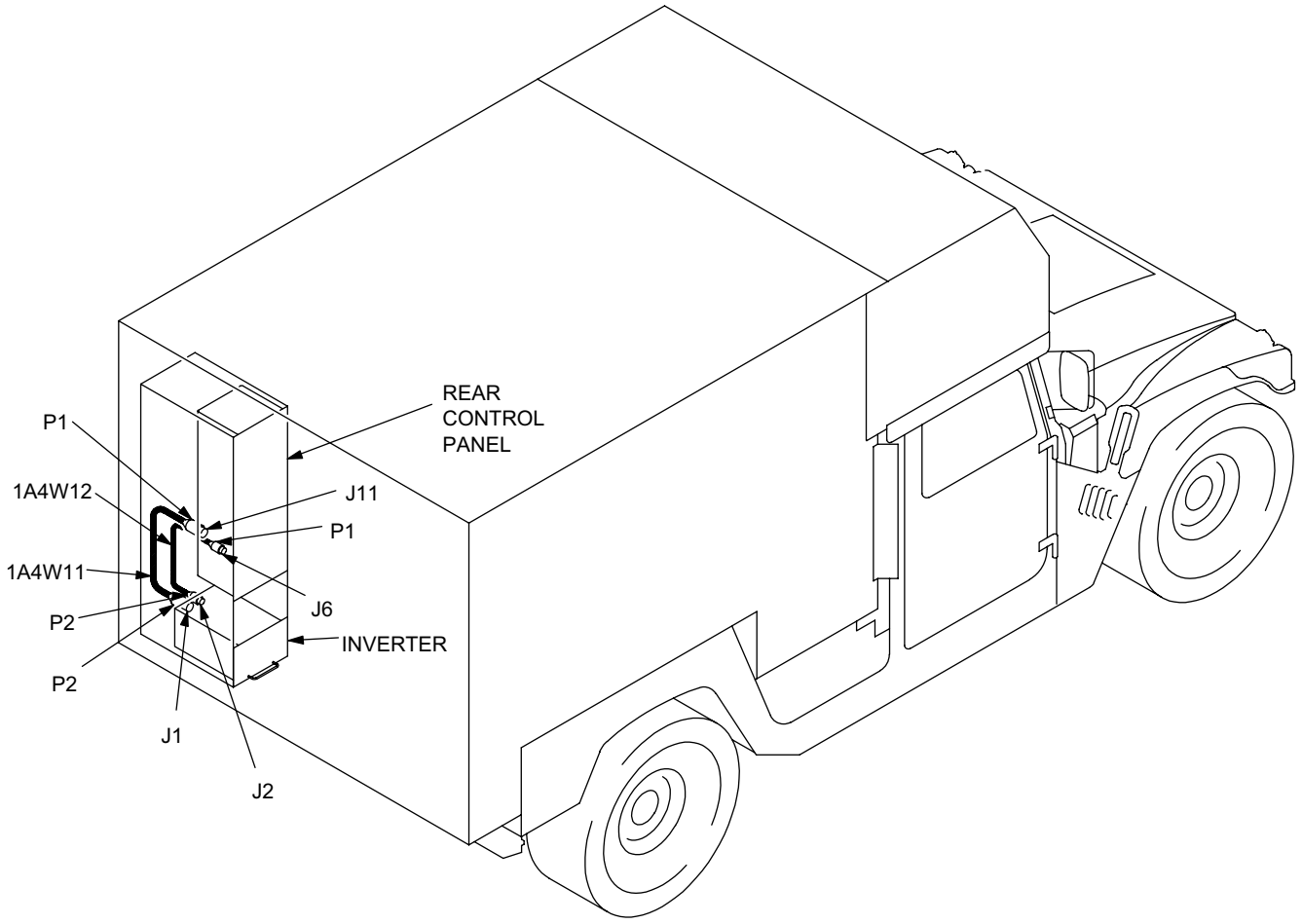


Figure 2-48. Electrical Cable Replacement (Sheet 9 of 12)



CABLES 1A4W11 AND 1A4W12

205-1-M

Figure 2-48. Electrical Cable Replacement (Sheet 10 of 12)

2.13.27 Electrical Cable Replacement – Continued.

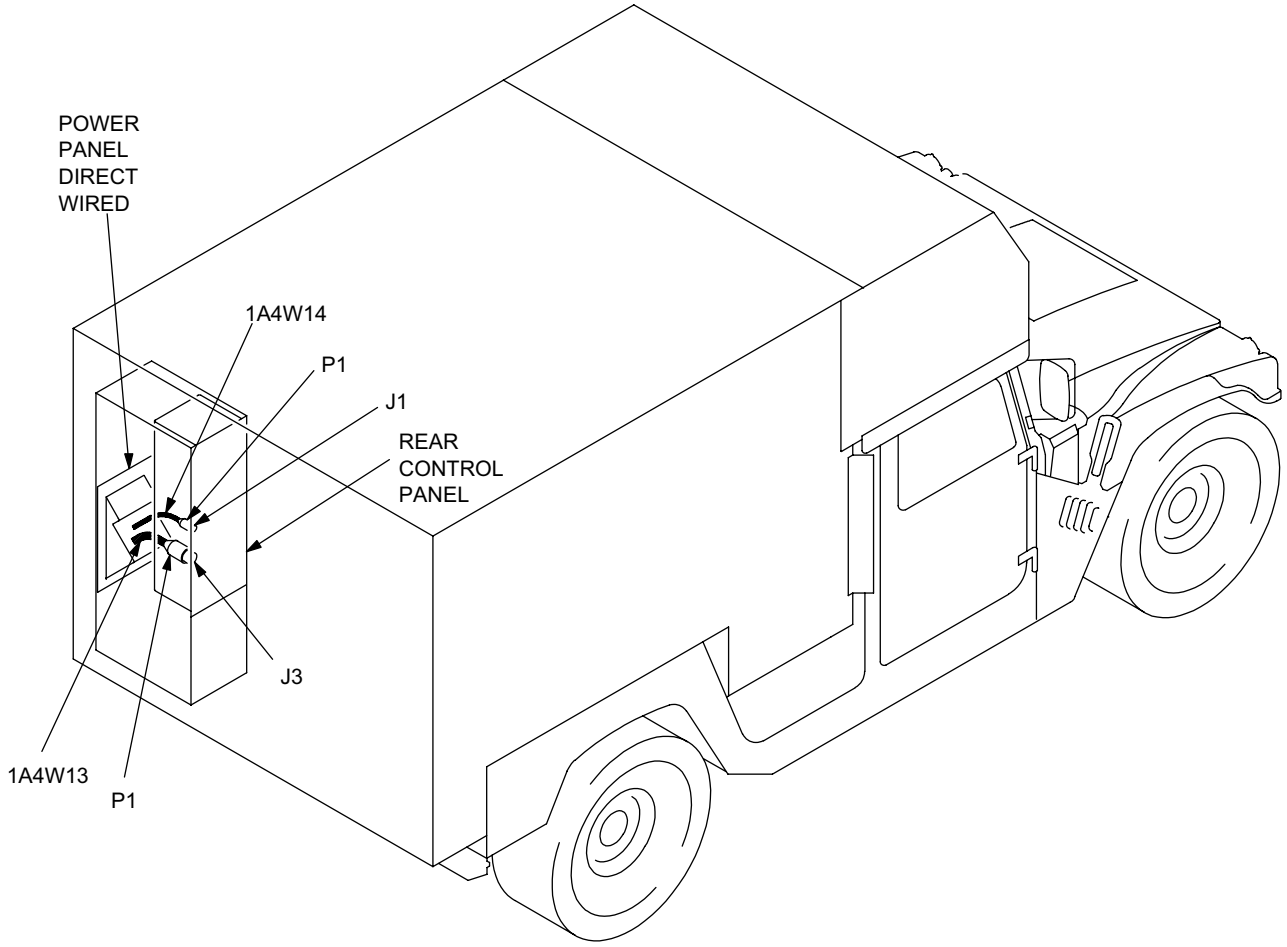


Figure 2-48. Electrical Cable Replacement (Sheet 11 of 12)

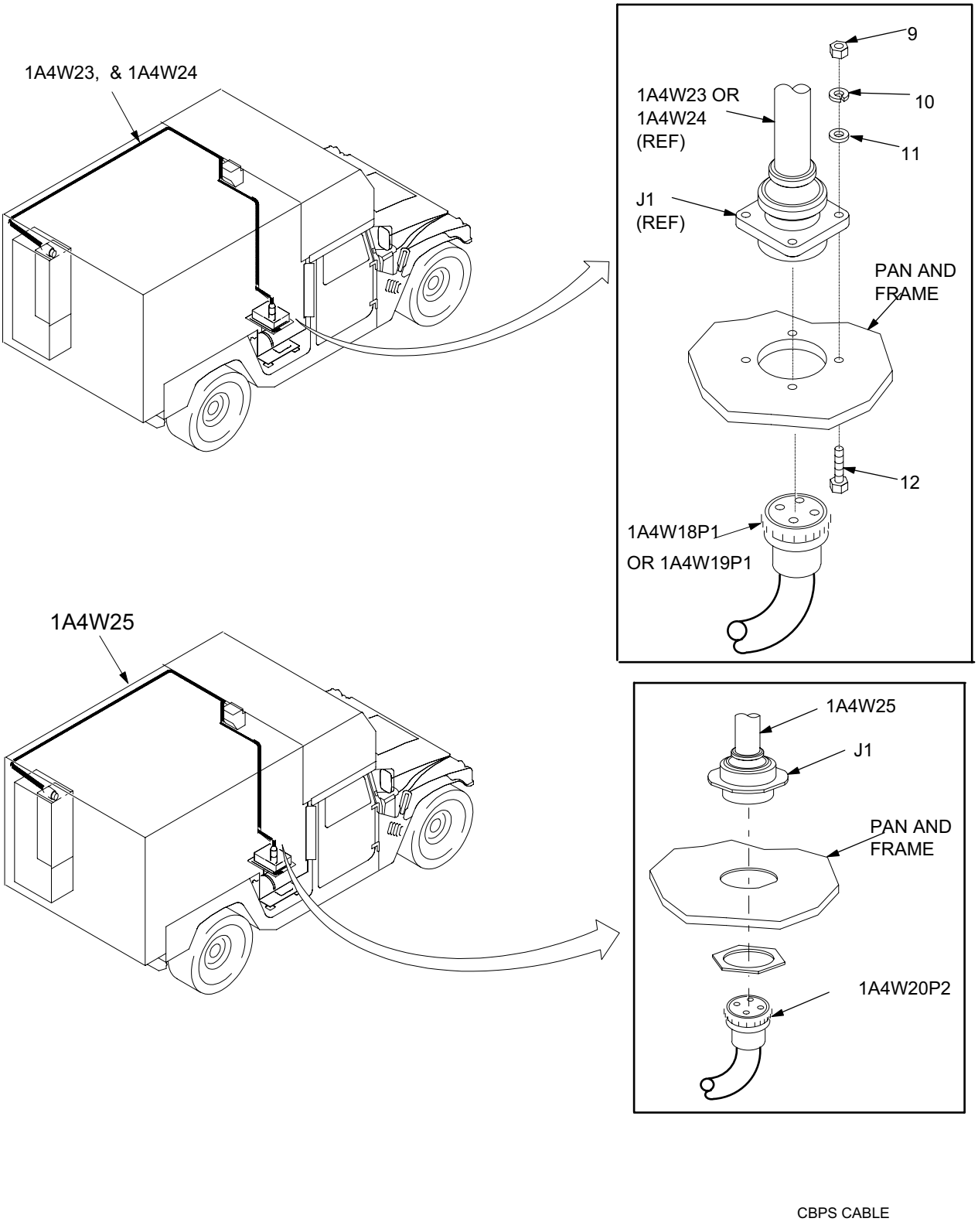
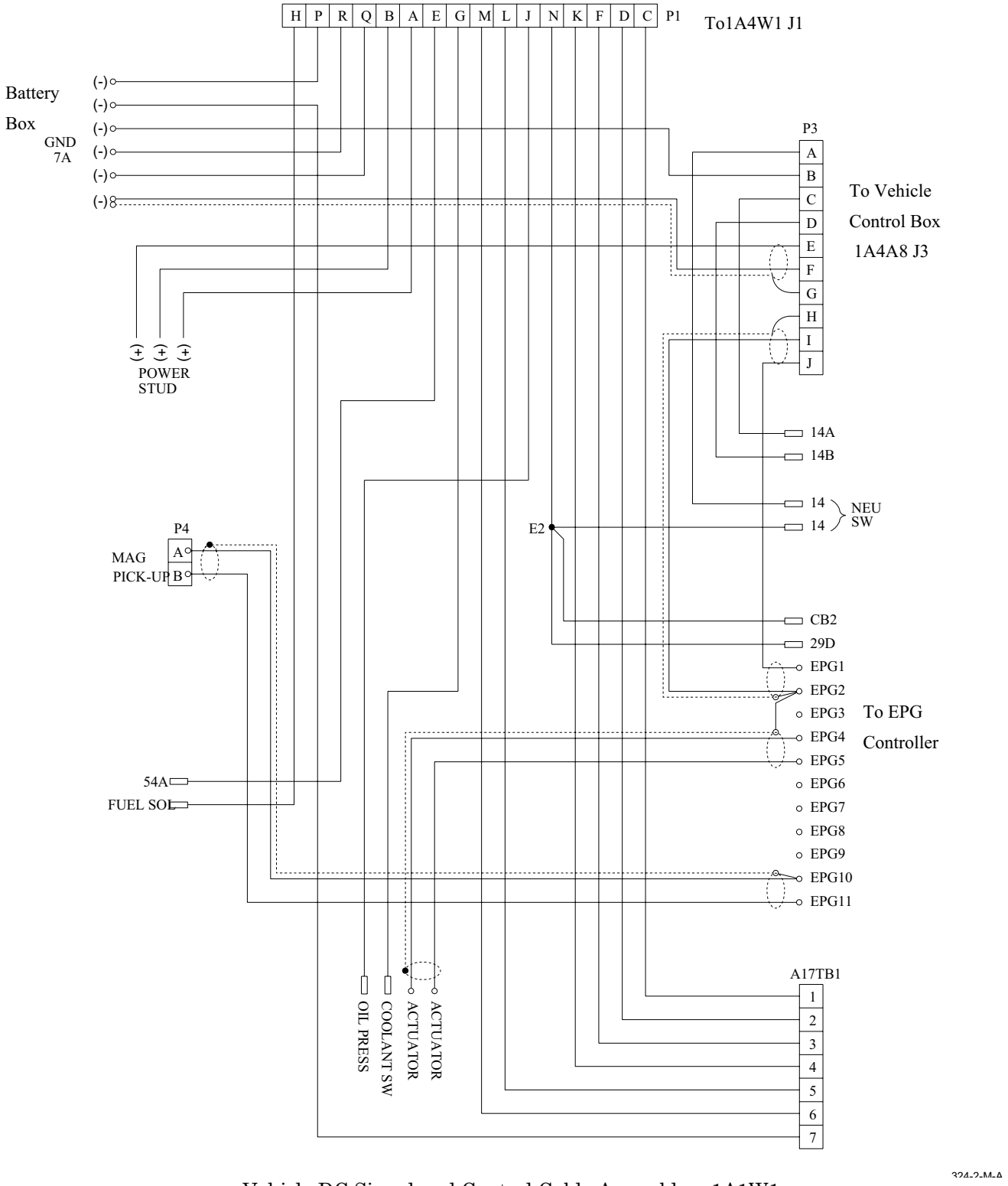


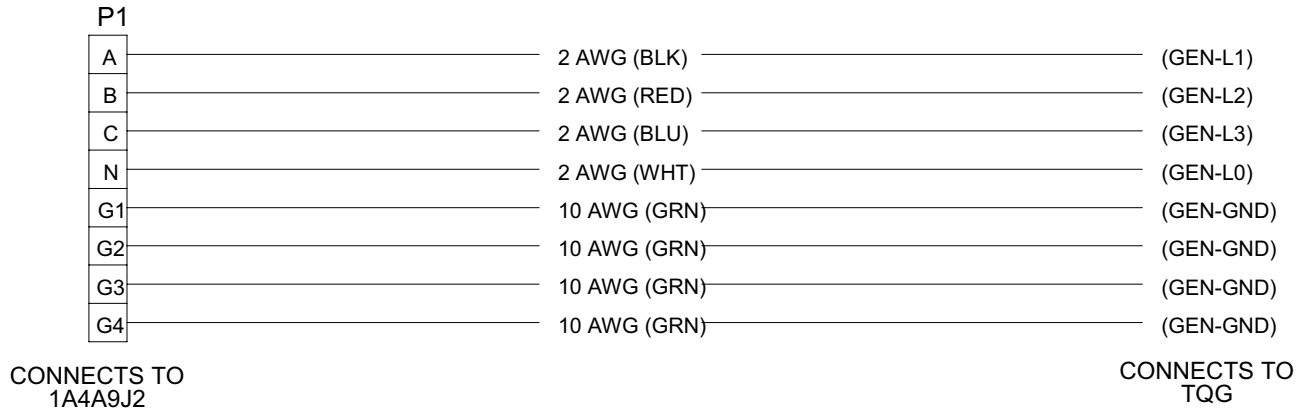
Figure 2-48. Electrical Cable Replacement (Sheet 12 of 12)

2.13.27 Electrical Cable Replacement – Continued.



Vehicle DC Signal and Control Cable Assembly – 1A1W1

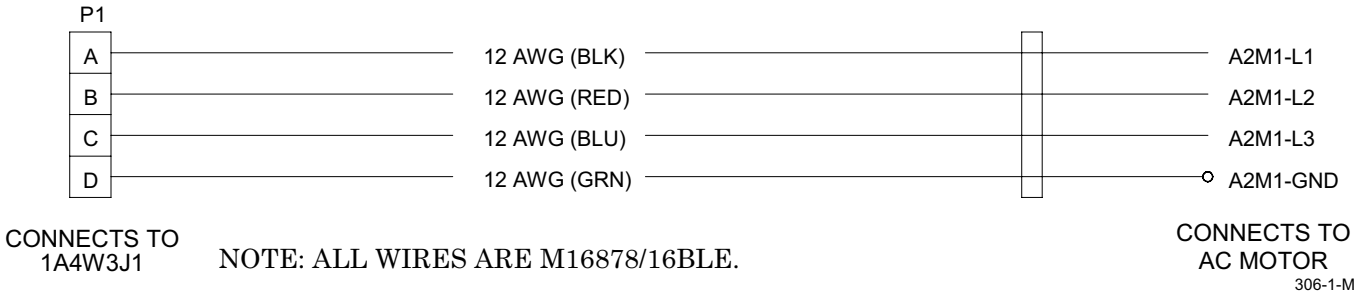
Figure 2-49. Cable Wiring Diagrams (Sheet 1 of 18)



Power Cable Assembly – 1W1

Figure 2-49. Cable Wiring Diagrams (Sheet 2 of 18)

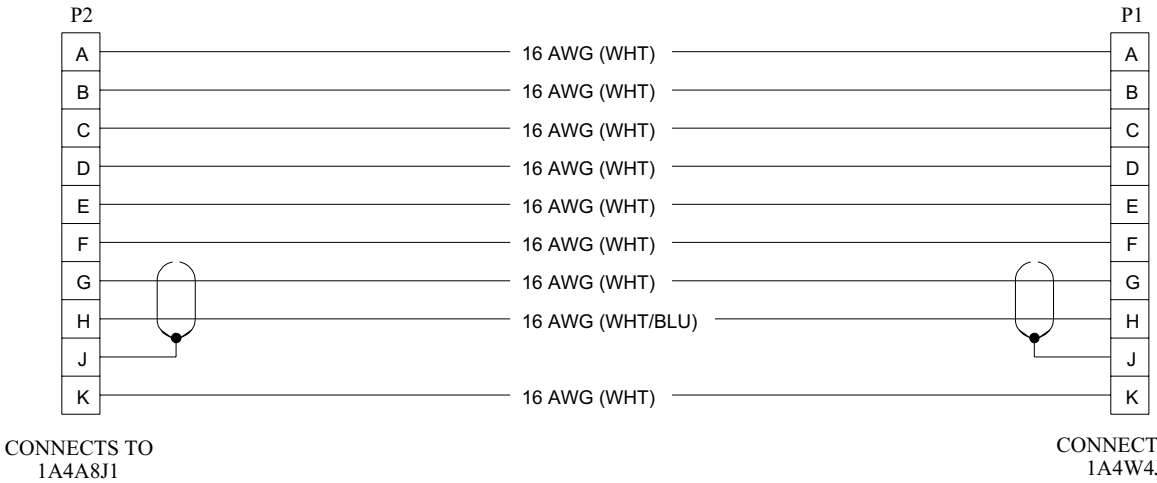
308-1-M



306-1-M

AC Motor Cable Assembly – 1A1W2

Figure 2-49. Cable Wiring Diagrams (Sheet 3 of 18)



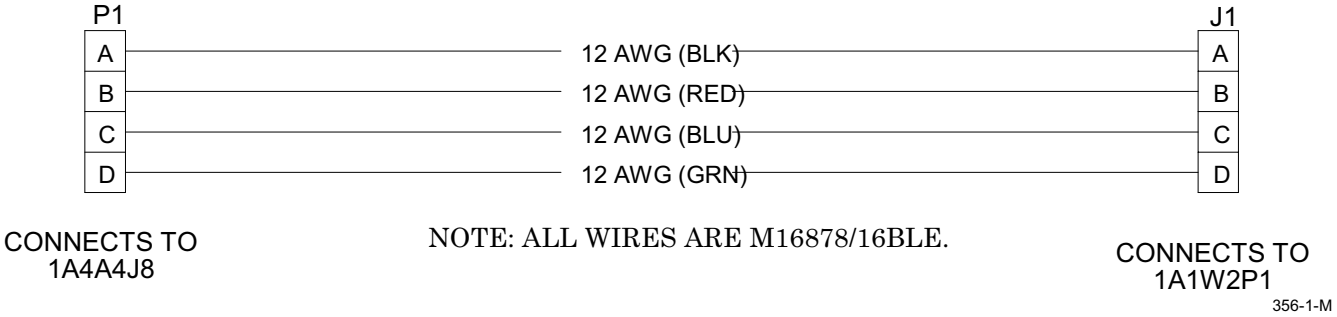
NOTE: ALL WIRES ARE M22759/34-16-9 & ALL SHIELDED WIRES ARE M27500-16SD2T14.

321-1-M

Intercom Cable Assembly – 1A1W3

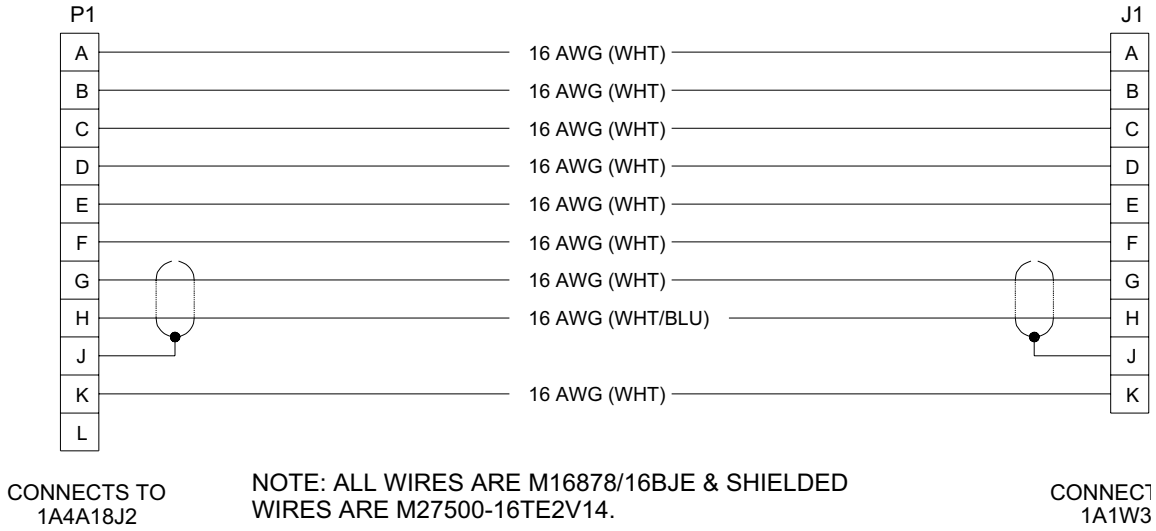
Figure 2-49. Cable Wiring Diagrams (Sheet 4 of 18)

2.13.27 Electrical Cable Replacement – Continued.



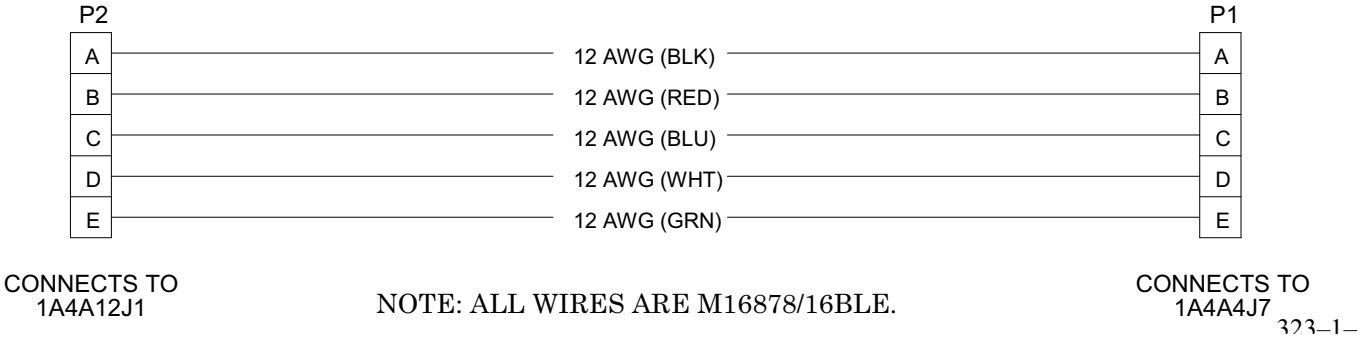
AC Motor Cable Assembly – 1A4W3

Figure 2-49. Cable Wiring Diagrams (Sheet 5 of 18)



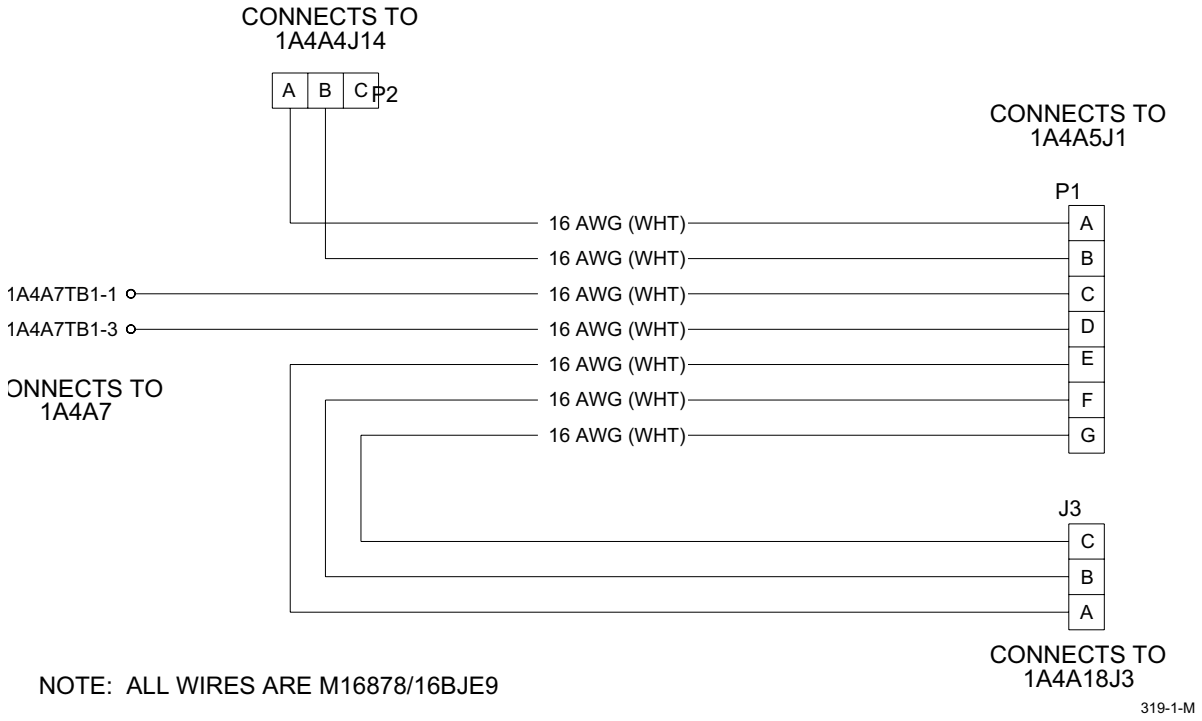
Intercom Cable Assembly – 1A4W4

Figure 2-49. Cable Wiring Diagrams (Sheet 6 of 18)



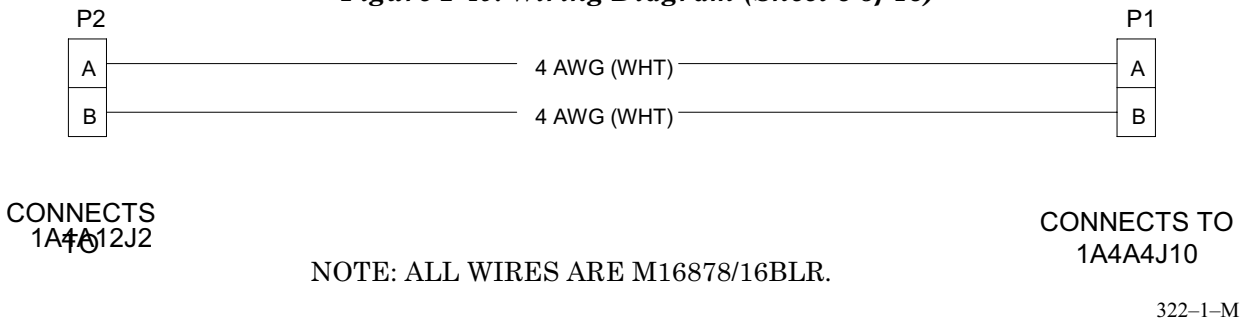
Converter AC Input Cable Assembly – 1A4W9

Figure 2-49. Wiring Diagram (Sheet 7 of 18)



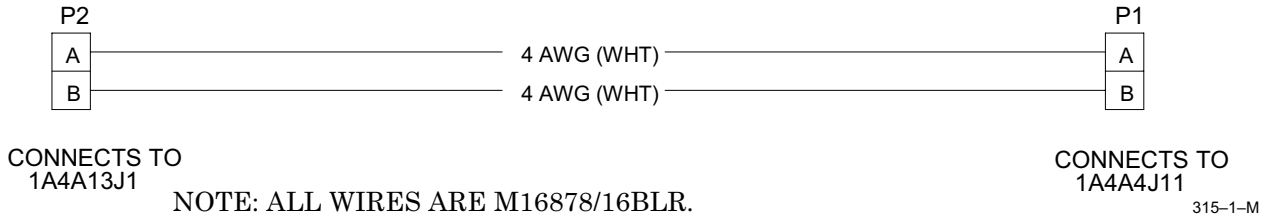
Lighting Cable Assembly – 1A4W7

Figure 2-49. Wiring Diagram (Sheet 8 of 18)



Converter DC Output Cable Assembly – 1A4W10

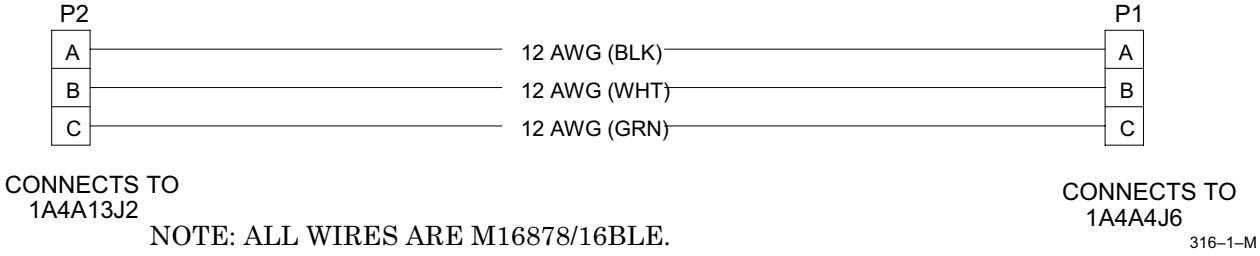
Figure 2-49. Wiring Diagram (Sheet 9 of 18)



Inverter DC Input Cable Assembly – 1A4W11

Figure 2-49. Wiring Diagram (Sheet 10 of 18)

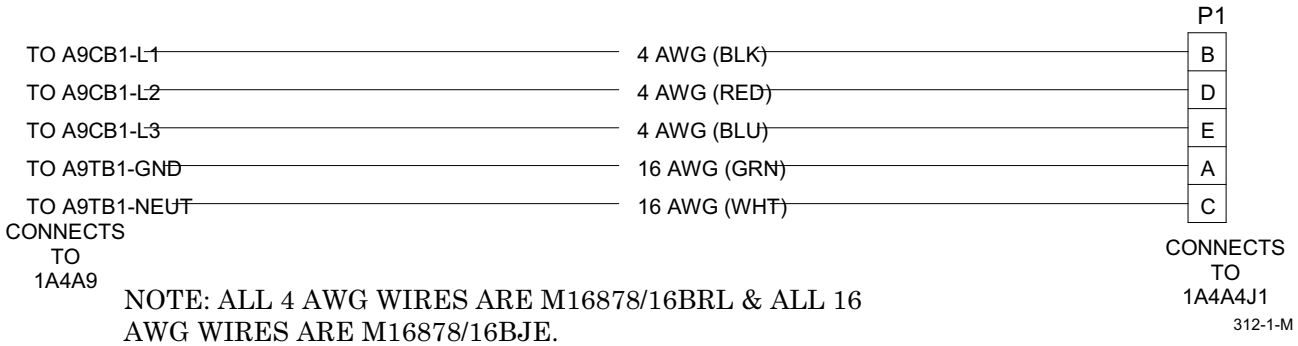
2.13.27 Electrical Cable Replacement – Continued.



NOTE: ALL WIRES ARE M16878/16BLE.

Inverter AC Outlet Cable Assembly – 1A4W12

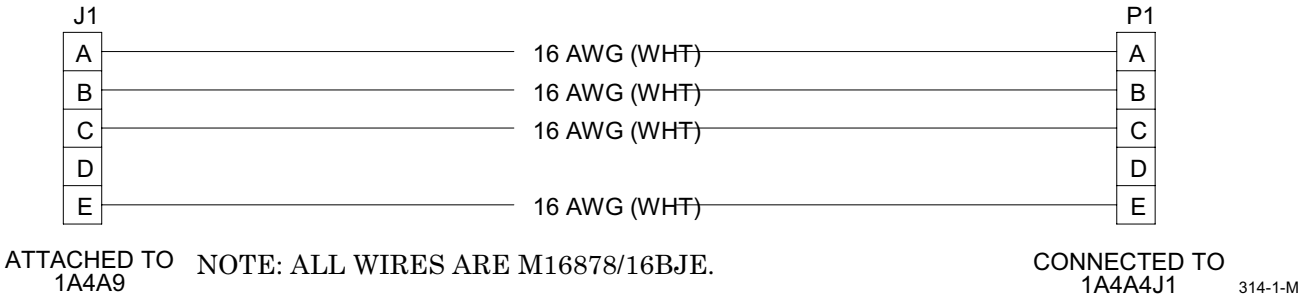
Figure 2-49. Wiring Diagram (Sheet 11 of 18)



NOTE: ALL 4 AWG WIRES ARE M16878/16BRL & ALL 16 AWG WIRES ARE M16878/16BJE.

AC Power Cable Assembly – 1A4W13

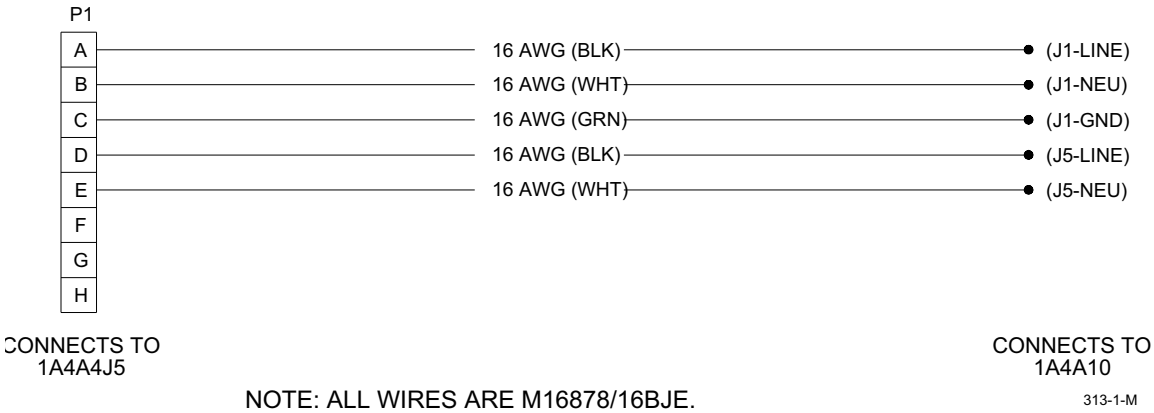
Figure 2-49. Wiring Diagram (Sheet 12 of 18)



NOTE: ALL WIRES ARE M16878/16BJE.

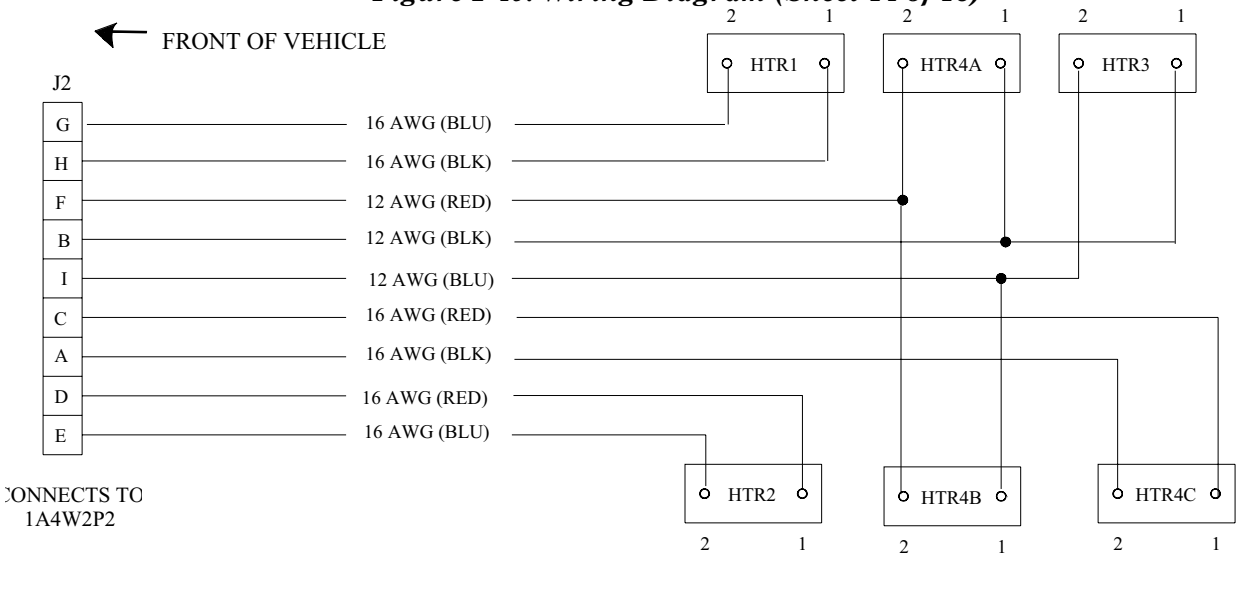
Chemical Sensor Cable Assembly – 1A4W14

Figure 2-49. Wiring Diagram (Sheet 13 of 18)



Utility Outlets Cable Assembly - !A4A10W1

Figure 2-49. Wiring Diagram (Sheet 14 of 18)



NOTE:

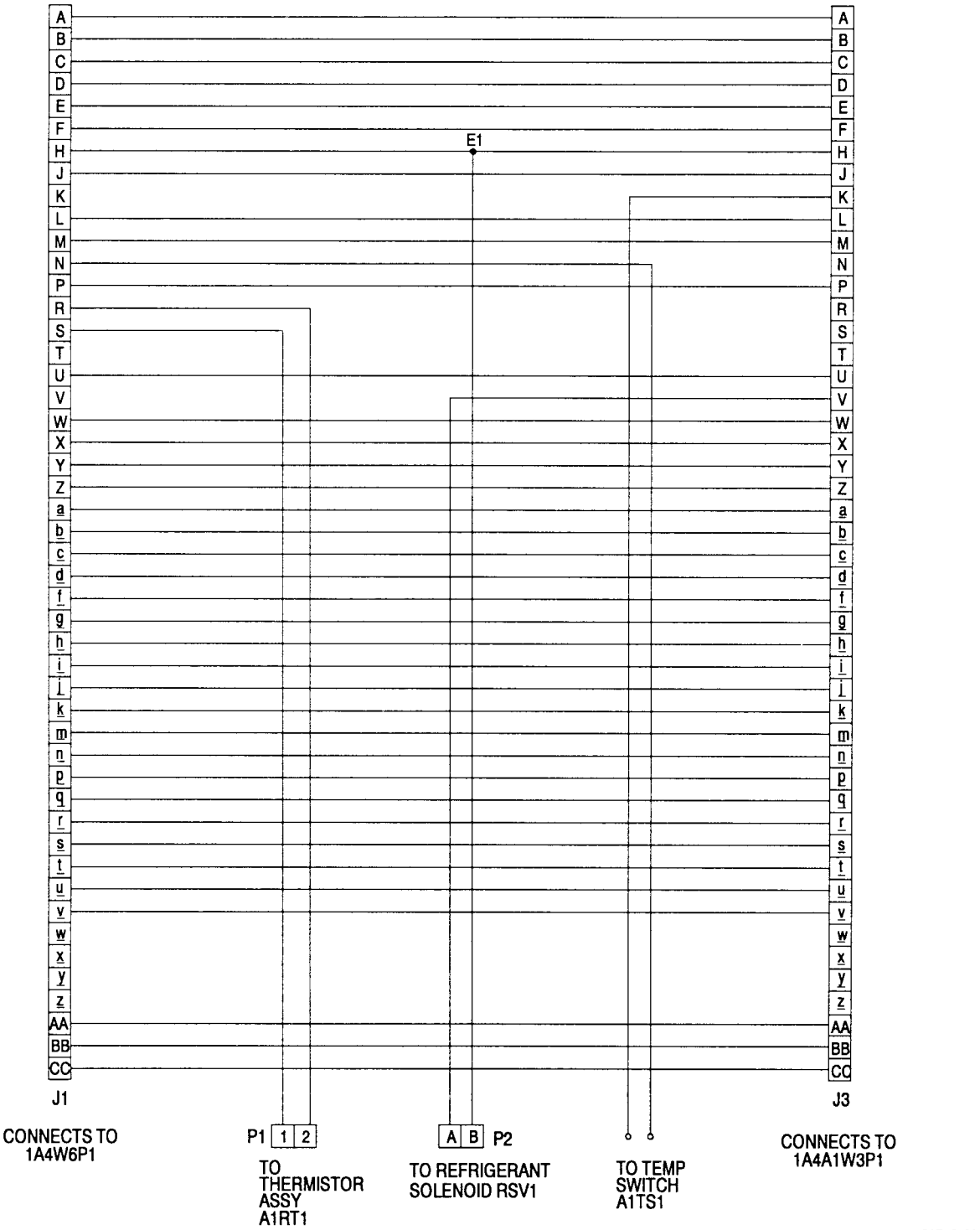
1.ALL 12 GAUGE WIRES ARE M16878/16BLE & ALL 16 GAUGE WIRES ARE M16878/16BJE.

2. HEATER COIL LOCATIONS ARE AS SHOWN. CABLE ECU 1A4A1W2 WIRING IS CLEARLY MARKEI

ECU Heater Cable Assembly – 1A4A1W2

Figure 2-49. Wiring Diagram (Sheet 15 of 18)

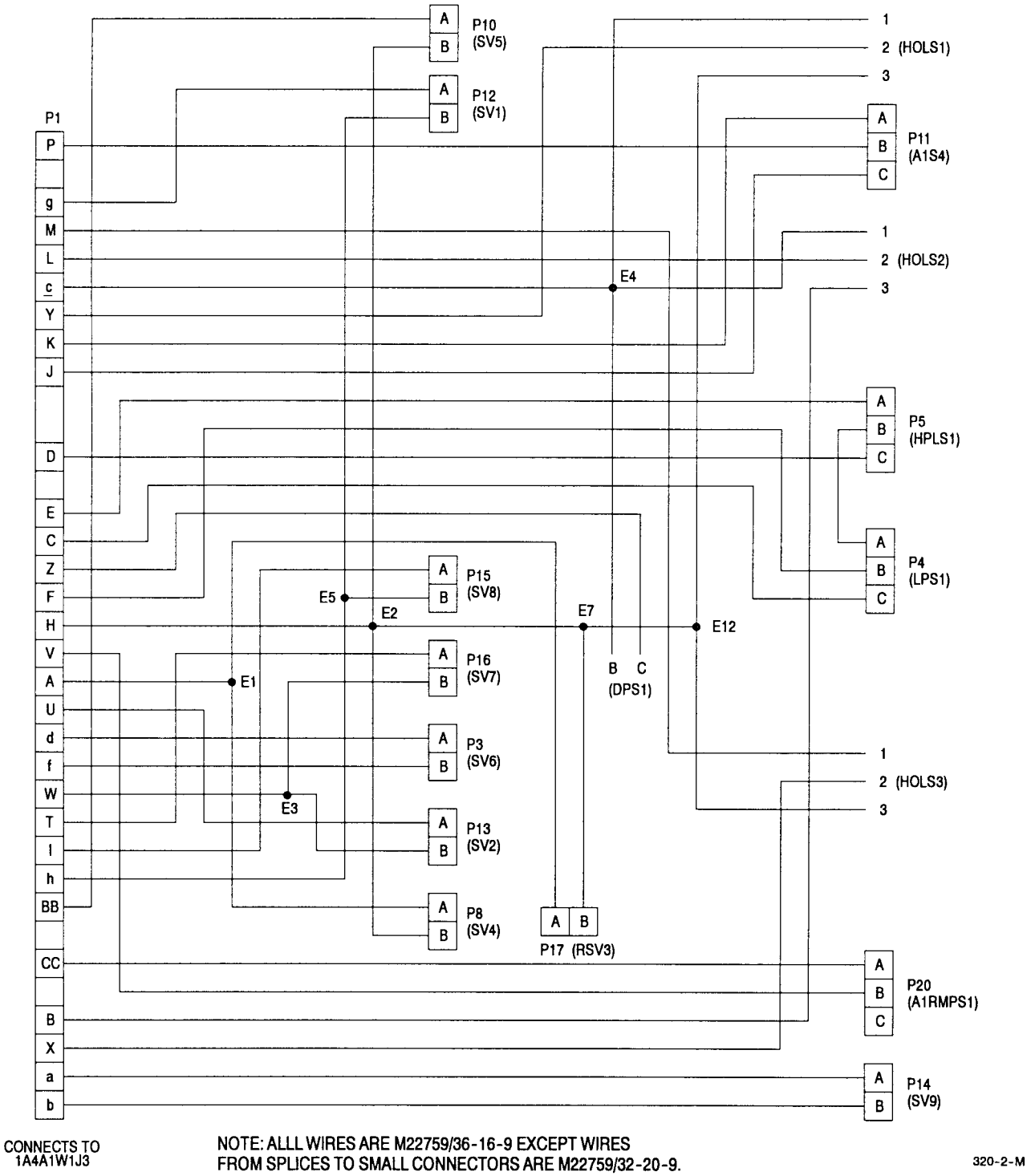
2.13.27 Electrical Cable Replacement – Continued.



NOTE: ALL WIRES ARE M16878/16BJE9

ECU Interconnection Cable Assembly - 1A4A1W1

Figure 2-49. Wiring Diagram (Sheet 16 of 18)



Pod Hydraulics Cable Assembly - 1A4A1W3

Figure 2-49. Wiring Diagram (Sheet 17 of 18)

2.13.27 Electrical Cable Replacement – Continued.

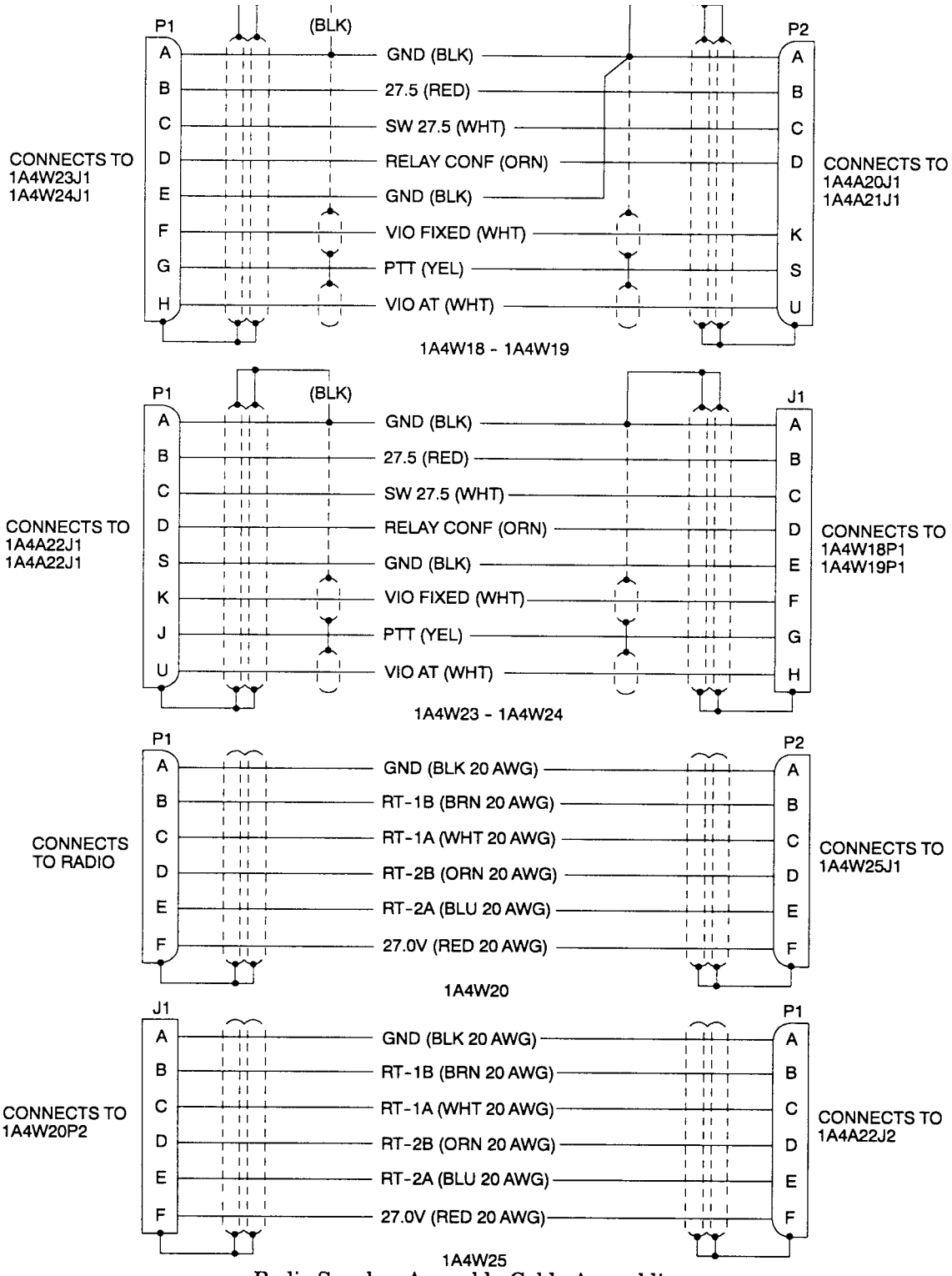


Figure 2-49. Wiring Diagram (Sheet 18 of 18)

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1 or connect external power cable, install raceway covers and retainers per para 2.13.8, remove tags, apply power and perform operational test.

2.13.28 AC Power Protector Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Shop Equipment: Electrical Equipment (Item 40, Appendix B)	Equipment Conditions: Power shut off and power panel tagged. External power cable disconnected. Guard removed (see para 2.13.20 or 2.13.21). ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
Materials/Parts: Four Lockwashers (Item 18, Appendix E)	References: TM 9-2320-387-24-1

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

a. Removal (Refer to Figure 2-50)

(1) Loosen two screws (1) and two clamps (2) on hinged cover of AC power line protector (3) and open hinged cover.

(2) Remove four screws (4), four lockwashers (5) and four flat washers (6) securing AC power line protector (3) to LMS (7). Discard four lockwashers (5).

(3) Tag and remove terminal lugs from terminal board mounted inside AC power line protector (3).

(4) Pull wires through strain relief connector on bottom of AC power line protector (3).

b. Installation (Refer to Figure 2-50)

(1) Open hinged cover on AC power line protector (3).

(2) Pull wires through strain relief connector on bottom of AC power line protector (3).

(3) Install terminal lugs on terminal board mounted inside AC power line protector (3). Remove tags from wires.

(4) Secure AC power line protector (3) to LMS (7) with four screws (4), four new lockwashers (5) (Item 18, Appx E) and four flat washers (6).

(5) Close hinged cover and tighten two screws (1) and two clamps (2) on hinged cover of AC power line protector (3).

2.13.28 AC Power Protector Replacement – Continued.

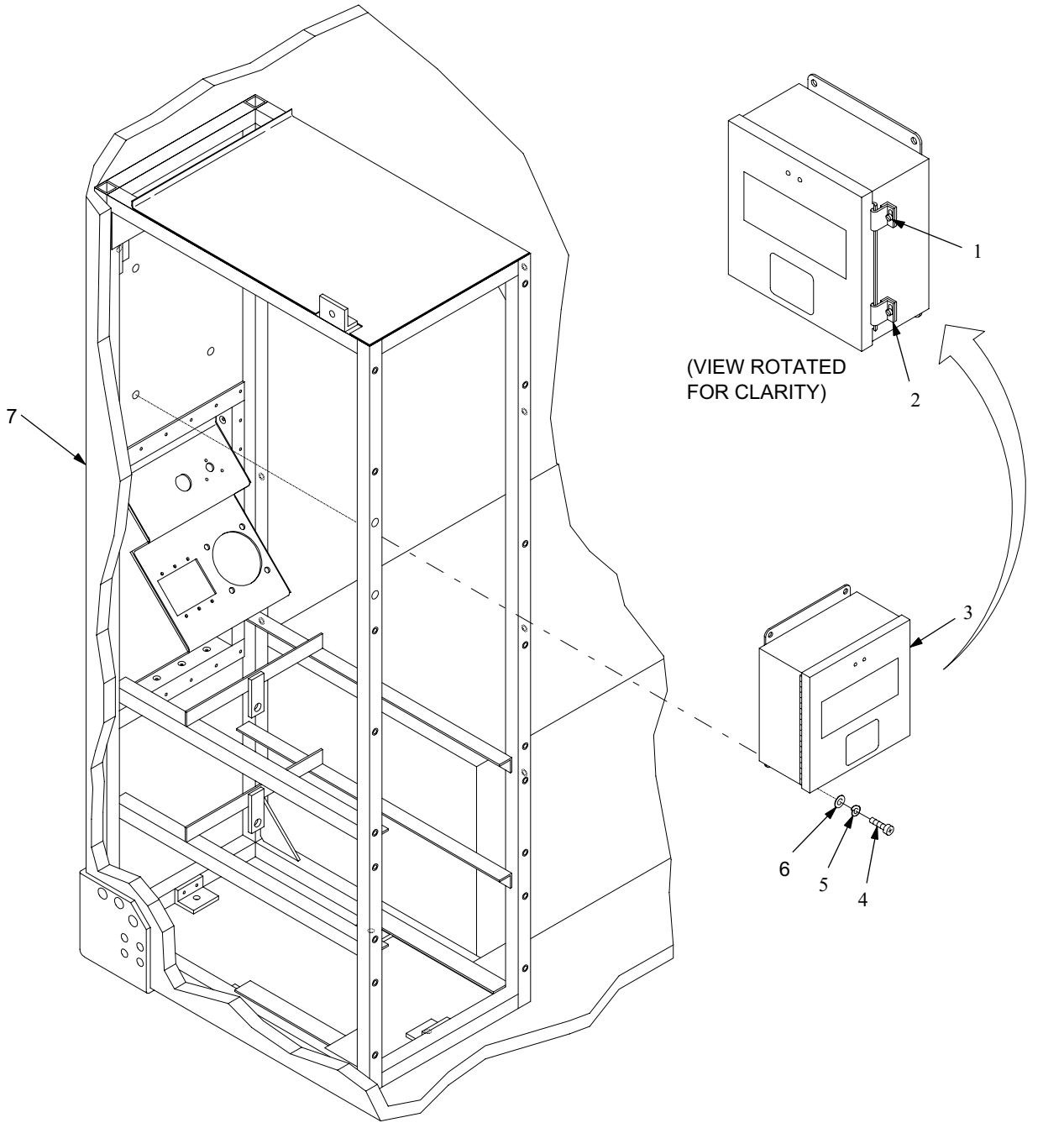


Figure 2-50. AC Power Protector Replacement

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24-1, connect external power cable, install guard per para 2.13.20 or 2.13.21, apply power and perform operational test.

2.13.29 EMERGENCY EXIT PANEL REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Caulking Tool, Hand (Item 18, Appendix B)

Materials/Parts:
Rubber Gloves (Item 25, Appendix C)
Sealer (Item 50, Appendix C)
Four Self-locking Nuts (Item 45, Appendix E)
Isopropyl Alcohol (Item 12, Appendix C)

Equipment Conditions:
ECV parking brake set.
Strap removed (see para 2.13.5).

Materials/Parts: (Cont.)
Adhesive (Item 39, Appendix C)
Wiping Rags (Item 39, Appendix C)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-51)

(1) From inside of LMS, release two latches (1) securing emergency exit panel (2) but do not open hatch.

(2) Carefully climb to roof of LMS.

(3) Remove four bolts (3), four flat washers (4) and four self-locking nuts (5) securing two hinges (6) to roof of LMS. Remove emergency exit panel (2) from roof of LMS. Discard four self-locking nuts (5).

(4) Remove gasket (7).

b. Installation (Refer to Figure 2-51)

WARNING

Alcohol and adhesive are flammable and give off harmful vapors. Use in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flame. Wear gloves when handling.

(1) Clean adhesive residue from emergency exit panel (2).

(2) Secure gasket (7) to emergency exit panel (2) with adhesive.

(3) Secure two hinges (6) to roof of LMS with four bolts (3), four flat washers (4) and four new self-locking nuts (5) (Item 45, Appx E).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(4) Using caulking gun, apply sealer (Item 50, Appx C) on two hinges (6) and on emergency exit panel (2) around hinges (6).

(5) From inside of LMS, close two latches (1) to secure emergency exit panel (2).

2.13.29 Emergency Exit Panel Replacement – Continued.

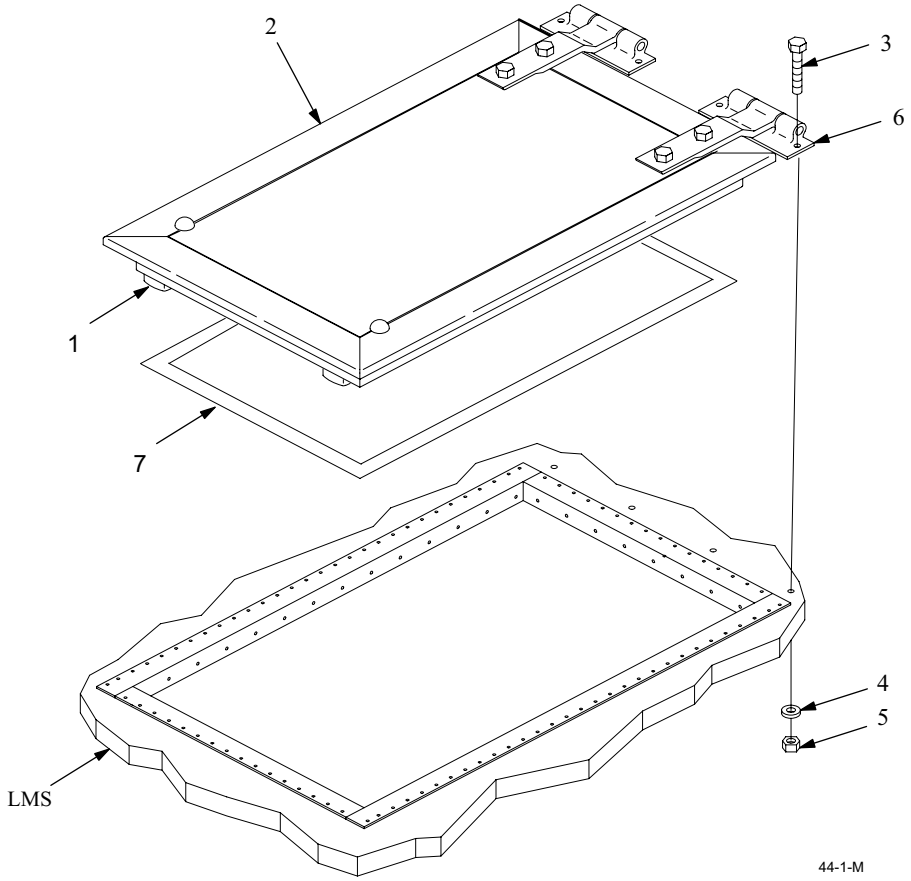


Figure 2-51. Emergency Exit Panel Replacement

Follow-on maintenance: Install strap per para 2.13.5.

2.13.30 Power Panel Repair.

This task covers:
a. Disassembly
b. Assembly

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Caulking Tool, Hand (Item 18, Appendix B)

Materials/Parts:
Rubber Gloves (Item 25, Appendix C)
Sealer (Item 50, Appendix C)
Sealant (Item 47, Appendix C)
Nine Lockwashers (Item 15, Appendix E)
Thirty Lockwashers (Item 17, Appendix E)
Four Lockwashers (Item 19, Appendix E)
Ten Tie-down Straps (Item 87, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECV battery ground cable disconnected (see TM 9-2320-387-24-1).
External power cable disconnected.
Cover assembly removed (see para 2.13.23).
Power mode switch removed (see para 2.13.24).
Guard removed (see para 2.13.21 or 2.13.22).
Pan assembly removed (see para 2.13.25).

References:
TM 9-2320-387-24-1

Personnel Required: (2)

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-52)

(1) Remove tie-down straps as required.

(2) Remove 30 screws (1), 30 lockwashers (2) and 30 flat washers (3) securing power panel (4) to exterior frame (5). Discard 30 lockwashers (2).

(3) Pull power panel (4) from exterior frame (5).

NOTE

Backside of connector is left hand thread.

(4) Remove protective cover (6) from chemical sensor cable assembly (7). Remove chemical sensor cable assembly (7) from power panel (4).

(5) Remove four screws (8), four flat washers (9), four lockwashers (10) and four nuts (11) securing connector (12) to power panel (4). Discard four lockwashers (10).

(6) Tag wires and remove bushings from back of connector (12). Disconnect wires.

(7) Remove six screws (13) and six lockwashers (14) securing dust and water seal boot (15) and circuit breaker (16) to power panel (4). Discard six lockwashers (14).

2.13.30 Power Panel Repair - Continued.

b. Assembly (Refer to Figure 2-52)

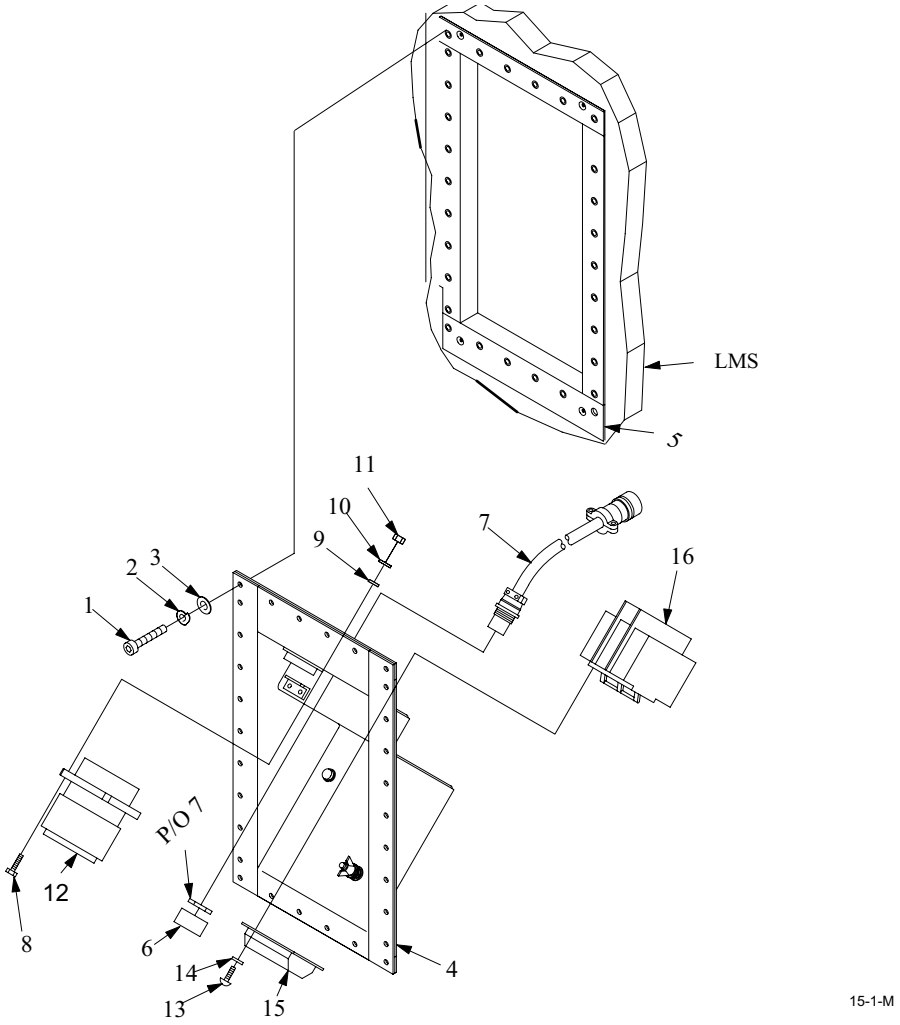
(1) Secure dust and water seal boot (15) and circuit breaker (16) to power panel (4) with six screws (13) and six new lockwashers (14) (Item 15, Appx E).

(2) Connect wires to connector and install bushings on connector (12). Remove tags from wires.

(3) Apply sealant (Item 47, Appx C) to flange of connector (12) and to screws (8). Secure connector (12) to power panel (4) with four screws (8), four flat washers (9), four new lockwashers (10) (Item 18, Appx E), and four nuts (11).

(4) Install chemical sensor cable assembly (7) on power panel (4). Install protective cover (6) on chemical sensor cable assembly (7).

(5) Secure power panel (4) to exterior frame (5) with 30 screws (1), 30 new lockwashers (2) (Item 17, Appx E) and 30 flat washers (3).



2.13.31 Receptacle Panel Repair.

This task covers:	
a. Disassembly	b. Assembly

INITIAL SETUP

Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Power shut off, power panel and rear control panel tagged.
Shop Equipment: Electrical Equipment (Item 40, Appendix B)	ECV battery ground cable disconnected (see TM 9-2320-387-24).
Multimeter (Item 27, Appendix B)	External power cable disconnected.
Power Supply (Item 29, Appendix B)	ABS deployed
Materials/Parts:	**References:**
Twenty-six Lockwashers (Item 17, Appendix E)	TM 9-2320-387-24-1
Twenty-four Lockwashers (Item 14, Appendix E)	

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-53)

(1) Remove twenty screws (1), twenty lockwashers (2) and twenty flat washers (3) securing receptacle panel (4) to exterior frame (5). Discard twenty lockwashers (2).

(2) Remove six screws (6), six lockwashers (7) and six flat washers (8) securing receptacle panel (4) to pan (9). Discard six lockwashers (7).

(3) Tag wires and remove eighteen screws (10) and 36 flat washers (11) securing 26 terminal lugs (12) and five terminal lugs (13) to six receptacle connectors (14).

NOTE

Six of the twenty four screws also secure receptacle connector cap lanyards to receptacle panel.

(4) Remove 24 screws (15), 24 flat washers (16), 24 lockwashers (17) and 24 nuts (18) securing six receptacle connectors (14) and six gaskets (19) to receptacle panel (4). Discard 24 lockwashers (17).

(5) Remove six caps (20) from six receptacle connectors (14).

(6) Remove utility outlet cable assembly (21) from strain relief (22).

2.13.31 Receptacle Panel Repair – Continued.

b. Assembly (Refer to Figure 2-53)

(1) Install utility outlet cable assembly (21) in strain relief (22).

(2) Secure six receptacle connectors (14) and six gaskets (19) to receptacle panel (4) with 24 screws (15), 24 flat washers (16), 24 new lockwashers (17) (Item 14, Appx E) and 24 nuts (18).

(3) If required, cut damaged terminal lug(s) (12) from wires and crimp new terminal lug(s) (12) to wire. Remove tags from wires.

(4) Secure 26 terminal lugs (12) and five terminal lugs (13) to six receptacle connectors (14) with eighteen screws (10) and 36 flat washers (11).

(5) Install tie-down straps as required.

(6) Secure receptacle panel (4) to pan (9) with six screws (6), six new lockwashers (7) (Item 17, Appx E) and six flat washers (8).

(7) Install six caps (20) on six receptacle connectors (14).

NOTE

Secure six cap lanyards under six screws when securing receptacle panel to exterior frame.

(8) Secure receptacle panel (4) to exterior frame (5) with twenty screws (1), twenty new lockwashers (2) (Item 17, Appx E) and twenty flat washers (3).

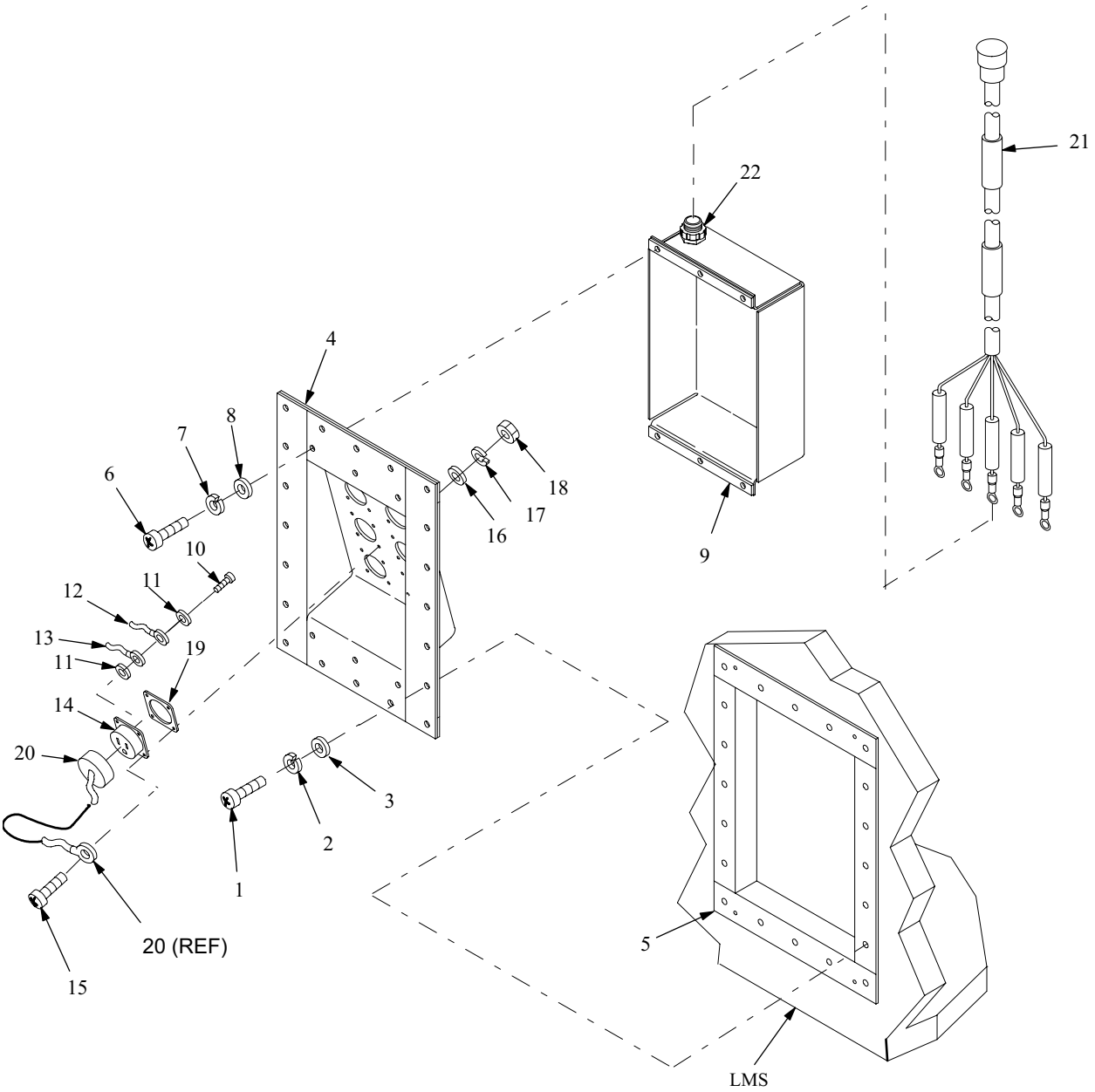


Figure 2-53. Receptacle Panel Repair

Follow-on maintenance: Connect ECV battery ground cable per TM 9-2320-387-24 or connect external power cable, apply power and perform operational test.

2.13.32 Sound Quilt Assembly Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Materials/Parts: One Hundred and Seven Lockwashers (Item 18, Appendix E)
Equipment Condition: Items secured to LMS walls removed (Reference TM 10-5410-228-10, Appendix E, Load Plan)	

a. Removal (Refer to Figure 2-54)

NOTE

The following steps apply to all sound quilt assemblies except floor sound quilt, which is not secured to LMS.

(1) Remove screws (1), lockwashers (2) and flat washers (3). Discard lockwashers (2).

(2) Pull sound quilt assembly (4) from fastener loop on LMS.

b. Installation (Refer to Figure 2-54)

(1) Install new sound quilt assembly (4) so fastener hook aligns with fastener loop on LMS and grommets align with mounting holes.

(2) Secure sound quilt assembly (4) with screws (1), new lockwashers (2) (Item 18, Appx E) and flat washers (3).

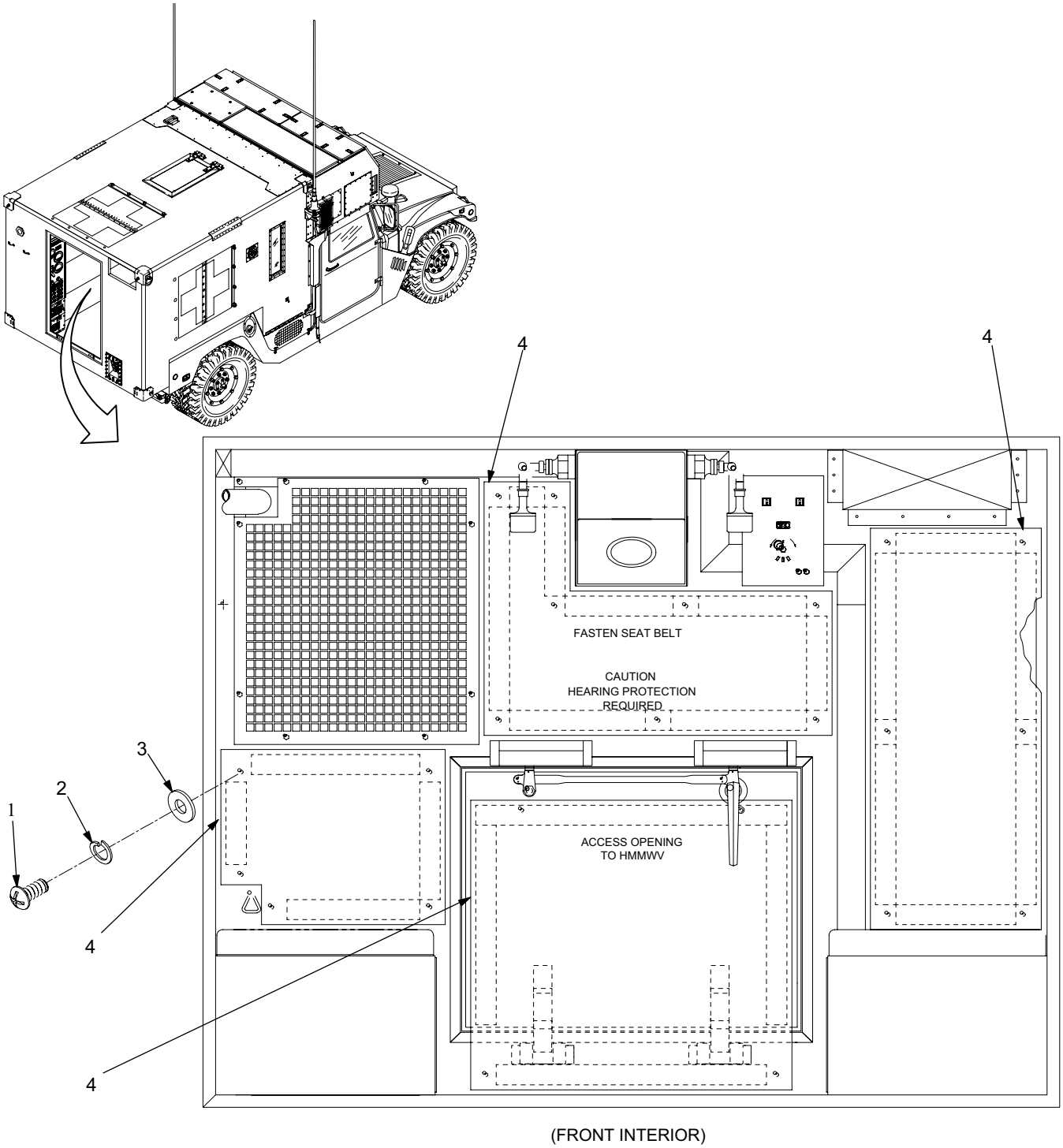


Figure 2-54. Sound Quilt Assembly Replacement (Sheet 1 of 6)

2.13.32 Sound Quilt Assembly Replacement – Continued.

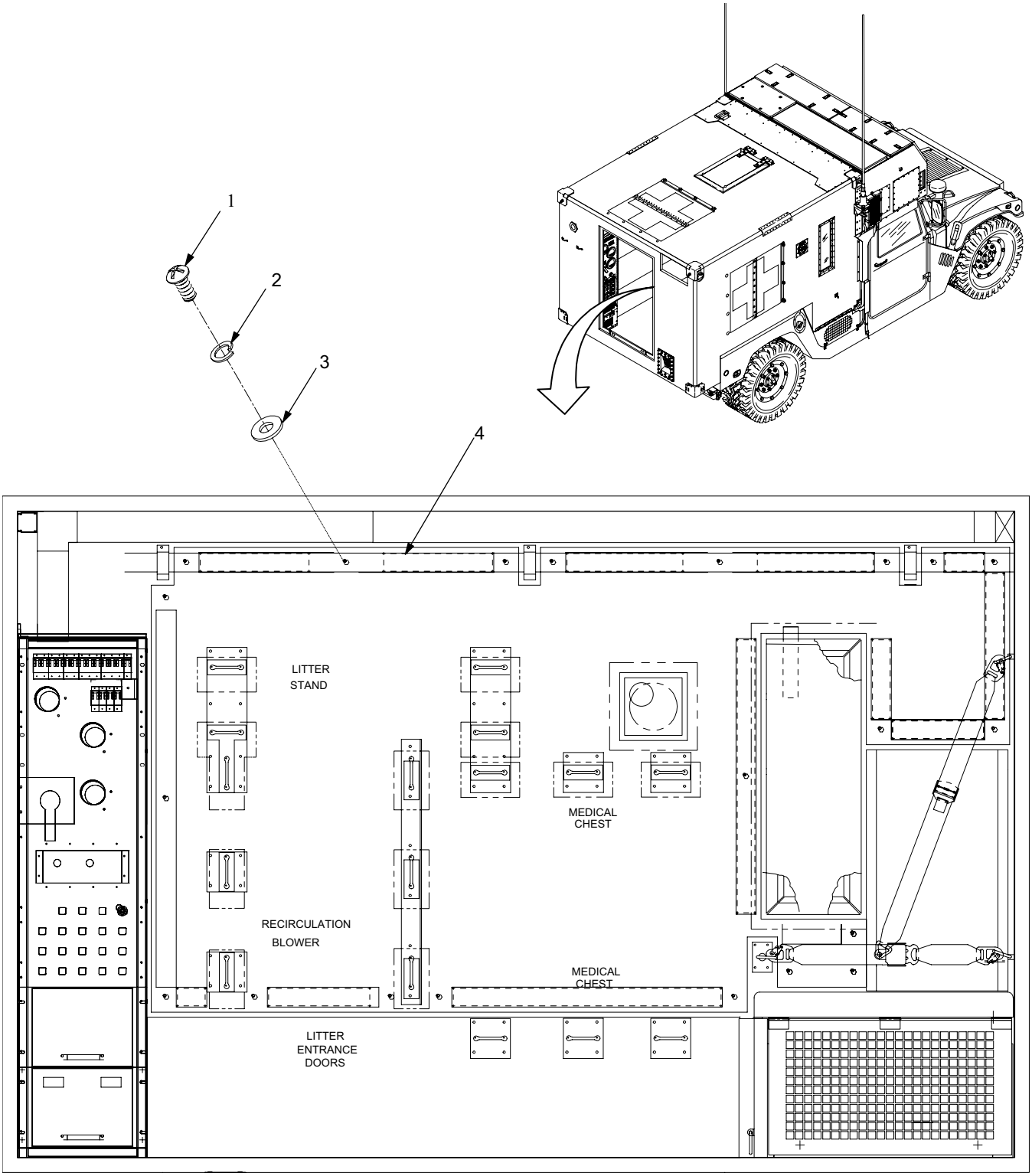


Figure 2-54. Sound Quilt Assembly Replacement (Sheet 2 of 6)

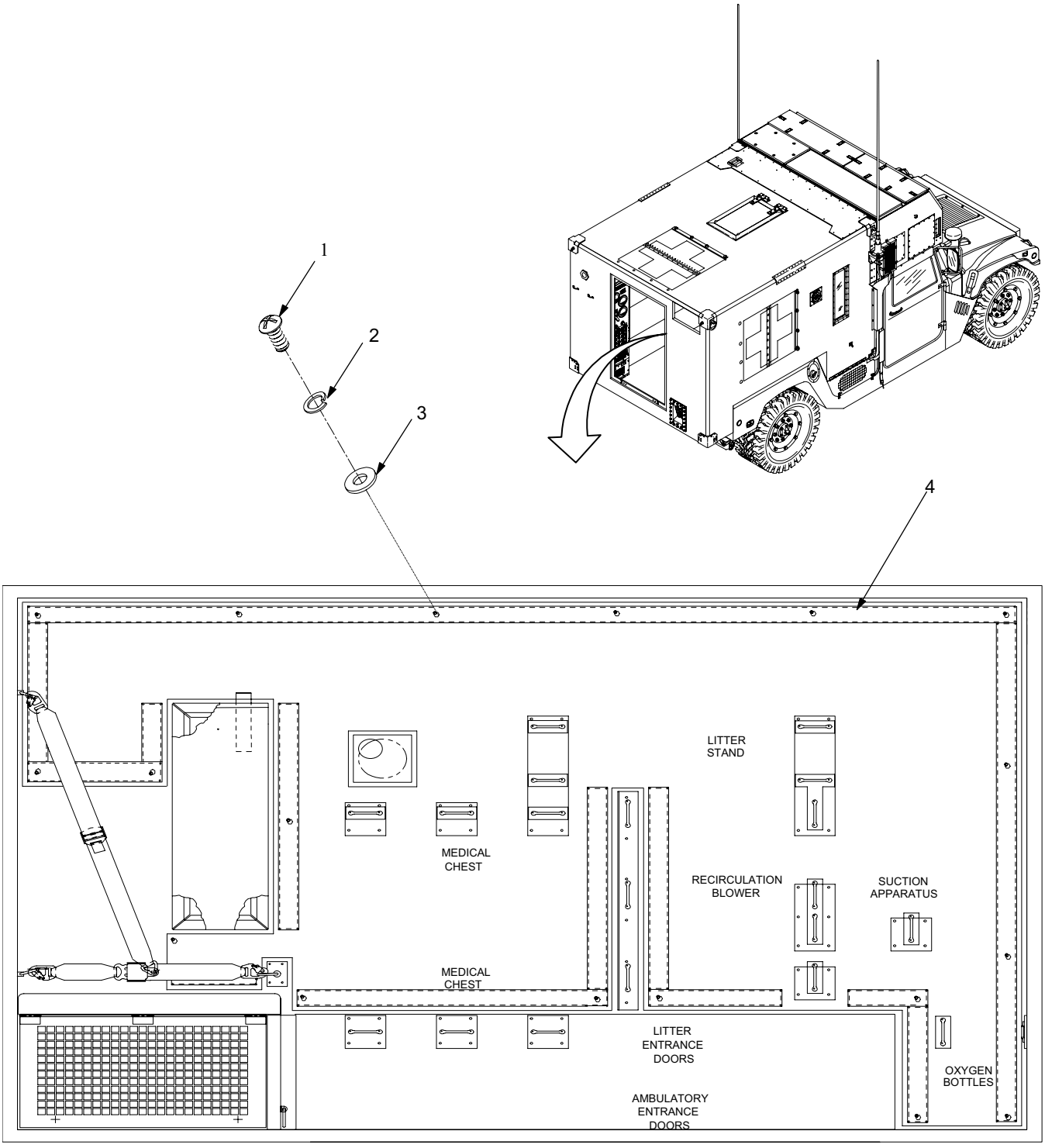


Figure 2-54. Sound Quilt Assembly Replacement (Sheet 3 of 6)

2.13.32 Sound Quilt Assembly Replacement – Continued.

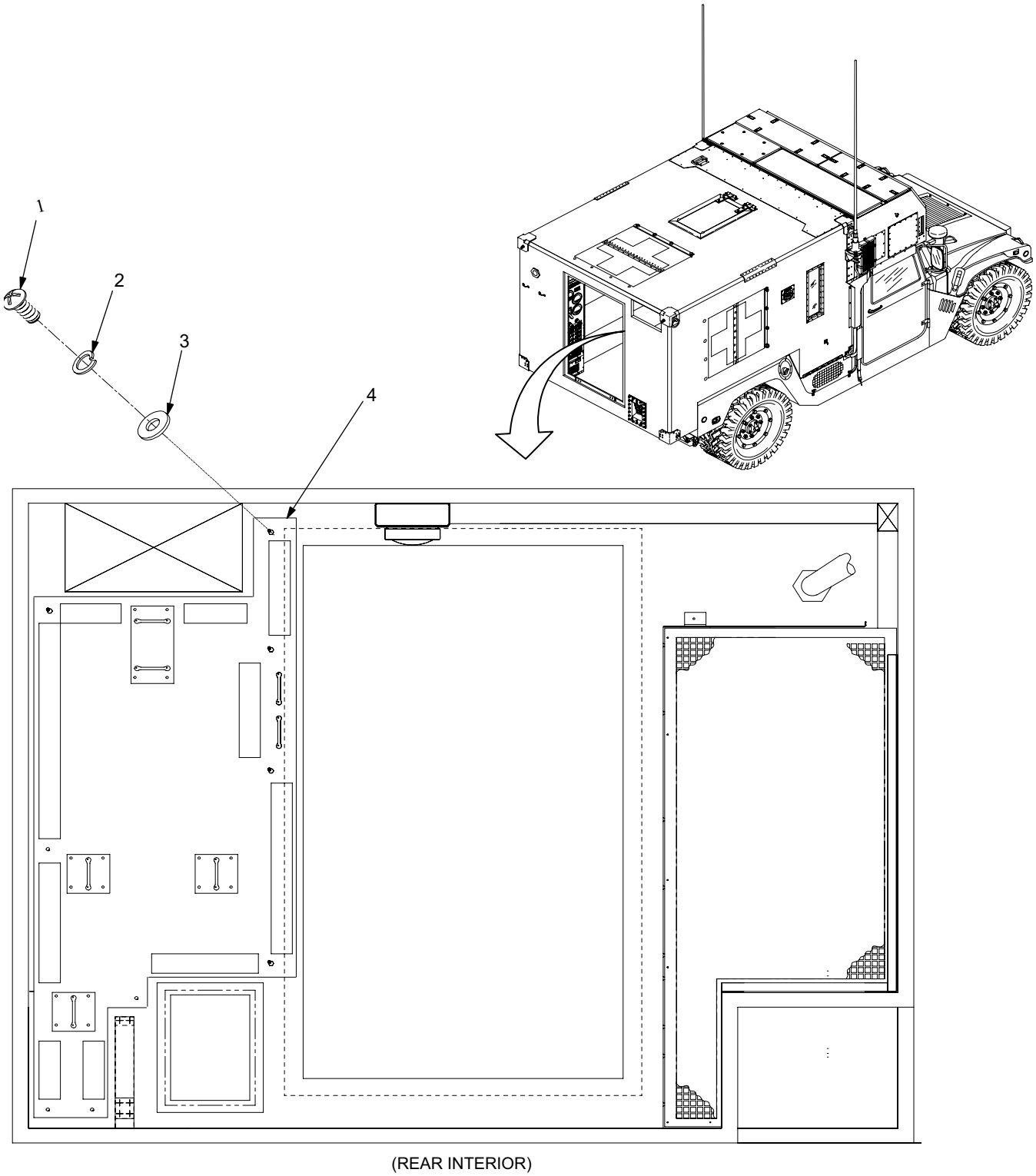


Figure 2-54. Sound Quilt Assembly Replacement (Sheet 4 of 6)

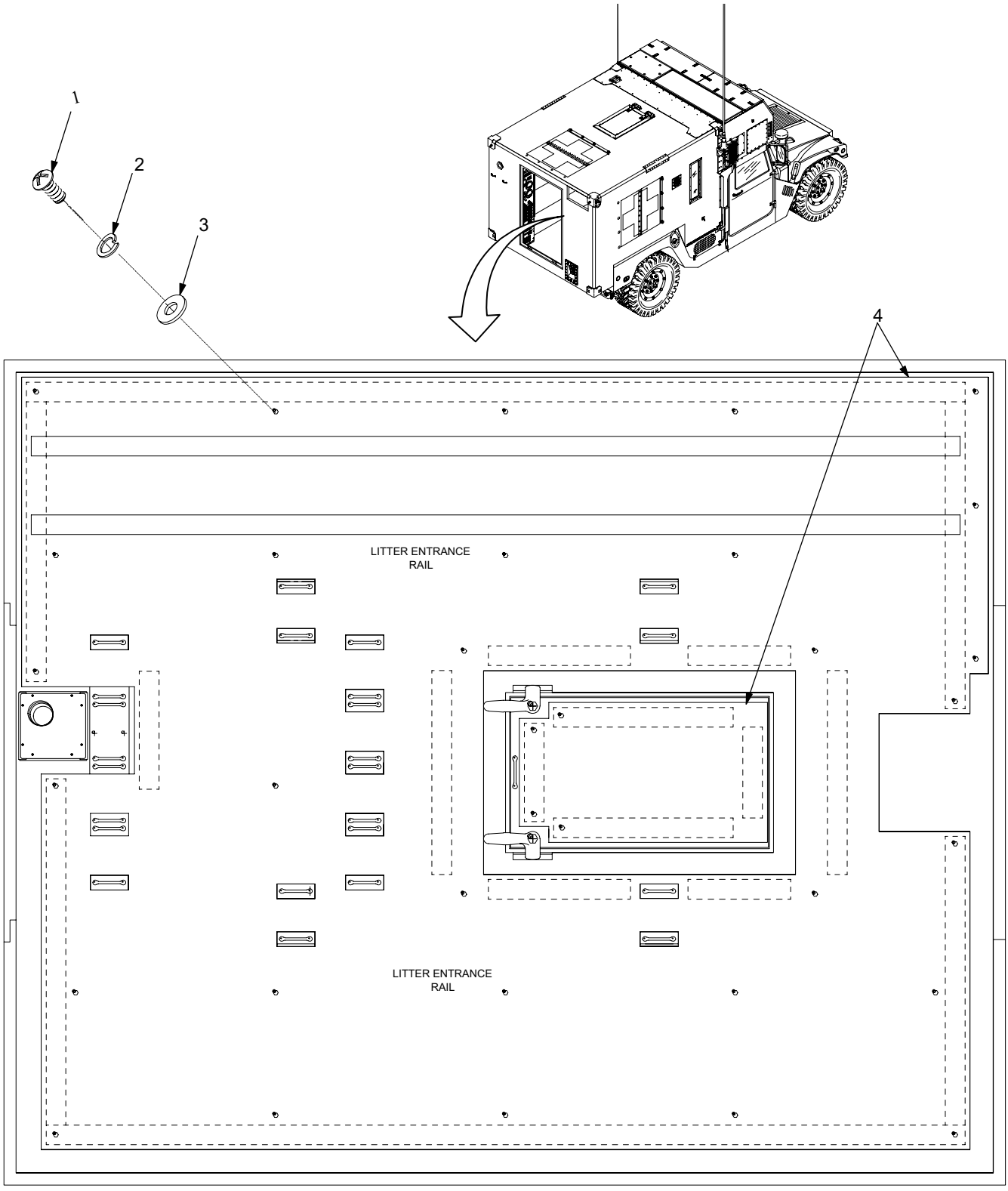


Figure 2-54. Sound Quilt Assembly Replacement (Sheet 5 of 6)

2.13.32 Sound Quilt Assembly Replacement – Continued.

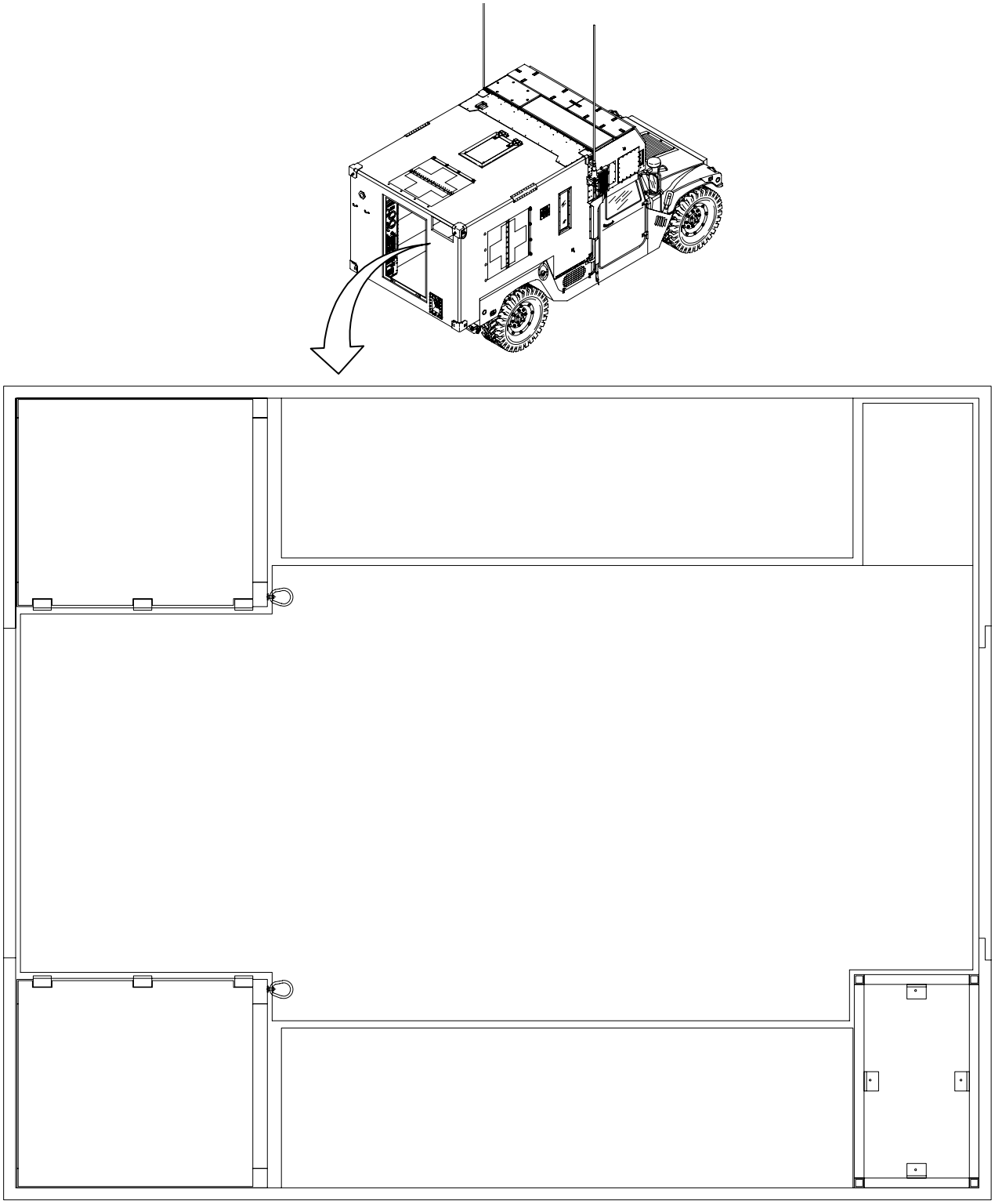


Figure 2-54. Sound Quilt Assembly Replacement (Sheet 6 of 6)

2.13.33 Grab Handle Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set.
Materials/Parts: Four Lockwashers (Item 17, Appendix E) Caulking Gun (Item 18, Appendix B) Sealer (Item 50, Appendix C)	Materials/Parts: (Cont.) Rubber Gloves (Item 25, Appendix C) Wiping Rags (Item 39, Appendix C) Isopropyl Alcohol (Item 12, Appendix C)

a. Removal

(1) Remove four screws (1), four lockwashers (2), and four flat washers (3) securing grab handle (4) to ECV mount plate (5). Discard lockwashers.

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(2) Clean adhesive residue from surface with rag dampened with alcohol.

b. Installation

(1) Using caulking gun, apply sealer (Item 50, Appendix C) to grab handle (4).

(2) Secure grab handle (4) to ECV mount plate (5) with four screws (1), four lockwashers (2) (Item 15, Appendix E) and four flat washers (3).

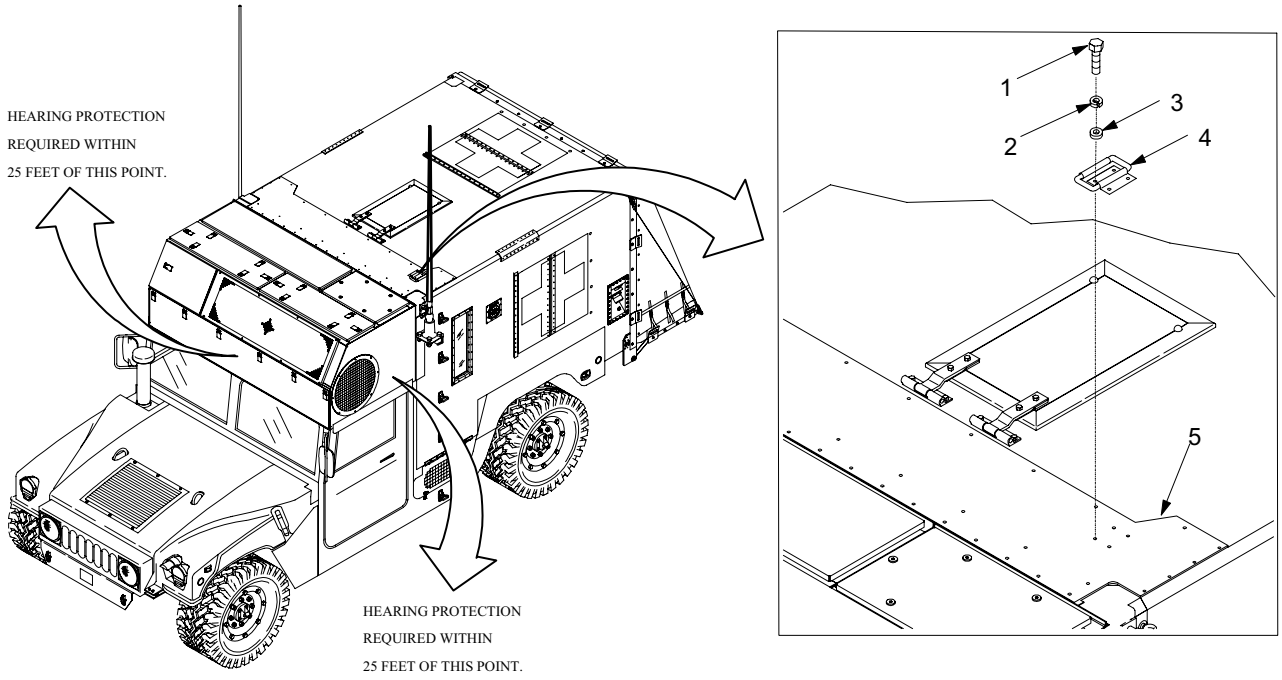


Figure 2-55. Grab Handle Replacement

2.14 ENVIRONMENTAL CONTROL UNIT (ECU).

2.14.1 ECU Covers/Screens Replacement.

This task covers:	
a. Removal	b. Installation

INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set. ECU work platform installed (reference TM 10-5410-228-10).
Materials/Parts: One Hundred and One Lockwashers (Item 18, Appendix E)	References: TM 10-5411-224-14

2.14.1.1 Passenger Side Rear Cover Assembly.

a. Removal (Refer to Figure 2-56)

Remove 32 screws (1), 32 lockwashers (2) and 32 flat washers (3) securing passenger side rear cover assembly (4) to ECU (5). Discard 32 lockwashers (2).

b. Installation (Refer to Figure 2-56)

Secure passenger side rear cover assembly (4) to ECU (5) with 32 screws (1), 32 new lockwashers (2) (Item 18, Appx E) and 32 flat washers (3).

2.14.1.2 Driver Side Rear Cover Assembly.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-56)

Release six vise action tool operated latches (6) securing driver side rear cover assembly (7) to ECU (5).

b. Installation (Refer to Figure 2-56)

Secure driver side rear cover assembly (7) to ECU (5) by latching six vise action tool operated latches (6).

2.14.1.3 Top Front Cover Assembly.

a. Removal (Refer to Figure 2-56)

Release six flush mounted latches (8) securing top front cover assembly (9) to ECU (5).

b. Installation (Refer to Figure 2-56)

Secure top front cover assembly (9) to ECU (5) by latching six flush mounted latches (8).

2.14.1.4 Venturi Screen.

a. Removal (Refer to Figure 2-56)

(1) Remove eight screws (10), eight lockwashers (11) and eight flat washers (12) securing venturi screen frame (13) to ECU (5). Discard eight lockwashers (11).

(2) Remove three screws (14) securing venturi weldment (15) to ECU (5) and remove venturi weldment (5).

b. Installation (Refer to Figure 2-56)

(1) Secure venturi weldment (15) to ECU (5) with three screws (14).

(2) Secure venturi screen frame (13) to ECU (5) with eight screws (10), eight new lockwashers (11) (Item 18, Appx E) and eight flat washers (12).

2.14.1.5 Condenser Coil Cover Assembly.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-56)

(1) Remove eight screws (16), eight lockwashers (17) and eight flat washers (18) securing condenser coil cover assembly (19) to ECU (5). Discard eight lockwashers (17).

(2) Release flush mounted latch (20) and remove condenser coil cover assembly (19) from ECU (5).

b. Installation (Refer to Figure 2-56)

(1) Secure condenser coil cover assembly (19) to ECU (5) with eight screws (16), eight new lockwashers (17) (Item 18, Appx E) and eight flat washers (18).

(2) Secure condenser coil cover assembly (19) to ECU (5) by latching flush mounted latch (20).

2.14.1.6 Side Access Cover Assembly.

a. Removal (Refer to Figure 2-56)

Remove twenty screws (21), twenty lockwashers (22) and twenty flat washers (23) securing side access cover assembly (24) to ECU (5). Discard twenty lockwashers (22).

b. Installation (Refer to Figure 2-56)

Secure side access cover assembly (24) to ECU (5) with twenty screws (21), twenty new lockwashers (22) (Item 18, Appx E) and twenty flat washers (23).

2.14.1.7 Prefilter Cover Assembly.

a. Removal (Refer to Figure 2-56)

Release ten quarter turn fasteners (25) securing prefilter cover assembly (26) to ECU (5) and remove prefilter cover assembly (26).

b. Installation (Refer to Figure 2-56)

Secure prefilter cover assembly (26) to ECU (5) with ten quarter turn fasteners (25).

2.14.1.8 Mist Eliminator.

a. Removal (Refer to Figure 2-56)

Remove six screws (27), six lockwashers (28) and six flat washers (29) securing mist eliminator (30) with six retaining clips (31) to the ECU (5). Discard six lockwashers (28).

b. Installation (Refer to Figure 2-56)

Secure mist eliminator (30) to ECU (5) with six retaining clips (31), six screws (27), six new lockwashers (28) (Item 18, Appx E) and six flat washers (29).

2.14.1 ECU Covers/Screens Replacement – Continued.

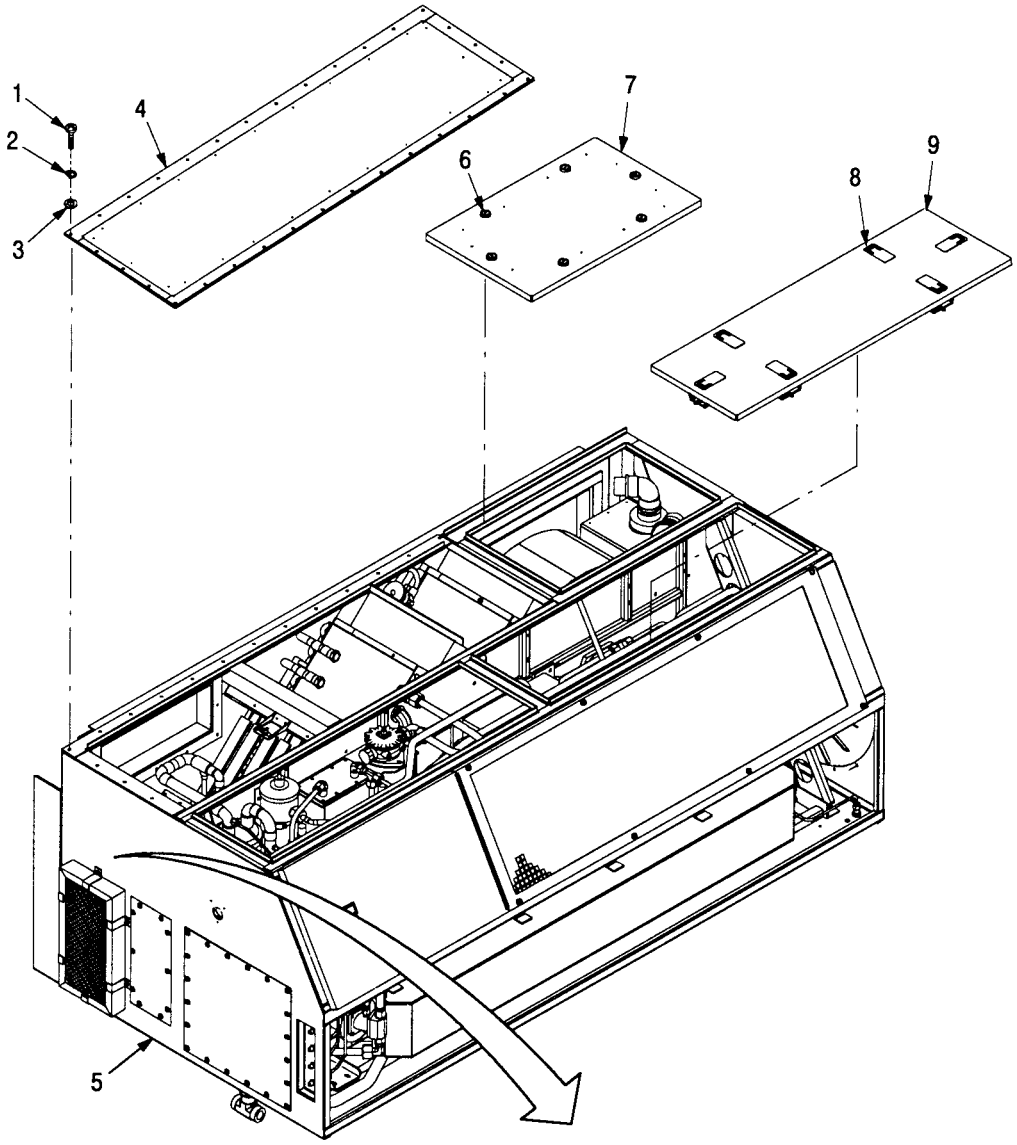


Figure 2-56. ECU Covers/Screens Replacement (Sheet 1 of 3)

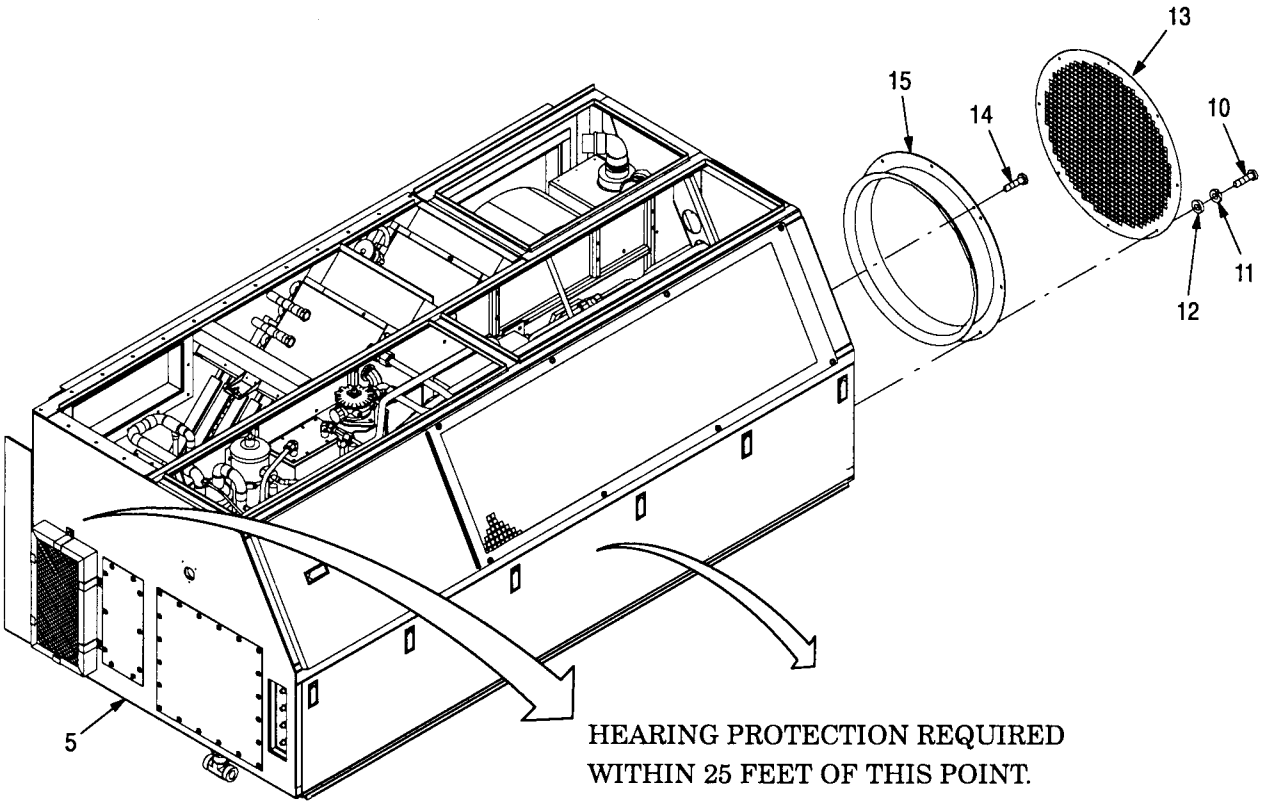


Figure 2-56. ECU Covers/Screens Replacement (Sheet 2 of 3)

2.14.1 ECU Covers/Screens Replacement – Continued.

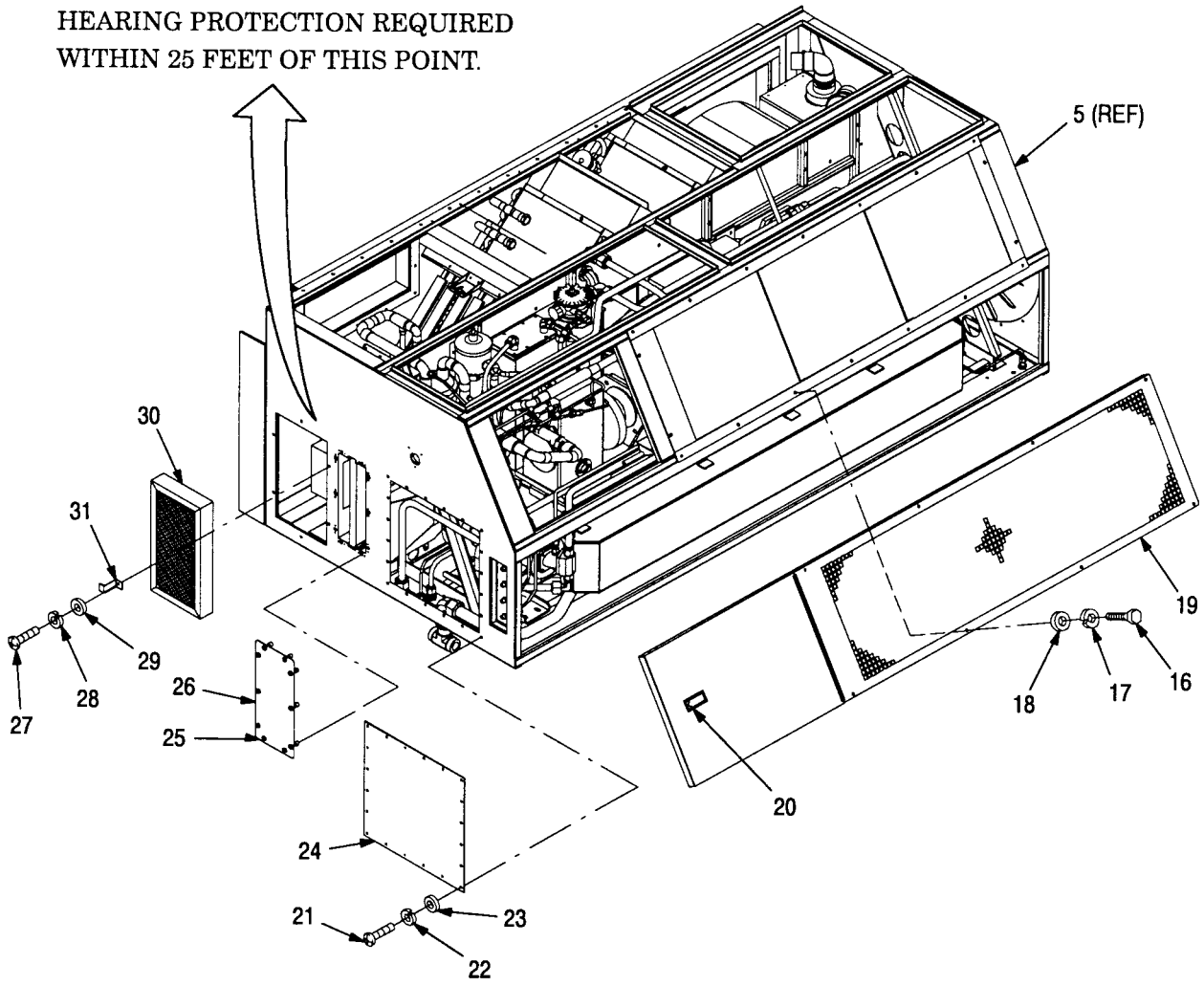


Figure 2-56. ECU Covers/Screens Replacement (Sheet 3 of 3)

Follow-on maintenance: Remove ECU work platform per para (refer to TM 10-5410-228-10).

2.14.2 Filter Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: ECV parking brake set. ECU work platform installed (reference TM 10-5410-228-10).
Materials/Parts: Filter (Item 1, Appendix E) Filter (Item 2, Appendix E)	References: TM 10-5410-228-10

a. Removal

(1) Lift covers, turn six allen screws (1) and remove driver side rear cover assembly (2) from ECU (3).

(2) Turn three screw heads (4) 90° and open hinged access door (5).

(3) Slide filter (6) out of ECU (3). Discard filter (6).

(4) Release ten screws (7) and remove prefilter cover assembly (8) from passenger side of ECU (3).

(5) Slide filter (9) out of ECU (3). Discard filter (9).

b. Installation

NOTE

Note direction of airflow arrow on filter when installing.

(1) Align new filter (9) in between rails and slide into ECU (3).

(2) Position prefilter cover assembly (8) and secure to passenger side of ECU (3) with ten screws (7).

(3) Align new filter (6) in between rails and slide into ECU (3).

(4) Close hinged access door (5) and turn three screw heads (4) 90° to secure.

(5) Position driver side rear cover assembly (2) on ECU (3) and turn six allen screws (1) to secure. Close covers.

HEARING PROTECTION REQUIRED WITHIN 25 FEET OF THIS POINT.

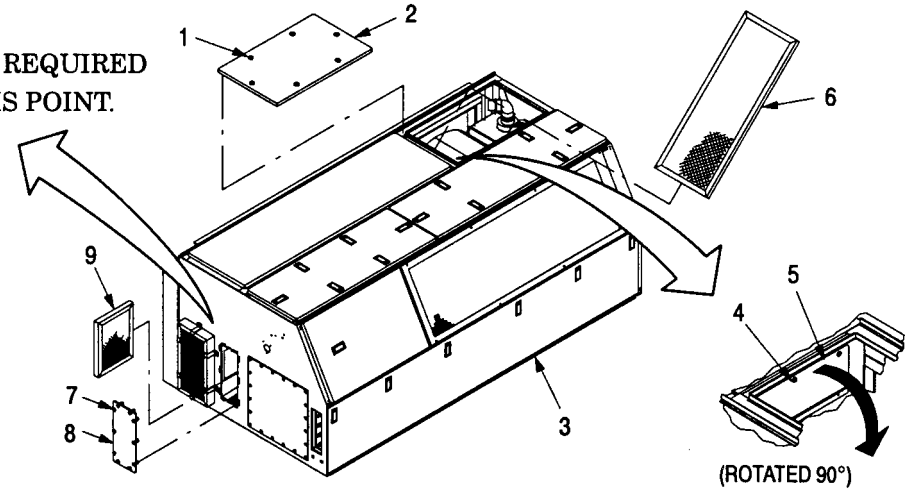


Figure 2-57. Filter Replacement

2.14.3 Drain/Fill Hydraulic System.

This task covers:
a. Drain
b. Fill

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Utility Funnel (Item 11, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
1-7/8 Inch Crowfoot Wrench (Item 63, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
55 Gallon Drum (Item 7, Appendix B)
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
O-ring (Item 60, Appendix E)
Nine Tie-down Straps (Item 86, Appendix E)

Equipment Conditions:
Power shut off. Power panel and rear control panel tagged.
Open and secure ECV hood (TM 9-2320-387-24).
ECU covers and doors opened or removed as required (see para 2.14.1).
ECV parking brake set.
ECV mirror removed (see TM 9-2320-387-24).
Hose guard removed (see para 2.11.4).

References:
TM 9-2320-387-24
TM 10-5410-228-10

a. Drain (Refer to Figure 2-58)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

CAUTION

Opening main hydraulic line before shutting off valve or draining hydraulic fluid from reservoir will cause hydraulic fluid to drain from the system.

(1) Verify that shut off valve (1) is OFF (valve handle 90_ to hose).

(2) Place 55 gallon drum (or suitable container) (2) on passenger side of ECV next to main hydraulic pump (3) in engine area.

(3) Disconnect hose (4) by loosening nut (5) from elbow (6) below shut off valve (1). Remove and discard O-ring from elbow (6).

(4) Cut tie-down straps as required and insert elbow (6) attached to hose (7) into funnel in drum (2).

(5) Open shut off valve (1). Hydraulic fluid will drain into drum (2).

(6) When hydraulic fluid is no longer flowing into drum (2), remove elbow (6) attached to hose (7) from funnel in drum (2).

(7) Check sealing surface and groove of elbow (6) and nut (5) for damage or material build up.

(8) Install new O-ring on elbow (6). Ensure O-ring is seated and retained properly.

(9) Lubricate O-ring on elbow (6) with light coating of hydraulic fluid.

(10) Install hose (4) on elbow (6) and tighten nut (5) finger tight.

(11) Torque nut (5) to 1,680 ± 90 in. lbs. or 140 ± 8 ft. lbs.

(12) Install new tie-down straps as required.

b. Fill (Refer to Figure 2-58)

CAUTION

Do not mix or substitute any other hydraulic fluid with MIL-H-5606.

NOTE

Install ECU work platform (reference TM 10-5410-228-10).

When filling the hydraulic reservoir, do not fill past the appropriate mark: COLD when system has not been running or has been running for less than 20 minutes; HOT when system has been running for more than 20 minutes. If hydraulic fluid is past the COLD mark when system has not been running, hydraulic fluid can overflow through the hydraulic reservoir filler cap.

When required, add just enough fluid to reach the mid-point on the gage. Start the system and let it reach operating temperature, then shut it off and check again. At 0_F and above, fluid can be checked before starting.

(1) Unscrew and remove filler cap (8) from hydraulic reservoir (9).

(2) Remove filter.

(3) Place funnel with flex spout into filler opening on hydraulic reservoir (9).

(4) Fill hydraulic reservoir (9) with hydraulic fluid.

(5) Inspect fluid level on gage (10) and add hydraulic fluid as necessary to bring level to above mid-point on gage.

(6) Remove funnel with flex spout from filler opening on hydraulic reservoir (9).

(7) Install filter.

(8) Install cap (8) onto hydraulic reservoir (9).

2.14.3 Drain/Fill Hydraulic System – Continued.

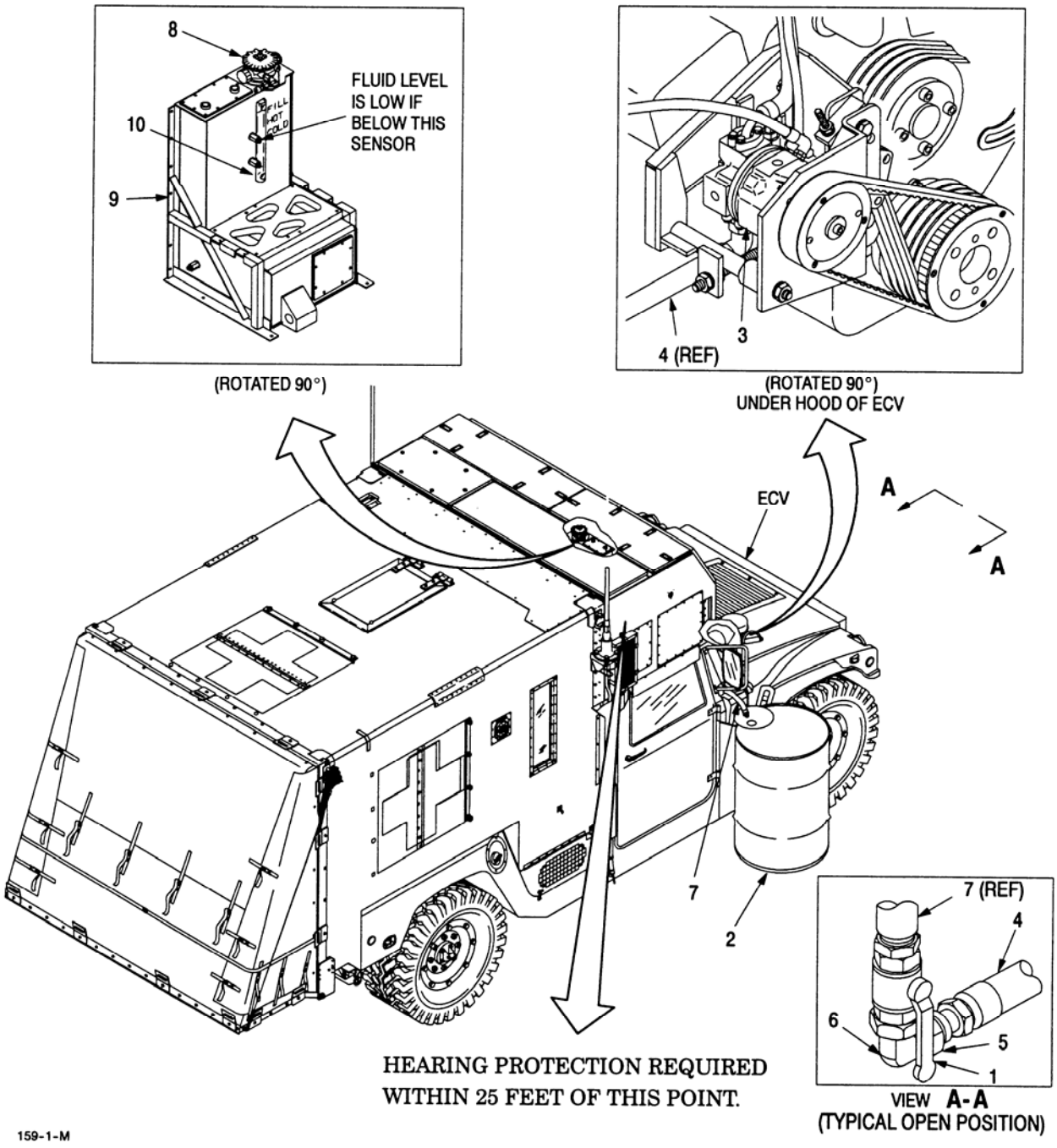


Figure 2-58. Drain/Fill Hydraulic System

Follow-on maintenance: Remove ECU work platform (reference TM 10-5410-228-10), remove tags, close ECV hood per TM 9-2320-387-10, install ECV mirror per TM 9-2320-387-24-1, install guard per para 2.11.4, close or install ECU covers and doors per para 2.14.1, prime hydraulic pump per para 2.12.8f, apply power and inspect for leaks. Dispose of hydraulic fluid per local regulations.

2.14.4 Solenoid Valve Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Multimeter (Item 27, Appendix B)
Power Supply (Item 29, Appendix B)
1 Inch Deep Well Socket - 1/2 Inch Drive (Item 44, Appendix B)
1-1/4 Inch Deep Well Socket - 1/2 Inch Drive (Item 46, Appendix B)
1-1/4 Inch Crowfoot Wrench (Item 58, Appendix B)
1 Inch Crowfoot Wrench (Item 56, Appendix B)
Torque Wrench (Item 66, Appendix B)

Equipment Conditions:
ECU covers and doors opened or removed as required (see para 2.14.1).
ECU work platform installed (reference TM 10-5410-228-10).
Hydraulic system drained (see para 2.14.3).

References:
TM 10-5410-228-10

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

O-rings are pre-installed on each solenoid valve.

The solenoid valves are all similar. Removal/installation is typical.

a. Removal (Refer to Figure 2-59)

(1) Disconnect and tag cable assembly 1A4A1W3 connectors P12, P13, P8, P10, P3 and P15 from solenoid valves SV1, SV2, SV4, SV5, SV6 and SV8 (respectively).

(2) Remove nut (1) and actuator (2) of each solenoid valve SV1, SV2, SV4, SV5, SV6 and SV8. Remove solenoid valve body (3) from hydraulic manifold (4).

(3) Disconnect and tag cable assembly 1A4A1W3 connector P16 from solenoid valve SV7.

(4) Remove nut (5) and actuator (6) of solenoid valve SV7. Remove solenoid valve body (7) from hydraulic manifold (4).

(5) Disconnect cable assembly 1A4A1W3 connector P14 from solenoid valve SV9.

(6) Remove nut (8) and actuator (9) of solenoid valve SV9. Remove solenoid valve body (10) from hydraulic manifold (4).

b. Installation (Refer to Figure 2-59)

(1) Install solenoid valve SV9 body (10) in hydraulic manifold (4). Ensure that O-rings are seated properly and not pinched. Tighten solenoid valve body (10) finger tight. Torque solenoid valve body (10) to 25 ft. lbs.

2.14.4 Solenoid Valve Replacement – Continued.

(2) Install actuator (9) on solenoid valve body (10). Install nut (8) finger tight. Torque nut (8) to 5 ft. lbs.

(3) Install solenoid valve SV7 body (7) in hydraulic manifold (4). Ensure that O-rings are seated properly and not pinched. Tighten solenoid valve body (7) finger tight. Torque solenoid valve body (7) to 35 ft. lbs.

(4) Install actuator (6) on solenoid valve body (7). Install nut (5) finger tight. Torque nut (5) to 5 ft. lbs.

(5) Install solenoid valve SV1, SV2, SV4, SV5, SV6 and SV8 valve bodies (3) in hydraulic manifold (4). Ensure that O-rings are seated properly and not pinched. Tighten each solenoid valve body (3) finger tight. Torque each solenoid valve body (3) to 35 ft. lbs.

(6) Install actuator (2) on solenoid valve body (3). Install nut (1) finger tight. Torque nut (1) to 5 ft. lbs.

(7) Connect cable assembly 1A4A1W3 connectors P12, P13, P8, P10, P3 and P15 to solenoid valves SV1, SV2, SV4, SV5, SV6 and SV8 (respectively). Remove tags. Press down and turn all override valves clockwise.

(8) Connect cable assembly 1A4A1W3 connector P16 to solenoid valve SV7. Remove tags.

(9) Connect cable assembly 1A4A1W3 connector P14 to solenoid valve SV9. Remove tags.

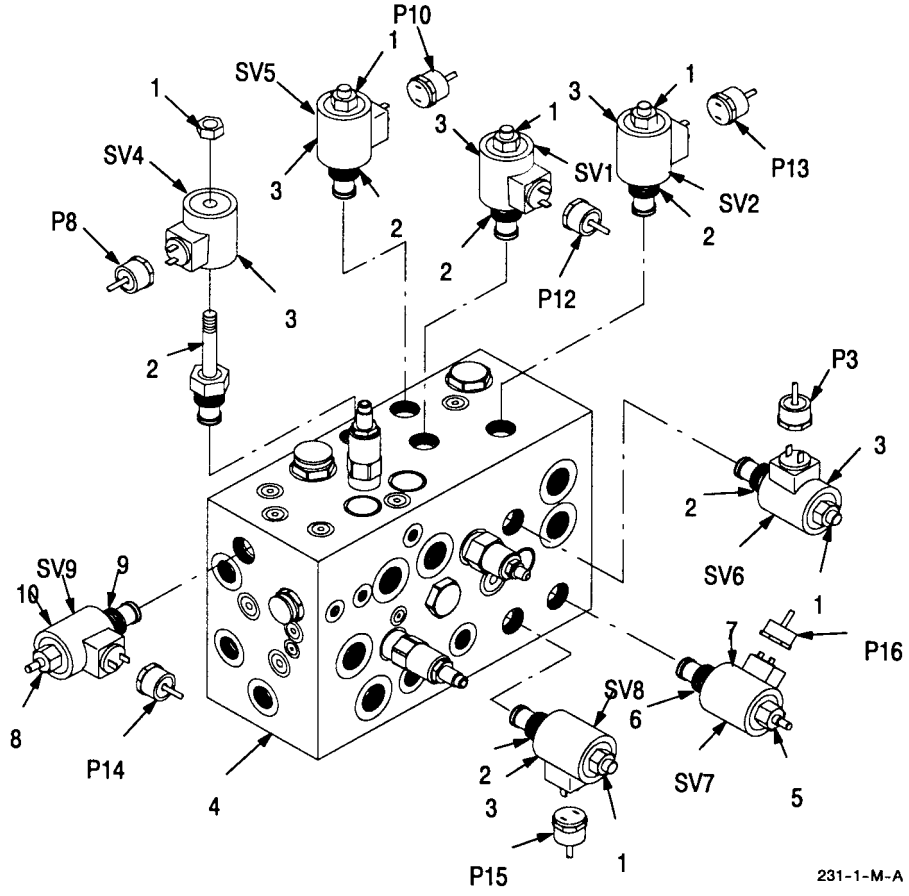


Figure 2-59. Solenoid Valve Replacement

Follow-on maintenance: Fill hydraulic system per para 2.14.3, install or close ECU covers and doors per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

2.14.5 Hydraulic Manifold Valve Replacement.

This task covers:
a. Removal
b. Installation
c. Primary Hydraulic Pump Output Pressure and Relief Valve Adjustment
d. Speed Control Adjustment
e. Auxiliary Power Adjustment

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)
Gage, Differential, Dial Indicatin (Air Flow) (Item 13, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Power Supply (Item 29, Appendix B)
7/8 Inch Deep Well Socket - 1/2 Inch Drive (Item 43, Appendix B)
1 Inch Deep Well Socket - 1/2 Inch Drive (Item 44, Appendix B)
1-1/8 Inch Deep Well Socket - 1/2 Inch Drive (Item 45, Appendix B)
1-1/4 Inch Deep Well Socket - 1/2 Inch Drive (Item 46, Appendix B)
Strobe Light Kit (Item 25, Appendix B)
Torque Wrench (Item 66, Appendix B)

Tools/Test Equipment: (Cont.)
Test Pressure Gage (Item 12, Appendix B)
3mm Hex Key (Figure D-21, Appendix D)

Equipment Conditions:
ABS deployed and unrolled (reference TM 10-5410-228-10).
ECU covers and doors opened or removed as required (see para 2.14.1).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 9-2320-387-24-1
TM 10-5410-228-10

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

O-rings are pre-installed on each valve.

a. Removal (Refer to Figure 2-60)
   (1) Unscrew valves CV1 through CV3 and remove from hydraulic manifold (1).
   (2) Unscrew valve SL1 and remove from hydraulic manifold (1).
   (3) Unscrew valve PD1 and remove from hydraulic manifold (1).
   (4) Loosen nut (2) on valves RD1 and RD2. Remove valves RD1 and RD2 from hydraulic manifold (1).
   (5) Unscrew valve FP3 and remove from hydraulic manifold (1).
   (6) Loosen nut (3) on valves FP1, FP2 and FP5. Remove valves FP1, FP2 and FP5 from hydraulic manifold (1).
   (7) Loosen nut (4) on valve FP6. Remove valve from hydraulic manifold (1).
   (8) Unscrew valve LS3 and remove from hydraulic manifold (1).

2.14.5 Hydraulic Manifold Valve Replacement – Continued.

b. Installation (Refer to Figure 2-60)

(1) Screw valve LS3 into hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Tighten valve LS3 finger tight. Torque valve to 20 ft. lbs.

(2) Install valve FP6 in hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Tighten nut (4) finger tight. Torque nut (4) to 30 to 35 ft. lbs.

(3) Install valves FP1, FP2, and FP5 in hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Tighten nut (3) finger tight. Torque each nut (3) to 45 to 50 ft. lbs.

(4) Screw valve FP3 into hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Tighten valve FP3 finger tight. Torque valve to 15 to 20 ft. lbs.

(5) Install valves RD1 and RD2 in hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Tighten nut (2) finger tight. Torque each nut (2) to 20 to 25 ft. lbs.

(6) Screw valve PD1 into hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Torque valve to 30 to 35 ft. lbs.

(7) Screw valve SL1 into hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Torque valve to 20 to 25 ft. lbs.

(8) Screw valves CV1 through CV3 into hydraulic manifold (1). Ensure that O-rings are seated properly and not pinched. Torque each valve to 20 to 25 ft. lbs.

c. Primary Hydraulic Pump Output Pressure and Relief Valve Adjustment (Refer to Figure 2-60)

NOTE

Steps 1 through 19 are for adjusting the primary hydraulic pump output pressure and relief valve.

(1) Set POWER MODE selector switch to INT. On rear control panel, set MISSION PROFILE switch to STATIC. Set ESS MODE selector switch to OFF.

(2) Disconnect hydraulic coupling (5) from large diameter hydraulic pump pressure hose (6), located on the driver side of ECV, below the window frame. Install test pressure gage in hydraulic pump pressure hose (6).

(3) Remove gage from test pressure gage. Connect flexible drain hose to gage port on tee. Position container at end of hose to catch hydraulic fluid.

(4) Disconnect fuel solenoid from ECV engine per TM 9-2320-387-24-1.

(5) Crank ECV engine to force air out of primary hydraulic pump and lines.

(6) Reconnect fuel solenoid to ECV engine per TM 9-2320-387-24-1.

(7) Remove flexible drain hose from gage port on tee. Reconnect gage to test pressure gage.

NOTE

Alternate method: Connect hose to tee and install gage on other end of hose. This will allow the maintainer to view the gage while adjusting pressure.

(8) Start ECV engine.

NOTE

When loosening nut, ensure sealing washer is not lost.

(9) Check gage indication on test pressure gage. Indication should be 300 to 350 psi. If indication is not correct, remove the outermost acorn nut and seal ring (7) from hydraulic pump control valve. Loosen nut and rotate screw clockwise to increase pressure and counterclockwise to decrease pressure. After pressure is correctly adjusted, tighten locknut and install acorn nut.

(10) Shut off ECV.

(11) Disconnect load sense quick disconnect and connect it to small male quick disconnect on test pressure gage.

(12) Locate main system relief valve RD1 on hydraulic manifold (1). Loosen locknut (8) bottom out adjusting screw (9) and back off 1/4 turn.

NOTE

When loosening nut, ensure sealing washer is not lost.

(13) Remove inboard acorn nut and sealing ring (10) from primary hydraulic pump pressure control valve. Loosen locknut and adjust allen screw one turn counterclockwise.

(14) Start ECV engine and set EPG switch on vehicle control box to ON.

WARNING

Hydraulic tubing may become hot when system has been running. Avoid contact to prevent injury to personnel.

(15) On primary hydraulic pump (11), adjust pump pressure control valve allen screw (12) clockwise until gage reads 3,300 to 3,325 psi.

(16) Rotate adjusting screw (9) on RD1 counterclockwise until pressure reading drops to 3,250 to 3,275 psi.

(17) On primary hydraulic pump (11), adjust pump pressure control valve allen screw (12) counterclockwise until gage reads 3,150 to 3,200 psi.

(18) Set EPG switch to OFF and shut ECV OFF.

(19) Reconnect load sense line.

(20) Locate relief valve RD2 Using 3/4 inch wrench, loosen locknut (8) and rotate adjustment screw (9) fully counterclockwise.

(21) Start ECV engine and set EPG switch on vehicle control box to ON.

(22) Set ESS MODE switch to HEAT and temperature control knob to highest setting.

(23) Using 1/4 inch hex key rotate adjustment screw on RD2 clockwise until pressure increases to 2,600 to 2,700 psi. If pressure is not achieved, check all solenoid valves for proper operation.

(24) Tighten locknut on RD2.

(25) Set ESS MODE switch to OFF.

(26) Set EPG switch to OFF and shut ECV OFF.

NOTE

Whenever flow control valves FP1, FP2, FP5 AND FP6 are replaced, the following speed control adjustment needs to be preformed. Flow control valve FP3 is not adjustable.

d. Speed Control Adjustment (Refer to Figure 2-60)

NOTE

Steps 1 through 8 are for adjusting speed controls in NBC mode.

(1) Gain access to NBC C-face adapter (13). Remove access cover from NBC C-face adapter (13).

(2) Start ECV engine and set EPG switch on vehicle control box to ON.

(3) Set POWER MODE selector switch to INT. On rear control panel, set MISSION PROFILE switch to STATIC. Set ESS MODE selector switch to VENT and set NBC FAN switch to ON.

(4) Using strobe, check rpm of NBC centrifugal fan (14) through NBC C-face adapter (13) access opening

2.14.5 Hydraulic Manifold Valve Replacement – Continued.

CAUTION

ECV engine rpm should not be adjusted above 1,500 rpm to obtain 8,950 to 9,050 rpm at NBC fan. If ECV engine adjustment above 1,500 rpm is required, other problems are indicated.

(5) Verify that NBC fan (14) is rotating at 8,950 to 9,050 rpm. If required, notify direct support to adjust EPG to obtain 8,950 to 9,050 rpm at NBC fan (14). Do not exceed ECV engine speed of 1,500 rpm.

(6) Set EPG switch on vehicle control box to OFF and shut off ECV.

(7) Start ECV engine and set EPG switch on vehicle control box to ON.

(8) Verify that NBC fan (14) rotates at 8,950 to 9,050 rpm.

NOTE

Steps 9 and 10 are for adjusting speed controls in non-NBC mode.

(9) Leave ESS MODE selector switch on VENT and set NBC FAN switch to OFF.

NOTE

Rotating adjusting screw on valve FP2 counterclockwise decreases NBC centrifugal fan speed and clockwise increases NBC fan speed.

(10) Loosen locknut (15) on valve FP2 and rotate adjusting screw (16) as required to obtain 6,000 to 6,100 rpm at NBC fan (14). Tighten locknut (15).

NOTE

Steps 11 through 18 are for adjusting speed controls in non-NBC VENT mode.

(11) Leave ESS MODE selector switch on VENT and ensure NBC FAN switch is ON.

(12) Gain access to recirculation fan.

(13) Using strobe light, check that recirculation fan is rotating at 1,550 to 1,659 rpm.

NOTE

Rotating adjusting screw on valve FP6 counterclockwise increases recirculation fan speed and clockwise decreases recirculation fan speed.

(14) If adjustment is required, loosen locknut (17) on valve FP6 and rotate adjusting screw (18) to obtain 1,550 to 1,659 rpm. Tighten locknut (17).

(15) From top of ECU, disconnect flexible hose (19) from rib fan (20). Connect dial indicatin differential gage (air flow) to rib fan (20).

CAUTION

To prevent damage to rib fan due to overheating, do not block air flow for more than one minute.

NOTE

Fluctuation of gage indication should be expected.

(16) On rear control panel, set RIB FAN switch ON. Momentarily block off air flow through dial indicatin differential gage (air flow) by rotating valve to closed position.

(17) Check gage indication for a reading of 4.2 psi.

NOTE

Rotating adjusting screw on valve FP5 counterclockwise decreases air pressure and clockwise increases air pressure.

(18) If pressure indication is greater than 4.2 psi, loosen locknut (15) on valve FP5 and rotate adjusting screw (16) as required to obtain 4.2 psi. Tighten locknut (15).

NOTE

Steps 19 through 23 are for adjusting speed controls in mobile mode.

(19) Start ECV and set EPG switch on vehicle control box to ON.

(20) Set POWER MODE selector switch to INT. On rear control panel, set MISSION PROFILE switch to MOBILE. Set ESS MODE selector switch to VENT.

(21) Gain access to NBC fan (14).

(22) Using strobe light, check that NBC fan (14) is rotating at 6,000 to 6,100 rpm.

NOTE

Rotating adjusting screw on valve FP1 counterclockwise increases NBC fan speed and clockwise decreases NBC fan speed.

(23) If adjustment is required, loosen locknut (15) on valve FP1 and rotate adjusting screw (16) to obtain 6,000 to 6,100 rpm. Tighten locknut (15).

(24) Set EPG switch on vehicle control box to OFF and shut off ECV.

e. Auxiliary Power Adjustment (Refer to Figure 2-60)

(1) Connect power cable from 10 kW TQG to power panel, J2 plug and connect ground leads from power panel and 10 kW TQG to ground stake.

(2) On rear control panel, set HYDRAULIC PUMP/MOTOR circuit breaker ON.

(3) On converter, set AC INPUT to ON and DC output switch to ON.

(4) Set POWER MODE selector switch to EXT. On rear control panel, set MISSION PROFILE switch to STATIC.

(5) Set circuit breaker on power panel ON.

(6) Remove access panel (21) from auxiliary power pack adapter (22), located between hydraulic pump (23) and AC motor (24).

(7) Jog the EXTERNAL HYDRAULIC PUMP switch on the rear control panel. Verify that motor/pump coupling rotates upward.

(8) If coupling does not rotate upward, check for correct phase input from the 10 kW TQG.

(9) Set ESS MODE selector switch to OFF and MISSION PROFILE switch to STATIC.

(10) Set EXTERNAL HYDRAULIC PUMP switch on the rear control panel ON.

(11) Set ESS MODE selector switch to VENT, and NBC FAN switch ON.

NOTE

AC motor power leads can be accessed in the wheel well or behind the rear control panel per para 2.13.27.

If AC motor power leads (cable 1A4W3) are accessed behind the rear control panel, guard must be removed per para 2.13.20 or para 2.13.21.

(12) Connect clamp type amp meter to AC motor (24) power leads (black) and check amp indication. AC motor (24) should draw 24.5 amps (maximum).

2.14.5 Hydraulic Manifold Valve Replacement – Continued.

(13) If amp draw is incorrect, remove plastic cap from hydraulic pump control valve (7). Loosen large, outer locknut on hydraulic pump control valve (7). Rotate entire barrel less than one half turn to obtain 24.5 amps (maximum) on meter. Tighten locknut.

(14) Set ESS MODE selector switch to COOL, NBC FAN switch should be OFF.

(15) Loosen small locknut on hydraulic pump control valve (7). Using 3mm hex key, adjust allen screw to obtain 24.5 amps (maximum).

(16) Set NBC FAN switch ON. Observe any amperage change on meter.

(17) Loosen large locknut on hydraulic pump control valve (7). Rotate entire barrel less than one half turn to obtain 24.5 amps (maximum) on meter. Tighten locknut.

(18) Repeat steps 13 through 17 to obtain 24.5 amp (maximum) draw in both NBC modes.

NOTE

It may not be possible to adjust to 24.5 amps in both NBC modes. After several attempts, adjust to 24.5 amps in VENT mode, then adjust in COOL mode as close to 24.5 amps as is possible without exceeding 24.5 amps in VENT mode.

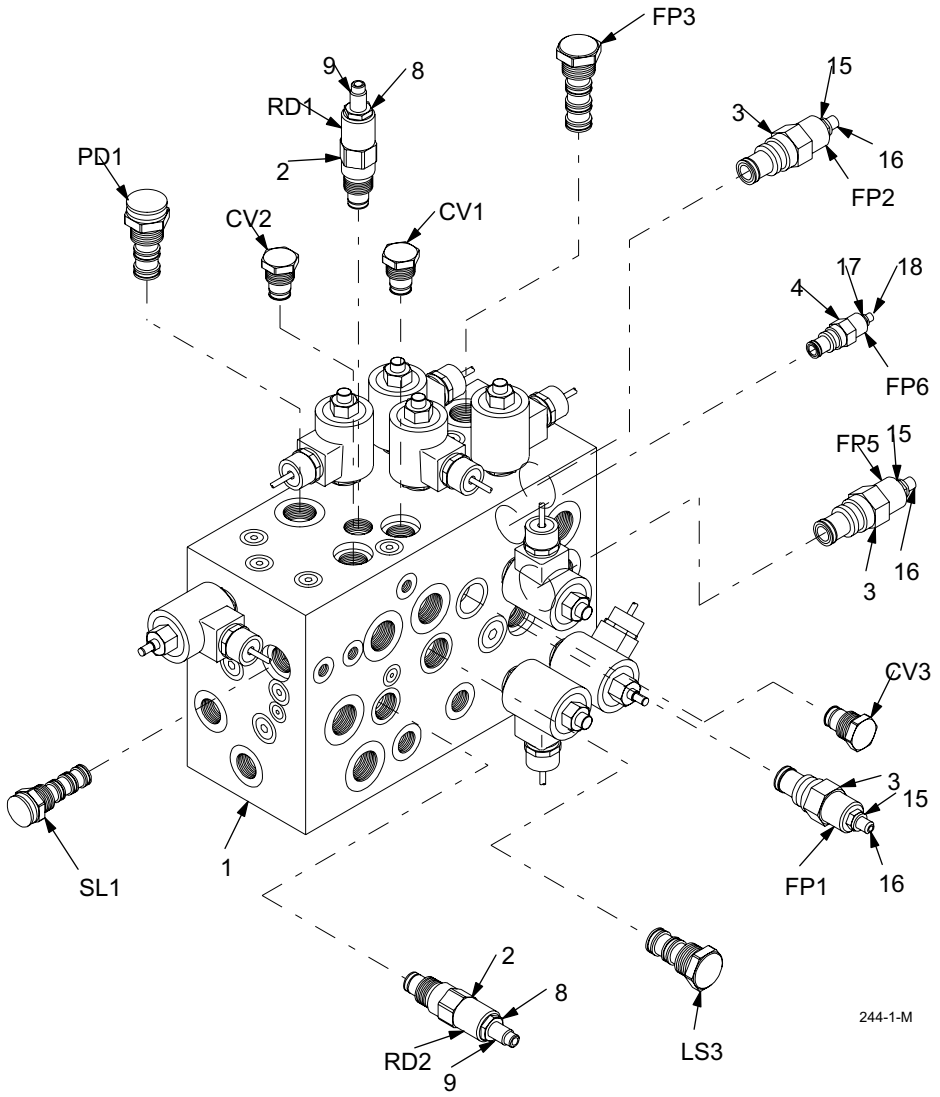


Figure 2-60. Hydraulic Manifold Valve Replacement (Sheet 1 of 3)

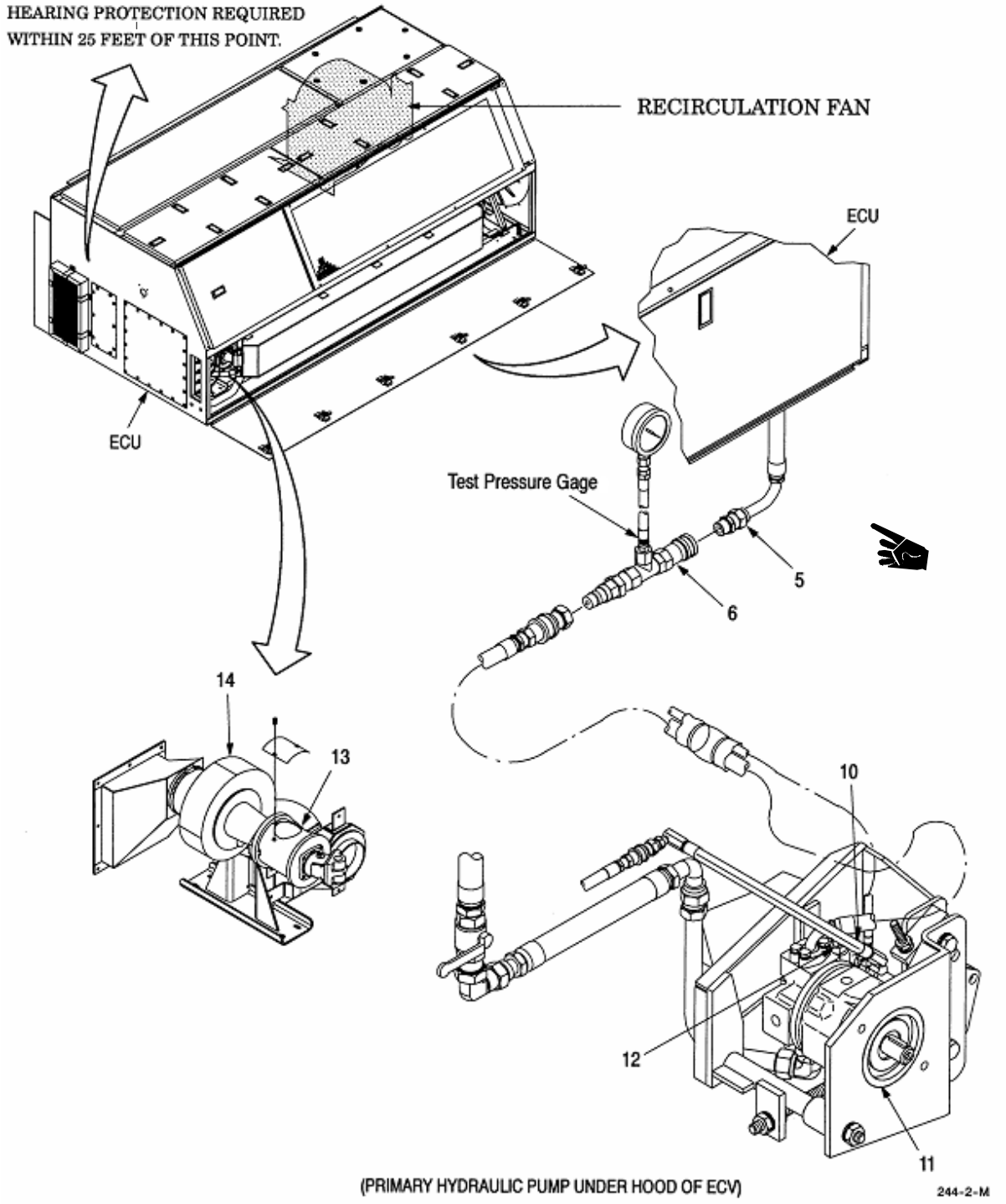


Figure 2-60. Hydraulic Manifold Valve Replacement (Sheet 2 of 3)

2.14.5 Hydraulic Manifold Valve Replacement – Continued.

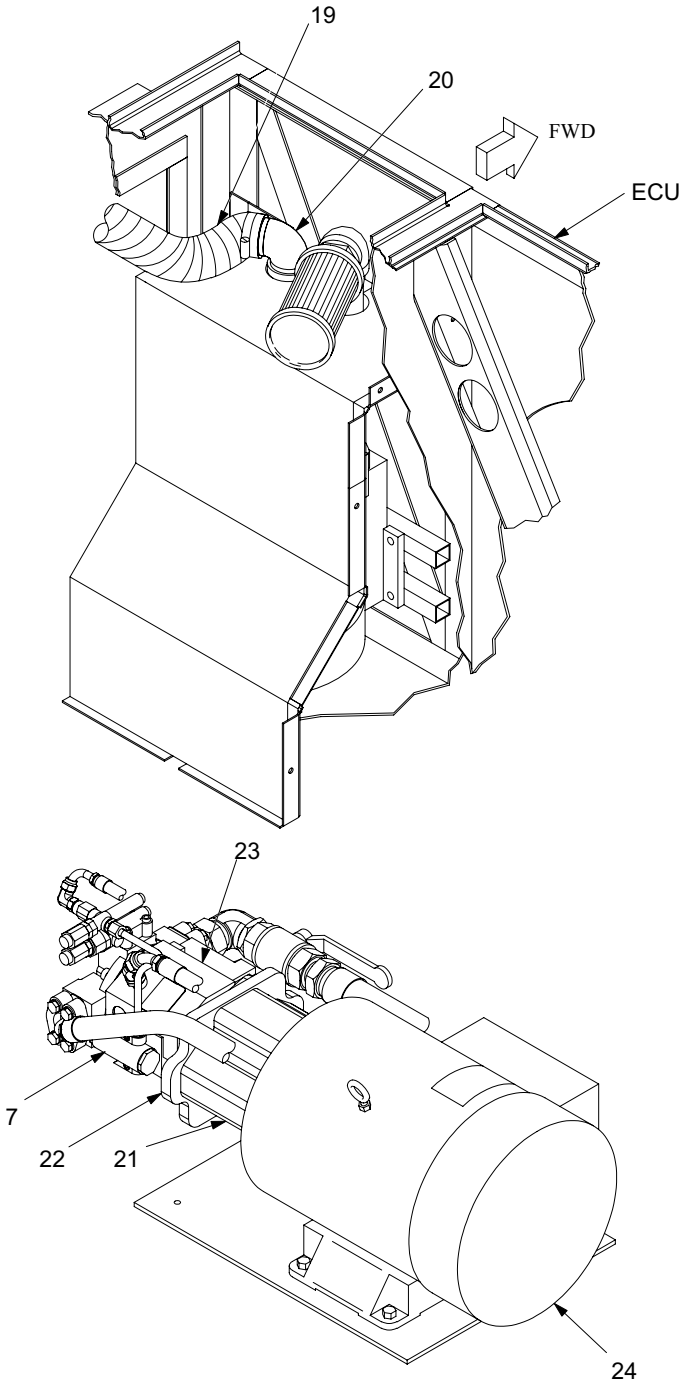


Figure 2-60. Hydraulic Manifold Valve Replacement (Sheet 3 of 3)

Follow-on maintenance: Install or close ECU covers and doors, remove ECU work platform (reference TM 10-5410-228-10).

2.14.6 Thermistor Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: Power shut off. Power panel and rear control panel tagged. ECV parking brake set. LMS guard removed (see para 2.13.15).

a. Removal

(1) Remove screw (1) and clamp (2) securing thermistor A1RT1 (3) to recirculation fan (4).

(2) Disconnect thermistor connector (5) from cable assembly 1A4A1W1 connector P1.

b. Installation

(1) Connect thermistor connector (5) to cable assembly 1A4A1W1 connector P1.

(2) Secure thermistor (3) to recirculation fan (4) with screw (1) and clamp (2).

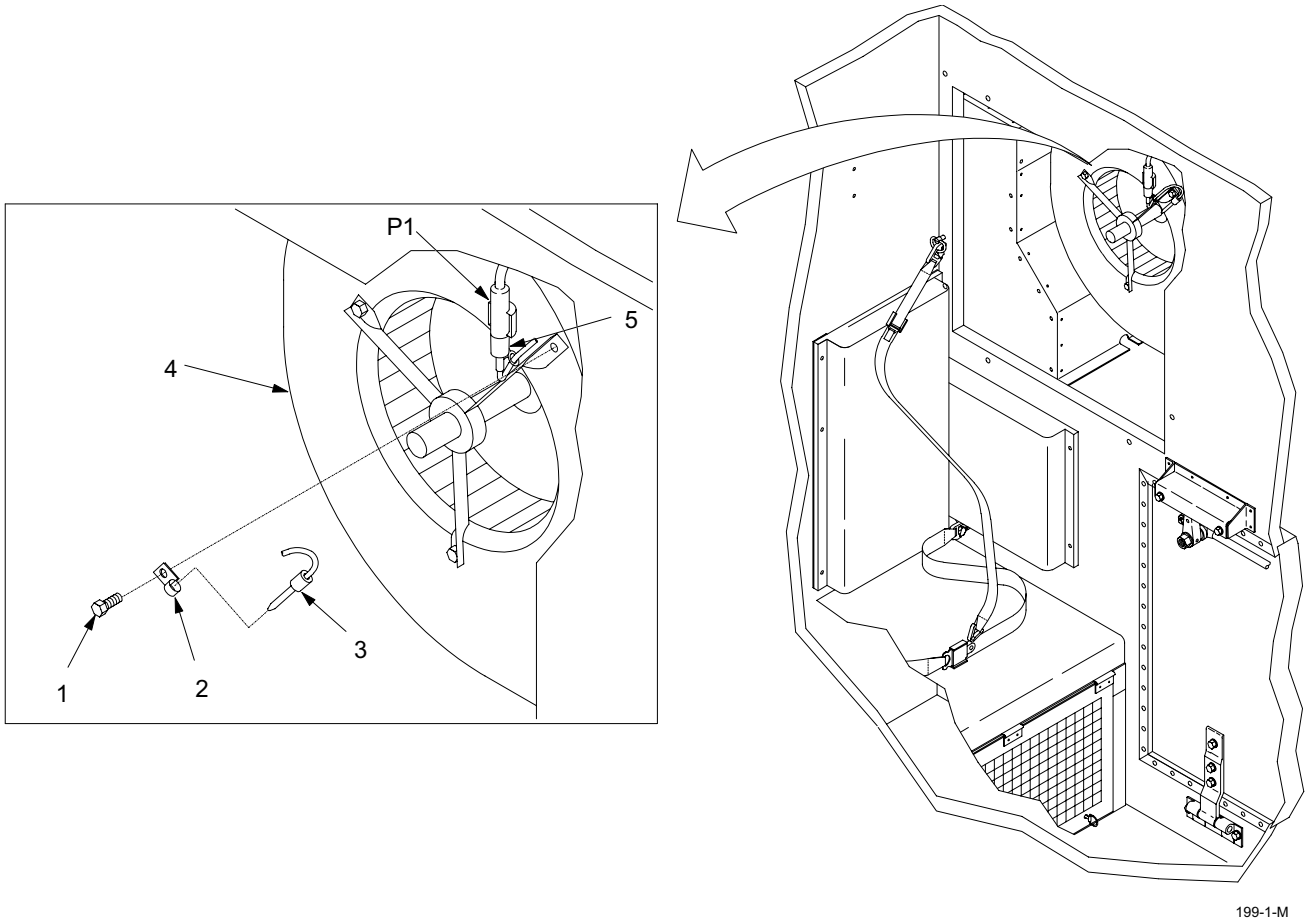


Figure 2-61. Thermistor Replacement

Follow-on maintenance: Install LMS guard per para 2.13.15, remove tags, apply power and perform operational test.

2.14.7 Overheat Switch Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Materials/Parts: Two Lockwashers (Item 18, Appendix E)	Equipment Conditions: Power shut off, power panel and rear control panel tagged. ECV parking brake set. ECU doors and covers open or removed as required (see para 2.14.1). ECU work platform installed (reference TM 10-5410-228-10). References: TM 10-5410-228-10

a. Removal (Refer to Figure 2-62)

(1) Tag and remove two screws (1) securing two leads (2) of cable assembly 1A4A1W1 from overheat switch A1TS1 (3) mounted on heater element assembly (4).

(2) Remove two nuts (5), two lockwashers (6), four flat washers (7) and two screws (8) securing overheat switch (3) to heater element assembly (4). Discard two lockwashers (6).

b. Installation (Refer to Figure 2-62)

NOTE

Screws that attach leads to overhead switch are supplied with the switch.

(1) Secure overheat switch (3) to heater element assembly (4) with two screws (8), four flat washers (7), two new lockwashers (6) (Item 18, Appx E) and two nuts (5).

(2) Install two leads (2) of cable assembly 1A4A1W1 on overheat switch A1TS1 (3) with two screws (1). Remove tags from two leads (2).

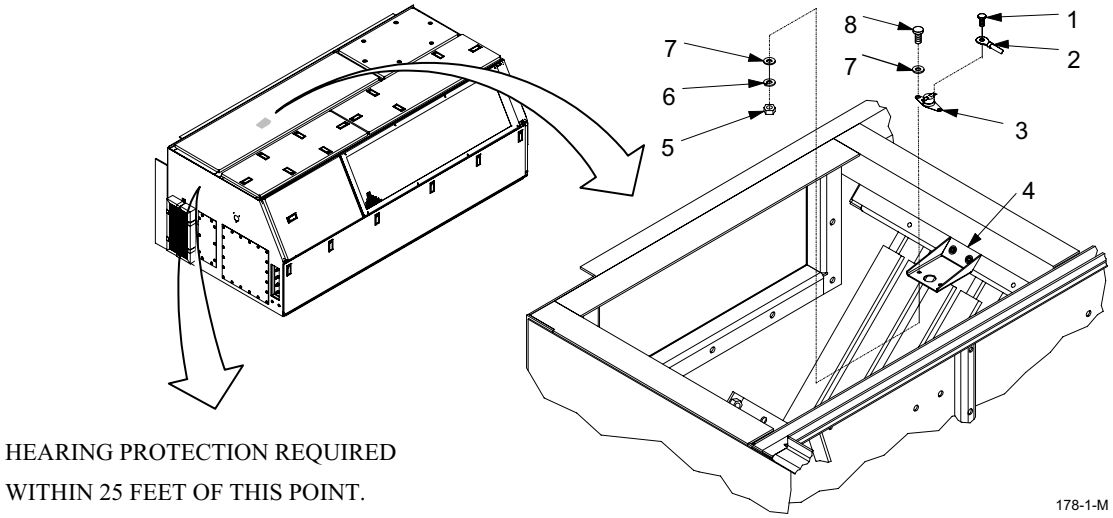


Figure 2-62. Overheat Switch Replacement

Follow-on maintenance: Install or close ECU covers and doors per para 2.14.1, remove tags, apply power and perform operational test, remove ECU work platform (reference TM 10-5410-228-10).

2.15 FRAME AND GENERATOR.

2.15.1 HMT Assembly Repair.

This task covers:
a. Disassembly
b. Assembly

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Engine Lifting Sling (Item 41, Appendix B)
Automotive Maintenance Stand (Item 48, Appendix B)

Materials/Parts:
Lockwasher (Item 23, Appendix E)
Ten Lockwashers (Item 30, Appendix E)
One Hundred and Twenty Eight Blind Rivets (Item 70, Appendix E)

Equipment Conditions:
HMT disconnected from ECV, if required.
Equipment removed from HMT.

Personnel Required: (2)

References:
TM 9-2330-392-14&P

Materials/Parts: (Cont.)
Twenty-Eight Blind Rivets (Item 75, Appendix E)
Sixteen Blind Rivets (Item 80, Appendix E)
Fourteen Blind Rivets (Item 73, Appendix E)

NOTE

For maintenance or repair of HMT frame, wheels, lights, brakes, etc., refer to TM 9-2330-392-14&P.

a. Disassembly (Refer to Figure 2-63)

(1) Disconnect cable assembly (1) from generator (2).

(2) Remove four screws (3), eight flat washers (4), four lockwashers (5) and four nuts (6) securing generator (2) to mounting frame (7). Discard four lockwashers (5).

WARNING

The 10 kW TQG is extremely heavy. Use proper lifting equipment and observe all safety practices for lifting to prevent injury to personnel.

(3) Using automotive maintenance stand and chains, remove generator (2) from HMT (8).

(4) Remove six screws (9), six lockwashers (10) and six flat washers (11) securing mounting frame (7) to HMT (8). Discard six lockwashers (10).

WARNING

To prevent injury to personnel, always wear eye protection when drilling. Warning applies to steps 5 through 15.

(5) Drill out eight rivets (12) securing two strap assemblies (13) to HMT (8).

(6) Drill out sixteen rivets (14) securing four strap assemblies (15) to HMT (8).

(7) Drill out 24 rivets (16) securing three strap assemblies (17) to HMT (8).

(8) Drill out eight rivets (18) securing strap assembly (19) to HMT (8).

(9) Drill out 30 rivets (20) and two rivets (21) securing four strap assemblies (22) to HMT (8).

2.15.1 HMT Assembly Repair – Continued.

(10) Drill out twelve rivets (23) and twelve rivets (24) securing three strap assemblies (25) to HMT (8).

(11) Drill our eight rivets (26) and four rivets (27) securing two strap assemblies (28) to HMT (8).

(12) Drill out four rivets (29) and four rivets (30) securing two strap assemblies (31) to HMT (8).

(13) Drill out nine rivets (32) securing driver side HMT floor (33) to HMT (8).

(14) Drill out nine rivets (34) securing passenger side HMT floor (35) to HMT (8).

(15) Drill out 28 rivets (36) securing HMT floor (37) to HMT (8).

(16) Remove screw (38), two flat washers (39), lockwasher (40) and nut (41) securing pintle extension (42) to HMT (8). Discard lockwasher (40).

b. Assembly (Refer to Figure 2-63)

(1) Secure pintle extension (42) to HMT (8) with screw (38), two flat washers (39), new lockwasher (40) (Item 23, Appx E) and nut (41). Torque to 850 ft-lbs.

(2) Secure HMT floor (37) to HMT (8) with 28 rivets (36) (Item 70, Appx E).

(3) Secure passenger side HMT floor (35) to HMT (8) with nine rivets (34) (Item 70, Appx E).

(4) Secure driver side HMT floor (33) to HMT (8) with nine rivets (32) (Item 70, Appx E).

(5) Secure two strap assemblies (31) to HMT (8) with four rivets (30) (Item 75, Appx E) and four rivets (29) (Item 75, Appx E).

(6) Secure two strap assemblies (28) to HMT (8) with four rivets (27) (Item 75, Appx E) and eight rivets (26) (Item 75, Appx E).

(7) Secure three strap assemblies (25) to HMT (8) with twelve rivets (24) (Item 73, Appx E) and twelve rivets (23) (Item 70, Appx E).

(8) Secure four strap assemblies (22) to HMT (8) with two rivets (21) (Item 73, Appx E) and 30 rivets (20) (Item 70, Appx E).

(9) Secure strap assembly (19) to HMT (8) with eight rivets (18) (Item 70, Appx E).

(10) Secure three strap assemblies (17) to HMT (8) with 24 rivets (16) (Item 70, Appx E).

(11) Secure four strap assemblies (15) to HMT (8) with sixteen rivets (14) (Item 80, Appx E).

(12) Secure two strap assemblies (13) to HMT (8) with eight rivets (12) (Item 75, Appx E).

(13) Secure mounting frame (7) to HMT (8) with six screws (9), six new lockwashers (10) (Item 30, Appx E) and six flat washers (11).

WARNING

The 10 kW TQG is extremely heavy. Use proper lifting equipment and observe all safety practices for lifting to prevent injury to personnel.

(14) Using automotive maintenance stand and chains, install generator (2) on HMT (8).

(15) Secure generator (2) to mounting frame (7) with four screws (3), eight flat washers (4), four new lockwashers (5) (Item 30, Appx E) and four nuts (6).

(16) Connect cable assembly (1) to generator (2).

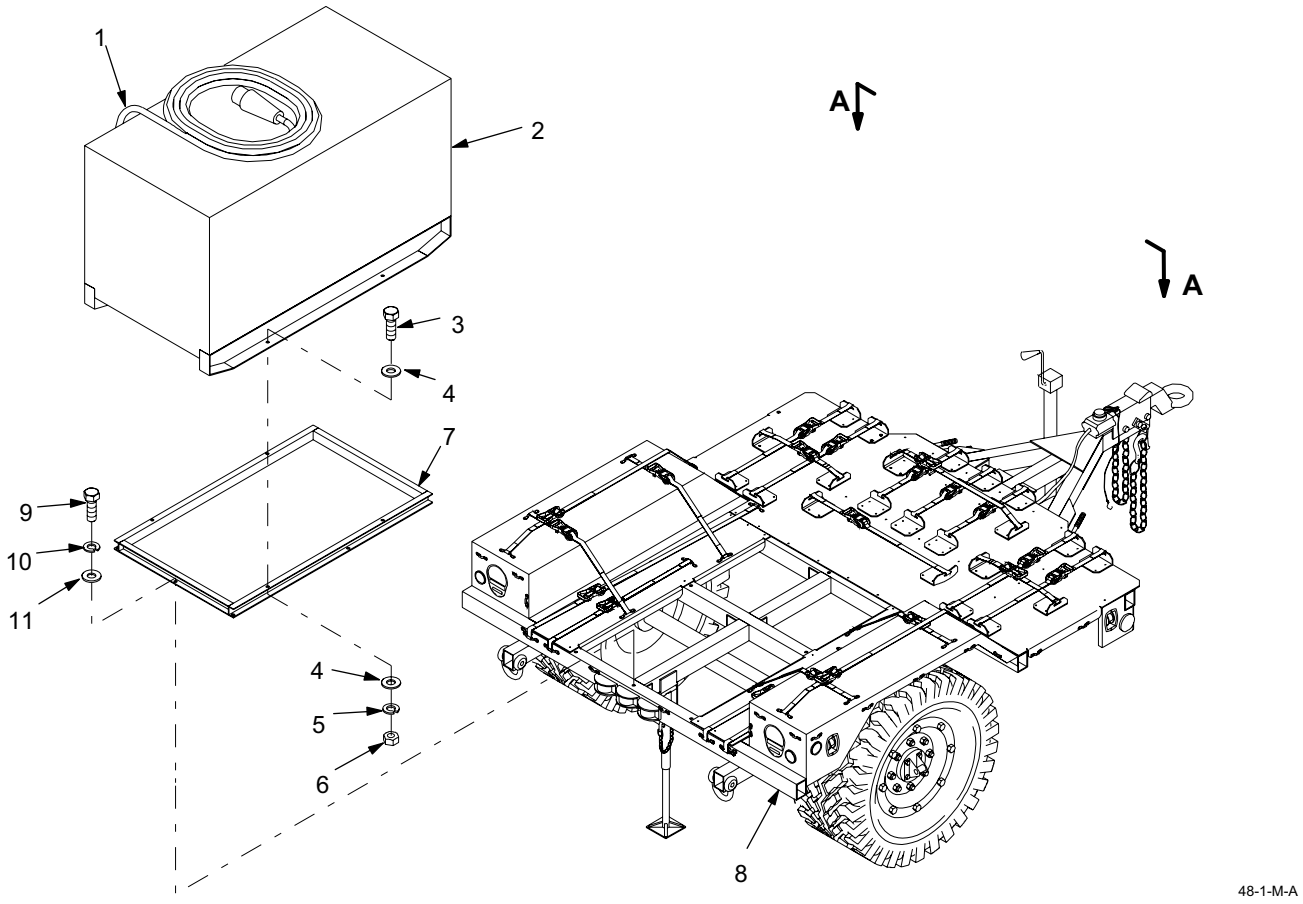


Figure 2-63. HMT Assembly Repair (Sheet 1 of 3)

2.15.1 HMT Assembly Repair – Continued.

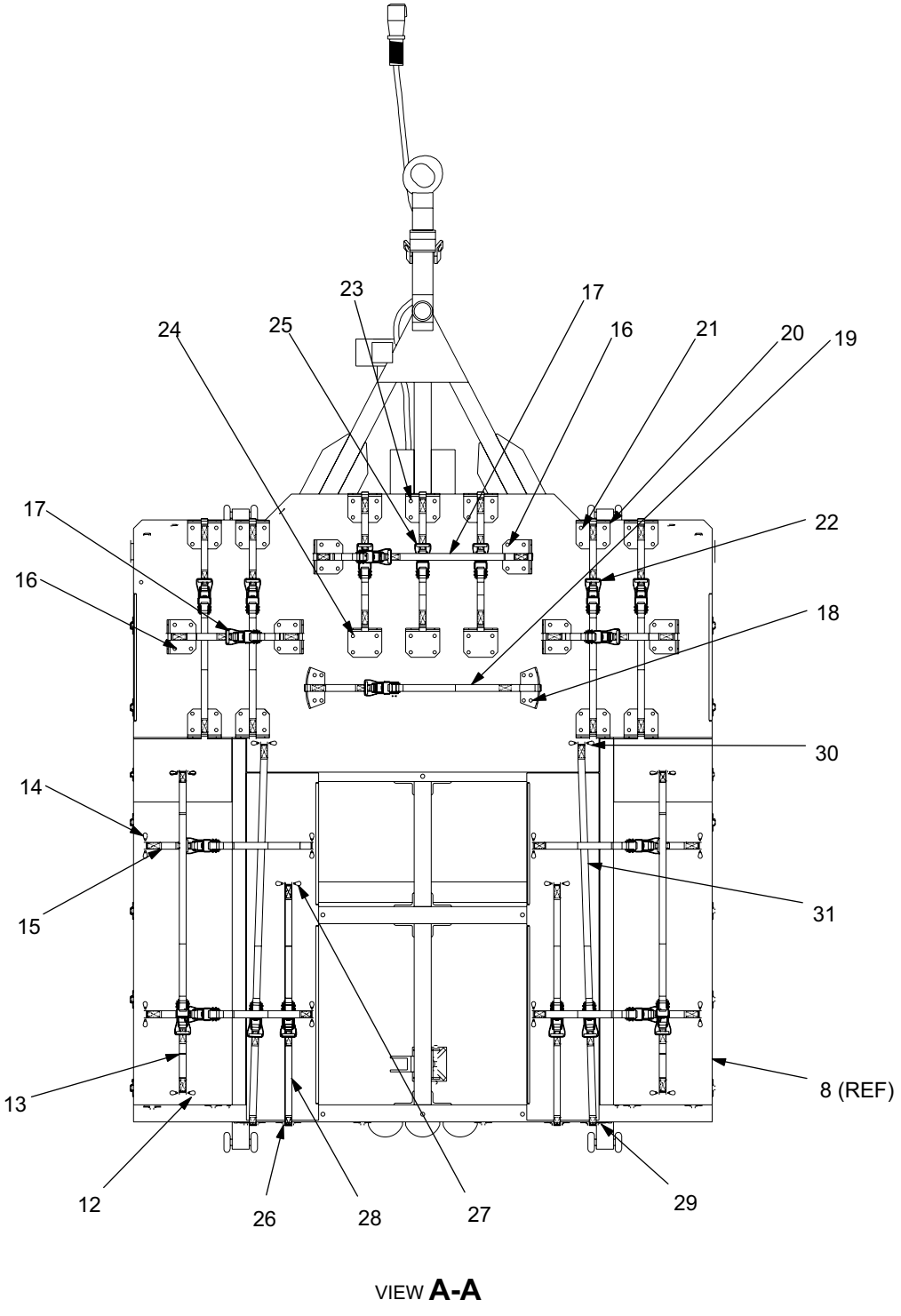


Figure 2-63. HMT Assembly Repair (Sheet 2 of 3)

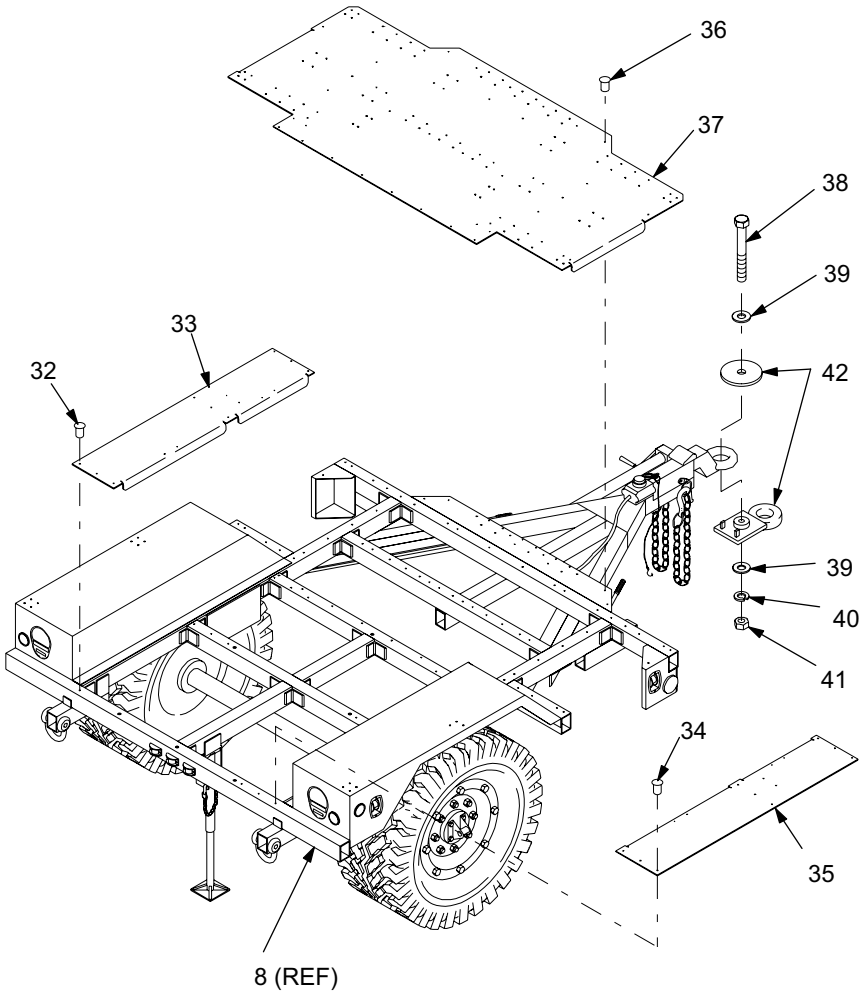


Figure 2-63. HMT Assembly Repair (Sheet 3 of 3)

2.16 AIR BEAM SHELTER (ABS).

2.16.1 Dee Ring Patch Assembly Replacement.

This task covers:	
a. Removal	b. Repair
INITIAL SETUP	
Tools/Test Equipment: ABS Repair Kit (TM 10-5410-228-10, Appendix B) Sealing Iron, Electric (Item 36, Appendix B)	Equipment Conditions: ABS deployed. References: TM 10-5410-228-10
Materials/Parts: Isopropyl Alcohol (Item 12, Appendix C) Wiping Rags (Item 39, Appendix C)	

NOTE

ABS repair kit (TM 10-5410-228-10, Appendix B) contains all the tools and materials required to repair the ABS.

a. Removal (Refer to Figure 2-64)

(1) Lift the damaged assembly from the ABS.

CAUTION

DO NOT cut into ABS when removing Dee Ring patch.

(2) Carefully cut off damaged Dee Ring assembly and loose edges as flush as possible to ABS.

b. Repair (Refer to Figure 2-64)

WARNING

Sealing irons operate at 700 degrees Fahrenheit. Use care to prevent injury to personnel. Keep flammable items away.

Heat seal repairs may produce toxic fumes. To prevent injury to personnel, use in well ventilated area.

(1) Place sealing iron (1) on sealing block (2). Plug in sealing iron (1) set temperature at 700 degrees F and heat for 20 minutes.

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(2) Perform seal test to ensure sealing iron (1) is operating at the correct temperature (700 degree F). Place two pieces of fabric on top of sealing block (2). Orientate the fabric to simulate repair (i.e. green to green, green to white, etc.). Place a piece of silicone release paper (3) on top piece of fabric. Place sealing iron (1) on the silicone paper (3). Leave a section along the edge unsealed. Set digital timer (4) for 1.50 seconds.

(3) When timer (4) stops remove sealing iron (1) and cool the material down with Cooling block (5) or cool damp rags (Item 39, Appendix C).

(4) After the fabric cools, peel fabric apart. A positive test will have around 85% of either material on the opposite piece of fabric. If test fails, allow sealing iron to heat up longer and retest.

(5) Clean the damaged area with a rag dampened with alcohol before repairing. Allow the alcohol ample time to dry so that the surface is not wet when the new assembly is installed.

(6) If there is any exposed Kevlar thread after removing the old Dee Ring, a piece of 5 MILS thick clear plastic must be applied to the new Dee Ring patch. Apply the plastic by laying the new Dee Ring on top of sealing block (2), place the plastic on top of the Dee Ring and then place a piece of silicone paper (3) on top of the entire assembly. Apply the sealing iron (1) and heat for 30 seconds. There is no need to cool with damp rag.

(7) Deflate the area of the ABS to be repaired (reference TM 10-5410-228-10). Place a sealing block (2) on the inside of the ABS so that the material to be repaired lays flat on the sealing block (2).

(8) Position the new assembly over the old Dee Ring assembly. Cover the new assembly with a piece of silicon paper (3) to prevent staining.

WARNING

Sealing irons operate at high temperatures. Use care to prevent injury to personnel

Heat seal repairs may produce toxic fumes. To prevent injury to personnel, use in well ventilated area. This warning applies to steps 4 and 5.

Sealing block will have to be supported to prevent sealing iron from moving when pressure is applied.

(9) Place sealing iron (1) against the new assembly and apply pressure for 1.50 seconds to weld the new assembly to the ABS.

(10) Remove the sealing iron (1) and press cooling block (5) against the hot area for 15 to 20 seconds or wipe with cold wet rags to draw out the heat.

(11) Repeat the sealing and cooling process until the entire new assembly is sealed in place. Ensure that all edges and corners are totally sealed.

(12) After the repaired area has cooled, check all edges and corners to ensure that the new assembly is securely bonded. If any edges or corners are loose, repeat sealing process.

(13) Inflate ABS (reference TM 10-5410-228-10).

2.16.1 Dee Ring Patch Assembly Replacement – Continued.

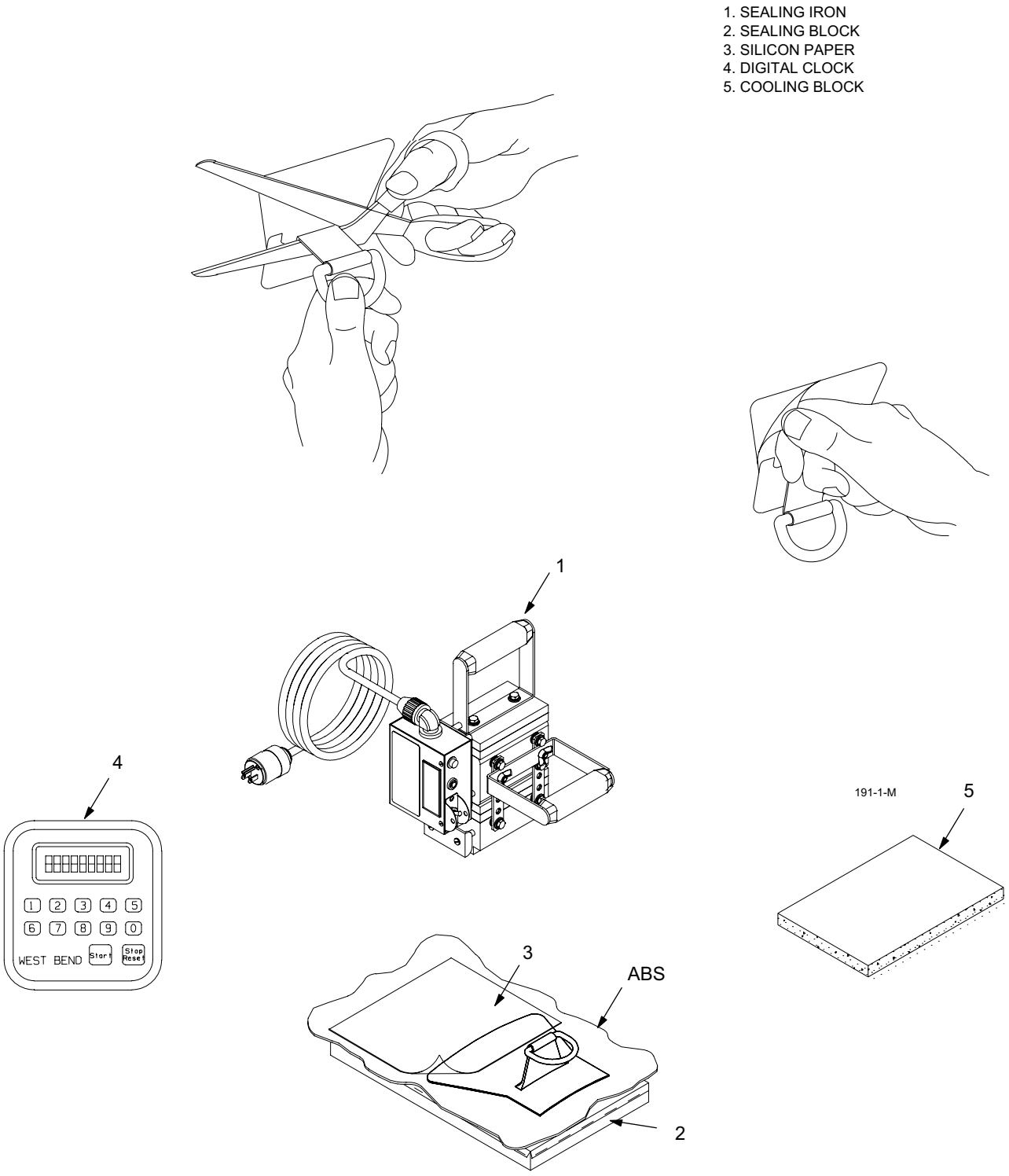


Figure 2-64. Dee Ring Patch

2.16.2 Window Film Replacement and Cleaning.

This task covers:	
a. Replacement	b. Cleaning
INITIAL SETUP	
Tools/Test Equipment: ABS Repair Kit	Equipment Conditions: ABS inflated and over pressurized with NBC fan ON (see TM 10-5410-228-10).
Materials/Parts: General Purpose Detergent (Item 20, Appendix C) Cream Cleaner (Item 19, Appendix C) Rubber Gloves (Item 26, Appendix C) Wiping Rags (Item 39, Appendix C) Toluene (Item 59, Appendix C) Adhesive Hardener (Item 28, Appendix C) Adhesive (Item 9, Appendix C)	Personnel Required: (2) One person inside ABS. One person outside ABS.

NOTE

Extra care must be given to proper alignment of new window so it does not slip down.

One person installs new window from inside ABS and the second person helps to apply pressure from the outside of ABS.

Window installation can be accomplished with ABS deflated and laying flat.

a. Replacement

(1) Secure outer window flap in up position.

NOTE

Do not remove old window until new window is in place.

(2) Cut a slit in the middle of the old window.

WARNING

Toluene is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Good general ventilation is normally adequate. Keep away from open flames or other sources or ignition.

(3) Clean outer edges on inside of the old window with a rag dampened with toluene. Allow toluene ample time to dry so that the surface is not wet when the new window is installed.

(4) Under cold or damp weather conditions and to avoid condensation, it may be necessary to dry the window area as well as the new window.

WARNING

Adhesive and adhesive hardener are flammable and give off harmful vapors. Use adhesive and adhesive hardener sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and adhesive hardener. May cause eye and skin irritation.

(5) Mix adhesive and adhesive hardener using 8 parts adhesive to 1 part hardener by volume.

(6) Apply three coats to each surface, allow 20 to 30 minutes between coats.

(7) Mate surfaces carefully with good pressure within 20 minutes of last coat.

2.16.2 Window Film Replacement and Cleaning – Continued.

(8) Cut out old window along edge of the film, being careful not to cut new window.

b. Cleaning

Never clean windows with abrasives. Repeated use of these products will cause damage to window.

(1) Wash window using detergent, water and clean rag.

(2) Apply cream cleaner with clean rag.

(3) Rinse with clean water.

2.16.3 Air Beam Replacement.

This task covers: a. Disassembly b. Repair	c. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Gloves (Item 16, Appendix B) Goggles (Item 17, Appendix B) ABS Repair Kit (TM 10-5410-228-10, Appendix B) Spare Parts Kit (TM 10-5410-228-10, Appendix B)	Equipment Conditions: ABS inflated, insulation removed (reference TM 10-5410-228-10). References: TM 10-5410-228-10 Materials/Parts: Adhesive (Item 1, Appendix C) Sealant (Item 46, Appendix C)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

The inflation manifold does not need to be removed to replace air beams or hoses.

a. Disassembly (Refer to Figure 2-65)

(1) Close shut-off valve (1) for damaged air beam (2).

WARNING

To prevent injury to personnel when removing air beam dump caps, grip dump cap firmly, release latches slowly, and keep face away. The pressure may cause the dump caps to come off forcefully.

(2) Release two latches (3) and remove camlock cap (4) for damaged air beam (2) from outside ABS.

(3) Remove supply hose (5) and adapter (6) from air beam input port (7).

(4) Remove lanyard (8) from camlock fitting (9).

NOTE

Dump bulkhead fitting has left-hand threads.

(5) Remove camlock fitting (9) from dump bulkhead fitting (12).

(6) Remove nut (10) and gasket (11) securing dump bulkhead fitting (12) to ABS.

(7) Remove air beam (2) from dump port opening in ABS wall.

NOTE

Partially deflate air beams to lower ABS for ease of air beam removal.

(8) Untie and remove lacing rope (13) from air beam (2). Save lacing rope (13) for installation of new air beam.

(9) Disconnect tie cords (14) on both ends of air beam from their attaching grommets.

(10) Remove air beam (2).

2.16.3 Air Beam Replacement – Continued.

(11) Remove two rings (15) from two latches (3) on camlock cap (4).

(12) Remove lanyard (8) from camlock cap (4).

b. Repair (Refer to Figure 2-65)

NOTE

The following repair is general in nature.

(1) Hose repair or replacement may be accomplished by cutting hose at barb end of adapters or elbows, and removing hose.

(2) Cut new hose to required length.

WARNING

Adhesives, sealants, solvents and cleaners are flammable and give off harmful vapors. Use adhesives, sealants, solvents and cleaners sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks and open flames. Wear gloves and goggles when handling adhesives, sealants, solvents and cleaners. This warning applies to steps 3 and 4.

(3) Ensure old adhesive and sealant has been removed from adapters or elbows.

(4) Apply adhesive to barb end of adapters or elbows.

(5) Install hose onto barb end of adapters or elbows.

(6) Ensure threads of adapter (6) are clean.

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(7) Apply sealant to threads of adapter (6).

(8) Install adapter (6) in airbeam input port (7).

(9) Apply adhesive to barb end of adapter (6).

(10) Install hose (5) on adapter (6).

c. Assembly (Refer to Figure 2-65)

(1) Locate air beam in ABS and secure tie cords (14) on both ends of the air beam (2) to their attaching grommets.

(2) Ensure threads of dump bulkhead fitting (9) are clean.

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(3) Apply sealant to threads of dump bulkhead fitting (12).

CAUTION

Hand tighten to avoid damage to plastic fittings during disassembly or assembly. Do not over tighten the fittings during assembly.

NOTE

Dump bulkhead fitting has left-hand threads.

(4) Insert threaded end of dump bulkhead fitting (12) through dump port opening in ABS wall, and secure in place with gasket (11) and nut (10).

(5) Ensure threads of camlock fitting (9) are clean.

(6) Apply sealant to threads of camlock fitting (9).

(7) Install camlock fitting (12) on air beam (2).

(8) Attach lanyard (8) to camlock cap (4).

(9) Attach two rings (15) to two latches (3) on camlock cap (4).

(10) Attach lanyard (8) to camlock fitting (9).

(11) Install camlock cap (4) onto camlock fitting (9).

(12) Install cam lock cap (4) then, open shut-off valve (1) and inflate air beam (2). Observe the entire air beam for leaks and proper orientation.

NOTE

Partially deflate air beam to lower ABS for ease of air beam installation.

(13) Ensure that center line mark on air beam is centered within the ABS. Secure air beam to ABS with lacing rope (13).

2.16.3 Air Beam Replacement – Continued.

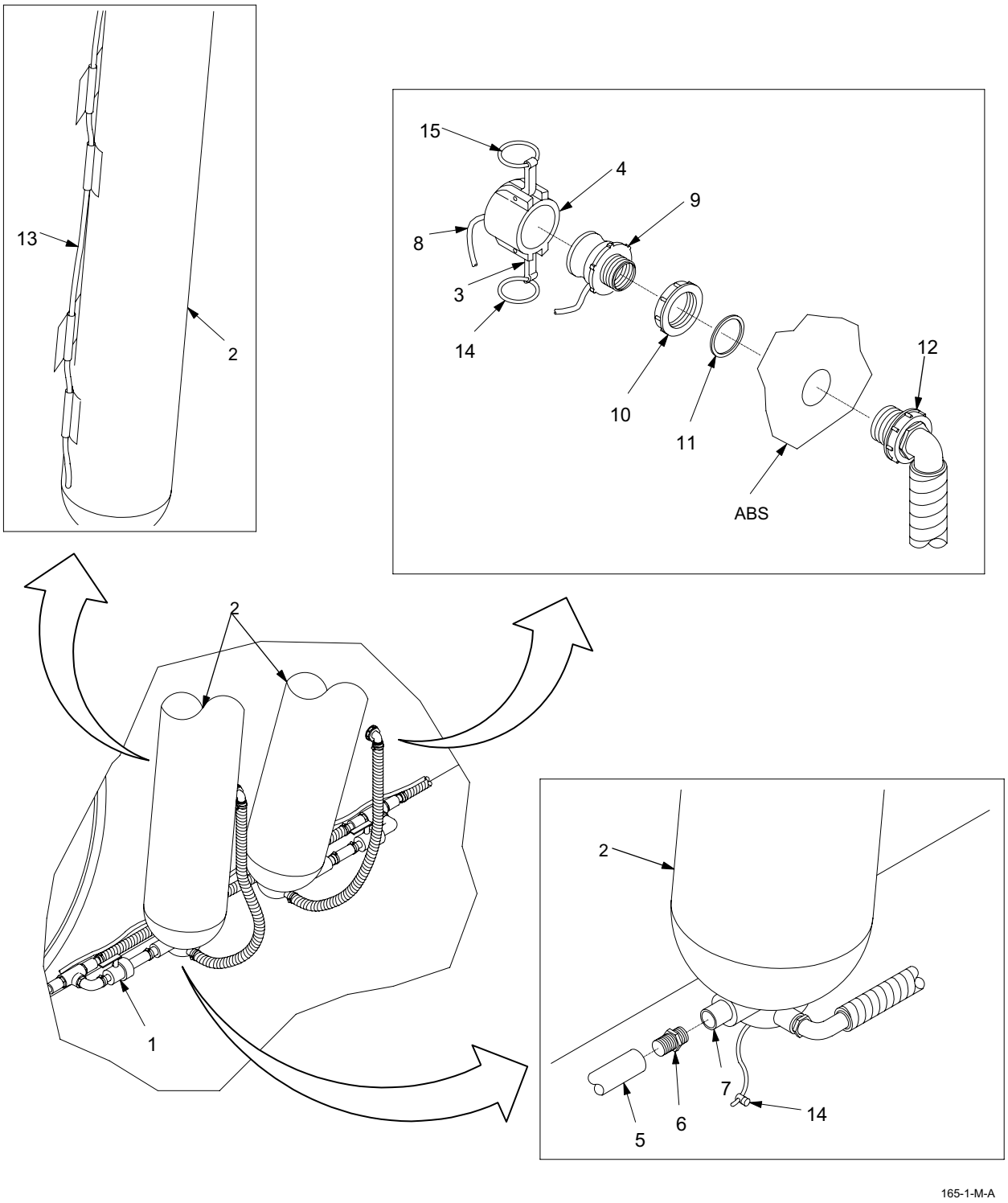


Figure 2-65. Air Beam Repair (Sheet 1 of 2)

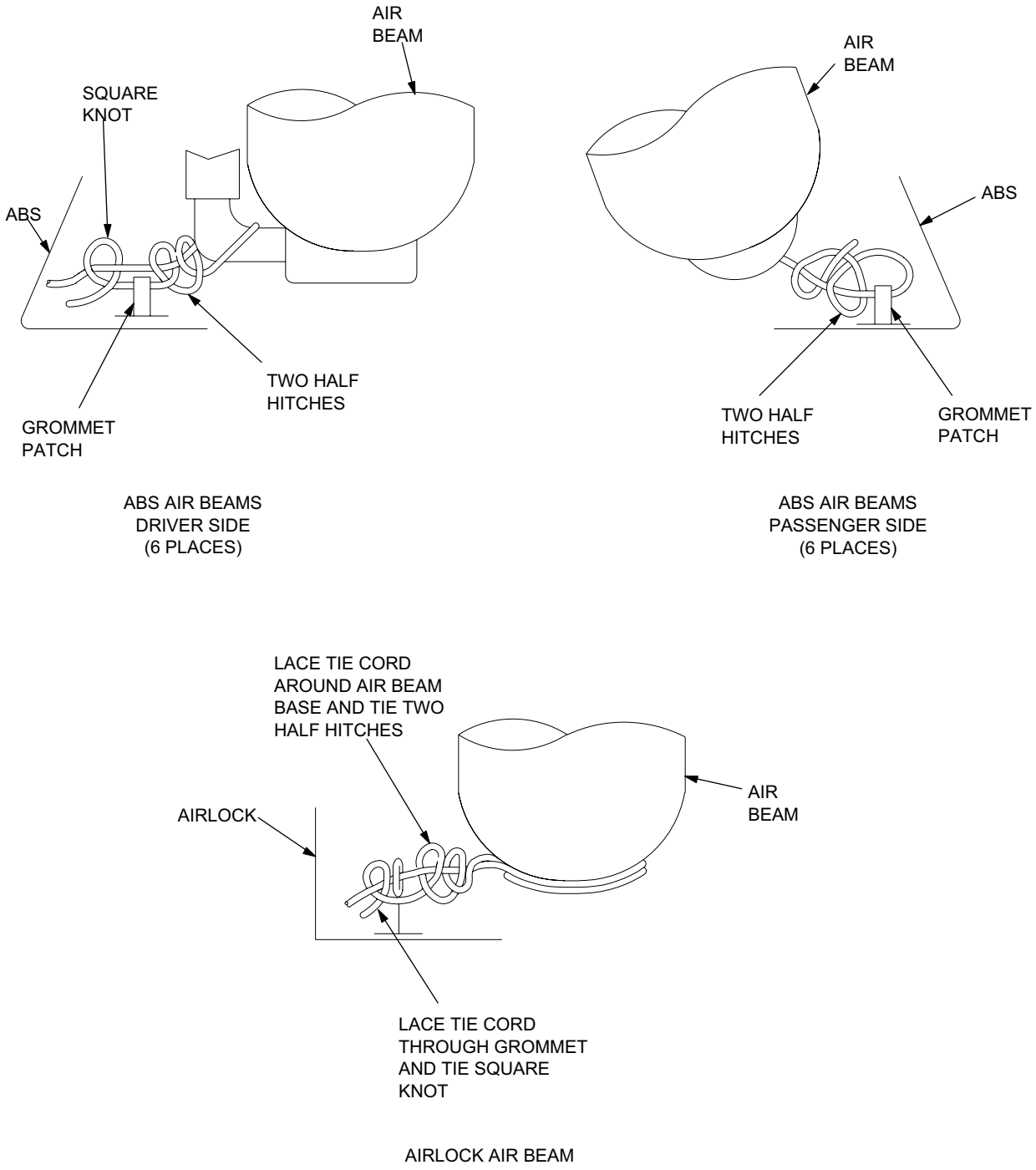


Figure 2-65. Air Beam Repair (Sheet 2 of 2)

Follow-on maintenance: Install insulation (reference TM 10-5410-228-10), apply power and perform operational test.

2.16.4 Inflation Manifold Replacement.

This task covers: a. Disassembly b. Repair	c. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Gloves (Item 16, Appendix B) ABS Repair Kit (TM 10-5410-228-10, Appendix B) Materials/Parts: Adhesive (Item 1, Appendix C) Sealant (Item 43, Appendix C)	Equipment Conditions: ABS inflated, insulation removed (reference TM 10-5410-228-10). References: TM 10-5410-228-10

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 2-66)

(1) Close seven shutoff valves (1) at air beam input ports (8).

NOTE

If air beam assemblies need to be kept inflated when inflation manifold is disconnected, plug individual air beam input port when inflation manifold attaching hose is removed.

(2) Unscrew shelter to airbeam hose assembly (2) from vehicle air flow bulkhead fitting (3).

(3) Unscrew shelter to airbeam hose assembly (2) from tee check value with shutoff (4).

(4) In six places, unscrew hose assembly (6) from tee check valve with shutoff (4).

(5) Unscrew hose assembly (7) from straight check valve with shutoff (5).

(6) Cut hose off barb on input port (8) of ambulatory door air beam.

b. Repair (Refer to Figure 2-66)

(1) Hose repair or replacement may be accomplished by cutting hose at barb end of adapters and elbows, then removing hose.

(2) Cut new hose to required length.

WARNING

Adhesives, sealants, solvents and cleaners are flammable and give off harmful vapors. Use adhesives, sealants, solvents and cleaners sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves and goggles when handling adhesives, sealants, solvents and cleaners.

(3) Ensure old adhesive and sealant has been removed from barbs.

(4) Apply adhesive to barbs.

(5) Install hose onto barbs.

c. Assembly (Refer to Figure 2-66)

NOTE

Sealant is in ABS repair kit.

(1) Apply sealant to threads on hose assembly (7). Install hose assembly (7) on large end of straight check valve with shutoff (5).

(2) Slide hose assembly (7) through hole in ambulatory airlock.

(3) Apply adhesive to barb end of elbow in air beam input port (8).

(4) Install hose assembly (7) on elbow in air beam input port (8).

(5) In six places, apply sealant and install hose assemblies (6) to tee check valve with shutoff (4).

(6) Apply sealant and install shelter to airbeam hose assembly (2) to tee check valve with shutoff (4).

(7) Apply sealant and install shelter to airbeam hose assembly (2) to vehicle air flow bulkhead fitting (3).

2.16.4 Inflation Manifold Replacement – Continued.

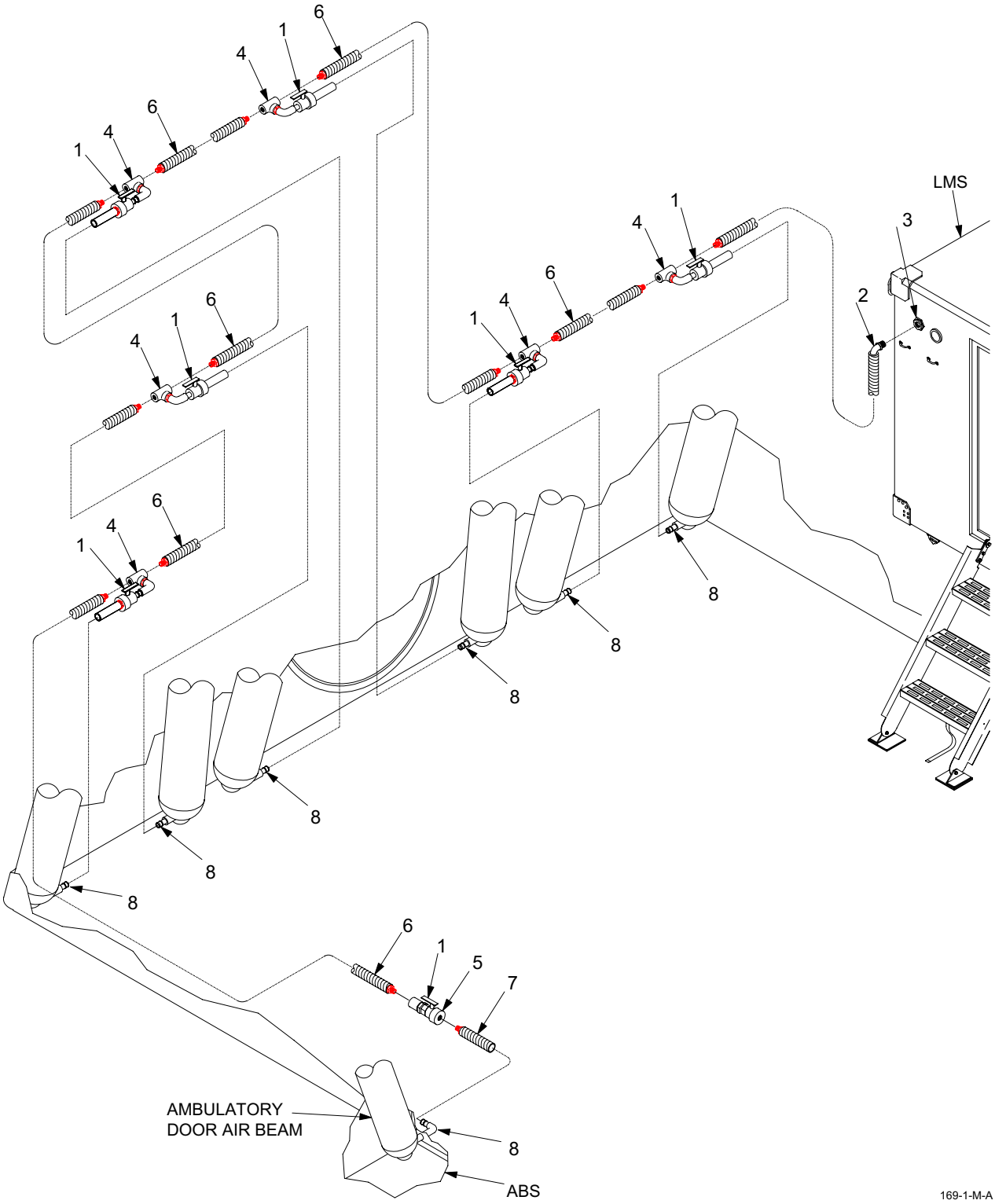


Figure 2-66. Inflation Manifold Replacement

Follow-on maintenance: Install insulation (reference TM 10-5410-228-10), apply power and perform operational test.

2.16.5 Pressure Gage Assembly Repair.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ABS inflated (reference TM 10-5410-228-10).
Heat Gun (Item 19, Appendix B)	Materials/Parts:
	Electrical Insulation Sleeving (Item 23, Appendix C)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 2-67)
   (1) Pull apart three quick disconnects (1, 2 and 3).
   (2) Pull back folded over ends of two straps (4), disengaging fastener hook and fastener loop.
   (3) Pull two straps (4) through two slots on mounting plate (5) and two loops (6) on ABS end wall.

b. Disassembly (Refer to Figure 2-67)
   (1) Remove two screws (7), two flat washers (8) and two nuts (9) securing mounting bracket (10) to mounting plate (5).
   (2) Cut electrical insulation sleeving and remove quick disconnect (2) from plastic tubing (11).
   (3) Cut electrical insulation sleeving and remove quick disconnect (1) from plastic tubing (12).
   (4) Cut electrical insulation sleeving and remove quick disconnect (3) from plastic tubing (13).
   (5) Remove plastic tubing (11) from tee union (14).
   (6) Remove plastic tubing (12) from female elbow (15).
   (7) Remove plastic tubing (13) from female elbow (15).
   (8) Remove two plastic tubings (16) from ends of tee union (14) and two female elbows (17).
   (9) Unscrew two female elbows (17) from the back of two pressure gages (18).
   (10) Remove four nuts (19) securing two brackets (20) to the back of two pressure gages (18).
   (11) Remove two straps (4) from mounting bracket (10).
   (12) Unscrew two female elbows (15) from the back of two pressure gages (18).

NOTE

Note alignment of pressure gage before removing.

   (13) Remove two pressure gages (18) from mounting plate (5).

c. Assembly (Refer to Figure 2-67)

NOTE

Note alignment of pressure gage before installing.

   (1) Install two pressure gages (18) on mounting plate (5). Ensure two pressure gages (18) are aligned properly as noted during removal.

2.16.5 Pressure Gage Assembly Repair – Continued.

(2) Screw two female elbows (15) into back of two pressure gages (18). Ensure nipple end of female elbows (15) are pointing down.

(3) Install plastic tubing (13) on female elbow (15).

(4) Install plastic tubing (12) on female elbow (15).

(5) Secure two brackets (20) to the back of two pressure gages (18) with four nuts (19).

(6) Screw two female elbows (17) to the back of two pressure gages (18). Ensure nipple end of female elbows (17) are pointing inward.

(7) Install two plastic tubings (16) on two female elbows (17).

(8) Install two plastic tubings (16) on ends of tee union (14).

(9) Install plastic tubing (11) on tee union (14).

NOTE

Heat plastic tubing to ensure tubing fits over 3 barbs on quick disconnects.

Use heat gun to seal heat-shrink tubing.

(10) Install quick disconnect (3) on plastic tubing (13). Seal plastic tube (13) on quick disconnect (3) by installing a 1.5 inch piece of electrical insulation sleeving over tube (13) and quick disconnect (3).

(11) Install quick disconnect (1) on plastic tubing (12). Seal plastic tube (12) on quick disconnect (1) by installing a 1.5 inch piece of electrical insulation sleeving over tube (12) and quick disconnect (1).

(12) Install quick disconnect (2) on plastic tubing (11). Seal plastic tube (11) on quick disconnect (2) by installing a 1.5 inch piece of electrical insulation sleeving over tube (11) and quick disconnect (2).

(13) Install two straps (4) onto mounting bracket (10).

(14) Secure mounting bracket (10) to mounting plate (5) with two screws (7), two flat washers (8) and two nuts (9).

d. Installation (Refer to Figure 2-67)

(1) Pull two straps (4) through two loops (6) on ABS end wall and two slots on mounting plate (5).

(2) Fold over ends of two straps (4), engaging fastener hook and fastener loop.

(3) Connect ambulatory airlock quick disconnects (1) together.

(4) Connect outside ambient air quick disconnects (2) together.

(5) Connect TALP airlock quick disconnects (3) together.

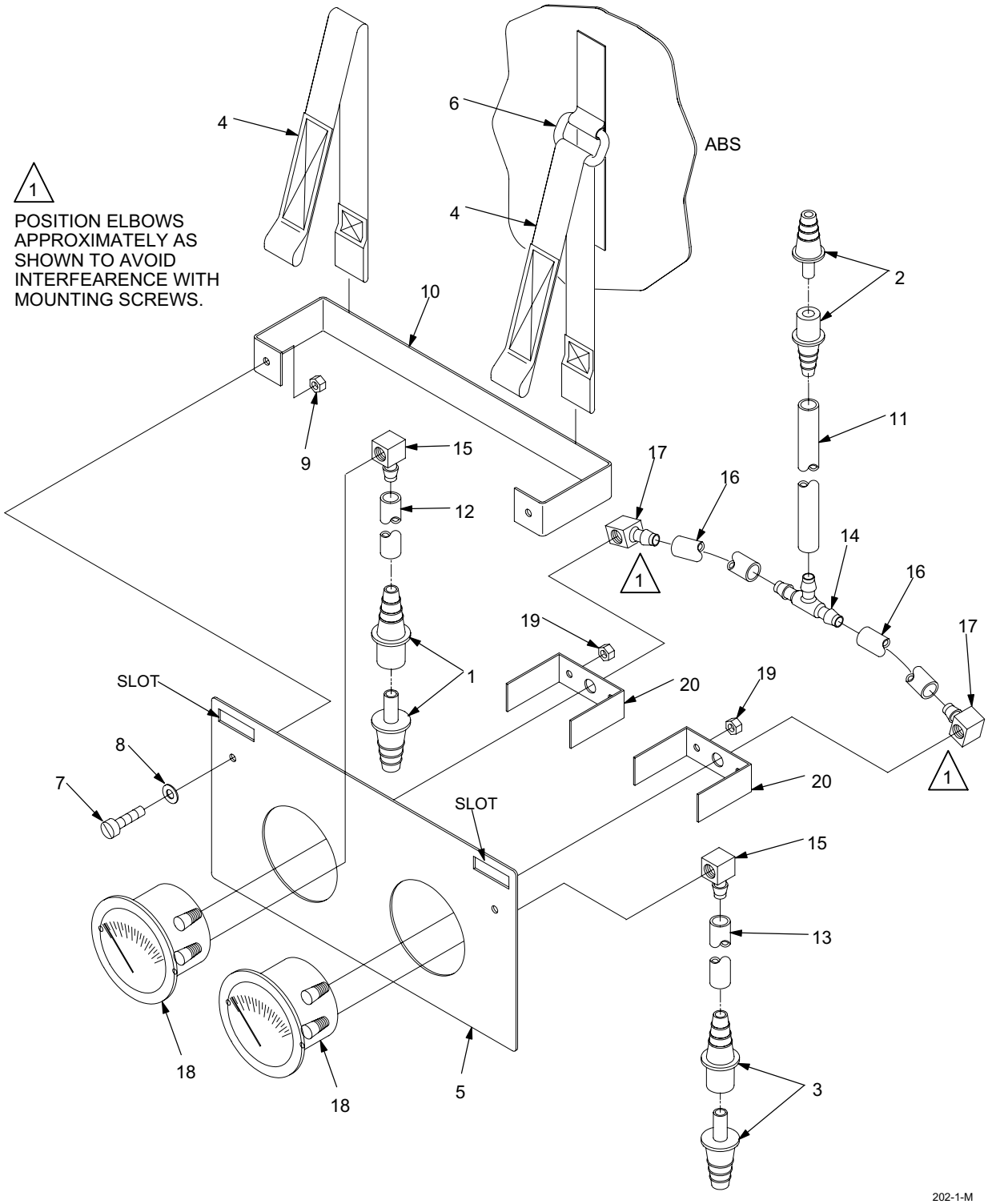


Figure 2-67. Pressure Gage Assembly Repair

2.16.6 Plastic Tubing Replacement.

This task covers:	
a. Disassembly	b. Assembly
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Heat Gun (Item 19, Appendix B)	Equipment Conditions: ABS inflated (reference TM 10-5410-228-10). Materials/Parts: Electrical Insulation Sleeving (Item 23, Appendix C) Adhesive (Item 11, Appendix C)

a. Disassembly. (Refer to Figure 2-68)
   (1) Cut plastic tubing (1) at ABS or TALP fitting (2) and remove plastic tubing (1).
   (2) Cut shrink tubing (3) at quick disconnect (4) and remove plastic tubing.

b. Assembly. (Refer to Figure 2-68)
   (1) Position an 1.5 inch piece of heat shrink tubing (3) over end of plastic tubing (1).
   (2) Slide plastic tubing (1) over quick disconnect (4) and secure by heating heat shrink tubing (3).
   (3) Secure other end of plastic tubing (1) to ABS or TALP fitting (2) with adhesive.

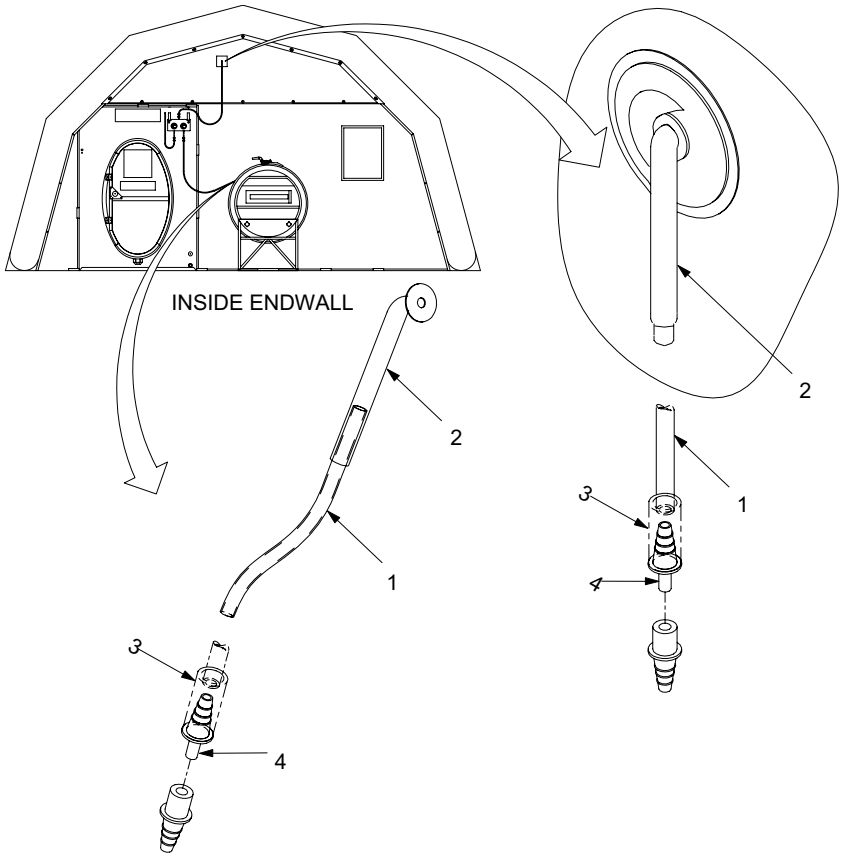


Figure 2-68. Plastic Tubing Replacement

2.17 RECIRCULATION FILTER.

2.17.1 Filter Element Replacement.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)

a. Removal (Figure 2-69)

WARNING

Ensure that recirculation filter is disconnected from power source before performing maintenance procedure. Electric shock can cause serious injury or death.

NOTE

Change filter in recirculation filter prior to every mission.

(1) Disconnect recirculation filter unit (1) from power source.

(2) Unlatch four link-lock fasteners (2) from cover (3).

(3) Remove cover (3) and filter element (4).

b. Installation (Figure 2-69)

(1) Install new filter element (4) with metal hem (5) facing downward.

(2) Replace cover (3).

(3) Latch four link-lock fasteners (2).

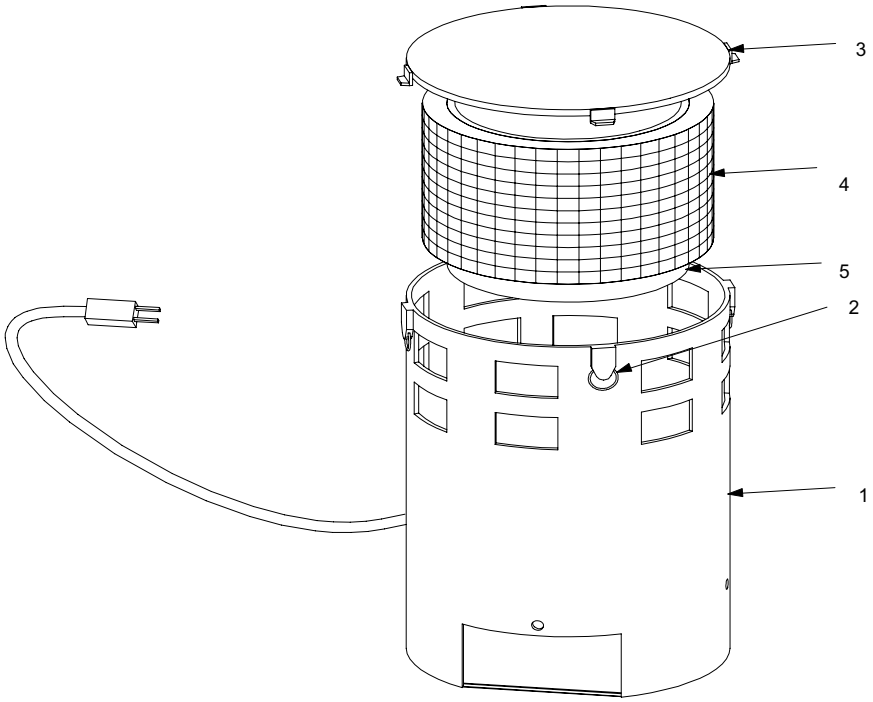


Figure 2-69. Recirculation Filter-Filter Element Replacement

2.17.2 Axial Fan Impeller Replacement.

WARNING

Ensure that recirculation filter is disconnected from power source before performing maintenance procedure. Electric shock can cause serious injury or death.

a. Removal (Figure 2-70)

(1) Position recirculation filter with bottom access cover (1) facing up.

(2) Remove three screws (2) from bottom access cover (1).

(3) Remove four screws (3), four lockwashers (4), four washers (5), and four nuts (6) securing fan impeller guard (7).

(4) Remove three screws (8) from fan hub (9) and remove axial fan impeller (10).

b. Installation (Figure 2-70)

(1) Position axial fan impeller (10) on fan hub (9) and secure with three screws (8).

(2) Secure fan impeller guard (7) with four screws (3), four lockwashers (4), four washers (5), and four nuts (6).

(3) Position bottom access cover (1) and secure with three screws (2).

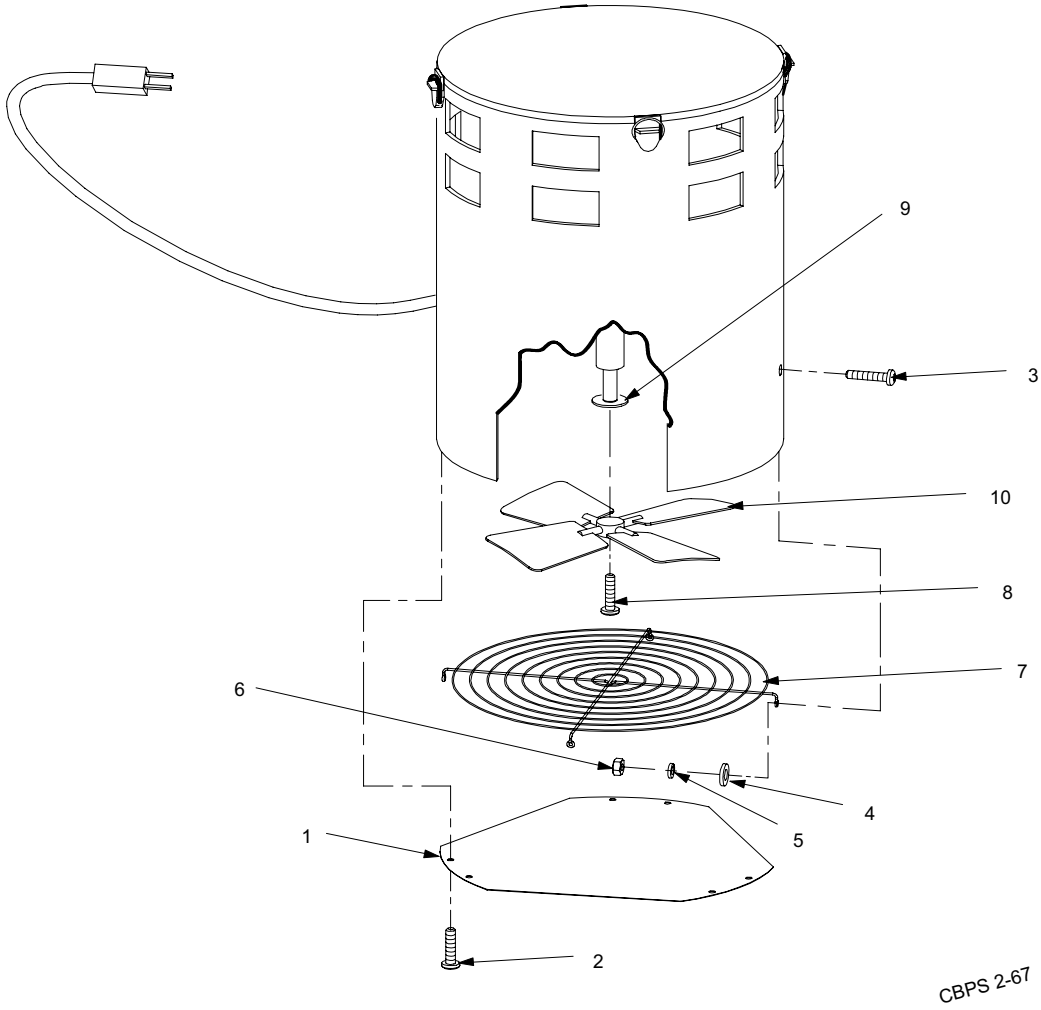


Figure 2-70. Recirculation Filter Axial Fan Impeller Replacement

2.18 PORTABLE LIGHT SET TEST AND REPAIR.

This task covers:
a. Removal
b. Installation
c. Test

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Multimeter (Item 27 Appendix B)

Materials/Parts:
Electrical Insulation Sleeving (Item 22, Appendix C)
Insulation Tape (Item 55, Appendix C)

WARNING

Lethal voltage is present when the light set is connected to power source. Disconnect from power source before inspecting or repairing any electrical component. Electrical shock and death may result from failure to heed this warning.

2.18.1 Ballast Assembly.

a. Removal (Refer to Figure 2-71)

(1) Remove male (1) and female (2) end caps from luminaire (3).

(2) Disconnect lampholder (4) by depressing retainer connector (5). Pull lamp (6) out of lens/screen assembly (7).

(3) Slide extrusion assembly (8) out of lens/screen assembly (7) from male side only.

(4) Disconnect ring terminal (9) of black wire from switch with flat tip screwdriver.

(5) Disconnect white AC wire (10) by removing splice (11) and separating wires.

(6) If leads (12,13) from ballast assembly (14) wires are serviceable, cut the wires at point of exit from the ballast assembly (14). If the wires are damaged, remove from lampholders (4) and extrusion assembly (8).

(7) Remove two hex nuts (15) and washer (16) securing ballast assembly (14) to extrusion assembly (8).

(8) Lift ballast assembly (14) off extrusion assembly (8).

b. Installation (Refer to Figure 2-71)

(1) Place ballast assembly (14) onto extrusion assembly (8), and secure with two hex nuts (15) and washers (16).

NOTE

Ensure that one set of wires of same color from ballast assembly goes to closest lampholder and one set goes to far lampholder.

(2) If wire leads (12, 13) from ballast assembly (14) were found serviceable, remove 1/4" of insulation from ends of wires. Solder wires on ballast assembly (14) to wires (12,13) on extrusion assembly (8). Apply insulation tape after solder point cools.

(3) If wire leads (12,13) from ballast assembly (14) were removed from extrusion assembly (8) entirely, install wires supplied with ballast assembly (14) onto extrusion assembly (8) and lampholders (4).

(4) Connect AC (white) wire (10) to AC input connection and install splice (10).

(5) Connect black wire ring terminal (9) to switch.

2.18.1 Ballast Assembly – Continued.

(6) Ensure that extrusion assembly (8) aligns with track in lens/screen assembly (7) and ballast assembly (14) is covered by solid portion. Slide extrusion assembly (8) into lens/screen assembly (7).

(7) Install male end cap assembly (1) on luminaire (3). Install lamp (6).

(8) Install lampholder (4) and female end cap (2) onto luminaire (3).

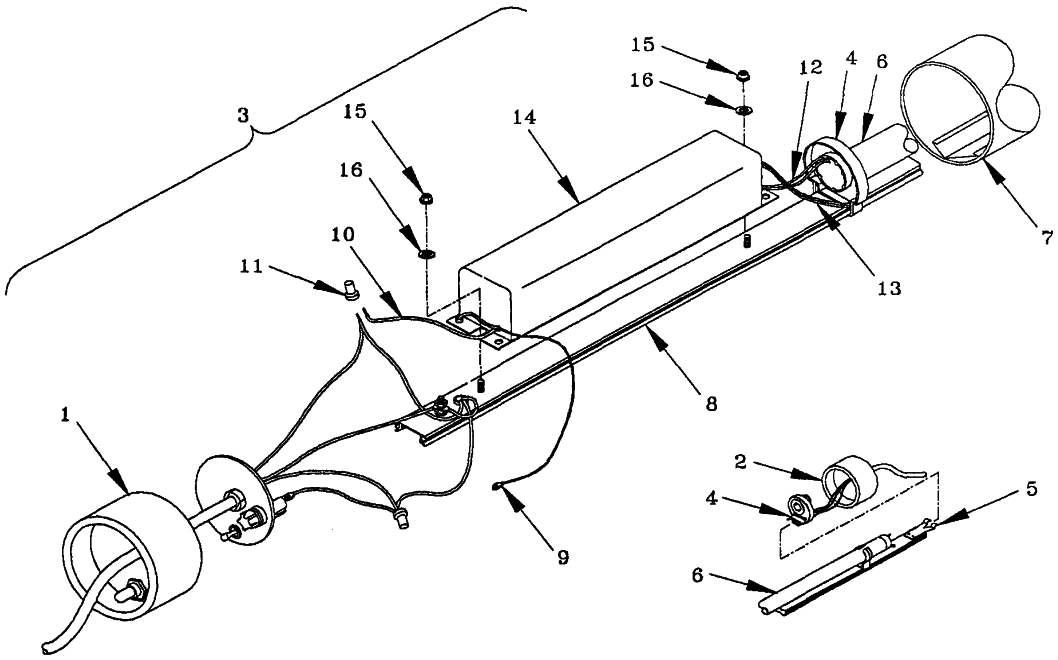


Figure 2-71. Ballast Removal and Installation.

c. Test (Refer to Figure 2-72)

(1) Remove both end caps (1) from luminaire (2).

(2) Disconnect lampholder (3) by depressing retainer connector (4). Pull lamp (5) out of lens/screen assembly (6).

(3) Slide extrusion assembly (7) out of lens/screen assembly (6).

(4) Check condition of wires leading from ballast assembly (8) to lampholders (3) along extrusion assembly (7) for cut, loose or exposed wires.

(5) Test for continuity at power input connection (9) (black and white wire splices).

(6) Connect lampholder (3) to extrusion assembly (7).

(7) If continuity exists at power input connection test at lampholder (3), (with switch in ON position).

NOTE

No continuity at lampholders indicates a faulty ballast assembly or wiring.

(8) Remove and install new ballast assembly (8).

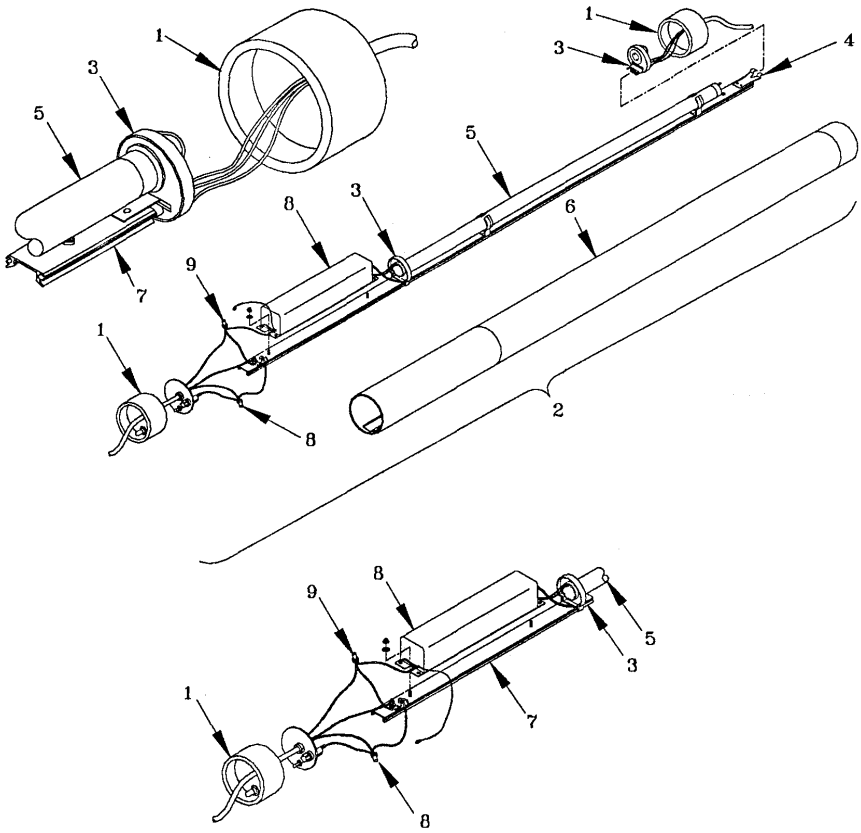


Figure 2-72. Ballast Assembly, Fuseholder and Switch Test

2.18.2 Switch.

a. Removal (Refer to Figure 2-73)

(1) Remove fuse cap and fuse.

(2) Remove molded male (1) and female (2) end caps from luminaire (3).

(3) Disconnect lampholder (4) by pressing retainer (5).

(4) Pull lens/screen assembly (6) off the extrusion assembly (7) to expose ballast (8).

(5) Separate bracket (9) from male end cap (1).

(6) Remove ring terminals (10) from rear of switch (11).

(7) Unscrew switch seal (12) and remove switch (11) and paper insulation (13) from rear of bracket (9).

2.18.2 Switch – Continued.

b. Installation (Refer to Figure 2-73)

(1) Insert new switch (11) through paper insulator (13) into cutout in bracket (9).

(2) Screw switch seal (12) onto threaded toggle sleeve.

(3) Connect ring terminals (10) to switch (11).

(4) Install bracket (9) into male end cap (1).

(5) Slide extrusion assembly (7) into lens/screen assembly (6).

(6) Install lampholders (4).

(7) Install male (1) and female (2) end caps over luminaire (3).

c. Test (Refer to Figure 2-72)

(1) Refer to paragraph 2.18.1a., steps 1 through 3, to partially disassemble luminaire.

(2) Test for continuity at the switch connector posts (with switch in ON position).

(3) If continuity does not exist, replace switch.

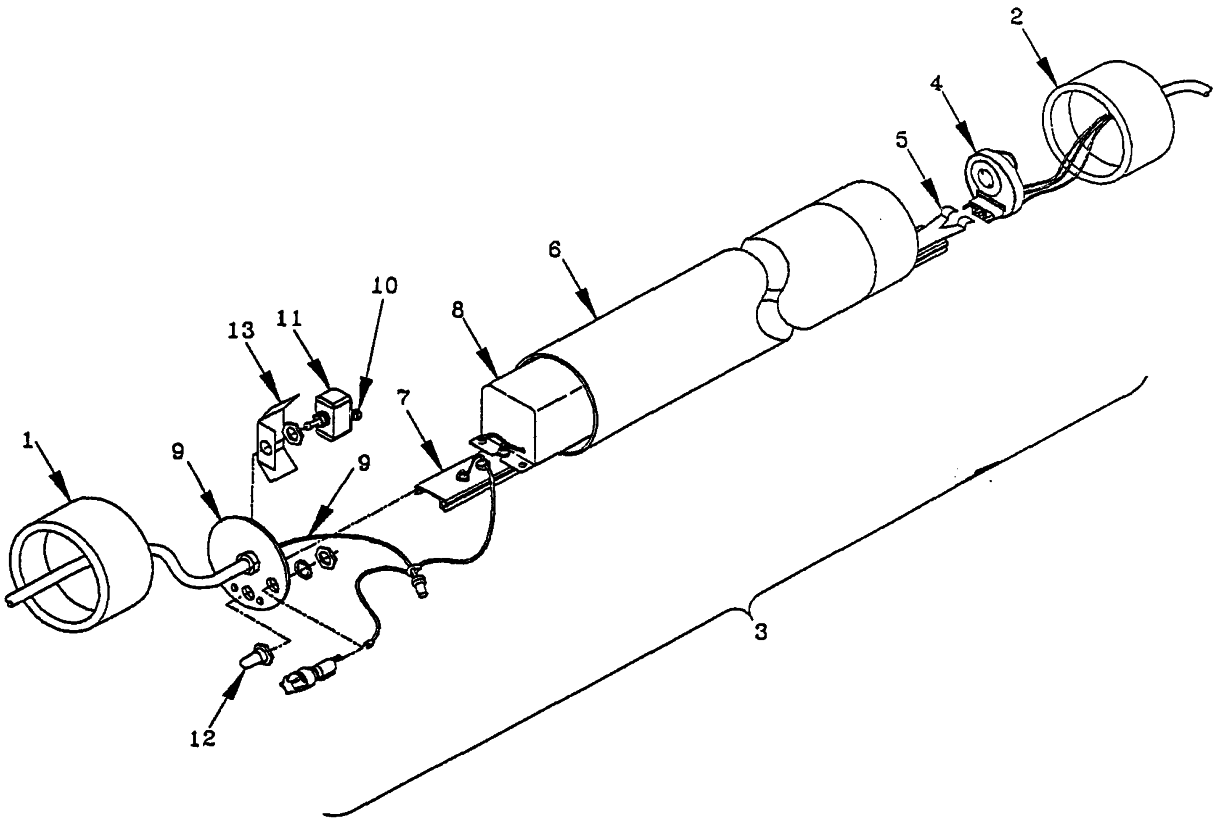


Figure 2-73. Switch Removal and Installation

2.18.3 Fuseholder.

a. Removal (Refer to Figure 2-74)

(1) Remove molded male (1) and female (2) end caps from luminaire (3).

(2) Disconnect lampholder (4) by pressing retainer (5).

(3) Pull lens/screen assembly (6) off the extrusion assembly (7) to expose ballast (8).

(4) Remove (cut) insulation sleeving (9) from rear of fuseholder (10) and remove wires from fuseholder terminals.

(5) Unscrew fuseholder cap (11) and remove fuseholder (10) from switch bracket (12).

b. Installation (Refer to Figure 2-74)

(1) Place new fuseholder (10) into position through switch bracket (12).

(2) Connect wires to fuseholder (10) terminals and install insulation sleeving (9) around terminals.

(3) Install cap (11) over fuseholder (10). (Install new fuse if necessary.)

(4) Slide extrusion assembly (7) into lens/screen assembly (6).

(5) Install lampholder (4).

(6) Install male (1) and female (2) molded end caps on luminaire (3).

c. Test (Refer to Figure 2-72)

(1) Refer to paragraph 2.18.1a., steps 1 through 3, to partially disassemble luminaire.

(2) Test for continuity at the fuseholder connection wires (with fuse in place).

(3) If continuity does not exist, replace fuseholder.

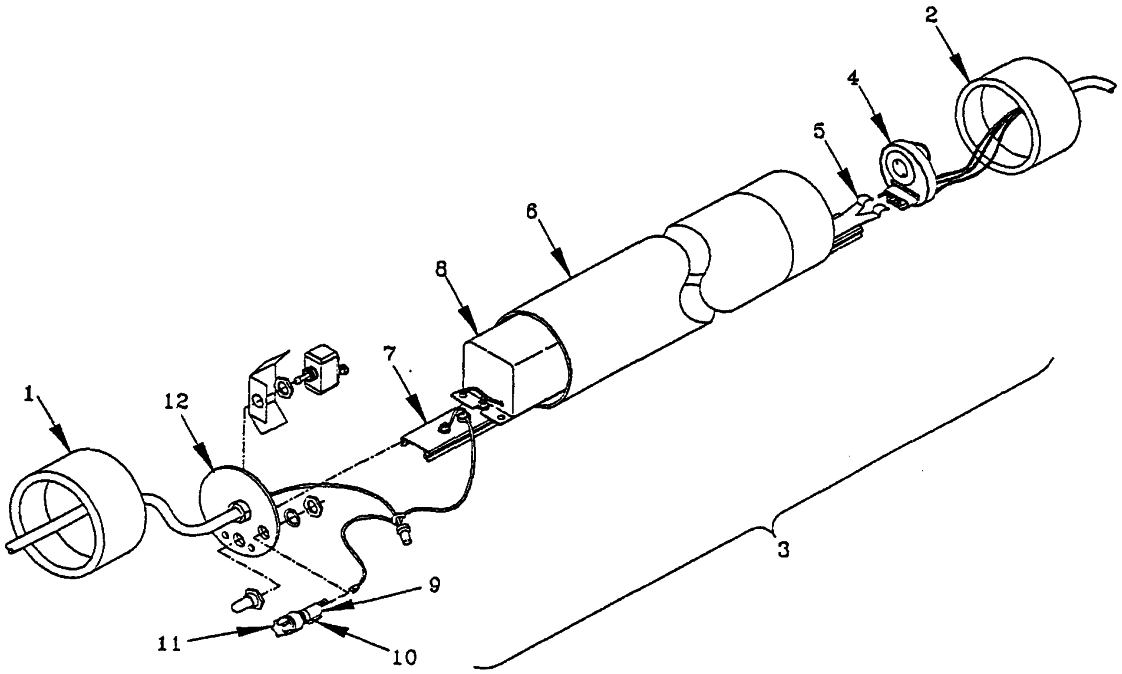


Figure 2-74. Fuseholder Removal and Installation

2.18.4 Female Cable Assembly.

a. Removal (Refer to Figure 2-75)

(1) Remove end cap (1) on female power cord (2) from luminaire (3).

(2) Remove lampholder (4) by depressing retainer connector (5).

(3) Cut female power cord (2) wires from lampholder (4) and pull power cord (2) out of end cap (1).

b. Installation (Refer to Figure 2-75)

(1) Insert loose wire end of new female power cord (2) through end cap (1) so that approximately three inches of cord are inside end cap (1).

(2) Remove outer insulation from power cord (2) on inside of end cap (1), and approximately 1/2 inch from individual wires.

(3) Solder power cord (2) wires to lampholder (4) wires.

(4) Install lampholder (4).

(5) Install end cap (1) onto luminaire (3).

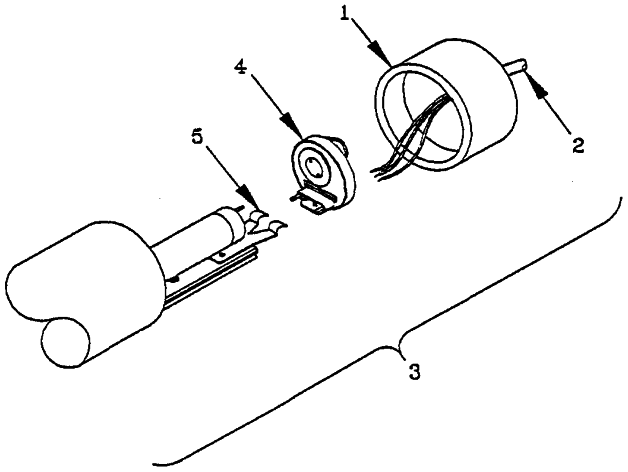


Figure 2-75. Female Cable Assembly Removal and Installation

2.18.5 Male Cable Assembly.

a. Removal (Refer to Figure 2-76)

(1) Remove fuse cap (1) and fuse (2).

(2) Remove molded male and female end caps (3,4) from luminaire (5).

(3) Disconnect lampholder (6) by depressing retainer connector (7).

(4) Pull lens/screen (8) off extrusion assembly (9) to expose ballast (10).

(5) Remove splices (11) and disconnect black (12) and white (13) wires of male power cord (14).

(6) Disconnect male power cord ground wire (15) from ground post (16).

(7) Pull male power cord (14) out of molded end cap (3) and bushing (17).

b. Installation (Refer to Figure 2-76)

(1) Push male power cord (14) through male molded end cap (3) and bushing (17).

(2) Connect black (12) and white (13) wires of male power cord (14) and reinstall splices (11).

(3) Connect male power cord ground wire (15) to ground post (16).

(4) Install lens/screen (8) over extrusion assembly (9) and ballast (10).

(5) Install molded end cap (3) of male power cord (14) over luminaire (5).

(6) Install fuse cap (1) and fuse (2).

(7) Install lampholder (6), and end cap (4) of female power cord (18) over luminaire (5).

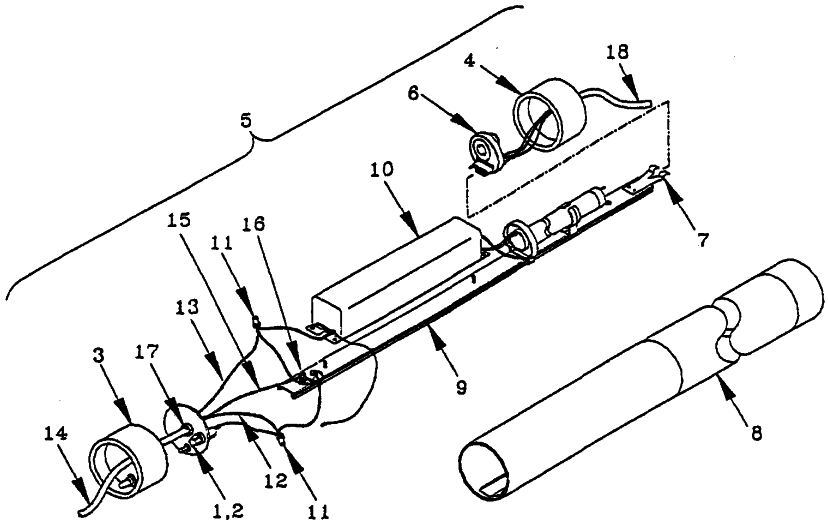


Figure 2-76. Male Cable Assembly Removal and Installation

CHAPTER 3
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS
TABLE OF CONTENTS

TABLE OF CONTENTS – Continued

Section I. GENERAL INFORMATION

3.1 GENERAL.

Direct support maintenance includes the repair and replacement of major components/assemblies which are beyond the scope of unit level repair and which can be accomplished normally within 36 hours and in accordance with Section II of Appendix B.

3.2 SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Refer to Appendix B, Section III, Tools and Test Equipment Requirements, for additional tool and equipment requirements.

3.3 REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List Manual (TM 10-5410-228-24P) for unit, direct support and general support maintenance for the CBPS.

Section II. DIRECT SUPPORT TROUBLESHOOTING PROCEDURES

3.4 GENERAL.

This section lists common equipment malfunctions and contains instructions to allow maintenance personnel to diagnose and correct each malfunction. Perform the indicated steps in the order listed. This section does not list all possible malfunctions. If a malfunction is either not listed or cannot be corrected by the prescribed procedure, notify support maintenance personnel.

3.5 GENERAL AIR CONDITIONING MALFUNCTIONS.

The following identifies general air conditioning malfunctions which may occur. Although typical of the components which may fail or conditions which effect operation, the ultimate result will be that there will be no air conditioning, or air conditioning will be insufficient or intermittent.

NOTE

Always put in a new filter/drier any time an air conditioner system component is removed for maintenance.

3.5.1 High Suction Line Pressure Is Accompanied By Low Superheat.

Problem lies with thermal expansion valve (figure 3-1). Typical thermal expansion valve problems are as follows:

a. Thermal Expansion Valve Out of Adjustment. If the expansion valve is set for too low a superheat (gas temperature above the saturation pressure point), too much liquid will be passed into the evaporator. The suction line will be abnormally cold and liquid may 'slug' (flow) back to the compressor. If the expansion valve is set for too high a superheat, too little liquid will be passed to the evaporator and the suction line will be abnormally warm.

b. Thermal Expansion Valve Stuck in Open Position. If the thermal expansion valve is stuck in open position, there will be an excessively low superheat and a possible liquid flow into the compressor.

c. Thermal Expansion Valve is Obstructed. Foreign material may obstruct the thermal expansion valve port. If the obstruction is small, the resulting operation will be an oscillating condition which will cause a suction pressure variation of possibly 10 to 15 psi (shown on a pressure test gage on the suction side). If the obstruction holds the valve open, liquid will flow back to the compressor. This can cause a liquid lock of the compressor, and may damage the compressor on start-up.

3.5 GENERAL AIR CONDITIONING MALFUNCTIONS – Continued.

CAUTION

Do not cause flood-back (liquid flow) through suction line as liquid flood-back could cause severe damage to compressor.

The thermal expansion valve is factory-set. Do not attempt to adjust. If the thermal expansion valve is identified as the problem, replace it (refer to para 3.9.10). Any attempt to adjust the thermal expansion valve may result in damage to the equipment.

Test operation of thermal expansion valve/sensor bulb as follows:

- Turn air conditioning system (compressor) off.
- Gain access to the evaporator coil (refer to para 3.9.9).
- Carefully place the remote sensor bulb in a container filled with ice water.
- Turn air conditioning system (compressor) on.
- Remove the remote bulb from the ice water and warm it in your hand. At the same time, feel the suction line for a rapid temperature change. A decreasing temperature indicates flood-through of liquid R22 refrigerant. If R22 refrigerant floods through the valve, the thermal expansion valve and sensor are operating properly.

3.5.2 Low Suction Line Pressure Is Accompanied by High Superheat.

Problem lies with thermal expansion valve (figure 3-1). Typical thermal expansion valve problems are as follows:

a. Thermal Expansion Valve Inoperative or Has Lost Its Charge. The thermal expansion valve consists of a valve located on the liquid line of the evaporator coil and a remote sensing bulb. The remote sensing bulb is secured to the evaporator output suction line. If the valve is inoperative, the bulb has lost its charge, or the interconnecting capillary tube is broken, the valve will either maintain in almost closed position or may close completely.

b. Thermal Expansion Valve Erratic. Usually caused by a faulty thermal expansion valve, due to an improperly installed or loose feeler bulb, or low evaporator coil loading due to air flow and air flow temperatures.

c. High Evaporator Coil Superheat. Possible causes include: inadequate R22 refrigerant charge, faulty thermal expansion valve, restriction in the liquid line filter/drier or in the liquid line itself, or extremely low head pressure.

NOTE

Occasionally the filter/drier in the liquid line may become blocked with foreign material in the system. When this happens, the liquid line leaving the filter/drier will feel cooler than the liquid entering. If it is badly blocked, some sweat or frost may appear at the drier outlet. When either condition occurs, the filter/drier should be changed (refer to para 3.9.13).

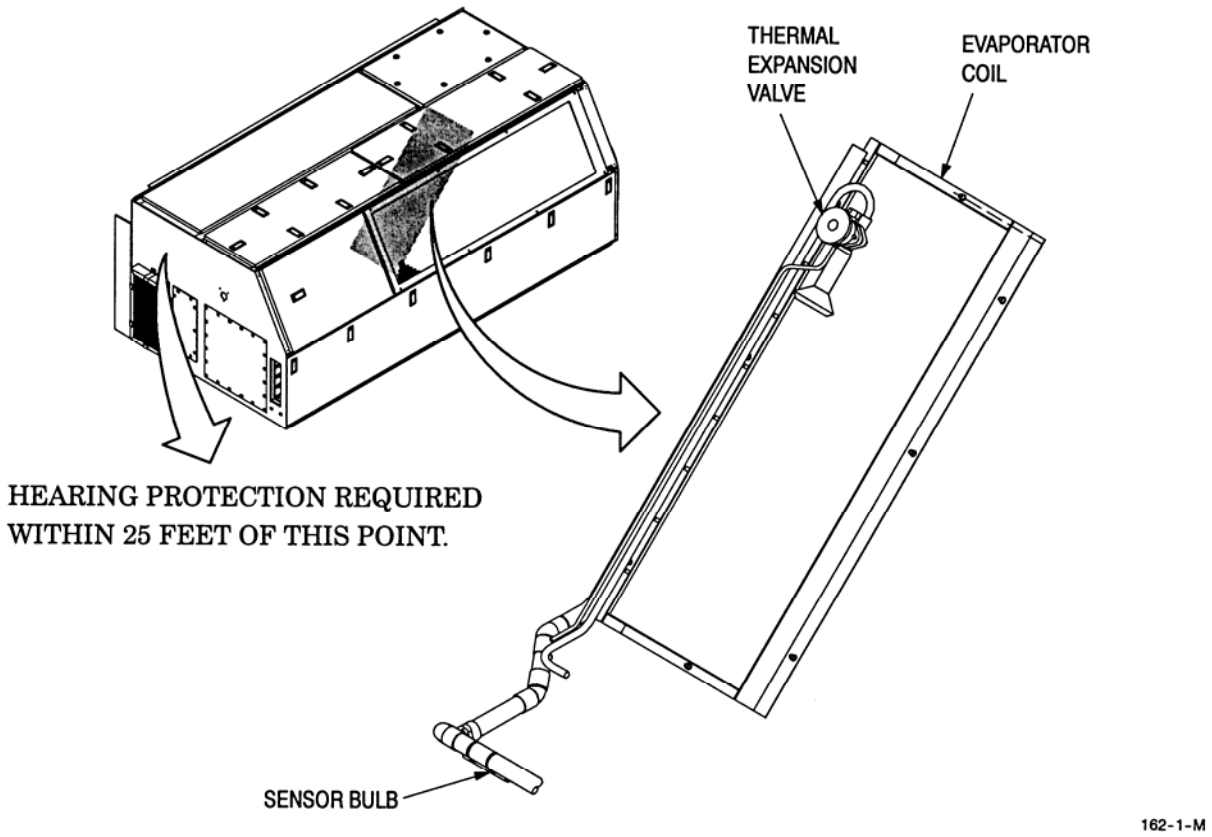


Figure 3-1. Thermal Expansion Valve/Sensor Bulb

3.5 GENERAL AIR CONDITIONING MALFUNCTIONS – Continued.

1. NO AIR CONDITIONING OR INSUFFICIENT COOLING.

NOTE

The following malfunctioning pressure symptoms are likely.

High (Compressed) Head Pressure. This is normally caused by high (warm) air temperature of the air to the condenser coil, insufficient air across condenser, too great a R22 refrigerant charge, a dirty condenser, or air in the R22 refrigeration system. Note: Too high a (compressor) head pressure will cause the air conditioning system to shut down and the HIGH R22 REFRIGERANT PRESSURE alarm light on the rear control pane to turn on.

CAUTION

Operating the air conditioning system with abnormally low superheat (gas temperature above the saturation pressure point) can cause high suction pressure since some of the liquid R22 refrigerant will evaporate in the suction line and possibly in the compressor itself. This condition may damage the compressor.

Low (Compressor) Head Pressure. Low head pressure is normally caused when operating the air conditioner with a low (cold) outside air temperature.

High Suction Line Pressure. This condition can be caused by a bad thermal expansion valve, a problem with the sensor bulb, a bad compressor, or when the air in the ABS is warm and is accompanied by high warm temperature of air being applied to the condenser (high head pressure).

Low Suction Line Pressure. This is normally caused by insufficient air flow or low (warm) temperature air flow to the evaporator coil. It can also be caused by restricted R22 refrigerant flow or short R22 refrigerant charge, problem with thermal expansion valve, or low head pressure. Too low a suction line pressure will cause the air conditioning system to shut down and the LOW R22 REFRIGERANT PRESSURE alarm light on the rear control panel to turn on.

WARNING

Always wear eye protection and use extreme care when working with R22 refrigerant.

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

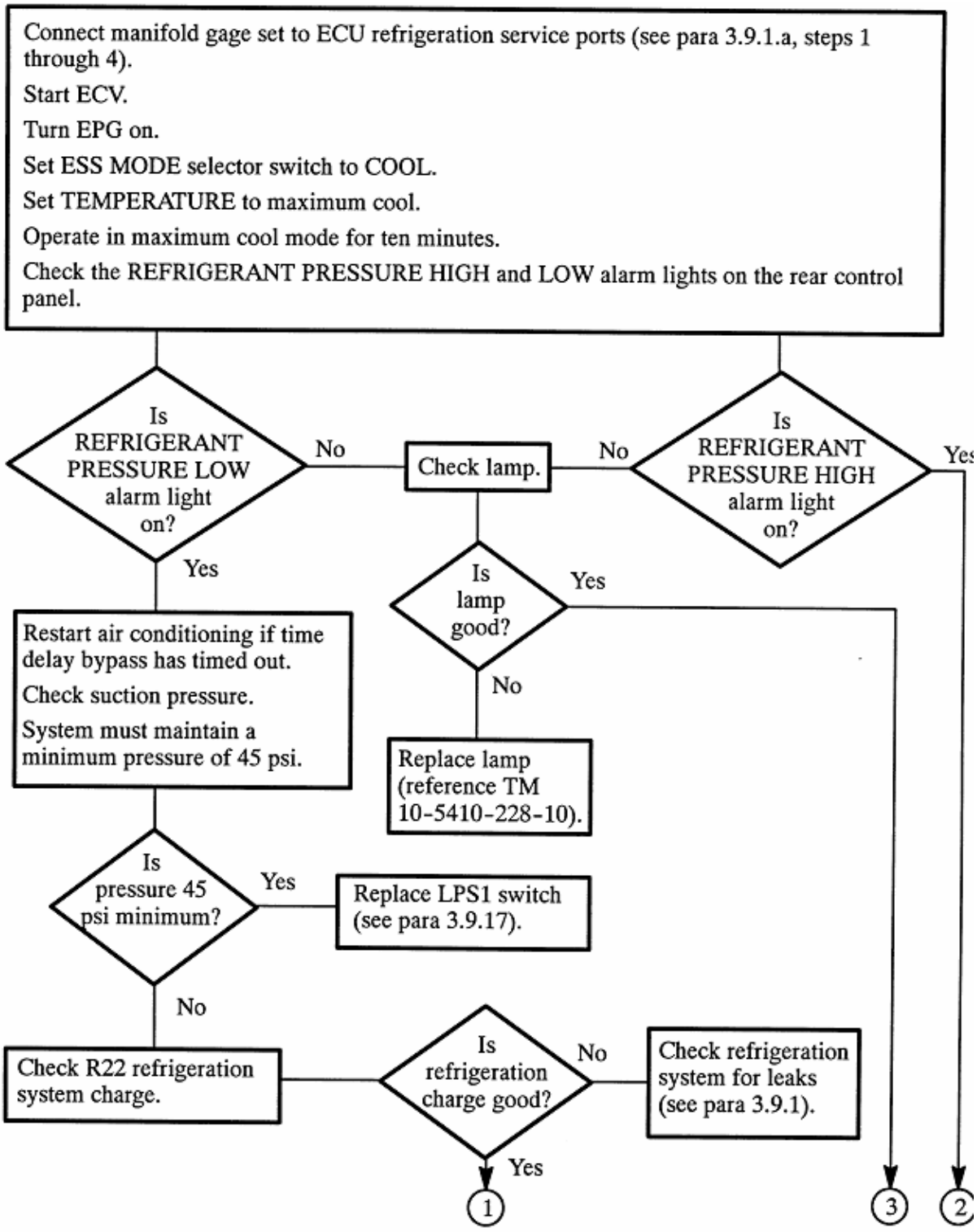
Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

NOTE

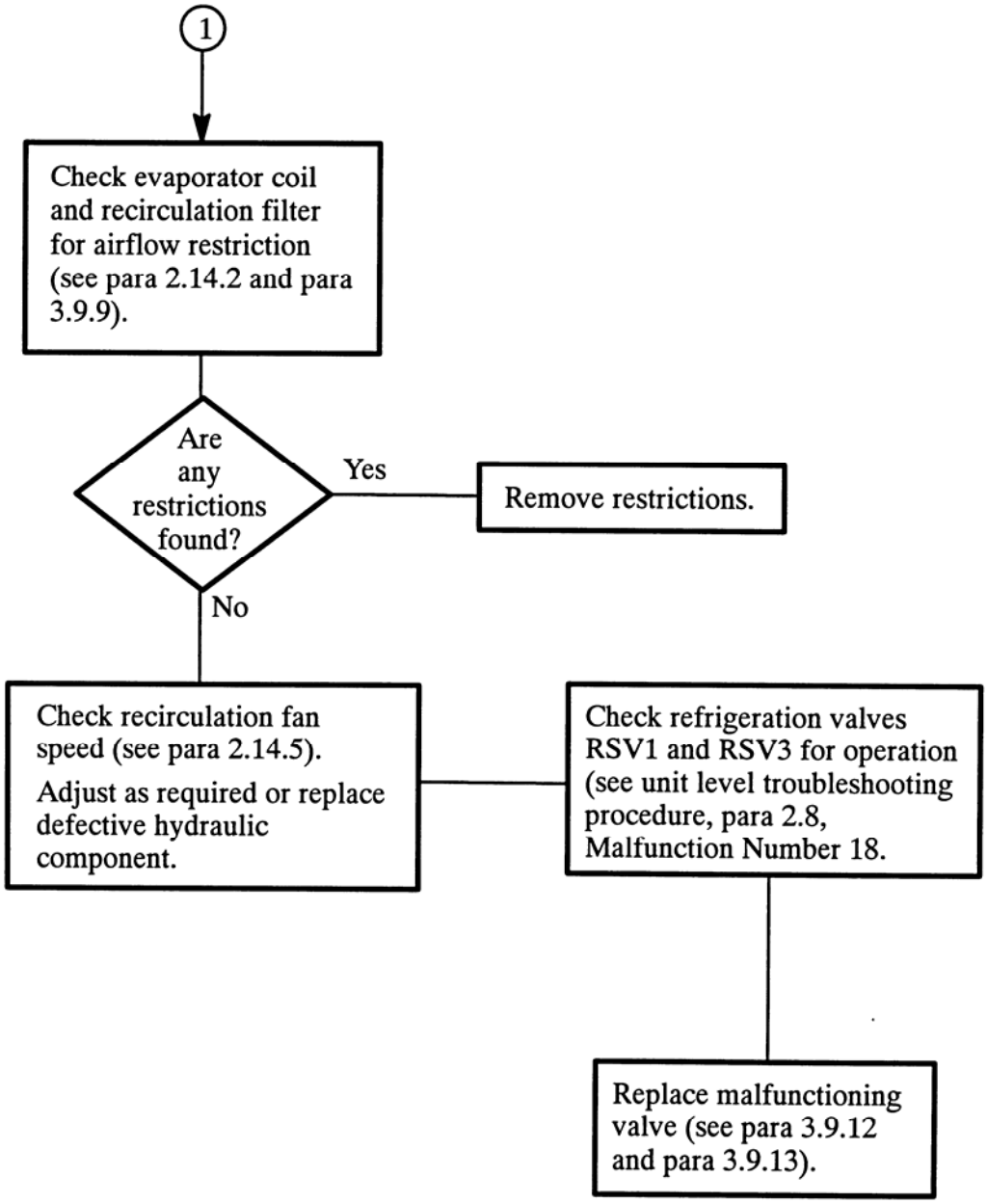
When checking the operation of the air conditioning system or troubleshooting the system, a manifold gage set should e used (Item 26, Appendix B).

1. NO AIR CONDITIONING OR INSUFFICIENT COOLING – Continued.

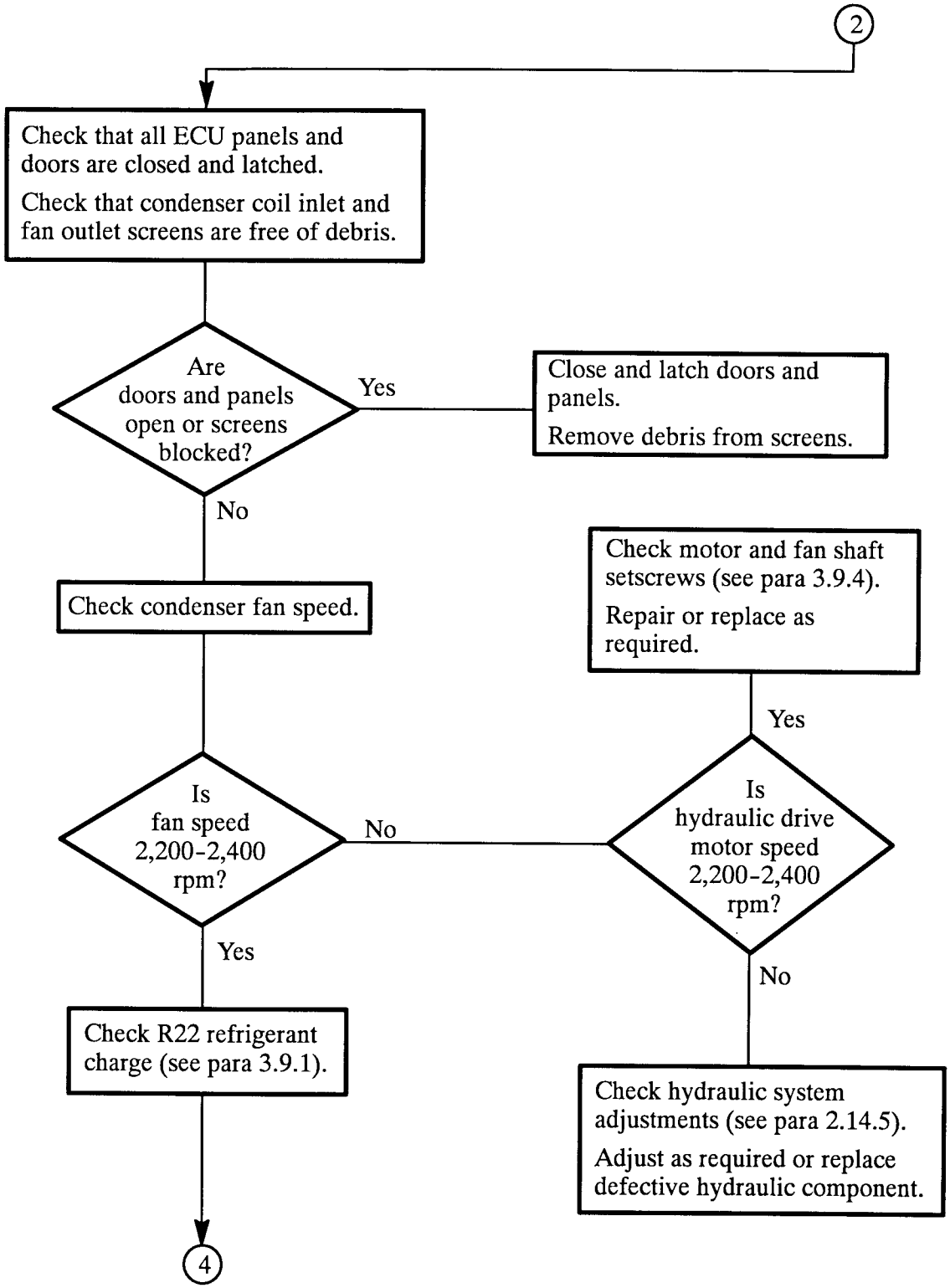


3.5 GENERAL AIR CONDITIONING MALFUNCTIONS – Continued.

1. NO AIR CONDITIONING OR INSUFFICIENT COOLING – Continued.

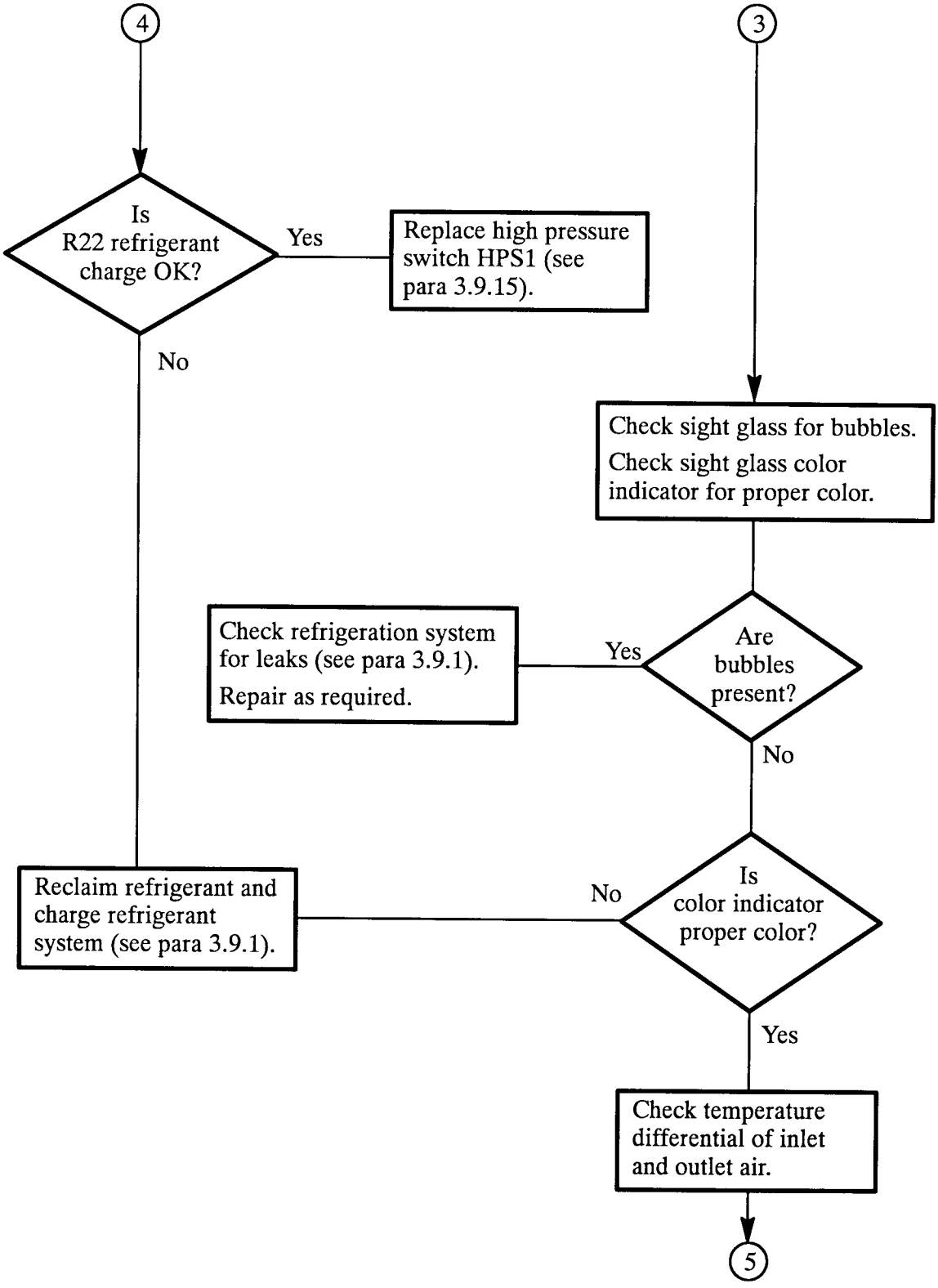


1. NO AIR CONDITIONING OR INSUFFICIENT COOLING – Continued.

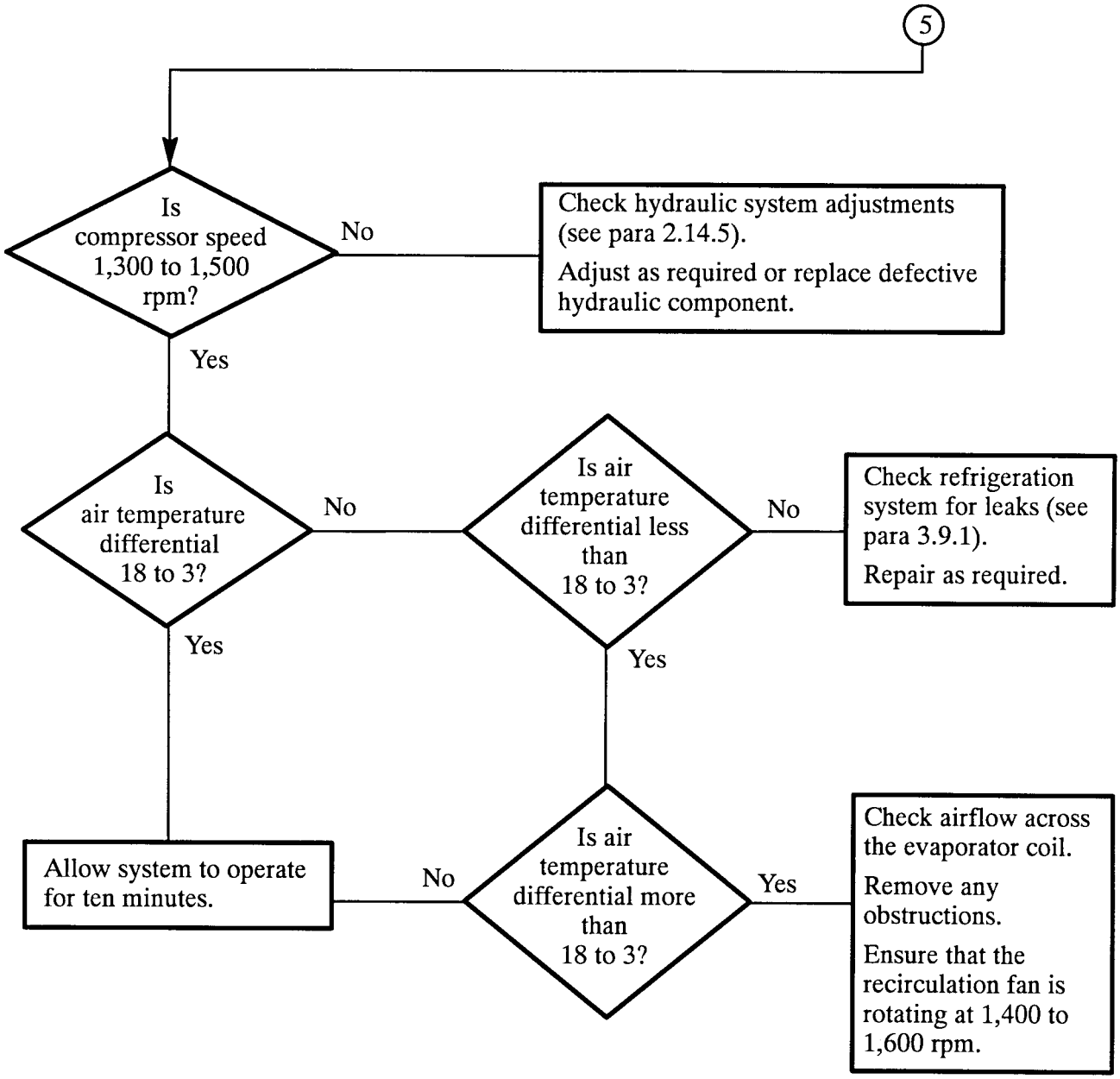


3.5 GENERAL AIR CONDITIONING MALFUNCTIONS – Continued.

1. NO AIR CONDITIONING OR INSUFFICIENT COOLING – Continued.

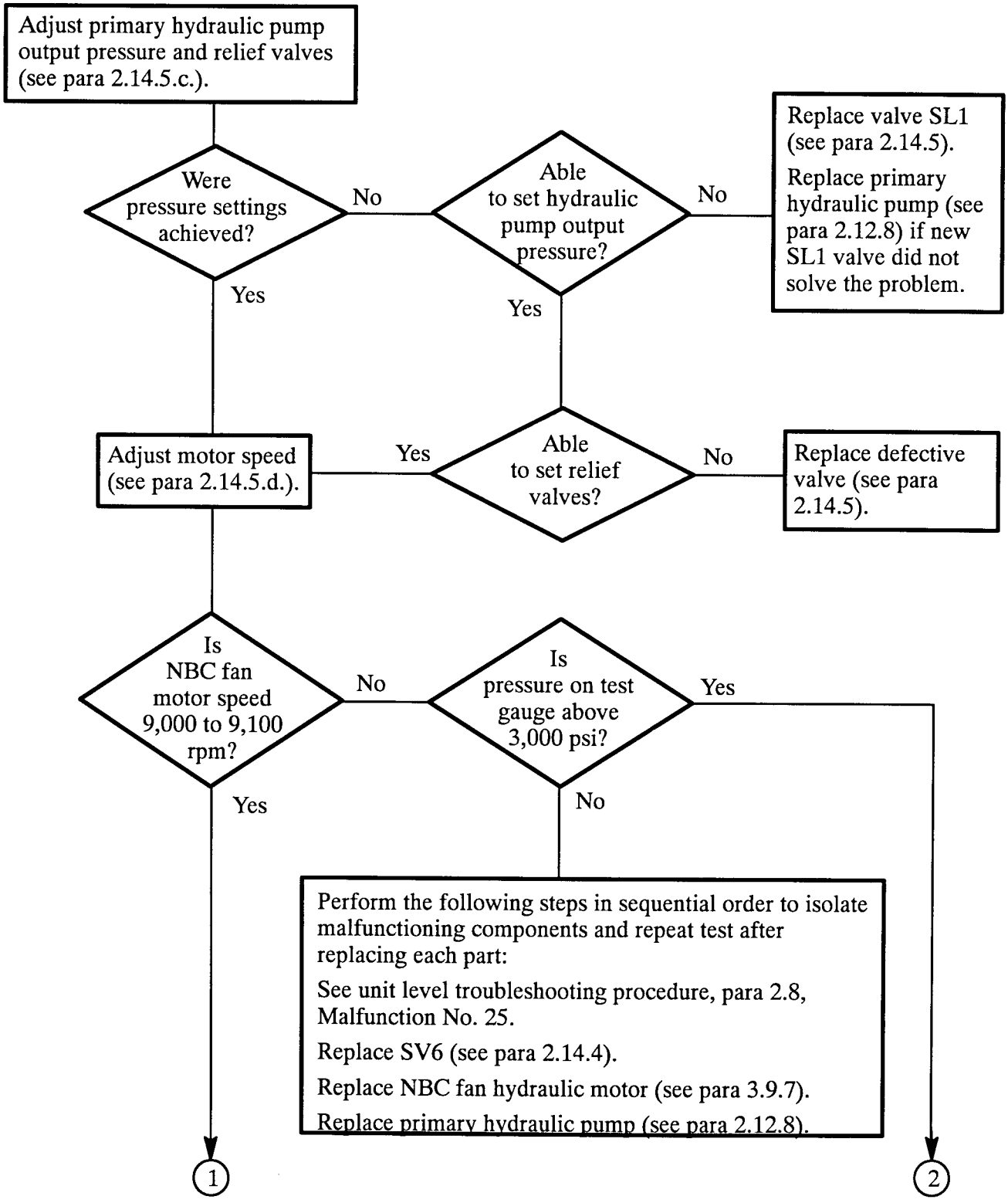


1. NO AIR CONDITIONING OR INSUFFICIENT COOLING – Continued.

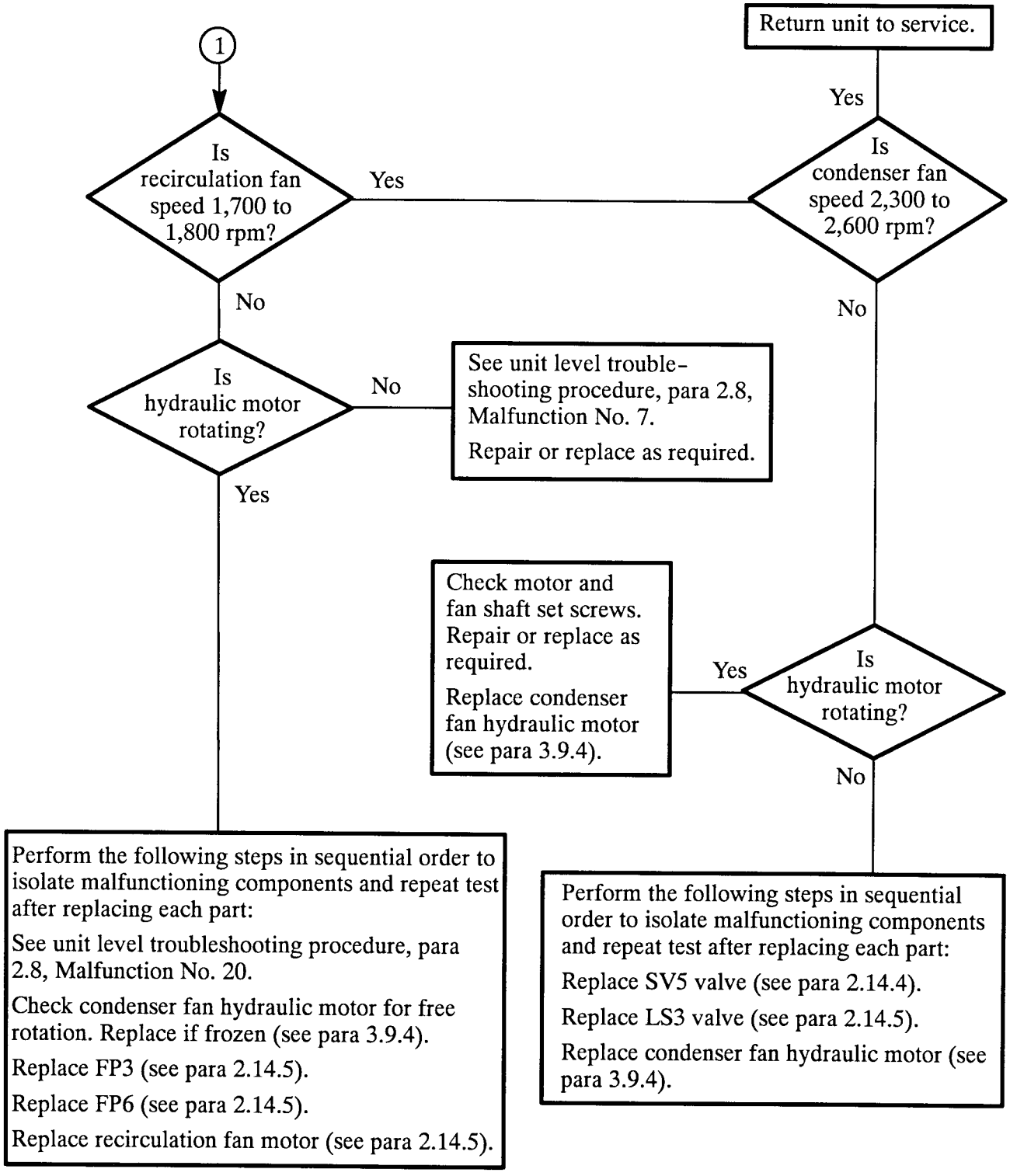


3.5 GENERAL AIR CONDITIONING MALFUNCTIONS – Continued.

2. HYDRAULIC SYSTEM INOPERATIVE OR HYDRAULIC DRIVE MOTORS NOT ABLE TO MAINTAIN MINIMUM SPEEDS.

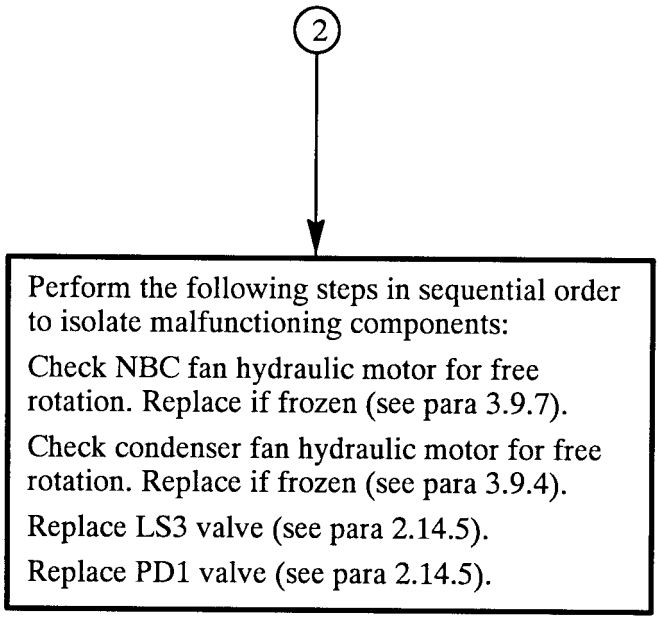


2. HYDRAULIC SYSTEM INOPERATIVE OR HYDRAULIC DRIVE MOTORS NOT ABLE TO MAINTAIN MINIMUM SPEEDS – Continued.



3.5 GENERAL AIR CONDITIONING MALFUNCTIONS – Continued.

2. HYDRAULIC SYSTEM INOPERATIVE OR HYDRAULIC DRIVE MOTORS NOT ABLE TO MAINTAIN MINIMUM SPEEDS – Continued



Section III. DIRECT SUPPORT MAINTENANCE PROCEDURES

3.6 GENERAL.

a. This section provides procedures for the replacement and repair of major components and assemblies which fall within the scope of direct support maintenance.

b. Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.7 EXPANDED CAPACITY VEHICLE (ECV).

3.7.1 Auxiliary Power Pack Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Prime Hydraulic Pump

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric, 1/2 in. (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Jack, Hydraulic, 12 Ton (Item 20, Appendix B)
Light, Extension (Item 24, Appendix B)
11/16 Inch Crowfoot Wrench (Item 53, Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)
1-1/8 Inch Crowfoot Wrench (Item 57, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
1-7/8 Inch Crowfoot Wrench (Item 63, Appendix B)
Torque Wrench (Item 66, Appendix B)
Collar Set, Drill Stop (Item 2, Appendix B)

Materials/Parts:
Antiseize Compound (Item 13, Appendix C)
Hydraulic Fluid (Item 24, Appendix C)

Reference:
TM 10-5411-224-14

Equipment Conditions:
ECV off, system power off, power panel and ECV tagged.
ECV parking brake set.
Power cable disconnected.
Hydraulic system drained (see para 2.14.3).

Materials/Parts: (Cont.)
Wiping Rags (Item 39, Appendix C)
Grease, Automotive (Item 27, Appendix C)
Sixteen Lockwashers (Item 18, Appendix E)
Four Lockwashers (Item 20, Appendix E)
Six Lockwashers (Item 21, Appendix E)
Six Lockwashers (Item 22, Appendix E)
O-ring (Item 61, Appendix E)
O-ring (Item 63, Appendix E)
O-ring (Item 50, Appendix E)
O-ring (Item 57, Appendix E)
O-ring (Item 53, Appendix E)
Two O-rings (Item 54, Appendix E)
Forty-three Blind Rivets (Item 80, Appendix E)
Twenty-four Self-locking Nuts (Item 42, Appendix E)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.7.1 Auxiliary Power Pack Replacement – Continued.

a. Removal (Refer to Figure 3-2)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

Hydraulic fluid will be released when removing tubes. Collect fluid in container and clean any spillage with rags.

An extension light should be used to help locate components and hardware.

(1) Open cover (1) and secure in place with latch (2).

(2) Close hose assembly shut off valve (3) in ECV compartment.

(3) Close shut off valve (4) to primary hydraulic pump per para 2.14.3.

(4) Disconnect hose assembly (5) from elbow (6) on piston pump (7).

(5) Remove elbow (6) from piston pump (7).

(6) Remove and discard O-rings (8 and 9) from elbow (6).

(7) Remove hose assembly (10) from elbow (11) on piston pump (7).

(8) Remove four bolts (12) and four lockwashers (13) securing two flange halves (14) and hose assembly (15) to piston pump (7).

(9) Remove and discard O-ring (16) from hose assembly (15).

(10) Center jack (or other suitable device) underneath the ECV wheel well and auxiliary power pack. Raise jack so that it makes contact with the interior frame assembly (17).

WARNING

The auxiliary power pack is extremely heavy. Use proper lifting equipment and observe all safety practices for lifting to prevent injury to personnel.

CAUTION

Clearances are extremely close. Damage may result if auxiliary power pack is not lowered carefully.

(11) Remove 24 bolts (18) and 24 self-locking nuts (19) securing the interior frame assembly (17) to the exterior frame assembly (20). Discard 24 self-locking nuts (19).

(12) Using jack, carefully lower auxiliary power pack. Disconnect cable assembly 1A1W2 connector P1 (21) from underside of pan and frame assembly per para 2.13.25.

(13) Disconnect hose assembly (22) from fitting (23).

(14) Remove four bolts (24) and four lockwashers (25) securing two flange halves (26) and fitting (23) to piston pump (7).

(15) Remove and discard O-rings (27 and 28) from fitting (23).

(16) Carefully slide jack and auxiliary power pack out from underneath ECV compartment.

b. Disassembly (Refer to Figure 3-2)

(1) Remove elbow (11) from piston pump (7).

(2) Remove and discard O-rings (29 and 30) from elbow (11).

NOTE

Gain access to pump coupling setscrew through access hole in C-face pump adapter.

(3) Loosen setscrew (31) on pump coupling (32) and setscrew (33) on motor coupling (34).

(4) Remove two screws (35), two lockwashers (36) and two flat washers (37) securing piston pump (7) to C-face pump adapter (38). Discard two lockwashers (36).

(5) Remove four screws (39), four lockwashers (40) and four flat washers (41) securing C-face pump adapter (38) to AC motor (42). Discard four lockwashers (40).

(6) Remove pump coupling (32), pump insert (43) and motor coupling (34) from shaft of AC motor (42).

(7) Remove pump shaft key (44) from shaft of AC motor (42).

WARNING

The AC motor is extremely heavy. Use proper lifting equipment and observe all safety practices for lifting to prevent injury to personnel.

(8) Remove four screws (45), four lockwashers (46) and four flat washers (47) securing motor mounting base (48) to four rubber mounts (49). Discard four lockwashers (46).

(9) Remove motor mounting base (48) with AC motor (42) attached.

(10) Remove six screws (50), 12 flat washers (51), six lockwashers (52) and six nuts (53) securing AC motor (42) and pump support weldment (54) to motor mounting base (48) and remove AC motor (42). Discard six lockwashers (52).

(11) Remove sixteen screws (55), 32 flat washers (56), sixteen lockwashers (57) and sixteen nuts (58) securing four rubber mounts (49) to interior frame assembly (17). Discard sixteen lockwashers (57).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

(12) Drill out 43 rivets (59) securing the exterior frame assembly (20) to the ECV compartment and remove exterior frame assembly (20).

c. Assembly (Refer to Figure 3-2)

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Secure exterior frame assembly (20) to the ECV compartment with 43 rivets (59) (Item 80, Appx E).

(2) Secure four rubber mounts (49) to interior frame assembly (17) with sixteen screws (55), 32 flat washers (56), sixteen new lockwashers (57) (Item 18, Appx E) and sixteen nuts (58).

(3) Secure AC motor (42) and pump support weldment (54) to motor mounting base (48) with six screws (51), 12 flat washers (52), six new lockwashers (53) (Item 21, Appx E) and six nuts (54).

3.7.1 Auxiliary Power Pack Replacement – Continued.

(4) Place motor mounting base (48) with AC motor (42) attached onto four rubber mounts (49) and secure with four screws (45), four new lockwashers (46) (Item 20, Appx E) and four flat washers (47).

(5) Install pump shaft key (44) onto shaft of AC motor (42). Apply antiseize compound to shaft.

(6) Align and slide motor coupling (34), pump insert (43) and pump coupling (32) onto shaft of AC motor (42).

(7) Secure C-face pump adapter (38) to AC motor (42) with four screws (39), four new lockwashers (40) (Item 22, Appx E) and four flat washers (41).

(8) Secure piston pump (7) to C-face pump adapter (38) with two screws (35), two new lockwashers (36) (Item 22, Appx E) and two flat washers (37).

NOTE

Gain access to pump coupling setscrew through access hole in C-face pump adapter.

(9) Tighten setscrew (31) on pump coupling (32) and setscrew (33) on motor coupling (34).

(10) Install new O-ring (29) (Item 56 Appx E) on elbow (11). Lubricate O-ring (29) with a small amount of grease.

(11) Install elbow (11) on piston pump (7). Ensure that O-ring (29) is properly seated and is not pinched. Tighten elbow (11) until finger tight.

(12) Torque elbow (11) to 720 ± 25 in.-lb (60 ± 2 ft-lb).

d. Installation (Refer to Figure 3-2)

WARNING

The auxiliary power pack is extremely heavy. Use proper lifting equipment and observe all safety practices for lifting to prevent injury to personnel.

NOTE

When removing hoses, catch excess hydraulic oil in hose with small container. Clean up spillage with rags.

An extension light should be used to help locate components and hardware.

(1) Place auxiliary power pack onto jack.

(2) Carefully slide jack and auxiliary power pack underneath ECV compartment.

(3) Center jack and auxiliary power pack underneath the ECV wheel well.

CAUTION

Clearances are extremely close. Damage may result if auxiliary power pack is not raised carefully.

(4) Using jack, carefully start to raise auxiliary power pack through cutout in ECV wheel well. Connect cable assembly 1A1W2 connector P1 (21) to underside of pan and frame assembly per para 2.13.25.

(5) Install new O-ring (27) (Item 53, Appx E) on fitting (23). Lubricate O-ring (27) with small amount of hydraulic fluid.

(6) Install fitting (23) on hose assembly (22). Ensure that O-ring (27) is properly seated and is not pinched.

(7) Install new O-ring (28) (Item 54, Appx E) on fitting (23). Lubricate O-ring (28) with small amount of hydraulic fluid.

(8) Install fitting (23) on piston pump (7). Ensure O-ring (28) is properly seated and is not pinched.

NOTE

Bolts and lockwashers supplied with flange halves.

(9) Secure two flange halves (26) to piston pump (7) with four bolts (24) and four lockwashers (25).

(10) Torque four bolts (24) in diagonal sequence in small increments to 488 □ 62 in.-lb (41 □ 5 ft-lb).

(11) Torque fitting (23) to 1,680 □ 90 in.-lb (140 □ 8 ft-lb).

(12) Using jack, carefully raise auxiliary power pack until in proper position. Secure the interior frame assembly (17) of auxiliary power pack to the exterior frame assembly (20) with 24 bolts (18) and 24 new self-locking nuts (19) (Item 42, Appx E).

(13) Install new O-ring (9) (Item 50, Appx E) on elbow (6). Lubricate O-ring (9) with small amount of hydraulic fluid.

(14) Install elbow (6) on piston pump (7). Ensure that O-ring (9) is properly seated and is not pinched. Tighten elbow (6) until finger tight.

(15) Torque elbow (6) to 190 □ 10 in.-lb (16 □ 1 ft-lb).

(16) Install new O-ring (8) (Item 61, Appx E) on elbow (6). Lubricate O-ring (8) with small amount of hydraulic fluid.

(17) Connect hose assembly (5) to elbow (6). Ensure that O-ring (8) is properly seated and is not pinched. Tighten nut on hose assembly (5) until finger tight.

(18) Torque nut on hose assembly (5) to 220 □ 10 in.-lb (18 □ 1 ft-lb).

(19) Install new O-ring (30) (Item 49, Appx E) on elbow (11). Lubricate O-ring (30) with small amount of hydraulic fluid.

(20) Connect hose assembly (10) to elbow (11) on piston pump (7). Ensure that O-ring (30) is properly seated and is not pinched. Tighten nut on hose assembly (10) until finger tight.

(21) Torque nut on hose assembly (10) to 480 □ 25 in.-lb (40 □ 2 ft-lb).

(22) Install new O-ring (16) (Item 53, Appx E) on hose assembly (15). Lubricate O-ring (16) with small amount of hydraulic fluid.

NOTE

Bolts and lockwashers supplied with flange halves.

(23) Secure hose assembly (15) and two flange halves (14) to piston pump (7) with four bolts (12) and four lockwashers (13). Ensure that O-ring (16) is properly seated and is not pinched.

(24) Torque four bolts (12) in diagonal sequence in small increments to 300 □ 50 in.-lb (25 □ 4.5 ft-lb).

(25) Open shut off valve (3) on hydraulic line in ECV wheel well.

(26) Open shut off valve (4) to primary hydraulic pump per para 2.14.3.

(27) Close and secure cover (1) with latch (2).

e. Prime Hydraulic Pump (Refer to Figure 3-2)

NOTE

Hydraulic pump must be primed when a new pump is being installed. If pump is being reinstalled, priming is not required as long as fluid has not drained out of pump.

(1) Fill 1/2 inch port case drain on piston pump (7) with hydraulic fluid. Fill until case drain overflows. Hose assembly (10) and elbow (11) have to be removed from case drain port when filling piston pump (7).

3.7.1 Auxiliary Power Pack Replacement – Continued.

NOTE

Ensure that hydraulic reservoir has the correct amount of hydraulic fluid. Fluid level on the hydraulic reservoir level gage should be between the HOT and COLD marks.

(2) Gain access to the ECU hydraulic manifold and disconnect connector on solenoid/valve SV2 per para 2.14.4.

(3) Manually open solenoid/valve SV2.

(4) Ensure that ESS is in the OFF position.

(5) Turn POWER MODE selector switch on the rear control panel to EXT position.

(6) Quickly push NBC FAN switch/indicator ON and OFF a couple of times. Listen to the sound of the pump and observe if the NBC fan is rotating. Loud noise indicates pump is not primed yet. Repeat this step several times until the fan turns.

(7) Reconnect connector on solenoid/valve SV2.

(8) Refer to para 2.14.5e. to adjust auxiliary power pump.

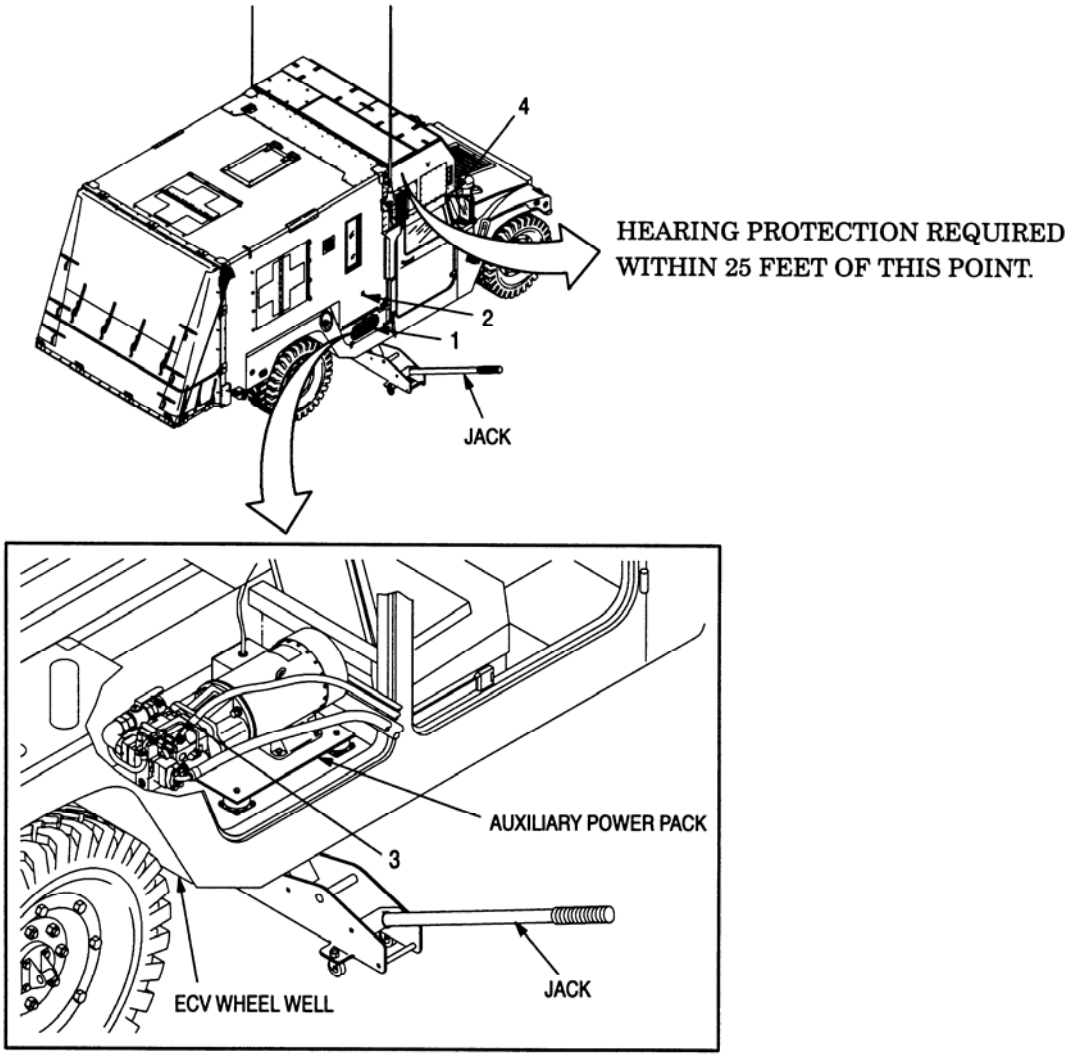


Figure 3-2. Auxiliary Power Pack (Sheet 1 of 2)

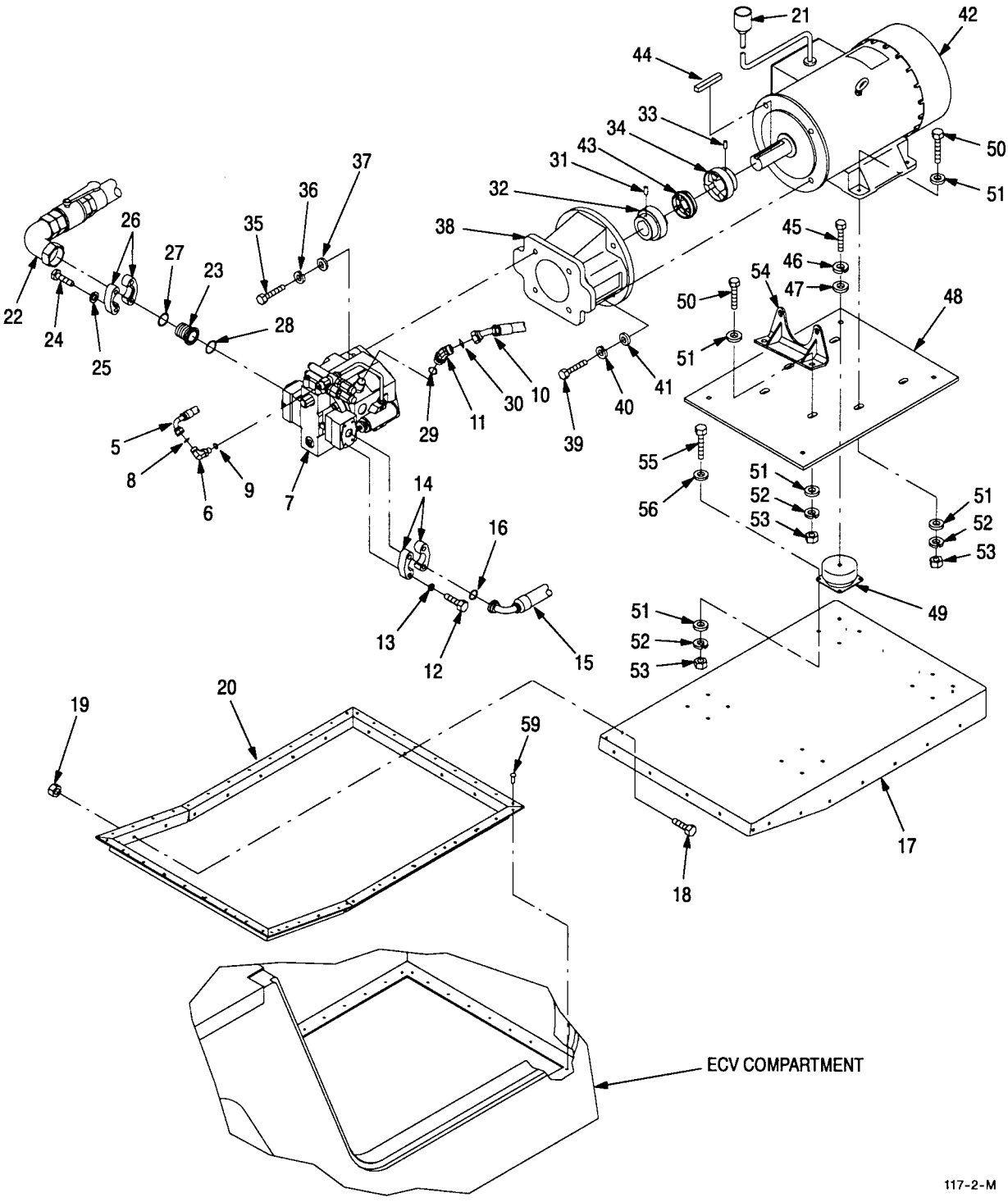


Figure 3-2. Auxiliary Power Pack (Sheet 2 of 2)

Follow-on maintenance: Fill hydraulic system per para 2.14.3, apply power and check for leaks.

3.8 LIGHTWEIGHT MULTIPURPOSE SHELTER (LMS).

3.8.1 LMS Air Duct Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV parking brake set.
Drill, Electric (Item 6, Appendix B)	References:
Drill Set (Item 5, Appendix B)	TM 10-5411-224-14
Goggles (Item 17, Appendix B)	
Riveter, Blind, Hand (Item 34, Appendix B)	Materials/Parts:
Collar Set, Drill Stop (Item 2, Appendix B)	Ten Blind Rivets (Item 137 Appendix E)

a. Removal (Refer to Figure 3-3)

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch.

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Drill out ten rivets (1) securing air duct (2) to LMS front wall (3).

(2) Remove six screws (5), six lockwashers (6) and six flat washers (7) and pull air duct (2) from LMS roof fastener loop (4).

b. Installation (Refer to Figure 3-3)

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets.

(1) Secure air duct (2) to LMS roof fastener loop (4) with six screws (5), six lockwashers (6) and six flat washers (7).

(2) Install air duct (2) to LMS front wall (3) with ten rivets (1).

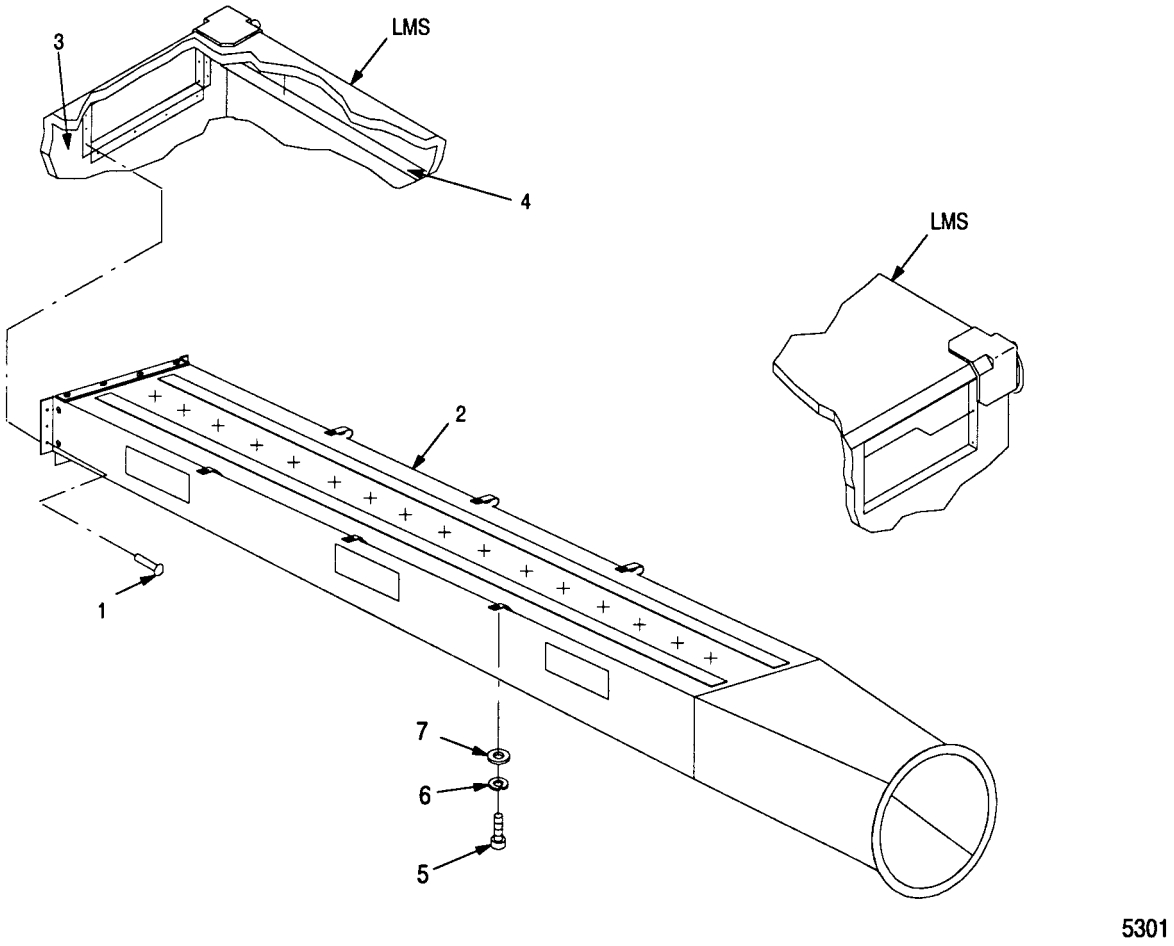


Figure 3-3. LMS Air Duct Replacement

3.8.2 Electrical Equipment Rack Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Equipment Conditions: Equipment cables/hoses tagged, equipment removed from rack (see para 2.13.20 through para 2.13.25).
Materials/Parts: Eleven Lockwashers (Item 19, Appendix E)	

NOTE

Note position and numbers for installation.

a. Removal

Remove seven screws (1), seven lockwashers (2) seven flat washers (3), three washers (4), and seven shims (5) securing electrical equipment rack (6) to LMS. Discard lockwashers (2).

b. Installation

Secure electrical equipment rack (6) to LMS with seven screws (1), seven new lockwashers (2), seven flat washers (3), three washers (4), and seven shims (5).

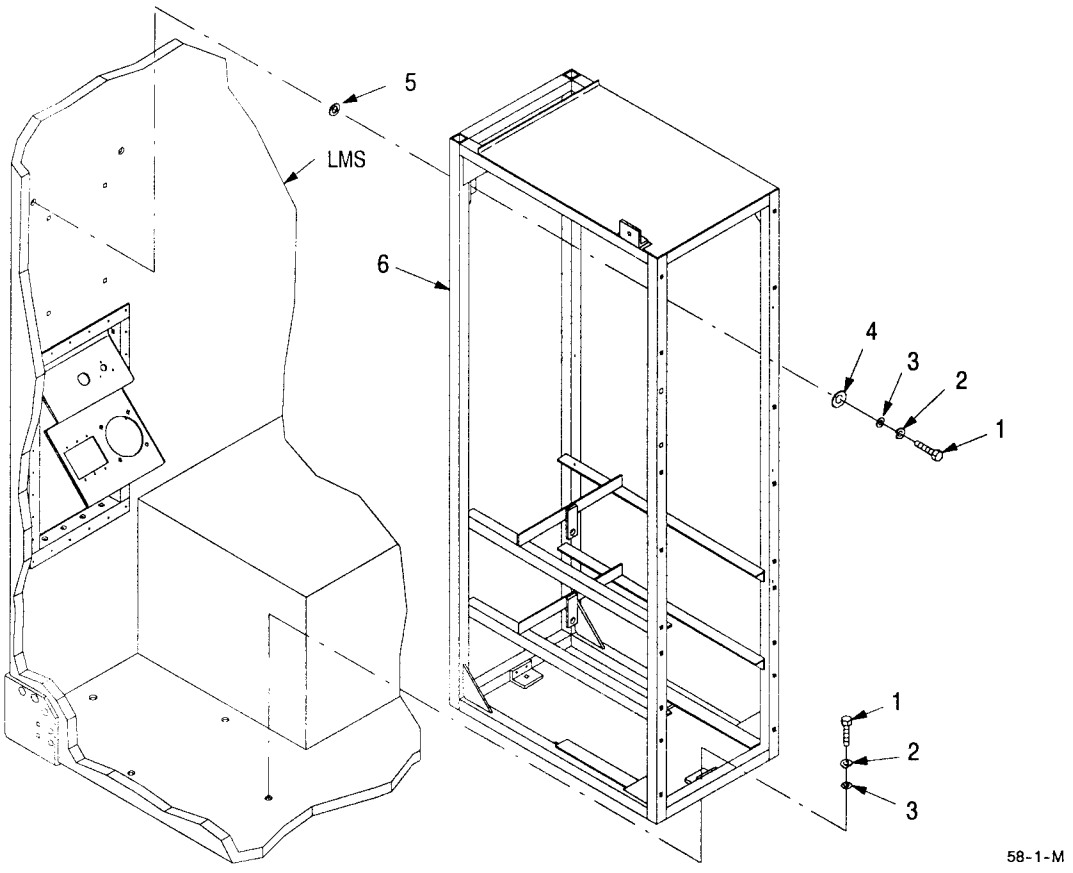


Figure 3-4. Electrical Equipment Rack Replacement

Follow-on maintenance: Install equipment per para 2.13.20 through para 2.13.25.

3.8.3 Electrical Cable Repair.

This task covers:
a. Removal
b. Repair
c. Installation

INITIAL SETUP

Tools/Test Equipment:
Multimeter, (Item 27, Appendix B)
Power Supply (Item 29, Appendix B)
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Shop Equipment: Electrical Equipment (Item 40, Appendix B)

Materials/Parts:
Sleeve (Figure D-4, Appendix D)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECV battery cable disconnected (see TM 9-2320-387-24-1).
External power cable disconnected.
Raceway covers and retainers removed (see para 2.13.8).

References:
TM 9-2320-387-24-1
TM 55-1500-323-24

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

Cables in LMS

a. Removal

Refer to para 2.13.27 for removal of cable assemblies.

b. Repair (Refer to Figure 3-5)

(1) The following table contains information pertaining to cable assembly repair.

(2) Refer to para 2.13.27 for repair of cable assemblies not included in the following table.

Cable No.	(CAGE C) Part No.	Repair Status
1A4W1	(81377) 17-1-9388-1	Repair cable assembly per TM 55-1500-323-24.
1A4W2	(81377) 17-1-5896-1	Repair cable assembly per TM 55-1500-323-24.
1A4W6	(81377) 17-1-5550-1	Repair cable assembly per TM 55-1500-323-24.
A17W1	(81377) 17-2-0547-1	Repair cable assembly per TM 55-1500-323-24.

(3) Replace connector per TM 55-1500-323-24.

(4) Cut damaged terminal lugs off cable, crimp on new terminal lugs.

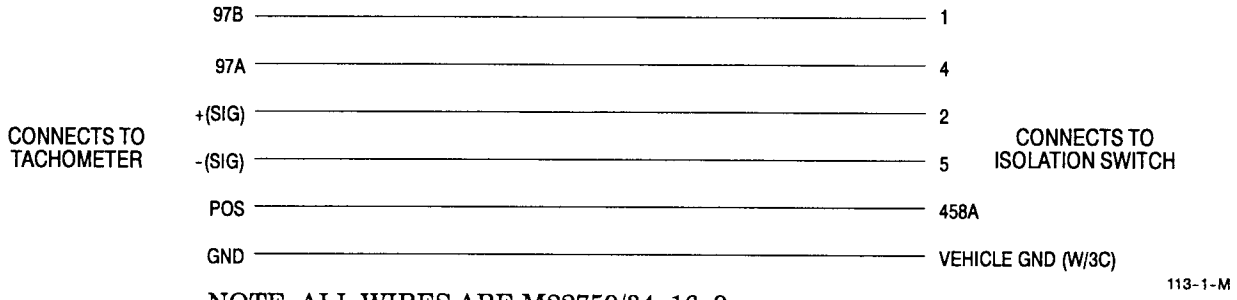
(5) Heat shrink marker onto cable.

(6) Perform operational test on cable assembly.

3.8.3 Electrical Cable Repair – Continued.

c. Installation

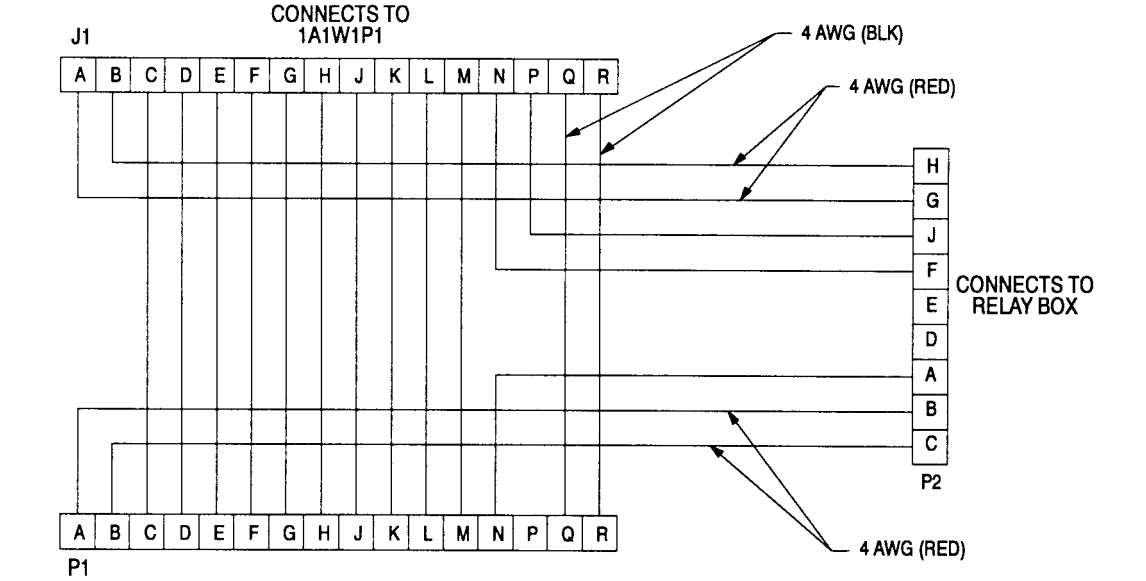
Refer to para 2.13.27 for installation of cable assemblies.



NOTE: ALL WIRES ARE M22759/34-16-9

Tachometer Cable Assembly – A17W1

Figure 3-5. Wiring Diagram (Sheet 1 of 4)



DC Power Cable Assembly - 1A4W1

Figure 3-5. Wiring Diagram (Sheet 2 of 4)

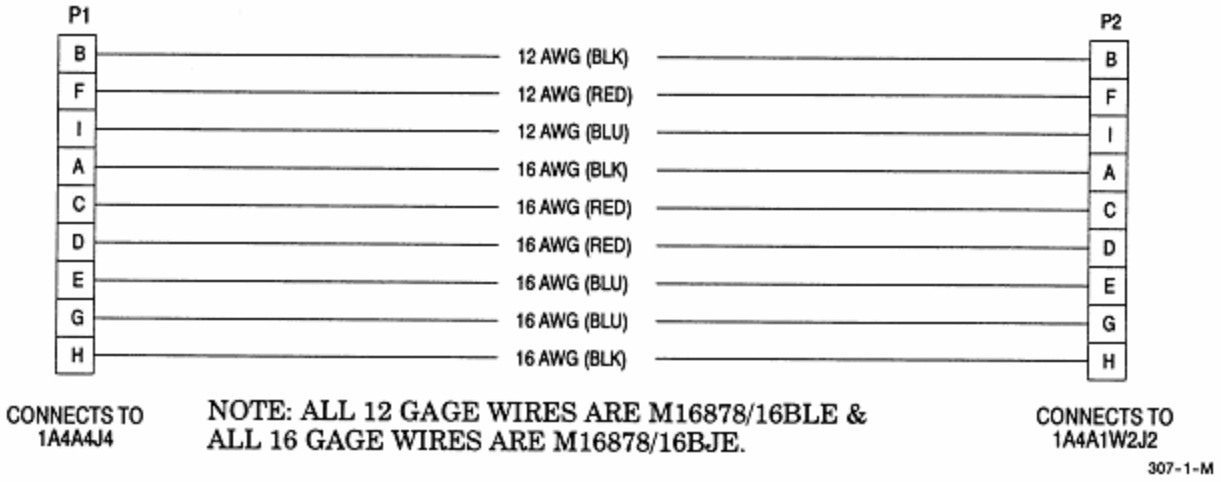
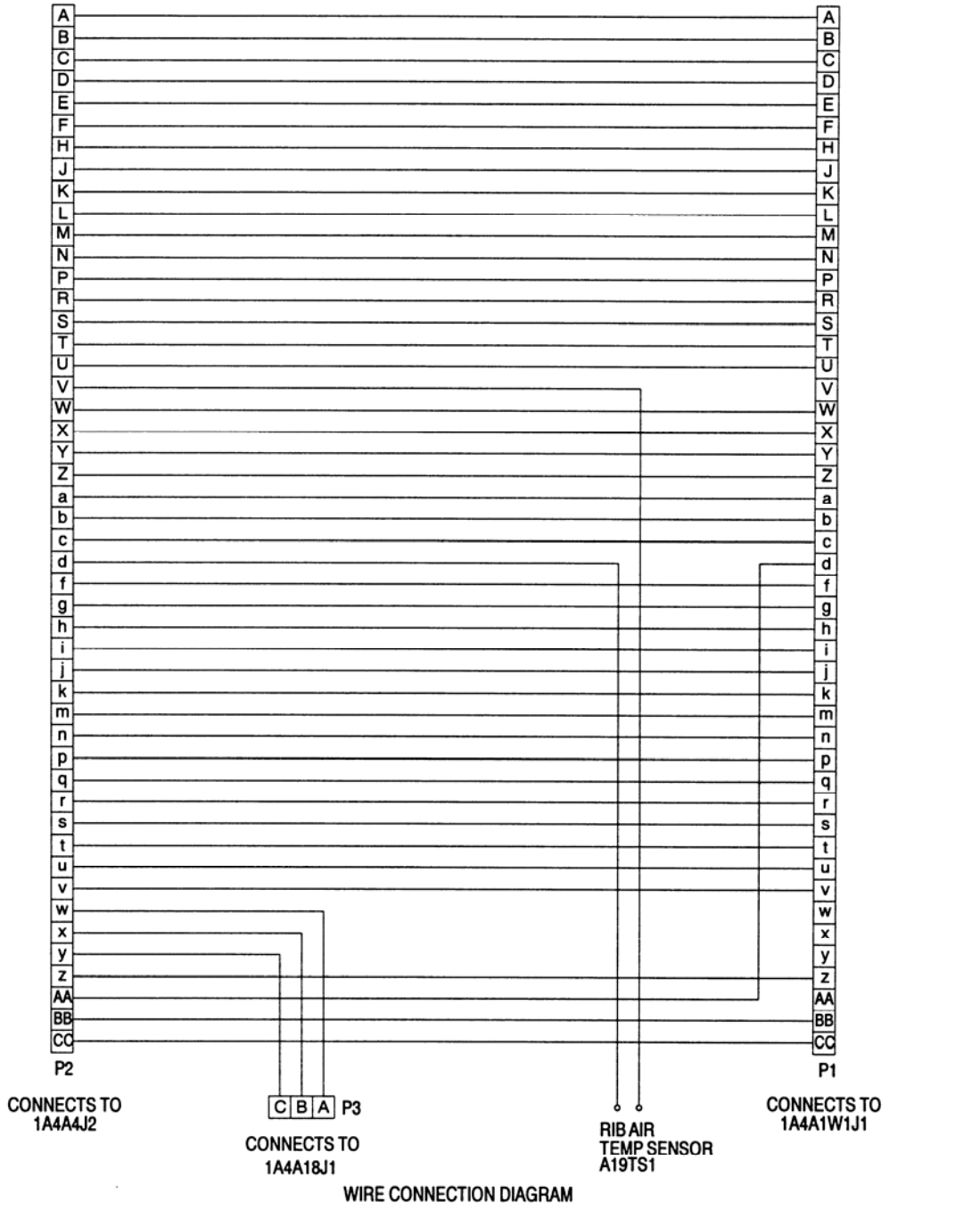


Figure 3-5. Wiring Diagram (Sheet 3 of 4)

3.8.3 Electrical Cable Repair – Continued.



ESS Signal and Control Cable Assembly - 1A4W6

Figure 3-5. Wiring Diagram (Sheet 4 of 4)

3.9 ENVIRONMENTAL CONTROL UNIT (ECU).

3.9.1 R22 Refrigerant System Servicing.

This task covers:

a. Manifold Gage Set Installation
b. Recovering Refrigerant
c. Adding Compressor Oil
d. Evacuating System
e. Checking for Leaks
f. Charging System
g. Pump Down System
h. Manifold Gage Set Removal

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Two Manifold Gage Sets (Item 26, Appendix B)
Vacuum Pump (Item 31, Appendix B)
R22 Refrigerant Recovery and Recycle Unit (Item 33, Appendix B)
R22 Refrigerant Cylinder (Item 32, Appendix B)
Gage Set Tee (Item 14, Appendix B)
Refrigerant Gas Leak Detector (Item 3, Appendix B)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU work platform installed (reference TM 10-5410-228-10).
ECU covers and doors opened or removed as required (see para 2.14.1).

References:
TM 9-2320-387-10
TM 9-2320-387-24-1
TM 10-5410-228-10

Materials/Parts:
Lubricating Oil (Item 32, Appendix C)
Nitrogen (Item 34, Appendix C)
R22 Refrigerant (Item 40, Appendix C)

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

Do not run unit or compressor while servicing.

NOTE

This procedure for servicing the refrigeration system uses two manifold gage sets. Servicing may be accomplished using only one manifold gage set, but the time to accomplish the task will be longer.

Whenever any refrigerant component is replaced, the system must be recovered, evacuated and a new filter/drier installed (per para 3.9.13).

a. Manifold Gage Set Installation (Refer to Figure 3-6)

(1) Hang manifold gage sets (1) at convenient location on passenger side of ECU next to service ports (2) and turn both the high pressure gage valves (3) and the low pressure gage valves (4) on gage sets (1) clockwise to their closed (front seated) position.

3.9.1 R22 Refrigerant System Servicing – Continued.

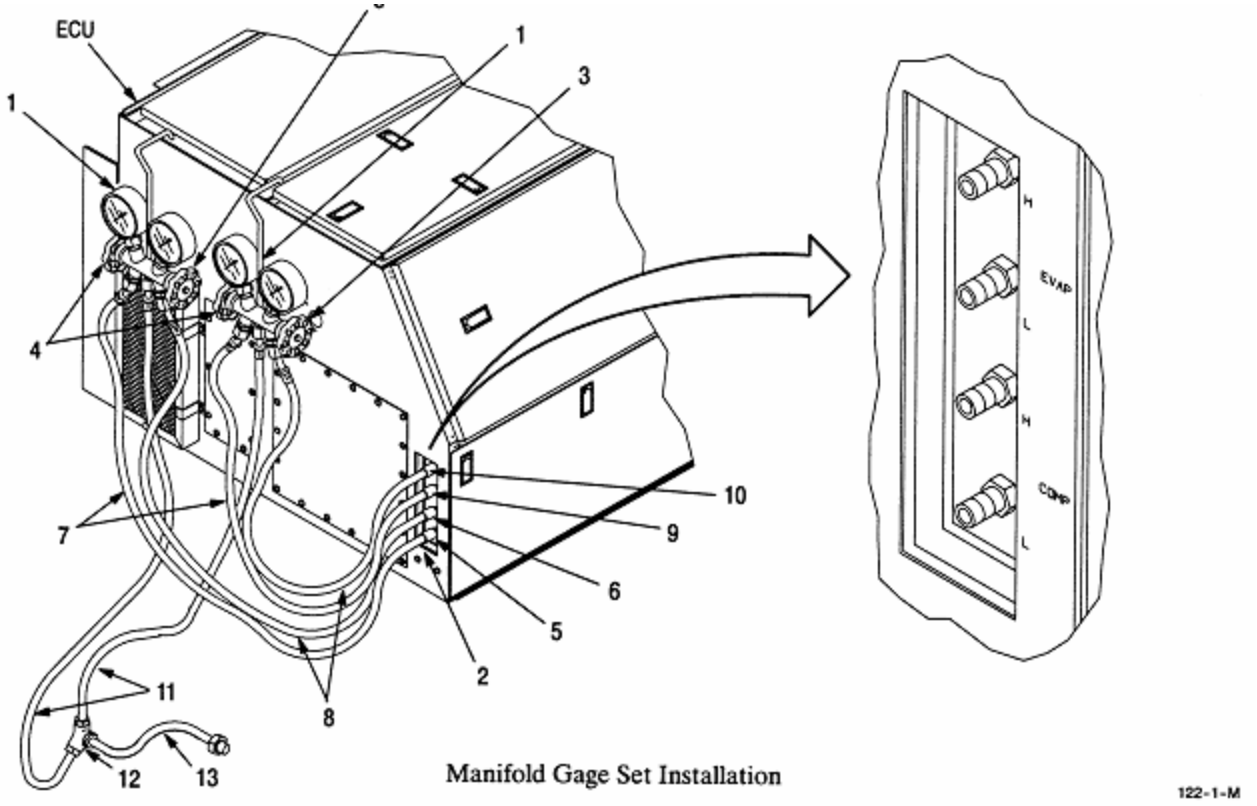


Figure 3-6. R22 Refrigerant System Servicing (Sheet 1 of 10)

(2) Remove dust caps from low (5) and high (6) compressor valve service ports.

(3) Connect low pressure gage hose (7) on manifold gage set (1) to suction (low side) compressor service valve port (5).

(4) Connect high pressure gage hose (8) on manifold gage set (1) to discharge (high side) compressor service port (6).

(5) Remove dust caps from low (9) and high (10) evaporator service valve ports.

(6) Connect low pressure gage hose (7) on second manifold gage set (1) to suction (low side) evaporator service valve port (9).

(7) Connect high pressure gage hose (8) on second manifold gage set (1) to discharge (high side) evaporator service valve port (10).

(8) Connect two center hoses (11) from manifold gage sets to tee (12).

(9) Connect center hose (13) from tee (12) to recovery unit, vacuum pump, refrigerant or nitrogen as required in the following servicing procedures.

CAUTION

Follow instructions for dedicated R22 refrigerant recovery unit being used to avoid compressor oil loss. Loss of oil could result in compressor damage.

NOTE

Only use dedicated R22 refrigerant recovery unit.

Manifold gage set valves, when set at mid-position, are used for recovering, evacuating, charging and testing.

Do not perform step 6 if system has already been evacuated. Replacement pressure tubes, hoses and air condition components must be purged with nitrogen and evacuated before charging system.

(10) Turn both manifold high pressure gage valves (3) and low pressure gage valves (4) to mid-position.

(11) Loosen low pressure gage hoses (7) and high pressure gage hoses (8) at manifold gage sets (1) slightly for a second to purge air from hoses (7) and (8) and then tighten.

(12) Turn manifold high pressure gage valves (3) and low pressure gage valves (4) clockwise to their closed (front seated) position.

b. Recovering Refrigerant (Refer to Figure 3-6)

WARNING

Do not run unit or compressor while servicing.

(1) Disconnect battery ground cable (TM 9-2320-387-24-1).

(2) If not already accomplished, install manifold gage sets (1) per para 3.9.1.a.

NOTE

Do not allow R22 refrigerant to escape too quickly. When high pressure and low pressure gages on manifold gage set read 0 (zero), the discharging procedure is complete.

(3) Turn high pressure gage valves (3) and low pressure gage valves (4) counterclockwise slightly to permit R22 refrigerant to slowly escape through center hose (13) into recovery unit until gages read 0 (zero).

(4) Turn high pressure gage valves (3) and low pressure gage valves (4) clockwise to their closed (front seated) positions.

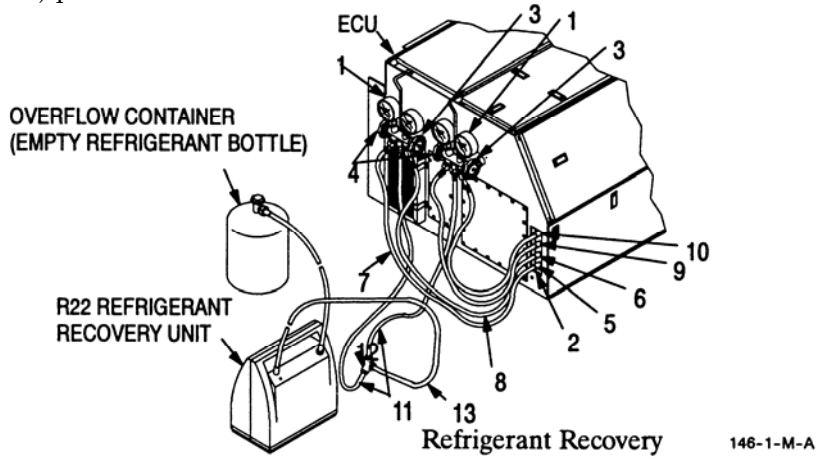


Figure 3-6. R22 Refrigerant System Servicing (Sheet 2 of 10)

3.9.1 R22 Refrigerant System Servicing – Continued.

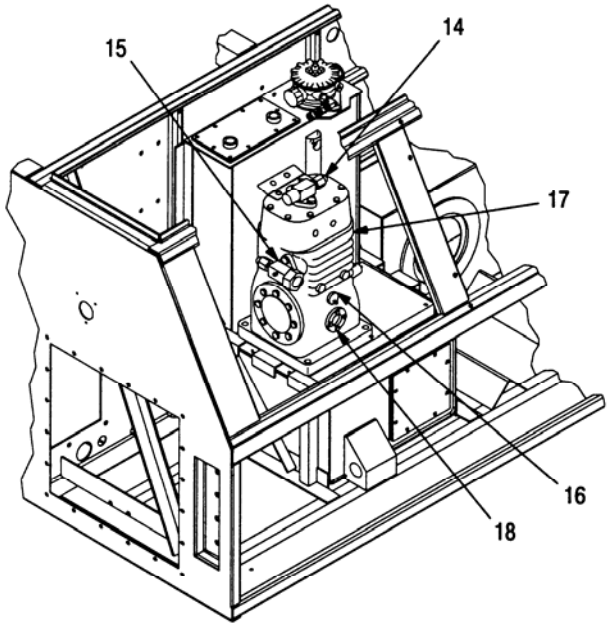


Figure 3-6. R22 Refrigerant System Servicing (Sheet 3 of 10)

c. Adding Compressor Oil (Refer to Figure 3-6)

(1) Install manifold gage sets per para 3.9.1.a.

(2) Make sure low pressure and high pressure gage valves (4 and 3) on manifold gage sets (1) are turned clockwise to their closed (front seated) position.

(3) Turn compressor service discharge valve (14) and compressor service suction valve (15) clockwise to their closed (front seated) position.

(4) Recover R22 refrigerant per para 3.9.1.

(5) Turn low pressure gage valves (4) and high pressure gage valves (3) counterclockwise slightly to permit R22 refrigerant in the compressor to slowly escape through center hoses (11) until gages read 0 (zero).

(6) Close low pressure gage valves (4) and high pressure gage valves (3).

(7) Remove fill plug (16) from compressor (17).

(8) Add oil as necessary to attain proper level on sight gage (18).

(9) Install fill plug (16) on compressor (17). Tighten fill plug to 6-9 lb-ft.

(10) Check for leaks per para e. Connect gage sets to compressor service ports only.

(11) Evacuate system per para 3.9.1.d.

(12) Turn compressor service discharge valves (14) and compressor service suction valves (15) counterclockwise to their open (back seated) position.

(13) If not already accomplished, charge system per para 3.9.1.

(14) Remove manifold gage sets per para 3.9.1.h.

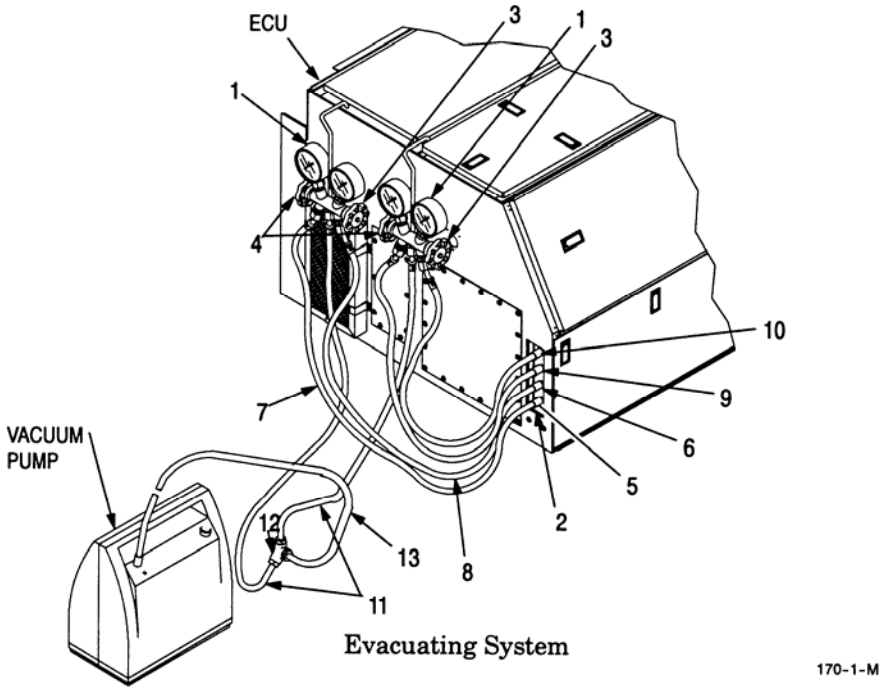


Figure 3-6. R22 Refrigerant System Servicing (Sheet 4 of 10)

d. Evacuating System (Refer to Figure 3-6)

CAUTION

Do not evacuate the refrigerant system if system has not been completely recovered.

(1) If not already accomplished, attach manifold gage sets (1) per para 3.9.1.a. and recover the refrigerant per para 3.9.1.

(2) Set manifold gage valves (3) and (4) to their open (back seated) position.

(3) Turn manifold gage valves (3) and (4) clockwise to mid-position.

(4) Connect vacuum pump to center hose (13).

(5) Turn vacuum pump on and open manifold gage valves (3) and (4).

NOTE

High side gage should drop to 0 (zero) or below. If not, a blockage in air conditioning is indicated. Locate and clean blockage.

28 to 30 inches of vacuum should be sustained on the low pressure gage for at least ten minutes. If not, a leak in the air conditioning system is indicated. Locate source of leak and repair as necessary.

(6) Evacuate system for 45 minutes while monitoring low pressure gages for 28-30 inches vacuum.

(7) Turn manifold gage valves (3) and (4) on manifold gage sets (1) clockwise to their closed (front seated) position.

(8) Turn off vacuum pump and disconnect from center hose (13).

3.9.1 R22 Refrigerant System Servicing – Continued.

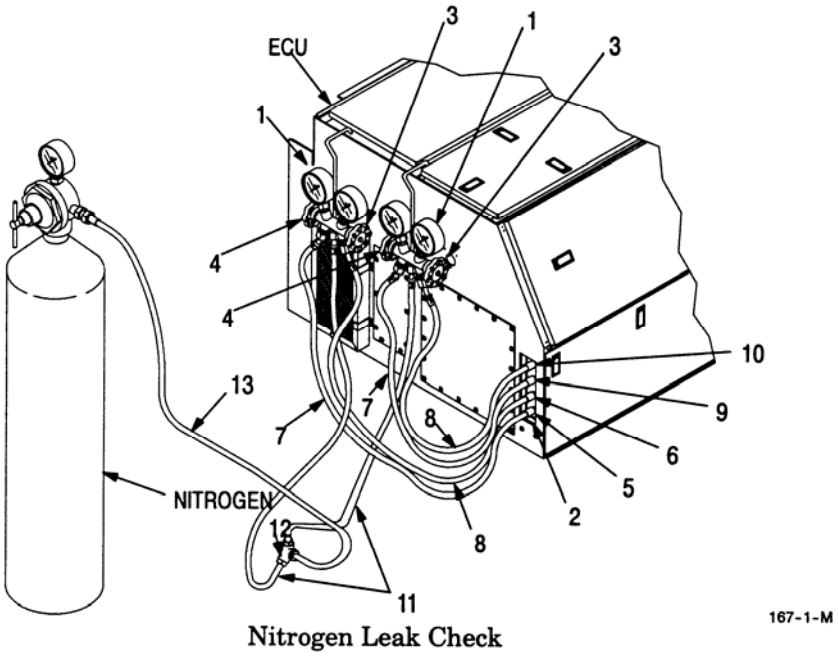


Figure 3-6. R22 Refrigerant System Servicing (Sheet 5 of 10)

e. Checking for Leaks (Refer to Figure 3-6)

NOTE

Checking for leaks is normally done using a refrigerant gas leak detector prior to maintenance actions. There must be approximately 100 psi of refrigerant in the system in order to detect a leak by this method. If the system cannot be run, or all refrigerant has been lost, checking for leaks is done using nitrogen and a vacuum as follows:

(1) Install two manifold gage sets, one to compressor service ports (5 and 6) and one to evaporator service ports (9 and 10).

(2) Make sure low pressure gage valves (4) and high pressure gage valves (3) are turned clockwise to their closed (front seated) position.

(3) Connect center hose (13) to bottle of nitrogen.

(4) Set the nitrogen regulator to 150 psig, turn system on and pressurize system to 150 psig.

(5) Turn manifold gage valves (3 and 4) counterclockwise to their open (full back seated) position.

(6) Listen for leaks and use soap bubbles to locate any leaks.

(7) If leaks are found, shut off nitrogen, bleed the system and repair all leaks.

(8) Turn manifold valves (3 and 4) clockwise to their closed (full front seated) position.

(9) Remove nitrogen bottle from center hose (13).

(10) Turn manifold valves (3 and 4) counterclockwise slowly until high pressure gages and low pressure gages on manifolds (1) read zero.

(11) Remove tee (12) and connect the two manifold gage set center hoses (11) to vacuum pump.

(12) Turn manifold valves (3 and 4) counterclockwise to their open (full back seated) position.

(13) Pull vacuum down to 28 to 30 inches of vacuum.

(14) Purge the system above 15 psig with nitrogen per steps 2 through 7, except step 4.

(15) Pull a second vacuum down to 28 to 30 inches of vacuum per steps 10 through 12.

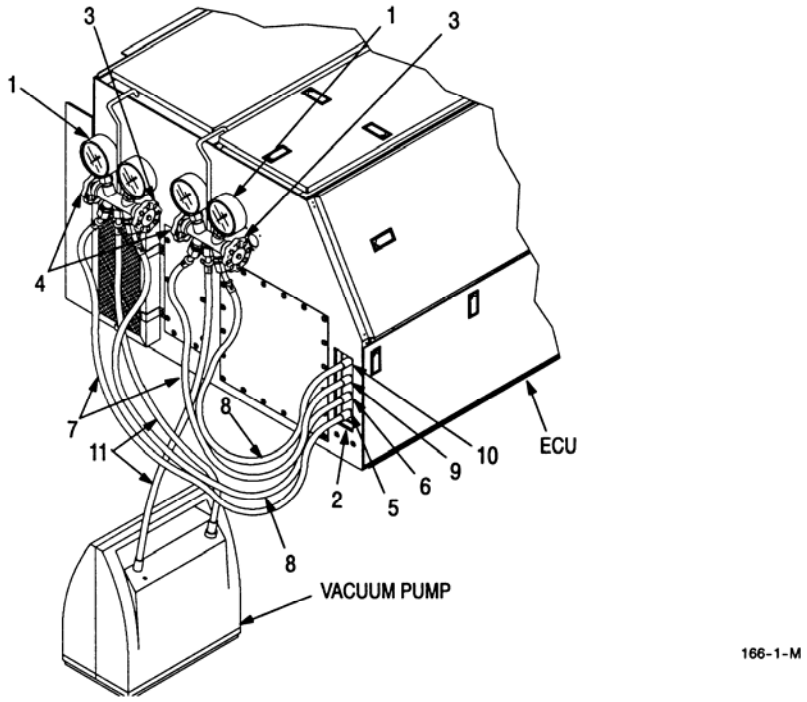


Figure 3-6. R22 Refrigerant System Servicing (Sheet 6 of 10)

(16) Close system to the compressor (17) by turning compressor service discharge valve (14) and compressor service suction valve (15) clockwise to their closed (full front seated) position.

(17) Continue to pull vacuum down to 28 to 30 inches of vacuum.

(18) Close system. Turn manifold gage set valves (3 and 4) clockwise to their closed (full front seated) position. The system should stay below 26 inches of vacuum after 15 minutes.

(19) Turn compressor service discharge valve (14) and compressor service suction valve (15) to their open (full back seated) position. If the system does not stay below 26 inches of vacuum, repeat steps 4 through 17.

(20) Charge system per para 3.9.1.

(21) Check the filter/drier sight glass (19). If other than blue in color, repeat steps 15 through 20.

(22) Remove manifold gage set per para 3.9.1.h.

f. Charging System (Refer to Figure 3-6)

NOTE

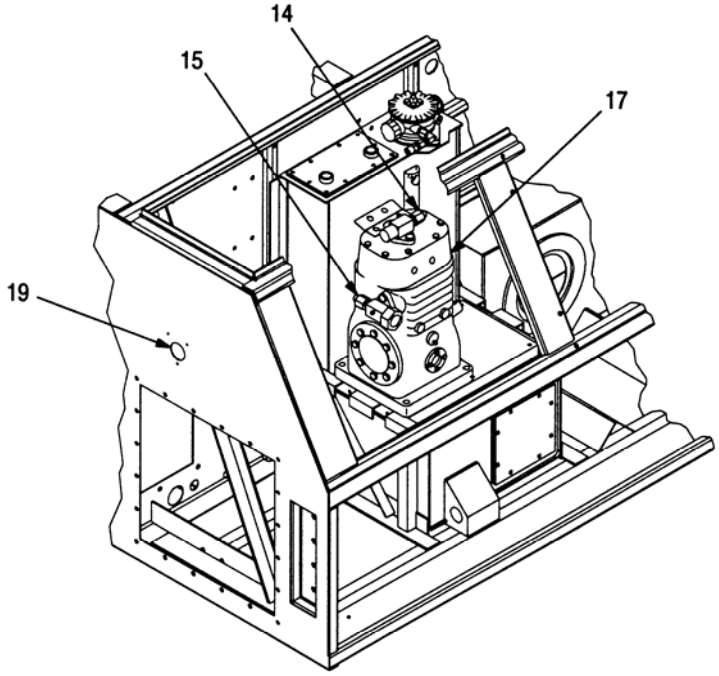
If air conditioning system required the replacement of a major component, compressor oil may have to be added to system to compensate for loss (refer to para 3.9.1.c.).

(1) Evacuate refrigerant system per para 3.9.1.d.

(2) Install tee (12) to manifold gage sets center hoses (11).

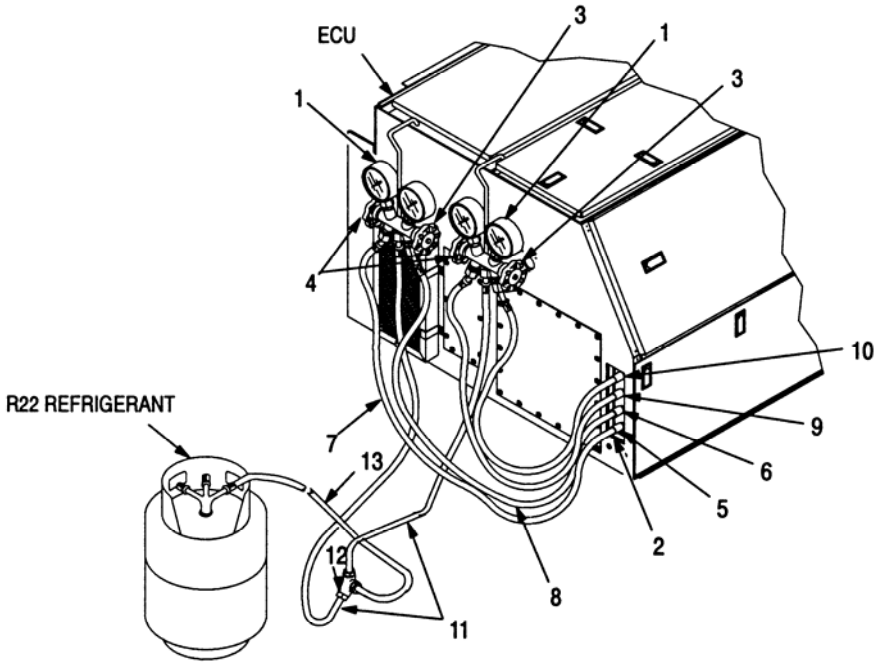
(3) Install center hose (13) to R22 refrigerant container and tee (12).

3.9.1 R22 Refrigerant System Servicing – Continued.



Compressor Valves and Drier Sight Glass 142-1-M

Figure 3-6. R22 Refrigerant System Servicing (Sheet 7 of 10



Charging System 122-2-M

Figure 3-6. R22 Refrigerant System Servicing (Sheet 8 of 10)

NOTE

Keep R22 refrigerant container upright at all times so R22 refrigerant enters system as a gas.

(4) Open R22 refrigerant source to allow R22 refrigerant to flow into center hose (13).

(5) Purge manifold gage set hoses as follows:

(a) Loosen center hoses (11) at manifold gage sets (1) center ports slightly until R22 refrigerant escapes, then tighten hoses (11).

WARNING

Failure to close high pressure gage valves will cause compressor to build pressure in refrigerant container, causing injury to personnel or damage to equipment.

(b) Make sure high pressure gage valves (3) are in closed position on manifold gage sets (1) during charging.

(6) Close high pressure gage valves (3) on manifold gage sets (1).

(7) Start ECV engine and turn EPG on.

(8) Turn on air conditioning and set for maximum cool.

(9) Open low pressure gage valves (4) on manifold gage sets (1) until system is fully charged.

(10) Close low pressure gage valves (4) on manifold gage sets (1).

(11) Turn off air conditioning system.

(12) Turn off EPG and shut off ECV engine.

(13) Remove R22 refrigerant source from center hose (13).

(14) Check R22 refrigerant system for oil leaks and compressor oil level.

(15) Remove manifold gage sets (1) per para 3.9.1.h.

g. Pump Down System (Refer to Figure 3-6)

NOTE

Prior to removing refrigerant components, the system should first be 'pumped down'. Pumping down the system is a procedure which stores the R22 refrigerant in the receiver which allows for the removal of components.

(1) Connect manifold gage set low pressure gage hose (7) to evaporator low pressure service port (9) located on the passenger side of the ECU.

(2) Turn low pressure gage valve (4) to its closed (front seated) position.

(3) Gain access to R22 refrigerant components in ECU and turn off receiver liquid line service valve (20) clockwise to full closed (front seated) position.

(4) Start ECV engine and turn EPG on.

(5) Turn on air conditioning system and set for maximum cool.

(6) Run air conditioning system until the gage on the suction side reads 0 (zero) or close to 0 (zero).

(7) Shut air conditioning system off.

3.9.1 R22 Refrigerant System Servicing – Continued.

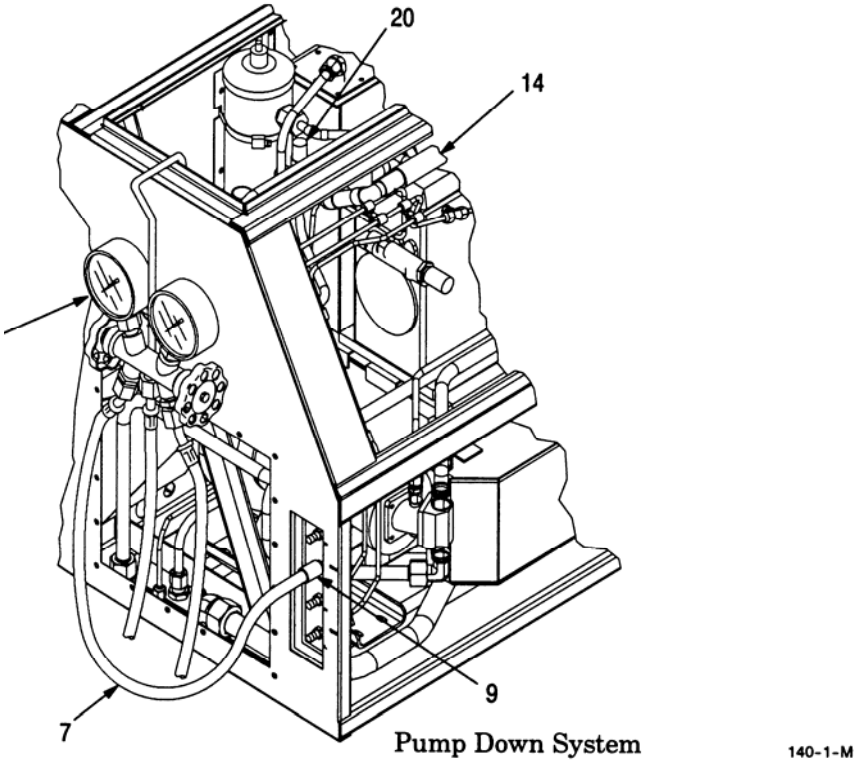


Figure 3-6. R22 Refrigerant System Servicing (Sheet 9 of 10)

(8) Turn compressor service discharge valve (14) clockwise to the full closed (front seated) position.

(9) Shut off ECV engine.

WARNING

Condenser and receiver are still at full pressure. R22 refrigeration system must be recovered before removing condenser or receiver. Failure to do so will cause injury to personnel or damage to equipment.

(10) The majority of the R22 refrigerant is now stored, in liquid form, in the receiver. Components in the R22 refrigeration system can now be removed, except for the receiver and condenser. The R22 refrigerant must be completely recovered before the receiver or condenser are removed.

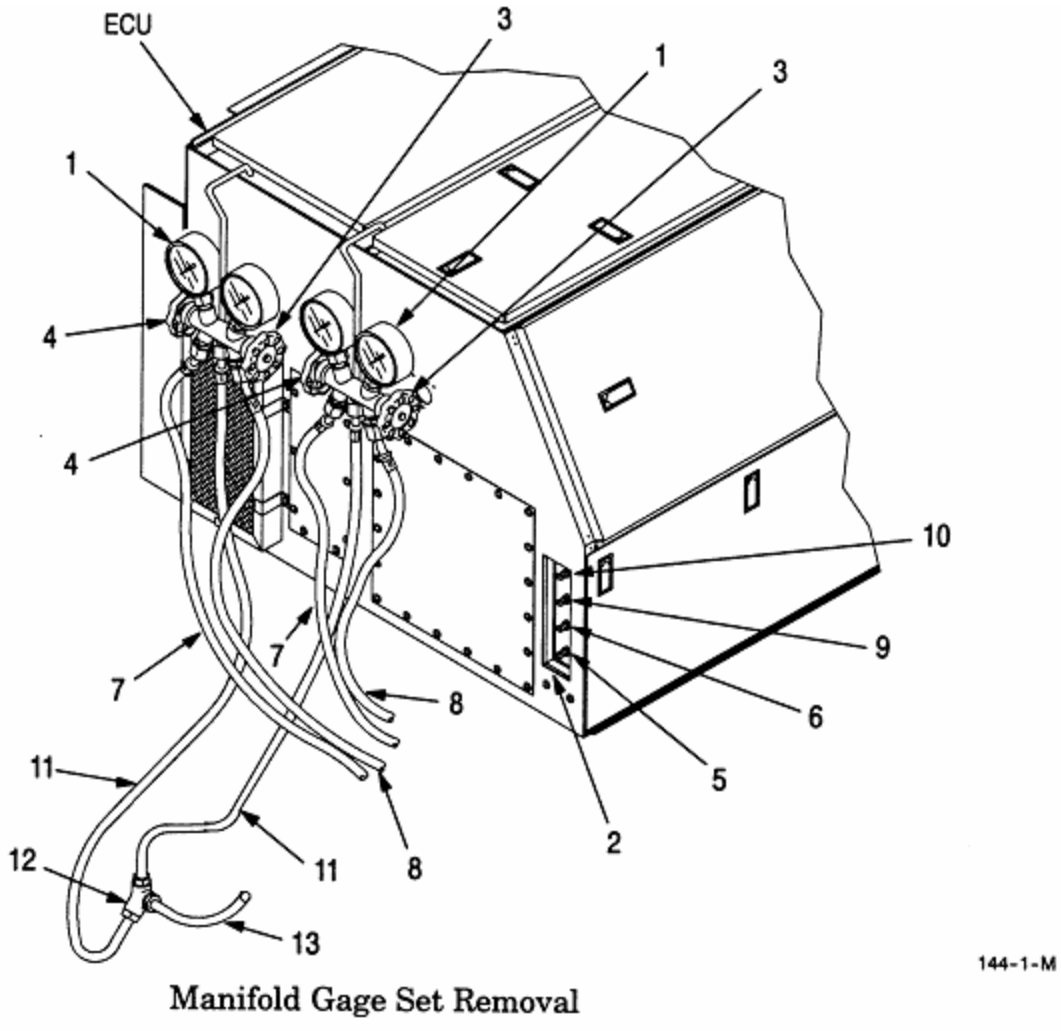


Figure 3-6. R22 Refrigerant System Servicing (Sheet 10 of 10)

h. Manifold Gage Set Removal (Refer to Figure 3-6)

WARNING

Before disconnecting manifold gage set hoses, the manifold gage set valves must be set to their closed (front seated) position. Failure to do so may result in injury to personnel.

(1) Set manifold high pressure gage valves (3) and low pressure gage valves (4) to their closed (front seated) position.

(2) Disconnect manifold low pressure gage hoses (7) and high pressure gage hoses (8) from low service ports (5 and 9) and high service ports (6 and 10).

(3) Disconnect center hoses (11) from recovery unit, vacuum pump, refrigerant or nitrogen.

(4) Install dust caps on all service valve ports (2).

Follow-on maintenance: Close or install ECU covers as required per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

3.9.2 Sound Guard Replacement.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Power shut off. Power panel and rear control panel tagged.
Drill, Electric (Item 6, Appendix B)	LMS guard removed (see para 2.13.15).
Drill Set (Item 5, Appendix B)	ABS inflation air hose disconnected
Gloves (Item 16, Appendix B)	(see para 2.13.7).
Goggles (Item 17, Appendix B)	
Riveter, Blind, Hand (Item 34, Appendix B)	References:
Collar Set, Drill Stop (Item 2, Appendix B)	TM 10-5411-224-14
Materials/Parts:	Materials/Parts: (Cont.)
Isopropyl Alcohol (Item 12, Appendix C)	Thirteen Blind Rivets (Item 78, Appendix E)
Rags, Wiping (Item 39, Appendix C)	
Seventeen Lockwashers (Item 17, Appendix E)	

NOTE

Removal of the strainer per para 3.9.5 will allow better access to the sound guard attaching hardware.

a. Removal (Refer to Figure 3-7)

Remove six screws (1), six lockwashers (2) and six flat washers (3) securing sound guard (4) to inside of ECU enclosure (5). Discard six lockwashers (2).

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

b. Disassembly (Refer to Figure 3-7)

(1) Remove three screws (6), three lockwashers (7) and three flat washers (8) securing shim (9) to guard top (10). Discard three lockwashers (7).

(2) Remove two screws (11), two lockwashers (12) and two flat washers (13) securing guard top (10) to guard segment (14). Discard two lockwashers (12).

(3) Remove six screws (15), six lockwashers (16) and six flat washers (17) securing guard segment (14) to three mounting angles (18, 19, and 20). Discard six lockwashers (16).

(4) Remove guard top (10) from shim (9) and guard segment (14).

(5) Remove guard segment (14) from three mounting angles (18, 19 and 20).

WARNING

To prevent injury to personnel, always wear eye protection when drilling. This warning applies to steps 1 through 3.

CAUTION

Make sure drill bit has a drill stop to prevent the drill bit from exceeding a depth of one inch. This caution applies to steps 1 through 3.

(6) Drill out three rivets (21) securing mounting angle (22) to guard segment (14).

(7) Drill out seven rivets (23) securing three mounting angles (18, 19 and 20) to guard wraparound (24).

(8) Drill out three rivets (25) securing shim (9) to guard wraparound (24).

NOTE

Soundfoam should only be replaced if damaged. Applies to steps 9 through 12.

(9) Remove soundfoam (26 and 27) from both sides of guard segment (14).

(10) Remove soundfoam (28) from top surface of top guard (10).

(11) Remove two soundfoams (29) and soundfoam (30) from front side of guard wraparound (24).

(12) Remove soundfoam (31) from back side of guard wraparound (24).

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(13) Clean adhesive residue from guards with rag dampened with alcohol.

c. Assembly (Refer to Figure 3-7)

NOTE

Reference TM 10-5411-224-14 for general repair procedures using rivets. Applies to steps 6 through 8.

(1) Secure shim (9) to guard wraparound (24) with three rivets (25).

(2) Secure three mounting angles (18, 19 and 20) to guard wraparound (24) with seven rivets (23).

(3) Secure mounting angle (22) to guard segment (14) with three rivets (21).

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

NOTE

Soundfoam should only be replaced if damaged.

(4) Apply new soundfoam to clean, dry surface only. Clean adhesive residue from guard segment with rag dampened with alcohol. Allow guard segment to dry completely before applying new soundfoam.

3.9.2 Sound Guard Replacement – Continued.

(5) Trim soundfoams, as required, to fit onto guard segment (14).

(6) Remove protective backing from two soundfoams and press onto both sides of guard segment (14). Cut eight 0.50 inch clearance holes in soundfoam to allow access to eight screw heads.

(7) Remove protective backing from soundfoam (31) and press onto back side of guard wraparound (24).

(8) Remove protective backing from two soundfoams (29) and soundfoam (30) and press onto front side of guard wraparound (24).

NOTE

Do not cut soundfoam to reflect notches in top guard. Only cut slit in soundfoam to accommodate ring compressor pipes.

Cut three 0.50 inch clearance holes in soundfoam to allow access to three screw heads.

(9) Remove protective backing from soundfoam (28) and press onto guard top (10). Trim soundfoam (27) even with bottom of guard top (10).

(10) Position guard wraparound (24) in ECU.

(11) Position guard segment (14) in ECU.

(12) Position guard top (10) in ECU.

(13) Install six screws (15), six new lockwashers (16) and six flat washers (17) securing guard segment (14) to three mounting angles (20, 19 and 18).

(14) Install two screws (11), two new lockwashers (12) and two flat washers (13) securing guard top (10) to guard segment (14).

(15) Install three screws (6), three new lockwashers (7) and three flat washers (8) securing shim (9) to guard top (10).

d. Installation (Refer to Figure 3-7)

Install six screws (1), six new lockwashers (2) and six flat washers (3) securing sound guard (4) to inside of ECU.

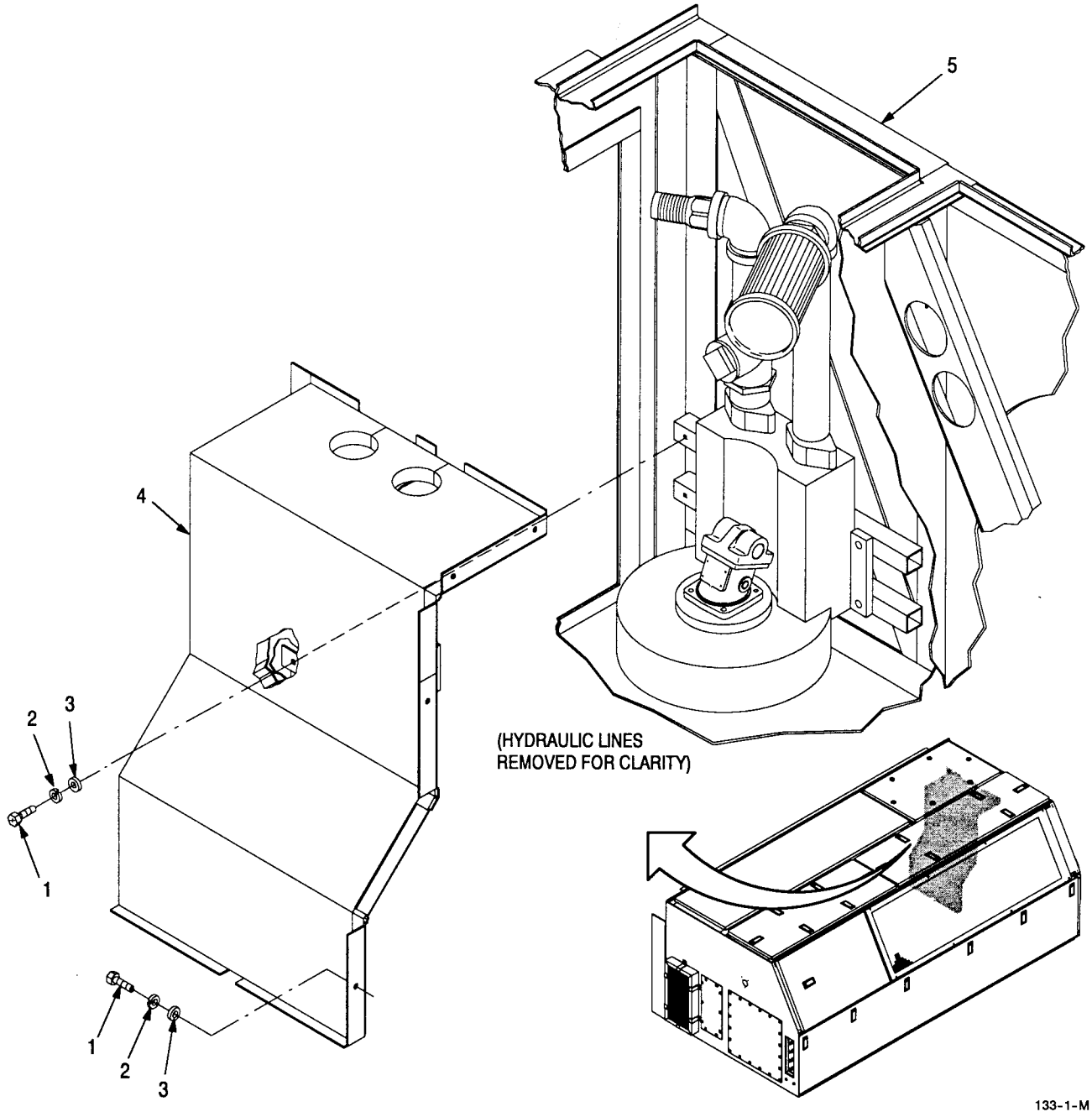


Figure 3-7. Sound Guard Replacement (Sheet 1 of 2)

3.9.2 Sound Guard Replacement – Continued.

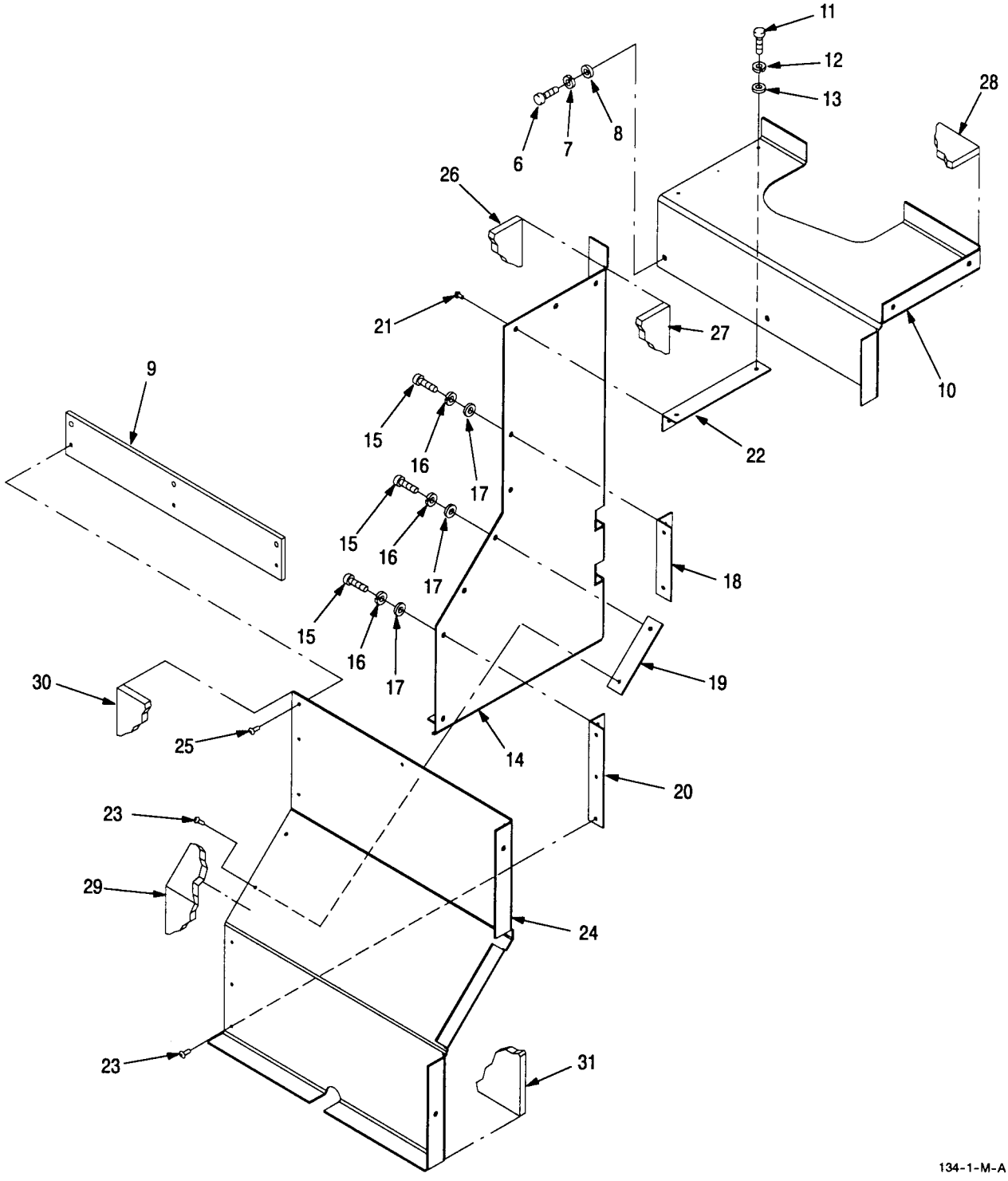


Figure 3-7. Sound Guard Replacement (Sheet 2 of 2)

Follow-on maintenance: Install LMS guard per para 2.13.15, connect ABS inflation air hose per para 2.13.7.

3.9.3 Recirculation Fan/Motor Replacement.

This task covers:

a. Removal	b. Installation

INITIAL SETUP

Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Power shut off. Power panel and rear control panel tagged.
Gloves (Item 16, Appendix B)	Hydraulic system drained if removing hydraulic motor (see para 2.14.3).
Goggles (Item 17, Appendix B)	Thermistor removed (see para 2.14.6).
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)	ECU covers and doors removed or open as required (see para 2.14.1).
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)	
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)	
1-11/16 Inch Crowfoot Wrench (Item 62, Appendix B)	References:
Torque Wrench (Item 66, Appendix B)	TM 10-5411-224-14
Materials/Parts:	Materials/Parts: (Cont.)
Isopropyl Alcohol (Item 12, Appendix C)	Twenty-two Lockwashers (Item 18, Appendix E)
Antiseize Compound (Item 13, Appendix C)	Two Lockwashers (Item 20, Appendix E)
Hydraulic Fluid (Item 24, Appendix C)	Five O-rings (Item 63, Appendix E)
Rubber Gloves (Item 25, Appendix C)	O-ring (Item 58, Appendix E)
Rags, Wiping (Item 39, Appendix C)	O-ring (Item 67, Appendix E)
Sealant (Item 44, Appendix C)	Sealer (Item 50, Appendix C)
Hydraulic Sealant (Item 48, Appendix C)	Machine Key (Item 6, Appendix E)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in cup or small container and clean any spillage with rags.

Cover or plug all tube openings immediately after disconnecting to prevent contamination.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.9.3.1 Hydraulic Motor.

a. Removal (Refer to Figure 3-8)

(1) Disconnect tube assembly (1) from elbow (2) on hydraulic motor (3). Remove and discard O-ring (4) from elbow (2).

(2) Disconnect tube assembly (5) from elbow (6) on hydraulic motor (3). Remove and discard O-ring (7) from elbow (6).

(3) Disconnect tube assembly (8) from tee (9).

(4) Disconnect tube assembly (10) from reducing connector (11) on tee (9). Remove and discard O-ring (12) from reducing connector (11).

3.9.3 Recirculation Fan/Motor Replacement – Continued.

NOTE

Plug open ports on hydraulic motor and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(5) Plug open ends of four tube assemblies (1, 5, 8, and 10).

NOTE

Remove two elbows, tee, and connector from hydraulic motor prior to removing hydraulic motor from ECU. Otherwise, a vise will be required to hold hydraulic motor.

Plug open ports on hydraulic motor and open ends of tube assemblies to keep the hydraulic motor free of contaminants.

(6) Remove elbow (2) from hydraulic motor (3). Remove and discard O-ring (13) from elbow (2). Plug open port on hydraulic motor (3).

(7) Remove elbow (6) from hydraulic motor (3). Remove and discard O-ring (14) from elbow (6). Plug open port on hydraulic motor (3).

(8) Remove reducing connector (11) from tee (9).

(9) Remove and discard two O-rings (15) from tee (9).

(10) Remove tee (9) from connector (16).

NOTE

Plug open ports on hydraulic motor and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(11) Remove connector (16) from hydraulic motor (3). Remove and discard two O-rings (17) from connector (16). Plug open port on hydraulic motor (3).

(12) Loosen setscrew (18) on coupling (19).

(13) Remove two screws (20), four flat washers (21), two lockwashers (22) and two nuts (23) securing hydraulic motor (3) and motor mount plate (24) to ECU enclosure (25). Discard two lockwashers (22).

(14) Remove coupling (19) from hydraulic motor (3). Remove hydraulic motor (3) from ECU enclosure (25).

(15) Remove machine key (26) from shaft of motor (3). Discard machine key (26).

b. Installation (Refer to Figure 3-8)

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(1) Clean mating surfaces of motor mount plate (24) and ECU enclosure (25) with rag dampened with alcohol before applying sealer.

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(2) Coat mating surfaces of motor mount plate (24) and ECU enclosure (25) with sealer.

CAUTION

Damage to hydraulic motor can occur if not aligned properly. Check alignment of hydraulic motor to coupling by turning recirculation fan. Recirculation fan should turn freely.

(3) Apply antiseize compound (Item 13, Appx C) to shaft of hydraulic motor (3).

NOTE

Machine key supplied with hydraulic motor.

(4) Align machine key (26) on shaft of hydraulic motor (3) to coupling (19).

(5) Apply sealant (Item 44, Appx C) to setscrew (18) and tighten.

(6) Secure hydraulic motor (3) and motor mount plate (24) to ECU enclosure (25) with two screws (20), four flat washers (21), two new lockwashers (22) (Item 20, Appx E) and two nuts (23). Apply sealant (Item 44, Appx C) to mating surfaces of hydraulic motor (3) and motor mount plate (24).

(7) Check connector (16) sealing surfaces for damage or material build up. If required, replace connector (16) or clean any material build up with clean, lint-free cloth.

(8) Coat male threads on connector (16) with hydraulic sealant.

(9) Lubricate two O-rings (17) with a light coat of hydraulic fluid.

(10) Install two new O-rings (17) (Item 63, Appx E) on connector (16). Ensure O-rings (17) are seated and retained properly.

(11) Remove plug from port on hydraulic motor (3). Install connector (16) on hydraulic motor (3), finger tight.

(12) Wrench tighten connector (16) two to three TFFT (Turns From Finger Tight).

(13) Check tee (9) sealing surfaces for damage or material build up. If required, replace tee (9) or clean any material build up with clean, lint-free cloth.

(14) Lubricate two O-rings (15) (Item 63, Appx E) with a light coating of hydraulic fluid.

(15) Install two new O-rings (15) on tee (9). Ensure two O-rings (15) are seated and retained properly.

(16) Install tee (9) on connector (16), finger tight.

(17) Check reducing connector (11) sealing surfaces for damage or material build up. If required, replace reducing connector (11) or clean any material build up with clean, lint-free cloth.

(18) Install new O-ring (12) (Item 67, Appx E) on reducing connector (11). Ensure O-ring is seated and retained properly.

(19) Lubricate O-ring (12) with a light coating of hydraulic fluid.

(20) Remove plug from tube assembly (8). Check tube assembly (8) sealing surfaces for damage or material build up. Remove any material build up with clean, lint-free cloth. If required, replace per para 3.9.11.

(21) Install tube assembly (8) on tee (9), finger tight. Adjust position of tube assembly (8) and tee (9) as required.

(22) Remove plug from tube assembly (10). Check tube assembly (10) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (10) per para 3.9.11.

(23) Install tube assembly (10) on reducing connector (11), finger tight. Adjust position of tube assembly (10) and reducing connector (11) as required.

(24) Torque reducing connector (11) on tee (9) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

3.9.3 Recirculation Fan/Motor Replacement – Continued.

(25) Torque tube assembly (10) on reducing connector (11) to 320 ± 25 in.-lb (27 ± 2 ft-lb).

(26) Torque tube assembly (8) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(27) Check elbow (6) sealing surfaces for damage or material build up. If required, replace elbow (6) or clean any material build up with clean, lint-free cloth.

(28) Lubricate O-rings (14 and 7) with a light coating of hydraulic fluid.

(29) Install new O-ring (14) (Item 58, Appx E) and new O-ring (7) (Item 63, Appx E) on elbow (6). Ensure O-rings (14 and 7) are seated and retained properly.

(30) Coat male threads on elbow (6) with hydraulic fluid.

(31) Remove plug in port of hydraulic motor (3). Install elbow (6) on hydraulic motor (3), finger tight.

(32) Remove plug from tube assembly (5). Check tube assembly (5) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (5) per para 3.9.11.

(33) Install tube assembly (5) on elbow (6), finger tight. Adjust position of tube assembly (5) and elbow (6) as required.

(34) Torque tube assembly (5) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(35) Torque elbow (6) on hydraulic motor (3) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

(36) Check elbow (2) sealing surfaces for damage or material build up. If required, replace elbow (2) or clean any material build up with clean, lint-free cloth.

(37) Lubricate O-rings (13 and 4) with a light coating of hydraulic fluid.

(38) Install new O-ring (13) (Item 58, Appx E) and new O-ring (4) (Item 63, Appx E) on elbow (2). Ensure O-rings (13 and 4) are seated and retained properly.

(39) Coat male threads on elbow (2) with hydraulic fluid.

(40) Remove plug in port of hydraulic motor (3). Install elbow (2) on hydraulic motor (3), finger tight.

(41) Remove plug from tube assembly (1). Check tube assembly (1) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (1) per para 3.9.11.

(42) Install tube assembly (1) on elbow (2), finger tight. Adjust position of tube assembly (1) and elbow (2) as required.

(43) Torque tube assembly (1) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(44) Torque elbow (2) on hydraulic motor (3) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

3.9.3.2 Recirculation Fan.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-8)

(1) Loosen setscrew (27) on coupling (19) and pry rear half of coupling back on shaft.

(2) Remove four screws (28), four lockwashers (29), and four flat washers (30) securing recirculation fan (31) to blower mount (32). Discard four lockwashers (29).

(3) Remove four screws (33), four lockwashers (34) and four flat washers (35) securing recirculation fan (31) to angle supports (36 and 37). Remove recirculation fan (31) from ECU enclosure (25). Discard four lockwashers (34).

(4) Remove coupling (19) and machine key (38) from shaft of recirculation fan (31). Discard machine key (38).

b. Installation (Refer to Figure 3-8)

NOTE

Apply antiseize compound to all screws installed in blind rivet nuts.

(1) Apply antiseize compound (Item 13, Appx C) to shaft of recirculation fan (31).

(2) Align new machine key (38) (Item 6, Appx E) on shaft of recirculation fan (31) to coupling (19).

CAUTION

Damage to hydraulic motor can occur if not aligned properly. Check alignment of hydraulic motor to coupling by turning recirculation fan. Recirculation fan should turn freely.

(3) Align coupling halves. Put eight screws on loosely, spin fan, tighten screws a little more, spin fan; coupling halves must align.

(4) Secure recirculation fan (31) to angle supports (36 and 37) with four screws (33), four new lockwashers (34) (Item 18, Appx E) and four flat washers (35). Torque screws to 50 ± 5 in.-lb.

(5) Secure recirculation fan (31) to blower mount (32) with four screws (28), four new lockwashers (29) (Item 18, Appx E) and four flat washers (30). Torque screws to 50 ± 5 in.-lb.

(6) Apply sealant (Item 44, Appx C) to setscrew (27) and tighten.

3.9.3 Recirculation Fan/Motor Replacement – Continued.

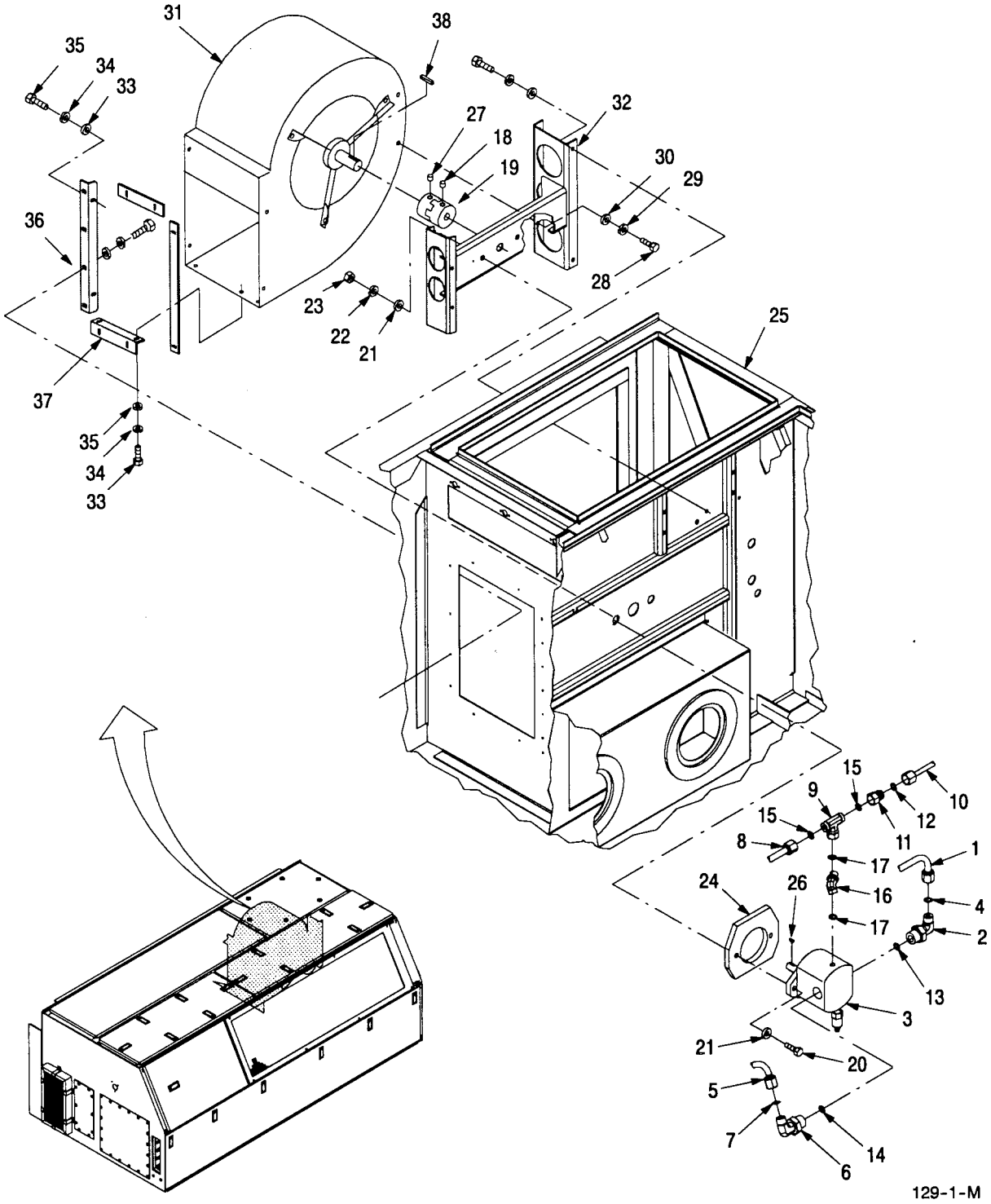


Figure 3-8. Recirculation Fan/Motor Replacement

Follow-on maintenance: If required, install ECU per para 3.9.21. Fill hydraulic reservoir per para 2.14.3. Install thermistor per para 2.14.6, close or install ECU covers and doors per para 2.14.1, apply system power and check for leaks.

3.9.4 Condenser Fan/Motor Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
12 Inch Extension (Item 8, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
11/16 Inch Crowfoot Wrench (Item 53, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
1-11/16 Inch Crowfoot Wrench (Item 62, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
Antiseize Compound (Item 13, Appendix C)
Hydraulic Fluid (Item 24, Appendix C)
Rubber Gloves (Item 25, Appendix C)
Rags, Wiping (Item 39, Appendix C)
Hydraulic Sealant (Item 48, Appendix C)
O-ring (Item 67, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
Condenser fan grill removed, ECU covers and doors removed or opened as required (see para 2.14.1).
Hydraulic system drained (see para 2.14.3).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Six Lockwashers (Item 20, Appendix E)
Two O-rings (Item 51, Appendix E)
Two O-rings (Item 58, Appendix E)
Machine Key (Item 7, Appendix E)
Three O-rings (Item 62, Appendix E)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in cup or small container and clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.9.4.1 Condenser Fan.

a. Removal (Refer to Figure 3-9)

(1) Loosen two setscrews (1) on hub of condenser fan (2).

(2) Slide condenser fan (2) off condenser fan motor shaft (3).

(3) Remove machine key (4) from condenser fan motor shaft (3). Discard machine key (4).

b. Installation (Refer to Figure 3-9)

(1) Install new machine key (4) (Item 7, Appx E) on condenser fan motor shaft (3).

(2) Apply antiseize compound to condenser fan motor shaft (3).

(3) Align machine key (4) with key way on condenser fan (2) and slide condenser fan (2) onto condenser fan motor shaft (3) until fan hub is flush with end of shaft.

3.9.4 Condenser Fan/Motor Replacement – Continued.

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(4) Apply sealant to two setscrews (1) on hub of condenser fan (2).

(5) Tighten two setscrews (1) on hub of condenser fan (2). Hand spin fan for clearance. Realign accordingly.

3.9.4.2 Condenser Hydraulic Motor.

a. Removal (Refer to Figure 3-9)

CAUTION

To prevent contamination of hydraulic system, clean all hydraulic connections before separating.

NOTE

Plug open ports on hydraulic motor and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(1) Remove condenser fan (2) per para 3.9.4.1.

(2) Disconnect tube assembly (5) from reducer (6). Remove reducer (6) from tee (7) on connector (8). Remove and discard O-rings (9 and 10).

(3) Disconnect tube assembly (11) from tee (7). Remove and discard O-ring (10).

(4) Disconnect tube assembly (12) from elbow (13) on hydraulic motor (14). Remove and discard O-ring (15) from elbow (13).

(5) Disconnect tube assembly (16) from elbow (17) on hydraulic motor (14). Remove and discard O-ring (18) from elbow (17).

NOTE

Remove two elbows, and connector from hydraulic motor prior to removing hydraulic motor from ECU. Otherwise, a vise will be required to hold hydraulic motor.

(6) Remove elbow (13) from hydraulic motor (14). Remove and discard O-ring (19) from elbow (13). Plug open port on hydraulic motor (14).

(7) Remove elbow (17) from hydraulic motor (14). Remove and discard O-ring (20) from elbow (17). Plug open port on hydraulic motor (14).

(8) Remove tee (7) from connector (8). Remove and discard O-ring (21) from connector (8).

(9) Remove connector (8) from hydraulic motor (14). Plug open port on hydraulic motor (14).

(10) Loosen setscrew (22) on condenser fan motor shaft (3) and remove fan motor shaft (3).

(11) Remove four screws (23), eight flat washers (24), four lockwashers (25) and four nuts (26) securing fan support bracket (27) to ECU enclosure (28). Remove fan support bracket (27) with hydraulic motor (14) attached. Discard four lockwashers (25).

(12) Remove two screws (29), four flat washers (30), two lockwashers (31) and two nuts (32) securing hydraulic motor (14) to fan support bracket (27). Discard two lockwashers (31).

b. Installation (Refer to Figure 3-9)

(1) Secure hydraulic motor (14) to fan support bracket (27) with two screws (29), four flat washers (30), two new lockwashers (31) (Item 20, Appx E) and two nuts (32).

(2) Apply antiseize compound to shaft of hydraulic motor (14).

(3) Slide condenser fan motor shaft (3) onto shaft of hydraulic motor (14). Tighten setscrew (22).

(4) Apply sealant to two setscrews (22) on condenser fan motor shaft (3).

(5) Loosely secure fan support bracket (27) with hydraulic motor (14) attached to ECU enclosure (28) with four screws (23), eight flat washers (24), four new lockwashers (25) (Item 20, Appx E) and four nuts (26).

(6) Install condenser fan (2) per paragraph 3.9.4.1.

(7) Adjust support bracket (27) so that condenser fan (2) will be centered in ECU enclosure (28). Tighten four screws (23) and four nuts (26).

(8) Check connector (8) sealing surfaces for damage or material build up. If required, replace connector (8) or clean any material build up with clean, lint-free cloth.

(9) Coat male threads of connector (8) with hydraulic sealant.

(10) Remove plug from port on hydraulic motor (14). Install connector (8) on hydraulic motor (14), finger tight.

(11) Wrench tighten connector (8) two to three TFFT.

(12) Lubricate O-ring (21) (Item 62, Appx E) with a light coating of hydraulic fluid and install on connector (8). Ensure that O-ring (21) is seated and retained properly.

(13) Check tee (7) sealing surfaces for damage or material build up. If required, replace tee (7) or clean any material build up with clean, lint-free cloth.

(14) Install tee (7) on connector (8), finger tight.

(15) Check elbow (17) sealing surfaces for damage or material build up. If required, replace elbow (17) or clean any material build up with clean, lint-free cloth.

(16) Lubricate O-ring (20) (Item 51, Appx E) with a light coating of hydraulic fluid and install on elbow (17). Ensure O-ring (20) is seated and retained properly.

(17) Coat male threads of elbow (17) with hydraulic fluid.

(18) Remove plug from port on hydraulic motor (14). Install elbow (17) on hydraulic motor (14), finger tight.

(19) Check elbow (13) sealing surfaces for damage or material build up. If required, replace elbow (13) or clean any material build up with clean, lint-free cloth.

(20) Lubricate O-ring (19) (Item 51, Appx E) with a light coating of hydraulic fluid and install new O-ring (19) on elbow (13). Ensure O-ring (19) is seated and retained properly.

(21) Coat male threads of elbow (13) with hydraulic fluid.

(22) Remove plug from port on hydraulic motor (14). Install elbow (13) on hydraulic motor (14), finger tight.

(23) Lubricate two O-rings (10) (Item 62, Appx E) with a light coating of hydraulic fluid and install on tee (7). Ensure O-rings (10) is seated and retained properly.

(24) Coat male threads of reducer (6) and install in tee (7) finger tight.

(25) Lubricate O-ring (9) (Item 67, Appx E) with a light coating of hydraulic fluid and install on reducer (6). Ensure O-ring(9) are seated and retained properly.

(26) Remove two plugs from two tube assemblies (5 and 11). Check two tube assemblies (5 and 11) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assemblies (5 and 11) per para 3.9.11.

(27) Coat male threads of tee (7) and reducer (6) with hydraulic fluid and install two tube assemblies (5 and 11) finger tight. Adjust position of two tube assemblies (5 and 11) and tee (7) as required.

3.9.4 Condenser Fan/Motor Replacement – Continued.

(28) Torque tee (7) and reducer (6) to 320 ± 25 in.-lb (27 ± 2 ft-lb).

(29) Torque two tube assemblies (5 and 11) to 320 ± 25 in.-lb (27 ± 2 ft-lb).

(30) Lubricate O-ring (15) (Item 58, Appx E) with a light coating of hydraulic fluid and install new O-ring (15) on elbow (13). Ensure O-ring (15) is seated and retained properly.

(31) Remove plug from tube assembly (12). Check tube assembly (12) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (12) per para 3.9.11.

(32) Coat male threads of elbow (13) with hydraulic fluid and install tube assembly (12) on elbow (13), finger tight. Adjust position of tube assembly (12) and elbow (13) as required.

(33) Torque elbow (13) on hydraulic motor (14) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

(34) Torque tube assembly (12) on elbow (13) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(35) Lubricate O-ring (18) (Item 58, Appx E) with a light coating of hydraulic fluid and install on elbow (17). Ensure O-ring (18) is seated and retained properly.

(36) Remove plug from tube assembly (16). Check tube assembly (16) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (16) per para 3.9.11.

(37) Install tube assembly (16) on elbow (17), finger tight. Adjust position of tube assembly (16) and elbow (17) as required.

(38) Torque elbow (17) on hydraulic motor (14) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

(39) Torque tube assembly (16) on elbow (17) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

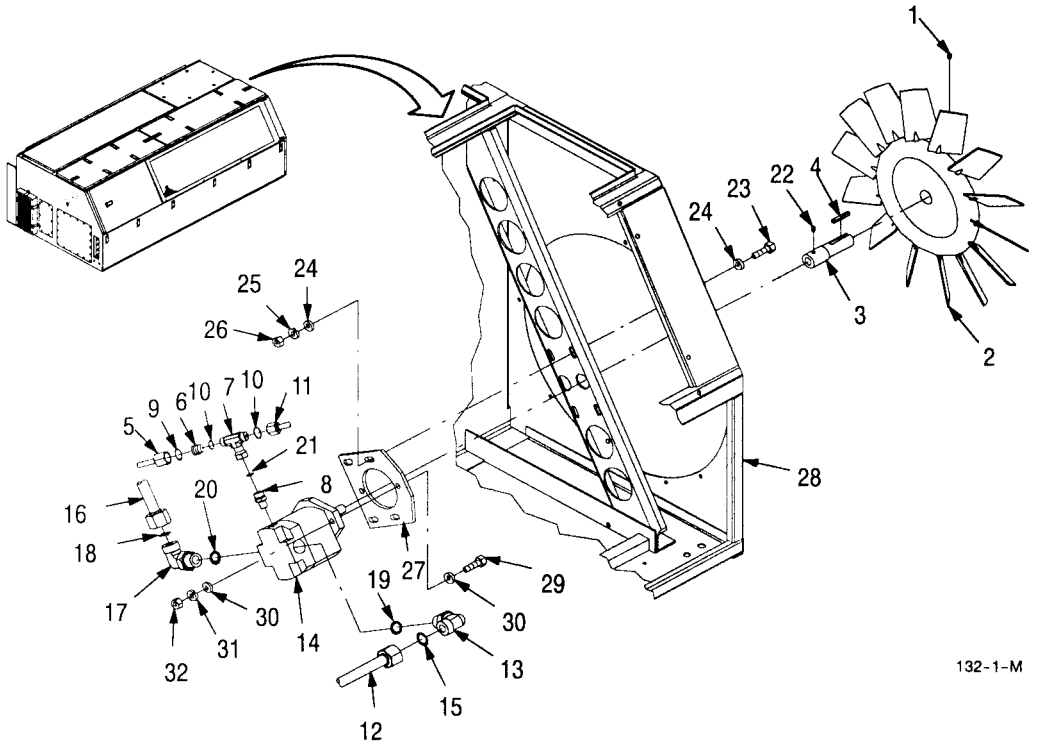


Figure 3-9. Condenser Fan/Motor Replacement

Follow-on maintenance: Fill hydraulic reservoir per para 2.14.3, apply system power and check for leaks, close or install ECU doors and covers per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

3.9.5 Rib Blower Replacement.

This task covers:
a. Removal/Disassembly
b. Assembly/Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
11/16 Inch Crowfoot Wrench (Item 53, Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Rubber Gloves (Item 25, Appendix C)
Wiping Rags (Item 39, Appendix C)
Sealant (Item 46, Appendix C)
Four Lockwashers (Item 19, Appendix E)
Two O-rings (Item 63, Appendix E)

Equipment Conditions:
Power shut off. Power panel and rear control panel tagged.
Hydraulic system drained (see para 2.14.3).
LMS guard removed (see para 2.13.15).
ABS inflation air hose disconnected (see para 2.13.7).
Sound guard removed as required (see para 3.9.2).

Materials/Parts: (Cont.)
Two O-rings (Item 57, Appendix E)
O-ring (Item 55, Appendix E)
O-ring (Item 56, Appendix E)
O-ring (Item 62, Appendix E)

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in cup or small container and clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal/Disassembly (Refer to Figure 3-10)

(1) Unscrew strainer (1) from close nipple (2) and remove from ECU (3).

(2) Disconnect tube assembly (4), tube assembly (5), and tube assembly (6) from three unions on ECU (3) partition wall. Plug unions to prevent contamination of the hydraulic system. Refer to para 3.9.11 for location of unions.

(3) Disconnect tube assembly (4) from elbow (7) on hydraulic motor (8). Remove and discard O-ring (9) from elbow (7).

(4) Disconnect tube assembly (5) from elbow (10) on hydraulic motor (8). Remove and discard O-ring (11) from elbow (10).

(5) Disconnect tube assembly (6) from connector (12) on adapter (13). Remove and discard O-ring (14) from connector (12).

(6) Remove three tube assemblies (4, 5, and 6) from ECU (3).

NOTE

Remove two elbows, connector, and adapter from hydraulic motor prior to removing hydraulic motor and ring compressor from ECU. Otherwise, a vise will be required to hold hydraulic motor.

Plug open ports on hydraulic motor to keep the hydraulic motor free of contaminants.

(7) Remove elbow (7) from hydraulic motor (8). Remove and discard O-ring (15) from elbow (7). Plug open port on hydraulic motor (8).

(8) Remove elbow (10) from hydraulic motor (8). Remove and discard O-ring (16) from elbow (10). Plug open port of hydraulic motor (8).

3.9.5 Rib Blower Replacement – Continued.

(9) Remove connector (12) from adapter (13) on hydraulic motor (8). Remove and discard O-ring (17) from connector (12).

(10) Remove adapter (13) from hydraulic motor (8). Remove and discard O-ring (18) from adapter (13). Plug open port on hydraulic motor (8).

(11) Remove four screws (19), four lockwashers (20) and four flat washers (21) securing rib blower (22) to inside of ECU (3). Remove rib blower (22) from ECU (3). Discard four lockwashers (20).

(12) Unscrew and remove nipple (2) from elbow (23).

(13) Unscrew and remove elbow (23) from nipple (24).

(14) Unscrew and remove nipple (24) from rib blower (22).

(15) Unscrew and remove swing check valve (25) with elbow (26) and hose barb (27) attached, from rib blower (22).

b. Assembly/Installation (Refer to Figure 3-10)

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(1) Apply sealant to male threads of swing check valve (25).

(2) Position swing check valve (25) so that flow arrow is pointing upward. Screw swing check valve (25) onto rib blower (22).

(3) Screw elbow (26) onto swing check valve (25) so that elbow (28) is rotated 60 degrees counterclockwise from center/front of rib blower (22).

(4) Apply sealant to male threads of hose barb (27) and screw onto elbow (26).

(5) Screw nipple (24) onto rib blower (22).

(6) Screw nipple (2) onto elbow (23).

(7) Screw elbow (23) with nipple (2) onto nipple (24).

(8) Secure rib blower (22) to inside of ECU (3) with four screws (19), four new lockwashers (20) and four flat washers (21).

(9) Check adapter (13) sealing surfaces for damage or material build up. If required, replace adapter (13) or clean any material build up with clean, lint-free cloth.

(10) Install new O-ring (18) (Item 55, Appx E) on adapter (13). Ensure that O-ring (18) is seated and retained properly.

(11) Lubricate O-ring (18) with a light coating of hydraulic fluid.

(12) Apply a light coating of hydraulic fluid to threads on adapter (13).

(13) Remove plug from port on hydraulic motor (8). Install adapter (13) on hydraulic motor (8), finger tight.

(14) Torque adapter (13) on hydraulic motor (8) to 220 ± 15 in.-lb (18 ± 1 ft-lb).

(15) Check connector (12) sealing surfaces for damage or material build up. If required, replace connector (12) or clean any material build up with clean, lint-free cloth.

(16) Install new O-ring (14) (Item 62, Appx E) and new O-ring (17) (Item 56, Appx E) on connector (12). Ensure O-rings (17 and 14) are seated and retained properly.

(17) Lubricate O-rings (17 and 14) with a light coating of hydraulic fluid.

(18) Install connector (12) on adapter (13), finger tight.

(19) Torque connector (12) on adapter (13) to 220 ± 15 in.-lb (18 ± 1 ft-lb).

(20) Check tube assembly (6) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (6) per 3.9.11.

(21) Remove plug from union on ECU (3) partition wall. Refer to para 3.9.11 for location of union.

(22) Install tube assembly (6) on connector (12) and on union on ECU (3) partition wall, finger tight. Adjust position of tube assembly (6) as required.

(23) Torque both ends of tube assembly (6) to 320 ± 25 in.-lb (27 ± 2 ft-lb).

(24) Check elbow (10) sealing surfaces for damage or material build up. If required, replace elbow (10) or clean any material build up with clean, lint-free cloth.

(25) Install new O-ring (11) (Item 63, Appx E) and new O-ring (16) (Item 57, Appx E) on elbow (10). Ensure O-rings (16 and 11) are seated and retained properly.

(26) Lubricate O-rings (16 and 11) with a light coating of hydraulic fluid.

(27) Remove plug in port of hydraulic motor (8). Install elbow (10) on hydraulic motor (8), finger tight.

(28) Check tube assembly (5) sealing surfaces for damage or material build up. If required, clean any material build-up with clean, lint-free cloth. If necessary, replace tube assembly (5) per para 3.9.11.

(29) Remove plug from union on ECU (3) partition wall. Refer to para 3.9.11 for location of union.

(30) Install tube assembly (5) on elbow (10) and on union on ECU (3) partition wall, finger tight. Adjust position of tube assembly (5) and elbow (10) as required.

(31) Torque elbow (10) on hydraulic motor (8) to 720 ± 25. in.-lb (60 ± 2 ft-lb).

(32) Torque both ends of tube assembly (5) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(33) Check elbow (7) sealing surfaces for damage or material build up. If required, replace elbow (7) or clean any material build up with clean, lint-free cloth.

(34) Install new O-ring (9) (Item 63, Appx E) and new O-ring (15) (Item 57, Appx E) on elbow (7). Ensure O-rings (15 and 9) are seated and retained properly.

(35) Lubricate O-rings (15 and 9) with a light coating of hydraulic fluid.

(36) Remove plug in port of hydraulic motor (8). Install elbow (7) on hydraulic motor (8), finger tight.

(37) Remove plug from union on ECU (3) partition wall. Refer to para 3.9.11 for location of union.

(38) Install tube assembly (4) on elbow (7) and on union on ECU (3) partition wall, finger tight. Adjust position of tube assembly (4) and elbow (7) as required.

(39) Torque elbow (7) on hydraulic motor (8) to 720 ± 25 in.-lb (60 ± 2 ft-lb).

(40) Torque both ends of tube assembly (4) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(41) Screw strainer (1) onto nipple (2).

3.9.5 Rib Blower Replacement – Continued.

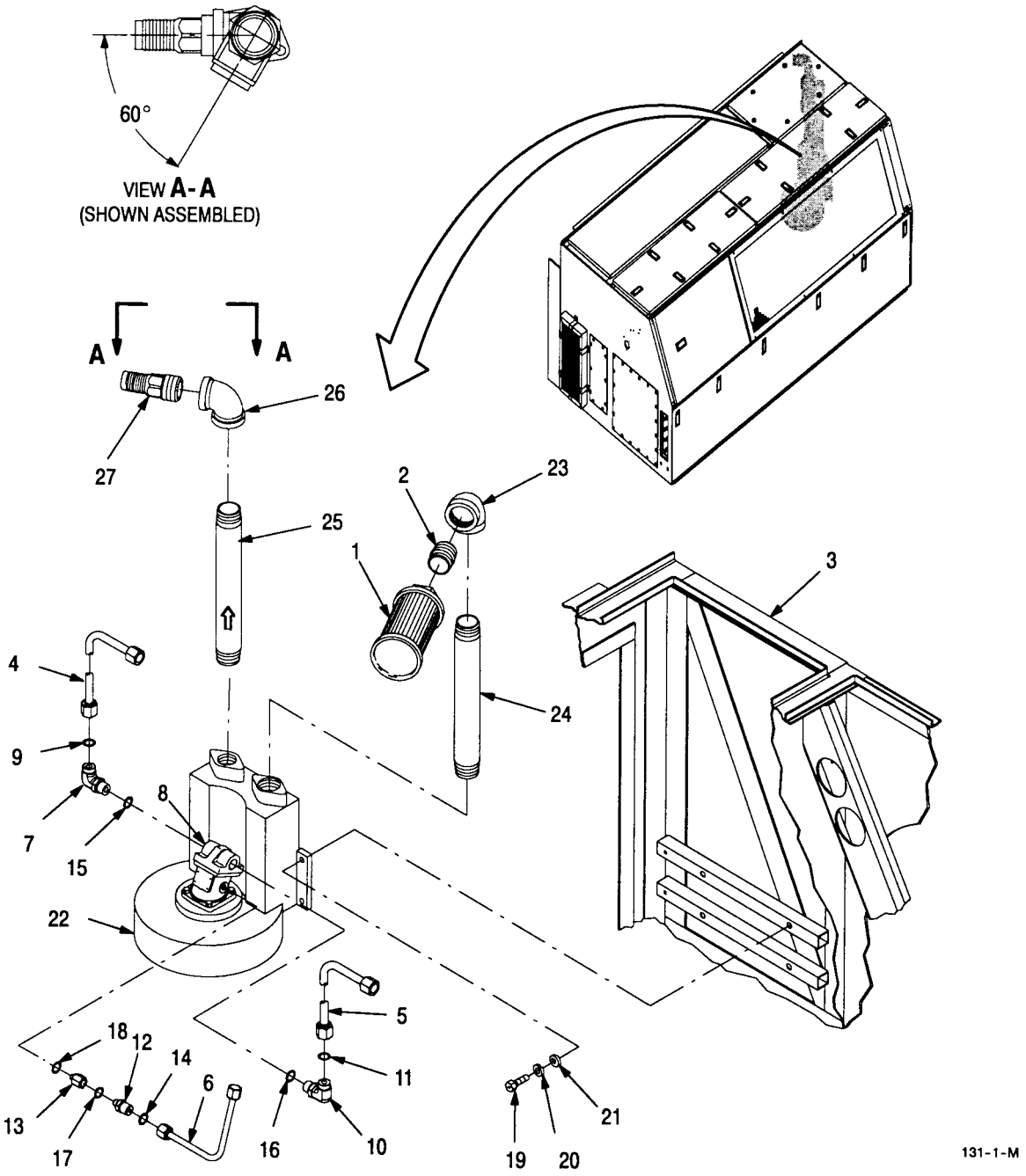


Figure 3-10. Rib Blower Replacement

Follow-on maintenance: Fill hydraulic reservoir per para 2.14.3, install sound guard per para 3.9.2, install LMS guard per para 2.13.15, install ABS inflation air hose per para 2.13.7, remove tags, apply system power, perform operational test and check for leaks.

3.9.6 Heater Element Assembly Replacement.

This task covers:	
a. Removal	c. Assembly
b. Disassembly	d. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Power shut off, power panel and rear control panel tagged.
	ECU covers and doors opened or removed (see para 2.14.1).
Materials/Parts:	ECU work platform installed (reference TM 10-5410-228-10).
Twenty-four Lockwashers (Item 15, Appendix E)	Overheat switch removed (see para 2.14.7).
Six Lockwashers (Item 16, Appendix E)	
Two Lockwashers (Item 17, Appendix E)	
Twelve Lockwashers (Item 18, Appendix E)	
	References:
	TM 9-2320-387-24-1
	TM 10-5410-228-10

WARNING

CBPS contains high electrical currents. To prevent electrical shock when working on electrical system, ensure that power cable is disconnected from power panel and ECV batteries are disconnected per TM 9-2320-387-24-1. Tag power panel and battery area with sign that states that the power must remain OFF while work is being performed.

Remove jewelry and observe all safety rules for working around high voltage.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-11)

(1) Remove twelve nuts and twelve flat washers securing leads to twelve posts on top of heater element assembly (1). Tag and remove leads.

(2) Remove three screws (2), three lockwashers (3), three flat washers (4), three nuts (5), three lockwashers (6) and three flat washers (7) securing heater element assembly (1) to ECU enclosure (8). Remove heater element assembly (1). Discard three lockwashers (3) and three lockwashers (6).

b. Disassembly (Refer to Figure 3-11)

(1) Remove two nuts (9), two lockwashers (10) and two flat washers (11) securing guard (12) to heater assembly rear bracket (17). Discard two lockwashers (10).

(2) Remove six screws (13), six lockwashers (14) and six flat washers (15) securing two retainer plate assemblies (16) to heater assembly rear bracket (17). Discard six lockwashers (14).

(3) Remove two screws (18), two lockwashers (19) and two flat washers (20) securing overheat switch bracket (21) to front bracket cover (22). Discard two lockwashers (19).

(4) Remove four screws (23), four lockwashers (24) and four flat washers (25) securing front bracket cover (22) to heater assembly front bracket (26). Discard four lockwashers (24).

(5) Remove 24 screws (27), 24 lockwashers (28) and 24 flat washers (29) securing six heating elements (30) to heater assembly front bracket (26). Discard 24 lockwashers (28).

3.9.6 Heater Element Assembly Replacement – Continued.

c. Assembly (Refer to Figure 3-11)

(1) Secure six heating elements (30) to heater assembly front bracket (26) with 24 screws (27), 24 new lockwashers (28) (Item 15, Appx E) and 24 flat washers (29).

(2) Secure front bracket cover (22) to heater assembly front bracket (26) with four screws (23), four new lockwashers (24) (Item 16, Appx E) and four flat washers (25).

(3) Secure overheat switch bracket (21) to front bracket cover (22) with two screws (18), two new lockwashers (19) (Item 16, Appx E) and two flat washers (20).

(4) Secure two retainer plate assemblies (16) to heater assembly rear bracket (17) with six screws (13), six new lockwashers (14) (Item 18, Appx E) and six flat washers (15).

(5) Secure guard (12) to heater assembly rear bracket (17) with two nuts (9), two new lockwashers (10) (Item 17, Appx E) and two flat washers (11).

d. Installation (Refer to Figure 3-11)

(1) Place heater element assembly (1) in ECU enclosure (8). Secure heater element assembly (1) to ECU enclosure (8) with three screws (2), three new lockwashers (3) (Item 18, Appx E) three flat washers (4), three nuts (5), three new lockwashers (6) (Item 18, Appx E) and three flat washers (7).

(2) Install leads to twelve posts on top of heater element assembly (1) and secure with twelve nuts and twelve flat washers. Remove tags from leads.

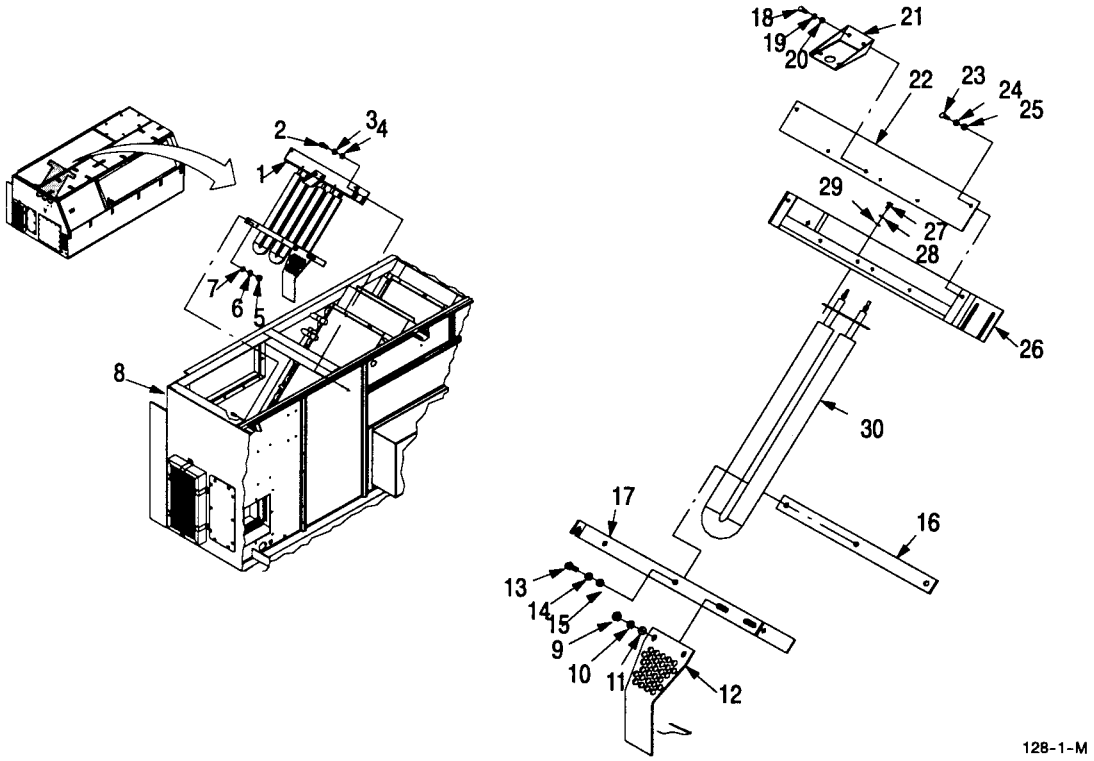


Figure 3-11. Heater Element Assembly Replacement

Follow-on maintenance: Install overheat switch per para 2.14.7, install or close ECU covers and doors per para 2.14.1, connect ECV battery ground cable per TM 9-2320-387-24, remove tags, apply system power and perform operational test. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.7 NBC Fan/Motor Repair.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
11/16 Inch Crowfoot Wrench (Item 53, Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
Antiseize Compound (Item 13, Appendix C)
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
Sealant (Item 46, Appendix C)
Hydraulic Sealant (Item 48, Appendix C)
Gasket (Figure D-15, Appendix D)
Gasket (Figure D-26, Appendix D)
Twenty-seven Lockwashers (Item 18, Appendix E)
Four Lockwashers (Item 19, Appendix E)

Equipment Conditions:
Power shut off. Power panel and rear control panel tagged.
ECV parking brake set.
ECU covers and doors opened or removed, as required (see para 2.14.1).
Hydraulic system drained (see para 2.14.3).
Plenum removed (see TM 10-5410-228-10).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Two Lockwashers (Item 20, Appendix E)
Two O-rings (Item 51, Appendix E)
Two O-rings (Item 57, Appendix E)
O-ring (Item 55, Appendix E)
O-ring (Item 56, Appendix E)
O-ring (Item 62, Appendix E)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in cup or small container and clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.9.7.1 NBC Hydraulic Motor.

a. Removal (Refer to Figure 3-12)

(1) Disconnect tube assembly (1) from elbow (2) on hydraulic motor (3). Remove and discard O-ring (4) from elbow (2).

(2) Disconnect tube assembly (5) from elbow (6) on hydraulic motor (3). Remove and discard O-ring (7) from elbow (6).

(3) Disconnect tube assembly (8) from connector (9) on adapter (10). Remove and discard O-ring (11) from connector (9).

3.9.7 NBC Fan/Motor Repair – Continued.

NOTE

Remove two elbows, connector, and adapter from hydraulic motor prior to removing hydraulic motor from C-face adapter. Otherwise, a vise will be required to hold hydraulic motor.

Plug open ports on hydraulic motor and open ends of tube assemblies to keep the hydraulic motor free of contaminants.

(4) Remove elbow (2) from hydraulic motor (3). Remove and discard O-ring (12) from elbow (2). Plug open port on hydraulic motor (3).

(5) Remove elbow (6) from hydraulic motor (3). Remove and discard O-ring (13) from elbow (6). Plug open port on hydraulic motor (3).

(6) Remove connector (9) from adapter (10). Remove and discard O-ring (14) from connector (9).

(7) Remove adapter (10) from hydraulic motor (3). Remove and discard O-ring (15) from adapter (10). Plug open port on hydraulic motor (3).

NOTE

Access setscrew on NBC motor coupling through access hole on C-face adapter (plate may have to be removed). In order to reach setscrew, NBC motor coupling may have to be rotated.

(8) Loosen setscrew (16) on NBC motor coupling (17).

(9) Remove four screws (18) and four lockwashers (19) securing hydraulic motor (3) to C-face adapter (20) and remove hydraulic motor (3). Discard four lockwashers (19).

b. Installation (Refer to Figure 3-12)

(1) Apply antiseize compound to shaft of hydraulic motor (3).

(2) Secure hydraulic motor (3) to C-face adapter (20) with four screws (18) and four new lockwashers (19) (Item 18, Appx E).

(3) Align NBC motor coupling (17) key way and slide onto shaft of hydraulic motor (3).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(4) Apply sealant to setscrew (16).

(5) Align NBC motor coupling (17) to NBC fan coupling insert (25) and tighten setscrew (16).

(6) Check adapter (10) sealing surfaces for damage or material build up. If required, replace adapter (10) or clean any material build up with clean, lint-free cloth.

(7) Install new O-ring (15) (Item 55, Appx E) on adapter (10). Ensure that O-ring (15) is seated and retained properly.

(8) Lubricate O-ring (15) with a light coating of hydraulic fluid.

(9) Coat male threads of adapter (10) with hydraulic fluid.

(10) Remove plug from port on hydraulic motor (3). Install adapter (10) on hydraulic motor (3), finger tight.

(11) Check connector (9) sealing surfaces for damage or material build up. If required, replace connector (9) or clean any material build up with clean, lint-free cloth.

(12) Install new O-ring (11) (Item 62, Appx E) and new O-ring (14) (Item 56, Appx E) on connector (9). Ensure O-rings (14 and 11) are seated and retained properly.

(13) Lubricate O-rings (14 and 11) with a light coating of hydraulic fluid.

(14) Install connector (9) on adapter (10), finger tight.

(15) Remove plug from tube assembly (8). Check tube assembly (8) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (8) per para 3.9.11.

(16) Install tube assembly (8) on connector (9), finger tight. Adjust position of tube assembly (8) as required.

(17) Torque both adapter (10) on hydraulic motor (3) and connector (9) to 220 ± 15 in.-lb (18 ± 1 ft-lb).

(18) Torque tube assembly (8) to 320 ± 25 in.-lb (27 ± 2 ft-lb).

(19) Check elbow (6) sealing surfaces for damage or material build up. If required, replace elbow (6) or clean any material build up with clean, lint-free cloth.

(20) Install new O-ring (7) (Item 51, Appx E) and new O-ring (13) (Item 57, Appx E) on elbow (6). Ensure O-rings (13 and 7) are seated and retained properly.

(21) Lubricate O-rings (13 and 7) with a light coating of hydraulic fluid.

(22) Coat male threads of elbow (6) with hydraulic fluid

(23) Remove plug in port of hydraulic motor (3). Install elbow (6) on hydraulic motor (3), finger tight.

(24) Remove plug from tube assembly (5). Check tube assembly (5) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (5) per para 3.9.11.

(25) Install tube assembly (5) on elbow (6), finger tight. Adjust position of tube assembly (5) as required.

(26) Torque elbow (6) on hydraulic motor (3) to 720 ± 25 in.-lb (60 ± 2 ft-lb).

(27) Torque tube assembly (5) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(28) Check elbow (2) sealing surfaces for damage or material build up. If required, replace elbow (2) or clean any material build up with clean, lint-free cloth.

(29) Install new O-ring (4) (Item 51, Appx E) and new O-ring (12) (Item 57, Appx E) on elbow (2). Ensure O-rings (12 and 4) are seated and retained properly.

(30) Lubricate O-rings (12 and 4) with a light coating of hydraulic fluid.

(31) Coat male threads of elbow (2) with hydraulic fluid.

(32) Remove plug in port of hydraulic motor (3). Install elbow (2) on hydraulic motor (3), finger tight.

(33) Remove plug from tube assembly (1). Check tube assembly (1) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (1) per para 3.9.11.

(34) Install tube assembly (1) on elbow (2), finger tight. Adjust position of tube assembly (1) as required.

(35) Torque elbow (2) on hydraulic motor (3) to 720 ± 25 in.-lb (60 ± 2 ft-lb).

(36) Torque tube assembly (1) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

3.9.7 NBC Fan/Motor Repair – Continued.

3.9.7.2 NBC Fan.

NOTE

Remove hydraulic motor and tube assemblies per para 3.9.7.1.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-12)

(1) Remove two screws (21), two lockwashers (22) and two flat washers (23) securing C-face adapter (20) to centrifugal fan (24). Discard two lockwashers (22).

(2) Loosen set screw (16) and remove NBC motor coupling (17) and NBC fan coupling insert (25).

(3) Loosen setscrew (26) securing NBC fan coupling (27) to centrifugal fan (24) and remove NBC fan coupling (27).

(4) Loosen clamp (28) securing sleeve (29) to back of centrifugal fan (24).

(5) Loosen clamp (30) securing sleeve (31) to bottom of centrifugal fan (24).

(6) Remove four allen screws (32), four lockwashers (33) and four flat washers (34) securing centrifugal fan (24) to blower mount (35). Discard four lockwashers (33).

b. Installation (Refer to Figure 3-12)

(1) Secure centrifugal fan (24) to blower mount (35) with four allen screws (32), four new lockwashers (33) (Item 19, Appx E) and four flat washers (34).

(2) Secure sleeve (31) to bottom of centrifugal fan (24) by tightening clamp (30).

(3) Secure sleeve (29) to back of centrifugal fan (24) by tightening clamp (28).

(4) Apply antiseize compound to shaft of centrifugal fan (24).

(5) Align NBC fan coupling (27), NBC fan coupling insert (25) and NBC motor coupling (17).

(6) Slide NBC fan coupling (27), NBC fan coupling insert (25) and NBC motor coupling (17) onto shaft of centrifugal fan (24).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(7) Apply sealant to setscrew (26).

(8) Secure NBC fan coupling (27) to centrifugal fan (24) by tightening setscrew (26).

(9) Secure C-face adapter (20) to centrifugal fan (24) with two screws (21), two new lockwashers (22) (Item 20, Appx E) and two flat washers (23).

(10) Install hydraulic motor and tube assemblies per para 3.9.7.1.

3.9.7.3 NBC Fan Components.

NOTE

Remove hydraulic motor and tube assemblies per para 3.9.7.1. Remove centrifugal fan per para 3.9.7.2.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-12)

(1) Loosen clamp (30) and remove sleeve (31) and clamp (30) from blower outlet duct (36).

(2) Loosen clamp (37) securing one end of hose (38) to blower outlet duct (36).

(3) Remove three screws (39), three lockwashers (40) and three flat washers (41) securing blower outlet duct (36) to blower mount (35). Discard three lockwashers (40).

(4) Remove gasket (42) from blower outlet duct (36). Discard gasket (42).

(5) Remove four screws (43), four lockwashers (44) and four flat washers (45) securing blower mount (35) to floor of ECU. Discard four lockwashers (44).

(6) Loosen clamp (28) and remove sleeve (29) and clamp (28) from blower inlet adapter (46).

(7) Remove seven screws (47), seven lockwashers (48) and seven flat washers (49) securing blower inlet adapter (46) and gasket (50) to ECU. Discard seven lockwashers (48) and gasket (50).

(8) Loosen clamp (51) securing other end of hose (38) to dust ejector (52). Remove hose (38).

(9) Loosen two clamps (53) securing hose (54) to dust ejector (52) and inertial separator (55) and remove hose (54) and dust ejector (52).

(10) Remove eight screws (56), eight lockwashers (57) and eight flat washers (58) securing inertial separator (55) to ECU enclosure. Discard eight lockwashers (57).

b. Installation (Refer to Figure 3-12)

(1) Secure inertial separator (55) to ECU with eight screws (56), eight new lockwashers (57) (Item 18, Appx E) and eight flat washers (58).

(2) Secure hose (54) to inertial separator (55) with clamp (53).

(3) Secure dust ejector (52) to hose (54) with clamp (53).

(4) Secure one end of hose (38) to dust ejector (52) with clamp (51).

(5) Feed other end of hose (38) through hole in ECU enclosure wall.

(6) Secure new gasket (50) and blower inlet adapter (46) to ECU with seven screws (47), seven new lockwashers (48) (Item 18, Appx E) and seven flat washers (49).

(7) Secure sleeve (29) on blower inlet adapter (46) by tightening clamp (28).

(8) Secure blower mount (35) to floor of ECU with four screws (43), four new lockwashers (44) (Item 18, Appx E) and four flat washers (45).

(9) Install new gasket (42) on blower outlet duct (36).

(10) Secure blower outlet duct (36) to blower mount (35) with three screws (39), three new lockwashers (40) (Item 18, Appx E) and three flat washers (41).

(11) Secure sleeve (31) to blower outlet duct (36) by tightening clamp (30).

(12) Secure hose (38) to blower outlet duct (36) by tightening clamp (37).

(13) Install centrifugal fan per para 3.9.7.2.

(14) Install hydraulic motor and tube assemblies per para 3.9.7.1.

3.9.7 NBC Fan/Motor Repair – Continued.

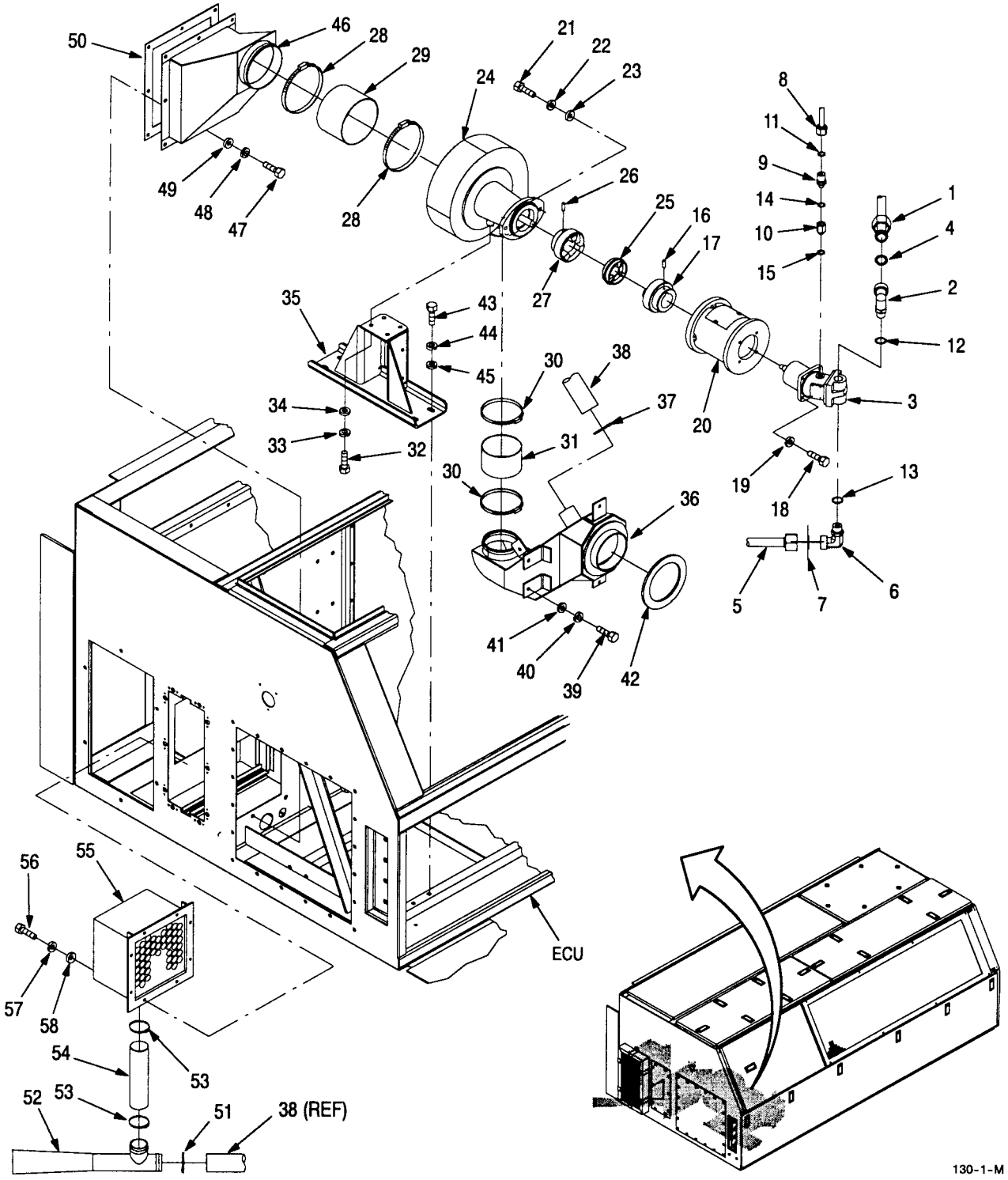


Figure 3-12. NBC Fan/Motor Repair

Follow-on maintenance: Fill hydraulic reservoir per para 2.14.3, install plenum per TM 10-5410-228-10, install or close ECU covers and doors per para 2.14.1, apply system power, and perform operational test. Check for leaks. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.8 Heater Coil Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	ECV shut off, power off.
Gloves (Item 16, Appendix B)	Rear control panel and power panel tagged.
Goggles (Item 17, Appendix B)	Hydraulic system drained (see para 2.14.3).
1-1/8 Inch Open End Wrench (Item 64, Appendix B)	ECU removed (see para 3.9.21).
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)	ECU covers and doors opened or removed as required (see para 2.14.1).
Torque Wrench (Item 66, Appendix B)	
Materials/Parts:	Materials/Parts: (Cont.)
Hydraulic Fluid (Item 24, Appendix C)	Six Lockwashers (Item 18, Appendix E)
Wiping Rags (Item 39, Appendix C)	Four O-rings (Item 51, Appendix E)

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in cup or small container and clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-13)

(1) Disconnect two hose assemblies (1 and 2) from two hose ports on heater coil (3) and ECU enclosure (4). Remove two hose assemblies (1 and 2) from ECU enclosure (4).

NOTE

Plug open ends on hose assemblies to keep the hydraulic system free of contaminants.

(2) Plug open ends on two hose assemblies (1 and 2).

(3) Remove two O-rings (5) from two hose ports on heater coil (3). Discard O-rings (5).

NOTE

Plug open ends of hose ports on heater coil to keep the hydraulic system free of contaminants.

(4) Plug open ends of two hose ports on heater coil (3).

(5) Remove two O-rings (5) from ECU enclosure (4) bulkhead fittings. Discard two O-rings (5).

(6) Remove six screws (6), six lockwashers (7) and six flat washers (8) securing heater coil (3) to ECU enclosure (4). Discard six lockwashers (7).

b. Installation (Refer to Figure 3-13)

(1) Secure heater coil (3) to ECU enclosure (4) with six screws (6), six new lockwashers (7) (Item 18, Appx E) and six flat washers (8).

(2) Remove two plugs from two hose ports on heater coil (3).

(3) Check both hose ports on heater coil (3) sealing surfaces for damage or material build up. If required, clean hose ports with clean, lint-free cloth or replace heater coil (3).

(4) Remove four plugs from two hose assemblies (1 and 2).

3.9.8 Heater Coil Replacement – Continued.

(5) Check two hose assemblies (1 and 2) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace two hose assemblies (1 and 2) per para 3.9.11.

(6) Install two new O-rings (5) (Item 51, Appx E) on two hose assemblies (1 and 2). Ensure two O-rings (5) are seated and retained properly.

(7) Install two new O-rings (5) (Item 51, Appx E) on ECU enclosure (4) bulkhead fittings. Ensure two O-rings (5) are seated and retained properly.

(8) Lubricate four O-rings (5) with a light coating of hydraulic fluid.

(9) Install two hose assemblies (1 and 2) on two hose ports on heater coil (3) and on ECU enclosure (4) bulkhead fittings.

(10) Torque both hose ports on heater coil (3) and ECU enclosure (4) bulkhead fittings to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(11) Refer to para 3.9.3 to service hydraulic system.

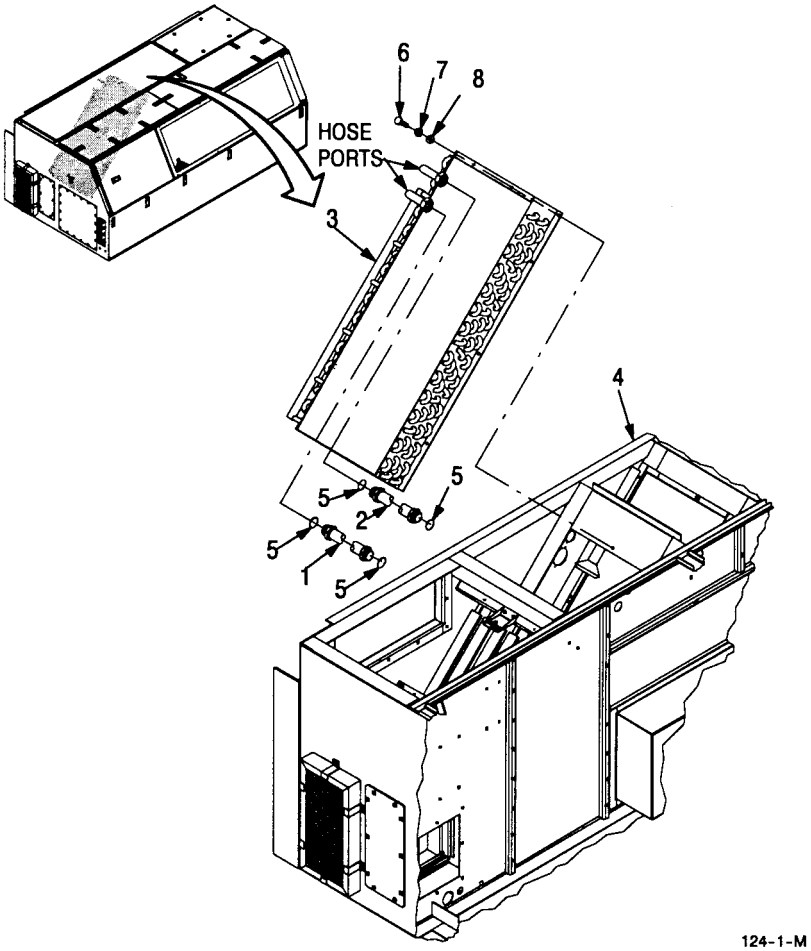


Figure 3-13. Heater Coil Replacement

Follow-on maintenance: Install ECU per para 3.9.21, fill hydraulic reservoir per para 2.14.3, install or close ECU covers and doors per para 2.14.1, remove tag, apply system power and perform operational test. Check for leaks.

3.9.9 Evaporator Coil Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)

Materials/Parts:
Six Lockwashers (Item 18, Appendix E)

Equipment Conditions:
ECV shut off, power shut off.
Power panel and rear control panel tagged.
ECU removed (see para 3.9.21).
ECU covers and doors opened or removed as required (per para 2.14.1).
R22 refrigerant system recovered (see para 3.9.1).
Heater coil removed (see para 3.9.8).
Thermal expansion valve removed (see para 3.9.10)

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

Failure to observe these warnings can result in injury to personnel.

a. Removal (Refer to Figure 3-14)

Remove six screws (1), six lockwashers (2) and six flat washers (3) securing evaporator coil (4) and remove evaporator coil (4) from inside ECU enclosure (5). Discard six lockwashers (2).

b. Installation (Refer to Figure 3-14)

Position evaporator coil (4) inside ECU enclosure (5) and secure with six screws (1), six new lockwashers (2) and six flat washers (3).

3.9.9 Evaporator Coil Replacement – Continued.

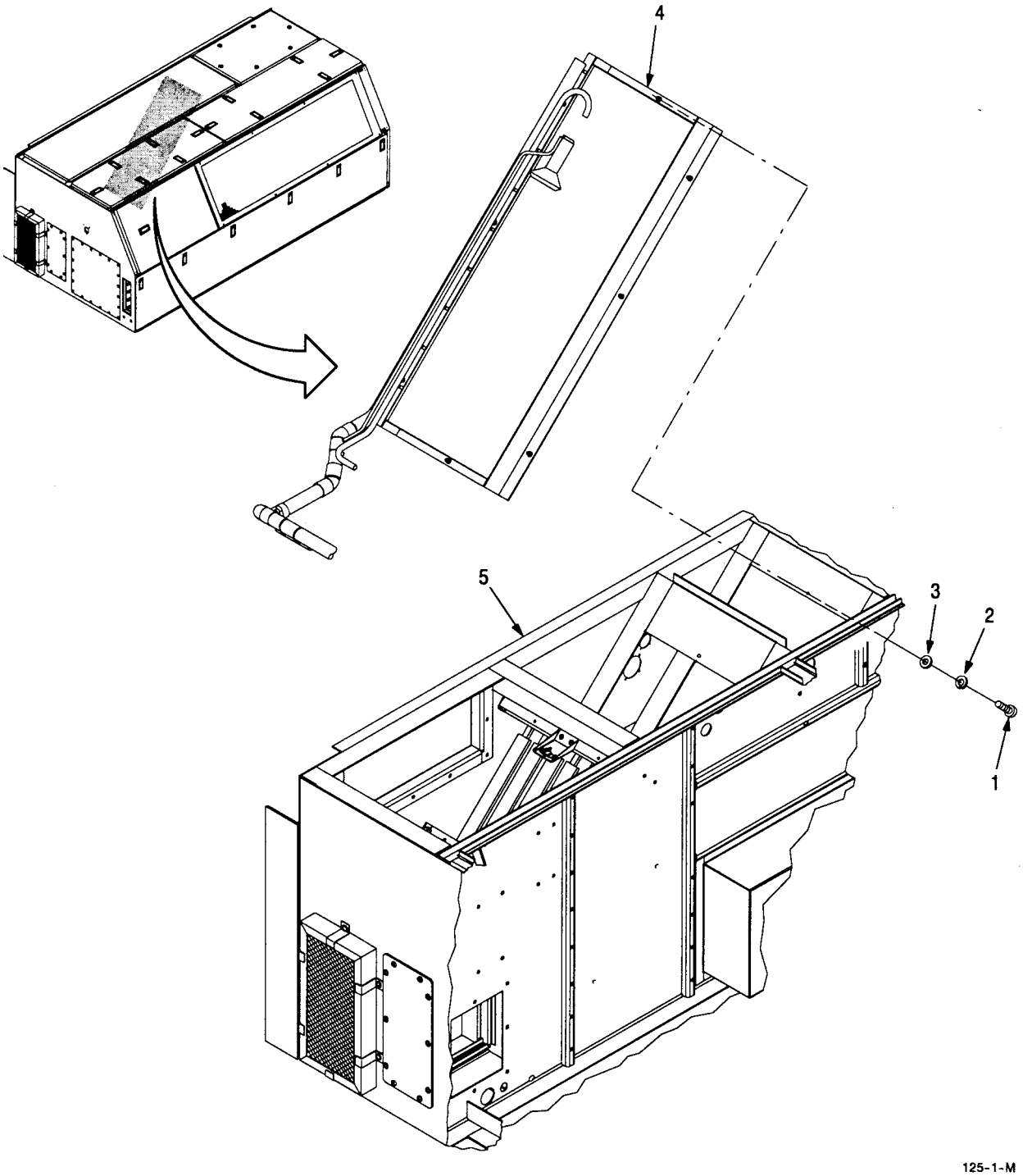


Figure 3-14. Evaporator Coil Replacement

Follow-on maintenance: Install ECU per para 3.9.21, replace filter/drier per para 3.9.13, install heater coil per para 3.9.8, install thermal expansion valve per para 3.9.10, install or close ECU covers and doors per para 2.14.1, charge R22 refrigerant system per para 3.9.1, apply system power, perform operational test and check for leaks.

3.9.10 Thermal Expansion Valve Replacement.

This task covers:
a. Removal
b. Installation
c. Adjustment

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Torque Wrench (Item 66, Appendix B)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU covers and doors opened or removed as required (see para 2.14.1).
R22 refrigerant system recovered (see para 3.9.1).
ECU work platform installed (reference TM 10-5410-228-10).

Materials/Parts:
Lubricating Oil (Item 32, Appendix C)
Nitrogen (Item 34, Appendix C)
Insulation (Item 31, Appendix C)
Insulation Tape (Item 55, Appendix C)
Heat Sink Compound (Item 29, Appendix C)
Sealant (Item 47, Appendix C)

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Insulation Adhesive (Item 3, Appendix C)
Three Lockwashers (Item 18, Appendix E)
Grommet (Item 5, Appendix E)

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

CAUTION

Cover or plug all openings immediately after removal of compressor to prevent contamination. Remove all covers/plugs prior to reconnecting.

Flow nitrogen through tube assemblies when brazing or unbrazing to prevent heat damage to components.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

Whenever any refrigerant component is replaced, the system must be recovered, evacuated and a new filter/drier installed (per para 3.9.13).

3.9.10 Thermal Expansion Valve Replacement – Continued.

a. Removal (Refer to Figure 3-15)

CAUTION

The capillary tube and sensor bulb are fragile. Make sure the capillary tube and sensor bulb are not damaged or detached from power assembly while removing/installing the thermal expansion valve or other components.

(1) Remove tape and insulation from tubing as required.

(2) Remove two screws (1) securing valve body (2) to power assembly (3).

NOTE

Do not remove clamp.

(3) Loosen two clamps (4) securing sensor bulb (5) to tube assembly (6).

(4) Remove power assembly (3) with sensor bulb (5), capillary tube (7) and cage assembly (8) from valve body (2) and ECU.

(5) Remove grommet (9) from slot in frame of ECU.

(6) Remove cage assembly (8) from power assembly (3).

(7) Remove nut (10), lockwasher (11), two flat washers (12), screw (13) and clamp (14) securing valve body (2) to mount (15). Discard lockwasher (11).

(8) Remove two nuts (16), two lockwashers (17), four flat washers (18) and two screws (19) securing mount (15) to ECU. Discard two lockwashers (17).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(9) Remove valve body (2) from two tube assemblies (20 and 21) and evaporator coil distributor (22).

b. Installation (Refer to Figure 3-15)

(1) Install valve body (2) on evaporator coil distributor (22) and two tube assemblies (21 and 20).

(2) Install two screws (19), four flat washers (18), two new lockwashers (17) (Item 18, Appx E) and two nuts (16) to secure mount (15) to ECU.

(3) Install screw (13), two flat washers (12), clamp (14), new lockwasher (11) (Item 18, Appx E) and nut (10) to secure valve body (2) to mount (15).

(4) Position sensor bulb (5) on tube assembly (6) in a 4 or 8 o'clock position relative to tube assembly (6).

(5) Apply heat sink compound to contact area between sensor bulb (5) and tube assembly (6).

(6) Tighten two clamps (4) to secure sensor bulb (5) to tube assembly (6).

(7) Install grommet (9) (Item 5, Appx E) in slot on frame at ECU.

(8) Route capillary tube (7) through grommet (9).

(9) Apply oil to seals on cage assembly (8).

(10) Install cage assembly (8) in power assembly (3). Make sure lugs of cage assembly (8) align with slots in power assembly (3).

(11) Install power assembly (3) in valve body (2).

(12) Install two screws (1) securing power assembly (3) to valve body (2). Torque screws (1) 290 to 310 in.-lb

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(13) Apply sealant to area of capillary tube (7) and grommet (9).

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

(14) Install insulation on tubing as required. Secure with insulation adhesive.

(15) Tape insulation approximately every three inches and at end of tubing runs with insulation tape.

c. Adjustment (Refer to Figure 3-15)

(1) Remove cap (23) from power assembly (3).

(2) Turn adjusting stem (24) clockwise to increase superheat, or counterclockwise to decrease superheat (approximately 1/2°F per turn).

NOTE

Allow adequate time between adjustments for system to stabilize before checking superheat.

(3) When desired superheat setting is achieved, install cap (23) on power assembly (3).

3.9.10 Thermal Expansion Valve Replacement – Continued.

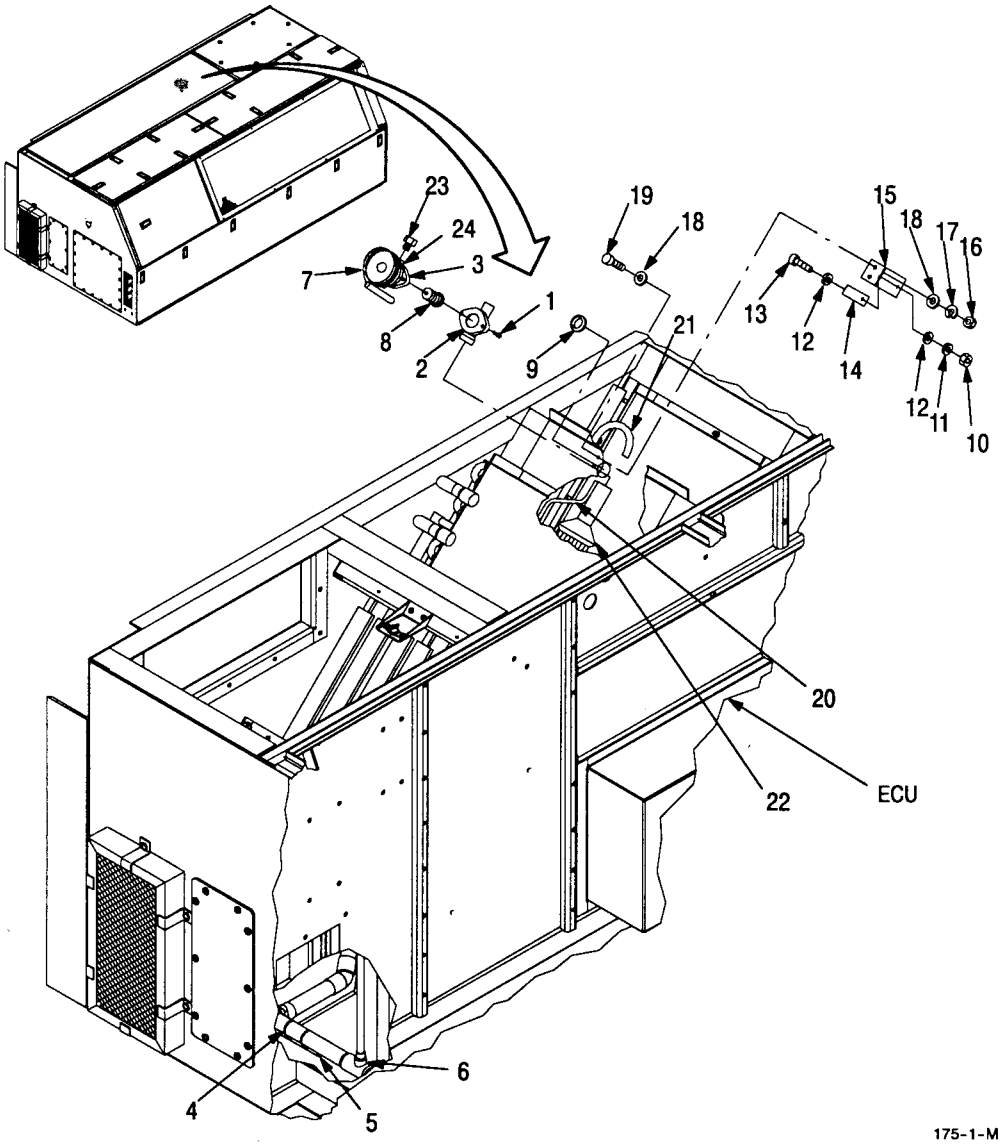


Figure 3-15. Thermal Expansion Valve Replacement

Follow-on maintenance: Service R22 refrigerant system and check for leaks per para 3.9.1, install or close ECU covers and doors per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

3.9.11 Hydraulic Tubing/Hoses Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
11/16 Inch Crowfoot Wrench (Item 53, Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)
1-1/8 Inch Crowfoot Wrench (Item 57, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
1-7/8 Inch Crowfoot Wrench (Item 63, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
Drain Pan (Item 28, Appendix B)
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
Sealant (Item 47, Appendix C)
Locknut (Item 8, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU covers and doors opened or removed (see para 2.14.1).
Hydraulic system drained (see para 2.14.3).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Twenty Lockwashers (Item 17, Appendix E)
Three Lockwashers (Item 18, Appendix E)
Twenty-five Tie-down Straps (Item 86, Appendix E)
O-ring (Item 67, Appendix E)

NOTE

Hydraulic tubes are secured using straight thread connectors. Main hydraulic hoses are identified by their large size and the fact that they have shut off valves in their lines.

Many tubes and hose connections used on the CBPS system contain an O-ring to prevent unwanted escape and loss of hydraulic fluid. O-rings, identified in Appendix E, are mandatory replacement parts.

Tubes or hoses may have to be loosened or removed completely when performing maintenance in the ECU.

A small amount of hydraulic fluid will be released when removing a tube or hose. Drain excess fluid from hose or tube into cup or container. Clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.9.11.1 Hydraulic Tubes.

a. Removal (Refer to Figure 3-16)

(1) Remove nut (1), lockwasher (2), flat washer (3) and screw (4) securing loop clamp (5). Remove loop clamp (5) from hydraulic tube. Discard lockwasher (2).

(2) Disconnect tube from fitting or elbow. Remove and discard O-ring.

NOTE

Remove fittings from hydraulic pump/motor before removing hydraulic pump/motor. Otherwise a vise will be required to hold hydraulic pump/motor in order to loosen fittings.

(3) Remove fitting, plug or elbow from component. Remove and discard O-ring.

(4) Plug port of component and open end of tube or hose to keep hydraulic system free of contaminants.

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

(5) Remove three screws (6), three flat washers (7), three lockwashers (8) and three nuts (9) securing bracket (10) to ECU. Discard three lockwashers (8).

(6) Remove brackets (11 and 12).

b. Installation (Refer to Figure 3-16)

CAUTION

Ensure that O-ring is seated and retained properly. During installation, fitting threads can damage O-ring causing leaks to occur.

(1) Secure bracket (10) to ECU with three screws (6), three flat washers (7), three new lockwashers (8) and three nuts (9).

(2) Check fitting and hose assembly sealing surface and groove for damage or material build up.

(3) Install new O-ring on fitting, plug or elbow. Ensure that O-ring is seated and retained properly.

(4) Lubricate O-ring with light coating of hydraulic fluid.

(5) Install fitting or plug on component, finger tight. Tighten plug to the appropriate torque. Refer to the following table for appropriate plug torque.

SAE Straight Thread O-ring Plugs (Steel)			
		Hollow Hex Head Plug (HP50N) Assembly Torque	
Fitting Size	SAE Port Thread Size	in.-lb	ft-lb
2	5/16 - 24	35 ± 5	3 ± 0.5
4	7/16 - 20	135 ± 10	11 ± 1
6	9/16 - 18	220 ± 10	18 ± 1
8	3/4 - 16	550 ± 20	46 ± 2

(6) Install new O-ring on hose assembly. Ensure that O-ring is seated and retained properly.

(7) Lubricate O-ring with light coating of hydraulic fluid.

(8) Install hose assembly on fitting, finger tight.

(9) Tighten nut on hose assembly to the appropriate torque.

(10) Adjust fitting, as required, to meet hose assembly. Tighten fitting to the appropriate torque.

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(11) Apply sealer to all bulkhead fittings prior to installation.

(12) Install straight thread fitting on component port until finger tight. Tighten to the appropriate torque. Refer to the following table for appropriate torque.

Seal-Lok Straight and Adjustable Fitting - Port End (Steel)			
Fitting Size	SAE Port Thread Size	Assembly Torque(2)	
		in.-lb	ft-lb
4	7/16 - 20	190 ± 10(1)	16 ± 1.0
6	9/16 - 18	420 ± 15	35 ± 1.0
8	3/4 - 16	720 ± 25	60 ± 2.0
10	7/8 - 14	1,260 ± 50	105 ± 5.0
12	1 1/16 - 12	1,680 ± 75	140 ± 6.0
16	1 5/16 - 12	2,520 ± 100	210 ± 8.0
20	1 5/8 - 12	3,100 ± 150	260 ± 12.0
24	1 7/8 -12	3,800 ± 150	315 ± 12.0
(1) For steel fittings. (2) Values in charts are for assemblies with O-ring lubricated.			

NOTE

When installing 90 degree adjustable fittings, assemble mating tube before torqueing. This will ensure proper face alignment.

(13) Install pipe thread port fitting on component port until finger tight. Turn fitting with wrench to the appropriate TFFT shown in the following table, taking into consideration the final position of the tube end to accept incoming tube or hose.

Pipe Thread Size	
NPTF	TFFT
0.125 – 27	2 – 3
0.250 – 18	2 – 3
0.375 – 18	2 – 3
0.500 – 14	2 – 3
0.750 – 14	2 – 3
1.000 – 11.5	1.5 – 2.5
1.250 – 11.5	1.5 – 2.5
1.500 – 11.5	1.5 – 2.5
2.000 – 11.5	1.5 – 2.5

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

(14) Secure tube to fitting by tightening by hand and then turning one flat using a torque wrench. Refer to the following table for appropriate torque.

Assembling Tube to Fitting			
SAE Dash Size	Tube Side Thread Size	Tube Side Assembly Torque	
		in.-lb	ft-lb
-4	0.563 – 18	220 ± 10	18 ± 1
-6	0.688 – 16	320 ± 25	27 ± 2
-8	0.813 – 16	480 ± 25	40 ± 2
-10	1.000 – 14	750 ± 35	63 ± 3
-12	1.188 – 12	1,080 ± 45	90 ± 4
-16	1.438 – 12	1,440 ± 90	120 ± 8
-20	1.688 – 12	1,680 ± 90	140 ± 8
-24	2.000 – 12	1,980 ± 100	165 ± 8

(15) Place brackets (11 and 12) in ECU.

(16) Install loop clamp (5) on hydraulic tube. Secure loop clamp (5) with nut (1), new lockwasher (2), flat washer (3) and screw (4).

(17) Add hydraulic fluid per para 2.14.3.

(18) Run system for five minutes and check for leaks. Tighten fittings as necessary.

3.9.11.2 Main Hydraulic Hoses.

a. Removal (Refer to Figure 3-16)

CAUTION

Opening a main hydraulic line before shutting off valve or draining hydraulic fluid from reservoir will cause hydraulic fluid to drain from the system.

(1) Verify that shut off valve is OFF (valve handle 90° to hose).

NOTE

If main hydraulic hose located after shut off valve is to be removed, the system need not be drained; proceed to step 4.

(2) Drain hydraulic system per para 2.14.3.

(3) Remove tie-down straps as required.

(4) Remove loop clamps and attaching hardware as required. Discard lockwashers.

(5) Remove bolts and lockwashers securing clamp halves to component. Discard lockwashers.

(6) Remove hose with flange. Remove and discard O-ring from flange.

b. Installation (Refer to Figure 3-16)

CAUTION

Ensure that O-ring is seated and retained properly. During installation, fitting threads can damage O-ring causing leaks to occur.

(1) For split flanged assemblies, install new O-ring on flange and position flange and clamp halves on component.

(2) Lubricate O-ring with light coating of hydraulic fluid.

(3) Install new lockwashers on bolts and bolt through clamp halves.

(4) Hand tighten bolts. Torque bolts in diagonal sequence in small increments to the appropriate torque listed in the following table.

4-Bolt Split Flange Code 61 Flange Adapter Recommended Bolt Torque				
Dash Size	Flange Size	Bolt Size	Torque	
			in.-lb	ft-lb
12	3/4	3/8 – 16	300 ± 50	25 ± 4.5
16	1	3/8 – 16	375 ± 50	31 ± 4.5
20	1 1/4	7/16 – 14	488 ± 62	41 ± 5
24	1 1/2	1/2 – 13	625 ± 75	52 ± 6
32	2	1/2 – 13	725 ± 75	60 ± 6

(5) Secure hose by tightening by hand and then turning one flat using a wrench.

(6) Install tie-down straps as required.

(7) Install loop clamps with attaching hardware as required.

(8) Add hydraulic fluid per para 2.14.3.

(9) Run system for five minutes and check for leaks. Tighten fittings as necessary.

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

NOTE
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ON FOLLOWING SHEETS

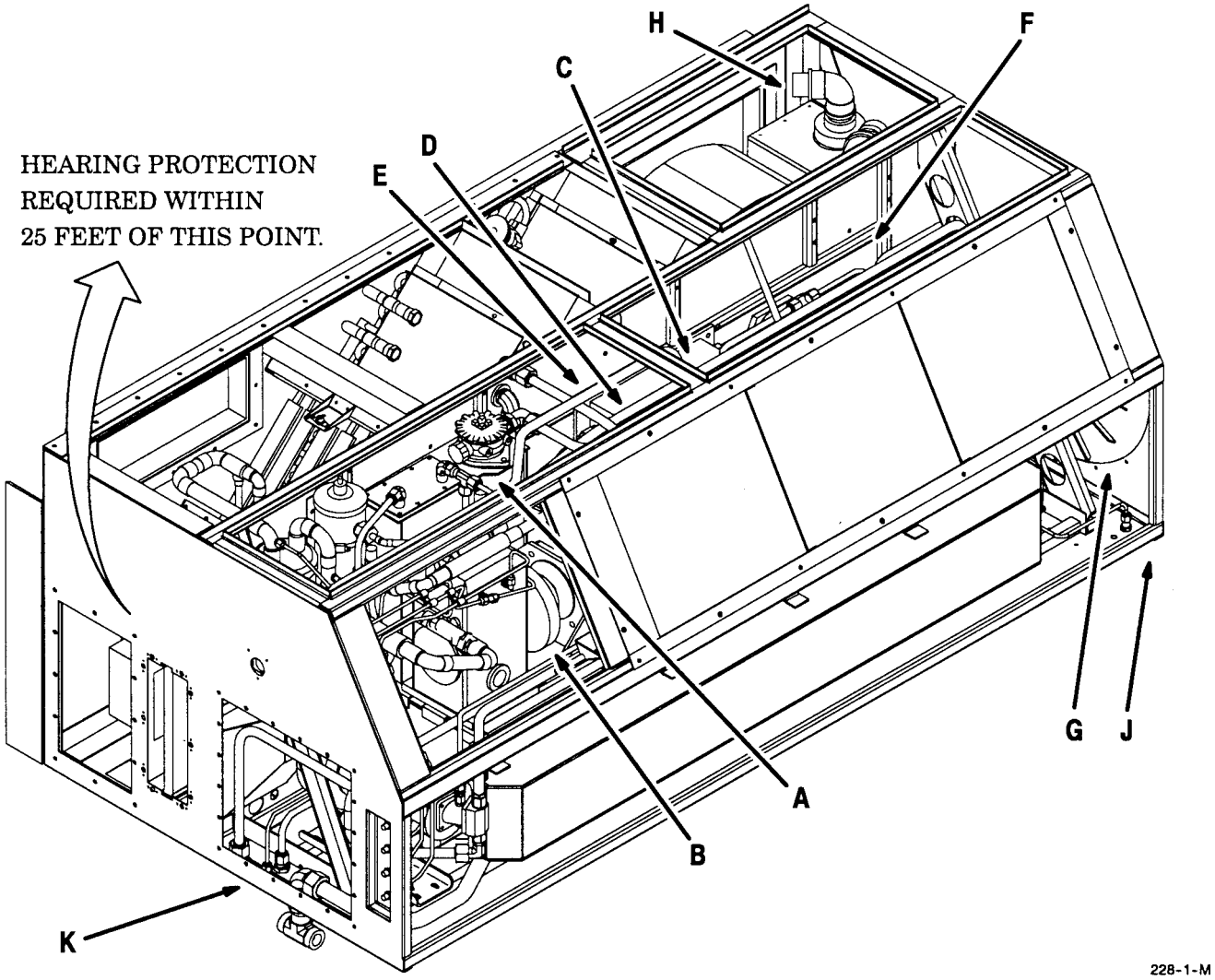

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 1 of 11)

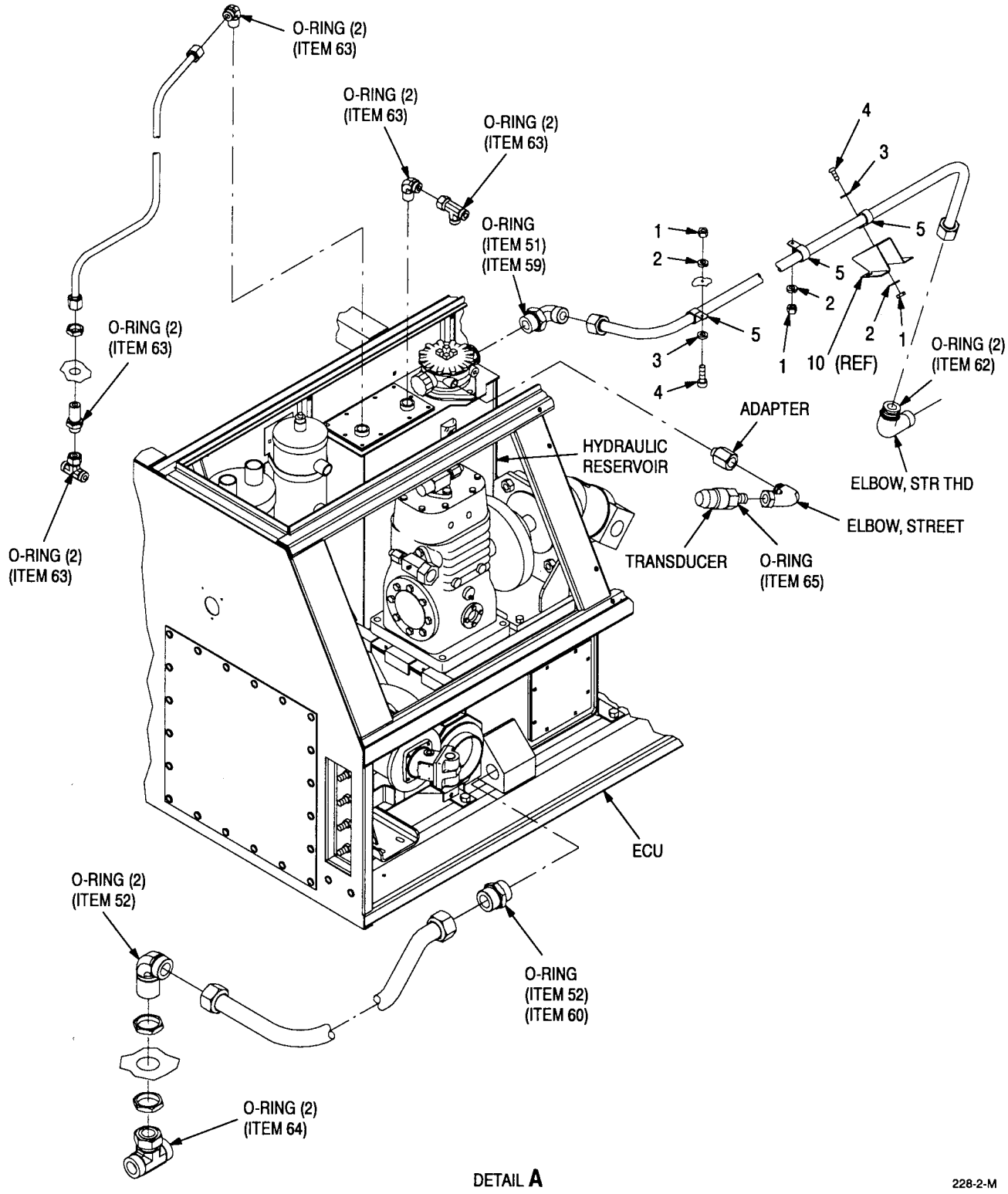

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 2 of 11)

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

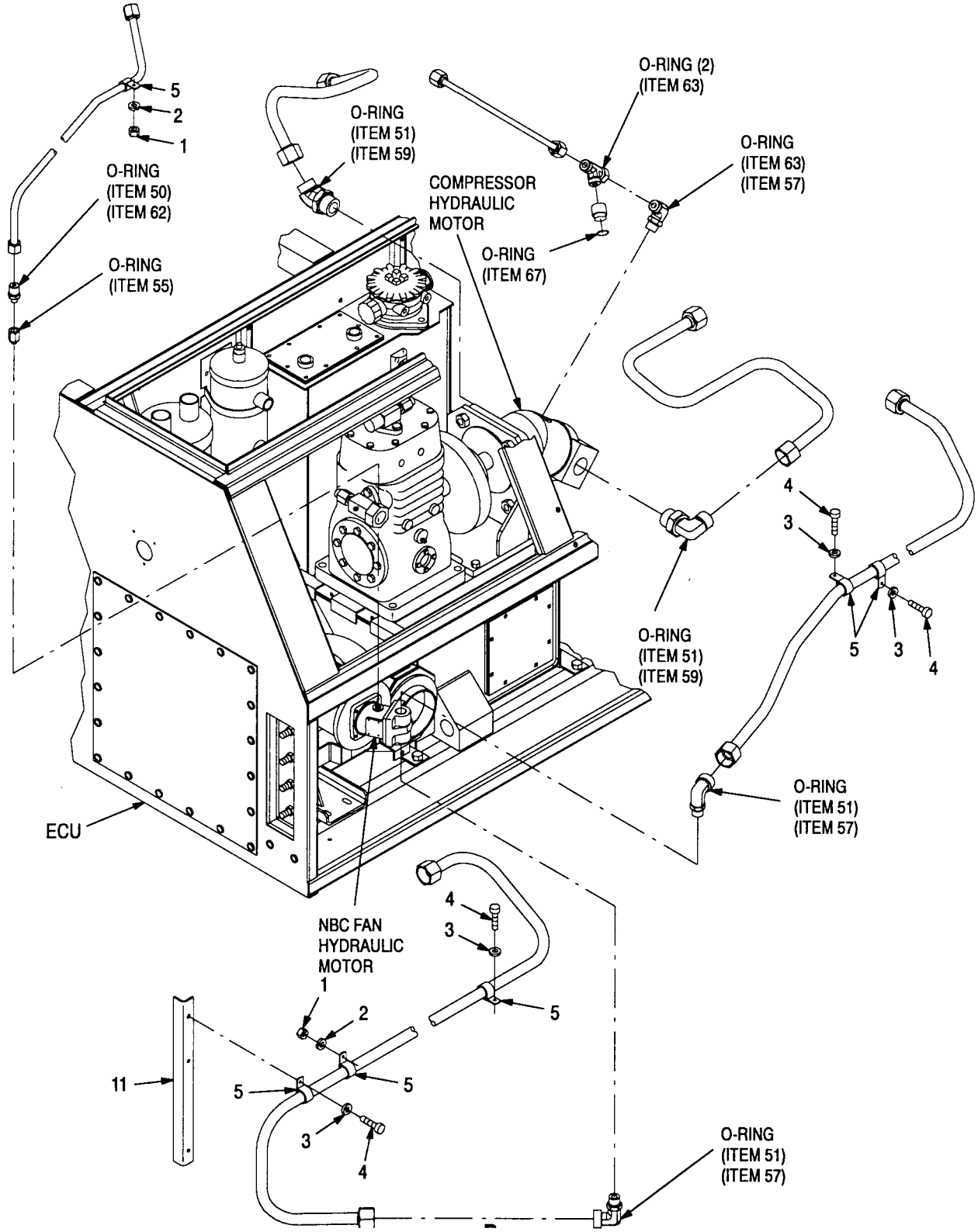

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 3 of 11)

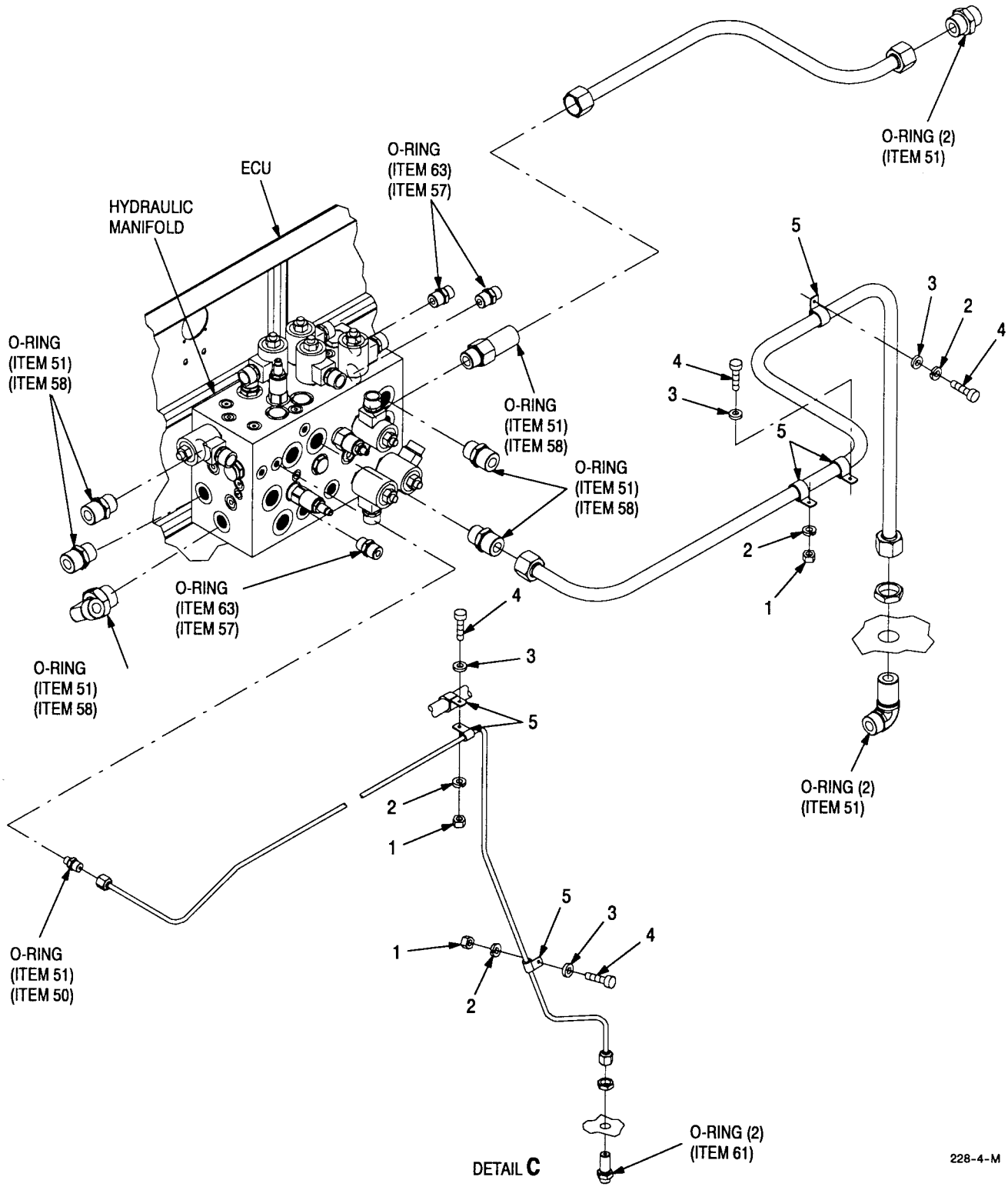

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 4 of 11)

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

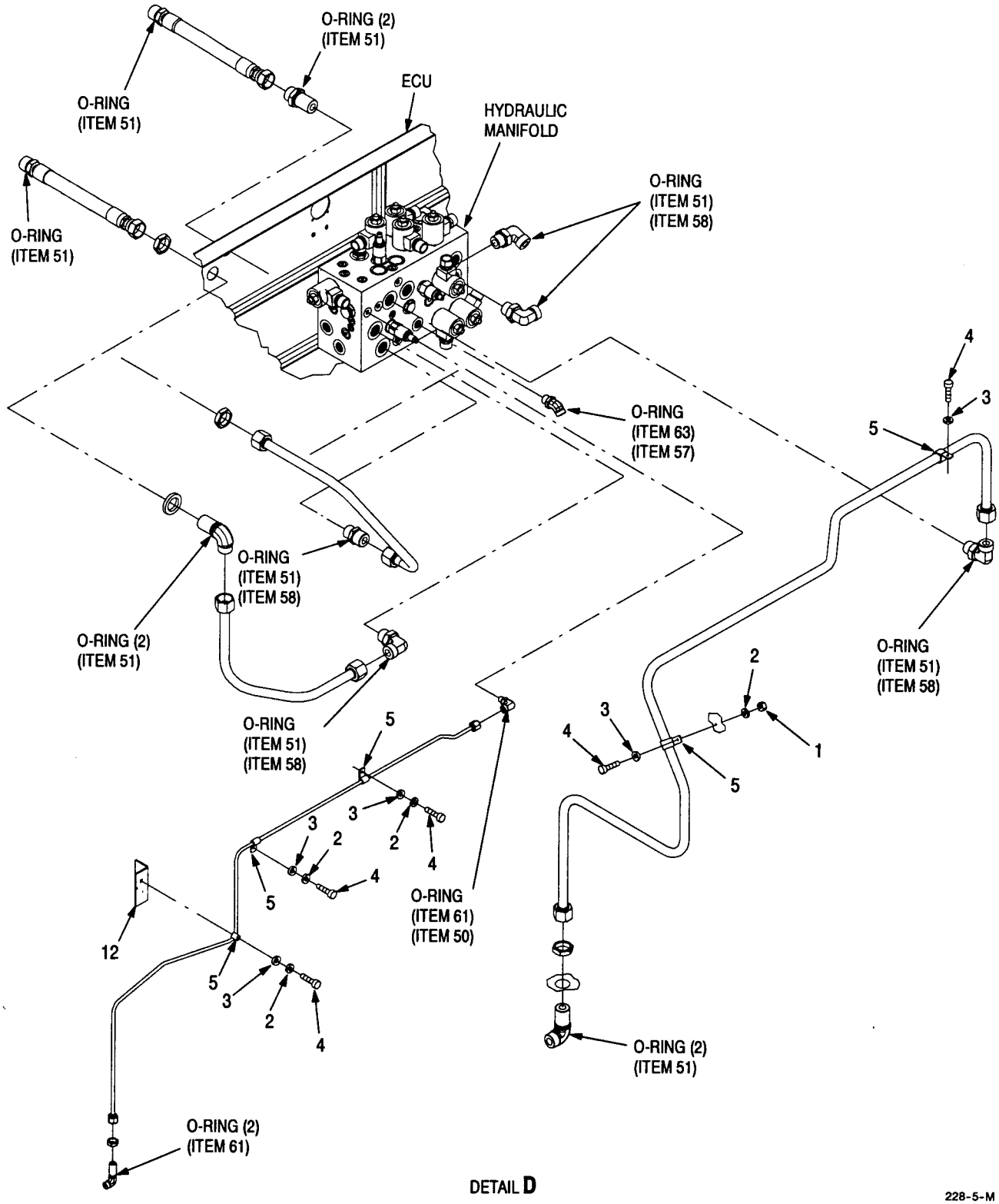

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 5 of 11)

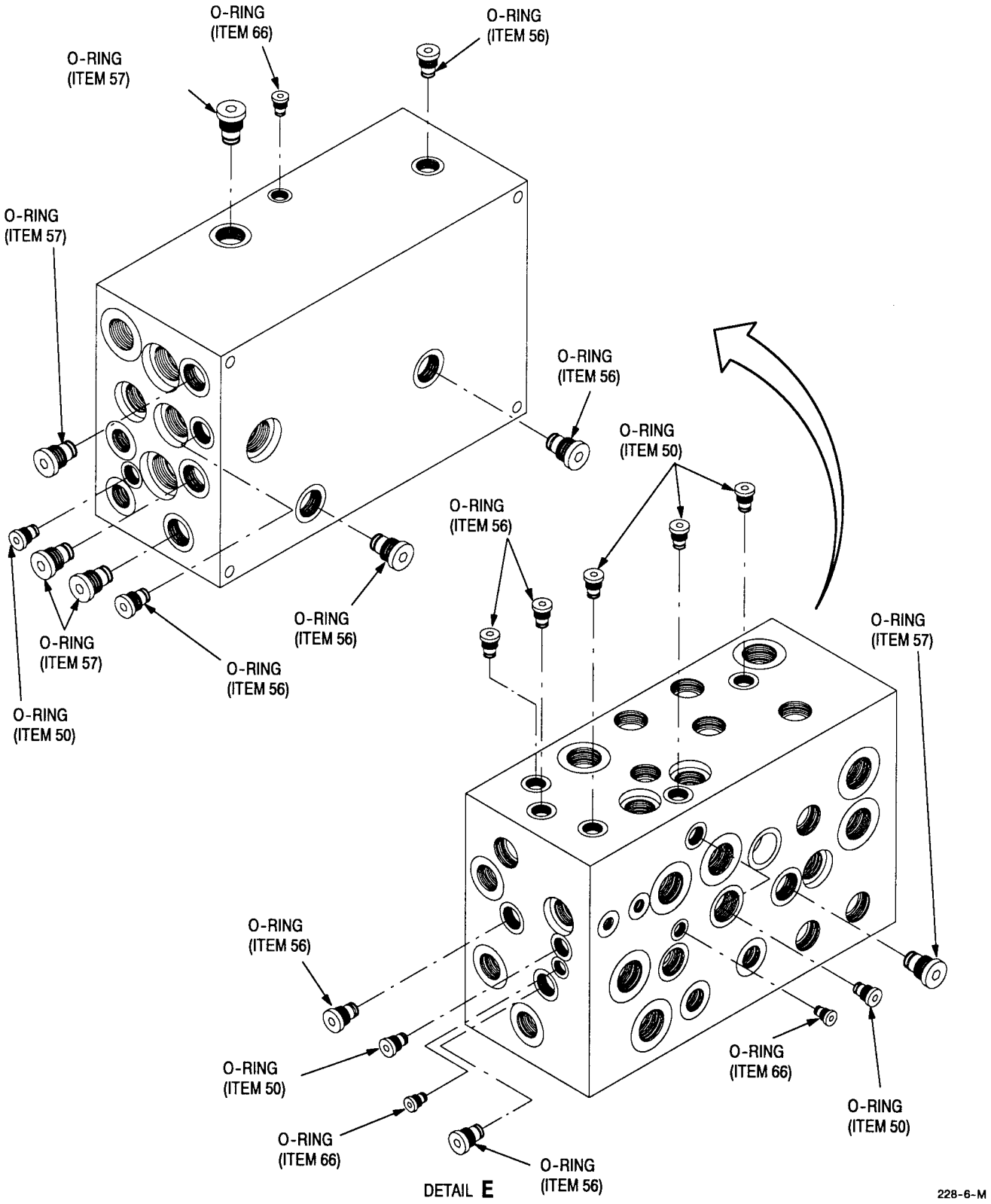

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 6 of 11)

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

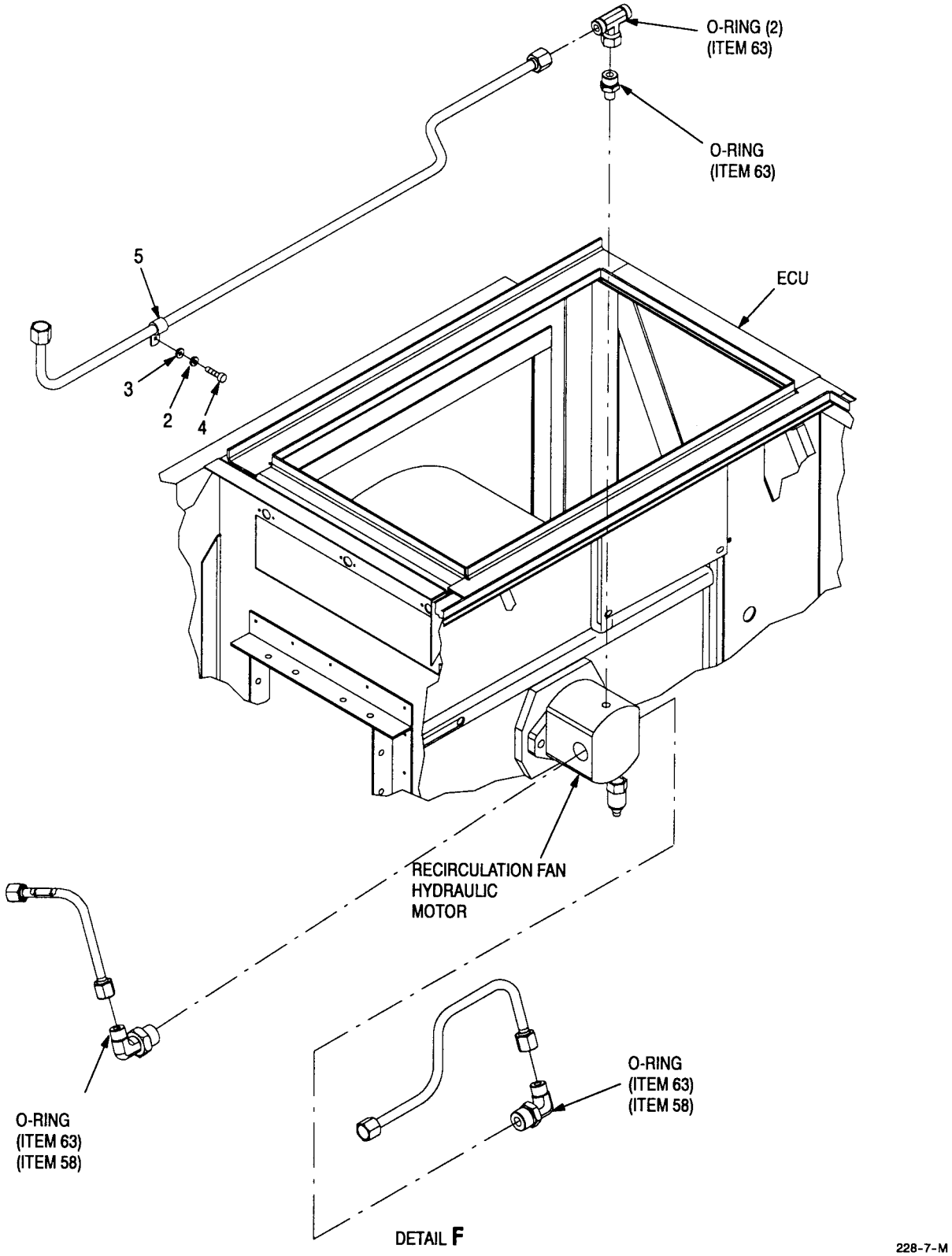

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 7 of 11)

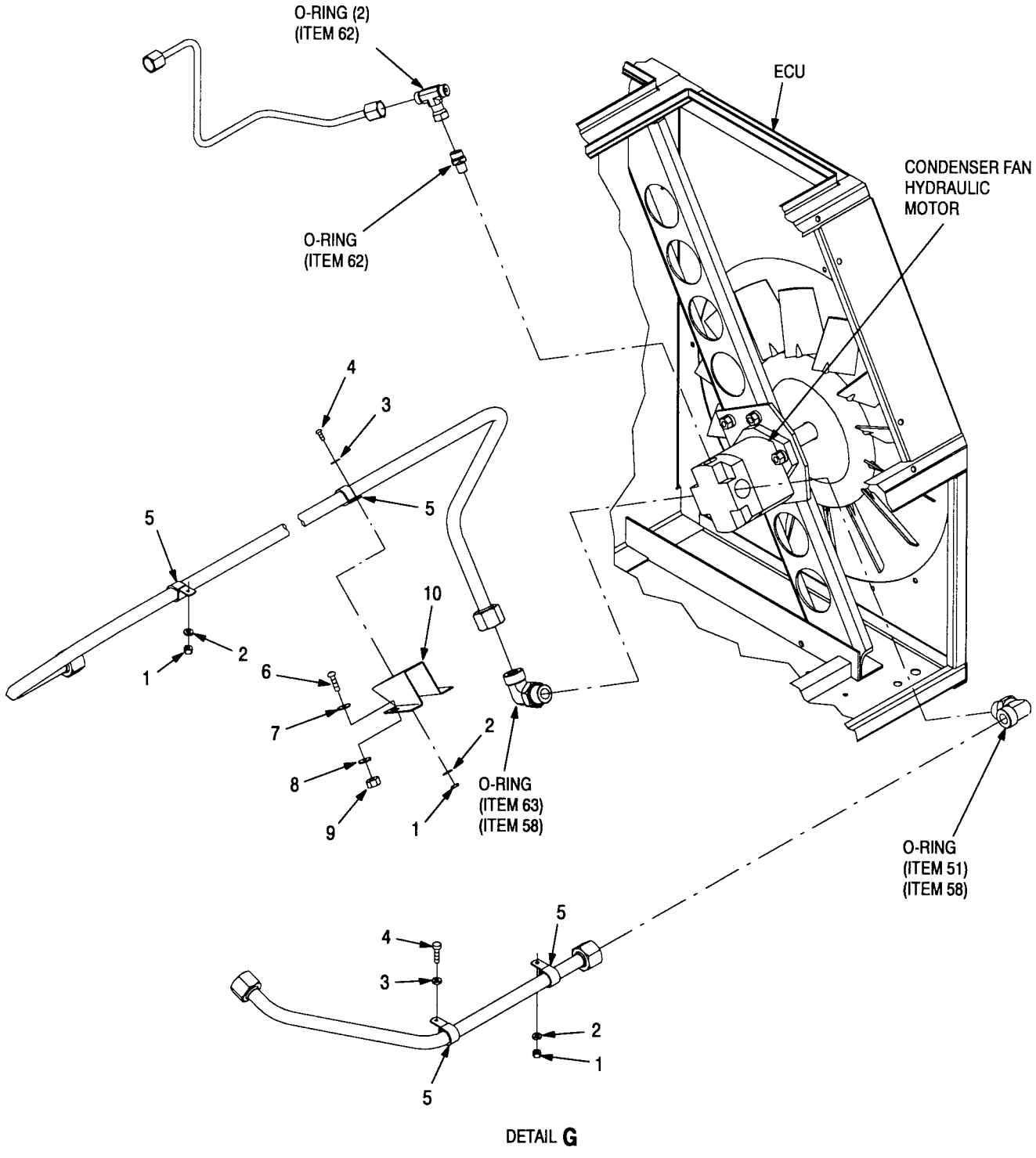

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 8 of 11)

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

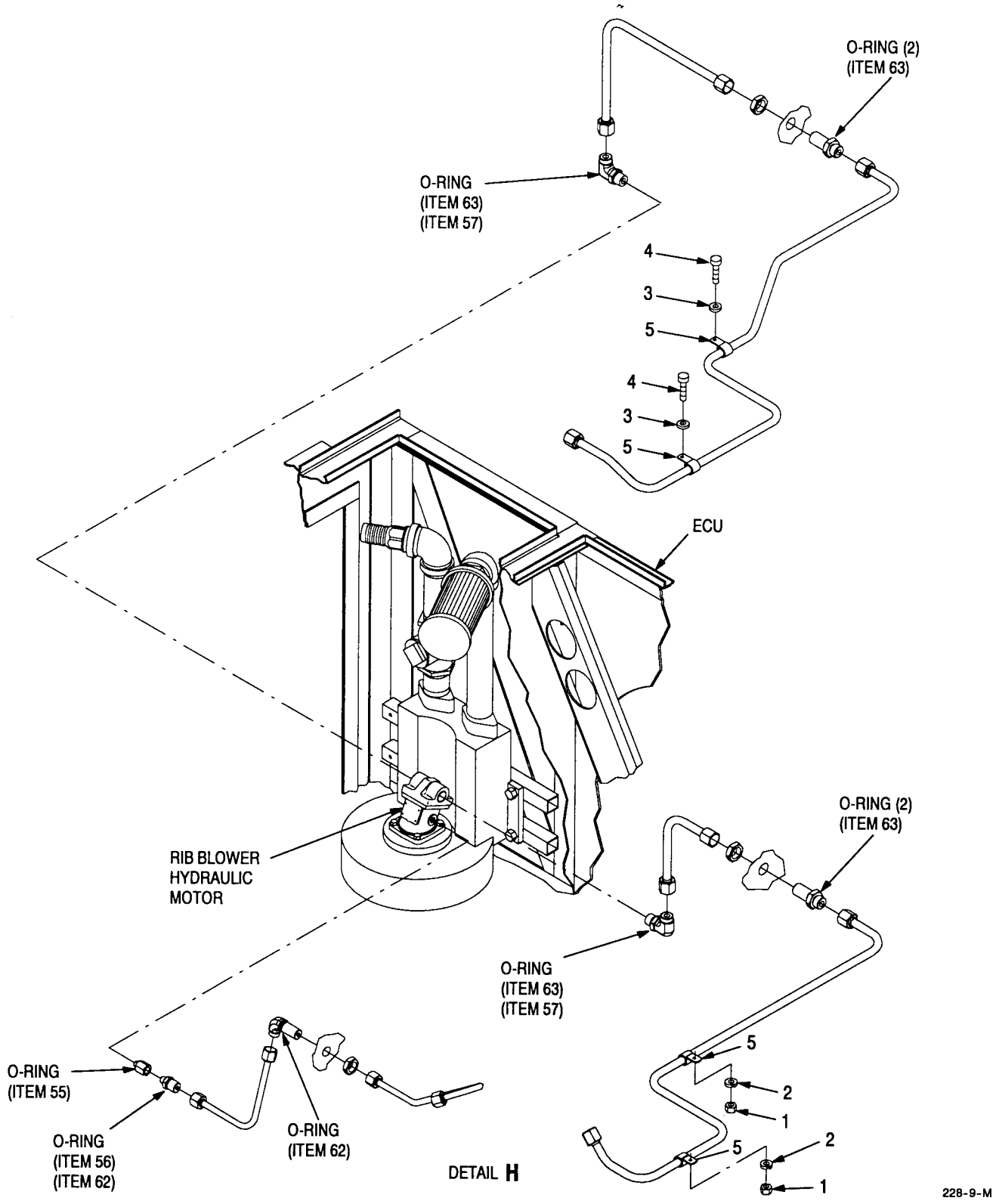

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 9 of 11)

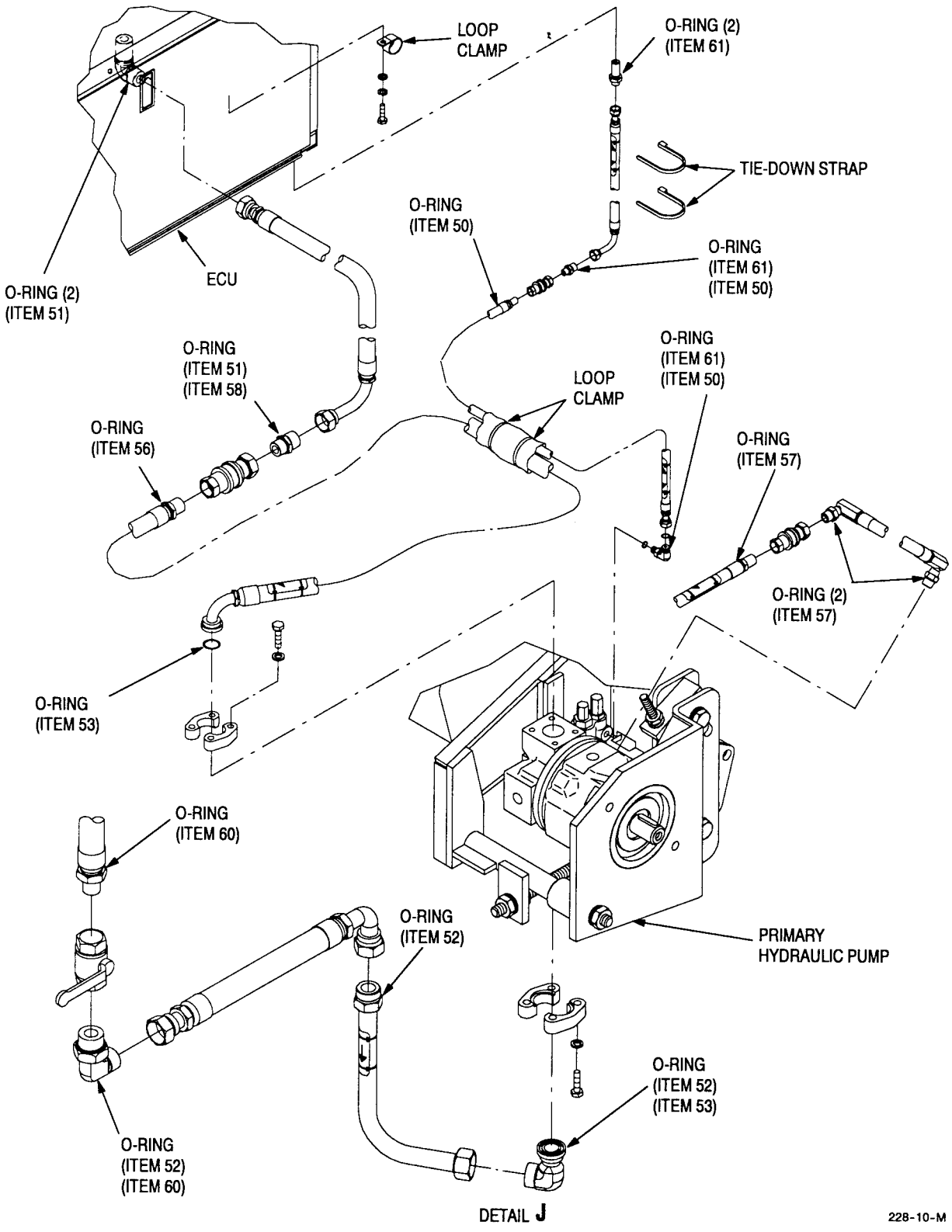

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 10 of 11)

3.9.11 Hydraulic Tubing/Hoses Replacement – Continued.

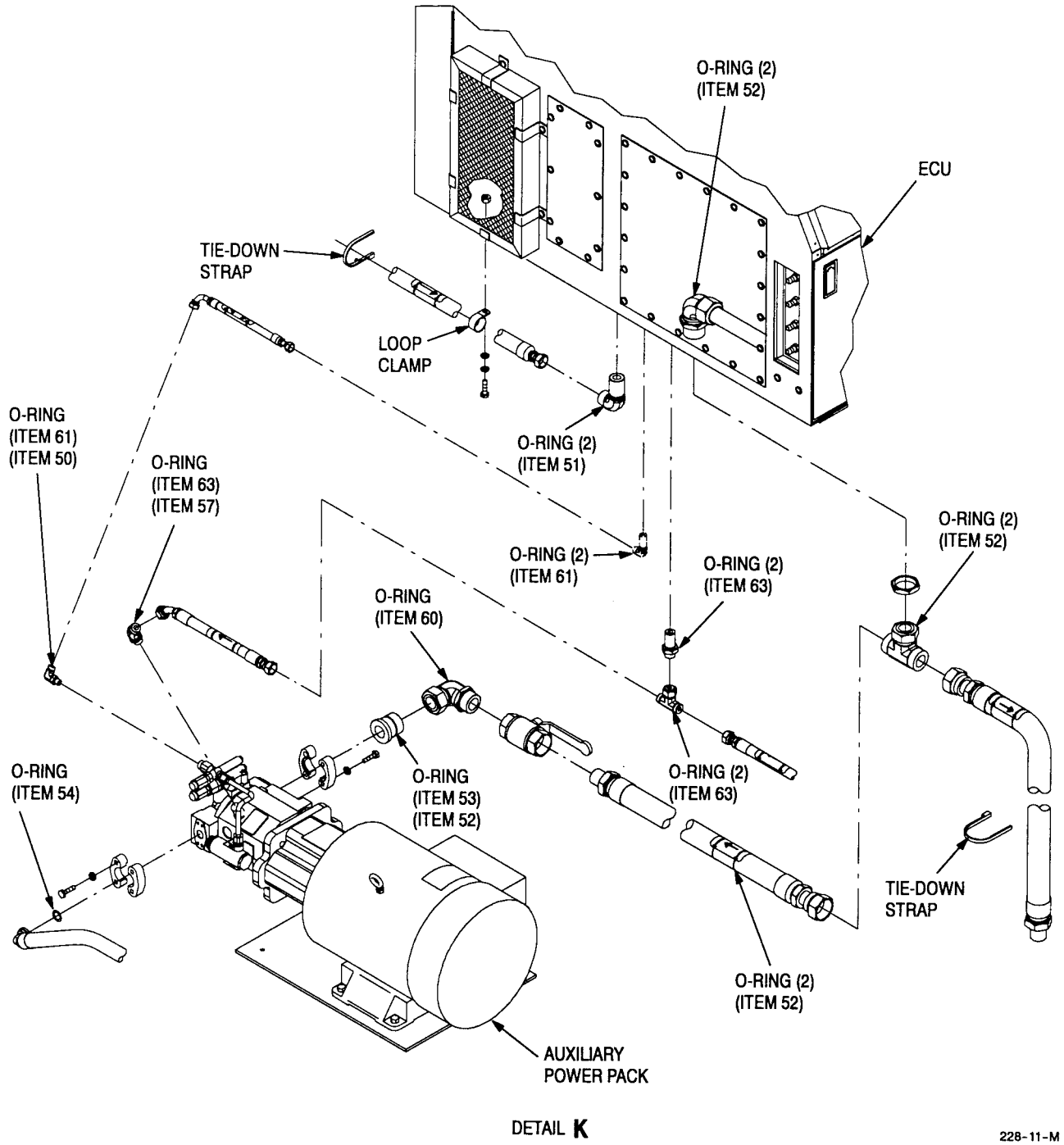

Figure 3-16. Hydraulic Tubing/Hoses Replacement (Sheet 11 of 11)

Follow-on maintenance: Fill hydraulic reservoir per para 3.9.12, install or close ECU covers and doors per para 2.14.1, remove tags, apply system power and check for leaks, remove ECU work platform (reference TM 10-5410-228-10).

3.9.12 R22 Refrigerant Pressure Tubes and Valves Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)

Materials/Parts:
Rubber Gloves (Item 25, Appendix C)
Lubricating Oil (Item 32, Appendix C)
Nitrogen (Item 34, Appendix C)
Insulation Tape (Item 56, Appendix C)
Insulation (Item 31, Appendix C)
Insulation Tape (Item 55, Appendix C)
Sealant (Item 47, Appendix C)
Copper Tubes (Figure D-13, Appendix D)
Lower Expansion Valve Tube (Figure D-16, Appendix D)

Equipment Conditions:
System shut down. Power shut off, power panel and rear control panel tagged.
R22 refrigerant system evacuated (see para 3.9.1).
ECU doors and covers opened or removed as required (see para 2.14.1).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Lower Receiver Tank Tube (Figure D-17, Appendix D)
Copper Tubes (Figure D-18, Appendix D)
Ten Lockwashers (Item 16, Appendix E)
Three Lockwashers (Item 17, Appendix E)
Two Lockwashers (Item 18, Appendix E)

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

R22 refrigerant system must be evacuated prior to replacing pressure lines (see para 3.9.1). Failure to evacuate system may result in injury to personnel.

CAUTION

Cover or plug openings immediately after removing line to prevent contamination. Remove all covers and plugs prior to connecting lines.

3.9.12 R22 Refrigerant Pressure Tubes and Valves Replacement – Continued.

NOTE

This procedure covers the replacement of the following components and valves: Discharge Line Vibration Absorber, Suction Line Solenoid Valve (Refrigeration Valve RSV1), Discharge Check Valve and Bulkhead Access Valves.

All air conditioning pressure lines are replaced basically the same. The procedure provided herein is typical in nature.

Remove and replace tape and insulation as required.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

Flow nitrogen through tube assembly when brazing or unbrazing.

a. Removal (Refer to Figure 3-17)

(1) Remove insulation tape and insulation from tubing as required.

(2) Remove two nuts (1), two lockwashers (2), four flat washers (3), two screws (4) and four loop clamps (5) from four tube assemblies. Discard two lockwashers (2).

(3) Remove nut (6), lockwasher (7), flat washer (8), screw (9) and four loop clamps (10) from four tube assemblies. Discard lockwasher (7).

(4) Remove four nuts (11) securing four bulkhead access valves (12) to ECU.

(5) Disconnect tube assembly (13) from compressor (14).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(6) Remove discharge check valve (15) from tube assembly (13).

(7) Remove discharge line vibration absorber (16) from tube assembly (13).

(8) Disconnect cable assembly 1A4A1W1 connector P2 (17) from actuator RSV1 (18). Remove actuator RSV1 (18) from suction line solenoid valve (19).

(9) Remove two screws (20), two lockwashers (21) and two flat washers (22) securing mount (23) to suction line solenoid valve (19). Discard two lockwashers (21).

(10) Remove two screws (24), two lockwashers (25) and two flat washers (26) securing mount (23) to ECU. Discard two lockwashers (25).

(11) Remove tube assemblies (27, 28 and 29).

(12) Remove four screws (30), four lockwashers (31) and four flat washers (32) securing mounting plate (33) to ECU. Discard four lockwashers (31).

(13) Remove four screws (34), four lockwashers (35) and four flat washers (36) securing mounting plate (37) to ECU. Discard four lockwashers (35).

b. Installation (Refer to Figure 3-17)

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(1) Apply sealant to both sides of mounting plate (37).

(2) Secure mounting plate (37) to ECU with four screws (34), four new lockwashers (35) (Item 16, Appx E) and four flat washers (36).

(3) Apply sealant to both sides of mounting plate (33).

(4) Secure mounting plate (33) to ECU with four screws (30), four new lockwashers (31) (Item 16, Appx E) and four flat washers (32).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(5) Install tube assemblies (27, 28 and 29) using torch brazing or other methods.

(6) Secure mount (23) to ECU with two screws (24), two new lockwashers (25) (Item 18, Appx E) and two flat washers (26).

(7) Install suction line solenoid valve (19) on tube assembly (29).

(8) Secure suction line solenoid valve (19) to mount (23) with two screws (20), two new lockwashers (21) (Item 16, Appx E) and two flat washers (22).

(9) Install actuator RSV1 (18) on suction line solenoid valve (19). Connect cable assembly 1A4A1W1 connector P2 (17) to actuator RSV1 (18).

(10) Install discharge line vibration absorber (16) on tube assembly (13).

(11) Install discharge check valve (15) on tube assembly (13).

(12) Connect tube assembly (13) to compressor (14).

(13) Apply sealer to four bulkhead access valves (12).

(14) Secure four bulkhead access valves (12) to ECU with four nuts (11).

(15) Install nut (6), new lockwasher (7) (Item 17, Appx E), flat washer (8), screw (9) and four loop clamps (10) on four tube assemblies.

(16) Install two nuts (1), two new lockwashers (2) (Item 17, Appx E), four flat washers (3), two screws (4) and four loop clamps (5) on four tube assemblies.

(17) Wrap piping and accumulator with insulation as required. Tape insulation approximately every three inches and at ends of insulation.

3.9.12 R22 Refrigerant Pressure Tubes and Valves Replacement – Continued.

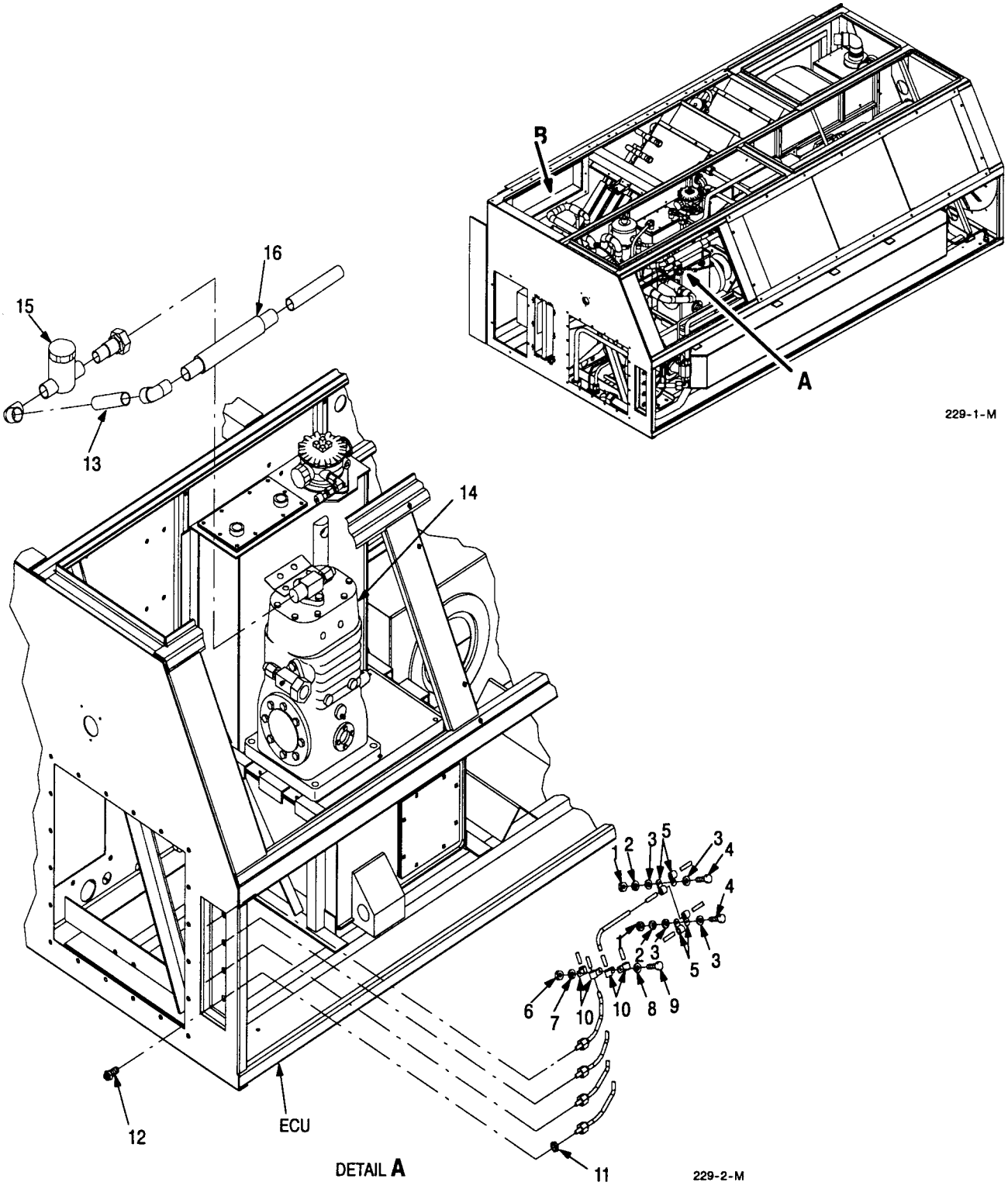

Figure 3-17. R22 Refrigerant Pressure Tubes and Valves Replacement (Sheet 1 of 2)

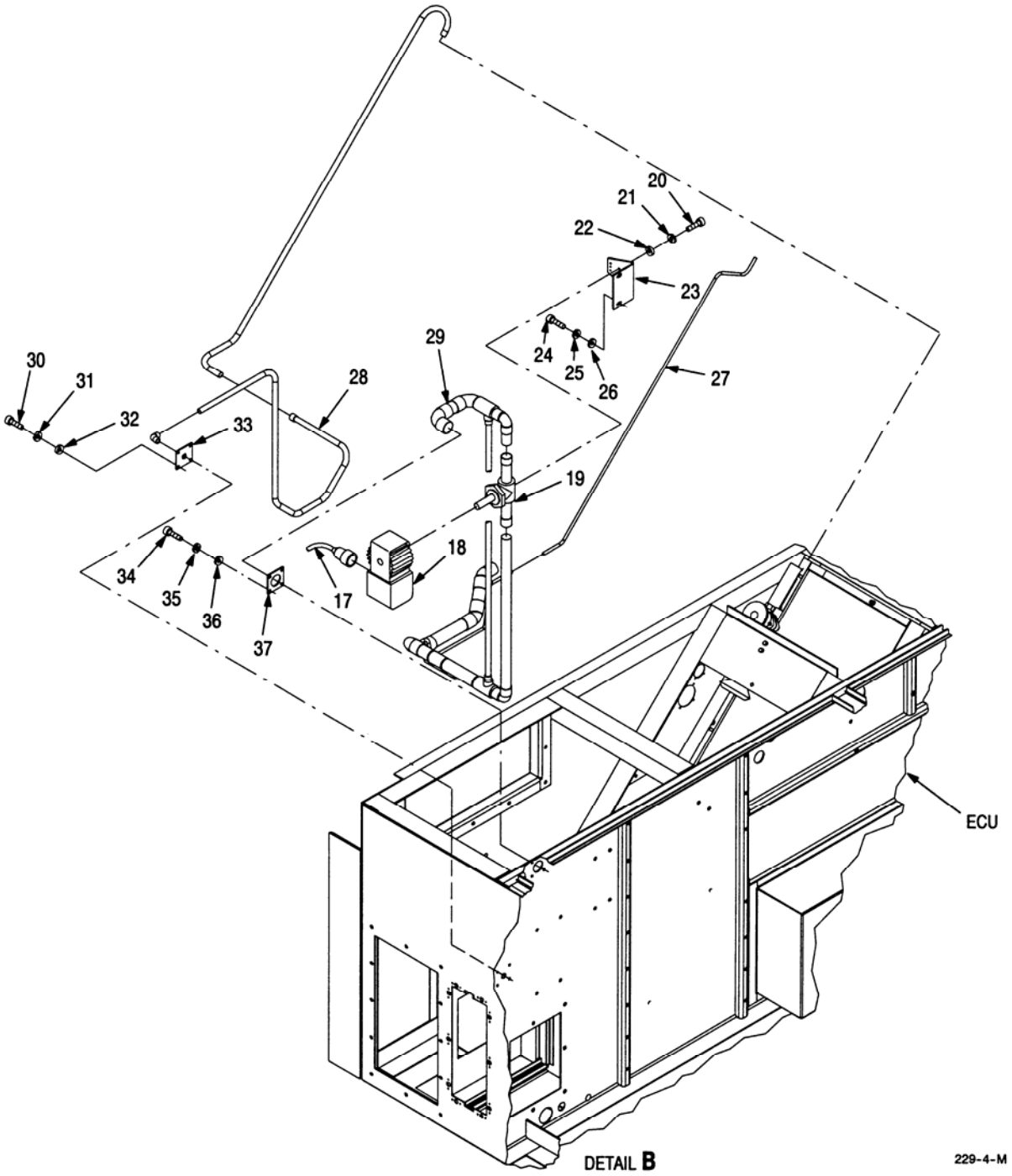

Figure 3-17. R22 Refrigerant Pressure Tubes and Valves Replacement (Sheet 2 of 2)

Follow-on maintenance: Service R22 refrigerant system per para 3.9.1, remove tags, install or close ECU covers and doors per para 2.14.1, apply system power, ECU work platform removed (reference TM 10-5410-228-10), and perform operational test. Check for leaks.

3.9.13 Filter/Drier Components and Valves Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Manifold Gage Set (Item 26, Appendix B)
Vacuum Pump (Item 31, Appendix B)
R22 Refrigerant Recovery and Recycle Unit (Item 33, Appendix B)
R22 Refrigerant Cylinder, Used (Item 32, Appendix B)

Materials/Parts:
Nitrogen (Item 34, Appendix C)
R22 Refrigerant (Item 40, Appendix C)
Insulation Tape (Item 56, Appendix C)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
R22 refrigerant system evacuated (see para 3.9.1).
ECU covers and doors opened or removed as required (see para 2.14.1).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (cont.)
Insulation (Item 31, Appendix C)
Two Lockwashers (Item 16, Appendix E)
Two Lockwashers (Item 17, Appendix E)
Two Lockwashers (Item 18, Appendix E)

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

CAUTION

Cover or plug all openings immediately after removal of filter/drier to prevent contamination. Remove all covers/plugs prior to reconnecting.

Flow nitrogen through tube assemblies when brazing or unbrazing to prevent damage to components.

NOTE

This procedure covers the replacement of the following components and valves: filter/drier and tube assembly (refrigerant valve RSV3).

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-18)

(1) Disconnect cable assembly 1A4A1W3 connector P17 (1) from actuator RSV3 (2) on top of tube assembly (3).

(2) Remove actuator RSV3 (2) from tube assembly (3).

(3) Loosen screw (4) on hose clamp (5) and remove hose clamp (5) securing filter/drier (6) to drier bracket (7).

(4) Using two wrenches, disconnect filter/drier (6) from tube assembly (3).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(5) Remove two screws (8), two lockwashers (9) and two flat washers (10) securing tube assembly (3) to valve support bracket (11). Discard two lockwashers (9).

(6) Remove two nuts (12), two lockwashers (13), four flat washers (14) and two screws (15) securing valve support bracket (11) to inside passenger side of ECU (16). Discard two lockwashers (13).

(7) Remove two nuts (17), two lockwashers (18), four flat washers (19) and two screws (20) securing drier bracket (7) to inside structure of ECU (16). Discard two lockwashers (18).

b. Installation (Refer to Figure 3-18)

(1) Secure drier bracket (7) to inside structure of ECU (16) with two screws (20), four flat washers (19), two new lockwashers (18) (Item 18, Appx E) and two nuts (17).

(2) Secure valve support bracket (11) to inside passenger side of ECU (16). Secure two screws (15), four flat washers (14), two new lockwashers (13) (Item 17, Appx E) and two nuts (12).

(3) Secure tube assembly (3) to valve support bracket (11) with two screws (8), two new lockwashers (9) (Item 16, Appx E) and two flat washers (10).

(4) Using two wrenches, connect filter/drier (5) to tube assembly (3).

(5) Secure filter/drier (6) to drier bracket (7) with hose clamp (5) and tighten screw (4) on hose clamp (5).

(6) Install actuator RSV3 (2) onto liquid line solenoid valve (3).

(7) Connect cable assembly 1A4A1W3 connector P17 (1) to actuator RSV3 (2) on top of tube assembly (3).

3.9.13 Filter/Drier Components and Valves Replacement – Continued.

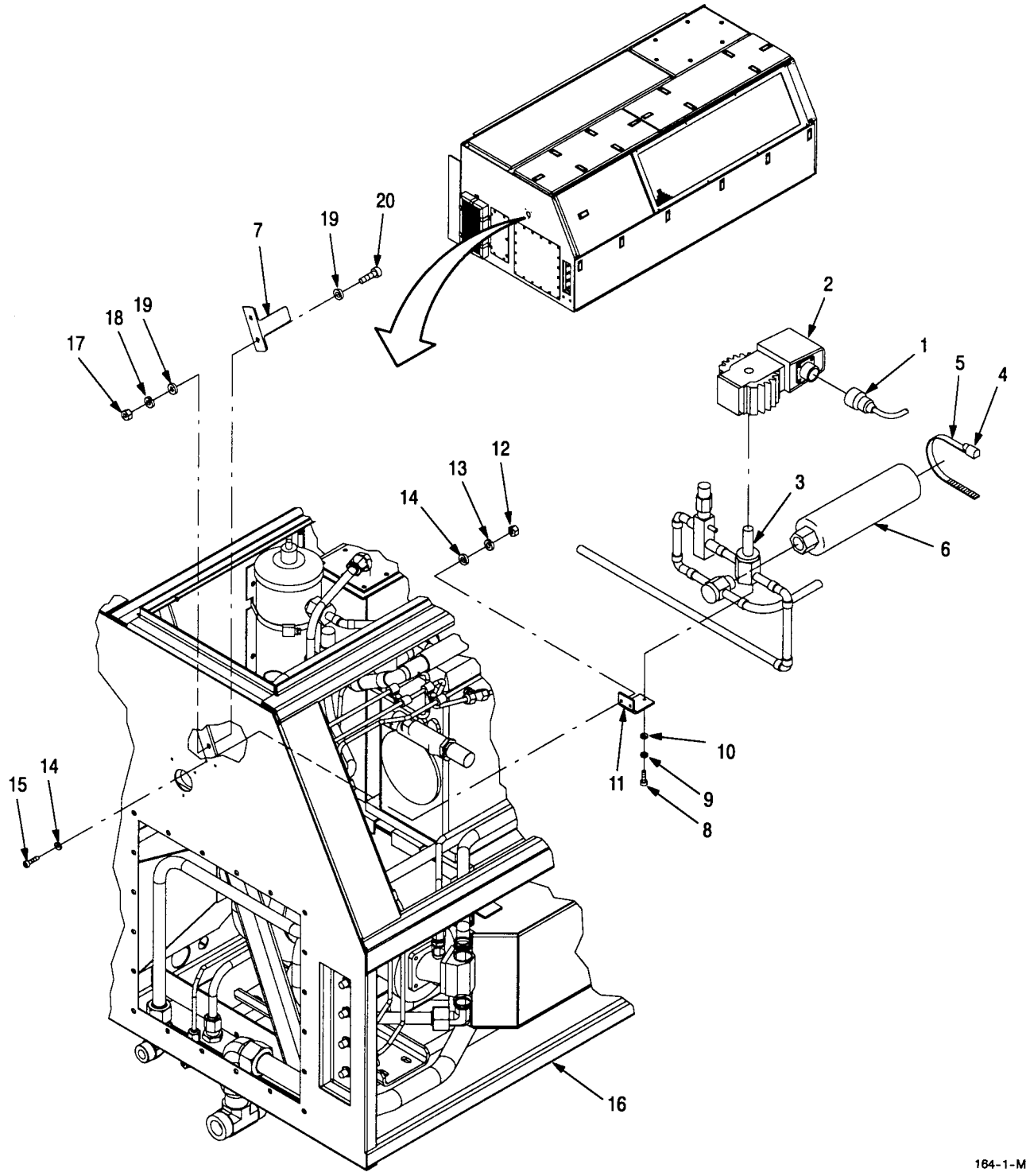

Figure 3-18. Filter/Drier Components and Valves Replacement

Follow-on maintenance: Service R22 refrigerant system per para 3.9.1, remove tags, install or close ECU covers and doors per para 2.14.1, apply system power and perform operational test. Check for leaks. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.14 R22 Refrigerant Receiver Tank and Valve Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Nitrogen (Item 34, Appendix C)
R22 Refrigerant (Item 40, Appendix C)
Four Lockwashers (Item 18, Appendix E)
Lockwasher (Item 20, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU doors and covers opened or removed as required (see para 2.14.1).
R22 refrigerant system recovered (see para 3.9.1).
ECU work platform installed (reference TM 10-5410-228-10)

References:
TM 10-5410-228-10

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

CAUTION

Cover or plug all openings immediately after removal of R22 refrigerant receiver tank to prevent contamination.

Flow nitrogen through tube assembly when brazing or unbrazing to prevent damage to components.

NOTE

This procedure covers the replacement of the R22 refrigerant receiver tank and the liquid line service valve (horizontal valve).

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-19)

(1) Tag and disconnect receiver tank upper tube (1) from 'IN' port on R22 refrigerant receiver tank (2).

(2) Push receiver tank upper tube (1) slightly to the side, so as to clear 'IN' port on R22 refrigerant receiver tank (2).

3.9.14 R22 Refrigerant Receiver Tank and Valve Replacement – Continued.

(3) Tag and disconnect horizontal valve (3) from 'OUT' port on R22 refrigerant receiver tank (2).

(4) Push horizontal valve (3) and receiver tank lower tube (4) slightly to the side, so as to clear 'OUT' port on R22 refrigerant receiver tank (2).

(5) Remove nut (5), lockwasher (6), and flat washer (7) securing R22 refrigerant receiver tank (2) to receiver tank bracket (8). Discard lockwasher (6).

(6) Loosen screw (9) on hose clamp (10) securing R22 refrigerant receiver tank (2) to receiver tank bracket (8).

(7) Remove R22 refrigerant receiver tank (2) from ECU (11).

(8) Remove four screws (12), four lockwashers (13), and four flat washers (14) securing receiver tank bracket (8) to inside wall of ECU (11). Discard four lockwashers (13).

(9) Remove tube assembly (15) from horizontal valve (3).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(10) Remove horizontal valve (3) from receiver tank lower tube (4).

b. Installation (Refer to Figure 3-19)

(1) Install horizontal valve (3) on receiver tank lower tube (4).

(2) Install tube assembly (15) on horizontal valve (3).

(3) Secure receiver tank bracket (8) to inside wall of ECU (11) assembly with four screws (12), four new lockwashers (13) (Item 18, Appx E) and four flat washers (14).

(4) Place R22 refrigerant receiver tank (2) on receiver tank bracket (8) in ECU (11).

(5) Tighten screw (9) on hose clamp (10) to secure R22 refrigerant receiver tank (2) to receiver tank bracket (8).

(6) Secure R22 refrigerant receiver tank (2) to receiver tank bracket (8) with nut (5), new lockwasher (6) (Item 20, Appx E) and flat washer (7).

(7) Lubricate O-ring on horizontal valve (3) with refrigeration oil.

(8) Push horizontal valve (3) and receiver tank lower tube (4) into place, so as to mate with 'OUT' port on R22 refrigerant receiver tank (2).

(9) Connect horizontal valve (3) to 'OUT' port on R22 refrigerant receiver tank (2) and remove tag.

(10) Lubricate O-ring on receiver tank upper tube (1) with refrigeration oil.

(11) Push receiver tank upper tube (1) into place, so as to mate with 'IN' port on R22 refrigerant receiver tank (2).

(12) Connect receiver tank upper tube (1) to 'IN' port on R22 refrigerant receiver tank (2), and remove tag.

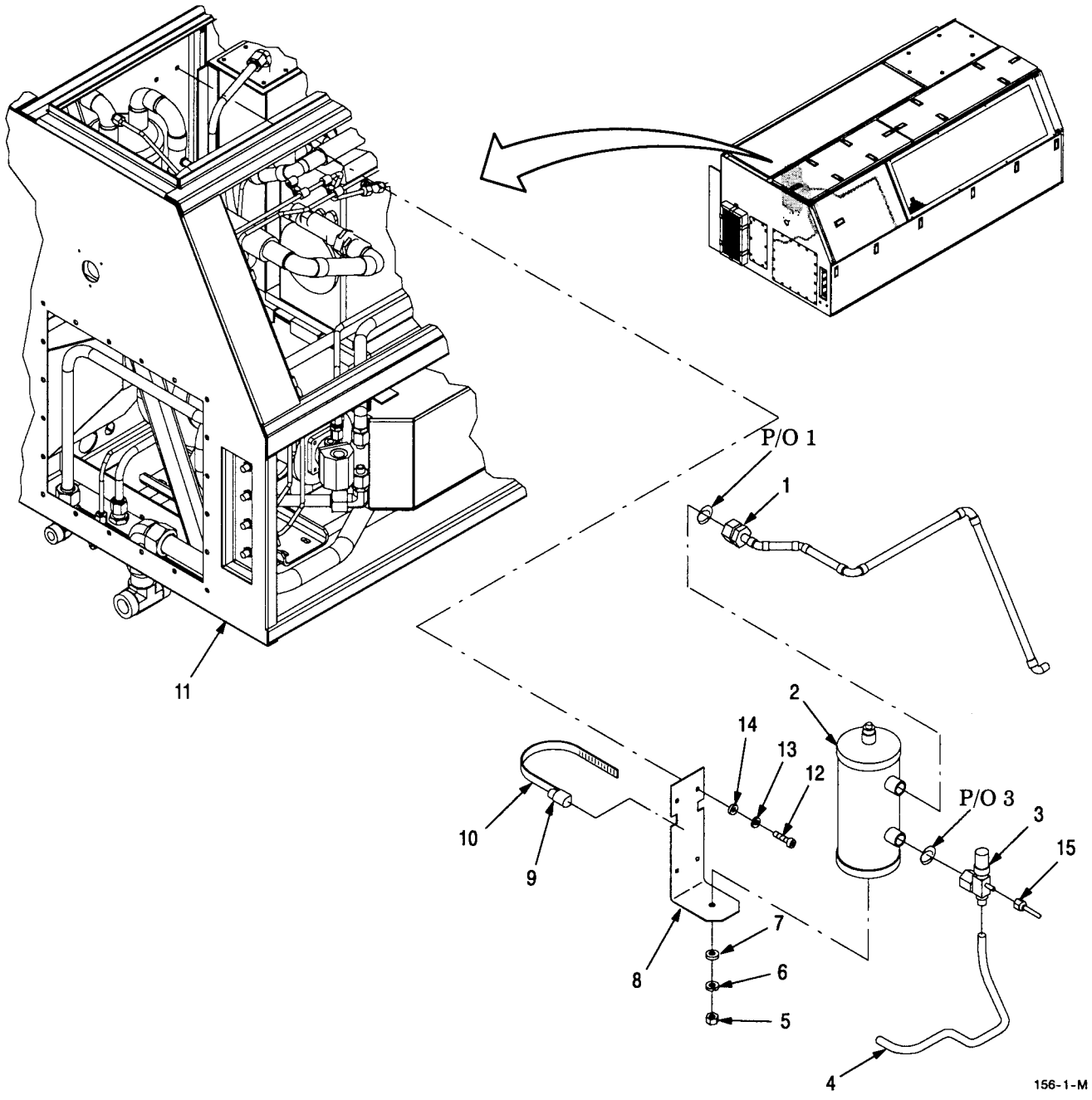

Figure 3-19. R22 Refrigerant Receiver Tank and Valve Replacement

Follow-on maintenance: Service R22 refrigerant system per para 3.9.1, remove tags, install or close ECU covers and doors per para 2.14.1, apply system power and perform operational test. Check for leaks. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.15 Compressor, Motor, Switch and Valve Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Compressor (Item 51, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)
1-5/16 Inch Crowfoot Wrench (Item 59, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
Hydraulic Sealant (Item 48, Appendix C)
R22 Refrigerant (Item 40, Appendix C)
Sealant (Item 47, Appendix C)
Eight Lockwashers (Item 19, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU covers opened or removed as required (see para 2.14.1).
R22 refrigerant system recovered (see para 3.9.1).
Hydraulic system drained (see para 2.14.3).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Four Lockwashers (Item 22, Appendix E)
Three O-rings (Item 63, Appendix E)
Two O-rings (Item 51, Appendix E)
O-ring (Item 57, Appendix E)
Two O-rings (Item 59, Appendix E)
O-ring (Item 67, Appendix E)
Refrigerant Sealant (Item 49, Appendix C)

3.9.15.1 Compressor.

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

CAUTION

Cover or plug all openings immediately after removal of compressor to prevent contamination. Remove all covers/plugs prior to reconnecting.

NOTE

This procedure covers the replacement of the following components: compressor, motor, high pressure switches HPS1 and A1RMPS1, and bulkhead access valves.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-20)

(1) Disconnect two tube assemblies (1 and 2) from compressor (3).

NOTE

Plug open ports on compressor and open ends of tube assemblies to prevent contamination of the refrigerant system.

(2) Plug open ends of two tube assemblies (1 and 2) and two open ports on compressor (3).

(3) Disconnect tube assembly (4) from tee (5) on compressor (3).

(4) Plug open end of tube assembly (4).

(5) Disconnect tube assembly (6) from elbow (7) on compressor (3).

(6) Plug open end of tube assembly (6).

(7) Disconnect cable assembly 1A4A1W3 connector P5 from high pressure switch HPS1 (8) and connector P20 from high pressure switch A1RMPS1 (9).

(8) Remove four screws (10), four lockwashers (11) and four flat washers (12) securing compressor (3) to hydraulic reservoir (13). Discard four lockwashers (11).

(9) Remove bolt (14) and washer (15) securing flywheel (16) to shaft of compressor (3).

(10) Remove high pressure switch HPS1 (8) and high pressure switch A1RMPS1 (9) from bulkhead access valves (17 and 18).

(11) Remove bulkhead access valves (17 and 18) from tube assembly (19) and bracket (20).

(12) Remove two screws (21) securing bracket (20) to compressor (3).

(13) Remove tube assembly (19) from tee (5).

(14) Remove tee (5) from compressor (3).

(15) Remove elbow (7) from compressor (3).

(16) Plug open ports on compressor (3).

b. Installation (Refer to Figure 3-20)

(1) Remove plug from port on compressor (3).

(2) Apply refrigerant sealant to threads of elbow (7) and install on compressor (3).

(3) Remove plug from port on compressor (3).

(4) Apply refrigerant sealant to threads of tee (5) and install on compressor (3).

(5) Secure bracket (20) to compressor (3) with two screws (21).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(6) Apply sealant to bracket (20) and bulkhead access valves (17 and 18).

(7) Install bulkhead access valves (17 and 18) in bracket (20).

(8) Remove plugs from ends of tube assembly (19).

(9) Apply refrigerant sealant to threads of tube assembly (19) and connect to tee (5) and bulkhead access valves (17 and 18).

(10) Install high pressure switch HPS1 (8) and A1RMPS1 (9) on bulkhead access valves (17 and 18).

3.9.15 Compressor, Motor, Switch and Valve Replacement – Continued.

(11) Ensure machine key (22) is on shaft of compressor (3).

(12) Align machine key (22) on shaft of compressor (3) and keyway on flywheel (16). Slide flywheel (16) onto shaft of compressor (3).

(13) Push flywheel (16) towards compressor (3). Install bolt (14) and washer (15), tighten fully.

(14) Secure compressor (3) in ECU enclosure with four screws (10), four new lockwashers (11) (Item 19, Appx E) and four flat washers (12).

(15) Connect cable assembly 1A4A1W3 connector P5 to high pressure switch HPS1 (8) and connector P20 to high pressure switch A1RMPS1 (9).

(16) Remove plug from end of tube assembly (6).

(17) Apply refrigerant sealant to threads of tube assembly (6) and connect to elbow (7) on compressor (3).

(18) Remove plugs from ends of tube assembly (4).

(19) Apply refrigerant sealant to threads of tube assembly (4) and connect to tee (5) on compressor (3).

(20) Remove plugs from ends of two tube assemblies (1 and 2) and two ports on compressor (3).

(21) Apply refrigerant sealant to threads of two tube assemblies (1 and 2) and connect on compressor (3).

3.9.15.2 Hydraulic Motor.

a. Removal (Refer to Figure 3-20)

(1) Disconnect tube assembly (23) from tee (24) on elbow (25). Remove and discard O-ring (26) from tee (24).

(2) Disconnect tube assembly (27) from reducer (28) on tee (24). Remove and discard O-ring (29) from reducer (28).

(3) Disconnect tube assembly (30) from elbow (31) on hydraulic motor (32). Remove and discard O-ring (33) from elbow (31).

(4) Disconnect tube assembly (34) from elbow (35) on hydraulic motor (32). Remove and discard O-ring (36) from elbow (35).

NOTE

Plug open ports on hydraulic motor and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(5) Plug open ends of four tube assemblies (23, 27, 30, and 34).

(6) Disconnect reducer (28) from tee (24). Remove and discard O-ring (37) from tee (24).

(7) Disconnect tee (24) from elbow (25) on hydraulic motor (32). Remove and discard O-ring (38) from elbow (25).

NOTE

Remove three elbows from hydraulic motor prior to removing hydraulic motor from ECU. Otherwise, a vise will be required to hold hydraulic motor.

(8) Remove elbow (25) from hydraulic motor (32). Remove and discard O-ring (39) from elbow (25). Plug open port on hydraulic motor (32).

(9) Remove elbow (31) from hydraulic motor (32). Remove and discard O-ring (40) from elbow (31). Plug open port on hydraulic motor (32).

(10) Remove elbow (35) from hydraulic motor (32). Remove and discard O-ring (41) from elbow (35). Plug open port on hydraulic motor (32).

(11) Remove four screws (42), four lockwashers (43) and four flat washers (44) securing hydraulic motor (32) to mounting bracket (45). Discard four lockwashers (43).

(12) Remove hydraulic motor (32) with coupling (47) and collar (48) attached from mounting bracket (45).

(13) Remove collar (48) from shaft of hydraulic motor (32).

(14) Loosen two setscrews (49) on coupling (47) and remove coupling (47) from shaft of hydraulic motor (32).

NOTE

Make note of shim location under mounting bracket so they are installed in same location.

(15) Remove four screws (50), four lockwashers (51) and four flat washers (52) securing mounting bracket (45) and shims (46) to hydraulic reservoir (13). Discard four lockwashers (51).

b. Installation (Refer to Figure 3-20)

(1) Secure mounting bracket (45) and shims (46) to hydraulic reservoir (13) with four screws (50), four new lockwashers (51) (Item 19, Appx E) and four flat washers (52).

(2) Slide coupling (47) onto shaft of hydraulic motor (32).

(3) Slide collar (48) onto shaft of hydraulic motor (32).

(4) Align collar (48) and coupling (47).

(5) Place hydraulic motor (32) with coupling (47) and collar (48) attached on mounting bracket (45). Secure hydraulic motor (32) to mounting bracket (45) with four screws (42), four new lockwashers (43) (Item 22, Appx E) and four flat washers (44).

(6) Align collar (48) and coupling (47) to flywheel (16). Tighten two setscrews (49) on coupling (47).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(7) Apply sealant to two setscrews (48) on coupling (46).

(8) Check elbow (35) sealing surfaces for damage or material build up. If required, replace elbow (35) or clean any material build up with clean, lint-free cloth.

(9) Lubricate O-ring (41) (Item 59, Appx E) with a light coating of hydraulic fluid.

(10) Install new O-ring (41) on elbow (35). Ensure that O-ring (41) is seated and retained properly.

(11) Coat male threads of elbow (35) with hydraulic fluid.

(12) Remove plug from port on hydraulic motor (32). Install elbow (35) on hydraulic motor (32), finger tight.

(13) Check elbow (31) sealing surfaces for damage or material build up. If required, replace elbow (31) or clean any material build up with clean, lint-free cloth.

(14) Install new O-ring (40) (Item 59, Appx E) on elbow (31). Ensure that O-ring (40) is seated and retained properly.

(15) Lubricate O-ring (40) with a light coating of hydraulic fluid.

(16) Coat male threads of elbow (31) with hydraulic fluid.

(17) Remove plug from port on hydraulic motor (32). Install elbow (31) on hydraulic motor (32), finger tight.

3.9.15 Compressor, Motor, Switch and Valve Replacement – Continued.

(18) Install new O-ring (36) (Item 51, Appx E) on elbow (35). Ensure that O-ring (36) is seated and retained properly.

(19) Lubricate O-ring (36) with a light coating of hydraulic fluid.

(20) Remove plug from tube assembly (34). Check tube assembly (34) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (34) per para 3.9.11.

(21) Install tube assembly (34) on elbow (35), finger tight. Adjust position of tube assembly (34) and elbow (35) as required.

(22) Torque elbow (35) on hydraulic motor (32) to 2,520 ± 100 in.-lb (210 ± 8 ft-lb).

(23) Torque tube assembly (34) on elbow (35) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(24) Install new O-ring (33) (Item 51, Appx E) on elbow (31). Ensure that O-ring (33) is seated and retained properly.

(25) Lubricate O-ring (33) with a light coating of hydraulic fluid.

(26) Remove plug from tube assembly (30). Check tube assembly (30) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (30) per para 3.9.11.

(27) Install tube assembly (30) on elbow (31), finger tight. Adjust position of tube assembly (30) and elbow (31) as required.

(28) Torque elbow (31) on hydraulic motor (32) to 2,520 ± 100 in.-lb (210 ± 8 ft-lb).

(29) Torque tube assembly (30) on elbow (31) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(30) Check elbow (25) sealing surfaces for damage or material build up. If required, replace elbow (25) or clean any material build up with clean, lint-free cloth.

(31) Install new O-ring (39) (Item 57, Appx E) on elbow (25). Ensure that O-ring (39) is seated and retained properly.

(32) Lubricate O-ring (39) with a light coating of hydraulic fluid.

(33) Coat male threads of elbow (25) with hydraulic fluid.

(34) Remove plug from port on hydraulic motor (32). Install elbow (25) on hydraulic motor (32), finger tight.

(35) Check tee (24) sealing surfaces for damage or material build up. If required, replace tee (24) or clean any material build up with clean, lint-free cloth.

(36) Install new O-ring (38) (Item 63, Appx E) on elbow (25). Ensure that O-ring (38) is seated and retained properly.

(37) Lubricate O-ring (38) with a light coating of hydraulic fluid.

(38) Install tee (24) on elbow (25), finger tight.

(39) Check reducer (28) sealing surfaces for damage or material build up. If required, replace reducer (28) or clean any material build up with clean, lint-free cloth.

(40) Install new O-ring (37) (Item 63, Appx E) on tee (24). Ensure O-ring (37) is seated and retained properly.

(41) Lubricate O-ring (37) with a light coating of hydraulic fluid.

(42) Coat male threads of reducer (28) with hydraulic fluid.

(43) Install reducer (28) on tee (24), finger tight.

(44) Install new O-ring (26) (Item 63, Appx E) on tee (24). Ensure O-ring (26) is seated and retained properly.

(45) Lubricate O-ring (26) with a light coating of hydraulic fluid.

(46) Install new O-ring (29) (Item 67, Appx E) on reducer (28). Ensure O-ring (29) is seated and retained properly.

(47) Lubricate O-ring (29) with a light coating of hydraulic fluid.

(48) Coat male threads of tee (24) with hydraulic fluid.

(49) Remove plug from tube assembly (23). Check tube assembly (23) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (23) per para 3.9.11.

(50) Install tube assembly (23) on tee (24), finger tight. Adjust position of tube assembly (23), tee (24), and elbow (25) as required.

(51) Remove plug from tube assembly (27). Check tube assembly (27) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (27) per para 3.9.11.

(52) Install tube assembly (27) on reducer (28), finger tight. Adjust position of tube assembly (23), tube assembly (27), tee (24), and elbow (25) as required.

(53) Torque elbow (25) on hydraulic motor (32) to 720 ± 20 in.-lb (60 ± 2 ft-lb).

(54) Torque tee (24) on elbow (25) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(55) Torque reducer (28) on tee (24) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(56) Torque tube assembly (23) on tee (24) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(57) Torque tube assembly (27) on reducer (28) to 320 ± 25 in.-lb (27 ± 2 ft-lb).

3.9.15 Compressor, Motor, Switch and Valve Replacement – Continued.

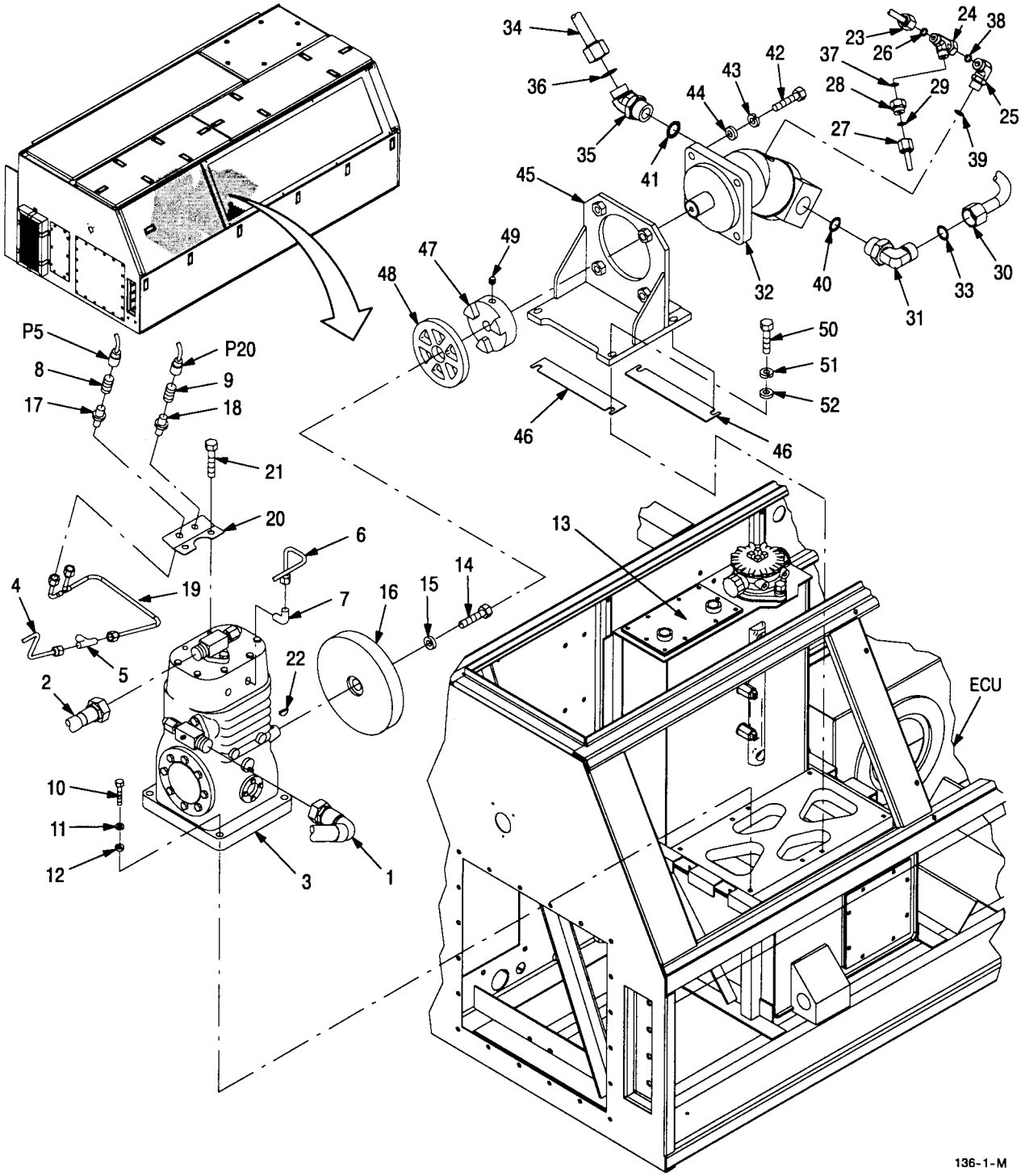

Figure 3-20. Compressor, Motor, Switch and Valve Replacement

Follow-on maintenance: Service R22 refrigerant system per para 3.9.1, fill hydraulic reservoir per para 2.14.3, remove tags, install or close ECU covers and doors per para 2.14.1, apply system power and perform operational test. Check for leaks. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.16 Condenser Coil/Oil Cooler Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
Torque Wrench (Item 66, Appendix B)
Manifold Gage Set (Item 26, Appendix B)
R22 Refrigerant Recovery and Recycle Unit (Item 33, Appendix B)
R22 Refrigerant Cylinder, Used (Item 32, Appendix B)
Refrigerant Gas Leak Detector (Item 3, Appendix B)
Vacuum Pump (Item 31, Appendix B)

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
R22 Refrigerant (Item 40, Appendix C)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU covers and doors opened or removed as required (see para 2.14.1).
R22 refrigerant system recovered (see para 3.9.1).
Hydraulic system drained (see para 2.14.3).
Filter/drier removed (see para 3.9.13).
ECU work platform installed (reference TM 10-5410-228-10).

Personnel Required: (2)

References:
TM 10-5410-228-10

Materials/Parts: (cont.)
Six Lockwashers (Item 18, Appendix E)
Eight Lockwashers (Item 26, Appendix E)
O-ring (Item 63, Appendix E)
Five O-rings (Item 51, Appendix E)

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

CAUTION

Cover or plug all openings immediately after removal of condenser coil/oil cooler to prevent contamination.

a. Removal (Refer to Figure 3-21)
   (1) Remove four compressor discharge and suction port caps (1) for ventilation.
   (2) Disconnect tube assembly (2) from union (3) on oil cooler (4). Remove and discard O-ring (5) from union (3).

3.9.16 Condenser Coil/Oil Cooler Replacement - Continued.

NOTE

Plug open ports on oil cooler and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(3) Plug open end of tube assembly (2).

(4) Disconnect tube assembly (6) from tee (7) on oil cooler (4). Remove and discard O-ring (8) from tee (7).

(5) Disconnect tube assembly nut (9) from reducer (10) on tee (7). Remove and discard O-ring (11) from reducer (10).

(6) Plug open end of tube assembly (6).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

CAUTION

Protect vibration absorber on R22 refrigerant tube assembly before unbrazing by wrapping the vibration absorber with a wet rag.

(7) Unbraze R22 refrigerant tube assembly (12) from condenser coil (13).

NOTE

Plug open ports on condenser coil and open ends of R22 refrigerant tube assemblies to keep the refrigerant system free of contaminants.

(8) Plug open port on condenser coil (13) and open end of R22 refrigerant tube assembly (12). Flow nitrogen through condenser coil while unbrazing.

(9) Unbraze R22 refrigerant tube assembly (14) from condenser coil (13).

(10) Plug open port on condenser coil (13) and open end of R22 refrigerant tube assembly (14).

(11) Loosen screws on two clamps (15) securing two hoses (16 and 17) to drain trough (18). Slide two hoses (16 and 17) off drain trough (18).

NOTE

Condenser coil/oil cooler assembly consists of condenser coil, oil cooler, and drain trough assembled together.

(12) Remove ten screws (19) securing condenser coil/oil cooler assembly to ECU enclosure (20).

WARNING

The condenser coil/oil cooler assembly is heavy. To prevent injury to personnel, two people are required to lift condenser coil/oil cooler assembly.

(13) Remove condenser coil/oil cooler assembly from ECU enclosure (20).

(14) Remove six screws (21), six lockwashers (22) and six flat washers (23) securing drain trough (18) to condenser coil (13). Discard six lockwashers (22).

(15) Remove eight screws (24), sixteen flat washers (25), eight lockwashers (26) and eight nuts (27) securing oil cooler (4) to condenser coil (13). Discard eight lockwashers (26).

(16) Remove two screws (28) securing drain trough (18) to oil cooler (4).

(17) Disconnect union (3) from oil cooler (4). Remove and discard O-ring (29) from union (3).

NOTE

Plug open ports on oil cooler and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(18) Plug open port on oil cooler (4).

(19) Disconnect reducer (10) from tee (7) on oil cooler (4). Remove and discard O-ring (30) from tee (7).

(20) Disconnect tee (7) from oil cooler (4). Remove and discard O-ring (31) from tee (7).

(21) Plug open port on oil cooler (4).

b. Installation (Refer to Figure 3-21)

(1) Check tee (7) sealing surfaces for damage or material build up. If required, clean any material build up with clean, lint-free cloth or replace tee (7).

(2) Install new O-ring (31) (Item 51, Appx E) on tee (7). Ensure O-ring (31) is seated and retained properly.

(3) Lubricate O-ring (31) with a light coating of hydraulic fluid.

(4) Coat male threads on tee (7) with hydraulic fluid.

(5) Remove plug from port on oil cooler (4). Install tee (7) on oil cooler (4), finger tight.

(6) Check reducer (10) sealing surfaces for damage or material build up. If required, replace reducer (10) or clean any material build up with clean, lint-free cloth.

(7) Install new O-ring (30) (Item 51, Appx E) on tee (7). Ensure O-ring (30) is seated and retained properly.

(8) Lubricate O-ring (30) with a light coating of hydraulic fluid.

(9) Install reducer (10) on tee (7), finger tight.

(10) Check tube assembly nut (9) sealing surfaces for damage or material build up. If required, replace tube assembly nut (9) or clean any material build up with clean, lint-free cloth.

(11) Install new O-ring (11) (Item 63, Appx E) on reducer (10). Ensure O-ring (11) is seated and retained properly.

(12) Lubricate O-ring (11) with a light coating of hydraulic fluid.

(13) Coat male threads on reducer (10) with hydraulic fluid.

3.9.16 Condenser Coil/Oil Cooler Replacement - Continued.

(14) Install tube assembly nut (9) on reducer (10), finger tight.

(15) Check union (3) sealing surfaces for damage or material build up. If required, replace union (3) or clean any material build up with clean, lint-free cloth.

(16) Install new O-ring (29) (Item 51, Appx E) on union (3). Ensure O-ring (29) is seated and retained properly.

(17) Lubricate O-ring (29) with a light coating of hydraulic fluid.

(18) Coat male threads on union (3) with hydraulic fluid.

(19) Remove plug from port on oil cooler (4). Install union (3) on oil cooler (4), finger tight.

(20) Torque union (3) to 1,080 ± 45 in.-lb (90 ± 5 ft-lb).

(21) Secure drain trough (18) to oil cooler (4) with two screws (28).

(22) Secure oil cooler (4) to condenser coil (13) with eight screws (24), sixteen flat washers (25), eight new lockwashers (26) (Item 26, Appx E) and eight nuts (27).

(23) Secure drain trough (18) to condenser coil (13) with six screws (21), six new lockwashers (22) (Item 18, Appx E) and six flat washers (23).

WARNING

The condenser coil/oil cooler assembly is heavy. To prevent injury to personnel, two people are required to lift condenser coil/oil cooler assembly.

NOTE

Condenser coil/oil cooler assembly consists of condenser coil, oil cooler, and drain trough assembled together.

(24) Place condenser coil/oil cooler assembly in ECU enclosure (20).

(25) Secure condenser coil/oil cooler assembly to ECU enclosure (20) with ten screws (19).

(26) Slide two hoses (16 and 17) on drain trough (18). Tighten screws on two clamps (15) to secure two hoses (16 and 17) to drain trough (18).

(27) Remove plugs from port on condenser coil (13) and R22 refrigerant tube assembly (14). Flow nitrogen through condenser coil while brazing.

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(28) Braze R22 refrigerant tube assembly (14) to condenser coil (13).

(29) Remove plugs from port on condenser coil (13) and R22 refrigerant tube assembly (12).

CAUTION

Protect vibration absorber on R22 refrigerant tube assembly before unbrazing by wrapping the vibration absorber with a wet rag.

(30) Braze R22 refrigerant tube assembly (12) to condenser coil (13).

(31) Remove plug from end on tube assembly (6). Check tube assembly (6) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (6) per para 3.9.11.

(32) Install new O-ring (8) (Item 51, Appx E) on tee (7). Ensure O-ring (8) is seated and retained properly.

(33) Lubricate O-ring (8) with a light coating of hydraulic fluid.

(34) Install tube assembly (6) on tee (7) on oil cooler (4), finger tight. Adjust position of tube assembly (6) and tee (7) as required.

(35) Torque tee (7) on oil cooler (4) to 1,080 ± 45 in.-lb (90 ± 5 ft-lb).

(36) Torque tube assembly (6) on tee (7) to 1,080 ± 45 in.-lb (90 ± 5 ft-lb).

(37) Torque reducer (10) on tee (7) to 1,080 ± 45 in.-lb (90 ± 5 ft-lb).

(38) Torque tube assembly nut (9) on reducer (10) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(39) Remove plug from end on tube assembly (2). Check tube assembly (2) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (2) per para 3.9.11.

(40) Install new O-ring (5) (Item 51, Appx E) on union (3). Ensure O-ring (5) is seated and retained properly.

(41) Lubricate O-ring (5) with a light coating of hydraulic fluid.

(42) Install tube assembly (2) on union (3) on oil cooler (4), finger tight.

(43) Torque tube assembly (2) on union (3) to 1,080 ± 45 in.-lb (90 ± 5 ft-lb).

(44) Install compressor discharge and suction port caps (1).

3.9.16 Condenser Coil/Oil Cooler Replacement - Continued.

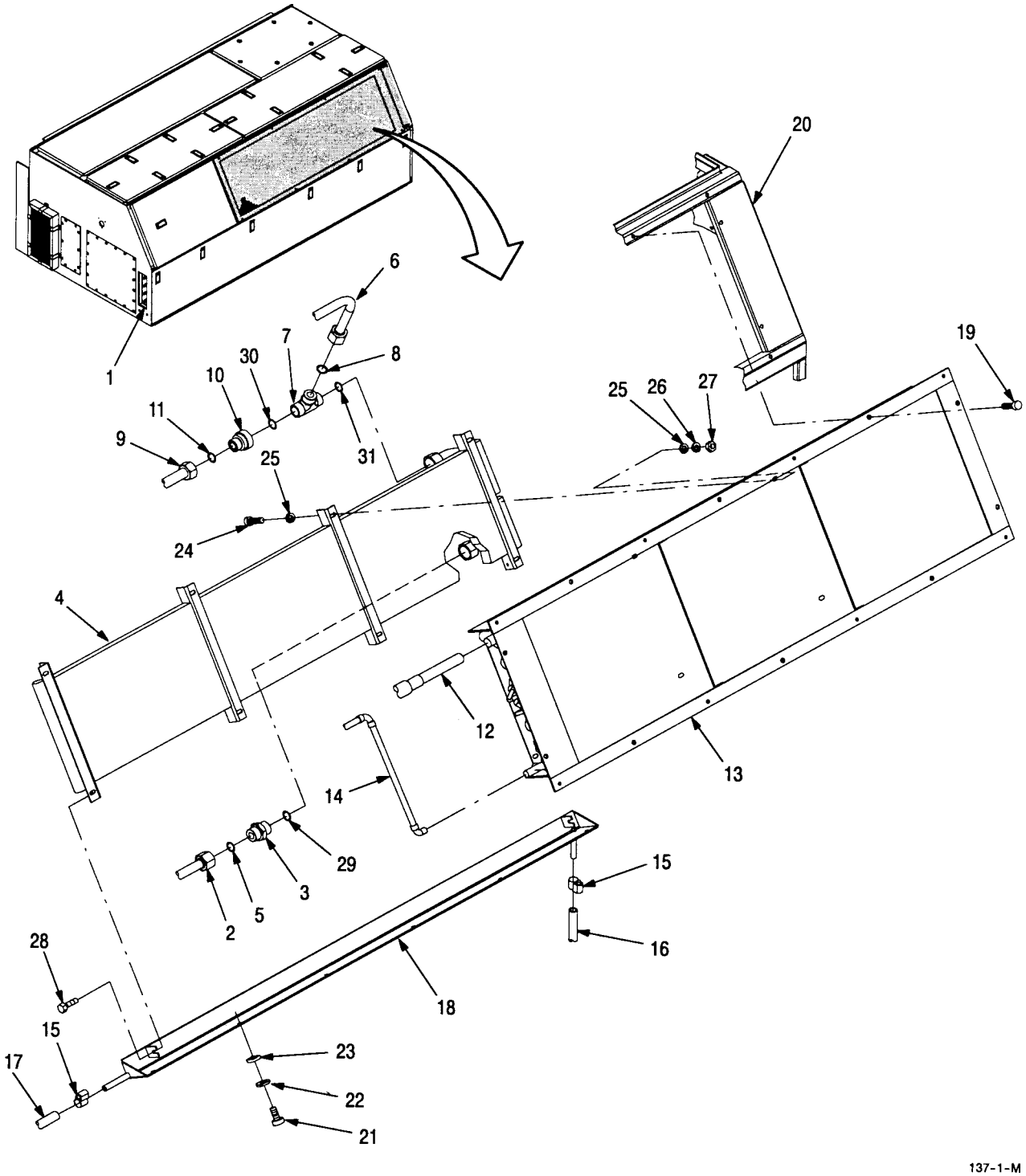

Figure 3-21. Condenser Coil/Oil Cooler Replacement

Follow-on maintenance: Secure ECU doors/covers, (if compressor replaced) replace filter/drier per para 3.9.13, charge R22 refrigerant system and check for leaks per para 3.9.1, (if hydraulic motor replaced) check hydraulic fluid level, turn system on and check for leaks. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.17 Accumulator and Components Replacement.

This task covers:
a. Removal
b. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Tool Kit, Service: R22 Refrigeration Unit (Item 52, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)

Materials/Parts:
Nitrogen (Item 34, Appendix C)
Insulation (Item 31, Appendix C)
Tape, Insulation (Item 55, Appendix C)
Insulation Adhesive (Item 3, Appendix C)
Four Lockwashers (Item 18, Appendix E)
Lockwasher (Item 20, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
Filter/drier removed (see para 3.9.13).
R22 refrigerant system recovered (see para 3.9.1).
ECU doors and covers opened or removed as required (see para 2.14.1).
ECU work platform installed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

WARNING

The R22 refrigerant system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on R22 refrigerant system.

Prevent contact of R22 refrigerant with flame or hot surface. Heat causes R22 refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

R22 refrigerant must be recovered. Venting R22 refrigerant into the atmosphere is a violation of public law and subject to severe penalties.

Do not attempt to remove or connect refrigerant servicing equipment while ECV is running.

Failure to observe these warnings can result in injury to personnel.

CAUTION

Cover or plug openings immediately after removing line to prevent contamination. Remove and replace tape as required.

Flow nitrogen through tube assembly when brazing or unbrazing to prevent damage to components.

NOTE

This procedure covers the replacement of the accumulator, suction line vibration absorber and low pressure switch LPS1.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Removal (Refer to Figure 3-22)

(1) Remove insulation on accumulator tube assembly (1), vibration absorber (2) and accumulator (3) to gain access to fittings.

(2) Remove cable assembly 1A4A1W3 connector P4 (4) from low pressure cutoff switch LPS1 (5) on accumulator tube assembly (1).

3.9.17 Accumulator and Components Replacement – Continued.

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(3) Remove accumulator tube assembly (1) and vibration absorber (2) from accumulator (3).

(4) Disconnect accumulator tube assembly (1) and vibration absorber (2) from compressor (6).

(5) Disconnect evaporator tube assembly (7) from accumulator elbow assembly (8). Move evaporator tube assembly (7) out of the way; push gently to one side, clear of mating 'port'.

(6) Remove accumulator elbow assembly (8) from accumulator (3) and tube (9).

(7) Remove nut (10), lockwasher (11) and flat washer (12) securing bottom of accumulator (3) to accumulator bracket (13). Discard lockwasher (11).

(8) Loosen screw (14) on hose clamp (15) and loosen hose clamp (15).

(9) Remove accumulator (3) from ECU (16).

(10) Remove four screws (17), four lockwashers (18) and four flat washers (19) securing accumulator bracket (13) to ECU (16). Discard four lockwashers (18).

b. Installation (Refer to Figure 3-22)

(1) Secure accumulator bracket (13) to ECU (16) with four screws (17), four new lockwashers (18) (Item 18, Appx E) and four flat washers (19).

(2) Place accumulator (3) onto accumulator bracket (13) in ECU (16). The screw fitting on the base of the accumulator (3) will fit through a hole in the accumulator bracket (13). The accumulator (3) will fit inside of hose clamp (15).

(3) Tighten screw (14) on hose clamp (15).

(4) Secure bottom of accumulator (3) to accumulator bracket (13) with nut (10), new lockwasher (11) (Item 20, Appx E) and flat washer (12).

WARNING

Removal and brazing of refrigerant tube assemblies shall be in accordance with safety requirements. All safety requirements applicable to brazing of tubes shall be observed.

(5) Install accumulator elbow assembly (8) to accumulator (3) and tube (9).

(6) Gently move evaporator tube assembly (7) into position at the nipple on the accumulator elbow assembly (8). Connect evaporator tube assembly (7) to accumulator elbow assembly (8).

(7) Connect accumulator tube assembly (1) to compressor (6).

(8) Install accumulator tube assembly (1) and vibration absorber (2) to accumulator (3).

(9) Connect cable assembly 1A4A1W3 connector P4 (4) to low pressure cutoff switch LPS1 (5) on accumulator tube assembly (1).

(10) Replace insulation on accumulator tube assembly (1), vibration absorber (2) and accumulator (3). Secure with insulation adhesive.

(11) Tape insulation approximately every three inches and at ends of tubing runs.

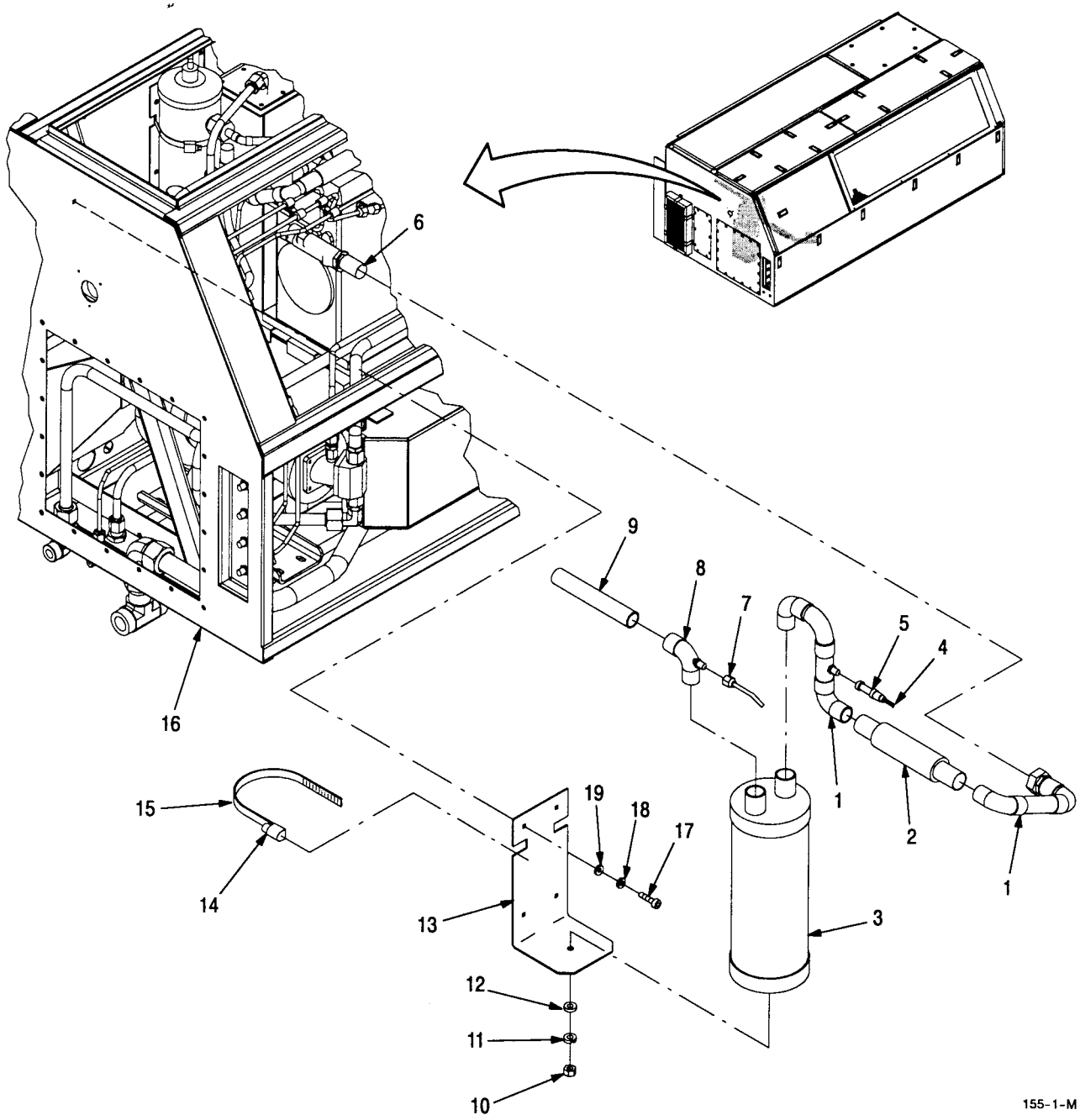

Figure 3-22. Accumulator and Components Replacement

Follow-on maintenance: Replace filter/drier per para 3.9.13, service R22 refrigerant system and check for leaks per para 3.9.1, install or close ECU covers and doors per para 2.14.1. Remove ECU work platform (reference TM 10-5410-228-10).

3.9.18 Hydraulic Manifold Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
11/16 Inch Crowfoot Wrench (Item 53, Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
15/16 Inch Crowfoot Wrench (Item 55, Appendix B)
1-1/8 Inch Crowfoot Wrench (Item 57, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
1-7/8 Inch Crowfoot Wrench (Item 63, Appendix B)
Torque Wrench (Item 66, Appendix B)

Materials/Parts:
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
Four Lockwashers (Item 20, Appendix E)
Two O-rings (Item 61, Appendix E)
Four O-rings (Item 63, Appendix E)
Ten O-rings (Item 51, Appendix E)
Eight O-rings (Item 50, Appendix E)
Nine O-rings (Item 57, Appendix E)

Equipment Conditions:
Power shut off, power panel and rear control panel tagged.
ECU covers and doors opened or removed as required (see para 2.14.1).
Hydraulic system drained (see para 2.14.3).
ECU work platform installed (reference TM 10-5410-228-10).
NBC filter and plenum removed (see TM 10-5410-228-10)

Personnel Required: (2)

References:
TM 10-5410-228-10

Materials:/Parts: (Cont.)
Eight O-rings (Item 58, Appendix E)
Two O-rings (Item 60, Appendix E)
Eight O-rings (Item 56, Appendix E)
Three O-rings (Item 66, Appendix E)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

Plug open ports on hydraulic manifold and open ends of tube assemblies to keep the hydraulic system free of contaminants.

a. Removal (Refer to Figure 3-23)

(1) Disconnect four tube assemblies (1) from four connectors (2) on hydraulic manifold (3). Remove and discard four O-rings (4) from four connectors (2).

(2) Remove four connectors (2) from hydraulic manifold (3). Remove and discard four O-rings (5) from four connectors (2).

(3) Plug open ports on hydraulic manifold (3) and open ends of four tube assemblies (1).

(4) Disconnect five tube assemblies (6) from five elbows (7) on hydraulic manifold (3). Remove and discard five O-rings (8) from five elbows (7).

(5) Remove five elbows (7) from hydraulic manifold (3). Remove and discard five O-rings (9) from five elbows (7).

(6) Plug open ports on hydraulic manifold (3) and open end of five tube assemblies (6).

(7) Disconnect two tube assemblies (10) from two connectors (11) on hydraulic manifold (3). Remove and discard two O-rings (12) from two connectors (11).

(8) Remove two connectors (11) from hydraulic manifold (3). Remove and discard two O-rings (13) from two connectors (11).

(9) Plug open ports on hydraulic manifold (3) and open ends of two tube assemblies (10).

(10) Disconnect two tube assemblies (14) from two connectors (15) on hydraulic manifold (3). Remove and discard two O-rings (16) from two connectors (15).

(11) Remove two connectors (15) from hydraulic manifold (3). Remove and discard two O-rings (17) from two connectors (15).

(12) Plug two open ports on hydraulic manifold (3) and open ends of two tube assemblies (14).

(13) Disconnect tube assembly (18) from elbow (19) on hydraulic manifold (3). Remove and discard O-ring (20) from elbow (19).

(14) Remove elbow (19) from hydraulic manifold (3). Remove and discard O-ring (21) from elbow (19).

(15) Plug open port on hydraulic manifold (3) and open end of tube assembly (18).

(16) Disconnect tube assembly (22) from connector (23) on hydraulic manifold (3). Remove and discard O-ring (24) from connector (23).

(17) Remove connector (23) from hydraulic manifold (3). Remove and discard O-ring (25) from connector (23).

(18) Plug open port on hydraulic manifold (3) and open end of tube assembly (22).

(19) Disconnect tube assembly (26) from elbow (27) on hydraulic manifold (3). Remove and discard O-ring (28) from elbow (26).

(20) Remove elbow (26) from hydraulic manifold (3). Remove and discard O-ring (29) from elbow (27).

(21) Plug open port on hydraulic manifold (3) and open end of tube assembly (26).

(22) Disconnect tube assembly (30) from connector (31) on hydraulic manifold (3). Remove and discard O-ring (32) from connector (31).

(23) Remove connector (31) from hydraulic manifold (3). Remove and discard O-ring (33) from connector (31).

(24) Plug open port on hydraulic manifold (3) and open end of tube assembly (30).

WARNING

The hydraulic manifold is heavy. To prevent injury to personnel, two people are required to lift the hydraulic manifold.

(25) Remove four bolts (34), four lockwashers (35) and four flat washers (36) securing hydraulic manifold (3) and mounts (37) to ECU. Remove hydraulic manifold (3) from ECU. Discard four lockwashers (35).

b. Disassembly (Refer to Figure 3-23)

(1) Remove four screws (38) securing two mounts (37) to hydraulic manifold (3).

(2) Remove three plugs (39) from hydraulic manifold (3). Remove and discard three O-rings (40) from three plugs (39).

NOTE

Plug open ports on hydraulic manifold and open ends of tube assemblies to keep the hydraulic system free of contaminants.

(3) Plug three open ports on hydraulic manifold (3).

3.9.18 Hydraulic Manifold Replacement – Continued.

(4) Remove six plugs (41) from hydraulic manifold (3). Remove and discard six O-rings (42) from six plugs (41).

(5) Plug six open ports on hydraulic manifold (3).

(6) Remove eight plugs (43) from hydraulic manifold (3). Remove and discard eight O-rings (44) from eight plugs (43).

(7) Plug eight open ports on hydraulic manifold (3).

(8) Remove five plugs (45) from hydraulic manifold (3). Remove and discard five O-rings (46) from five plugs (45).

(9) Plug five open ports on hydraulic manifold (3).

(10) Unscrew valve CV4 (47) and remove from back of hydraulic manifold (3).

(11) Refer to para 2.14.4 for solenoid valve removal and para 2.14.5 for valve removal.

c. Assembly (Refer to Figure 3-23)

(1) Screw valve CV4 (47) into back of hydraulic manifold (3). Ensure that O-rings are seated properly and not pinched. Torque valve CV4 (46) to 25 ft-lb

(2) Check sealing surfaces on five plugs (45) for damage or material build up. If required, replace plugs (45) or clean any material build up with clean, lint-free cloth.

(3) Install five new O-rings (46) (Item 57, Appx E) on five plugs (45). Ensure five O-rings (46) are seated and retained properly.

(4) Lubricate five O-rings (46) with a light coating of hydraulic fluid.

(5) Unplug five ports on hydraulic manifold (3).

(6) Install five plugs (45) on hydraulic manifold (3). Torque five plugs (45) to 550 ± 10 in.-lb (46 ± 2 ft-lb).

(7) Check sealing surfaces on eight plugs (43) for damage or material build up. If required, replace plugs (43) or clean any material build up with clean, lint-free cloth.

(8) Install eight new O-rings (44) (Item 56, Appx E) on eight plugs (43). Ensure eight O-rings (44) are seated and retained properly.

(9) Lubricate eight O-rings (44) with a light coating of hydraulic fluid.

(10) Unplug eight ports on hydraulic manifold (3).

(11) Install eight plugs (43) on hydraulic manifold (3). Torque eight plugs (43) to 220 ± 10 in.-lb (18 ± 1 ft. lb.).

(12) Check sealing surfaces on six plugs (41) for damage or material build up. If required, replace plugs (41) or clean any material build up with clean, lint-free cloth.

(13) Install three new O-rings (42) (Item 66, Appx E) on three plugs (41). Ensure three O-rings (42) are seated and retained properly.

(14) Lubricate three O-rings (42) with a light coating of hydraulic fluid.

(15) Unplug three ports on hydraulic manifold (3).

(16) Install three plugs (41) on hydraulic manifold (3). Torque three plugs (41) to 135 ± 10 in.-lb (11 ± 1 ft. lb.).

(17) Check sealing surfaces on six plugs (39) for damage or material build up. If required, replace plugs (39) or clean any material build up with clean, lint-free cloth.

(18) Install six new O-rings (40) (Item 50, Appx E) on three plugs (39). Ensure six O-rings (40) are seated and retained properly.

(19) Lubricate six O-rings (40) with a light coating of hydraulic fluid.

(20) Unplug six ports on hydraulic manifold (3).

(21) Install six plugs (39) on hydraulic manifold (3). Torque six plugs (39) to 35 ± 5 in.-lb (3 ± 0.5 ft-lb).

(22) Secure two mounts (37) to hydraulic manifold (3) with four screws (38).

(23) Refer to para 2.14.4 for solenoid valve installation and para 2.14.5 for valve installation.

d. Installation (Refer to Figure 3-23)

WARNING

The hydraulic manifold is heavy. To prevent injury to personnel, two people are required to lift the hydraulic manifold.

(1) Secure hydraulic manifold (3) and mounts (37) to ECU with four bolts (34), four new lockwashers (35), and four flat washers (36).

(2) Unplug three ports on hydraulic manifold (3) and ends of three tube assemblies (1).

(3) Check sealing surfaces on three connectors (2) for damage or material build up. If required, replace connectors (2) or clean any material build up with clean, lint-free cloth.

(4) Install three new O-rings (5) (Item 58, Appx E) on three connectors (2). Ensure O-rings (5) are seated and retained properly.

(5) Lubricate three O-rings (5) with a light coating of hydraulic fluid.

(6) Install three connectors (2) on hydraulic manifold (3), finger tight.

(7) Torque three connectors (2) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

(8) Install three new O-rings (4) (Item 51, Appx E) on three connectors (2). Ensure O-rings (4) are seated and retained properly.

(9) Lubricate three O-rings (4) with a light coating of hydraulic fluid.

(10) Install three tube assemblies (1) on three connectors (2), finger tight.

(11) Torque three tube assemblies (1) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(12) Unplug five ports on hydraulic manifold (3) and ends of five tube assemblies (6).

(13) Check sealing surfaces on five elbows (7) for damage or material build up. If required, replace elbows (7) or clean any material build up with clean, lint-free cloth.

(14) Install five new O-rings (9) (Item 58, Appx E) on five elbows (7). Ensure O-rings (9) are seated and retained properly.

(15) Lubricate five O-rings (9) with a light coating of hydraulic fluid.

(16) Install five elbows (7) on hydraulic manifold (3), finger tight.

(17) Torque five elbows (7) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

(18) Install five new O-rings (8) (Item 51, Appx E) on five elbows (7). Ensure O-rings (8) are seated and retained properly.

(19) Lubricate five O-rings (8) with a light coating of hydraulic fluid.

(20) Install five tube assemblies (6) on five elbows (7), finger tight.

(21) Torque five tube assemblies (6) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(22) Unplug two ports on hydraulic manifold (3) and ends of two tube assemblies (10).

(23) Check sealing surfaces on two connectors (11) for damage or material build up. If required, replace connectors (11) or clean any material build up with clean, lint-free cloth.

3.9.18 Hydraulic Manifold Replacement – Continued.

(24) Install two new O-rings (13) (Item 57, Appx E) on two connectors (11). Ensure O-rings (13) are seated and retained properly.

(25) Lubricate two O-rings (13) with a light coating of hydraulic fluid.

(26) Install two connectors (11) on hydraulic manifold (3), finger tight.

(27) Torque two connectors (11) to 720 ± 25 in.-lb (60 ± 2 ft-lb).

(28) Install two new O-rings (12) (Item 63, Appx E) on two connectors (11). Ensure O-rings (12) are seated and retained properly.

(29) Lubricate two O-rings (12) with a light coating of hydraulic fluid.

(30) Install two tube assemblies (10) on two connectors (11), finger tight.

(31) Torque two tube assemblies (10) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(32) Unplug two ports on hydraulic manifold (3) and ends of two tube assemblies (14).

(33) Check sealing surfaces on two connectors (15) for damage or material build up. If required, replace connectors (15) or clean any material build up with clean, lint-free cloth.

(34) Install two new O-rings (17) (Item 60, Appx E) on two connectors (15). Ensure O-rings (17) are seated and retained properly.

(35) Lubricate two O-rings (17) with a light coating of hydraulic fluid.

(36) Install two connectors (15) on hydraulic manifold (3), finger tight.

(37) Torque two connectors (15) to 1,680 ± 75 in.-lb (140 ± 6 ft-lb).

(38) Install two new O-rings (16) (Item 51, Appx E) on two connectors (15). Ensure O-rings (16) are seated and retained properly.

(39) Lubricate two O-rings (16) with a light coating of hydraulic fluid.

(40) Install two tube assemblies (14) on two connectors (15), finger tight.

(41) Torque two tube assemblies (14) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(42) Unplug port on hydraulic manifold (3) and end of tube assembly (18).

(43) Check sealing surfaces on elbow (19) for damage or material build up. If required, replace elbow (19) or clean any material build up with clean, lint-free cloth.

(44) Install new O-ring (21) (Item 50, Appx E) on elbow (19). Ensure O-ring (21) is seated and retained properly.

(45) Lubricate O-ring (21) with a light coating of hydraulic fluid.

(46) Install elbow (19) on hydraulic manifold (3), finger tight.

(47) Torque elbow (19) to 720 ± 25 in.-lb (60 ± 2 ft-lb).

(48) Install new O-ring (20) (Item 63, Appx E) on elbow (19). Ensure O-ring (20) is seated and retained properly.

(49) Lubricate O-ring (19) with a light coating of hydraulic fluid.

(50) Install tube assembly (18) on elbow (19), finger tight.

(51) Torque tube assembly (18) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(52) Unplug port on hydraulic manifold (3) and end of tube assembly (22).

(53) Check sealing surfaces on connector (23) for damage or material build up. If required, replace connector (23) or clean any material build up with clean, lint-free cloth.

(54) Install new O-ring (25) (Item 50, Appx E) on connector (23). Ensure O-ring (25) is seated and retained properly.

(55) Lubricate O-ring (25) with a light coating of hydraulic fluid.

(56) Install connector (23) on hydraulic manifold (3), finger tight.

(57) Torque connector (23) to 190 ± 10 in.-lb (16 ± 1 ft-lb).

(58) Install new O-ring (24) (Item 61, Appx E) on connector (23). Ensure O-ring (24) is seated and retained properly.

(59) Lubricate O-ring (24) with a light coating of hydraulic fluid.

(60) Install tube assembly (22) on connector (23), finger tight.

(61) Torque tube assembly (22) to 220 ± 10 in.-lb (18 ± 1 ft-lb).

(62) Unplug port on hydraulic manifold (3) and end of tube assembly (26).

(63) Check sealing surfaces on elbow (27) for damage or material build up. If required, replace elbow (27) or clean any material build up with clean, lint-free cloth.

(64) Install new O-ring (29) (Item 50, Appx E) on elbow (27). Ensure O-ring (29) is seated and retained properly.

(65) Lubricate O-ring (29) with a light coating of hydraulic fluid.

(66) Install elbow (27) on hydraulic manifold (3), finger tight.

(67) Torque elbow (27) to 190 ± 10 in.-lb (16 ± 1 ft-lb).

(68) Install new O-ring (28) (Item 61, Appx E) on elbow (27). Ensure O-ring (28) is seated and retained properly.

(69) Lubricate O-ring (28) with a light coating of hydraulic fluid.

(70) Install tube assembly (26) on elbow (27), finger tight.

(71) Torque tube assembly (26) to 220 ± 10 in.-lb (18 ± 1 ft-lb).

(72) Unplug port on hydraulic manifold (3) and end of tube assembly (30).

(73) Check sealing surfaces on connector (31) for damage or material build up. If required, replace connector (31) or clean any material build up with clean, lint-free cloth.

(74) Install new O-ring (33) (Item 57, Appx E) on connector (31). Ensure O-ring (33) is seated and retained properly.

(75) Lubricate O-ring (33) with a light coating of hydraulic fluid.

(76) Install connector (31) on hydraulic manifold (3), finger tight.

(77) Torque connector (31) to 780 ± 25 in.-lb (60 ± 2 ft-lb).

(78) Install new O-ring (32) (Item 63, Appx E) on connector (31). Ensure O-ring (32) is seated and retained properly.

(79) Lubricate O-ring (32) with a light coating of hydraulic fluid.

(80) Install tube assembly (30) on connector (31), finger tight.

(81) Torque tube assembly (30) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

3.9.18 Hydraulic Manifold Replacement – Continued.

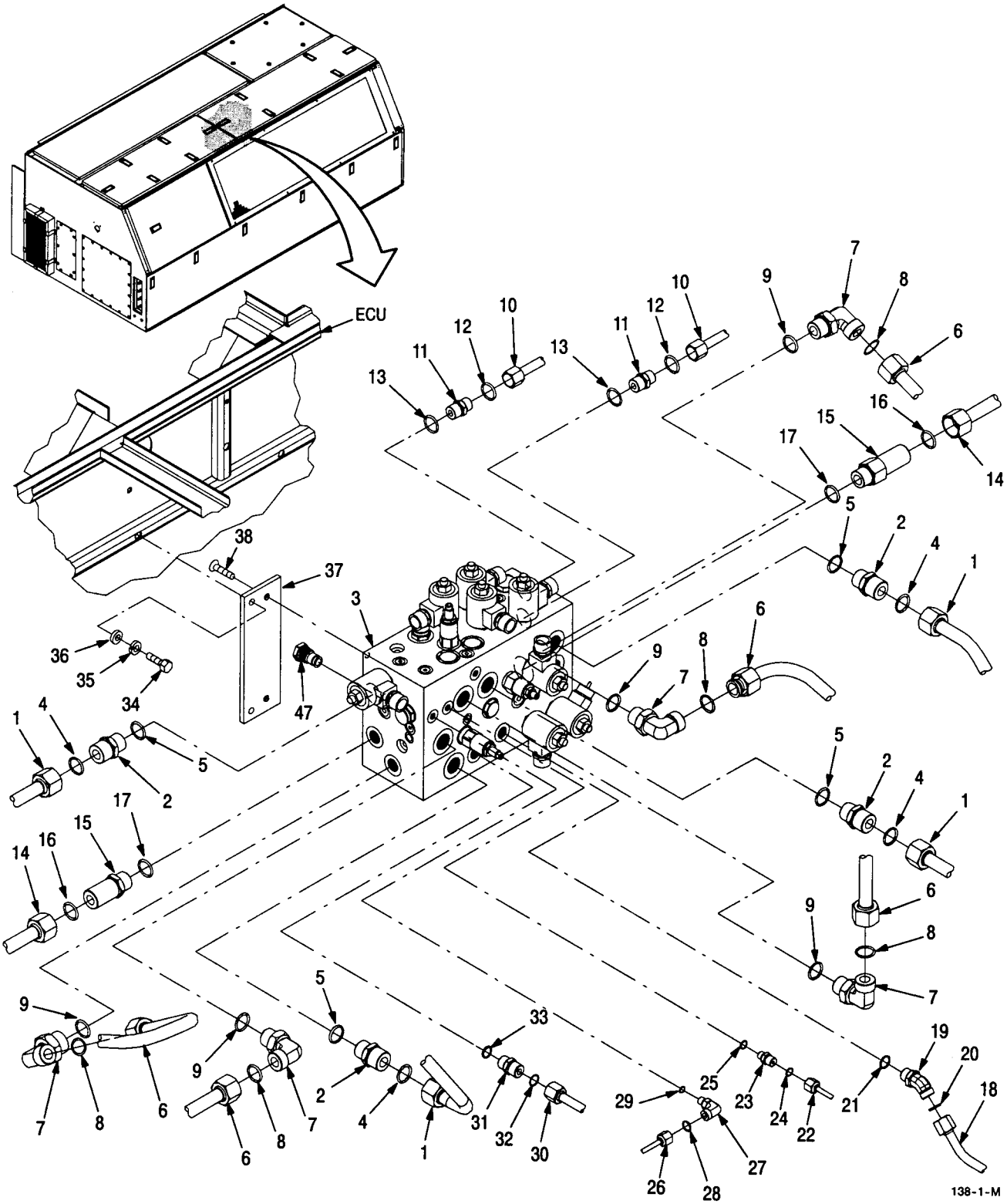

Figure 3-23. Hydraulic Manifold Replacement (Sheet 1 of 2)

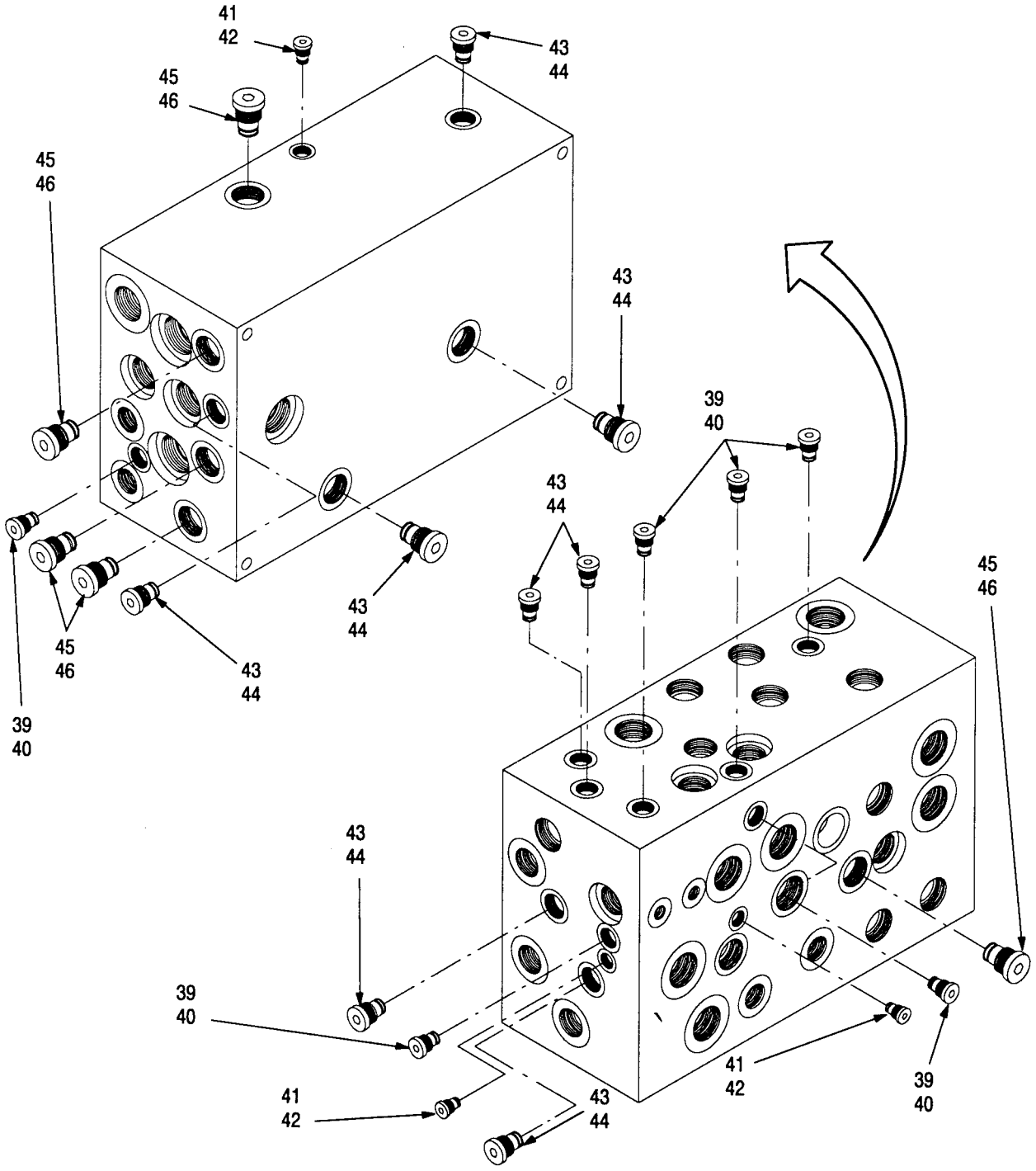

Figure 3-23. Hydraulic Manifold Replacement (Sheet 2 of 2)

Follow-on maintenance: Replace NBC filters and plenum per TM 10-5410-228-10. Fill hydraulic reservoir per para 2.14.3, apply system power and perform operational test. Check for leaks. Install or close ECU covers and doors per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

3.9.19 Hydraulic Reservoir Filter Replacement.

This task covers: a. Removal	b. Installation
INITIAL SETUP	
Materials/Parts:	Equipment Conditions: System power off. ECV parking brake set. ECU work platform installed (TM 10-5410-228-10).

a. Removal

(1) Release six latches (1) and remove front top passenger side ECU cover (2).

(2) Unscrew cap (3) on hydraulic reservoir filter assembly (4).

(3) Rotate filter element (5) counterclockwise and remove from hydraulic reservoir filter assembly (4). Discard filter element (5).

b. Installation

(1) Place new filter element (5) in hydraulic reservoir filter assembly (4).

(2) Rotate filter element (5) clockwise. Make sure filter element (5) is fully seated.

(3) Screw cap (3) onto hydraulic reservoir filter assembly (4).

(4) Install front top passenger side ECU cover (2) and engage six latches to secure (1).

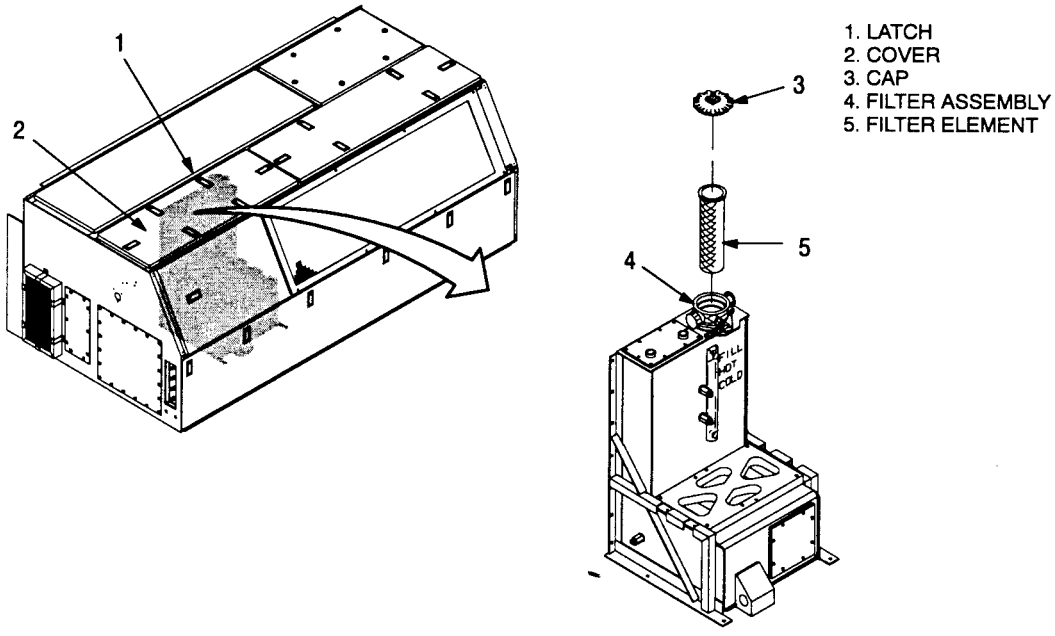

Figure 3-24. Hydraulic Reservoir Filter Replacement

3.9.20 Hydraulic Reservoir Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17 Appendix B)
13/16 Inch Crowfoot Wrench (Item 54, Appendix B)
1-5/16 Inch Crowfoot Wrench (Item 59, Appendix B)
1-3/8 Inch Crowfoot Wrench (Item 60, Appendix B)
1-5/8 Inch Crowfoot Wrench (Item 61, Appendix B)
1-11/16 Inch Crowfoot Wrench (Item 62, Appendix B)
1-7/8 Inch Crowfoot Wrench (Item 63, Appendix B)
Torque Wrench (Item 66, Appendix B)
Screwdriver, Rachet (Item 35, Appendix B)

Materials/Parts:
Drain Pan (Item 29, Appendix B)
Hydraulic Fluid (Item 24, Appendix C)
Wiping Rags (Item 39, Appendix C)
Hydraulic Sealant (Item 48, Appendix C)
Tape (Item 23, Appendix C)
Primer (Item 37, Appendix C)
Thread Locking Compound (Item 57, Appendix C)
Two Gaskets (Figure D-11, Appendix D)
Ten Lockwashers (Item 17, Appendix E)
Twenty-six Lockwashers (Item 18, Appendix E)
Six Lockwashers (Item 19, Appendix E)
Ten O-rings (Item 63, Appendix E)
O-ring (Item 51, Appendix E)

Equipment Conditions:
ECV engine off.
Power shut off. Power panel and rear control panel tagged.
ECU covers and doors opened or removed, as required (see para 2.14.1).
Hydraulic system drained (see para 2.14.3).
Hydraulic tubing/hoses removed (see para 3.9.11).
R22 refrigerant system recovered (see para 3.9.1).
Filter/drier removed (see para 3.9.13).
Compressor and motor removed (see para 3.9.15).
ECU work platform installed (see TM 10-5410-228-10).
NBC filters and plenum removed (see TM 10-5410-228-10)
NBC fan removed (see para 3.9.7).

Personnel Required: (2)

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
O-ring (Item 52, Appendix E)
O-ring (Item 59, Appendix E)
O-ring (Item 60, Appendix E)
Gasket (Item 3, Appendix E)
Seal (Item 85, Appendix E)
O-ring (Item 49, Appendix E)
Two Lockwashers (Item 32, Appendix E)
O-ring (Item 85, Appendix E)

WARNING

The hydraulic system is pressurized. To prevent injury to personnel, gloves and eye protection must be worn when working on hydraulic system.

NOTE

A small amount of hydraulic fluid will be released when removing tubes. Collect fluid in cup or small container and clean any spillage with rags.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard shop practices/procedures.

Plug open ports on hydraulic reservoir and open end of tube assemblies to keep hydraulic system free of contaminants.

a. Removal (Refer to Figure 3-25)

(1) Disconnect tube assembly (1) from connector (2) on hydraulic reservoir (3). Remove and discard O-ring (4) from connector (2).

3.9.20 Hydraulic Reservoir Replacement – Continued.

(2) Remove tube assembly (1) from ECU per para 3.9.11.

(3) Remove connector (2) from hydraulic reservoir (3) and plug openings. Remove and discard O-ring (5) from connector (2).

(4) Disconnect tube assembly (6) from elbow (7) on filter assembly (8) and plug openings. Remove and discard O-ring (9) from elbow (7).

(5) Remove elbow (7) from filter assembly (8) and plug opening. Remove and discard O-ring (10).

(6) Disconnect tube assemblies (11 and 12) from tee (13) on elbow (14) and plug openings. Remove and discard O-rings (15 and 16) from tee (13).

(7) Remove tee (13) from elbow (14) on hydraulic reservoir (3). Remove and discard O-ring (17) from elbow (14).

(8) Remove elbow (14) from hydraulic reservoir (3) and plug opening.

(9) Disconnect tube assembly (18) from elbow (19) on hydraulic reservoir (3) and plug openings. Remove and discard O-ring (20) from elbow (19).

(10) Remove elbow (19) from hydraulic reservoir (3) and plug opening.

(11) Tag and disconnect leads (21) from differential pressure switch (22) on filter assembly (8).

(12) Disconnect electrical connector (23) from thermal immersion switch (52) in hydraulic reservoir (3).

CAUTION

Ensure three electro-optical sensors are removed before removal of hydraulic reservoir from ECU enclosure. Electro-optical sensors may break off during removal of hydraulic reservoir.

(13) Tag and disconnect leads (24) on three electro-optical sensors (25) on hydraulic reservoir (3). Remove three electro-optical sensors (25) from hydraulic reservoir (3) and plug openings.

(14) Remove fourteen screws (26), fourteen lockwashers (27) and fourteen flat washers (28) securing hydraulic reservoir (3) to ECU enclosure. Discard fourteen lockwashers (27).

(15) Remove four screws (29), four lockwashers (30) and four flat washers (31) securing hydraulic reservoir (3) and four shims (32) to bottom of ECU enclosure. Discard four lockwashers (30).

WARNING

The reservoir assembly is heavy. To prevent injury to personnel, two people are required to remove or install it in ECU.

(16) Remove hydraulic reservoir (3) from ECU enclosure. Ensure electro-optical sensors (25) are removed before removing reservoir.

b. Disassembly (Refer to Figure 3-25)

(1) Remove differential pressure switch (22) from elbow (33).

(2) Remove elbow (33) from adapter (34).

(3) Remove adapter (34) from filter assembly (8) and plug opening. Remove and discard O-ring (35) from adapter (34).

(4) Remove two screws (36), two lockwashers (37) and two flat washers (38) securing filter assembly (8) and gasket (39) from hydraulic reservoir (3). Discard two lockwashers (37) and gasket (39).

(5) Place a protective cover over open hole in hydraulic reservoir (3).

(6) Disconnect return pipe (40) from filter assembly (8).

(7) Remove ten screws (41), ten lockwashers (42) and ten flat washers (43) securing tank top cover (44) and gasket (45) to hydraulic reservoir (3). Discard ten lockwashers (42) and gasket (45).

(8) Place a protective cover over open hole in hydraulic reservoir (3).

(9) Disconnect two return pipes (46) from tank top cover (44).

(10) Remove two nuts (47), two lockwashers (48), two hollow screws (49) and four O-rings (50) securing fluid level gage (51) to hydraulic reservoir (3). Discard two lockwashers (48) and four O-rings (50).

(11) Plug open holes in hydraulic reservoir (3).

(12) Remove thermal immersion switch (52) from hydraulic reservoir (3) and plug opening.

(13) Remove four screws (53), four lockwashers (54) and four flat washers (55) securing two bracket reinforcements (56) and mounting plate assembly (57) to hydraulic reservoir (3). Discard four lockwashers (54).

(14) Remove eight screws (58), eight lockwashers (59) and eight flat washers (60) securing cover plate (61) and gasket (62) to hydraulic reservoir (3). Discard eight lockwashers (59) and gasket (62).

(15) Place a protective cover over open hole in hydraulic reservoir (3).

c. Assembly (Refer to Figure 3-25)

NOTE

To avoid damage to hydraulic system, inside of hydraulic reservoir is to be free of all foreign materials. Remove plugs or protective covers from ports or openings in hydraulic reservoir just prior to installing components in hydraulic reservoir.

(1) Remove protective cover from hydraulic reservoir (3).

(2) Secure new gasket (62) and cover plate (61) to hydraulic reservoir (3) with eight screws (58), eight new lockwashers (59) (Item 18, Appx E) and eight flat washers (60). Torque screws (58) to 55 □ 5 in.-lb

(3) Secure two bracket reinforcements (56) and mounting plate assembly (57) to hydraulic reservoir (3) with four screws (53), four new lockwashers (54) (Item 19, Appx E) and four flat washers (55).

(4) Remove plugs from hydraulic reservoir (3).

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(5) Coat male threads on thermal immersion switch (52) with hydraulic sealant, and coat the mating female threads in the hydraulic reservoir (3) with primer. Thread the thermal immersion switch (52) into its mounting hole in hydraulic reservoir (3).

(6) Remove plugs from holes in hydraulic reservoir (3).

(7) Coat threads on two hollow screws (49) with thread locking compound.

(8) Secure fluid level gage (51) to reservoir (3) with two hollow screws (49), four new O-rings (50) (Item 49, Appx E), two new lockwashers (48) (Item 32, Appx E) and two nuts (47).

(9) Remove plugs from ports on tank top cover (44).

(10) Coat male screw threads on two return pipes (46) with hydraulic sealant, and coat mating female threads in tank top cover (44) with primer. Thread the two return pipes (46) into their mating holes on tank top cover (44).

3.9.20 Hydraulic Reservoir Replacement – Continued.

(11) Secure new gasket (45) and tank top cover (44) to hydraulic reservoir (3) with ten screws (41), ten new lockwashers (42) (Item 17, Appx E) and ten flat washers (43).

(12) Connect return pipe (40) to filter assembly (8).

(13) Remove protective cover from hydraulic reservoir (3).

(14) Position new gasket (39) on hydraulic reservoir (3).

(15) Secure filter assembly (8) to hydraulic reservoir (3) with two screws (36), two new lockwashers (37) (Item 19, Appx E) and two flat washers (38).

(16) Install new O-ring (35) (Item 85, Appx E) on adapter (34).

(17) Lubricate O-ring (35) with a light coating of hydraulic fluid.

(18) Remove plugs from ports on filter assembly (8).

(19) Coat male threads on adapter (34) with hydraulic sealant, and coat mating female threads in filter assembly (8) with primer.

(20) Install adapter (34) in filter assembly (8). Torque adapter (34) to two to three TFFT.

(21) Coat male threads on elbow (33) with hydraulic sealant, and coat mating female threads in adapter (34) with primer.

(22) Install elbow (33) in adapter (34). Torque elbow (33) to 2 to 3 TFFT. Adjust position of elbow (33) as necessary.

(23) Coat male threads of differential pressure switch (22) with hydraulic sealant, and coat the mating female threads in elbow (33) with primer.

(24) Install differential pressure switch (22) in elbow (33). Torque differential pressure switch to 2-3 TFFT.

d. Installation (Refer to Figure 3-25)

WARNING

The reservoir assembly is heavy. To prevent injury to personnel, two people are required to remove or install it in the ECU.

CAUTION

Install three electro-optical sensors on hydraulic reservoir after installing hydraulic reservoir inside ECU enclosure. Electro-optical sensors may break off during installation of hydraulic reservoir.

(1) Secure hydraulic reservoir (3) and four shims (32) to bottom of ECU enclosure with four screws (29), four new lockwashers (30) (Item 18, Appx E) and four flat washers (31).

(2) Secure hydraulic reservoir (3) to ECU enclosure with fourteen screws (26), fourteen new lockwashers (27) (Item 18, Appx E) and fourteen flat washers (28).

(3) Wrap male threads on three electro-optical sensors (25) with tape (Item 23, Appx C) and thread the three electro-optical sensors (25) into their mounting holes in the hydraulic reservoir (3). Torque sensors minimum 110 in.-lb (12.4 NM); maximum 120 in.-lb (13.5 NM).

(4) Connect leads (24) to three electro-optical sensors (25) on hydraulic reservoir (3). Remove tags from leads (24).

(5) Connect electrical connector (23) to thermal immersion switch (52) in hydraulic reservoir (3).

(6) Connect leads (21) to differential pressure switch (22). Remove tags from leads (21).

(7) Check elbow (19) sealing surfaces for damage or material build up. If required, replace elbow (19) or clean any material build up with clean, lint-free cloth.

(8) Remove plug from port on hydraulic reservoir (3).

(9) Coat male threads of elbow (19) with hydraulic sealant and coat the mating female threads on reservoir (3) with primer.

(10) Install elbow (19) on hydraulic reservoir (3). Torque elbow (19) to 2 to 3 TFFT.

(11) Install new O-ring (20) (Item 63, Appx E) on elbow (19). Ensure O-ring (20) is seated and retained properly.

(12) Lubricate O-ring (20) with a light coating of hydraulic fluid.

(13) Remove plug from end of tube assembly (18). Check tube assembly (18) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (18) per para 3.9.11.

(14) Connect tube assembly (18) to elbow (19) on hydraulic reservoir (3), finger tight. Adjust position of tube assembly (18) and elbow (19) as required.

(15) Torque tube assembly (18) on elbow (19) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(16) Check elbow (14) sealing surfaces for damage or material build up. If required, replace elbow (14) or clean any material build up with clean, lint-free cloth.

(17) Remove plug from port on hydraulic reservoir (3).

(18) Coat male threads of elbow (14) with hydraulic sealant and coat the mating female threads on reservoir (3) with primer.

(19) Install elbow (14) on hydraulic reservoir (3). Torque elbow (14) to 2 to 3 TFFT.

(20) Check tee (13) sealing surfaces for damage or material build up. If required, replace tee (13) or clean any material build up with clean, lint-free cloth.

(21) Install new O-ring (17) (Item 63, Appx E) on elbow (14). Ensure O-ring (17) is seated and retained properly.

(22) Lubricate O-ring (17) with a light coating of hydraulic fluid.

(23) Coat female threads of tee (13) with primer and coat mating male threads of elbow (14) with hydraulic sealant.

(24) Install tee (13) on elbow (14) finger tight.

(25) Install new O-rings (15 and 16) (Item 63, Appx E) on tee (13). Ensure O-rings (15 and 16) are seated and retained properly.

(26) Lubricate O-rings (15 and 16) with a light coating of hydraulic fluid.

(27) Remove two plugs from ends of tube assemblies (11 and 12). Check tube assemblies (11 and 12) sealing surfaces for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assemblies (11 and 12) per para 3.9.11.

(28) Coat male threads of tee (13) with hydraulic fluid.

(29) Connect tube assemblies (11 and 12) to tee (13), finger tight. Adjust position of tube assemblies (11 and 12), tee (13), and elbow (14) as required.

(30) Torque tee (13) on elbow (14) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(31) Torque tube assemblies (11 and 12) on tee (13) to 480 ± 25 in.-lb (40 ± 2 ft-lb).

(32) Check elbow (7) sealing surfaces for damage or material build up. If required, replace elbow (7) or clean any material build up with clean, lint-free cloth.

(33) Install new O-ring (10) (Item 59, Appx E) on elbow (7). Ensure O-ring (10) is seated and retained properly.

3.9.20 Hydraulic Reservoir Replacement – Continued.

(34) Lubricate O-ring (10) with a light coating of hydraulic fluid.

(35) Remove plug from port on filter assembly (8).

(36) Coat male threads of elbow (7) with hydraulic fluid.

(37) Install elbow (7) on filter assembly (8). Torque elbow (7) to 2,520 ± 100 in.-lb (210 ± 8 ft-lb).

(38) Install new O-ring (9) (Item 51, Appx E) on elbow (7). Ensure O-ring (9) is seated and retained properly.

(39) Lubricate O-ring (9) with a light coating of hydraulic fluid.

(40) Remove plug from end of tube assembly (6). Check tube assembly (6) for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (6) per para 3.9.11.

(41) Coat male threads of elbow (7) with hydraulic fluid.

(42) Connect tube assembly (6) to elbow (7), finger tight. Adjust position of tube assembly (6) and elbow (7) as required.

(43) Torque tube assembly (6) on elbow (7) to 1,080 ± 45 in.-lb (90 ± 4 ft-lb).

(44) Check connector (2) sealing surfaces for damage or material build up. If required, replace connector (2) or clean any material build up with clean, lint-free cloth.

(45) Install new O-ring (5) (Item 60, Appx E) on connector (2). Ensure O-ring (5) is seated and retained properly.

(46) Lubricate O-ring (5) with a light coating of hydraulic fluid.

(47) Remove plug from port on hydraulic reservoir (3).

(48) Coat male threads of connector (2) with hydraulic fluid.

(49) Install connector (2) on hydraulic reservoir (3). Torque connector (2) to 3,100 ± 150 in.-lb (260 ± 12 ft-lb).

(50) Install new O-ring (4) (Item 52, Appx E) on connector (2). Ensure O-ring (4) is seated and retained properly.

(51) Lubricate O-ring (4) with a light coating of hydraulic fluid.

(52) Remove plug from end of tube assembly (1). Check tube assembly (1) for damage or material build up. Clean any material build up with clean, lint-free cloth. If required, replace tube assembly (1) per para 3.9.11.

(53) Coat male threads of connector (2) with hydraulic fluid.

(54) Install tube assembly (1) in ECU per para 3.9.11.

(55) Connect tube assembly (1) to connector (2). Torque tube assembly (1) to 1,680 ± 90 in.-lb (140 ± 8 ft-lb).

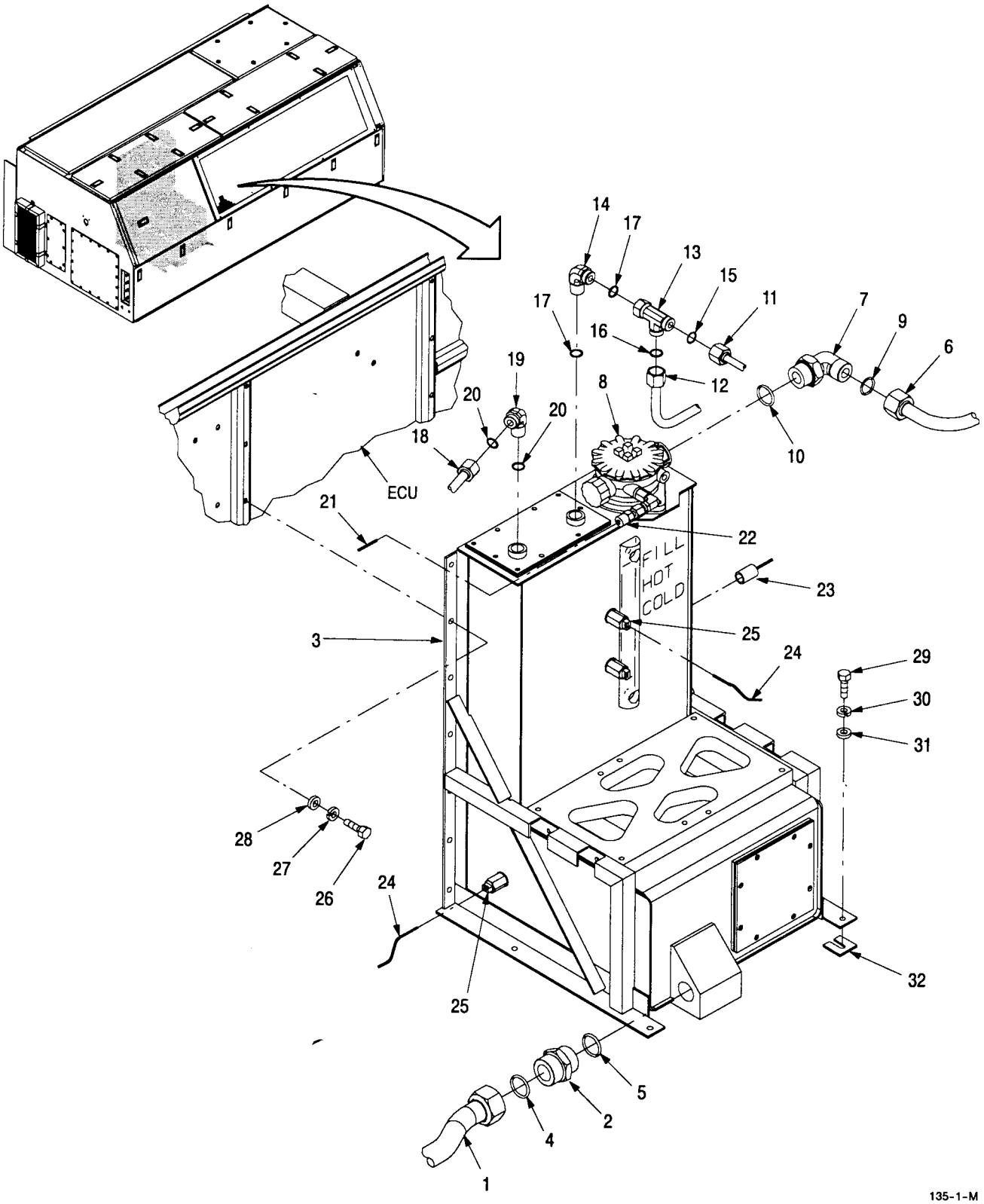

Figure 3-25. Hydraulic Reservoir Replacement (Sheet 1 of 2)

3.9.20 Hydraulic Reservoir Replacement – Continued.

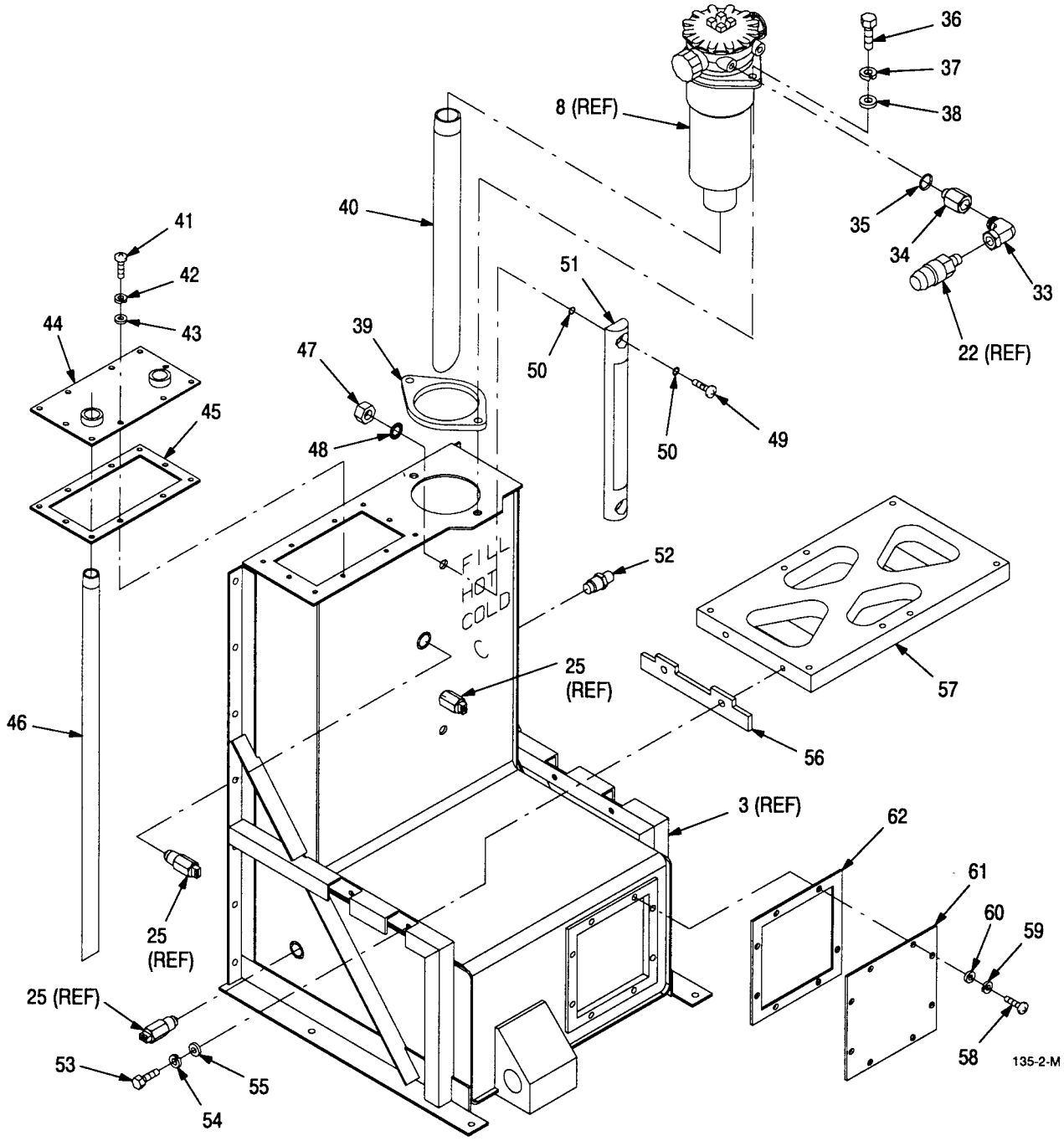

Figure 3-25. Hydraulic Reservoir Replacement (Sheet 2 of 2)

Follow-on maintenance: Replace filter/drier per para 3.9.13, install compressor and motor per para 3.9.15, install NBC filters and plenum per TM 10-5410-228-10, install NBC fan per para 3.9.7, service R22 refrigerant system and check for leaks per para 3.9.1, fill hydraulic reservoir per para 2.14.3, apply system power and perform operational test. Check for leaks. Install or close ECU covers and doors per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

3.9.21 ECU Replacement.

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Caulking Tool, Hand (Item 18, Appendix B)
Gloves (Item 16, Appendix B)
Goggles (Item 17, Appendix B)
Pallet Lifting Fork (Item 23, Appendix B)
Torque Wrench (Item 66, Appendix B)
Rachet Strap (Item 47, Appendix B)

Materials/Parts:
Drain Pan (Item 28, Appendix B)
Isopropyl Alcohol (Item 12, Appendix C)
Rubber Gloves (Item 25, Appendix C)
Wiping Rags (Item 39, Appendix C)
Sealer (Item 50, Appendix C)
Adhesive (Item 5, Appendix C)
Four Gaskets (Figure D-9, Appendix D)
Five Gaskets (Figure D-30, Appendix D)
Sixteen Lockwashers (Item 17, Appendix E)
Twenty-five Lockwashers (Item 20, Appendix E)
Sixty-four Lockwashers (Item 18, Appendix E)
Twenty-eight Lockwashers (Item 19, Appendix E)

Equipment Conditions:
System power off.
ECV parking brake set.
ECV Doors and mirrors removed.
Hose guards removed (see para 2.11.4).
ECV cab horizontal rails and bow assembly removed.
Hydraulic system drained (see para 2.14.3).
LMS screen removed (see para 2.13.15).
ABS inflation flex hose removed (see para 2.13.7).
Antenna mounts removed (see para 2.11.5).
ECU covers and doors opened or removed, as required (see para 2.14.1).
ECU work platform installed (see TM 10-5410-228-10).

References:
TM 10-5411-224-14-1
TM 9-2320-387-24-1 & -2

Personnel Required: (4)

WARNING

The ECU weighs approximately 1,100 pounds. Lifting equipment must have the capacity of lifting the ECU plus weight of any equipment attach to it. To prevent injury to personnel, rope off work area prior to removing ECU. Observe all safety practices for lifting to prevent injury to personnel.

a. Removal (Refer to Figure 3-26)

NOTE

Drain any excess hydraulic fluid from lines into container. Clean spillage with rags.

Remove mist eliminator to gain access to nut holding hose clamp.

(1) Tag and disconnect hoses and drain tubes from ECU. Cover and/or plug all hydraulic openings. Refer to paragraph 3.9.11.

(2) Disconnect connectors 1A4W2P2 and 1A4W6P1 and two hoses from ECU located behind forward light box assembly.

(3) Remove fourteen screws (1) securing boot mounting frame (2) to inside of LMS. Pull boot free of sealant.

(4) Remove six screws (3), six lockwashers (4) and six flat washers (5) securing two bracket segments (6) to sides of air outlet cutout on LMS. Discard six lockwashers (4).

(5) Remove ten screws (7), ten lockwashers (8) and ten flat washers (9) securing two bracket segments (10) to top and bottom of air outlet cutout on LMS. Discard ten lockwashers (8). Pull boot free of sealant.

3.9.21 ECU Replacement – Continued.

CAUTION

Exercise care when using pry bar. Damage to LMS skin could occur.

(6) Using a pry bar and a piece of 2X4 placed against LMS to prevent damage, pry apart LMS and cab support. Insert a block of wood approximately 1-1/2 inches wide. Do this on both sides.

(7) Remove sealant from screws heads and remove ten screws (11), ten lockwashers (12) and ten flat washers (13) securing ECU (14) to two angle mounts (15 and 16). Discard ten lockwashers (12).

(8) Remove five hinge pins securing ECV windshield.

(9) Remove eight screws and two brackets from bottom of windshield.

(10) Carefully place windshield on seat.

(11) Move lifting loop to front notch and attach pallet lifting fork to overhead lifting device.

(12) Carefully place forks under ECU with left tine placed 21 3/4 inches from left side of ECU. Right tine should be 23 inches from right side.

WARNING

Inspect straps for damage, frays, or cuts. Do not use tie down straps for lifting.

(13) Using safety strap, run strap around ECU and pallet lifting forks and tighten.

(14) Attach guide straps to sides from ECU.

(15) Lift ECU slightly to relieve weight from mountings.

(16) Remove twelve screws (17), twelve lockwashers (18) and twelve flat washers (19) securing passenger side and driver side of ECU (14) to LMS. Discard twelve lockwashers (18).

(17) Remove ten screws (20), ten lockwashers (21) and ten flat washers (22) securing passenger side and driver side of ECU (14) to LMS. Discard ten lockwashers (21).

(18) Remove fifteen screws (23), fifteen lockwashers (24) and fifteen flat washers (25) securing mount plate (26) to ECU (14). Discard fifteen lockwashers (24).

CAUTION

To prevent damage to equipment, verify that all (ABS inflation and hydraulic) tubes, hoses and electrical connectors are removed or disconnected prior to removing ECU.

Exercise care when prying ECU from LMS. Damage to LMS skin could occur.

(19) Using a pry bar on LMS corner lifting plates, pry ECU slightly away from LMS.

(20) Position a safety strap around pallet lifting fork from front to back of ECU and tighten.

(21) Lift and remove ECU (14). Place ECU on suitable surface that will allow three inches of clearance for hoses attach to bottom of ECU.

b. Disassembly (Refer to Figure 3-26)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

(1) Remove twelve screws (27), twelve lockwashers (28), and twelve flat washers (29) securing boot mounting frame (30) and outlet air boot (31) to ECU (14). Discard twelve lockwashers (28). Pull boot free of sealant

(2) Remove twenty-two screws (32) securing boot mounting frame (33) and inlet air boot (34) to ECU (14). Pull boot free of sealant.

(3) Remove four gaskets (35) from LMS. Discard four gaskets (35).

(4) Remove gasket (36) from mounting plate (26). Discard gasket (36).

(5) Remove two gaskets (37) from angle mounts (15 and 16). Discard gaskets (37).

(6) Remove two gaskets (38) from sides of ECU. Discard gaskets (38).

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(7) Remove adhesive residue from areas that gaskets were installed using rag dampened with isopropyl alcohol.

c. Assembly (Refer to Figure 3-26)

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

(1) Install two new gaskets (38) (Figure D-30, Appx D) to sides of ECU with adhesive (Item 5, Appx C). Cut gaskets to length.

(2) Install two new gaskets (37) (Figure D-30, Appx D) to angle mounts (15 and 16) with adhesive (Item 5, Appx C). Cut gaskets to length.

(3) Install new gasket (36) (Figure D-30, Appx D) to mounting plate (26) with adhesive (Item 5, Appx C).

(4) Install four new gaskets (35) (Figure D-9, Appx D) onto LMS with adhesive (Item 5, Appx C).

(5) Secure boot mounting frame (33) and inlet air boot (34) to ECU (14) with twenty-two screws (32). Ensure that inlet air boot (34) flange is laying flat between boot mounting frame (33) and ECU (14). Torque screws (32) to 50 in.-lb.

(6) Secure boot mounting frame (30) and outlet air boot (31) to ECU (14) with twelve screws (27), twelve new lockwashers (28) (Item 18, Appx E) and twelve flat washers (29). Ensure outlet air boot (31) flange is laying flat between boot mounting frame (30) and ECU (14). Torque screws (27) to 50 in.-lb.

3.9.21 ECU Replacement – Continued.

NOTE

Record in ECV log book the date when boots are replaced.

d. Installation (Refer to Figure 3-26)

WARNING

The ECU weighs approximately 1,100 pounds. Use proper lifting equipment and observe all safety practices for lifting to prevent injury to personnel.

NOTE

Support ECU with pallet lifting fork until steps 1 through 5 have been accomplished.

(1) Lift and position ECU (14) to LMS. Ensure that outlet air boot (31) and inlet air boot (34) are positioned correctly in the LMS outlet and inlet cutouts.

(2) Remove safety strap around ECU and pallet lifting fork.

(3) Place a long strap and rachet around front of ECU and attached to lifting ring on rear of LMS, compress gaskets to line up holes.

(4) Secure mounting plate (26) to ECU (14) with fifteen screws (23), fifteen new lockwashers (24) (Item 18, Appx E) and fifteen flat washers (25). Torque screws (23) to 50 in.-lb.

(5) Secure passenger and driver side of ECU (14) to LMS with ten screws (20), ten new lockwashers (21) (Item 19, Appx E) and ten flat washers (22). Torque screws (20) to 50 in.-lb.

(6) Secure passenger and driver side of ECU (14) to LMS with twelve screws (17), twelve new lockwashers (18) (Item 18, Appx E) and twelve flat washers (19). Torque screws (17) to 50 in.-lb.

(7) Remove pallet lifting fork.

(8) Position ECV windshield and install five hinge pins.

(9) Secure two brackets to windshield with eight screws.

(10) Secure ECU (14) to two angle mounts (15 and 16) with ten screws (11), ten new lockwashers (12) (Item 20, Appx E) and ten flat washers (13). Torque screws (11) to 80 in.-lb.

WARNING

Wear gloves when working with sealers. Use in well ventilated area. Avoid prolonged contact with skin.

(11) Apply sealer around the entire perimeter of mount plate (26), side plates of ECU, angle mounts (15 and 16) and screw heads.

(12) Secure two bracket segments (10) to top and bottom of air outlet cutout on LMS with ten screws (7), ten new lockwashers (8) (Item 17, Appx E) and ten flat washers (9). Torque screws (7) to 25 in.-lb.

(13) Secure two bracket segments (6) to sides of air outlet cutout on LMS with six screws (3), six new lockwashers (4) (Item 17, Appx E) and six flat washers (5). Torque screws (3) to 25 in.-lb.

(14) Secure boot mounting frame (2) to inside of LMS with fourteen screws (1). Torque screws (1) to 50 in.-lb.

(15) Connect hoses, tubes and electrical connectors. Remove tags.

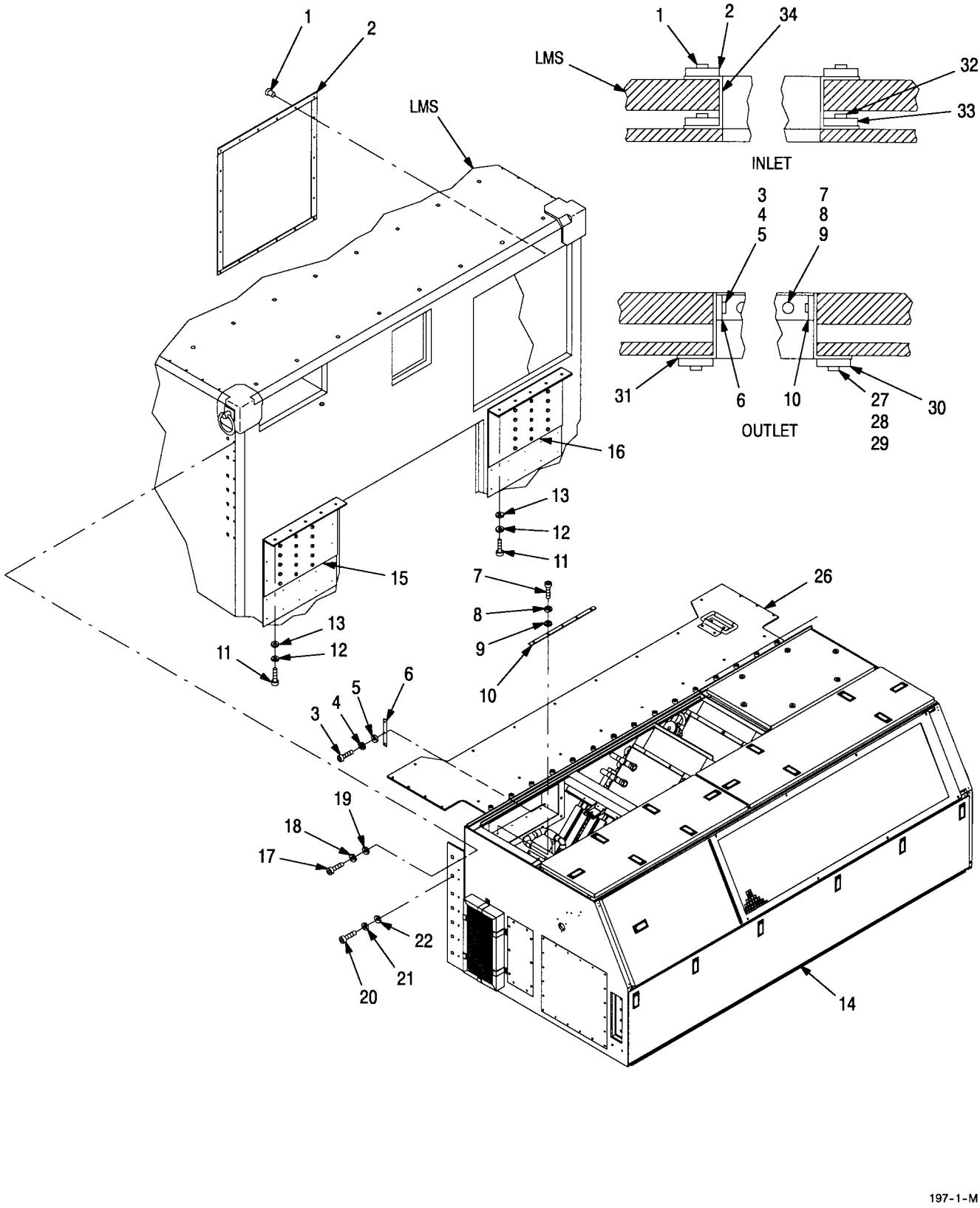

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Figure 3-26. ECU Replacement (Sheet 1 of 3)

3.9.21 ECU Replacement – Continued.

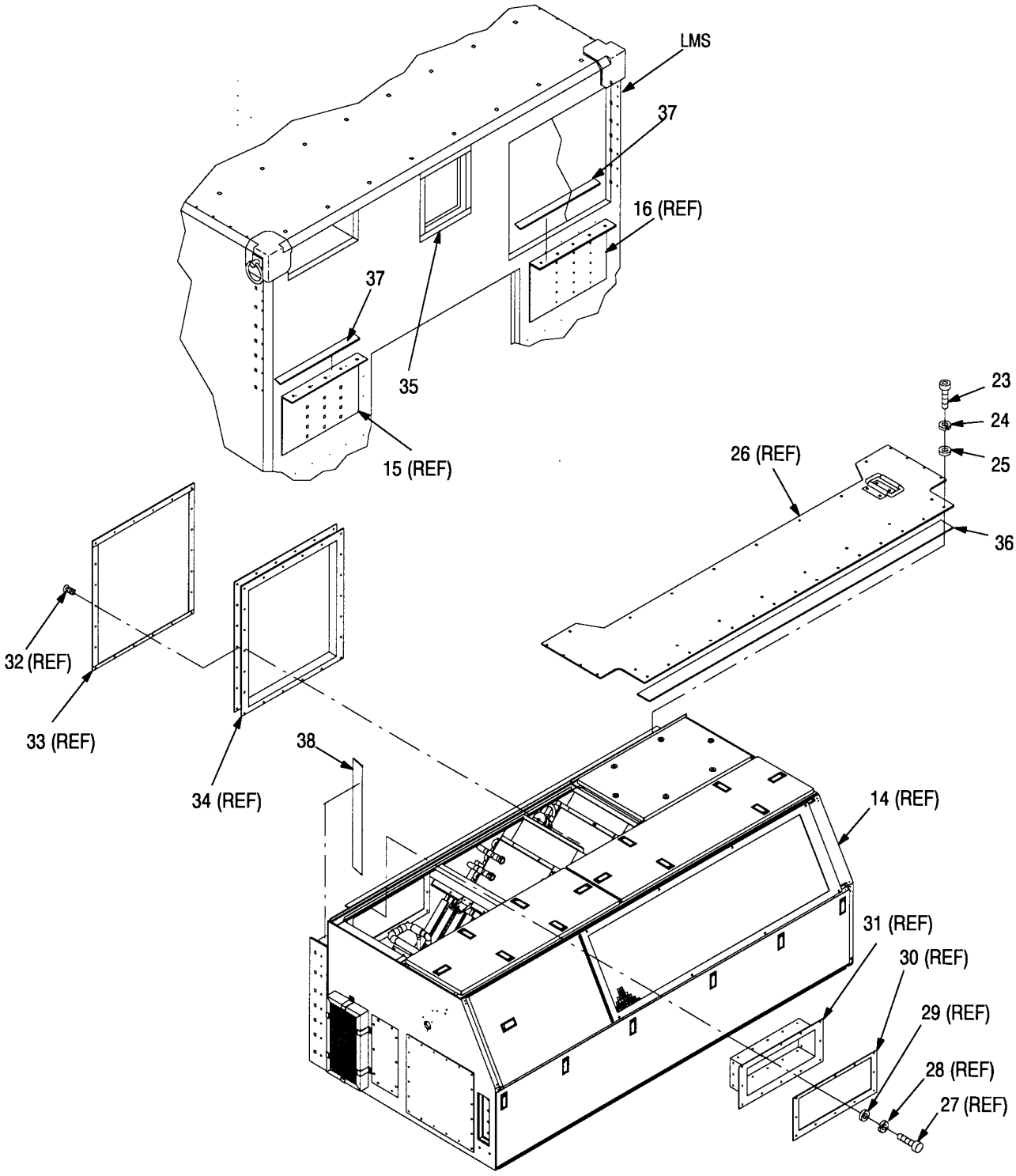


Figure 3-26. ECU Replacement (Sheet 2 of 3)

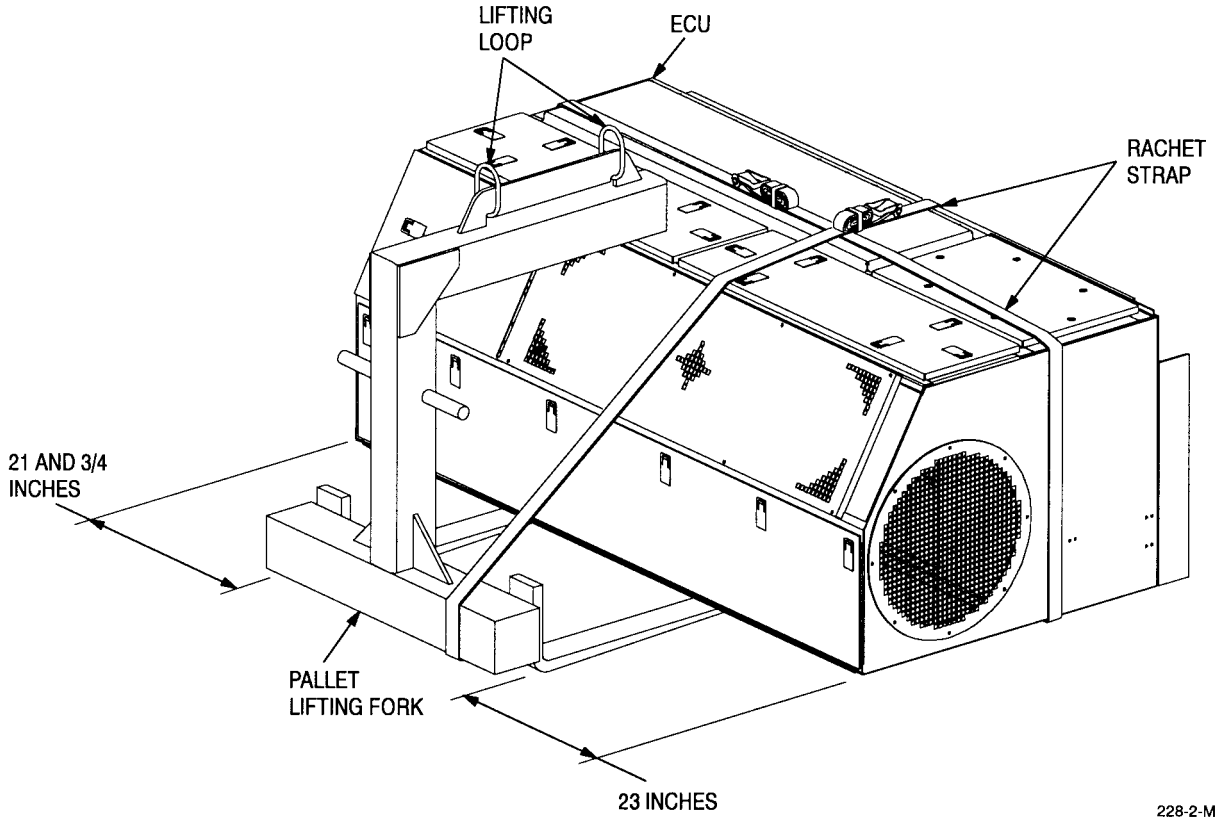


Figure 3-26. ECU Replacement (Sheet 3 of 3)

Follow-on maintenance: Install ABS inflation flex hose per para 2.13.7, install LMS guard per para 2.13.15, install antenna mount per para 2.11.5, install ducting components per para 3.8.1 and fill hydraulic reservoir per para 2.14.3. Apply system power and perform operational test. Check for leaks. Install or close ECU covers and doors per para 2.14.1.

3.9.22 ECU Drain Replacement.

This task covers:	
a. Removal	b. Installation
INITIAL SETUP	
Tools/Test Equipment:	Equipment Conditions:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)	Power shutoff. Power panel and rear control panel tagged.
	ECU covers and doors opened or removed (see para 2.14.1).
Materials/Parts:	LMS guard removed (see para 2.13.15).
Drain Pan (Item 28, Appendix B)	Heater element assembly removed (see para 3.9.6).
Wiping Rags (Item 39, Appendix C)	Heater coil removed (see para 3.9.8).
Drain Tubing (Figure D-5, Appendix D)	ECU sound guard removed (see para 3.9.2).
PVC hose (Figure D-28, Appendix D)	ECU work platform installed (reference TM 10-5410-228-10).
PVC hose (Figure D-29, Appendix D)	ECU mist eliminator removed (see para 2.14.1).
Four Lockwashers (Item 20, Appendix E)	
Tie-down strap (Item 86, Appendix E)	References:
	TM 10-5410-228-10

NOTE

ECU has two drain systems: hydraulic fluid overflow drain system and water condensation drain system.

3.9.22.1 Hydraulic Fluid Overflow Drain System.

NOTE

A small amount of hydraulic fluid will be released when removing tubes or hoses. Collect fluid in cup or small container and clean any spillage with rags.

Cover or plug all tube and hose openings immediately after disconnecting to prevent contamination.

a. Removal (Refer to Figure 3-27)

(1) Empty hydraulic overflow container (1) by opening ball valve (2) and draining fluid into an appropriate container.

(2) Remove PVC hose (3) from hose barb (4) by loosening hose clamp (5) and sliding PVC hose (3) off hose barb (4).

(3) Remove hose barb (4) from ball valve (2).

(4) Remove ball valve (2) from hydraulic overflow container (1).

(5) Remove PVC hose (6) from hydraulic overflow container (1) by loosening hose clamp (7) and sliding PVC hose (6) off hydraulic overflow container (1).

(6) Remove PVC hose (8) by cutting strap (9) and loosening two hose clamps (10) on both ends of hose (8) and sliding PVC hose (8) off its connections.

(7) Remove PVC hose (11) from drain port under driver side of ECU by loosening hose clamp (12) and sliding PVC hose (11) off drain port.

(8) Remove PVC hose (11) by loosening hose clamp (12) on other end of PVC hose (11) and sliding PVC hose (11) off its connection.

(9) Remove PVC hose (13) from drain port under passenger side of ECU by loosening hose clamp (14) and sliding the PVC hose (13) off the drain port.

(10) Remove PVC hose (13) by loosening hose clamp (14) on other end of PVC hose (13) and sliding PVC hose (13) off its connection.

(11) Remove two cushion clamps (15) on aluminum tubing tee (16) and remove aluminum tubing tee (16).

(12) Remove four screws (17), four lockwashers (18) and four flat washers (19) securing hydraulic overflow container (1) to front, lower, driver side corner casting of LMS. Discard four lockwashers (18).

b. Installation (Refer to Figure 3-27)

(1) Secure hydraulic overflow container (1) to front, lower, driver side corner casting of LMS with four screws (17), four new lockwashers (18) (Item 20, Appx E) and four flat washers (19).

(2) Install ball valve (2) in hydraulic overflow container (1).

(3) Install hose barb (4) in ball valve (2).

(4) Connect PVC hose (3) on hose barb (4) with hose clamp (5).

(5) Connect PVC hose (13) to drain port under passenger side of ECU with hose clamp (14).

(6) Connect PVC hose (11) to drain port under driver side of ECU with hose clamp (12).

(7) Connect aluminum tubing tee (16) to PVC hose (11) and (13) with hose clamps (12 and 14) on either end.

(8) Install two cushion clamps (15) on aluminum tubing tee (16).

(9) Connect PVC hose (8) between the aluminum tubing tee (16) and hydraulic overflow container (1) with hose clamps (10) on both ends and a strap (9).

(10) Connect PVC hose (6) to hydraulic overflow container (1) with hose clamp (7).

3.9.22.2 Water Condensation Drain System.

a. Removal (Refer to Figure 3-27)

NOTE

ECU front door must be opened to gain access to PVC tubing.

(1) Remove PVC hose (20) from drip pan inside, front, driver side of ECU by loosening two hose clamps (21) on both ends of PVC hose (20) and sliding PVC hose (20) off its connections.

(2) Remove two cushion clamps (22) on PVC hose (23).

(3) Remove PVC hose (23) from drain port, under, front, driver side of ECU by loosening hose clamp (24) and sliding PVC hose (23) off the drain port.

(4) Remove cushion clamp (25) on PVC hose (26) and (27).

NOTE

ECU front cover must be opened, and ECU passenger side access cover, prefilter cover, and mist eliminator must be removed to gain access to PVC hose.

(5) Remove PVC hose (26) from drip pan inside front passenger side of ECU by loosening hose clamp (28) and sliding PVC hose (26) off its connection.

(6) Remove drain tubing (29) from PVC hose (26) by loosening hose clamp (30) and sliding drain tubing (29) off PVC hose (26).

NOTE

ECU mist eliminator must be removed to gain access to PVC hose.

(7) Remove PVC hose (27) from drain port inside rear passenger side of ECU by loosening hose clamp (31) and sliding PVC hose (27) off drain port.

3.9.22 ECU Drain Replacement – Continued.

NOTE

The ECU heater element assembly and heater coil must be removed to gain access to PVC hose.

(8) Remove PVC hose (32) from inside, rear of ECU by loosening two hose clamps (33) on both ends of PVC hose (32) and sliding PVC hose (32) off its connection.

NOTE

ECU return air opening grill and sound guard must be removed to gain access to PVC hose.

(9) Remove PVC hose (34) from inside, rear, driver side of ECU by loosening two hose clamps (35) on both ends of PVC hose (34) and sliding PVC hose (34) off its connections.

(10) Remove two cushion clamps (36) on PVC hose (37).

(11) Remove drain tubing (38) from PVC hose (37) by loosening hose clamp (39) and sliding drain tubing (38) off PVC hose (37).

(12) Remove PVC hose (37) from drain port under rear driver side of ECU by loosening hose clamp (40) and sliding PVC hose (37) off drain port.

b. Installation (Refer to Figure 3-27)

(1) Connect PVC hose (37) to drain port under rear driver side of ECU with hose clamp (40).

(2) Connect drain tubing (38) to PVC hose (37) with hose clamp (39).

(3) Install two cushion clamps (36) on PVC hose (37).

NOTE

ECU return air opening grill and sound guard must be removed to gain access to PVC hose.

(4) Connect PVC hose (34) to its drain port connections inside rear driver side of ECU with two hose clamps (35) on both ends.

NOTE

ECU heater element assembly and heater coil must be removed to gain access to PVC hose.

(5) Connect PVC hose (32) to its drain port connections inside rear of ECU with two hose clamps (33) on both ends.

NOTE

ECU mist eliminator must be removed to gain access to PVC hose.

(6) Connect PVC hose (26) to its drain port inside rear passenger side of ECU with hose clamp (28).

(7) Connect drain tubing (29) to PVC hose (26) with hose clamp (30).

NOTE

ECU front door must be opened and ECU passenger side access cover, prefilter cover, and mist eliminator must be removed to gain access to PVC hose.

(8) Connect PVC hose (27) to drip pan inside front passenger side of ECU with hose clamp (31).

(9) Install cushion clamp (25) on PVC hose (26) and (27).

(10) Connect PVC hose (23) to drain port under front driver side of ECU with hose clamp (24).

(11) Install two cushion clamps (22) on PVC hose (23).

NOTE

ECU front door must be opened to gain access to PVC hose.

(12) Connect PVC hose (20) to drip pan inside front driver side of ECU with two hose clamps (21) on both ends.

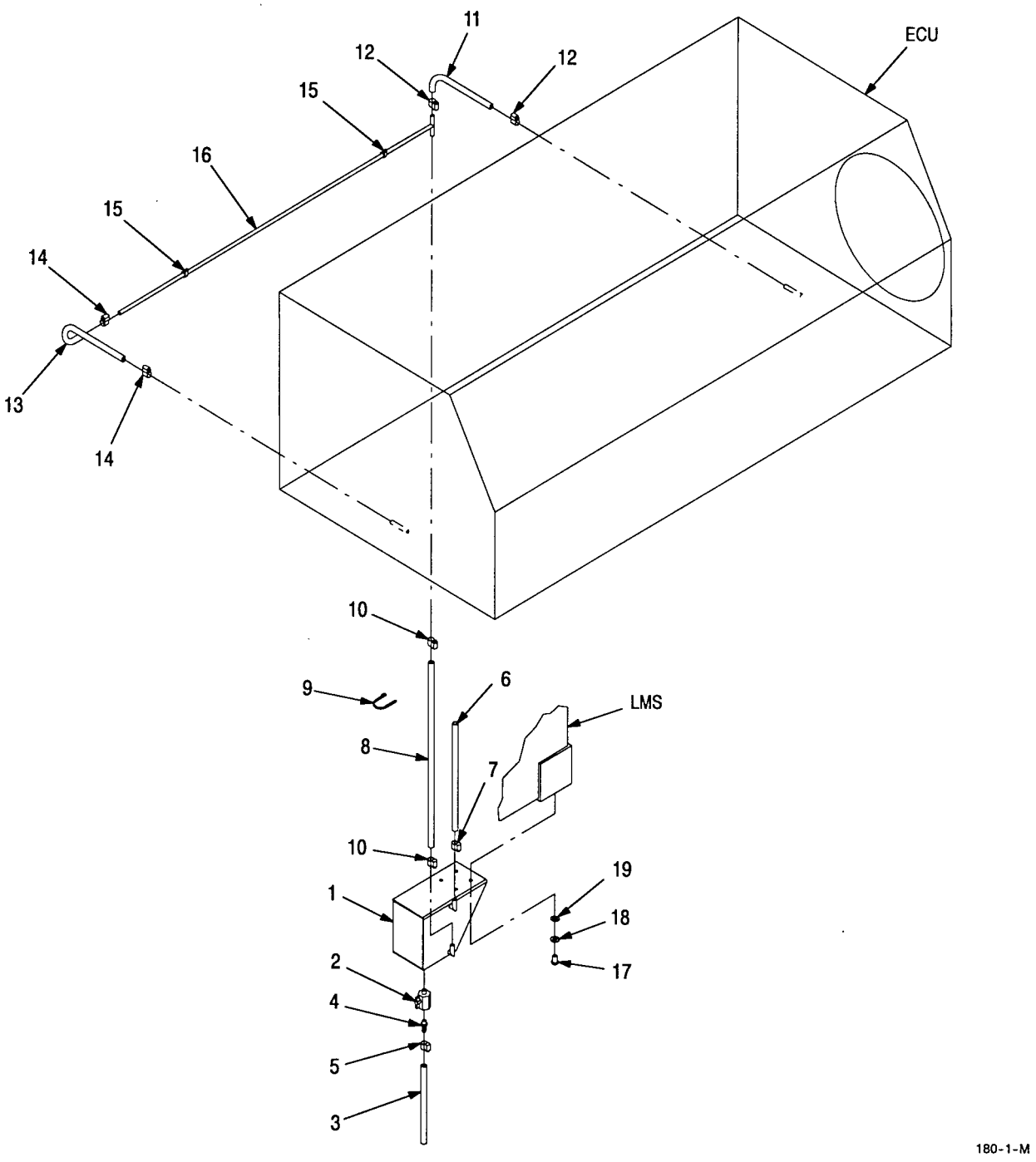


Figure 3-27. ECU Drain Replacement (Sheet 1 of 2)

3.9.22 ECU Drain Replacement – Continued.

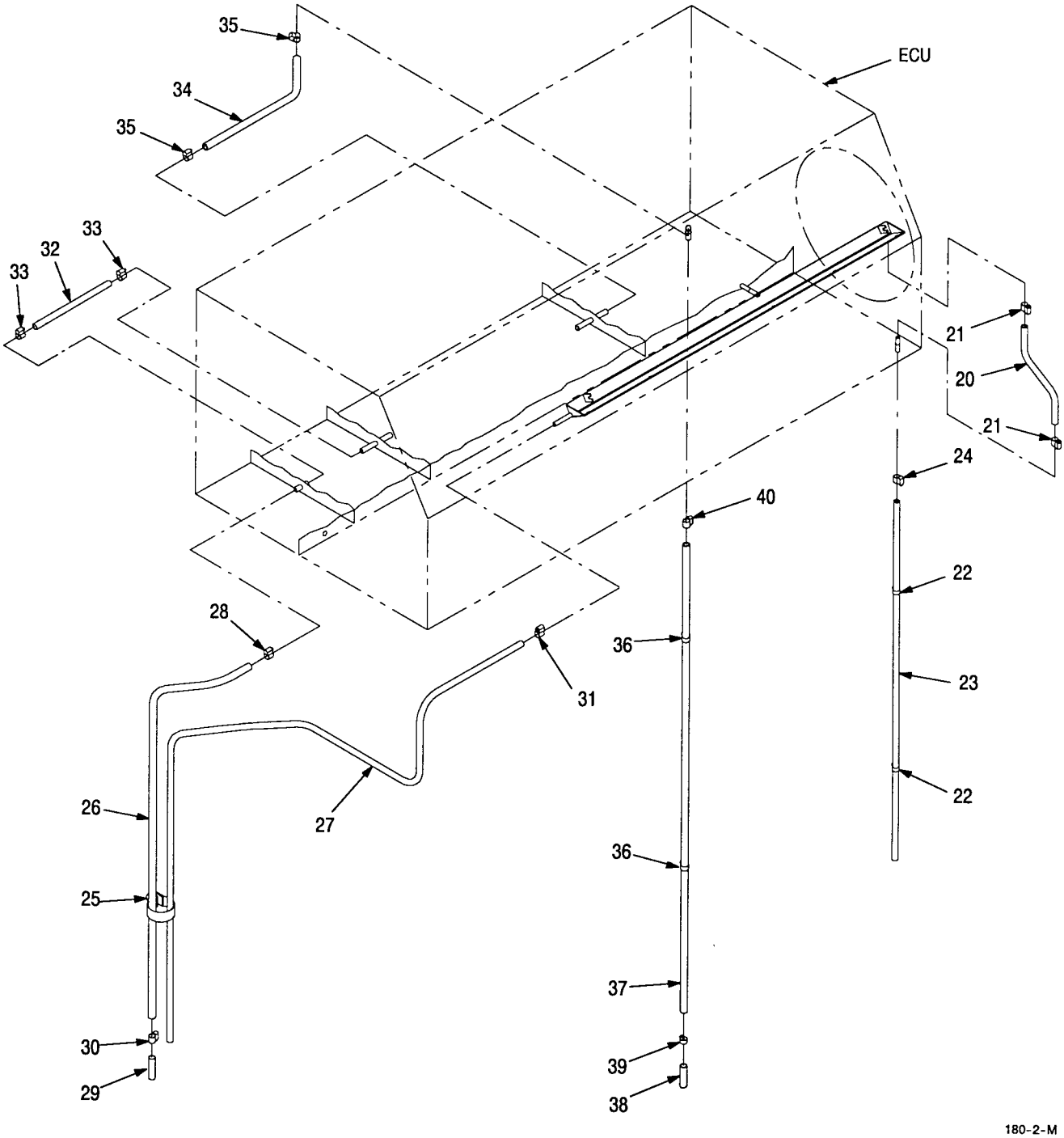


Figure 3-27. ECU Drain Replacement (Sheet 2 of 2)

Follow-on maintenance: Install heater element assembly per para 3.9.6, install heater coil per para 3.9.8, install ECU sound guard per para 3.9.2, install LMS guard per para 2.13.15, install mist eliminator per para 2.14.1, install or close ECU covers and doors per para 2.14.1, remove ECU work platform (reference TM 10-5410-228-10).

3.10 AIR BEAM SHELTER (ABS).

3.10.1 ABS and Door Fabric Repair.

This task covers:
a. Tears, Holes, Worn Areas
b. Rivet or Grommet Rips
c. Buckles, Fasteners, and Webbing

INITIAL SETUP

Tools/Test Equipment:
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Sewing Machine (Item 37, Appendix B)
Electric Sealing Iron (Item 36, Appendix B)
ABS Repair Kit (see TM 10-5410-228-10)

Equipment Conditions:
ABS deflated, detached from LMS (see para 2.13.3).

Materials/Parts:
Marking Chalk (Item 16, Appendix C)
Blind Rivet (Item 82, Appendix E)

References:
TM 10-5410-228-10

NOTE

Major tears and holes should be repaired using a sewing machine. Small hand sewn repairs should be permanently repaired as soon as possible.

No attempt has been made to identify all fabric repair procedures. Procedures provided herein are representative in nature. Repair materials can be found in the ABS repair kit.

a. Tears, Holes, Worn Areas of Travel Covers and Insulated Liner Only (Refer to Figure 3-28) (for repairs to ABS fabric, reference TM 10-5410-228-10).

(1) Measure damaged area.

(2) Cut patch from matching fabric making sure that the patch is large enough to extend 2-3/4 inches beyond damaged area (1) on all four sides.

(3) Fold patch in half lengthwise (2) and crease fold.

(4) Unfold patch and fold top left-hand corner (3) to crease in center.

(5) Fold right-hand corner (4) to crease in center aligning right corner with left corner.

(6) Fold inside corner (5) of each triangle to edge of outside fold.

(7) Patch should look like (6). Crease folds in place.

(8) Cut off top fold (7) from patch (6).

(9) Turn patch face up and draw chalk line 3/4 inch from edges of patch (8).

(10) Turn patch over and fold edges along chalk lines inward. Crease fold.

NOTE

Use single needle industrial sewing machine with compound feed and high-lift alternating pressure to sew fabric.

Slanted edges of patch should point towards direction of water run off.

(11) Place fabric and patch on sewing machine and sew patch by stitching a seam 1/8 inch from the folded edges (9). Tack first seam by stitching over first stitches by at least 1 inch.

(12) Sew second seam 3/8 inch to 1/2 inch inside the first seam. Tack second seam by stitching over first stitches by at least 1 inch.

(13) Cut out damaged area on inside of fabric to within 1/8 inch of second seam.

3.10.1 ABS and Door Fabric Repair – Continued.

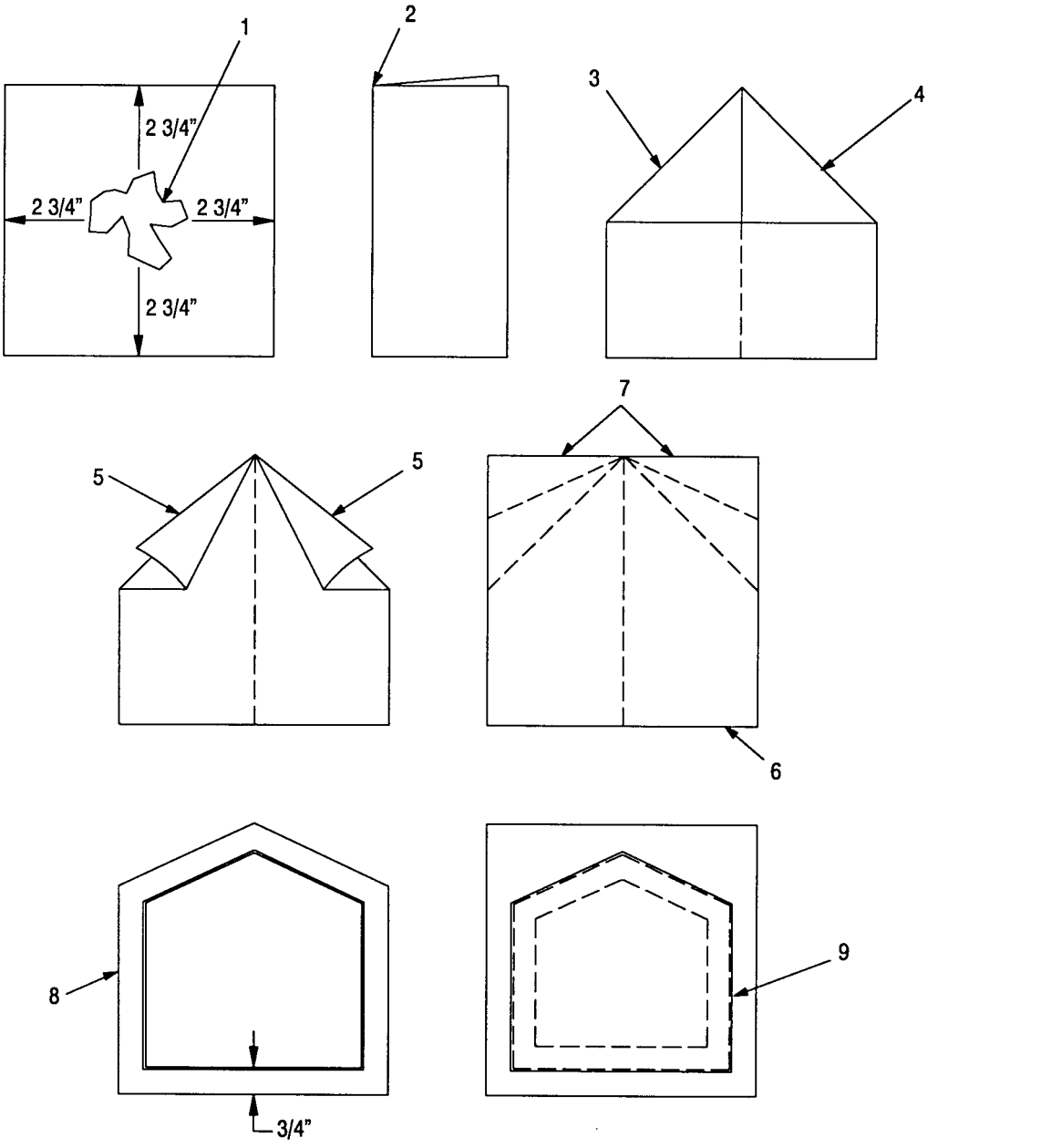


Figure 3-28. ABS and Door Fabric Repair (Sheet 1 of 3)

b. Rivet or Grommet Rips in Travel Covers and Insulated Liner Only (Refer to Figure 3-28) (for repairs to ABS fabric, reference TM 10-5410-228-10).

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

NOTE

Rivet rips are tears in the fabric caused by the fabric ripping away from the attaching hardware.

Twist drill size is determined by size of pop rivet used.

(1) Drill out rivet or cut out grommet.

(2) Measure length of damaged area and cut patch large enough to cover damage on top side and underside and to extend 2-3/4 inches beyond damage on each side.

(3) Turn patch (10) face up and draw a line 3/4 inches from edges on all sides of patch.

(4) Fold edges along chalk line and crease edges (11).

(5) Fold patch (10) in half.

(6) Overlap damaged fabric (12) using folded patch (10) and place fabric (12) and patch (10) on sewing table.

NOTE

When sewing patch, be sure to sew through all layers of material.

(7) Sew patch (10) in place by stitching seam (13) around patch (10) 1/8 inch from all edges. Tack seam (13) by sewing over first stitches by at least 1 inch.

(8) Install new rivet or grommet.

(9) Seal stitches with film tape (reference TM 10-5410-228-10).

3.10.1 ABS and Door Fabric Repair – Continued.

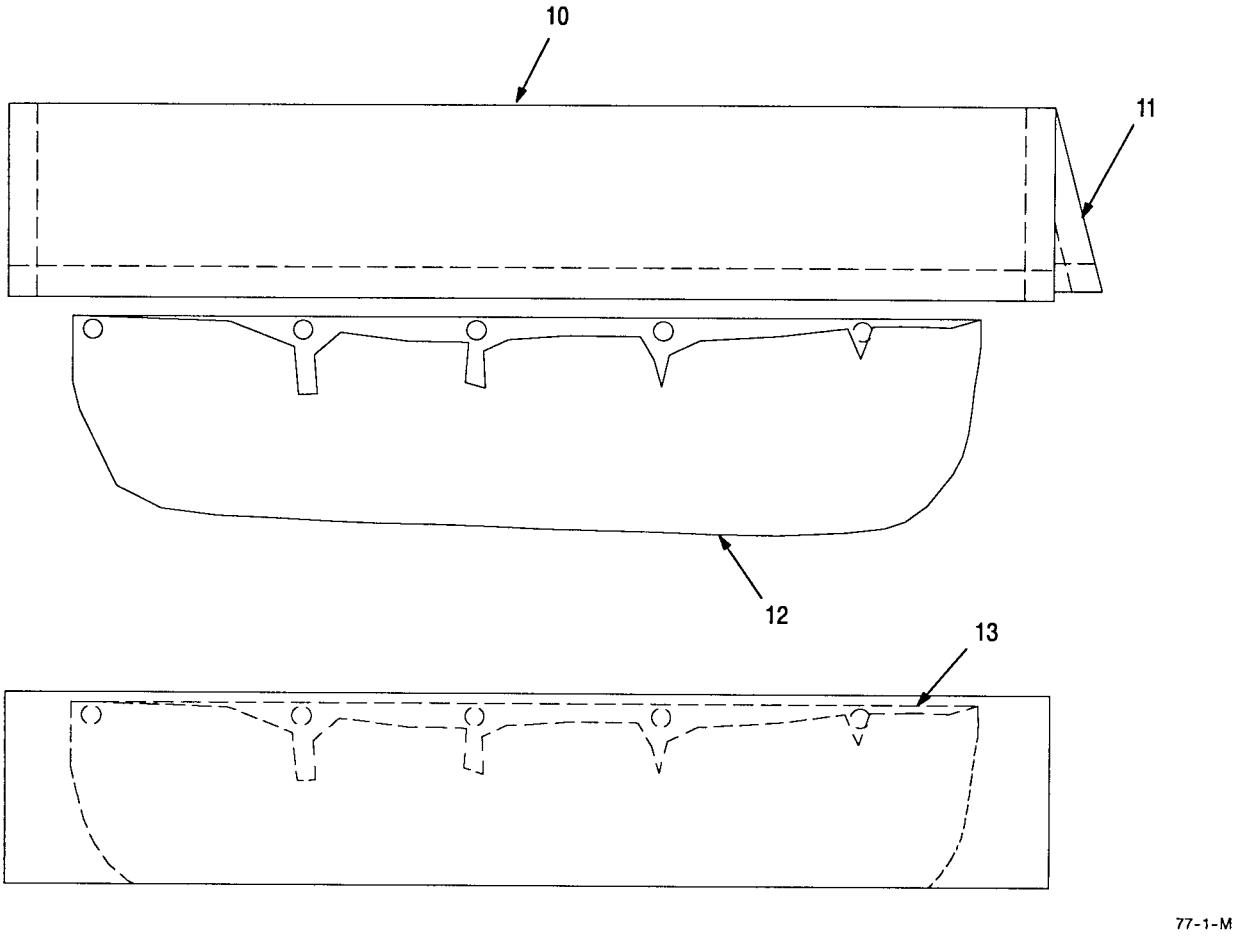


Figure 3-28. ABS and Door Fabric Repair (Sheet 2 of 3)

c. Buckles, Fasteners, and Webbing (Refer to Figure 3-28)

(1) Place fabric with strap (14) on sewing table making sure strap (14) is in correct position for stitching.

(2) Sew seam (15) across webbing at base of strap (14) to repair damage.

(3) Sew base to fabric with X-shaped seams (15) and border to repair damage.

NOTE

Webbing is used as strapping by which ABS items are held fastened, pulled, or lifted. The ends of the webbing are left plain or rolled, angled, or shaped to take hardware.

End of all webbing and tapes are to be sealed smooth to prevent fraying.

(4) Notice which bar of the fastener (16) the webbing is lapped over. On some items, it is the center bar while on others, it is one of the end bars.

(5) Cut through and remove stitches at end of the overlap.

(6) Unfold the overlap and remove fastener (16). Retain hardware if not broken for reuse.

(7) Measure strap (14), including folded under section, to determine length of strap (14) needed.

(8) Cut piece or pieces of strap (14) to required length.

(9) Pass the end of the strap (14) through the fastener (16), turn under the raw edge, and fold under at the fastener (16).

(10) Stitch the underlap in place with two rows of stitching 1/8 inch from the edge. Tack all seams (15).

(11) Sew the strap (14) to the connector assembly with X-shaped seams (15) and border.

(12) If the strap is sewn to the ABS or door, seal the stitches with film tape (reference TM 10-5410-228-10).

3.10.1 ABS and Door Fabric Repair – Continued.

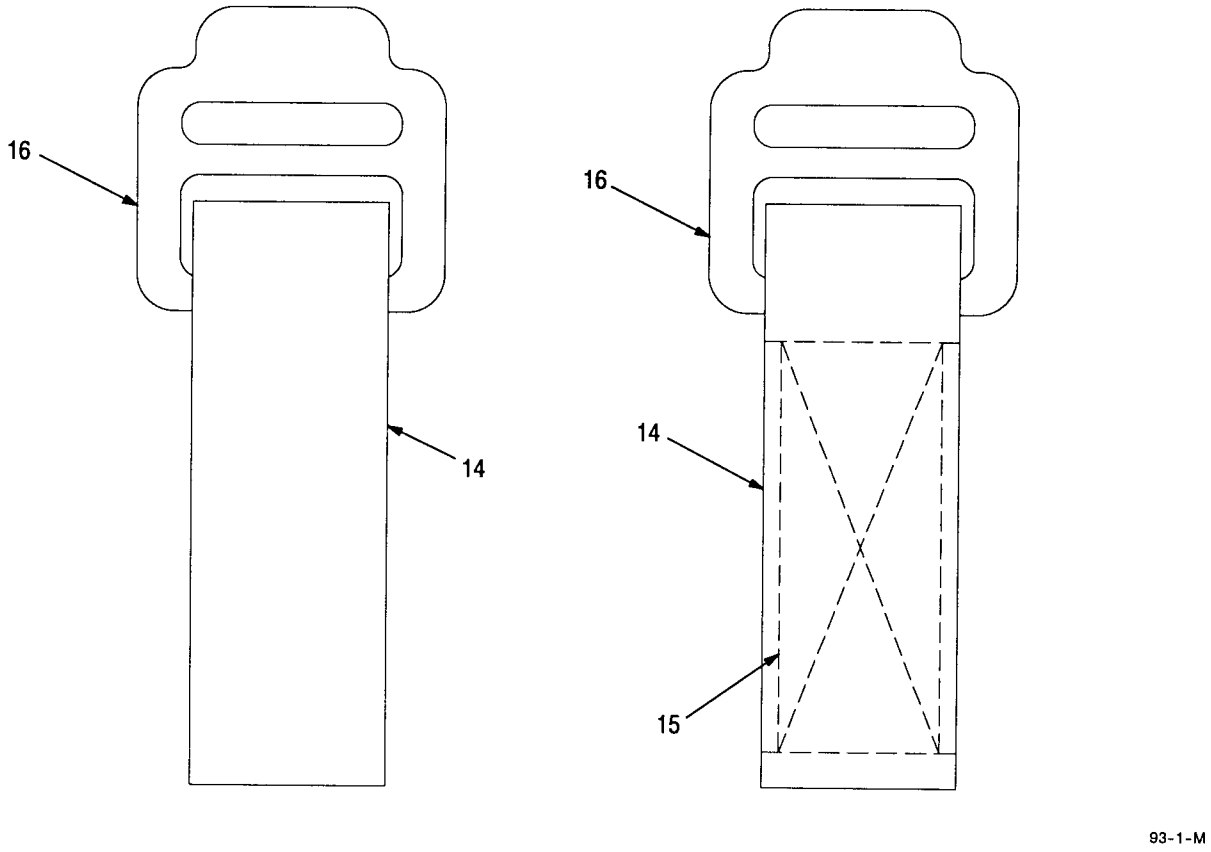


Figure 3-28. ABS and Door Fabric Repair (Sheet 3 of 3)

Follow-on maintenance: Attach ABS to LMS per para 2.13.3.

3.10.2 TALP Airlock Door Assembly Repair.

This task covers: a. Disassembly b. Assembly	c. Repair
INITIAL SETUP	
Tools/Test Equipment: Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B) Drill, Electric (Item 6, Appendix B) Drill Set (Item 5, Appendix B) Goggles (Item 17, Appendix B) Riveter, Blind, Hand (Item 34, Appendix B)	Equipment Conditions: TALP airlock door assemblies removed (reference TM 10-5410-228-10). TALP rail assemblies removed (reference TM 10-5410-228-10). References: TM 10-5410-228-10
Materials/Parts: Spare Parts Kit (TM 10-5410-228-10) Isopropyl Alcohol (Item 12, Appendix C) Rubber Gloves (Item 25, Appendix C) Adhesive (Item 9, Appendix C) Wiping Rags (Item 39, Appendix C)	Materials/Parts: (Cont.) Eighteen Self-locking Nuts (Item 44, Appendix E) Two Blind Rivets (Item 76, Appendix E) Twelve Self-locking Nuts (Item 48, Appendix E) Four Cotter Pins (Item 68, Appendix E)

NOTE

The TALP has two airlock door assemblies: an outside door assembly and an inside door assembly.

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

3.10.2.1 Outside Door Assembly.

a. Disassembly (Refer to Figure 3-29)

(1) Release clamp latch (1) and remove retaining clamp (2) securing TALP tunnel fabric (3) to outside door frame assembly (4).

(2) Remove fabric (3) from outside door frame assembly (4) by slipping four grommets (5) over pins (6) attached to outside door frame assembly (4).

(3) Remove six self-locking nuts (7) and six screws (8) securing clamp latch (1) to retaining clamp (2). Discard six self-locking nuts (7).

(4) Remove two cotter pins (9), two flat washers (10), two hand knobs (11), two flat washers (12) and two Teflon washers (13) securing two lockplate assemblies (14) to outside door frame assembly (4). Discard two cotter pins (9).

(5) Pull hand knob (15) from bell timer (16).

(6) Remove nut (17) and washer (18) securing bell timer (16) and dial (19) to outside door frame assembly (4).

(7) Remove five screws (20), five flat washers (21), and five self-locking nuts (22) attaching door hinge (23) to outside door frame assembly (4). Discard five self-locking nuts (22).

(8) Remove four screws (24), four flat washers (25), and four self-locking nuts (26) attaching door hinge (23) to door weldment (27). Discard four self-locking nuts (26).

(9) Remove two nuts (28), two lockwashers (29) and latch cam (30) from threaded post of latch (31).

3.10.2 TALP Airlock Door Assembly Repair – Continued.

NOTE

Two screws and two lockwashers are supplied with latch.

(10) Remove two screws (32) and two lockwashers (33) securing latch (31) to door weldment (27).

NOTE

Only remove gasket if damaged or worn.

(11) Remove gasket (34) from inside surface of door weldment (27). Discard gasket (34).

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(12) Clean gasket adhesive residue from surface of door weldment (27) with rag dampened with alcohol.

b. Assembly (Refer to Figure 3-29)

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

NOTE

Apply new gasket to clean, dry surface only. Clean adhesive residue from door weldment with rag dampened with alcohol. Allow door weldment to dry completely before applying new gasket.

(1) Remove protective tape backing from new gasket (34) and secure new gasket (34) around inside edge of door weldment (27) with adhesive.

NOTE

Two screws and two lockwashers are supplied with latch.

(2) Secure latch (31) to door weldment (27) with two screws (32) and two lockwashers (33).

NOTE

Two nuts, two lockwashers, and latch cam are supplied with latch.

(3) Install two nuts (28), two lockwashers (29) and latch cam (30) onto threaded post of latch (31).

(4) Secure door hinge (23) to door weldment (27) with four screws (24), four flat washers (25), and four nuts (26) (Item 44, Appx E).

(5) Secure door hinge (23) to outside door frame assembly (4) with five screws (20), five flat washers (21), and five nuts (22) (Item 44, Appx E).

(6) Move two nuts (28) as necessary to adjust position of latch cam (30) on latch (31) to ensure latch (31) holds door weldment (27) securely in place in outside door frame assembly (4) when the door weldment (27) is closed.

(7) Secure dial (19) and bell timer (16) to outside door frame assembly (4) with washer (18) and nut (17). Shaft flats on bell timer should be vertical and zero on dial should be at 12 o'clock.

(8) Push knob assembly (15) onto bell timer (16). Ensure pointer on knob assembly (15) points to zero on dial (19).

(9) Secure two lockplate assemblies (14) to outside door frame assembly (4) with two hand knobs (11), two flat washers (12), two Teflon washers (13), two flat washers (10) and two new cotter pins (9) (Item 68, Appx E). Leave room for TALP rail assemblies to slide in place between the two lockplate assemblies (14) and outside door frame assembly (4).

(10) Secure clamp latch (1) to retaining clamp (2) with six screws (8) and six new self-locking nuts (7) (Item 48, Appx E).

(11) Position TALP tunnel fabric (3) over outside door frame assembly (4), ensuring four grommets (5) engage pins (6).

(12) Position retaining clamp (2) over TALP tunnel fabric (3) and outside door frame assembly (4) and close clamp latch (1).

c. Repair (Refer to Figure 3-29)

See para 3.10.1 for repair of holes, cuts, or tears in fabric of outside TALP door.

3.10.2.2 Inside Door Assembly.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

a. Disassembly (Refer to Figure 3-29)

(1) Release clamp latch (35) and remove retaining clamp (36) securing TALP tunnel fabric (37) to inside door frame assembly (38).

(2) Remove fabric (37) from inside door frame assembly (38) by slipping four grommets (39) over pins (40) attached to inside door frame assembly (38).

(3) Remove six self-locking nuts (41) and six screws (38) securing clamp latch (35) to retaining clamp (36). Discard six self-locking nuts (41).

(4) Remove two cotter pins (43), two flat washers (44), two hand knobs (45), two flat washers (46) and two Teflon washers (47) securing two lockplate assemblies (48) to inside door frame assembly (38). Discard two cotter pins (43).

(5) Remove five screws (49), five flat washers (50), and five self-locking nuts (51) securing door hinge (52) to inside door frame assembly (38). Discard five self-locking nuts (51).

(6) Remove four screws (56), four flat washers (57), and four self-locking nuts (55) securing door hinge (55) to door weldment (60). Discard four self-locking nuts (55).

(7) Remove two nuts (57), two lockwashers (58) and latch cam (59) from threaded post of latch (60).

(8) Remove two screws (61) and two lockwashers (62) securing latch (60) to door weldment (56).

(9) Remove gasket (63) from inside surface of door weldment (56). Discard gasket (63).

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

(10) Drill out two rivets (64) and remove hose guard (65) from inside door frame assembly (38).

(11) Clean gasket adhesive residue from surface of door weldment (56) with rag dampened with alcohol.

3.10.2 TALP Airlock Door Assembly Repair – Continued.

b. Assembly (Refer to Figure 3-29)

(1) Secure hose guard (65) to inside door frame assembly (38) with two rivets (64) (Item 76, Appx E).

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

NOTE

Apply new gasket to clean, dry surface only. Clean adhesive residue from door weldment with rag dampened with alcohol. Allow door weldment to dry completely before applying new gasket.

(2) Remove protective tape backing from new gasket (63) and cut to fit door weldment (56); secure gasket (63) around inside edge of door weldment (56) with adhesive.

NOTE

Two screws and two lockwashers are supplied with latch.

(3) Secure latch (60) to door weldment (56) with two screws (61) and two lockwashers (62).

NOTE

Two nuts, two lockwashers and latch cam are supplied with latch.

(4) Install two nuts (57), two lockwashers (58) and latch cam (59) onto threaded post of latch (60).

(5) Secure door hinge (52) to door weldment (56) with four screws (52), four flat washers (53), and four self-locking nuts (55) (Item 44, Appx E).

(6) Secure door hinge (52) to inside door frame assembly (38) with five screws (49), five flat washers (50), and five self-locking nuts (51) (Item 44, Appx E).

(7) Move two nuts (57) as necessary to adjust position of latch cam (59) on latch (60) to ensure latch (60) holds door weldment (56) securely in place in inside door frame assembly (38) when door weldment (56) is closed.

(8) Secure two lockplate assemblies (48) to inside door frame assembly (38) with two hand knobs (45), two flat washers (46), two Teflon washers (47), two flat washers (44), and two new cotter pins (43) (Item 68, Appx E). Leave room for two TALP rail assemblies to slide in place between two lockplate assemblies (48) and inside door frame assembly (38).

(9) Secure clamp latch (35) to retaining clamp (36) with six screws (42) and six new self-locking nuts (41) (Item 48, Appx E).

(10) Position TALP tunnel fabric (37) over inside door frame assembly (38), ensuring four grommets (39) engage four pins (40).

WARNING

The slots on retaining clamp must align with pins or damage to pins may occur.

(11) Position retaining clamp (36) over TALP tunnel fabric (37) and inside door frame assembly (38), with slots on retaining clamp (36) engaged on pins (40), and close clamp latch (35).

c. Repair (Refer to Figure 3-29)

See para 3.10.1 for repair of holes, cuts, or tears in fabric of inside TALP door.

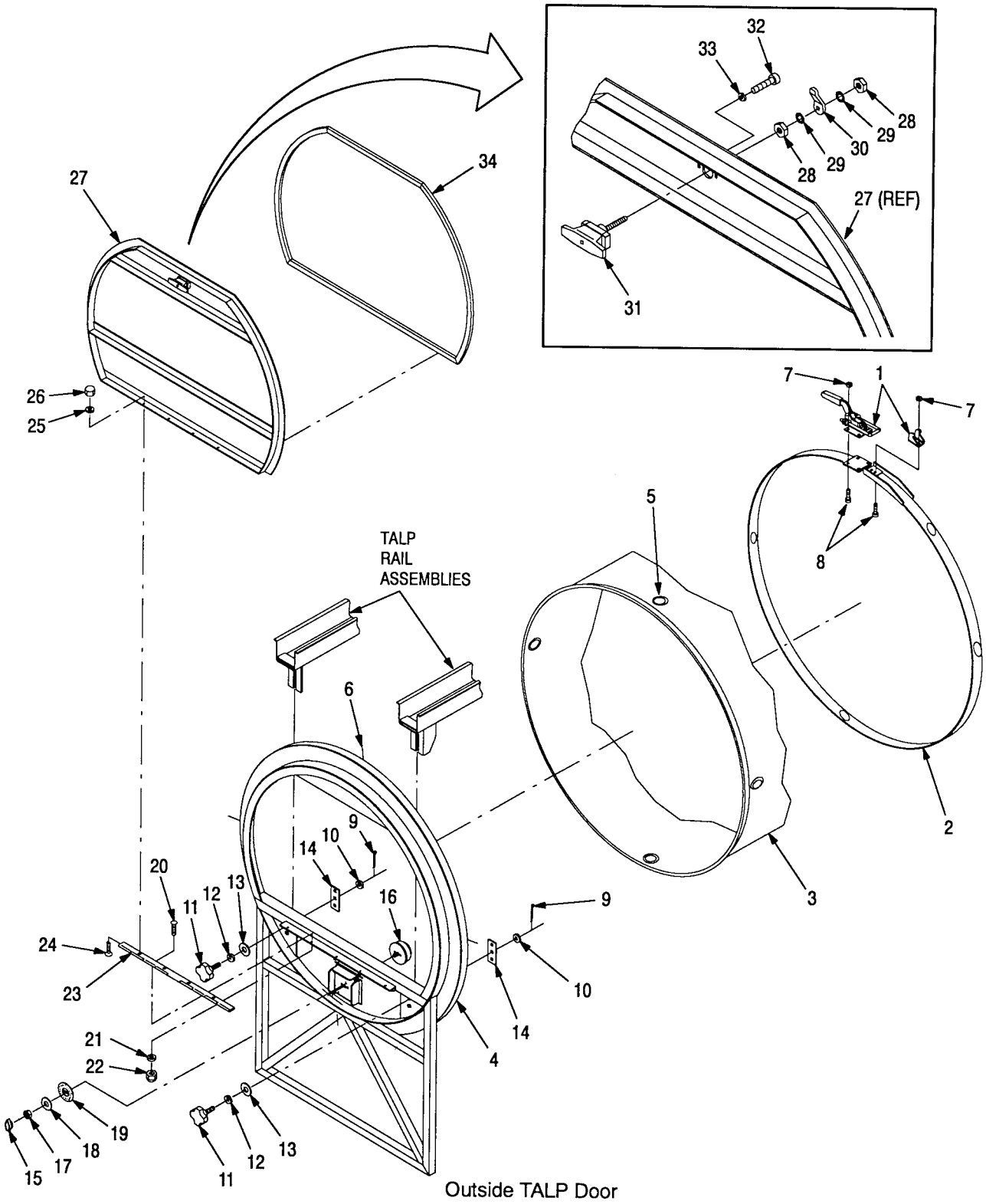


Figure 3-29. TALP Airlock Door Assembly Repair (Sheet 1 of 2)

3.10.2 TALP Airlock Door Assembly Repair – Continued.

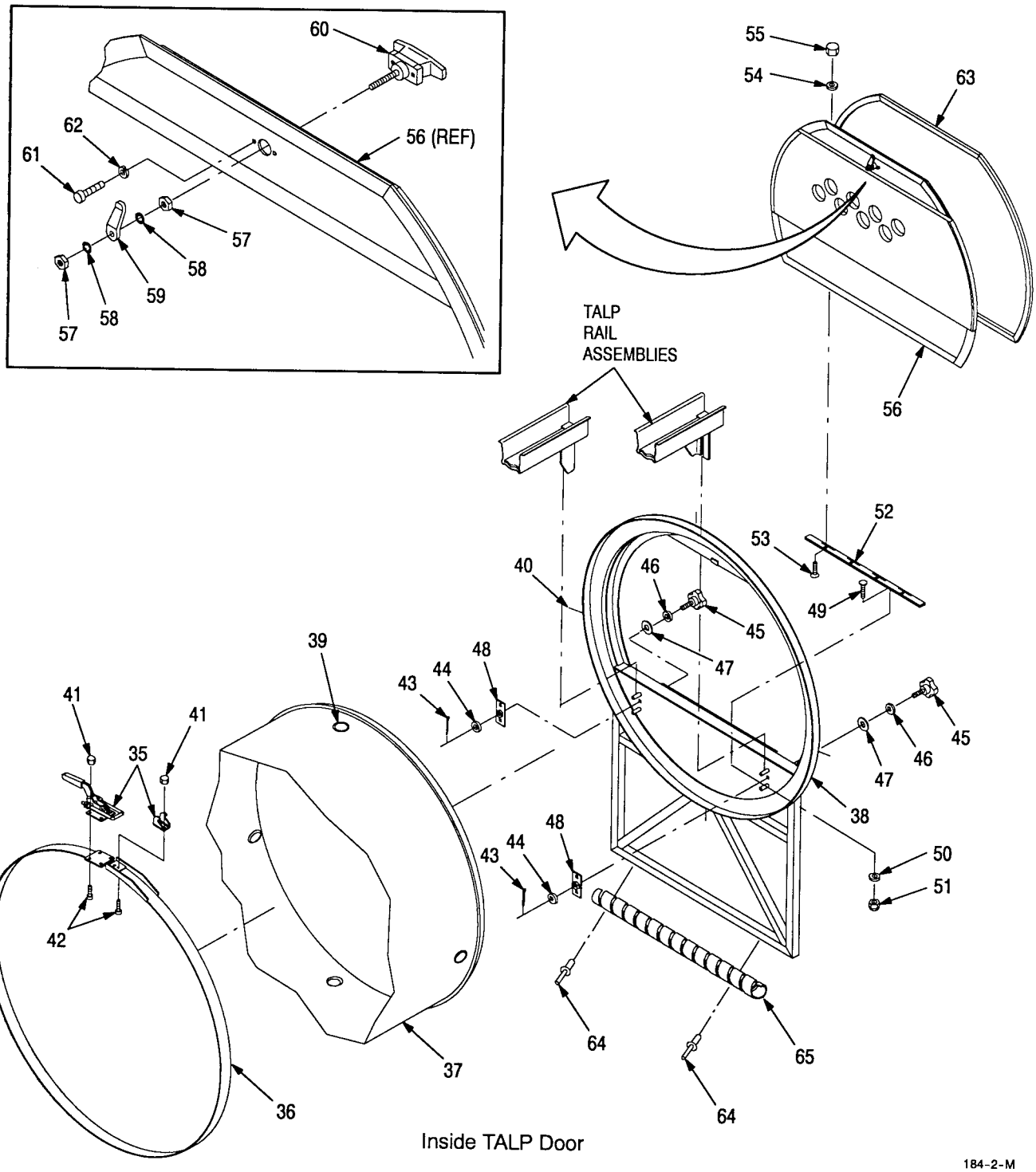


Figure 3-29. TALP Airlock Door Assembly Repair (Sheet 2 of 2)

Follow-on maintenance: Install TALP airlock door assemblies and TALP rail assemblies (reference TM 10-5410-228-10).

3.10.3 Inner Ambulatory Airlock Door Assembly Repair.

This task covers:
a. Disassembly
b. Assembly
c. Repair

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Drill, Electric (Item 6, Appendix B)
Drill Set (Item 5, Appendix B)
Goggles (Item 17, Appendix B)
Riveter, Blind, Hand (Item 34, Appendix B)
Spare Parts Kit (TM 10-5410-228-10)

Materials/Parts:
Isopropyl Alcohol (Item 12, Appendix C)
Rubber Gloves (Item 25, Appendix C)
Wiping Rags (Item 39, Appendix C)

Equipment Conditions:
Ambulatory airlock door assemblies removed (reference TM 10-5410-228-10)

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Adhesive (Item 7, Appendix C)
Thread Locking Adhesive (Item 8, Appendix C)
Four Lockwashers (Item 24, Appendix E)
Twelve Self-locking Nuts (Item 44, Appendix E)
Two Rivets (Item 83, Appendix E)
Four Lockwashers (Item 31, Appendix E)

a. Disassembly (Refer to Figure 3-30)

WARNING

Alcohol solvents are flammable and give off harmful vapors. Use solvents sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames.

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

Fastener hook should only be replaced if damaged.

(1) Remove fastener hook (1) from inner ambulatory frame assembly (2) and clean adhesive residue from surface of inner ambulatory frame assembly (2) with rag dampened with alcohol. Discard fastener hook (1).

(2) Remove six screws (3), six flat washers (4), and six self-locking nuts (5) securing two hinges (6) to door assembly (7). Discard six self-locking nuts (5). Separate door assembly (7) from inner ambulatory frame assembly (2).

(3) Remove screw (8) securing striker plate (9) to door assembly (7).

(4) Remove two screws (10) securing handle (11) to door assembly (7).

(5) Remove two screws (12) securing handle (13) to door assembly (7).

(6) Remove four screws (14), four lockwashers (15) and four flat washers (16) securing timer mounting plate (17) to door assembly (7). Discard four lockwashers (15).

(7) Pull knob assembly (18) from bell timer (19).

(8) Remove nut (20) and flat washer (21) securing dial (22) and bell timer (19) to timer mounting plate (17).

(9) Remove window assembly (23) from door frame assembly (7) (reference TM 10-5410-228-10).

3.10.3 Inner Ambulatory Airlock Door Assembly Repair – Continued.

WARNING

To prevent injury to personnel, always wear eye protection when drilling.

(10) Drill out two rivets (24) securing guard timer (25) to door assembly (7).

NOTE

Rubber door gasket should only be replaced if damaged.

(11) Remove rubber door gasket (26) from door assembly (7). Clean gasket adhesive residue from surface of door assembly (7) with rag dampened in isopropyl alcohol. Discard rubber door gasket (26).

(12) Remove six screws (27), six flat washers (28), six self-locking nuts (29) and four hinge spacers (30 and 31) securing two hinges (6) to inner ambulatory frame assembly (2). Discard six self-locking nuts (29).

(13) Remove fourteen screws (32) securing seven spring clips (33) to inner ambulatory frame assembly (2).

(14) Remove four screws (34), four flat washers (35), four lockwashers (36) and four nuts (37) securing door catch (38) and door catch spacer (39) to inner ambulatory frame assembly (2). Discard four lockwashers (38).

b. Assembly (Refer to Figure 3-30)

(1) Secure door catch (38) and door catch spacer (39) to inner ambulatory frame assembly (2) with four screws (34), four flat washers (35), four new lockwashers (36) (Item 24, Appx E) and four nuts (37).

(2) Apply adhesive (Item 8, Appx C) to fourteen screws (32) and secure seven spring clips (33) to inner ambulatory frame assembly (2).

(3) Secure two hinges (6) and four hinge spacers (30 and 31) to inner ambulatory frame assembly (2) with six screws (27), six flat washers (28), and six new self-locking nuts (29) (Item 44, Appx E).

NOTE

Apply new gasket to clean, dry surface only.

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

(4) Clean adhesive residue from door assembly (7) with rag dampened with alcohol. Allow door assembly (7) to dry completely before applying new gasket.

(5) Cut new rubber door gasket (26) to length and secure to door assembly (8) with adhesive (Item 7, Appx C).

(6) Install two rivets (24) (Item 83, Appx E) securing guard timer (25) to door assembly (7).

(7) Install window assembly (23) in door assembly (7) (reference TM 10-5410-228-10).

(8) Secure bell timer (19) and dial (22) to timer mounting plate (17) with flat washer (21) and nut (20). Shaft flats of bell timer should be vertical and zero on dial should be at 12 o'clock.

(9) Push knob assembly (18) onto bell timer (19). Ensure pointer on knob assembly (18) points to zero on dial (22).

(10) Apply adhesive (Item 8, Appx C) to four screws (15). Secure timer mounting plate (17) to door assembly (7) with four screws (14), four new lockwashers (15) (Item 31, Appx E) and four flat washers (16).

(11) Secure handle (13) to door assembly (7) with two screws (12).

(12) Secure handle (11) to door assembly (7) with two screws (10) with adhesive (Item 7, Appx C).

(13) Secure striker plate (9) to door assembly (7) with screw (8).

(14) Place door assembly (7) in inner ambulatory frame assembly (2). Secure two hinges (6) to door assembly (7) with six screws (3), six flat washers (4), and six new self-locking nuts (5) (Item 44, Appx E).

(15) Cut new fastener hook (1) to length, remove protective tape backing and press onto inner ambulatory frame assembly (2).

c. Repair (Refer to Figure 3-30)

See para 3.10.1 for repair of holes, cuts, or tears in fabric of inner ambulatory airlock door assembly.

3.10.3 Inner Ambulatory Airlock Door Assembly Repair – Continued.

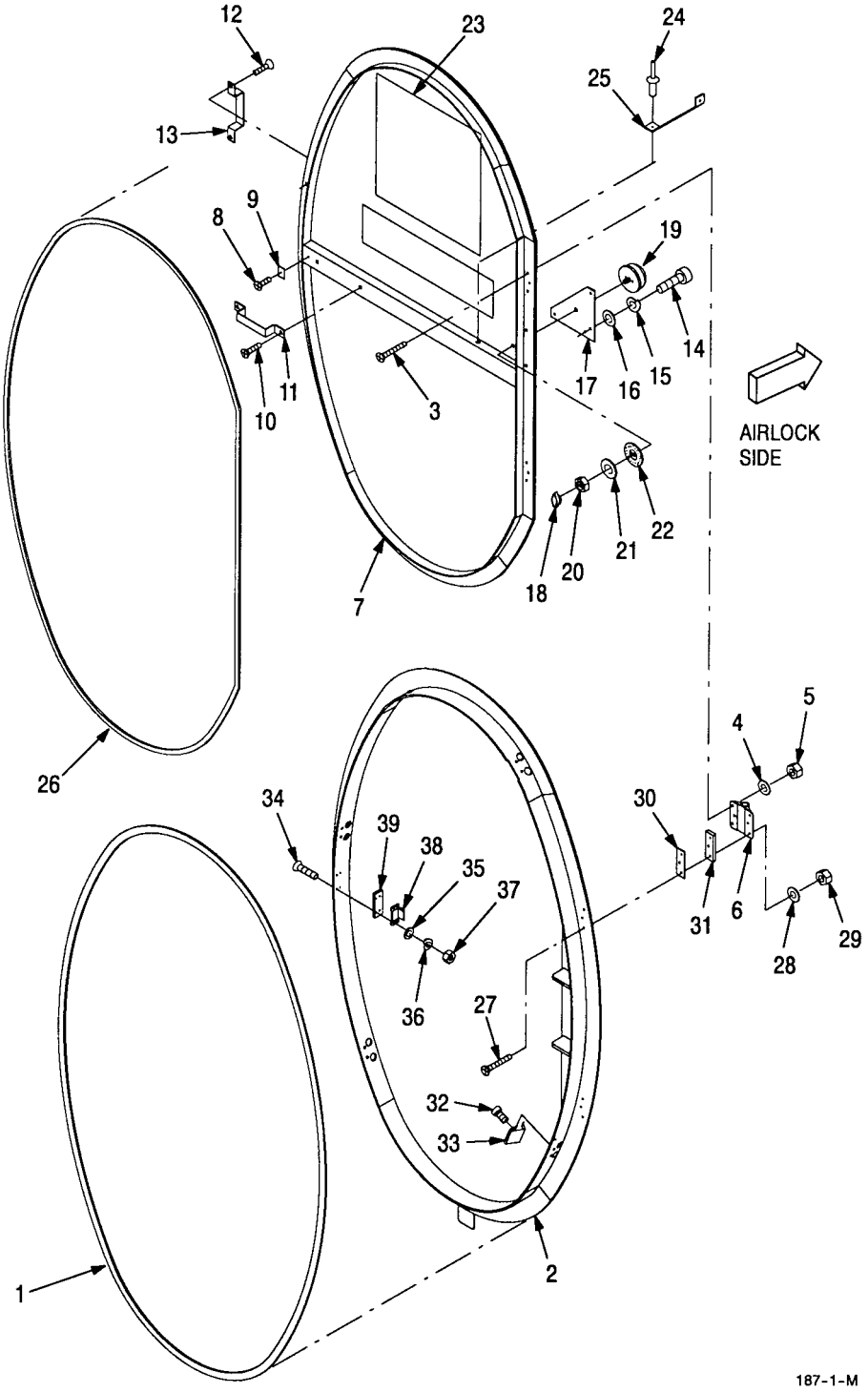


Figure 3-30. Inner Ambulatory Airlock Door Assembly Repair

Follow-on maintenance: Install ambulatory door assemblies (reference TM 10-5410-228-10).

3.10.4 Outer Ambulatory Airlock Door Assembly Repair.

This task covers:
a. Disassembly
b. Assembly
c. Repair

INITIAL SETUP

Tools/Test Equipment:
Shop Equipment, Automotive Maintenance and Repair (Item 38, Appendix B)
Spare Parts Kit (TM 10-5410-228-10)

Materials/Parts:
Isopropyl Alcohol (Item 12, Appendix C)
Rubber Gloves (Item 25, Appendix C)
Wiping Rags (Item 39, Appendix C)
Adhesive (Item 7, Appendix C)
Thread Locking Adhesive (Item 8, Appendix C)
Four Lockwashers (Item 24, Appendix E)
Twelve Self-locking Nuts (Item 44, Appendix E)

Equipment Conditions:
Ambulatory airlock door assemblies removed (reference TM 10-5410-228-10).

References:
TM 10-5410-228-10

Materials/Parts: (Cont.)
Coated Fabric Gasket (55926) STYLE 11265
Gasket (Clean Seal Inc.) CS 109 HR-1
Fastener Hook and Fastener Loop Gasket (11153) 173098

a. Disassembly (Refer to Figure 3-31)

NOTE

Remove/disassemble only to the extent necessary to remove or replace defective assemblies/components. Use standard maintenance shop practices/procedures.

Fastener hook should only be replaced if damaged.

(1) Remove fastener hook and fastener loop door frame gasket (1) from outer ambulatory frame assembly (2), and clean gasket adhesive residue from surface of outer ambulatory frame assembly (2) with rag dampened with alcohol. Discard gasket (1).

(2) Remove six screws (3), six flat washers (4), and six self-locking nuts (5) securing two hinges (6) to door assembly (7). Discard six self-locking nuts (5). Separate door assembly (7) from outer ambulatory frame assembly (2).

(3) Remove screw (8) securing striker plate (9) to door assembly (7).

(4) Remove two screws (10) securing handle (11) to door assembly (7).

(5) Remove two screws (12) securing handle (13) to door assembly (7).

(6) Remove window assembly (14) from door assembly (7) (reference TM 10-5410-228-10).

NOTE

Rubber door gasket should only be replaced if damaged.

(7) Remove rubber door gasket (15) from door assembly (7). Clean gasket adhesive residue from surface of door assembly (7) with rag dampened in isopropyl alcohol. Discard rubber door gasket (15).

(8) Remove six screws (16), six flat washers (17), six self-locking nuts (18) and four hinge spacers (19 and 20) securing two hinges (6) to outer ambulatory frame assembly (2). Discard six self-locking nuts (18).

(9) Remove fourteen screws (21) securing seven spring clips (22) to outer ambulatory frame assembly (2).

3.10.4 Outer Ambulatory Airlock Door Assembly Repair – Continued.

(10) Remove four screws (23), four flat washers (24), four lockwashers (25) and four nuts (26) securing door catch (27) and door catch spacer (28) to outer ambulatory frame assembly (2). Discard four lockwashers (25).

b. Assembly (Refer to Figure 3-31)

WARNING

Adhesives and cleaners are flammable and give off harmful vapors. Use adhesive and cleaner sparingly and only in well ventilated area. Avoid prolonged breathing of vapors. Keep away from heat, sparks, open flames. Wear gloves when handling adhesive and cleaner.

NOTE

Apply new gasket to clean, dry surface only.

(1) Clean adhesive residue from door assembly (7) with rag dampened with alcohol. Allow door assembly (7) to dry completely before applying new gasket.

(2) Cut new rubber door gasket (15) to length and secure to door assembly (7) with adhesive (Item 7, Appx C).

(3) Install window assembly (14) in door assembly (7) (reference TM 10-5410-228-10).

(4) Secure handle (13) to door assembly (7) with two screws (12).

(5) Secure handle (11) to door assembly (7) with two screws (10) with adhesive (Item 9, Appx C).

(6) Secure striker plate (9) to door assembly (7) with screw (8).

(7) Secure two hinges (6) to door assembly (7) with six screws (3), six flat washers (4), and six new self-locking nuts (5) (Item 44, Appx E).

(8) Secure door catch (17) and door catch spacer (28) to outer ambulatory frame assembly (2) with four screws (23), four flat washers (24), four new lockwashers (25) (Item 24, Appx E) and four nuts (26).

(9) Apply adhesive (Item 8, Appx C) to fourteen screws (21) and secure seven spring clips (22) to outer ambulatory frame assembly (2).

(10) Place door assembly (7) in outer ambulatory frame assembly (2). Secure two hinges (6) and four hinge spacers (19 and 20) to outer ambulatory frame assembly (2) with six screws (16), six flat washers (17), six new self-locking nuts (18) (Item 31, Appx E).

(11) Cut fastener hook (1) to length, remove protective tape backing and press onto outer ambulatory frame assembly (2).

c. Repair (Refer to Figure 3-31)

See para 3.10.1 for repair of holes, cuts, or tears in fabric of outer ambulatory airlock door assembly.

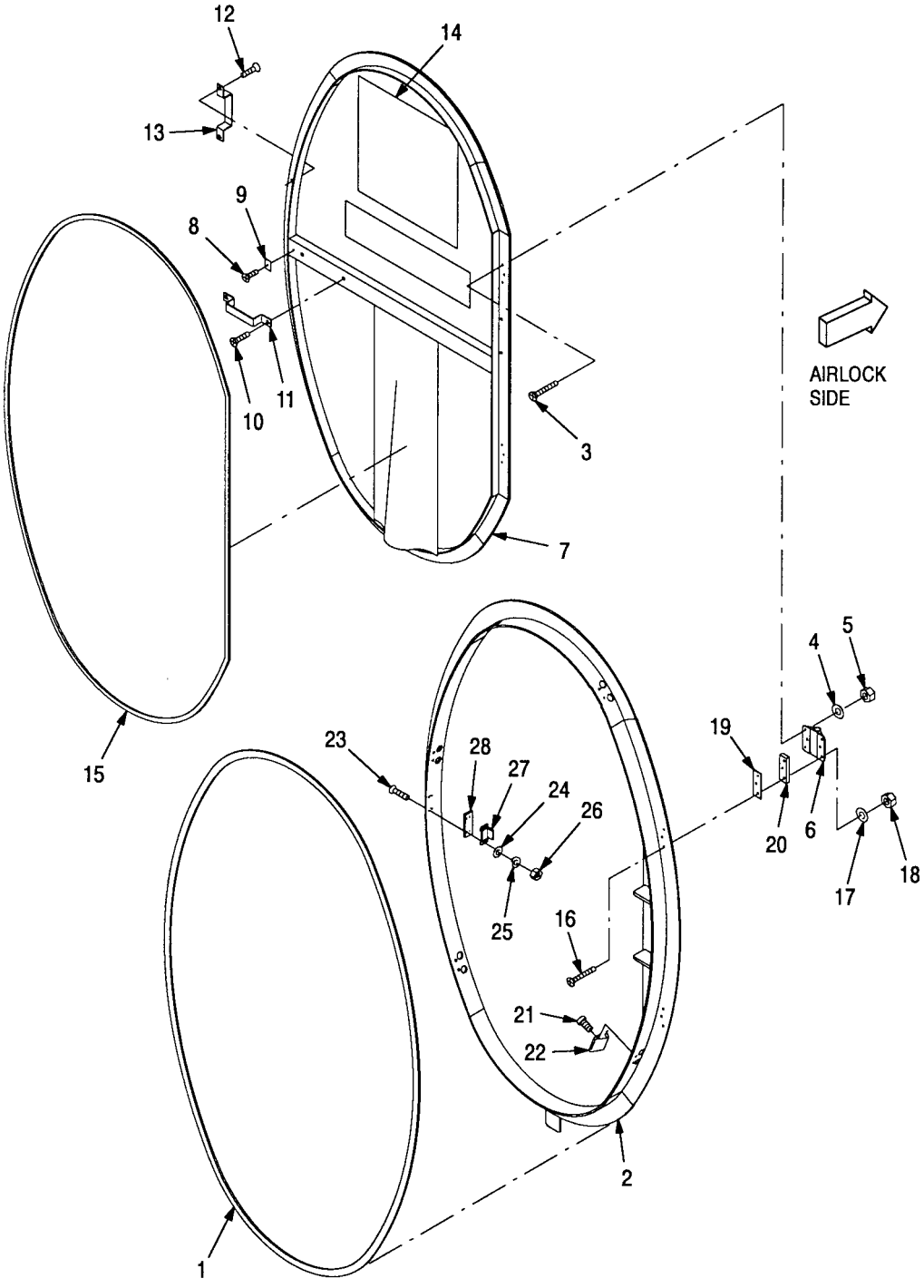


Figure 3-31. Outer Ambulatory Airlock Door Assembly Repair

Follow-on maintenance: Install ambulatory door assemblies (reference TM 10-5410-228-10).

CHAPTER 4

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

This technical manual does not have any general support maintenance procedures for the Chemical Biological Protective Shelter (CBPS) System. However, there are references to the Lightweight Multipurpose Shelter (LMS) manual, Utility Truck manuals, and the Trailer Chassis manual to perform general support maintenance on the major components.

APPENDIX A
REFERENCES

A.1 SCOPE.

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A.2 MILITARY SPECIFICATIONS.

Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum and Aluminum Alloys MIL-B-7883

Hydraulic Fluid, Petroleum Base, For Preservation and Operation MIL-PRF-6083

Procedures, Sampling and Tables for Inspection by Attributes ASQC-Z1.4-93

A.3 FORMS.

Recommended Changes to Publications and Blank Forms ..... DA Form 2028

Equipment Inspection and Maintenance Worksheet ..... DA Form 2404

Report of Discrepancy ..... SF 364

Product Quality Deficiency Report ..... SF 368

A.4 FIELD MANUALS.

NBC Protection ..... FM 3-11.4

NBC Decontamination ..... FM 3-11.5

Medical Platoon Leader's Handbook Tactics, Techniques and Procedures ..... FM 4-02.4

Health Service Support in a Nuclear, Biological and Chemical Environment ..... FM 4-02.7

Operation and Maintenance of Ordnance Material in Cold Weather ..... FM 9-207

General Fabric Repair ..... FM 10-16

First Aid for Soldiers ..... FM 4-25.11

A.5 TECHNICAL BULLETIN/MANUALS.

Lubrication Instructions - Generator Set, Skid Mounted, Tactical Quiet 10 kW TQG, 60 and 400 Hz ..... LO 9-6115-642-12

Unit Maintenance for Truck, Utility: 1 1/4 Ton, 4X4, M998 Series ..... TM 9-2320-280-20-2

Operator's Manual for Truck, Utility ..... TM 9-2320-387-10

Hand Receipt for Truck, Utility ..... TM 9-2320-387-10-HR

Unit, Direct Support and General Support Maintenance for Truck, Utility (Volume 1) ..... TM 9-2320-387-24-1

Unit, Direct Support and General Support Maintenance for Truck, Utility (Volume 2) ..... TM 9-2320-387-24-2

Direct Support and General Support Maintenance Repair Parts and Special Tools List for Truck, Utility ..... TM 9-2320-387-24P

Operator's, Unit, Direct Support and General Support Maintenance Manual (including Repair Parts and Special Tools List) for Chassis, Trailer ..... TM 9-2330-392-14&P

A.5 TECHNICAL BULLETIN/MANUALS – Continued.

Generator Set, Skid Mounted, Tactical Quiet 10 kW TQG, 60 and 400 Hz ..... TM 9-6115-642-10

Operator's Manual for Chemical Biological Protective Shelter (CBPS) System .....TM 10-5410-228-10

Unit, Direct Support & General Support Maintenance Repair Parts and Special Tools List for Chemical Biological Protective Shelter (CBPS) System..... TM 10-5410-228-24P

Operator's, Unit, Direct Support and General Support for Lightweight Multipurpose Shelter (LMS) ..... TM 10-5411-224-14

Installation Practices, Aircraft, Electric and Electronic Wiring ..... TM 55-1500-323-24

Procedures for Destruction of Equipment to Prevent Enemy Use ..... TM 750-244-3

A.6 DA PAMPHLETS.

Consolidated Index of Army Publications and Blank Forms..... DA PAM 25-30

Functional Users Manual for The Army Maintenance Management System (TAMMS) ..... DA PAM 750-8

APPENDIX B
MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

B.1 THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

b. The MAC in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field - includes two columns, Unit maintenance and Direct Support maintenance. The Unit maintenance column is divided again into two more sub-columns, C Operator or Crew and O for Unit maintenance.

Sustainment - includes two subcolumns, General Support (H) and Depot (D).

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B.2 MAINTENANCE FUNCTIONS.

Maintenance functions are limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical mechanical, and/or electrical characteristics with established standards through examination (e.g. by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item which required to perform service or other maintenance functions. Install may be the act of placing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. 'Replace' is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

i. Repair. The application of maintenance services[1], including fault location/troubleshooting[2], removal/installation and disassembly/assembly[3] procedures, and maintenance actions[4] to identify trouble and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied, to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

B.3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 list the functions to be performed on the item listed in column 2. ***(For detailed explanation of these functions, see paragraph B.2.)***

d. Column 4, Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in column 3, by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number of complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures are shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

Field:	C	Operator or Crew Maintenance
	O	Unit Maintenance
	F	Direct Support Maintenance
Sustainment:	H	General Support Maintenance
	D	Depot Maintenance

---

[1] Services – Inspect, test, service, adjust, align, calibrate, and/or replace.

[2] Fault location/troubleshooting – The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

[3] Disassembly/assembly – The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

[4] Actions – Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

e. Column 5, Tools and Equipment Ref Code. Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section III.

f. Column 6, Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

B.4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1, Tool or Test Equipment Ref Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, column 5.

b. Column 2, Maintenance Category. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National NATO Stock Number. The National Stock Number of the tool or test equipment.

e. Column 5, PN Tool Number. The manufacturer's part number, model number, or type number.

B.5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1, Reference Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
00	Chemical Biological Protective Shelter (CBPS) System	Inspect Service Adjust Replace Repair						18	
01	Expanded Capacity Vehicle (ECV) 17-1-9238-1	Inspect Service Adjust Replace Repair							A, B
0101	Alarm, Audible 17-1-5757-1	Inspect Service Adjust Replace Repair	.1	 .5				 18	
0102	Push Button Switch Assembly 17-1-5962-21	Inspect Service Adjust Replace Repair	.1	 .5 .3				 18,19,54 54	
0103	Push Button Switch Assembly 17-1-5962-22	Inspect Service Adjust Replace Repair	.1	 .5 .3				 18,19,54 54	
0104	Tachometer 17-2-0236-1	Inspect Service Adjust Replace Repair	.1	 .5				 18	
0105	Speed Control 17-2-0530-1	Inspect Service Adjust Replace Repair	.1	 5 .3				 18 18,19 18, 19	
0106	Box, Vehicle Control 17-1-9372-1	Inspect Service Adjust Replace Repair	.1 .5	.3 2.0 1.5				 18,19,54 18,19,54	
010601	Cover Assembly 17-1-9371-1	Inspect Service Adjust Replace Repair	.4	 1.0 1.2				 18,19,54 18,19,54	

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
010602	Push Button Switch 17-1-5962-1	Inspect Service Adjust Replace Repair	.1	 .5 .3				 18,19,54 54	
010603	Push Button Switch 17-1-5962-2	Inspect Service Adjust Replace Repair	.1	 .5 .3				 18,19,54 54	
010604	Buzzer 17-1-5802-1	Inspect Service Adjust Replace Repair	.1	 .3				 18	
010605	Relay, Electromatic M83536/10-024L	Inspect Service Adjust Replace Repair	.1 .3					 18	
010606	Circuit Breaker AA55571/05-001	Inspect Service Adjust Replace Repair	.1 .3					 18	
0107	Linkage, Actuator 17-2-0531-1	Inspect Service Adjust Replace Repair	.1	 .5 1.0				 18 18	
010701	Magnetic Pickup Cable DYNK-230-5	Inspect Service Adjust Replace Repair	.1	 .3				18 18	
010702	Magnetic Pickup DYNK-10300	Inspect Service Adjust Replace Repair	.1	 .3				18 18	
0108	Actuator, Engine Speed 17-2-0529-1	Inspect Service Adjust Replace Repair	.2	 4.0				 18	

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Field			Sustainment			
Group Number	Component/ Assembly	Maintenance Function	Unit		Direct Support	General Support	Depot	Tools and Equipment Ref Code	Remarks Code
			C	O	F	H	D		
0109	Auxiliary Power Pack Assembly 17-1-9295-1	Inspect Service Adjust Replace Repair	.4		 8.0 3.0			 18	
010901	Piston Pump 17-2-0214-1	Inspect Service Adjust Replace Repair	.2		 1.5			 18	 F
010902	Electric Motor 17-1-9436-1	Inspect Service Adjust Replace Repair	.2		 1.5			 18	
0110	Pump/Drive Pulleys 17-2-0520-1	Inspect Service Adjust Replace Repair	.4	 1.5 1.0				 18 18, 31	 A,B,F A,B,F
011001	Drive Belt 17-1-9951-1	Inspect Service Adjust Replace Repair	.1	 .5 1.0				 18,58,59,60 18,58,59,60	
011002	Piston Pump 17-1-9289-1	Inspect Service Adjust Replace Repair	.1	 1.5				 18	 F
011003	Belts, Matched Set 12339359-18	Inspect Service Adjust Replace Repair	.1	 .5 1.0				 18 18	
011004	Power Steering Belt 12339359-1	Inspect Service Adjust Replace Repair	1.0	 .5 1.0				 18 18	
011005	Pump, Water 23500085-1	Inspect Service Adjust Replace Repair		 3.5				 39, 40	

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
011006	Alternator	Inspect							
		Service							
		Adjust							
		Replace		0.3				40	
		Repair							
02	Lightweight Multipurpose Shelter (LMS) 17-1-5508-1	Inspect							
		Service							
		Adjust							
		Replace							
		Repair							
0201	Windows 17-1-5592-1	Inspect	.1						G
		Service		.5					
		Adjust							
		Replace		.3					
		Repair							
0202	Chair 17-1-5868-1	Inspect	.1						
		Service							
		Adjust							
		Replace		1.0					
		Repair							
0203	LMS Electrical System 17-1-9400-1	Inspect	.1						
		Service							
		Adjust							
		Replace			1.5			2,3,8,11,18,19	A,D
		Repair		1.0	3.0			2,3,8,11,18,19	A,D
020301	Light Box 17-1-5946-1	Inspect	.1						
		Service							
		Adjust							
		Replace			.5			18	
		Repair			1.0			18,19	
02030101	Cover Assy 17-1-5948-1	Inspect						18	
		Service						18	
		Adjust							
		Replace			1.0				
		Repair			1.0				
02030102	Lamp Assy 17-1-5794-1	Inspect						18	
		Service						18	
		Adjust							
		Replace			.5				
		Repair	.5		.5				
020302	Forward Light Box Assembly 17-1-5758-1	Inspect	.1						
		Service							
		Adjust							
		Replace	1.5					18,19	A,D
		Repair	.5					18,19	A,D

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
02030201	Lighting Fixture 17-1-5795-1	Inspect Service Adjust Replace Repair		.5				18,19	A,D
02030202	Front Panel Assy 17-2-0737-1	Inspect Service Adjust Replace Repair		.5 .5				2,3,11,18,19	D
02030203	Lamp Assembly 17-1-5794-1	Inspect Service Adjust Replace Repair	.1	.5 .2					
020303	Control Box Assy 17-2-0724-1	Inspect Service Adjust Replace Repair	.1	2.0 1.0				18,19	
02030301	Control Box Faceplate Assy 17-2-0726-1	Inspect Service Adjust Replace Repair		2.0 3.0				18 18, 19, 54	
02030302	Pushbutton Switch Assy 17-1-5962-1, -2	Inspect Service Adjust Replace Repair	.1	.5 .3				18, 19, 54 18, 19, 54	
02030303	Pushbutton Switch Assy 17-1-5962	Inspect Service Adjust Replace Repair	.1	.5 .3				18,19,54	
020304	Rack Assy 17-1-9401-1	Inspect Service Adjust Replace Repair			8.0 3.0			18	F
02030401	Rear Control Panel 17-1-9402-1	Inspect Service Adjust Replace Repair	.5	2.0 2.0				18 18,19	

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
02030401 01	Hose Assembly	Inspect Service Adjust Replace Repair		.5 1.0 1.0					
02030401 02	Cover Assy 17-1-9404-1	Inspect Service Adjust Replace Repair		 4.0 4.0				18 18	
02030401 03	Pan Assy 17-1-9403-1	Inspect Service Adjust Replace Repair		 8.0 8.0				 18 18,19	
02030401 0301	Support Assy 17-1-9163-1	Inspect Service Adjust Replace Repair		 .5 1.0				 18 18	
02030402	Converter 17-1-5790-1	Inspect Service Adjust Replace Repair		 .5 				18	F
02030403	Inverter 17-1-5791-1	Inspect Service Adjust Replace Repair		 .5 				18	F
020305	Relay Box Assy 17-1-9378-1	Inspect Service Adjust Replace Repair		 1.0 				18	
020306	Cable Assy, Heater 17-1-5896-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					E
020309	Cable Assy, Lighting 17-1-5989-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					F

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
020310	Cable Assy, AC Motor 17-1-5537-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					F
020311	Wiring Harness Assy 17-1-9734-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					F
020312	Cable Assy, DC Power 17-1-9388-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					F
020313	Tachometer Cable 17-2-0547-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					F
020314	Cable Assy, ESS Sign 17-1-5550-1	Inspect Service Adjust Replace Repair		2.0 4.0 4.0					F
020315	Tent Inflation System 17-1-9214-1	Inspect Service Adjust Replace Repair	.5 1.0 1.0					18 18	
02031501	Hose, Mod, PG2-HI 17-1-9219-1	Inspect Service Adjust Replace Repair		.5 1.0 1.0					
02031502	Hose, Mod, PG3-HI 17-1-0345-2	Inspect Service Adjust Replace Repair		.5 1.0 1.0					
02031503	Hose, Mod, PG3-LOW 17-1-0346-2	Inspect Service Adjust Replace Repair		.5 1.0 1.0					

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
020607	Hose, Mod, PG2-LOW 17-1-9223-1	Inspect Service Adjust Replace Repair		.5 1.0 1.0					
0204	Door Assy 17-1-5665-1	Inspect Service Adjust Replace Repair	.1	 1.5					
0205	Storage Box Assy 17-1-5658-1	Inspect Service Adjust Replace Repair		 1.0				2,3,8,11,18 2,3,8,11,18	 D D
020701	Soft Air Duct 17-2-0894-1	Inspect Service Adjust Replace Repair	.1		 1.0 .5			 2,3,8,11,18 2,3,8,11,18	 D D
0208	Power Panel 17-1-5930-1	Inspect Service Adjust Replace Repair		 1.5 1.0					 F
020801	Receptacle Connector MS90558C444 12P	Inspect Service Adjust Replace Repair	.1	 2.0				18	
020802	Circuit Breaker 17-1-6003-1	Inspect Service Adjust Replace Repair	.1	 1.0				18	
021201	Block Assembly 17-1-5521-1	Inspect Service Adjust Replace Repair	.1	 .5 1.0				 18 18	
03	Environmental Control Unit (ECU) 17-1-9194-1	Inspect Service Adjust Replace Repair	.5		 8.0				

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
0301	Environmental Control Unit Components 17-1-9676-1	Inspect Service Adjust Replace Repair		.5 1.0 3.0 2.0	 8.0 2.0			 5,18 2,3,8,11,18,34 2,3,8,11,18,34	 D F D
030101	Covers 17-1-9747-1	Inspect Service Adjust Replace Repair	.1 .1						
03010101	Mist Eliminator 17-2-0674-1	Inspect Service Adjust Replace Repair	.1 	 .5 					
030102	Heating/Cooling Coil 17-1-9760-1	Inspect Service Adjust Replace Repair							
03010201	Heater Element Assemblies 17-1-9685-1	Inspect Service Adjust Replace Repair			 1.5 1.0			 2,3,8,11,18 2,3,8,11,18	 D D
03010301	Compressor 17-1-9424-1	Inspect Service Adjust Replace Repair	.1 		 1.5 		 2.0	 18 	 F
03010302	Hydraulic Motor 17-1-0207-1	Inspect Service Adjust Replace Repair	.1 		 1.5 			 18,34 	 F
030104	ECU Electrical System 17-1-9581-1	Inspect Service Adjust Replace Repair	.5 	 2.0 4.0	 6.0 			7,8,17,36 40,41,42,48,49 18 18,19	

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
03010401	Coil Assembly 17-1-9558-1	Inspect	.1						
		Service							
		Adjust							
		Replace			.5			18	
		Repair							
03010402	ECU Hydraulic Cable 17-1-9742-1	Inspect		.1					
		Service							
		Adjust							
		Replace		.5				18	
		Repair		1.0				18,19	
03010403	ECU Cable Assembly 17-1-9748-1	Inspect		.1					
		Service							
		Adjust							
		Replace		.5				18	
		Repair		1.0				18,19	
03010501	Motor, Hydraulic 17-1-9425-1	Inspect	.1						
		Service							
		Adjust							
		Replace			1.0			18	
		Repair							
030106	Guard, Sound 17-1-9964-1	Inspect							
		Service							
		Adjust							
		Replace			.5			18	
		Repair			1.0			2,3,11,18	
03010701	Rib Strainer 17-1-9700-1	Inspect	.1						
		Service							
		Adjust							
		Replace		.5				18	
		Repair							
03010702	Blower /Hydraulic Motor 17-1-9455-1	Inspect	.1						
		Service							
		Adjust							
		Replace			1.0			18,34	
		Repair					8.0		F
030109	Gas Particulate Filter Unit 5-19-7435	Inspect	.1						
		Service			6.0			7,8,26,34,36, 40,41,42,48,49	
		Adjust							
		Replace			1.0			18,48	
		Repair							

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
030110	Piping, Hydraulic 17-2-0460-1	Inspect	.5						
		Service						5,7,8,18,34,35	
		Adjust							
		Replace			2.0			7,8,18,20,21, 22,23,26,29,34	
		Repair			1.0			18	
03011101	Hydraulic Motor 17-1-9419-1	Inspect	.1						
		Service							
		Adjust							
		Replace			1.0			18,21,22,26,34	
		Repair							
030112	Piping, Refrig-erant 17-2-0450-1	Inspect	.1						
		Service			6.0			7,8,17,36,40, 41,42,48,49,50	
		Adjust							
		Replace			4.0			18,48	
		Repair			2.0			18,48	
030113	ECU Drain System 17-2-0533-1	Inspect	.2						
		Service							
		Adjust						18	
		Replace			1.0			18	
		Repair			1.0				
03011401	Hydraulic Manifold Assembly 17-1-9426-1	Inspect		.3	.3				
		Service						5,7,8,18,32,35	
		Adjust		2.0	2.0			18,10	
		Replace			4.0			18	
		Repair		1.0	2.0			18	
03011402	Reservoir Assy 17-1-9694-1	Inspect	.1						
		Service	.2						
		Adjust							
		Replace			4.0			18	
		Repair			2.0			18	
03011501	Hydraulic Motor 17-2-0213-1	Inspect	.1						
		Service							
		Adjust							
		Replace			1.0			18,20,26,28,34	
		Repair							
030116	Air Filter 17-2-0207-1, -2	Inspect	.1					18	
		Service		.5				18	
		Adjust							
		Replace		.2				18	
		Repair							

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
04	Air Beam Protective Shelter Assembly (Green/Tan) 5-4-7001-1, -2	Inspect Service Adjust Replace Repair	.2	.2 1.0	.2 4.0 2.0	 1.0		18,43,52	F, H
0401	T.A.L.P. Assembly 5-4-7028-1, -2	Inspect Service Adjust Replace Repair		.1 	.1 .5 1.0			43,52	H
0402	Door Assembly, Outside 5-4-7029-1, -2	Inspect Service Adjust Replace Repair	.1		 .5 1.0			18,43	H
0403	Door Assembly, Inside 5-4-7029-3, -4	Inspect Service Adjust Replace Repair	.1		 .5 1.0			18,43	H
0404	Connector Assembly, DCS 17-2-0979-1, -2	Inspect Service Adjust Replace Repair	.1	.1 .5	 .5 			43	F, H
0405	Gage Assembly, Pressure 5-4-7056-1	Inspect Service Adjust Replace Repair	.1	 .3 	 			18,57	
0406	Tent Lines 5-4-7034-1, -2, -3	Inspect Service Adjust Replace Repair	.1	 	 				
0407	Shelter and Airlock Assy 5-4-7002-1, -2	Inspect Service Adjust Replace Repair	.3	 .5	 2.0 2.0			43,52 43,52	 H F, H
040701	Airlock Assembly 5-4-7020-1, -2	Inspect Service Adjust Replace Repair	.1	 .5	 1.0			43,52	 F F, H

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
040702	Air Beam Entrance 17-2-0204-1	Inspect	.1						
		Service							
		Adjust							
		Replace		1.0					
		Repair							
040703	Airlock, Roof 5-4-7021-1, -2	Inspect							
		Service							
		Adjust							
		Replace			8.0				
		Repair		.5	1.0			43,52	F, H
040704	Airlock Wall 5-4-7022-1, -2	Inspect	.1	.1					
		Service							
		Adjust							
		Replace			1.0				F
		Repair			.5				H
040705	Airlock Fr Assy 5-4-7136-1, -2	Inspect		.1					
		Service							
		Adjust							
		Replace			8.0				
		Repair			1.0			18	F
040706	Ambulatory Cvr 5-4-7044-1, -2	Inspect	.1						
		Service							
		Adjust							
		Replace		2.0					
		Repair		1.0				18	F
040707	Manifold, Inflation 17-2-0205-1	Inspect							
		Service							
		Adjust							
		Replace		1.0				18,51	
		Repair		.5				18,51	
040708	Shelter Assy 5-4-7003-1, -2	Inspect	.1						
		Service							
		Adjust							F
		Replace			8.0				
		Repair							
040709	End Wall Assy 5-4-7006-1, -2	Inspect							
		Service							F
		Adjust							
		Replace		1.0					
		Repair			8.0				
040710	Tunnel Assy 5-4-7299-1, -2	Inspect	.1						
		Service							
		Adjust						18	F, H
		Replace			8.0				
		Repair			1.0				

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
040711	T.A.L.P. Cover 5-4-7043-1, -2	Inspect Service Adjust Replace Repair	.1		 4.0 1.5			18	H
040712	Leaning Air Beam 17-2-0203-1, -2, -3, -4	Inspect Service Adjust Replace Repair	.1	 1.0					
040713	Straight Air Beam 17-2-0202-1, -2,	Inspect Service Adjust Replace Repair	.1	 1.0					
040714	Roof Assy 5-4-7004-1, -2,	Inspect Service Adjust Replace Repair		 .5	 8.0				F
040715	Window Assy 5-4-7046-1, -2	Inspect Service Adjust Replace Repair	.1	 1.0	 2.0 1.0			 18	
040716	Drain Assy, Roof 5-4-7059-1	Inspect Service Adjust Replace Repair	.1	 1.0	 8.0			 18	F
0408	Ground Cloth Assy 5-4-7025-1	Inspect Service Adjust Replace Repair	.2	 .5					
0409	ABS Repair Kit PL5-4-7132-1, -2	Inspect Service Adjust Replace Repair	.1	 .2 .5					
0410	Spare Parts Kit PL5-4-7134-1, -2	Inspect Service Adjust Replace Repair	.1	 .2 .5					

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
041001	Hydraulic O-ring Kit 17-2-0694-1	Inspect							
		Service							
		Adjust							
		Replace		.5					
		Repair		.2					
0411	Light Set, Portable 5-4-6765	Inspect	.5						
		Service	.4						
		Adjust			.2				
		Replace	.2					18,19	
		Repair	.2		1.0			18,19	
041101	Light, Extension 5-4-6764	Inspect							
		Service							
		Adjust							
		Replace		.5				18,19	
		Repair	.2	1.0				18,19	
04110101	Electrical Assembly, Partial 5-4-6766-1	Inspect	.1	.1					
		Service							
		Adjust							
		Replace		1.0				18,19	
		Repair	.2	.5				18,19	
05	High Mobility (HMT) Trailer 17-2-0600-1	Inspect	.2	.5					
		Service							
		Adjust							
		Replace		1.5	2.0			18	
		Repair						2,3,8,11,18	C
0501	Generator MEP-803A	Inspect		.2					E
		Service		.5					E
		Adjust							
		Replace			1.0			18	
		Repair			1.0				E
0502	Modified Trailer Assy 17-2-0534-1	Inspect		.1					
		Service							
		Adjust							
		Replace			1.5			2,3,8,11,18	C
		Repair			2.0				

Section II. MAINTENANCE ALLOCATION CHART FOR CBPS – Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Field			Sustainment			
Group Number	Component Assembly	Maintenance Function	Unit		Direct Support	General Support	Depot	Tools and Equipment Ref Code	Remarks Code
			C	O	F	H	D		
06	Recirculation Filter 5-19-10878	Inspect	.1		.1				
		Service							
		Adjust							
		Replace		.5					
		Repair		1.0					
07	Hydraulic System 17-1-9407-1	Inspect	.4						
		Service	.5					18,32	
		Adjust							
		Replace			2.0			18	
		Repair			1.0			18	

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR CBPS

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National NATO Stock Number	PN Tool Number
1	O	V-Belt, Tension	6635-00-921-6255	(81337) 17-2-0733-1
2	O	Drill Stop Set	5133-01-383-7665	ADC-7 (IN343)
3	F	Detector, Refrigerant Gas, Leak	4940-01-378-3354	(16734) TIF5650A
4	O	Dispenser, Tape (0.75 inch)		ATG-752
5	O	Drill Set, Twist	5133-00-293-0983	(19203) 800434
6	O	Drill, Electric, Portable	5130-00-293-1849	(80244) 5130-00-293-1849
7	O	Drum, 55 Gallon		
8	O	Extension, Socket Wrench	5120-01-335-1264	(55719) SX10
9	O	Extension, Socket Wrench	5120-01-335-1059	FXK6 (55719)
10	O	Electronic Insert and Remover	5120-01-504-5834	(12522) 15193
11	O	Funnel	7240-00-404-9797	(39428) 1479T7
12	O	Tester, Pressure Gage,	6685-01-500-2980	(81337) 17-2-0689-1
13	O	Gage, Differential, Dial Indicating (Air flow)	6685-01-502-7538	(81337) 17-2-0900-1
14	O	Manifold Charging and Test Refrigerant	4130-00-714-0794	(30327) 495-C
15	O	Meter, Dial Indicating	6635-01-093-3710	(33287) BT-3373-F
16	O	Gloves, Rubber Industrial	8415-00-266-8675	(81349) MIL-DTL-32066
17	O	Goggles, Industrial	4240-00-052-3776	SC4910-95CL-A74
18	O	Caulking Tool, Hand	5120-00-072-6977	(16712) LJ170D
19	O	Heat Gun Electric	4940-01-502-7918	(39428) 3149K13
20	F	Jack, Hydraulic, Hand	5120-00-224-7330	(28047) E12-9A
21	F	Tool Kit, Electrical Contact	5180-01-341-3824	DMC 256 (11851)
22	O	Bit, Screwdriver	5120-01-428-8571	(55719) SDM2708C
23	F	Fork, Pallet Lifting	3940-01-502-4310	(3BM39) PL-AB-3/4-36I
24	O	Light, Extension	6230-00-729-9259	6230-00-729-9259
25	O	Light Kit, Strobe	6220-01-495-2020	(81337) 17-2-0695-1
26	F	Manifold Gage Set	4130-00-714-0794	D-100-MIL-1
27	O	Multimeter	6625-01-139-2512	SC4910-95CL-A74
28	O	Pan, Drain		(39428) 40465T3
29	O	Power Supply (0-35 Vdc, 2.4 A)	6130-00-006-5224	(0V1G9) DC-25-40-0

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR CBPS – Continued

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National NATO Stock Number	PN Tool Number
30	O	Puller, Mechanical	5120-00-499-1489	(55719) CJ83C
31	F	Pump, Vacuum, Rotary	4310-00-098-5272	(64484) 1400B
32	F	R22 Refrigerant Cylinder, Used		
33	F	Reclaimer Refrigerant	4250-01-338-2707	(07295) 17500B
34	O	Riveter, Blind, Hand	5120-00-017-2849	(54402) 98
35	O	Screwdriver, Rachet	5120-00-106-4553	(80244) PD5120-00-106-4553
36	O	Sealing Iron, Electric	3540-01-522-7598	(3WDP7) HS15-110A
37	F	Sewing Machine, Industrial	3530-00-892-4631	(77948) 251-12
38	O	Shop Equipment, Automotive Vehicle	4910-00-754-0705	SC4910-95-CL-A31
39	O	Shop Equipment, Automotive Vehicle	4910-00-754-0654	SC4910-95-CL-A74
40	O	Shop Equipment: Electrical Equipment	4940-01-234-2322	SC4940-95-CL-B05
41	F	Sling, Engine and Transmission	4919-01-193-7808	J33139
42	O	Socket, Wrench	5120-01-335-0881	SFS141
43	O	Socket, Wrench	5120-01-437-1789	(55719) GS281
44	O	Socket, Wrench	5120-01-437-1792	(55719) GS321
45	O	Socket, Wrench	5120-01-437-1811	(55719) GS361
46	O	Socket, Wrench	5120-01-437-1829	(55719) GS401
47	F	Strap, Rachet	3990-01-255-8153	(OKHZ6) 532720
48	F	Stand, Maintenance Automotive	4910-00-529-8387	SC4910-95-A63
49	O	Tension Tester, Bar	4240-01-500-1082	(81337) 17-2-0783-1
50	F	Tester, Cylinder Compression	4910-00-785-6437	(33287) J 6692
51	F	Tool Kit, Compressor		J529642-C
52	F	Tool Kit, Refrigeration Equipment	5180-00-596-1474	SC5180-90-CL-N18
53	O	Wrench, Crowfoot, 11/16 in.	5120-01-428-8128	(55719) GFC22B
54	O	Wrench, Crowfoot, 13/16 in.	5120-01-428-8073	(55719) GFC26B
55	O	Wrench, Crowfoot, 15/16 in.	5120-01-428-1693	(55719) GSC30A
56	O	Wrench, Crowfoot, 1 in.	5120-01-355-1694	(55719) GFC32B

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR CBPS

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National NATO Stock Number	PN Tool Number
57	O	Wrench, Crowfoot, 1-1/8 in.	5120-01-428-8130	(55719) GSCO36
58	O	Wrench, Crowfoot, 1-1/4 in.	5120-01-428-8084	(55719) GSCO40
59	O	Wrench, Crowfoot, 1-5/16 in.	5120-01-428-8240	(55719) GSCO42
60	O	Wrench, Crowfoot, 1-3/8 in.	5120-01-428-8249	(55719) GSCO44
61	O	Wrench, Crowfoot, 1-5/8 in.	5120-01-428-8253	(55719) GSCO52
62	O	Wrench, Crowfoot, 1-11/16 in.	5120-01-428-8304	(55719) GSCO54
63	O	Wrench, Crowfoot, 1-7/8 in.	5120-01-428-8267	(55719) GSCO60
64	O	Wrench, Open End, 1-1/8 in.	5120-01-335-1264	(55719) OEX36B
65	O	Wrench, Pipe	5120-00-242-3249	(19207) D170X
66	O	Wrench, Torque	5120-00-247-2540	(33287) J-1313-B

Section IV. REMARKS

Remarks Code	Remarks
A	Refer to TM 9-2320-280-20.
B	Refer to TM 9-2320-280-34.
C	Refer to TM 9-2330-392-14&P.
D	Refer to TM 10-5411-224-14.
E	Refer to TM 9-6115-642-10.
F	Return to original manufacturer for repair.
G	Follow local procedures for servicing.
H	Materials and tools required for repair are included in ABS repair kit.

APPENDIX C
EXPENDABLE AND DURABLE ITEM LIST

Section I. INTRODUCTION

C.1 SCOPE.

This appendix lists expendable and durable items that you will need to operate and maintain the Chemical Biological Protective Shelter (CBPS) System. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by Common Table of Allowances (CTA) 50-970, Expendable/Durable Items (except medical, class V repair parts, and heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

C.2 EXPLANATION OF COLUMNS.

a. Column (1) Item Number. This number is assigned to the entry in the listing and is referenced in the 'Initial Setup' of applicable tasks under the heading of 'Materials/Parts', (e.g., 'Cleaning compound, Item 5, Appendix E').

b. Column (2) Maintenance Level. This column identifies the lowest level of maintenance that requires the listed item.
   C – Operator/Crew
   O – Unit Level Maintenance
   F – Direct Support Maintenance

c. Column (3) National Stock Number. This is the National Stock Number (NSN) assigned to the item; use it to request or requisition the item.

d. Column (4) Description (CAGEC) Part Number. This indicates the Federal Item Name and, if required, a description to identify the item. The last line indicates the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. Column (5) Unit of Measure (U/M). This indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character abbreviation, (e.g., EA, GL, PT). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE AND DURABLE ITEM LIST

(1) Item Number	(2) Maintenance Level	(3) National Stock Number	(4) Description (CAGEC) Part Number	(5) U/M
1	O	8040-01-009-6355	ADHESIVE ASTM F493	PT
2	F	8040-00-097-6524	ADHESIVE (18876) 10215341	QT
3	F	8040-01-017-1517	ADHESIVE (81349) MIL-A-24179TY2CL1	QT
4	O	8040-01-118-0680	ADHESIVE (80244) MIL-A-46106TY1	AR
5	F	8040-00-515-2250	ADHESIVE (80244) MMM-A-1617TY3	QT
6	O		ADHESIVE (00333) M6128	QT

Section II. EXPENDABLE AND DURABLE ITEM LIST – Continued

(1) Item Number	(2) Maintenance Level	(3) National Stock Number	(4) Description (CAGEC) Part Number	(5) U/M
7	F	8040-01-164-6863	ADHESIVE (81349) MIL-A-24179 TY2 CL2	QT
8	F	8030-00-823-7917	SEALING COMPOUND 50CC (80244) MIL-S-22473 GRC	BT
9	F	8040-01-125-4675	ADHESIVE (70707) 1096M	GL
10	F	840-01-035-7848	ADHESIVE (81337), 5-4-4841	KT
11	F		ADHESIVE, 7133	AR
12	O	6810-00-286-5435	ALCOHOL, ISOPROPYL (81349) TT1735 GRADE A	GL
13	O	8030-00-059-2761	ANTISEIZE COMPOUND (81349) MIL-A-907	CO
14	O	5120-00-673-1886	CARTRIDGE, DISPOSAL (92108) 250-C6	EA
15	O	8030-00-181-7225	CAULKING COMPOUND (04552) ECCOSHIELDVY	CN
16	F	7510-00-223-6706	CHALK, MARKING (58536) A-A-318	GR
17	F	6830-00-000-0196	CLEANING COMPOUND, SOLVENT (81348) BBF1421	LB
18	F	8030-01-054-0740	COMPOUND, SEALING (05972) 59231	BX
19	O	8520-00-082-2146	CLEANER, HAND (19410) PAXSOLV16	LB
20	C	7930-00-282-9699	DETERGENT, GENERAL PURPOSE (81349) MIL-D-16791	GL
21	O	6850-00-285-8011	DRY CLEANING SOLVENT (81348) P-D-680	GL
22	F	5970-00-431-8599	ELECTRICAL, INSULATION SLEEVING, (81349), M23053/2-207-C	AR
23	F	5970-00-812-2967	ELECTRICAL, INSULATION SLEEVING, (81349), M23053/5-108-0	AR
24	O	9150-00-252-6383	FLUID, HYDRAULIC (81349) MIL-H-5606	QT
25	F		GASKET COUMPOUND, HIGH TEMPERATURE (81337) 17-2-1051-1	CN
26	O	8415-00-009-1900	GLOVES, RUBBER (86523) N36	PR
27	F	9150-01-197-7689	GREASE, AUTOMOTIVE & ARTILLERY (81349) M-1092D	CN

Section II. EXPENDABLE AND DURABLE ITEM LIST – Continued

(1) Item Number	(2) Maintenance Level	(3) National Stock Number	(4) Description (CAGEC) Part Number	(5) U/M
28	O	8040-01-370-1542	HARDENER, ADHESIVE (70707) BOSCODUR 9R	GL
29	O	8030-01-230-4692	HEAT SINK COMPOUND (71964) DC-340	TU
30	F		INSULATION COMPOUND (PDINC), 10107	GL
31	F	5640-00-237-4780	INSULATION, SHEET THERMAL (81349) MIL-P-15280	AR
32	F		LUBRICATING OIL: R22 REFRIGERANT COMPRESSOR SUNISCO 5GS or TEXACO CAPELLA 100	CN
33	F	9150-01-260-2534	LUBRICANT, SOLID (96906) MIL-L-23398	CN
34	F	6830-01-277-6447	NITROGEN, TECHNICAL (81348) BB-N-411	CL
35	F	5330-00-833-7491	O-RING (96906) MS28778-5	EA
36	O	5930-01-141-5368	PANEL SEAL (81349) M5423/16-01	GL
37	F	8030-01-449-3912	PRIMER (SEALING COMPOUND) MIL-S-22473-T 7471 (05972)	CN
38	F	4240-00-022-2946	PROTECTOR, HEARING (58536) A-A-58084	EA
39	O	7920-00-148-9666	RAGS, WIPING (80244) 7920-00-148-9666	LB
40	F	6830-00-106-1659	REFRIGERANT, R22 (80244) BB-F-1421, TY22	LB
41	O		ROPE, FIBROUS (81349) MIL-R-17343	FT
42	F	8030-00-204-9149	SEAL COMPOUND, HIGH TEMPERATURE (05972) 592	TU
43	O		SEALANT (70707) BOSTIC-1100 FASTSET	TU
44	O	8030-00-081-2333	SEALANT COMPOUND (10 BT PER BOX) (81346) ASTMD5363TYAN0141	BT
45	O	8030-01-371-4216	SEALANT (03538) M22473GC	CN
46	O		SEALANT (60150) RECTORSEAL No. 21	CN

Section II. EXPENDABLE AND DURABLE ITEM LIST – Continued

(1) Item Number	(2) Maintenance Level	(3) National Stock Number	(4) Description (CAGEC) Part Number	(5) U/M
47	O		SEALANT (OPMNO) SIKAFLEX 221	CN
48	O	8030-01-510-4811	SEALANT, COMPOUND (05972) 545	EA
48.1	O		SEALANT, POLYURETHANE (81337) 17-2-0966-1 (10.3OZ)	CA
49	F		SEALANT, REFRIGERANT (81337) 17-2-0983	BT
50	O	5999-01-414-2131	WIRE, MESH NETTING (80063) SM-B563756	EA
51	O	3439-00-224-3567	SOLDER, TIN ALLOY (81346) SN60WRAP30.094 5LB	RO
52	O	8030-01-333-4123	TAPE, ANTISEIZING (81349) M27730SIZEII(MOD)	EA
53	O		TAPE (1A319) 601	RO
54	F		TAPE, ADHESIVE TRANSFER (81337) 17-1-9239-1	RO
55	F		TAPE, INSULATION ASTM 3005, TY1, .75 WIDE (81337) 17-2-0450-73	AR
56	F		TAPE, INSULATION (OUZYO) N-5	RO
57	F	8030-00-823-7917	THREAD LOCKING COMPOUND (81346) ASTM D5363TYAN0141	BT
58	O	8030-01-014-5869	THREAD LOCKING COMPOUND MIL-S-46163, Type II, Grade N (Low Strength) (80244)	BT
59	O	6810-00-711-2185	TOLUENE, TECHNICAL (58536) A-A-59107	CN

APPENDIX D
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

D.1 SCOPE.

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit maintenance level for use on the Chemical Biological Protective Shelter (CBPS) System.

D.2 GENERAL.

a. A part number index in part number order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

b. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

Table D-1. Manufactured Items
Part Number Index

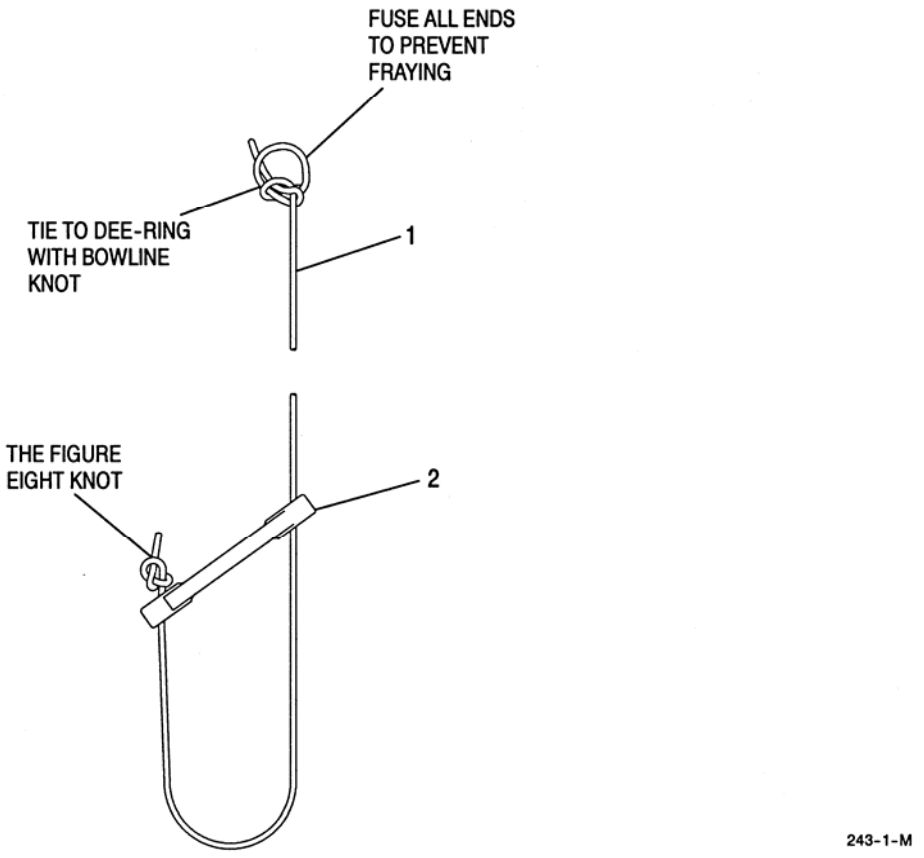
Part No.	Nomenclature	Figure No.
MIL-R-17343	Rope, Fabric	D-2
57122	Key, Hex, 3 mm	D-21
17-1-5887	Marker, Cable	D-3
17-1-5888	Sleeve	D-4
17-1-9210	Pipe, CPVC MOD	D-6
17-1-9235	Hose, MOD PG2-HI	D-7
17-1-9236	Hose, MOD PG1-LOW	D-7
17-1-9237	Hose, MOD PG2-LOW	D-7
17-1-9451	Gasket, ECU Door	D-8
17-1-9472	Tubing, Drain	D-5
17-1-9579	Gasket	D-9
17-1-9623	Pipe, CPVC MOD	D-10
17-1-9625	Gasket	D-19
17-1-9704	Gasket	D-11
17-1-9801	Gasket	D-27
17-1-9809	Gasket, Access Cover	D-20
17-1-9866	Soundfoam	D-12
17-1-9883	Tube, Copper	D-13
17-2-0008-4	Foam	D-22

Table D-1. Manufactured Items
Part Number Index – Continued

Part No.	Nomenclature	Figure No.
17-2-0008-11	Foam	D-23
17-2-0015	Foam, Top Front	D-24
17-2-0249	Soundfoam	D-12
17-2-0250	Soundfoam	D-12
17-2-0338	Gasket	D-14
17-2-0342	Gasket	D-25
17-2-0345	Hose, MOD PG3-HI	D-7
17-2-0346	Hose, MOD PG3-LOW	D-7
17-2-0347	Hose, MOD PS1-HI	D-7
17-2-0348	Hose, MOD PS1-LOW	D-7
17-2-0349	Hose, MOD PS1-HI/PG3-LOW	D-7
17-2-0350	Hose, MOD PS1-LOW/ PG1-LOW/PG2-LOW	D-7
17-2-0386	Gasket, Adapter, Blower	D-26
17-2-0397	Gasket, Blower, Inlet	D-15
17-2-0437	Tube, LWR EXP	D-16
17-2-0453	Tube, LWR RCVR Tank	D-17
17-2-0499	Tube, Copper	D-18
17-2-0500	Hose, PVC	D-28
17-2-0506	Hose, PVC	D-29
17-2-0897-2	Gasket, Foam	D-30
5-4-7034	ABS Lines	D-1

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS

PART NO.	MATERIAL	CUT LENGTH
5-4-7034-1	MIL-C-43256	90.00±2.00
5-4-7034-2	MIL-C-43256	132.00±2.00
5-4-7034-3	MIL-C-43256	210.00±2.00
5-4-7034-4	MIL-C-43256	48.00±2.00



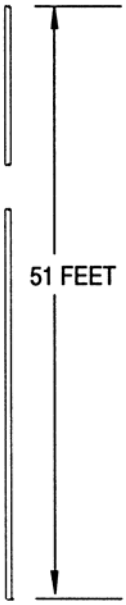
MATERIALS	
Description	CAGEC/Part Number
Item 1, 2: Cord, fibrous, polyester, solid braid, ∅0.31, Color: Natural.	81349/MIL-C-43256
Item 3: Slips, ABS lines, type II, Color: CG-483.	81349/MIL-S-1734

NOTE: Dimensions are in inches.

Figure D-1. ABS Lines

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-1-9451



MATERIALS	
Description	CAGEC/Part Number
Rope, nylon. Diameter 0.375 inches, length 51.0 feet, Color: Natural.	81349/MIL-R-17343

NOTE: Mark in accordance with MIL-STD-130.

Figure D-2. Rope

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	MATERIAL	MARKING
17-1-5887-1	17-1-5884-1	1W1 EXT POWER 81337-17-1-5886
17-1-5887-2	17-1-5884-1	1W1P1 (1A4A9J2)
17-1-5887-3	17-1-5888-7	GEN-L1
17-1-5887-4	17-1-5888-7	GEN-L2
17-1-5887-5	17-1-5888-7	GEN-L3
17-1-5887-6	17-1-5888-7	GEN-L0
17-1-5887-7	17-1-5888-4	GEN-GND
17-1-5887-8	17-1-5888-7	1A4W1 DC POWER 81337-17-1-5893
17-1-5887-9	17-1-5888-7	1A4W1J1 (1A1W4P1)
17-1-5887-10	17-1-5888-7	1A4W1P1 (1A4A4J9)
17-1-5887-11	17-1-5888-7	1A4W2 ELEC. HEATERS 81337-17-1-5896
17-1-5887-12	17-1-5888-7	1A4W2P2 (1A4A1J2)
17-1-5887-13	17-1-5888-7	1A4W2P1 (1A4A4J4)
17-1-5887-14	17-1-5888-6	1A4A10W1 UTILITY OUTLETS 81337-17-1-5891
17-1-5887-15	17-1-5888-3	1A4A10J5 (NEU)
17-1-5887-16	17-1-5888-6	1A4A10W1P1 (1A4A4J5)
17-1-5887-17	17-1-5888-7	1A4W3P1 (1A4A4J8)
17-1-5887-18	17-1-5888-7	1A4W3J1 (1A1W2P1)
17-1-5887-19	17-1-5888-7	1A4W3 AC MOTOR 81337-17-1-5537
17-1-5887-20	17-1-5888-8	1A4W6P2 (1A4A4J2)
17-1-5887-21	17-1-5888-8	1A4W6P1 (1A4A1J1)
17-1-5887-23	17-1-5888-8	1A4W6 ESS SIGNAL & CONT

PART NO.	MATERIAL	MARKING
		81337-17-1-5550
17-1-5887-25	17-1-5888-7	1A4W7P1 (1A4A5J1)
17-1-5887-26	17-1-5888-5	1A4W7P2 (1A4A4J14)
17-1-5887-27	17-1-5888-5	1A4W7 LIGHTING 81337-17-1-5989
17-1-5887-28	17-1-5888-3	A7TB1-1
17-1-5887-29	17-1-5888-3	A7TB1-2
17-1-5887-36	17-1-5888-7	1A1W3 81337-17-1-9138
17-1-5887-37	17-1-5888-7	1A4W4P1 (1A4A18J2)
17-1-5887-38	17-1-5888-7	1A4W4J1 (1A1W3P1)
17-1-5887-39	17-1-5888-7	1A4W4 INTERCOM 81337-17-1-9139
17-1-5887-40	17-1-5888-7	1A1W3P1 (1A4W4J1)
17-1-5887-41	17-1-5888-7	1A1W3P2 (1A4A8J1)
17-1-5887-42	17-1-5888-3	A9TB1-NEUT
17-1-5887-43	17-1-5888-8	1A4W13P1 (1A4A4J3)
17-1-5887-44	17-1-5888-8	1A4W13 AC POWER 81337-17-1-5778
17-1-5887-45	17-1-5888-6	A9CB1-L1
17-1-5887-46	17-1-5888-6	A9CB1-L2
17-1-5887-47	17-1-5888-6	A9CB1-L3
17-1-5887-48	17-1-5888-3	A9TB1-GND

MATERIALS	
Description	CAGEC/Part Number
Heat shrinkable tubing, flexible polyolefin per MIL-I-23053 (shrink ratio 3 to 1). ID 1/8 - 1-1/2, Length 2.0, Color: White.	81337/17-1-5888

NOTES:

1. Mark in accordance with MIL-STD-130.
2. Dimensions are in inches.

Figure D-3. Marker, Cable (Sheet 1 of 5)

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	MATERIAL	MARKING
17-1-5887-49	17-1-5888-6	1A4W12P2 (1A4A13J2)
17-1-5887-50	17-1-5888-6	1A4W12P1 (1A4A4J6)
17-1-5887-51	17-1-5888-6	1A4W12 INVERTER AC OUTPUT 81337-17-1-9135
17-1-5887-52	17-1-5888-6	1A4W14J1 (1A4A9)
17-1-5887-53	17-1-5888-6	1A4W14P1 (1A4A4J1)
17-1-5887-54	17-1-5888-6	1A4W14 CHEM SENSOR 81337-17-1-9137
17-1-5887-55	17-1-5888-6	1A4W8P1 (1A4A4J12)
17-1-5887-56	17-1-5888-6	1A4W8J1 (1A1W1P1)
17-1-5887-57	17-1-5888-6	1A4W8 VEHICLE DC SIGNAL 81337-17-1-9134
17-1-5887-58	17-1-5888-6	1A4W9P2 (1A4A12J2)
17-1-5887-59	17-1-5888-6	1A4W9P1 (1A4A4J7)
17-1-5887-60	17-1-5888-6	1A4W CONVERTER AC INPUT 81337-17-1-9136
17-1-5887-61	17-1-5888-7	1A4W10P2 (1A4A12J1)
17-1-5887-62	17-1-5888-7	1A4W10P1 (1A4A4J10)
17-1-5887-63	17-1-5888-7	1A4W10 CONVERTER DC OUTPUT 81337-17-1-5539
17-1-5887-64	17-1-5888-7	1A4W11P2 (1A4A13J1)
17-1-5887-65	17-1-5888-7	1A4W11P1 (1A4A4J11)
17-1-5887-66	17-1-5888-7	1A4W11 INVERTER, DC INPUT 81337-17-1-5538
17-1-5887-67	17-1-5888-8	1A4W1P2 (1A4A17J1)
17-1-5887-68	17-1-5888-3	1A4A10J1 (LINE)
17-1-5887-69	17-1-5888-3	1A4A10J1 (NEU)
17-1-5887-70	17-1-5888-3	1A4A10J1 (GND)
17-1-5887-71	17-1-5888-3	1A4A10J5 (LINE)

PART NO.	MATERIAL	MARKING
17-1-5887-72	17-1-5888-7	PG1 - HI
17-1-5887-73	17-1-5888-7	PG1 - LOW
17-1-5887-74	17-1-5888-7	PG2 - HI
17-1-5887-75	17-1-5888-7	PG2 - LOW
17-1-5887-76	17-1-5888-7	1A1W2P1 (1A4W3-J1)
17-1-5887-77	17-1-5888-7	1A1W2 AC MOTOR 81337-17-1-9296
17-1-5887-78	17-1-5888-4	A2M1-L1
17-1-5887-79	17-1-5888-4	A2M1-L2
17-1-5887-80	17-1-5888-4	A2M1-L3
17-1-5887-81	17-1-5888-4	A2M1-GND
17-1-5887-85	17-1-5888-7	1A1W1-P1 (1A4W8J1)
17-1-5887-86	17-1-5888-7	1A1W1 DC SIGNAL & CONTROL 81337-17-1-9310
17-1-5887-90	17-1-5888-5	1A4A1RT1
17-1-5887-93	17-1-5888-5	HYDRAULIC OIL LEVEL OLS1
17-1-5887-94	17-1-5888-5	REFRIGERANT HIGH PRESSURE LIMIT SW
17-1-5887-95	17-1-5888-5	REFRIGERANT LOW PRESSURE LIMIT SW
17-1-5887-96	17-1-5888-5	3200 PSI PRESS SW (MAKE ON RISE)
17-1-5887-97	17-1-5888-5	2000 PSI PRESS SW (MAKE ON FALL)
17-1-5887-98	17-1-5888-5	SV4
17-1-5887-100	17-1-5888-5	SV5
17-1-5887-101	17-1-5888-5	HIGH OIL TEMP
17-1-5887-102	17-1-5888-5	SV1
17-1-5887-103	17-1-5888-5	SV9
17-1-5887-104	17-1-5888-5	SV2
17-1-5887-105	17-1-5888-5	SV6
17-1-5887-106	17-1-5888-5	SV7
17-1-5887-107	17-1-5888-5	SV8
17-1-5887-108	17-1-5888-5	DPS1
17-1-5887-109	17-1-5888-5	DPS2
17-1-5887-110	17-1-5888-7	1A4A1W2-J2 (1A4W2-P2)

Figure D-3. Marker, Cable (Sheet 2 of 5)

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	MATERIAL	MARKING
17-1-5887-111	17-1-5888-7	1A4A1W2 ELEC HEATERS 81337-17-1-9298
17-1-5887-112	17-1-5888-3	A1HTR3-1
17-1-5887-113	17-1-5888-3	A1HTR3-2
17-1-5887-114	17-1-5888-4	A1HTR4B-1
17-1-5887-115	17-1-5888-4	A1HTR4B-2
17-1-5887-116	17-1-5888-3	A1HTR2-1
17-1-5887-117	17-1-5888-3	A1HTR2-2
17-1-5887-118	17-1-5888-4	A1HTR4C-1
17-1-5887-119	17-1-5888-4	A1HTR4C-2
17-1-5887-120	17-1-5888-4	A1HTR4A-1
17-1-5887-121	17-1-5888-4	A1HTR4A-2
17-1-5887-122	17-1-5888-3	A1HTR1-1
17-1-5887-123	17-1-5888-3	A1HTR1-2
17-1-5887-124	17-1-5888-8	1A1W4P1 (1A4W1J1)
17-1-5887-128	17-1-5888-4	GND-7A
17-1-5887-129	17-1-5888-7	GND-7A
17-1-5887-130	17-1-5888-7	49A BATT POS
17-1-5887-131	17-1-5888-7	6A PWR STUD
17-1-5887-132	17-1-5888-3	COOLANT 29D
17-1-5887-133	17-1-5888-3	OIL 29D
17-1-5887-134	17-1-5888-3	VEHICLE WIRE 29D
17-1-5887-135	17-1-5888-5	NEUTRAL SWITCH
17-1-5887-136	17-1-5888-3	1A1S2 - 1
17-1-5887-137	17-1-5888-3	1A1S2 - 2
17-1-5887-138	17-1-5888-3	1A1K1 - X1
17-1-5887-139	17-1-5888-3	1A1K1 - X2
17-1-5887-140	17-1-5888-3	54A
17-1-5887-141	17-1-5888-3	FUEL SOLENOID
17-1-5887-142	17-1-5888-3	29D
17-1-5887-143	17-1-5888-3	COOLANT TEMP
17-1-5887-144	17-1-5888-3	OIL PRESSURE
17-1-5887-145	17-1-5888-8	1A4W1-P1 (1A4A4-J9)
17-1-5887-146	17-1-5888-8	1A4W1 DC PWR/CONTROL 81337-17-1-9388
17-1-5887-147	17-1-5888-8	1A4W1-J1 (1A1W4-P1)
17-1-5887-148	17-1-5888-8	1A4W1-P2 (1A4A17-J1)
17-1-5887-149	17-1-5888-7	NEGATIVE LEADWIRE 81337-17-1-9392
17-1-5887-150	17-1-5888-7	POSITIVE LEADWIRE 81337-17-1-9398
17-1-5887-151	17-1-5888-6	1A1W1-P1 (1A4A8-J3)
17-1-5887-154	17-1-5888-3	EPG-1
17-1-5887-155	17-1-5888-3	EPG-2
17-1-5887-156	17-1-5888-3	14B
17-1-5887-157	17-1-5888-3	14A
17-1-5887-158	17-1-5888-3	14
17-1-5887-159	17-1-5888-3	EPG-3
17-1-5887-160	17-1-5888-5	EPG-4
17-1-5887-161	17-1-5888-3	EPG-5
17-1-5887-164	17-1-5888-3	EPG-10
17-1-5887-166	17-1-5888-3	CB2
17-1-5887-167	17-1-5888-6	GND 7A
17-1-5887-169	17-1-5888-6	1A1W1P3 (1A4A8J1)
17-1-5887-171	17-1-5888-3	GROUND
17-1-5887-175	17-1-5888-5	1A1W1P4 (MAG PICKUP)
17-1-5887-176	17-1-5888-8	1A4A1W3-P1 (1A4A1W1-J1)
17-1-5887-177	17-1-5888-7	1A4A1W3 POD HYDRAULICS 81337-17-1-9742
17-1-5887-178	17-1-5888-4	1A4A1W3-P15 (SV8)
17-1-5887-179	17-1-5888-4	1A4A1W3-P16 (SV7)
17-1-5887-180	17-1-5888-4	1A4A1W3-P3 (SV6)
17-1-5887-181	17-1-5888-4	1A4A1W3-P13 (SV2)
17-1-5887-182	17-1-5888-4	1A4A1W3-P8 (SV4)
17-1-5887-183	17-1-5888-4	1A4A1W3-P14 (SV9)
17-1-5887-184	17-1-5888-4	1A4A1W3-P10 (SV5)
17-1-5887-185	17-1-5888-4	1A4A1W3-P12 (SV1)
17-1-5887-187	17-1-5888-4	1A4A1W3-P7 (DPS1)
17-1-5887-189	17-1-5888-4	1A4A1W3-P4 (LPS1)
17-1-5887-190	17-1-5888-4	1A4A1W3-P11 (A1S4)

Figure D-3. Marker, Cable (Sheet 3 of 5)

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	MATERIAL	MARKING
17-1-5887-191	17-1-5888-4	1A4A1W3-P5 (HPLS1)
17-1-5887-192	17-1-5888-8	1A4A1W1-J1 (1A4W6-P1)
17-1-5887-193	17-1-5888-8	1A4A1W1 ESS CONTROL 81337-17-1-9748
17-1-5887-194	17-1-5888-8	1A4A1W1-J3 (1A4A1W3-P1)
17-1-5887-195	17-1-5888-3	EPG2 - GND
17-1-5887-196	17-1-5888-4	17-1-9750 (1A4A1W1-P1)
17-1-5887-197	17-1-5888-4	17-1-5519
17-1-5887-198	17-1-5888-4	17-1-9349
17-1-5887-199	17-1-5888-4	1A4A1W3-P17 (RSV3)
17-1-5887-201	17-1-5888-5	1A4A1W3-P19 (RSV1)
17-1-5887-202	17-1-5888-4	1A4A1W3-P20 (AIRMPS1)
17-1-5887-203	17-1-5888-7	PG3 - HI
17-1-5887-204	17-1-5888-7	PG3 - LOW
17-1-5887-205	17-1-5888-7	PS1 - HI
17-1-5887-206	17-1-5888-7	PS1 - LOW
17-1-5887-207	17-1-5888-7	PS1 - HI/PG3 - LOW
17-1-5887-208	17-1-5888-7	PS1 - HI/PG3 - LOW/PG2 - LOW
17-1-5887-209	17-1-5888-3	1A4A1W3 (HOLS1 - 1)
17-1-5887-210	17-1-5888-3	1A4A1W3 (HOLS1 - 2)
17-1-5887-211	17-1-5888-3	1A4A1W3 (HOLS1 - 3)
17-1-5887-212	17-1-5888-3	1A4A1W3 (HOLS2 - 1)
17-1-5887-213	17-1-5888-3	1A4A1W3 (HOLS2 - 2)
17-1-5887-214	17-1-5888-3	A17TB1 - 1
17-1-5887-215	17-1-5888-3	A17TB1 - 2
17-1-5887-216	17-1-5888-3	A17TB1 - 3
17-1-5887-217	17-1-5888-3	A17TB1 - 4
17-1-5887-218	17-1-5888-3	A17TB1 - 5
17-1-5887-219	17-1-5888-3	A17TB1 - 6

PART NO.	MATERIAL	MARKING
17-1-5887-220	17-1-5888-6	POWER STUD
17-1-5887-221	17-1-5888-3	A17TB1 - 7
17-1-5887-222	17-1-5888-3	1A4A1TS1
17-1-5887-223	17-1-5888-3	1A4A1W3 (HOLS2 - 3)
17-1-5887-224	17-1-5888-3	POWER STUD
17-1-5887-226	17-1-5888-5	458A
17-1-5887-227	17-1-5888-6	ISOLATION SWITCH
17-1-5887-228	17-1-5888-6	TACHOMETER
17-1-5887-229	17-1-5888-5	97A
17-1-5887-230	17-1-5888-5	97B
17-1-5887-231	17-1-5888-3	+(SIG)
17-1-5887-232	17-1-5888-3	-(SIG)
17-1-5887-233	17-1-5888-3	POS (+)
17-1-5887-234	17-1-5888-3	GND (-)
17-1-5887-235	17-1-5888-3	1
17-1-5887-236	17-1-5888-3	4
17-1-5887-237	17-1-5888-3	2
17-1-5887-238	17-1-5888-3	5
17-1-5887-239	17-1-5888-3	VEHICLE GND
17-1-5887-240	17-1-5888-6	HMMWV RPM SENSOR
17-1-5887-241	17-1-5888-3	ACTUATOR
17-1-5887-242	17-1-5888-3	GND 7A
17-1-5887-243	17-1-5888-3	1A4A1W3 (HOLS3 - 1)
17-1-5887-244	17-1-5888-3	1A4A1W3 (HOLS3 - 2)
17-1-5887-245	17-1-5888-3	1A4A1W3 (HOLS3 - 3)
17-1-5887-246	17-1-5888-3	EPG - 11
17-1-5887-247	17-1-5888-5	1A4AW6P3 (1A4A18J1)
17-1-5887-248	17-1-5888-4	1A4AW6 (1A4A19)
17-1-5887-249	17-1-5888-5	1A4AW7J3 (1A418P3)
17-1-5887-250	17-1-5888-3	RIB AIR TEMP SENSOR
17-1-5887-264	17-1-5888-6	1A4W20 RADIO REMOTE 81337-17-2-1036

Figure D-3. Marker, Cable (Sheet 4 of 5)

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	MATERIAL	MARKING
17-1-5887-265	17-1-5888-6	1A4W20P2 (1A4W25J1)
17-1-5887-266	17-1-5888-7	1A4W20P1 RADIO 1A4A15
17-1-5887-267	17-1-5888-7	1A4W19 REMOTE SPEAKER 81337-17-2-1037
17-1-5887-268	17-1-5888-7	1A4W19P1 (1A4W24J1)
17-1-5887-269	17-1-5888-7	1A4W19P1 (1A4A21J1)
17-1-5887-270	17-1-5888-7	1A4W18 REMOTE SPEAKER 81337-17-2-1038
17-1-5887-271	17-1-5888-7	1A4W18P1 (1A4W23J1)
17-1-5887-272	17-1-5888-7	1A4W18P1 (1A4A20J1)
17-1-5887-273	17-1-5888-7	1A4W25 RADIO REMOTE 81337-17-2-1039
17-1-5887-274	17-1-5888-7	1A4W25P1 SPKR AND HDST ASSY 17-2-1032
17-1-5887-275	17-1-5888-7	1A4W25J1 (1A4W20P2)
17-1-5887-276	17-1-5888-7	1A4W24 REMOTE SPEAKER 81337-17-2-1040
17-1-5887-277	17-1-5888-7	1A4W24P1 SPKR AND HDST ASSY 17-2-1032
17-1-5887-278	17-1-5888-7	1A4W24J1 (1A4W19P1)
17-1-5887-279	17-1-5888-7	1A4W23 REMOTE SPEAKER 81337-17-2-1041
17-1-5887-280	17-1-5888-7	1A4W23J1 SPKR AND HDST ASSY 17-2-1032
17-1-5887-281	17-1-5888-7	1A4W23J1 (1A4W18P1)

Figure D-3. Marker, Cable (Sheet 5 of 5)

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

CONTROL NO.	WIRE OR CABLE DIAMETER RANGE		PART NUMBER	RECOVERED WALL THICKNESS	SUPPLIED INSIDE DIAMETER
	MIN.	MAX.		(MAX.)	(MIN.)
17-1-5888-2	0.075	0.110	TMS-SCE-1/8-2.0-9	0.026	0.125
17-1-5888-3	0.100	0.150	TMS-SCE-3/16-2.0-9	0.028	0.187
17-1-5888-4	0.135	0.215	TMS-SCE-1/4-2.0-9	0.028	0.250
17-1-5888-5	0.200	0.300	TMS-SCE-3/8-2.0-9	0.028	0.375
17-1-5888-6	0.260	0.450	TMS-SCE-1/2-2.0-9	0.028	0.475
17-1-5888-7	0.370	0.680	TMS-SCE-3/4-2.0-9	0.030	0.710
17-1-5888-8	0.651	1.350	TMS-SCE-1-1/2-2.0-9	0.040	1.496

MATERIALS	
Description	CAGEC/Part Number
Heat shrinkable tubing. flexible polyolefin per MIL-I-23053 (shrink ratio 3 to 1). ID 1/8 - 1-1/2, length 2.0, Color: White.	81337/17-1-5888

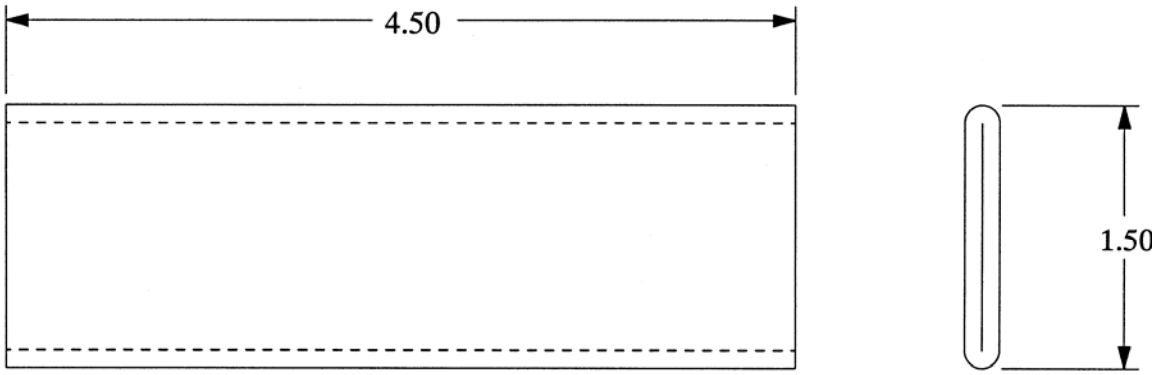
NOTES:

1. Installed sleeve length: 2.0 (NOM).
2. Markable length (characters): 18.
3. Dimensions are in inches.

Figure D-4. Sleeve

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-1-9472-1

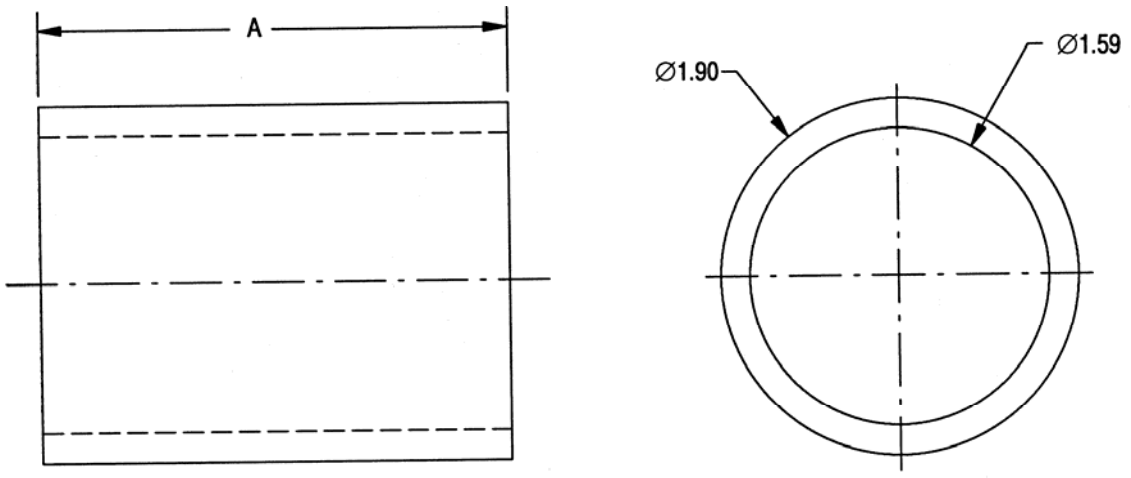


MATERIALS	
Description	CAGEC/Part Number
High quality EPDM rubber.	87585/KAZ00241025

Figure D-5. Tubing, Drain

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-1-9210-2	2.5



MATERIALS	
Description	CAGEC/Part Number
1.5 schedule 40 CPVC, type IV, grade 1. Cell classification conforming to ASTM-D-1785.	81346/ASTM-D-1785, Type IV, Grade 1

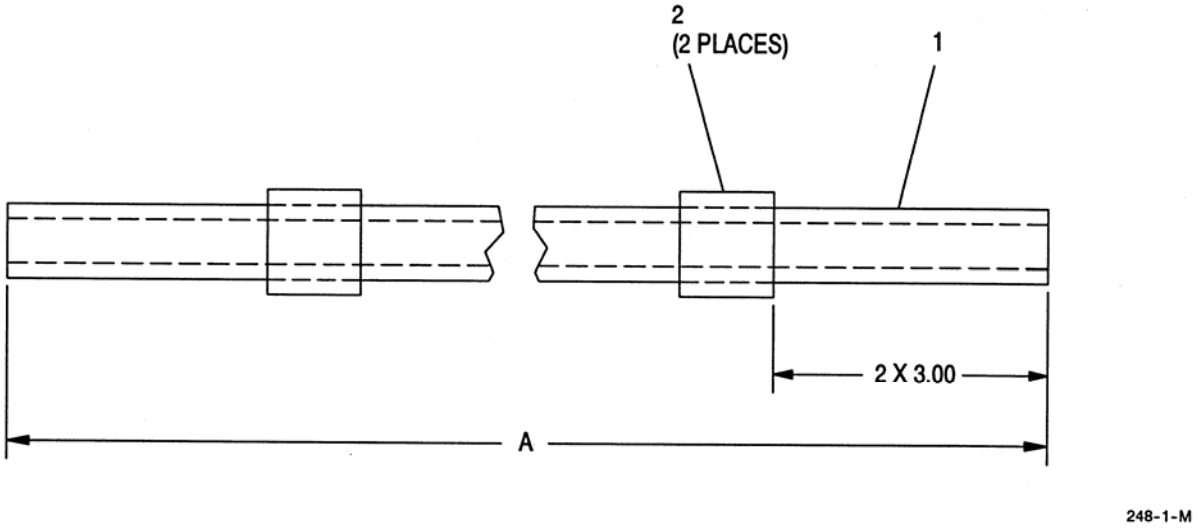
NOTES:

1. Remove all burrs and sharp edges. R.005 - R.015.
2. Remove original identification and reidentify in accordance with MIL-STD-130.
3. Dimensions are in inches.

Figure D-6. Pipe, CPVC Modified

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	Item 1: HOSE	A	Item 2: MARKER	Marking
17-1-9235-1	17-1-9234-3	29.00	17-1-5887-74	PG2-HI
17-1-9236-1	17-1-9234-4	17.00	17-1-5887-73	PG1-LOW
17-1-9237-1	17-1-9234-5	19.00	17-1-5887-75	PG2-LOW
17-2-0345-1	17-1-9234-6	31.00	17-1-5887-203	PG3-HI
17-2-0346-1	17-1-9234-4	17.00	17-1-5887-204	PG3-LOW
17-2-0347-1	17-1-9234-7	13.00	17-1-5887-205	PS1-HI
17-2-0348-1	17-1-9234-8	9.00	17-1-5887-206	PS1-LOW
17-2-0349-1	17-1-9234-10	14.00	17-1-5887-207	PS1-HI/ PG3-LOW
17-2-0350-1	17-1-9234-10	10.00	17-1-5887-208	PS1-LOW/ PG1-LOW/ PG2-LOW



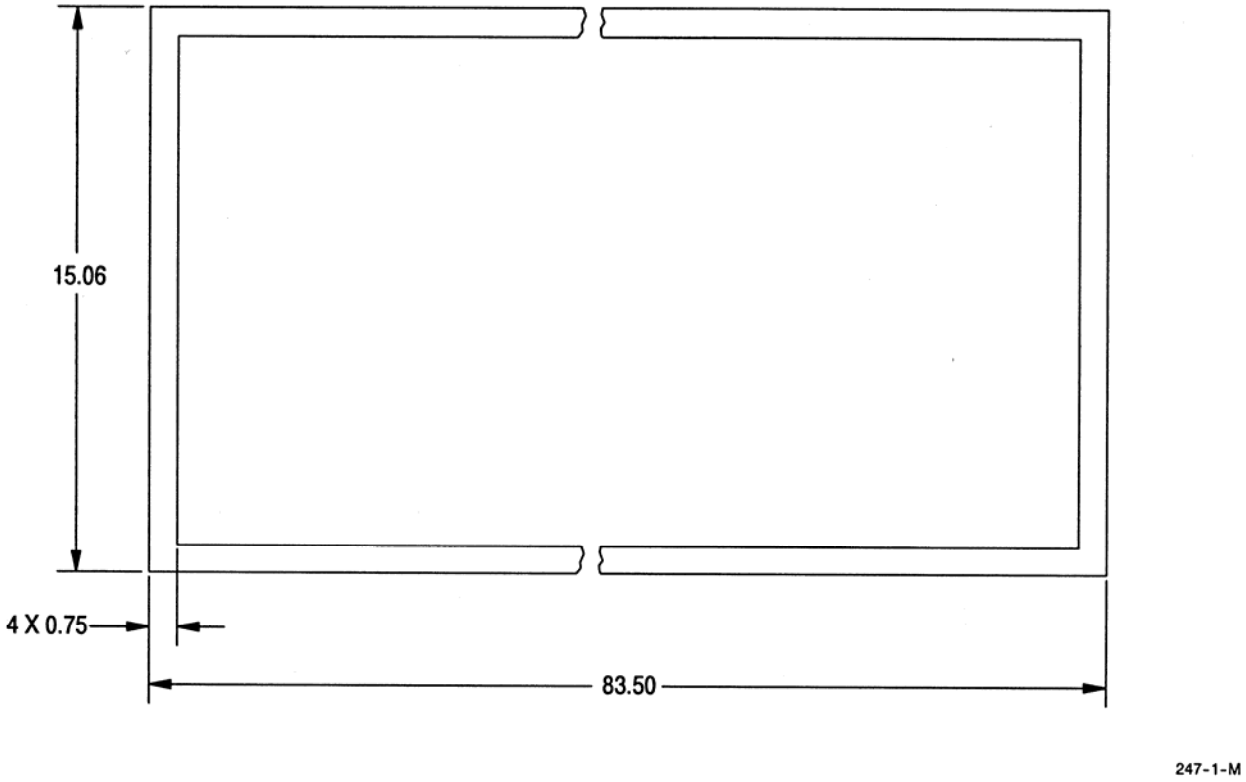
MATERIALS	
Description	CAGEC/Part Number
Item 1: Hose. buna N. ID: 0.188, OD: 0.359, Cover: neoprene, Reinforcement: 1 rayon braid.	81337/17-1-9184-1
Item 2: Marker, Cable (2 required), heat shrinkable.	81337/17-1-5887

NOTE: Dimensions are in inches.

Figure D-7. Hose, Modified

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-1-9451



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.25 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

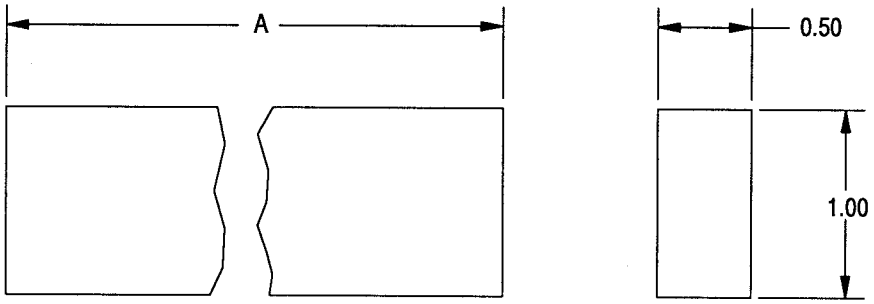
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-8. Gasket, ECU Door

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-1-9579	10.50



251-1-M

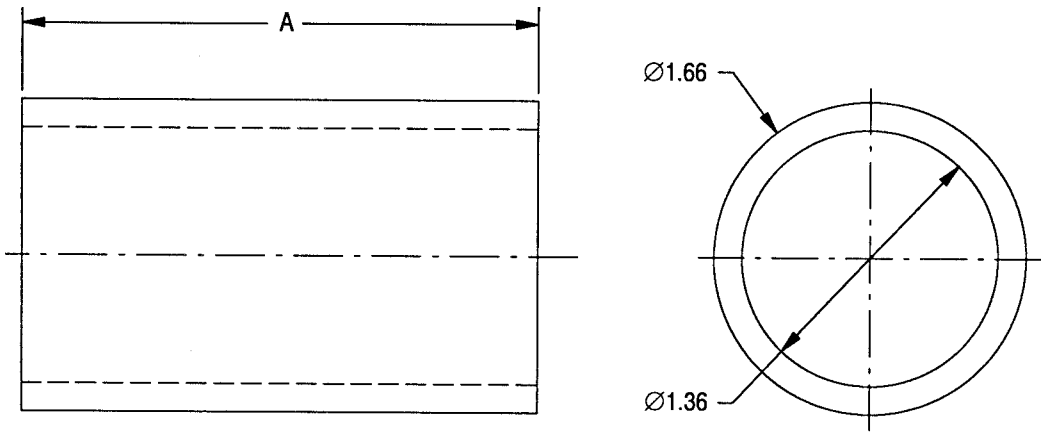
MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.50 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

NOTE: Dimensions are in inches.

Figure D-9. Gasket

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-1-9623	2.75



MATERIALS	
Description	CAGEC/Part Number
1.25 schedule 40 CPVC, type IV, grade 1. Cell classification conforming to ASTM-D-1785.	81346/ASTM-D-1785, Type IV, Grade 1

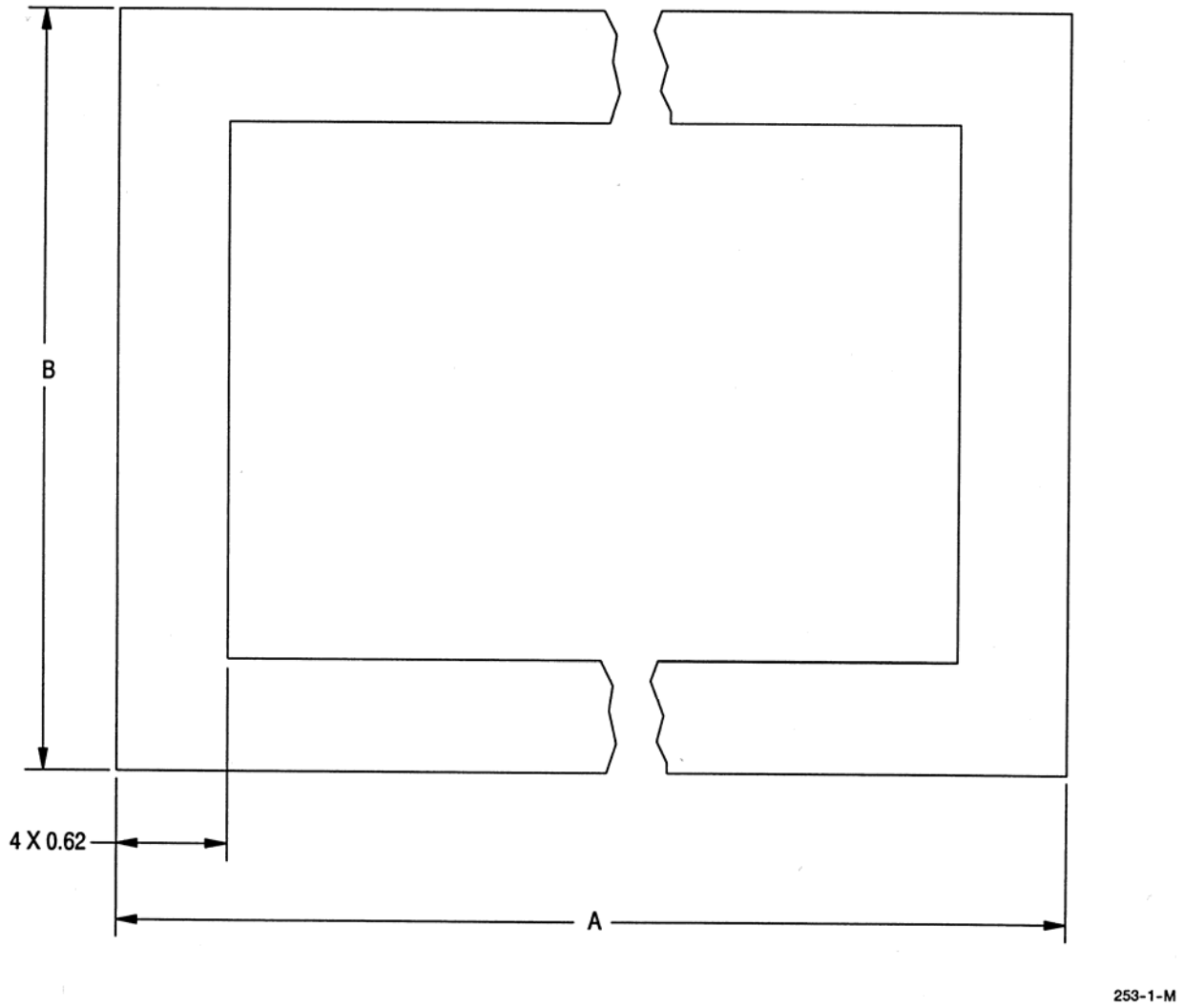
NOTES:

1. Remove all burrs and sharp edges. R.005 - R.015.
2. Remove original identification and re-identify in accordance with MIL-STD-130.
3. Dimensions are in inches.

Figure D-10. Pipe, CPVC Modified

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A	B
17-1-9704	7.62	4.25
17-1-9704-2	6.25	6.25



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.12 thick, with pressure sensitive adhesive backing.	81337/17-2-0008-5 OADKI/CC-0316-50

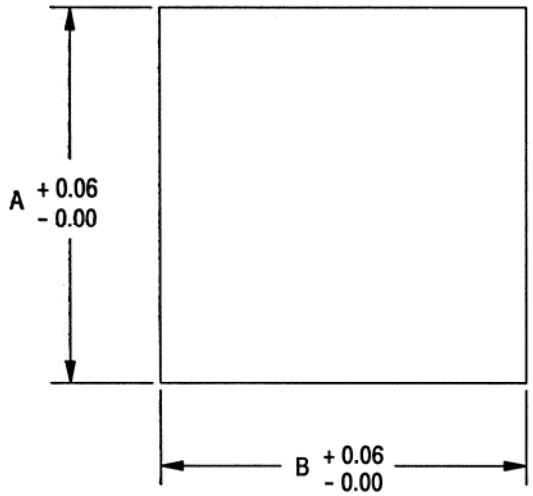
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-11. Gasket

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A	B	MATERIAL
17-1-9866-1	16.69	16.31	17-2-0250-1
17-1-9866-2	9.44	16.31	17-2-0250-1
17-1-9866-3	13.12	16.31	17-2-0249-1
17-1-9866-4	16.81	27.25	17-2-0249-1
17-1-9866-5	29.69	15.31	17-2-0249-1
17-1-9866-6	21.81	15.31	17-2-0249-1
17-1-9866-7	2.25	15.31	17-2-0249-1
17-1-9866-8	3.50	15.31	17-2-0249-1
17-1-9866-9	27.25	29.69	17-2-0250-1
17-1-9866-11	56.94	30.19	17-2-0250-1
17-1-9866-13	11.06	16.81	17-2-0249-1
17-1-9866-22	27.45	29.69	17-2-0249-1
17-1-9866-23	56.94	30.19	17-2-0249-1



NOTE

Apply soundfoam using adhesive (Item 7, Appendix C) on entire contact surface of foam shape.

254-1-M

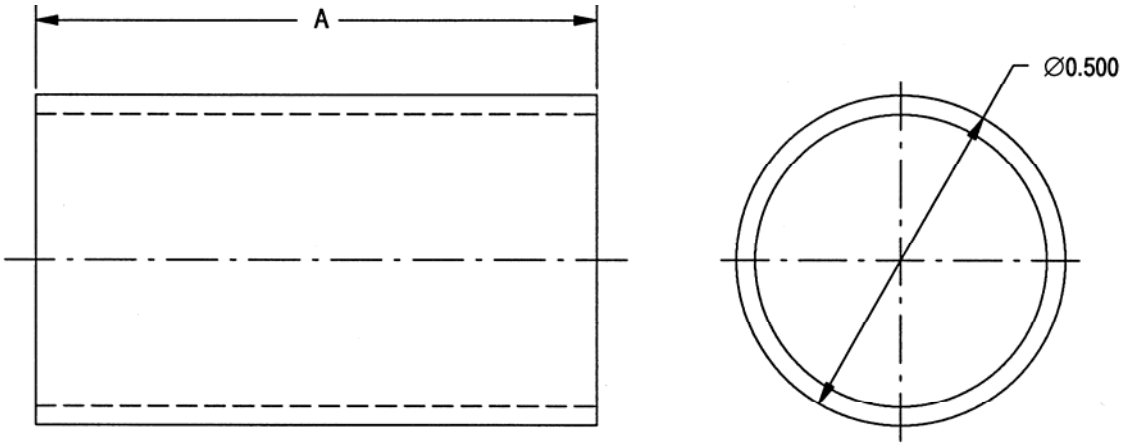
MATERIALS	
Description	CAGEC/Part Number
Foam, acoustical (Hushcloth), 1.0 thick	81337/17-2-0249-1
Foam, acoustical (Whispermat) with barrier, 0.75 thick	81337/17-2-0250-1

NOTE: Dimensions are in inches.

Figure D-12. Soundfoam

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-1-9883-17	3.75
17-1-9883-18	1.00
17-1-9883-19	3.00
17-1-9883-20	25.00



255-1-M

MATERIALS	
Description	CAGEC/Part Number
Tube, copper 0.500 OD x 0.032 wall IAW ASTM B-280.	81346/ASTM-B-280

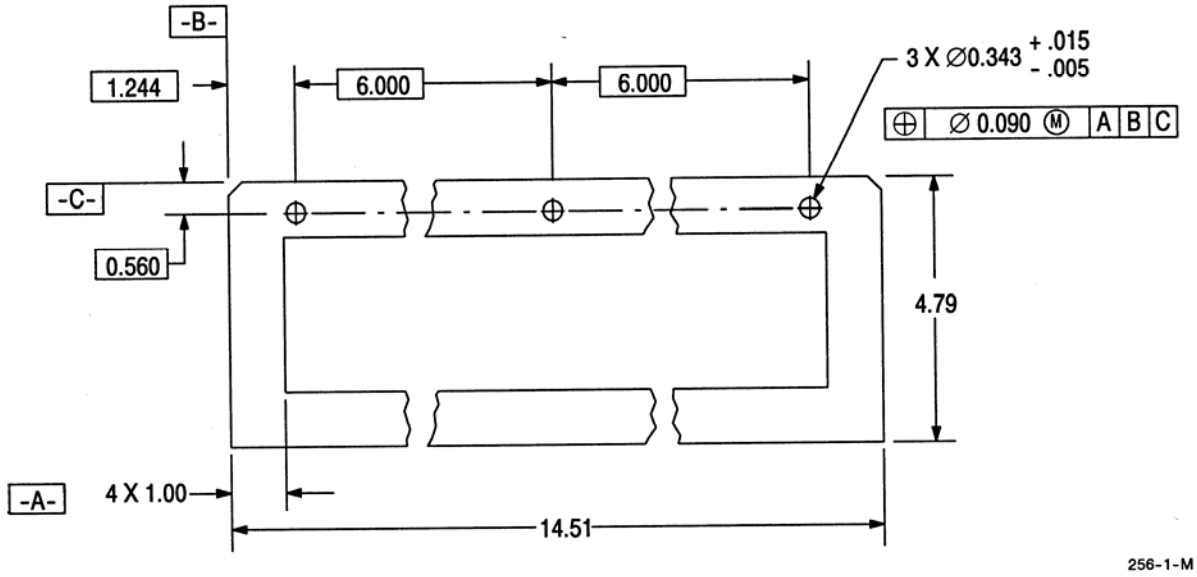
NOTES:

1. Remove all burrs and sharp edges. R.005 - R.015.
2. Dimensions are in inches.

Figure D-13. Tube, Copper

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0338



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.12 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

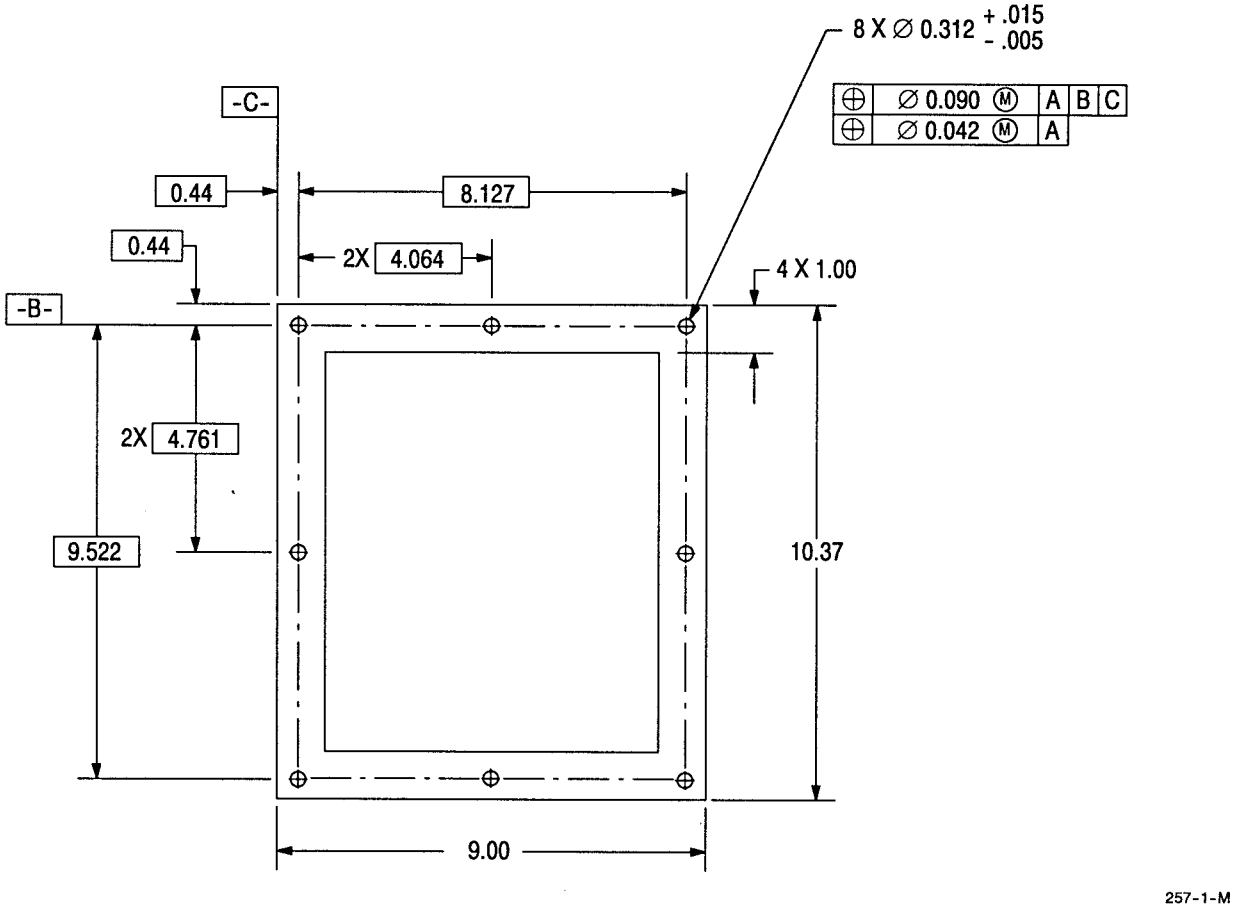
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-14. Gasket

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0397



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.12 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

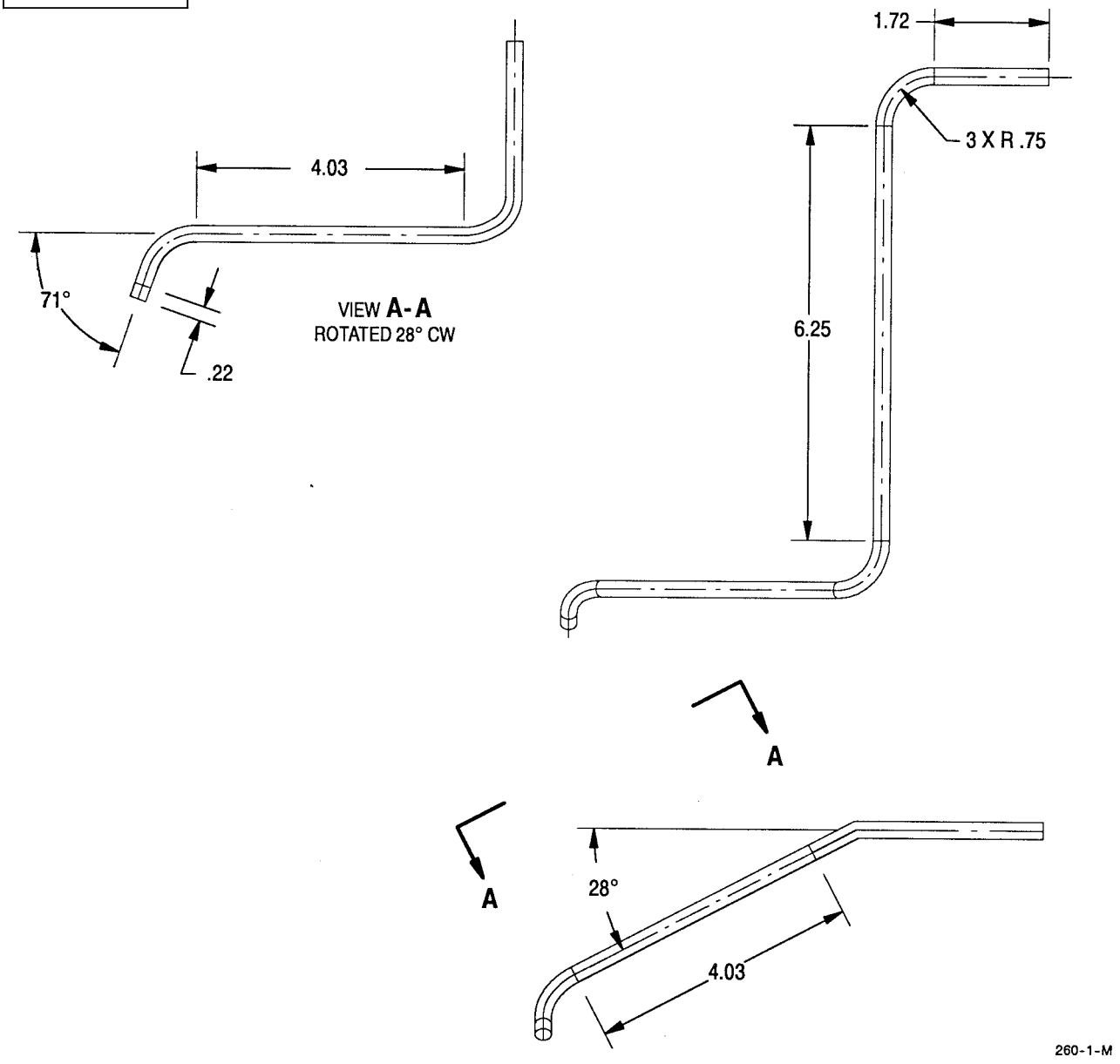
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-15. Gasket, Adapter Blower

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0437



MATERIALS	
Description	CAGEC/Part Number
Tube, copper, seamless, type L, nitrogenized, 0.250 OD x 0.030 wall x 15.70 long.	81337/17-2-0437 81346/ASMT-B-88, Type L

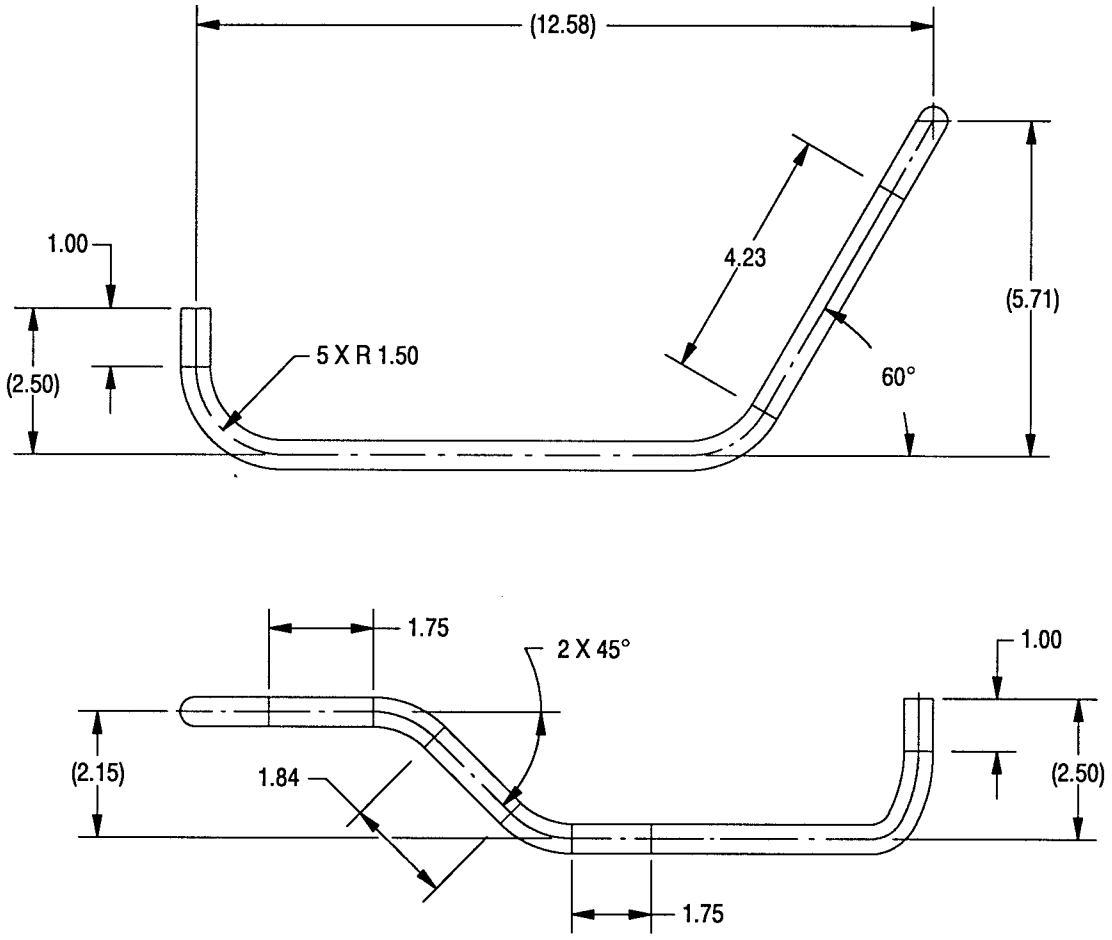
NOTES:

1. Remove all burrs and sharp edges. R.005 - R.015.
2. Dimensions are in inches.

Figure D-16. Tube, Lower Expansion Valve

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0453



MATERIALS	
Description	CAGEC/Part Number
Tube, copper, seamless, type L, nitrogenized, 0.500 OD x 0.035 wall x 20.19 long.	81337/17-2-0453 81346/ASTM-B-88, Type L

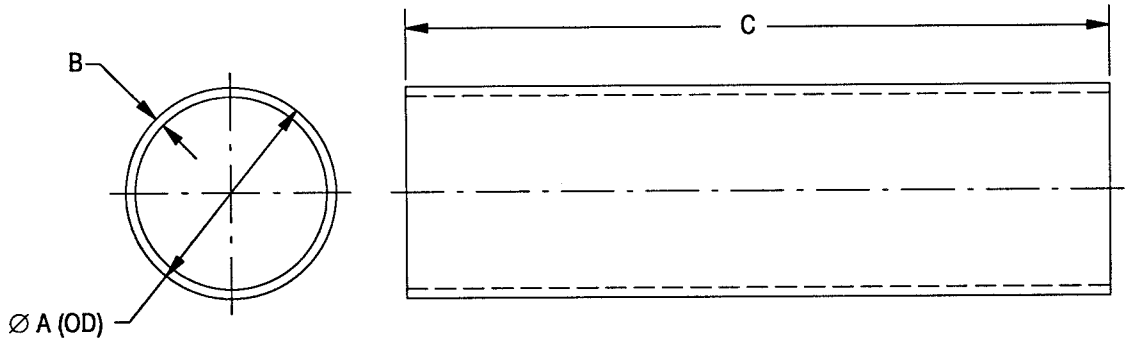
NOTES:

1. Remove all burrs and sharp edges. R.005 - R.015.
2. Dimensions are in inches.

Figure D-17. Tube, Lower Receiver Tank

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A	B	C
17-2-0499-1	1.125	0.050	3.75
17-2-0499-2	1.125	0.050	5.00
17-2-0499-3	0.875	0.045	2.00
17-2-0499-4	0.875	0.045	2.25
17-2-0499-5	0.875	0.045	6.38
17-2-0499-6	0.875	0.045	2.25
17-2-0499-7	1.125	0.050	3.00
17-2-0499-8	1.125	0.050	17.50
17-2-0499-9	1.125	0.050	6.00
17-2-0499-10	1.125	0.050	6.62
17-2-0499-11	1.125	0.050	6.50



258-1-M

MATERIALS	
Description	CAGEC/Part Number
Tube, copper, seamless, nitrogenized.	81346/ASTM-B-88, Type L

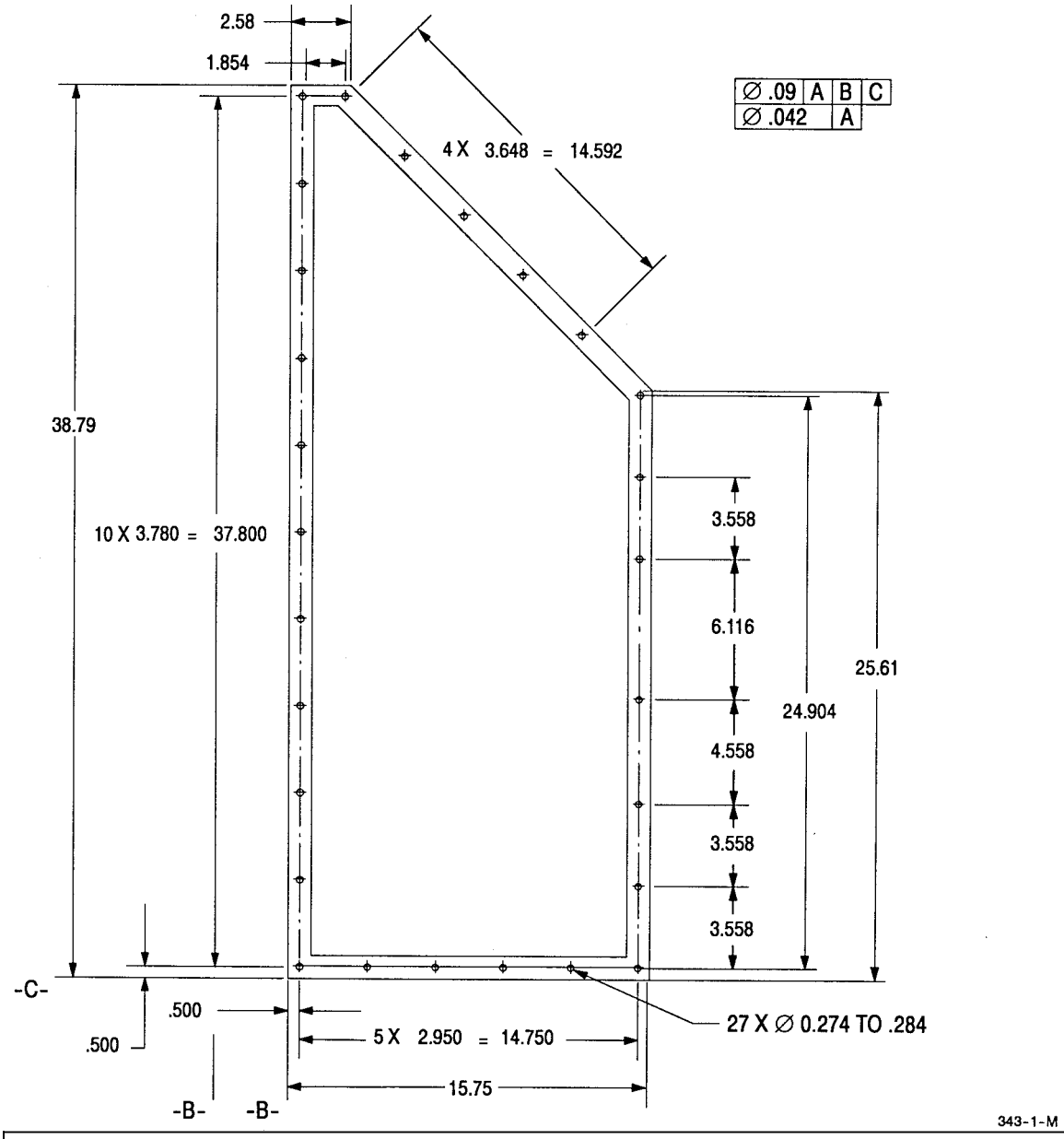
NOTES:

1. Remove all burrs and sharp edges. R.005 - R.015.
2. Dimensions are in inches.

Figure D-18. Tube, Copper

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-1-9625



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.21 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

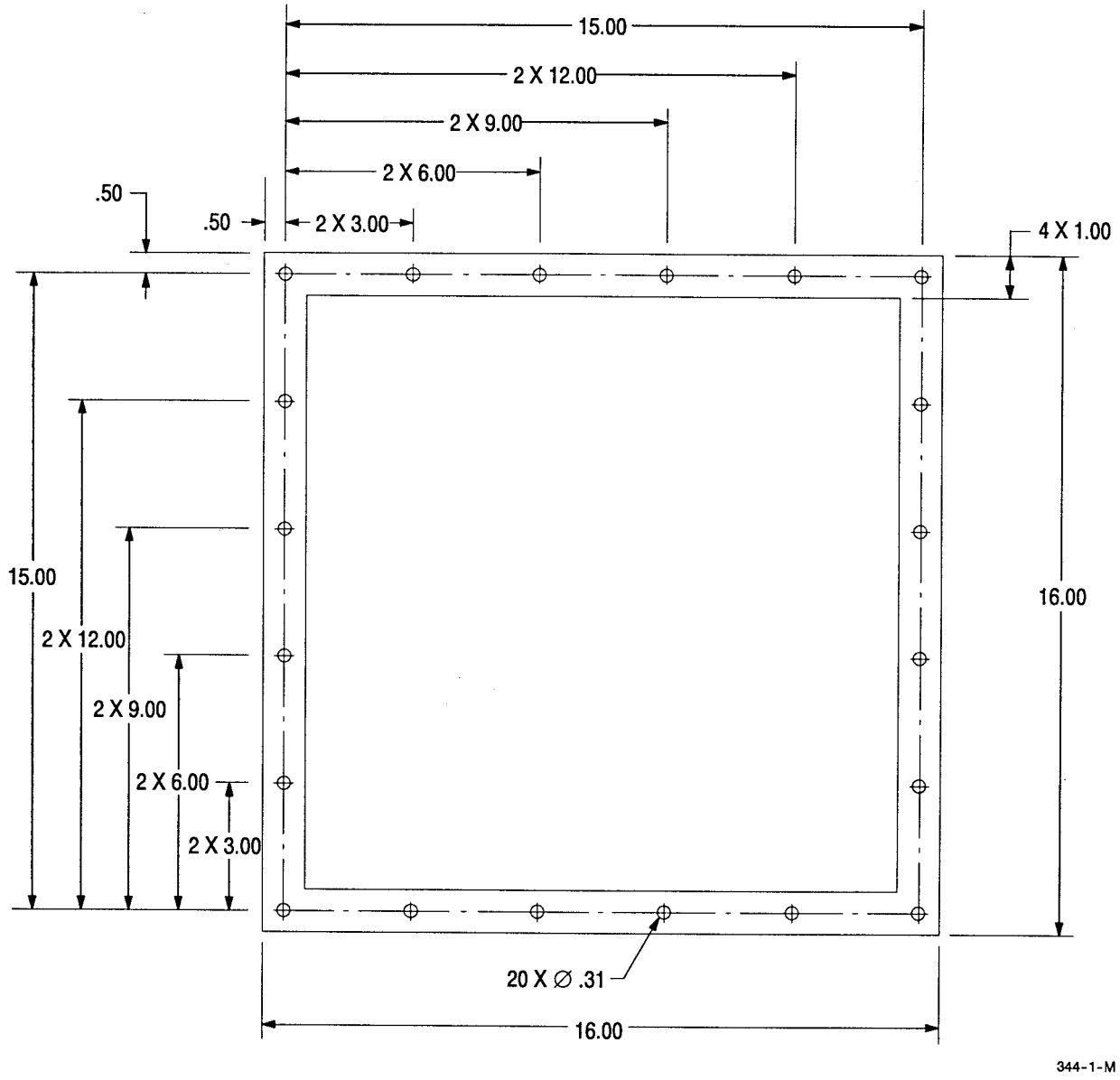
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-19. Gasket

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-1-9809



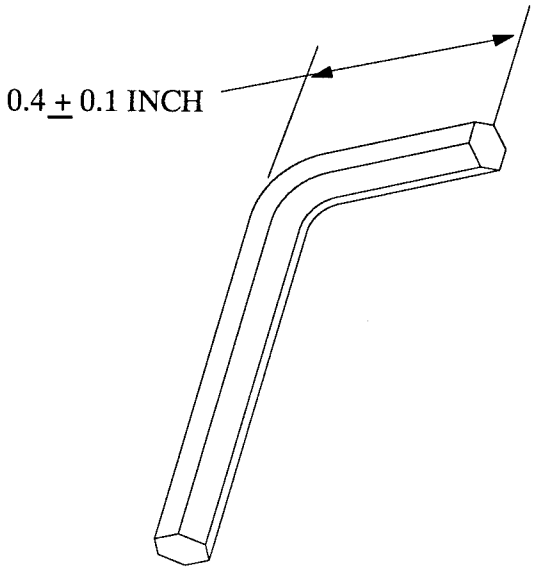
MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.21 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-20. Gasket, Access Cover

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued



MATERIALS	
Description	CAGEC/Part Number
Socket Head Screw Key; S, L-HDL 3.0mm NSN 5120-01-045-4888	74445 /57122

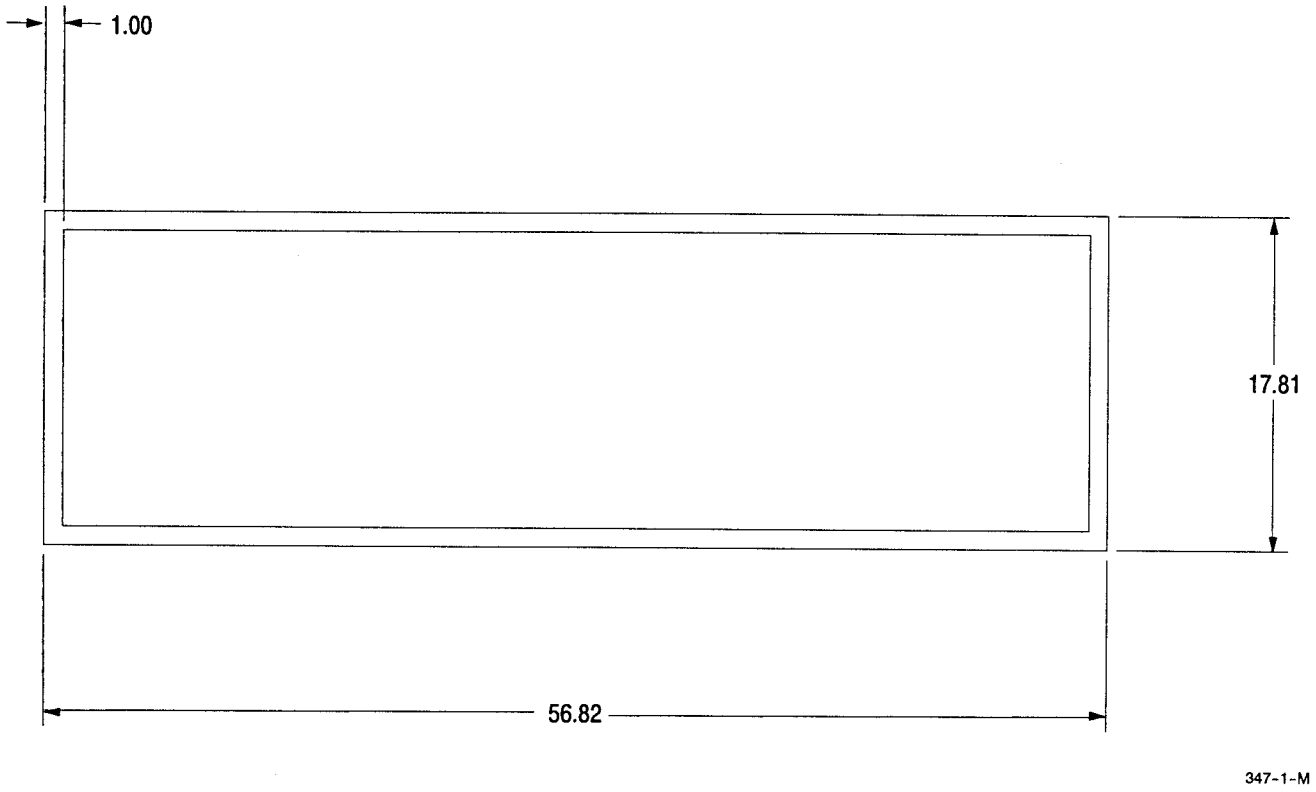
NOTES:

1. Dimensions are in inches.
2. Cut short end to dimension as shown.

Figure D-21. Modified 3mm Hex Key

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0008-4



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.12 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

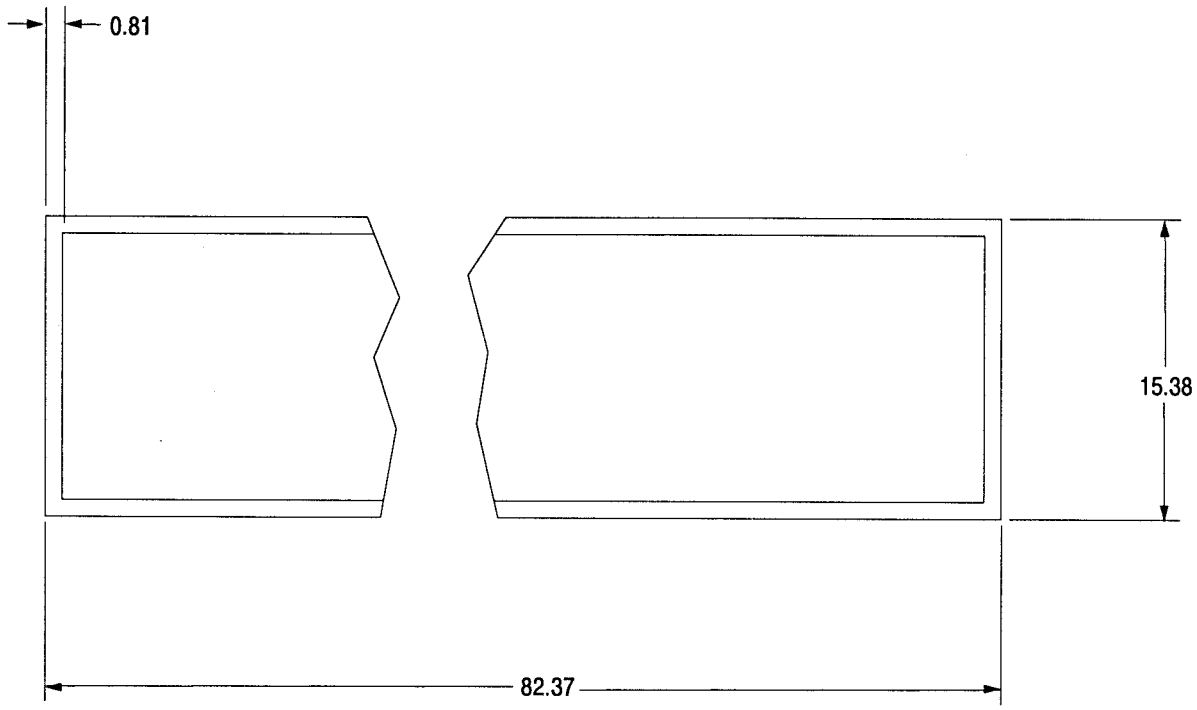
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-22. Foam

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0008-11



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.12 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

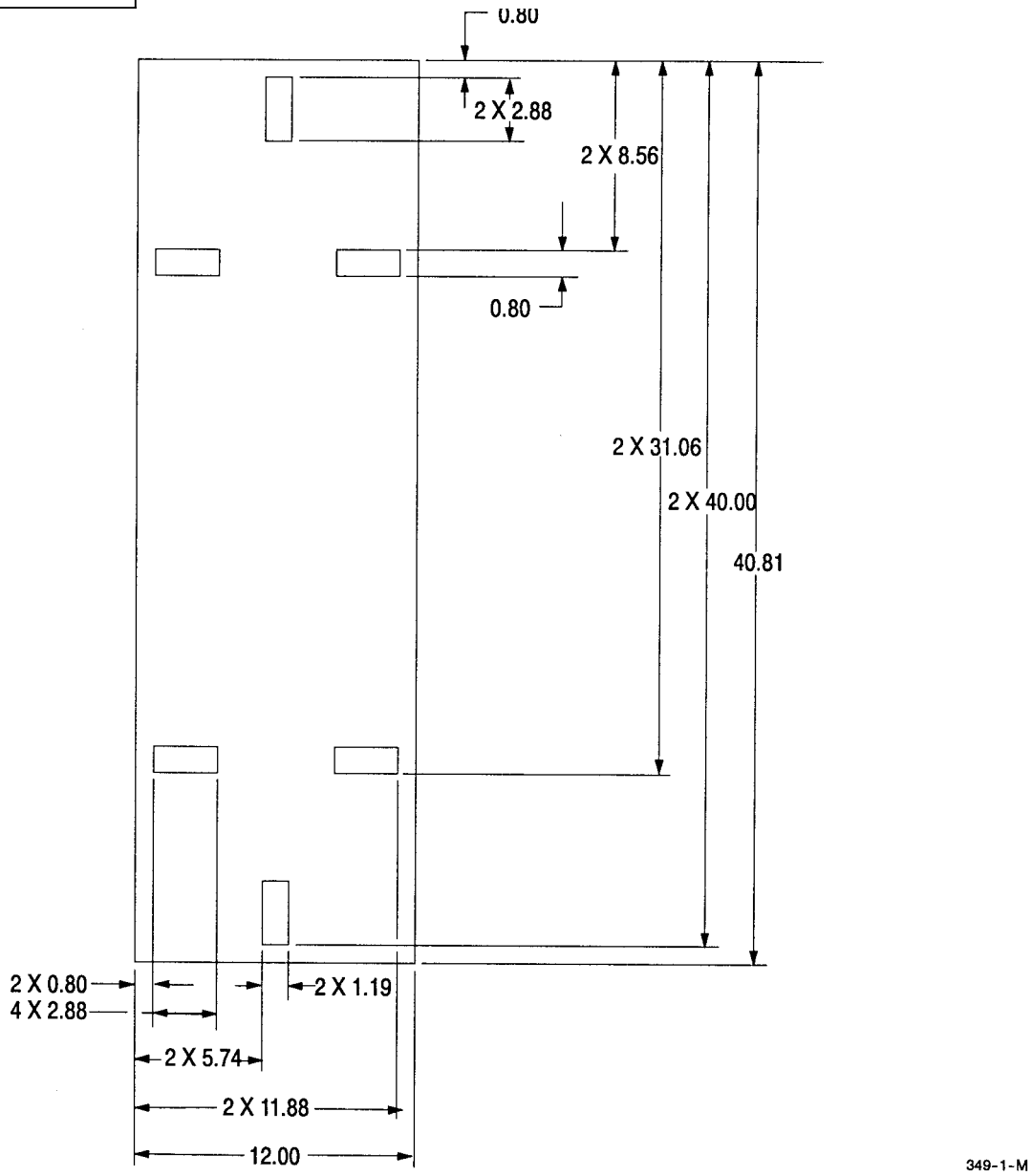
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-23. Foam

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0015



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.50 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

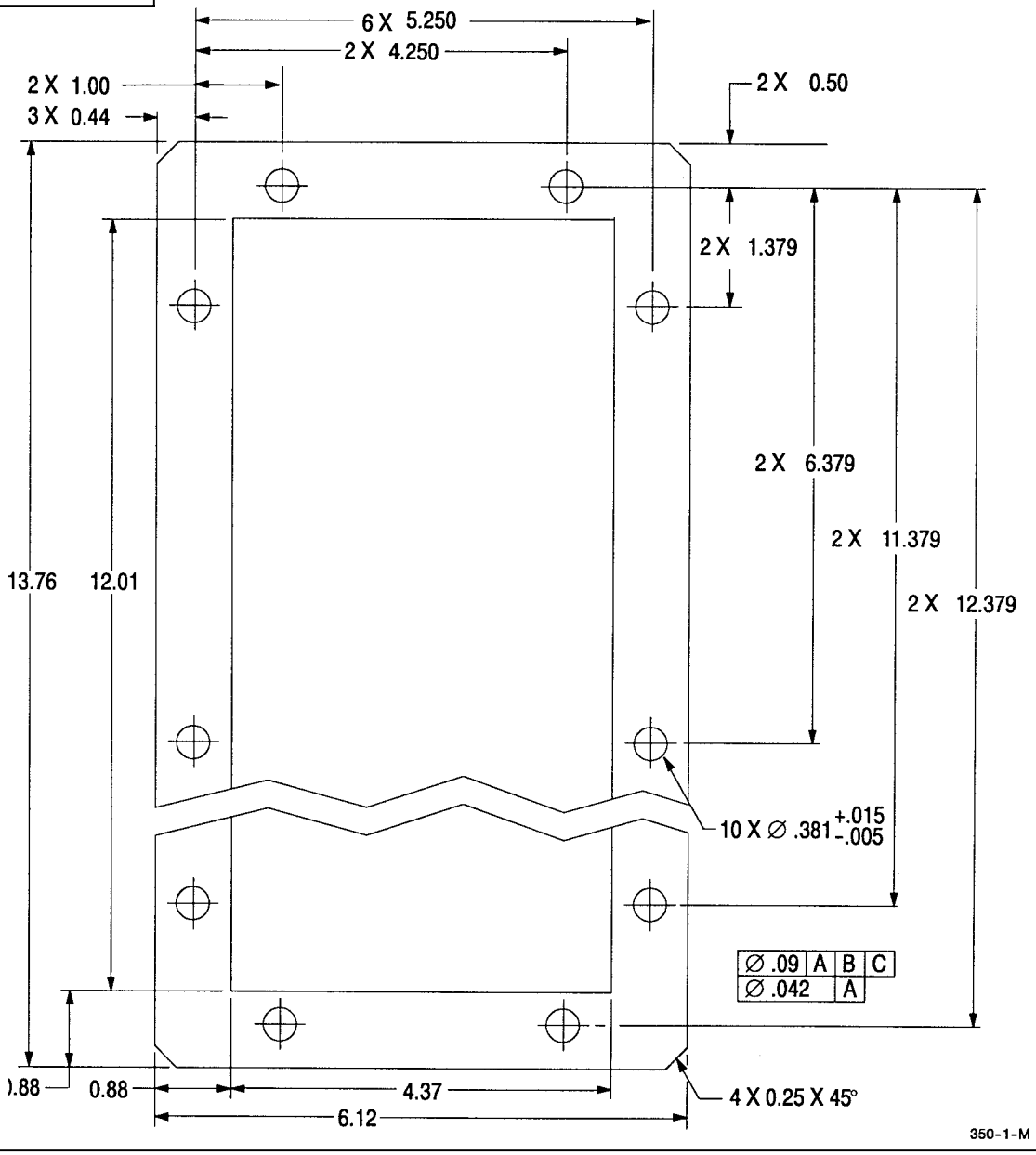
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-24. Foam, Top Front

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0342



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.12 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

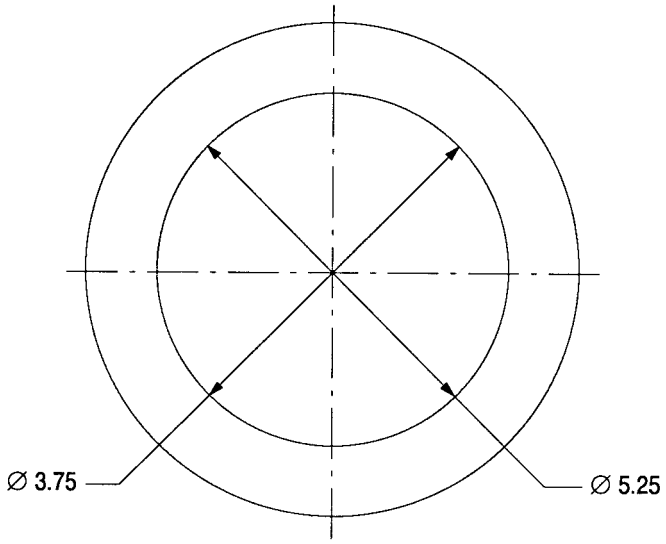
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-25. Gasket

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-2-0386



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.25 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

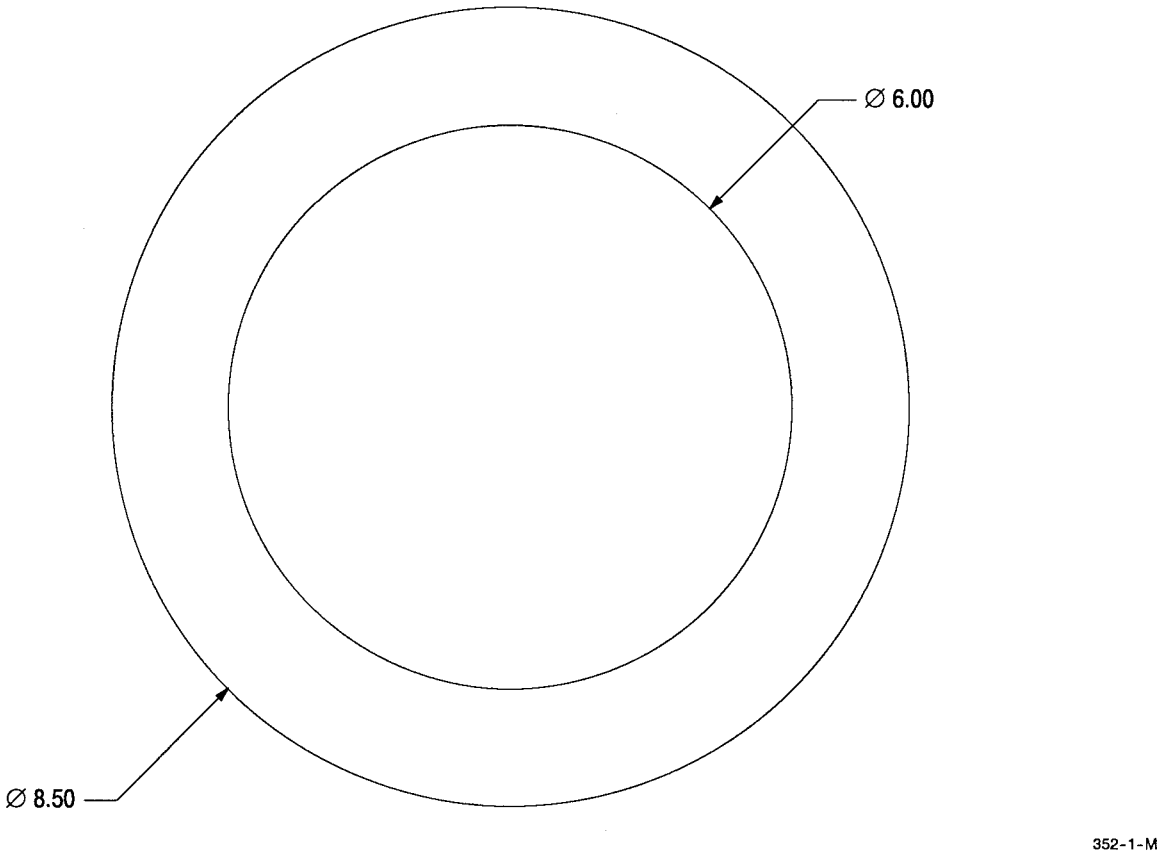
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-26. Gasket, Blower Outlet

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.
17-1-9801



MATERIALS	
Description	CAGEC/Part Number
Foam, EPDM epter polymer, 0.25 thick, with pressure sensitive adhesive backing.	OADKI/CC-0316-50

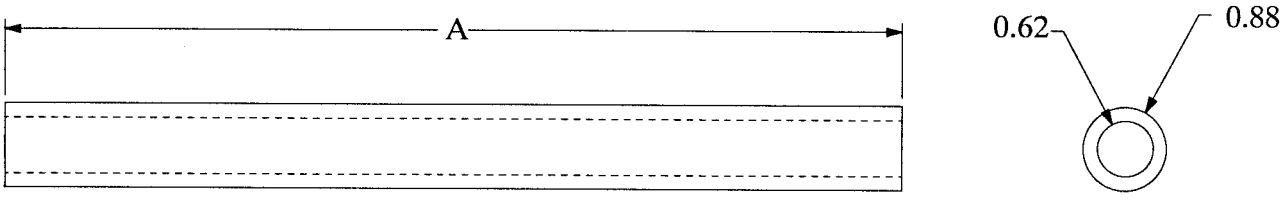
NOTES:

1. Dimensions are in inches.
2. Construction optional.

Figure D-27. Gasket

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-2-0500-1	48.00
17-2-0500-2	22.00
17-2-0500-3	11.00
17-2-0500-4	54.00
17-2-0500-5	2.00

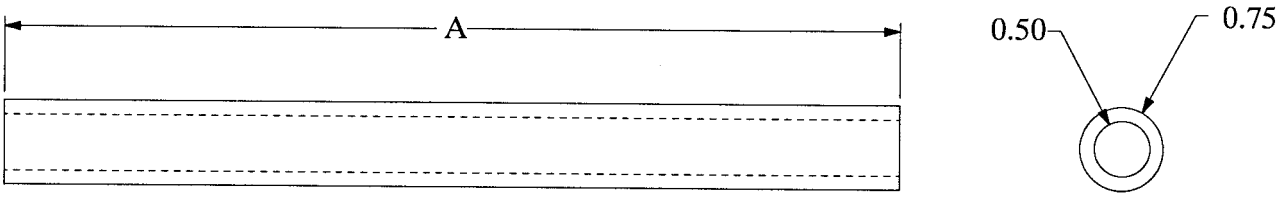


MATERIALS	
Description	CAGEC/Part Number
Tubing, non-metallic; ID 0.62, OD 0.88.	06034/110-3074

Figure D-28. Hose, PVC

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-2-0506-1	10.00
17-2-0506-2	24.00
17-2-0506-3	41.00
17-2-0506-4	18.00
17-2-0506-5	53.00
17-2-0506-6	14.00
17-2-0506-7	95.00
17-2-0506-8	21.00

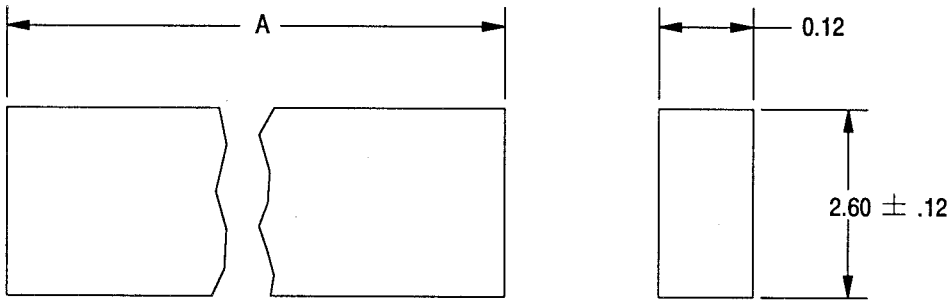


MATERIALS	
Description	CAGEC/Part Number
Tubing, non-metallic; ID 0.50, OD 0.75.	06034/110-2381

Figure D-29. Hose, PVC

Section II. ILLUSTRATED MANUFACTURING INSTRUCTIONS – Continued

PART NO.	A
17-2-0897-2	72.00 ? .25



MATERIALS	
Description	CAGEC/Part Number
Foam, Neoprene	OU929/R411N

NOTE: Dimensions are in inches.

Figure D-30. Gasket, Foam

APPENDIX E
MANDATORY REPLACEMENT PARTS

Section I. INTRODUCTION

E.1 SCOPE.

This appendix lists mandatory replacement parts you will need to maintain the Chemical Biological Protective Shelter (CBPS) System.

E.2 EXPLANATION OF COLUMNS.

a. Column (1) Item Number. This number is assigned to each entry in the listing and is referenced in the 'Initial Setup' of applicable tasks under the heading of 'Material/Parts', (e.g., Lockwasher, Item 19, Appendix H).

b. Column (2) Nomenclature. Federal item name or identification of the part.

c. Column (3) (CAGEC) Part Number. The Commercial and Government Entity Code (CAGEC) is in parentheses followed by the manufacturer's part number.

d. Column (4) National Stock Number. This is the National Stock Number (NSN) assigned to the item; use it to request or requisition the item.

Section II. MANDATORY REPLACEMENT PARTS

(1) Item Number	(2) Nomenclature	(3) (CAGEC) Part Number	(4) National Stock Number
1	FILTER, ELEMENT, AIR CONDITIONING	(81337) 17-2-0207-1	4130-01-488-4540
2	FILTER, ELEMENT, AIR CONDITIONING	(81337) 17-2-0207-2	4130-01-488-4542
3	GASKET	(59793) 004-02146	
4	GASKET, WATER PUMP	(19207) 10137492-1	5330-01-147-9808
5	GROMMET, NONMETALLIC	(80205) MS21266-1	5325-00-960-2410
6	KEY, MACHINE	(96906) MS20068-144	5315-00-879-1660
7	KEY, MACHINE	(80205) MS20068-175	5315-01-489-1106
8	LOCKNUT	111-B-02	
9	WASHER, LOCK	(05047) ASME-B18-21-1	5310-00-637-9541
10	WASHER, LOCK	(80205) MS35338-47	5310-00-209-0965
11	WASHER, LOCK	(05624) CYRD558	5310-01-252-6430
12	WASHER, LOCK	(80205) MS35333-39	5310-00-579-5752
13	WASHER, LOCK	(80205) MS35333-42	3510-00-595-7237
14	WASHER, LOCK	(80205) MS35338-135	5310-00-933-8118
15	WASHER, LOCK	(80205) MS35338-136	5310-00-929-6395
16	WASHER, LOCK	(80205) MS35338-137	5310-00-933-8119
17	WASHER, LOCK	(80205) MS35338-138	5310-00-933-8120
18	WASHER, LOCK	(80205) MS35338-139	5310-00-933-8121
19	WASHER, LOCK	(80205) MS35338-140	5310-00-974-6623

Section II. MANDATORY REPLACEMENT PARTS – Continued

(1) Item Number	(2) Nomenclature	(3) (CAGEC) Part Number	(4) National Stock Number
20	WASHER, LOCK	MS35338-141	5310-00-984-7042
21	WASHER, LOCK	(96906)MS35338-142	5310-00-973-8786
22	WASHER, LOCK	MS35338-143	5310-00-933-8778
23	WASHER, LOCK	MS35338-148	5310-00-974-6642
24	WASHER, LOCK	(96906) MS35338-155	5310-00-883-9385
25	WASHER, LOCK	MS35338-42	5310-00-045-3299
26	WASHER, LOCK	MS35338-44	5310-00-582-5965
27	WASHER, LOCK	MS35338-45	5310-00-407-9566
28	WASHER, LOCK	MS35338-46	5310-01-334-4710
29	WASHER, LOCK	MS35338-47	5310-00-209-0965
30	WASHER, LOCK	(96906) MS35338-48	5310-00-003-4094
31	WASHER, LOCK	MS35338-81	5310-00-933-8120
32	LOCKWASHER	(OIPL3) RL65175	
33	WASHER, FLAT	(01843) W1227	5310-00-485-8600
34	WASHER, LOCK	(08302) 102423	5310-00-481-6481
35	WASHER, LOCK	(7X677) 11500207	5310-01-206-7306
36	WASHER, LOCK	(29930) 120382	5310-00-481-6411
37	LOCKWASHER	(34623) 120383-1	
38	LOCKWASHER, EXTERNAL TOOTH	(39428) 95060A400	
39	LOCKWASHER, METRIC, 10M	(31361) P/O 8923-056	
40	INSERT, SCREW THREADED	(81337) 17-1-5726-3	5325-01-148-5965
41	NUT, SELF-LOCKING, HEXAGON	(96906) MS16228-5C	5310-00-241-6638
42	NUT, SELF-LOCKING, HEXAGON	(80205) MS16228-4C	5310-00-245-8825
43	NUT, SELF-LOCKING	(96906) MS17827-5C	
44	NUT, SELF-LOCKING, HEXAGON	(80205) MS17829-3C	5310-00-989-3877
45	NUT, SELF-LOCKING, EXTENDED WASHER	(80205) MS21042-5	5310-00-807-1469
46	NUT, SELF-LOCKING, HEXAGON	(80205) MS21044C5	5310-00-982-6816
47	NUT, SELF-LOCKING, HEXAGON	(80205) MS21044N3	5310-00-877-5797
48	NUT, SELF-LOCKING, HEXAGON	(81349) M45913/1-4CG5C	5310-00-088-1251
49	O-RING	(OIPL3) RL72200	
50	O-RING	(81337) 17-2-0693-1	5331-01-011-7049
51	O-RING	(81337) 17-2-0693-10	5330-01-264-9971
52	O-RING	(81337) 17-2-0693-11	
53	O-RING	(81337) 17-2-0693-12	

Section II. MANDATORY REPLACEMENT PARTS – Continued

(1) Item Number	(2) Nomenclature	(3) (CAGEC) Part Number	(4) National Stock Number
54	O-RING	(81337) 17-2-0693-13	
55	O-RING	(81337) 17-2-0693-14	
56	O-RING	81337) 17-2-0693-2	5330-01-162-4759
57	O-RING	(81337) 17-2-0693-3	5330-01-235-8332
58	O-RING	(81337) 17-2-0693-4	5331-00-162-3807
59	O-RING	(81337) 17-2-0693-5	5331-00-109-0111
60	O-RING	(81337) 17-2-0693-6	
61	O-RING	(81337) 17-2-0693-7	5331-00-916-6639
62	O-RING	(81337) 17-2-0693-8	5331-01-006-2132
63	O-RING	(81337) 17-2-0693-9	5330-01-344-1417
64	O-RING	(02697) 2-021-C873-70	5331-01-219-8073
65	O-RING	(30780) 1/8-C873-70	
66	O-RING	(30780) 3-902-C873-70	5331-01-007-4906
67	O-RING	(30780) 8-6-C873-70	
68	PIN, COTTER	(80205) MS24665-366	5315-00-236-8356
69	RIVET, BLIND	(07707) MK665BS	5320-00-156-4457
70	RIVET, BLIND	(0BV94) MGLP-BB-10	
71	RIVET, BLIND	(29666) MGL100-U6-9	
72	RIVET, SOLID	(80205) MS20426AD6-7	5320-00-117-7287
73	RIVET, BLIND	(96906) MS20600AD8W13	5320-00-982-5885
74	RIVET, BLIND	(81349) M24243/1-B302	5320-00-999-0397
75	RIVET, BLIND	(81349) M24243/1-B604	5320-00-493-4101
76	RIVET, BLIND	(81349) M24243/3-B608	5320-01-489-1254
77	RIVET, BLIND	(D9182) M24243/6-A602H	5320-00-956-7362
78	RIVET, BLIND	(D9182) M24243/6-A604H	5320-00-956-7355
79	RIVET, BLIND	(81349) M24243/6-A606F	5320-00-952-4161
80	RIVET, BLIND	(81349) M24243/6-A606H	5320-00-882-8385
81	RIVET, BLIND	(81349) M24243/6-A608H	5320-01-032-6534
82	RIVET, BLIND	(81349) M24243/7-A604H	5320-00-420-2165
83	RIVET, BLIND	(81337) 17-1-5711-6	5320-00-956-7355
84	RIVET, BLIND	(81337) 17-1-5737-7	5320-01-498-7355
85	SEAL	(59793) 02061812	
86	STRAP, TIE-DOWN, ELEC COMPOUND	(96906) MS3367-3-0	5975-00-985-6630
87	STRAP, TIE-DOWN, ELEC COMPOUND	(96906) MS3367-4-0	5975-00-903-2284
88	STRAP, TIE-DOWN, ELEC COMPOUND	(81343) MS3367-7-0	5975-01-034-5871

APPENDIX F
ASSOCIATED DRAWINGS

F.1 SCOPE.

This appendix provides drawings to assist you in troubleshooting the Chemical Biological Protective Shelter (CBPS) System.

Figure	Title	(CAGEC) Part Number	Identifier	Page
F-1	Rear Light Box Assembly	(81337) 17-1-9365	1A4A7	F-2
F-2	CBPS Cable Interconnect Diagram	(81337) 17-1-9400	1A1/1A4	F-3
F-3	Control Box Assembly	(81337) 17-2-0748	1A4A18	FO-1
F-4	ECU Connections	(81337) 17-1-9359	1A4A1	FO-3
F-5	ECV Electrical Connections	(81337) 17-1-9124	1A1/A17	FO-7
F-6	Forward Light Box Assembly	(81337) 17-1-9364	1A4A5	F-5
F-7	Hydraulic Manifold	(81337) 17-1-9897	1A4A1	FO-9
F-8	Power Panel	(81337) 17-1-5826	1A4A9	F-7
F-9	Rear Control Panel	(81337) 17-1-9360	1A4A4	FO-11
F-10	Receptacle Panel	(81337) 17-1-5824	1A4A10	F-9
F-11	Relay Box	(81337) 17-1-9358	1A4A17	F-10
F-12	R22 Refrigeration Schematic	(81337) 17-1-9898	1A4A1(R22)	FO-23
F-13	System Schematic	(81337)17-1-9868	A4	F-11
F-14	Tachometer Wiring	–	1A1A17	FO-25
F-15	Vehicle Control Box	(81337) 17-1-9363	1A4A8	FO-27
F-16	Troubleshooting Interconnect Diagram	–	–	FO-29

F.2 REFERENCE DESIGNATION.

Reference designations are used in this manual to identify and locate assemblies and parts in the Chemical Biological Protective Shelter (CBPS) system. The reference designator consists of the unit designator (1A1 or 1A4) followed by assembly designator (A1) then component designator (W1, R1, C1, etc). 1A1 reference designator identifies assemblies in the Expanded Capacity Vehicle (ECV). 1A4 reference designator identifies assemblies of the CBPS system. The following examples shows how cables and individual wires are identified. The reference designator in parenthesis under the reference designator on a cable indicates the connector it is mating to.

1A4W6P2 The 1A4 identifies the unit (CBPS), W6 is cable identifier, and P2 is connector identifier.

A4K1-C2 <-> A4J1-G The unit designator is not stamped on wire. A4 identifies the assembly, K1 identifies the component (relay), C2 identifies pin on relay, < identifies wire end connected to pin C2, > identifies other end of wire to pin G on connector J1 on assembly A4.

F.3 FOLDOUTS (FO).

Foldouts (FO) are oversized drawings. FO's are placed in back of manual for printing purposes. Figure numbers are not in sequence due to moving drawings.

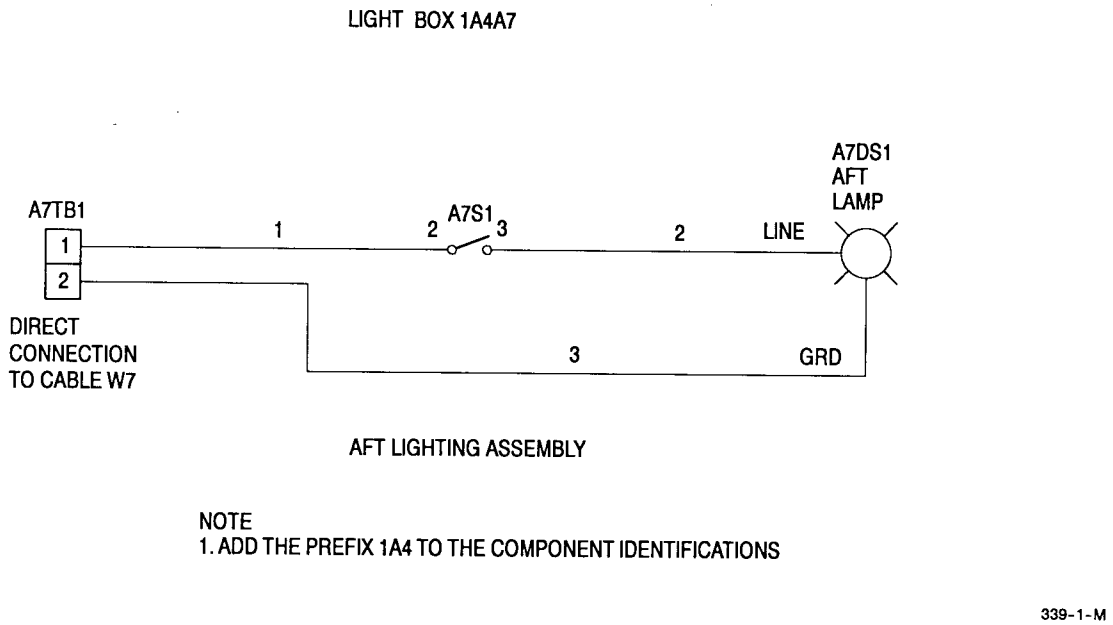
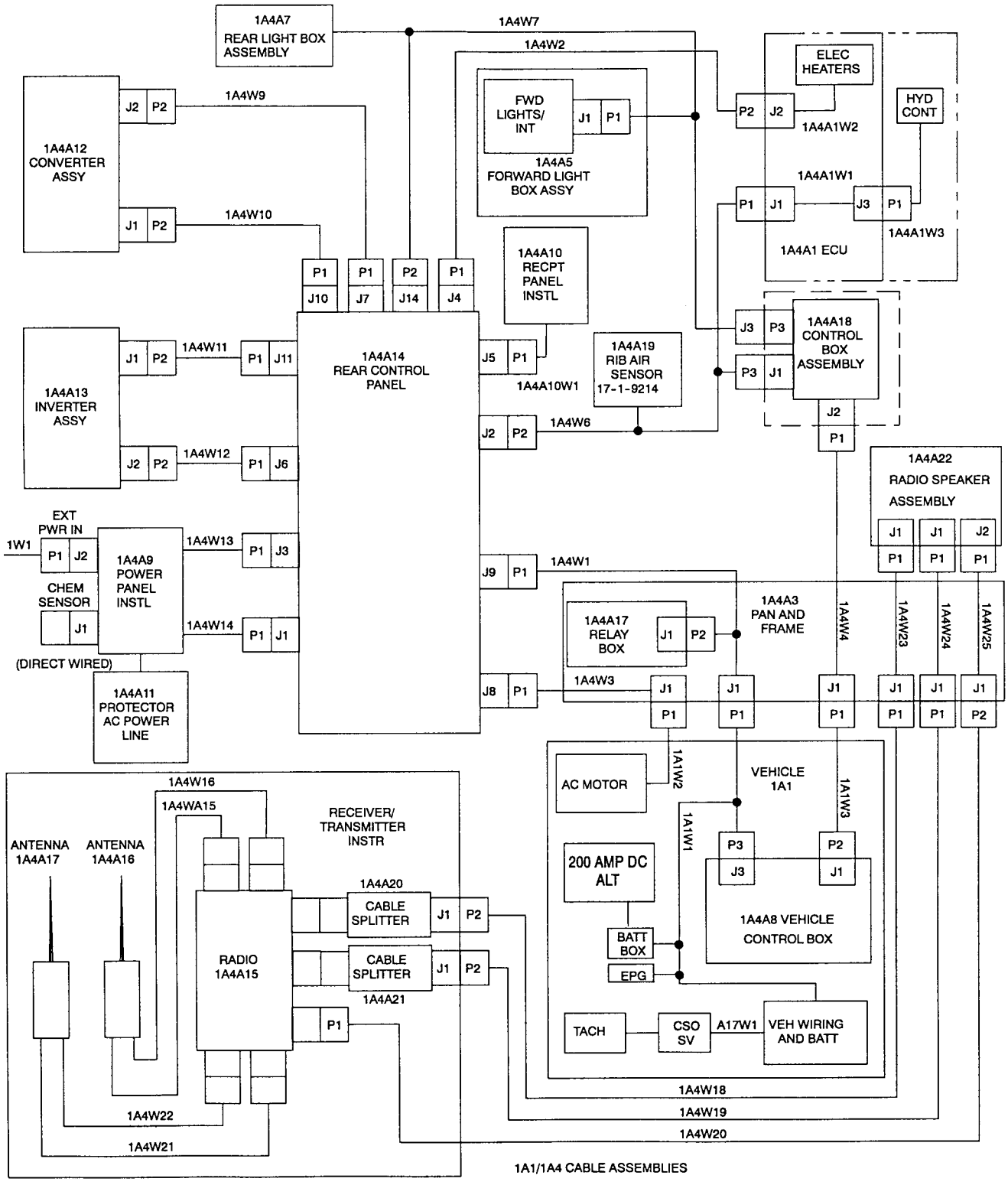
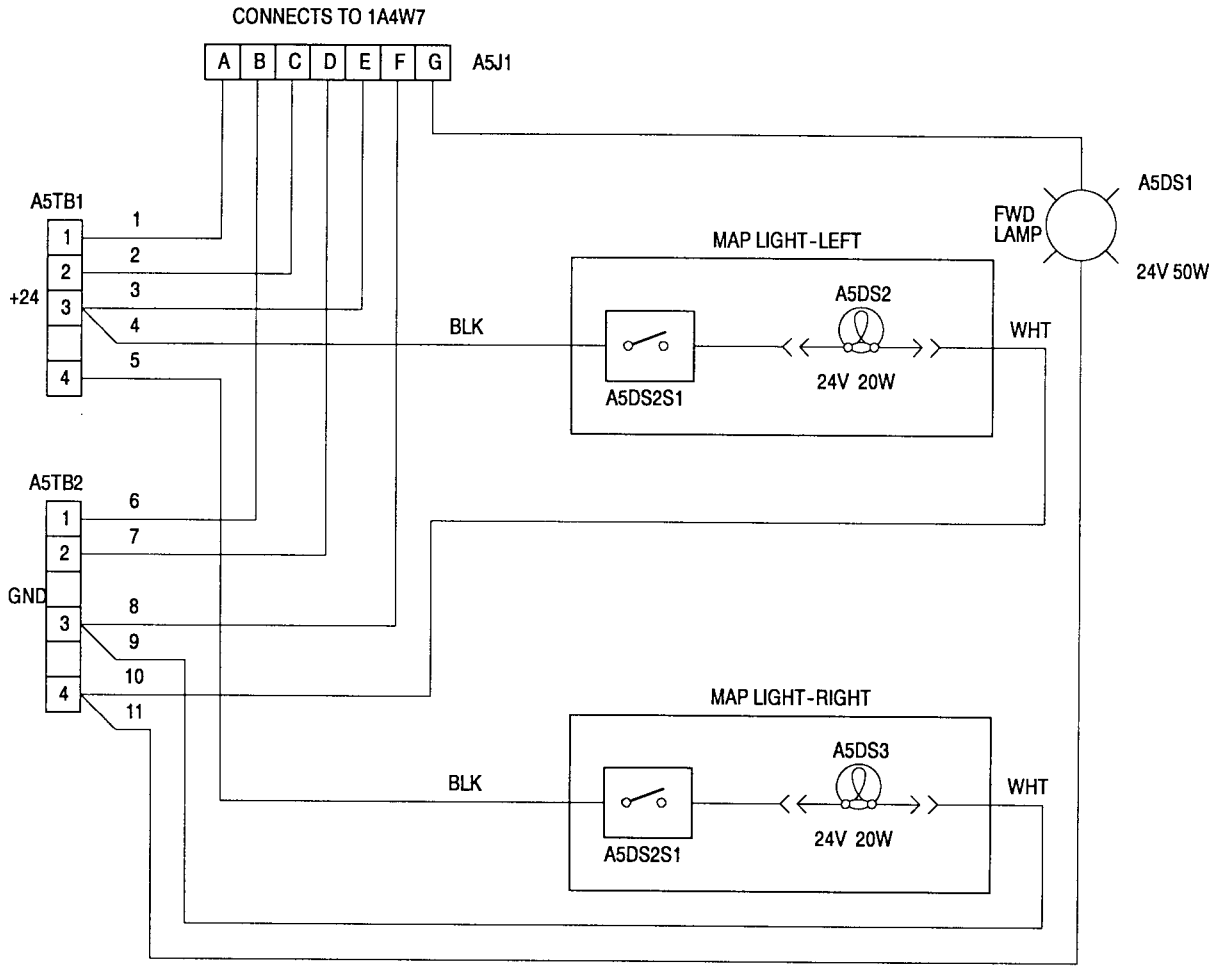


Figure F-1. Rear Light Box Assembly



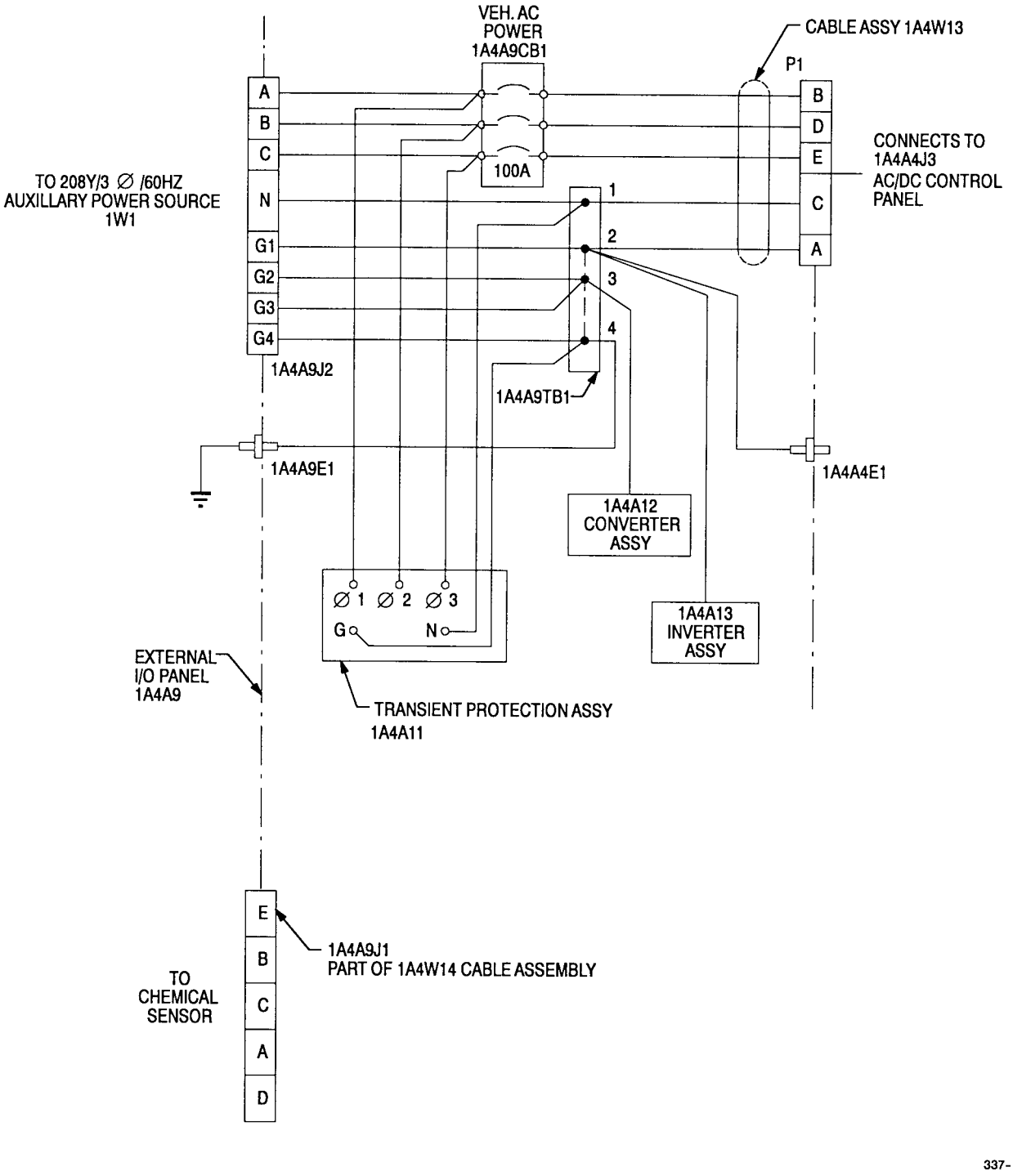
F-2. CBPS Cable Interconnect Diagram



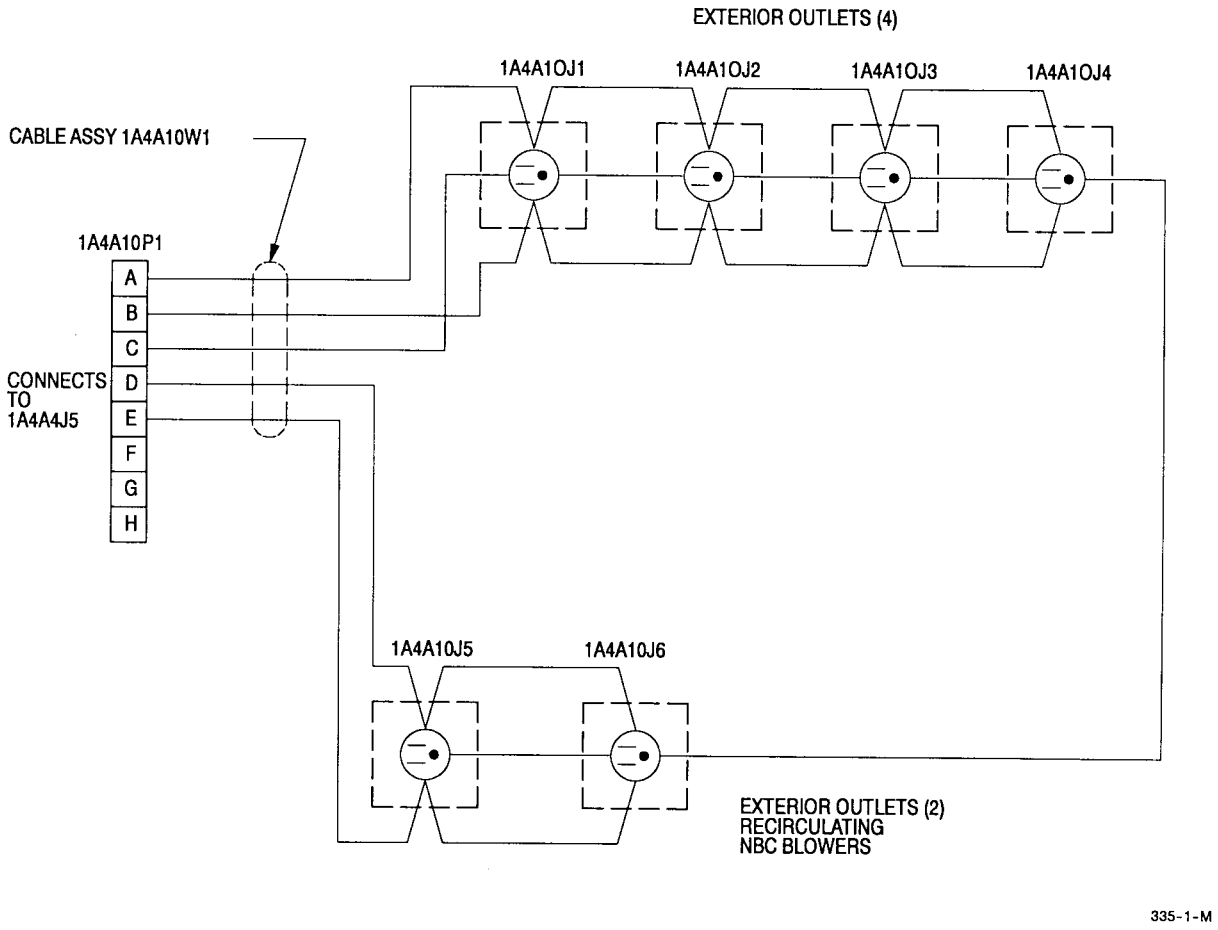
NOTE
1. ADD THE PREFIX 1A4 TO THE COMPONENT IDENTIFICATIONS

338-1-M

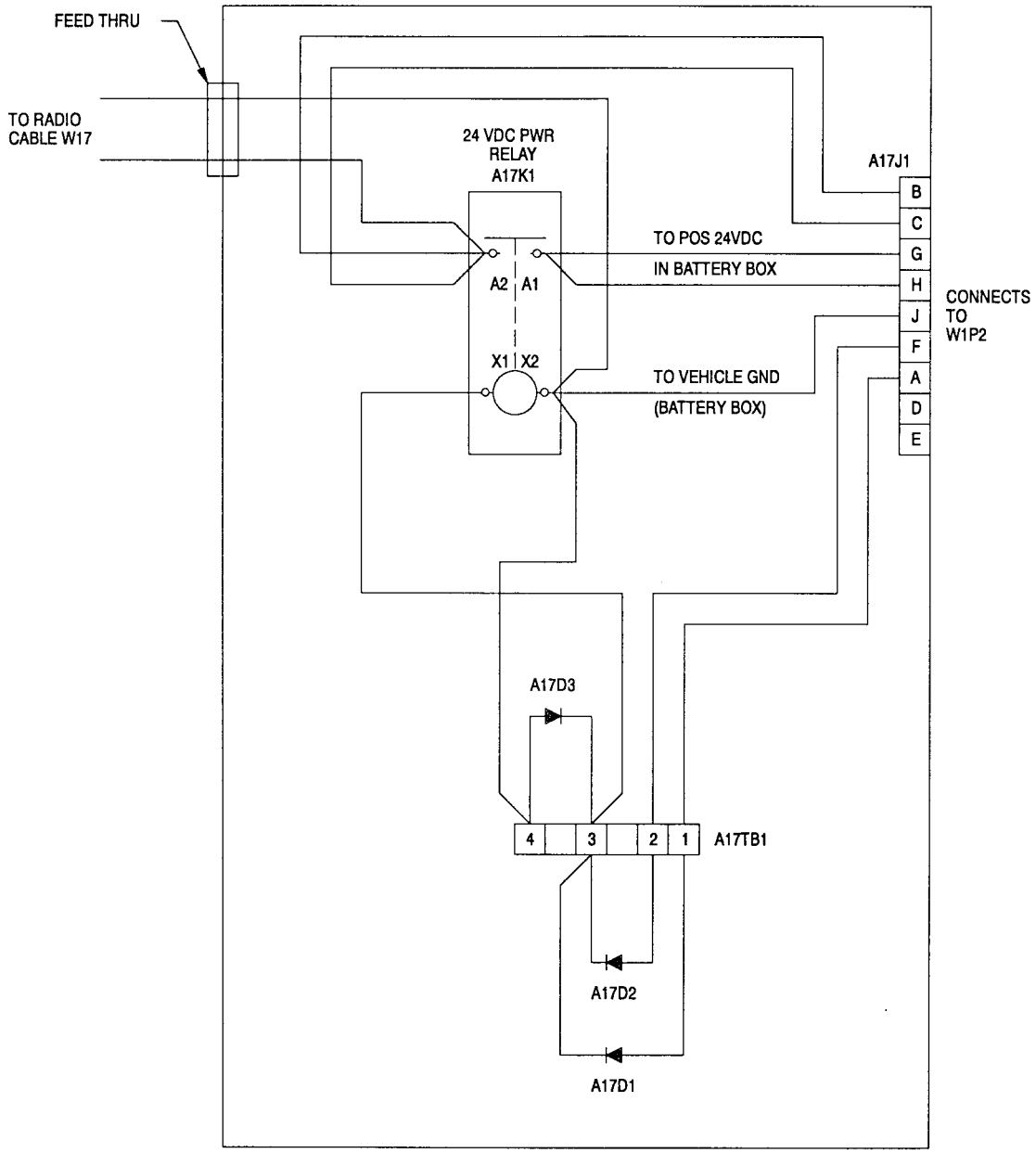
F-6. Forward Light Box Assembly



F-8. Power Panel

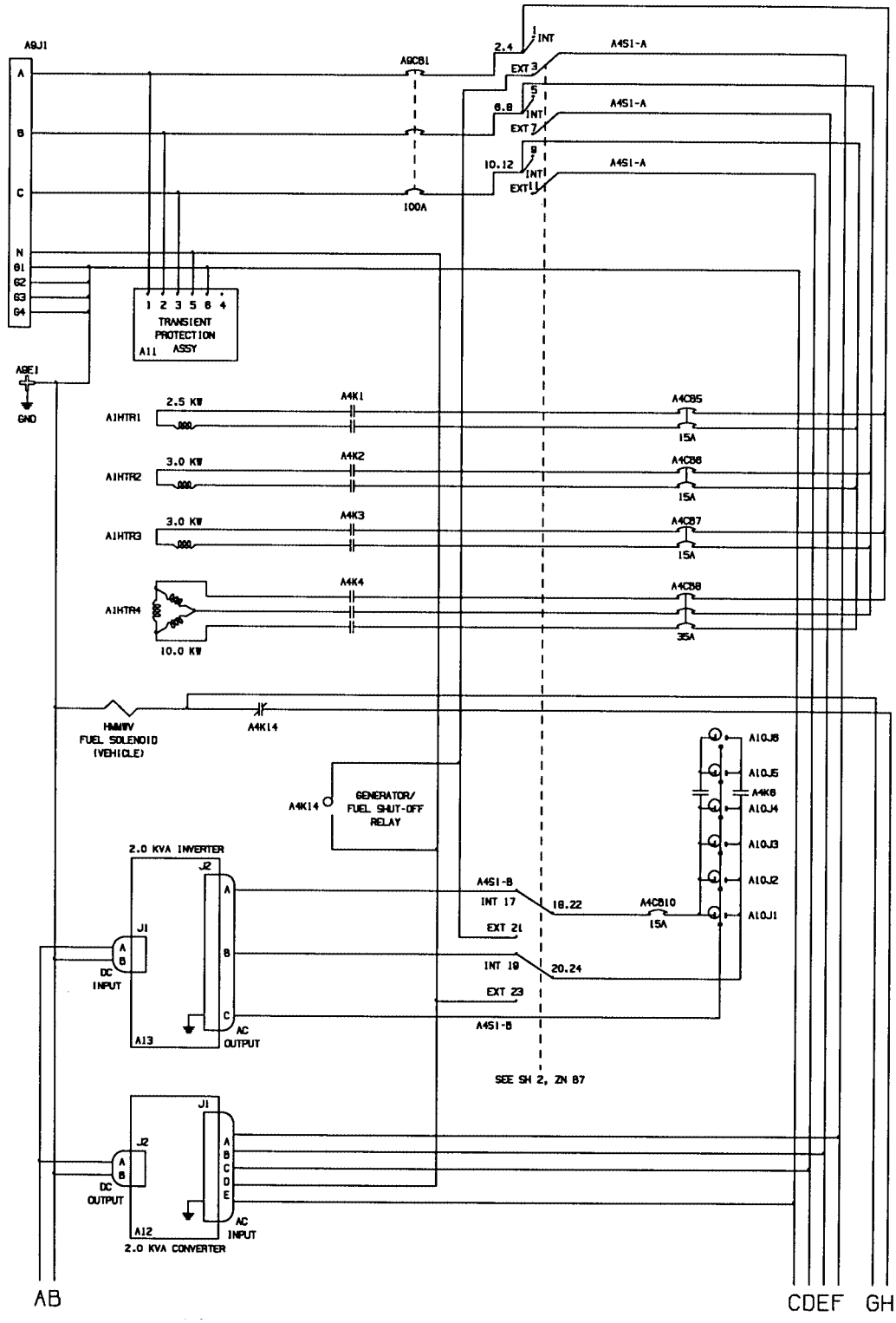


F-10. Receptacle Panel – 1A4A10

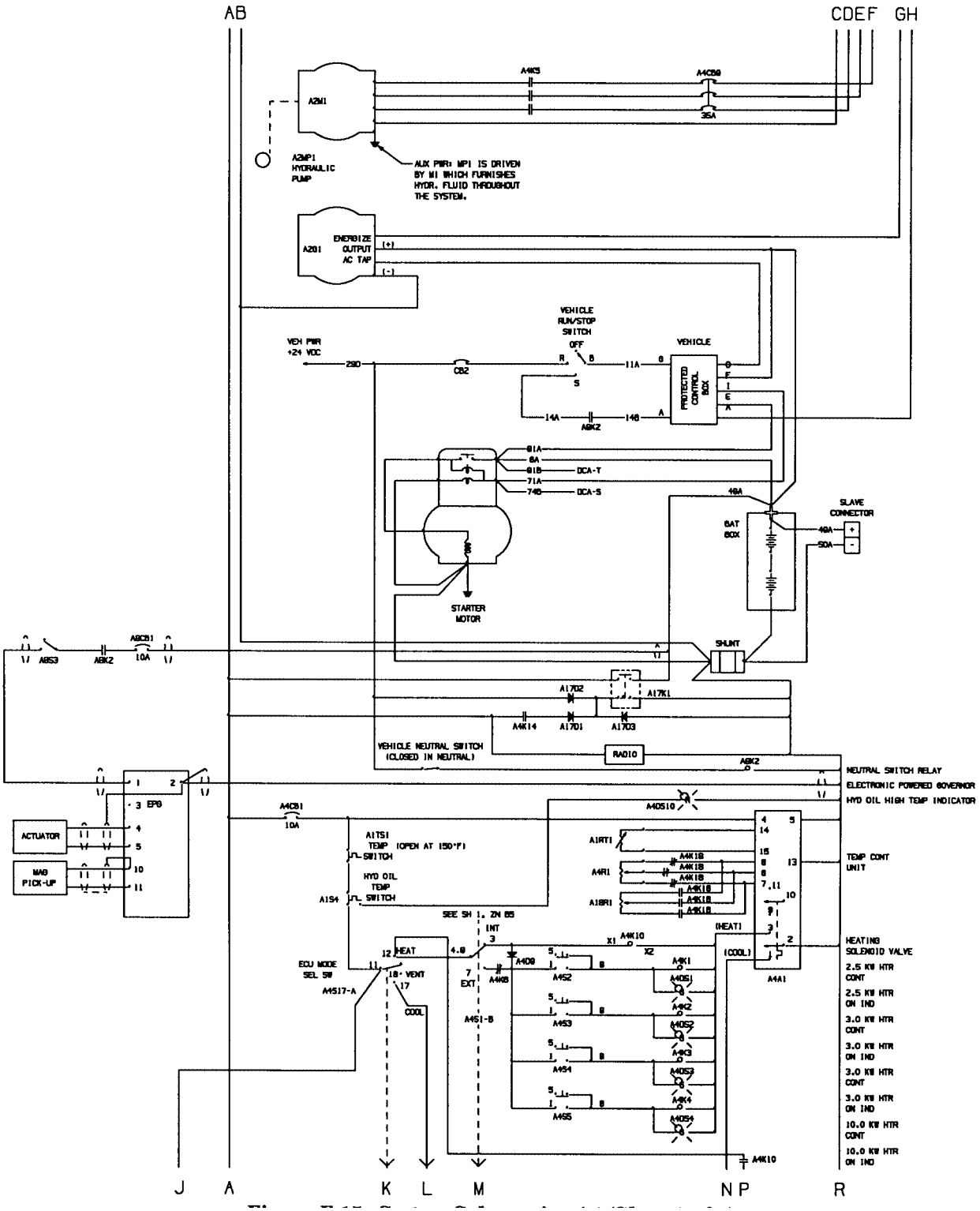


NOTE
1. ADD THE PREFIX 1A4 TO THE COMPONENT IDENTIFICATIONS

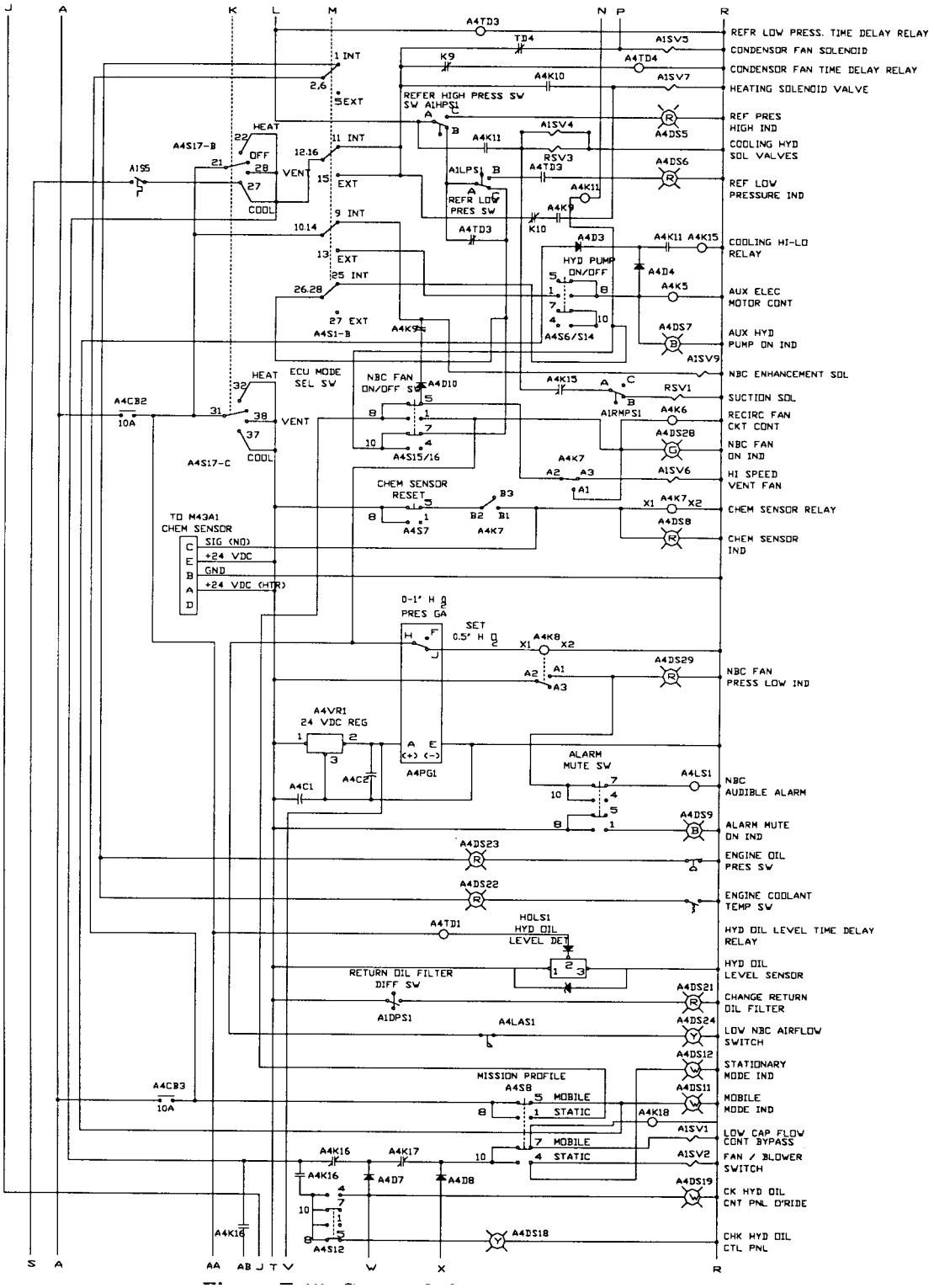
F-11. Relay Box – 1A4A17



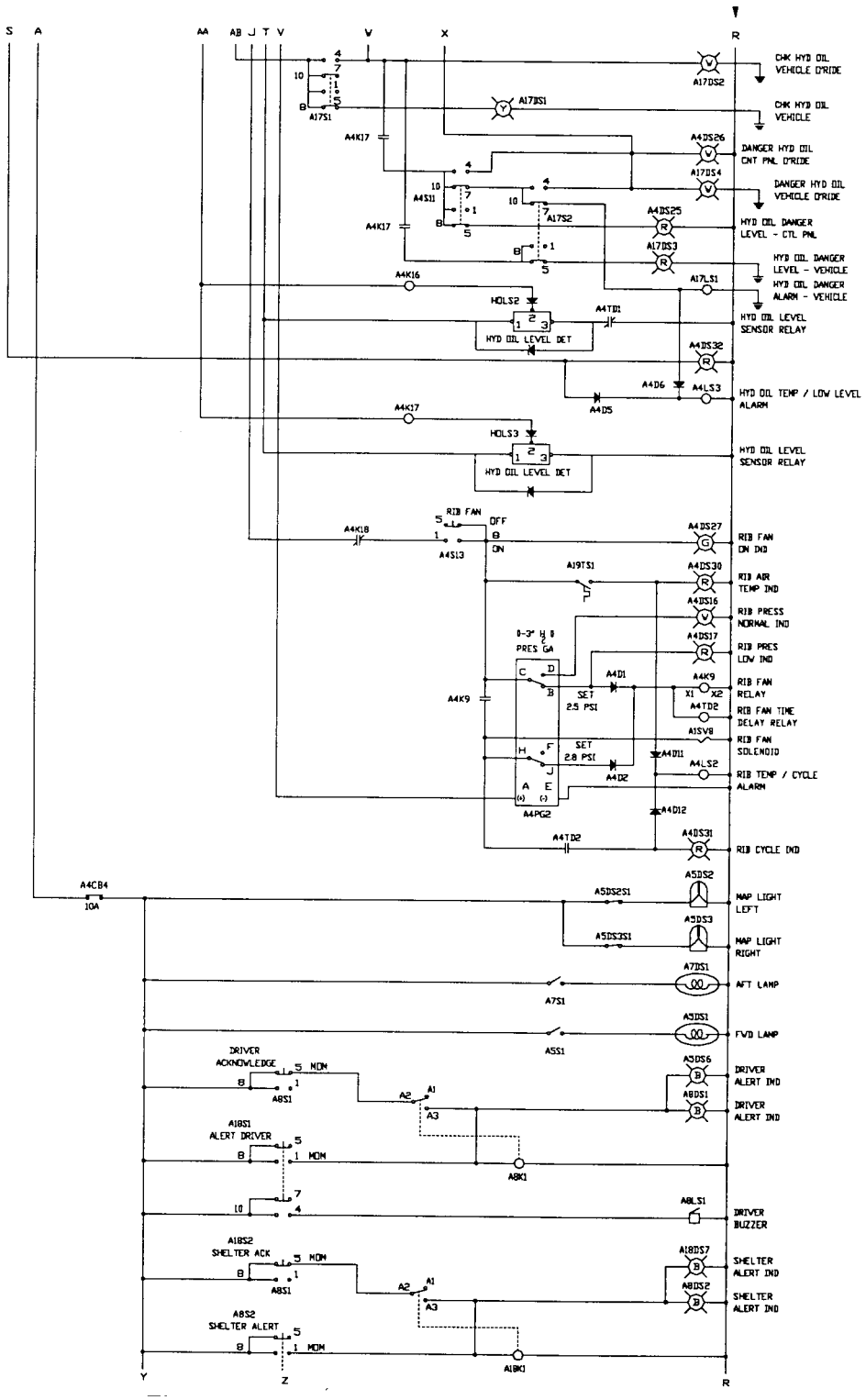
F-13. System Schematic – A4 (Sheet 1 of 5)



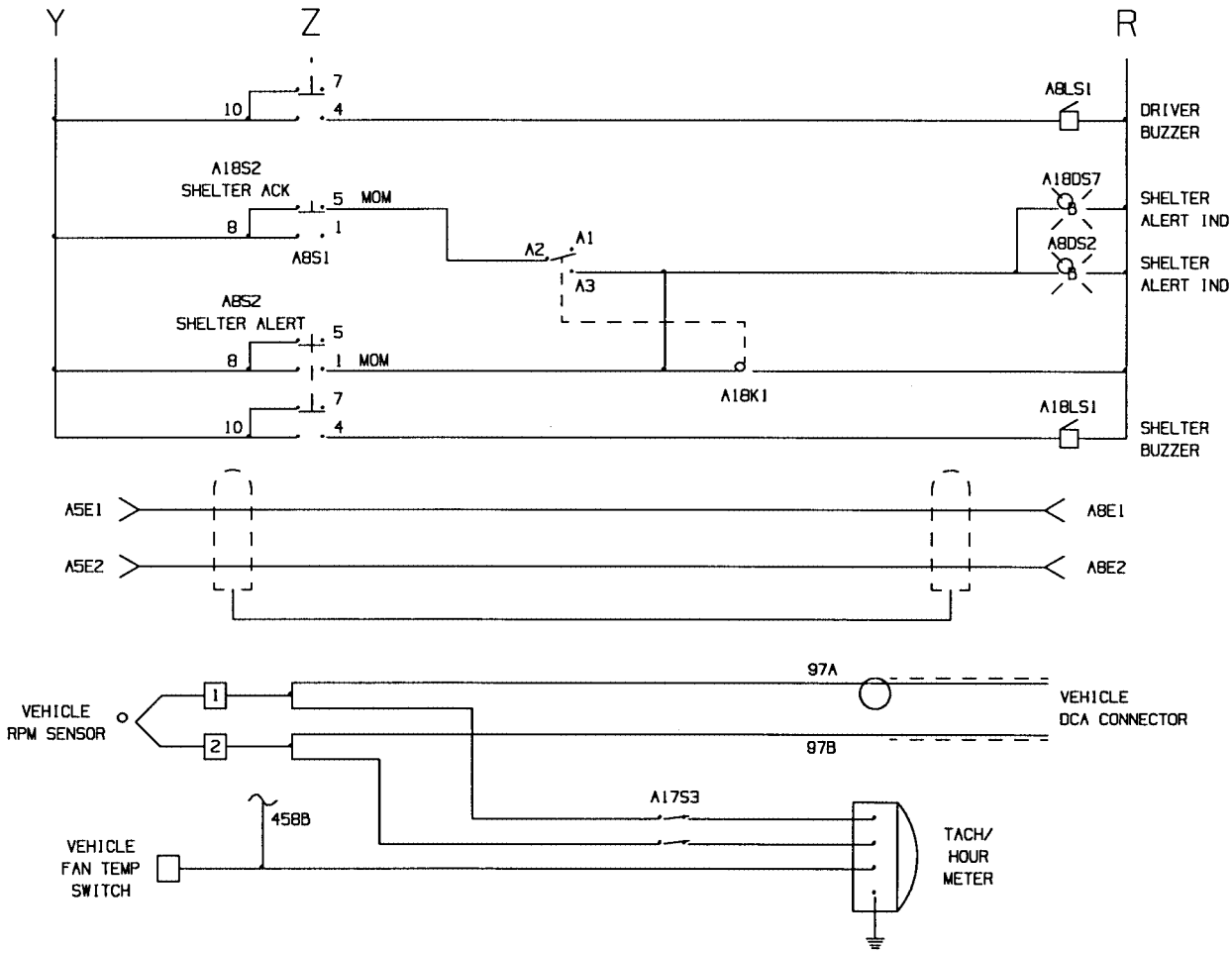
F-13. System Schematic – A4 (Sheet 2 of 5)



F-13. System Schematic – A4 (Sheet 3 of 5)



F-13. System Schematic – A4 (Sheet 4 of 5)



F-13. System Schematic – A4 (Sheet 5 of 5)

APPENDIX G
TORQUE LIMITS

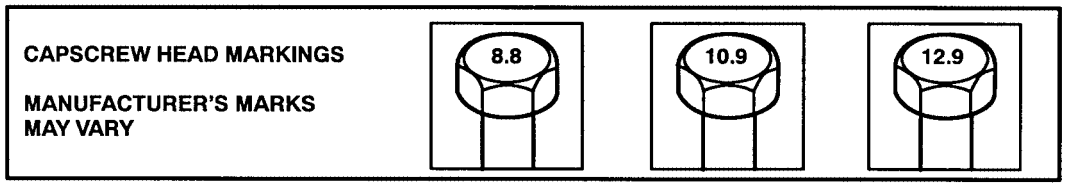
G.1 GENERAL.

This appendix lists standard torque values. Special torque values and sequence are listed in specific maintenance procedures.

G.2 TORQUE LIMITS.

Table G-1 lists dry torque limits for metric fasteners. Dry torque limits are used on screws that do not have lubricants applied to the threads. Table G-2 lists dry torque limits for SAE fasteners. Table G-3 lists maximum torque limits for fasteners installed in LMS. Table G-4 lists torque values for fasteners installed in rivnut used in ECU.

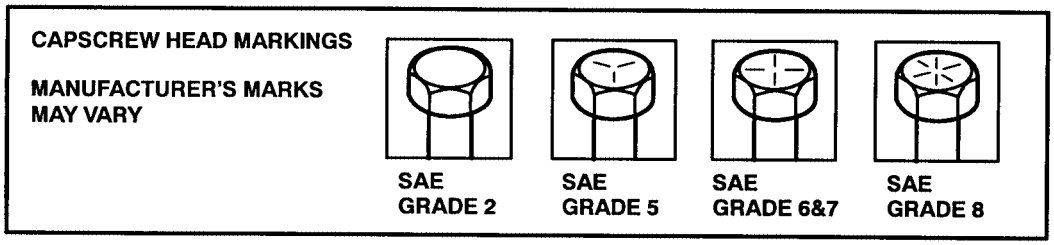
Table G-1. Dry Torque Limits for Metric Fasteners



STKR-362-23-6004

SIZE		METRIC GRADE 8.8		METRIC GRADE 10.9		METRIC GRADE 12.9	
DIA IN	DIA MM	FT-LB	Nm	FT-LB	Nm	FT-LB	Nm
0.157	4	2	3	3	4	4	5
0.197	5	4	5	6	8	7	9
0.237	6	7	9	10	14	11	15
0.276	7	11	15	16	32	20	27
0.315	8	18	24	25	34	29	39
0.394	10	32	43	47	64	58	79
0.473	12	58	79	83	113	100	136
0.630	16	144	195	196	266	235	319
0.709	18	190	258	269	365	323	438
0.788	20	260	353	366	496	440	597
0.867	22	368	499	520	705	678	919
0.946	24	470	637	664	900	794	1077
1.064	27	707	959	996	1351	1235	1675
1.182	30	967	1311	1357	1840	1630	2210

Table G-2. Dry Torque Limits for SAE Fasteners



SIZE			SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 6 OR 7		SAE GRADE NO. 8	
DIA IN	THREADS PER INCH	DIA MM	FT-LB	NM	FT-LB	NM	FT-LB	NM	FT-LB	NM
1/4	20	6.35	5	7	8	11	10	14	12	16
1/4	28	6.35	6	9	10	14	12	16	14	19
5/16	18	7.94	11	15	17	23	21	28	25	34
5/16	24	7.94	12	16	19	26	24	33	25	34
3/8	16	9.53	20	27	30	41	40	54	45	61
3/8	24	9.53	23	31	35	47	45	61	50	68
7/16	14	11.11	30	41	50	68	60	81	70	95
7/16	20		35	47	55	75	70	95	90	108
1/2	13	12.70	50	68	75	102	95	129	110	149
1/2	20		55	75	90	122	100	135	120	163
9/16	12	14.29	65	85	110	149	135	183	150	203
9/16	18		75	102	120	163	150	203	170	231
5/8	11	15.88	90	122	150	203	190	258	220	298
5/8	18		100	136	180	244	210	285	240	325
3/4	10	19.05	160	217	260	353	240	434	380	515
3/4	16		180	244	300	407	360	488	420	597
7/8	9	22.23	140	190	400	542	520	705	600	814
7/8	14		155	210	440	597	580	786	660	895
1	8	25.40	220	298	580	786	800	1085	900	1220
1	12		240	325	640	868	860	1166	1000	1350
1-1/8	7	25.58	300	407	800	1085	1120	1519	1280	1736
1-1/8	12		340	461	880	1193	1260	1709	1440	1953
1-1/4	7	31.75	420	570	1120	1519	1580	2142	1820	2468
1-1/4	12		460	624	1240	1681	1760	2387	2000	2712

Table G-2. Dry Torque Limits for SAE Fasteners – Continued

SIZE			SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 6 OR 7		SAE GRADE NO. 8	
1-3/8	6	34.93	560	759	1460	1980	2080	2820	2380	3227
1-3/8	12		640	868	1680	2278	2360	3227	2720	3688
1-1/2	6	38.10	740	1003	1940	2631	2780	3770	3160	4285
1-1/2	12		840	1139	2200	2983	3100	4204	3560	4827

Table G-3. Maximum Torque Requirements for Rivnut Screws in LMS

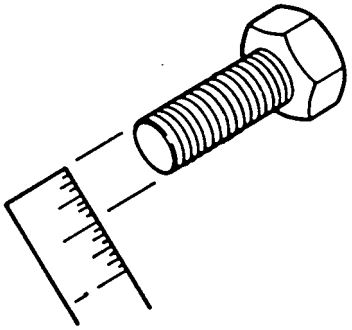
Screw Size	Torque (in.-lb)
4 - 40	8
6 - 32	12
8 - 32	20
10 - 32	20
1/4 - 20	50
5/16 - 18	65
3/8 - 16	120

Table G-4. Torque Limits for Rivnuts Screws in ECU

Rivnut Part Number	Thread Size	Torque (in.-lb)
17-1-5738-5	1/2 - 20	50 +/- 5
17-1-5738-9	1/4 - 20	50 +/- 5
17-2-0253-5	10 - 32	25 +/- 5
17-2-0253-7	1/4 - 20	50 +/- 5
17-2-0253-8	1/4 - 20	50 +/- 5
17-2-0253-11	.375 - 16	130 +/- 5
17-2-0254-4	1/4 - 20	50 +/- 5
17-2-5738-12	1/4 - 20	50 +/- 5
MS27130-S25	.190 - 32	25 +/- 5
MS27130-S33	1/4 - 20	50 +/- 5
MS27130-S36	1/4 - 20	50 +/- 5
MS27130-S43	.3125 - 18	50 +/- 5
MS27130-S133	1/4 - 20	50 +/- 5
NAS1329S3B130	.190 - 32	25 +/- 5
NAS1330S3B166	.190 - 32	25 +/- 5
NAS1330S5-181	.3125 - 24	50 +/- 5
NAS1330S6B211	.375 - 24	80 +/- 5

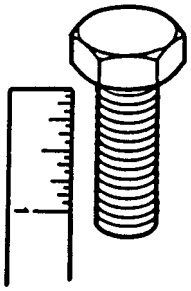
G.3 HOW TO USE TORQUE TABLE.

a. Measure the diameter of the screw you are installing.



b. Count the number of threads per inch.

c. Under the heading SIZE, look down the left-hand column until you find the diameter of the screw you are installing (there will usually be two lines beginning with the same size).



d. In the second column under SIZE, find the number of threads per inch that matches the number of threads you counted in step b.

CAPSCREW HEAD MARKINGS

Manufacturer's marks may vary.
These are all SAE Grade 5
(3-line).

e. To find the grade screw you are installing, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the torque table.

f. Look down the column under the picture you found in step e. until you find the torque limit (in ft-lb or N•m) for the diameter and threads per inch of the screw you are installing.

INDEX

INDEX (Continued)

INDEX (Continued)

INDEX (Continued)

INDEX (Continued)

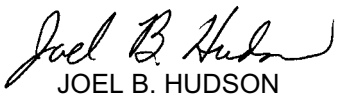
INDEX (Continued)

INDEX (Continued)

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:



JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0406414

Distribution: To be distributed in accordance with initial distribution number (IDN) 256786 requirements for TM 10-5410-228-24.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@avma27.army.mil>

To: amssbriml@natick.army. mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19-OCT-93
8. ***Pub no:*** 55-2840-229-23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04-JUL-85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123-123-1234
17. ***Problem:*** 1
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE Today's Date
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* Commander, US Army Tank-automotive and Armament Command ATTN: AMSTA-LC-R 15 Kansas St., Natick, MA 01760-5052	FROM: *(Activity and location) (Include ZIP Code)* Your mailing address	

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication)*	FROM: (*Activity and location) (Include ZIP Code)*	DATE

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-5410-228-24		

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

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PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

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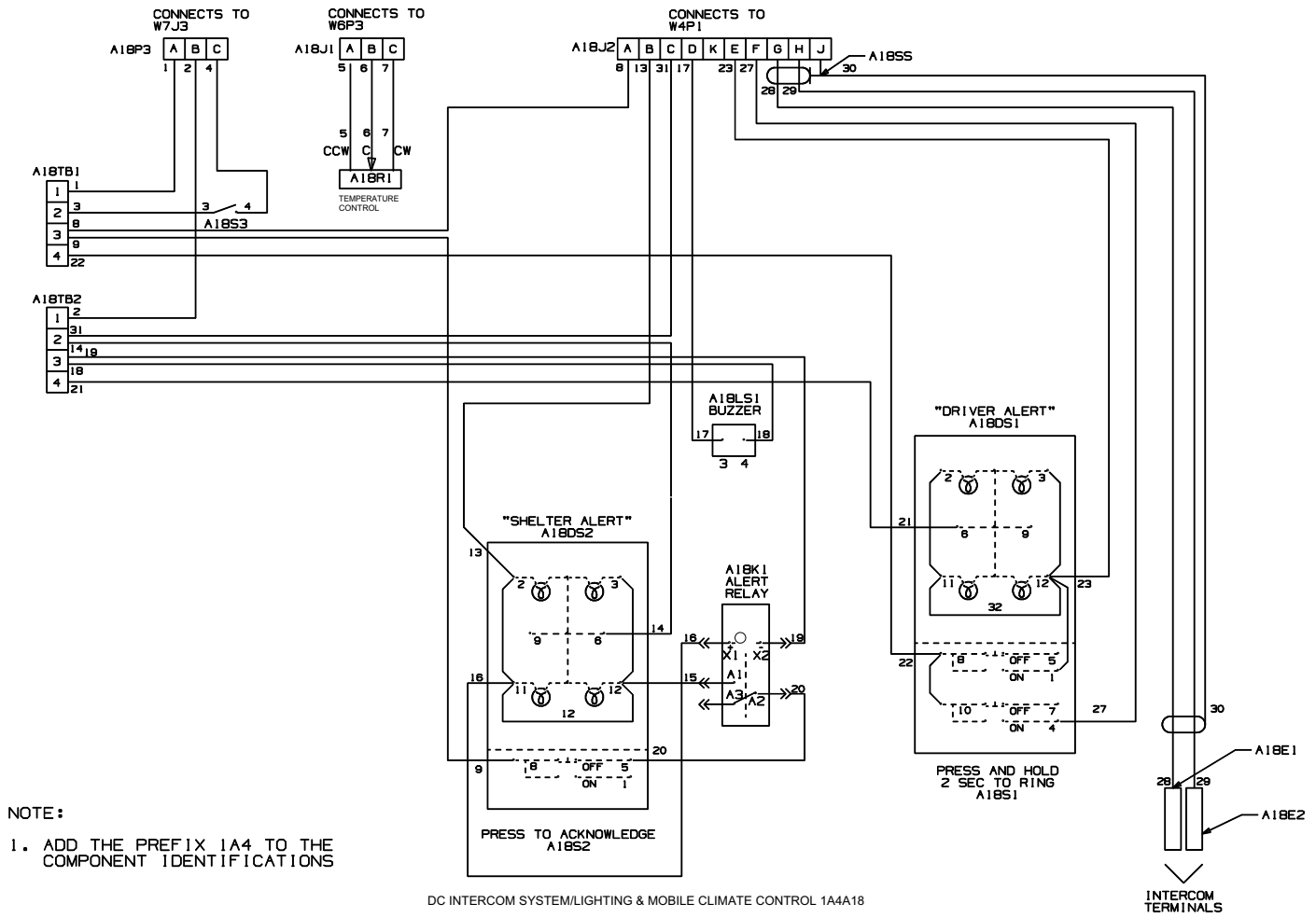
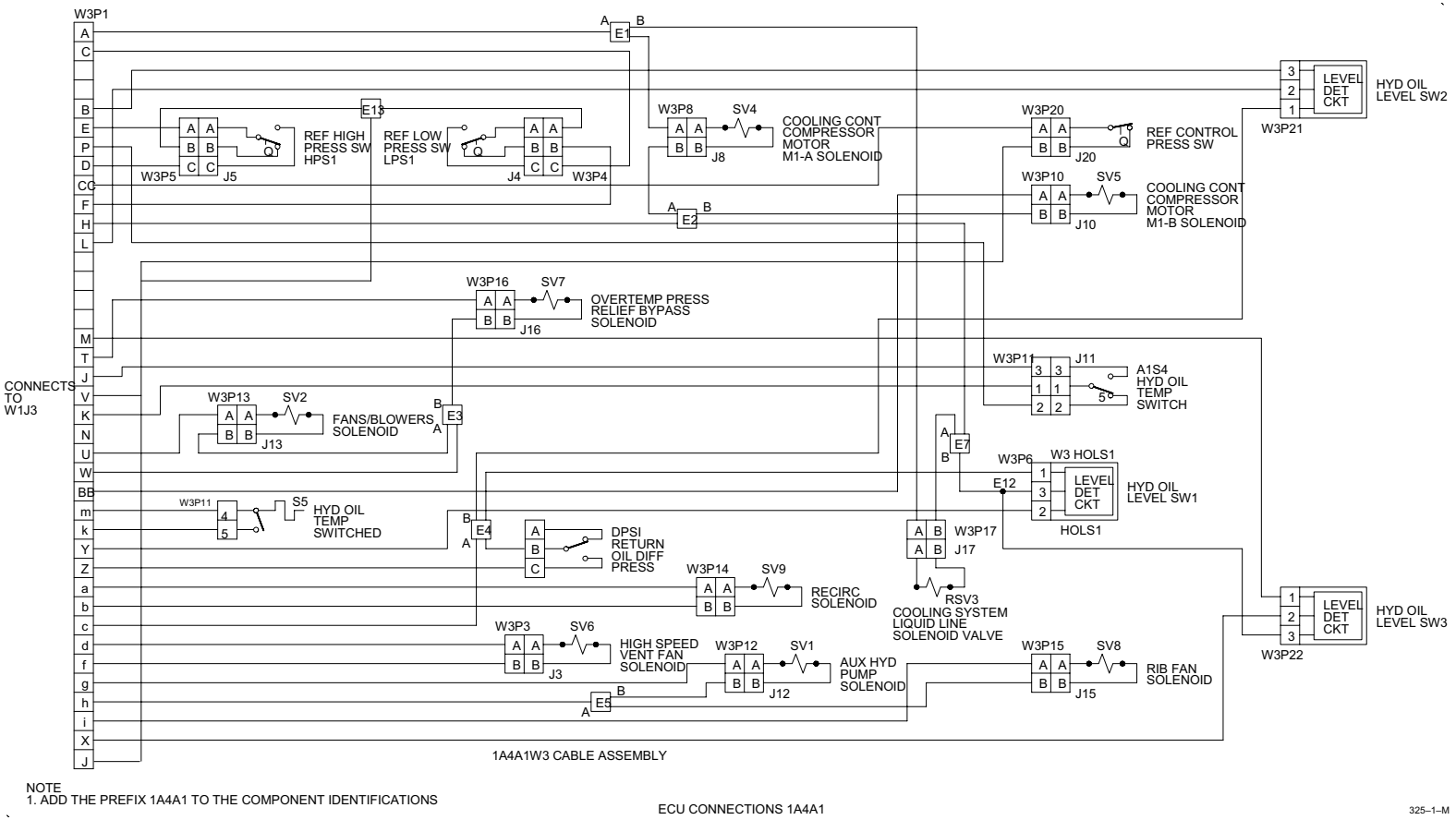
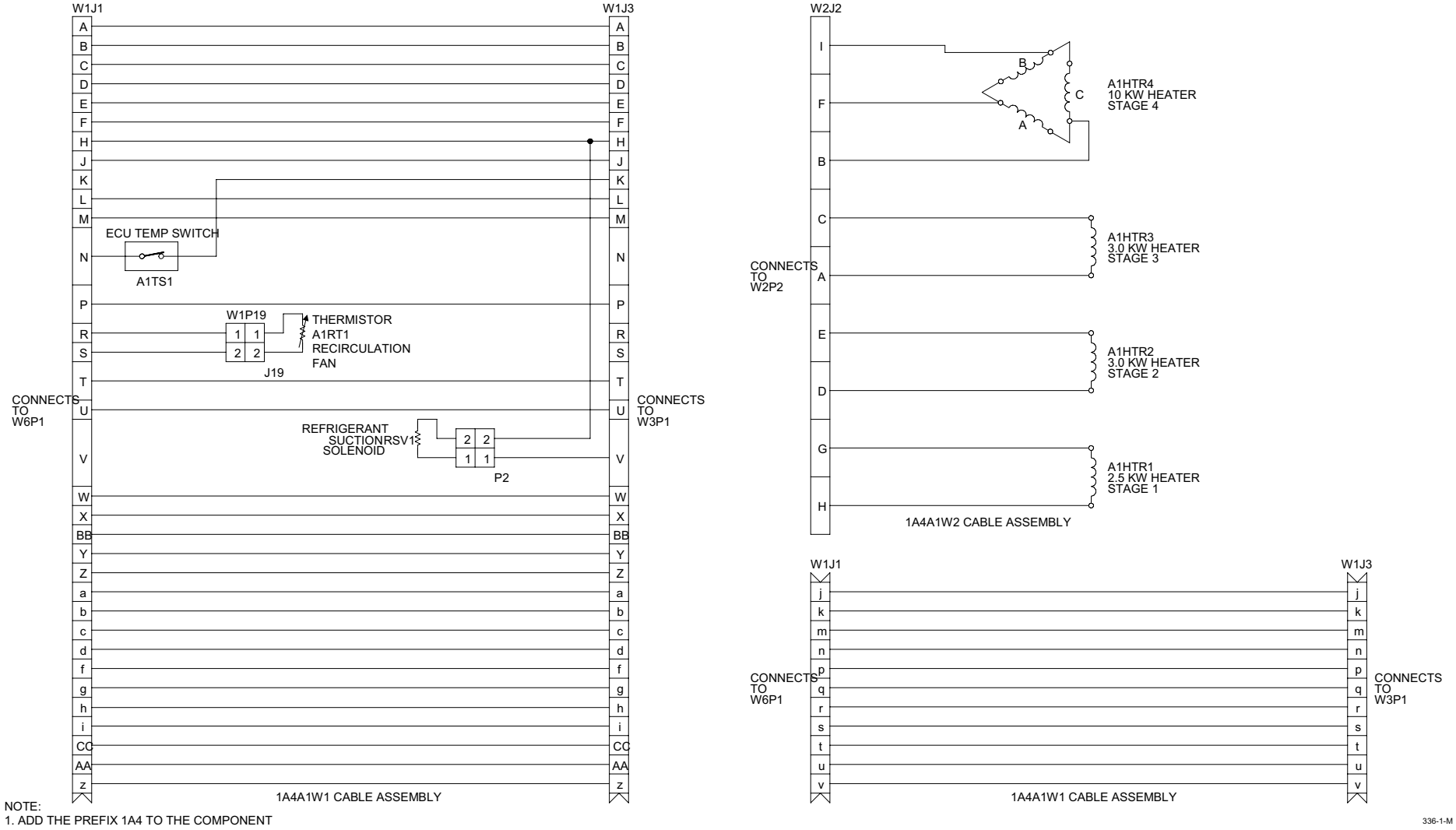


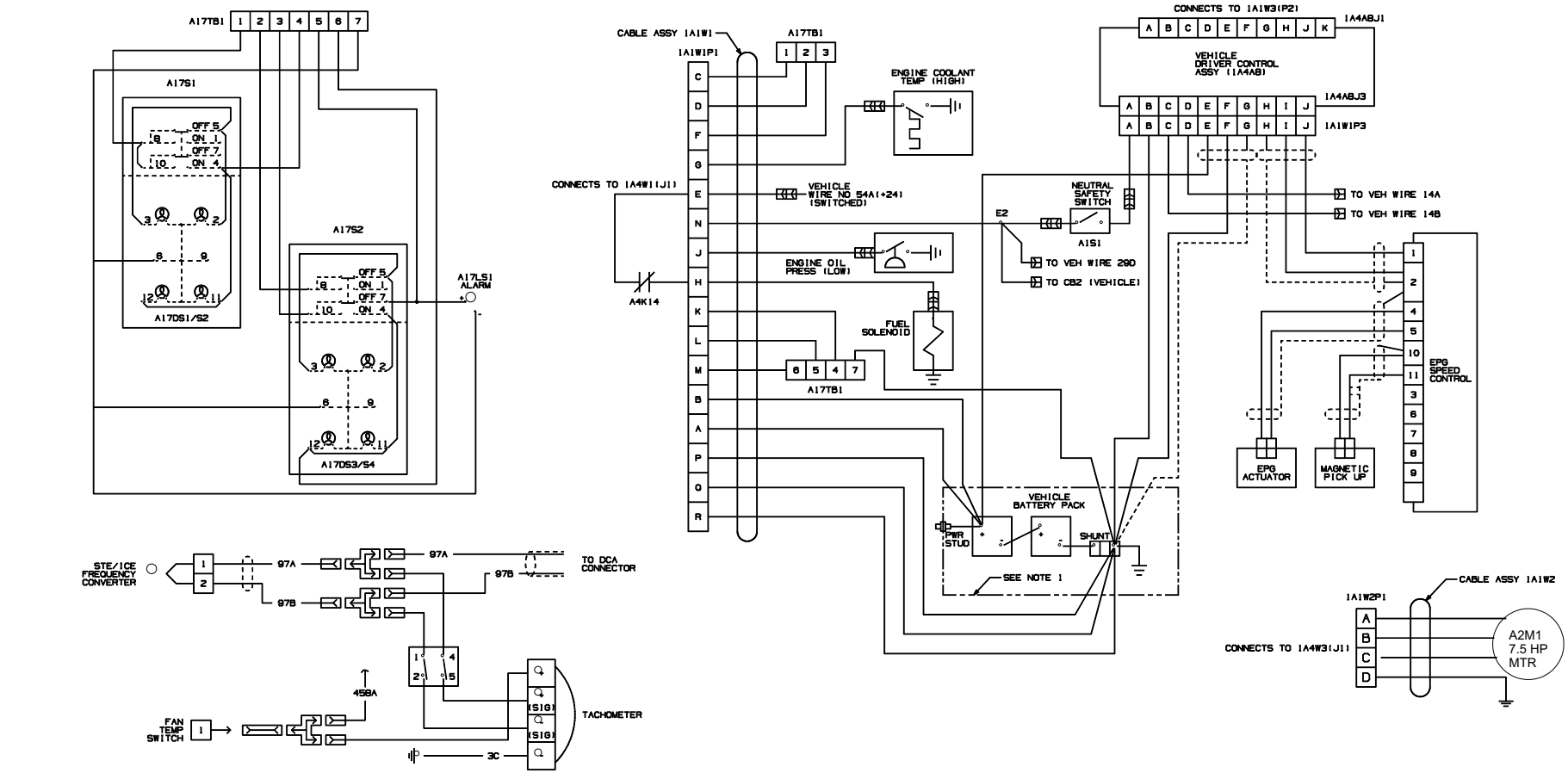
F-3. Control Box Assembly



F-4. ECU Connections – 1A4A1 (Sheet 1 of 2)



F-4. ECU Connections – 1A4A1 (Sheet 2 of 2)

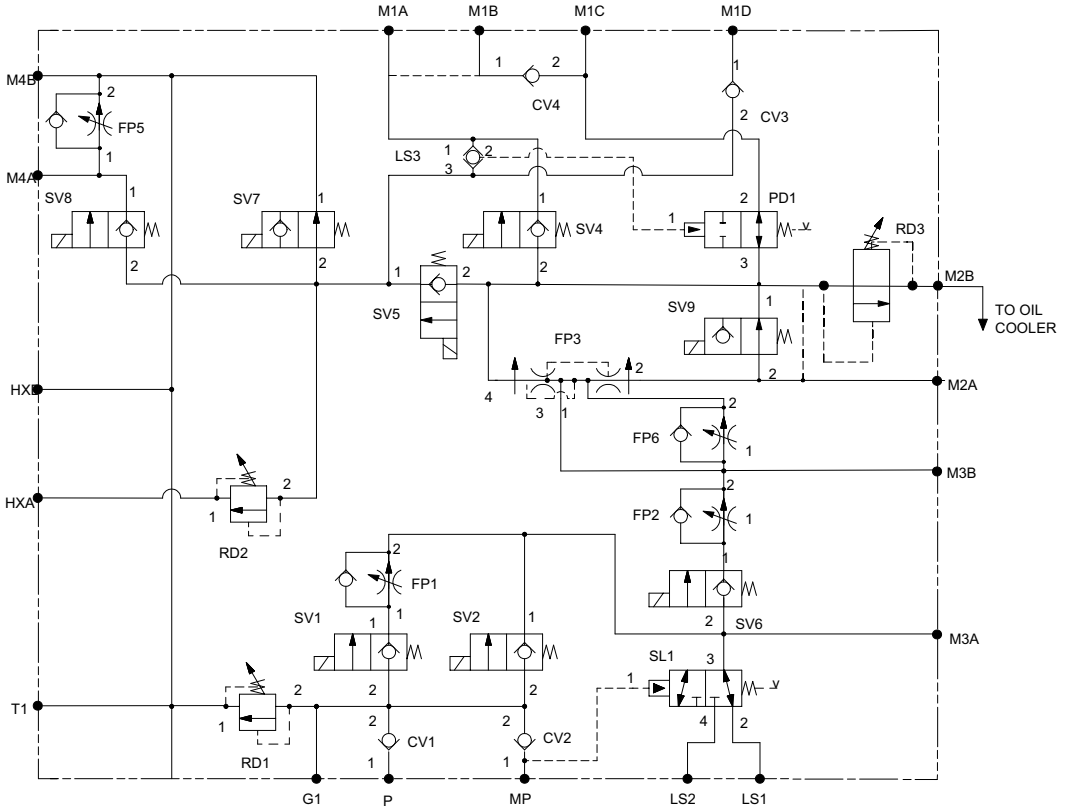


NOTE:

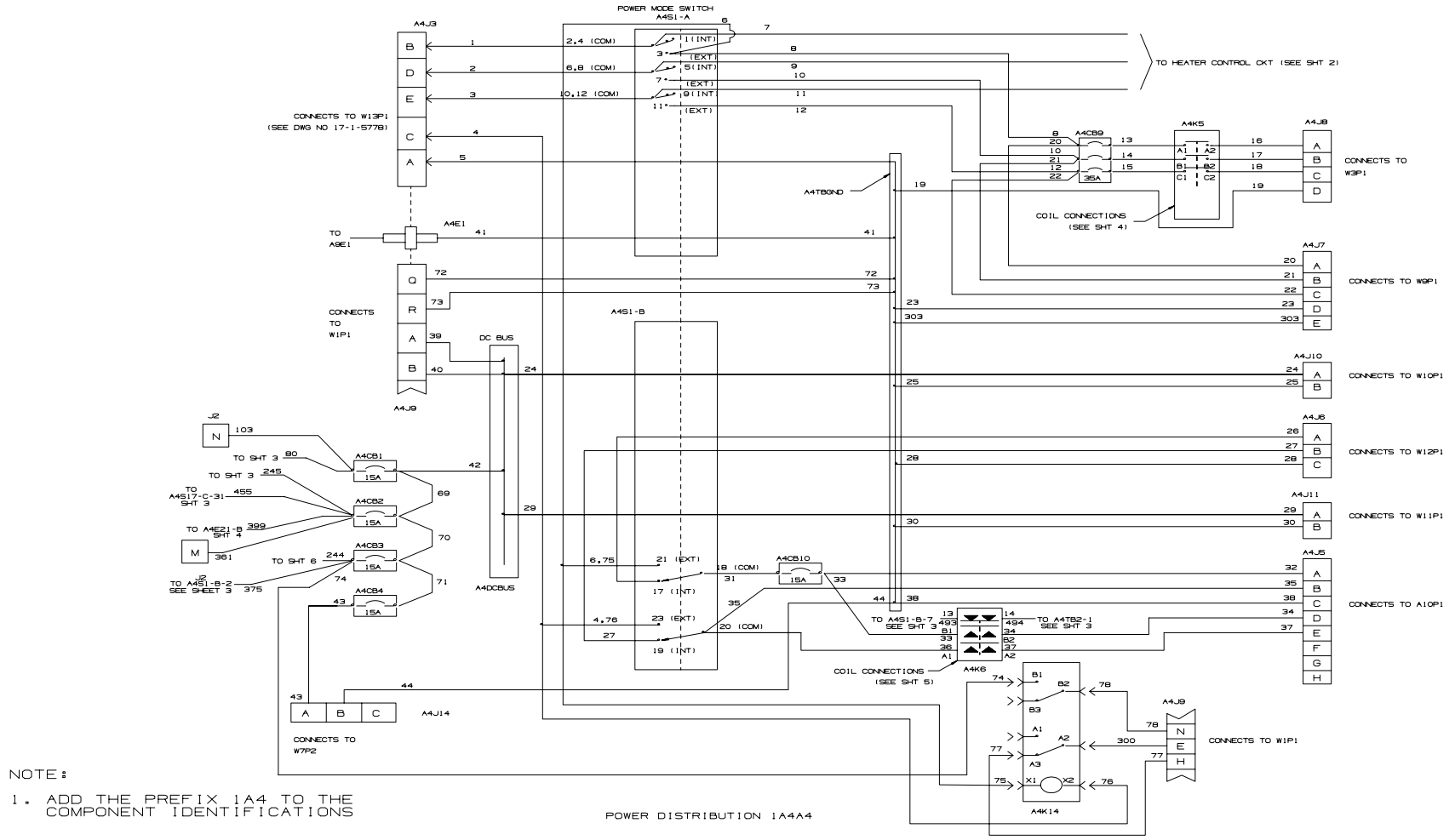
1. OTHER EXISTING CONNECTIONS TO BATTERIES AND SHUNT HAVE BEEN OMITTED FROM THIS DRAWING FOR CLARITY

F-5. ECV Electrical Connections

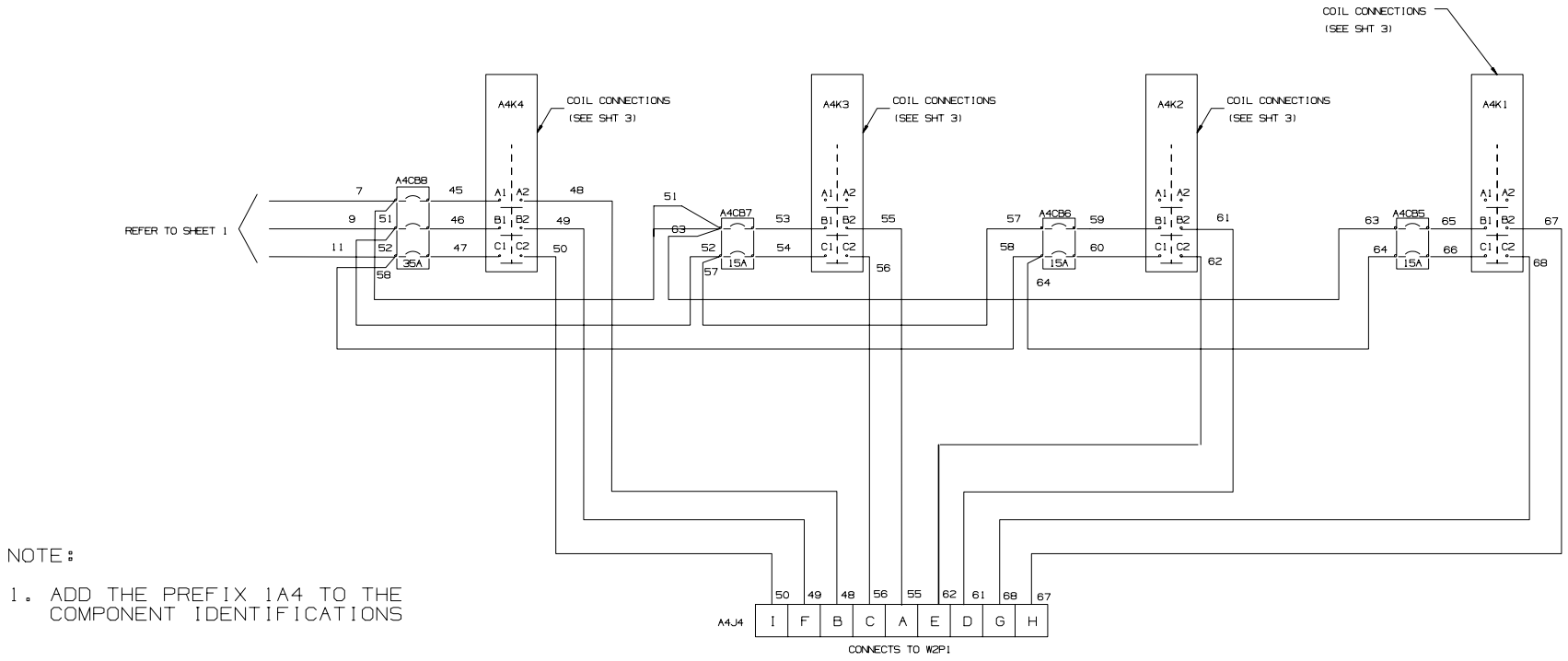
LEGEND	
DESIGNATION DESCRIPTION PART NO.	
P1 VARIABLE PISTON PUMP (ENGINE DRIVEN) 17-1-9289-1	
P2 VARIABLE PISTON PUMP (MOTOR DRIVEN) 17-2-0214-1	
M 7.5 HP ELECTRIC MOTOR 17-1-9436-1	
HM HYDRAULIC FLOW CONTROL MANIFOLD 17-1-9426-1	
M1A COMPRESSOR MOTOR, HYDRAULIC 17-1-9435-1	
M1C CONDENSER FAN MOTOR, HYDRAULIC 17-2-0213-1	
M2 RECIRCULATION FAN MOTOR, HYDRAULIC 17-1-9425-1	
M3 NBC FAN MOTOR, HYDRAULIC 17-1-9419-1	
M4 RIB FAN 17-1-9455-1	
HX-1A HEAT COIL, HYDRAULIC 17-1-9673-1	
HX-2 HYDRAULIC OIL COOLER 17-2-0215-1	
F1 HYDRAULIC OIL FILTER 17-1-9418-1	
E HMMWV DIESEL ENGINE	
RD3 PRESSURE RELIEF VALVE 17-2-0740-1	



F-7. Hydraulic Manifold

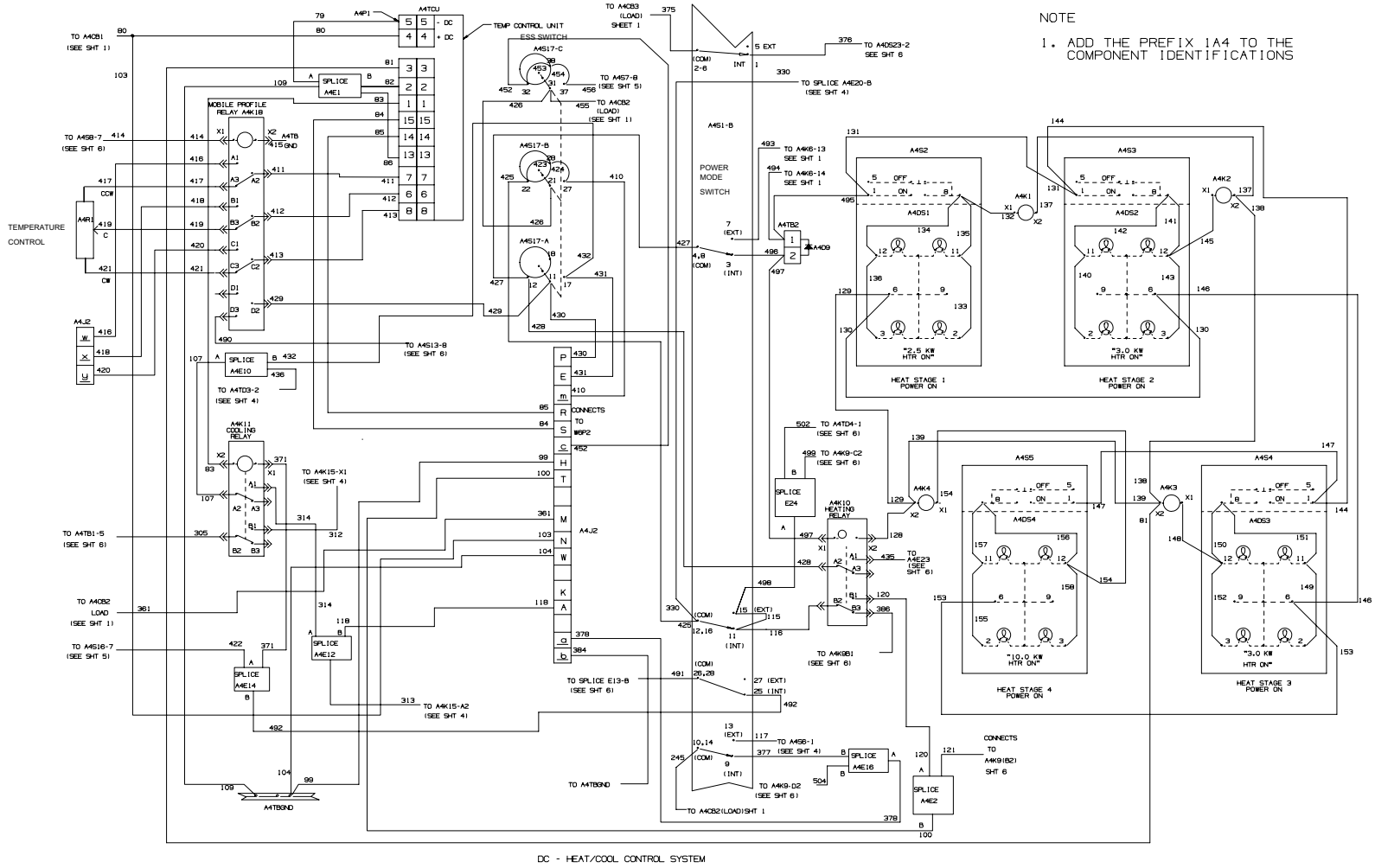


F-9. Rear Control Panel – 1A4A4 (Sheet 1 of 6)

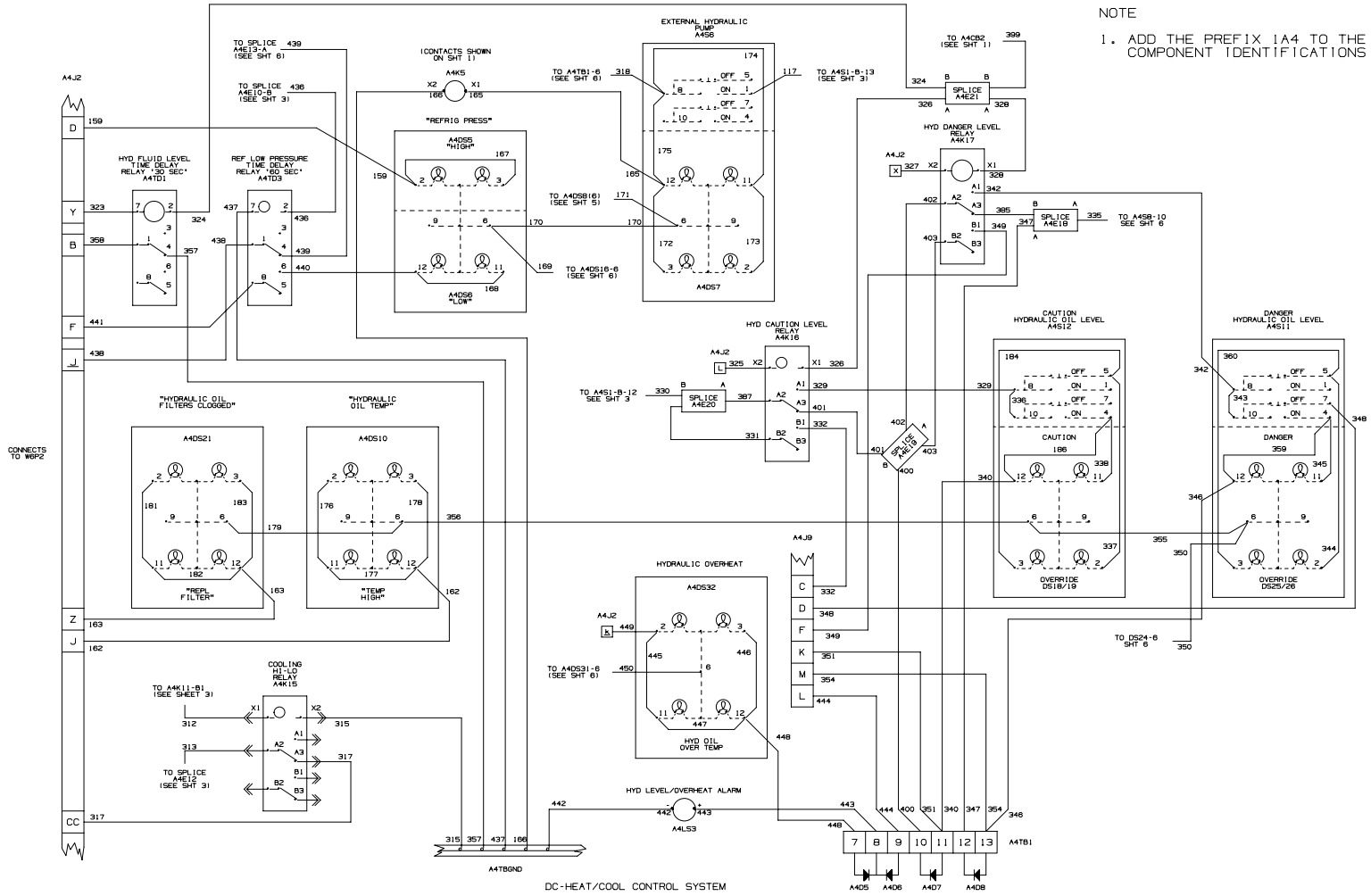


AC-HEATER POWER DISTRIBUTION

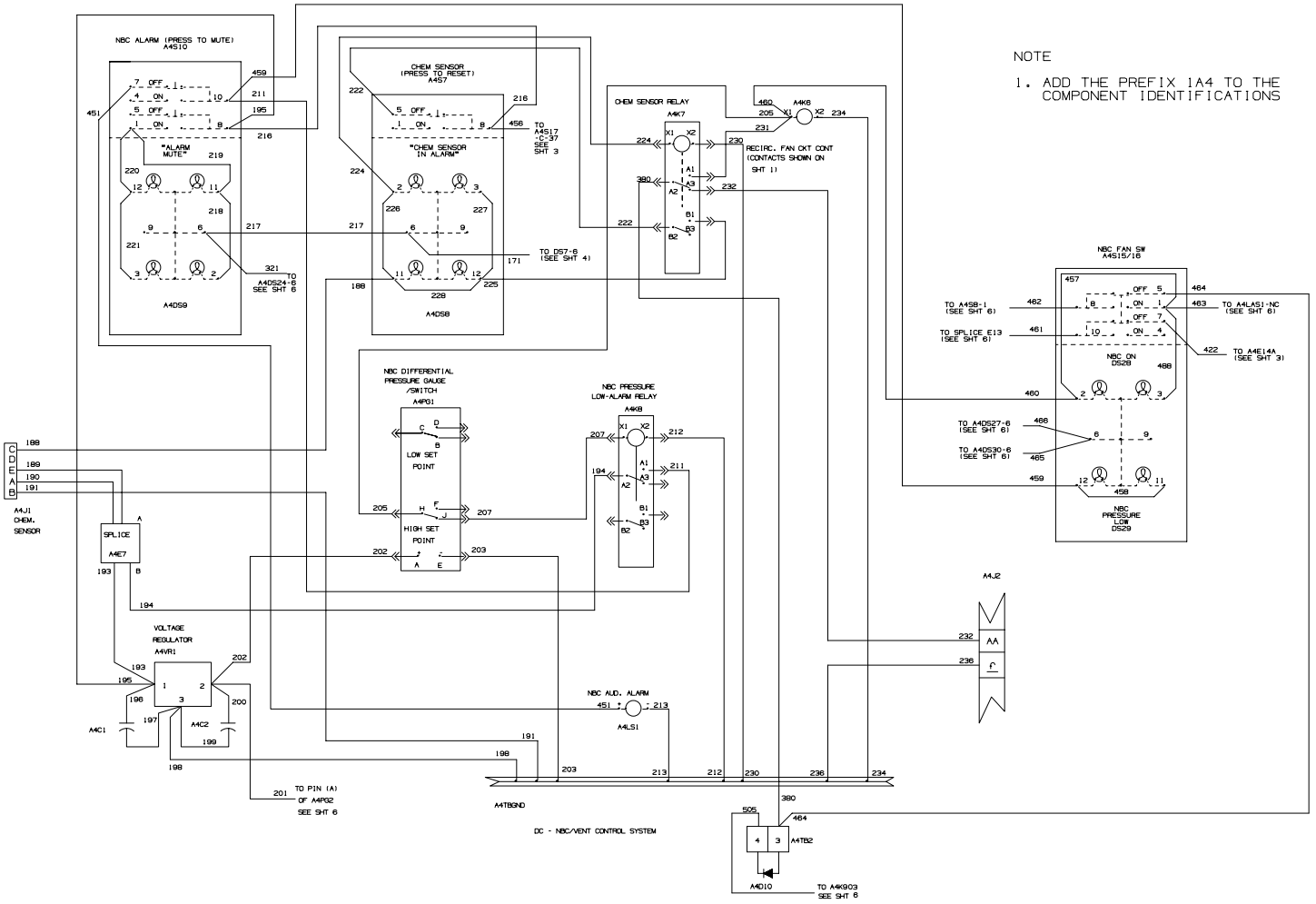
F-9. Rear Control Panel – 1A4A4 (Sheet 2 of 6)



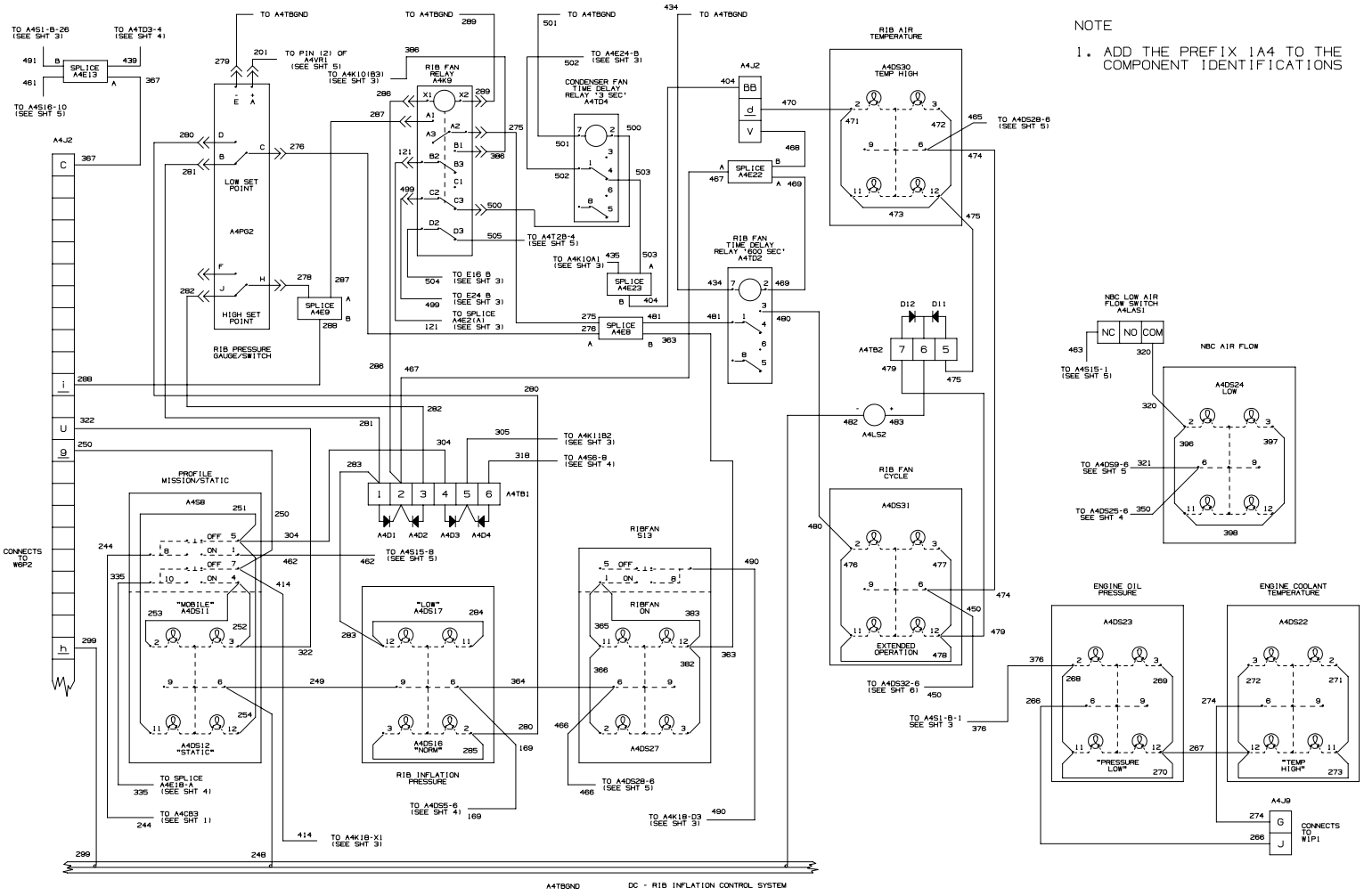
F-9. Rear Control Panel – 1A4A4 (Sheet 3 of 6)



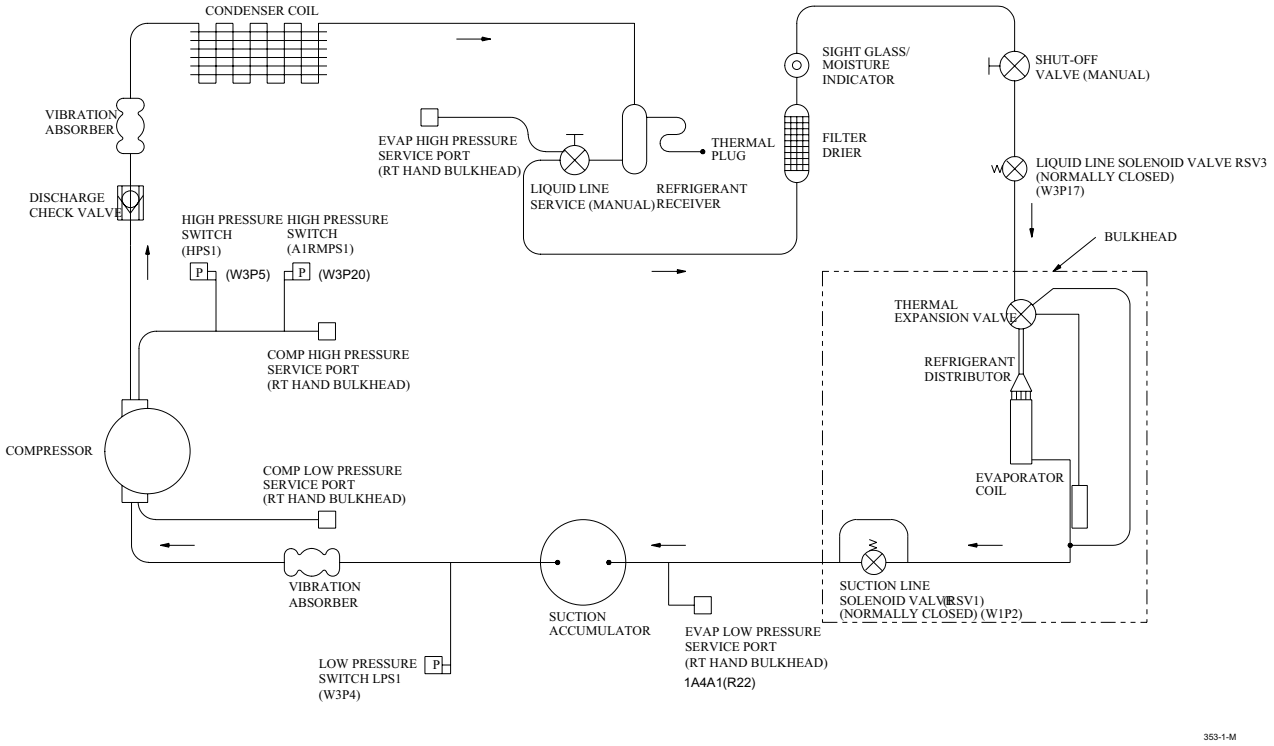
F-9. Rear Control Panel – 1A4A4 (Sheet 4 of 6)



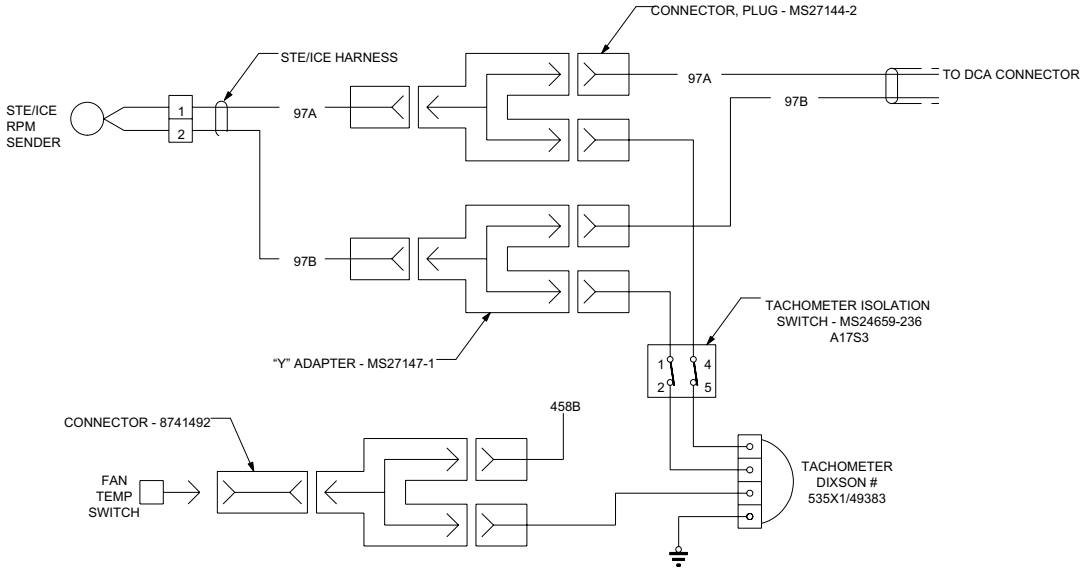
F-9. Rear Control Panel – 1A4A4 (Sheet 5 of 6)



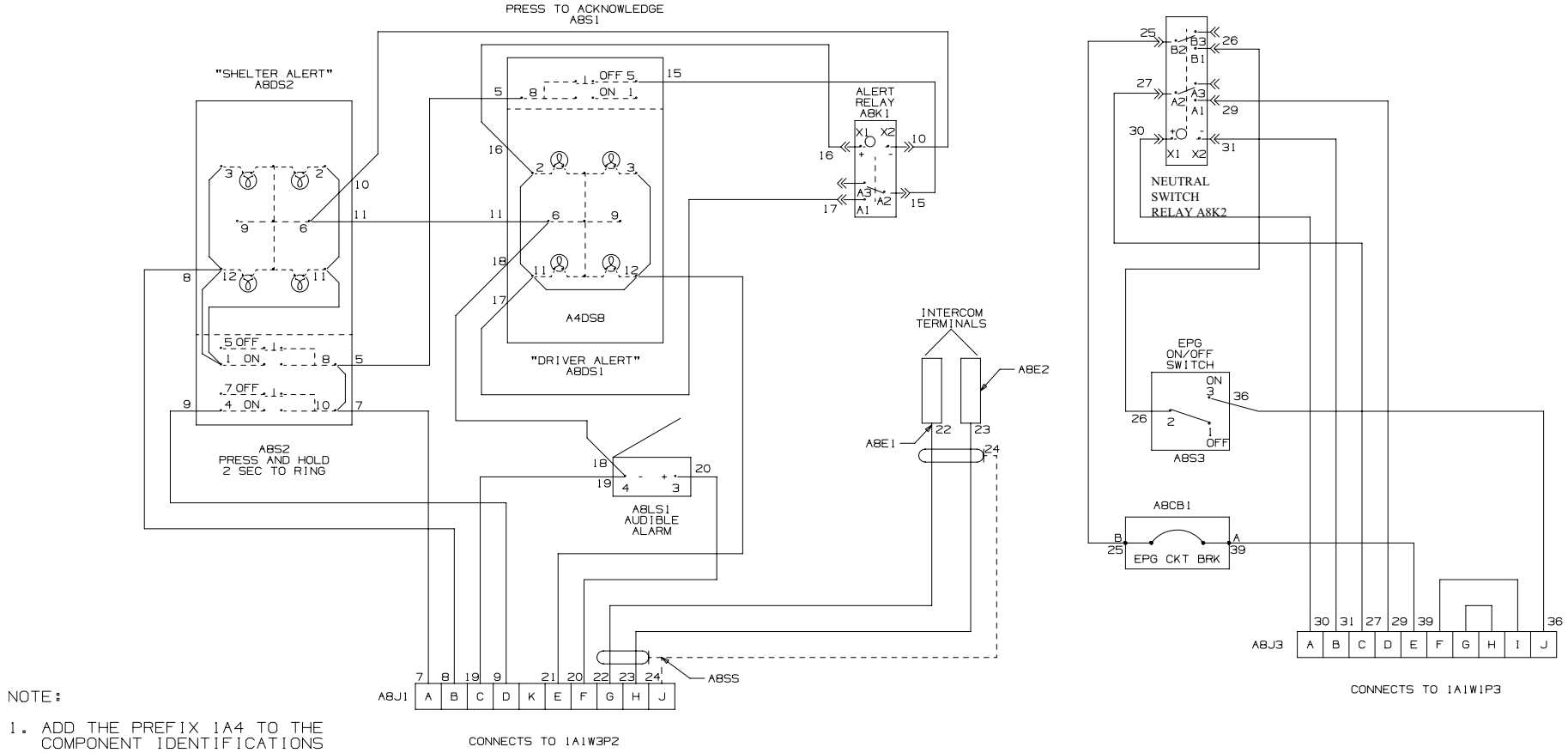
F-9. Rear Control Panel – 1A4A4 (Sheet 6 of 6)



F-12. R22 Refrigeration Schematic – 1A4A1 (R22)



F-14. Tachometer Wiring – 1A1A17



NOTE:

1. ADD THE PREFIX 1A4 TO THE COMPONENT IDENTIFICATIONS

F-15. Vehicle Control Box – 1A4A8

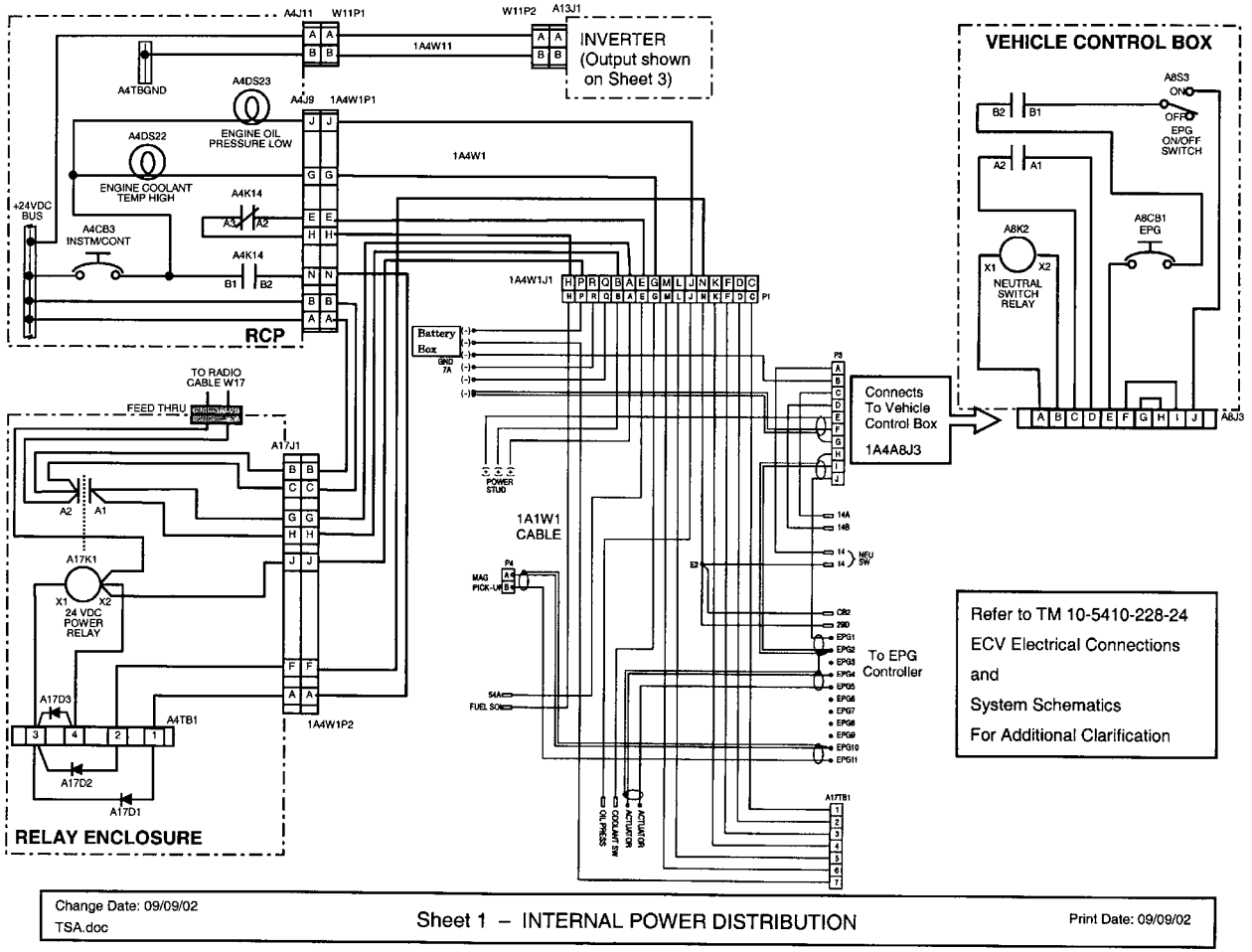
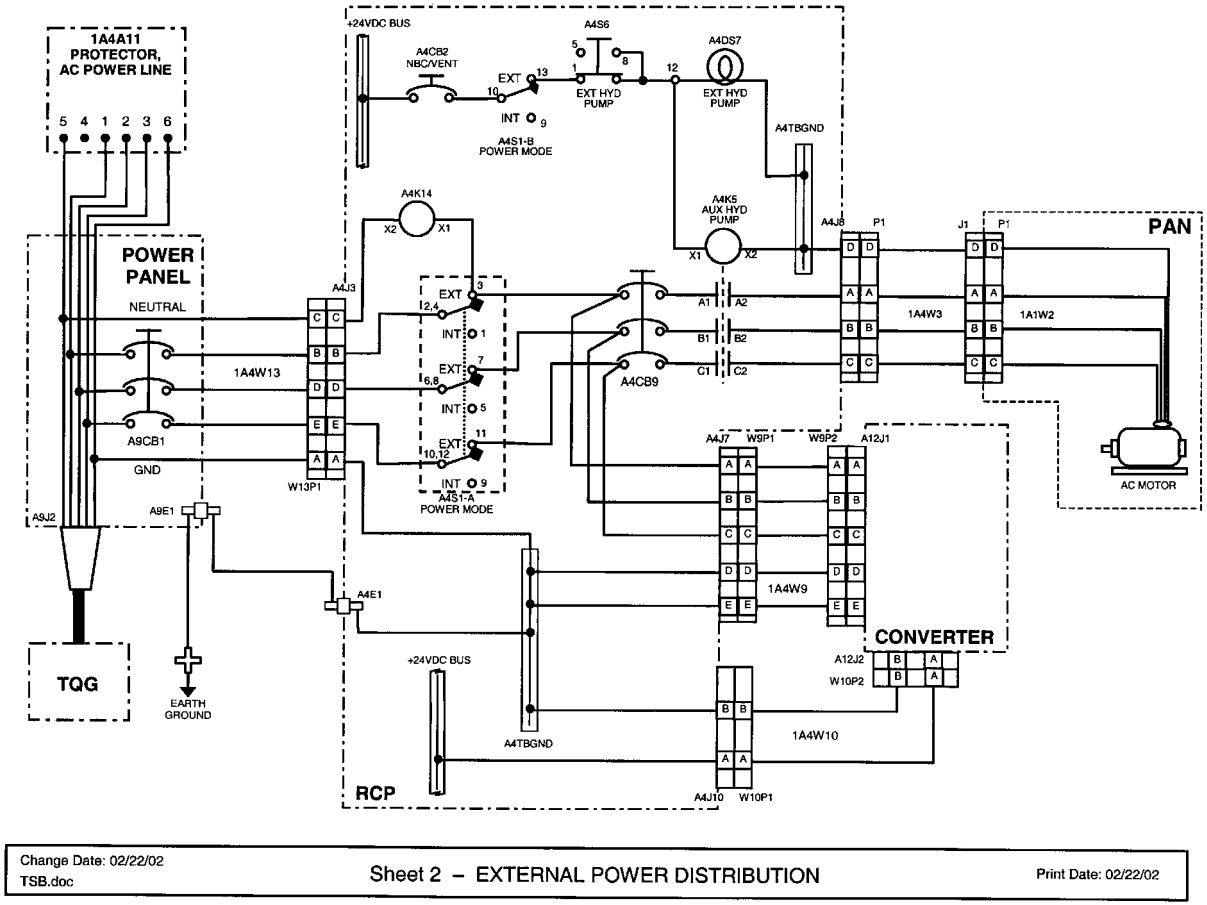


Figure F–16. Troubleshooting Interconnect Diagram (Sheet 1 of 12)



Change Date: 02/22/02
TSB.doc

Sheet 2 – EXTERNAL POWER DISTRIBUTION

Print Date: 02/22/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 2 of 12)

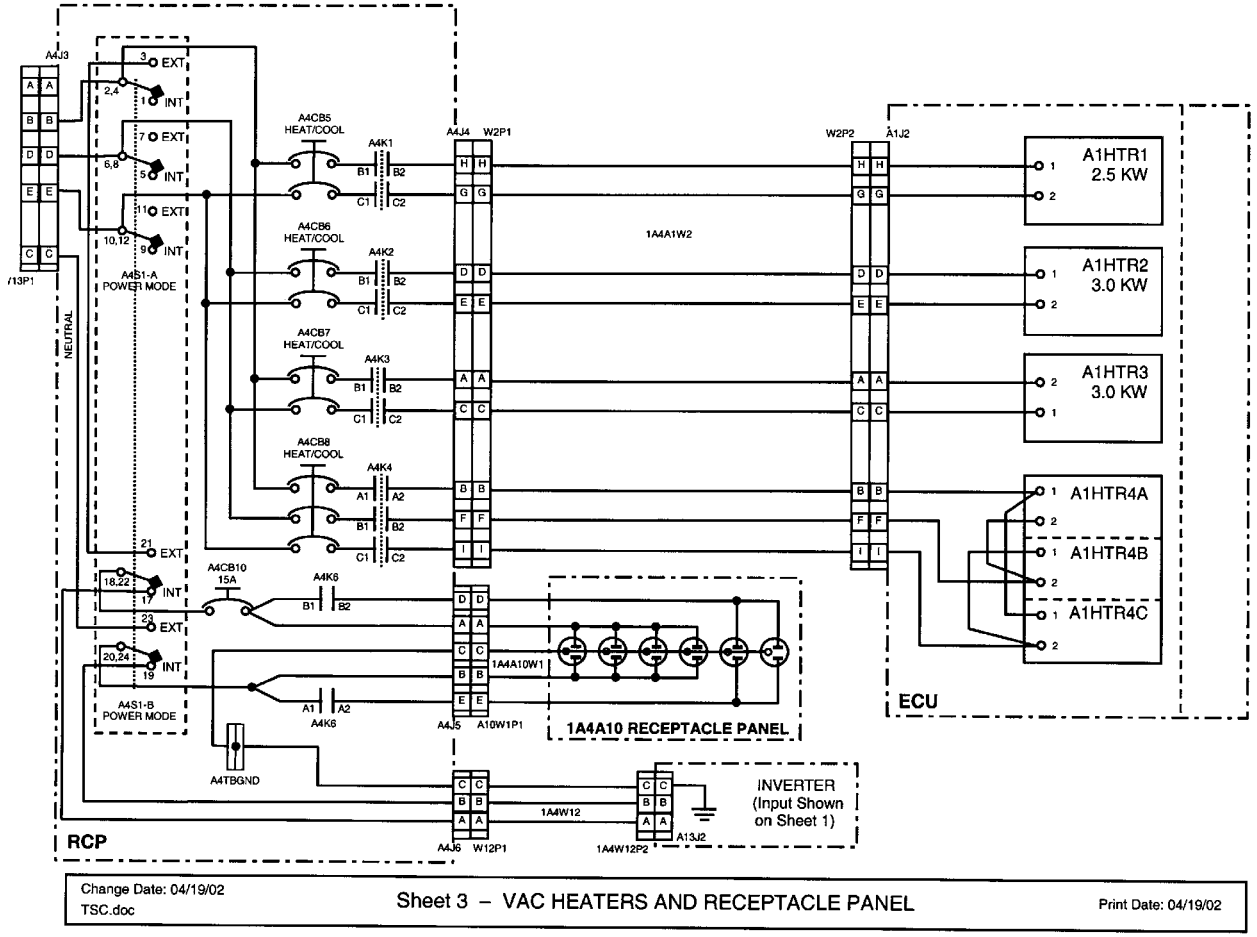
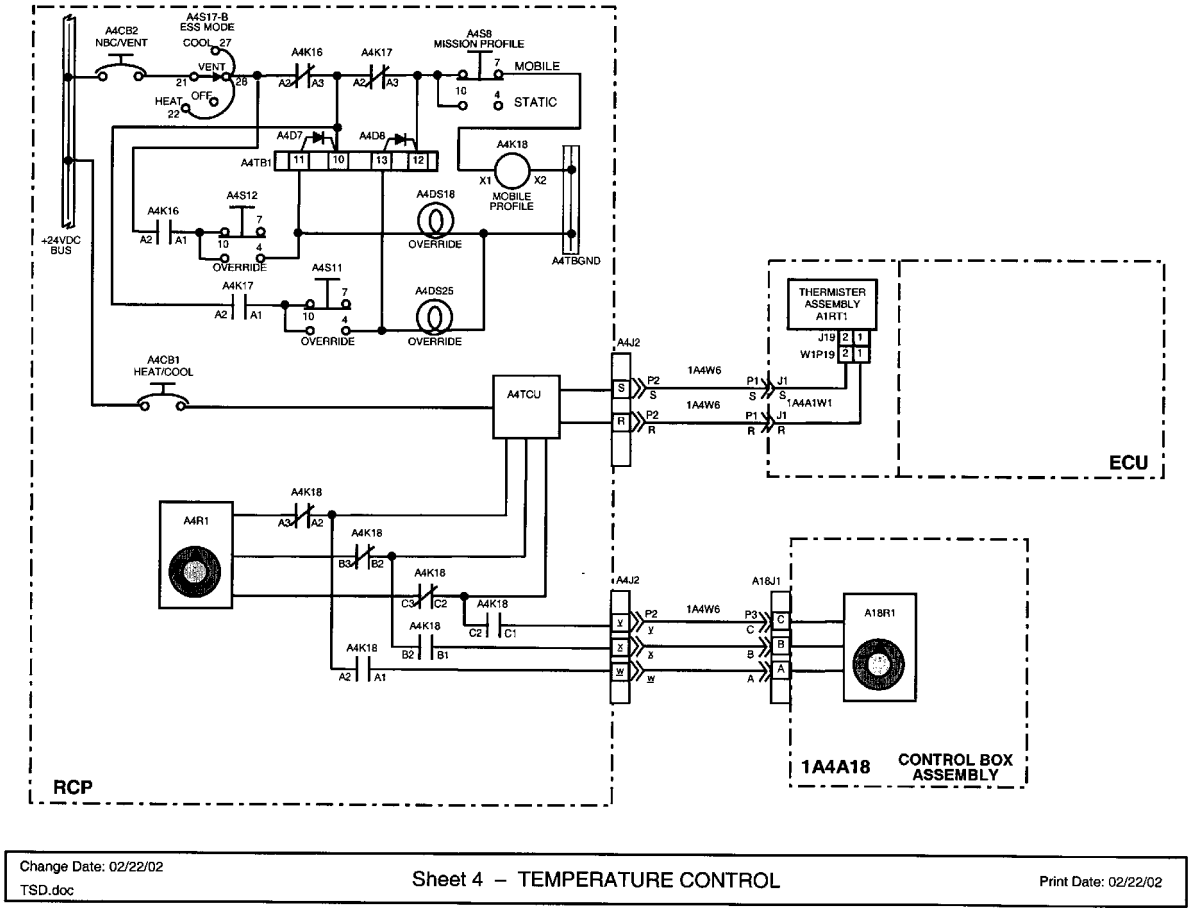


Figure F–16. Troubleshooting Interconnect Diagram (Sheet 3 of 12)

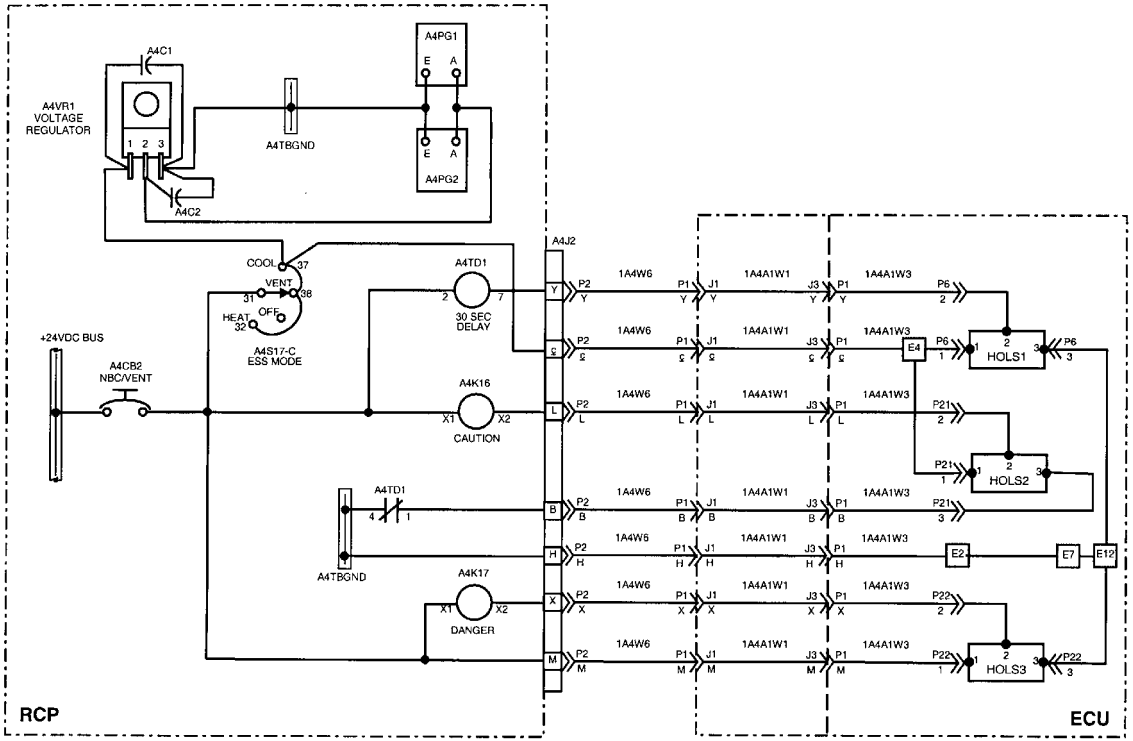


Change Date: 02/22/02
TSD.doc

Sheet 4 – TEMPERATURE CONTROL

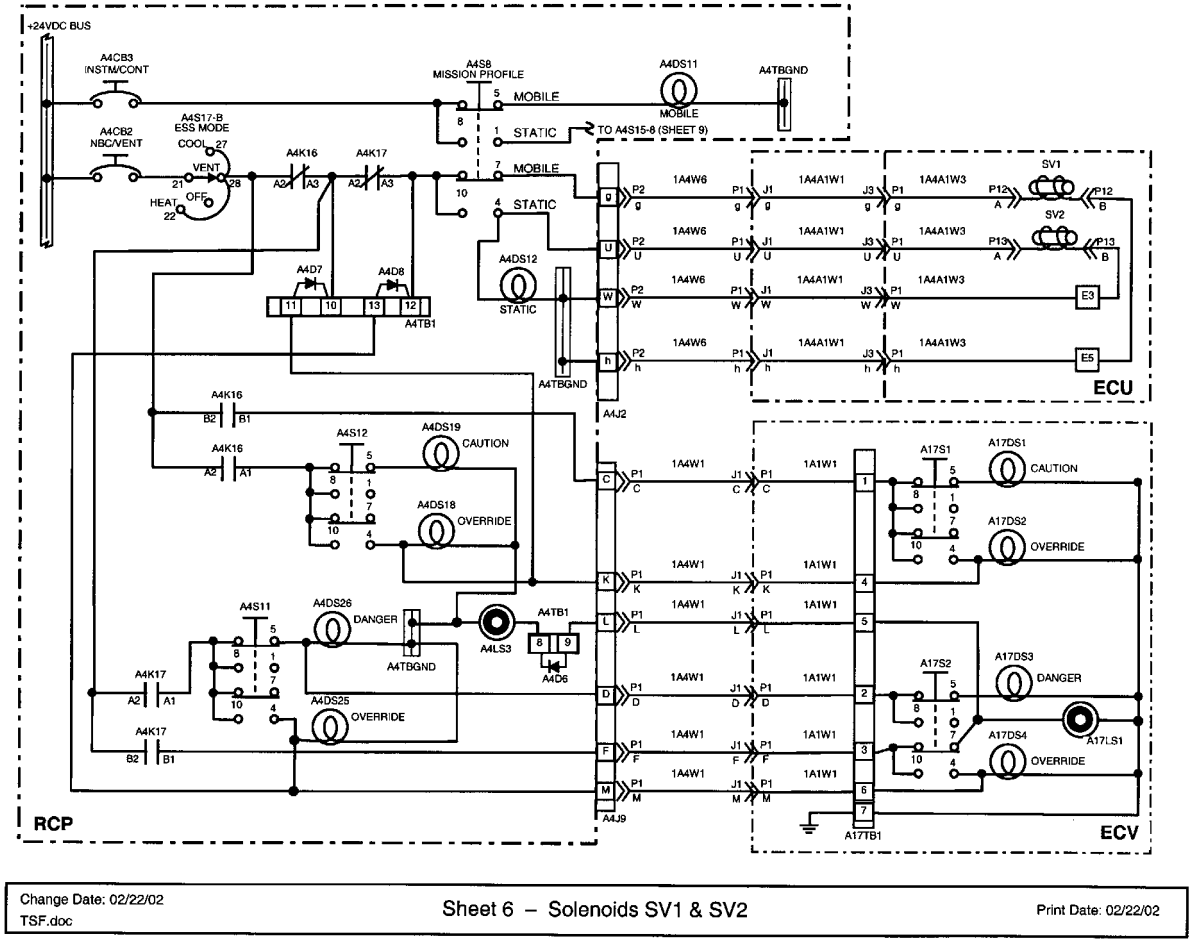
Print Date: 02/22/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 4 of 12)



Change Date: 03/01/02 TSE.doc	Sheet 5 – Hydraulic Oil Level & Voltage Regulator Circuits	Print Date: 03/01/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 5 of 12)

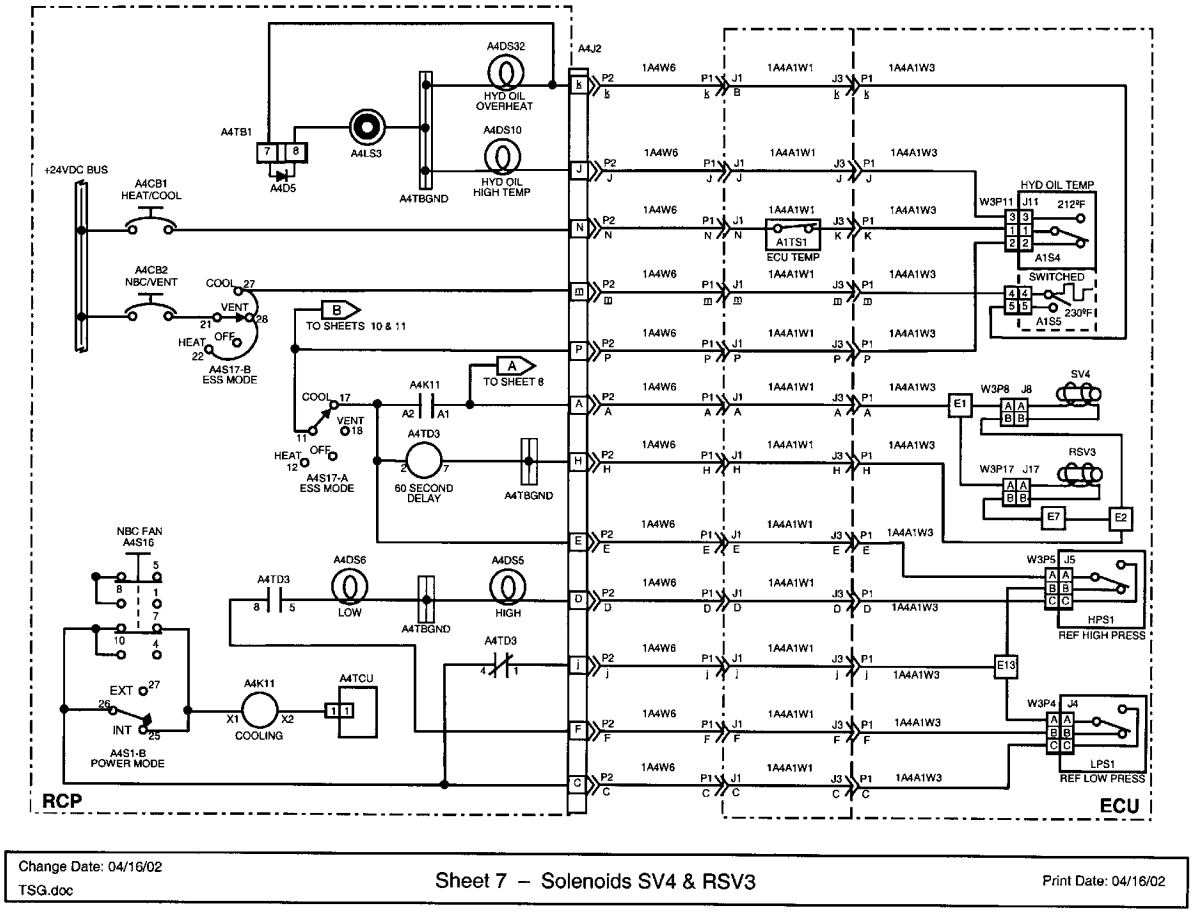


Change Date: 02/22/02
TSF.doc

Sheet 6 – Solenoids SV1 & SV2

Print Date: 02/22/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 6 of 12)

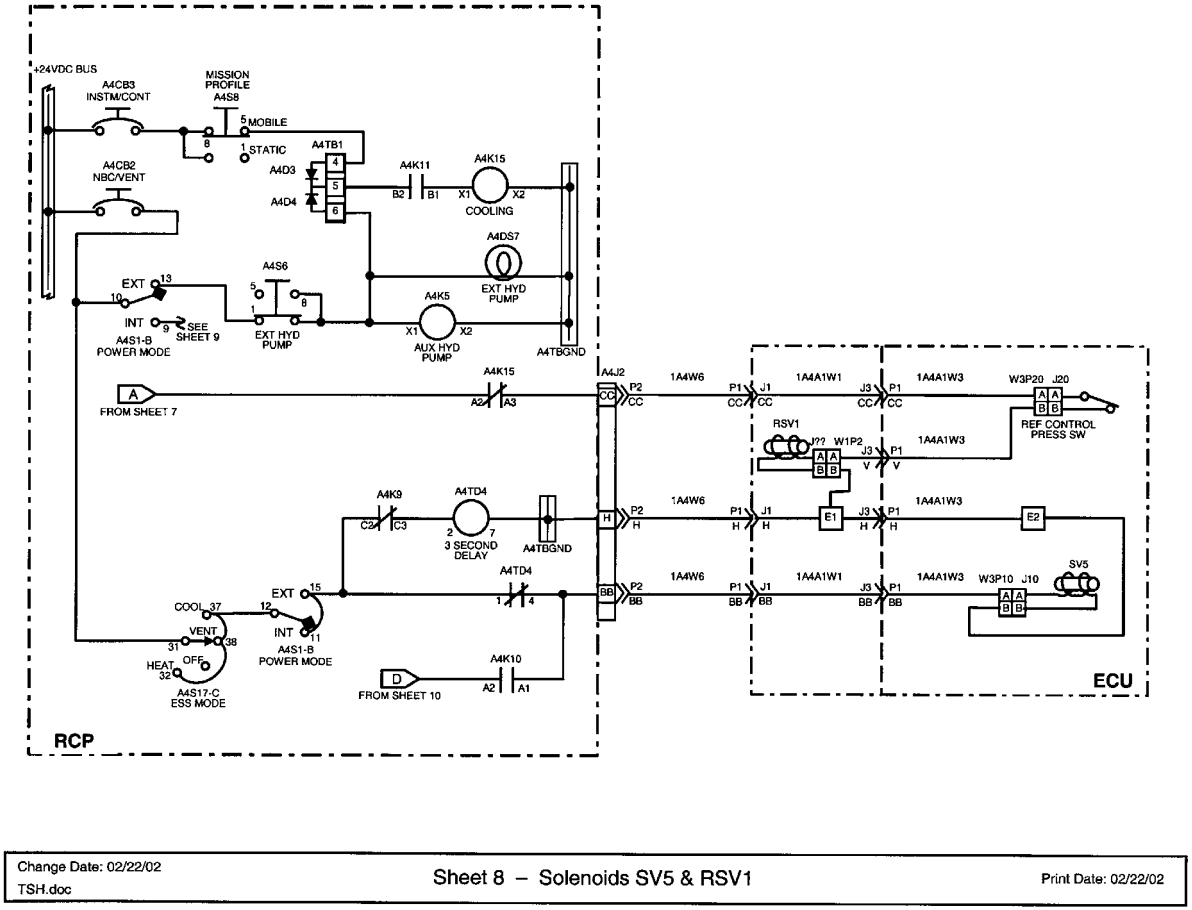


Change Date: 04/16/02
TSG.doc

Sheet 7 – Solenoids SV4 & RSV3

Print Date: 04/16/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 7 of 12)

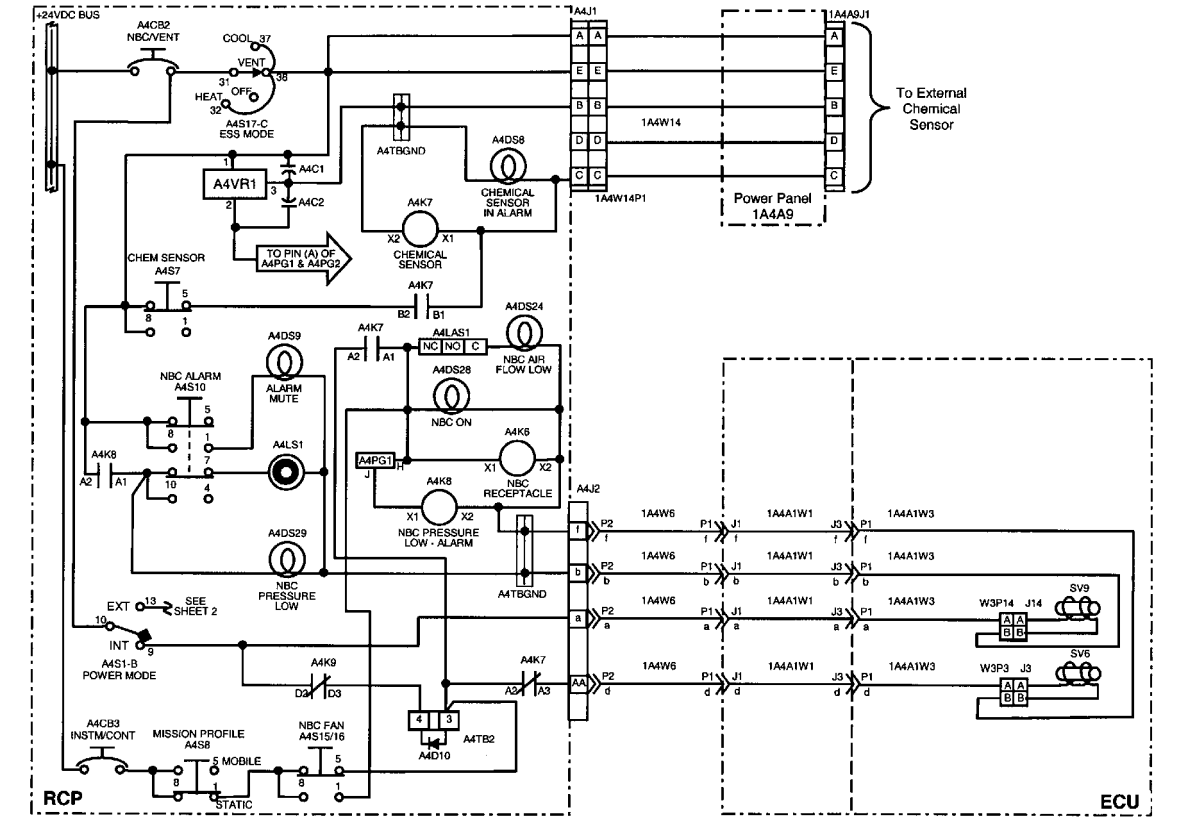


Change Date: 02/22/02
TSH.doc

Sheet 8 – Solenoids SV5 & RSV1

Print Date: 02/22/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 8 of 12)

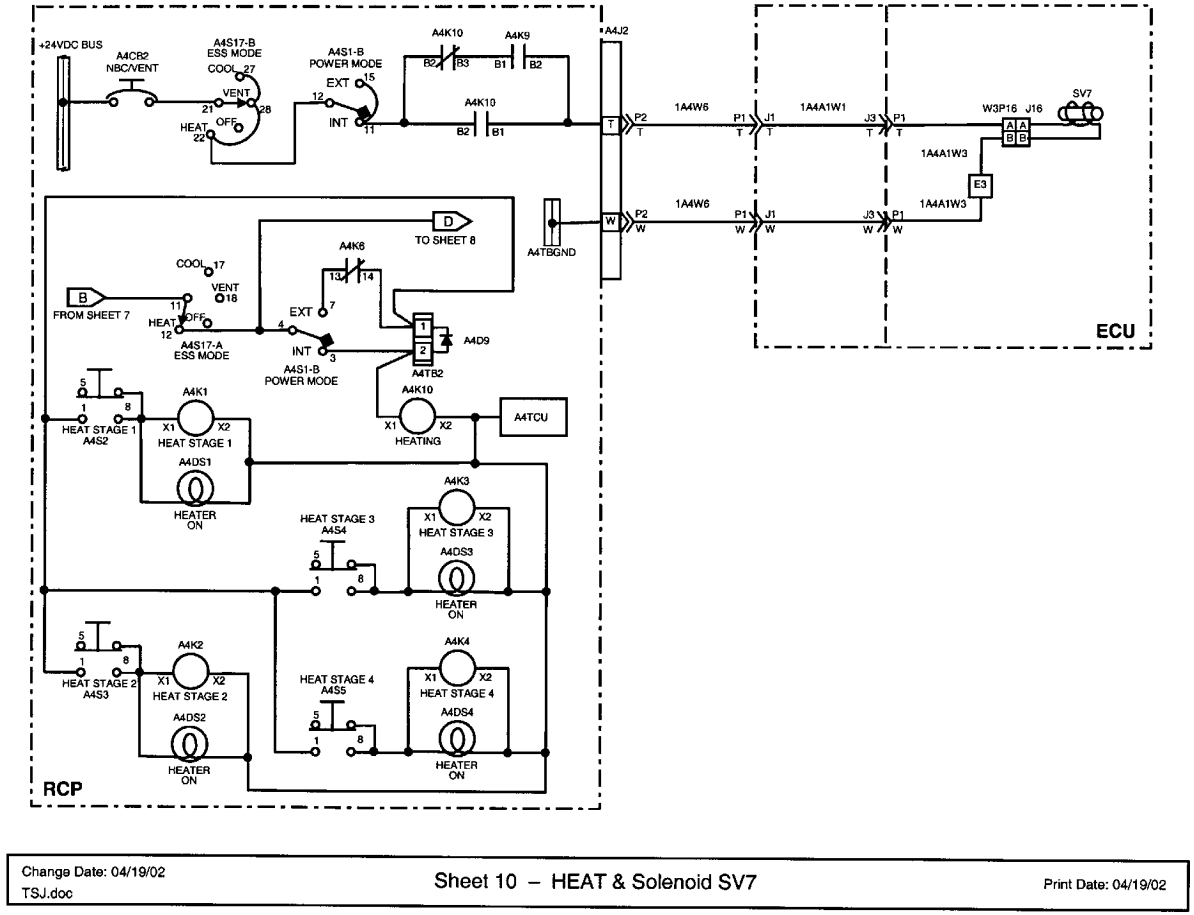


Change Date: 02/22/02
TSI.doc

Sheet 9 – CHEMICAL SENSE and Solenoids SV6 & SV9

Print Date: 02/22/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 9 of 12)

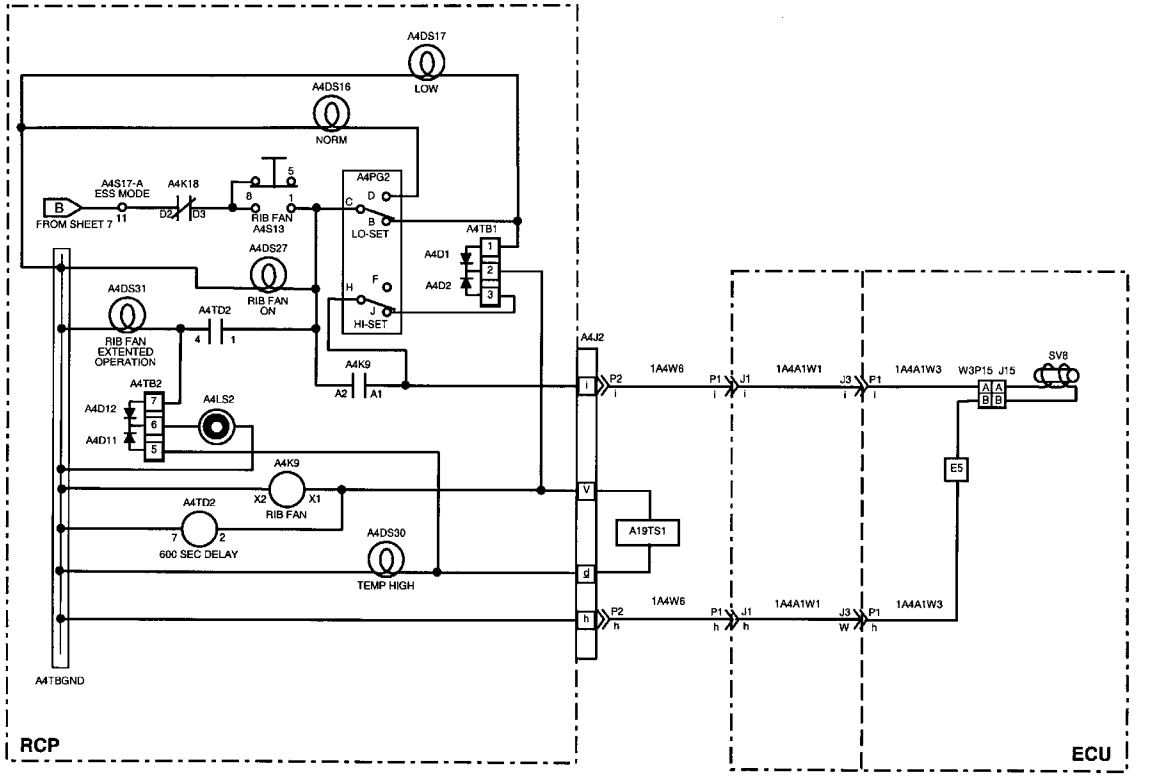


Change Date: 04/19/02
TSJ.doc

Sheet 10 – HEAT & Solenoid SV7

Print Date: 04/19/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 10 of 12)



Change Date: 04/16/02
TSK.DOC

Sheet 11 – Solenoid SV8

Print Date: 04/16/02

Figure F–16. Troubleshooting Interconnect Diagram (Sheet 11 of 12)

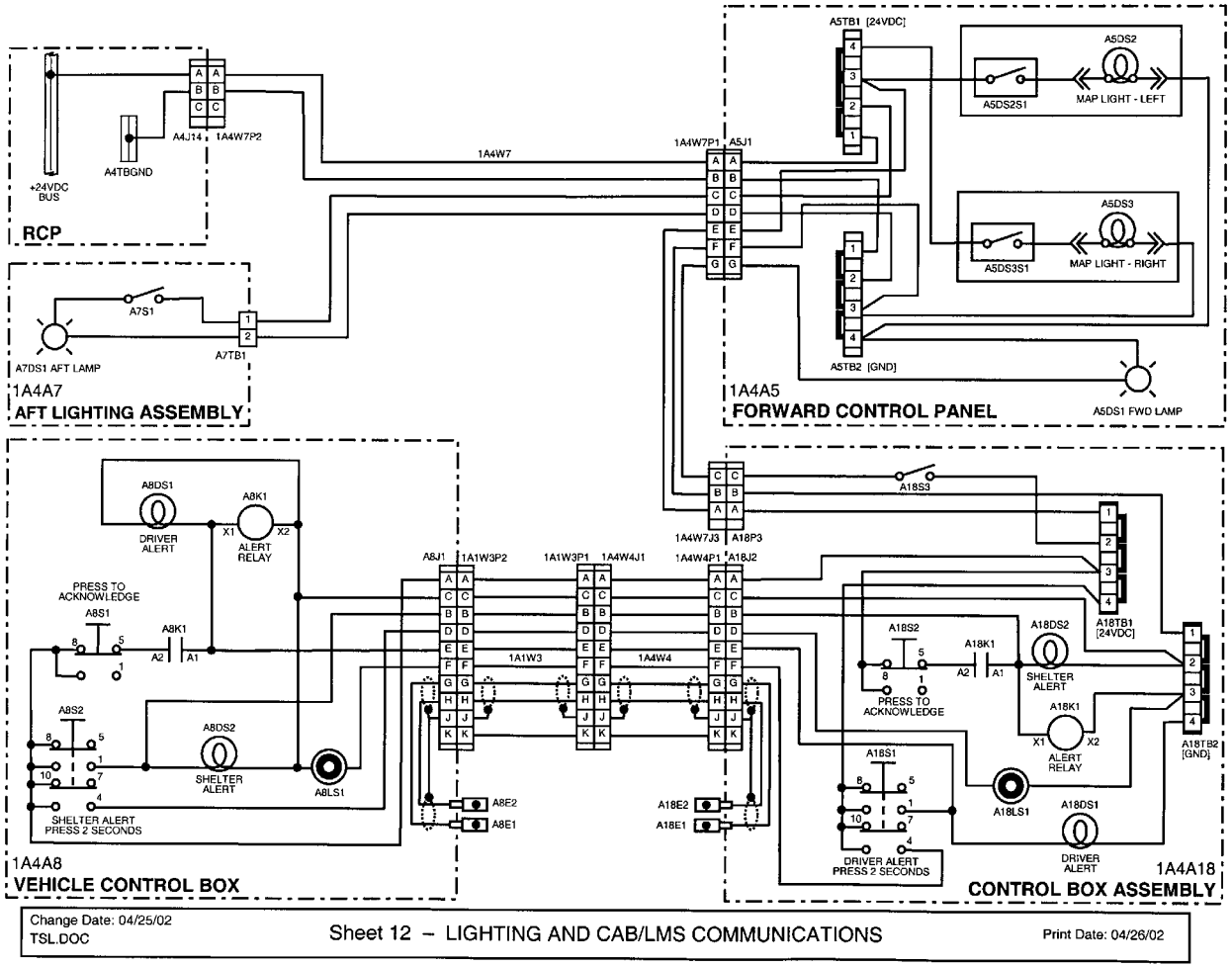


Figure F–16. Troubleshooting Interconnect Diagram (Sheet 12 of 12)

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

TEMPERATURE

5/9 (°F – 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 °C + 32 = °F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.741
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621