

TECHNICAL MANUAL

**OPERATOR'S ORGANIZATIONAL,
DIRECT SUPPORT, GENERAL
SUPPORT, AND DEPOT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS
INFORMATION AND SUPPLEMENTAL
OPERATING, MAINTENANCE AND
REPAIR PARTS INSTRUCTIONS)**

**ROLLER MOTORIZED,
STEEL WHEEL2 DRUM
TANDEM, 10-14
TON (CCE)
HYSTER MODEL C350B-D
NSN 3895-00-578-0372**

**H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y
27 MARCH 1981**

- WARNING:** Never shut down the engine when attempting to stop the unit. This will reduce or eliminate all dynamic braking capabilities.
- WARNING:** Always use extreme caution when positioning scrapers as they are under considerable spring tension and may become sharp when worn.
- WARNING:** Always support ballast securely when removing or installing ballast mounting capscrews.
- WARNING:** In order to check the high-pressure relief valve, it is necessary to bring the unit to stall. CAUTION must be taken to ensure the safety of personnel when attempting to stall the unit.
- WARNING:** Changing the quantity of shims in the relief valves is not recommended.
- WARNING:** When adjusting the Displacement Control Valve, the drive drum must be safely blocked off the ground. Any movement of the Control Valve Spool causes the unit to shift out of neutral and the drum will turn. CAUTION personnel to stand clear of the drive drum.
- WARNING:** The brake assembly will be removed prior to drive drum removal. Block the machine safely to prevent movement.
- WARNING:** When removing the drive drum, take caution. The drive drum is extremely heavy (approximately 12,000 lb., 5440 kg without ballast). CAUTION personnel to stand clear.
- WARNING:** During transmission start-up procedure, disconnect the cable from the pump until after initial start-up. This will allow the pump to remain in neutral (see figure 7-104).
- WARNING:** Connect the drum hub to a hoist before removal from the drive drum. The outer planetary assembly will accompany the drum hub upon removal. Care should be taken when handling these components.
- WARNING:** When assembling the steering control unit, alignment of the cross slot in the drive with the valleys between the teeth of the meter gear star determines proper valve timing of the unit. There are 12 teeth on the spline and 6 pump teeth on the star. Alignment is exactly right in 6 positions and exactly wrong in 6 positions. If the parts slip out of position during this part of assembly, repeat until you are certain correct alignment is obtained (see figure 9-57).

WARNING: DO NOT extend the hands or arms through the center of the steering wheel during start-up after the steering control unit has been reassembled. If the steering control unit has been disassembled and incorrectly timed, the steering wheel may suddenly become motorized or rotate abruptly with extreme force. If this occurs, see figure 9--2 and paragraph 9-27, step t and retime the control unit as shown.

WARNING: When checking water spray motor brushes, be sure ignition key switch and water spray switch are in the OFF position before inspecting brushes.

WARNING: Support heavy components securely BEFORE attempting to remove them.

WARNING: Always block the unit securely to prevent movement while performing maintenance or repairs.

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 DIVISION OF GENERAL MOTORS CORPORATION.

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TECHNICAL MANUAL }
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HEADQUARTERS
 DEPARTMENT OF THE ARMY
 WASHINGTON, DC, 27 March 1981

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,
 GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL
 (INCLUDING REPAIR PARTS INFORMATION AND SUPPLEMENTAL
 OPERATING, MAINTENANCE AND REPAIR PARTS INSTRUCTIONS)
 ROLLER MOTORIZED, STEEL WHEEL 2 DRUM
 Tandem 10-14 TON (CCE)
 HYSTER MODEL C350B-D
 NSN 3895-00-578-0372
 CONTRACT NO. DSA700-74-C-9024**

REPORTING OF ERRORS

You can help improve this manual. If you find any mistake 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) direct to: Commander, US Army Tank-Automotive Materiel Readiness Command, ATTN: DRSTA-MBS, Warren, MI 48090. A reply will be furnished to you.

		<i>Page</i>
VOLUME	1 Service Manual, Supplemental Operating, Maintenance and Repair Parts Instructions, and Parts Manual	
PART Section	I SERVICE MANUAL	
	1. Introduction	1-2
	2. Specification.....	2-1
	3. Operations	3-1
	4. Hyster-Care Maintenance	4-1
	5. Troubleshooting.....	5-1
	6. Electrical ..	6-1
	7. Transmission	7-22
	8. Final Drive	8-2
	9. Steering	9-1
	10. Park Brake	10-1
	11. Water Spray System	11-1
PART Section	II SUPPLEMENTAL OPERATING, MAINTENANCE AND REPAIR PARTS INSTRUCTIONS	
	I General	1
	II Maintenance	3
	III Repair Parts Supply	6
APPENDIX	A. EQUIPMENT PUBLICATIONS	8
	B. WARRANTY GUIDELINES	9
	C. MAINTENANCE ALLOCATION CHART	11
	D. MODIFICATION PROCEDURE	25
	E. BASIC ISSUE ITEMS LIST	26

		<i>Page</i>
	F.	PRESCRIBED LOAD LIST (PLL) & AUTHORIZED STOCKAGE LIST (ASL) 27
	G.	ADDITIONAL REPAIR PARTS 28
	H.	SAMPLE FORMAT DA FORM 2765 REQUEST (PART NUMBER) 29
	I.	SAMPLE FORMAT, MILSTRIP REQUEST (NSN) 30
	J.	SAMPLE FORMAT, MILSTRIP REQUEST (NON-NSN) 31
	K.	SAMPLE FORMAT, MILSTRIP REQUEST (NON-NSN MANUAL) 33
	L.	MAINTENANCE & OPERATING SUPPLY LIST 35
	M.	PREVENTIVE MAINTENANCE CHECKS & SERVICES 37
		OPERATOR/CREW PMCS 39
		ORGANIZATIONAL PMCS 43
	N.	HYSTER TECHNICAL PUBLICATION CORRECTION 45
	O.	HYSTER TECHNICAL PUBLICATION CORRECTION 47
PART	III	PARTS MANUAL
VOLUME	2	Engine Operators, Service, and Parts Manual
PART	I	ENGINE OPERATORS MANUAL
Section	1.	Description 4
	2.	Engine System 13
	3.	Engine Equipment 31
	4.	Operating Instruction 47
	5.	Lubrication and Preventive Maintenance 55
	6.	Engine Tune-Up Procedures 75
	7.	Trouble Shooting 113
	8.	Storage 119
	9.	Built-In Parts Book 123
	10.	Owner Assistance 147
INDEX, ALPHABETICAL		3-149
PART	II	ENGINE SERVICE MANUAL
Section	1.	Engine (Less Major Assemblies) 1-1
	2.	Fuel System and Governors 2-1
	3.	Air Intake System 3-1
	4.	Lubrication System 4-1
	5.	Cooling System 5-1
	6.	Exhaust System 6-1
	7.	Electrical Equipment 7-1
	13.	Operating Instructions 13-1
	14.	Engine Tune-Up 14-1
	15.	Preventive Maintenance-Trouble Shooting-Storage 15-1
INDEX, ALPHABETICAL		INDEX 1
PART	III	ENGINE PARTS MANUAL
		ENGINE (LESS MAJOR ASSEMBLIES) A1
		FUEL SYSTEM B1
		AIR SYSTEM..... C1
		LUBRICATING SYSTEM D1
		COOLING SYSTEM E1
		EXHAUST SYSTEM F1
		ELECTRICAL SYSTEM G1

This technical manual is an authentication of the manufacturers' commercial literature and does not conform with the format and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

PART I
SERVICE MANUAL

STEEL WHEEL ROLLER C350B
CONTRACT NO. DSA 700-74-C-9024

OPERATING INSTRUCTIONS
C350B STEEL WHEEL ROLLER

Starting

1. Set park brake.
2. Move throttle bail to neutral (vertical position).
3. Start engine.
4. *To Protect Engine and Transmission:*
Do not operate above half throttle until transmission temperature is over 100°F.

Operating

1. Release park brake.
2. Direction and speed are controlled by bail. Machine will travel in direction bail is moved. Additional bail movement increases speed.
3. To prevent lugging engine on an upgrade move bail back towards neutral position.
4. Use emergency stop, identified on dash in red, only if engine speed cannot be controlled.

Stopping

1. Put throttle bail in neutral (vertical position).
2. Set park brake.
3. Turn ignition switch to off position.

Do not Tow - In case of machine malfunction, vehicle may be moved at slow speed by opening transmission by-pass valve. This is done by pulling up and locking the control cable located under the hood on the hydraulic tank side of the unit.

FOR SAFETY

TRAINED OPERATOR ONLY

1. Use slower speed and added caution when operating close to fill edge and when traveling downhill.
2. Travel up and down the grade when operating on slopes.
3. Report damage and faulty operation immediately, do not operate machine until corrected.
4. Always set park brake before getting off machine. Transmission will not hold parked machine on a grade.
5. Follow the operating instructions above and in the owners and operators manual. Extra copies available from your Hyster dealer.

**DIESEL ENGINE GUARANTY CLAUSE
FOR GOVERNMENT CONTRACTS**

Notwithstanding the provisions of Clause 5 of the General Provisions, entitled "Inspection", the Contractor guarantees that, at the time of delivery thereof, the supplies provided for under this contract will be free from defects in material or workmanship and will conform to the requirements set forth in the contract. Notice of any alleged defect or non-conformance shall be given by the Government to the Contractor within one (1) year following delivery of the allegedly defective or non-conforming item. The Contractor shall be afforded the opportunity to examine the allegedly defective or non-conforming supplies, or parts thereof, at the site at which the suspected malfunction is experienced or, if field examination cannot be accomplished, such allegedly defective or non-conforming supplies, or parts thereof, shall be returned freight collect via cheapest transportation to the Contractor's plant. The Contractor shall with all possible speed, exchange such supplies, or parts thereof, with supplies or parts of like kind and ship such supplies or parts thereof freight prepaid to the location from which the defective or non-conforming supplies or parts thereof were returned or, if such location is not within CONUS, to the port of embarkation or other location within the original 48 States or the District of Columbia prescribed by the Contracting Officer, provided examination of such supplies or parts thereof discloses to the Contractor's satisfaction that the material received (a) was defective or non-conforming when delivered, or (b) has become defective or non-conforming since delivery for reasons other than as a result of having been (1) improperly repaired, altered or subjected to misuse, negligence, accident, or lack of normal maintenance services, or (2) operated at load factors which, although consistent with the user's duty cycle requirements, are in excess of Detroit Diesel Allison's published commercial ratings for the product. This Guaranty shall then continue as to any such exchange supplies or parts thereof until one (1) year after the date of delivery thereof.

Notwithstanding the foregoing, the Contractor's total liability for transportation charges shall not exceed the cost of transporting the allegedly defective or non-conforming supplies, or parts thereof, by the usual commercial surface method of shipment, from the shipping destination originally specified under this contract for the applicable CLIN to the Contractor's plant and return, and the Government shall reimburse the Contractor for all transportation expense in excess of such amount upon request.

If the Government does not require the exchange of any supplies, or parts thereof agreed to be defective or non-conforming, the Contractor, if required by the Contracting Officer within a reasonable time after notice of the defect or non-conformance, shall repay such portion of the contract price for the supplies as is equitable in the circumstances and comparable to the price(s) at which the Contractor then offers the exchanged supplies, or parts thereof, for sale to the Government.

March 1974

TABLE OF CONTENTS

	Page
SECTION 1. INTRODUCTION	
GENERAL	1-2
UNIT NAMEPLATE	1-2
SERIAL NUMBER DATA	1-2
SYSTEM DESIGN SPECIFICATIONS	1-2
OPERATING INSTRUCTIONS	1-2
HYSTER-CARE MAINTENANCE	1-2
TROUBLESHOOTING	1-2
SYSTEM DESCRIPTIONS AND REPAIRS	1-3
SAFETY PRECAUTIONS	1-3
SECTION 2. SPECIFICATIONS	
GENERAL	2-1
COMPACTOR DIMENSIONS	2-1
PERFORMANCE SPECIFICATIONS	2-2
WEIGHT, BALLAST COMPRESSION DATA	2-2
DETROIT DIESEL ENGINE SPECIFICATIONS.....	2-5
WATER SPRAY SYSTEM SPECIFICATIONS	2-6
HYDROSTATIC TRANSMISSION SPECIFICATIONS	2-7
FINAL DRIVE AND DRUM ASSEMBLY SPECIFICATIONS	2-10
STEERING SYSTEM SPECIFICATIONS	2-11
BRAKE SYSTEM SPECIFICATIONS	2-13
TORQUE SPECIFICATIONS FOR STANDARD HARDWARE	2-14
SECTION 3. OPERATION	
GENERAL	3-1
OPERATING CONTROLS AND INDICATORS	3-4
SAFETY PRECAUTIONS	3-4
STARTING THE UNIT	3-5
OPERATING THE UNIT	3-6
SPEED AND DIRECTION CONTROL	3-6
DYNAMIC BRAKING	3-6
DRUM SCRAPERS	3-6
COCO MAT	3-6
WATER SPRAY SYSTEM	3-7
UNIT SHUTDOWN	3-6
EMERGENCY ENGINE STOP (DETROIT DIESEL ONLY)	3-7
RESETTING EMERGENCY ENGINE STOP (DETROIT DIESEL ONLY)	3-7
MOVING THE UNIT	3-7
SHIPPING THE UNIT	3-8
MISCELLANEOUS OPERATING POINTS	3-8
SECTION 4. HYSTER-CARE MAINTENANCE	
GENERAL.....	4-1
HYSTER-CARE MAINTENANCE SCHEDULE	4-1
HYSTER-CARE MAINTENANCE PROCEDURES	4-5
FUEL SYSTEM	4-5
DETROIT DIESEL FUEL STRAINER AND FILTER	4-7

	Page
AIR FILTRATION SYSTEM	4-8
AIR CLEANER FILTER(S).....	4-8
DIESEL CRANKCASE BREATHER	4-9
DETROIT DIESEL BLOWER SCREEN	4-9
ENGINE AIR BOX DRAIN	4-9
ELECTRICAL SYSTEM	4-9
CHECKING BATTERY ELECTROLYTE LEVEL	4-9
ALTERNATOR AND WATER PUMP DRIVE BELT(S)	4-10
ELECTRICAL WIRING	4-11
COOLING SYSTEM	4-11
RADIATOR	4-12
FAN SHROUD	4-13
WATER PUMP	4-13
HOSES	4-13
FLUSHING THE SYSTEM	4-13
DETROIT DIESEL FAN DRIVE BELTS	4-14
ENGINE LUBRICATION SYSTEM	4-16
ENGINE OIL	4-16
ENGINE OIL FILTER	4-16
LUBRICATING THROTTLE AND TRANSMISSION LINKAGE	4-17
HYDRAULIC SYSTEM	4-17
FILLING THE TANK	4-17
CHANGING THE HYDRAULIC OIL	4-17
TRANSMISSION HYDRAULIC FILTERS	4-17
WATER SPRAY SYSTEM	4-18
FILTERS	4-18
MANIFOLD AND NOZZLES	4-18
STORAGE	4-18
PARKING BRAKE	4-19
LUBRICATION	4-19
ADJUSTING	4-19
FINAL DRIVE ASSEMBLY	4-20
CHECKING LUBRICANT LEVEL	4-20
FLUSHING THE FINAL DRIVE MECHANISM	4-20
STEERING	4-20
GUIDE ROLL AXLE BEARINGS	4-20
TRUNNION ASSEMBLY	4-20
STEERING CYLINDER BALL JOINTS	4-21
REMOVING AND REPLACING STEEL BALLAST	4-22
UNIT STORAGE	4-22
WATER SPRAY SYSTEM	4-22
DRUM BALLAST	4-22
STEERING CYLINDER	4-22
FUEL SYSTEM	4-22
ENGINE COOLING SYSTEM	4-22
ENGINE CYLINDERS	4-22
BATTERY	4-22

SECTIONS 5. TROUBLESHOOTING

GENERAL	5-1
TROUBLE ANALYSIS FOR WATER SPRAY SYSTEM	5-1
TROUBLE ANALYSIS FOR SUNDSTRAND HYDROSTATIC TRANSMISSION.	5-4
TROUBLE ANALYSIS FOR FINAL DRIVE ASSEMBLY	5-7
TROUBLE ANALYSIS FOR STEERING SYSTEM	5-8
TROUBLE ANALYSIS FOR BRAKE SYSTEM	5-12

SECTION 6. ELECTRICAL

GENERAL	6-1
ELECTRICAL SCHEMATIC FOR DETROIT ENGINE	6-4
INSTRUMENT PANEL DETAIL FOR DETROIT ENGINE	6-5
ROUTING DIAGRAM FOR DETROIT DIESEL ENGINE	6-6

SUNDSTRAND HYDROSTATIC TRANSMISSION	7-23
GENERAL	7-23
HYDRAULIC SYSTEM	7-23
HYDRAULIC OIL	7-23
HYDRAULIC SYSTEM COMPONENTS	7-23
GENERAL	7-23
CHARGE PUMP CIRCUIT	7-23
CHARGE PUMP	7-23
NEUTRAL CHARGE PUMP RELIEF VALVE	7-23
SUCTION FILTER	7-23
COOLING CIRCUIT	7-23
OIL COOLER	7-27
OIL COOLER BY-PASS VALVE	7-27
SHUTTLE VALVE	7-27
CONTROL FUNCTION	7-27
MAKEUP CIRCUIT	7-27
HYDROSTATIC PUMP ASSEMBLY	7-27
VARIABLE DISPLACEMENT HYDROSTATIC PUMP	7-27
CHARGE PUMP	7-28
CHECK VALVES	7-28
SERVO CONTROL SYSTEM	7-28
DISPLACEMENT CONTROL VALVE	7-28
SERVO CONTROL CYLINDERS	7-29
HYDROSTATIC MOTOR ASSEMBLY	7-29
FIXED DISPLACEMENT HYDROSTATIC MOTOR	7-29
MANIFOLD	7-29
HIGH PRESSURE RELIEF VALVES	7-29
SHUTTLE VALVE	7-29
LOW CHARGE PRESSURE RELIEF VALVE	7-30
PRESSURE CHECKS	7-30
CHECKING NEUTRAL CHARGE PRESSURE	7-30
CHECKING LOW CHARGE PRESSURE	7-30
CHECKING HIGH PRESSURE	7-31
CHECKING CONTROL PRESSURE	7-32
CHECKING CASE PRESSURE	7-32
VACUUM CHECK	7-32
ADJUSTMENTS	7-32
DISPLACEMENT CONTROL VALVE NEUTRAL ADJUSTMENT	7-32
TRANSMISSION CONTROL LINKAGE ADJUSTMENT	7-33
THROTTLE CONTROL LINKAGE ADJUSTMENT	7-35
TRANSMISSION REPAIR	7-36
HYDROSTATIC PUMP REMOVAL	7-36
REMOVAL OF HYDROSTATIC MOTOR	7-37
REPLACEMENT OF CHARGE PUMP	7-37
REPLACEMENT OF CHECK VALVES	7-38
REPLACEMENT OF ROTARY BY-PASS VALVE AND MOTOR MANIFOLD	7-38
REPLACEMENT OF HIGH PRESSURE RELIEF VALVES	7-40
REPLACEMENT OF DISPLACEMENT CONTROL VALVE	7-40
REPLACEMENT OF MOTOR OR PUMP SHAFT SEAL	7-40

REMOVAL OF DRIVE DRUM	7-43
REMOVAL OF MOTOR CARRIER	7-44
DISASSEMBLY OF MOTOR CARRIER	7-44
REASSEMBLY OF MOTOR CARRIER	7-46
INSTALLATION OF MOTOR CARRIER	7-48
INSTALLATION OF DRIVE DRUM	7-48
INSTALLATION OF HYDROSTATIC MOTOR	7-51
INSTALLATION OF HYDROSTATIC PUMP	7-51
CLEANING THE HYDRAULIC SYSTEM	7-51
SUNDSTRAND TRANSMISSION START-UP PROCEDURE	7-52
BY-PASS VALVE	7-53
BY-PASS CONTROL ADJUSTMENT	7-53

SECTION 8. FINAL DRIVE

GENERAL	8-2
C350B FINAL DRIVE DESCRIPTION	8-2
REMOVAL AND DISASSEMBLY OF FINAL DRIVE ASSEMBLY	8-2
CLEANING AND INSPECTION	8-6
REASSEMBLY AND INSTALLATION OF FINAL DRIVE ASSEMBLY	8-7

SECTION 9. STEERING

GENERAL	9-1
DESCRIPTION	9-1
STEERING SYSTEM	9-1
DESCRIPTION	9-1
OPERATION	9-3
REMOVAL OF STEERING CONTROL UNIT	9-4
DISASSEMBLY OF STEERING CONTROL UNIT	9-4
INSPECTION	9-10
REASSEMBLY OF STEERING CONTROL UNIT	9-10
INSTALLATION OF STEERING CONTROL UNIT	9-17
STEERING PUMP (DETROIT DIESEL)	9-23
DESCRIPTION	9-23
DISASSEMBLY OF STEERING PUMP	9-24
CLEANING AND INSPECTION	9-24
REASSEMBLY OF STEERING PUMP	9-25
FLOW DIVIDER (DETROIT DIESEL)	9-26
DESCRIPTION	9-26
OPERATION	9-27
REMOVAL OF FLOW DIVIDER	9-27
DISASSEMBLY OF FLOW DIVIDER	9-27

CLEANING AND INSPECTION	9-27
REASSEMBLY AND INSTALLATION OF FLOW DIVIDER	9-27
ADJUSTMENT OF FLOW DIVIDER RELIEF VALVE	9-27
STEERING CYLINDER	9-27
DESCRIPTION	9-27
REMOVAL OF STEERING CYLINDER	9-28
DISASSEMBLY OF STEERING CYLINDER	9-29
CLEANING AND INSPECTION	9-29
REASSEMBLY OF STEERING CYLINDER	9-29
INSTALLATION OF STEERING CYLINDER	9-29
BLEEDING THE SYSTEM	9-30
CHECKING RELIEF PRESSURE	9-30
STEERING TRUNNION ASSEMBLY	9-31
DESCRIPTION	9-31
REMOVAL OF GUIDE ROLLS AND STEERING AXLE ASSEMBLY	9-31
DISASSEMBLY OF AXLE SHAFT ASSEMBLY	9-32
CLEANING AND INSPECTION	9-32
REASSEMBLY OF AXLE SHAFT ASSEMBLY	9-33
INSTALLATION OF GUIDE ROLLS AND STEERING AXLE ASSEMBLY	9-35
REMOVAL AND DISASSEMBLY OF YOKE AND KING PIN ASSEMBLY	9-36
CLEANING AND INSPECTION	9-37
REASSEMBLY AND INSTALLATION OF YOKE AND KING PIN ASSEMBLY	9-38
SECTION 10. PARK BRAKE	
GENERAL	10-1
DESCRIPTION	10-1
REMOVAL AND DISASSEMBLY	10-1
CLEANING AND INSPECTION	10-2
REASSEMBLY AND INSTALLATION	10-2
ADJUSTMENT	10-3
BRAKE LINING BREAK-IN PROCEDURE	10-3
SECTION 11. WATER SPRAY SYSTEM	
GENERAL	11-1
DESCRIPTION	11-1
CHECKS AND ADJUSTMENTS	11-1
SPRAY MANIFOLDS	11-1
WATER PRESSURE	11-2
CHECKING MOTOR BRUSHES	11-2
REMOVAL OF PUMP AND MOTOR ASSEMBLY	11-2
REPAIR	11-3
INSTALLATION OF PUMP AND MOTOR ASSEMBLY	11-3
CLEANING THE WATER TANK	11-3

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SECTION 1 INTRODUCTION

1. GENERAL.

1-2. This manual contains Operation and Maintenance Instructions for the C350B Steel Wheel Roller (figure 1-3 and 1-4). Operating instructions must be carefully reviewed and understood before attempting to operate a unit. The individual assigned to operate the unit should see that it is kept in good condition to ensure prolonged efficiency.

1-3. UNIT NAMEPLATE.

1-4. The unit nameplate is located at the front of the operator's compartment as shown in figure 1-4. Make sure the nameplate remains attached to the unit at all times.

NOTE: Make sure that nameplate information is complete. If not, contact a Hyster Dealer.

1-5. SERIAL NUMBER DATA (see figure 1-4).

CAUTION: The COMPLETE serial number must be identified when ordering parts or communicating service information to Hyster Company.

1-6. The unit serial number is located on the unit nameplate. It is also stamped on the left hand side of the gooseneck. The serial number indicates the design series, manufacturing plant, serial number of the unit and year manufactured, Example B89 C 0000 T.

1-7. SYSTEM DESIGN SPECIFICATIONS.

1-8. Design specifications for individual systems of the unit are listed: in Section 2. Maintenance Specifications are given in Section 4.

1-9. OPERATING INSTRUCTIONS.

1-10. All instructions necessary for safe and efficient operation are given in Section 3.

1-11. HYSTER—CARE MAINTENANCE.

1-12. Section 4 Contains the schedule and procedures required for proper maintenance. The schedule lists recommended time intervals between maintenance checks. The procedures provide detailed instructions for performing maintenance checks.

1-13. TROUBLESHOOTING.

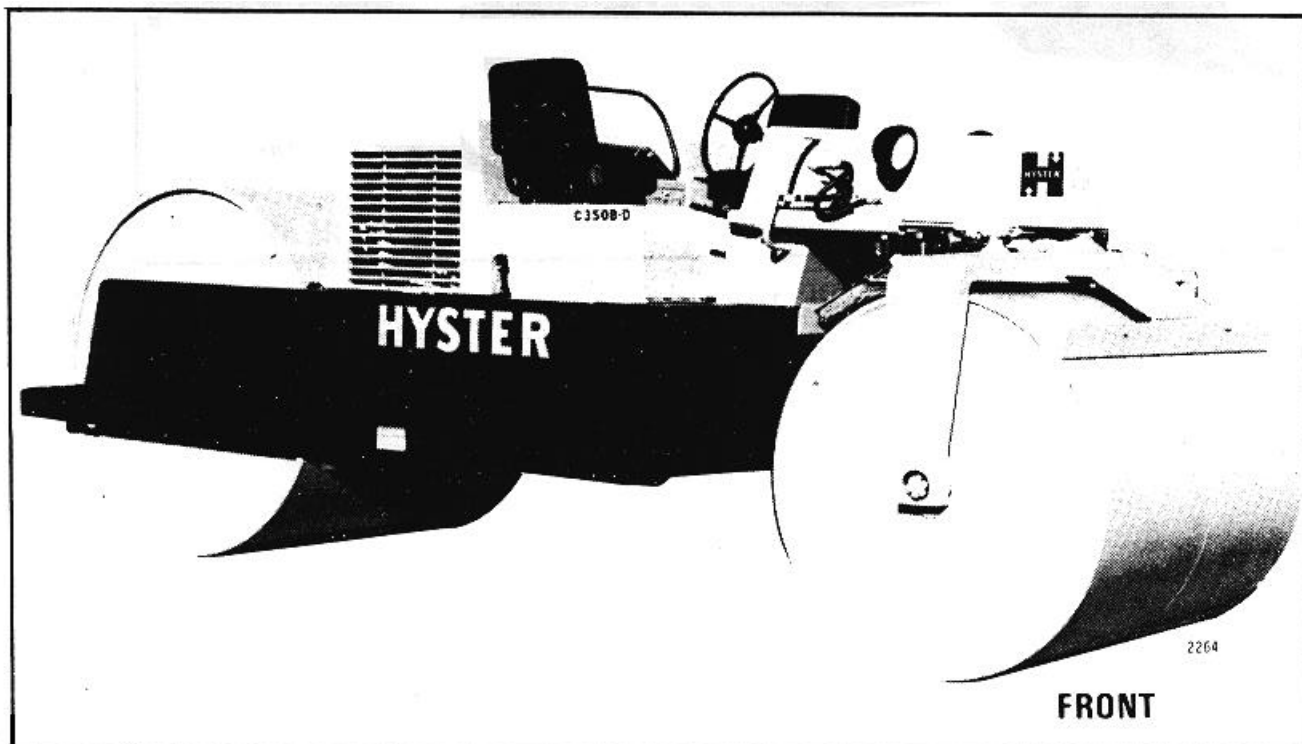


FIGURE 1-3.

**SECTION 1
INTRODUCTION**

1-14. Refer to C350B Service Manual or Section 5 of this publication.

1-15. SYSTEM DESCRIPTIONS AND REPAIRS.

1-16. Refer to C350B Service Manual.

1-17. SAFETY PRECAUTIONS.

1-18. When operating the unit, always observe recommended procedures given on the inside front cover of this manual.

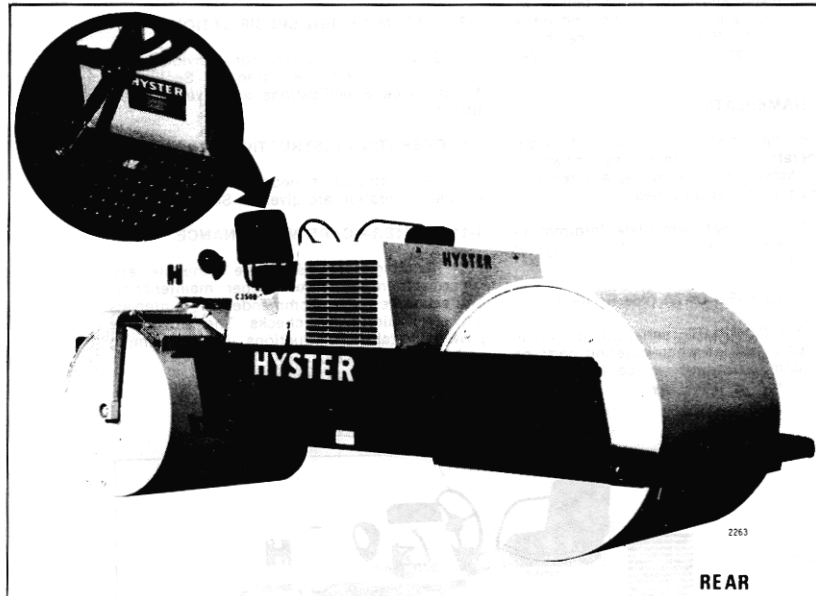


FIGURE 1-4.

**SECTION 2
SPECIFICATIONS**

2-1. GENERAL.

Additional specification tables are included for unit dimensions, weight, performance and torques. Following is a list of specification tables included in this section:

2-2. This section contains specification tables for each major system of the compactor.

TABLE	TITLE
2-1	Compactor Dimensions
2-2	Performance Specifications
2-3	Weight, Ballast Compression Data
2-6	Detroit Diesel Engine Specifications
2-7	Water Spray System Specifications
2-8	Hydrostatic Transmission Specifications
2-9	Final Drive and Drum Assembly Specifications
2-10	Steering System Specifications
2-11	Brake System Specifications
2-12	Torque Specifications for Standard Hardware

TABLE 2-1. COMPACTOR DIMENSIONS (see figure 2-1).

ITEM	DESIGN DATA	
	C350B	
	INCH	(cm)
A. Overall Height	77	(196)
B. Overall Length	197	(500)
C. Overall Width	65	(165)
D. Ground Clearance	18	(46)
10-14 Ton C350B	15	(38)
E. Wheelbase	140	(356)
F. Guide Roll Width	54	(137)
G. Guide Roll Diameter	48	(122)
H. Drive Roll Diameter	60	(152)
I. Drive Roll Width	54	(137)
J. Guide Roll Maximum Oscillation		
Going Straight		25° From Level on Each Side
In Full Turn		10° From Level on Each Side
K. Guide Roll Maximum Turn		90° Total (45° Each Side)

SECTION 2
SPECIFICATIONS

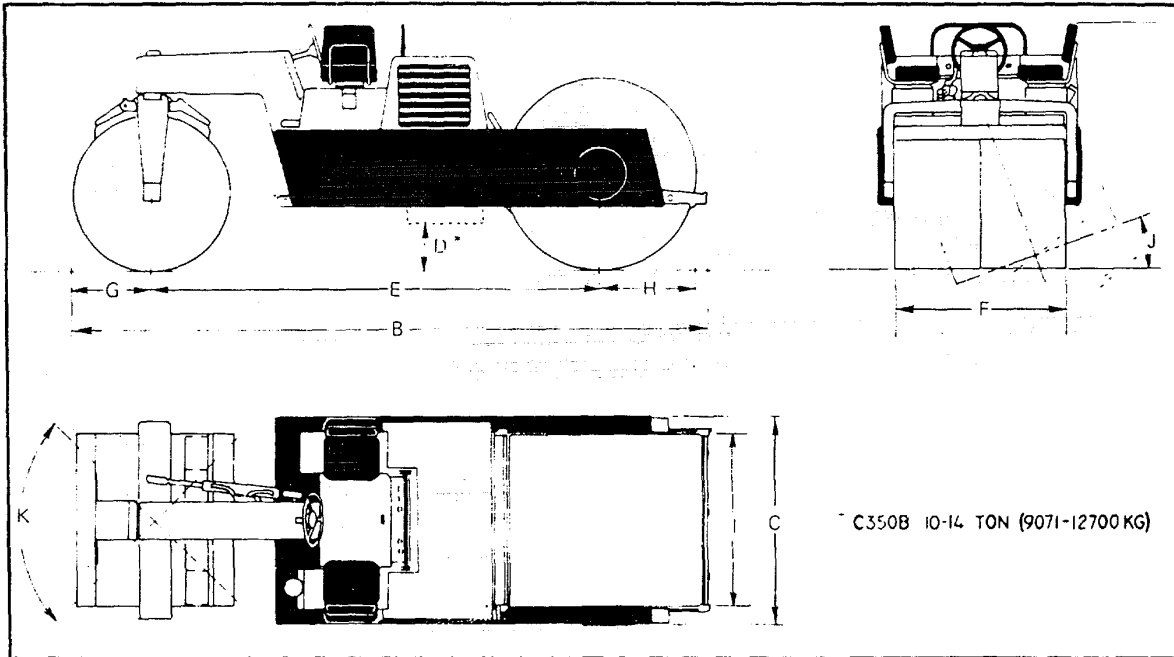


FIGURE 2-1.

TABLE 2-2. PERFORMANCE SPECIFICATIONS.

ITEM	DESIGN DATA	
	C350B	
Maximum Travel Speed	8 MPH (12.9 KPH)	
Inside Turning Radius	130 In. (3405 mm)	
Outside Turning Radius	293 In. (7492 mm)	

TABLE 2-3. WEIGHT, BALLAST COMPRESSION DATA.

ITEM	DESIGN DATA			
	WITHOUT BALLAST			
	Weight		Compression	
	lb	(kg)	lb/lineal inch	(kg/lineal cm)
C350B				
10-14 Ton				
Guide Roll	8000	(3629)	148	(264)
Drive Roll	12000	(5443)	222	(396)
Total	20000	(9072)		

TABLE 2-3. WEIGHT, BALLAST COMPRESSION DATA (CONT.)

ITEM	DESIGN DATA			
	WITHOUT BALLAST			
	Weight		Compression	
	lb	(kg)	lb/lineal inch	(kg/lineal cm)
	WITH LIQUID BALLAST			
	Weight		Compression	
	lb	(kg)	lb/lineal inch	(kg/lineal cm)
C350B				
10-14 Ton				
Guide Roll	11200	(5080)	208	(371)
Drive Roll	16800	(7620)	310	(554)
Total	28000	(12700)		

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TABLE 2-6. DETROIT DIESEL ENGINE SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
TYPE	In-Line, 3 Cylinder	
CYCLE	2 Stroke	
BORE	3.875 In.	9.8 cm

TABLE 2-6. DETROIT DIESEL ENGINE SPECIFICATIONS (CONT.).

ITEM	DESIGN DATA	
	ENGLISH	METRIC
STROKE	4.5 In.	11.4 cm
DISPLACEMENT	159.3 Cubic Inches	2610 cc
TORQUE	202 ft.-lbs. at 1500 RPM	27.9 kg-m at 1500 RPM
HORSEPOWER	80 at 2200 RPM	
INJECTORS	N-45	
COMPRESSION RATIO	17 to 1	
IDLE SPEED	550 RPM	
HIGH IDLE SPEED (No Load)	3040 RPM	
FIRING ORDER	1-3-2	
EXHAUST VALVE CLEARANCE	0.025 In. (Cold) 0.023 In. (Hot)	0.635 mm 0.584 mm
OIL PRESSURE (2200 RPM)	30 PSI	2.1 kg/cm ²
THERMOSTAT SETTING	165-185 °F	74-85 °C

NOTE: For additional engine specifications refer to engine manufacturer's service literature.

TABLE 2-7. WATER SPRAY SYSTEM SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
TANK CAPACITY	200 Gallons	757 Liters
PUMP TYPE	Centrifugal	
OPERATING PRESSURE	7-10 PSI at 800 RPM (Non-adjustable)	0.5-0.7 kg/cm ² at 800 RPM (Non-adjustable)
NOZZLE FLOW (TOTAL)	Approx. 0.25 GPM	0.95 LPM
NOZZLE ORIFICE	0.040 In.	1.016 mm

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TABLE 2-8B. SUNDSTRAND HYDROSTATIC TRANSMISSION SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
HYDRAULIC TANK CAPACITY	9 Gallons (also supplies steering)	34 ltrs.
OIL TYPE	SAE 10W Viscosity Index 90 Approved Oils: Mobilfluid 423 Shell Tellus 29 Type "F" Transmission Fluid conforming to Ford Motor Co. specification No. ESW-M2C33F (or E)	
OIL FILTERS Suction Return Oil Cooler By-pass Valve	10 Micron 33 Micron Opens at 15 PSI	Opens at 1 kg/cm ²

TABLE 2-8B. SUNDSTRAND HYDROSTATIC TRANSMISSION SPECIFICATIONS (CONT.).

ITEM	DESIGN DATA	
	ENGLISH	METRIC
SYSTEM PRESSURES (At 100–150°Oil Temp and 1500–2000 RPM engine speed)		
Charge Pump Pressure (Transmission in Neutral)	190–220 PSI*(Controlled by Relief Package in Charge Pump)	13.4–15.5 kg/cm ² *(Controlled by Relief Package in Charge Pump)
Transmission in Forward or Reverse	150–180 PSI*(Controlled by Relief Package in Hydraulic Motor)	10.5–12.7 kg/cm ² *(Controlled by Relief Package in Hy- draulic Motor)
Main Pump Pressure	5500 (± 200) PSI	386.7 (± 14) kg/cm ²
Control Pressure (Trans- mission in Forward or Reverse)	45 PSI approximately	3.2 kg/cm ² approximately
Case Pressure Suction Oil	40 PSI Max. (Normally 10 PSI) 10 In. HG Maximum	2.8 kg/cm ² (Normally 0.7 kg/cm ²) 25.4 HG Maximum
HYDRAULIC PUMP		
Type	Variable Displacement Axial Piston	
Swashplate Angle	18° Max. Either Side of Center	
Maximum Displacement	4.2 Cubic Inches per Revolution at 18° Swashplate Angle	68.8 cc per Revolution at 18° Swashplate Angle
Maximum Pressure Rating	5500 PSI	386.7 kg/cm ²
Maximum Case Pressure	40 PSI	2.8 kg/cm ²
Minimum Main Port Pressure	130 PSI Above Case Pressure	9.1 kg/cm ² Above Case Pressure
Maximum Allowable Case Temperature	180° F	
Maximum Shaft Speed		
At No Load	3000 RPM	
At 4700 PSI (330.5 kg/cm ²)	2810 RPM	
Charge Check Flow Rating	10 GPM	37.9 LPM
Charge Pump Displacement	0.75 Cubic Inch Per Revolution 9 GPM Max. at High Idle	12.3 cc Per Per Revolution 34.1 LPM Max. at High Idle
Port Sizes		
Main Line Inlet/Outlet Ports (2)	3/8–16 Thread, Four Bolt, Split-flange Boss	9.525 mm–16 Thread, Four Bolt, Split-flange Boss
Case Ports (Inlet and Outlet)	7/8–14 UNF–2B, O–ring Boss	22.225 mm–14 UNF–2B, O–ring Boss
Charge Pump Inlet	7/8–14 UNF–2B, O–ring Boss	22.225 mm–14 UNF–2B, O–ring Boss
Control Lever Movement	26° Either Direction from Center	

* Above case pressure

TABLE 2-8B. SUNDSTRAND HYDROSTATIC TRANSMISSION SPECIFICATIONS (CONT.).

ITEM	DESIGN DATA	
	ENGLISH	METRIC
HYDRAULIC MOTOR		
Type	Fixed Displacement, Axial Piston	
Displacement	4.26 Cubic Inches at 18° Pump Swashplate Angle	69.8 cc at 18° Pump Swashplate Angle
Charge Pressure Relief Valve setting	150-180 PSI	10.5-12.7 kg/cm ²
Main Relief Valve Setting	5500 PSI Above Charge Pressure	386.7 kg/cm ² Above Charge Pressure
Port Sizes		
Main Line Inlet/Outlet Ports (2)	3/8-16 Thread Four Bolt, Split-flange Boss	9.525 mm-16 Thread, Four Bolt Split-flange Boss
Case Drain Port	7/8-14UNF-2B, O-ring Boss	22.225 mm-14UNF-2B, O-ring Boss

TABLE 2-9. FINAL DRIVE AND DRUM ASSEMBLY SPECIFICATIONS.

ITEM	DESIGN DATA	
	C350B	
FINAL DRIVE GEAR RATIO	60.1: 1	
LUBRICATION		
Type	SAE 90 Multi-purpose Gear Oil	
Quantity	4 Quarts (3.8 ltrs.)	
GEAR TOOTH DATA		
Inner Sun Gear	17 Teeth	
Inner Planet Gears	47 Teeth	
Ring Gear	108 Teeth	
Outer Sun Gear (Cage)	29 Teeth	
Outer Planet Gears	47 Teeth	
GEAR BEARING BORE		
Inner Planet Gears	1.9800-1.9810 In. 50.317 - (50.292 mm)	
Outer Planet Gears	2.5312-2.5322 In. (64.292-64.318 mm)	
PLANETARY SHAFT O.D.		
Inner Planet Gears	0.9998-0.9993 In. (25.395-25.382 mm)	
Outer Planet Gears	1.1868-1.1873 In. (30.145-30.157 mm)	

TABLE 2-9. FINAL DRIVE AND DRUM ASSEMBLY SPECIFICATIONS (CONT.).

ITEM	DESIGN DATA	
	C350B	
PLANETARY SYSTEM TORQUE		
Inner Planet Capscrews	15 ft.-lbs. (2.073 kg-m)	
Outer Planet Capscrews	15 ft.-lbs. (2.073 kg-m)	
Drum Hub Capscrews	120 ft.-lbs. (16.584 kg-m)	
Planet Anchor Flange Capscrews	200 ± 10 ft.-lbs. (27.64 ± 1.38 kg-m)	
Anchor Flange to Outer Planetary Hub 12 Point Capscrews	120 ft.-lbs. (16.584 kg-m)	
MOTOR HOUSING TORQUE		
Housing to Frame Capscrews	88 ft.-lbs. (12.162 kg-m)	
Motor Mounting Capscrews	115 ft.-lbs. (15.893 kg-m)	
Bearing Carrier to Drum Capscrews	130 ft.-lbs. (17.966 kg-m)	
Bearing Carrier to Lock-plate Capscrews	105 ft.-lbs. (14.511 kg-m)	
Bearing Carrier Shimming	0.002 In. (0.0508 mm) Preload to 0.003 In. (0.0762 mm) End Play	

TABLE 2-10. STEERING SYSTEM SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
SYSTEM TYPE	Hydrostatic	
HYDRAULIC TANK CAPACITY	9 Gallons (also supplies transmission)	34 ltrs.
OIL TYPE	SAE 10W Viscosity Index 90 Approved Oils: Mobilfluid 423 Shell Tellus 29 Type "F" Transmission Fluid conforming to Ford Motor Co. specification No. ESW-M2C33F (or E)	
RELIEF PRESSURE		
Detroit Diesel	1500 ± 50 PSI	105.5 ± 3.5 kg/cm ²

TABLE 2-10. STEERING SYSTEM SPECIFICATIONS. (CONT.).

ITEM	DESIGN DATA	
	ENGLISH	METRIC
RELIEF VALVE SETTING	1500 PSI	105.5 kg/cm ²
HYDRAULIC PUMP (Detroit Diesel Only) Type Pump Output at 2400 Engine RPM and no Pressure Restriction	External Gear 18.6 GPM NOTE: Flow divider controls to 6.5 ± 1.0 GPM.	70.4 LPM NOTE: Flow divider controls to 24.6 ± 4 LPM.
ROTATION VIEWED FROM SHAFT END	Counterclockwise	
PUMP DIMENSIONS		
Gear Diameter	2.1965–2.1970 in.	55.791–55.804 mm
Gear Width	1.1545–1.550 in.	29.324–39.370 mm
Gear Lash	0.006–0.010 in.	0.152–0.254 mm
Gear to Body	0.00175 in.	0.043 mm
Body Bore	2.199–2.200 in.	55.855–55.880 mm
Bearing Diameter	2.1970–2.1975 in.	55.804–55.817 mm
Bearing Bore	0.995–1.000 in.	25.273–25.400 mm
Bearing Width	1.9990–1.9993 in.	50.775–50.782 mm
Bearing to Shaft Between Flats	Total 0.0025 in. 0.0002–0.0005 in.	Total 0.0635 mm 0.0051–0.0127 mm
FLOW DIVIDER (Detroit Diesel Only) Input Rating Controlled Flow Relief Setting	30 GPM 6.5 ± 1.0 GPM 1500 ± 50 PSI	114 LPM 25 ± 4 LPM 105.5 ± 3.5 kg/cm ²
STEERING CYLINDER Type Stroke	Double Acting 18 ± 1/8 Inches	45.7 ± 0.3 cm

TABLE 2-10. STEERING SYSTEM SPECIFICATIONS (CONT.).

ITEM	DESIGN DATA	
	ENGLISH	METRIC
STEERING WHEEL TURNS (Stop to Stop)	2 1/4 Clockwise (3 Seconds Clockwise and 3.5 Seconds Counterclockwise)	
STEERING HANDPUMP Type Displacement Port Size	Open Center, Rotary Actuated 7.4 Cubic Inches per Revolution 3/4-16 UNF (All Ports)	121.3 cc per Revolution 19.05 mm-16 UNF (All Ports)
GUIDE ROLL STEERING ANGLE (Full Turn)	45° Each Side	
CLEARANCE BETWEEN GUIDE ROLL DRUMS	0.010-0.030 in.	0.25-0.76 mm
TRUNNION TORQUE Steering Axle Nuts Oscillation Pin Nut King Pin Nut Trunnion Capscrews	200, then 45 ft.-lbs. 200, then 75 ft.-lbs. 200, then 75 ft.-lbs. 200 ft.-lbs.	27.6, then 6.2 kg-m 27.6, then 10.4 kg-m 27.6, then 10.4 kg-m 27.6 kg-m

TABLE 2-11. BRAKE SYSTEM SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
BRAKE DRUM DIAMETER	10.0 in.	25.4 cm
BRAKE LINING THICKNESS	0.25 in.	0.64 mm
LINING TYPE	Segmented, Riveted	
BRAKE LEVER ADJUSTMENT	80 Lbs. Min. Pull	36.3 kg-Min. Pull
BACKING PLATE CAPSCREWS	49 ft.-lbs.	6.8 kg-m
BRAKE HUB TO BRAKE DRUM CAPSCREWS	49 ft.-lbs.	6.8 kg-m
BRAKE SHAFT NUT	100 ft.-lbs.	13.8 kg-m

TABLE 2-12. TORQUE SPECIFICATIONS FOR STANDARD HARDWARE.

SAE GRADE 5 CARBON STEEL CAPSCREWS											
FOOT-POUNDS (U.S.)						KILOGRAM-METERS (EUROPEAN)					
SIZE	TORQUE		SIZE	TORQUE		SIZE	TORQUE		SIZE	TORQUE	
	UNC	UNF		UNC	UNF		UNC	UNF		UNC	UNF
1/4	6	7	3/4	200	220	1/4	0.83	0.97	3/4	27.66	30.43
5/16	13	14	7/8	300	320	5/16	1.80	1.94	7/8	41.49	44.26
3/8	23	25	1	440	480	3/8	3.18	3.46	1	60.85	66.38
7/16	35	40	1-1/8	600	660	7/16	4.84	5.53	1-1/8	82.98	91.28
1/2	55	65	1-1/4	840	920	1/2	7.16	8.99	1-1/4	116.17	127.24
9/16	80	90	1-3/8	1100	1260	9/16	11.06	12.45	1-3/8	152.13	174.26
5/8	110	130	1-1/2	1460	1460	5/8	15.21	17.98	1-1/2	201.92	226.81
SAE GRADE 8 CARBON STEEL CAPSCREWS AND PLACEBOLTS											
1/4	9	10	3/4	280	320	1/4	1.24	1.38	3/4	38.13	44.26
5/16	18	20	7/8	460	500	5/16	2.49	2.77	7/8	63.62	69.15
3/8	35	35	1	680	740	3/8	4.84	4.84	1	94.04	102.34
7/16	55	60	1-1/8	960	1080	7/16	7.61	8.29	1-1/8	132.77	149.36
1/2	80	90	1-1/4	1360	1500	1/2	11.06	12.45	1-1/4	188.08	207.45
9/16	110	130	1-3/8	1780	2040	9/16	15.21	17.98	1-3/8	246.17	282.13
5/8	170	180	1-1/2	2360	2660	5/8	23.51	24.89	1-1/2	326.39	356.81

NOTE This table lists torque values for standard hardware and is intended as a guide for average applications involving typical stresses and machined surfaces. Values are based on the physical limitations of clean, plated and lubricated hardware. In all cases, when an individual torque value is specified, it should take priority over values given in this table. Replace original equipment with hardware of equal grade.

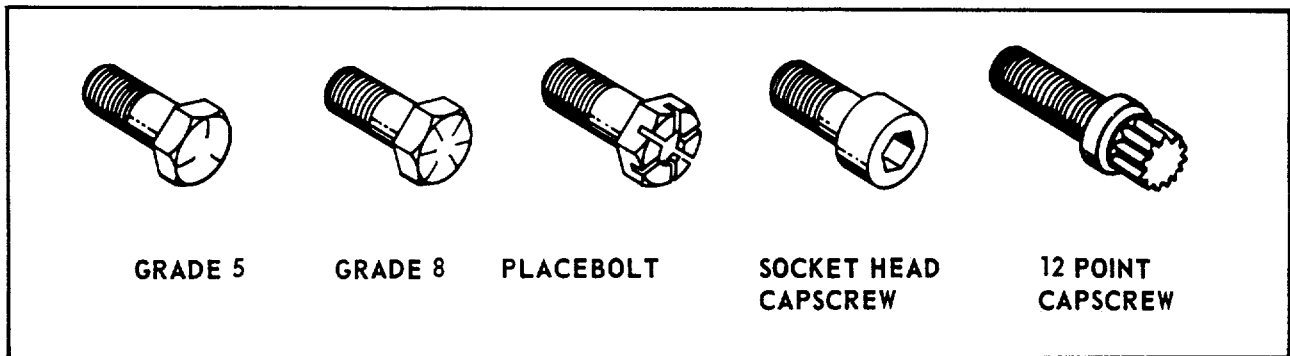


FIGURE 2-2. TYPES OF HARDWARE.

SECTION 3 OPERATION

3-1. GENERAL.

3-2. This section contains instructions necessary for operation of the C350B Steel Wheel Roller. These instructions must be carefully reviewed and understood before attempting to operate the unit. Also, new operators must be thoroughly trained by a skilled operator before attempting to operate the unit unassisted.

3-3. The individual assigned to operate the compactor should always maintain it in good mechanical condition to ensure prolonged efficiency. Report any mechanical failures immediately for correction. Even minor failures or damage may eventually result in major failures if uncorrected.

NOTE: Follow all operating instructions in the order given on the operating instructions decal (see figure 3-3).

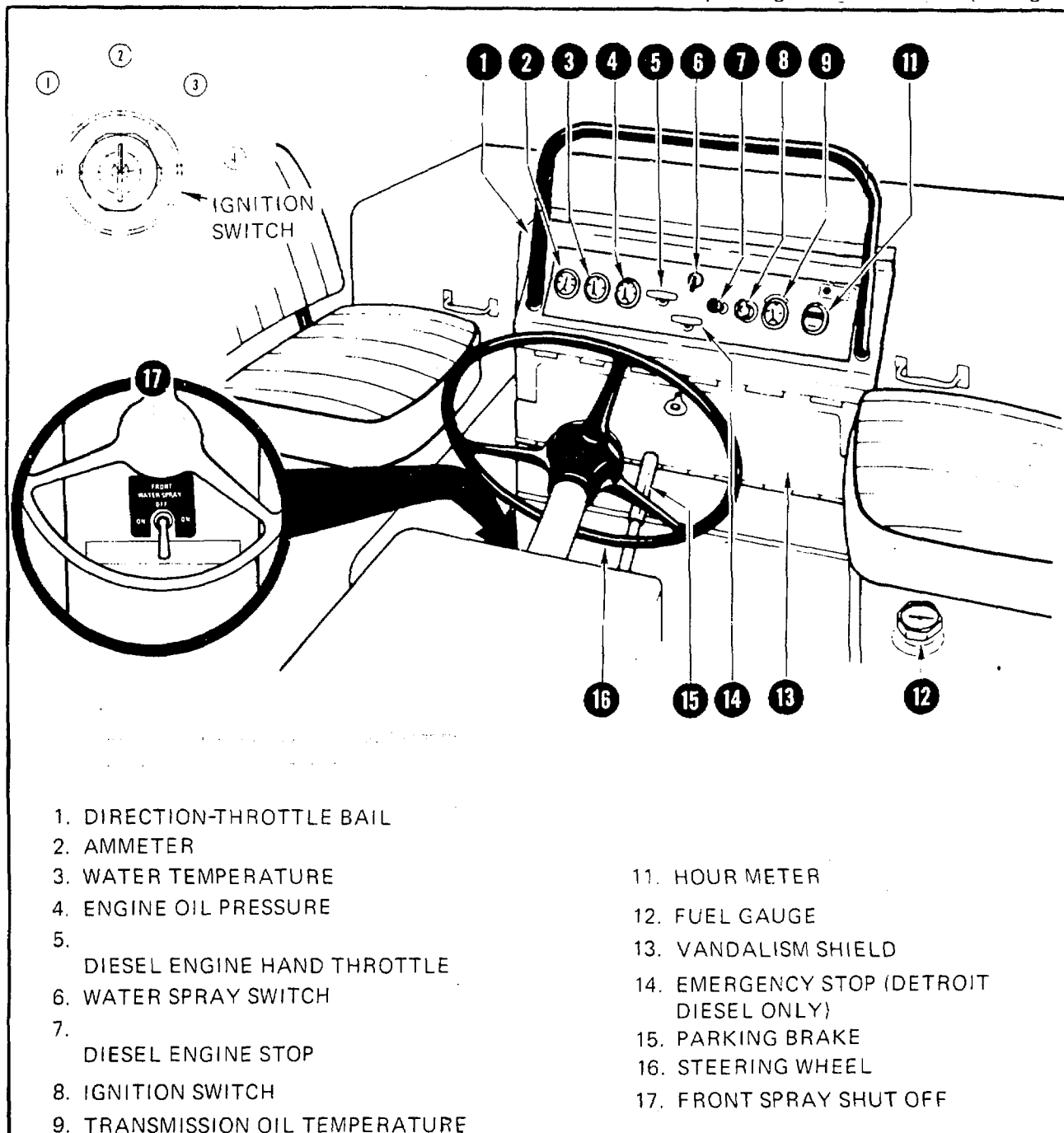


FIGURE 3-1. OPERATING CONTROLS AND INDICATORS

TABLE 3-1. OPERATING CONTROLS AND INDICATORS.

FIGURE 3-1 INDEX NO.	NOMENCLATURE	TYPE	FUNCTION
1	DIRECTION- THROTTLE BAIL	Cross-bar with mechanical linkage to fuel system and transmission control.	Controls direction and speed of compressor. Vertical position detents and transmission in Neutral. Moving lever toward Guide Roll from Neutral causes unit to move forward. Moving lever toward Drive Roll from Neutral causes unit to move in reverse direction. Distance lever is moved from Neutral determines engine and unit speed. This lever also acts as a means for dynamic braking of the unit.
2	AMMETER	Gauge.	Indicates output current of alternator. Gauge may show slight discharge (RED) at idle, but should indicate charge (GREEN) when engine speed is increased.
3	ENGINE WATER TEMPERATURE	Gauge.	Indicates temperature of water circulating through engine. Needle should point to the white or cold operating band when engine is first started. After warmup period, needle should register in the green operating band. If needle registers in the red band, stop operation and correct the cause of the overheating condition.
4	ENGINE OIL PRESSURE	Gauge.	Indicates pressure of the oil being pumped through engine. Gauge may indicate high pressure when engine is first started but should drop to normal level as engine warms. Stop engine immediately if no pressure is indicated while engine is running.
5	DIESEL ENGINE HAND THROTTLE	Push-Pull Lever.	HAND THROTTLE - Controls engine speed independently of Direction-Throttle Bail. Use for cold starting conditions and to regulate initial warmup speed.
6	WATER SPRAY SWITCH	Toggle Switch.	Engages or disengages water spray system.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS (CONT.).

FIGURE 3-1 INDEX NO.	NOMENCLATURE	TYPE	FUNCTION
7	DIESEL ENGINE STOP	Push-Pull Lever.	ENGINE STOP – Shuts off diesel fuel flow for engine shutdown.
8	IGNITION SWITCH	Four-position, Key-operated Interlock Switch.	<p>No. 1 Position: Accessory Position. Applies power to water spray switch.</p> <p>No. 2 Position: OFF position. Removes all power to electrical circuits.</p> <p>No. 3 Position: ON position. Applies power to all electrical circuits. This position is also a lockout position. Prevents accidental engagement of the starter motor when engine is running. Ignition Key must be rotated back past this position to the No. 2 (OFF) position before starter motor can be energized again.</p> <p>No. 4 Position: Start position. Applies power to starter motor to crank engine. Switch spring-returns to No. 3 position when key is released.</p>
9	TRANSMISSION OIL TEMPERATURE	Gauge.	Indicates temperature of oil flowing through hydrostatic transmission and steering systems. Shut down unit if gauge pointer moves to RED zone.
10			<p>CAUTION: Do not use starting fluid and cold start aid together. It may damage engine components.</p>
11	HOUR METER	Gauge.	Indicates total hours of engine operation.
12	FUEL	Gauge.	Indicates quantity of fuel remaining in fuel tank.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS (CONT.).

FIGURE 3-1 INDEX NO.	NOMENCLATURE	TYPE	FUNCTION
13	VANDALISM SHIELD	Hinged Panel.	Protects controls, engine compartment, and battery against vandalism.
14	EMERGENCY STOP (Detroit Diesel only)	Push-Pull Lever.	Shuts down engine if engine RPM cannot be controlled by Direction-Throttle Bail. This control shuts off air to engine. Lever must be manually re-set at the engine. (Refer to paragraph 3-28.) CAUTION: The EMERGENCY STOP should be used ONLY in the event of serious engine mal-functions.
15	PARKING BRAKE CONTROL LEVER	Overcenter Lever.	In BRAKE ON position (up), lever holds park brake shoes in "applied" position. In BRAKE OFF position (down), lever releases linkage that holds park brake shoes in "applied" position.
16	STEERING WHEEL	Power.	Controls oil flow to and from steering cylinder (Hydrostatic steering).
17	FRONT SPRAY SHUT-OFF CONTROL	Gate Valve.	Shuts off water supply to guide roll when water spray is required only on drive roll.

3-4. OPERATING CONTROLS AND INDICATORS.

3-5. The controls and indicators necessary for operation of the compactor are listed and described in Table 3-1 and illustrated in figure 3-1 .

3-6. SAFETY PRECAUTIONS.

3-7. Always observe the following safety precautions to prevent possible injury to personnel and damage to the equipment.

a. TRAINED OPERATORS ONLY.

b. Always use slower unit speeds and added caution when operating close to a lift edge or when traveling downhill.

c. Never travel across a slope. Always travel up or down a grade.

d. Always set the park brake before dismounting the unit.

e. Never shut down the engine when traveling downhill. Always move the Direction-Throttle Bail toward the "neutral" position to slow the unit.

f. Report damage and faulty operation immediately. Do not operate the unit until corrected.

g. Make sure the operating decal is attached to the unit as shown in figure 3-3. make sure that the markings on the decal are legible.

3-8. STARTING THE UNIT (see figure 3-1).

- a. Set the park brake by moving the control lever to BRAKE ON position (UP).
- b. Place the Direction-Throttle Bail in Neutral detented position (vertical).
- c. Pull Hand Throttle out slightly (at approximately a 700 RPM setting).

NOTE: During cold weather conditions it may be necessary to proceed as follows:

Detroit Diesel Engine; Consult manufacturers service literature.

- d. Turn the Ignition Key fully clockwise to engage the starter.

CAUTION: Do not crank the engine for more than THIRTY SECONDS at any one time. If the engine fails to start, set the IGNITION key to off and wait one (1) minute - allowing the starter to cool.

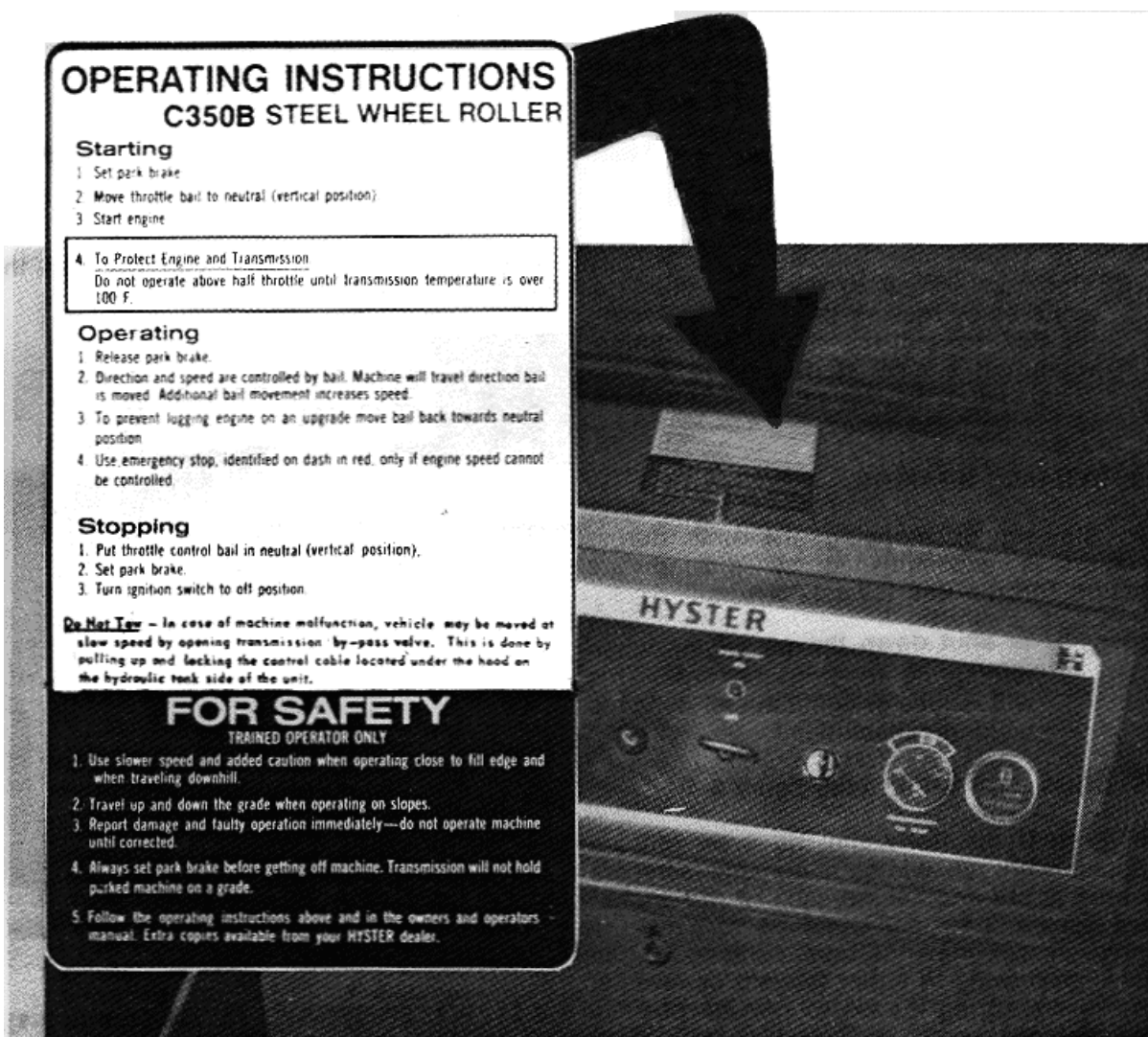


FIGURE 3-3. OPERATING INSTRUCTIONS DECAL.

NOTE: If the Detroit Diesel engine fails to start after the third attempt, check the EMERGENCY STOP Control has been manually reset as described in paragraph 3-28.

3-9. OPERATING THE UNIT (see figure 3-1).

NOTE: Before operating the unit, allow the engine to idle at 700 RPM for approximately two minutes to allow engine and hydraulic oil to begin to reach operating temperature.

3-10. Release the park brake by pushing the control lever to the BRAKE OFF position (down),

3-11. SPEED AND DIRECTION CONTROL.

3-12. Speed and direction of the unit are controlled by the Direction-Throttle Bail (figure 3-1). Move the Direction-Throttle Bail off of "neutral" in the desired direction (forward or reverse). To increase unit speed, move the lever further away from the "neutral" position. To decrease unit speed, move the lever back toward the "neutral" position.

NOTE: Optimum torque to the drive drum is achieved by moving the Direction-Throttle Bail toward the "neutral" position when the engine starts to lug down. Move bail until engine RPM increases to loaded RPM speed.

3-13. DYNAMIC BRAKING.

3-14. Slowing or stopping the unit during operation is accomplished by moving the Direction-Throttle Bail toward "Neutral".

WARNING: Never shut down the engine when attempting to stop the unit. This will reduce or eliminate all dynamic braking capabilities.

3-15. DRUM SCRAPERS (see figure 3-4).

3-16. Both Guide Rolls and the Drive roll are equipped with full width, adjustable scrapers mounted ahead and behind each of the drums. These scraper bars are designed to keep the large pieces of material from clinging to the rolls when moving in either forward or reverse. Scrapers are spring loaded to provide positive drum contact.

3-17. All four scraper bars have an "off-the-

drum" locking position. To lock any of the four scrapers into the "off-the-drum" position:

1. Pull scraper away from the drum.
2. Move the pawl into the lock position.
3. Slowly move the scraper towards the drum until the pawl holds the scraper.

WARNING: Always use extreme caution when positioning scrapers as they are under considerable spring tension and may become sharp when worn.

3- 18. COCO MATS (See figure 3-4).

3-19. A full width COCO mat is located on each roll and is used in conjunction with the water spray system to keep the rolls clean.

3-20. Both coca mat arrangements have "off-the-drum" locking positions. To lock either of the two coca mats "off-the-drum, ":

1. Pull or lift the coca mat off of the drum.
2. Engage the mat hook in the mat link.
3. Slowly move the coca mat towards the drum until the mat hook holds the mat.

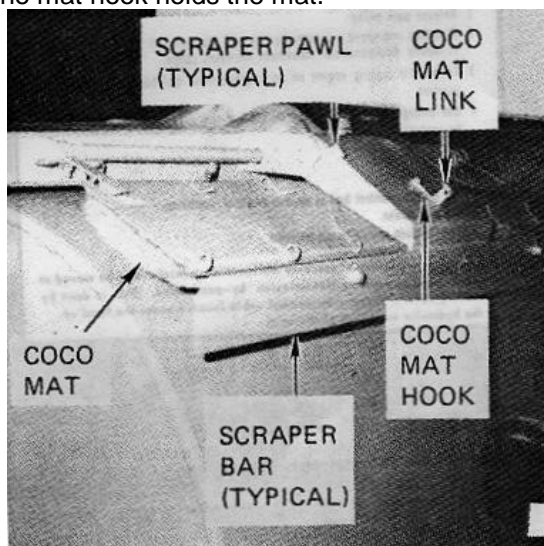


FIGURE 3-4.

3-21. WATER SPRAY SYSTEM (see figure 3-1).

3-22. The water spray system is designed to help keep the drums clean when rolling asphalt. To activate

the water spray system, push the water spray switch to the ON position. This will produce pressurized water spray on the Guide Roll and Drive Roll drums. The pressurized supply to the Guide Roll drum can be turned off (if conditions dictate) by rotating the Front Spray Shut-off lever. The water spray switch should be in the OFF position when the water spray system is not needed.

CAUTION: Do Not operate water system without water. Damage to pump may result.

3-23. UNIT SHUTDOWN (see figure 3-1).

- a. Set the Direction-Throttle bail to the "neutral" position.
- b. Set the Park Brake Control Lever to the BRAKE ON position (UP).
- c. Set the IGNITION key to the "off" (vertical) position.
- d. On units equipped with a diesel engine, pull the ENGINE STOP out. Hold in this position until the engine stops.

NOTE: If the Detroit Diesel engine fails to stop, pull out the EMERGENCY STOP lever. Reset the control as specified in paragraph 3-28. Troubleshoot the system to determine the malfunction before operating the unit again.

- e. Position the Vandalism Shield over the instrument panel. If the unit is to be left unattended, lock the shield.

3-24. EMERGENCY ENGINE STOP (Detroit Diesel Only) (see figure 3-1).

3-25. A manually operated EMERGENCY STOP Control is mounted on the instrument panel to shut down the Detroit Diesel engine in the event of a serious engine malfunction. If the engine continues to run after the ~ ENGINE STOP has been pulled out, or if the engine overspends, the shut-down device will prevent damage to the engine by cutting off the air supply and thus stop the engine.

3-26. The shut-down device (figure 3-5) consists of an air shut-off valve mounted in the engine air inlet housing. The shut-off valve is retained in the open position by a latch. A cable connected to the EMERGENCY STOP

control is used to remotely trip the latch, closing the shut-off valve.

3-27. RESETTING EMERGENCY ENGINE STOP (Detroit Diesel Only) (see figure 3-5).

3-28. The emergency engine stop must be manually reset before the engine can be restarted. To reset the emergency stop, push the cam-pin handle (located on the engine air inlet housing) downward. This will open the shut-off valve. Then push the EMERGENCY STOP Control lever against the instrument panel.

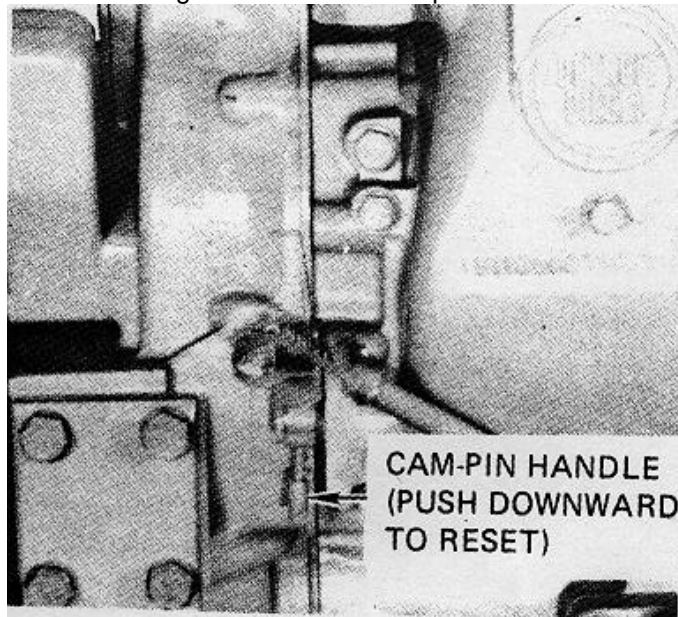


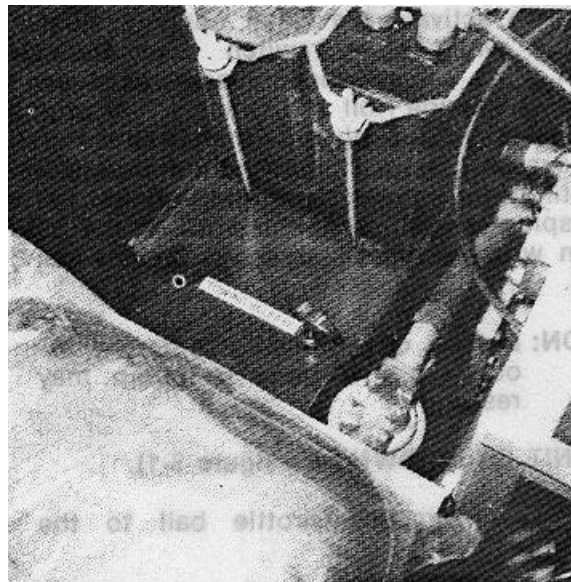
FIGURE 3-5.

3-29. MOVING THE UNIT (see figure 3-6).

3-30. Before moving a malfunctioning unit, the transmission by-pass valve **MUST** be opened. If the valve is not opened, the drive drum will have restricted movement.

Rotate the slotted cam 90 degrees clockwise. On units equipped with a Sundstrand Transmission, pull up and lock the control cable located under the hood on the hydraulic tank side of the unit.

CAUTION: The by-pass valve is not intended for towing a unit from one jobsite to another. Tow at speeds of one (1) to two (2) M PH (1.61-3.22 km/in) for as short a distance as possible.



**FIGURE 3-6. SUNDSTRAND TRANSMISSION
BY-PASS VALVE ON DIESEL
UNITS.**

3-31. SHIPPING THE UNIT.

3-32. When shipping the roller, the four tie down eyes should be used. One eye is located at each end of the rear scraper bar mount and under each operator mounting step in front. The drive roll should be blocked front and rear and on both sides. The guide rolls must be blocked on both sides.

CAUTION: Do not block the guide rolls front and rear as it will shock load the trunnion king pin and bearings.

**3-33. MISCELLANEOUS OPERATING
POINTS.**

- a. Using the hood as an arm rest will ensure smooth control.
- b. No more than two people are allowed on the machine when operating.
- c. Do not use the steering wheel or direction-throttle bail as machine mounting assists.
- d. Always look in the direction of travel.

**SECTION 4
HYSTER-CARE MAINTENANCE**

4-1. GENERAL.

4-2. This section contains instructions necessary for proper Hyster-Care Maintenance for the C350B Steel Wheel Roller. Hyster-Care Maintenance is divided into two subsections: Hyster-Care Maintenance Schedule and Hyster-Care Maintenance Procedures. The maintenance schedule lists the recommended time intervals between maintenance checks. The procedures subsection provides detailed instructions for performing the maintenance checks. Instructions listed in the procedures subsection are given by systems and are not necessarily in the order listed in Table 4-1.

4-3. Hyster-Care Maintenance is a planned maintenance program that includes periodic inspection and lubrication. Hyster-Care maintenance should be

correlated closely with the operating hours recorded on the hourmeter located on the instrument panel.

4-4. HYSTER-CARE MAINTENANCE SCHEDULE.

4-5. Table 4-1 lists the recommended maintenance checks. It is outlined in two schedules: the hourly schedule and the periodic schedule. If the unit is operated more than eight hours per day, the hourly schedule should be followed. If the unit is operated less than eight hours per day, the periodic schedule should be followed.

4-6. Maintenance checks given in Table 4-1 are listed in the same sequence as listed on the maintenance decal starting with the eight hour checks. The first and last columns of the table

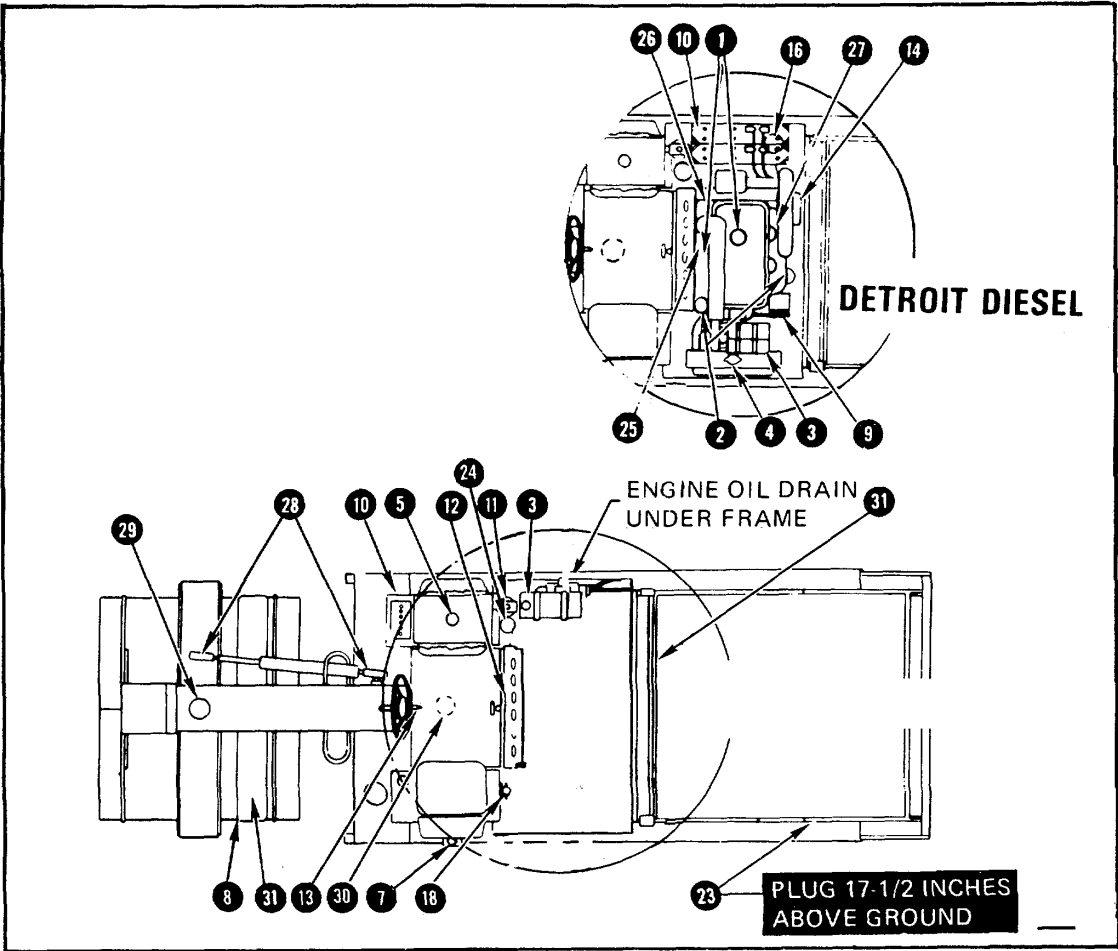


FIGURE 4-1. MAINTENANCE CHECKPOINTS.
4-1

**SECTION 4
HYSTER-CARE MAINTENANCE**

TABLE 4-1. HYSTER-CARE MAINTENANCE SCHEDULE.

FIGURE ITEM NO.	ITEM	SCHEDULE HOUR/PERIOD							QUANTITY	TYPE	REFER TO PARA- GRAPH
		8/ day	50/ wk	100/ 2wks	200/ mo	300/ 6wks	500/ 3mo	1000 yr			
1	ENGINE OIL + DETROIT DIESEL 3-53	X		C						NOTE: Refer to engine manufacturer's maintenance manual for engine oil specifications. MIL-L-2104C	4-56
2	FUEL STRAINER AND FILTER (D) +	X				C				SEE PARTS MANUAL	4-8 +
3	AIR CLEANER FILTER + DETROIT DIESEL	X						C C C		SEE PARTS MANUAL NOTE: Check air restriction indicator on Detroit Diesel	4-20
4	COOLING SYSTEM + DETROIT DIESEL	X						C C C	16 Qts.(15.1 ltr.)	Winter: Water and ethylene glycol base anti-freeze with rust inhibitors and anti-foaming qualities. Summer: Water and rust inhibitor. MIL-O-A-548	4-40
5	HYDRAULIC OIL TANK	X						C	9 Gals.(34.1 ltr.)	Approved Oils: MIL-L-2104B Mobilfluid 423 Shell Tellus 29 Type "F" transmission fluid conforming to Ford Motor Co. spec. #ESW-M2C33F or E	

**SECTION 4
HYSTER-CARE MAINTENANCE**

TABLE 4-1. HYSTER-CARE MAINTENANCE SCHEDULE (CONT.).

FIGURE ITEM NO.	ITEM	SCHEDULE HOUR/PERIOD							QUANTITY	TYPE	REFER TO PARA- GRAPH
		8/ day	50/ wk	100/ 2wks	200/ mo	300/ 6wks	500/ 3mo	1000/ yr			
7	FUEL TANK	X							25 Gals. (94.6 ltr.)	No. 2 Diesel fuel + MIL-VV-F-800	
8	GUIDE ROLL AXLE BEARINGS	X							A. R.	Multi-purpose Grease MIL-G-10924B	4-95
9	DRIVE BELTS		X								4-36 4-72
10	BATTERY			X					A. R.	Distilled Water	4-32
11	TRANSMISSION SUCTION FILTER			X				C25		SEE PARTS MANUAL	4-69
12	THROTTLE AND TRANS- MISSION LINKAGE			X					A. R.	Engine Oil MIL-L-2104C	4-61
13	PARKING BRAKE LEVER (Lube and Adjustment)			X					A. R.	Multi-purpose Grease MIL-G-10924B	4-82
14	THROTTLE CONTROL MECHANISM (D) +			X					A. R.	Multi-purpose Grease MIL-G-10924B	+
16	ENGINE OIL FILTER + DETROIT DIESEL			C						SEE PARTS MANUAL	4-59

SECTION 4
HYSTER-CARE MAINTENANCE

TABLE 4-1. HYSTER-CARE MAINTENANCE SCHEDULE (CONT.).

FIGURE ITEM NO.	ITEM	SCHEDULE HOUR/PERIOD							QUANTITY	TYPE	REFER TO PARA- GRAPH
		8/ day	50/ wk	100/ 2wks	200/ mo	300/ 6wks	500/ 3mo	1000/ yr			
.23	FINAL DRIVE (Oil Bath)						X	C	(C350B) 6 Qts. (5.7 ltr.)	SAE 90 Multi-purpose gear oil. MIL-L-2105B	4-87
24	TRANSMISSION RETURN FILTER							C25		SEE PARTS MANUAL	4-71
25	ENGINE BLOWER SCREEN (D) +							X			4-27+
26	ENGINE CRANKCASE BREATHING (D) +							X			4-25+
27	ENGINE AIR BOX DRAIN (D)+							X			4-29+
28	STEERING CYLINDER BALL JOINTS							X	¼ lb. (.11 kg)	Multi-purpose Grease MIL-G-10924B	4-99
29	STEERING TRUNNION BEARINGS							X	3 lbs. (1.36 kg)	Multi-purpose Grease MIL-G-10924B	4-97
30	WATER SPRAY FILTERS							A.R.			4-75
31	WATER SPRAY NOZZLES							A.R.			4-78

X = Check.

C = Change.

C25 = No. next to C indicates hours for first change.

A.R. = As Required.

(D) = Detroit Diesel engine.

+ = Refer to engine manufacturer's manual
for complete instructions.

**SECTION 4
HYSTER-CARE MAINTENANCE**

should be used to locate the applicable maintenance procedure. Figure 4-1 shows the location of all maintenance points.

**4-7. HYSTER-CARE MAINTENANCE
PROCEDURES.**

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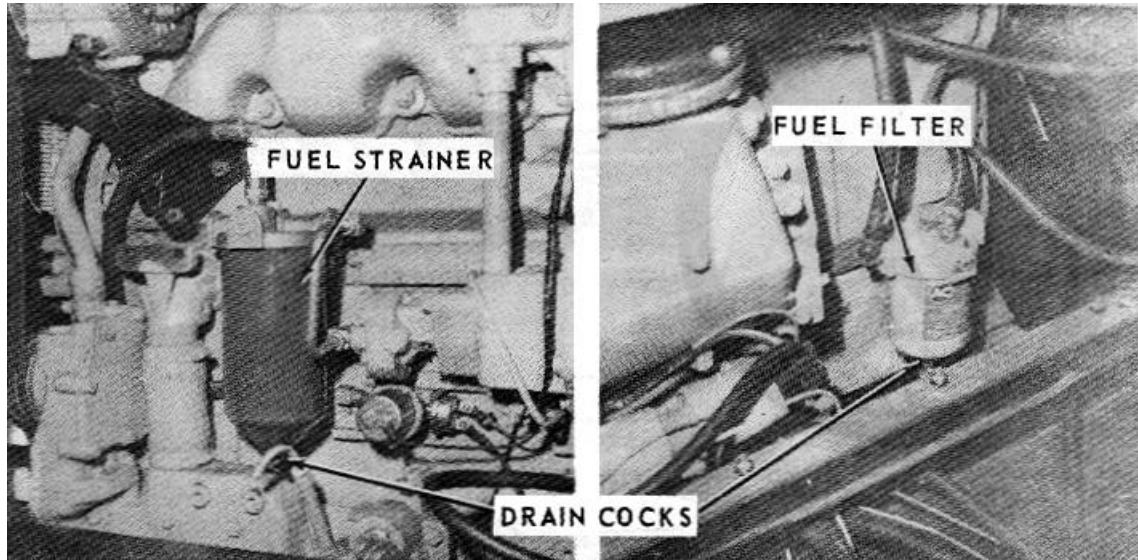


FIGURE 4-6. DETROIT DIESEL FUEL FILTER AND FUEL STRAINER.

**4-17. DETROIT DIESEL FUEL STRAINER AND FILTER
(see figure 4-6).**

4-18. Drain approximately 1/4 pint of fuel from each filter bowl daily to remove dirt and water accumulations. A drain cock is located in the bottom of each filter bowl for this purpose. The filter elements in the strainer and filter must be replaced at the time interval specified in Table 4-1. Replace the elements as follows:

- a. With the engine shut down, place a suitable container under the bowl of the strainer or filter and open the applicable drain cock. The fuel will drain more freely if the retaining nut at the inlet/outlet head is loosened slightly.
- b. Support the bowl, then unscrew the retaining nut and remove the bowl and element.
- c. Remove and discard the element and gasket. Clean the bowl with fuel oil and dry thoroughly with a clean, lint-free cloth and compressed air.
- d. Place a new filter element, that has been thoroughly soaked in clean fuel oil, over the stud and push the element down onto the seat. Close the drain cock and fill the bowl approximately two-thirds full of clean fuel oil.

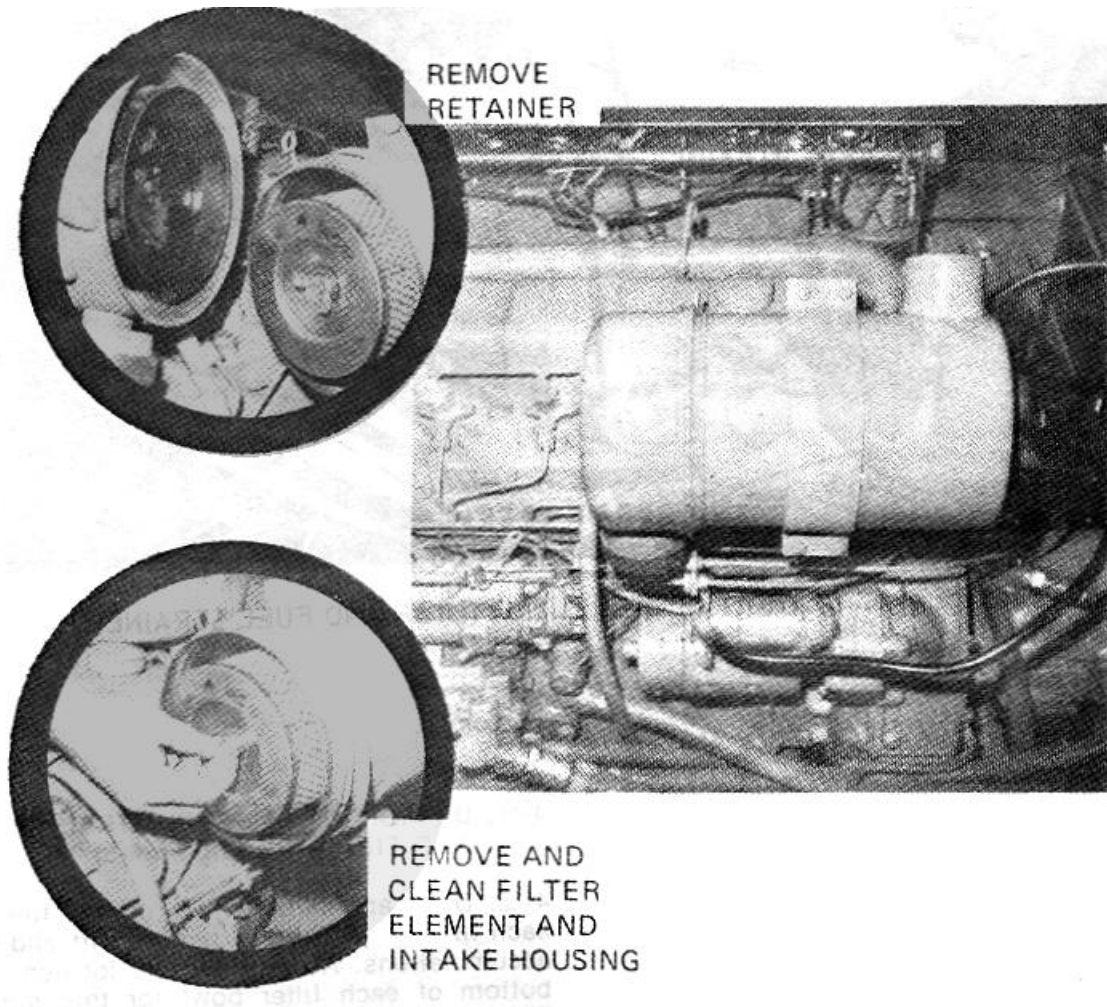


FIGURE 4-7. AIR CLEANER MAINTENANCE.

e. Install a new gasket in the inlet/outlet head. Place the bowl with element into position under the inlet/outlet head and start the retaining nut into the bowl stud.

f. Tighten the retaining nut only enough to prevent fuel leakage. Remove the plug in the inlet/outlet head and fill the bowl with clean fuel oil.

4-19. AIR FILTRATION SYSTEM.

4-20. AIR CLEANER FILTERS(S) (see figure 4-7).

4-21 .

The Detroit Diesel restriction indicator should be checked every eight hours of operation, or daily.

4-22. The air cleaner element is a reusable element that can be cleaned periodically. The element should be

replaced, however, after ten cleanings or when the specified change interval occurs. Remove and clean the element as follows:

NOTE: Clean the exterior of the air cleaner body before disassembly.

a. Loosen the retainer bar securing the element. Then remove the retainer bar from the housing.

b. Remove the element from the housing.

c. Tap the element lightly against a smooth surface while keeping it parallel to the surface to avoid damage to the end cap.

d. Blow out the element in the opposite direction of normal air flow using compressed air. Do not exceed 30 PSI (2.1 kg/cm²) air

SECTION 4
HYSTER-CARE MAINTENANCE

pressure against the element.

e. Carefully inspect the dry element for damaged paper pleats by placing a light inside of the element. Replace element if it is damaged or after ten cleanings.

f. Clean the intake housing with a lint-free cloth moistened with cleaning solvent before installing element.

g. On Detroit Diesel units, reset the restriction indicator by pushing the reset button at the end of the indicator body after reassembly.

h. Check rubber dust unloading valve for cracks, clogging or deterioration.

4-25. DIESEL CRANKCASE BREATHER
(see figure 4-9).

4-26. Remove the crankcase breather from the engine each 1,000 hours of operation and wash the breather in clean fuel oil. Dry thoroughly with compressed air. Also clean the breather cap, mounted on the valve rocker arm cover, in clean fuel oil every time the engine oil is changed.

4-27. DETROIT DIESEL BLOWER SCREEN
(see figure 4-10).

4-28. Inspect the blower screen each 1,000 hours of operation. If necessary, clean the screen in clean fuel oil and dry thoroughly with compressed air. Reinstall the screen and gasket assembly with the screen side of the assembly toward the blower.

4-29. ENGINE AIR BOX DRAIN (see figure 4-11).

4-30. With the engine running, check for flow of air from the air box drain tubes each 1,000 hours of operation. If the tubes are clogged, remove, clean and reinstall the tubes. The air box drain tubes should be cleaned periodically even though a clogged condition is not apparent.

4-31. ELECTRICAL SYSTEM.

4-32. CHECKING BATTERY ELECTROLYTE LEVEL.

4-33. The electrolyte level in each battery cell should never be below the top of the plates. If the level is low, add drinking water. The electrolyte level is correct when filled to the bottom of the split ring in each cell.

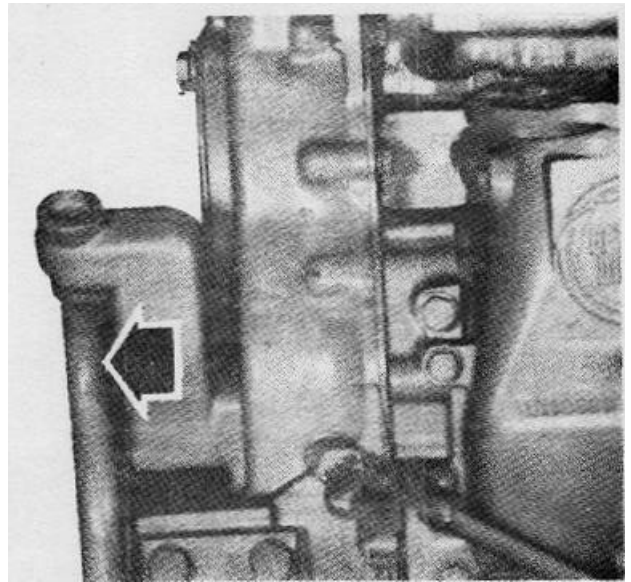


FIGURE 4-9. DIESEL CRANKCASE BREATHER.

4-36. ALTERNATOR AND WATER PUMP DRIVE BELT(S).

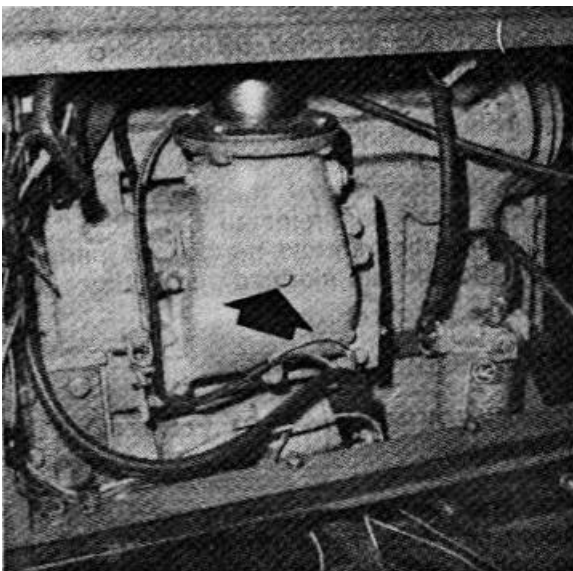


FIGURE 4-10. SERVICING DETROIT DIESEL- BLOWER SCREEN.

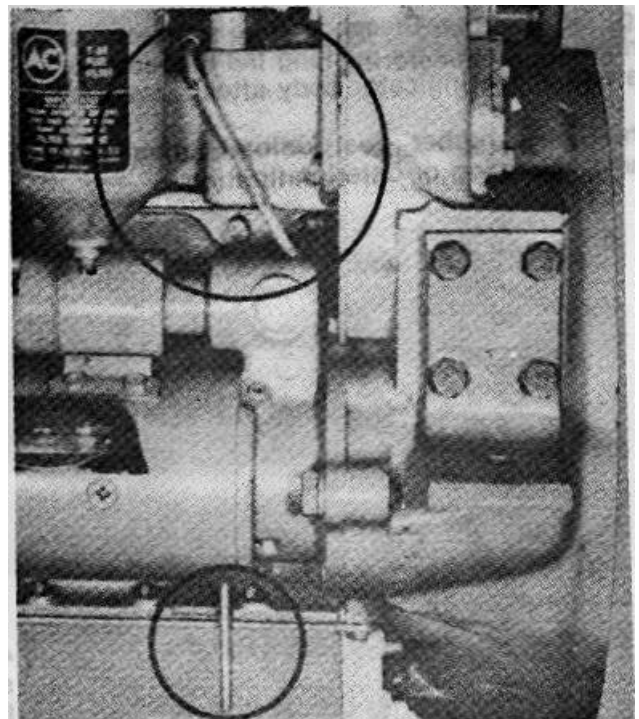


FIGURE 4-11. DETROIT DIESEL AIR BOX DRAIN TUBES.

4-37. Examine the belt(s) for cracks on the inner surface of the plys before making tension adjustments. A belt that is adjusted too tight places an added load on the water pump and alternator bearings, as well as the belt. A belt that is too loose allows slippage, premature failure of the belt and may lower the output of

SECTION 4
HYSTER-CARE MAINTENANCE

the charging system. The drive belt(s) should be checked and adjusted after each 50 hours of operation or weekly. The alternator belt(s) should deflect 1/4 inch (6.35 mm) with six pounds (2.7 kg) of force.

CAUTION: (Detroit Diesel Only) Replace both alternator drive belts when one or both needs replacing.

4-38. ELECTRICAL WIRING (see figure 4-14) .

4-39. Periodically inspect all wiring for: Proper routing, loose terminal connections, cracks, wear, faulty insulation, brittleness, and that they are free from oil and grease. Electrical components should be connected per the schematic drawing (figure 4-14) when components are replaced.

CAUTION: Do not use a wire smaller than the original factory installed wires.

4-40. COOLING SYSTEM (see figure 4-15).

SECTION 4
HYSTER-CARE MAINTENANCE

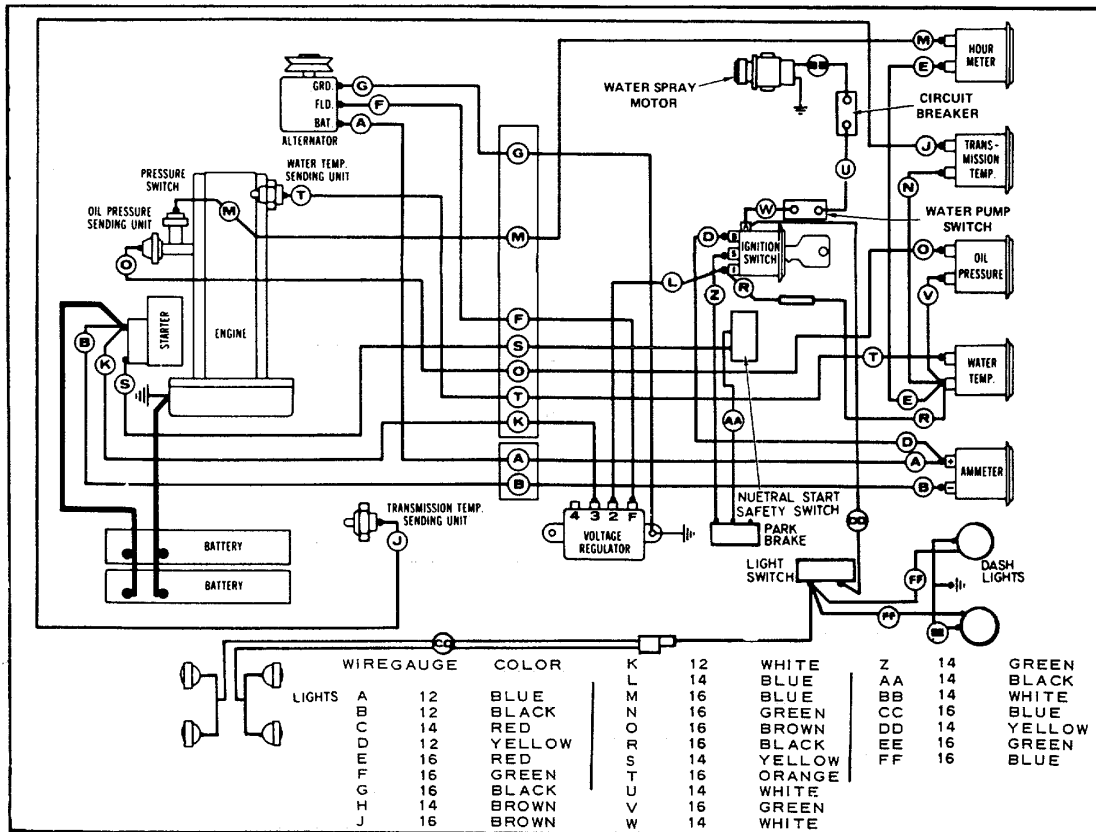


FIGURE 4-14.. ELECTRICAL SYSTEM SCHEMATIC (WITH DIESEL ENGINE)

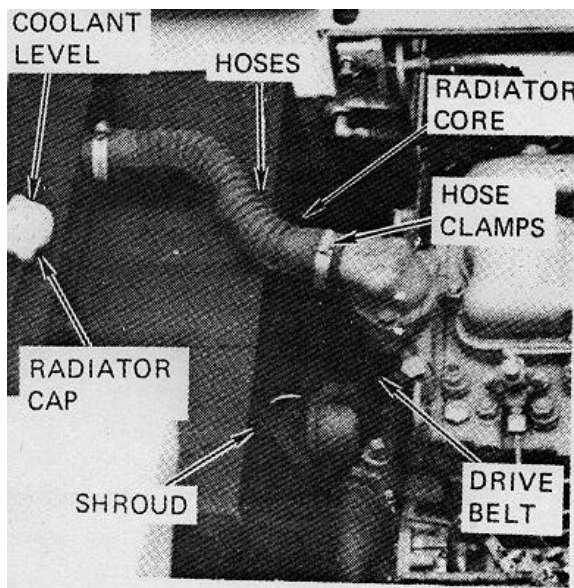


FIGURE 4-15. CHECKING Cooling SYSTEM.

4-41. RADIATOR.

4-42. The radiator should be filled to one inch (2.54 cm) below the filler neck.

4-43. The radiator core must be serviced if it becomes clogged at any point where light cannot be seen through the core. Blow out thoroughly with compressed air, then steam clean if facilities are available. Apply the air or steam to the side opposite of normal air flow. Be careful not to bend the radiator fins. If fins are bent, straighten carefully.

4-44. The radiator cap gasket and filler neck seat must also be checked to be sure that they are providing the proper seal. If the rubber face of the valve is damaged, a new cap must be installed. Always install a cap having a 7 PSI (0.53 kg/cm²) pressure rating. Always inspect the overflow pipe for restrictions. A plugged or damaged pipe may prevent the cap from venting excess pressure.

4-12.

SECTION 4
HYSTER-CARE MAINTENANCE

4-45. FAN SHROUD.

4-46. The fan shroud directs air flow through the radiator with a minimum loss of air due to turbulence. On Detroit Diesel units, the four capscrews securing the shroud can be loosened so that the shroud can be moved up or down for proper positioning with respect to the fan blades. **DO NOT ALTER, ADD TO, OR REMOVE THE SHROUD.** Check to see that it is anchored securely and not bent from its original shape. The depth that the fan penetrates into the shroud is critical and should not be altered.

4-47. WATER PUMP.

4-48. The water pump should be checked for leaks after each 50 hours of operation. Water pump leaks may allow air to be drawn into the cooling system. This can cause foaming or overheating. Repair or replace the pump immediately if leakage occurs.

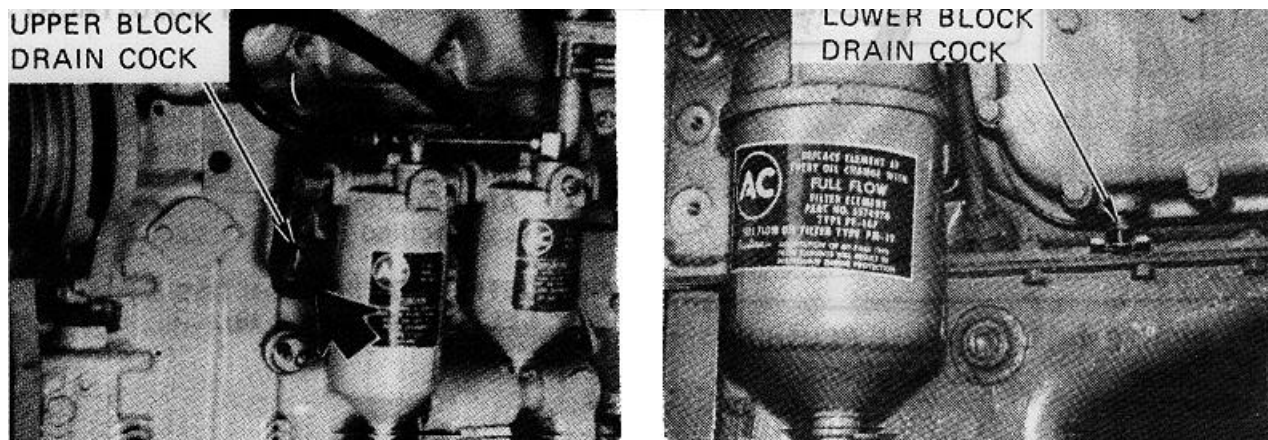
4-49. HOSES.

4-50. Examine hoses at least twice each year for cracks, hardening, softening and swelling. Remove the hose and check the interior section. Hoses can deteriorate on the inside and appear satisfactory on the outside. The

Hose, must be pliable and able to pass coolant without restriction.

4-51. FLUSHING THE SYSTEM.

4-52. Rust in the radiator or coolant indicate c that the corrosion inhibitor has lost its effectiveness. This can be avoided by draining and flushing the system at least once each year. For effective flushing, remove the radiate, hoses and the thermostat. Open the engine



DETROIT 5-53

FIGURE 4-16. ENGINE COOLANT DRAIN COCKS.

SECTION 4
HYSTER-CARE MAINTENANCE

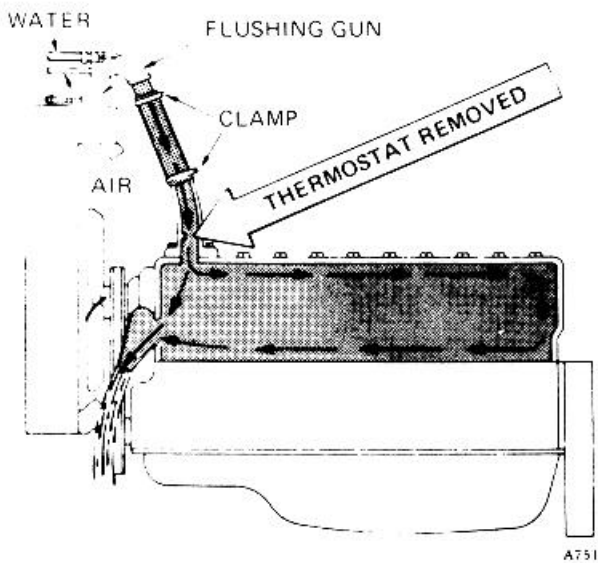


FIGURE 4-17. REVERSE FLUSHING ENGINE BLOCK.

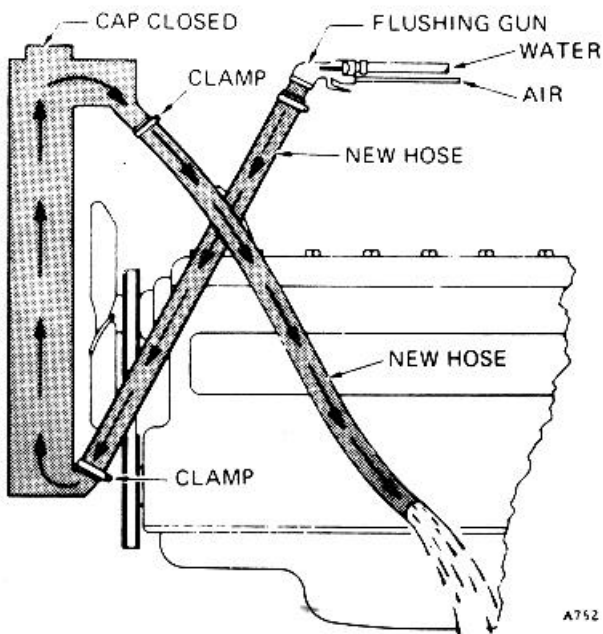


FIGURE 4-18. REVERSE FLUSHING RADIATOR.

drain cock (see figure 4-16) and allow the block to drain. Close the drain cock and reverse flush the block as shown in figure 4-17. Reverse flush the radiator as shown in figure 4-18.

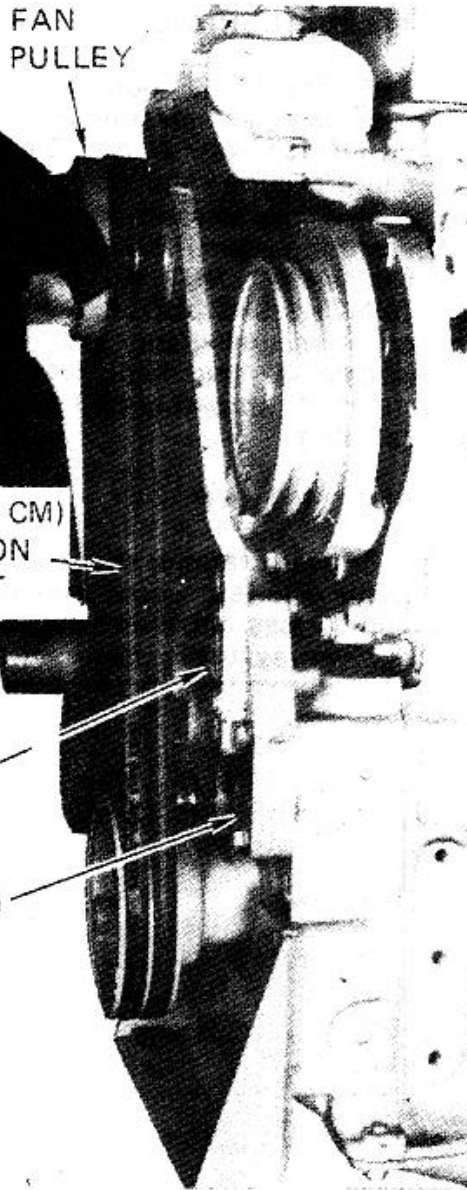


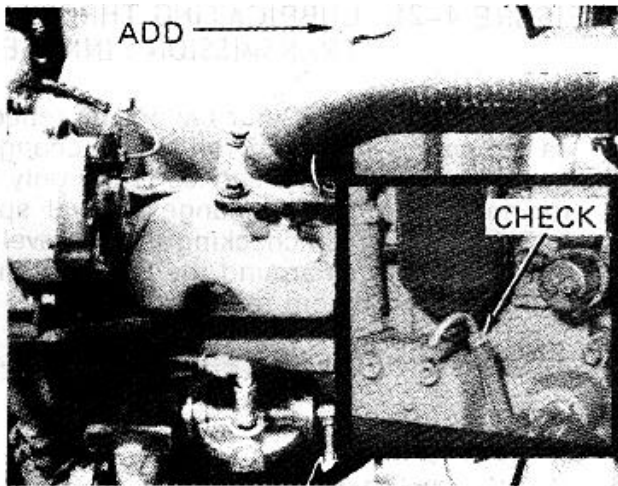
FIGURE 4-19. DETROIT DIESEL FAN BELT ADJUSTMENTS.

NOTE: Make sure that the thermostat is removed. Flushing as shown in figure 4-17 will close the thermostat and prevent complete flushing of the block. After flushing the system, add coolant as specified in Table 4-1.

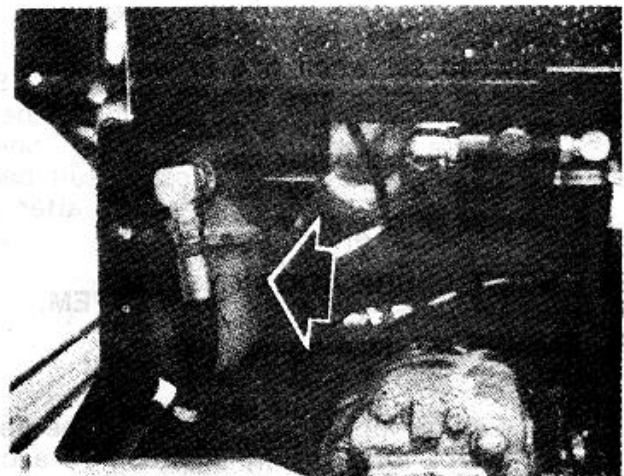
4-53. DETROIT DIESEL FAN DRIVE BELTS (see figure 4-19).

4-54. Examine the belt for cracks on the inner

**SECTION 4
HYSTER-CARE MAINTENANCE**



CHECK AND ADD



FILTER

DETROIT 3-53

FIGURE 4-20. CHECKING AND CHANGING ENGINE OIL AND FILTER.

plys before making tension adjustments. The fan drive belts should be checked and adjusted after each 50 hours of operation, or weekly.

4-55. New drive belts will stretch after the first few hours of operation. After the first eight hours of operation, check the belts again and retighten if necessary. Adjust the belt tension so that a firm push with the thumb at a point midway between the longest span deflects the belts approximately 3/4 inch (2 cm). Adjust the belt tension as follows:

a. Loosen the four capscrews (2 on each side of engine) securing the fan bracket to its mounting blocks. Also loosen the four capscrews securing the fan shroud to the radiator.

b. If the belts are too tight, push the fan bracket downward to loosen the belts. If the belts are too loose, use a pry bar (between the stud welded on the inside of mounting bracket and the mounting block) to move the bracket upward.

CAUTION: When adjusting the fan pulley, always adjust the fan shroud the same distance in either direction. The fan must always be centered in the shroud.

c. When the correct adjustment is obtained, tighten the four fan bracket capscrews securely. Tighten the four fan shroud capscrews.

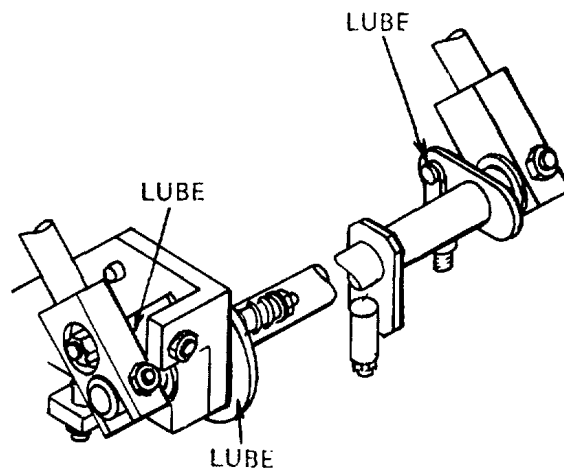
CAUTION: Before starting the engine, make sure that fan blade tips do not contact the shroud.

NOTE: Replace the two drive belts as a matched set when one is worn. Single belts of similar size shout De uses as a substitute for a matched belt set. Premature belt wear can result because of belt length variations after short periods of operation.

4-56. ENGINE LUBRICATION SYSTEM.

4-57. ENGINE OIL (see figure 4-20).

4-58. Engine lubrication oil should be kept up to the FULL mark on the dipstick. To accurately check the oil level, stop the engine and allow approximately five minutes for the oil to drain off of engine internal parts. This eliminates the possibility of overfilling. The oil should generally be changed every 100 hours or two weeks, or more often where adverse



SUNDSTRAND
FIGURE 4-21. LUBRICATING THROTTLE AND TRANSMISSION LINKAGE.

conditions prevail. Color cannot be relied upon as indicating the need for an oil change. The use of an oil analysis service is the only reason for not following the change interval specified in Table 4-1. When checking the oil level, make sure that the area around the dipstick and filler cap are clean before removing them.

4-59. ENGINE OIL FILTER (see figure 4-20).

4-60.

The Detroit Diesel oil filter should be changed each time the oil is changed. Clean the outside of the filter flange to prevent dirt from entering the engine. Be sure that a new HYSTER-APPROVED filter and gasket are installed.

SECTION 4 HYSTER-CARE MAINTENANCE

4-63. HYDRAULIC SYSTEM (see figure 4-22).

NOTE: The steering system and the hydrostatic transmission system share a common reservoir (located under the right hand operators seat).

4-64. FILLING THE TANK.

4-65. Check the oil level when the hydraulic system is cold and with the steering cylinder fully extended. The oil in the hydraulic tank should be visible through the sight gauge or slightly above gauge level when the oil is cold. Add oil when no longer visible in the sight gauge until oil fills the sight gauge window.

CAUTION: Do not completely fill the tank with oil. Air space is designed into the tank for expansion at warm temperatures. Pressurization will occur in the tank at operating temperature. No attempt should be made to vent the hydraulic system.

4-66. CHANGING THE HYDRAULIC OIL.

4-67. After each 1,000 hours of operation or yearly (whichever occurs first), the hydraulic oil should be drained from the tank and replaced with new oil. This removes dirt, water and mechanical wear particles that have accumulated in the tank. Also, the chemical structure of the oil deteriorates after prolonged use.

4-68. Drain the oil by removing the drain plug at the bottom of the tank. Fill the tank through the filler neck shown in figure 4-22.

CAUTION: Make absolutely sure that the oil level can be seen in the sight gauge before starting the engine and operating the steering or hydrostatic transmission systems.

4-69. TRANSMISSION HYDRAULIC FILTERS.

4-70. The suction filter should be checked every 100 hours of operation or at two week intervals by noting the reading on the vacuum gauge. Change the filter element if the reading exceeds 9 inches of mercury with oil temperature at 100°F and engine at high idle. Always replace the suction filter element at least once a year or 1,000 hours, whichever occurs first.

NOTE: Removal of hydraulic lines or hoses is not required for replacement of the element in the suction filter assembly.

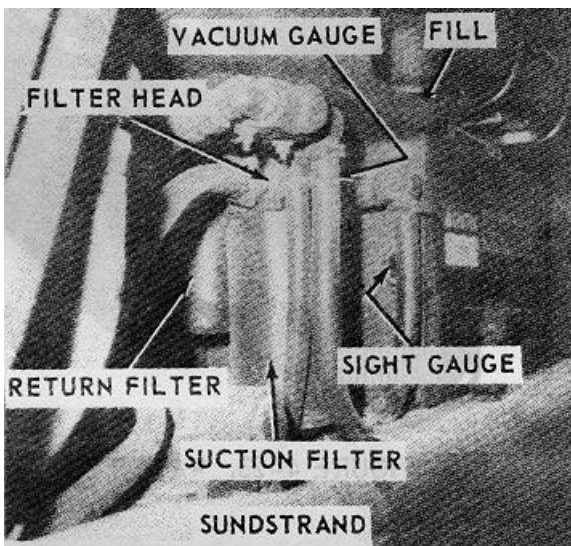


FIGURE 4-22. SERVICING THE HYDRAULIC SYSTEM.

4-61. LUBRICATION THROTTLE AND TRANSMISSION LINKAGE (see figure 4-21).

4-62. Place a few drops of engine oil on the detent plate and crank arm connections every 100 hours of operation or at two week intervals.

a. Unscrew the bowl center post fitting at the bottom of the bowl.

b. Remove and discard the element. Inspect filter head o-ring and bowl gasket. Replace if necessary.

c. Wipe the bottom section of the filter head using a clean, lint-free cloth. Install a new o-ring in the filter head if required. Use a light film of grease to hold the o-ring in place if necessary.

CAUTION: Do not use lint-type cloth to clean hydraulic components. Lint deposits can affect the operation of the system.

d. Install a new element in the filter bowl.

CAUTION: Use only HYSTER-APPROVED filter elements.

e. Screw the assembled filter bowl into the filter head. When tightening the center post, hold the bowl from turning because it may stretch the o-ring out of shape and cause suction leakage. Tighten the center post to a maximum of 20 ft.-lbs.(2.8 kg-m).

4-71. The throw-a-way return filter should be replaced at 1,000 hours of operation or every year, whichever occurs first. Always change the return filter if the suction filter is replaced.

a. Unscrew the filter from the filter head and discard the filter.

b. Wipe bottom of the filter using a clean, lint-free cloth.

CAUTION: Use only HYSTER-APPROVED filters.

c. Apply a film of oil or grease to the new filter gasket (integral with filter).

d. Hand turn the filter into the filter head until the gasket just makes contact. Then tighten one-quarter turn only.

4-74. WATER SPRAY SYSTEM.

4-75. FILTERS (see figure 4-23).

4-76. The non-corrosive sump filter normally requires no maintenance because of the self cleaning action of the water washing back and forth in the tank. If excessive foreign material accumulates in the tank, the filter and the tank will need cleaning. The filter can be inspected by removing the tank access plate.

4-77. The tank inlet screen filter should be periodically cleaned when the water does not readily pass through. The screen lifts out of the tank freely after snap ring is removed.

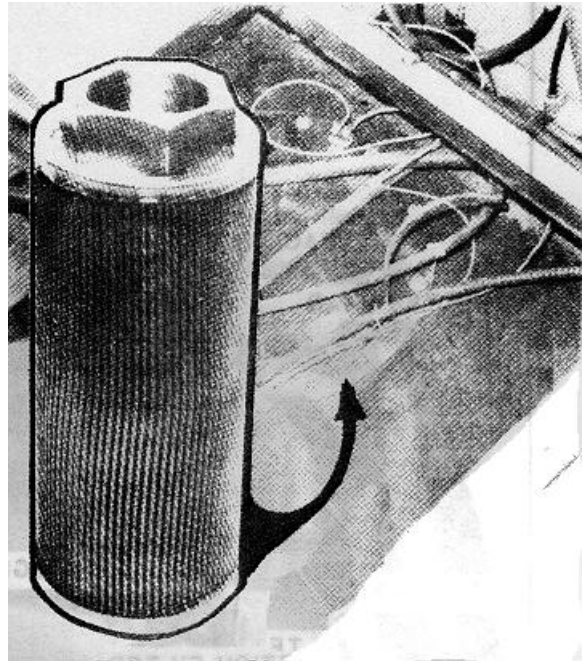


FIGURE 4-23. WATER FILTER

4-78. MANIFOLD AND NOZZLES (see figure 4-24).

4-79. The nozzles are mounted so they receive water from the center of the manifold tube where corrosion and sediment are minimized. This eliminates most of the nozzle plugging problems. Periodically the end caps on the water spray manifold should be removed and the sediment blown from the manifold.

4-80. STORAGE.

4-81. Drain the entire water spray system to

**SECTION 4
HYSTER-CARE MAINTENANCE**

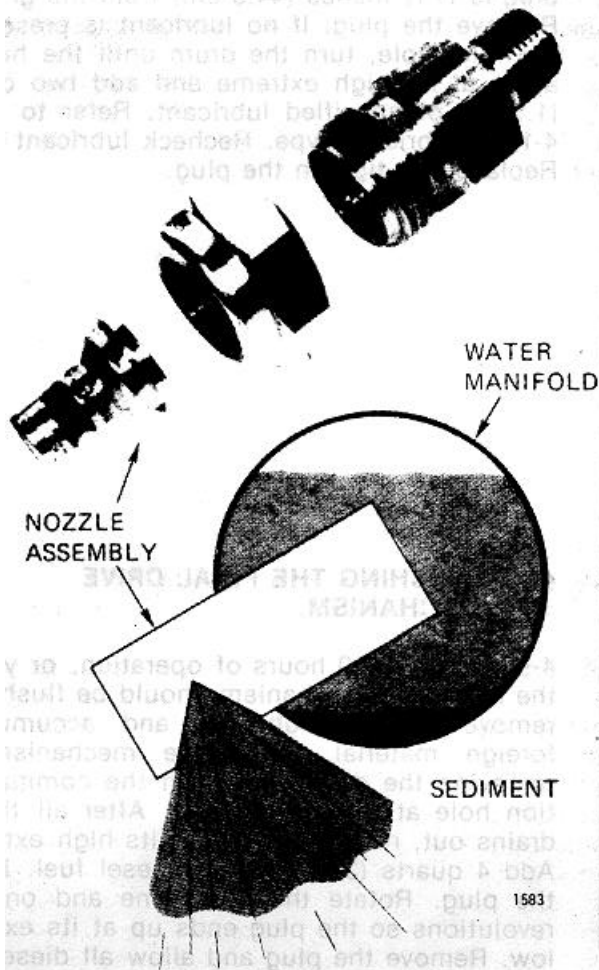


FIGURE 4-24. CLEANING MANIFOLD AND NOZZLES.

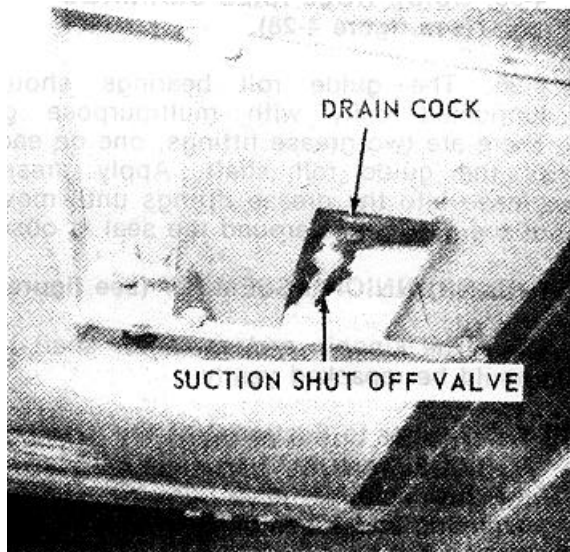


FIGURE 4-25. PUMP DRAIN COCKS,

prevent freezing of water and the resulting damage to components. A drain hole is provided in the tank bottom left corner to drain the tank. Be sure to open the pump drain cock (see figure 4-25). The suction shutoff valve should be open when draining the pump so all the water from the suction side is removed. Water in the pressure side of the system should be blown out with compressed air.

4-82. PARKING BRAKE (see figure 4-26).

4-83. LUBRICATION.

4-84. The parking brake lever assembly should be lubed after each 100 hours of operation or every two weeks. This will prevent the adjusting threads from rusting.

4-85. ADJUSTING.

4-86. The parking brake lever should be adjusted sufficiently to require at least 80 pounds (36.3 kg) to pull it into the brake applied position. Twist the end of the brake lever clockwise (lever in brake off position) to increase force required to apply the brake.

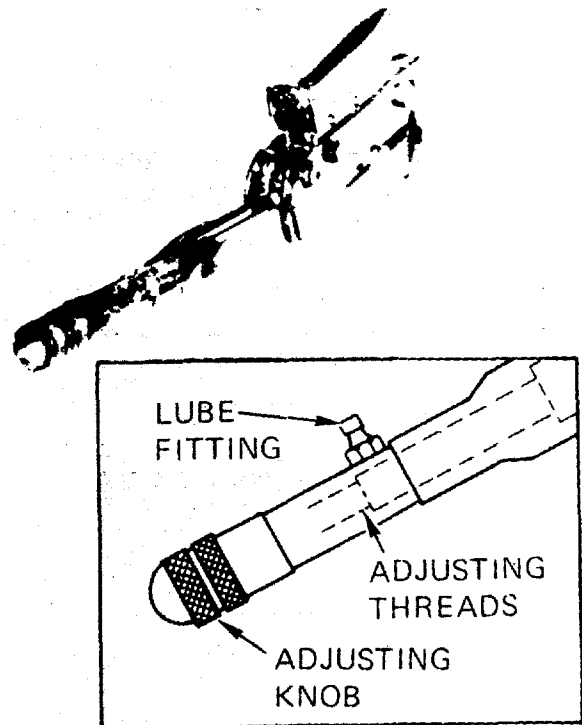


FIGURE 4-26. PARKING BRAKE LEVER MAINTENANCE.

4-87. FINAL DRIVE ASSEMBLY (see figure 4-27).

4-88. CHECKING LUBRICANT LEVEL.

4-89. Model C350B has a fill-and-check plug as described in paragraph 4-90.

4-90. On model C350B, the small pipe plug located on the left-hand side of the drive drum communicates with the final drive compartment. The correct lubricant level of the final drive compartment can be checked by rotating the plug to its high extreme. Then slowly rotate the drive drum until the bottom of the

plug is 17 1/2 inches (44.5 cm) from the ground. Remove the plug. If no lubricant is present at the filler hole, turn the drum until the hole is again at its high extreme and add two quarts (1.9 ltr) of specified lubricant. Refer to Table 4-1 for lubricant type. Recheck lubricant level. Replace and tighten the plug.

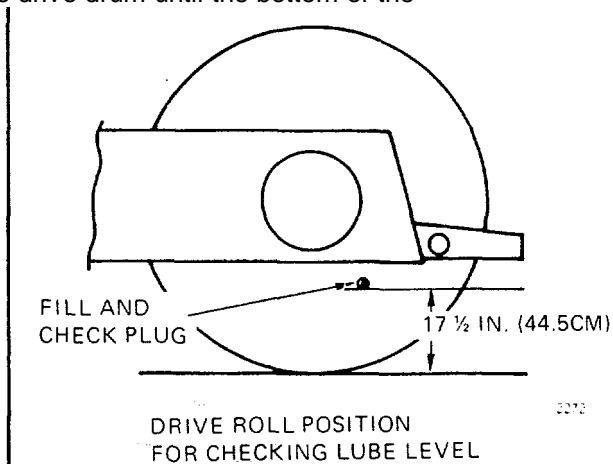


FIGURE 4-27. SERVICING C350B FINAL DRIVE ASSEMBLY.

4-92. FLUSHING THE FINAL DRIVE MECHANISM.

4-93. Each 1,000 hours of operation, or yearly, the final drive mechanism should be flushed to remove the old lubricant and accumulated foreign material. Drain the mechanism by removing the drain plug with the communication hole at its extreme low. After all the oil drains out, rotate the hole to its high extreme. Add 4 quarts (3.8 liters) of diesel fuel. Install the plug. Rotate the drum one and one-half revolutions so the plug ends up at its extreme low. Remove the plug and allow all diesel fuel to drain prior to filling with fresh lubricant.

4-94. STEERING.

4-95. GUIDE ROLL AXLE BEARINGS (see figure 4-28).

4-96. The guide roll bearings should be lubricated daily with multipurpose grease. There are two grease fittings, one on each end of the guide roll shaft. Apply pressurized grease into the grease fittings until movement of the old grease around the seal is observed.

4-97. TRUNNION ASSEMBLY (see figure 4-29).

4-98. The kingpin and oscillator shaft bearing should be repacked yearly.

NOTE: Refer to Section 9 of the C350B SERVICE MANUAL, part number 599661, for the detailed procedure for disassembling and assembling trunnion components.

**SECTION 4
HYSTER-CARE MAINTENANCE**

- a. Remove the trunnion assembly from the main frame.
- b. Remove oscillator shaft assembly.
- c. Clean, inspect, and re-pack kingpin and oscillator shaft bearings.
- d. Install oscillator shaft bearings and new

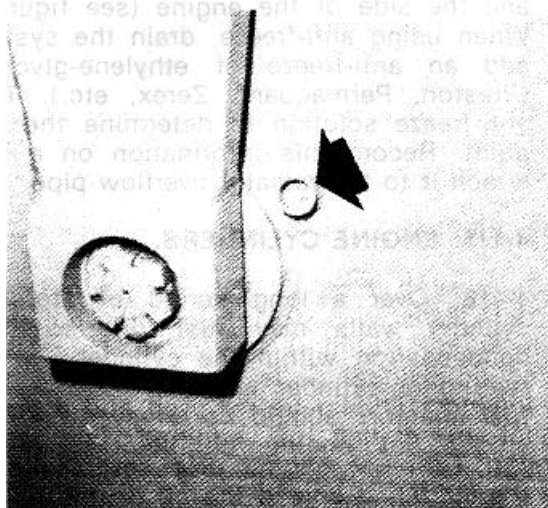


FIGURE 4-28. LUBRICATING GUIDE ROLL AXLE BEARINGS.

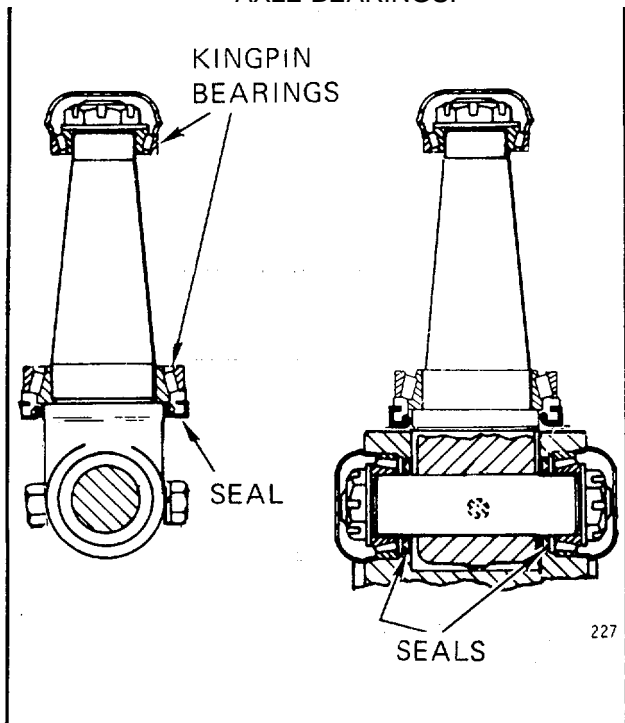


FIGURE 4-29. TRUNNION ASSEMBLY.

seals. Torque bearing retainer nut to specifications listed in Section 2.

CAUTION: Use only HYSTER-APPROVED parts.

- e. Install kingpin bearings and lower seal.
- f. Install trunnion assembly into the frame and torque bearing retainer nut to the specification listed in Section 2.

**4-99. STEERING CYLINDER BALL JOINTS
(see figure 4-30).**

4-100. The steering ball joints should be re-packed yearly.

- a. Remove rubber dust covers.
- b. Disassemble the ball joint on each end of the cylinder.
- c. Clean and inspect components.
- d. Pack each ball joint assembly with multi-purpose grease.
- e. Reassemble the ball joints and adjust so there is no end play.
- f. Install rubber dust covers.

CAUTION: Damaged dust covers will not keep out contaminants. Replace with HYSTER-APPROVED parts if original dust covers are damaged.

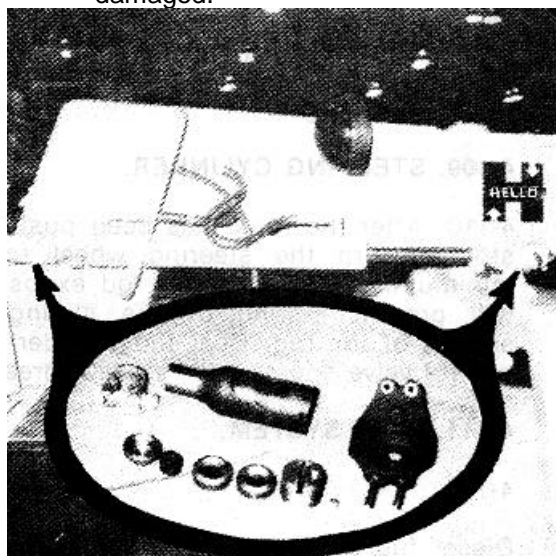


FIGURE 4-30. STEERING CYLINDER BALL JOINTS.

4-101. REMOVING AND REPLACING STEEL BALLAST (see figure 4 -31).

4 -102. The steel ballast can be removed to provide access to the lower engine compartment.

WARNING: Always support ballast securely when removing or installing capscrews.

4-103. UNIT STORAGE.

4-104. To prevent deterioration of components the following precautions should be taken when storing the roller for any length of time.

4 -105. WATER SPRAY SYSTEM.

4-106. Drain the entire water spray system to prevent freezing of water and the resulting damage to components. A drain hole is provided in the tank bottom left corner to drain the tank. Be sure to open the pump drain cock (see figure 4 -25). The suction shut -off valve should be open when draining the pump so all water from the suction side is removed. Water in the pressure side of the system should be blown out with compressed air. Cap or tape the nozzles and coat the tank fill cap threads with grease.

4-107. DRUM BALLAST.

4-108. If water ballast is being used in the guide rolls and drive drum, this water should be drained before storing. Rotate each drum until the ballast plug (largest plug) is at its low extreme when draining. Replace the drain plugs for storage.

4-109. STEERING CYLINDER.

4-110. After the roller has been positioned for storage, turn the steering wheel to provide minimum steering cylinder rod exposure. This will prevent rusting of the sliding contact surface of the rod. Coat the cylinder rods and control valve spools with a heavy grease.

4-111. FUEL SYSTEM.

4-112.

Diesel fuel will leave a waxy substance that plugs the system. If the unit is placed in storage for any appreciable length of time, all fuel should be drained from the tank and the engine run until the fuel in the system is used.

4-113. ENGINE COOLING SYSTEM

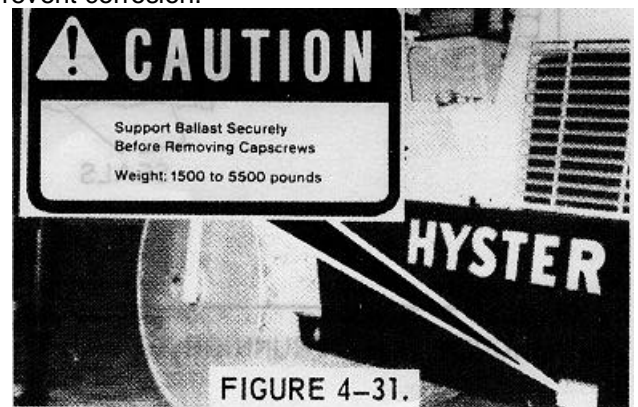
4-114. When storing the unit, the engine cooling system should be protected against freezing. This can be done by either draining the system or adding one of the various anti -freeze mixtures. To drain the system, open the stop cocks on the bottom of the radiator and the side of the engine (see figure 4 -16). When using anti -freeze, drain the system and add an anti -freeze of ethylene -glycol base (Preston, Permaguard, Zerex, etc.). Test the anti -freeze solution to determine the freezing point. Record this information on a tag and attach it to the radiator overflow pipe.

4-115. ENGINE CYLINDERS.

4-116. Over a long period of storage, the cylinder walls may rust due to moisture condensation within the cylinder. To prevent rusting of cylinder walls, the or fuel injectors should be removed and a small amount of engine oil squirted into each cylinder. Turn the engine over several times with the starter to spread the oil on the entire cylinder wall. Replace the or fuel injectors. Repeat this procedure prior to starting after storage.

4-117. BATTERY.

4-118. A fully charged battery will maintain itself for a long period of time if kept cool and disconnected. The electrolyte in the battery should be checked periodically to insure a proper level. If it is low, add clean drinking water until proper level is obtained. Check the electrolyte specific gravity periodically and recharge the battery as necessary. This is especially important if freezing temperatures are expected. Clean and dry the battery, especially the terminals. Coat the terminals with HYSTER -APPROVED battery terminal coating to prevent corrosion.



**SECTION 5
TROUBLE SHOOTING**

5-1. GENERAL.

ysis check charts for the individual systems of the compactor.

5-2. Tables 5-1 through 5-5 are trouble anal-

TABLE 5-1. TROUBLE ANALYSIS FOR WATER SPRAY SYSTEM.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Spray Motor Will Not Operate.	Toggle switch open.	Replace switch.
	Circuit breaker not re-setting.	Replace breaker.
	Motor brushes worn excessively.	Replace brushes.
Spray Motor Will Not Turn Off.	Toggle switch shorted.	Replace switch.
Pump Operates But There Is Little Or No Spray Pattern.	Insufficient liquid in reservoir.	Replenish liquid supply.
	Water filter plugged.	Clean water filter and tank.
	Spray nozzles plugged.	Clean nozzles and nozzle manifold.
	Pump housing cracked from freezing.	Replace pump.
Spray Pattern Not Completely Covering The Drum (s).	Spray angle incorrect.	Adjust nozzle manifold so spray pattern completely covers drum. Refer to the water spray section.
	One or more nozzles plugged.	Clean nozzle(s).
	Charging system malfunctioning (low voltage to motor).	Check charging system.

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TABLE 5-2B. TROUBLE ANALYSIS FOR SUNDSTRAND HYDROSTATIC TRANSMISSION.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Will Not Operate In Either Direction.	Transmission by-pass valve open.	Close valve. Refer to Section 3.
	System low on oil.	Check oil level at sight gauge on side of unit. Replenish with approved oil listed in Section 4. Locate and repair leaks causing loss of oil.*
	Faulty control linkage to pump.	Check the linkage from control levers to pump arm to make sure it is connected and free to operate. Refer to Section 7 for adjustment procedure.
	Faulty control linkage inside pump.	Refer to Section 7 for pressure check procedure.
	Low or zero charge pressure.	Refer to Section 7 for pressure check procedure.
	a. Charge pressure relief valves in charge pump or motor manifold damaged or stuck open.	Refer to Section 7 for replacement of charge pressure relief valve.
	b. Suction filter or hose from tank to charge pump clogged.	Service filter, flush suction line from tank to charge pump. Refer to Section 3.
	c. Charge pump drive shaft sheared.	Replace the charge pump.
	d. Internal damage to pump or motor.	Refer to Probable Cause "Internal damage to pump and motor."
	e. Cold or improper oil.	Refer to Section 4 for approved oil.

*Refer to manufacturer's warranty policy.

TABLE 5-2B. TROUBLE ANALYSIS FOR SUNDSTRAND HYDROSTATIC TRANSMISSION (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
<p>Unit Will Not Operate In Either Direction (Cont.)</p>	<p>Low and fluctuating charge pressure.</p> <p>a. Air in system.</p> <p>b. Charge pressure relief valve in the motor manifold stuck open.</p> <p>c. Internal damage to pump or motor.</p> <p>Defective charge check valves.</p> <p>Defective high pressure relief valves at motor manifold.</p> <p>Internal damage to pump or motor. Indicated by:</p> <p>a. Low, zero or rapidly fluctuating charge pressure.</p> <p>b. Operating pressure in forward or reverse is less than high pressure relief setting. Charge pressure lower than normal, may drop to zero when high pressure is reached.</p> <p>c. Noisy pump or motor.</p> <p>d. Pieces or flakes of brass in tank or filters.</p>	<p>Refer to Section 7 for proper pressure check procedure.</p> <p>Check all fittings, especially around filter, in the suction line and locate point or points where air is being drawn into the system. Tighten fittings where air leaks exist.</p> <p>Free-up or replace charge pressure relief valve. Refer to Section 7 for replacement procedure.</p> <p>Replace with new or overhauled pump and motor. Refer to Section 7.</p> <p>Check operation in both directions to determine which check valve is defective.</p> <p>Refer to Section 7 for pressure check procedures. Examine both relief valves. Clean and replace if defective. Do not attempt to shim valves.</p> <p>NOTE: Indications a, b and c may be corrected by minor repair procedures. Refer to Section 7 for hydrostatic system checks and adjustments before removing pump or motor. If internal failure is certain, replace with a new or overhauled pump or motor.*</p> <p>d. Replace pump or motor with a new or overhauled pump or motor.*</p> <p>NOTE: If either unit is considerably worn or damaged, carefully check and clean the other unit (pump or motor). Refer to Section 7 for system start-up procedures.</p>
<p>Unit Operates In One Direction Only.</p>	<p>Faulty control linkage to pump.</p>	<p>Check the linkage from control levers to pump arm to make sure it is connected and free to operate. Refer to Section 7 for adjustment procedures.</p>

*Refer to manufacturer's warranty policy.

TABLE 5-2B. TROUBLE ANALYSIS FOR SUNDSTRAND HYDROSTATIC TRANSMISSION (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Operates In One Direction Only (Cont.)	Faulty high pressure relief valve.	Refer to Section 7 for pressure check procedures.
	Charge check valve faulty.	Replace and check pressure.*
	Defective control valve.	Replace and check pressure.*
Neutral Difficult Or Impossible To Find.	Faulty controls or linkage to pump.	Refer to Section 7 for adjustment procedures.
	Oil level low.	Check oil level at sight gauge on tank. Replenish tank with approved oil listed in Section 4.
System Operating Hot.	Oil cooler clogged.	Clean oil cooler air passages.
	Oil cooler being bypassed.	Inspect cooler bypass valve. Clean or replace. Arrow on valve should point up in the line to the return manifold.
	Clogged filters or suction line.	Service suction or return filters. Clean or replace line from tank to charge pump.
	Internal leakage (usually accompanied by loss of acceleration and power). a. High pressure relief valves stuck partially open.	Refer to Section 7 for pressure check procedures. If the operating pressure is 200 PSI (14 kg/cm ²) or more, lower in one direction, switch the high pressure valves. If the lower pressure reading switches to the opposite side of the circuit, do not attempt to shim valve. Replace the valve.
System Operating Hot. (Cont.)	b. Internal parts of pump or motor (or both) worn.	Refer to Section 7 for pressure check procedures. Replace defective pump or motor. NOTE: If either unit is considerably worn or damaged, carefully check and clean other unit (pump or motor).
System Noisy.	Air in system. a. Low oil level.	Check oil level at sight gauge on side of tank. Replenish with approved oil listed in Section 4. Locate and fix leaks causing loss of oil.

*Refer to manufacturer's warranty policy.

**SECTION 5
TROUBLESHOOTING**

TABLE 5-2B. TROUBLE ANALYSIS FOR SUNDSTRAND HYDROSTATIC TRANSMISSION (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
System Noisy (Cont.)	b. Line or filter leaks (considerable amount of foam in the tank).	Check suction filter and suction line between tank and charge pumps for leaks allowing air to enter into system. Replace defective hose and/or tighten fitting.
	Hosing or tubing not properly insulated.	Make sure hose or tubing is not touching any metal that can amplify natural hydraulic system hum.
Acceleration and Deceleration Sluggish.	Air in system.	Refer to "System Noisy" air in system.
	Low charge pressure.	Refer to "System Will Not Operate In Either Direction." Low or zero charge pressure.
	Control orifice plug partially blocked.	Refer to Section 4. Replace suction filter more often.
	Internal wear or damage.	Refer to "Unit Will Not Operate In Either Direction." Internal damage to pump or motor.
	Engine lugs down.	Refer to engine manufacturer's service manual.

*Refer to manufacturer's warranty policy.

TABLE 5-3. TROUBLE ANALYSIS FOR FINAL DRIVE ASSEMBLY.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Will Not Move.	Control linkage to transmission.	Adjust. Refer to Section 7.
	Transmission bypass valve open.	Close valve control. Refer to Section 3.
	Broken drive shaft.	Replace defective part. Determine cause of failure and correct before placing unit back in service. Check entire drive train for possible damage.
	Planetary gears jammed.	Remove final drive from unit for complete teardown and inspection. Check all parts for damage. Replace as needed. Check alignment of components. Refer to Section 8.
	Parking brake not releasing.	Inspect for jammed linkage or material jammed against brake drum.

TABLE 5-3. TROUBLE ANALYSIS FOR FINAL DRIVE ASSEMBLY (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Noisy Final Drive.	Dry or defective bearings.	Remove final drive assembly from axle housing. Disassemble as needed to check for damaged parts. Replace as needed (refer to Section 8). Assemble and fill with proper lubricant (refer to Section 4).
	Incorrect bearing adjustment.	Adjust the motor carrier bearing preload. Refer to Section 8.
	Worn or broken planetary gear teeth.	Replace parts as needed. Check for use of proper lubricant (refer to Section 4). Install gears as specified in Section 8.
	Incorrect or lack of lubricant.	Fill with correct lubricant as specified in Section 4.
Losing Lubricant.	Worn brake shaft seal.	Replace seal. Lubricate before installation.
	Defective motor housing gasket.	Replace gasket. Fill final drive as specified in Section 4.
	Incorrect lubricant.	Drain lubricant. Refill as specified in Section 4.
	Over-filling.	Drain to correct level. Refer to Section 4 for filling instructions.
	Operating on side slope.	Operate the unit up or down the grade.

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TABLE 5-4. TROUBLE ANALYSIS FOR STEERING SYSTEM (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
GEAR PUMP (Detroit Diesel Only)		
Pumping Not Delivering Fluid.	Drive shaft sheared.	Remove and disassemble the pump. Inspect and replace worn or broken parts.
	Air leaks at the intake.	Check the inlet connections to determine where air is being drawn in. Tighten any loose connections. Replace seals where necessary.
	Fluid intake hose in reservoir restricted.	Remove and flush or replace suction hose between the pump and tank. Service transmission filters if necessary.
Insufficient Pump Pressure.	Gears worn or broken.	Replace parts as necessary.
	Insufficient relief pressure.	Check relief valve in the flow divider for contamination. Clean or replace.
	Worn parts causing internal leakage of pump delivery.	Inspect and replace as necessary.
Pump Making Noise.	Damage to cylinder packing.	Refer to "Steering Cylinder Troubles".
	Pump intake partially blocked.	Remove and flush or replace suction line between pump and tank. Check the fluid condition and, if necessary, drain and flush the system. Refill with clean fluid.
	Air leaks at the intake or shaft seal. (Oil in tank may be foamy.)	Check the inlet connections and seal to determine where air is being drawn in. Tighten any loose connections and replace if necessary.
	Air in circuit.	Check all connections for tightness.
	Dirt and sludge in the pump.	Disassemble the pump and clean all parts. Drain the hydraulic tank and flush. Replace with the proper oil as specified in Section 4. Replace the transmission oil filters.

TABLE 5-4. TROUBLE ANALYSIS FOR STEERING SYSTEM (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
STEERING CONTROL UNIT (Handpump)		
No Response When Steering Wheel Is Turned Slowly.	Dirt in hydraulic system.	Drain and flush complete hydraulic system. Change transmission suction and return filters. Refill system with specified hydraulic fluid. Refer to Section 4.
	Oil level too low.	Fill to sight gauge on tank. Refer to Section 4 for specified hydraulic fluid.
Slow Or Hard Steering.	Oil level low.	Fill to sight gauge on tank. Refer to Section 4 for specified hydraulic fluid.
	Clogged line.	Check lines. Clean and replace as required.
	Dirt in hydraulic system.	Drain and flush complete hydraulic system. Change transmission suction and return filters. Refill system with specified hydraulic fluid. Refer to Section 4.
	Worn sleeve and spool.	Replace sleeve, spool and housing as a unit.
	Worn metering gear.	Replace both sets of metering gears.
	Malfunction of double vane hydraulic pump.	Refer to troubleshooting – Gear Pump.
	Manual steering check bail off its seat.	Replace spring and ball. Check seat.
Steering Wheel Does Not Center.	Broken centering springs.	Replace all springs (6). Refer to Section 9.
Continuous Steering Wheel Rotation.	Broken centering springs.	Replace centering springs (6). Refer to Section 9.
	Burr on sleeve and spool.	Remove burr with 600 grit abrasive paper on a flat surface. Remove sharp edges from abrasive paper to prevent scratches.
	Dirty fluid.	Drain and flush complete hydraulic system. Change suction and return filters. Refill system with specified hydraulic fluid. Refer to Section 4.
No Response.	Pump failure.	Refer to troubleshooting – Gear Pump.

TABLE 5-4. TROUBLE ANALYSIS FOR STEERING SYSTEM (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
STEERING CONTROL UNIT (Handpump) (Cont.)		
No Response (Cont.)	Hoses clogged.	Replace or flush hoses.
Wrong Response To Steering Wheel.	Hose incorrectly installed.	Refer to Section 9 for hose routing.
	Metering star gear to slot in shaft misaligned.	Realign star gear and shaft. Refer to Section 9.
STEERING CYLINDER		
No Motion Of Hydraulic Cylinder.	No oil or insufficient oil being supplied to cylinder.	Check the hydraulic system for: defective pump or pump drive, vacuum or pressure leak in lines, low oil level, low relief setting at pump. Repair defective unit.
Slow Cylinder Motion.	Insufficient oil being supplied to cylinder.	Check hydraulic system as described above.
	Worn cylinder-piston packing.	Replace packing.
Spongy Or Jerky Action.	Air in system.	Check reserve oil level, fill tank as necessary. Check inlet side of pump for vacuum leaks. Tighten connections. Bleed system. Refer to Section 9.
	Sticky relief valve.	Remove and check the relief valve. Repair or replace parts as necessary. If foreign particles are the cause of malfunction, check reserve oil for contamination. Whenever oil is contaminated, it should be replaced and the filter serviced. Make sure sealing surfaces are mating properly.
	Bent or deformed cylinder-piston or rod.	Disassemble, check and repair cylinder assembly.

TABLE 5-5. TROUBLE ANALYSIS FOR BRAKE SYSTEM.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Parking Brake Will Not Apply.	Cable disconnected, clamps loose or linkage binding.	Connect cable or related linkage rods. Tighten clamps. Free-up linkage. Adjust linkage as specified in Section 10.
	Brake lining worn.	Replace.

TABLE 5-5. TROUBLE ANALYSIS FOR BRAKE SYSTEM (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Parking Brake Applies But Will Not Hold.	Maladjusted.	Adjust. Refer to Section 10.
	Grease or oil on lining.	Replace lining. Locate cause of contamination.
	Worn lining.	Replace.
	Cables on linkage seized.	Free-up or replace.
Parking Brake Will Not Release Or Drags.	Adjusted too tightly.	Adjust as specified in Section 10.
	Shoe retracting spring or linkage springs weak, broken or disconnected.	Replace.
	Cable seized.	Free-up or replace.

SECTION 6 ELECTRICAL

6-1. GENERAL (see figure 6 -1).

6-2. The electrical system consists of several subsystems, they are: starting circuit, charging circuit and the discharge circuit (gauges, lights, etc.)

When checking for default each subsystem should be considered because of their interdependence. The electrical system specifications are given in Section 2, and a troubleshooting guide is presented in Section 5.

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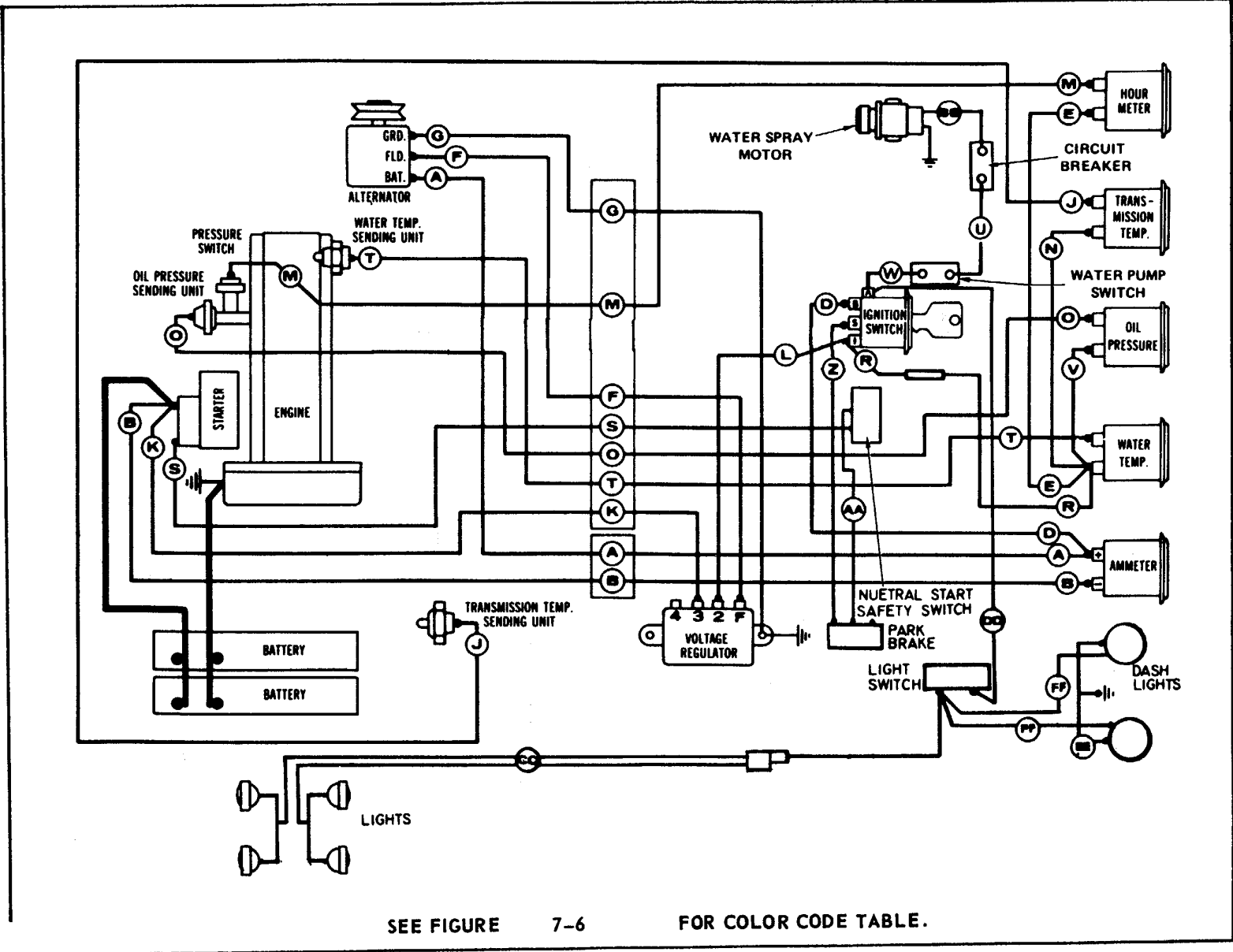


FIGURE 6-4. ELECTRICAL SCHEMATIC FOR DETROIT 6-4.

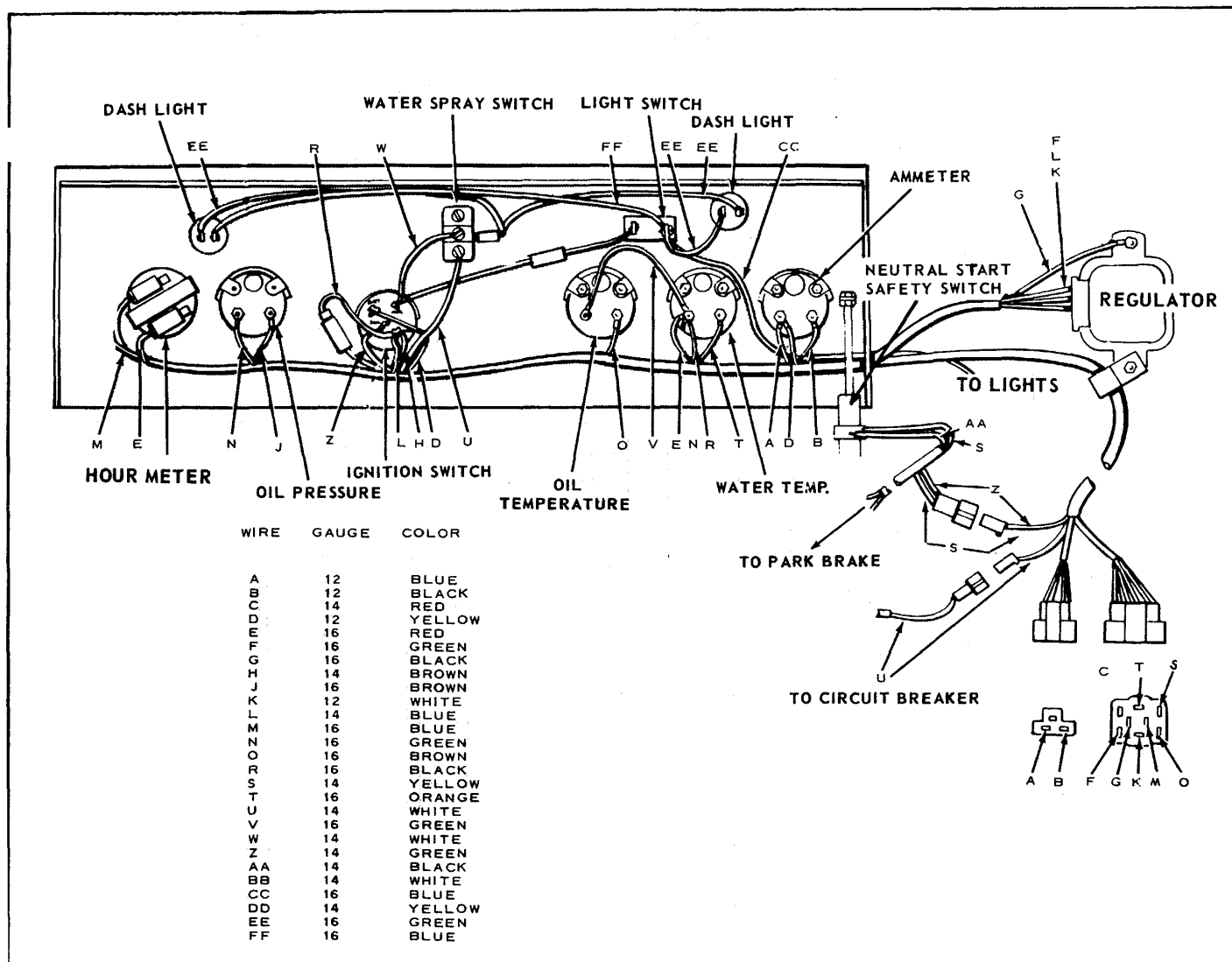


FIGURE 6-5. INSTRUMENT PANEL DETAIL FOR DETROIT ENGINE 6-5.

SECTION 6
ELECTRICAL

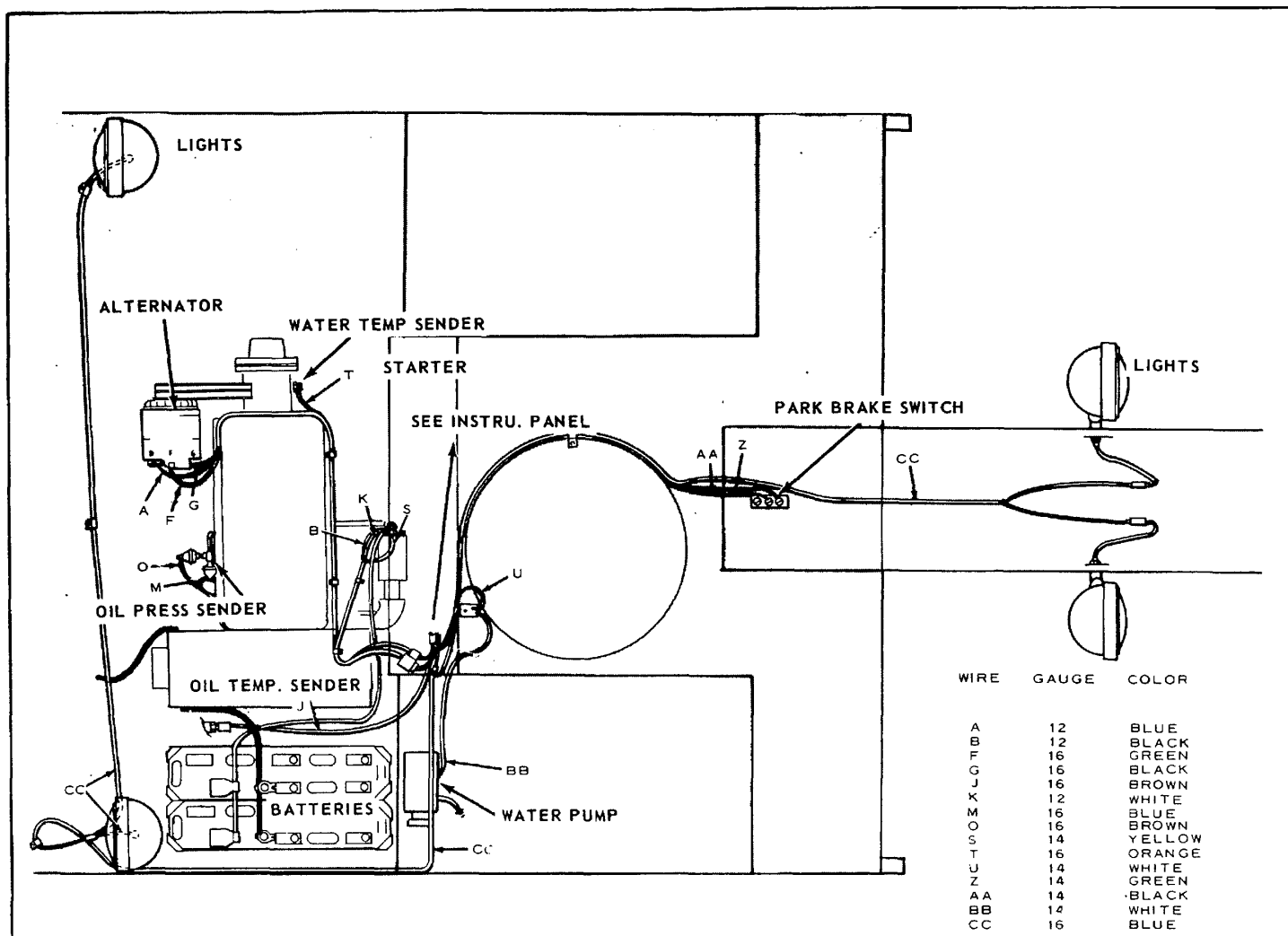


FIGURE 6-6. ROUTING DIAGRAM FOR DETROIT DIESEL ENGINE.

SEE FIGURE 6-4 FOR ELECTRICAL SCHEMATIC

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SECTION 7
TRANSMISSION

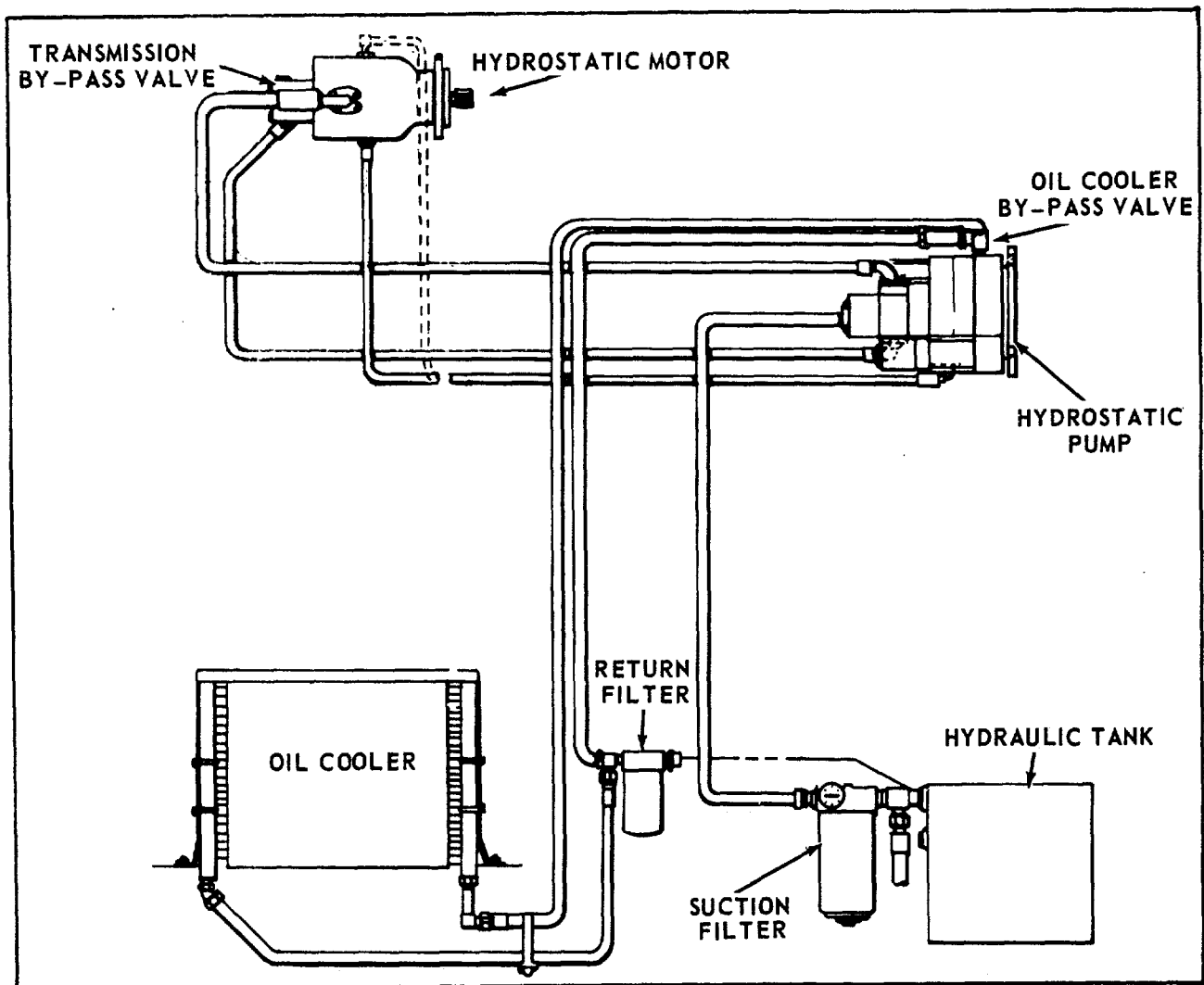


FIGURE 7-32

SUNDSTRAND HYDROSTATIC TRANSMISSION

7-85. GENERAL.

7-86. This section contains a description of the Sundstrand hydrostatic transmission, transmission components and their function in their hydraulic circuits. Service instructions are given that include removal of components, disassembly, inspection, reassembly and installation procedures.

7-87. Checks and adjustments are presented in this section. Design and performance specifications are presented in Section 2. The troubleshooting guide is presented in Section 5.

7-88. HYDRAULIC SYSTEM (see figure 7-32).

7-89. The closed loop hydraulic system consists of two subsystems: the hydrostatic transmission subsystem and the steering subsystem. The two subsystems share hydraulic oil and hydraulic tank. These components are presented in this section. Refer to the steering section for the remaining coverage of the steering hydraulic components.

7-90. HYDRAULIC OIL.

7-91. Specifications for hydraulic oil are given in Section 2.

**7-92. HYDRAULIC SYSTEM COMPONENTS
(see figures 7-33, 7-34 and 7-35).**

7-93. GENERAL.

7-94. The hydrostatic transmission offers infinite control of speed and direction. Control of the variable displacement, axial piston pump and the fixed displacement motor is the key to controlling the unit. When the variable pump swash plate is tilted, by movement of the Direction-Throttle Control Bail, a positive stroke to the pistons is created. This, at any given input speed, produces a flow from the pump. This flow is transferred through high-pressure lines to the motor. The ratio of the volume of flow from the pump to the displacement of the motor will determine the speed of the motor output shaft. Movement of the Direction-Throttle Control Bail to the opposite side of neutral causes the flow from the pump to reverse and the motor output shaft turns in opposite direction. Speed of the output shaft is controlled by adjusting the displacement (flow) of the transmission. Load (working pressure) is determined by external conditions such as grade and

ground conditions which establish the demand on the system. The pump and motor are contained in separate housings and are connected by high-pressure hoses. All valves required for a closed loop circuit are included in either the pump or motor assemblies. A reservoir, filter, oil cooler and lines complete the circuit. Figure 7-33, 7-34 and 7-35 illustrate the system in neutral, forward and reverse modes.

7-95. CHARGE PUMP CIRCUIT.

7-96. CHARGE PUMP.

7-97. A charge pump is a part of the hydrostatic pump assembly. When the engine is running, the charge pump provides oil supply, cooling and pressure for control functions.

7-98. The charge pump draws oil from the hydraulic tank, through the suction filter to supply oil, under pressure, to the low-pressure side of the main circuit.

7-99. NEUTRAL CHARGE PRESSURE RELIEF VALVE.

7-100. When the transmission is in neutral, charge pump pressure is controlled by the neutral charge pressure relief valve. This valve is an integral part of the charge pump and has no adjustments that can be made in the field. When charge pressure exceeds the range of 190 to 220 PSI (13.36-15.47 kg/cm²) above case pressure, the neutral charge pressure relief valve opens allowing oil to flow into the pump case, oil cooler and hydraulic tank.

7-101. SUCTION FILTER.

7-102. A low-pressure filter is mounted on the hydraulic tank. It serves as the suction filter for the transmission inlet oil. It is a 10 micron filter. There is **no** by-pass valve on the suction filter.

7-103. COOLING CIRCUIT.

7-104. The cooling circuit maintains a flow of oil through the transmission for cooling purposes. Excess oil from the low-charge- pressure relief valve enters the motor housing. Flow is then directed through drain lines to the pump housing. The circuit is completed from the pump housing through the oil cooler to the oil tank. When the hydrostatic pump is in

SECTION 7
TRANSMISSION

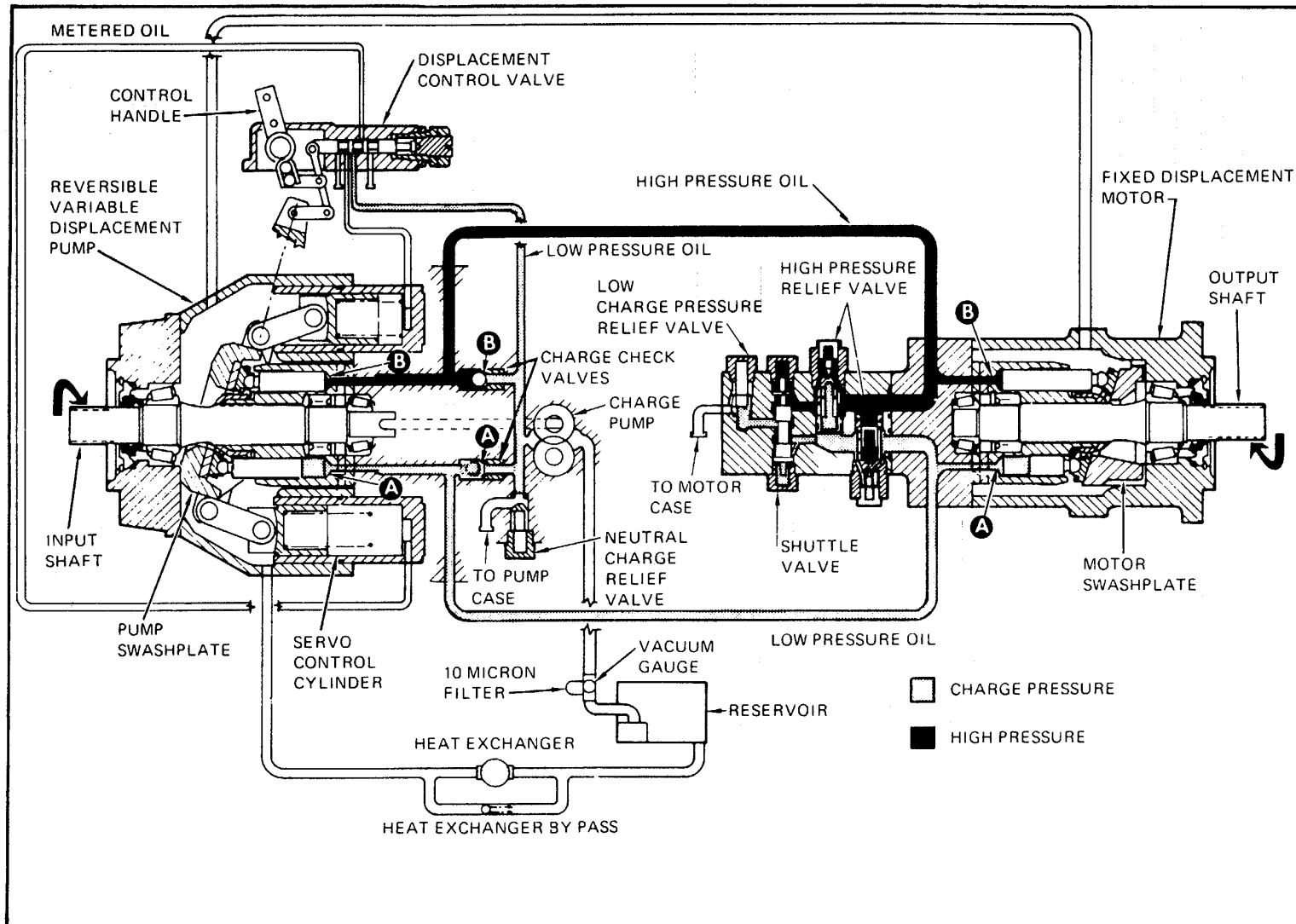


FIGURE 7-33. SUNSTRAND TRANSMISSION IN FORWARD.

**SECTION 7
TRANSMISSION**

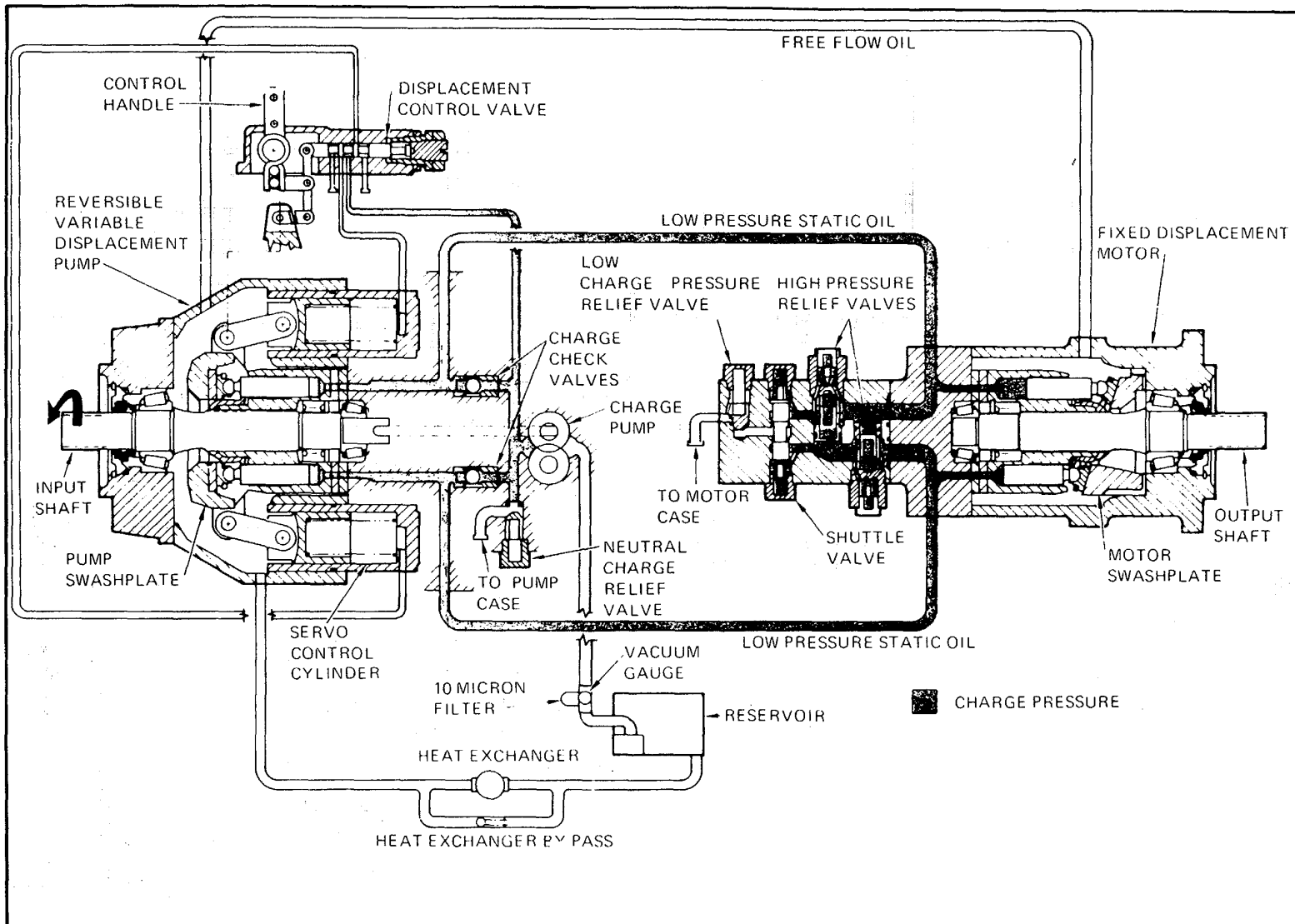


FIGURE 7-34. SUNSTRAND TRANSMISSION IN NEUTRAL

SECTION 7
TRANSMISSION

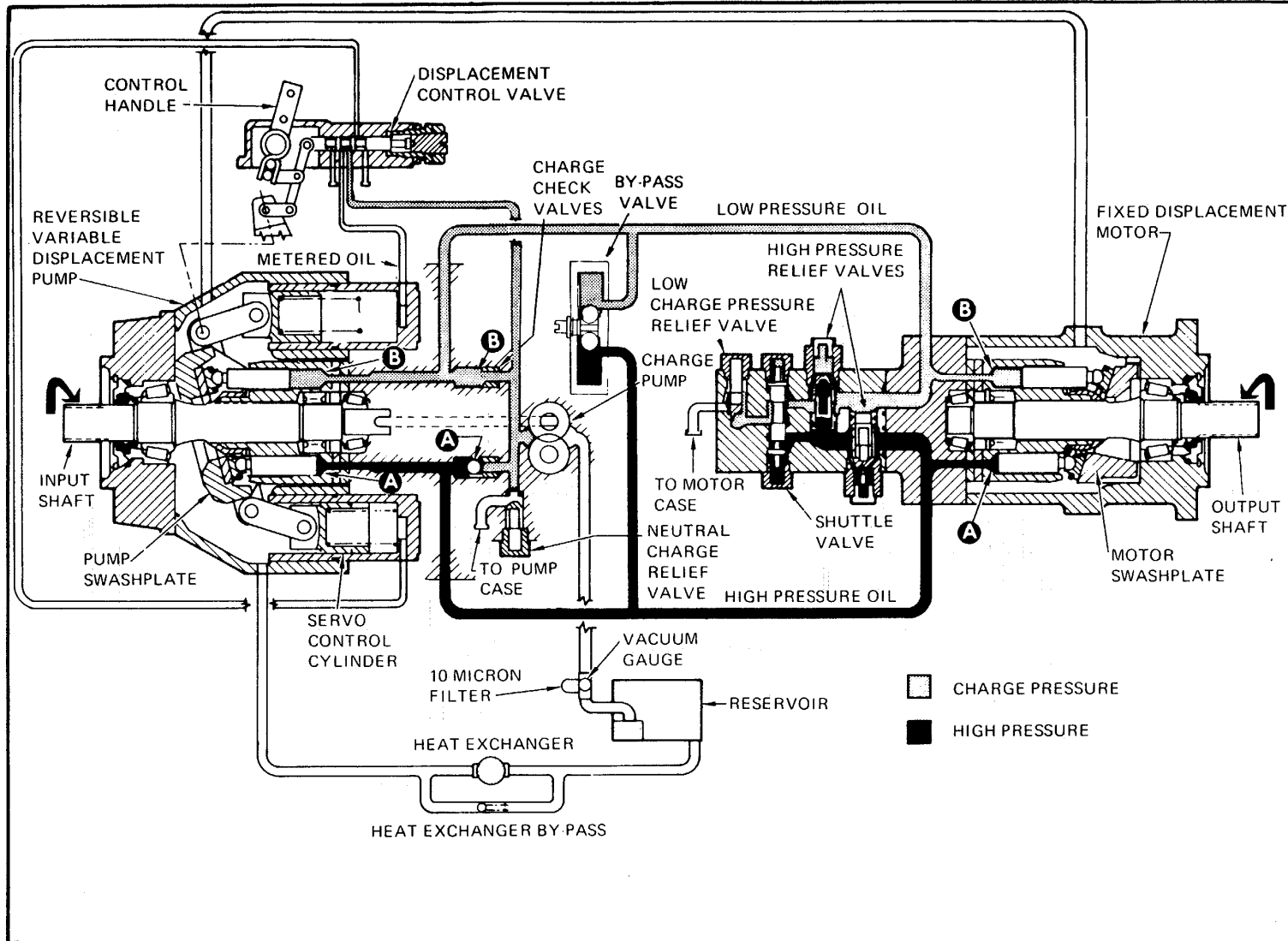


FIGURE 7-35. SUNSTRAND TRANSMISSION IN REVERSE.

SECTION 7 TRANSMISSION

neutral, the shuttle valve (located in the hydrostatic motor manifold) is centered allowing oil from the charge pump to be directed to the cooling circuit by the low-charge-pressure relief valve. Cooling circuit flow in neutral is not admitted to the motor, but is directed to the pumps' drain circuit, through the oil cooler to the hydraulic tank.

7-105. OIL COOLER.

7-106. The oil cooler is mounted with the engine radiator. It is connected between the motor case drain port and the hydraulic tank. Excess cooling oil from the low-charge-pressure relief valve enters the motor case, then flows through the case drain line through the pump case to the oil cooler and the tank.

7-107. OIL COOLER BYPASS VALVE.

7-108. The oil cooler bypass valve prevents high back-pressure at the pump case. Back-pressure can result from cold fluid or a restricted oil cooler passage. The valve is set to open at 15 PSI (1.05 kg/cm²) pressure at normal operating temperature. During cold start conditions or if flow through the cooler becomes restricted, the valve opens to allow flow from the pump directly to the hydraulic tank.

7-109. SHUTTLE VALVE.

7-110. When in neutral, the shuttle valve directs oil flow to the cooling circuit. The shuttle valve prevents loss of high pressure oil when transmission is reversed.

7-111. CONTROL FUNCTION.

7-112. The charge pump provides oil under pressure to control valves.

7-113. MAKE-UP CIRCUIT.

7-114. The charge pump provides oil to the circuit to make up for internal leakage.

7-115. HYDROSTATIC PUMP ASSEMBLY.

7-116. The hydrostatic transmission employs a variable displacement hydraulic pump driving a fixed displacement hydraulic motor to transfer engine power to the final drive.

7-117. The hydrostatic pump assembly is attached to, and driven by, a hub assembly on the engine flywheel.

7-118. VARIABLE DISPLACEMENT HYDROSTATIC PUMP (see figure 7-36).

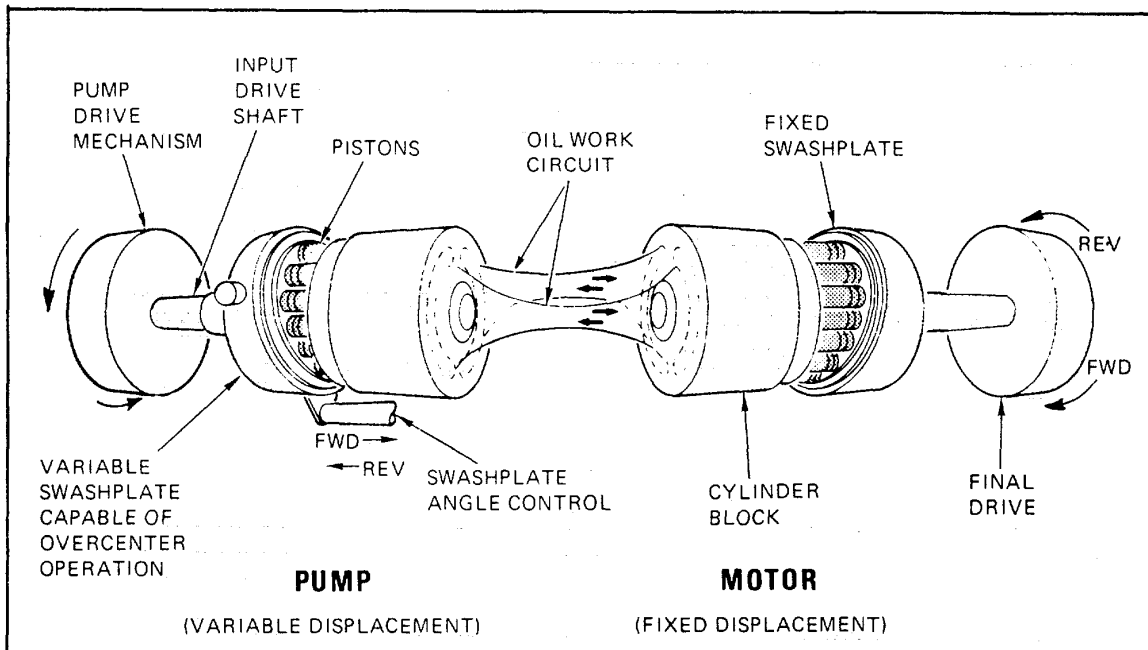


FIGURE 7-36.

SECTION 7 TRANSMISSION

7-119. The variable displacement hydrostatic pump consist primarily of a drive shaft, charge pressure relief valve, replenishing check valves, servo pistons, swashplate, cylinder block assembly and valve-bearing plate.

7-120. The pump drive shaft is splined into the center of the cylinder block. The cylinder block assembly contains nine (9) cylinder pistons. When the engine is running the cylinder block and pistons are always rotating.

7-121. Movement of the Direction-Throttle Control Bail causes the servo control circuit to act on the displacement control valves. These valves cause one or the other of the two (2) servo pistons to move the pump swashplate.

7-122. The pump swashplate can tilt either side of center. When the swashplate is exactly centered, the transmission is in neutral.

7-123. Each cylinder piston has a slipper plate at one end. The slipper retainer keeps all nine

(9) slippers in contact with the thrust plate which contacts the swashplate. When the swashplate is centered, the cylinder pistons do not stroke in the cylinders. When the swashplate is tilted, the cylinder pistons stroke. The degree of tilt determines the volume (displacement) of oil pumped by each cylinder piston.

7-124. The valve-bearing plate contains elongated ports that are in contact with the cylinder block. The opposite side of the valve-bearing plate mates with the pump end cap. Two ports in the end cap are connected through high-pressure lines to a hydrostatic motor.

7-125. When the swashplate is tilted, each cylinder piston moves back and forth in its cylinder with each revolution of the cylinder block. When a piston rotates past the inlet ports in the valve-bearing plate, it moves out of the block and draws low-pressure oil into the cylinder. This is the intake stroke of the piston. Further rotation of the cylinder block moves the filled cylinders toward the outlet ports in the valve-bearing plate. They are forced into the cylinder block by the tilt of the swashplate. The oil under high pressure ports to the outlet port in the end cap through the valve-bearing plate. With the swashplate tilted to either side of center, one side will be forward vehicle motion with one main circuit line to the motor being high-pressure and the other being return. The opposite tilt of the swashplate reverses the vehicle direction and it also reverses the

high-pressure and return functions of the main circuit lines.

7-126. When the transmission is in neutral, the swashplate in the hydrostatic pump is also in neutral and the cylinder pistons are not stroking. In this mode no oil is being pumped into the main circuit, therefore, the cylinder block assembly in the motor is stationary and the motor output shaft does not turn.

7-127. CHARGE PUMP.

7-128. A charge pump is a part of the hydrostatic pump assembly. Whenever the engine is running, oil is being drawn from the tank through the suction filter by the charge pump.

7-129. CHECK VALVES.

7-130. There are two (2) check valves in the hydrostatic pump assembly. With the transmission in neutral, both check valves will open allowing charge pressure to lubricate the system. With the transmission out of neutral, one of the valves will be closed and the other open. The valve on the high-pressure side of the main circuit will be held closed by high-pressure. The other valve will admit oil from the charge pump to the low-pressure side of the cylinder block assembly to maintain adequate oil in the loop.

7-131. SERVO CONTROL SYSTEM.

7-132. Control of swashplate angle (displacement) is accomplished in the hydrostatic pump by use of a powered servo system.

7-133. DISPLACEMENT CONTROL VALVE.

7-134. The Displacement Control valve assembly is a closed center four-way valve with the servo pressure ports exhausted at the center (neutral) position. The valve is operated through internal linkage connections with both the swashplate and the external control (Direction-Throttle Control Bail).

7-135. To put the pump in stroke, the control handle moves the displacement control spool through a torsion spring. Once the swashplate angle is set, a feed-back link returns the displacement spool almost to neutral where it ports just enough oil to the servo cylinder to keep the swashplate at the proper angle.

SECTION 7 TRANSMISSION

7-136. When the Direction-Throttle Control Bail is released, the displacement control spool tends to be returned to neutral by a spring.

7-137. SERVO CONTROL CYLINDERS.

7-138. The hydrostatic pump is equipped with two (2) servo cylinders. They are controlled by low-pressure oil directed from the displacement control valve.

7-139. When the pump is stroked, oil under charge pressure is ported to the servo cylinder. The piston moves the swashplate against the opposite servo spring. Both servo springs are constrained so that they can only force the swashplate toward neutral. When the swashplate has moved to the angle set by the control handle, the feed-back link returns the displacement control spool almost to neutral where it ports just enough oil to the servo cylinder to keep the swashplate at the proper angle. 7-140. When the Direction-Throttle Bail is released, the displacement control spool is returned to neutral by a spring. This allows oil from both servo cylinders to flow into the case through the small underlaps. Both servo cylinders are thus exhausted and one of the servo springs mechanically forces the swash-plate to neutral.

7-141. HYDROSTATIC MOTOR ASSEMBLY (see figure 7-36).

7-142. The fixed displacement motor is an axial-piston motor that converts fluid power (received from the variable displacement pump) into rotary mechanical power.

7-143. The fixed displacement motor is attached to the unit final drive mechanism at the right-hand side of the drive drum (as viewed from the rear of the unit). The ports of the variable displacement pump are connected to the motor through high-pressure hoses.

7-144. FIXED DISPLACEMENT HYDROSTATIC MOTOR.

7-145. The fixed displacement hydrostatic motor output is coupled to a final drive by a shaft extending through the center of the drive drum.

7-146. The hydrostatic motor converts high- pressure hydraulic power into rotary mechanical power. The motor shaft can rotate in either direction. The action of the hydrostatic pump reversing the direction of oil in the

main circuit reverses the direction of the motor output shaft.

7-147. The motor shaft and cylinder block assembly rotate together. The direction of rotation depends on the direction of the high-pressure oil entering the motor from the hydrostatic pump. High-pressure oil enters one of the motor main ports to push the cylinder pistons out of their cylinder and firmly against the motor swashplate. This action causes each piston slipper, which is protected by a thin film of oil to slide down the face of the thrustplate, rotating the entire cylinder block assembly. The cylinder block is splined to, and rotates the motor output shaft. As the cylinder block rotates and the filled cylinders pass the other main port, return oil flows to the hydrostatic pump at low-pressure. The speed at which the cylinder block rotates is determined by the volume of pump output oil.

7-148. MANIFOLD.

7-149. The manifold is connected across the high-pressure and low-pressure sides of the main circuit. It includes:

- (1) two high-pressure relief valves
- (2) a shuttle valve
- (3) a low-charge-pressure relief valve.

7-150. HIGH-PRESSURE RELIEF VALVES.

7-151. Two high-pressure relief valves are part of the manifold. They serve to prevent abnormal pressure surges in either of the two branch lines of the main circuit. They accomplish this by dumping oil from the high-pressure line to the low-pressure line. Situations such as rapid acceleration, abrupt braking and sudden application of load will activate the relief valves.

7-152. SHUTTLE VALVE.

7-153. At other than neutral setting, the shuttle valve establishes a connection between one of the low-charge-pressure relief valves and whichever branch of the main circuit is at low-pressure. This connection provides a control of charge pressure and a path for excess oil to escape to the cooling circuit. When the two branches of the main circuit are reversing their high-pressure and low-pressure functions, the spring-centered design of the shuttle valve closes the valve to prevent loss of

SECTION 7 TRANSMISSION

high-pressure oil.

7-154. LOW-CHARGE-PRESSURE RELIEF VALVE.

7-155. The low-charge-pressure relief valve works with the shuttle valve to control pressure in the charge circuit and to remove excess oil to the cooling circuit. This valve will allow additional oil to dump if the high-pressure relief valves cannot dump fast enough under excessive conditions. Excess oil will be ported through the drain circuit to the oil cooler. It is operative only when the transmission is **not** in neutral.

7-156. PRESSURE CHECKS.

7-157. Pressure checks are imperative in troubleshooting the hydraulic system.

7-158. CHECKING NEUTRAL CHARGE PRESSURE (see figure 7-37).

7-159. Neutral charge pressure can be checked at the transmission pump as follows:

a. Remove the threaded plug from the charge pressure port. Install a 600 PSI (40 kg/cm²) gauge equipped with a short section of hose. Make sure the gauge is accurately calibrated.

NOTE: Use a 7/16 x 20 o-ring adapter in the port.

b. Place the Direction-Throttle Control Bail in neutral.

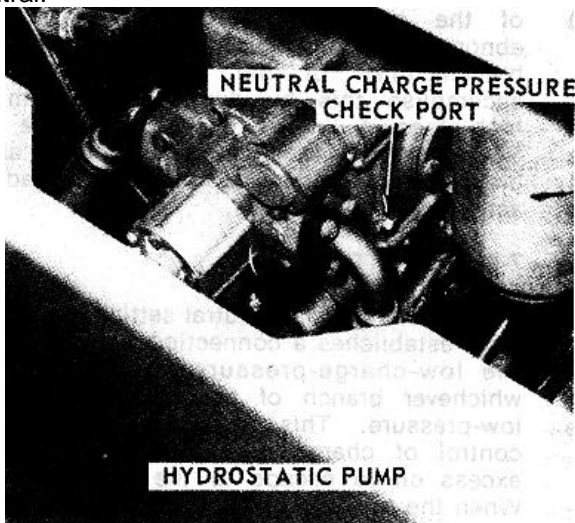


FIGURE 7-37.

c. Start the engine and increase speed to 1500 RPM. The gauge should indicate 190 to 220 PSI (13.36 to 15.47 kg/cm²) above case pressure with oil at operating temperature. If the pressure is not within the specified limits, troubleshoot the system as specified in Table 5-2B.

7-160. CHECKING LOW CHARGE PRESSURE (see figure 7-38).

7-161. The low charge pressure should be between 150 and 180 PSI (10.55 and 12.66 kg/cm²) above case pressure with oil at operating temperature, when the transmission is operating in forward or reverse. The low charge pressure relief valve is located in the motor manifold as shown in figure 7-38. Check the pressure as follows:

a. Remove the threaded plug from the Low Charge Pressure Check Port. Install a 600 PSI (40 kg/cm²) gauge equipped with a short section of hose. Use an o-ring adapter in the port. Make sure that the gauge is accurately calibrated.

b. Block the drive drum safely off the ground and start the engine.

c. Increase engine speed to 1500 RPM. Move the Direction-Throttle Control Bail slightly to

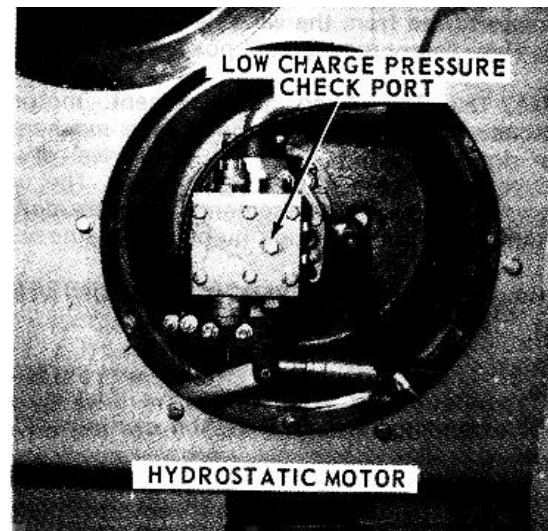


FIGURE 7-38.

SECTION 7 TRANSMISSION

the forward and reverse positions. The gauge should indicate 150 to 180 PSI above case pressure (10.55 to 12.66 kg/cm^2) in each direction.

d. If the pressure is not within the specified limits, replace the low charge pressure relief valve. If this fails to correct the pressure, troubleshoot the system as specified in Table 5-2B.

WARNING: Changing the quantity of shims in the relief valve is not recommended

7-162. CHECKING HIGH PRESSURE RELIEF (see figure 7-39).

CAUTION: Transmission should **NOT** be stalled at high pressure relief for periods longer than 15 seconds.

7-163. The pressure in the high-pressure lines should be 5500 PSI (386.7 kg/cm^2) when the transmission is in a stalled condition. Two (2) high-pressure relief valves are located in the motor manifold as shown in figure 7-39. Two (2) check ports are located at the side of the manifold for checking the setting of the relief valves. Check the high-pressure valves as follows:

WARNING: In order to check the high-pressure relief valves it is necessary to bring the unit to stall. CAUTION must be taken to ensure the safety of personnel when attempting to stall the unit.

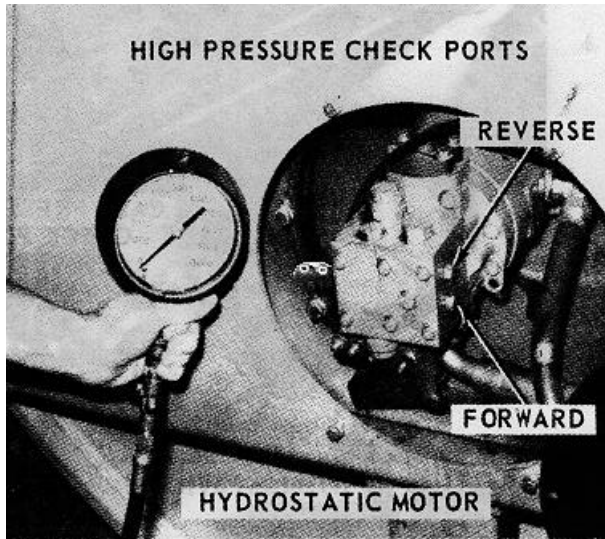


FIGURE 7-39.

- a. Movement of the unit must be safely restricted.
- b. Remove the cover from the right-hand side of the frame at the drive drum.
- c. Connect a 10,000 PSI (700 kg/cm^2) gauge to the REVERSE check port (see figure 7-39).
- d. Start the engine and set Park Brake. Increase engine speed to 1500 RPM.
- e. Slowly move the Direction-Throttle Control Bail in the Reverse direction from neutral and bring the unit to stall. Observe the pressure gauge. With the transmission stalled, the gauge should indicate 5500 PSI (386.7 kg/cm^2). If not, stop the engine and remove the two (2) high-pressure relief valves. It will be necessary to disconnect the two (2) high-pressure hoses.
- f. Reverse the relief valves in the manifold ports and recheck at the REVERSE check port. If the pressure is normal, replace the relief valve originally removed from the reverse side of the manifold. If the pressure remains abnormal, troubleshoot the transmission as specified in Table 5-2B.

WARNING: Changing the quantity of shims in the relief valves is not recommended.

- g. If pressure reading at Reverse port was normal then connect the gauge to the FORWARD check port (see figure 7-39).
- h. Start the engine again and increase speed to 1500 RPM.
- i. Slowly move the Direction-Throttle Control Bail in the Forward direction from neutral and bring the unit to stall. Observe the pressure gauge. With the transmission stalled, the gauge should indicate 5500 PSI (386.7 kg/cm^2). If not, stop the engine and remove the two (2) high-pressure relief valves.
- j. Reverse the relief valves in the manifold ports and recheck the pressure at the FORWARD port. If the pressure is normal, replace the relief valve originally removed from the forward side of the manifold. If the pressure remains abnormal, troubleshoot the system as specified in Table 5-2B.
- k. Stop the engine and disconnect the gauge. Install all plugs and tighten all fittings

**SECTION 7
TRANSMISSION**

securely.

7-164. CHECKING CONTROL PRESSURE (see figure 7-40).

7-165. The control pressure can be checked at the transmission pump as follows:

a. Remove the threaded plugs from the two check ports and install a 600 PSI (40 kg/cm²) gauge equipped with a short hose in each port. Make sure that the gauges are accurately calibrated.

b. Place the Direction-Throttle Control Bail in neutral. Block the drive drum safely off the ground.

c. Start the engine and set speed at approximately 1500 RPM with the transmission in neutral. Shift the Direction-Throttle Control Bail to the forward position and observe the gauge. The pressure should be 45 PSI (3.2 kg/cm²) initially, then gradually reach charge pressure. Shift the Control Bail to the reverse position. The gauge should indicate 45 PSI (3.2 kg/cm²) initially, then gradually reach charge pressure.

d. If the pressures in both the forward and reverse directions is not as specified, the control valve assembly may be dirty or defective. If the pressure is abnormal in one direction only, the associated servo piston may be leaking.

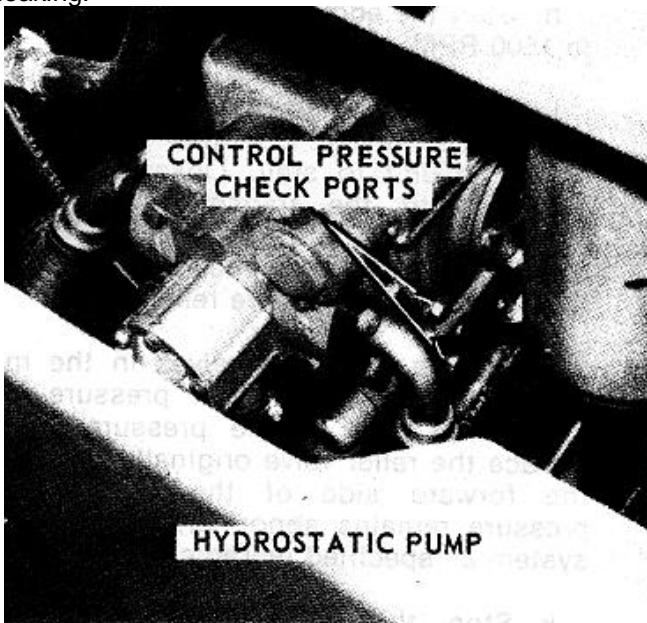


FIGURE 7-40.

7-166. CHECKING CASE PRESSURE (see figure 7-41).

7-167. Case pressure should not be greater than 40 PSI (2.8 kg/cm²). Attach adequate gauge to either pump or motor case as shown in figure 7-11.

7-168. VACUUM CHECK

7-169. The suction filter is equipped with a vacuum gauge which indicates flow from the tank to the charge pump. The maximum vacuum at the charge pump inlet should not exceed ten inches (254 mm) of mercury at normal operating conditions. During cold start-up it is acceptable to have a higher reading. The unit should not be operated until hydraulic oil is at normal operating temperature and vacuum is below 10 inches (254 mm) of mercury.

7-170. ADJUSTMENTS.

7-171. DISPLACEMENT CONTROL VALVE NEUTRAL ADJUSTMENT (see figure 7-42).

WARNING: The drive drum **MUST** be safely blocked off the ground. Any movement of control valve spool causes the unit to shift out of neutral and the drum will turn. Caution personnel to stand clear of the drive drum.

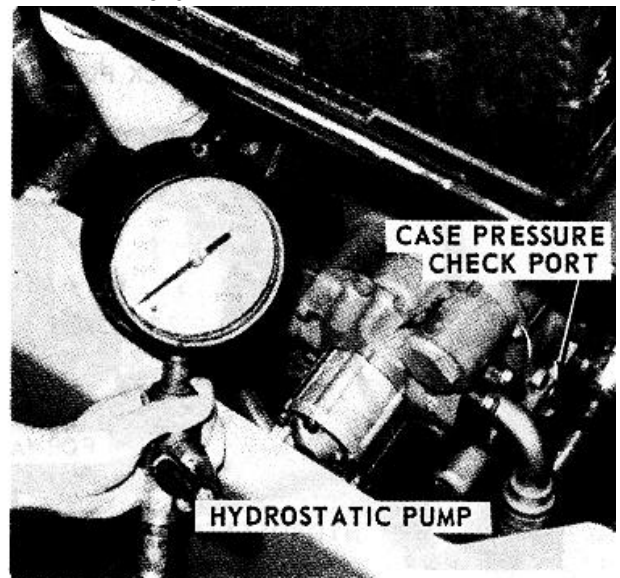


FIGURE 7-41.

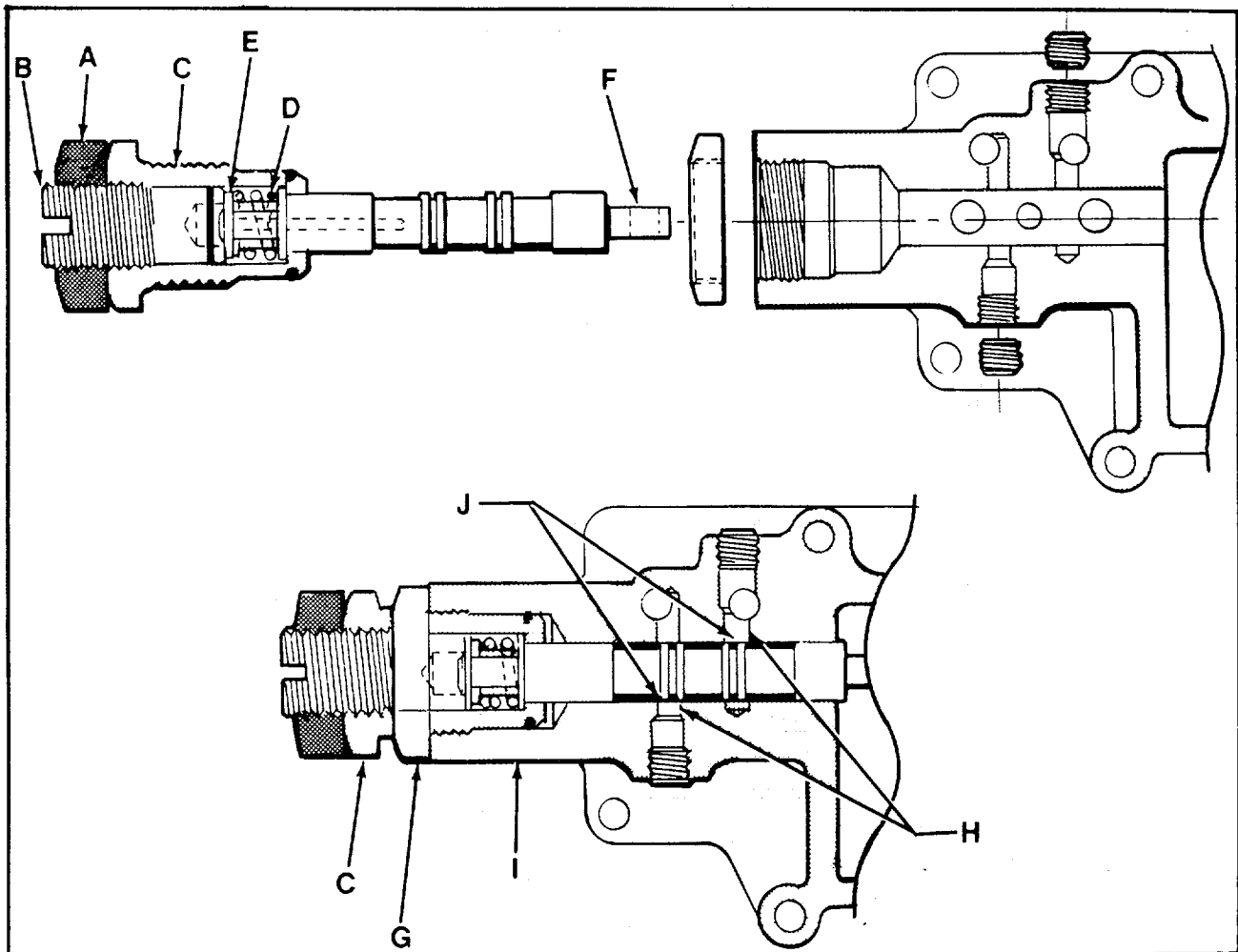


FIGURE 7-42

a. Remove end play from centering spring mechanism with lockout (Ref. A) loose and holding the centering spring housing (Ref. C), turn the spring adjusting screw (Ref. B) until the screw is just touching the centering spring washer; thus taking the free end play out of the centering spring mechanism. This is best done by exerting a light back and forth force on the control valve spool (Ref. F) at the same time adjusting screw is being turned down. Care must be taken not to compress the centering spring (Ref. D) beyond its installed height. Tighten the locknuts (Ref. A) and recheck the spool (Ref. F) for end play.

b. Adjust control valve spool for neutral position. Remove the 7/16 x 20 straight thread o-ring plugs on either side of the control valve housing (Ref. I) to reveal the servo cylinder porting holes (Ref. H). Loosen locknut (Ref. G) and adjust the control valve by screwing the centering spring housing (Ref. C) in or out so that the open areas (shaded areas of Ref. J) between the spool

lands and sides of the porting holes are equal. Tighten locknut (Ref. G), recheck the open areas and reinstall the two 7/16 x 20 plugs.

7-172. TRANSMISSION CONTROL LINKAGE ADJUSTMENT (see figure 7-43).

a. Place Direction-Throttle Control Bail in neutral (vertical) position. Adjust control cable at pump so that jam nut on end of cable has full thread engagement and no more. Tighten jam nut securely. Loosen jam nut on engine flywheel housing and adjust cable so that the swivel on the servo pump control arm is centered in the bracket. Tighten jam nut securely. Measure distance between swivel bracket and external cable end. These must be a minimum of 13/32 in.(27.69 mm). Refer to figure 7-43.

SECTION 7
TRANSMISSION

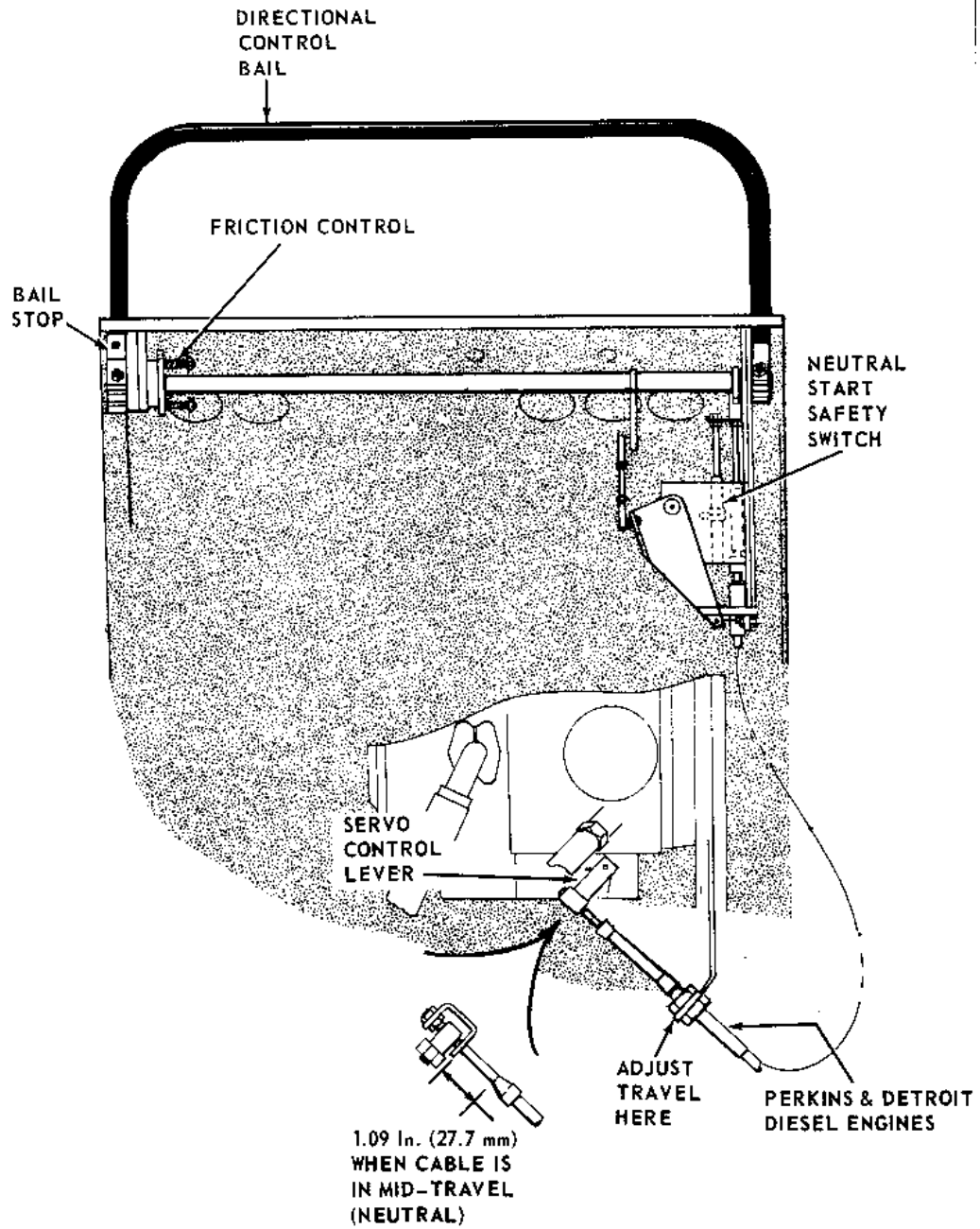


FIGURE 7-43.

SECTION 7 TRANSMISSION

b. Adjust and tighten ball joint of control cable at bail shaft end. Adjust neutral start safety (transmission lockout) switch so that it makes contact in neutral.

c. Move Direction-Throttle Control Bail in the forward direction until control cable at servo lever has traveled 11/16 - 31/32 in. (24.64 - 26.92 mm). Adjust ball stops so that cable cannot be moved beyond this point.

d. Repeat step c in reverse direction.

CAUTION: Ensure that the amount of ball (control cable) travel is limited by bail stops and not the interval servo stops.

e. Return Direction-Throttle Control Bail to neutral (vertical) position.

f. Adjust and tighten wire stop at throttle crank for

1/16 in. (1.59 mm) gap between swivel and wire stop (see figure 7-44).

g. Adjust ball joint in slotted crank on bail shaft to allow full throttle when bail is moved to either full forward or full reverse.

h. Adjust friction control nuts and spring assembly so that Direction-Throttle Control Bail will remain in any desired position.

7-173. THROTTLE CONTROL LINKAGE ADJUSTMENT PROCEDURE (see figure 7-44).

a. Adjust transmission control linkage per procedure outlined in paragraph 7-172 (Sundstrand).

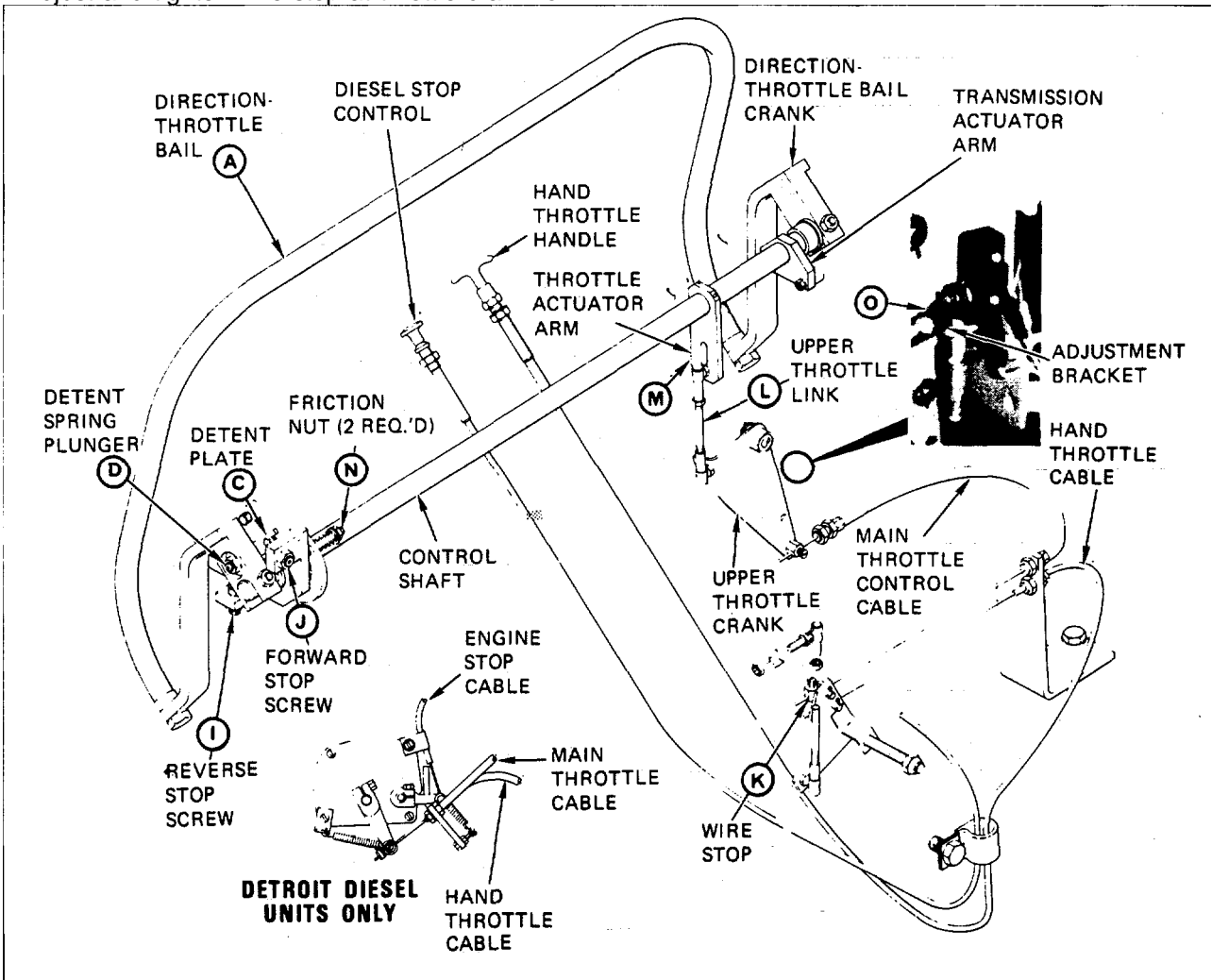


FIGURE 7-44

SECTION 7 TRANSMISSION

b. Place Direction-Throttle Bail in detonated neutral position.

c. Adjust wire stop (A) at lower throttle crank for 1/16 in. (1.59 mm) gap between swivel and wire stop.

d. Adjust position of upper throttle link (B) ball joint in slot of throttle actuator arm (C) so that full stroke of throttle is obtained when Direction-Throttle Bail is stroked from stop to stop. LENGTHEN upper throttle link (B) to reduce throttle stroke or SHORTEN link to increase throttle stroke.

NOTE: Throttle stroke should be identical in forward and reverse. Check for bent or binding linkage if a problem exists.

e. Adjust friction nuts (D) so Direction Throttle Bail will stay in any position.

f. Adjust the neutral safety switch adjustment bracket (E) so that the switch will just barely be activated when the Direction-Throttle Bail is in neutral position.

7-174. TRANSMISSION REPAIR.

7-175. Should it become necessary to perform repairs to the Sundstrand transmission during the warranty period, certain parts, components or kits may be replaced without affecting or violating the warranty.

7-176. The following parts, components or kits may be replaced in the field as an assembly without affecting, violating or voiding the transmission warranty:

- a. Charge pump
- b. Check valves
- c. Motor manifold assembly
- d. High-pressure relief valves
- e. Displacement control valve (pump)
- f. Pump or motor shaft seals

7-177. The proper procedures for replacement of the above components are presented in the following paragraphs.

NOTE: Unauthorized repairs to transmission components other than those listed in paragraph 7-176 may void the warranty. Contact Hyster Company before attempting to perform repairs other than those presented in this manual.

CAUTION: When working on all hydraulic equipment, cleanliness is very important. Before removing any of the transmission components, clean the immediate area to

prevent dirt from entering the transmission.

CAUTION: Whenever a component of the hydrostatic system has been removed, the transmission start-up procedure **MUST** be performed before the unit can be started, operated or returned to service.

7-178. HYDROSTATIC PUMP REMOVAL (see figure 7-45).

a. Remove the suction line at the filter and plug or cap hose and fitting.

b. Disconnect control linkage from servo control lever.

c. Disconnect the hydraulic lines at the top of the pump.

d. Disconnect the high-pressure lines from the pump end housing. Plug or cap all hoses and fittings.

WARNING: Use a hoist and sling arrangement to support the weight of the pump.

e. Remove the capscrews securing the pump to mount plate.

f. Pull pump straight back and tilt shaft end of pump up enough to lift pump from unit.

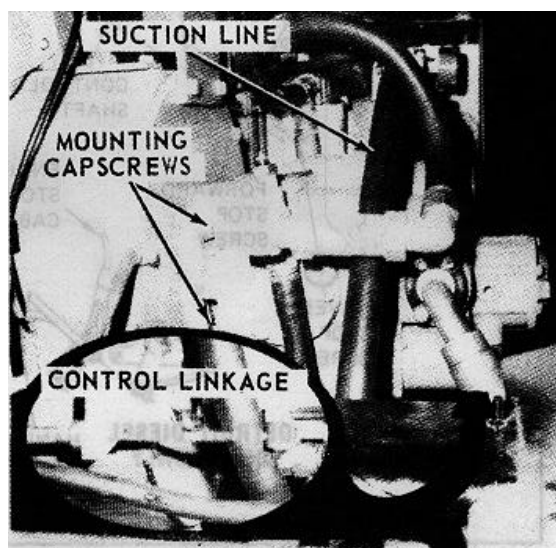


FIGURE 7-45.

SECTION 7 TRANSMISSION

- g. Plug or cap all ports to prevent contamination.

7-179. REMOVAL OF HYDROSTATIC MOTOR (see figure 7-46).

- a. Remove hydrostatic motor inspection plate on the right-hand side of the frame.
- b. Disconnect high-pressure lines. Plug or cap ports on hoses. Remove the by-pass valve linkage.
- c. Support the hydrostatic motor and remove the four (4) motor mounting bolts.
- d. Carefully pull the motor far enough out of the motor carrier to remove the case drain line. Plug or cap all hoses and ports to prevent contamination of the hydrostatic system.

7-180. REPLACEMENT OF CHARGE PUMP.

7-181. REMOVAL (see figure 7-47).

- a. Remove the line connecting the charge pump to the reservoir and plug to prevent draining of the reservoir. Remove the connector fitting.
- b. Remove the four (4) capscrews.

NOTE: Do not remove the capscrews at the top and bottom of the charge pump (see figure 7-47).

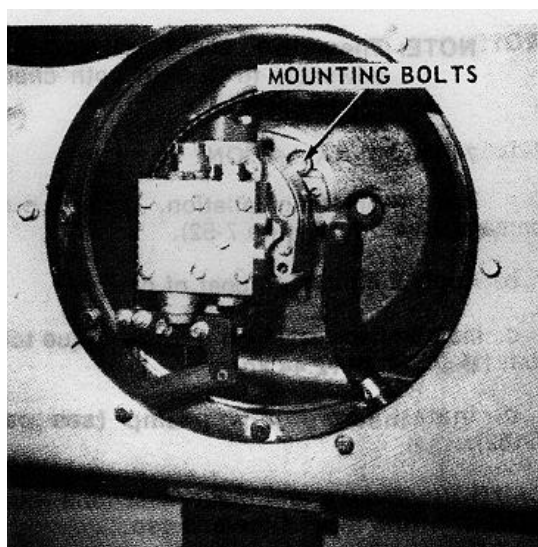


FIGURE 7-46.

- c. Pull charge pump away from the main pump. Use caution not to drop aluminum spacer.

CAUTION: Do not use sharp tools to pry charge pump from main pump. A scratch on the sealing surface may cause leakage. If charge pump does not pull loose, tap **LIGHTLY** on the side of the charge pump with a plastic hammer to break paint or gasket seal.

7-182. INSTALLATION (see figures 7-48 and 7-49).

- a. Install a new gasket. Make sure that the new gasket is properly installed as shown in figure 7-48. If positioned wrong, the relief valve port will be covered by the gasket.
- b. Line the drive tank on charge pump shaft with the slot on the main pump shaft (see figure 7-49). The charge pump should assemble freely with the main pump. Do not force charge pump into position. Hold aluminum spacer in position with fingers to prevent its dislodging.
- c. Torque the four (4) mounting bolts 10-11 ft. -lbs. (1 38-1.52 kg-m).
- d. Install the connector to charge pump and torque to 14-20 ft.-lbs. (1.93-2.76 kg-m).
- e. Install the line from the reservoir to the connector on the charge pump.

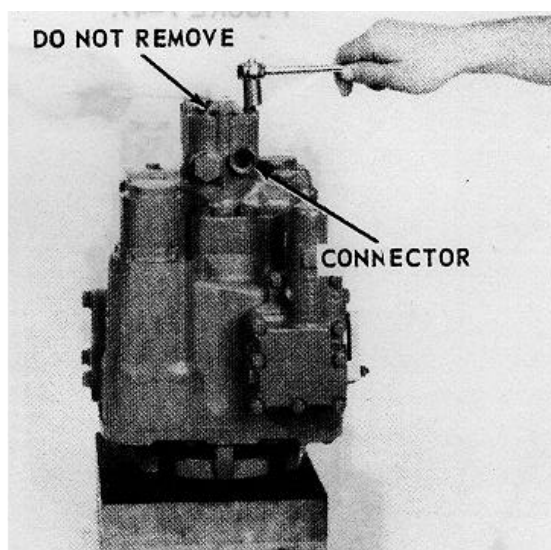


FIGURE 7-47.

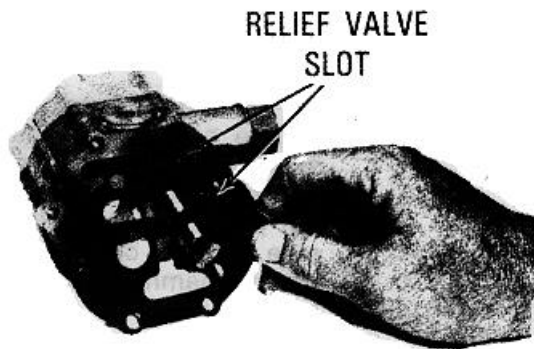


FIGURE 7-48.

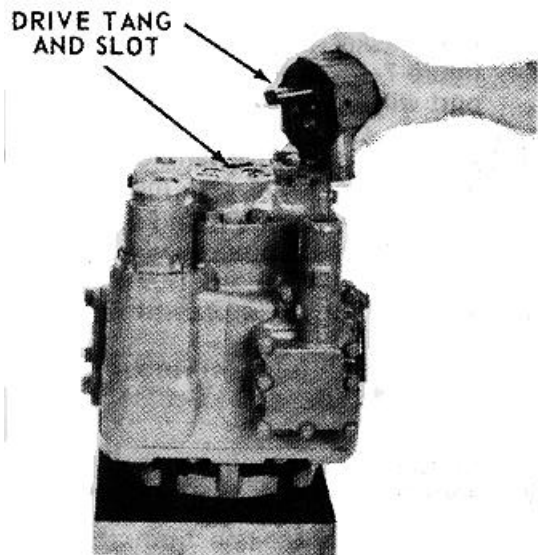


FIGURE 7-49.

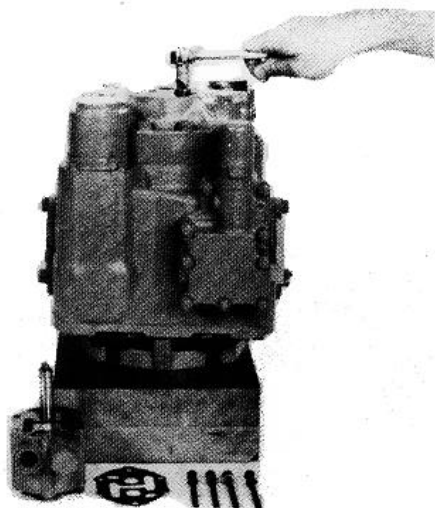


FIGURE 7-50.

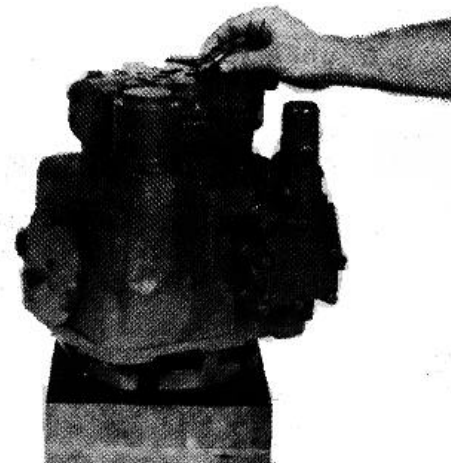


FIGURE 7-51.

NOTE: Excessive tightening may distort the charge pump and cause leakage or malfunction.

- f. Check oil level in the reservoir.

7-183. REPLACEMENT OF CHECK VALVES.

7-184. REMOVAL.

- a. Remove the charge pump (see paragraph 7-181).
- b. Using a drag link, unscrew check valve from end cap (see figures 7-50 and 7-51).

NOTE: There are two check valves. It is advisable to replace both check valves at the same time.

7-185. INSTALLATION.

- a. Prior to installation, inspect o-rings for damage (see figure 7-52).
- b. Apply a light coat of oil.
- c. Install check valves and torque to 80-90 ft.-lbs. (11.06-12.44 kg-m).
- d. Install charge pump (see paragraph 7-182).

CAUTION: The valves must assemble below the face of the end cap.

7-186. REPLACEMENT OF BY-PASS VALVE AND MOTOR MANIFOLD.

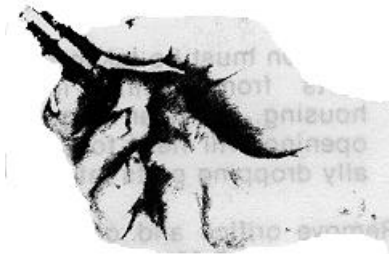


FIGURE 7-52

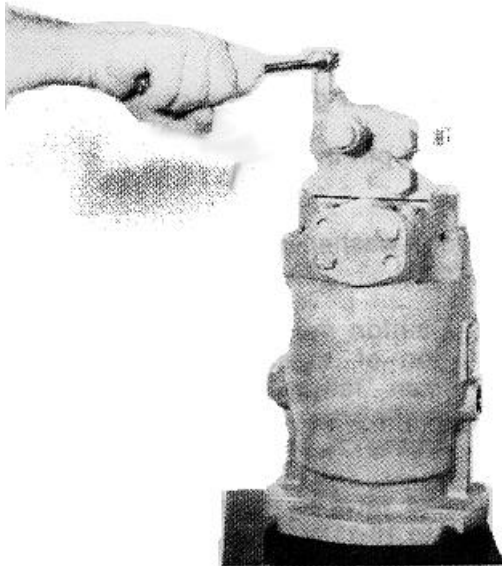


FIGURE 7-53.

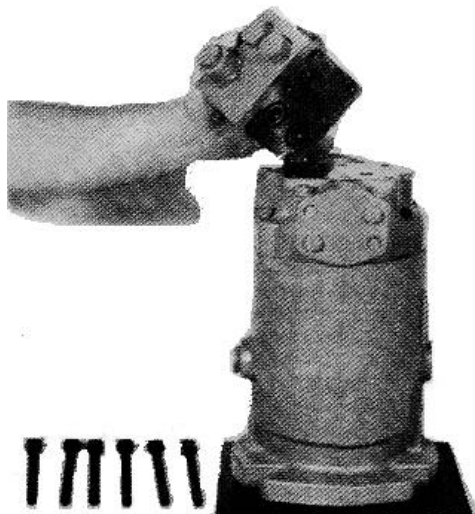


FIGURE 7-54.

7-187. REMOVAL.

a. Prior to removal of the manifold assembly remove all dirt and clean the area where manifold assembly is attached to the end cap.

b. Place drain pan under manifold to catch oil. Remove by-pass valve linkage.

c. Remove the four (4) corner bolts holding the manifold to motor end cap (see figure 7-53).

d. Grasp manifold to prevent it from dropping and remove the remaining two (2) mounting bolts (see figure 7-54). There is no gasket between the manifold and the end cap. Sealing is obtained by o-rings and back-up rings.

7-188. INSTALLATION.

a. Use new o-rings and back-up rings.

b. The two grooves side by side on manifold assembly (see figure 7-55) require an o-ring and a back-up ring (one of each per groove).

The o-ring goes into the groove first. Then install the back-up ring on top of the o-ring. The flat side of the back-up ring faces away from the o-ring.

c. The groove positioned by itself (see figure 7-55) requires only an o-ring.

d. Place the manifold against the motor end cap. Install the bolts while making certain that

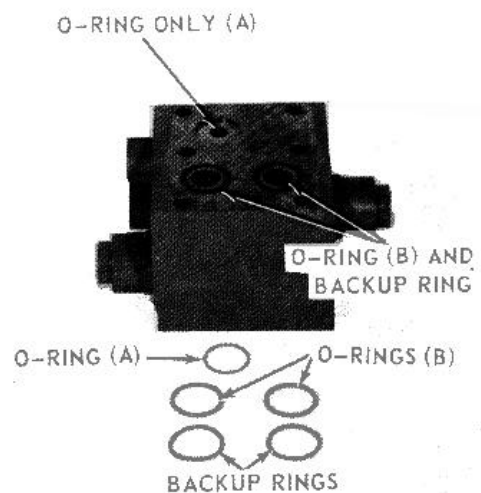


FIGURE 7-55.

SECTION 7 TRANSMISSION

the o-rings do not slip from their- grooves. Torque bolts to 19-21 ft.-lbs. (2.66-2.90 kg-m).

7-189. REPLACEMENT OF HIGH-PRESSURE RELIEF VALVES.

7-190. REMOVAL.

a. Apply a wrench on HEX portion of the valve and unscrew from manifold block (see figures 7-56 and 7-57).

NOTE: There are two relief valves in the manifold block.

7-191. INSTALLATION.

a. Prior to installation, inspect o-rings and back-up rings for damage.

b. Apply a lubricant to the o-ring and install in the manifold block.

c. Torque valves to 20 ft.-lbs. (2.76 kg-m).

7-192. REPLACEMENT OF DISPLACEMENT CONTROL VALVE.

7-193. REMOVAL.

a. Remove the control linkage from the displacement control valve assembly.

b. Remove the nine (9) capscrews holding the valve to the pump housing (see figure 7-58).

c. Lift the valve away from the housing and remove the cotter pin and washer (see figure 7-59). Remove pin

NOTE: Caution must be taken to prevent these parts from falling into the pump housing. A clean rag placed in the opening will help to prevent accidentally dropping parts into housing.

d. Remove orifice and o-rings from control valve (see figure 7-60). Check to ensure that orifice is open.

7-194. INSTALLATION.

a. Install orifice tip down, and new o-rings in control valve.

b. Install new gasket on control valve (dry).

c. Install pin in control valve links and pump links.

d. Place washer in pin, install the cotter pin and spread.

NOTE: Caution must be taken during installation of these parts to prevent them from falling into the unit. Lightly coating the parts with petroleum (**NOT** grease) is advised.

e. Install valve to motor and torque the nine (9) bolts to 10-11 ft.-lbs. (1.38-1.52 kg-m).

7-195. REPLACEMENT OF MOTOR OR PUMP SHAFT SEAL.

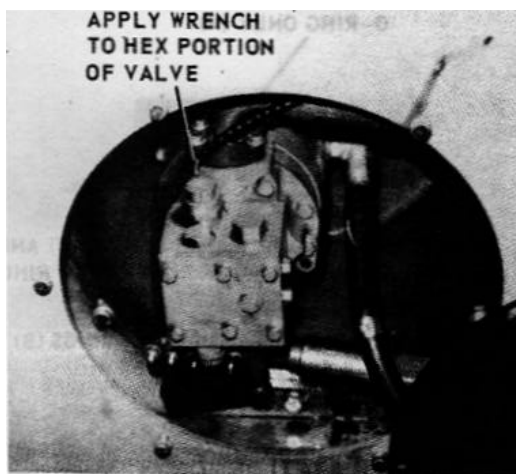


FIGURE 7-56.

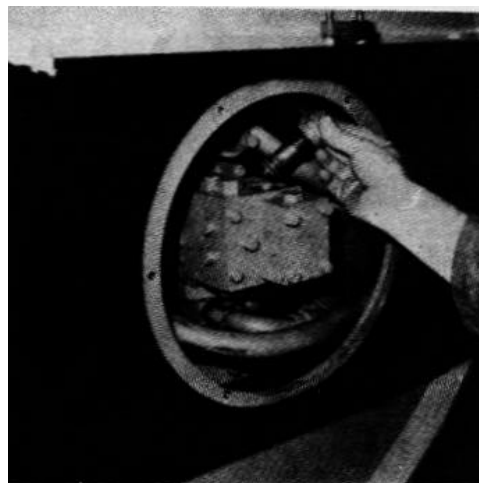


FIGURE 7-57.

**SECTION 7
TRANSMISSION**

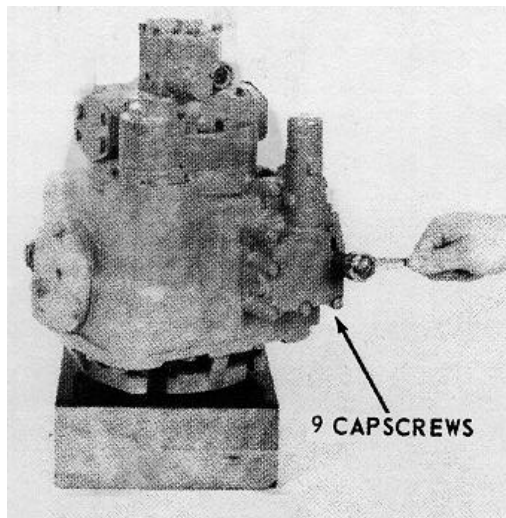


FIGURE 7-58.

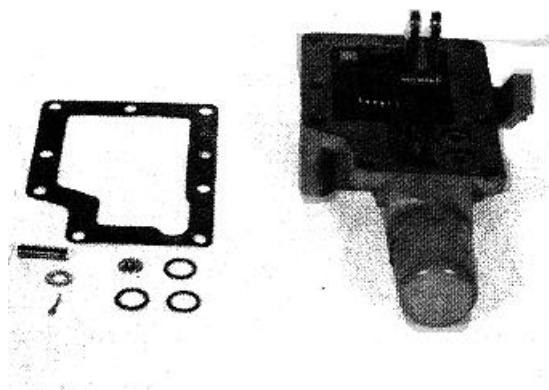


FIGURE 7-60.

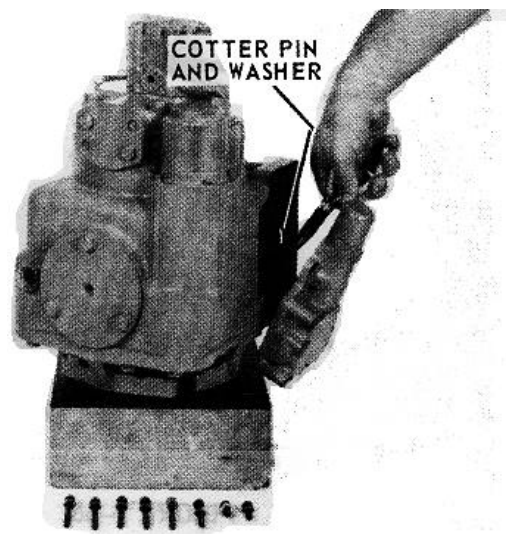


FIGURE 7-59.

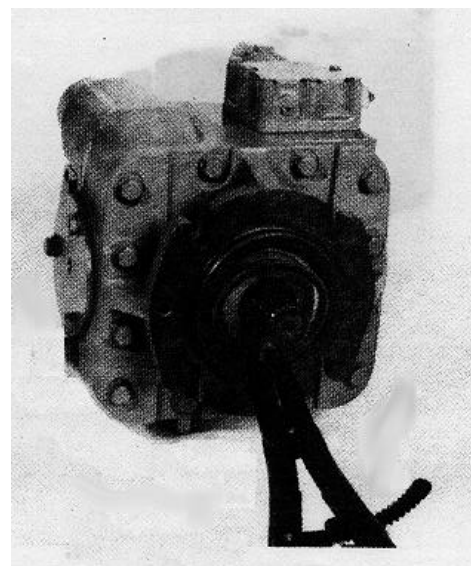


FIGURE 7-61.

7-196. REMOVAL.

- a. Disconnect hoses and remove pump or motor from unit.
- b. Insert Tru-Arc #7 pliers in snap ring holes, compress the ring and roll it out (see figure 7-61).
- c. Remove the aluminum seal retainer with a screwdriver (see figure 7-62).
- d. Remove the steel stationary seal. This seal will usually come out with the retainer

(see figure 7-63).

- e. With fingers or two screwdrivers remove bronze rotating part of the seal from drive shaft (see figure 7-64).

CAUTION: Use care not to damage bronze rotating ring or shaft splines.

- f. See figure 7-63 and account for all the parts shown.

7-197. INSTALLATION.

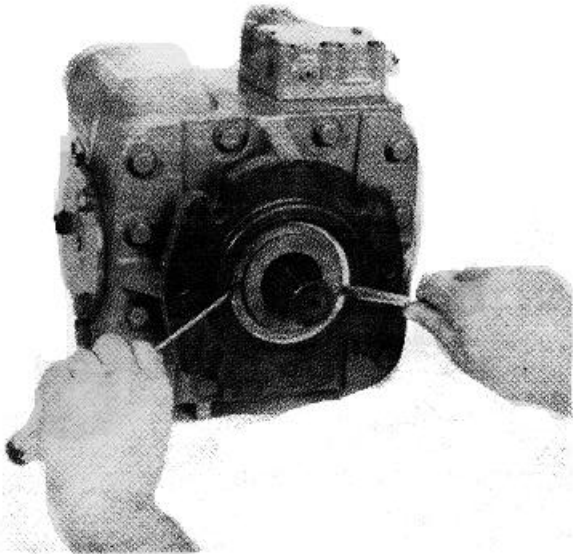


FIGURE 7-62.

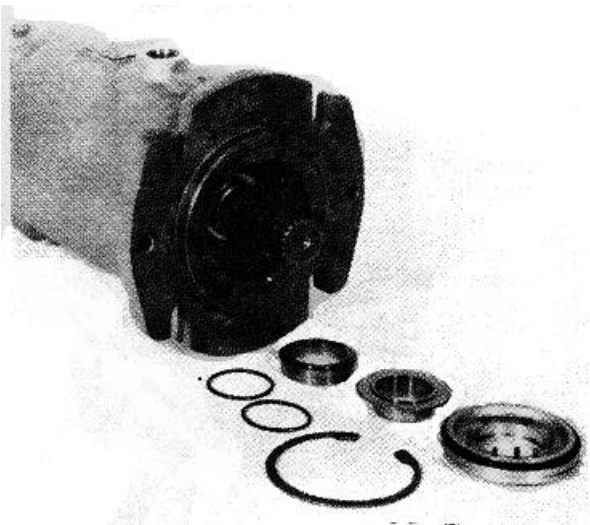


FIGURE 7-63.

CAUTION: Always replace both stationary and rotating parts of the seal. DO NOT mix old and new parts.

- a. Wash and clean air dry new seal parts.
- b. Install the seal springs into the aluminum seal retainer. Install the new o-rings (dry) on stationary steel part of seal into retainer so notch is located in pin in retainers (see figure 7-65).
- c. Install large o-ring O.D. of retainer (see figure 7-65).



FIGURE 7-64.



FIGURE 7-65.

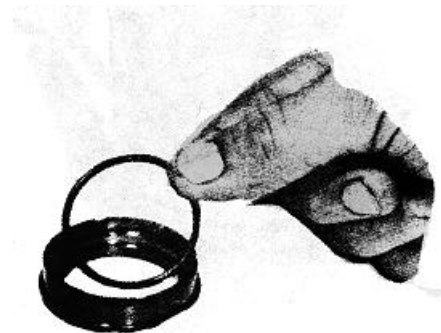


FIGURE 7-66.

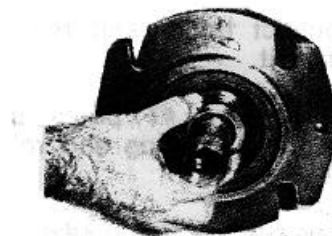


FIGURE 7-67.

SECTION 7 TRANSMISSION

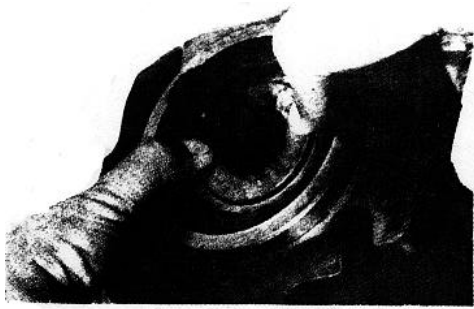


FIGURE 7-68.

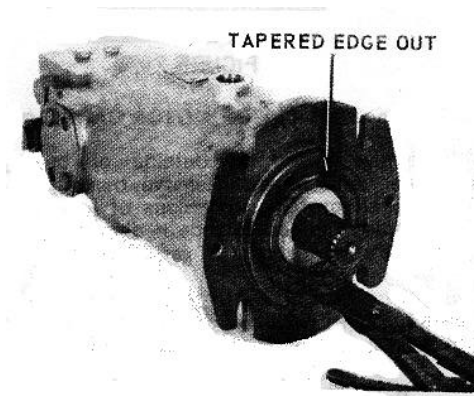


FIGURE 7-69.

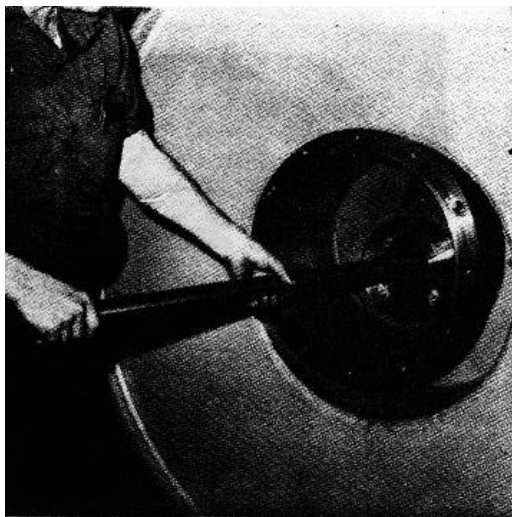


FIGURE 7-70.

d. Install new o-ring in I.D. of bronze rotating part of seal (see figure 7-66).

e. Wrap a piece of plastic around the drive shaft and slide the rotating bronze part over the shaft making sure it is sealed. Do not press on seal surface (see figure 7-67).

f. Install stationary seal and retainer into place and press the retainer in so the snap ring groove is open (see figure 7-68).

g. Close the snap ring with pliers. Install snap ring with tapered edge out.

h. For ease of installation, start snap ring in groove with the side opposite the snap ring holes (see figure 7-69).

7-198. REMOVAL OF DRIVE DRUM.

a. Complete the hydrostatic motor removal procedure presented in paragraph 7-179 (Sundstrand). Remove the drive shaft from the center of the drum (see figure 7-70).

b. Support the frame on both sides at the rear of the unit. Block the unit at the front and rear of the guide roll to prevent movement.

WARNING: The brake assembly will be removed prior to drum removal. Block the machine safety to prevent movement.

c. Complete brake assembly removal procedure presented in Section 10, paragraph 10.

d. Drain the final drive lubricant (refer to Section 4).

e. Remove the flange anchor capscrews. Before removing the hub capscrews, pull the anchor flange using the puller holes provided and appropriate capscrews. At the same time pry between the right side frame and drum moving the motor housing out of the side frame pilot (see figure 7-71).

f. Remove the hub (12 point) capscrews (C350B only) from the anchor flange and remove the flange from the drive drum. Then remove the brakeshaft outer snap ring (C350B only). Push brakeshaft in so that it will clear the frame for drum removal (see figure 7-72).

g. Carefully lift the drive drum from the unit. An alternate procedure is to remove the scraper beam at the rear of the unit and roll the drive

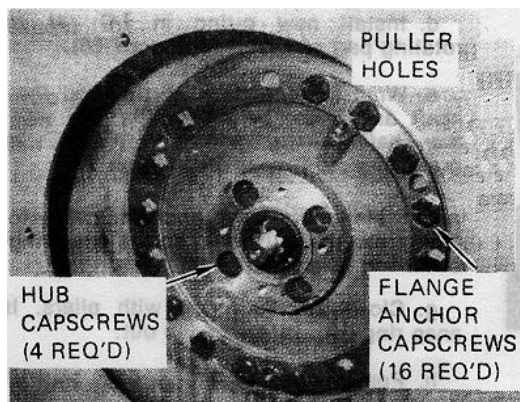


FIGURE 7-71.

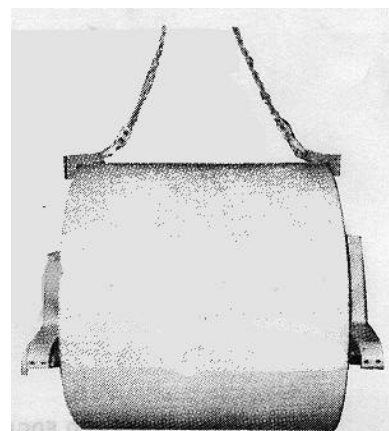


FIGURE 7-73.

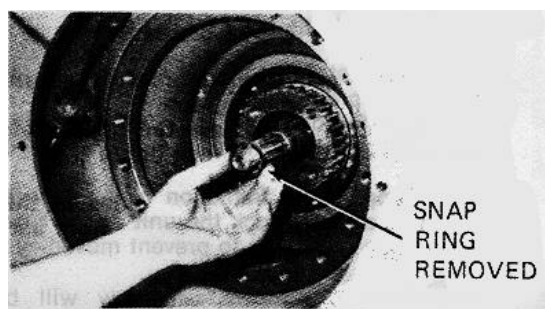


FIGURE 7-72.

7-200. DISASSEMBLY OF MOTOR CARRIER.

a. Remove o-ring on outside of bearing carrier for replacement. Remove bearing lock plate and shims. Check flatness of lock plate with a straight edge. Replace if deformed (see figure 7-75).

b. Lift off bearing carrier, upper bearing, and seal from motor housing. Tag the bearing cone with its respective cup (see figure 7-76).

c. Inspect the bearings, cups and cones. Remove bearing from the carrier and replace if the rollers or cups are worn, pitted or damaged in any way (see figure 7-77).

drum out of the rear of the unit taking care not to damage machined surfaces (see figure 7-73).

CAUTION: Care must be taken not to damage machined surfaces.

WARNING: The drive drum is extremely heavy (approximately 12,000 lbs. (5,440 kg) without ballast.) Caution personnel in area to stand clear.

7-199. REMOVAL OF MOTOR CARRIER.

a. Complete the drive drum removal procedure presented in paragraph 7-198.

b. Remove the motor carrier-to-drum mounting cap screws by turning the carrier and aligning the hole in carrier with cap screws (see figure 7-74).

WARNING: Support the motor carrier with hoist and sling arrangement.

c. Using the puller holes provided, pull the carrier and lift from unit.

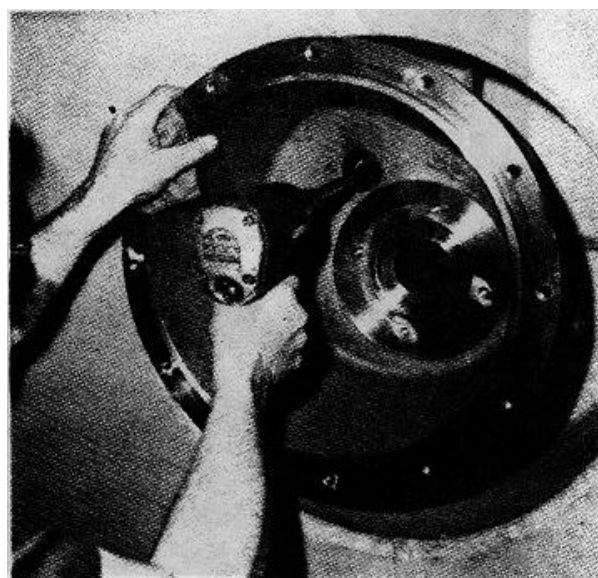


FIGURE 7-74.

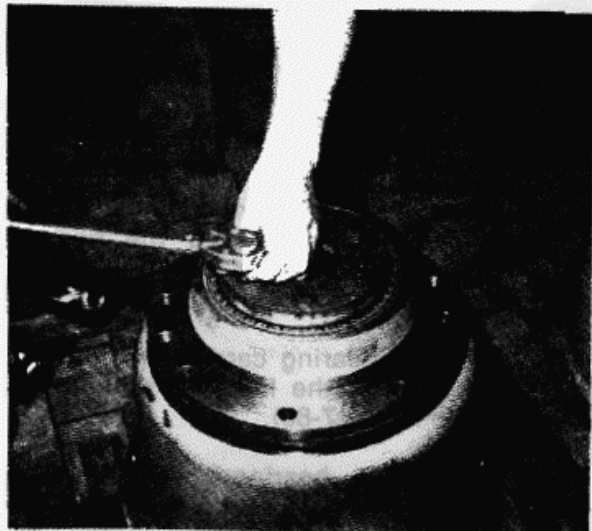


FIGURE 7-75.

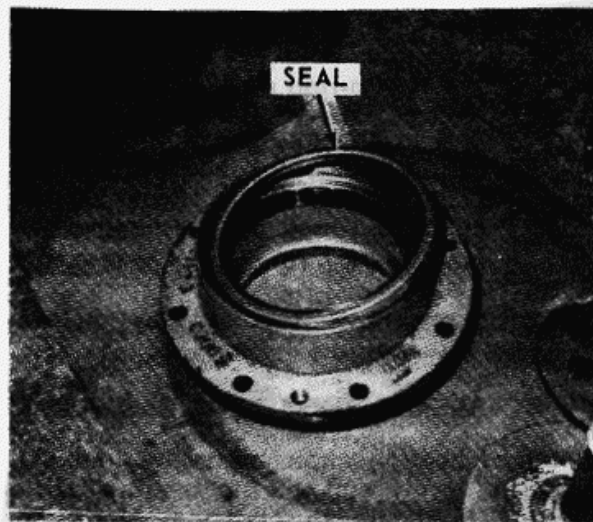


FIGURE 7-78.

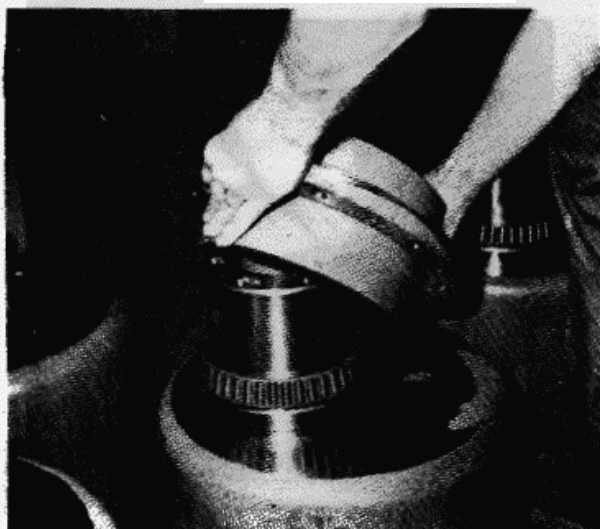


FIGURE 7-76.

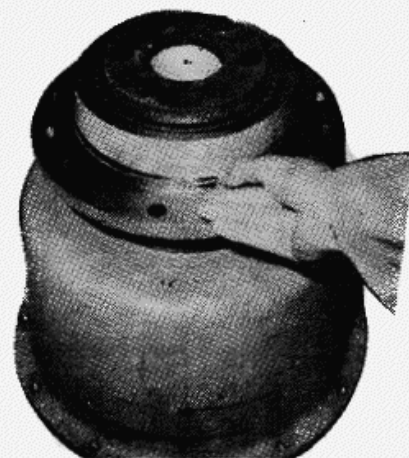


FIGURE 7-79.

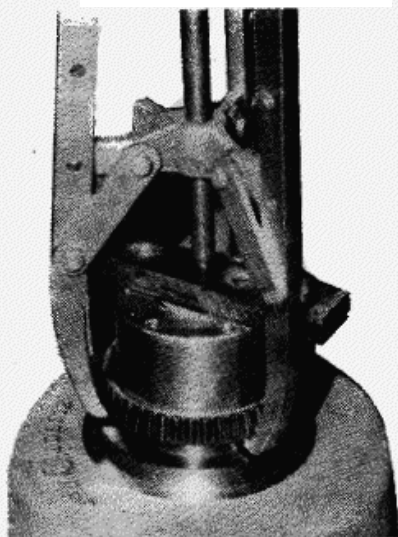


FIGURE 7-77.



FIGURE 7-80.

SECTION 7 TRANSMISSION

d. Remove oil seal for replacement.

CAUTION: The o-ring and oil seal in the motor side of the drive drum play a critical part in preventing premature failure of drum support bearing and the planetary system. These seals should be replaced during overhaul (see figure 7-78).

e. Replace o-ring if required by inspection in step c (see figure 7-79).

7-201. REASSEMBLY OF MOTOR CARRIER.

a. If new bearing cups are to be installed, press them firmly against the bearing carrier shoulders. Lubricate the bearings and cups with light machine oil or grease (see figure 7-80).

b. Install a new oil seal with a press. Avoid use of drifts and hammers. They may easily damage component parts. Lubricate the oil seal lip (see figure 7-81).

c. Install bearing on housing by heating slightly if necessary. Seat the bearing cone firmly against the motor housing shoulder (see figure 7-82).

d. Set the bearing carrier with bearing cups and oil seal on the housing mounted bearing cone (see figure 7-83).

e. Place the bearing cone around motor housing hub and seat it into the bearing cup (see figure 7-84).



FIGURE 7-81.



FIGURE 7-83.

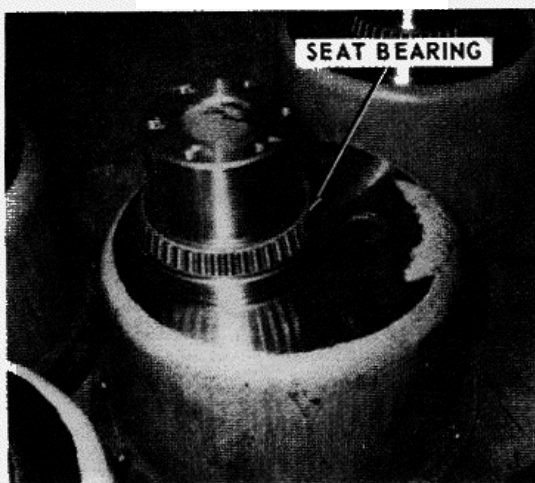


FIGURE 7-82.

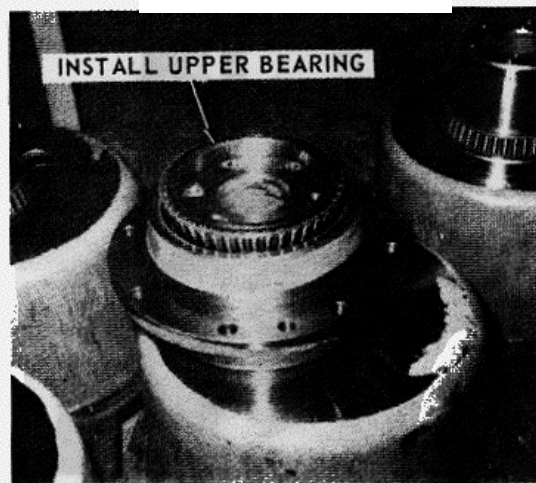


FIGURE 7-84.

SECTION 7 TRANSMISSION

NOTE: Rotate the bearing carrier on the motor housing hub to insure proper seating of the bearing and the oil seal lip.

f. Temporarily install the bearing retainer plate and torque the capscrews to 25 ft.-lbs. (3.457 kg-m). Rotate the bearing retainer on the motor housing hub to insure proper seating of the bearings (see figure 7-85).

g. Remove the bearing retainer plate and place a straight edge across the end of the motor housing hub and bearing cone. With a feeler gauge measure the

distance between the motor housing hub and the straight edge (see figure 7-86).

h. Assemble a shimpack equaling measurement determined in step g plus .001 in. (.025 mm). Replace the bearing retainer plate and torque capscrews to 105 ft.-lbs. (14.521 kg-m) (see figure 7-87).

i. Install the o-ring (well lubricated) on the bearing carrier. Seat against the mounting flange (see figure 7-88).

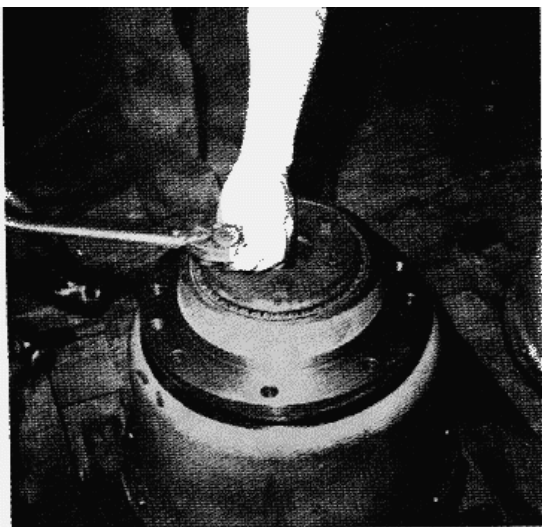


FIGURE 7-85.



FIGURE 7-87.

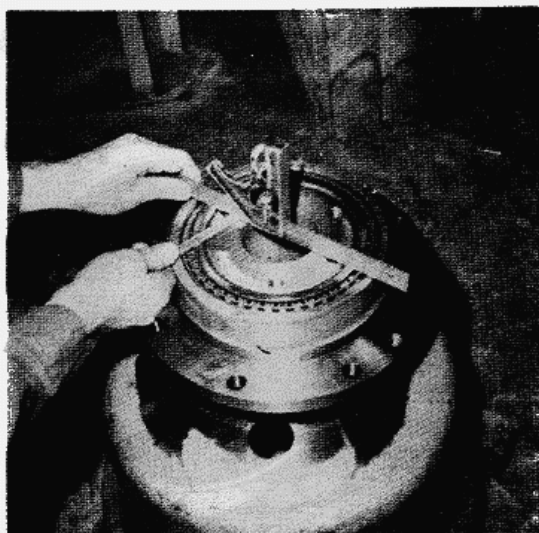


FIGURE 7-86.

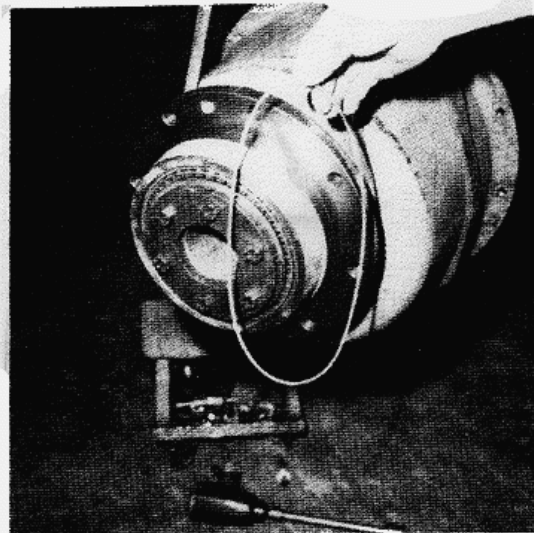


FIGURE 7-88.

SECTION 7 TRANSMISSION

7-202. INSTALLATION OF MOTOR CARRIER.

a. Lift motor housing with hoist and pilot the bearing carrier into the drum.

CAUTION: Care should be taken when installing the motor housing in the drum as not to damage the o-ring.

b. Align the capscrew mounting holes of the bearing carrier flange with those of the drum flange. This can be done through the access hole in the back surface of the motor housing. Coat capscrews with John Crane number 2 seal. Insert capscrews and torque per specifications (see figure 7-89). Torque C350B cap- screws to 130 ft.-lbs. (17.98 kg-m).

a. Position the drum directly behind the unit and lift or roll the drum into the frame until the drum is aligned with the large holes in the frame (see figure 7-90).

b. Rotate the motor housing in the drum until the access hole in the back wall of the housing is at its highest extreme. Position motor housing pilot flange so it will fit into the frame (see figure 7-91).

c. Align the frame to motor housing capscrew holes and insert the capscrews. Tighten the capscrews in an alternate pattern back and forth across the motor housing. Turn these capscrews only 1/4 to 1/2 turn at a time until the motor housing is piloted into and bottomed against the frame (see figure 7-92).

7-203. INSTALLATION OF DRIVE DRUM.

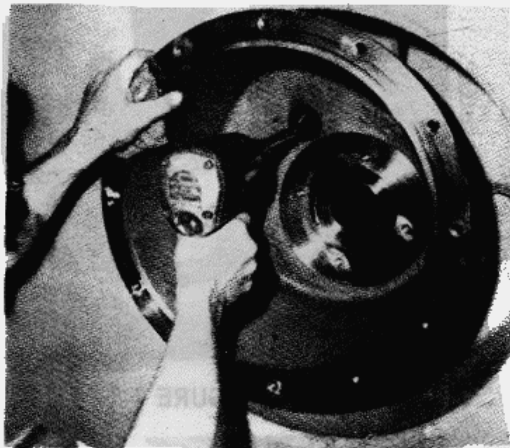


FIGURE 7-89.

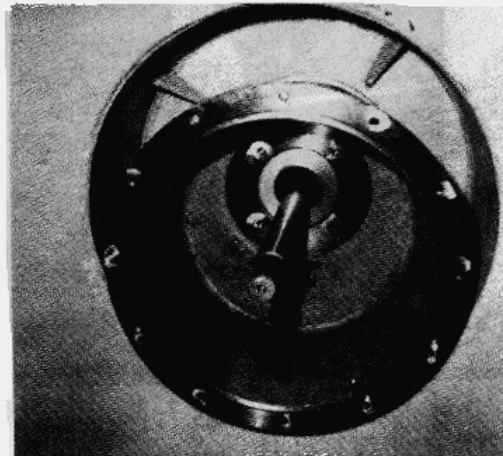


FIGURE 7-91.

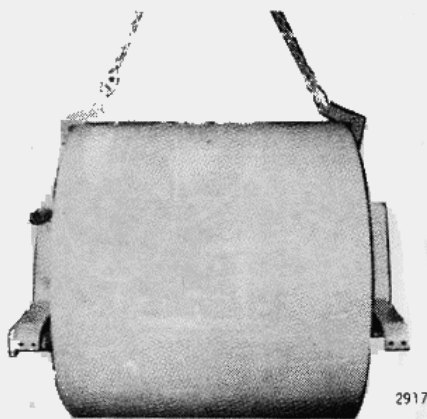


FIGURE 7-90.

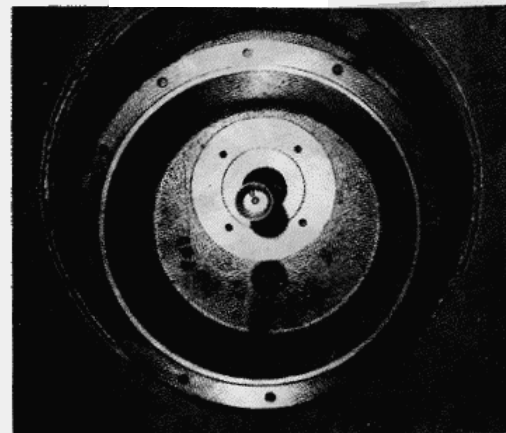


FIGURE 7-92.

SECTION 7 TRANSMISSION

NOTE: The frame-motor housing capscrews will turn hard as the drum is being pulled into position by these cap-screws. Torque the capscrews per specification. Install the drive shaft.

d. Install snap ring on brake shaft (C350B only) (see figure 7-93).

e. Turn the drive shaft from the motor housing end until the oil holes in the outer planetary hub are horizontal with the floor and above center (C350B only) (see figure 7-94).

f. Install scraper bar and bumper assembly if removed during disassembly.

g. Install two alignment bolts and spline the planetary anchor flange on to the outer planetary hub (C350B only) (see figure 7-95). Install two capscrews in two remaining holes and torque to 120 ft.lbs. (C350B only) (16.6 kg-m).

NOTE: The alignment mark on the anchor flange should be aligned to the alignment mark on the planetary hub (C350B only).

h. Insert three equally spaced capscrews. Torque these capscrews to 15 ft.-lbs. (2.074 kg-m) and then remove them (see figure 7-96).

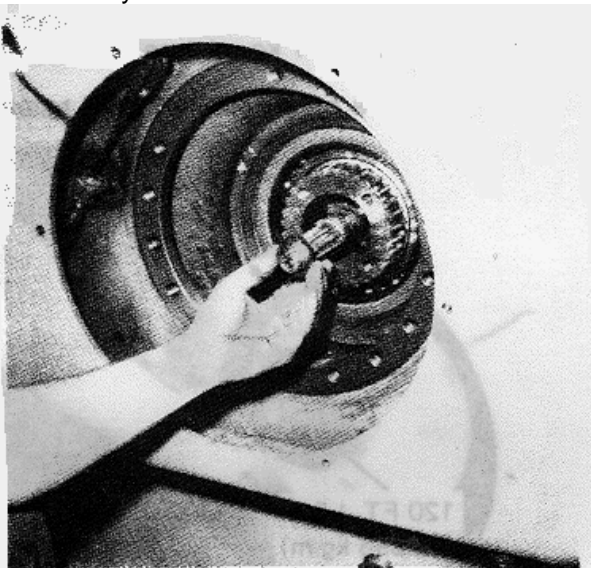


FIGURE 7-93.

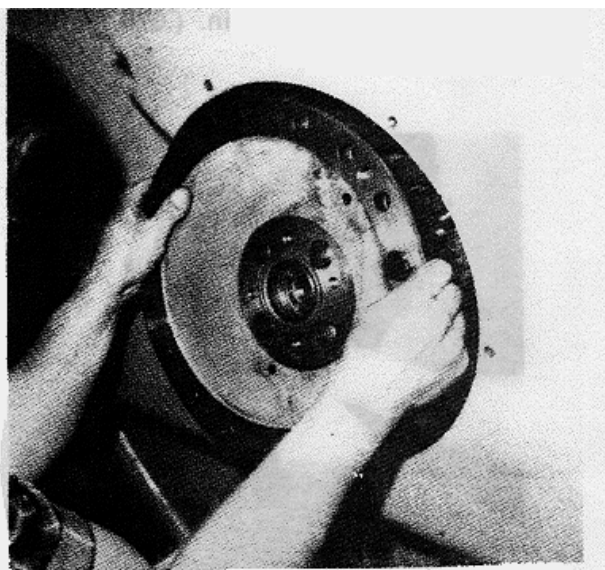


FIGURE 7-95.

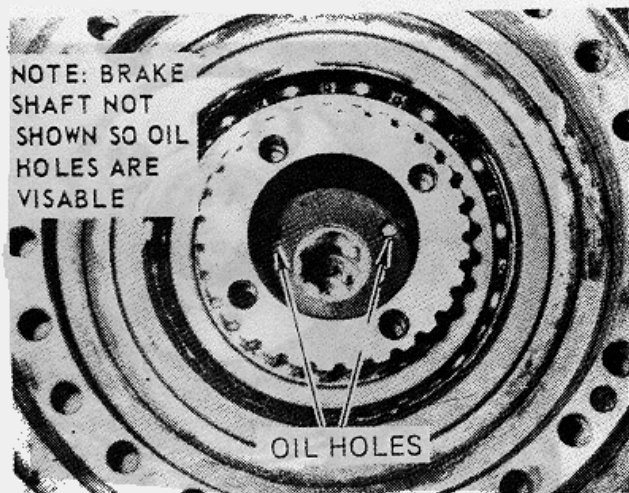


FIGURE 7-94.

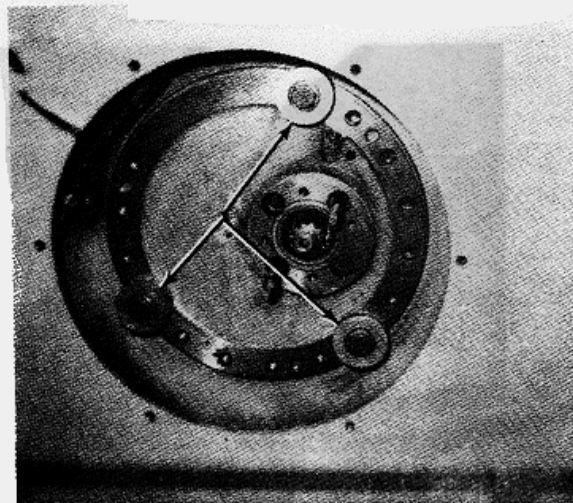


FIGURE 7-96.

SECTION 7 TRANSMISSION

i. Measure the distance between the frame and the planetary anchor flange. Take this measurement in three equally spaced locations. The best method of measurement is to use a depth micrometer and measure the depth from the outside of the flange through the puller bolt holes to the machined face of the frame. Total the three measurements taken and record them. Remove the anchor flange by using three puller capscrews (see figure 7-97). With a micrometer, measure the thickness of the flange next to the puller holes. Total the three measurements taken and subtract from the depth measurement. Divide your answer by three to obtain the shim thickness needed. For the C350B assemble a shim pack equal to the final answer plus .003 in. (.076 mm) or minus .002 in. (.051 mm).

j. Insert a shim pack equal (or as close as possible with available shims) to the measured distance in step i. Be sure marks are aligned as in step g (C350B only) (see figure 7-98).

CAUTION: The mating surface of the frame, shims, and planetary anchor flange must be cleaned with solvent and dried with compressed air. Any lubricant on these surfaces could cause the planetary anchor flange to work back and forth.

k. Install the four planetary-to-anchor flange capscrews and torque to 120 ft.-lbs. (16.6 kg-m) (C350B only). Insert all of the frame-to-anchor flange capscrews and torque to 200 ft.-lbs. (27.7 kg-m) (see figure 7-99).

l. Pump the brake shaft support bearing full

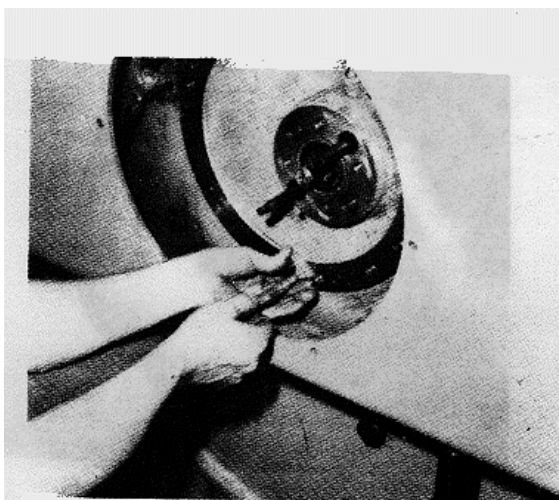


FIGURE 7-97.

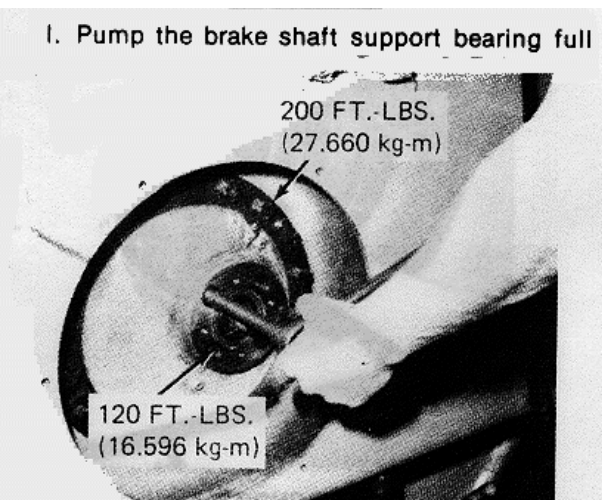


FIGURE 7-99.



FIGURE 7-98.

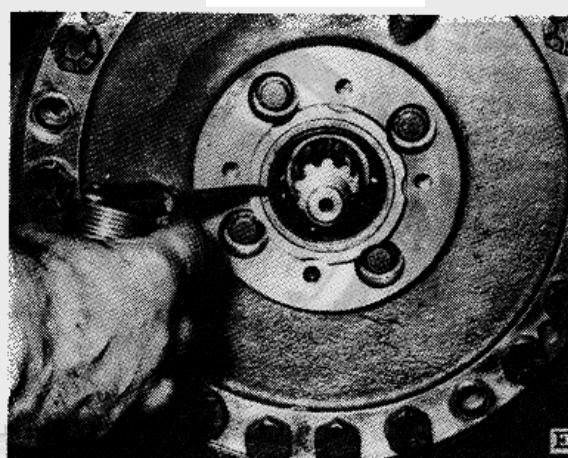


FIGURE 7-100.

SECTION 7 TRANSMISSION

of oil (C350B only). Reassemble the brake (refer to Section 10) (see figure 7-100).

- m. Fill final drive with lubricant (refer to Section 4).
- n. Install the hydrostatic pump and motor.
- o. Replenish transmission lubricant supply (refer to Section 4).
- p. Follow transmission start-up procedure before returning unit to service.

7-204. INSTALLATION OF HYDROSTATIC MOTOR.

7-205. Install the hydrostatic motor by reversing the procedure presented in paragraph 179. Note the following:

- a. The motor mounting surface should be coated with a plastic sealer.
- b. Torque the motor mounting bolts to 75 ft.-lbs. (10.4 kg-m).
- c. Torque the high-pressure lines to 35 ft.-lbs. (4.8 kg-m). Connect by-pass valve linkage.
- d. After installation the transmission start-up procedure must be completed before returning the unit to service.

7-206. HYDROSTATIC PUMP INSTALLATION.

7-207. Install the hydrostatic pump by reversing the procedures presented in paragraph 7-178. Take note of the following:

- a. Torque pump mounting capscrews to 75 ft.-lbs. (10.4 kg-m).
- b. Torque high-pressure line capscrews to 35 ft.-lbs. (4.8 kg-m).

CAUTION: Follow transmission start-up procedure before returning unit to service.

7-208. CLEANING THE HYDRAULIC SYSTEM.

CAUTION: The importance of cleaning the entire hydraulic system after any component failure cannot be over-emphasized. If a failure occurs in either the hydrostatic drive system or the steering circuit, the entire

hydraulic system should be disassembled and cleaned.

7-209. Removal and disassembly of the following list of components is required when any system component fails. Inspect each component for damage and rebuild or replace as required.

- a. Steering pump.
- b. Steering cylinder.
- c. Steering control unit.

NOTE: Matching of mating parts is critical.

- d. Cooler by-pass valve.
- e. Hydraulic tank.
- f. Transmission displacement control valve.
- g. Transmission servo cylinders.
- h. All hoses.

NOTE: Replace the oil filter with a Hyster approved 10 micron filter only. It is recommended after overhaul that the oil filter be replaced at 50 hours after start-up before returning to normal maintenance cycle.

7-210. Refill the hydraulic system with oil per specifications (see Section 2).

7-211. Precharge the hydraulic system as follows:

- a. Disconnect the case drain hose at the pump.
- b. Fill pump and motor cases with specified oil (see Section 2).
- c. Loosen the end of the suction hose at the charge pump. If hydraulic oil is not present, pressurize the tank to a maximum of 10 PSI (0.7 kg/cm²).
- d. Retighten hose fittings when oil appears.
- e. Complete the transmission start-up procedure.

NOTE: Partial cleaning of the system is ineffective. Any contamination left in the system may cause a repeat failure.

SECTION 7 TRANSMISSION

CAUTION: Oil **MUST** be at the charge pump before engine is started.

7-212. SUNDSTRAND TRANSMISSION START-UP PROCEDURE.

- a. Block the drive drum safely off the ground.
- b. After the transmission has been installed, remove the threaded plug from the top of the main pump housing (see figure 7-101). Install a 600 PSI (42.19 kg/cm²) pressure gauge with a short section of hose. The port is 7/16 x 20 straight thread with o-ring. Low charge pressure may be checked at the motor case port as shown in figure 7-102.
- c. Check all fittings to be sure that they are tight.

- d. Fill the pump and motor cases through the upper case drain openings with specified oil (see Section 2). All fluid should be passed through a 10 micron filter. Reinstall and tighten case drain line.

- e. Loosen the charge pump line, coming from the filter/reservoir (see figure 7-103).

- f. Fill the reservoir and hoses with specified oil (see Section 2). Install and tighten the hoses (see figure 7-103).

WARNING: Disconnect the push-pull cable from the pump until after Initial start-up. This will allow the pump to remain in neutral (see figure 7-104).

- g. Pull out the engine coil wire or close the

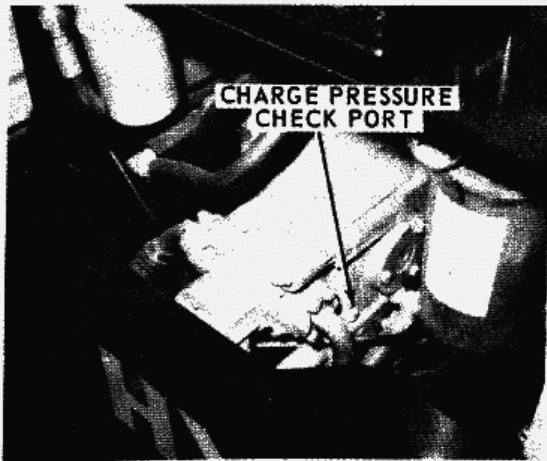


FIGURE 7-101.

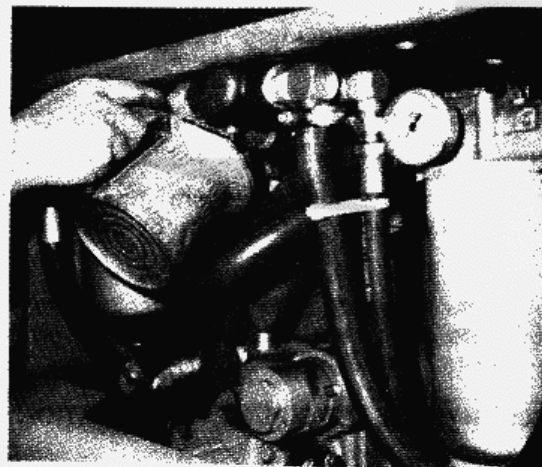


FIGURE 7-103.

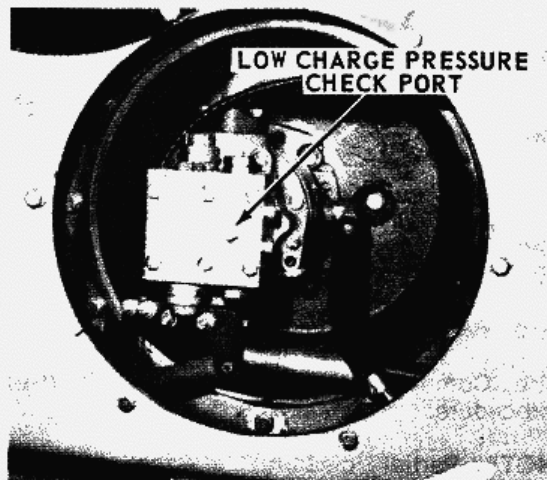


FIGURE 7-102.

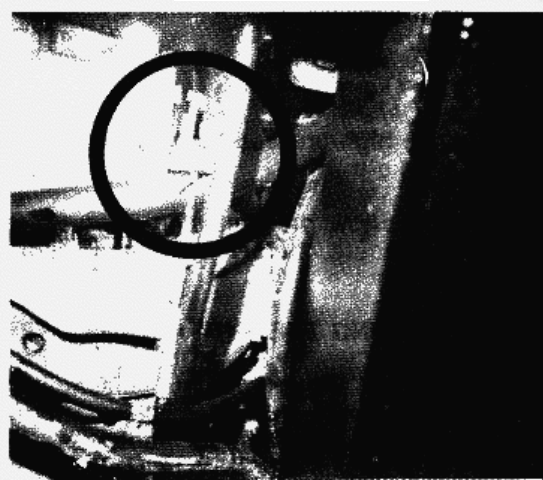


FIGURE 7-104.

SECTION 7 TRANSMISSION

injector rack and turn the engine over until charge pressure reaches 30 PSI (2.1 kg/cm²) or more.

h. Start the engine and maintain a 750 RPM speed for five (5) minutes. This will allow the system to fill properly. Pressure surges may be observed on pressure gauge - this is normal while running at 750 RPM, the charge pressure must be at least 100 PSI (7.0 kg/cm²) above case pressure. If it is not, shut down and troubleshoot (see Section 5).

i. Increase speed to 1000 RPM; charge pressure should be 190-220 PSI (13.4-15.5 kg/cm²) above pump case pressure.

j. Shut down the engine and reconnect the push-pull cable to the pump linkage.

k. Check oil level in reservoir. Fill if necessary.

l. Restart engine and run at 1500 to 1800 RPM. Charge pressure should be 190-220 PSI (13.4-15.5 kg/cm²) above pump case pressure.

m. Move Direction-Throttle Control Bail slowly to the forward and then to the reverse position. Charge pressure will drop to 160-180 PSI (11.2-12.7 kg/cm²) above pump case

pressure. Repeat cycle for five minutes.

CAUTION: Should the charge pressure drop below 100 PSI (7.0 kg/cm²) above pump case pressure at any time, discontinue start-up until trouble has been determined.

n. Run engine at maximum RPM with the pump in neutral. Observe the reading of the suction filter vacuum gauge located on the filter. This gauge should be reading NORMAL.

o. Shut down engine, remove all gauges and replace all lines and plugs. Check reservoir oil level and tighten oil fill cap.

p. Machine is now ready for operation.

7-213. BY-PASS VALVE.

7-214. Refer to Section 3, paragraph 3-29 for a complete explanation of the by-pass valve and its function.

7-215. BY-PASS CONTROL ADJUSTMENT.

a. Adjust wire stop on control cable for 1/8 - 1/4 in. (3.2-6.4 mm) free play (see figure

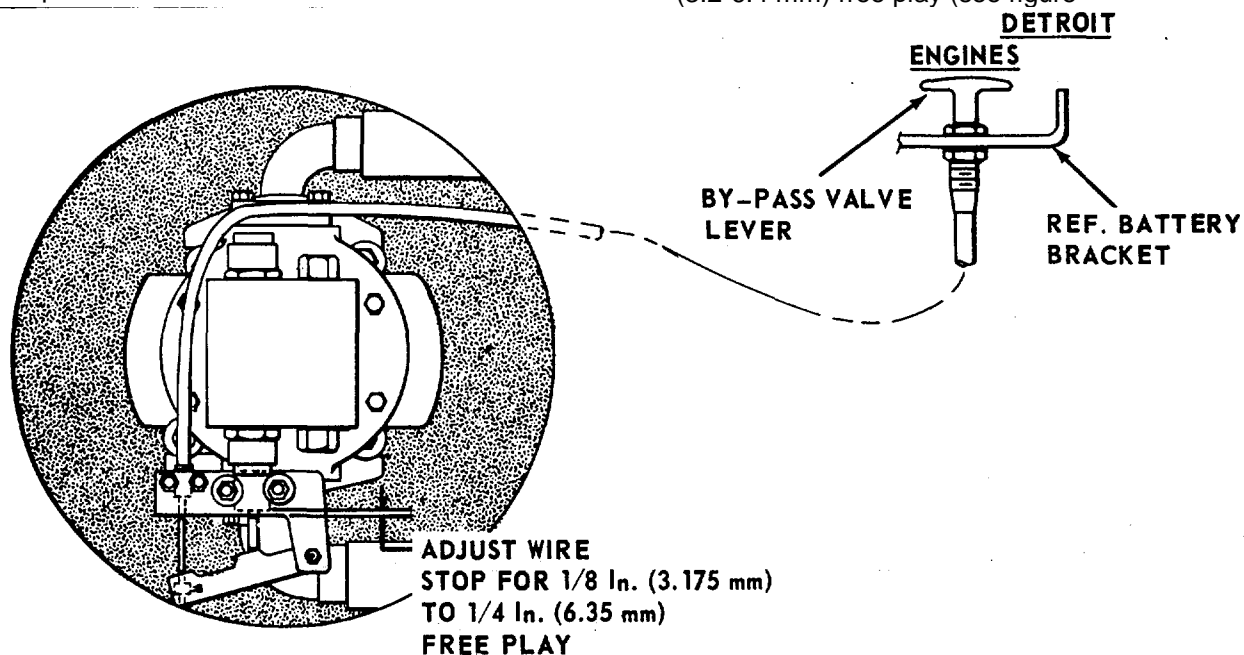


FIGURE 7-105.

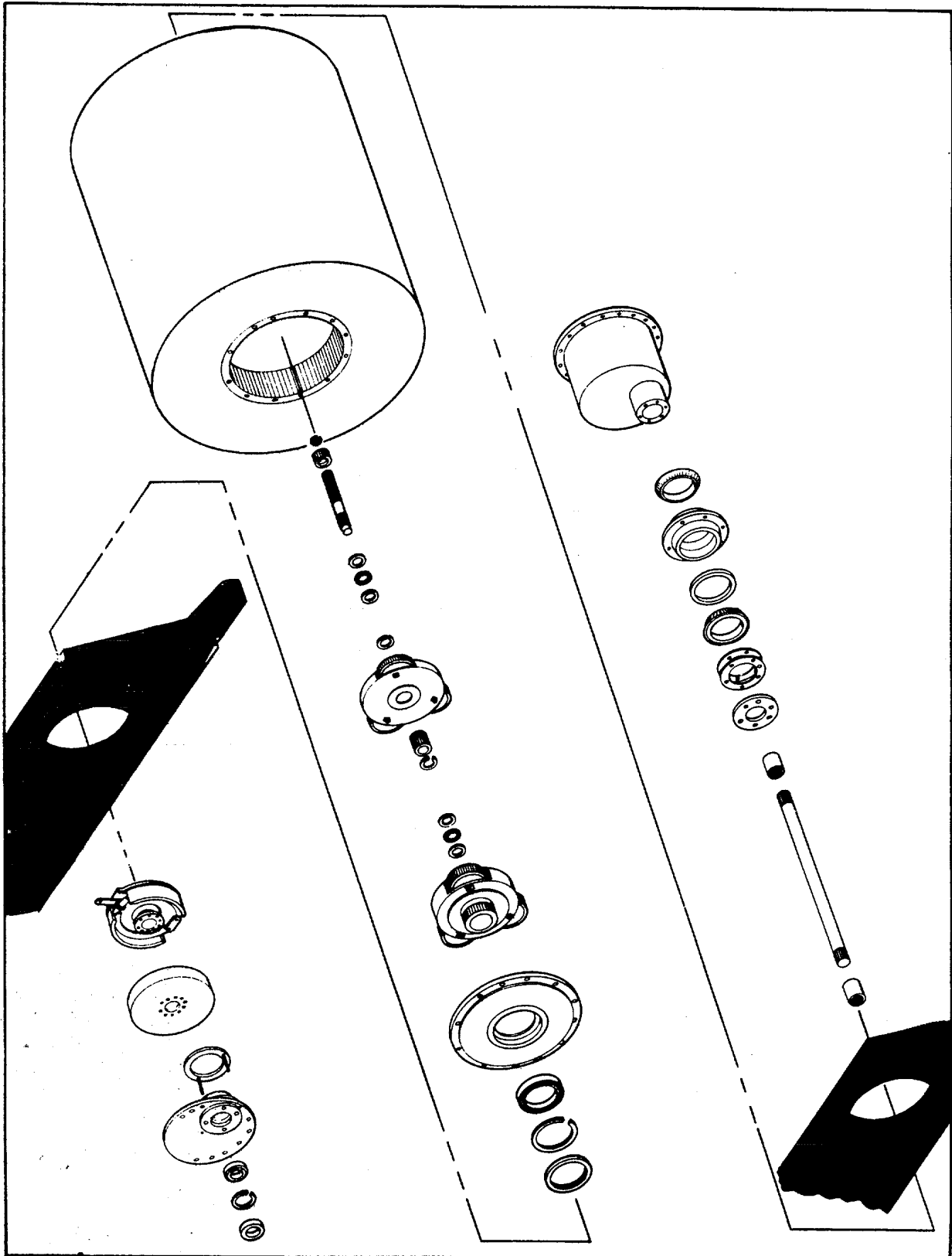


FIGURE 8-1.

8-1.

8-1. GENERAL.

8-2. This section contains a description of the final drive operation and overhaul instructions for components of the drive drum assembly. Overhaul instructions include removal, dis-assembly, inspection, reassembly and installation of all components of the final drive assembly. Design specifications are given in Section 2. Troubleshooting instructions are given in Section 5.

8-4. C350B FINAL DRIVE DESCRIPTION (see figure 8-2).

8-5. The final drive consists of an internal, double reduction planetary system located within the left side of the single drive drum (see figure 8-1). Torque is transferred from the hydraulic motor (across the drum) to the planetary system by the drive shaft (A). A sun gear (B) is splined to this shaft and drives the smaller of the two planetary gear sets (C) in the opposite direction. This gear set (C), in turn, attempts to turn the ring gear (D) (bolted directly to the drive drum) in the same direction gear set (C) is traveling, but does not possess the mechanical advantage to do so.

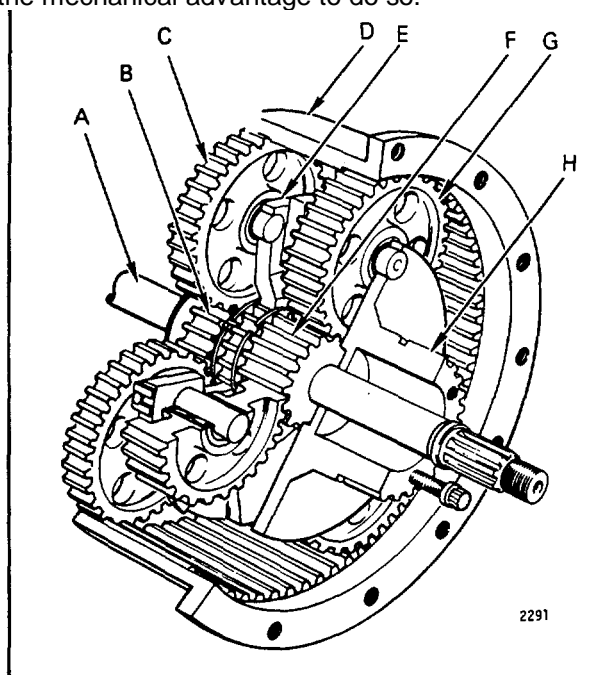


FIGURE 8-2.

Consequently, the small planet carrier (E) (non-stationary) walks around the ring gear (D). Planet carrier (E) is splined to and drives a second sun gear (F) which rotates in the same direction as, but independently of, sun gear (B). Sun gear (F) then drives the larger planetary gear set (G) which is capable of turning the ring gear (D) and the drive drum. (Ring gear (D) is attached to the drum.) The second larger planet carrier (H) is bolted to the frame, and provides the reaction necessary to drive the drum.

8-6. REMOVAL AND DISASSEMBLY OF FINAL DRIVE ASSEMBLY.

- a. Drain the lubricant (refer to Section 4).

NOTE: Inspect the lubricant for foreign particles. Keep samples for failure analysis.

- b. Block the guide rolls front and rear.

WARNING: Do not depend on the parking brake to prevent the unit from moving. The brake assembly will be removed prior to the removal of the drive drum.

- c. Jack up both sides of the frame so that the weight of the frame is on the jacks and not the drive drum.

- d. Remove the scraper bar and bumper assembly mounting capscrews and lift off the assembly.

- e. Complete the DRIVE DRUM removal procedure presented in Section 7, paragraph 7-1 98.

- f. Remove the capscrews in the drum hub. Pull the hub using the puller holes provided and appropriate puller bolts. Install two dowel (guide) pins (see figure 8-3).

WARNING: Connect the drum hub to a hoist prior to complete removal from the drive drum. The outer planetary assembly will accompany the drum hub upon removal. Care should be taken when handling these components.

- g. Remove the inner planetary assembly (see figure 8-4).

- h. Remove the brake shaft snap ring. Then pull the inner sun gear, small thrust washers

SECTION 8 FINAL DRIVE

and needle thrust bearing from inner planetary assembly to prevent their loss or damage (see figure 8-5).

i. Inspect ring gear for wear, damage, cracked teeth or any other signs of impending failure. Use the puller holes provided to remove ring gear if replacement or repair is necessary (see figure 8-6).

j. Seal off drive shaft hole and steam clean planetary gear case in the drive drum. make sure pockets and corners are cleaned thoroughly.

k. Remove the planetary anchor flange oil seal for replacement. Remove snap ring, dust protector and bearing if it is worn or damaged (see figure 8-7).

l. Inspect the interlocked sun gear for excessive wear on both of its thrust surfaces (one located at each end) and twisted or cracked splines or any other signs of impending failure. Remove if necessary by removing snap ring from inside of the carrier and lift out the gear (see figure 8-8).



FIGURE 8-3

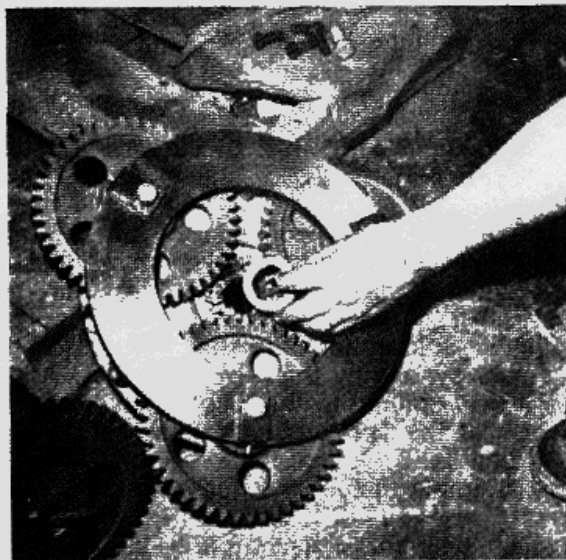


FIGURE 8-5

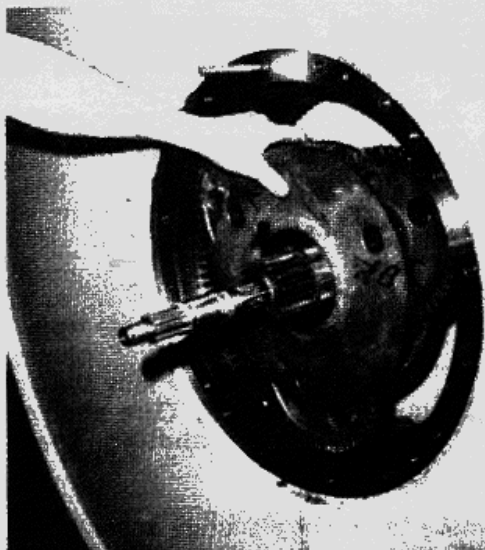


FIGURE 8-4

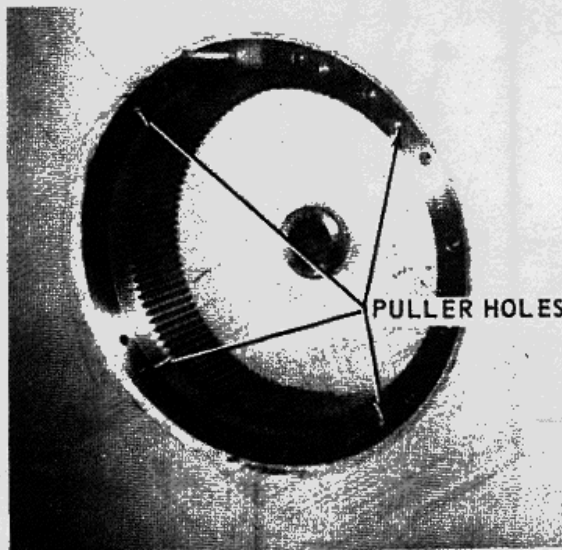


FIGURE 8-6

**SECTION 8
FINAL DRIVE**

m. Press outer planetary assembly out of the drive drum hub using an arbor press (see figure 8-9).

CAUTION: The drum hub must be supported in three equally spaced points when pressing out the outer planetary assembly to prevent damage to the drum hub.

n. Disassembly of drive drum hub. Remove the oil seal for replacement. Check that companion flange seal surface is smooth (see figure 8-10).

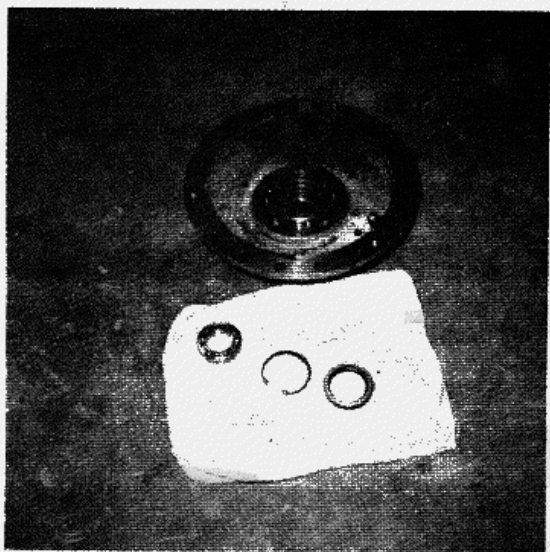


FIGURE 8-7

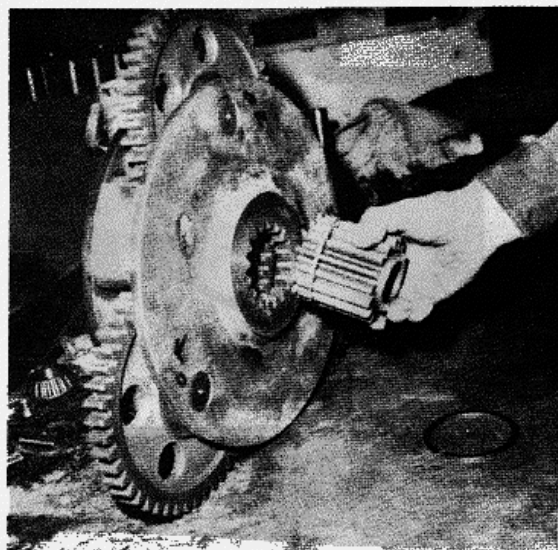


FIGURE 8-8

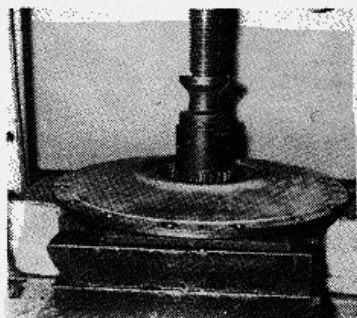


FIGURE 8-9

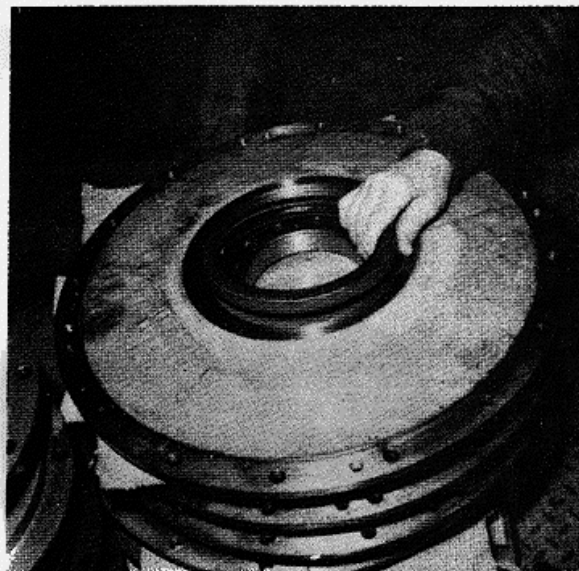


FIGURE 8-10

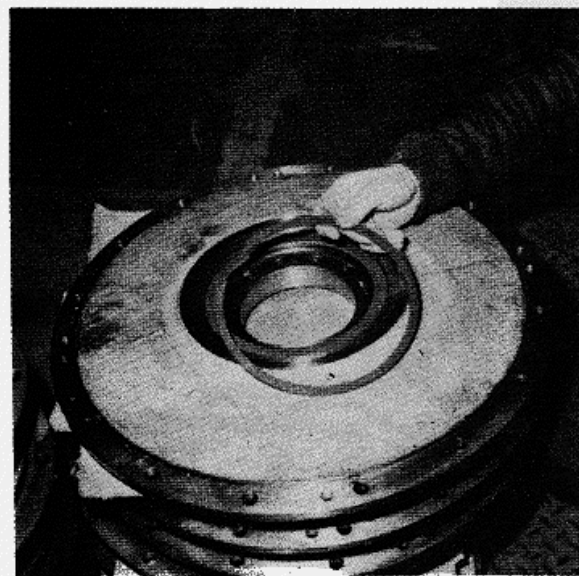


FIGURE 8-11

SECTION 8 FINAL DRIVE

o. Pry out the snap ring with a large screwdriver or medium size pry bar; Replace if worn or scored (see figure 8-11).

p. Turn the drum hub over and place it in an arbor press. Using an appropriate size pusher, press out the large bearing (see figure 8-12).

q. Place the inner planetary assembly on a protected surface with the interlocked sun gear down.

r. Clean the webbed portion of each of the three planetary pinion gear and mark their position with respect to the planetary carrier (see figure 8-13).

NOTE: Since the planetary pinions are extremely hard, a punch is not effective. To mark these planetary pinions, paint a small portion of each gear with a light color paint and etch either 1, 2, or 3 on each gear.

NOTE: The planetary carrier can be marked correspondingly with a punch.

s. With the planetary pinion gears and carrier properly marked, unlock and remove one pinion gear capscrew, lockplate and spacer (see figure 8-14).

t. Push the pinion gear riding pin out of the

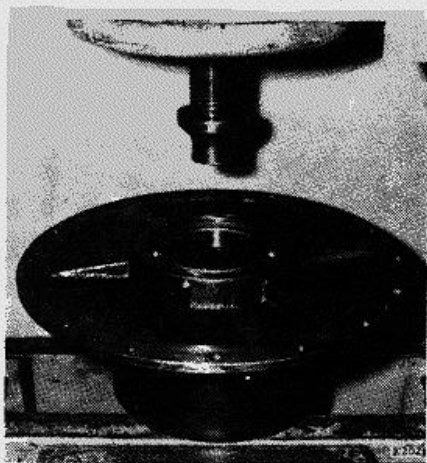


FIGURE 8-12

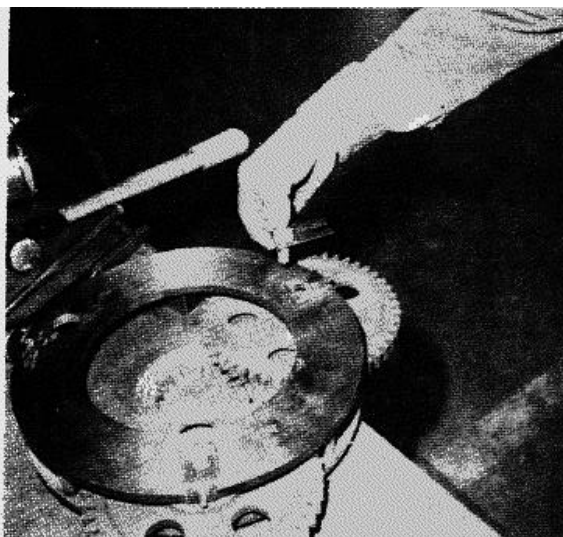


FIGURE 8-14

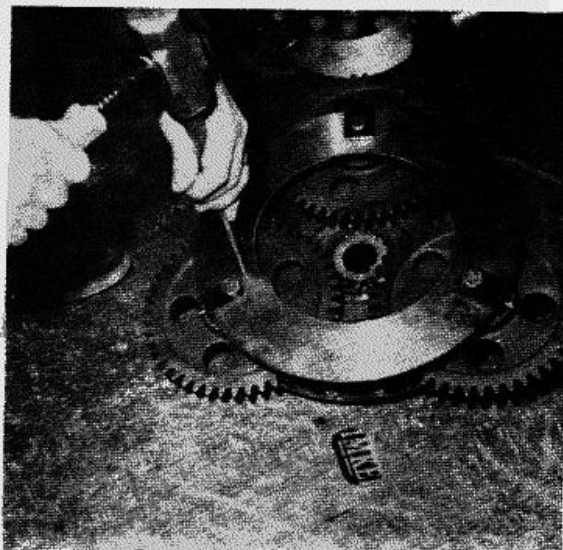


FIGURE 8-13

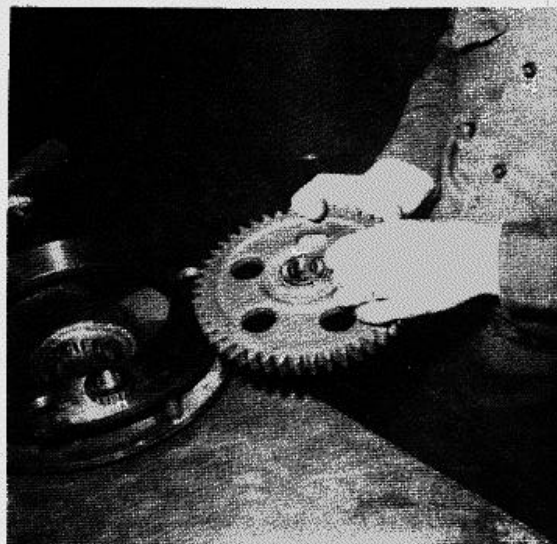


FIGURE 8-15

carrier and gear. Lift out planetary pinion gear, thrust washers, and bearings (see figure 8-15).

CAUTION: The bearing cones will fall out of the pinion gear as soon as they are free to do so. Keep each cone with its respective cup by tying them in position in the pinion gears. Remove the other two, pinion gears from the carrier using the same procedure. Keep each gear and its associated parts separate. Do not mix component parts.

u. Inspect each bearing cup and cone, including those not removed from the pinion gears, and replace if rollers or cups are worn, pitted or damaged in any way. Remove parts needing replacement (see figure 8-16).

v. Remove bearing cups from planetary pinion with a small soft punch and hammer.

NOTE: A snap ring separates and locates the two cups in each pinion gear. Remove the lower cup only, i.e., the pinion must be turned over once to remove both cups (see figure 8-17).

w. Remove the snap ring with a screwdriver or a small pry bar and inspect for chipping or wear. Replace if necessary (see figure 8-18).

x. Place the outer planetary assembly on a protective surface with the large splined hub upward. Follow steps q through w of the inner planetary disassembly procedure.

8-7. CLEANING AND INSPECTION.

8-8. All gears (including both sun gears), carrier, pins, plates, and capscrews should be cleaned in solvent. Inspect each gear for galling, nicking, chipping and cracking, especially at the root of each tooth.

8-9. All bearings should be washed in fresh solvent. Agitate in the solvent; do not use a brush as some of the bristles may break off and lodge in the bearing. Blow

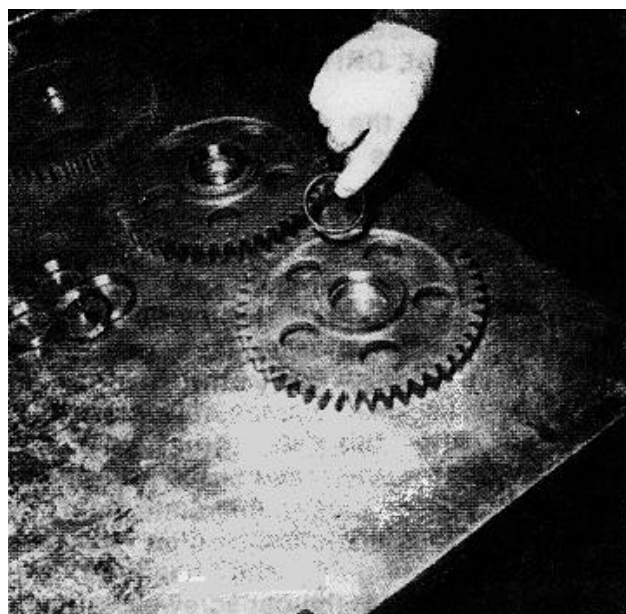


FIGURE 8-17.

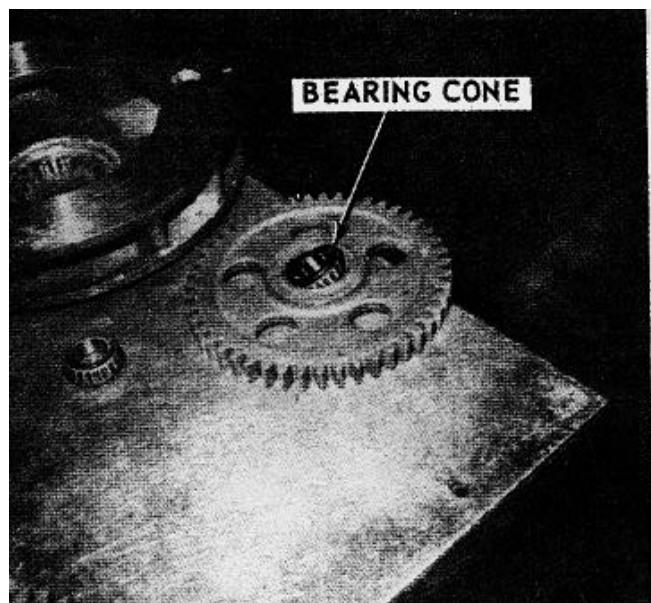


FIGURE 8-16.

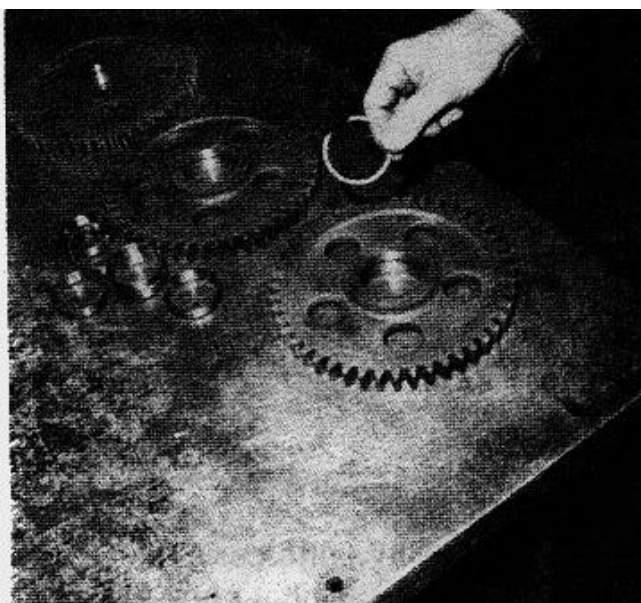


FIGURE 8-18.

SECTION 8 FINAL DRIVE

bearing completely dry, do not spin, with compressed air. Oil bearing with light oil and rotate several times by hand. Discard bearing if rotation is not free of binding and clicking. Compare bearing looseness with a new one. Discard the bearing if there is a considerable difference. The bearing cages must be tight and the bearings free of defects. Wrap bearings in clean paper if they are not to be installed immediately.

8-10. Discard all seals, snap rings and thrust washers that are worn or scored.

8-11. REASSEMBLY AND INSTALLATION OF FINAL DRIVE ASSEMBLY.

a. Install the snap ring, bearing cups, and bearing cones in each pinion gear (see figure 8-20).

b. Matching the marks on the pinion gear and planetary carrier install one pinion gear into the planetary carrier (long hub on pinion gear away from interlocked sun gear). Place thrust washer between pinion gear and planetary carrier on the capscrew side of the pinion gear. Align the gear, thrust washer and planetary carrier and insert the riding pin. Install the spacer, lockplate and capscrew. Rotate the planetary pinion gear to insure proper seating of the bearings and thrust washer. Torque the capscrews per specification back off one flat and lock. Then install the other two pinion gears in the same manner (see figure 8-21).

c. Assembly of Outer Planetary Assembly. Place the outer planetary assembly on a protective surface with the large splined hub upward. Note that the outer planetary pinions do not have a longer hub as do the inner planetary pinions. The outer planetary pinions are symmetrical and can be installed correctly with either side towards the splined hub (see figure 8-22).

d. Install the snap ring, bearing cups, and bearing cones in each pinion gear. Place thrust washer between pinion gear and planetary carrier on the capscrew side of

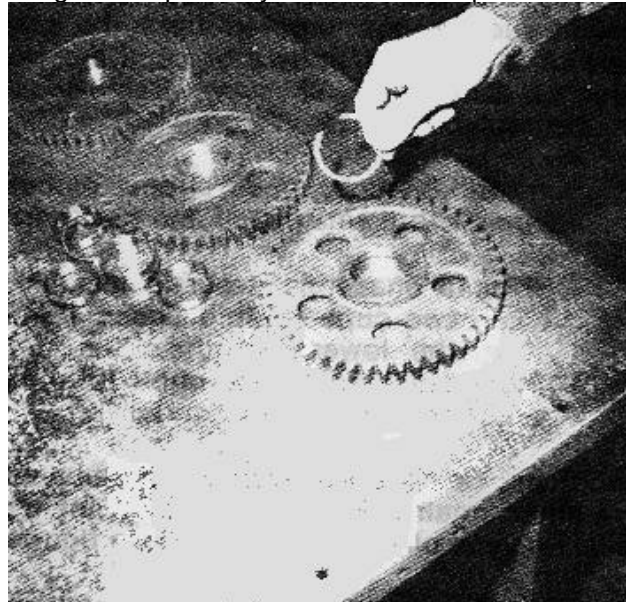


FIGURE 8-20A.

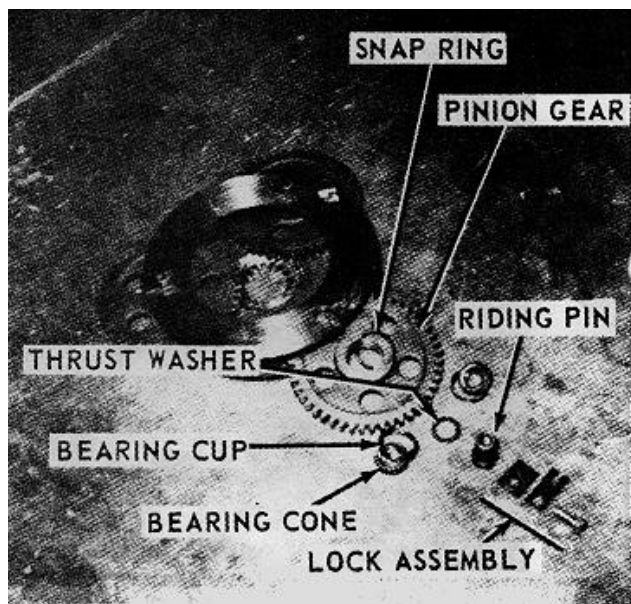


FIGURE 8-19.

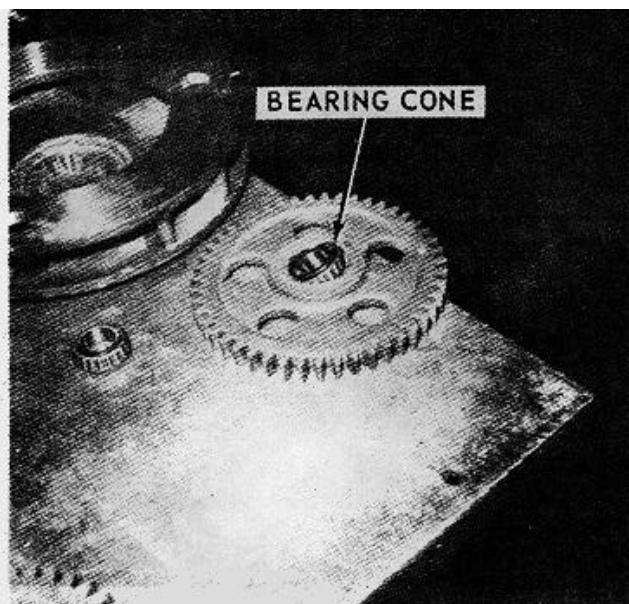


FIGURE 8-20B.

the pinion gear (see figure 8-23).

e. Align the gear, thrust washer and planetary carrier and insert the riding pin. Install the spacer, lockplate and capscrew. Rotate the planetary pinion gear to insure proper seating of the bearings and thrust washer. Torque the capscrew per specification, back off one flat and lock. Then install the other two pinion gears in the same manner (see figure 8-24).

f. Place the planetary anchor flange on a protective surface with the oil breather side up. Press the bearing into the flange and install the snap ring. Press the oil seal into the flange until the seal bottoms on the shoulder provided (see figure 8-25). Install dust protector onto anchor flange and tighten dust protector mounting bolts.

g. Assembly of drive drum hub. Press the bearing into the drum hub (see figure 8-26).



FIGURE 8-21.

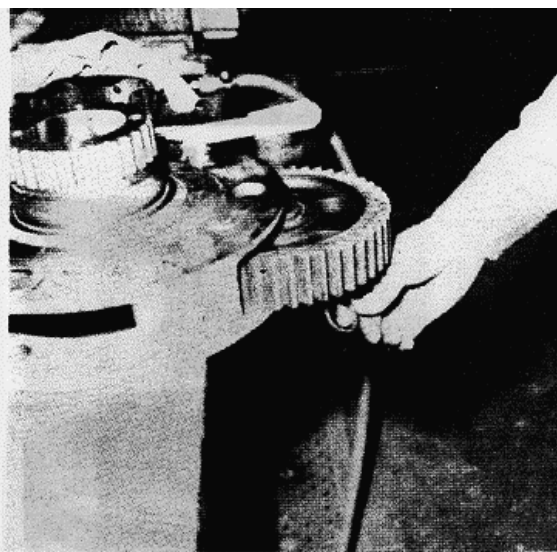


FIGURE 8-23.



FIGURE 8-22.



FIGURE 8-24.



FIGURE 8-25.

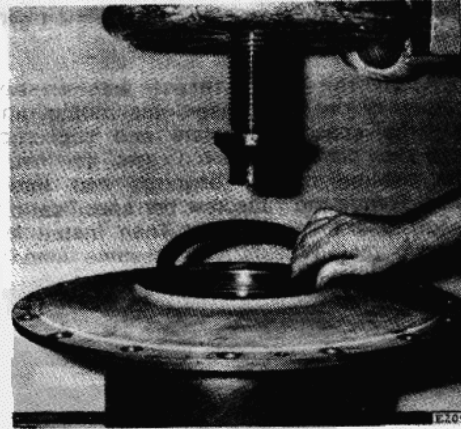


FIGURE 8-28.

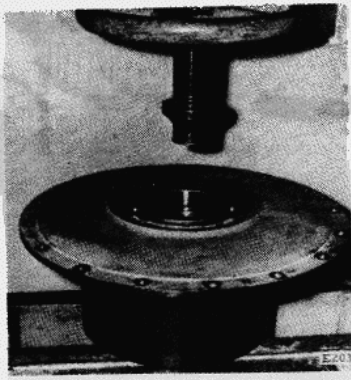


FIGURE 8-26.

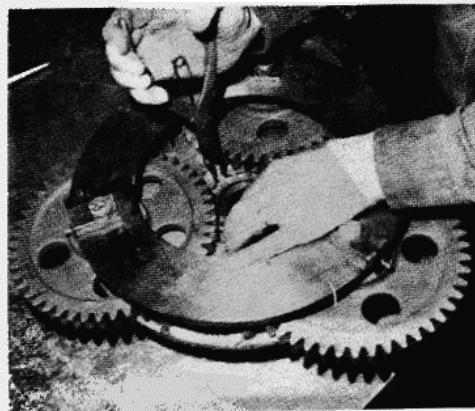


FIGURE 8-29.

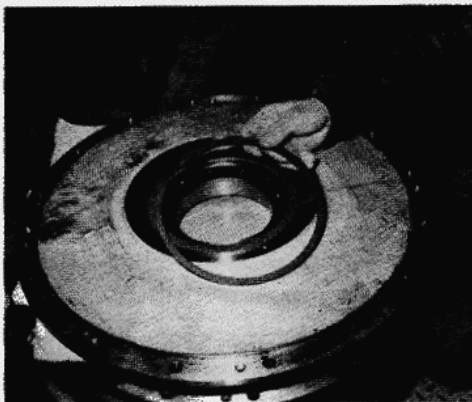


FIGURE 8-27.

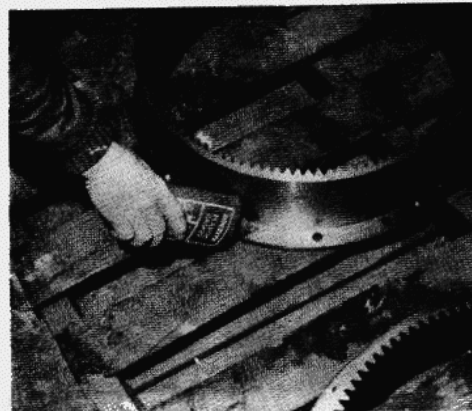


FIGURE 8-30.

SECTION 8 FINAL DRIVE

- h. Install the large snap ring (see figure 8-27).
- i. Press the oil seal into the drum hub until it bottoms against the snap ring (see figure 8-28).
- j. Assembly of Inner Planetary Assembly. Install the interlocking sun gear in planetary carrier and lock it in place with the snap rings. Place the planetary carrier on a protective surface with the long hub of the interlocked sun gear down (see figure 8-29).
- k. Installation of the Planetary System. If the ring gear has been removed, clean its

mounting flange and paint it with "Loctite Plastic Gasket" or equivalent (see figure 8-30).

l. Do the same to the mating machined surface of the drum (see figure 8-31).

m. Install the ring gear using a pilot stud. Using four capscrews, seat the ring gear in the drum. Remove the four capscrews (see figure 8-32).

n. Insert thrust washer first, then needle thrust bearing into the machined pilot of the interlocked sun gear of the inner planetary assembly using a heavy machine grease to hold them in the pilot (see figure 8-33).

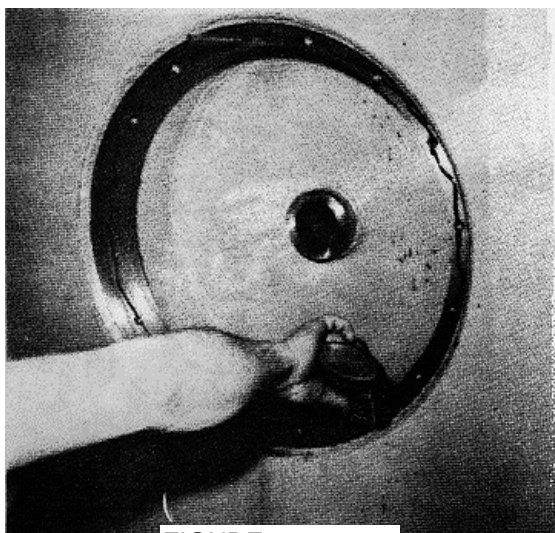


FIGURE 8-31.

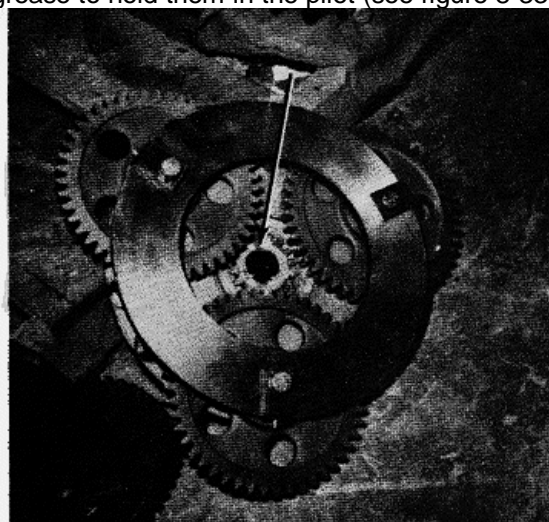


FIGURE 8-33.

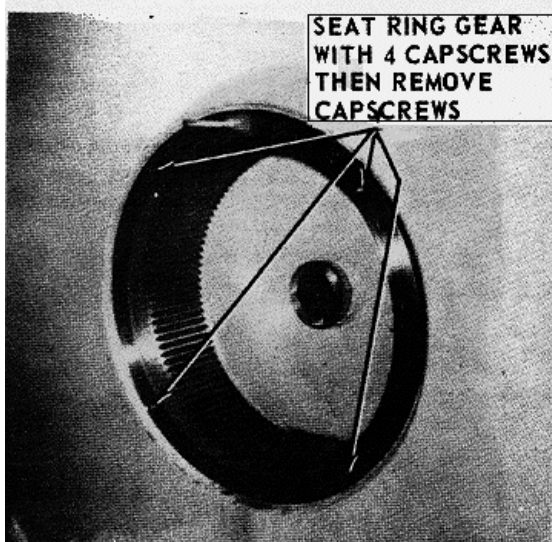


FIGURE 8-32.

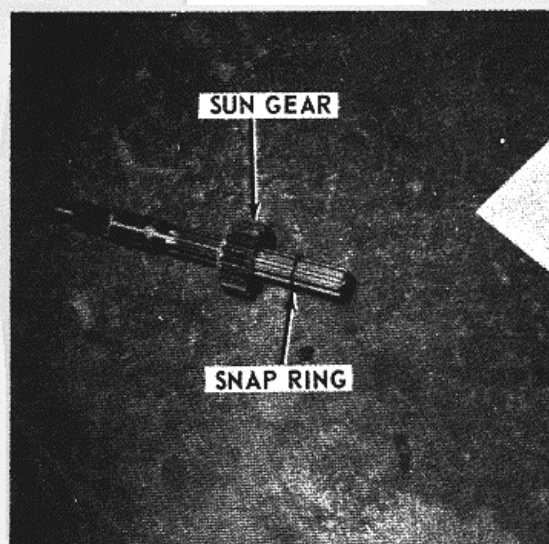


FIGURE 8-34.

SECTION 8 FINAL DRIVE

o. Install the small sun gear on the brake shaft. Then install the snap ring into its retaining groove (see figure 8-34).

p. Assemble brake shaft into inner planetary gear (see figure 8-35).

q. Install inner planetary into ring gear (see figure 8-36).

r. Apply a large amount of lubriplate. Insert thrust washer first and then assemble needle bearing into outer planetary (see figure 8-37).

s. Lift the outer planetary assembly into the ring gear, meshing the planetary pinions with

the ring gear, and push this assembly into the drum until it bottoms against the thrust washers (see figure 8-38).

NOTE: Check to see that the two planetary carriers do not touch. Also, check that the thrust needle bearings have not fallen out of place. Planetaries must be removed if these conditions are a problem.

t. Paint outer face of ring gear with "Loctite Plastic Gasket" or equivalent. Apply Lubriplate to machine boss of outer planetary (see figure 8-39).

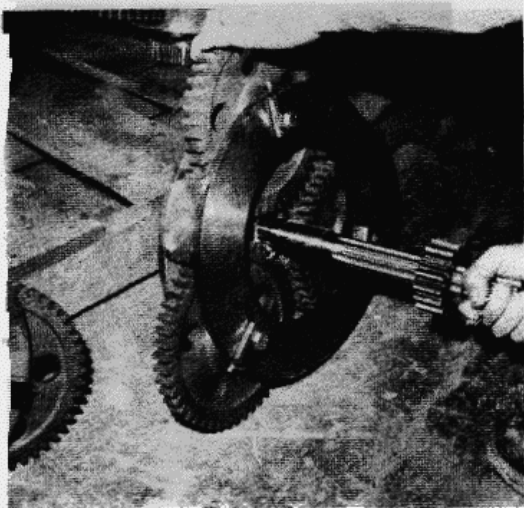


FIGURE 8-35.

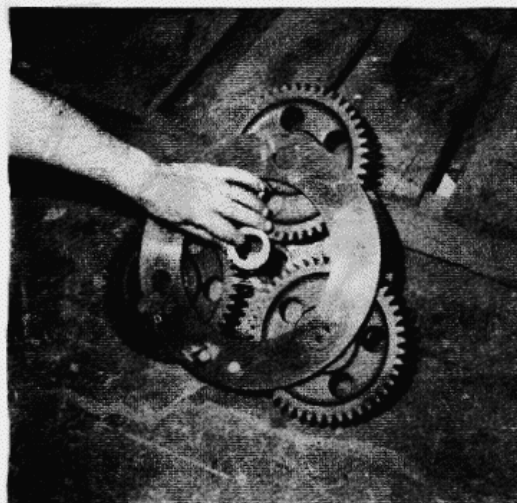


FIGURE 8-37.



FIGURE 8-36.

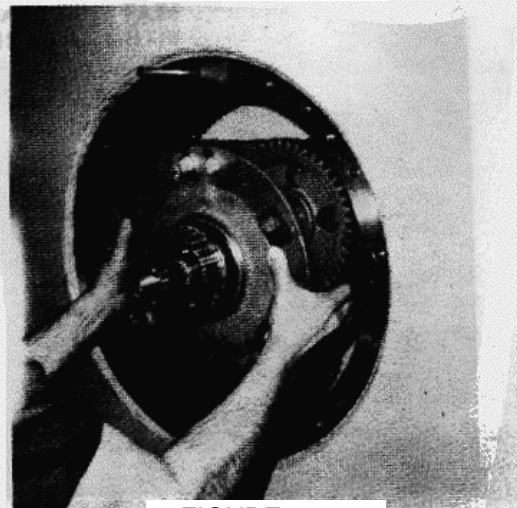


FIGURE 8-38.

**SECTION 8
FINAL DRIVE**

u. Position drum hub loosely against drive wheel. Use three place bolts equally spaced to initially pull hub against ring gear (see figure 8-40).

CAUTION: Do not align puller holes of the drum with those of the ring gear.

v. Remove puller bolts and install the 16 drum hub capscrows. Torque in a circular pattern to specification (see figure 8-41).

w. Manufacture a puller per illustration in figure 8-42.

x. Assemble special puller onto splined

gear. Tighten capscrews until splined gear is flush with bearing (see figure 8-43).

y. Install the drive drum following the procedure presented in Section 7, paragraph 7-203. Fill final drive with specified lubricant (refer to Section 4).

z. Install scraper bar and bumper assembly.

CAUTION: Follow transmission start-up procedure before returning unit to service.

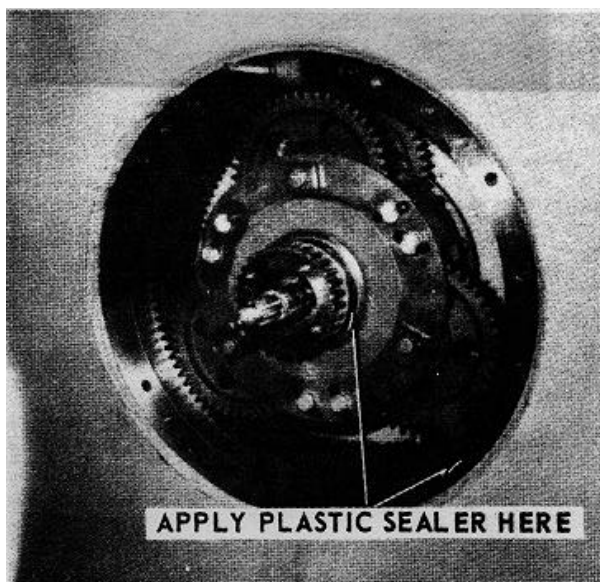


FIGURE 8-39.



FIGURE 8-41.

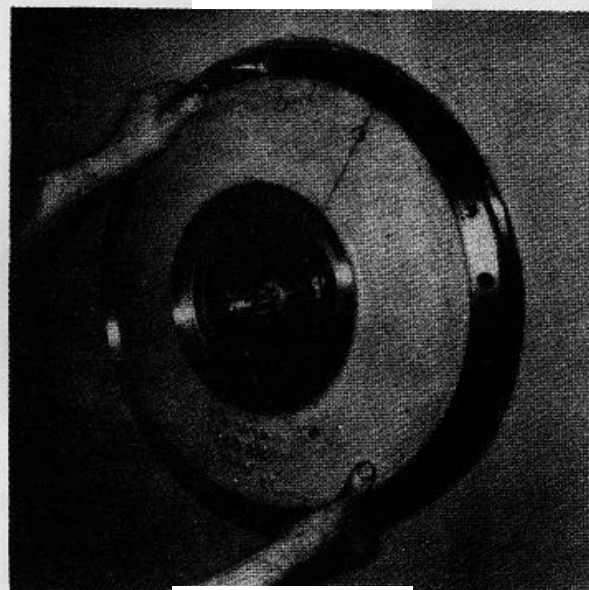


FIGURE 8-40.

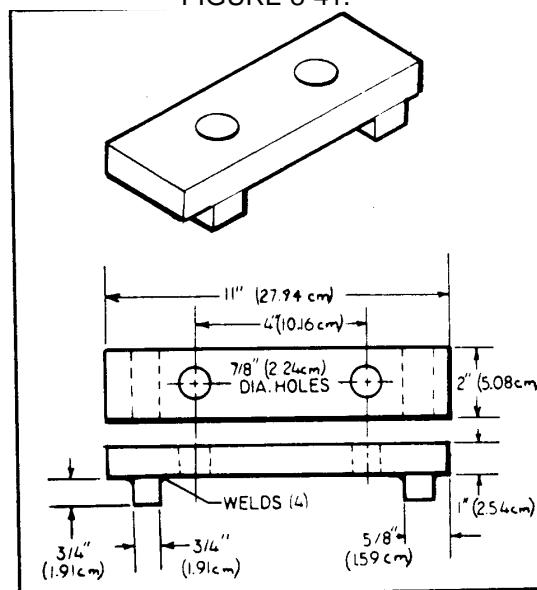


FIGURE 8-42.

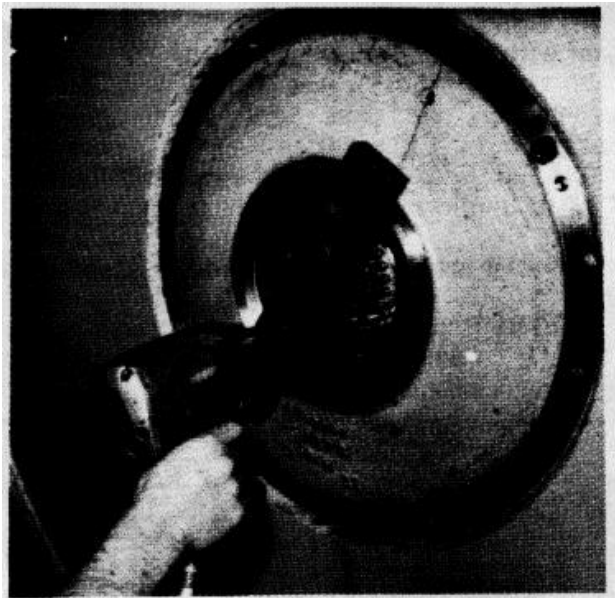


FIGURE 8-43A.

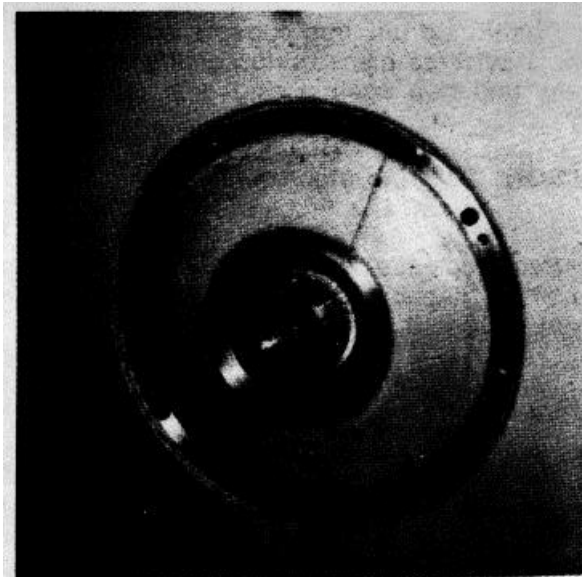


FIGURE 8-43B.

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9-1. GENERAL.

9-2. This section contains a description of the steering system operation and overhaul instructions for major components. Overhaul instructions include removal, disassembly, inspection, reassembly and installation procedures. System checks and adjustments are given at the end of steering cylinder repairs. Design and performance specifications are given in Section 2. Troubleshooting instructions are given in Section 5.

9-3. DESCRIPTION (see figure 9-1).

9-4. STEERING SYSTEM.

9-5. The steering system is a hydrostatic operated, manually controlled system with provisions for manual steering. The steering system has a natural feel for the operator by provide in a direct relation between the steering wheel position and the guide roll position.

9-6. Components of the steering system are:

- (1) an engine mounted hydraulic power pump
- (2) the gooseneck mounted power steering control unit
- (3) double acting hydraulic steering cylinder
- (4) steering wheel
- (5) hydraulic fluid reservoir (common with the transmission hydraulic reservoir)
- (6) hydraulic lines and fittings.

9-7. STEERING CONTROL UNIT.

9-8. DESCRIPTION (see figure 9-2).

9-9. The steering control unit is an open-center rotary actuated unit consisting of three major section:

- (1) a column section
- (2) control section

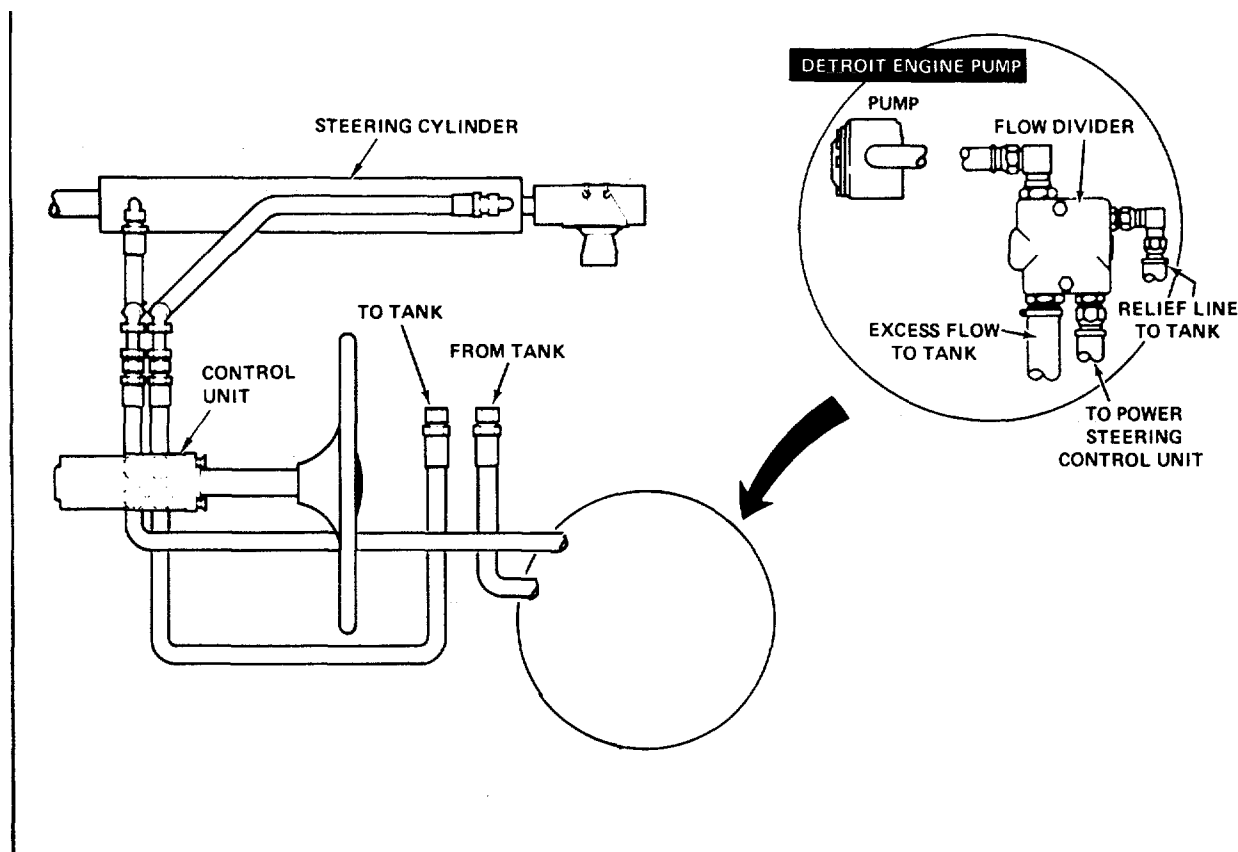


FIGURE 9-1.

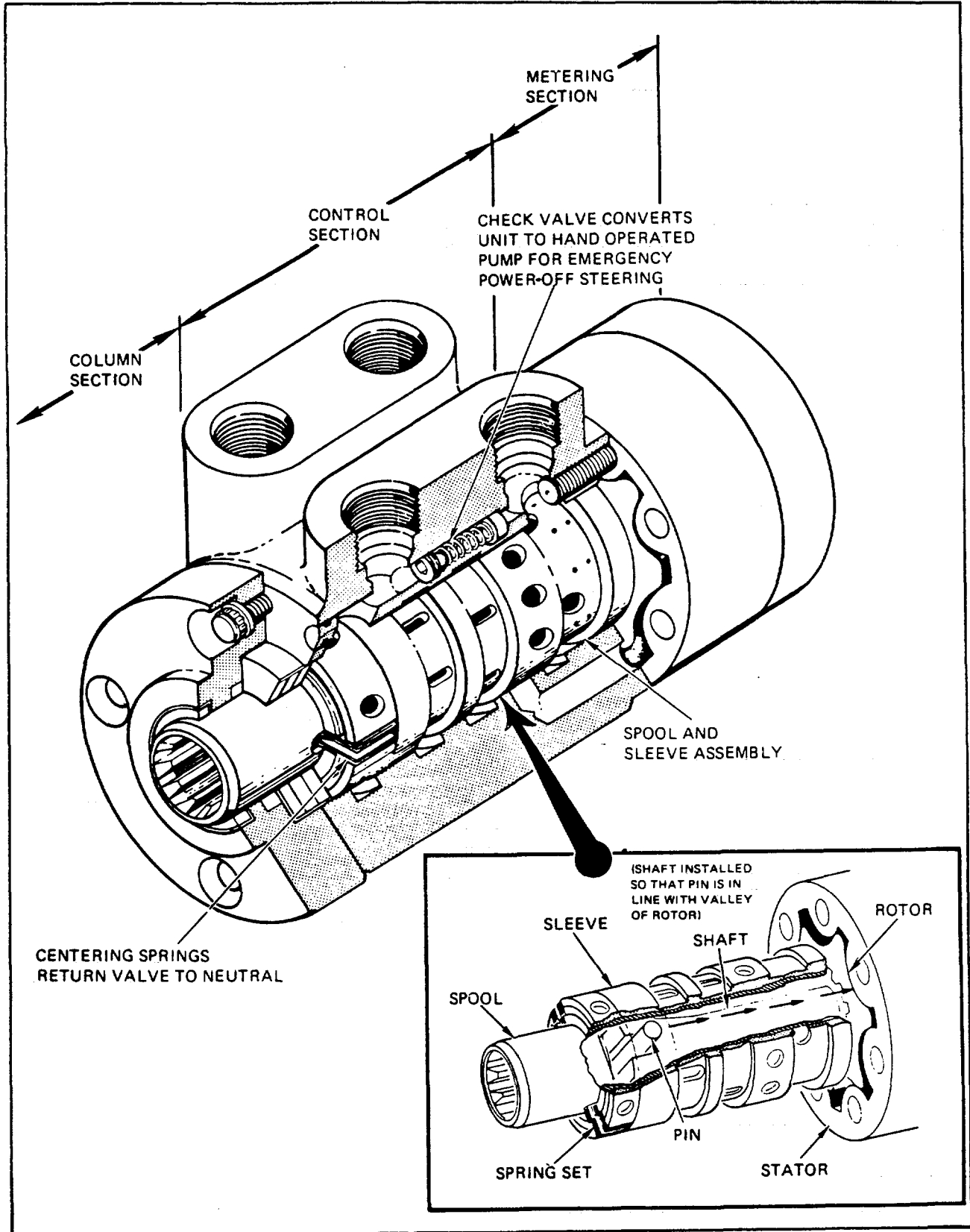


FIGURE 9-2.

(3) a metering section.

The column section provides a means of mounting and actuating the control and metering sections. The control section distributes the oil to and from the metering section. The metering section determines the quantity of oil delivered to the control section.

9-10. The column section consists of a splined shaft and housing assembly. The unit steering wheel is splined to one end of the shaft. The opposite end of the shaft is splined into the control section spool to rotate the spool for distribution of oil.

9-11. The control section consists of a spool and sleeve assembly, six centering springs and a manual steering check valve mounted in a cast housing. The housing also contains an inlet port, a dump port and two steering cylinder ports. The spool is fitted into the center of the sleeve and is held in place in the sleeve by a straight pin and the set of six centering springs. The pin extends through the sleeve and two radial slots in the spool. The pin is a tight fit in the sleeve and a loose fit in the spool. The centering springs extend through the spool and out each side of the sleeve so that they return the spool to the center position. The spool contains a series of porting holes that align with similar holes in the sleeve when the spool is rotated off of the center position.

9-12. A shaft with a radial slot at one end and splines at the opposite end connects the control section to the metering section. The slotted end of the shaft mates with the straight pin extending through the spool. The splined end fits into the center of the rotor set closest to the control section. The control section is also attached to the metering section through a porting plate.

9-13. The metering section consists of a rotor set (metering element) which is connected to the control section spool. The rotor set consists of a matched rotor and stator.

9-14. The stator has seven concave configurations (serving as oil cavities). It also contains the same number of convex configurations, each one being diametrically opposite a cavity. The rotor contains six lobes that are formed to mate with the stator cavities. Each lobe has a diametrically opposite lobe: therefore when one rotor is in a cavity of the stator, its opposite lobe is at the crest of the stator convex

configuration opposite the cavity. Due to the interaction between the rotor and stator, there are 42 overlapping fluid discharging actions in one revolution of the rotor.

9-15. OPERATION (see figure 9-2).

9-16. Rotation of the steering wheel actuates three main components in the steering control unit:

- (1) The control section spool
- (2) The control section sleeve
- (3) The metering element (rotor) in the metering section.

When the steering wheel is stationary, the control section spool and sleeve are held in the center position by the six centering springs. During this condition, oil is received from the system hydraulic pump and is routed back to the tank.

9-17. As the steering wheel is turned and the spool just begins to rotate, the spring set tends to rotate the sleeve to maintain the "center" relationship between the spool and sleeve. However, the force required to turn the rotor set is greater than the spring pressure and the springs start to flex. This "flexing" action permits the spool to move within the sleeve (approximately 1/8 inch) until the ends of the spool slots contact the straight pin extending through the sleeve and the spool. In this position, the porting holes in the sleeve and spool are aligned. This permits incoming oil to flow to the metering section and opens one of the cylinder ports.

9-18. Further rotation of the steering wheel causes the spool to rotate the pin, which then turns the sleeve and the rotor in the metering section. At this time, oil is being metered by the metering section and is allowed to flow through the spool and sleeve to one side of the steering cylinder. The porting arrangement also allows the oil to flow from the opposite side of the cylinder, through the control section and back to the hydraulic tank. The output of the metering section is directly proportional to the speed and distance that the steering wheel rotates.

9-19. When rotation of the steering wheel stops, the metering action in the metering section also stops. The six centering springs then return the sleeve to the neutral (open-center) position. When this occurs,

SECTION 9 STEERING

pressure is maintained in the cylinder to maintain guide roll position, but all incoming oil from the system pump flows back to the tank. To return the guide roll to the straight ahead position, the steering wheel must be rotated in the opposite direction. The control unit will then function as described, but all parts will rotate in the opposite direction.

9-20. REMOVAL OF STEERING CONTROL UNIT.

a. Remove the horn cover and lock ring, then lift the horn button assembly from the steering wheel (see figure 9-3).

b. Remove steering wheel jam nut and use a puller to remove steering wheel. Then remove the two countersunk mounting capscrews from the gooseneck (see figure 9-4).

c. Remove gooseneck access plate (see figure 9-5).

d. Disconnect the two hydraulic hoses and the water spray hose. Plug or cap all hoses and fittings (see figure 9-6).

NOTE: Mark the hydraulic hoses as to their position with respect to the steering cylinders.

e. Disconnect the inlet hose from the pump and the return hose from the tank. Plug or cap all hoses and fittings. Remove the control unit and hoses from the gooseneck opening (see figure 9-7).

9-21. DISASSEMBLY OF STEERING CONTROL UNIT (see figures 9-2 and 9-8).

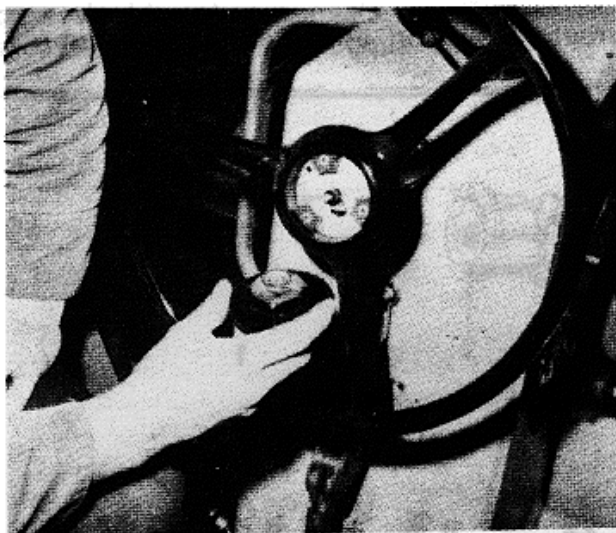


FIGURE 9-3.

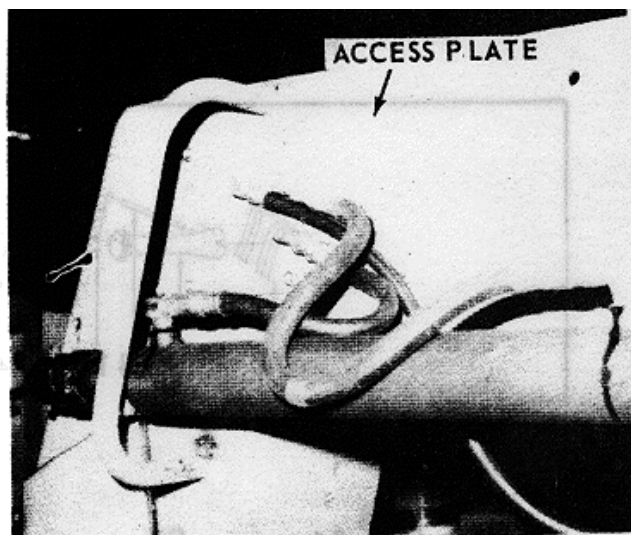


FIGURE 9-5.

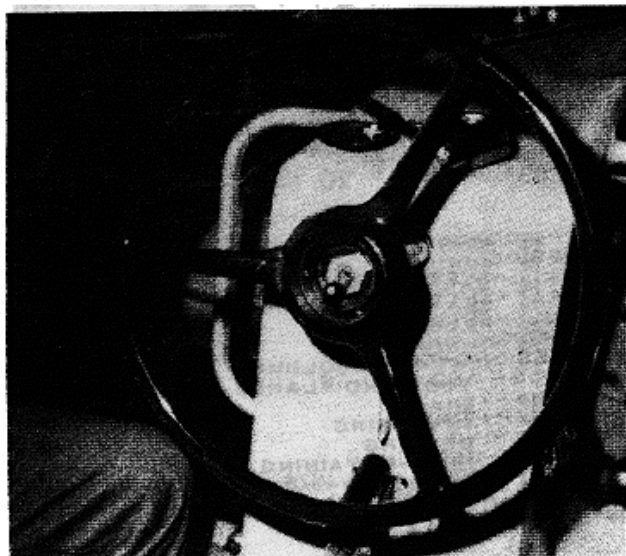


FIGURE 9-4.

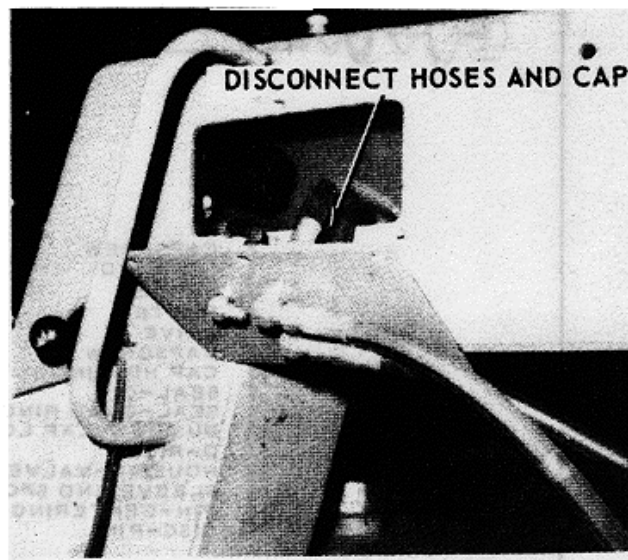


FIGURE 9-6.

**SECTION 9
STEERING**

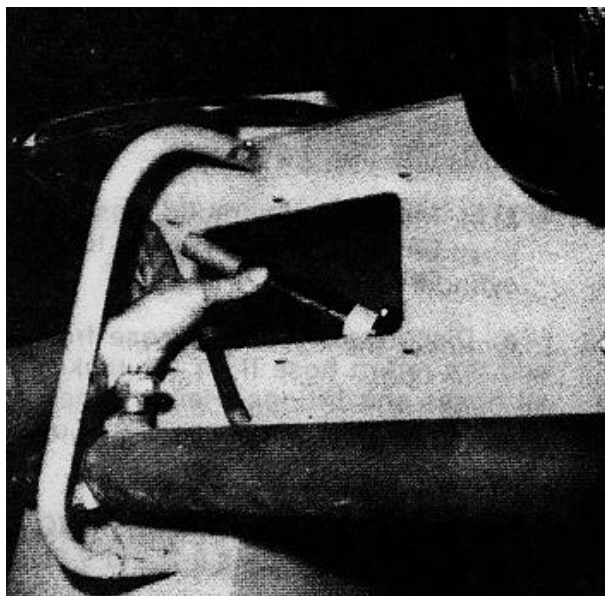


FIGURE 9-7.

a. Place the unit in vise, control end up. Clamp across port surface and opposite side of housing lightly. Remove the two capscrews that fasten column to lower unit. Remove column and set aside. Mark the capscrew holes so that the ports will be in the proper direction when reassembled (see figure 9-9).

b. Clamp unit in vise across mounting plate edges with meter end up and remove 7 capscrews (see figure 9-10).

c. Lift off metering section (see figures 9-11, 9-12, and 9-13).

d. Remove control assembly from vise and check for free rotation of the control spool and sleeve parts with column shaft (see figure 9-14).

e. Place clean wooden block across vise throat to support spool parts and clamp unit

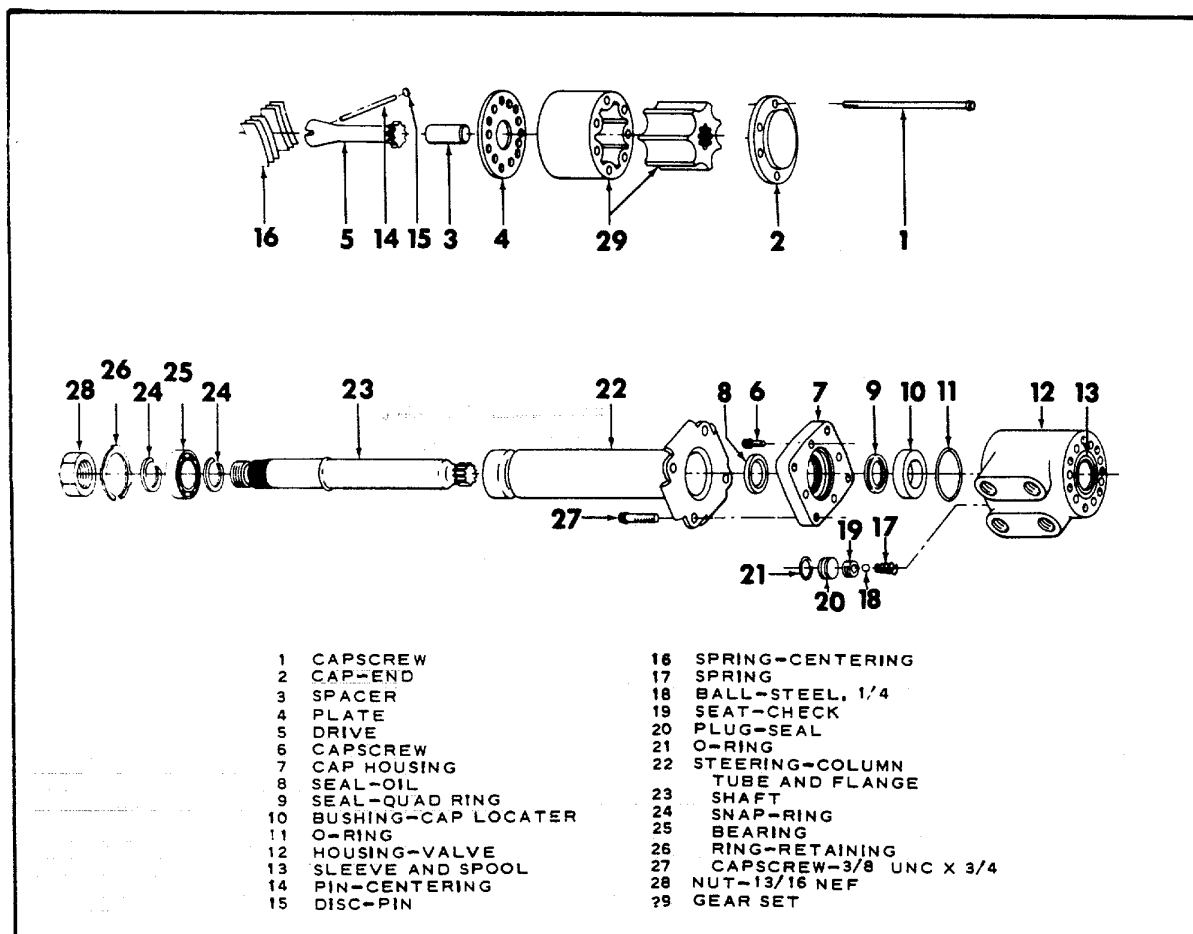


FIGURE 9-8.

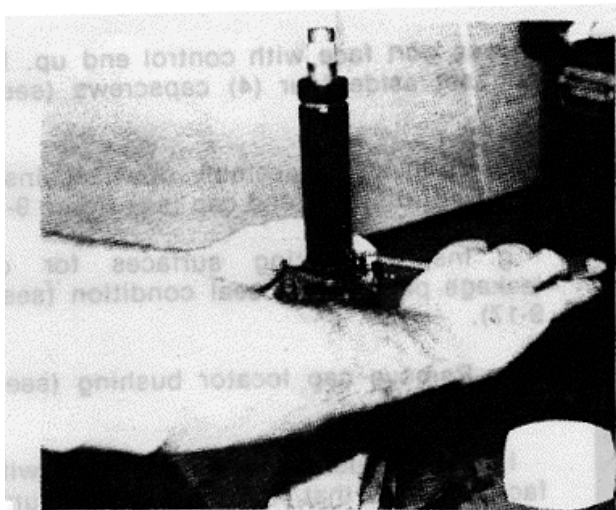


FIGURE 9-9A.



FIGURE 9-11.

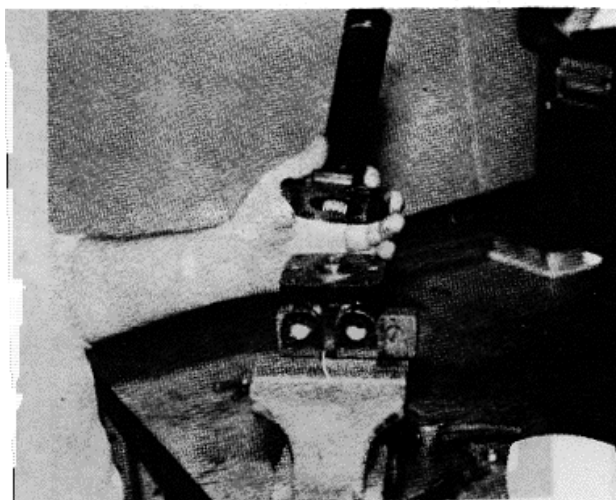


FIGURE 9-9B.

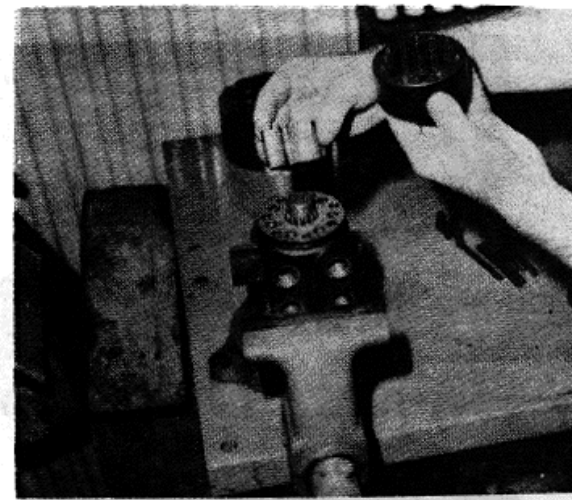


FIGURE 9-12.

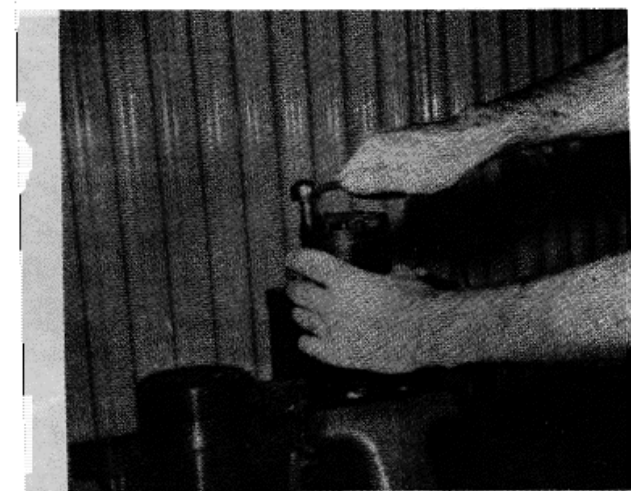


FIGURE 9-10.

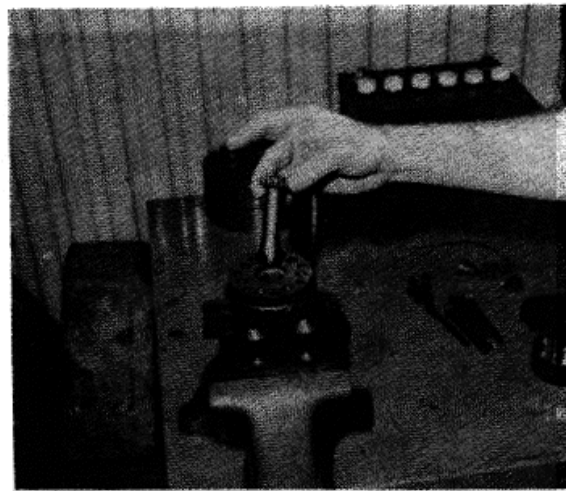


FIGURE 9-13.

SECTION 9 STEERING

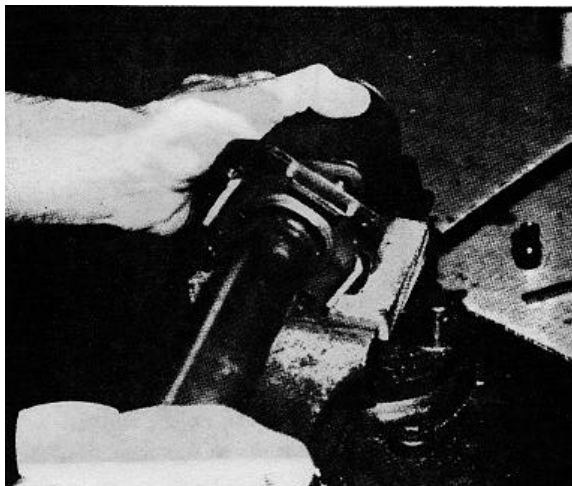


FIGURE 9-14.

across port face with control end up. Remove and set aside four (4) capscrews (see figure 9-15).

f. Hold spool assembly down against block in vise and lift off end cap (see figure 9-16).

g. Inspect mating surfaces for obvious leakage path, wear, seal condition (see figure 9-17).

h. Remove cap locator bushing (see figure 9-18).

i. Place housing on solid surface with port face down so that it can be held securely and remove spool-sleeve assembly from the 14 hole end of housing (see figure 9-19).

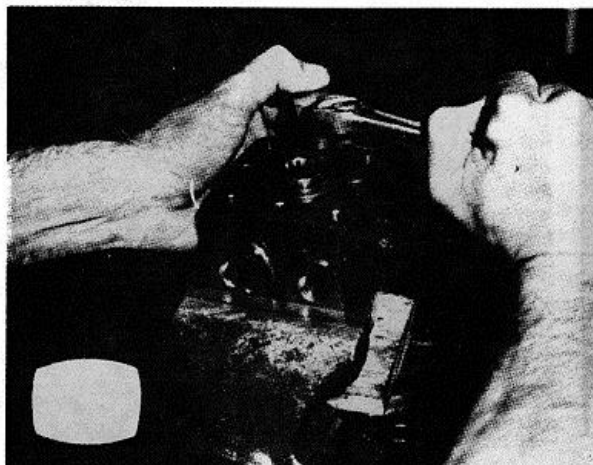


FIGURE 9-15.



FIGURE 9-17.

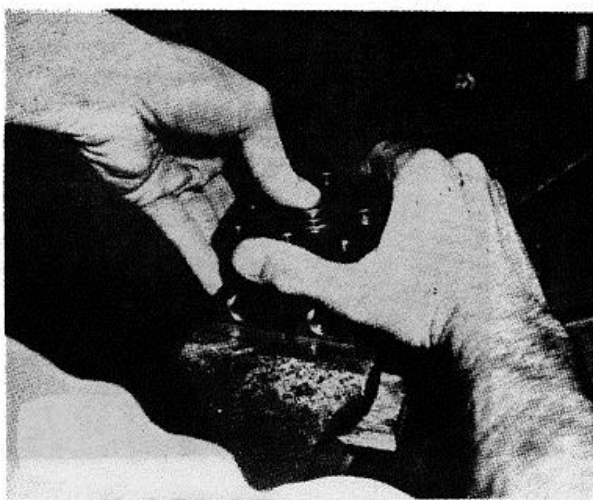


FIGURE 9-16.



FIGURE 9-18.

j. Be extremely careful to prevent these parts from binding as they are very closely fitted and must generally be rotated slightly as they are withdrawn (see figure 9-20).

k. Using a small bent tool or wire, the check valve seal can be removed by pushing on it, reaching it through the "out" port. Do not pry against edge of hole in housing bore (see figure 9-21).

l. Place housing in vise, control end up, and unscrew check valve seat with 3/16 inch hex wrench (see figure 9-22).

m. Up-end the housing and tap slightly with butt of hand. Hold check valve hole toward lowest corner and remove check valve seat, ball and spring (see figure 9-23).



FIGURE 9-21.



FIGURE 9-19.

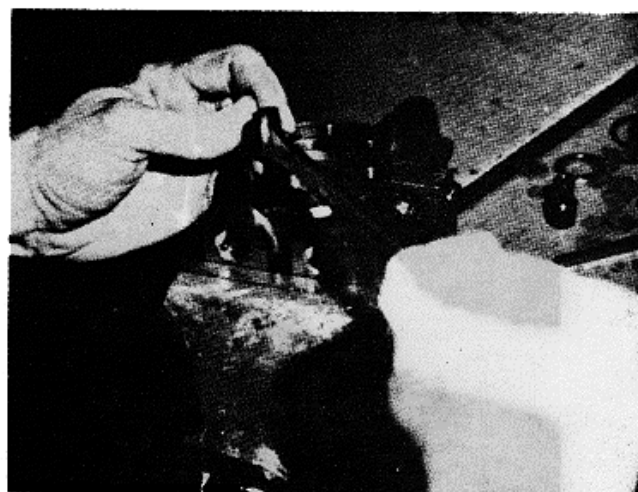


FIGURE 9-22.

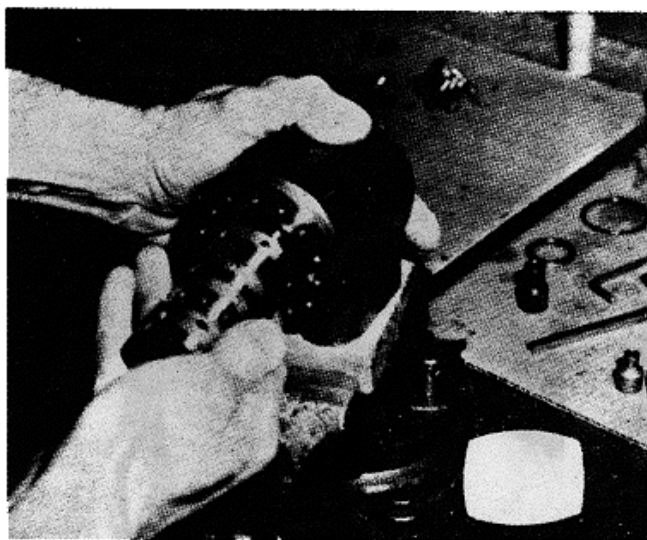


FIGURE 9-20.

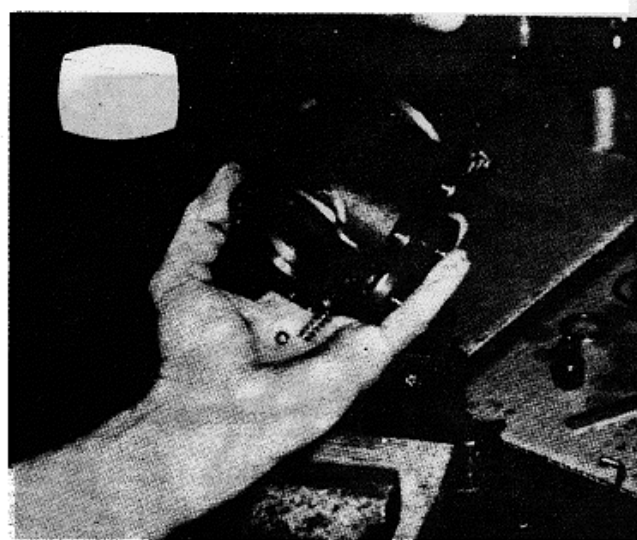


FIGURE 9-23.

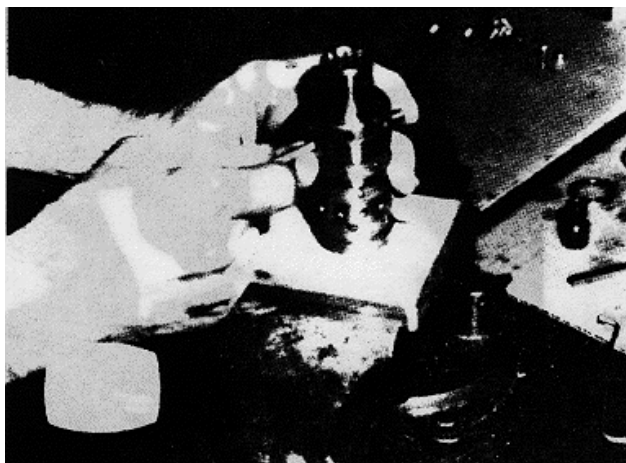


FIGURE 9-24.

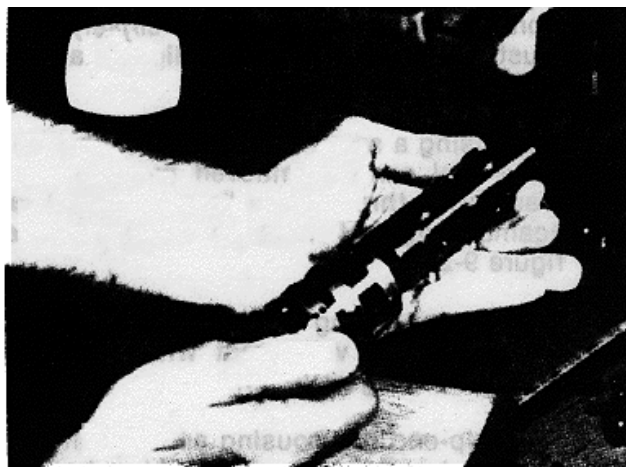


FIGURE 9-27.



FIGURE 9-25.



FIGURE 9-28.



FIGURE 9-26.

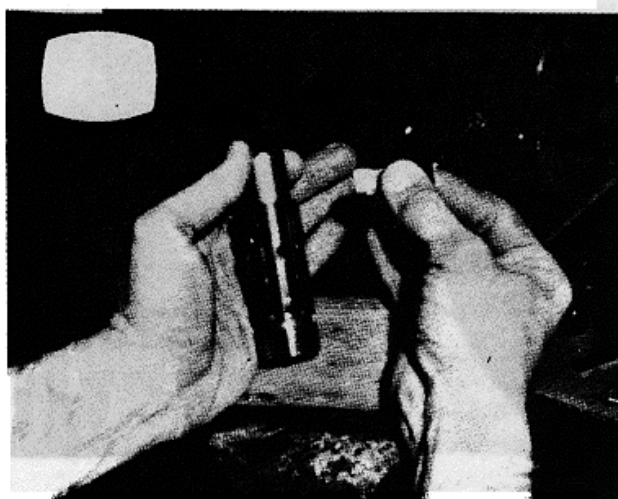


FIGURE 9-29.

SECTION 9 STEERING

n. In spool assembly, push the cross pin to loosen from spool sleeve assembly (see figure 9-24). Remove cross pin and set aside (see figure 9-25).

o. Push inside lower edge of spool so that spool moves towards splined end and remove carefully from sleeve (see figures 9-26 and 9-27).

p. Push centering spring set out of spring slot in spool (see figures 9-28 and 9-29).

9-22. INSPECTION.

9-23. Each part should be rinsed carefully in clean solvent, even such exterior parts as all capscrews and all seals that appear to be reusable. If in doubt, replace with new seals. It is good service policy to replace all seals when unit is reassembled. They are available in kit form. Rinsing and cleaning can be done while other parts of the unit are being disassembled and parts can be set to dry on clean paper towel. The meter gear set must be disassembled and cleaned similarly.

9-24. Inspect all moving surfaces to insure that they have not been scored or abraded by dirt particles or otherwise disrupted. Smooth burnished surfaces are normal in many areas. Slightly scored parts can be cleaned with 600 grit abrasive paper by hand rubbing only.

9-25. To prepare all surfaces of the meter section for reassembly and insure that all edges of the parts are burr free, place a piece of 600 grit abrasive paper face up on an extremely flat, clean, hard surface. The surface to be used for this purpose should be as flat as

plate glass or better. If the 600 grit paper is new it should first be rubbed down with a scrap steel part to remove grit which would produce scratches. The ends of the star gear can be used for this purpose if necessary. Then both sides of the ring gear, both sides of the plate, the 14 hole end of the housing and the flat side of the end cap should be cleaned lightly.

9-26. Stroke each surface across the abrasive several times and observe the part (see figures 9-30, 9-31 and 9-32). Any small bright area near an edge indicates a burr which must be removed. Hold the part so that contact with the abrasive is as flat as possible (Do not push one edge down hard or the part will become rounded). Check each part after 6 to 10 strokes across the abrasive. After polishing each part, rinse clean in solvent and blow dry. Keep these parts absolutely clean until they are assembled.

9-27. REASSEMBLY OF STEERING CONTROL UNIT .

CAUTION: Observe the shaft-to-rotor alignment procedures specified in figure 9-2. Do not oil any component prior to reassembly. The sealing of one component to another is dependent on lapped surfaces. Seepage may occur as a result of dust retained in an oil film. Blow all parts dry with compressed air prior to reassembly.

a. Place housing in vise with control end up.



FIGURE 9-30



FIGURE 9-31



9-32

SECTION 9
SECTION 9
STEERING

Protect 14 hole end and clamp across port surface lightly. Drop check valve spring into check hole with large end down (see figure 9-33).

b. Drop check ball into check hole and insure that it rests on top of the small end of the spring within the hole (see figure 9-34). Place the check valve seat on hex wrench and screw into threads within check hole so that the machined counterbore of the check seat is towards the ball (see figure 9-35).

c. Torque check seat to 12.5 ft.-lbs. (1.728 kg-m) (see figure 9-36). Test check ball action by pushing ball with small clean pin against spring force. Ball need NOT be snug against seat for proper function.

d. Install spool within sleeve carefully so that spring slots of both parts will be at same end. Rotate while sliding parts together (see figures 9-37 and 9-38). Test for free rotation. Spool should rotate smoothly in sleeve with finger tip force applied at splined end.

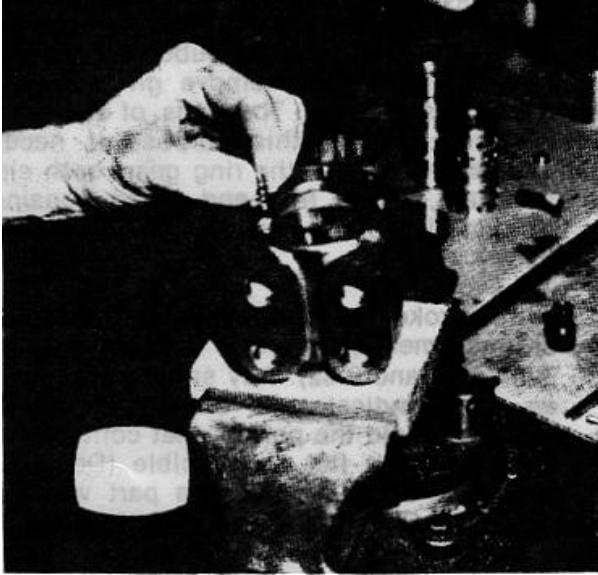


FIGURE 9-33

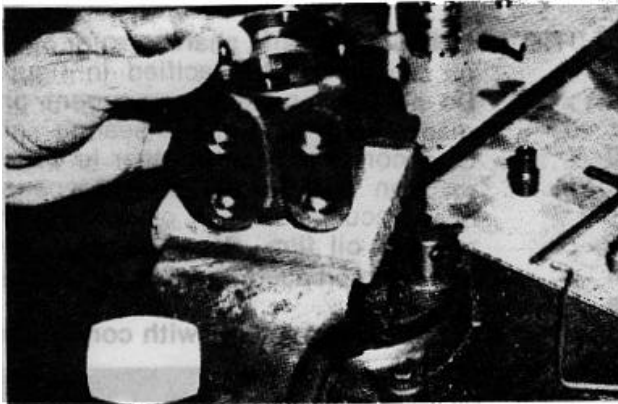


FIGURE 9-34

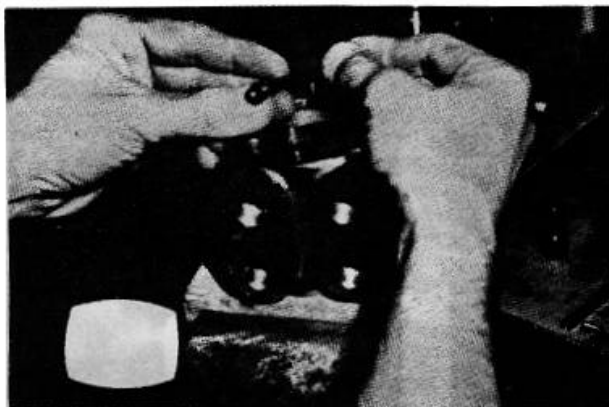


FIGURE 9-35



FIGURE 9-36



FIGURE 9-37

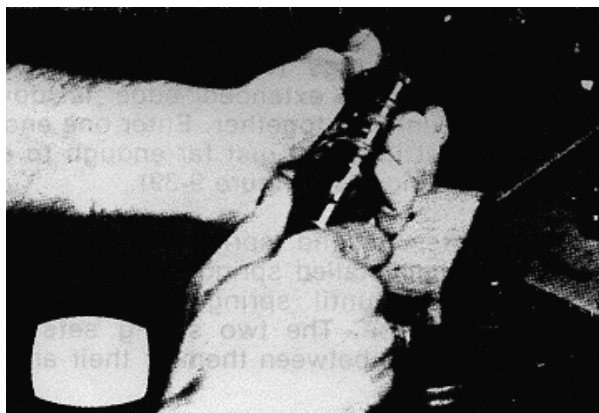


FIGURE 9-38

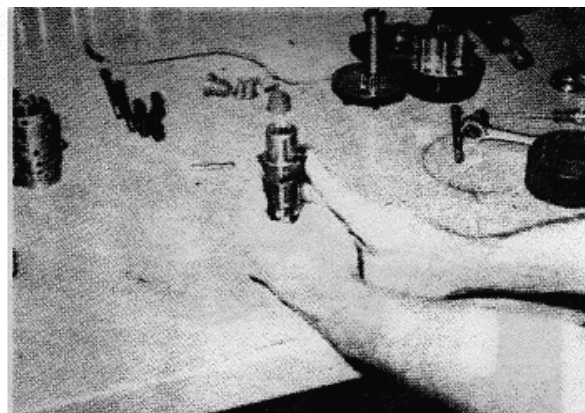


FIGURE 9-41

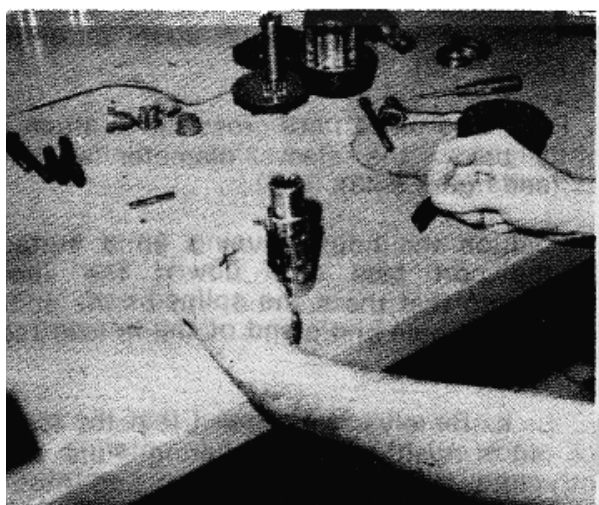


FIGURE 9-39



FIGURE 9-42

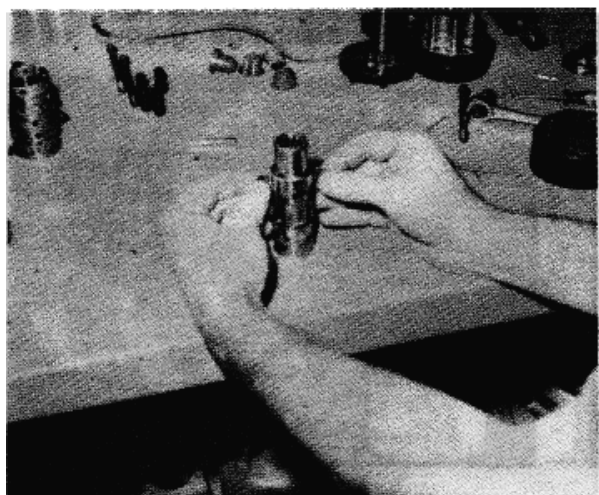


FIGURE 9-40



FIGURE 9-43

SECTION 9 STEERING



FIGURE 9-44



FIGURE 9-45

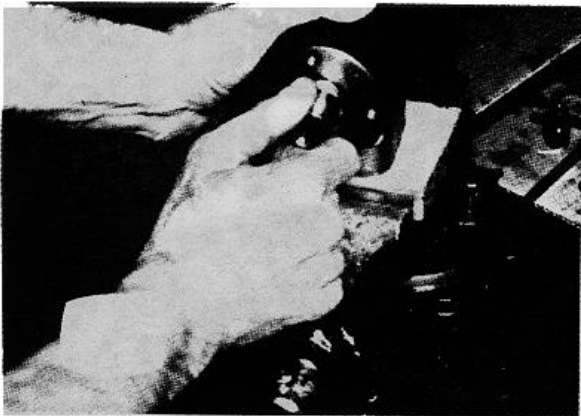


FIGURE 9-46

e. Bring spring slots in both parts in line and stand on end of bench. Position pairs of centering springs (or 2 sets of 3 each) on bench so that extended edge is down and arched center is together. Enter one end of one spring set into slot just far enough to edge on opposite side (see figure 9-39).

f. Enter second spring set from opposite side from installed spring set. Work the spring set around until spring set enters slot on opposite side. The two spring sets will now have tension between them at their arches (see figure 9-40).

g. Center the spring set so that they push down evenly and flush with the upper surface of the spool and sleeve (see figure 9-41).

h. Install cross pin through spool assembly (see figure 9-42).

i. Push into place until cross pin is flush or slightly below the sleeve diameter at both ends (see figure 9-43).

j. Position the housing on a solid surface with the port face down. Start the spool assembly so that the splined end of the spool enters the 14 hole end of the housing first (see figure 9-44).

k. Be extremely careful that the parts do not cock out of position while entering. Push parts gently into place with slight rotating motion (see figure 9-45). Bring the spool assembly entirely within the housing bore until the parts are flush at the meter end or 14 hole end of the housing. Do not pull the spool assembly beyond this point to prevent the cross pin from dropping into the discharge groove of the

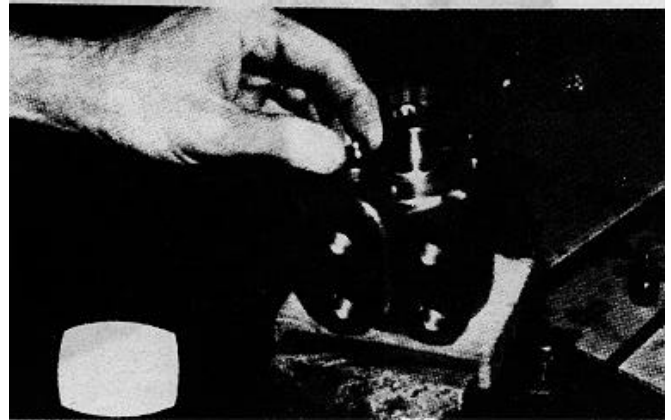


FIGURE 9-47

housing. With the spool assembly in this flush position, check for free rotation within the housing by turning with light finger force at the splined end (see figure 9-46). Hold the parts in this flush position and rest the 14 hole end of the assembly on the protective block on the vise and clamp lightly across the port face with the vise.

NOTE: It is good service policy to replace all seals when unit is reassembled. They are available in kit form.

NOTE: Do not force the spool into the housing if it will not slide in freely. The assembly tolerance is so close that the temperature of your hand can expand metal of the spool enough that it will not slide in the housing.

l. Check the condition of the o-ring seal on the check plug and replace it if necessary. Install the check plug in the check hole with a steady pressure while rocking it slightly so that the o-ring feeds in smoothly without cutting (see figures 9-47 and 9-48).

m. Position the cap locator bushing with large O. D. chamfer UP partly into end of housing (see figure 9-49). Insure that it seats against spool assembly flat and smooth by rotating with finger tips.

n. Check the mounting plate and shaft seal carefully to insure that they are clean and in good condition. Insure that the mounting plate seal grooves are clean and smooth. Each of these seals are slightly larger than its seal grooves so that they will be adequately retained in service. Push each gently into place and smooth down into seal groove with finger tip (see figure 9-50).

o. Thin oil seal at exterior of mounting is a dirt exclusion seal and does not generally need replacement. If this is replaced, it should be pressed into counterbore so that the lip is directed away from the unit.

p. Place the mounting plate sub-assembly over spool shaft and slide down into place over cap locator bushing smoothly so that seals will not be disrupted in assembly (see figure 9-51). Be certain that the mounting plate rests fairly flush against the end of housing assembly so that the cap locator bushing is not cocked and install four mounting plate capscrews. Tighten these evenly and gradually to a torque setting of 21 ft.-lbs. (2.9 kg-m) (see figure 9-52).



FIGURE 9-48



FIGURE 9-49

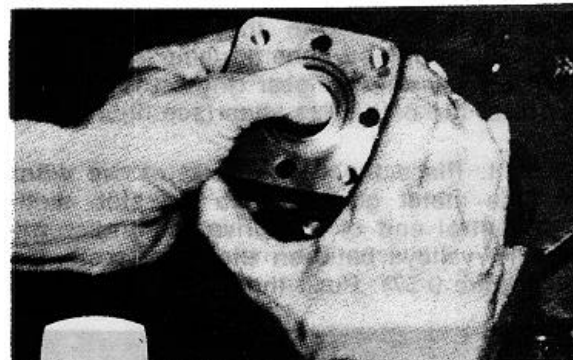


FIGURE 9-50



FIGURE 9-51

**SECTION 9
STEERING**

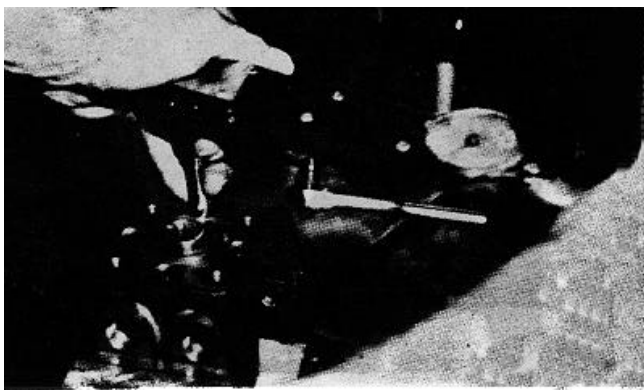


FIGURE 9-52



FIGURE 9-54

q. Reposition in vise and clamp across the edges of the mounting plate lightly. Check to insure that the spool and sleeve are flush or slightly below the 14 hole surface of the control housing (see figure 9-53).

r. Clean the upper surface of the housing by wiping with the back of a clean hand or the butt of the thumb. Clean each of the flat surfaces of the meter section parts as it is ready for assembly in a similar way (see figure 9-54).

s. Place the plate over this assembly so that the bolt- holes in the plate-align-with the tapped holes in the housing (see figure 9-55). Place the meter gear ring on the assembly so that the bolt holes align (see figure 9-56).

t. Place the splined end of the drive within the meter gear star so that the slot at the control end of the drive is in alignment with the valleys between the meter gear teeth (see figure 9-57). Push the splined end of the drive

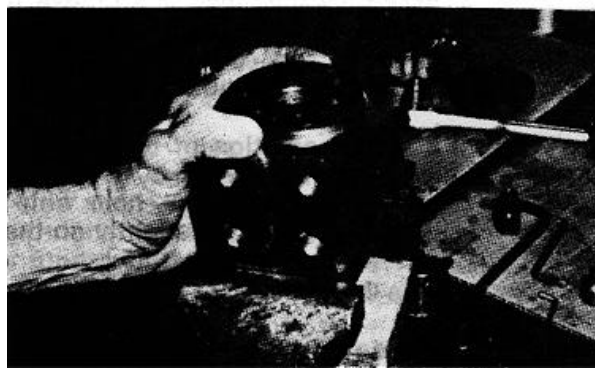


FIGURE 9-55



FIGURE 9-56

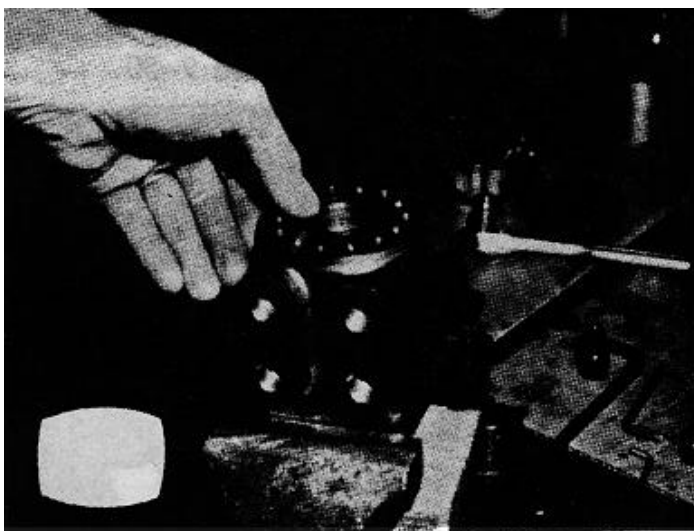


FIGURE 9-53



FIGURE 9-57

through the gear so that the spline extends about one half its length beyond the meter gear star and hold it in this position while installing into the unit. Note the position or direction of the cross pin within the unit. Enter the meter gear star into the meter gear ring and wiggle the parts slowly in position so that the drive does not become disengaged from the meter gear star. Hold the plate and meter gear ring in position on the assembly while the star is being installed. Rotate the meter gear star slightly to bring the cross slot of the drive into engagement with the cross pin and the splined end of the drive will drop down against the plate (see figures 9-58, 9-59 and 9-60).

WARNING: Alignment of the cross slot in the drive with valleys between the teeth of the meter gear star determines proper valve timing of the unit. There are 12 teeth on the spline and 6 pump teeth on the star. Alignment is exactly right in 6 positions and exactly wrong in 6 positions. If the parts slip out of position during this part of assembly, repeat until you are certain correct alignment is obtained (see figure 9-57).

u. Place the spacer in position within the end of the meter gear star (see figure 9-61). If the spacer does not drop flush with the gear surface, the drive has not properly engaged the cross pin - RECHECK. Place the meter end cap over the assembly and install two (2) capscrews, finger tight, to maintain alignment of the parts (see figure 9-62). Install all seven capscrews and bring them gradually and evenly to 12.5 ft.-lbs. (1.728 kg-m) (see figure 9-63).



FIGURE 9-59



FIGURE 9-60



FIGURE 9-58



FIGURE 9-61

SECTION 9 STEERING

v. Check the condition of the column assembly, clean it, and replace on the unit with two capscrews oriented as before. Rotate the steering shaft while bringing the surfaces into contact to allow splines to engage (see figure 9-64). If in doubt, follow the orientation as shown. Tighten capscrews to 23.3 ft.-lbs. (3.22 kg-m) (see figure 9-65).

9-28. INSTALLATION OF STEERING CONTROL UNIT.

9-29. Install the steering control unit by reversing procedure presented in paragraph

9-19. Install hydraulic hoses per illustration figure 9-66.

CAUTION: Complete bleeding the system procedure paragraph 9-83 before returning unit to service.



FIGURE 9-62

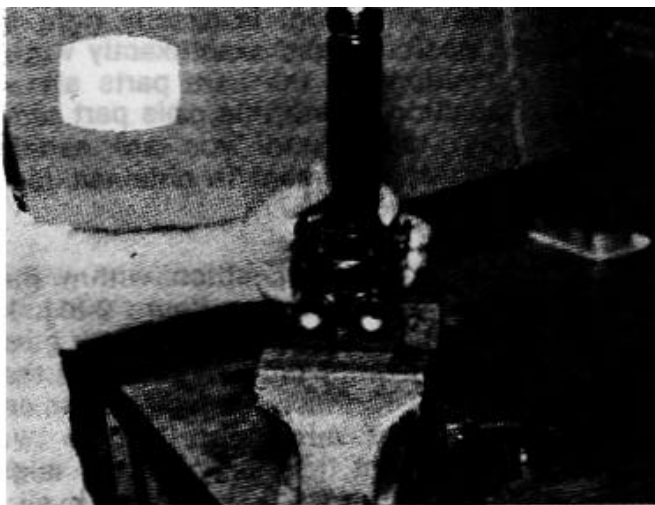


FIGURE 9-64



FIGURE 9-63

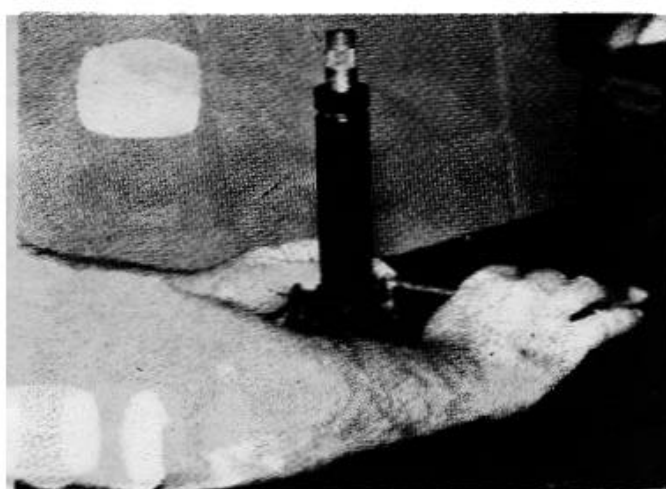


FIGURE 9-65

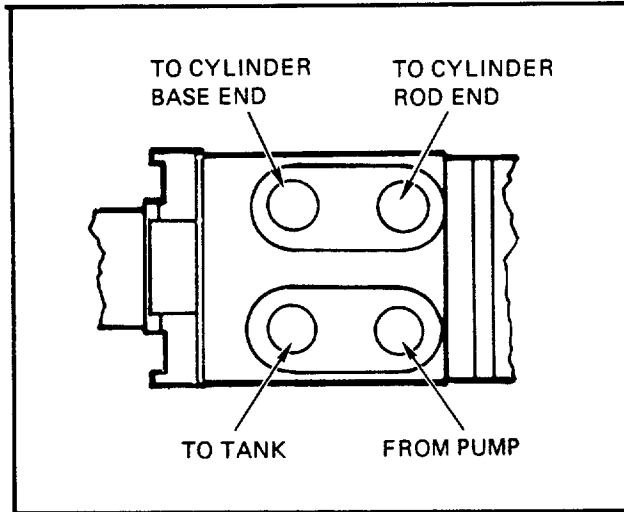


FIGURE 9-66.

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**SECTION 9
STEERING**

9-52. STEERING PUMP (DETROIT DIESEL UNITS).

9-53. DESCRIPTION.

9-54. The steering pump is a positive displacement gear pump. It is located at the right rear of the Detroit Diesel engine and is gear driven (see figure 9-82).

9-55. The pump (see figure 9-91) is made up of a housing, two gears, four bearings, a front cover and a rear cover. Pressure loading the front bearing assures correct gear-to-bearing clearance. During pump operation, pressurized oil is directed to an area between the front cover and bearings, forcing them toward the gears. Pressure from the outlet side of the pump is against the opposite side of the bearings. When the two pressures are balanced, a thin film of oil

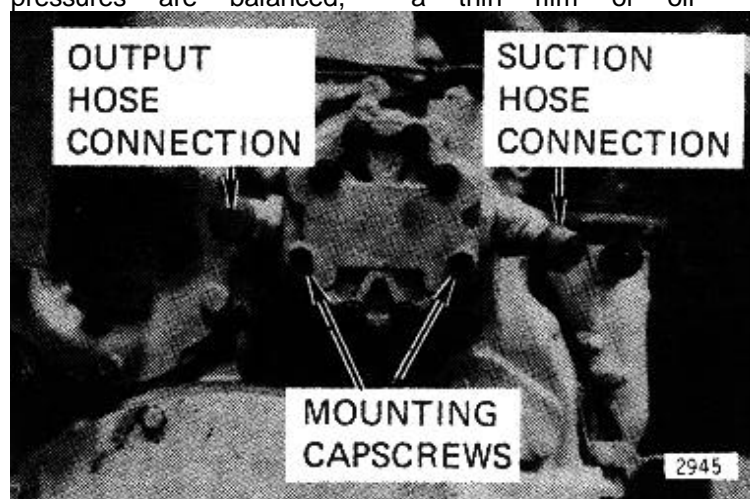


FIGURE 9-82.

exists between the gears and bearings, and actual gear-to-bearing contact is prohibited.

9-56. Oil is prevented from by-passing the body and end covers by neoprene gaskets between the components. A replaceable low pressure shaft seal is pressed into the front cover. Communication of the high pressure and low pressure oil between the bearings and front cover is prevented by a "W" shaped seal.

9-57. DISASSEMBLY OF STEERING PUMP.

a. Clean pump exterior. Remove woodruff key and capscrews. Separate rear cover from body. Remove and discard gasket. Remove front cover. Remove and discard front cover gasket. Lift out "W" shaped gasket seal and neoprene spacer (see figure 9-83). Drive out shaft seal.

b. Mark relative position of front and rear bearings and body (see figure 9-84). Do not scratch; use Prussion blue for marking of all pump parts. Push on rear of gear shafts until front bearings are free of the housing (see figure 9-85). Remove bearings. Mark relative position of gears, then extract gears. Match mark and remove rear bearings.

9-58. CLEANING AND INSPECTION.

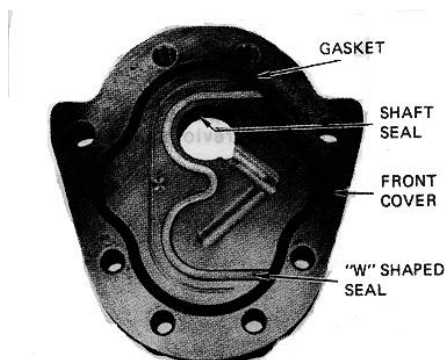


FIGURE 9-83.

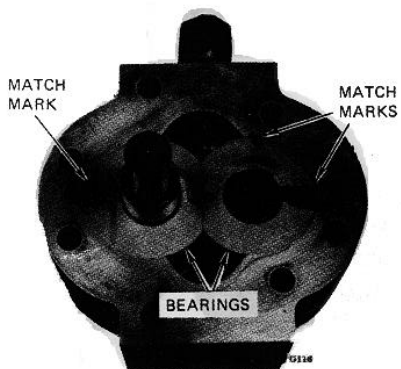


FIGURE 9-84.

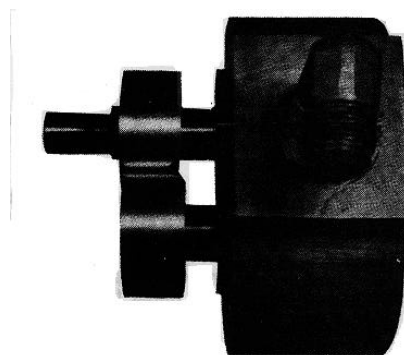


FIGURE 9-85.

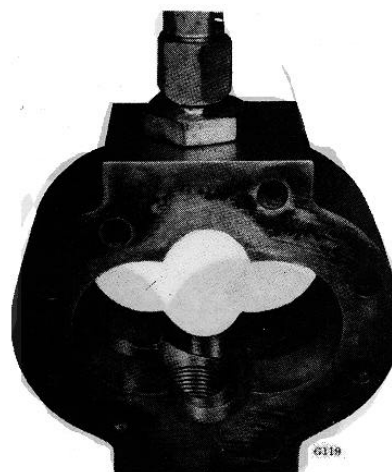


FIGURE 9-86.

- a. Clean all parts thoroughly in cleaning solvent.
- b. Check gears and shafts for nicks, burrs, cracks or chipping. Discard defective components.
- c. Examine gear chamber of body for contact between gears and body, especially the intake cavity of the body. Although wear of more than 1/64 of an inch (0.397 mm) is abnormal, it is not critical if the bearings are not defective. The intake cavity is shown in figure 9-86.
- d. Inspect the body and bearing for irregularities of the bore caused by bearing attempting to turn or signs of working. (see figure 9-87).
- e. Examine bearings and body for scratches and pitting (see figure 9-88). Use fine sand paper on a surface plate to dress out any slight imperfections of bearings (see figure 9-89). Do not attempt to remove deep scratches or gouges. Check bearing bores for concentricity (see figure 9-90). Place bearings in their respective positions in the body and check clearance between bearing flats. Under no circumstances should

these clearances exceed specifications (refer to Section 2).

- f. Check milled seal and gasket recesses of the cover for any obstruction that would prevent normal seating. Make sure internal threads of front cover and threads on capscrews are in good condition.

9-59. REASSEMBLY OF STEERING PUMP (see figure 9-91).

- a. Apply a light coat of non-hardening gasket-cement to the bore in the front cover. Press new shaft seal into the bore and wipe off excess cement. Stake seal in three places.

NOTE: Generously lubricate all parts with SAE 10 W oil during pump assembly.

- b. Install front bearing gears and rear bearings in their respective positions. Make sure all marks previously made during disassembly are aligned.

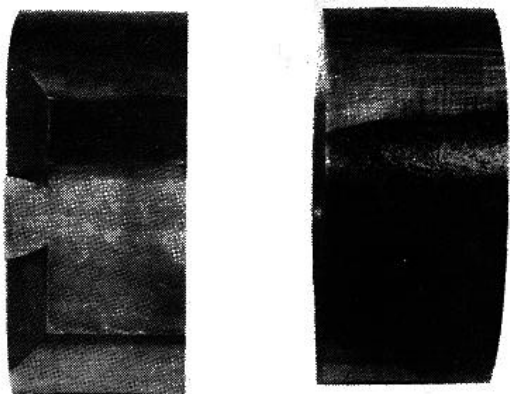


FIGURE 9-87.

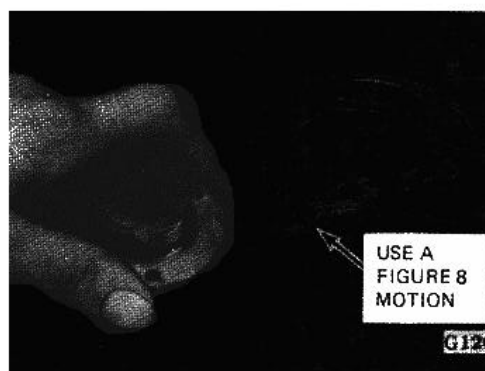


FIGURE 9-89.



FIGURE 9-88.

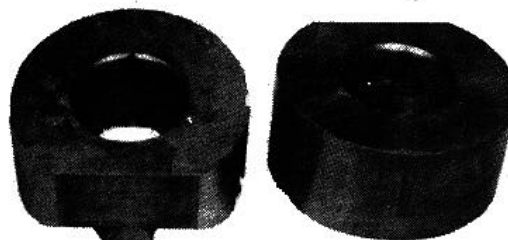


FIGURE 9-90.

**SECTION 9
STEERING**

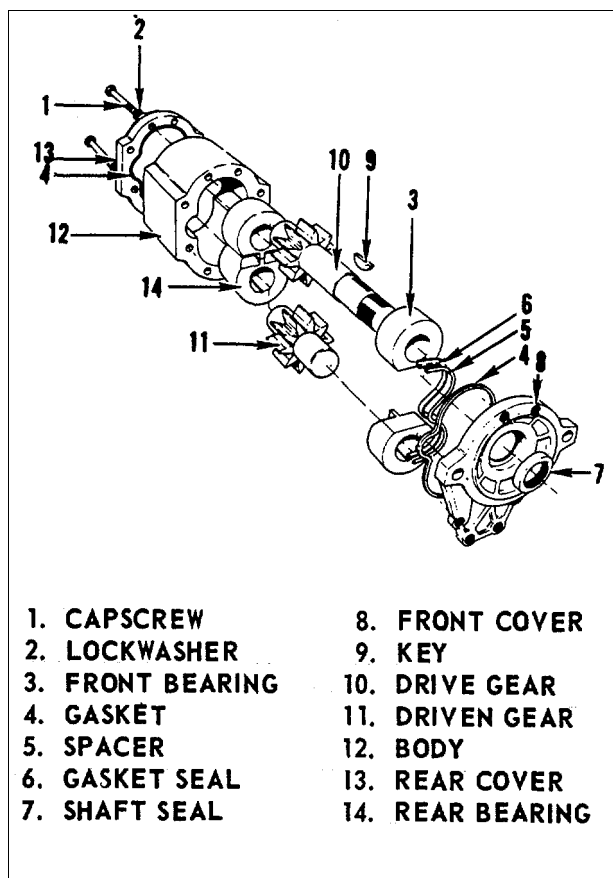


FIGURE 9-91.

c. Position gasket, spacer and "W" shaped gasket seal in front cover recesses.

d. Assemble front and rear cover to the body, being careful that the "W" gasket seal retains its position in the recess of the front cover. Tighten capscrews to specified torque.

CAUTION: The pump rotation is identified by arrow stamped on the pump body. When assembling the pump, the front cover (drive end of the pump) should be located on the "arrow" end.

9-60. INSTALLATION.

- a. Tighten the mounting bolts securely.
- b. Make certain all hydraulic fittings are tightened.
- c. Bleed the system as specified in paragraph 9-83.

CAUTION: Check for abnormal hot spots. If any particular area is hot, disassemble and inspect.

9-61. FLOW DIVIDER (DETROIT DIESEL).

9-62. DESCRIPTION (see figure 9-92).

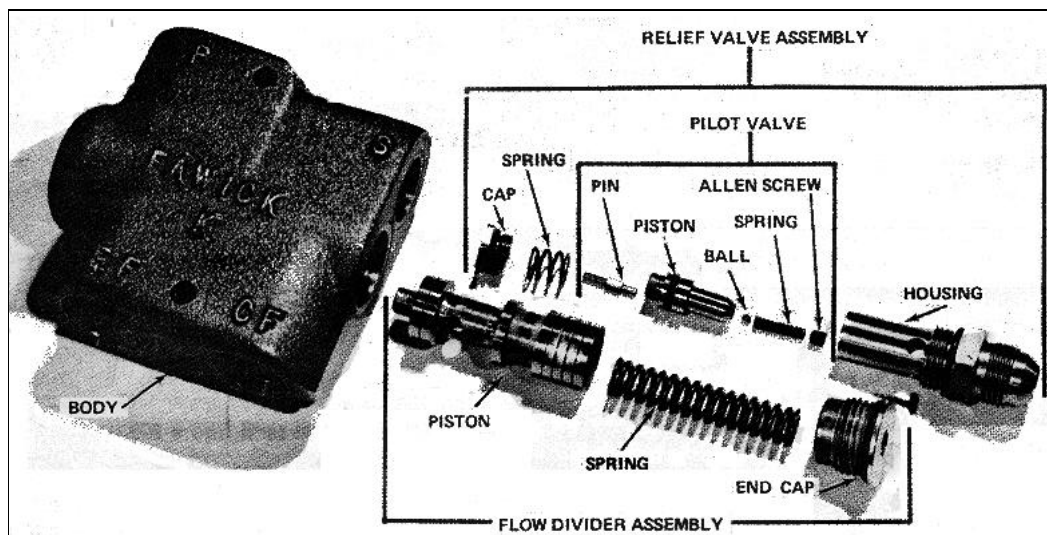


FIGURE 9-92.

9-26.

9-63. The flow divider is mounted on the front, right-hand side of the engine compartment. Four hoses are routed to and from the flow divider. The unit consists of a body, a pressure-compensated piston and a pilot operated relief valve.

9-64. Port "P" is for the pump supply hose. Port "CF" is for controlled flow and is connected to the steering control unit at the gooseneck. Port "EF" is for excess flow and is connected to the inlet fitting of the pump. Port "S" is for relief flow and is connected to the outlet fitting in the hydraulic tank.

9-65. OPERATION (see figure 9-92).

9-66. At low pump speed, with input flow equal or less than set controlled flow, all flow is directed to the controlled flow "CF" port. The pressure-compensating pistons prevent or block any flow to the excess flow port. Controlled flow in this situation may be used up to the full integral relief valve pressure, however, the rate of controlled flow will decrease if the input flow decreases.

9-67. When input flow is increased, the pressure-compensated piston, in maintaining a fixed pressure drop across the orifice, moves further away from its stop position to allow fluid to flow from the input port to the excess flow "EF" port in maintaining the set controlled flow.

9-68. The pilot operated relief valve is factory set to 1500 ± 50 PSI (105.5 ± 3.5 kg/cm²) and cannot be adjusted. This valve relieves excessive pressures due to shock loads or other causes.

9-69. REMOVAL OF FLOW DIVIDER (see figure 9-1.)

a. Remove all hydraulic lines from the flow divider and cap all openings.

b. Unscrew mounting capscrews and remove flow divider from mounting bracket.

9-70. DISASSEMBLY OF FLOW DIVIDER (see figure 9-92).

CAUTION: The piston end cap is spring loaded.

a. Remove end cap, spring and piston.

b. Remove relief valve assembly. If further

disassembly of the relief valve is required, follow these steps:

(1) Remove the spring loaded end cap and remove the spring and pin.

(2) Push the piston out of the housing by inserting a small drift into the hose end of the housing. Removal of piston may be difficult because the o-ring has to slide past threads.

9-71. CLEANING AND INSPECTION.

a. Clean all parts thoroughly.

b. Check bores and spools for nicks and scratches. Spools must slide freely in their bores.

c. Ports and orifices must be free of obstructions.

9-72. REASSEMBLY AND INSTALLATION OF FLOW DIVIDER (see figures 9-1 and 9-92).

CAUTION: Replace and oil all o-rings.

a. Insert the relief piston into the relief valve housing. Insert the pin into the piston (the short side goes into the piston) and the spring. Screw the end cap into relief valve housing.

b. Screw the relief valve housing assembly into the flow divider.

c. Install the piston, spring and cap.

d. Install the mounting capscrews.

e. Connect the hydraulic lines.

9-73. ADJUSTMENT OF FLOW DIVIDER RELIEF VALVE.

9-74. The relief valve is factory set at 1500 ± 50 PSI (105.5 ± 3.5 kg/cm²). Do not try to adjust or repair the relief valve, but replace the whole valve.

9-75. STEERING CYLINDER.

9-76. DESCRIPTION (see figure 9-93).

9-77. The steering cylinder is a double-acting cylinder consisting primarily of a shell, piston and rod assembly and two end plugs. Hydraulic oil applied to one of the cylinder ports acts against the piston, causing piston and

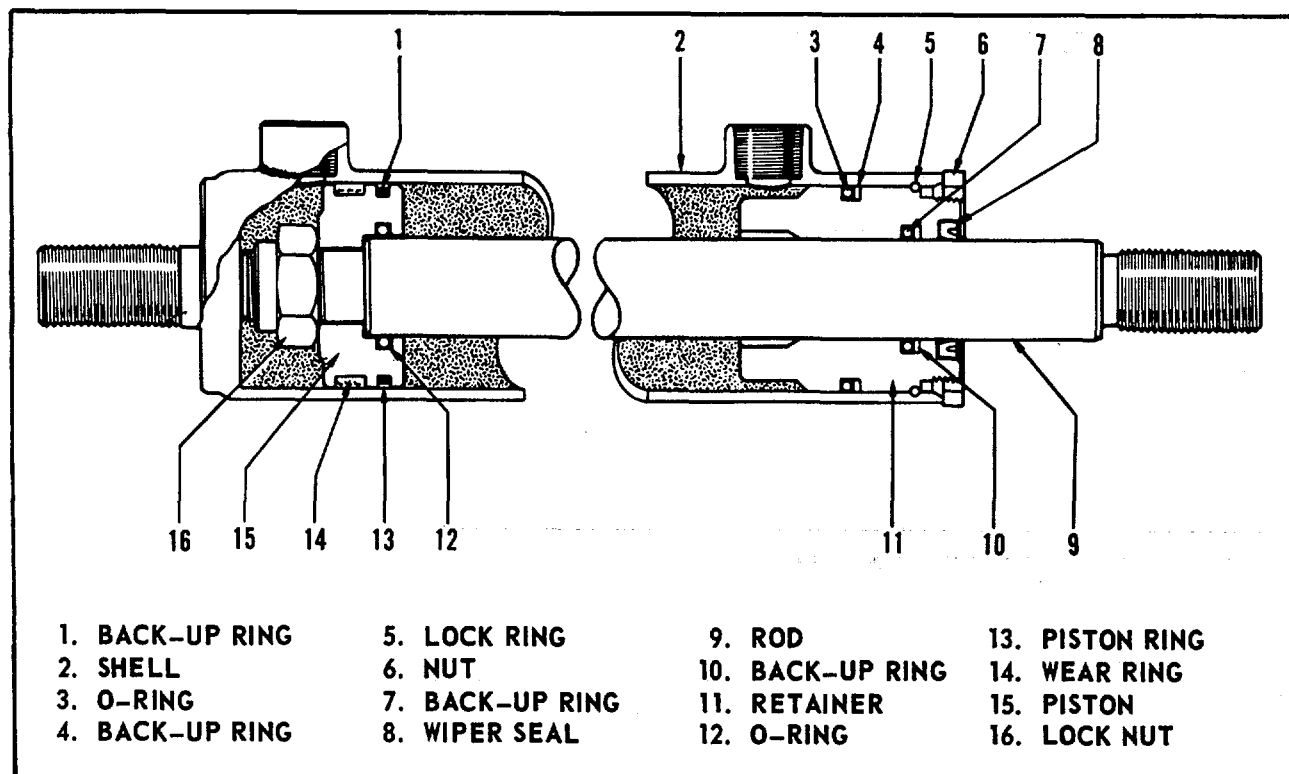


FIGURE 9-93.

rod movement. As one side of the cylinder fills, the opposite side is dumping an equal amount of oil. Oil is prevented from internally transferring from one side of the piston to the other by a teflon seal ring. The cylinder completes its stroke when the piston reaches a retainer. At this time, hydraulic pressure increases, causing the system relief valve to open. This prevents excessive pressure buildup in the system.

NOTE: For straight-ahead travel, the piston is positioned in the center of the cylinder shell.

9-78. REMOVAL OF STEERING CYLINDER (see figure 9-94).

- a. Disconnect the hydraulic lines from the cylinder and plug or cap to keep out dirt and reduce oil loss.
- b. Remove the cotter pin from the trunnion end of the cylinder and remove the plug and ball seat.
- c. Remove dirt boot by straightening the connector straps.
- d. Pry rod end of the cylinder from the ball stud.

- e. Disconnect the shell end of the cylinder following steps b through d above.

- f. Lift off cylinder and drain.

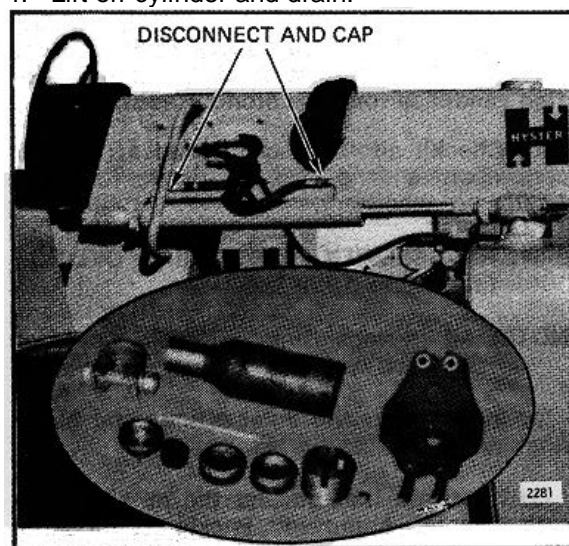


FIGURE 9-94.

9-79. DISASSEMBLY OF STEERING CYLINDER (see figure 9-93).

- a. Remove rod end ball joint.
- b. Unscrew and remove the retainer.
- c. Using a section of hollow round stock, push the retainer into the cylinder shell until the snap ring can be easily removed from the shell.
- d. Remove snap ring.
- e. Pull sharply on rod to remove retainer, piston and rod.
- f. Clamp rod in a vise between two pieces of clean, soft wood. Remove piston jam nut.
- g. Tape rod threads and remove piston.
- h. Remove the wear ring from piston if damaged, scored or chipped.
- i. Remove the teflon piston ring and o-ring.
- j. Remove the inner o-ring from the piston.
- k. Remove retainer from the cylinder rod and remove the outer and inner o-rings and back-up rings.
- l. Remove wiper seal from the end of the retainer.

9-80. CLEANING AND INSPECTION.

- a. Wash all parts in solvent and inspect for nicks, burrs, and scratches. Dress parts with fine sandpaper or India stone if necessary.
- b. Check all contact surfaces for any abnormalities and piston rings for wear. Replace if necessary.

9-81. REASSEMBLY OF STEERING CYLINDER (see figure 9-93).

NOTE: All o-rings and wipers should be replaced on reassembly.

- a. Install outer and inner o-rings and backup rings and wiper seal in the retainer.
- b. Lubricate the rod and the entire retainer with "Hyster Approved" Packing Lubrication. Carefully install the retainer on the rod.

c. Install inner o-ring in the piston.

d. Install the wear ring, outer o-ring and teflon piston ring on the piston.

e. Lubricate the piston with "Hyster Approved" Packing Lubricant and install the piston on the rod.

f. Remove tape and install jam nut. Torque per specification.

g. Compress wear ring and piston ring with fingers and insert into the cylinder shell.

h. Push the rod and the retainer into the shell until the snap ring can be installed easily. Install snap ring.

i. Pull sharply on the rod until the retainer bottoms against the snap ring.

j. Install the nut on the retainer. Torque per specification.

k. Install rod end ball joint.

l. Lubricated the five rod end ball joint internal parts which include the spring seat, spring, both ball stud seats and threaded plug (refer to Section 4).

9-82. INSTALLATION OF STEERING CYLINDER (see figure 9-94).

a. Install the spring seat, spring and one ball stud seat in the shell end of the cylinder and position the cylinder on the gooseneck mounted ball stud.

b. Install the remaining ball stud seat and threaded plug. Tighten plug until the cylinder will hold its position horizontal to the floor without assistance.

c. Tighten plug until the cotter pin can be installed. Install cotter pin.

d. Connect hydraulic hoses to the cylinder.

e. Position the rod end ball stud joint on the trunnion arm mounted ball stud. Install the remaining ball stud seat the threaded plug.

f. Tighten plug until all the spring movement in the ball joint is taken up. Tighten plug until the cotter pin can be installed. Install the cotter pin.

g. Fold boots over the ball joints and secure their position with the metal ribbons.

9-83. BLEEDING THE SYSTEM.

9-84. Air may become trapped in the system if any hoses or components are removed. An aerated system is indicated by jerky or spongy operation when the steering wheel is turned.

9-85. All hydraulic hoses leading to and from the cylinder enter at the top of the cylinder. Therefore, the system can be bled without disconnecting the hoses. Bleed the system as follows:

a. Fill the hydraulic tank with the specified oil (refer to Section 4).

b. Start the engine and allow to idle at 500 to 600 RPM for approximately one minute. This allows large air bubbles in the system to escape.

WARNING: Do not extend the hands or arm through the center of the steering wheel. If the steering control unit has been disassembled and incorrectly timed, the wheel may suddenly become motorized or rotate abruptly with extreme force. If this occurs, see figure 9-2 and paragraph 9-27, step t and retime the control unit as shown.

c. Increase engine speed to approximately 1,000 RPM and rotate the steering wheel as fast as possible in either direction. This should produce enough compression of oil to force the air out of the lines.

d. Continue to rotate the wheel in the same direction until the guide roll reaches its limit. Quickly reverse the steering wheel rotation to pressurize the opposite end of the steering cylinder.

e. Continue to rotate the wheel left and right, from stop to stop, until steering control is normal.

NOTE: If steering control fails to return to normal, air may be entering the system at the suction side of the pump (see figure 9-82). Check and tighten all hose fittings securely. Also check system pressure as specified in paragraph 9-86.

9-86. CHECKING RELIEF PRESSURE (see figure 9-95).

9-87. Pressure can be checked at the base of the steering cylinder fitting. Use a gauge rated at 3000 PSI (200 kg/cm²) or greater. Oil temperature should be approximately 100° F. (37° C). To check pump output pressure, proceed as follows:

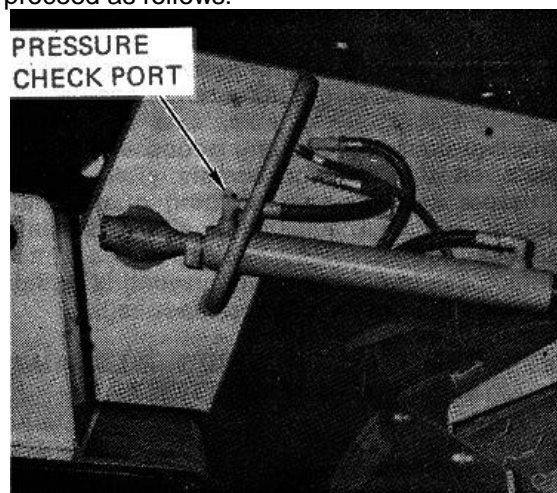


FIGURE 9-95.

a. Remove the plug at the steering cylinder base inlet fitting.

b. Connect pressure gauge to the cylinder fitting.

c. Start the engine and set speed at high idle. Rotate steering wheel from stop-to-stop. As guide rolls reach stops, the pressure gauge should indicate relief pressure (refer to Section 2).

CAUTION: Do not hold system over relief for longer than 20 seconds. This will damage the pump.

NOTE: If proper pressure is not obtained, remove the relief valve and clean all parts thoroughly. Carefully check the relief valve spool for burrs. Install the valve and recheck the pressure. If proper pressure cannot be

obtained, replace the relief valve assembly. If pressure remains low, disassemble the pump and inspect all parts for damage and wear.

9-88. STEERING TRUNNION ASSEMBLY.

9-89. DESCRIPTION (see figure 9-96).

9-90. The Steering Trunnion Assembly consists primarily of a king pin assembly, oscillation pin assembly, steering yoke, axle assembly, and two guide rolls. The unit gooseneck frame rests on the trunnion assembly. Two guide rolls are used to prevent scuffing of material during turns. The oscillation pin assembly allows the steering yoke to adjust to differences in ground levels preventing bridging between the drive drum and guide rolls.

9-91. REMOVAL OF GUIDE ROLLS AND STEERING AXLE ASSEMBLY.

9-92. The method of removing the axle shaft assembly depends upon the availability of the equipment. An overhead crane of a lift truck

can be used to lift the front end of the unit so the guide rolls and steering axle assembly can be removed.

a. Remove front scraper assembly. Then position guide roll rear scraper in the "up" position (see figure 9-97).

WARNING: The scraper bar may be sharp.

b. Remove the capscrews (four) from both steering yoke caps. Then remove and tag the caps (see figure 9-98).

NOTE: Yoke caps are matched and must be assembled to the same side of the yoke from which they were removed.

WARNING: Be sure drive drum is securely blocked.

c. Lift the gooseneck up until the guide roll shaft will clear the steering yoke. Carefully roll the guide roll ahead. Block up the front of unit frame (see figure 9-99).

d. Lower the gooseneck until the frame is securely held by the blocks. Then lift the axle

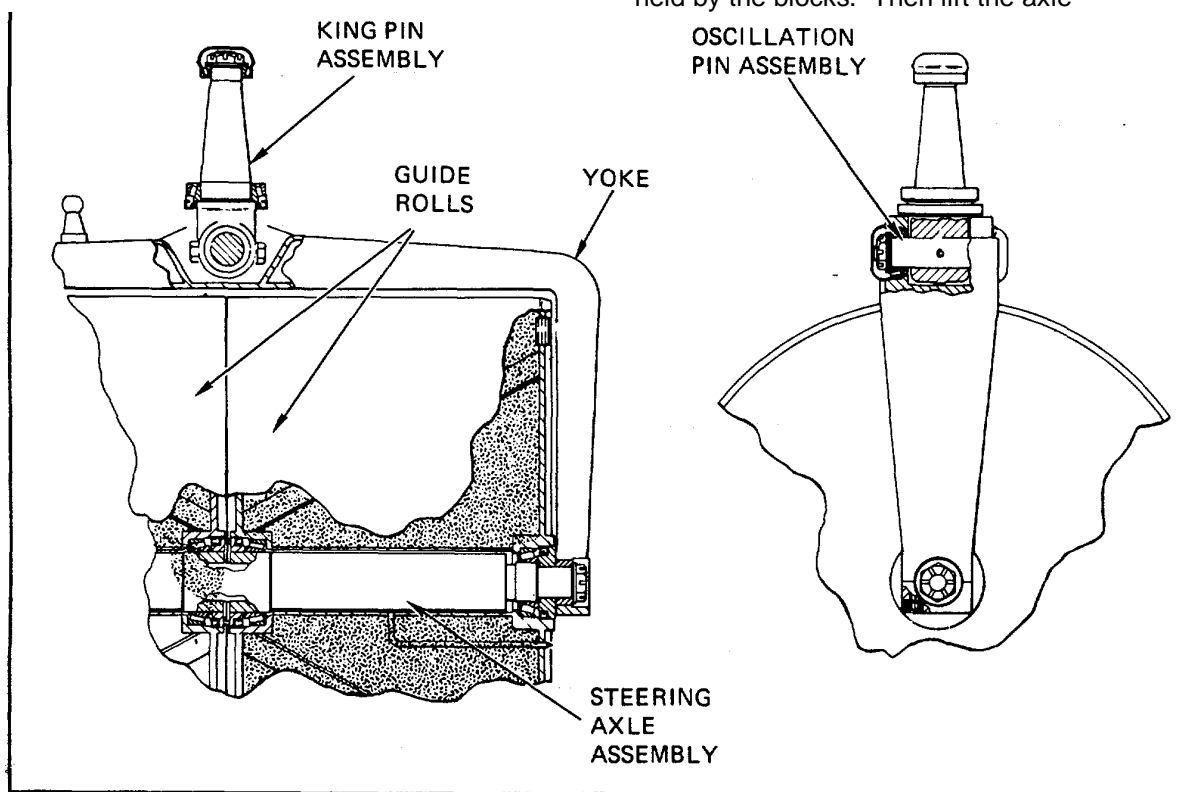


FIGURE 9-96.

SECTION 9 STEERING

shaft assembly away from the unit (see figure 9-100).

9-93. DISASSEMBLY OF AXLE SHAFT ASSEMBLY (see figure 9-101).

NOTE: Remove axle shaft assembly from unit by following procedure outlined in paragraph 9-91. Then position axle shaft assembly on a hard level surface.

a. Remove cotter pin, slotted nut, and thrust washer from one side.

b. Remove split spacers and solid spacer. Tag for reassembly into same position.

c. Slightly lift the drum (with components removed) and slide the drum off of the axle.

d. Perform steps a and b on the remaining drum, then pull the axle shaft from the drum.

e. Remove seals, bearings, shim(s) and center spacer from axle shaft.

CAUTION: Tag bearings and shim(s) for reassembly into same position.

f. Clean and inspect components per paragraph 9-94.

9-94. CLEANING AND INSPECTION.

a. Clean all parts in solvent or other suitable cleaning agent. Dry thoroughly with compressed air or clean lint-free cloth. If parts are not to be assembled immediately, coat all machined surfaces with clean oil and cover.

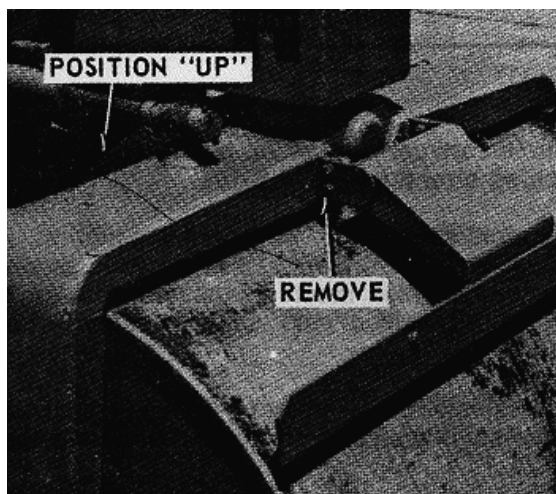


FIGURE 9-97.

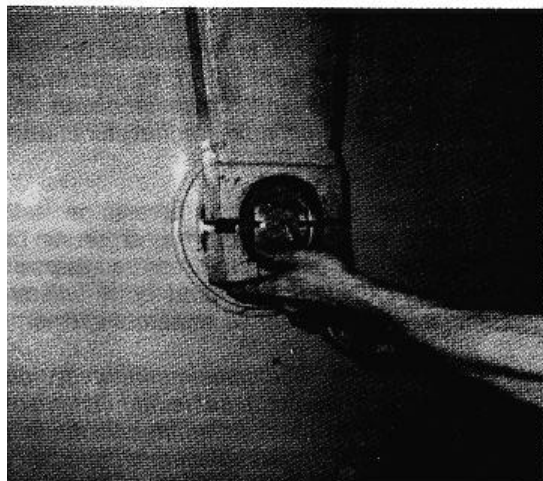


FIGURE 9-98.

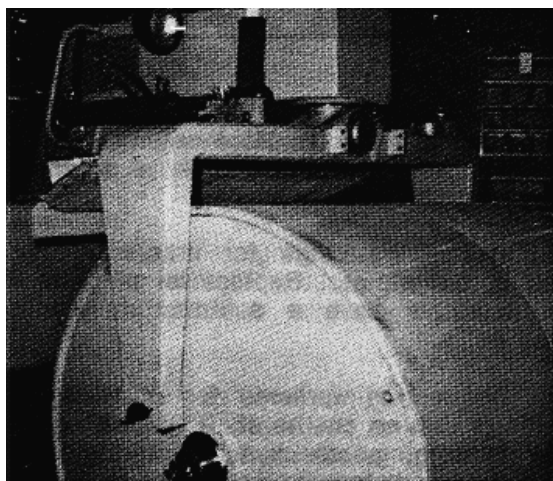


FIGURE 9-99.

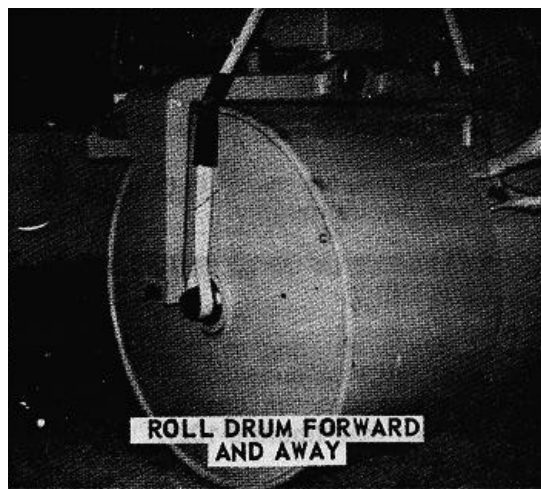


FIGURE 9-100.

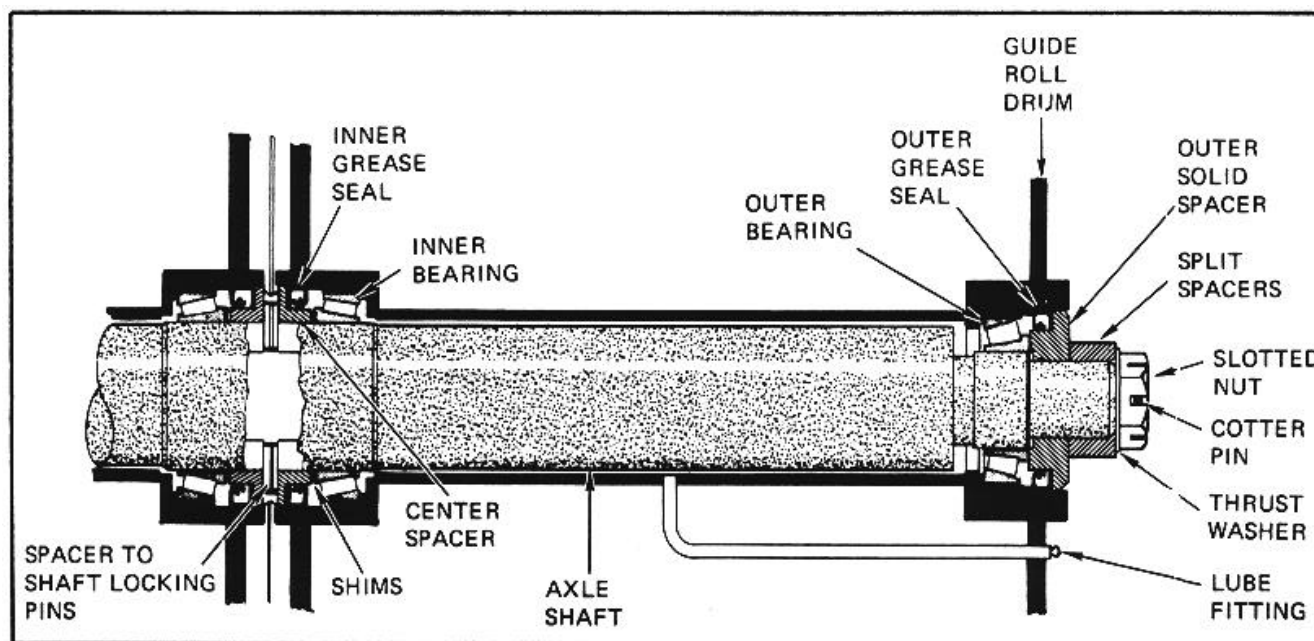


FIGURE 9-101.

b. Inspect all seals. Replace any seals that are cut, worn or otherwise have a doubtful remaining service life.

c. Inspect all bearings for cracks, nicks, galling, brinelling, etc. Replace all parts that are defective or have a doubtful remaining service life.

d. Check bearing surfaces for evidence of bearings turning on the shaft. If bearing inner race is turning, check concentricity of the shaft. Repair or replace if found to be eccentric or badly worn. Slight imperfections of the shaft may be removed with fine sandpaper. Check the roller bearing surfaces of the shaft for nicks, galling and cracks. Repair or replace shaft if any of these are found or if a definite step can be felt between the worn and unworn surfaces when checked with fingernail.

e. Clean the shaft cavity of the drums with solvent and dry thoroughly.

9-95. REASSEMBLY OF AXLE SHAFT ASSEMBLY.

a. Lubricate all bearing cup bores (four), then install bearing cups (one inner and outer cup per drum) into the drums. Be sure cups are firmly seated (see figure 9-102).

b. Install inside bearing cones and grease seals into inside hubs on both drums (see figure 9-103).

c. Insert center spacer on shaft and install locking pins (see figure 9-104).

d. Install shim(s) in original location (see step e, paragraph 9-101). Insert shaft assembly into one drum, then insert the other drum into the other side of the shaft assembly (see figure 9-105).

e. Install outer bearing, grease seal, and outer solid spacer into each drum (see figure 9-106).

f. Install split spacers, thrust washers, and slotted nuts (see figure 9-107).

g. Working at each end separately, torque slotted nut to 200 ft.-lbs. (27.7 kg-m); back off to 25 ft.-lbs. (3.5 kg-m), then retorque to 45 ft.-lbs. (6.3 kg-m) or next higher slot. Install cotter pin (see figure 9-108).

NOTE: Ensure that the drums are on a flat, level surface. Placing one drum on a pallet and the other drum supported with a lift truck or hand dolly will allow the drums to easily assemble together.

h. Check to see if clearance between guide rolls is within specifications. If correct clearance does not exist, remove one drum and adjust shim pack between center spacer and bearing to maintain .010 - .030 in. (.25 - .76 mm) clearance (see figure 9-109).

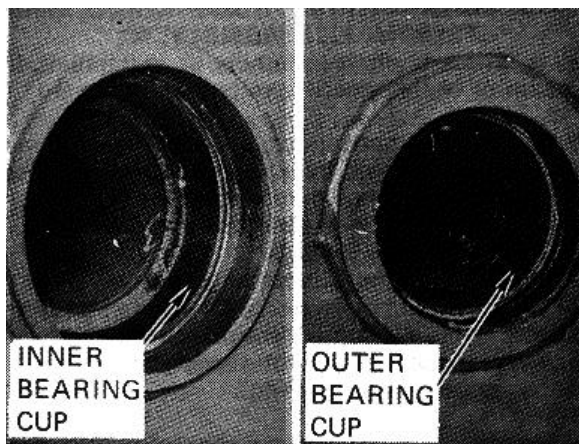


FIGURE 9-102.

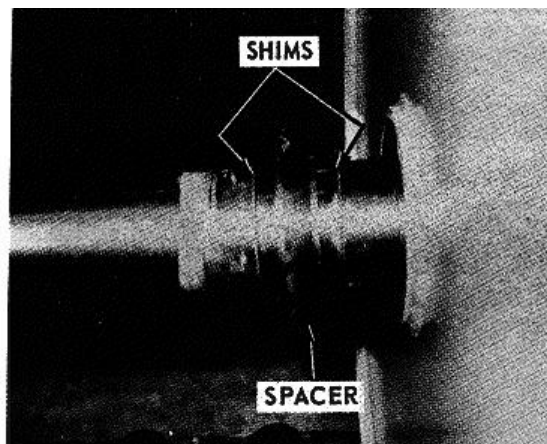


FIGURE 9-105.

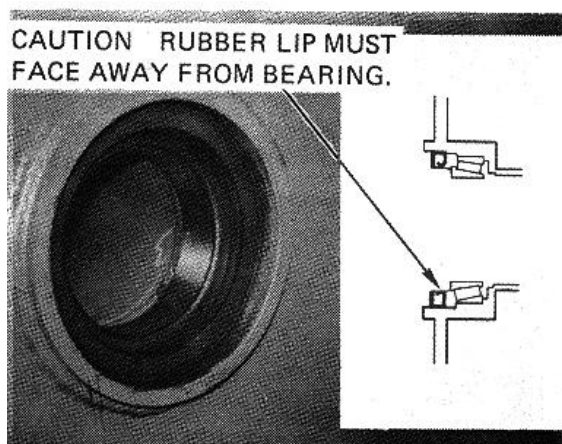


FIGURE 9-103.

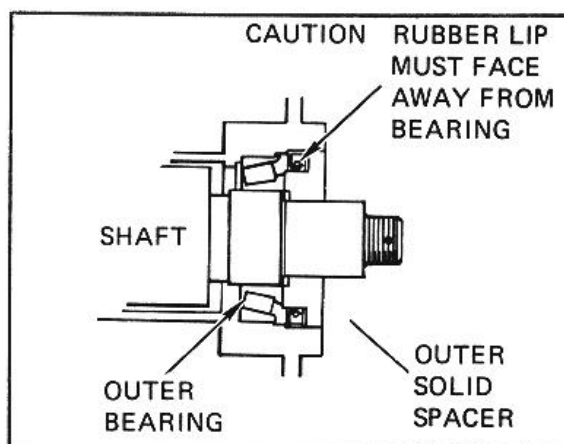


FIGURE 9-106.

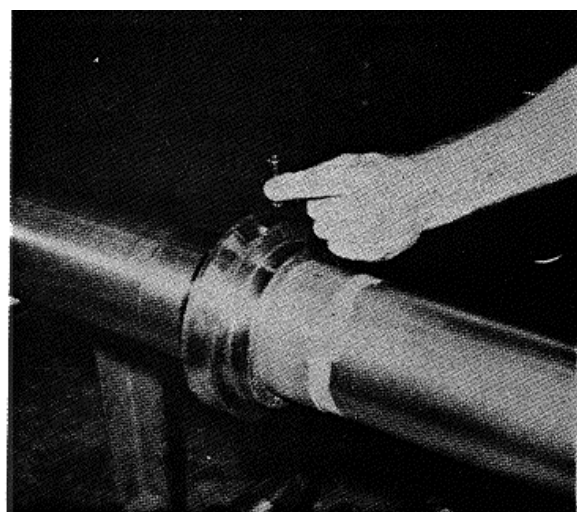


FIGURE 9-104.

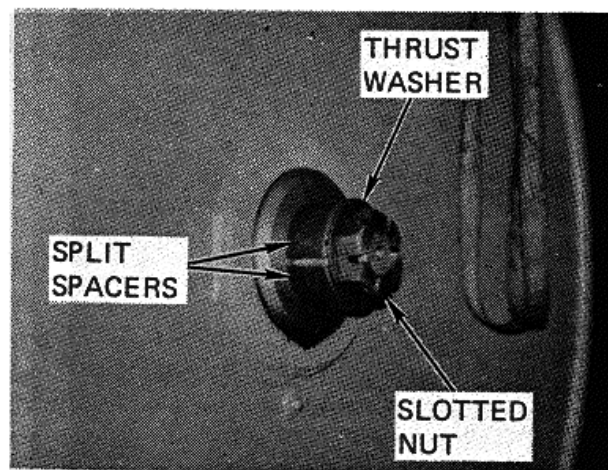


FIGURE 9-107.

SECTION 9 STEERING

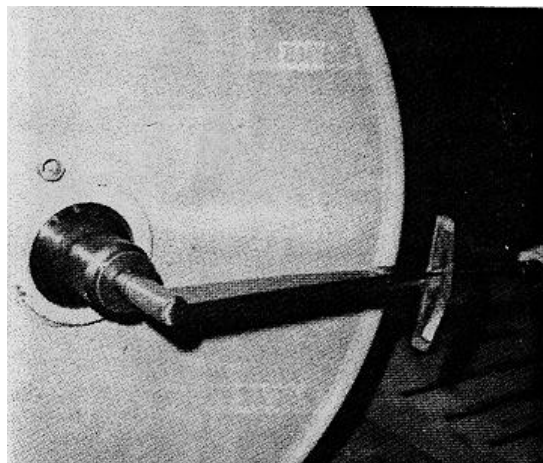


FIGURE 9-108.

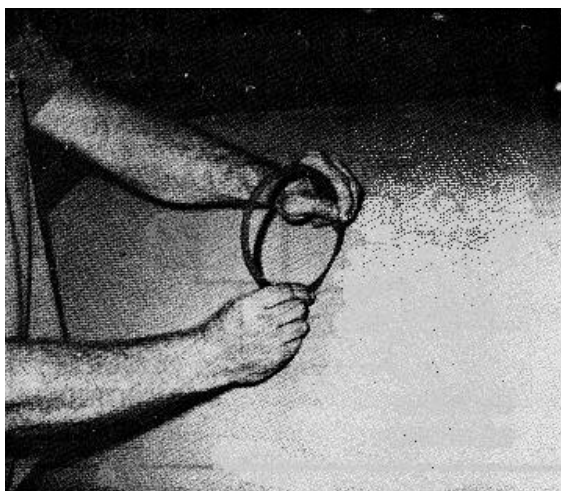


FIGURE 9-109.

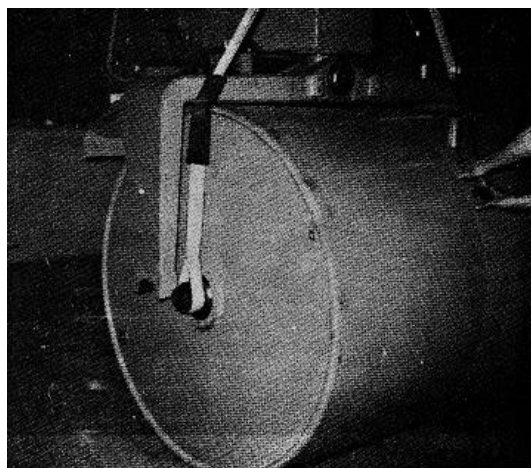


FIGURE 9-110.

9-96. INSTALLATION OF GUIDE ROLLS AND STEERING AXLE ASSEMBLY.

a. Lift axle shaft assembly so it parallels the position of the steering yoke (see figure 9-110).

b. Lift the gooseneck up until the steering yoke clears the axle shaft spacers. Then carefully roll the guide rolls until yoke is directly over the axle shaft (see figure 9-111).

c. Position the spacer slits so they line up with the slits between the caps and the steering yoke. Remove the frame blocking and lower the gooseneck until the axle shaft carries the weight (see figure 9-112).

d. Install each cap on the original side it was removed from. Be sure groove (larger I. D.) is to the outside (see figure 9-113).

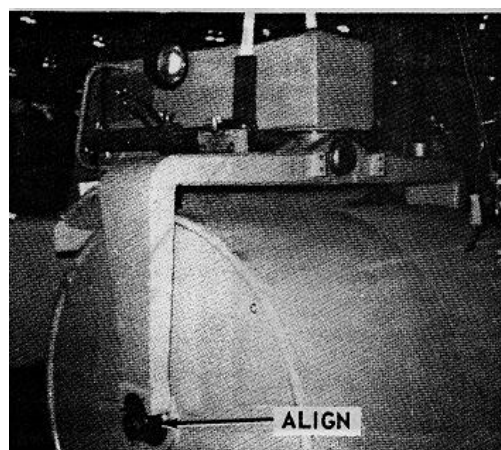


FIGURE 9-111.

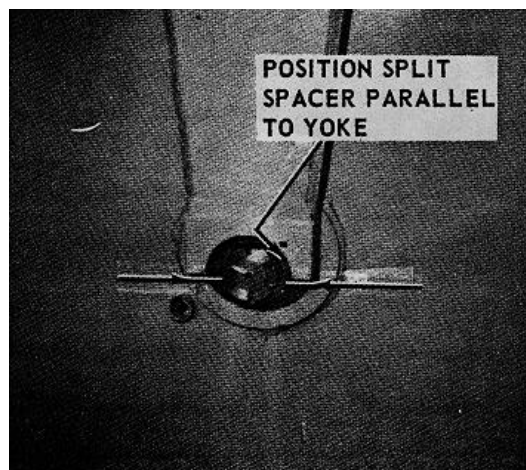


FIGURE 9-112.

SECTION 9 STEERING

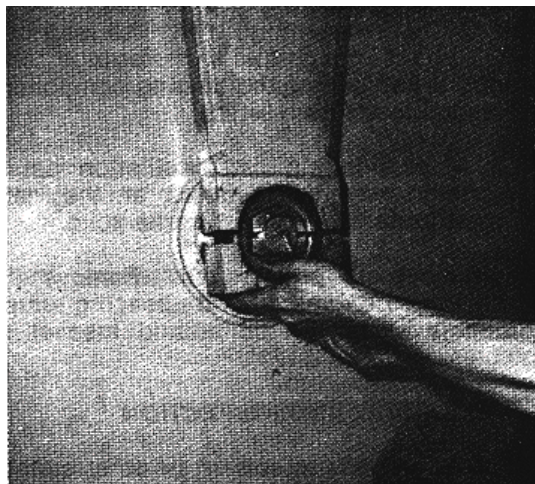


FIGURE 9-113.

e. Torque the cap screws to specification (see figure 9-114).

f. Install the front scraper bar. Lubricate the axle shaft assembly (refer to Section 4). See figure 9-115.

9-97. REMOVAL AND DISASSEMBLY OF YOKE AND KING PIN ASSEMBLY.

NOTE: Remove axle shaft assembly from unit by following procedures outlined in paragraph 9-91. Then proceed as follows:

a. Remove scraper bar and coco mat assembly, water spray manifold and disconnect steering cylinder ball joint assembly (see figure 9-116).

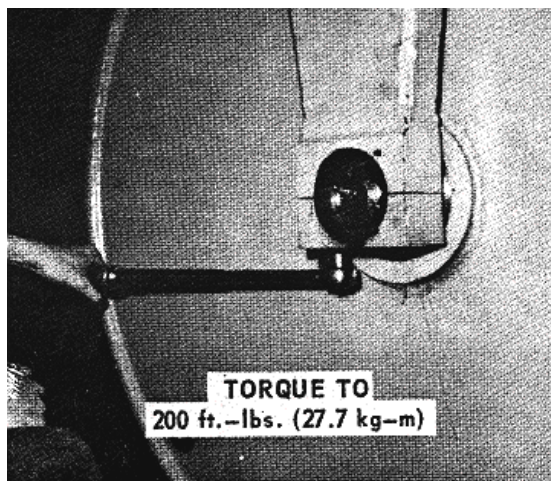


FIGURE 9-114.

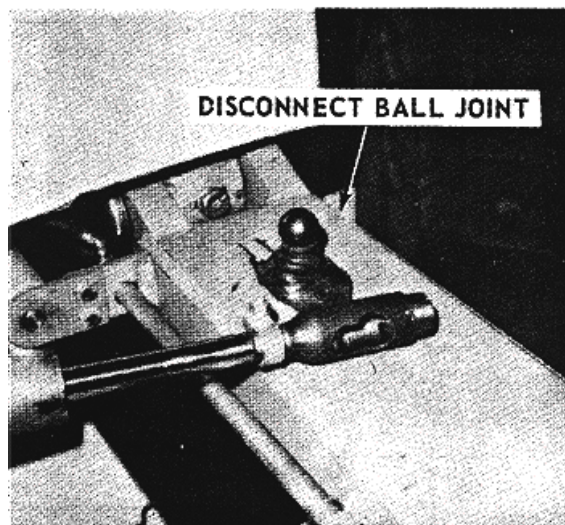


FIGURE 9-116.

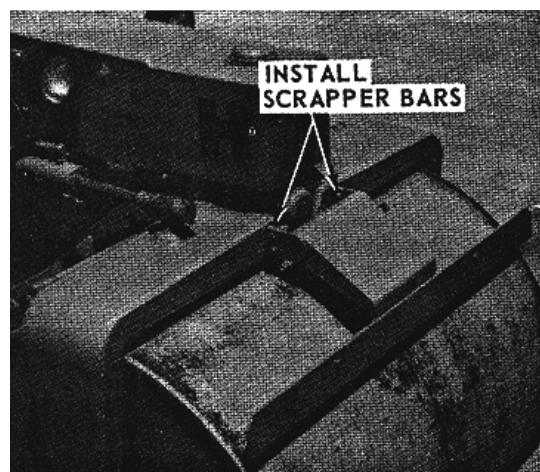


FIGURE 9-115.

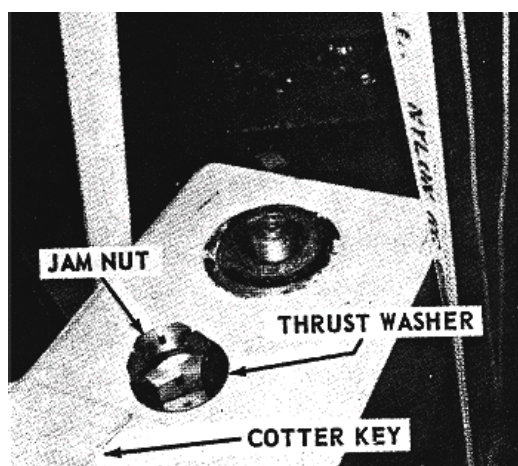


FIGURE 9-117.

SECTION 9 STEERING

b. Support yoke with a hoist or lift truck. Then remove king pin dust cover, cotter pin, jam nut, and thrust washer (see figure 9-117).

WARNING: Be sure unit is securely blocked.

c. Lower yoke assembly onto the floor, then remove both king pin bearings and the seal. Tag bearings for reassembly with its respective cup. Inspect bearings and replace both king pin bearing assemblies if any one; of the bearing components is damaged (see figure 9-118).

d. Remove oscillation pin dust covers, cotter keys, jam nuts, and thrust washers, then remove locking bolt (see figure 9-119).

e. Remove oscillation pin and bearings. Tag

bearings for reassembly with its respective cup. Inspect bearings and replace both bearings if any one of the bearing components is damaged (see figure 9-120).

NOTE: Mark king pin and oscillation pin so they may be installed at the same attitude with respect to the yoke.

f. Lift out the king pin. Remove the oscillation pin seals and bearing cups. Thoroughly clean the bores and inspect for damage (see figure 9-121).

9-98. CLEANING AND INSPECTION.

a. Clean all parts in solvent or other suitable cleaning agent. Dry thoroughly with compressed air or clean lint-free cloth. If parts are not

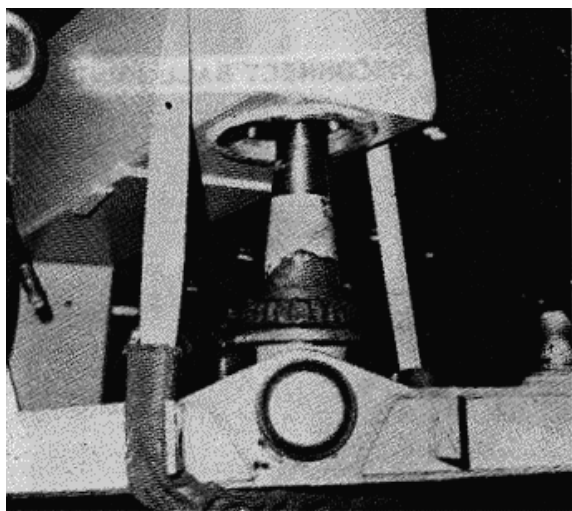


FIGURE 9-118.

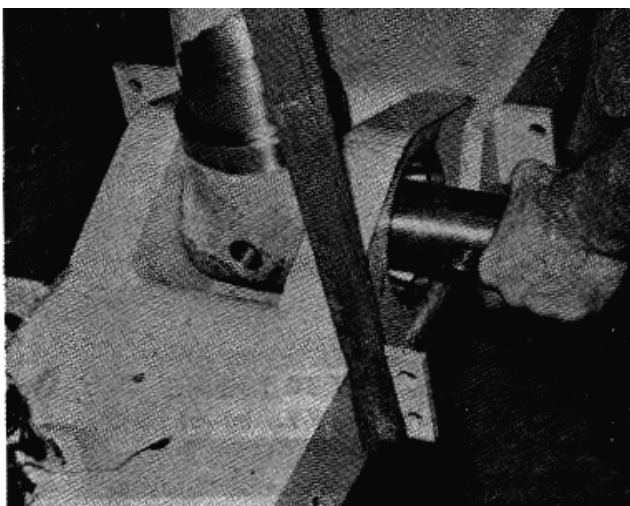


FIGURE 9-120.

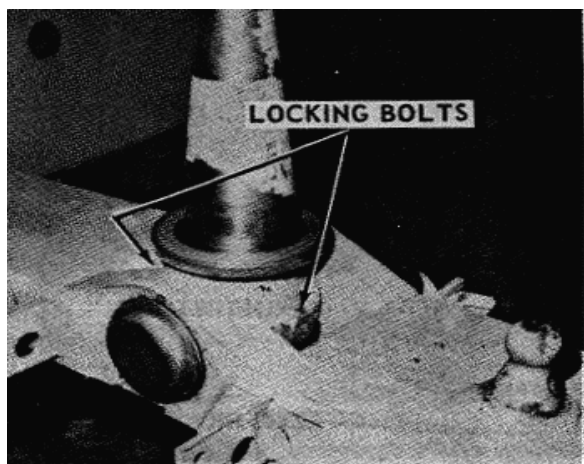


FIGURE 9-119.

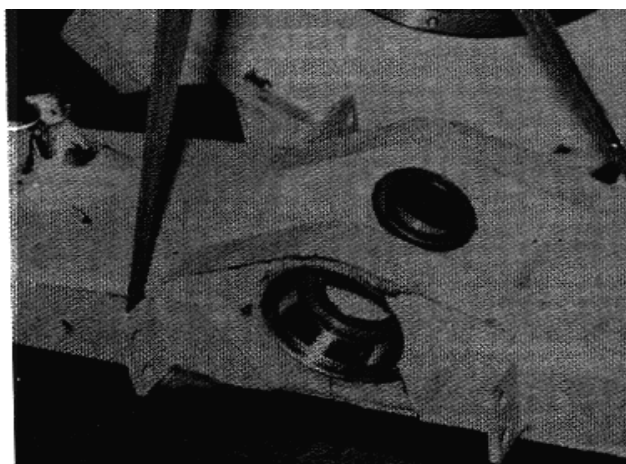


FIGURE 9-121.

SECTION 9 STEERING

to be assembled immediately, coat all machined surfaces with clean oil and cover.

b. Inspect all seals. Replace all seals that are cut, worn or otherwise have a doubtful remaining service life.

c. Inspect all bearings for cracks, nicks, galling, brinelling, etc. Replace all parts that are defective or have a doubtful remaining service life.

d. Check bearing surfaces for evidence of bearings turning on the shaft. If bearing inner race is turning, check concentricity of the shaft. Repair or replace if found to be eccentric or badly worn. Slight imperfections of the shaft may be removed with fine sandpaper. Check the roller bearing surfaces of the shaft for nicks, galling and cracks. Repair or replace shaft if any of these are found or if a

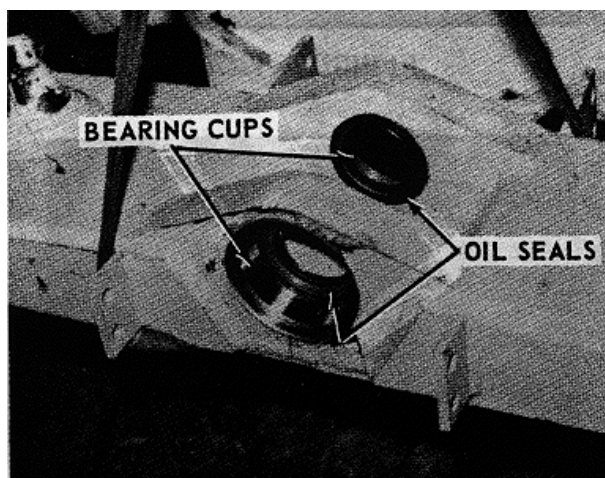


FIGURE 9-122.

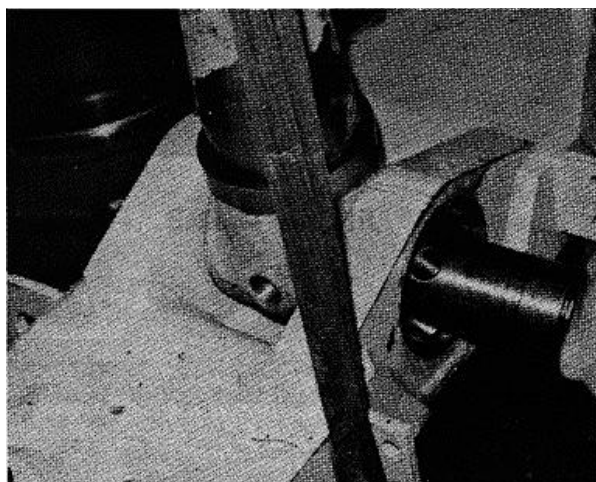


FIGURE 9-123.

definite step can be felt between the worn or unworn surfaces when checked with fingernail.

e. Clean the inside of the gooseneck with solvent and dry thoroughly.

9-99. REASSEMBLY AND INSTALLATION OF YOKE AND KING PIN ASSEMBLY.

a. Install bearing cups into gooseneck housing if removed during disassembly (see figure 9-122).

b. Pack bearing cones with Hyster Approved multipurpose grease.

c. Install bearing cone and oil seal into gooseneck (see figure 9-122).

d. Insert king pin into gooseneck and fill housing with Hyster approved multipurpose grease.

e. Install upper bearing cone washer and slotted nut (see figure 9-123).

f. Install bearing cups into yoke (see figure 9-124).

g. Insert oscillation pin into yoke and king pin. Install two locking bolts into oscillation pin and torque to 200 ft.-lbs. (27.7 kg-m). See figure 9-125.

h. Pack bearing cones with Hyster approved multipurpose grease and install two (2) washer and slotted nut on each end of the oscillation

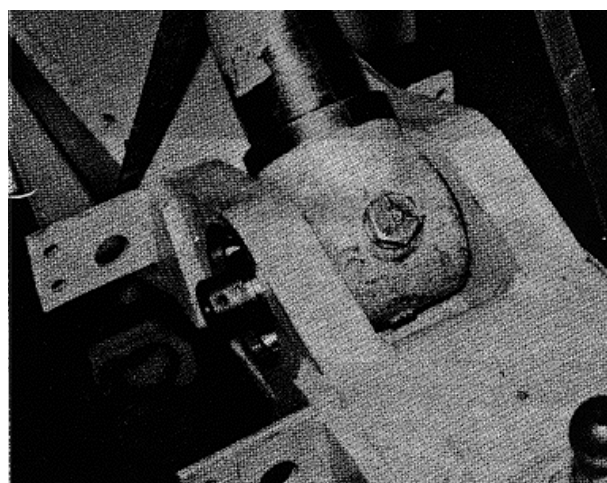


FIGURE 9-124.

pin (see figure 9-126). Tighten slotted nuts equally so that king pin remains centered on yoke. Torque one slotted nut to 200 ft.-lbs. (27.7 kg-m) lubed then back off to loose and retorque to 75 ft.-lbs. (10.4 kg-m). Check torque on opposite slotted nut. It should be 75 ft.-lbs. (10.4 kg-m).

NOTE: Check that running clearance exists on both sides of king pin. Adjust if necessary by repeating step h.

i. Install cotter keys into slotted nuts on both ends of the oscillation pin. Fill dust caps half full with Hyster approved multipurpose grease and install.

j. Install guide roll assembly (refer to paragraph 9-96).

k. Place unit on ground so that entire weight of gooseneck rests on king pin. Torque slotted nut to 200 ft.-lbs. (27.7 kg-m) lubed. Back off to loose and retorque to 75 ft.-lbs. (10.4 kg-m).

l. Install cotter key and fill dust cap half full with Hyster approved multipurpose grease and install.

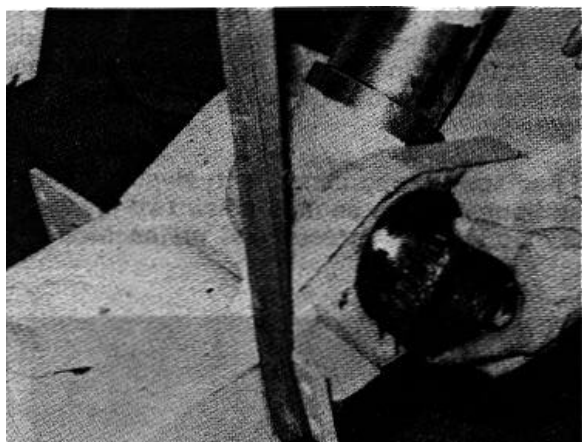


FIGURE 9-125.

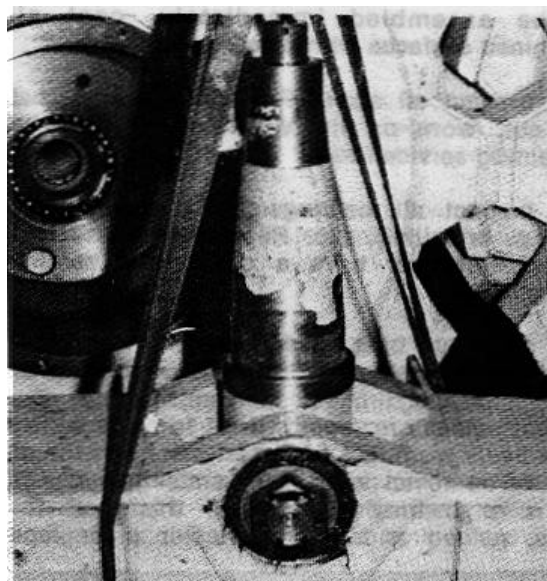


FIGURE 9-126A..

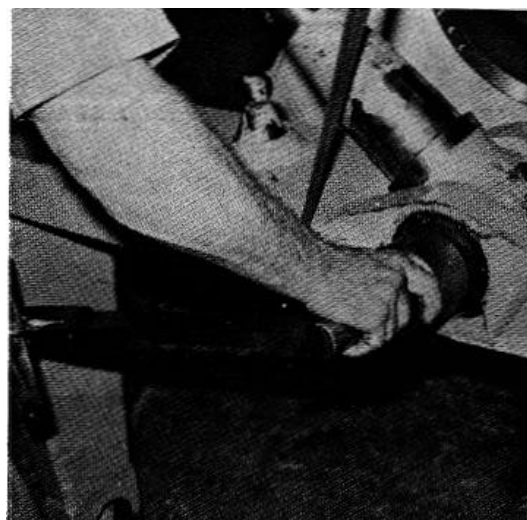


FIGURE 9-126B.

SECTION 10

10-1. GENERAL.

10-2. This section contains a description of the parking brake system and repair instruction for the brake drum assembly. Repair instructions include removal, inspection, and installation of the park brake assembly.

10-3. Design specifications are given in Section 2. Maintenance requirements are discussed in Section 4. Troubleshooting instructions are given in Section 5.

10-4. DESCRIPTION.

10-5. The parking brake is a mechanically operated friction brake mechanism that prevents the final drive from rotating. The braking mechanism is mounted on

the left-hand side of the final drive housing. It is operated by a handlever mounted to the gooseneck. A flexible teflon coated steel cable connects the braking mechanism to the handlever. When the handlever is pulled, the cable retracts, operating an actuator lever which forces the brake shoe-type lining against the Inside of the brake drum. The brake drum is splined to the final drive shaft.

10-6. REMOVAL AND DISASSEMBLY (see figure 10-1).

10-7. Block guide roll and drive drums prior to removal of the brake drum assembly to prevent movement of the unit. Set the parking brake handlever to the brake applied position. Remove parking brake access cover located on the rear of the left-hand frame channel.

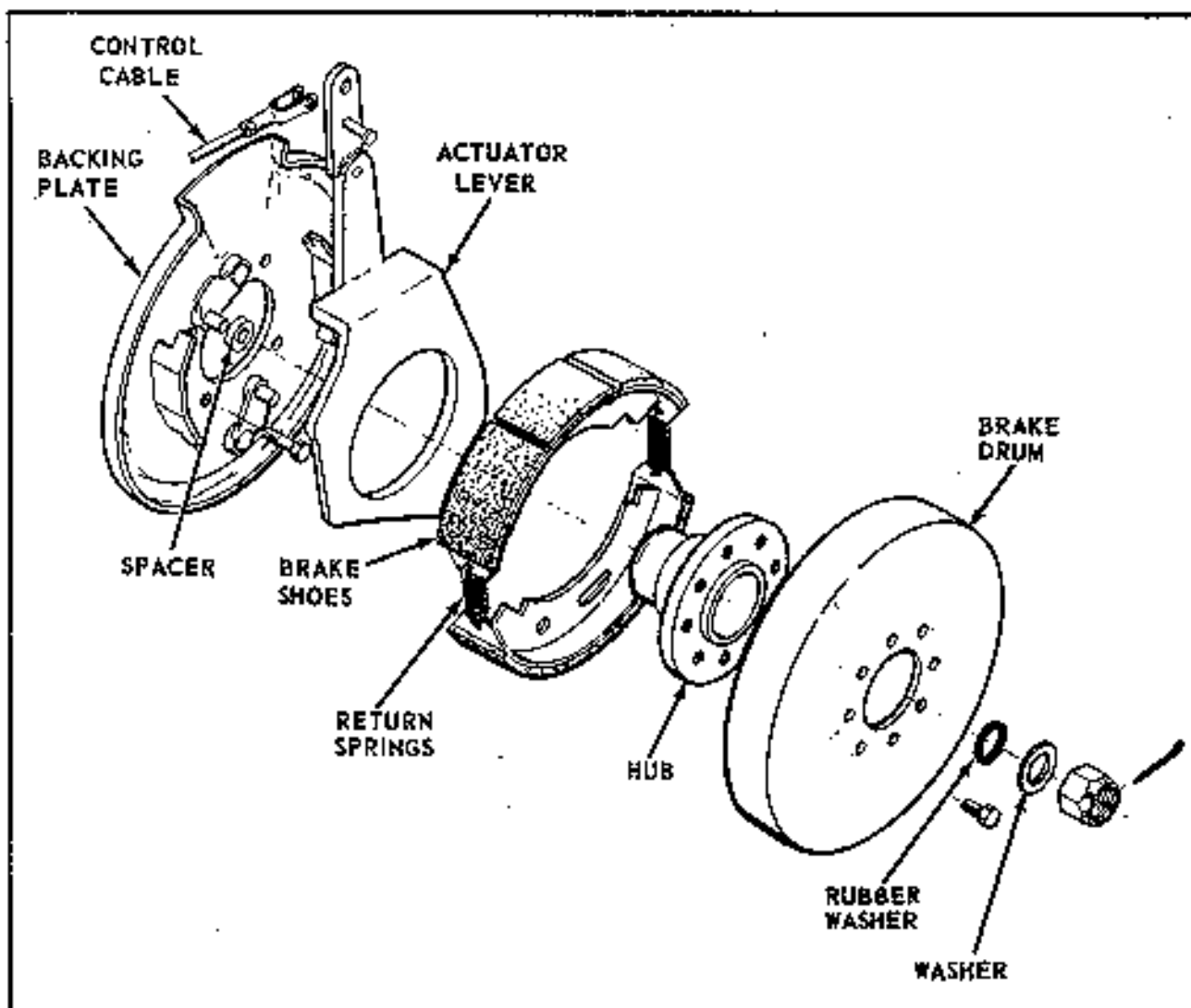


FIGURE 10-1.
10-1.

a. Remove the brake drum capscrews, then release the parking brake control lever. Remove the brake drum.

b. Remove the brake shaft cotter pin, then remove slotted nut. Remove hub and spacer.

c. Disconnect and remove the brake return springs. Remove brake shoes.

d. Lift out the brake shoe actuator lever and disconnect the control cable.

e. Remove backing plate capscrews, then remove the backing plate.

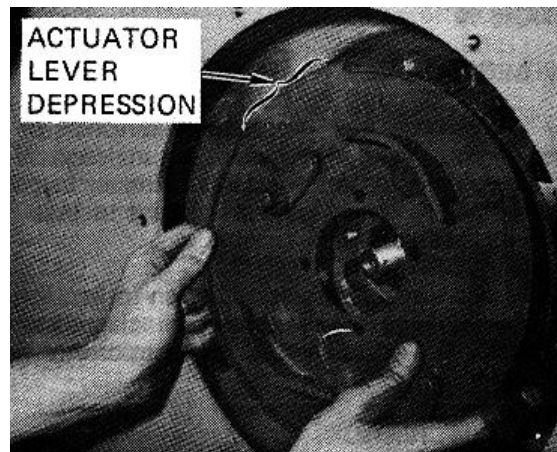


FIGURE 10-2.

10-8. CLEANING AND INSPECTION.

a. Use solvent to clean all metal parts except the brake shoe assemblies. The shoe rib and table can be wiped with a solvent dampened cloth. No solvent should get on the lining.

b. Examine drum for cracks, heat checks and deep grooves. The drums should not be bell-mouthed or barrel-shaped, nor should the mounting holes be elongated. If any of these conditions exist, the drum should be replaced. Glaze on the drum, which is otherwise in good condition, can be removed with coarse sandpaper .

c. The brake shoe linings should be replaced if worn to within 1/16 inch (1.69 mm) or if bonding agent is failing. Do not attempt to save lining soaked with oil or with deep scores.

d. Check springs and discard them if broken, rusted, twisted, nicked or appear fatigued.

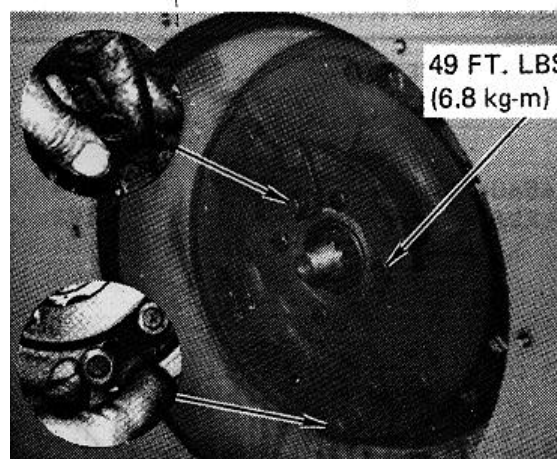


FIGURE 10-3.

10-9. REASSEMBLY AND INSTALLATION.

CAUTION: Use only Hyster Approved replacement parts.

a. Install backing plate with actuator lever depression in position shown (see figure 10-2).

b. Install backing plate capscrews and torque to 49 ft.-lbs. (6.8 kg-m). Then install rollers on both actuator cranks (see figure 10-3).

c. Connect actuator lever to control cable, then position actuator lever into backing plate as shown (see figure 10-4).

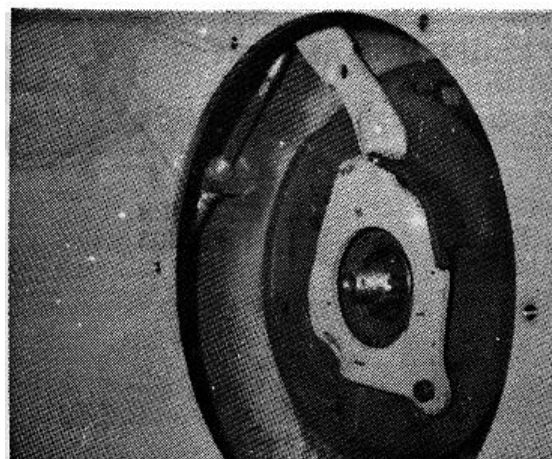


FIGURE 10-4.

d.

Next install brake hub, rubber seal, washer and slotted nut (see figure 10-5). Tighten slotted nut to remove end play. Back off one (1) flat (.012 in. - .305 mm loose). **DO NOT EXCEED 26 FT.-LBS. TORQUE.** Secure with cotter pin

e. Install brake shoes and return springs in position shown (see figure 10-6).

f. Install brake drum and torque capscrews to 49 ft.-lbs. (6.8 kg-m) (see figure 10-7).



FIGURE 10-5.

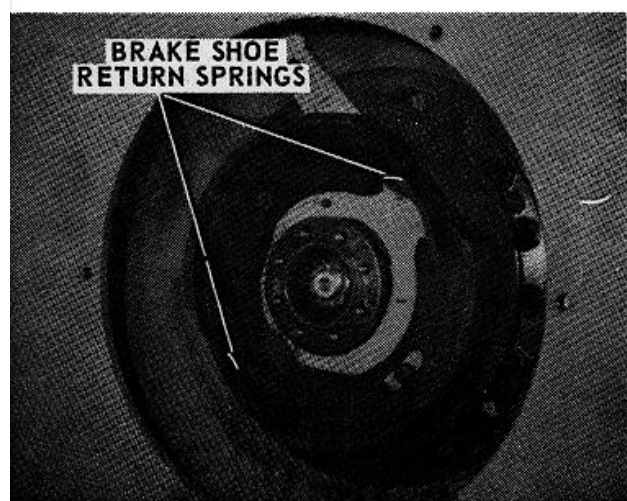


FIGURE 10-6.



FIGURE 10-7.

10-10. ADJUSTMENT (see figure 10-8).

10-11. The parking brake handlever should be adjusted sufficiently to require at least 80 pounds (36.3 kg) to pull it into the applied position. Turn the adjusting knob on the handlever clockwise (lever in brake-off position) to increase force required to apply the brake.

10-12. Whenever the brake lining wears to the point where the brake cannot be adjusted with the handlever adjusting knob or when new lining is installed because of wear, another adjustment must be made. This adjustment is made in the linkage on the actuator lever end of the brake cable.

a. Disconnect the brake cable from the actuator lever and loosen the cable end jam nut on the cable.

b. Push the actuator lever arm until the shoes contact the brake drum. Adjust cable end until it aligns with the actuator lever arm in the shoe contact position.

c. Connect the cable to the actuator lever and adjust the handlever to obtain maximum braking power.

10-13. BRAKE LINING BREAK-IN PROCEDURE.

CAUTION: Break-in is essential to ensure adequate braking of the unit.

a. Jack the drive roll off the ground.

b. Warm up unit (Hydraulic oil temperature 100°F).

**SECTION 10
BRAKES**

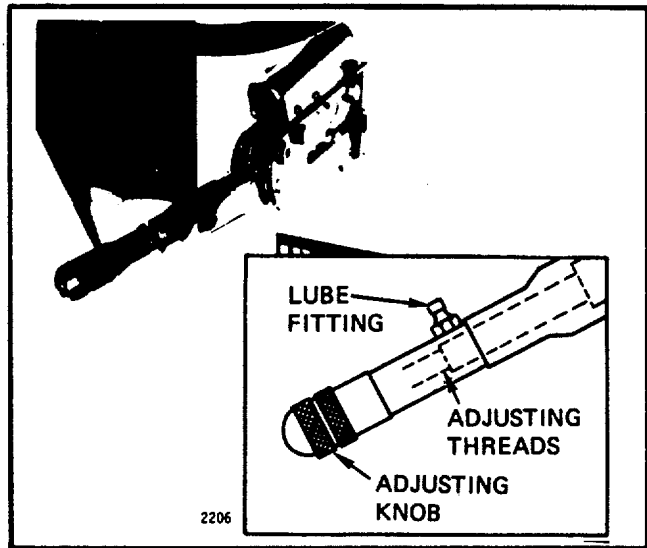


FIGURE 10-8.

c. Adjust brake handle to 40 lb. (18.2 kg) pull.

d. (1) Using full throttle, gradually pull brake handle "on" until transmission is almost to stall and hold for 5 seconds. (2) Release brake for 60 seconds and then repeat steps (1) and (2) 20 times.

e. Adjust brake handle to 80 lbs. (36.3 kg) minimum pull.

SECTION 11 WATER SPRAY SYSTEM

11-1. GENERAL.

11-2. This section contains the water spray system description, checks, adjustment and service repair information. Refer to Section 2 for Water Spray System Specifications. Hyster-Care Maintenance Instructions are contained in Section 4 and a troubleshooting guide is presented in Section 5.

11-3. DESCRIPTION. (see figure 11-1).

11-4. The Water Spray System consists of a water tank, Inlet screen, sump filter, water pump and motor, spray manifolds (bars), associated lines and fittings, electrical switch and a circuit breaker. Refer to Section 6 for electrical schematic. The water pump is centrifugal type pump. The pump is mounted in a cavity recessed into the bottom of the water tank and accessible from under right-hand side of unit.

11-5. The Water Spray System is activated when the operator turns the water spray switch to the ON position.

Once the motor is electrically energized it rotates the centrifugal pump. This causes the water to gravity feed from the tank into the pump, the pump then pressurizes the water to about 10 PSI (0.7 kg/cm²). Water then flows through the lines to the spray manifolds. Each manifold distributes the water to the drum(s).

11-6. The non-corrosive sump filter normally requires no maintenance because of the self-cleaning action of the water washing back and forth in the tank. The filter should be cleaned when the tank needs cleaning because of excessive accumulation of foreign material (see figure 11-2).

11-7. CHECKS AND ADJUSTMENTS.

11-8. SPRAY MANIFOLDS.

11-9. The water spray angle is adjusted by rotating the spray manifold. Check to see that the spray pattern completely covers the drum(s). Adjust the spray pattern so that spray

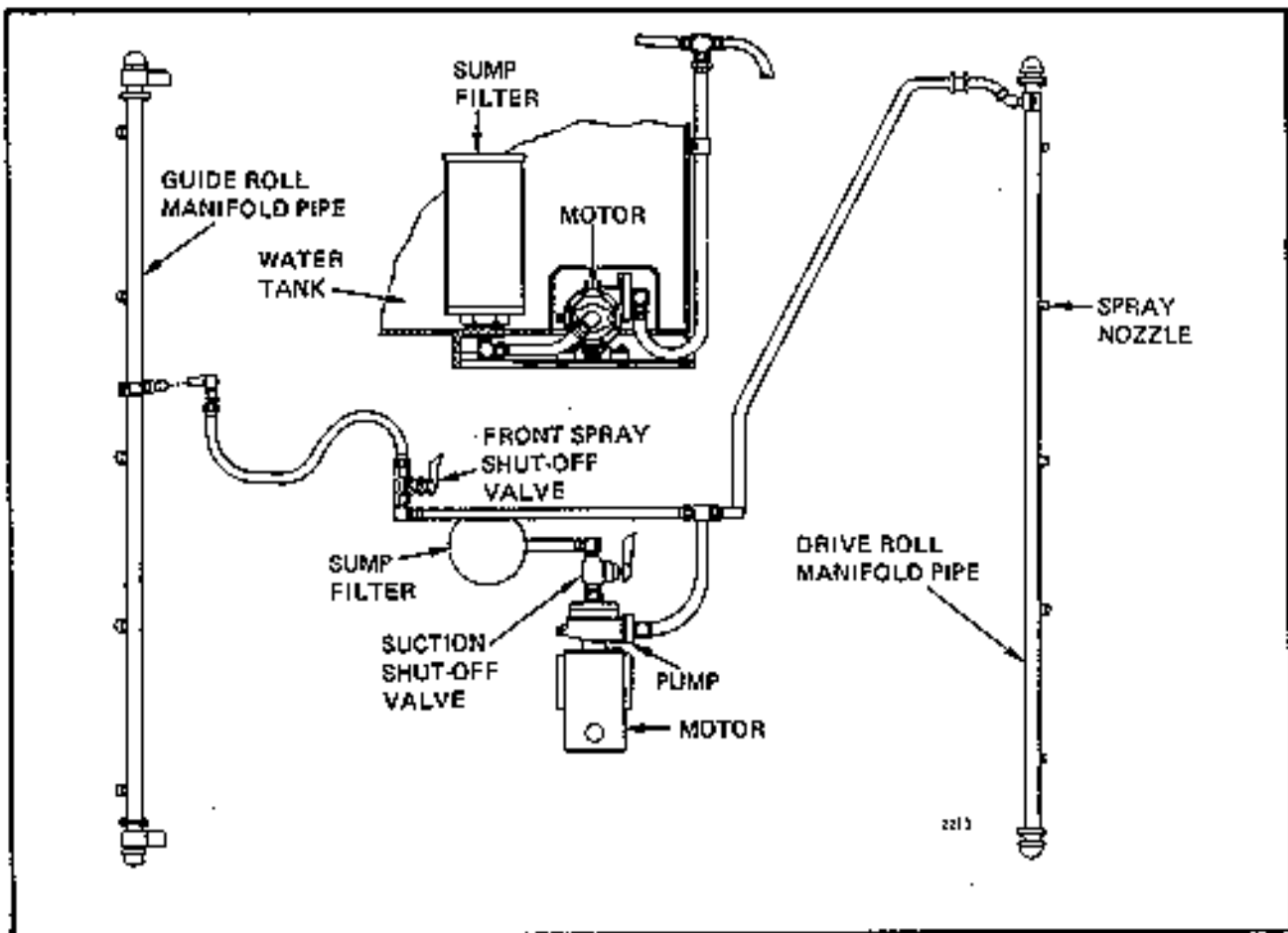
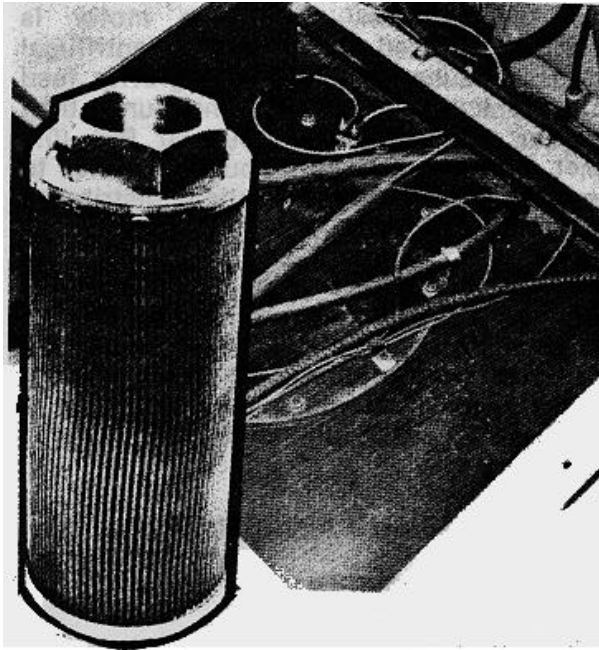


FIGURE 11-1.



11-10. WATER PRESSURE.

11-11. Water pressure and flow can be varied by turning the (spray) control valve located in the operator's compartment directly below the steering wheel. If greater pressure is desired on the drive drum the front (guide roll) spray can be restricted by turning the shut-off valve located under the unit steering wheel.

11-12. CHECKING MOTOR BRUSHES (see figure 11-3).

WARNING: Be sure ignition key switch and water spray switch are in the OFF position before inspecting brushes.

11-13. To inspect the brushes, unscrew the brush retainers. Blow out any brush "dust" with compressed air. Check for at least 3/8 inch (9.5 mm) of brush length at the shortest point.

11-14. Examine the commutator for burns, pits or wear. The space between the segments should be clean and free of deposits. Replace motor if commutator is damaged.

11-15. REMOVAL OF PUMP AND MOTOR ASSEMBLY.

a. Turn the shut-off valve located at the pump under the unit (see figure 11-4).

b. Disconnect electrical wiring, pressure and suction lines (see figure 11-4).

FIGURE 11-2.
strikes drum at upper edge of coco mat. Adjust as follows:

- a. Loosen the manifold mounting U-bolts.
- b. Rotate the manifold to give desired spray pattern.
- c. Re-tighten the U-bolts when desired pattern adjustment is completed.

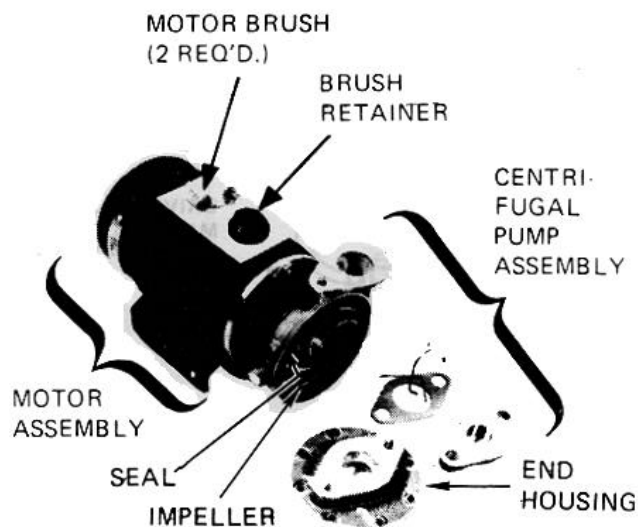


FIGURE 11-3.

**SECTION 11
WATER SPRAY SYSTEM**

c. Remove four (4) mounting plate capscrews and lower unit to floor.

WARNING: Support mounting plate during capscrew removal. DO NOT allow subassembly to fall.

11-16. REPAIR.

11-17. Determine if pump or motor has failed. Separate pump or motor and replace failed unit. Refer to CHECK MOTOR BRUSHES paragraph 11-12.

NOTE: The pump impellar is pressed on the armature shaft.

11-18. INSTALLATION OF PUMP AND MOTOR ASSEMBLY.

11-19. Install pump and motor assembly by reversing procedure presented in paragraph 11-15.

11-20. CLEANING THE WATER TANK.

a. Drain the water tank for periodic cleaning by removing the drain plug located under the unit (see figure 11-5). An access plate is located at the front of the unit frame.

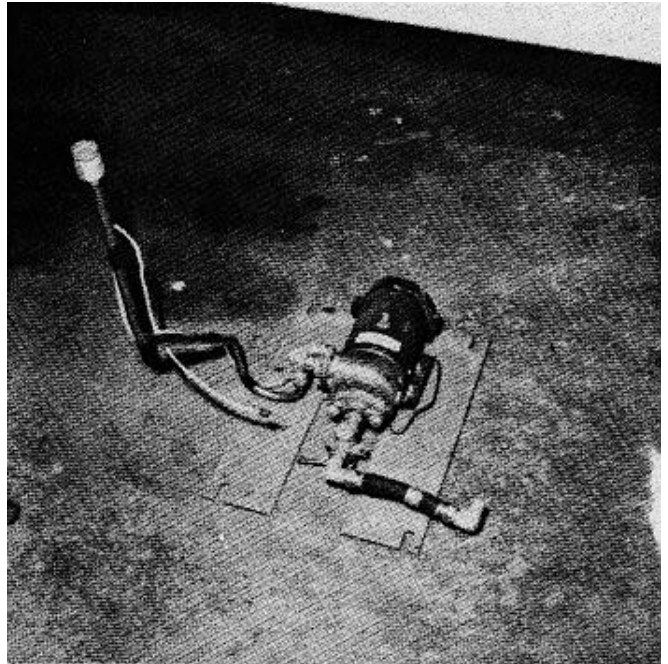


FIGURE 11-4.

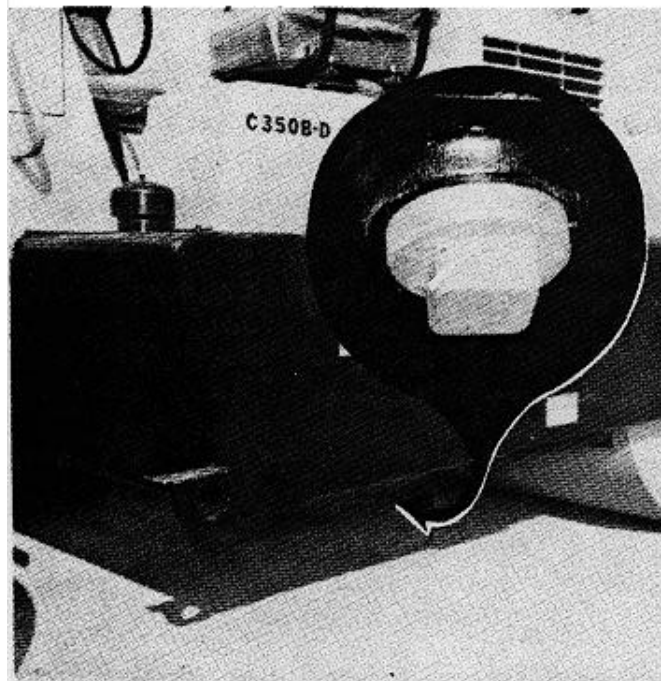
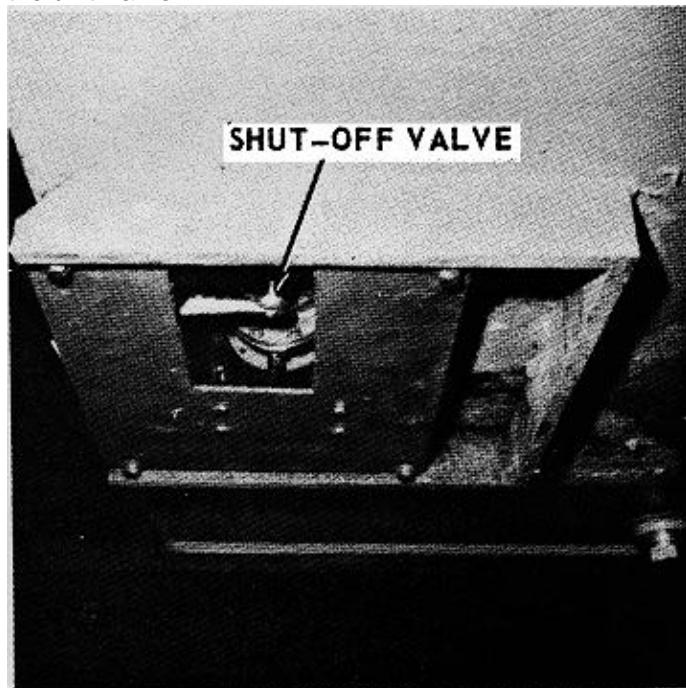


FIGURE 11-5.



11-3.

NO MATTER HOW YOU SAY IT ...

La Prudence Paye
La Seguridad Paga
Betriebssicherheit Macht Sich Bezahlt
Passaa Olla Huolellinen
Veiligheid Voor Alles
Säkerhet Först
Essere Sicuro Paga
Segurança Paga
Sikkerhet Først
Pinter Be Awas

सावधान और जिन्दा रहौ !

في التاني السلامة

**SAFETY
PAYS!**

用心
無難

**PART II
SUPPLEMENTAL OPERATING MAINTENANCE
AND
REPAIR PARTS INSTRUCTIONS**

**STEEL WHEEL ROLLER C350B
CONTRACT NO. DSA 700-74-C-9024**

SUPPLEMENTAL OPERATING MAINTENANCE AND REPAIR PARTS INSTRUCTIONS
 FOR
 ROLLER, MOTORIZED, STEEL WHEEL 2 DRUM TANDEM 10-14 TON
 MODEL C350BD
 TABLE OF CONTENTS

Section I	GENERAL	Paragraph	Page
	Purpose	1-1	1
	Scope	1-2	1
	CCE Item	1-3	1
	Description	1-4	1
	Operational Concept	1-5	1
	Procurement Status	1-6	1
	Equipment Publications	1-7	2
	Personnel and Training	1-8	2
	Logistics Assistance	1-9	2
	Warranty	1-10	2
	Reporting	1-11	3
Section II	MAINTENANCE		
	Maintenance Concept	2-1	3
	Maintenance Allocation Chart	2-2	3
	Modifications	2-3	4
	Equipment Improvement Recommendations	2-4	4
	Equipment Readiness Reporting	2-5	4
	Maintenance Expenditure Limits	2-6	4
	Shipment and Storage	2-7	4
	Destruction to Prevent Enemy Use	2-8	4
	Fire Protection	2-9	4
	Basic Issue Items List	2-10	4
	Maintenance and Operating Supply List	2-11	5
	Special Tools and Equipment	2-12	5
	Maintenance Forms and Records	2-13	5
	Towing the Roller	2-14	5
	Starting the Roller	2-15	5
	Safety Precautions	2-16	5
Section III	REPAIR PARTS SUPPLY		
	General	3-1	6
	Prescribed Load List	3-2	6
	Authorized Stockage List	3-3	6
	Requisitioning Repair Parts	3-4	7
	Submitting Requisitions	3-5	7

*This publication superseded USMP 5-3895-348, dated Jul 76.

APPENDIXES**Page**

A	Equipment Publications	8
B	Warranty Guidelines	9
C	Maintenance Allocation Chart	11
D	Modification Procedure	25
E	Basic Issue Items List	26
F	Prescribed Load List (PLL) & Authorized Stockage List (ASL)	27
G	Additional Repair Parts	28
H	Sample Format, DA Form 2765, Request (Part Number)	29
I	Sample Format, MILSTRIP Request (NSN)	30
J	Sample Format, MILSTRIP Request (Non-NSN)	31
K	Sample Format, MILSTRIP Request (Non-NSN Manual)	33
L	Maintenance & Operating Supply List	35
M	Preventive Maintenance Checks & Services	37
	Operator/Crew PMCS	39
	Organizational PMCS	43
N	HESTER Technical Publication Correction	45
O	HYSTER Technical Publication Correction	47

SECTION I

GENERAL

1-1. Purpose. To provide User and Support personnel supplemental maintenance and repair parts instructions that have special application to Commercial Construction Equipment (CCE) items.

1-2. Scope. This publication applies to Department of the Army Units, Organizations and Activities that use and/or support the CCE Roller Motorized Steel Wheel, 10-14 Ton.

1-3. CCE Item. The term "CCE" Item used in this publication applies to a standard commercial item of commercial equipment that has been approved for a specific TOE requirements and is procured and supported under the CCE System Plan. This plan permits maximum utilization of the civilian construction industry's competitive research and development, manufacturer's equipment publications and commercial sources for repair parts.

1-4. Description. The CCE Roller Steel Wheel is manufactured by Hyster Co. of Kewanee, IL. It is powered by an in-line three cylinder (3-53 series) Detroit Diesel Engine. The final drive consists of an internal, double reduction planetary system located within the left side of the single drive drum. Engine power is transferred to the final drive assembly by a closed hydrostatic transmission system. The steering system is a hydrostatic operated, manually controlled system, with provisions for manual steering.

1-5. Operational Concept. The CCE Roller, Steel Wheel will be deployed worldwide as a replacement for the following: 5-8 Ton Roller (LIN S1068), 8-12 Ton Roller (LIN S11136), 9-14 Ton Roller (LIN S11205) and (LIN S11273). It will also partially replace the 10 Ton Roller listed under LINs S11479 and S11616.

The Roller is intended for use in road construction and rehabilitation, airfield, heliport and port construction. Primary tasks are breakdown and finish rolling asphalt pavements and asphalt patch work. Secondary uses are compaction of pavement base courses and stabilized bases and pavements.

1-6. Procurement Status. The procurement contract number is DSA 700-74-C-9024 and was awarded June 1974.

1-7. Equipment Publications.

a. Initially two sets of the manufacturer's commercial publications will be overpacked and shipped with each Roller (reference Appendix A).

b. Additional commercial manuals may be obtained by requisitioning from Defense Construction Supply Center (DCSC). Requisitions to DCSC should be prepared in the same manner as for part numbered repair parts, using the Federal Supply Code for manufacturer' s FSCM and manual numbers listed in Appendix A. If DD Form 1348-6 is used, mail it direct to Commander, DCSC, ATTN: DCSC-OSR, Columbus, OH 43215.

c. If additional assistance is required, contact the address in paragraph 1-11 of this publication.

1-8. Personnel and Training.

a. MOS Requirements:

(1) Operator: 62J20, General Construction Machine Operator.

(2) Organizational Maintenance: 62B20, Construction Equipment Repairman.

(3) Direct and General Support Maintenance: 62B30, Construction Equipment Repairman; 63G20, Fuel and Electrical Systems Repairman, 44B20 Metal Body Repairman.

b. New Equipment Training: New Equipment Training Teams (NETTs) are available to major field commands. Requests for NETTs should be forwarded to Commander, US Army Tank-Automotive Materiel Readiness Command (TAROOM), ATTN: DRSTA-MLT, Warren, MI 48090. Training teams should be requested only when trained personnel are not available in the command to operate and/or maintain the Roller.

1-9. Logistics Assistance.

a. Tank-Automotive Command Field Maintenance Technicians stationed at CONUS and OCONUS installations will be fully qualified and available to furnish on-site training and or assistance concurrent with receipt of the Roller.

b. Assistance can be obtained by contacting the Logistics Assistance Office listed in Appendix B or AR 700-4.

1-10. Warranty. The CCE Roller contractor warrants the products furnished under this contract according to the terms and conditions described in the equipment publications and Appendix B of this publication . All

warranties furnished to the Roller contractor by subcontractors of assemblies or components utilized in the manufacture of the end item will be extended to the Government. See Appendix B for warranty guide-lines.

1-11. Reporting. You can improve this publication by recommending improvements, using DA Form 2028 (Recommended Changes to Publications and Blank Forms) and mail direct to Commander, US Army Tank-Automotive Materiel Readiness Command, ATTN: DRSTA-MVB, Warren, MI 48090.

SECTION II

MAINTENANCE

2-1. Maintenance Concept. The CCE Roller will not require any new or special maintenance considerations. All maintenance functions can be accomplished within the current maintenance concepts established for construction equipment.

a. Operator/Crew Maintenance: Operator and crew maintenance is limited to daily preventive maintenance checks and services.

b. Organizational Maintenance: Organizational maintenance consists of scheduled preventive maintenance services, minor repairs and adjustments.

c. Direct Support Maintenance: Direct support maintenance consists of repairs on-site or in a direct support unit's shops. Repairs are accomplished with a minimum of tools and test equipment; the assemblies and end items thus repaired are returned to their users.

d. General Support Maintenance: General support maintenance overhauls selected assemblies and repairs items designated by the area support command for return to stock.

e. Depot Maintenance: Depot Maintenance overhauls end items and selected major assemblies when they are required to satisfy overall Army requirements. Overhaul of the end item may also be performed by contract with the manufacturer.

2-2. Maintenance Allocation Chart. Maintenance will be performed as necessary by the category indicated in the Maintenance Allocation Chart (MAC) (Appendix C) to retain or restore serviceability. All authorized maintenance within the capability of a using organization will be accomplished before referring the item to support maintenance. Higher categories will perform the maintenance functions of lower categories when required or directed by the appropriate Commanders. Using and support units may exceed their authorized scope and functions in the

MAC when approval is granted by the next higher support maintenance Commander.

2-3. Modifications. Modifications will be accomplished by the end item manufacturer after TARCOM approves the field campaign or modification plan. See Appendix D.

2-4. Equipment Improvement Recommendations (EIR). Equipment Improvement Recommendations will be submitted in accordance with TM 38-750.

2-5. Equipment Readiness Reporting. Readiness Reporting will be accomplished as required by the current TM 38-750.

2-6. Maintenance Expenditure Limits. The average life expectancy for the Roller is 15 years.

<u>PERCENT OF REPAIR</u>	<u>YEAR</u>
50%	1982
45%	1985
40%	1987
35%	1989
30%	1991
20%	1993
100	1994

2-7. Shipment and Storage.

a. Shipment and Storage. Refer to TB 740-97-2 for procedures covering preservation of equipment for shipment and storage.

b. Administrative Storage. Refer to TM 74D0-90-1 for instructions covering administrative storage of equipment.

2-8. Destruction to Prevent Enemy Use. Refer to TM 750-244-3 for procedures covering destruction of equipment to prevent enemy use.

2-9. Fire Protection.

a. A hand operated fire extinguisher may be installed at the discretion of the using unit.

b. Approved hand-portable fire extinguishers are listed in TB 5-4200-200-10.

2-10. Basic Issue Items List (BILL). See Appendix E for a list of items which accompany the end item or are required for operation and/or operator's maintenance.

2-11. Maintenance and Operating Supply List. See Appendix L for a list of maintenance and operating supplies required for initial operation.

2-12. Special Tools and Equipment. No special tools or equipment are required for operation and maintenance of the Roller.

2-13. Maintenance Forms and Records. Operational, Maintenance and Historical records will be maintained as required by the current TM 38-750.

2-14. Towing the Roller. Before towing a unit that has malfunctioned ensure that the transmission by-pass valve is in the open position and park brake has been released. The by-pass valve is located under the hood next to the batteries. After towing be sure that the b-pass valve has been closed.

CAUTION: The by-pass valve is not intended for towing a unit from one job site to another. Tow at speeds of one (1) to (2) MPE for as short a distance as possible.

2-15. Starting the Roller.

- a. Always set the park brake by moving the control lever to BRAKE ON position (up).
- b. Place the Direction-Throttle Bail in Neutral detented position (vertical).
- c. Start engine.

2-16. Safety Precautions. Always observe the following safety pre-cautions to prevent possible injury to personnel and damage to the equipment.

- a. TRAINED OPERATIONS ONLY.
- b. Always use slower unit speeds and added caution when operating close to a lift edge or when traveling downhill.
- c. Never travel across a slope. Always travel up or down a slope.
- d. Always engage the parking brake before dismounting the unit.
- e. Never shut down the engine when traveling up or down a slope

Always move the Direction-Throttle Bail toward the neutral position to slow the unit.

SECTION III

REPAIR PARTS SUPPLY

3-1. General.

- a. The basic policies are procedures in AR 710-2, AR 725-50 and DA Cir 700-27 are generally applicable to repair parts management for CCE items.
- b. Manufacturer's parts manuals are furnished with CCE items instead of Department of the Army Repair Parts and Special Tool List (RPSTL).
- c. National Stock Number (NSNs) are initially assigned only to PLL/ASL parts and major assemblies, i.e. engines, transmissions, etc. Additional NSNs are assigned by the supply support activities as demands warrant.
- d. Proper use of project codes and weapon systems designator codes on parts requisitions is essential.
- e. Automated Processing (AUTODIN) of Federal Supply Code Manufacturer (FSCM) part number requisitions, without edit for matching NSNs and exception data, is authorized.
- f. Repair parts are available from commercial sources and may be purchased locally in accordance with AR 710-2 and AR 734-110.
- g. Initial Prescribed Load List (PLL) and Authorized Stock List (ASL) will be distributed by US Army Tank-Automotive Materiel Readiness Command, (TARCOM), ATTN: DRSTA-FH.

3-2. Prescribed Load List (PLL). The PLL distributed by TARCOM is an estimated 15 days supply recommended for initial stockage at organizational maintenance. Management of PLL items will be governed by the provisions of AR 710-2 and local command procedures. Selection of PLL parts for shipment to CONUS/OCONUS units is based upon the receiving Command's recommendation after their review of the TAROOM prepared list. Organizations and activities in CONUS/OCONUS will establish PLL stocks through normal requisitioning process.

3-3. Authorized Stockage List (ASL). The ASL distributed by TARCOM is an estimated 45 days supply of repair parts for support units and activities. The ASL parts will be shipped according to the recommendations of the receiving commands, after they have reviewed the initial list distributed by TARCOM. Support units and activities in CONUS/OCONUS will establish ASL stocks through normal requisitioning process.

3-4. Requisitioning Repair Parts.

a. Using Units/Organizations: Requisitions (DA Form 2765 Series) will be prepared according to AR 710-2 and local command directives. All requisitions will have the Weapons System Designator code "BD" (Interim Change 5-1, AR 710-2 per DA Message, DALO-SMS 091400Z Jun 78) entered in the 2nd and 3rd positions of block 18. Units in CONUS will use project code "BGW" in block 19. Units OCONUS will enter in block 19 project code "JZC", Appendix H.

b. Support Units and Activities:

(1) General: All MILSTRIP requisitions (DD Form 1348 Series) prepared for repair parts support of CCE items will include distribution and project codes, see Appendixes I, J and K.

(2) Distribution Code: Supply customers in CONUS will use code "F" in card column 54. Customer OCONUS will use the appropriate code from Appendix P, paragraph P-3a(1) AR 725-50. Weapons System Designator code "BD" (DA Message 091400Z, DALO-SMS, June 78), will be entered in card columns 55 and 56 of all requisitions for parts to support the roller.

(3) Project Codes: The applicable project code will be entered in card columns 57-59 of requisitions for Non-NSN parts, whether CONUS or OCONUS customers. Project code "BGW" will be used by CONUS customers when requisitioning part numbered parts. Supply customers OCONUS will use project code "JZC" for part numbered parts.

3-5. Submitting Requisitions.

a. Using Units and Organizations will submit DA Form 2765 Series requisitions to designated support units or activities in accordance with local procedures.

b. Support units and activities will forward MILSTRIP requisitions for NSN parts through the Defense Automated Addressing System (DAAS) to the Managing Supply Support Activity. Requisitions for part numbered part will be forwarded through DAAS to the Defense Construction Supply Center (DCSC).

NOTE: When the manufacturers part number and Federal Supply Code for Manufacturer (FSCM) exceed the space in card columns 8 through 22 of A02/AOB requisitions, prepare an A05/AOE requisition (DD Form 1348-6) and mail it to Commander Defense Construction Supply Center, ATTN: DCSC-OSR, Columbus, OH 43215.

APPENDIX A

REFERENCES

A-1. Publications

Logistic Assistance Program AR700-4
 Material Management for Using Units, Support Units and Installations AR 710-2
 Requisitioning Receipt and Issue System AR 725-50

Indexes should be consulted frequently for latest change of revisions of references and for new publications relating to material covered in this publication.

Index of Administrative Publications.....DA PAM 310-1
 Index of Blank FormsDA PAM 310-2
 Index of Doctrinal Training and Organization Publications.....DA PAM 310-3
 Index of Technical Manuals Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply
 Bulletins and Lubrication OrdersDA PAM 310-4
 Index of Graphic Training Aid and DevicesDA PAM 310-5

A-2. Forms

Refer to TM 38-750, The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to the materiel.

A-3. Other Publications

The following publications contain information pertinent to the major item and associated equipment.

a. Camouflage.
 Camouflage FM 5-20
b. Decontamination.
 Chemical, Biological, and Radiological (CBR) Decontamination TM 3-220
 NBC (Nuclear, Biological and Chemical) Defense FM 21-40
c. General.
 Utilization of Engineer Construction Equipment TM 5-331A
 Basic Cold Weather Manual FM 31-70
 Northern Operations..... FM 31-71
 Operation and Maintenance of Ordnance Materiel in Cold Weather (0° to -650 F)..... FM 9-207
 Procedures for Destruction of Equipment to Prevent Enemy Use TM 750-244-3
d. Maintenance and Repair
 Inspection, Care and Maintenance of Antifriction Bearings TM 9-214
 Welding Theory and Application..... TM 9-237
 Hand Portable Fire Extinguishers Approved for Army Users..... TB 5-4200-200-10
e. Administrative Storage.
 Administrative Storage of Equipment TM 740-90-1
 Preservation of USAMECOM Mechanical Equipment for Shipment and Storage..... TB 740-97-2

APPENDIX B

WARRANTY GUIDELINES

1. A warranty period of 12 months applies to the Roller, Motorized, Steel Wheel, Model C350B-D, Contract Number DSA 700-74-C-9024, manufactured by HYSTER Co. after delivery to the Government. This warranty applies to the end item, components and all supplies furnished under the contract.

2. Using units may not contact their local dealer. You must mail DA Form 2407 to the Maintenance Directorate, TARCOM, at the following address: US Army Tank-Automotive Material Readiness Command, ATTN: DRSTA-MVB, Warren Michigan 48090. To expedite actions you may call the information to AUTOVON 273-3349 or 273-3439 with the information from your DA 2407, section 1, block 1 through 11, blocks 16, 17, 18 and 20.

3. General information:

a. DA Form 2407 (prepared in accordance with warranty claim actions in TM 38-750) will be used to submit warranty claim actions for end items when components, parts or assemblies are defective and are covered by a manufacturer's warranty. End items under warranty are identified by a decal plate and/or warranty statement included in the operator's and maintenance manual for the end item. All warranty actions settled or unsettled will be reported to the National Maintenance Point (NMP) on DA Form 2407. For warranties settled locally the DA Form 2407 will contain a statement "For Information Only" in block 35.

b. Maintenance activities in support of organizational maintenance are the responsible points of contract between the originator of warranty claims and the National Maintenance Point (US Army Tank-Automotive Material Readiness Command, DRSTA-MVB, AUTOVON 273-3349, or 273-3439 Warren, Michigan 48090, which serves as the DA Representative with the contractor in warranty matters.

NOTE: In certain instances, the originating organization and the support activity are one and the same.

c. Before you take your equipment to a dealer for repair, whether or not it was necessary for you to go through the NMP (TARCOM), check with your local procurement office to see if a funds commitment document is needed. Sometimes, even though the majority of the repairs are covered by the warranty, there may be a small charge for normal maintenance costs, i.e., oil filters, oil, etc. Further, the cause of damage could be determined by the dealer to be directly related to "operator abuse." In that case, the Government may be obligated to pay for tear-down services even if the repairs are no longer desired, or for the complete cost if repairs are to be completed by the dealer.

d. When the equipment is given to the dealer for repairs, find out how long the work will take, the extend of the problem, if possible, and the charges, if any, which may be involved. Leave the name and telephone number of the person to be contacted for pickup of the equipment and specifically state that he should be called as soon as the repairs are finished. In addition, state he should be telephoned if unexpected problems, costs and/or delays are encountered. Get the name and telephone number of the Service Manager, for any required follow-up purposes.

e. When you arrive to pick up your equipment after completion of servives, make certain that you know exactly what repairs were performed and/or parts replaced. This is required for overall problem trend evaluation by the NMP and must be identified upon completion of warranty servives.

f. Telephone the NMP at TARCOM, AUTOVON 273-3349, 273-3439 and/or 273-3387 if:

(1) Your equipment requires repairs and you cannot obtain these servives using the procedures listed above.

(2) The length of time required for repairs may seriously hamper your mission, or if the dealer's overall response to your requirements are not satisfactory.

(3) You have any questions regarding warranty procedures - either in general or about a specific job. Do not wait until your problems become critical.

g. Do not attempt to conduct negotiations regarding a breech of warranty. This is a function of the Contracting Officer, through the NMP at TARCOM.

APPENDIX C
MAINTENANCE ALLOCATION CHART
FOR
Roller, Motorized, Steel Wheel, Model C35B-D

Section I. INTRODUCTION

1. General: This Maintenance Allocation Chart designates responsibility for performance of Maintenance functions to specific Maintenance categories.
2. Maintenance functions:
 - a. Inspect: To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.
 - b. Test: To verify serviceability and detect incipient failures by measuring the mechanical 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 (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.
 - d. Adjust: To maintain, within prescribed limits, by bringing into proper or exact 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. Install: The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
 - h. Replace: The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.
 - i. Repair: The application of maintenance services or other maintenance actions to 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) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DM:IR) in appropriate technical publications. 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 materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

3. Column entries: Columns used in the Maintenance allocation chart are explained below:

a. Column 1, Group Number: Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly: Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions: Column 3 lists the functions to be performed on the item listed in Column 2.

d. Column 4, Maintenance Category: Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance -authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of man-hours specified by 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, troubleshooting time, and quality assurance/ quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the Maintenance Allocation Chart.

e. Column 5, Tools and Equipment: Column 5 specifies by code those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks: Column 6 contains an alphabetic code which leads to the remark in Section IV, Remarks, which is pertinent to the item opposite the particular code.

APPENDIX C

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
01	ENGINE								
0100	Engine Assembly	Test		2.0				1,2,3,4	
		Service	0.1						
		Replace			16.0				
		Repair			21.0				
		Overhaul				48.0			
	Engine Mounts	Replace		3.0					
0101	Cylinder Block	Test				5.0			
		Replace				40.0			
		Repair				16.0			
	Cylinder Sleeve	Replace				3.0			
	Cylinder Head	Replace			4.0				
		Repair				4.0			
		Overhaul				8.0			
0102	Crankshaft	Replace		5.0				1,2,3,4	
	Main Bearings	Replace		4.0					
	Drive Pulley	Replace		2.0					
0103	Flywheel	Replace			3.0			1,2	
0104	Pistons & Connecting Rods	Replace				3.0		1,2	
		Repair				2.0			
	Rings & Bearings	Replace				0.5			

*The subcolumns are as follows:

C--operator/crew F--direct support D-depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
0105	Rocker Arms	Replace			0.5				
	Valve Springs	Test Replace				0.8 0.3			
	Valves, Exhaust	Adjust			2.0				
		Replace				1.0			
	Repair					2.0			
Camshaft, Bearings & Gears	Replace				4.0				
0106	Oil Cooler	Service		0.2				1,2	
		Replace			1.0				
	Oil Pan	Replace			1.5				
		Repair			1.0				
	Oil Pump	Replace			0.8				
		Repair			2.0				
	Oil Pressure Regulator	Adjust			0.2				
Replace				0.5					
Oil Filter Assembly	Service Replace		0.5	1.0					
Oil Filter Element	Replace		0.5						
0108	Exhaust Manifold	Replace			1.0			1,2,3,4	
		Repair			1.0				

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
03	FUEL SYSTEM								
0301	Fuel Injector	Test Replace			1.0 1.5			1,2	
0302	Fuel Pump	Replace Repair		1.0	1.0			1,2	
0304	Air Cleaner	Service Replace	0.4	1.0				1	
		Repair		0.5					
	Air Cleaner Element	Replace		0.5					
0305	Blower, Air Intake	Service Replace		0.3	1.0			1,2	
		Repair			2.0				
0306	Fuel Tank	Service Replace		0.2	1.5			1,2	
		Repair				1.0.			
	Lines & Fittings	Replace		1.0				1,2	
0308	Governor, Engine Speed	Test Adjust			0.5 0.5				
		Replace			1.0				
		Repair				2.0			

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
0309	Fuel Filters	Service	0.2						1
	Fuel Filter Element	Replace		0.5					
0312	Throttle Control/Linkage	Adjust			0.1				1,2
		Replace			0.4				
04	EXHAUST SYSTEM								
0401	Muffler & Exhaust Pipes	Replace		1.0					1
05	COOLING SYSTEM								
0501	Radiator	Service	0.2						1,2
		Replace		2.0					
		Repair			2.0				
0503	Thermostat	Replace		1.0					
	Hoses & Clamps	Replace		0.5					
0504	Water Pump	Replace		2.0					1,2
		Repair			1.0				
0505	Pan Assembly	Replace		1.0					1,2
		Repair			1.0				
	Fan Belts	Inspect		0.1					
		Adjust		0.5					
		Replace		1.0					
06	ELECTRICAL SYSTEM								
0601	Alternator	Test		0.1					1,2,5
		Replace		0.5					
		Repair			1.5				

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
0603	Alternator Drive Belt	Inspect	0.1						
		Adjust		0.2					
		Replace		0.2					
	Starting Motor	Test		0.2				1,2,5	
		Replace		1.0					
0607	Instrument Panel Accessories	Repair			1.5				
		Replace		0.5				1,5	
		Repair		0.7					
0608	Miscellaneous Electrical Items: (Switches, Circuit Breakers, etc.)	Replace		0.5				1,5	
0609	Head Light Assembly	Replace		0.2				1,5	
		Repair		0.4					
0610	Read Light Lamp Units	Replace		0.2					
		Sendng Unites/Warning Switches.	Replace		0.2				1,5
0611	Horn Assembly	Replace		0.3				1,5	
0612	Battery	Inspect	0.1					1,5	
		Test		0.3					
		Service	0.2						
	Replace		0.5						
	Battery Cables	Replace		0.4					
Repair			0.5						

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
0613	Wiring Harness	Replace Repair		1.0 1.0					1,5
07	TRANSMISSION SYSTEM								
0721	Hydraulic Tank	Service Replace Repair	0.2		3.0 3.0				1,2
	Suction Filter	Service Replace		0.3 1.0					
	Hydrostatic Pump	Replace Repair Overhaul			2.0 2.0		4.0		
	Servo Control Valve	Replace Repair			1.5 2.0				
	Direction-Throttle Control Assy	Service Adjust Replace Repair		0.2	1.0 2.0 2.0				
	Hydrostatic Motor	Replace Repair Overhaul			1.5 3.0		4.0		
	Transmission By-.Pass Valve	Replace			1.0				

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
11 1100	Hydraulic Oil Cooler	Repair			1.0				
		Service Replace		0.3	1.5				
		Repair			2.0				
	Oil Return Filter	Service Replace		0.3					
		Repair		1.0					
	Case Pressure Relief Valve	Replace			1.0				
		Repair			1.0				
	Lines & Fittings	Replace		1.0					
		Repair		1.0					
	12 1201	FI.AL DRIVE							
Drive Drum Assembly	Replace			2.0				1,2,3,4	
	Repair			3.0					
Motor Carrier Assembly	Replace			1.5					
	Repair			2.5					
Final Drive Assembly	Service		0.5					1,2,3,4	
	Replace			3.0					
	Repair Overhaul			3.0		8.0			
12 1201	PARKIC BRAKE SYSTEM								
1201	Brake Lever	Adjust		0.4					

**The subcolumns are as follows:

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 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
		Replace		1.0					
		Repair		1.0					
	Cable & Linkage	Replace		1.0					
		Repair		1.0					
	Brake Shoe	Replace		2.0	1.0				
		Repair							
	Brake Drum	Replace		2.0	1.0				
		Repair							
14	STEERING SYSTEM								
1401	Steering Wheel	Replace		1.0				1	
1405	Guide Rolls	Replace			3.0			1,2	
		Repair			1.0				
	Axle Shaft Bearings	Service		0.2	4.0				
		Replace							
		Repair							3.0
	Yoke & Pin Assembly	Service			3.0				
		Replace							3.0
		Repair							2.0
1407	Steering Control Unit	Replace			2.0			1,2	
		Repair			2.0				
1410	Hydraulic Pump	Replace			2.0				
		Repair			2.0				

*The subcolumns are as follows:
 C--operator/crew F--direct support D--depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
		Overhaul			4.0				
1411	Hoses, Lines & Fittings	Replace		1.0				1	
1412	Steering Cylinder	Service		1.0				1,2	
		Replace			1.5				
		Repair			2.0				
1414	Flow Divider	Replace			1.5			1,2	
		Repair			1.0				
15	FRAME								
1501	Frame Assembly	Repair			4.0			1,2	
18	BODY, HOOD & COWLING								
1801	Hood & Cowling	Replace		1.0				1	
		Repair		1.5					
1806	Seat Assembly	Replace		1.0				1	
		Repair		1.0					
1806	Tool Box	Replace		0.5				1	
		Repair		0.5					
74	EARTH MOVING EQUIPMENT COMPONENTS								
1476	Roll Scrapers	Service		0.2				1	
		Replace		1.0					
		Repair		1.0					
	Roll Mat	Replace		0.5					

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
 O--organizational H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE Category					(5) TOOLS AND EQUIP	(6) REMARKS
			C	O	F	H	D		
7471	Water Spray System Tank Spray Pump & Motor	Service		0.5				1,2	
		Replace		2.0					
		Repair		2.0					
	Water Tank Inlet Screen	Service		0.3					
		Replace		0.3					
	Water Tank Sump Filter	Service		0.3					
		Replace		0.3					
	Spray Manifolds & Nozzles	Service		0.5					
		Replace		0.5					
		Repair		1.0					
Spray Pipes, Valves & Hoses	Replace		1.0						
	Repair		1.0						

*The subcolumns are as follows:

C--operator/crew F--direct support D--depot
 O--organizational H--general support

MAINTENANCE ALLOCATION CHART FOR

Roller, Motorized, Steel Wheel, Model c350B-D

SECTION III - TOOL AND TEST EQUIPMENT REQUIREMENTS

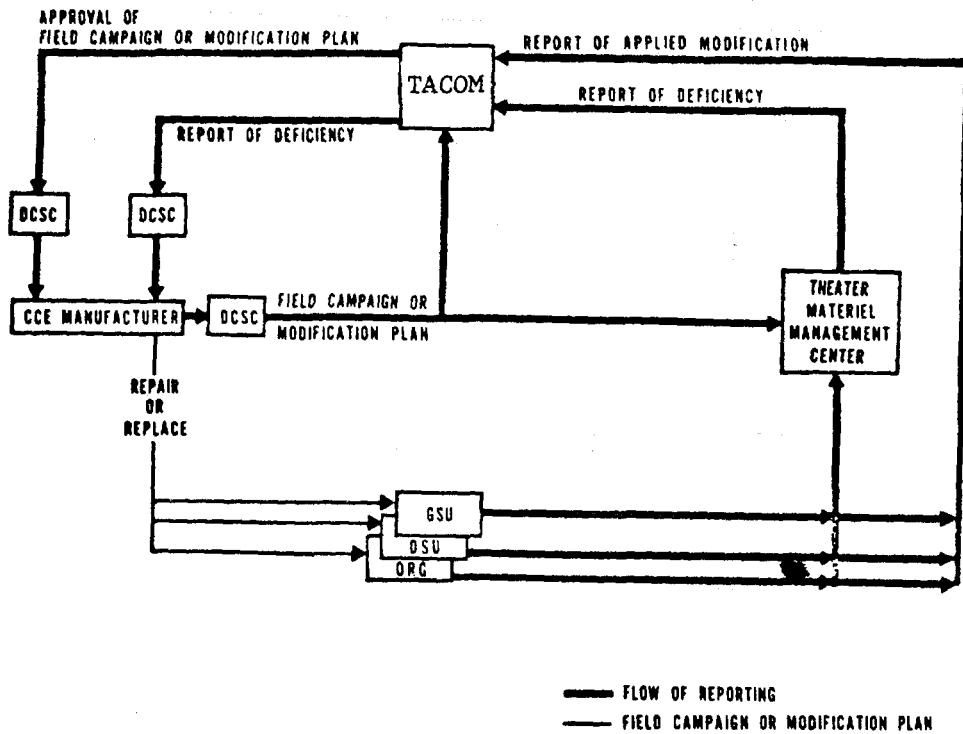
TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NATIOHAL/NATO NOMENCLATURE	TOOL STOCK NUMBER	NUMBER
		Unless otherwise noted, functions can be accomplished contained in the following	all maintenance with the tools common two sets.	
1	O, F, H	Shop Equip Contact Maint. TRK MTD (SC 4940-97-C1IE-05)	49'40-00-294-9518	T10138
1	O, F, H	Shop Equip Org Repair, Light RK MTD (SC 4940-97-CL-D4)	1/940-*.294-9516	T13152
1	O, F, H	Tool Kit Automotive Maint, Org Maint Common #1 (SC 4910-95-CL-A74)	4910-00-754-0654	W32593
1	O, F, H	Tool Kit Automotive Maint, Org Maint Common #2 (SC 4910-95-CL-A72)	4910-00-754-0650	W32730
1	O, F, H	Tool Kit, Light Weight 5180-90-CL-W26)	(SC 51t0-00-177-7033	W33004
1	O, F, H	Shop Equip Auto Maint and Repair Org Maint Supp #1 (SC 4910-95-CL-A73)	4910-00-754-0653	W32867
1	O, F, H	Shop Equip Welding Field Maint (SC 3470-95-CL-A08)	3470-00-357-7268	T16714
1	O, F, H	Tool Set, Veh Full Tracket. Sugg #2 SC 4940-95-CL-A08	49400-00-754-073	W65747
2	F, H	Shop Equip Gen Purp Repair Semitrlr MTD (SC 4940-97-C-ED 3)	4914000-287-4894	T10549
2	F, H	Tool Kit Automotive, Fuel and Elec Sys Repair (SC 4910-95-CL-A50)	5180-00-754-0655	W32456
2	F, H	Tool Kit, Master Mechanic and Equip Maint and Repair (SC 51S0-9o-CLEO5)	5180-00-699-5273	W45060

MAINTENANCE ALLOCATION CHART FOR
Roller, Motorized, Steel Wheel, Model C350B-D

SECTION III - TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
2	F, H	Shop Set, Fuel and Elec Sys Field Maint Basic (SC 4910-95-CL-AO1)	4910-00-754-0714	T30414
2	F, H	Shop Set, Fuel and Elec Sys Field Maint Basic Sup #2 (SC 4910-95-CL-A65)	4910-00-390-7775	T30688
2	F, H	Shop Equip Machine Shop, Field Maint Basic (SC 3470-95-CL-Ao2)	3470-00-754-0708	T15644
2	F, H	Measuring and Lay Out Tool Set Mach (SC 5280-95-CL-A02)	5280-00-511-1950	W44512
2	F, H	Tool Kit Body and Fender Repair	5180-00-754-0643	W33689
3	F, H	Wrench Set Socket, 3/4" Drive Hex Type	49400-754-0743	W65747
4	O, F, H	Wrench Torque, 3/4" Drive 500 lb Cap	5120-00-542-5577	Y84966
5	O, F, H	Multimeter	6625-00-999-7465	M80242

CCE MANUFACTURER FIELD CAMPAIGNS AND MODIFICATION PROCEDURES



APPENDIX E

BASIC ISSUE ITEMS LIST				
NOMENCLATURE: MANUFACTURER: SERIAL NUMBER RANGE:				
(1) MFR PART NO.	(2) MVR FED CODE	(3) DESCRIPTION	(4) UNIT OF ISSUE	(5) QUANTITY FURNISHED W/EQUIP
		N-O-N-E		

ITEMS TROOP INSTALLED OR AUTHORIZED LIST				
(1) SMR CODE	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION REF No & IFR CODE	(4) UNIT OF	(5) QTY AUTH
		NOTE: The following items are overpacked with the roller.		
	7520-00-559-9618	Case, Cotton Duck: MIL-B- 11743 (81349)	EA	1
	7510-00-889-3494	Log Book Binder: MIL-B-43064	EA	1
		NOTE: The following items are authorized but not issued with the roller.		
	4210-00-889-2221	Extinguisher, Fire Dry Chemical	EA	1
	4930-00-277-9525	Grease Gun, Hand	EA	1
	4930-00-204-2550	Adapter, Grease Gun Coupling, Rigid	EA	1
	4930-00-288-1511	Adapter, Grease Gun Coupling, Flex	EA	1

APPENDIX F

INITIAL RECOMMENDATION
 PRESCRIBED LOAD LIST (PLL)
 AUTHORIZED STOCKAGE LIST (ASL)

END ITEM: Roller, Motorized, Steel Wheel, 2 Drum Tandem 10-14 Ton (CCE)				MAKE: HYSTER	MODEL C350B-D				
MFR PART NO: N/A		NSN: 3895-00-578-0372		SERIAL NUMBER RANGE TO		DATE Feb 79			
SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM		U/M	QTY OF PARTS REQ'D FOR NO. OF END ITEMS			
						PLL	ASL		
						1-5	1-5	6-20	21-50
PAOZZ	2940-00-019-8087	5574978	72582	Element, Engine Oil Filter	EA	1	1	2	4
PAOZZ	2910-00-792-8985	5774961	72582	Element, Primary Fuel Filter	EA	1	1	2	4
PAOZZ	2910-00-890-2436	5573261	72582	Element, Secondary Fuel Filter	EA	1		2	4
PAOZZ	3030-00-899-4888	154382	30076	V-Belt, Alternator	EA	1	1	2	
PAOZZ	2940-00-755-6584	180595	30076	Element, Hydraulic Oil Filter	EA	1	1	2	
PAOZZ	2940-00-368-8338	156954	30076	Element, Air Cleaner	EA	1	3	6	12
PAOZZ	3030-00-982-1212	5126447	72582	V-Belt, Matched, Fan	EA	1	1	2	
PAOZZ	2540-01-042-5750	157321	30076	Cocoa Mat	EA		1	2	

APPENDIX G

ADDITIONAL REPAIR PARTS

<u>NSN</u>	<u>P/4</u>	<u>FSCM</u>	<u>Description</u>
4120-01-013-1355	100434	30076	Hose, Radiator, Upper
472D--01-013-1354	169107	30076	Hose Radiator, Lower
2340-00-019-8087	5574978	72582	Element, Engine Oil Filter
2910-00-792-8985	5774961	72582	Element, Primary Fuel Filter
2910-00-890-2436	5573261	72582	Element, Secondary Fuel Filter
5930-00-220-6716	169776	30076	Sender, Oil Pressure
6620-00-933-3594	77328	30076	Sender, Water Temperature
5925-01-010-1084	163762	30076	Breaker, Circuit
5920-00-925-2639	53123	30076	Fuse, 5 Ampere
3030-00-899-4888	154382	30076	V-Belt, Alternator
2940-00-755-6584	180595	30076	Element, Hyd Oil Filter
4330-00-355-7750	237014	30076	Seal Element Kit, Hyd Oil Filter
5330-01-016-7837	243868	30076	Seal Kit, Steering Control
2530-00-158-1312	189585	30076	Parts Kit, Steering Control
5330-01-016-7838	223641	30076	Seal Kit, Steering Cyl
4320-00-237-3947	158913	30076	Kit - Minor, Steering Pump
6240-00-733-2984	156776	30076	Element Light, Seal Beam
6240-00-155-7859	MS15571-8	96906	Bulb, 12 Volt
5920-00-131-9915	F02832V20A	81349	Fuse, 20 Ampere
5920-00-925-2640	53124	30076	Fuse, 10 Ampere
5330-01-013-7673	169787	30076	O-Ring, Hose Flange
2940-00-368-8338	156954	30076	Element, Air Cleaner
4320-01-032-7972	190641	30076	Seal, Kit
4320-01-032-7973	267025	30076	Manifold Valve Kit, Hyd Sys
4320-01-032-7974	194393	30076	Manifold Seal Kit, Hyd Sys
3030-00-982-1212	5126447	72582	Belt-V Matched, Fan
2540-01-042-5750	157321	30076	Cocoa Mat
5330-01-043-1803	156961	30076	O-Ring, Air Cleaner
6140-00-917-2141	79792	30076	Battery, 12-Volt

APPENDIX H

SAMPLE FORMAT - DA FORM 2765 PART NUMBER REQUEST

(CONUS Requester)

USE TYPEWRITER OR BALL-POINT PEN
PRESS HARD TO ASSURE LEGIBILITY ON ALL COPIES

SEND TO:

REQUEST IS FROM: Use National Stock Number (NSN)

STOCK NUMBER: 4 7 2 0 0 1 0 1 3 1 3 5 5

Weapons Sys Dsg. Code: B D B G W

Project Code: []

ITEM DESCRIPTION: Hose

PUBLICATION DATA: TM 5-3895-348-14&P-1, Page 2A08

DATE POSTED: [] DATE AVAILABLE: [] DATE RECEIVED: []

SIGNATURE: []

(CONUS Requester)

USE TYPEWRITER OR BALL-POINT PEN
PRESS HARD TO ASSURE LEGIBILITY ON ALL COPIES

SEND TO:

REQUEST IS FROM: Use National Stock Number (NSN)

STOCK NUMBER: 4 7 2 0 0 1 0 1 3 1 3 5 5

Weapons Sys Dsg. Code: B D J Z C

Project Code: []

ITEM DESCRIPTION: Hose

PUBLICATION DATA: TM 5-3895-348-14&P-1, Page 2A08

DATE POSTED: [] DATE AVAILABLE: [] DATE RECEIVED: []

SIGNATURE: []

APPENDIX J

SAMPLE FORMAT-MILSTRIP REQUISITION FOR (NON-NSN)

DD FORM 1348m 1 MAR 74 EDITION OF 1 APR 71 MAY BE USED

Card Column	Description of Data	Mandatory Entry for CCE
1-3	Documentary Identifier Code	A0B - CONUS A02 - Overseas
4-6	Routing Identifier Code	Always S9C
7	Media/Status Code	
8-22	FSCM and Part Number	
23-24	Unit of Issue	
25-29	Quantity	
30-43	Document Number	
44	Demand Code	
45-50	Supplementary Address	
51	Signal Code	
52-53	Fund Code	
54-56	Distribution Code CC-54	"F" for CONUS; see AR 725-50 for OCONUS
	CC-55-56	Weapon System Code
57-59	Project Code	
60-61	Priority Code	
62-64	Required Delivery Date	
65-66	Advice Code	

CARD
COLUMN

DESCRIPTION OF DATA

MANDATORY ENTRY
FOR CCE

67-69

Blank

70

Identification code applicable to entry in cc 71-80.

A - Technical order or Technical Manual.

B - End Item Identification

C - Noun Description

D- Drawing or Specification No.

71-80

Reference Identification

Identification of reference specified in cc 70

INSTRUCTIONS

This form will only be used in those cases where the manufacturer's code and part number exceed the spaces allocated in card columns S - 22 of the requisition.

<u>CARD COLUMN</u>	<u>DESCRIPTION DATA</u>	<u>MATUDATORY ENTRY FOR CCE</u>
1 - 3	Document Identifier Code	A0E - CONUS A05 - OCONUS
4 - 6	Routing Identifier Code	Always S9C
7	Media Status Code	
8 - 22	FSCM and Part Number	Leave Blank Enter In Block 1 under Identification Data
23-24	Unit of Issue	
25-29	Quantity	
30-43	Document Number	
44	Demand Code	
45-50	Supplementary Address	
51	Signal Code	
52-53	Fund Code	
54-56	Distribution Code CC 54 CC 55-56	"F" for CONUS. (See AR 725-50 for OCONUS) Weapon Systems Code
57-59	Project Code	
60-61	Priority Code	
62-64	Required Delivery Date	
65-66	Advice Code	
67-80		Blank

IDENTIFICATION DATA - Lower half of DD Form 1348-6, complete Blocks 1 thru 9.

APPENDIX L

MAINTENANCE AND OPERATING SUPPLY LIST

NOMENCLATURE. Roller, Motorized, Steel Wheel 2 Drum Tandem, 10-14 Ton (CCE)			MAKE HYSTER		MODEL: C350-D
MFR PART NO: N/A		NSN: 3845-00-578-0372	SERIAL NO. RANGE TO		DATE Feb 79
(1) COMPONENT APPLICATION	(2) MFR PART NO OR NAT'L STOCK NO	(3) DESCRIPTION	(4) QTY REQ QTY REQ F/INITIAL OPN	(5) QTY REQ F/8 HRS OPN	(6) NOTES
Fuel Tank	9140-00-286-5296	Diesel Fuel, DF2	25 Gal	*	55 gal drum
Engine Crank- case	9150-00-189-6727	Oil Lubricating OE/HDO 10	14 qts	*	1 qt
	9150-00-186-6668	MIL-L-2104C			5 gal.
	9150-00-186-6681	Oil Lubricating OE/HDO 30			1 qt.
	9150-00-188-9858	MIL-L-2104C			5 gal
Hydraulic Reservoir	9150-00-189-6727	Oil Lubricating O0/4DO 10	9 gal	*	1 qt
	9150-00-186-6668	MIL-L-2104C			5 gal
Final Drive	9150-01-035-5392	Oil Lubricating GO80W/90	6 qts	*	1 qt
	9150-01-035-5393	MIL-L-2105C			5 gal
	9150-01-035-5394				55 gal

MAINTENANCE AND OPERATING SUPPLY LIST

NOMENCLATURE. Roller, Motorized, Steel Wheel 2 Drum Tandem, 10-14 Ton (CCE)			MAKE HYSTER		MODEL: C350-D
MFR PART NO: N/A		NSN: 3845-00-578-0372	SERIAL NO. RANGE TO		DATE Feb 79
(1) COMPONENT APPLICATION	(2) MFR PART NO OR NAT'L STOCK NO	(3) DESCRIPTION	(4) QTY REQ QTY REQ F/INITIAL OPN	(5) QTY REQ F/8 HRS OPN	(6) NOTES
General Application	9150-00-190-0905	GAA Grease MIL-G-10924	*	*	50-50 solution
Cooling System	6850-00-181-7933	Anti-Freeze Permanent MIL-A-46153	16 qts	*	

APPENDIX M

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Maintenance Forms and Records

Every mission begins and ends with the paperwork. There isn't much of it, but you have to keep it up. The forms and records you fill out have several uses. They are a permanent record of the services, repairs, and modifications made on your vehicle. They are reports to organizational maintenance and to your commander. And they are a checklist for you when you want to know what is wrong with the vehicle after its last use, and whether those faults have been fixed. For the information you need on forms and records, see TM 38-750.

Preventive Maintenance Checks and Services

1. Do your before (B) PREVENTIVE MAINTENANCE just before you operate the vehicle. Pay attention to the CAUTIONS and WARNINGS.
2. During checks and services (D) of PREVENTIVE MAINTENANCE will be performed while the equipment and/or its component systems are in operation.
3. Do your after (A) PREVENTIVE MAINTENANCE right after operating the vehicle. Pay attention to the CAUTIONS and WARNINGS.
4. Do your weekly (W) PREVENTIVE MAINTENANCE weekly.
5. Do your monthly (M) PREVENTIVE MAINTENANCE once a month.
6. If something doesn't work, troubleshoot it with the instructions in this manual or notify your supervisor.
7. Always do your PREVENTIVE MAINTENANCE in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.
8. If anything looks wrong and you can't fix it, write it on your DA Form 2404. If you find something seriously wrong, report it to organizational maintenance TRGHT NOW.
9. When you do your PREVENTIVE MAINTENANCE, take along the tools you need to make all the checks. You always need a rag or two.

A-Keep it clean: Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (SD-2) on all metal surfaces. Use soap and water when you clean rubber or plastic material.

WARNING

Dry cleaning solvent, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 1000F - 1380F.

B - Bolts, nuts, and screws: Check them all for obvious looseness, missing, bent or broken condition. You can't try them all with a tool, of course, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose, tighten it, or report it to organizational maintenance if you can't tighten it.

C - Welds: Look for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to organizational maintenance.

D - Electric wires and connectors: Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and make sure the wires are in good shape.

E - Hoses and fluid lines: Look for wear, damage, and leaks, and make sure clamps and fittings are tight. Wet spots show leaks, of course. But a stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to organizational maintenance.

10. It is necessary for you to know how fluid leakage affects the status of your vehicle. The following are definitions of the types/classes of leakage an operator or crew member needs to know to be able to determine the status of his/her vehicle. Learn, then be familiar with them and REMEMBER - WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR!

Leakage Definitions for Crew/Operator PMCS

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

CAUTION

EQUIPMENT OPERATION IS ALLOWABLE WITH MINOR LEAKAGES (CLASS I OR II). OF COURSE, CONSIDERATION MUST BE GIVEN TO THE FLUID CAPACITY IN THE ITEM/SYSTEM BEING CHECKED/INSPECTED. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR.

Operator/Crew Preventive Maintenance Checks and Services

B-Before D-During A-After W-Weekly M-Monthly

Item no.	Interval					ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/available if:
	B	D	A	W	M		
						NOTE PERFORM WEEKLY AS WELL AS BEFORE PMCS'S IF: a. You are the assigned operator but have not operated the equipment since the last weekly. b. You are operating the equipment for the first time.	
1	•					<u>GENERAL:</u> a. Visually check for loose wiring, damaged piping or hoses. b. Look for evidence of fluid leakage (oil, fuel coolant).	Class 111 leaks or any fuel leakages are found.
2	•	•				<u>ENGINE CRANK CASE:</u> Check dipstick for proper level. Add oil as necessary to FULL mark.	
3	•					<u>RADIATOR:</u> Check coolant level. Add coolant as required. (Level should be approximately 1 inch from bottom of filler neck).	
4	•					<u>FUEL STRAINER:</u> Drain approximately ½ pint to remove sediment and water.	

Operator/Crew Preventive Maintenance Checks and Services

B-Before D-During A-After W-Weekly M-Monthly

Item no.	Interval					ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/available if:
	B	D	A	W	M		
5	•					<p><u>GUIDE ROLL AXLE BEARINGS:</u></p> <p>Lubricate daily with GAA grease. One fitting is located on each end of the guide roll shaft. Apply grease into fitting until movement of old grease around seal is observed.</p>	<p>Engine coolant, engine oil pressure and transmission oil temperature gauges indicate abnormal operation.</p>
6	•					<p><u>STEERING/TRANSMISSION HYDRAULIC RESERVOIR:</u> (Cold check)</p> <p>Check fluid level at sight gauge. Add as required.</p>	
7						<p><u>CONTROLS AND INSTRUMENTS:</u> (Check for proper indication and operation)</p> <p>a. <u>Ammeter</u></p> <p>Slight (+) charge.</p> <p>b. <u>Engine Coolant Temperature Gauge</u></p> <p>White (warm-up)/Green (normal)/Red (hot)</p> <p>c. <u>Engine Oil Pressure</u></p> <p>40-60 PSI normal operation</p> <p>d. <u>Transmission Oil Temperature Gauge</u></p> <p>Green/Red</p> <p>e. <u>Hourmeter</u></p>	

Operator/Crew Preventive Maintenance Checks and Services

B-Before D-During A-After W-Weekly M-Monthly

Item no.	Interval					ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/available if:
	B	D	A	W	M		
8		•				F. <u>Fuel Gauge:</u>	Gauge indicates 10 or above.
		•				g. <u>Controls</u> (i.e. steering, shifting etc.) Check for proper operation.	
9				•		<u>TRANSMISSION SUCTION FILTER:</u> With engine running, check reading on filter gauge.	
				•		<u>WATER SPRAY SYSTEM/TANK:</u>	
10				•		a. Check strainer and clean with water if required.	
				•		b. Check water spray nozzle and clean if required.	
11				•		<u>COCO MATS AND SCRAPER BAR:</u> Check for missing or worn mats on scraper bar. *WARNING* Always use extreme caution when repositioning the scraper bars as they are under considerable spring tension and may become sharp when worn.	
				•		<u>AIR CLEANER:</u>	
		•				a. Inspect air cleaner element.	
						b. Check air cleaner indicator, if red, clean and service element.	

Operator/Crew Preventive Maintenance Checks and Services

B-Before D-During A-After W-Weekly M-Monthly

Item no.	Interval					ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/available if:
	B	D	A	W	M		
12						<ul style="list-style-type: none"> • <u>V-BELTS:</u> Check for frayed, cracked or broken belts. 	One or more missing or will not crank engine.
13						<ul style="list-style-type: none"> • <u>BATTERY:</u> Check fluid level. Fill as necessary to split ring. Inspect for obvious defects; such as cracked case or burnt, broken or loose terminal and cables. 	

ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Q-Quarterly S-Semiannually A-Annually B-Biennially H-Hours M-Miles

ITEM NO	INTERVAL						ITEM TO BE INSPECTED PROCEDURE: Check for and have repaired, filled, or adjusted as needed
	Q	S	A	B	H	MI	
1.	●						<u>ENGINE:</u> Check for leaks, loose mounts and proper operation.
2.					100		<u>OIL FILTER:</u> Change oil and filter.
3.					300		<u>FUEL FILTER AND STRAINER:</u> Change filter element and strainer element.
4.					200		<u>V-BELTS:</u> (all belts) Check tension.
5.		●					<u>RADIATOR:</u> a. Check for leaks and clean exterior as required. b. Check antifreeze protection.
6.			●		1000		c. Drain and flush radiator and engine. <u>AIR CLEANER:</u> a. Check filter element and clean as required.
	●				500		b. Change filter element.
7.		●					<u>BLOWER SCREEN:</u> Clean

ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Q-QUARTERLY S-SEMIANNUALLY A-ANNUALLY B-BIENNIALY H-HOURS MI-MILES

ITEM NO	INTERVAL						ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED <u>PERFORM ALL OPERATOR PMCS FIRST</u>
	Q	S	A	B	H	MI	
8.					1000		<u>BATTERY:</u> Check specific gravity of electrolyte in each cell.
9.			•				<u>WATER SPRAY SYSTEM:</u> Inspect and clean if required, the tank, strainer and nozzles.
10.			•		1000		<u>STEERING/TRANSMISSION HYDRAULIC RESERVOIR:</u> Drain fluid, change filters and refill. (Change both the return filter and suction filter.)
11.			•				<u>GAGES AND CONTROLS:</u> Check operation.
12.	•				1000		<u>FINAL DRIVE:</u> a. Check fluid level, add as required. b. Drain fluid, flush and refill.

APPENDIX N

HYSTER

Technical Publication Correction

TITLE: C350B Parts Manual

NUMBER: 599352

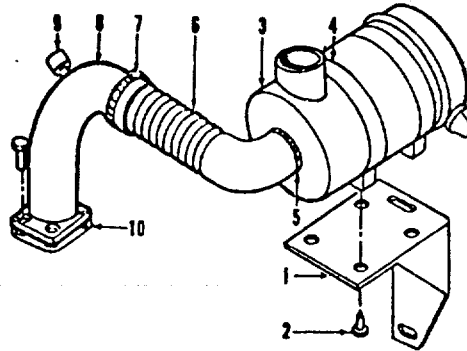
CONTRACT NUMBER: DSA 700-74-C-9024

Make the following corrections to the publication listed above:

1. Cross out page 1D05 (Air Filters) as it does not apply to this roller.
2. Include attached page 1E04 in your manual.

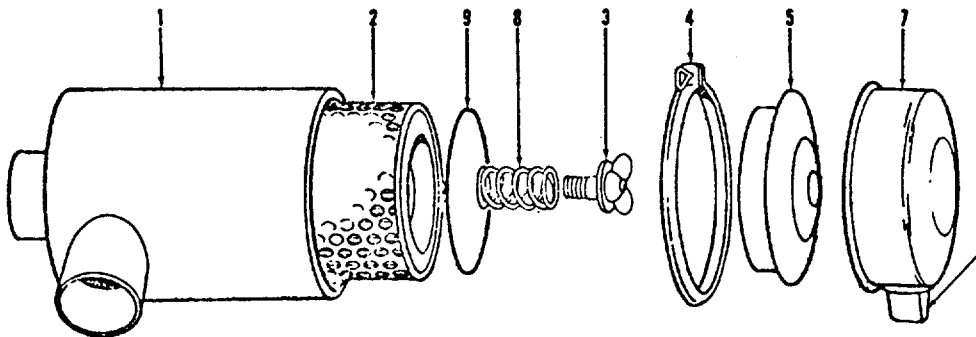
AIR FILTER

FOR 3-53 DIESEL ENGINE
FIRST USED ON SERIAL NO. B89C-3300 AND A146C-1546



REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.
		1	2	3	4				1	2	3	4	
1	391734	PLATE-AIR CLEANER				1	6	391051	HOSE				1
2	16598	CAPSCREW-3/8 UNC X 7/8				5	7	115696	CLAMP				1
2	17478	NUT-3/8 UNC				5	8	169096	TUBE				1
3	182645	FILTER-AIR, SEE 1D08				1	9	168846	INDICATOR-RESTRICTION				1
4	138718	BAND-MOUNTING				2	10	170306	GASKET				1
5	78286	CLAMP				1							

AIR FILTER



KEY

D-FOR 3-53 DIESEL ENGINE ONLY.

REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.		REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	
		1	2	3	4	A	B			1	2	3	4	A	B
	182645	FILTER-AIR				1	..	4	156958	CLAMP				..	1
	182645	FILTER-AIR				..	1	170002	ORIFICE					..	..
1	169299	BODY				..	1	5	156960	BAFFLE				..	1
	182645	FILTER-AIR				..	..	141276	VALVE REGULATOR					..	..
2	156954	ELEMENT				..	1	169096	TUBE					..	..
3	262281	BOLT				..	1	7	189248	CUP				..	1
3	141266	BOLT				..	1	169096	TUBE					..	..
4	262282	CLAMP				..	..	9	156961	O-RING				..	1

APPENDIX O

HESTER TECHNICAL PUBLICATION CORRECTION

TITLE: C350B Service Manual
NUMBER: 7109M
CONTRACT NUMBER: DSA 700-74-C-9024

Make the following corrections to the publication listed above:

1. Section 2, Table 2-11, page 2-16 entitled BRAYR. SYSTEM SPECIFICATIONS. Torque specification on BRAKR SEART NUT reads 100 ft-lbs (13.8 g-m) and should read 26 ft-lbs (3.6 kg-m) maximum. Please note change in manual.
2. Figure 4-14, page 4-12 and figure 6-4, page 6-4 have been revised to include the horn circuit. The revised figures are attached--please include in the manual.
3. Figure 7-40, page 7-32 shows two (2) arrows pointing to control pressure port. The top (upper most) arrow is incorrect. Cross out the upper most arrow.
4. Figure 7-41, page 7-32 is incorrect. Cross out the entire figure. Case pressure must be checked by tying into the case drain line on top of the hydrostatic pump.
5. Figure 7-44, page 7-35 is incorrect. Cross out entire figure. The revised figure is attached - please include in the manual.
6. Section 7, paragraph 7-172 a, page 7-33 reads a dimension of 13/32. Please correct copy to read 1-3/32
7. Section 7, paragraph c, page 7-35 reads a dimension of 11/16. Please correct copy to read 1-1/16
8. Section 8, figure 8-42, page 8-12 is incorrect. Cross out entire figure. The revised figure is attached - please include in the manual.

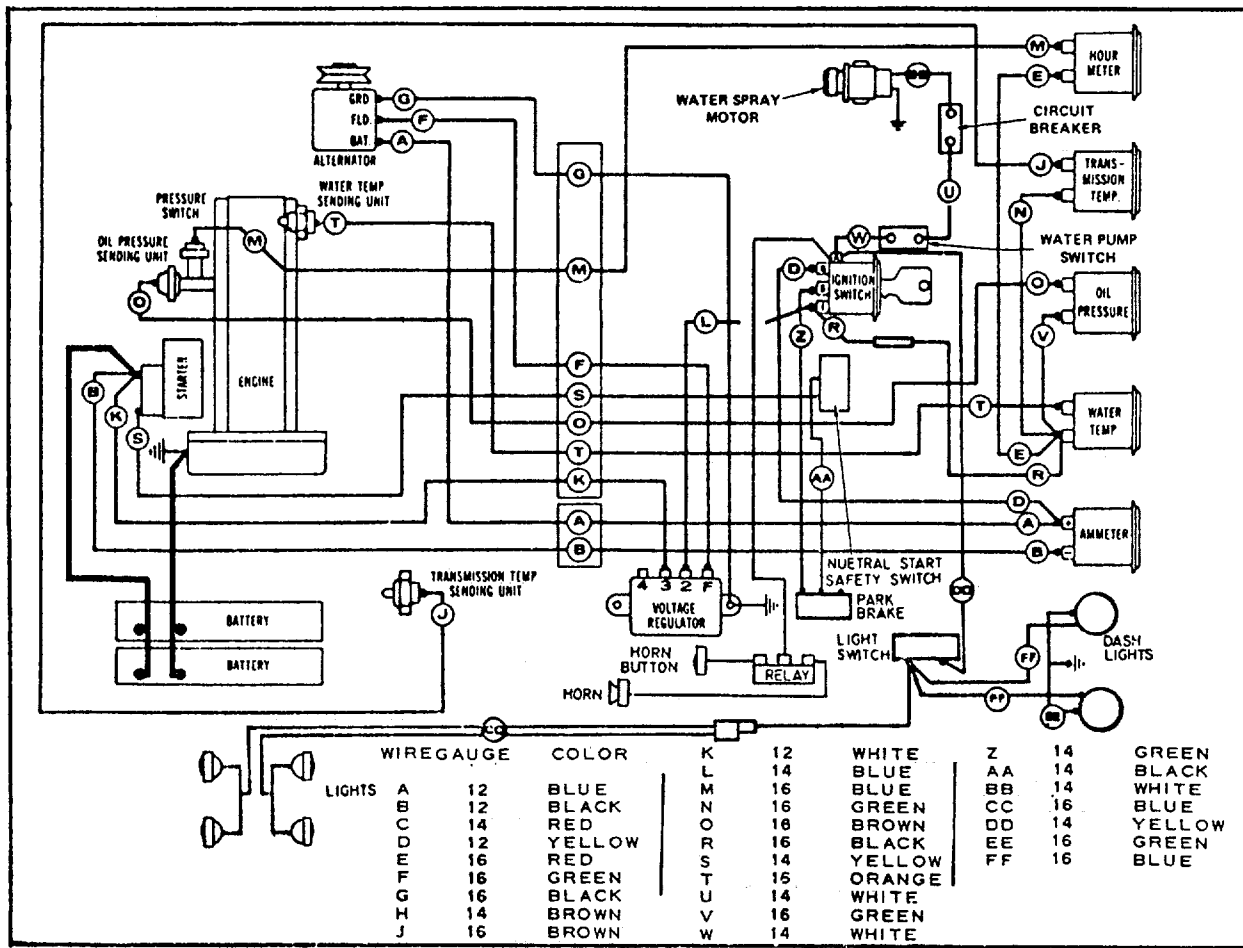


FIGURE 4-14. ELECTRICAL SYSTEM SCHEMATIC (WITH DIESEL ENGINE).

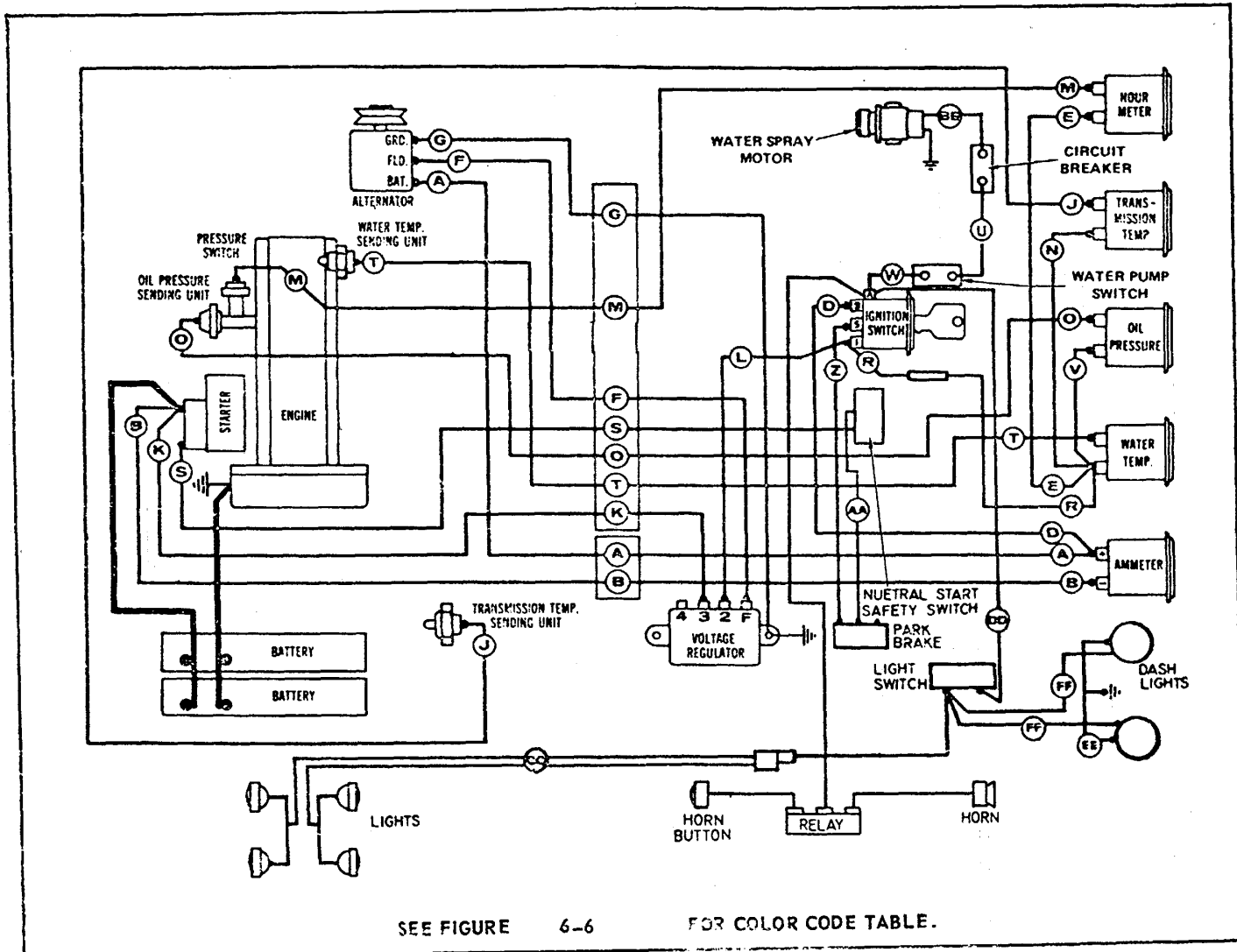


FIGURE 6-4. ELECTRICAL SCHEMATIC FOR DETROIT.

b. Adjust and tighten ball Joint of control cable at bail shaft end. Adjust neutral start safety (transmission lockout) switch so that it makes contact in neutral.

c. Move Direction-Throttle Control Bail In the forward direction until control cable at servo lever has traveled $11/16 - 31/32$ in. (24.64 - 26.92 mm). Adjust bail stops so that cable cannot be moved beyond this point.

d. Repeat step c in reverse direction.

CAUTION: Ensure that the amount of bail (control cable) travel is limited by ball stops and not the interval servo stops.

e. Return Direction-Throttle Control Ball to neutral (vertical) position.

f. Adjust and tighten wire stop at throttle crank for 1116 In. (1.59 mm) gap between swivel and wire stop (see figure 7-44).

g. Adjust ball Joint in slotted crank on bail shaft to allow full throttle when bail is moved to either full forward or full reverse.

h. Adjust friction control nuts and spring assembly so that Direction-Throttle Control Bail will remain in any desired position.

**7-173. THROTTLE CONTROL LINKAGE
ADJUSTMENT PROCEDURE (see figure 7-44).**

a. Adjust transmission control linkage per procedure outlined in paragraph 7-172 (Sundstrand).

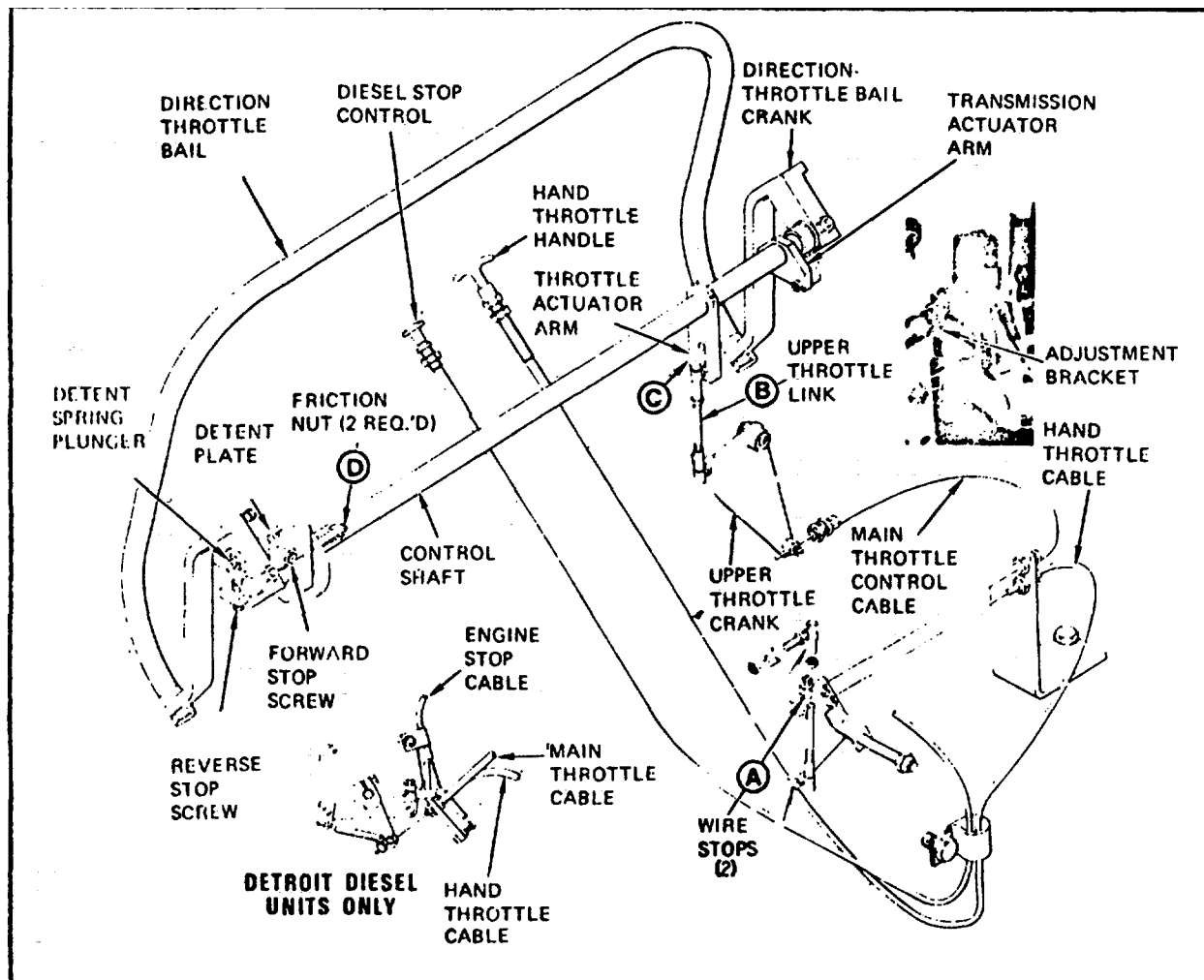


FIGURE 7-44.

7-35.

3 1/2"

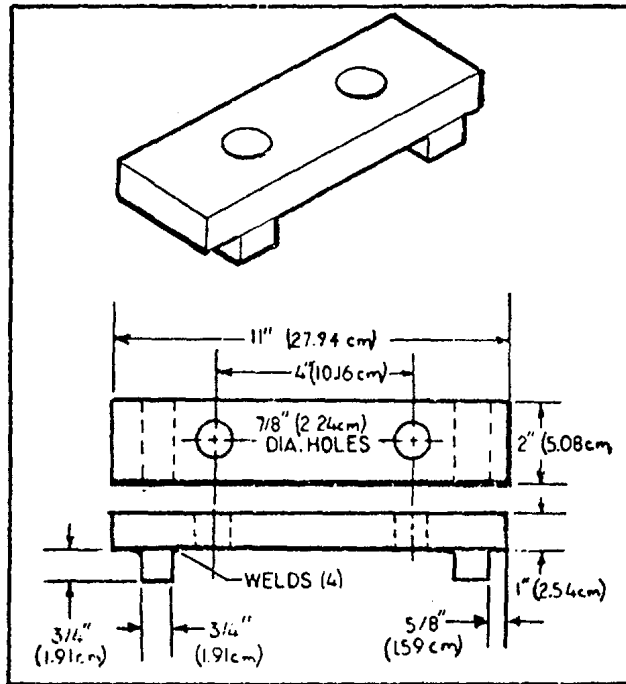
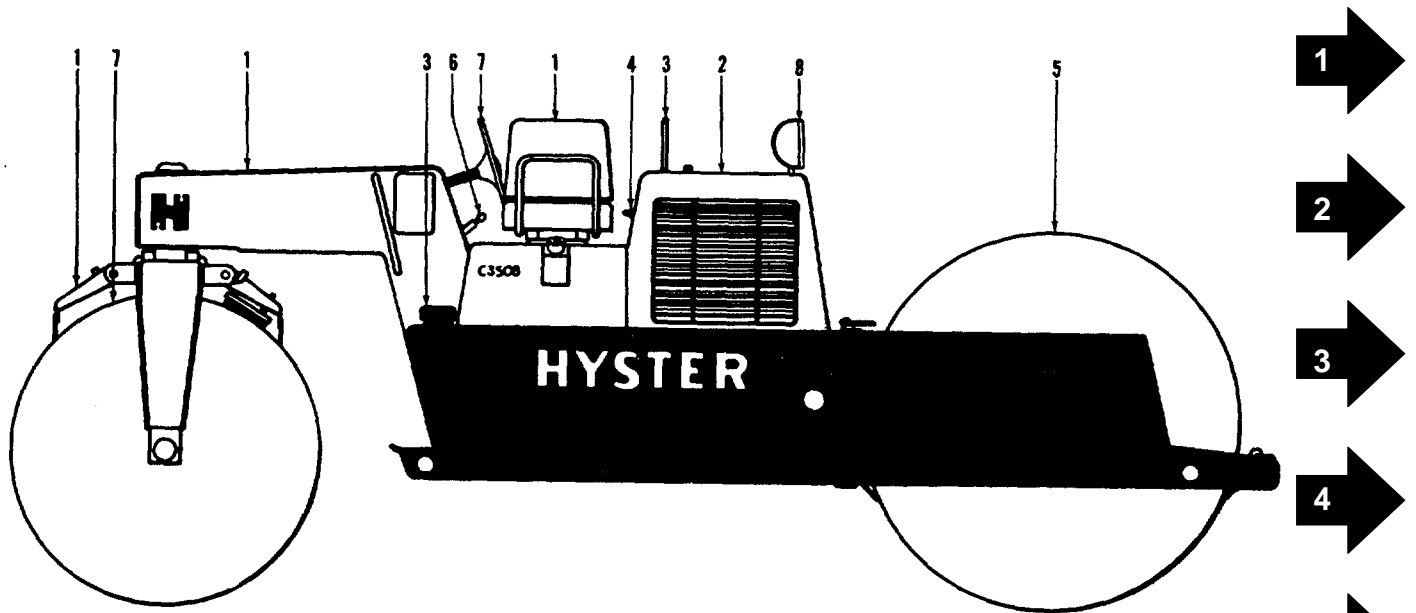
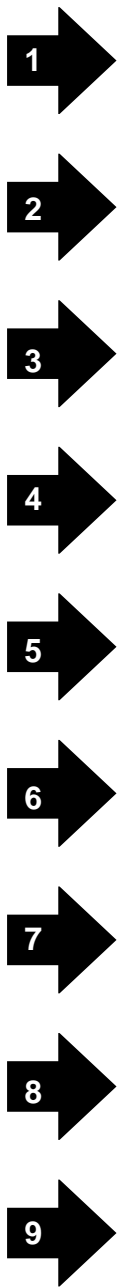


FIGURE 8-42.

ILLUSTRATED INDEX



1	FRAME AND BODY PARTS, WATER SPRAY SYSTEM	1A04
2	POWER UNIT	1B02
3	FUEL SYSTEM	1D02
4	ELECTRICAL SYSTEM.....	1F02
5	TRANSMISSION AND POWER TRAIN.....	2A04
6	BRAKES AND LINKAGE	2C02
7	STEERING AND LINKAGE	2D02
8	OPTIONAL EQUIPMENT	2E02
9	NUMERICAL INDEX	G02

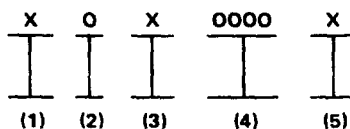


ALPHABETICAL INDEX

ALTERNATOR.....	1F09		
BRAKE AND LINKAGE.....	2C03		
CARBURETOR.....	1E04	FUEL SYSTEM-3-53 DIESEL.....	1E03
CONTROL LINKAGE.....	2A09	HORN.....	1F08
COOLING SYSTEM.....	1B09	HYDRAULIC MOTOR.....	2A11
		HYDRAULIC PUMP.....	2A13 & 2B03
		HYDRAULIC SYSTEM.....	2A06
		LIGHTING SYSTEM.....	2E03
		OIL FILTER.....	2802
DECALS AND PAINTING INSTRUCTIONS.....	1A08		
DISTRIBUTOR.....	1F04	SCRAPERS AND HATS.....	1A06
		SERVO CONTROL VALVE.....	2B01
ELECTRICAL SYSTEM-4-236 AND 3-53 DIESEL	1F05		
		STEERING CONTROL.....	2D04
		STEERING CYLINDER.....	2D07
ENGINE MOUNTS-3-53 DIESEL.....	1C07		
		STEERING PUMP-3-53 DIESEL.....	2D07
		STEERING SYSTEM.....	2D03
		STEERING TRUNNION AND DRUMS.....	2D05
EXHAUST SYSTEM-3-53 DIESEL.....	1C08		
FINAL DRIVE-C350B.....	2B05		
FRAME AND COWLING.....	1A05	THROTTLE LINKAGE.....	1D07
		WATER SPRAY SYSTEM.....	1A07

UNIT IDENTIFICATION

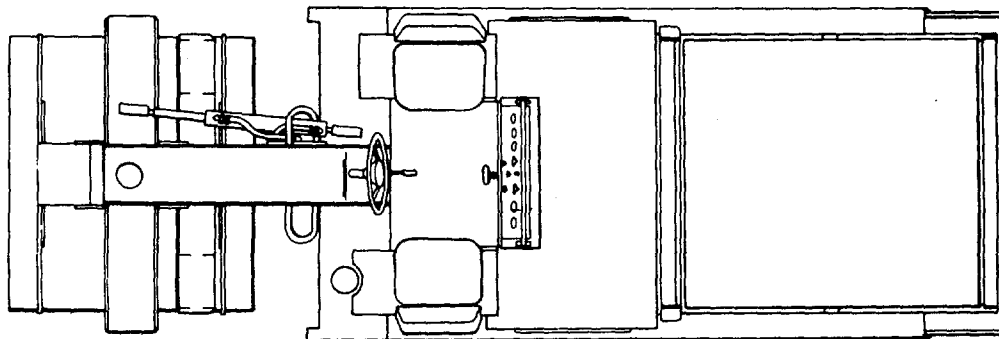
UNIT SERIAL NO.



- (1) & (2) The first letter and number denote the design series and model of the unit.
- (3) The second letter denotes the plant at which the unit was manufactured.
- (4) The number series denotes the serial number of the unit.
- (5) The final letter denotes the year of manufacture starting with "A" in 1957. The letters "I", "O", and "Q" will not be used.

**Parts Referred To In This Book As Right Or Left Hand Parts
Are In Accordance With The Illustration Below**

R. H. Side



L. H. Side

CAUTION!
**Never Attempt To Clean, Oil Or Adjust A Machine
While It Is In Motion**

HOW TO USE THE ILLUSTRATED PARTS MANUAL

This parts manual describes and illustrates assemblies subassemblies and detail parts needed for serious replacement.

It also includes all parts peculiar to units built in overseas plants. These parts are indicated by keys, symbols and footnotes.

3 → **ALPHABETICAL INDEX**

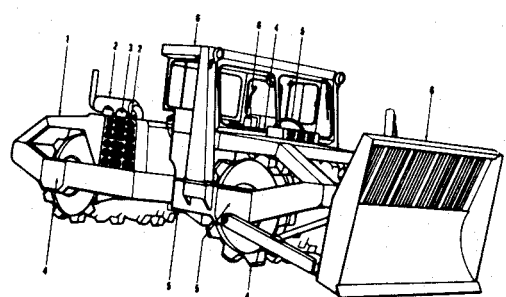
→ **4**

HYDRAULIC PUMP.....1P04
 HYDRAULIC SYSTEM-STEERING AND BLADE.....1A01
 ILLUSTRATED INDEX.....002
 NUMERICAL INDEX.....1C00
 OIL COOLER.....1C06
 PISTON.....1A07

5 → **NUMERICAL INDEX**

PART NO.	PAGE	REF. NO.	PART NO.	PAGE	REF. NO.	PART NO.	PAGE	REF. NO.	PART NO.	PAGE	REF. NO.
100020	1004	10	100020	1004	20	100020	1004	40	100020	1004	60
100021	1004	11	100021	1004	21	100021	1004	41	100021	1004	61
100022	1004	12	100022	1004	22	100022	1004	42	100022	1004	62
100023	1004	13	100023	1004	23	100023	1004	43	100023	1004	63
100024	1004	14	100024	1004	24	100024	1004	44	100024	1004	64
100025	1004	15	100025	1004	25	100025	1004	45	100025	1004	65
100026	1004	16	100026	1004	26	100026	1004	46	100026	1004	66
100027	1004	17	100027	1004	27	100027	1004	47	100027	1004	67
100028	1004	18	100028	1004	28	100028	1004	48	100028	1004	68
100029	1004	19	100029	1004	29	100029	1004	49	100029	1004	69
100030	1004	20	100030	1004	30	100030	1004	50	100030	1004	70

1 → **ILLUSTRATED INDEX**



2 →

3 →

4 →

5 →

6 →

7 →

REF.	ITEM	PAGE
1	COIL AND FLOOR PLATES.....	1A04
2	ENGINE DIVISION.....	1B02
3	EXHAUST SYSTEM.....	1C02
4	HYDRAULIC SYSTEM.....	1D02
5	FINAL DRIVE SYSTEM.....	1E02
6	DRUM AND SCRAPERS.....	1F02
7	ELECTRICAL SYSTEM.....	1G02
8	STEERING SYSTEM.....	1H02
9	HITCH.....	1I02
10	BRAKE SYSTEM.....	1J02
11	BLADE.....	1K02
12	BLADE CONTROLS.....	1L02
13	CAB AND OPTIONAL EQUIPMENT.....	1M02
14	NUMERICAL INDEX.....	1N02

6 →

7 →

8 →

REV. 0-FOR C440A
 1-FOR C441A
 2-FOR C441B

REV. NO.	HYSTER NO.	PART NO.	NAME OF PART	QTY.	REF. NO.
1	230433	1	NAMEPLATE	1	0
2	230434	2	NAMEPLATE	1	9
3	230435	3	DECAL-OPERATING INSTRUCTIONS	1	10
4	230436	4	DECAL-SPEED RANGE	1	20
5	230437	5	DECAL-WARNING DRIVE DISCO	1	21
6	230438	6	DECAL-WARNING	1	22
7	230439	7	DECAL-DRIVING	1	23
8	230440	8	DECAL-DRIVING	1	24

When The Part Number And Next Higher Assembly Is Not Known:

1. **USE:** Determine the function and application of the part required. Turn to the illustrated index page immediately behind the front cover, and select the most appropriate area.
2. Line up the black arrow containing the appropriate reference number, with the black tab on the division index page with the same reference number. Use the division index to determine the assembly which would normally contain the part required. Proceed then to locate the part on the assembly breakdown page.

When The Part Number Is Not Known And Next Higher Assembly Is Known:

3. Determine the assembly the required part is used on. Turn to the alphabetical index immediately following the illustrated index.
4. Locate the assembly the required part is used on and turn to the page indicated for that assembly. Proceed then to locate the part on the assembly breakdown page.

When The Part Number Is Known:

5. Use the numerical Index to find the part number. Turn to the page listed and locate the part as indicated by the reference number.

GENERAL: The assembly breakdowns include part numbers, description, quantities required, keys and footnotes to help in selecting the correct parts.

6. Keys are used to show effective serial numbers, two or more similar assemblies, RH and LH assembly parts, etc. Select the appropriate key, "A", "B", "C" or "D" and the corresponding quantity column to find the required part.
7. Indent numbers are used to indicate assemblies and sub-parts of assemblies. Number 1 is the major assembly. Part descriptions which are indented under 2, 3, or 4 are sub-parts of that major assembly shown above.
8. Quantities shown are for one assembly. Note that three assemblies are shown, but the quantities of the sub-parts are indicated as one and two. This means one and two per assembly.

ORDERING PARTS: When ordering replacement parts, give the unit serial number, part number, name of part and quantity required.

For any further information on parts, service, or ordering, consult your local Hyster dealer.

FIRE PRECAUTION

To avoid fires, operators should be instructed to refuel compactors in well lighted areas outside of buildings. Repairs and adjustments should be made on only those compactors which have been taken to a garage or maintenance shop.

STORAGE OF COMPACTOR

Lubricate the compactor according to lubrication recommendations if it is to be left standing for any length of time. This will protect against rusting.

The engine should be run once a week until it is thoroughly warm. This will circulate the oil and prevent rusting from condensation, in addition to keeping the battery charged.

If freezing weather is expected before the engine will be started again, see that the cooling system is adequately protected against freezing. Drain all water ballast from drums, or use calcium chloride solution.

If the engine is to be stored or left standing longer than a normal day, fill the fuel tank with clean fuel to keep out moisture laden air. This will prevent condensation and rust from forming inside the tank.

OPERATION AND MAINTENANCE TIPS

The following tips will help increase compactor life and contribute to the reduction of expensive downtime.

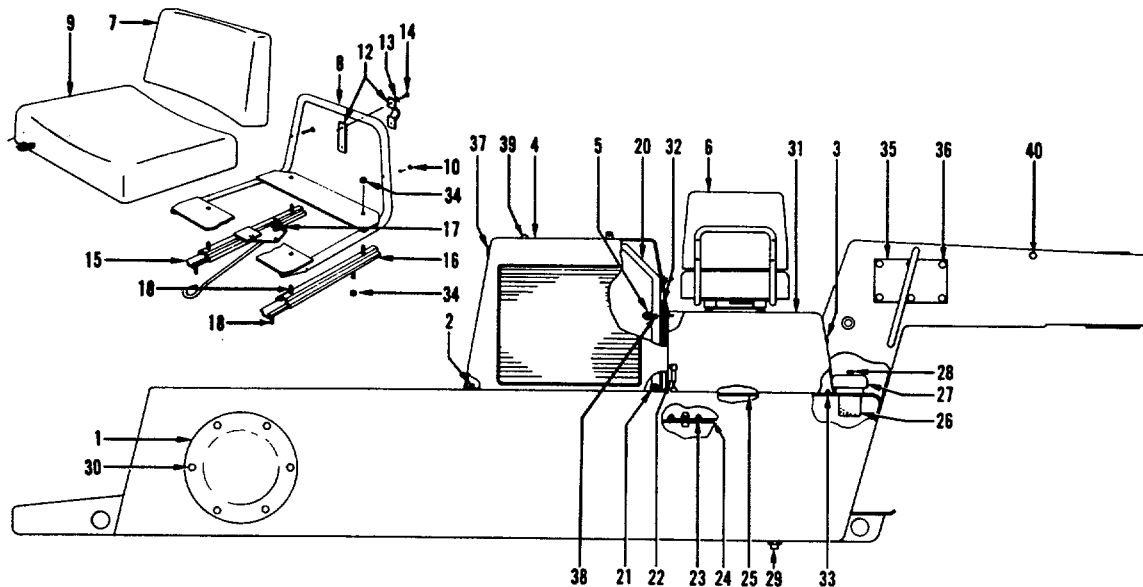
1. Check lubricating and hydraulic oils and engine coolant at the beginning of each work shift. Use only recommended oils.
 2. Don't work compactor until engine and hydraulic oils are warm.
 3. Don't let engine idle for extended periods.
 4. Don't operate compactor with faulty engine governor or with excessive hydraulic pressure. Have qualified personnel make these checks.
 5. Make sure the air cleaner and oil filters are serviced correctly. All connections must be tight with no leaks in the system.
 6. Do not add coolant to an overheated engine.
 7. After working compactor let engine idle a few minutes before stopping.
 8. Fill fuel tank at the end of the shift, when compactor is warm.
 9. Repair minor defects immediately.
 10. Adhere to lubrication and maintenance recommendations.
-



FRAME AND BODY PARTS, WATER SPRAY SYSTEM

DECALS AND PAINTING INSTRUCTIONS.....	1A08
FRAME AND COWLING	1A05
SCRAPERS AND MATS.....	1A06
WATER SPRAY SYSTEM.....	1A07

FRAME AND COWLING



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	390723	PLATE COVER	2	27	87393	CAP-FILLER, WATER	1
1	393083	PLATE-COVER, RH	1	28	21420	PLUG-BREATHER	1
1	390723	PLATE-COVER, LH	1	29	15310	PLUG	1
2	15056	NUT-3/8 UNC	4	30	16597	CAPSCREW-3/8 UNC X 3/4 G5	12
2	15134	WASHER-3/8	4	30	15156	LOCKWASHER-3/8	12
2	15156	LOCKWASHER-3/8	4	31	158439	HOOD	1
3	158452	BUMPER-GROMMET TYPE	2	32	189303	GUARD-VANDALISM, GAS AND	
4	189288	COWL-GAS	1	32	236	DIESEL	1
4	189287	COWL-3-53 DIESEL	1	32	189648	GUARD-VANDALISM, 3-53 DIESEL	1
4	391373	COWL-3-53 DIESEL	1	32	15055	NUT-5/16 UNC	4
4	189286	COWL-4-336 DIESEL	1	32	18515	WASHER-5/16	4
5	164524	EYEBOLT-5/16 UNC	1	32	15155	LOCKWASHER-5/16	4
5	95675	SPRING	1	32	16597	CAPSCREW-3/8 UNC X 3/4 G5	2
5	18515	WASHER-5/16	2	32	15156	LOCKWASHER-3/8	2
5	145639	LOCKNUT-5/16 UNC	1	33	15055	NUT-5/16 UNC	4
6	109983	A SEAT	2	33	18515	WASHER-5/16	4
7	233157	CUSHION-BACK	1	33	15155	LOCKWASHER	4
7	136112	COVER	1	34	15005	NUT-5/16 UNC	8
8	233155	FRAME	1	34	16775	LOCKWASHER-5/16	8
9	233156	CUSHION-SEAT	1	34	15175	WASHER-5/16	8
9	136111	COVER	1	35	158449	PLATE-COVER	1
10	148260	SCREW	4	36	15056	NUT-3/8 UNC	6
12	164065	KIT-BRACKET	2	36	15156	LOCKWASHER-3/8	6
13	.....	WASHER-1/4	4	37	181859	BUMPER	2
14	16709	SCREW-1/4 UNC X 3/4	4	37	15002	NUT-#10 UNF	2
15	204120	ADJUSTER-WITH LATCH	2	37	15152	LOCKWASHER-3/16	2
16	204121	ADJUSTER-WITHOUT LATCH	2	38	16634	CAPSCREW-3/8 UNF X 1 G5	1
17	233163	SPRING-LATCH	1	38	15006	NUT-3/8 UNF	1
18	203920	STUD	8	38	15156	LOCKWASHER-3/8	1
20	391081	PANEL-INSTRUMENT	1	38	16818	CAPSCREW-5/16 UNF X 3/4 G5	1
20	391340	PANEL-INSTRUMENT	1	38	15155	LOCKWASHER-5/16	1
20	391612	PANEL-INSTRUMENT	1	38	18515	WASHER-5/16	1
20	261162	TAPE-SPONGE RUBBER, BULK	1	38	15005	NUT-5/16 UNF	1
20	261158	TAPE-SPONGE RUBBER, BULK	1	39	166296	PLUG	2
21	15058	NUT-1/2 UNC	2	40	170686	PLUG	2
21	15158	LOCKWASHER-1/2	2				
22	* 177989	LATCH	2				
22	* 15687	CAPSCREW-1/4 UNC X 1 1/2	2				
22	* 177991	BRACKET-ANCHOR	2				
22	* 221341	LOCKNUT-1/4 UNC	2				
23	156133	LOCKNUT-3/8 UNC	12				
24	184814	COVER-WATER TANK	1				
24	158445	GASKET	1				
25	158447	PLATE-FLOOR	1				
26	184819	STRAINER	1				
26	184818	SNAP RING	1				

*INCLUDED IN LATCH KIT 180313.

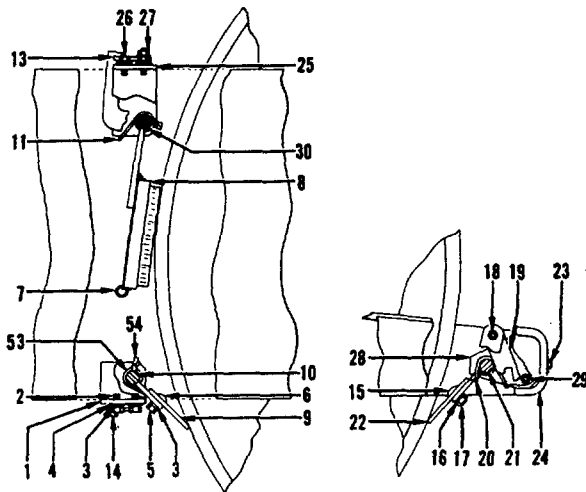
‡LAST USED ON SERIAL NO. A146C-1535
AND B89C-3239.

‡FIRST USED ON SERIAL NO. A146C-1536
AND B89C-3240. A146C-1539 USES PANEL 391081.

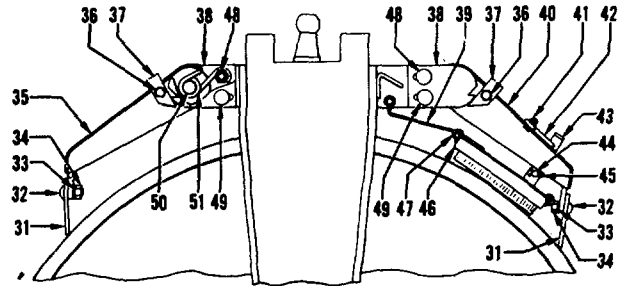
‡FIRST USED ON SERIAL NO. A146C-1546
AND B89C-3300.

‡FIRST USED ON SERIAL NO. A146C-1700
AND B89C-3401.

SCRAPERS AND MATS



FOR DRIVE DRUM



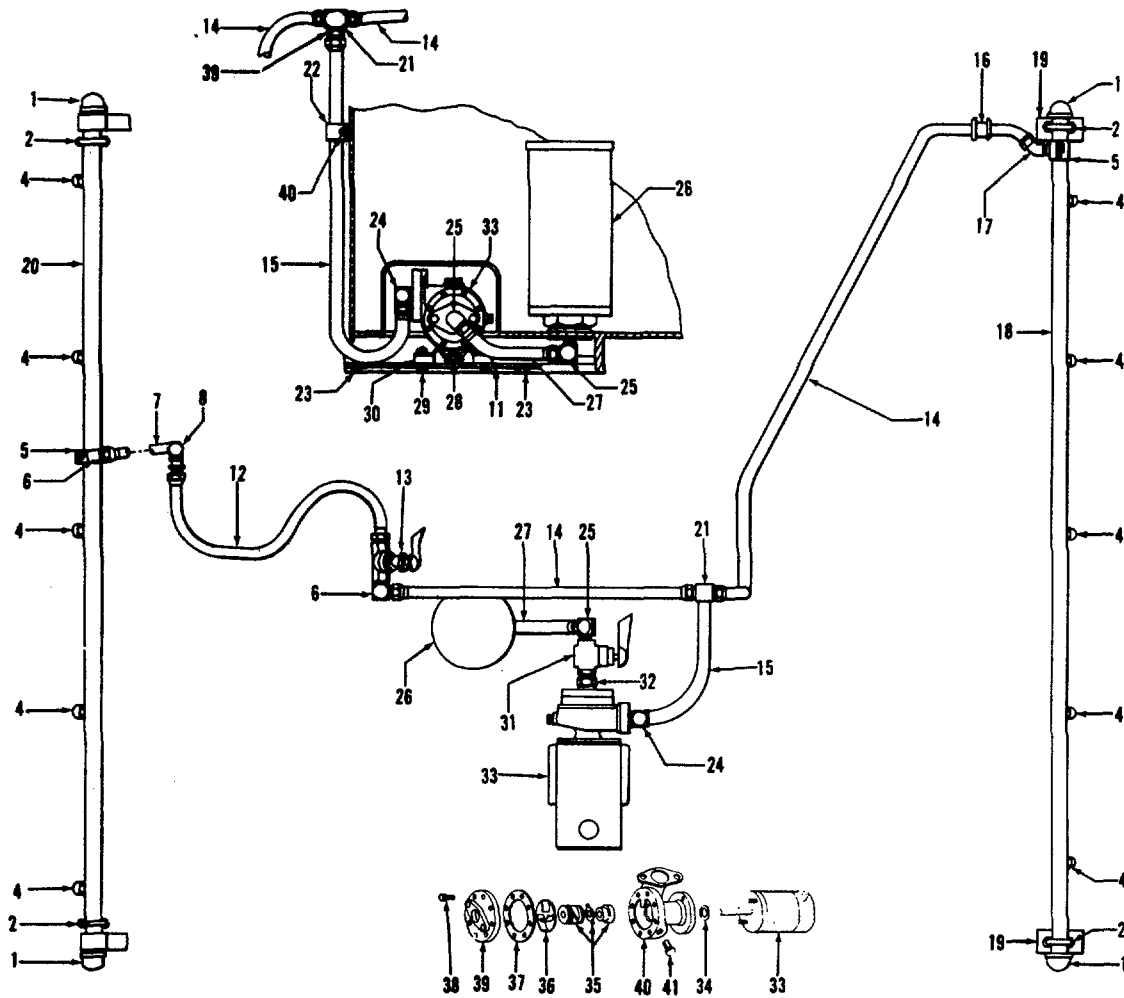
FOR STEERING DRUM

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	169694	BRACKET-LH	1
1	157325	BRACKET-RH	1
2	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	4
3	15158	LOCKWASHER-1/2	6
4	15135	WASHER-1/2	8
5	15058	NUT-1/2 UNC	2
6	18588	BOLT-1/3 UNC X 1-1/4	2
7	89469	COTTER	16
8	157321	MAT	1
8	390603	MAT	1
9	157315	PLATE-SCRAPER	1
9	390602	PLATE-SCRAPER	1
10	169695	SHAFT	1
11	169698	SPRING-RH	1
13	157314	HOOK	2
14	16691	CAPSCREW-5/16 UNF X 7/8 G5	1
14	18515	WASHER-5/16	2
14	15025	NUT-5/16 UNF	1
15	18588	BOLT-1/2 UNC X 1-1/4	2
16	15158	LOCKWASHER-1/2	2
17	15058	NUT-1/2 UNC	2
18	16634	CAPSCREW-3/8 UNF X 1 G5	1
18	15006	NUT-3/8 UNF	1
19	157343	PLATE-LOCKING	1
20	169697	SPRING-RH	1
20	169698	SPRING-LH	1
21	169699	SHAFT	1
22	157315	PLATE-SCRAPER	1
22	390602	PLATE-SCRAPER	1
23	16085	CAPSCREW-1/2 UNC X 1 3/4 G5	4
23	15158	LOCKWASHER-1/2	4
23	15058	NUT-1/2 UNC	4
24	157335	BUMPER	1
25	184335	BRACKET-LH	1
25	184337	BRACKET-RH	1
26	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	4
26	15135	WASHER-1/2	4
26	15158	LOCKWASHER-1/2	4
27	16825	CAPSCREW-5/16 UNF X 1 G5	1
27	18515	WASHER-5/16	2
27	15005	NUT-5/16 UNF	1
28	157342	PLATE	1
29	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	2
29	15158	LOCKWASHER-1/2	2

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
29	15058	NUT-1/2 UNC	2
30	170551	BRACKET-MAT	1
30	390693	BRACKET-MAT	1
31	157315	PLATE-SCRAPER	2
31	390602	PLATE-SCRAPER	2
32	18588	BOLT-1/2 UNC X 1-1/4	4
33	15158	LOCKWASHER-1/2	4
34	15058	NUT-1/2 UNC	4
35	157305	BRACKET-SCRAPER	1
36	18202	CAPSCREW-SPECIAL	2
36	15026	NUT-3/8 UNF	2
37	157322	PAWL-RATCHET	2
38	157302	BRACKET-LH	2
38	390601	BRACKET-LH	2
38	157303	BRACKET-RH	2
38	390604	BRACKET-RH	2
39	184331	BRACKET-MAT	1
40	157309	BRACKET-SCRAPER	1
41	18497	CAPSCREW-5/16 UNC X 3/4	1
41	18515	WASHER-5/16	1
41	15114	NUT-5/16 UNC	1
42	157314	HOOK	1
43	157318	PLATE	1
44	142	PIN-ROD END	1
45	15212	COTTER-3/32 X 3/4	1
46	157321	MAT	1
46	390603	MAT	1
47	89469	COTTER	16
48	18590	CAPSCREW-1/2 UNC X 2 1/2 G5	2
48	15158	LOCKWASHER-1/2	2
48	15058	NUT-1/2 UNC	2
48	67326	SPACER	2
49	18588	BOLT-1/2 UNC X 1-1/2	6
49	15158	LOCKWASHER-1/2	6
49	15058	NUT-1/2 UNC	6
50	157313	SHAFT	2
50	58933	SNAP RING	2
51	157312	SPRING	2
53	169698	SPRING-RH	1
53	169697	SPRING-LH	1
54	19936	ROLL PIN-5/16 X 3 3/4	1

~~USED ON C340A ONLY~~

WATER SPRAY SYSTEM

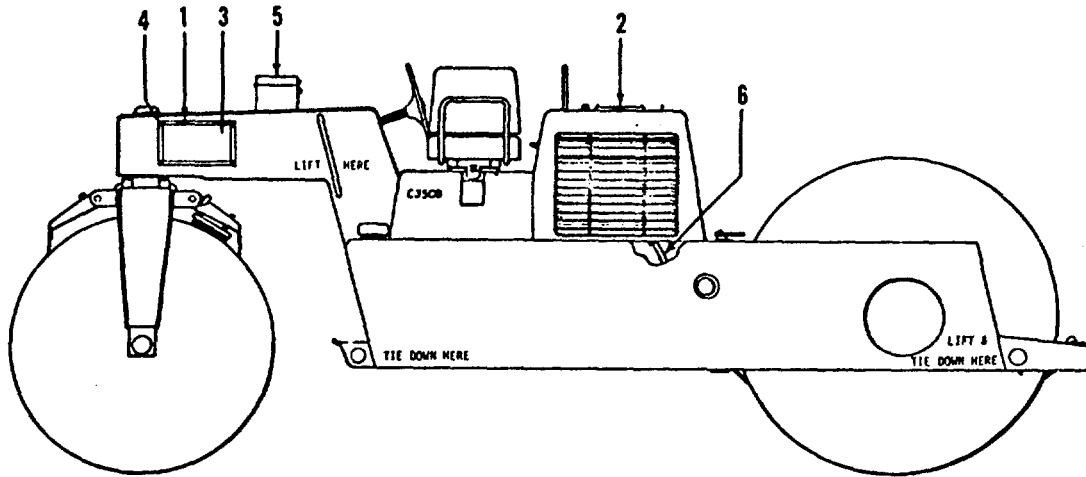


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	15373	CAP-PIPE	2
2	184313	U-BOLT	4
2	15154	LOCKWASHER-1/4	8
4	199400	NOZZLE-SPRAY	10
5	184317	CONNECTOR	2
6	69240	ELBOW	1
6	14546	ELBOW	1
7	116486	HOSE	1
8	16457	ELBOW	1
11	184321	PLATE	1
12	169708	HOSE	1
13	169693	VALVE	1
14	153685	HOSE	2
15	184320	TUBE	1
16	115983	GROMMET	1
17	14546	ELBOW	1
18	390016	PIPE-MANIFOLD	1
19	184327	PLATE	2
20	199398	PIPE-MANIFOLD	1
21	14652	TEE	1
22	136516	CLAMP-HOSE	1
23	18535	CAPSCREW-3/8 UNC X 5/8 G5	4
23	15156	LOCKWASHER-3/8	4
24	17306	ELBOW	1
25	17309	ELBOW	2
26	199401	FILTER-SUMP	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
27	192335	HOSE	1
28	15329	PLUG-DRAIN	1
29	18466	CAPSCREW-1/4 UNC X 1 1/4 G5	4
29	15054	NUT-1/4 UNC	4
29	15154	LOCKWASHER-1/4	4
30	184322	BLOCK-SUPPORT	2
31	184324	VALVE	1
32	16116	BUSHING	1
33	184325	PUMP AND MOTOR	1
33	196281	MOTOR	1
33	197861	CAP-BRUSH	2
33	197862	BRUSH AND SPRING	2
34	196431	SLINGER	1
35	196284	SEAL	1
36	196283	IMPELLER	1
37	196286	GASKET	1
38	196285	SCREW AND WASHER	8
39	249292	COVER	1
40	249291	BODY-PUMP	1
41	15329	PLUG-DRAIN	1
42	14678	CONNECTOR	1
43	15056	NUT-3/8 UNC	1
43	15156	LOCKWASHER-3/8	1

*USED ON 03508
*USED ON 04104

DECALS AND PAINTING INSTRUCTIONS



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	393321	PLATE-COVER	1
2	393320	PLATE-COVER	1
3	393317	DECAL-NOISE	1
4	393316	DECAL	1
4	222031	RIVET	8
5	393562	TOOL BOX	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
5	15155	WASHER-5/16	4
5	10515	WASHER-5/16	4
5	16836	CAPSCREW-5/16 UNC X 3/4	4
6	168718	CLAMP	1
6	193772	HOSE-CRANKCASE VENT	1
	393563	PAINT-MILITARY GREEN	AR

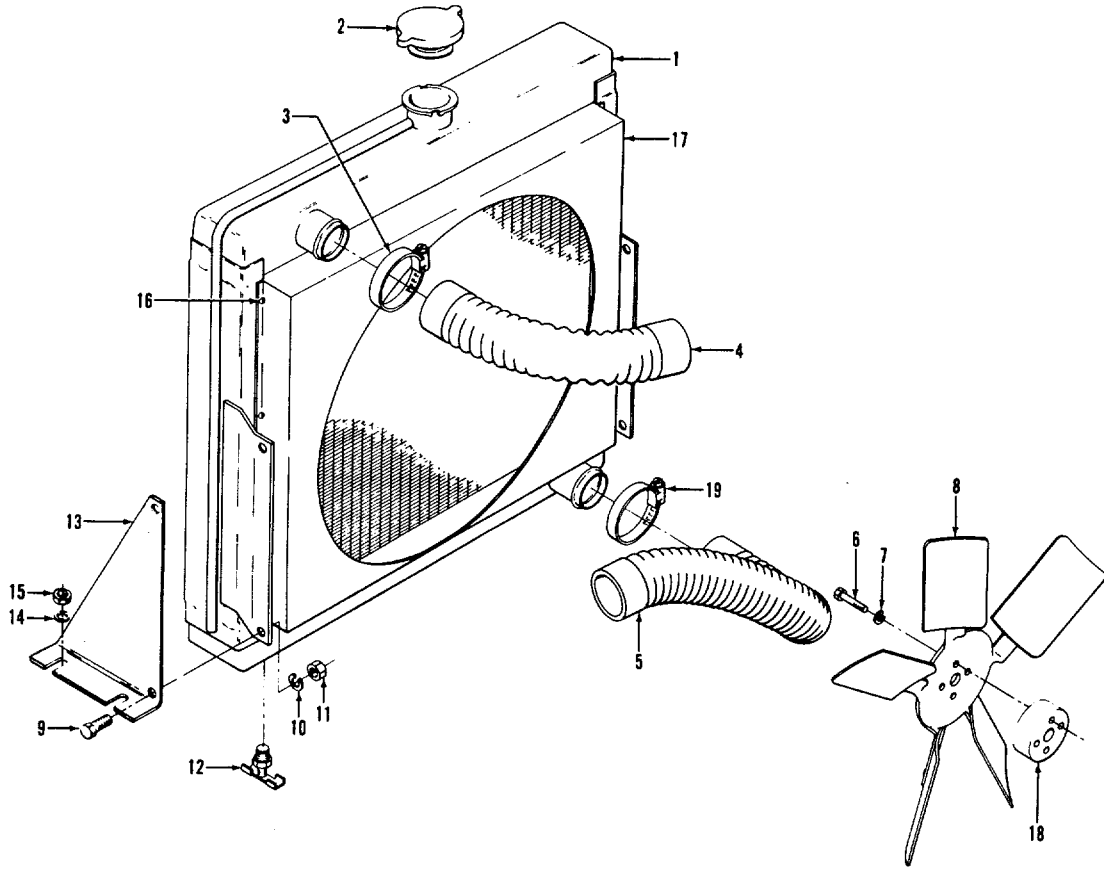
DETROIT DIESEL ENGINE-SERIES 3-53

NOTE-FOR SERVICE OF THIS ENGINE, SEE YOUR DETROITDIESEL
MANUAL AND CONTACT YOUR LOCAL DETROIT DEALER.

POWER UNIT

CAMSHAFT GAS	1803
CAMSHAFT 4 236 DSL	1603
COOLING SYSTEM	1809
CRANKSHAFT GAS	1803
CRANKSHAFT 4 236 DSL	1602
CYLINDER BLOCK GAS	1803
CYLINDER BLOCK 4 236 DSL	1812
CYLINDER HEAD GAS	1805
CYLINDER HEAD 4 236 DSL	1813
CYLINDER HEAD COVER GAS	1805
CYLINDER HEAD COVER 4 236 DSL	1601
ENGINE MOUNTS GAS	1807
ENGINE MOUNTS 4 236 DSL	1811
ENGINE MOUNTS-3-53 DSL	1C07
EXHAUST SYSTEM GAS	1808
EXHAUST SYSTEM 4 236 DSL	1604
EXHAUST SYSTEM-3-53 DSL	1C08
MANIFOLDS GAS	1805
MANIFOLDS 4 236 DSL	1813 1814
OIL FILTER GAS	1805
OIL FILTER 4 236 DSL	1605
OIL PUMP GAS	1808
OIL PUMP 4 236 DSL	1604
TIMING GEAR GAS	1803
TIMING GEAR 4 236 DSL	1603
WATER PUMP GAS	1809
WATER PUMP 4 236 DSL	1810

COOLING SYSTEM



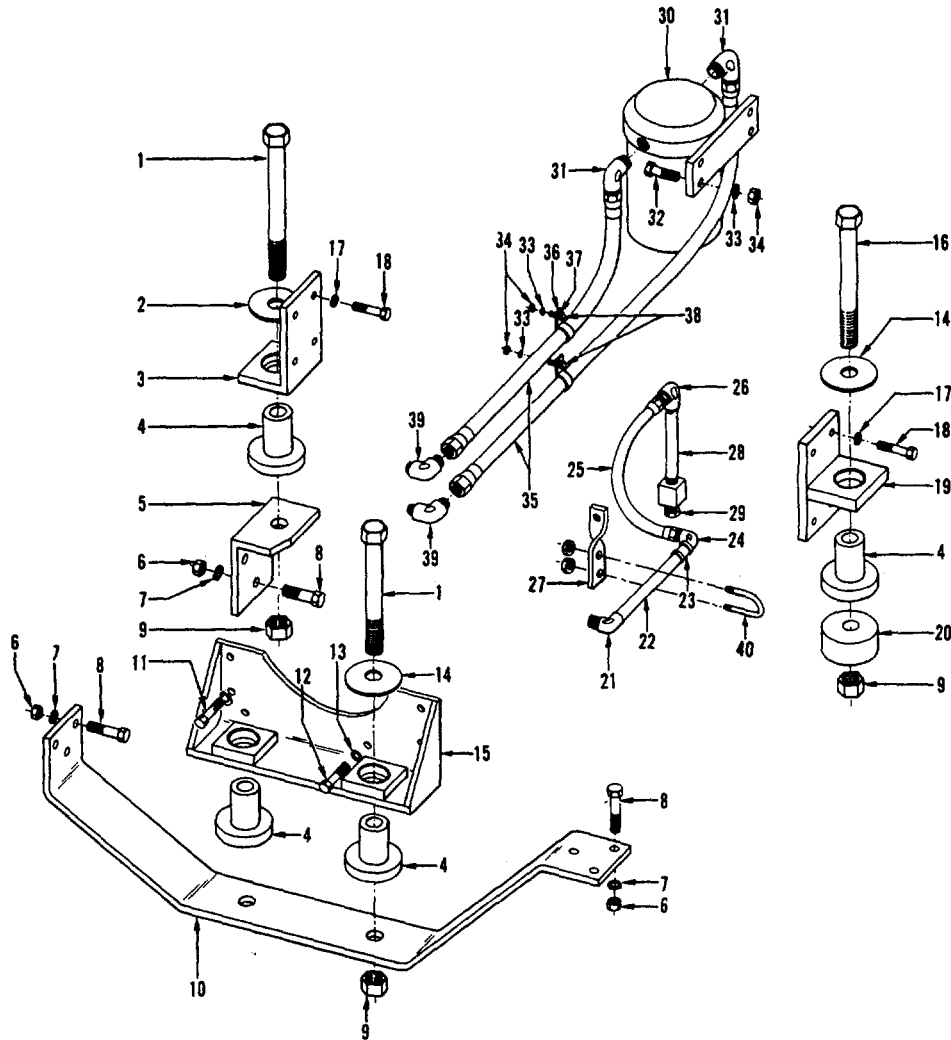
KEY
~~A-FOR GAS ENGINE.~~
~~B-FOR 1-236 DIESEL ENGINE.~~
 C-FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.		
		1	2	3	4	A	B	C
1	100445	RADIATOR						
1	165282	RADIATOR						
1	169105	RADIATOR						
2	106483	CAP-RADIATOR						
3	119236	CLAMP						
4	390325	HOSE COOLANT						
4	390325	HOSE COOLANT						
4	100434	HOSE-RADIATOR						
5	155467	HOSE RADIATOR						
5	110667	HOSE RADIATOR						
5	169107	HOSE-RADIATOR						
5	164134	TUBE						
5	146644	HOSE RADIATOR						
6	18511	CAPSCREW 5/16 UNC X 3 CS						
6	16663	CAPSCR. 5/16 UNC X 5/8 CS						
8	18499	CAPSCREW						
7	15155	LOCKWASHER 5/16						
8	147360	FAN						
8	106155	FAN						
9	16805	CAPSCREW-3/8 UNC X 1						
9	17262	CAPSCREW-7/16 UNC X 5/8						
10	15156	LOCKWASHER-3/8						

REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.		
		1	2	3	4	A	B	C
11	15057	NUT-7/16 UNC						
12	12815	COCK-DRAIN						
13	157364	BRACKET-RADIATOR						
13	190519	BRACKET-RADIATOR						
14	15134	WASHER-3/8						
15	145641	NUT-3/8 UNC						
16	134102	SCREW						
16	16719	SCREW-#8 UNC X 3/8						
16	15163	LOCKWASHER-#8						
17	161145	SHROUD						
17	190520	SHROUD						
17	101104	SHROUD						
17	391369	SHROUD						
18	169827	SPACER						
18	161527	SPACER						
19	112989	CLAMP-HOSE						
19	119236	CLAMP-HOSE						

~~*FIRST USED ON SERIAL NO. A140C 1546 AND 809C 3500.~~
~~*FIRST USED ON SERIAL NO. 809C 3202.~~

ENGINE MOUNTS, CRANKCASE DRAIN, AND FILTER HOSES
FOR 3-53 DIESEL ENGINE

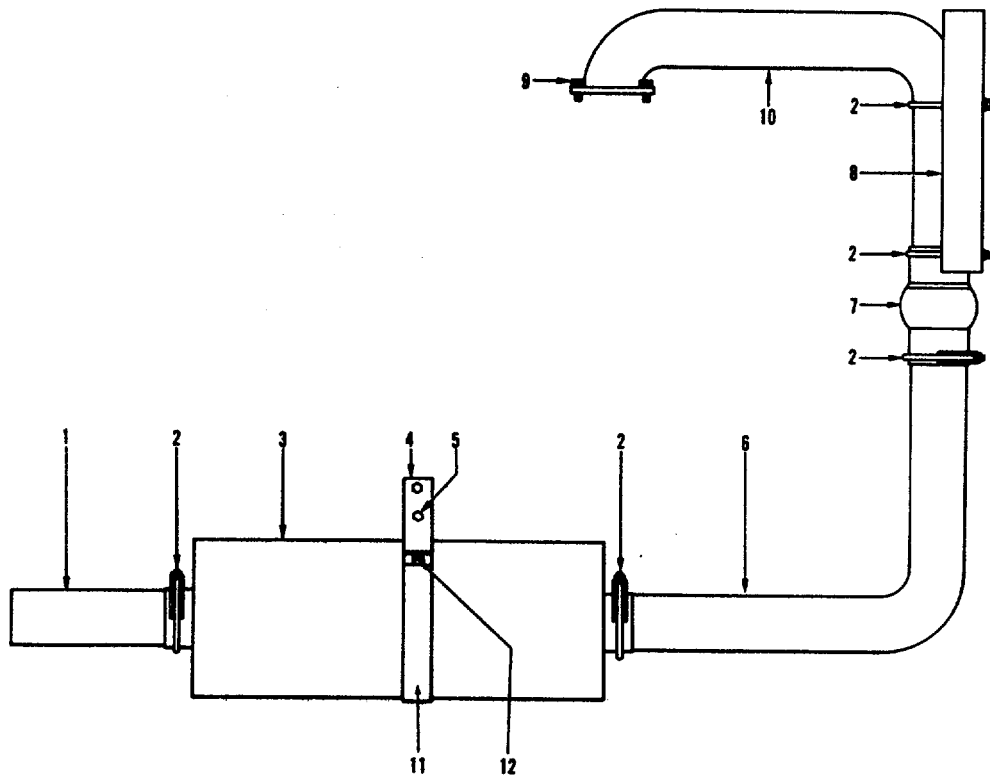


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	12948	CAPSCREW-5/8 UNF X 3 G5	3
2	21162	WASHER-5/8	1
3	168836	BRACKET	1
4	164280	MOUNT-ENGINE	4
5	168835	ANGLE	1
6	15012	NUT-3/4 UNF	9
7	15162	LOCKWASHER-3/4	9
8	16800	CAPSCREW-3/4 UNF X 2 G5	9
9	17405	LOCKNUT-5/8 UNF	4
10	168830	BRACKET	1
11	18543	CAPSCREW-3/8 UNF X 3 3/4 G5	4
11	15156	LOCKWASHER-3/8	4
12	18557	CAPSCREW-7/16 UNC X 1 1/4 G5	2
13	15157	LOCKWASHER-7/16	2
14	164281	WASHER-5/8	3
15	205127	BRACKET	1
16	12481	CAPSCREW-5/8 UNF X 4 1/2 G5	1
17	15158	LOCKWASHER-1/2	8
18	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	8
19	168838	BRACKET	1
20	168841	SPACER	1
21	17311	ELBOW	1
22	19689	NIPPLE	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
23	15461	COUPLING	1
24	17300	ELBOW	1
25	99443	HOSE-HYDRAULIC	1
26	14526	ELBOW	1
27	191782	BRACKET	1
28	198881	PIPE	1
29	14386	PLUG-3/8	1
30	.....	OIL FILTER-COMES WITH ENGINE	1
31	17301	ELBOW	2
31	16275	PLUG	2
32	16828	CAPSCREW-3/8 UNC X 1 1/4 G5	4
33	15156	LOCKWASHER-3/8	6
34	15056	NUT-3/8 UNC	6
35	76787	HOSE-HYDRAULIC	2
36	113687	CLAMP	2
37	15176	WASHER-3/8	2
38	16805	CAPSCREW-3/8 UNC X 1 G5	2
39	17307	ELBOW	2
40	184313	U-BOLT	1

~~LAST USED ON SERIAL NUMBER 880C-3033~~
~~FIRST USED ON SERIAL NUMBER 880C-3033~~

EXHAUST SYSTEM
FOR 3-53 DIESEL ENGINE



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	169116	TAILPIPE	1
2	30375	CLAMP	6
3	153025	MUFFLER	1
4	192208	STRIP	1
5	16828	CAPSCREW-3/8 UNC X 1 1/4 G5	2
5	15156	LOCKWASHER-3/8	2
5	15056	NUT-3/8 UNC	2
6	169112	PIPE	1
7	169115	SWIVEL-EXHAUST	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
8	169114	SHIELD-HEAT	1
9	16805	CAPSCREW-3/8 UNC X 1 G5	4
9	15156	LOCKWASHER-3/8	4
9	15176	WASHER-3/8	4
10	169109	PIPE-EXHAUST	1
11	192205	STRIP-FORMED	2
12	15529	CAPSCREW-3/8 UNC X 1	2
12	15156	LOCKWASHER-3/8	2
12	15056	NUT-3/8 UNC	2

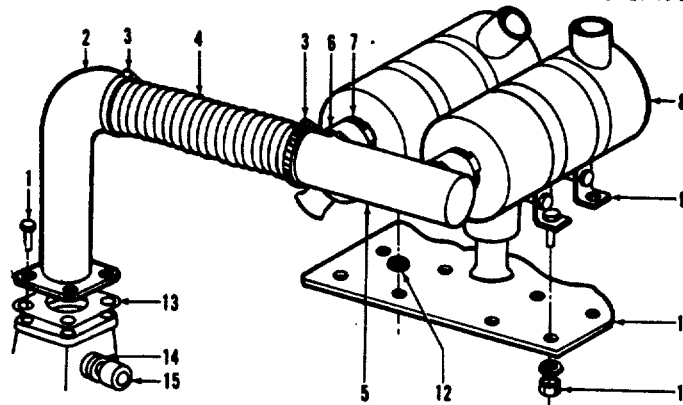
FUEL SYSTEM



AIR FILTER-GAS.....	1D04
AIR FILTER-4-236 DSL	1D04
AIR FILTER-3-53 DSL	1E04
CARBURETOR.....	1E04
FUEL INJECTION PUMP-4-236 DSL.....	1D13
FUEL INJECTION SYSTEM-4-236 DSL	1D12
FUEL OIL LIFT PUMP-4-236 DSL	1E01
FUEL PUMP-GAS	1D03
FUEL SYSTEM-GAS	1D03
FUEL SYSTEM-4-236 DSL.....	1D11
FUELS SYSTEM-3-53 DSL.....	1E03
GOVERNOR.....	1D03
SECONDARY FUEL FILTER040236 DSL.....	1E01
SECONDARY FUEL FILTER-3-53 DSL	1E03
THROTTLE LINKAGE	1D07

AIR FILTER

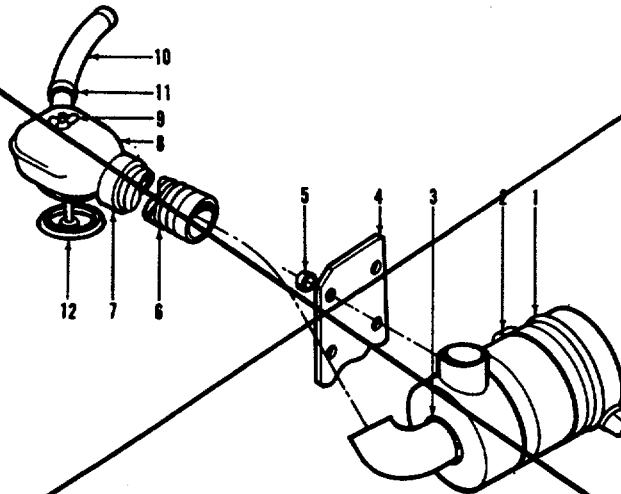
~~FOR 9-93 DIESEL ENGINE
FIRST USED ON SERIAL NO. 8098-9299 AND A1468-1545~~



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	18497	CAPSCREW-5/16 UNC X 1	4	8	130845	CLAMP	1
1	15155	LOCKWASHER-5/16	4	9	169099	BRACKET-AIR CLEANER	1
2	169092	TUBE-AIR INLET	1	10	168843	BRACKET-MOUNTING	1
3	115696	CLAMP-HOSE	2	11	16691	CAPSCREW-5/16 UNF X 7/8	4
4	169095	HOSE	1	11	15155	LOCKWASHER-5/16	4
5	169100	MANIFOLD-AIR CLEANER	1	11	15005	NUT-5/16 UNF	4
6	169098	HOSE	2	12	16374	CAPSCREW-5/16 UNC X 5/8	4
7	112989	CLAMP	4	12	15155	LOCKWASHER-5/16	4
8	169096	AIR CLEANER	2	13	170306	GASKET	1
8	234718	BAR-RETAINER	1	14	16187	BUSHING	1
8	234719	ELEMENT	1	15	168846	RESTRICTION INDICATOR KIT	1
8	138253	UNLOADER	1				

AIR FILTER

~~FOR GAS ENGINE
FIRST USED ON SERIAL NO. 889C-3300 AND A146C-1546~~

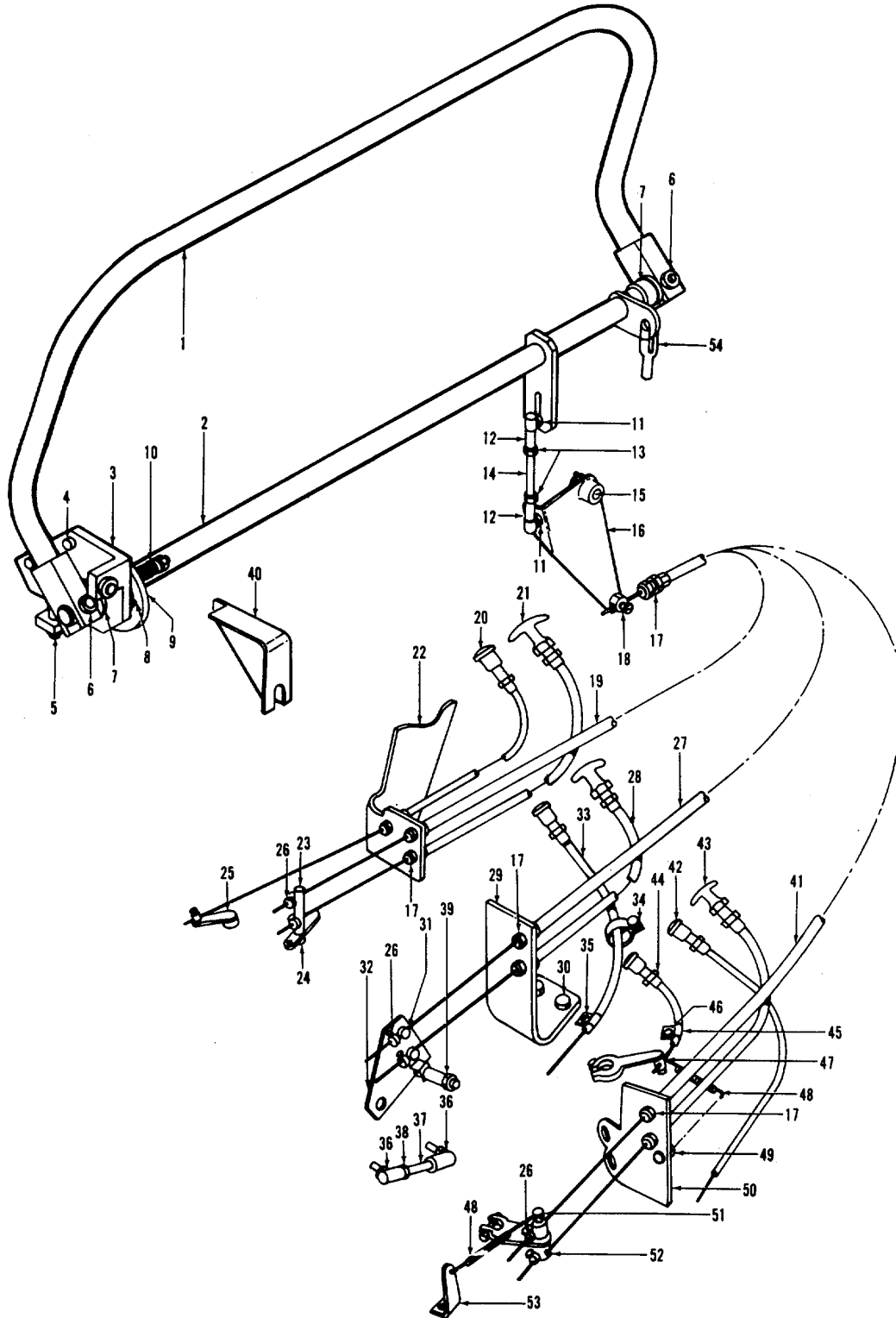


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	223137	AIR CLEANER-SEE 1008	1	8	157116	ELBOW	1
2	169428	BRACKET-AIR CLEANER	2	9	17443	WING NUT-5/16 UNC	1
3	115696	CLAMP	1	9	183586	WASHER-SEALING	1
4	391055	PLATE-SUPPORT	1	9	164222	LINK	1
5	17828	CAPSCREW-3/8 UNC X 1 1/4	4	9	145639	LOCKNUT	1
5	17428	NUT-3/8 UNC	4	10	163730	HOSE	1
6	390370	HOSE	1	11	127045	CLAMP-HOSE	2
7	112989	CLAMP	1	12	181329	GASKET	1

1D09

THROTTLE LINKAGE

FIRST USED ON SERIAL NO. 889C-3401 AND A146C-1700



THROTTLE LINKAGE

FIRST USED ON SERIAL NO. 889C-3401 AND A146C-1700

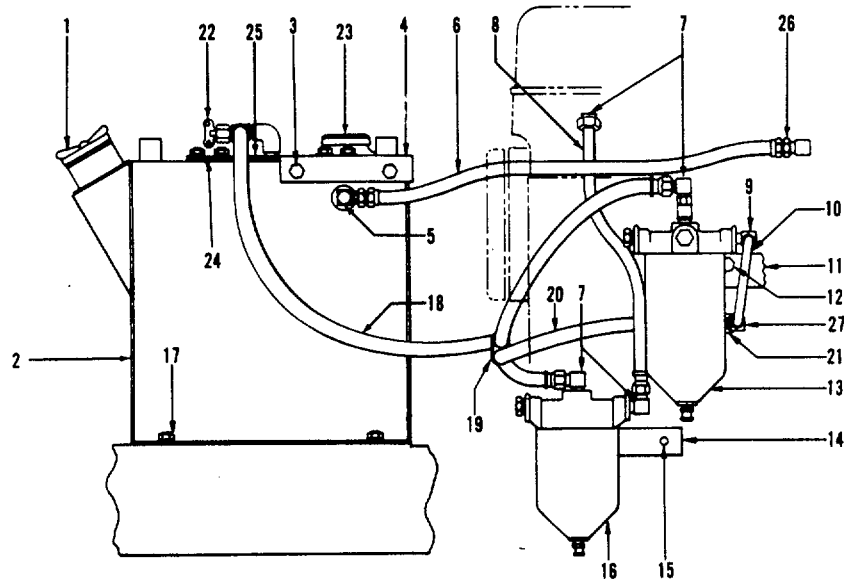
KEY
~~A FOR 1-236 DIESEL ENGINE.~~
~~B FOR GAS ENGINE.~~
 C-FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	C
1	391649	LEVER	1		1
2	391569	SHAFT	1		1
3	391729	SUPPORT-L.H.	1		1
4	16598	CAPSCREW-3/8 UNC X 7/8	2		2
4	15156	WASHER-3/8	2		2
5	16215	CAPSCREW-3/8 UNC X 1	2		2
5	15086	NUT-3/8 UNC	2		2
6	16816	CAPSCREW-3/8 UNC X 1 3/4	2		2
6	15156	WASHER-3/8	2		2
6	15056	NUT-3/8 UNC	2		2
7	157938	BUSHING-FLANGED	2		2
8	157587	DISK	1		1
8	19880	PIN	1		1
9	157588	PLATE	1		1
10	157942	STUD-SPECIAL	2		2
10	177964	SPRING	2		2
10	15127	WASHER-1/4	2		2
10	15004	NUT-1/4 UNF	2		2
11	15004	NUT-1/4 UNF	2		2
11	15912	WASHER-1/4	2		2
12	161607	JOINT-BALL	2		2
12	15127	WASHER-1/4	2		2
13	15024	NUT-1/4 UNF	2		2
14	157954	LINK	1		1
15	213892	BEARING	1		1
15	15134	WASHER-3/8	1		1
15	15212	COTTER	1		1
16	213894	CRANK	1		1
17	15026	NUT-3/8 UNF	4		4
17	15156	WASHER-3/8	4		4
18	161606	SWIVEL	1		1
18	16752	SCREW-#10 UNF X 3/8	1		1
18	15127	WASHER-1/4	1		1
18	15200	COTTER	1		1
19	161613	CABLE			
20	213256	CABLE CONTROL			
21	213265	CABLE THROTTLE			
22	.....	BRACKET AIR CLEANER, 1006			
23	165300	PIN THROTTLE LEVER			
24	15127	WASHER 1/4			

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	C
24	221541	NUT 1/4 UNC			
25	.....	LEVER CONTROL, 1013 REF 00			
26	154565	STOP-WIRE	2		2
27	161613	CABLE			
28	213264	CABLE-THROTTLE			
29	164473	PLATE			
30	18536	CAPSCREW-3/8 UNF X 5/8			
30	15156	WASHER-3/8			
31	161606	SWIVEL			
31	15200	COTTER			
32	164400	CRANK			
33	213255	CABLE-CONTROL			
34	153070	CLAMP			
34	15512	CAPSCREW-#2 UNC X 3/4			
34	15158	LOCKWASHER-1/2			
35	16651	SCREW-#10			
36	161252	STUD-BALL			
36	15923	LOCKWASHER-1/4			
36	15004	NUT-1/4 UNF			
37	164221	LINK			
38	15002	NUT-#10 UNF			
39	18542	CAPSCREW-3/8 UNC 3 1/2			
39	145641	NUT-3/8 UNC			
40	371272	SHROUD			
41	169140	CABLE			1
42	.....	CABLE-EMERGENCY STOP			1
43	213266	CABLE-THROTTLE			1
44	213257	CABLE-CONTROL			1
45	124359	CLAMP			1
46	15127	WASHER-1/4			1
47	169135	SWIVEL			1
48	154560	SPRING			2
49	15002	NUT-#10 UNF			1
49	16701	SCREW-#10 UNF X 1			1
50	169134	BRACKET			1
51	16708	SCREW-#10 UNF X 1/2			1
51	15002	NUT-#10 UNF			1
52	15200	PIN-COTTER			1
53	169136	BRACKET			1
54	.....	ROD END-SEE 2A10 REF 13			1

FUEL SYSTEM

FOR 3-53 DIESEL ENGINE



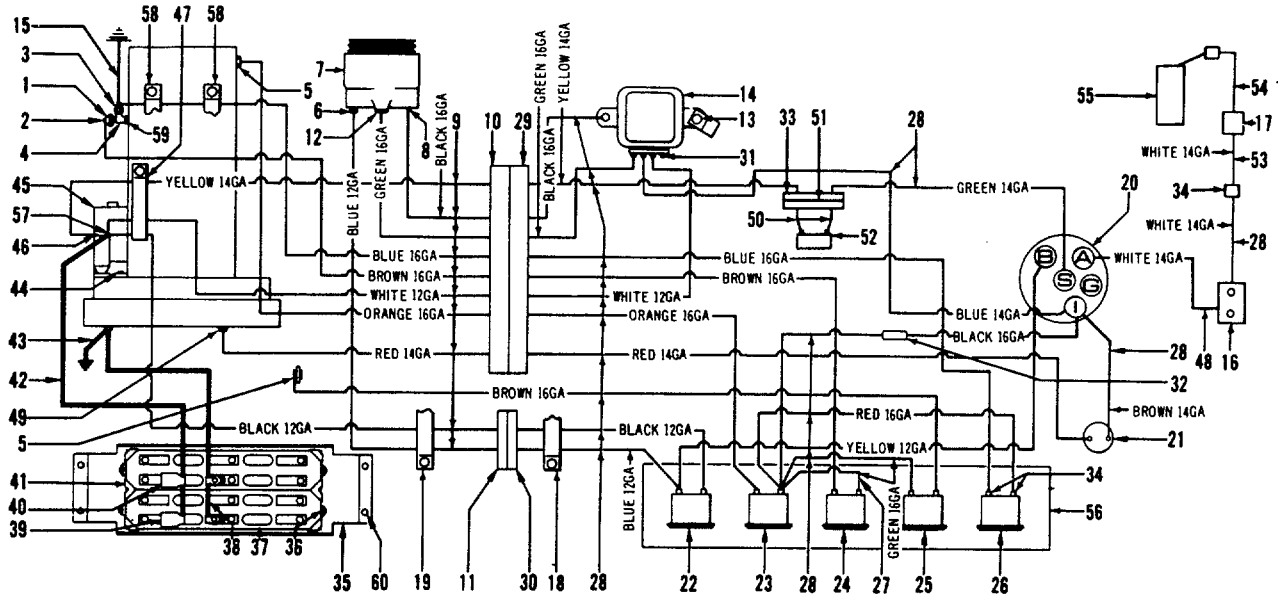
REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.
		1	2	3	4				1	2	3	4	
1	157704					1	13	15056					2
1	67353					1	13	15156					2
2	181771					1	13	15129					2
3	15055					2	14	169122					1
3	15155					2	15	16805					2
3	18515					2	15	16815					1
4	164363					1	15	15156					3
5	14271					1	16	.....					1
6	169119					1	17	156133					4
7	14358					3	18	169446					1
7	160622					1	19	119074					2
8	172833					1	20	169118					1
9	14273					1	21	16863					2
10	154494					1	22	16192					1
11	169120					1	22	15360					1
12	16377					2	23	156606					1
12	15157					2	26	16101					1
13	.....					1	27	14274					1

ELECTRICAL SYSTEM

ALTERNATOR	1F09
DISTRIBUTOR	1F04
ELECTRICAL SYSTEM GAS	1F03
ELECTRICAL SYSTEM-DSL	1F05
HORN	1F08
STARTING MOTOR	1F07



ELECTRICAL SYSTEM
FOR DIESEL ENGINE



KEY
 * FOR 4-336 DIESEL ENGINE.
 8-FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			1	8
1	169776	SENDER-PRESSURE	1	
2	15002	NUT-#10 UNF	1	
2	15916	LOCKWASHER-#10	1	
3	901070	SENDER HOUR METER		
3	55983	SWITCH-PRESSURE	1	
4	16186	TEE	1	
4	16151	ELBOW	1	
4	15372	NIPPLE-LONG	1	
5	77328	SENDER-TEMPERATURE	2	
5	15002	NUT-#10 UNF	2	
5	15916	LOCKWASHER-#10	2	
6	120436	NUT #12 UNG		
6	15915	LOCKWASHER-1/4		
6	157065	BOOT-PROTECTOR	1	
7	.....	ALTERNATOR-SEE 1F09	1	
8	15002	NUT #10 UNF		
8	15916	LOCKWASHER #10		
9	166021	HARNESS-WIRING, ENGINE		
9	169152	HARNESS-WIRING, ENGINE	1	
10	134813	CONNECTOR	1	
11	152728	CONNECTOR	1	
12	126381	CONNECTOR	1	
13	18460	CAPSCREW-1/4 UNC X 3/4 G5	2	
13	15054	NUT-1/4 UNC	2	
13	15154	LOCKWASHER-1/4	2	
13	173247	CLAMP	1	
14	134796	REGULATOR-VOLTAGE	1	
15	132853	WIRE	1	
16	168421	SWITCH-TOGGLE, SPRAY PUMP	1	
17	163762	BREAKER-CIRCUIT	1	
17	15002	NUT-#10 UNF	2	
17	15052	NUT-#10 UNC	1	
17	15916	LOCKWASHER-#10	3	
18	154200	CLAMP		
18	128408	CLAMP	1	
18	16378	CAPSCREW-1/4 UNC X 5/8 G5	1	

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			1	8
18	15154	LOCKWASHER-1/4	1	
18	15054	NUT-1/4 UNC	1	
19	136516	CLAMP	1	
19	16597	CAPSCREW-3/8 UNC X 3/4 G5	1	
19	15156	LOCKWASHER-3/8	1	
20	186305	SWITCH-IGNITION AND START	1	
20	186304	KEY-IGNITION	1	
21	90541	SWITCH GOLD START		
21	104293	PLATE DIESEL		
22	169758	AMMETER	1	
23	169779	GAUGE-WATER TEMPERATURE	1	
24	169759	GAUGE-OIL PRESSURE	1	
25	170805	GAUGE-TRANSMISSION TEMP.	1	
26	119379	METER-HOUR	1	
27	87415	WIRE	1	
28	104030	HARNESS-WIRING, INSTRUMENT		
28	184825	HARNESS-WIRING, INSTRUMENT	1	
29	134814	CONNECTOR	1	
30	126319	CONNECTOR	1	
31	126380	CONNECTOR-REGULATOR	1	
32	148767	HOLDER-FUSE	1	
32	53123	FUSE-5 AMP.	1	
33	148659	CONNECTOR	1	
34	121384	CONNECTOR	3	
35	183575	BRACKET	1	
36	391826	BOLT-5/16 UNC X 9	4	
36	18515	WASHER-5/16	4	
36	17443	NUT-WING, 5/16 UNC	4	
37	79792	BATTERY-12 VOLT	2	
38	166196	CABLE-BATTERY		
38	169156	CABLE-BATTERY	1	
39	111770	PROTECTOR	1	
40	147633	PROTECTOR	1	
41	74751	HOLD DOWN-BATTERY	2	
42	166195	CABLE-BATTERY		
42	169155	CABLE-BATTERY	1	

ELECTRICAL SYSTEM
FOR DIESEL ENGINE

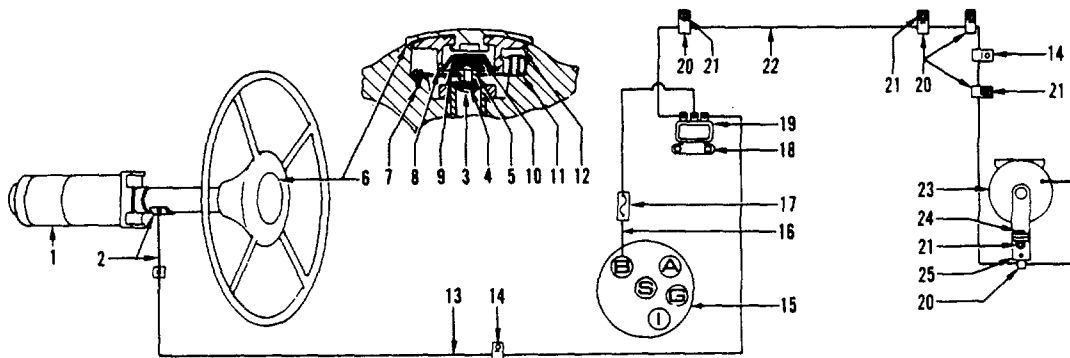
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			A	B
43	101618	CABLE-GROUND	1	
44	16020	CAPSCREW 3/8 UNC X 1 1/4 CS	..	..
44	15156	LOCKWASHER 3/8	..	..
45	.....	MOTOR-STARTING SEE 1F07	..	..
45	.....	MOTOR-STARTING, COMES WITH ENGINE	1	
46	15039	NUT #0 UNC	..	..
46	15917	LOCKWASHER #0	..	..
47	132131	CLAMP	1	
48	181898	WIRE	1	
49	.....	THERMOSTART SEE 1014 REF. 17	..	..
50	391750	HARNES- WIRING	1	
51	148658	CONNECTOR	1	
52	.....	SWITCH-MICRO, SEE 2C03 REF 48	1	

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			A	B
53	393091	WIRE	1	
54	393092	WIRE	1	
55	.....	PUMP-SPRAY, PAGE B3 REF. 33	1	
56	215017	PLATE-NAME	1	
57	204223	BOOT	1	
57	15086	NUT-JAM, 3/8 UNC	..	..
57	19150	LOCKWASHER 3/8	..	..
58	124297	CLAMP	..	..
58	132972	CLAMP	2	
58	15623	CAPSCREW 3/8 UNF X 5/8	..	..
58	15156	LOCKWASHER 3/8	..	..
59	16148	NIPPLE	..	..
60	156133	NUT-3/8 UNC	4	

STARTING MOTOR

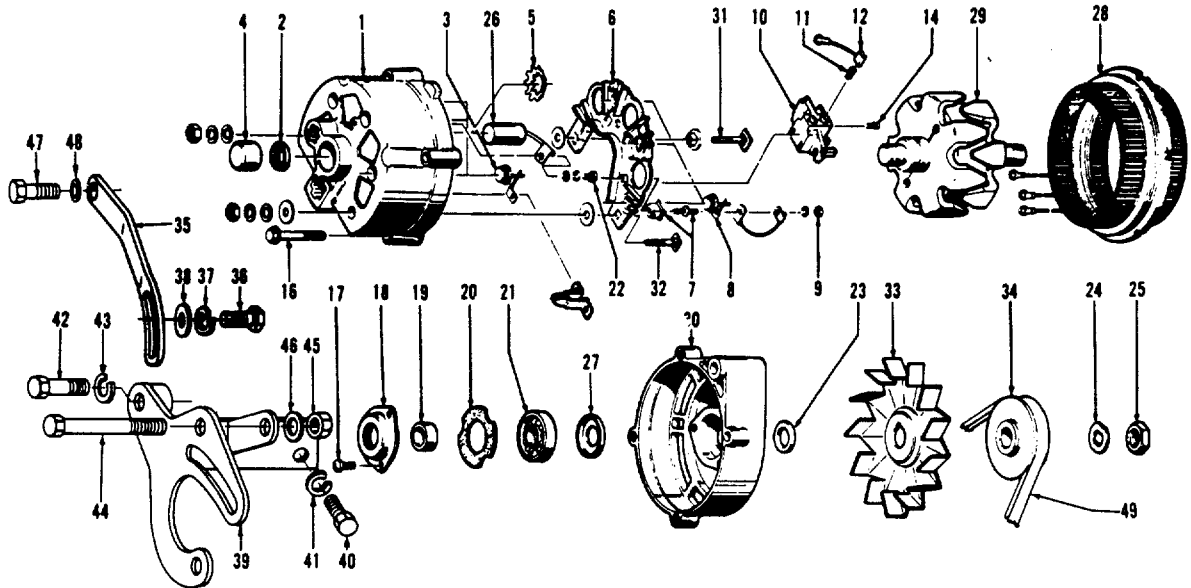
REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.		REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	
		1	2	3	4	A	B			1	2	3	4	A	B
50	166541	HOUSING-DRIVE END				1	..	57	166336	SPRING				..	1
50	172812	BUSHING				1	..	58	55590	COLLAR				1	..
50	137699	HOUSING-DRIVE END				..	1	58	166479	LOCKWIRE				1	..
50	55585	BUSHING				..	1	59	123675	PLATE-CENTER BEARING				..	1
51	236078	STUD-SHIFT LEVER				1	1	59	131174	SEAL-OIL				..	1
52	97497	WASHER-THRUST				1	..	59	131172	BUSHING				..	1
52	137698	WASHER-THRUST				..	1	59	131173	GASKET				..	1
53	97498	RING-RETAINING				1	..	59	55978	WASHER-CENTER BEARING				..	1
53	236081	RING-RETAINING				..	1	60	151840	GROMMET-FIELD FRAME				1	..
54	97499	COLLAR				1	..	60	167010	GROMMET-FIELD FRAME				..	1
54	236082	COLLAR				..	1	62	151837	INSULATION-FIELD COIL				4	..
55	55894	PIN-DOWEL				1	1	63	16598	CAPSCREW-3/8 UNC X 7/8 G5				2	2
56	156289	DRIVE				1	..	63	16828	CAPSCREW-3/8 UNC X 1 1/4 G5				1	1
56	97360	DRIVE				..	1	64	15156	LOCKWASHER-3/8				3	3
56	166337	BUSHING-OILLESS				..	1								

HORN



REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.
		1	2	3	4				1	2	3	4	
1	.....	CONTROL-STEERING				1	14	124359	CLAMP				2
1	.....	COLUMN-STEERING				1	15	.....	SWITCH-IGNITION, SEE 1F03 REF 29 AND 1F05 REF. 20				1
2	.....	BRUSH-HORN				1	15	.....	WIRE				1
3	.....	WASHER-CONTACT				1	16	121062	WIRE				1
4	.....	SPRING-CONTACT				1	17	53124	FUSE-10 AMP.				1
5	.....	INSULATOR-CONTACT				1	18	15004	NUT-1/4 UNF				2
5	.....	REF. 32				1	18	15912	LOCKWASHER-1/4				2
6	163910	KIT-HORN BUTTON				1	19	103739	RELAY-HORN				1
6	166169	COVER-WEATHER				1	20	132131	CLAMP				7
7	166174	SCREW				3	21	15055	NUT				6
8	166171	CUP-CONTACT				1	21	15913	LOCKWASHER-5/16				6
9	166173	CAP-CONTACT				1	22	164767	WIRE				1
10	166172	SPRING				1	23	126364	HORN				1
11	166175	PLATE-BASE				1	24	16836	CAPSCREW-5/16 UNC X 3/4 G5				1
12	166170	BUTTON-HORN				1	25	164758	CLIP				1
13	164766	WIRE				1							

ALTERNATOR



KEY
~~A FOR GAS ENGINE.~~
~~B FOR 1-236 DIESEL ENGINE.~~
~~C FOR 3-53 DIESEL ENGINE.~~

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	A B C
	199196	ALTERNATOR	1
	.....	ALTERNATOR-COMES W/ENGINE	1
	152236	FRAME-S.R.E.	1
2	128837	RETAINER-BEARING	1
3	128836	DIODE-NEGATIVE, BLACK	1
4	128838	BEARING-S.R.E.	1
5	128839	SPRING-CAPACITOR	1
6	128844	HEAT SINK	1
7	128846	TERMINAL PACKAGE	1
8	128845	DIODE-POSITIVE	1
9	15039	NUT	1
9	128841	LOCKWASHER	1
10	138559	HOLDER AND BRUSH	1
11	128848	SPRING-BRUSH	1
12	.....	BRUSH	1
14	128851	SCREW	1
14	128842	LOCKWASHER	1
16	128852	BO T-THRU	1
17	138554	SCREW	1
18	128831	RETAINER-BEARING	1
19	138553	COLLAR-INSIDE	1
20	202004	GASKET	1
21	235950	BEARING-DRIVE END	1
22	16713	SCREW	1
22	128842	LOCKWASHER	1
22	128841	WASHER	1
23	128834	COLLAR-OUTSIDE	1
24	128835	LOCKWASHER	1
25	55580	NUT-SHAFT	1
26	128840	CAPACITOR	1
27	152234	SLINGER-GREASE	1
28	152235	STATOR	1
28	154793	CLIP-STATOR LEAD	1
29	138555	ROTOR	1
30	198047	FRAME-DRIVE END	1
31	152237	TERMINAL PACKAGE-GROUND	1
32	152238	TERMINAL PACKAGE-BATT.	1
32	154794	INSULATOR-BATTERY TERM.	1
32	152239	WASHER-INSULATOR	1
37	126358	FAN	1
34	164083	PULLEY	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	A B C
34	116609	PULLEY	1
35	199416	ARM-ADJUSTING	1
35	154099	ARM-ADJUSTING	1
35	154402	ARM-ADJUSTING	1
36	18497	CAPSCREW-5/16 UNC X 1 G5	1
36	992503	SET SCREW	1
36	15639	CAPSCREW-5/16 UNC X 1	1
37	15155	LOCKWASHER-5/16	1
37	15156	LOCKWASHER-3/8	1
38	15175	WASHER-5/16	1
38	18515	WASHER-5/16	1
39	155437	BRACKET-ALTERNATOR	1
39	160895	BRACKET-ALTERNATOR	1
39	154399	BRACKET-ALTERNATOR	1
40	16596	CAPSCREW-3/8 UNC X 1 1/8 G5	1
40	16828	CPSCR.-3/8 UNC X 1 1/4 G5	3
40	160898	STUD	1
41	15156	LOCKWASHER-3/8	1
41	992503	LOCKWASHER	1
41	177947	LOCKWASHER-3/8	3
41	17136	NUT-3/8 UNF	1
41	15086	NUT	1
42	10559	CAPSCREW-7/16 UNC X 1 3/4	1
42	05	05	1
42	16805	CAPSCREW-3/8 UNC X 1 G5	1
43	15157	LOCKWASHER-7/16	1
43	15156	LOCKWASHER-3/8	1
43	15134	WASHER-3/8	1
44	10791	CPSCR.-3/8 UNC X 3 1/4 G5	1
44	17321	CPSCR.-3/8 UNF X 3 1/2 G5	1
44	17155	CPSCR.-3/8 UNF X 3 1/4 G5	1
45	17188	LOCKNUT-3/8 UNC	1
45	43740	NUT-3/8 UNF	1
46	15134	WASHER-3/8	1
47	16096	CAPSCREW-3/8 UNF X 7/8 G5	1
48	15156	LOCKWASHER-3/8	1
49	154382	V-BELT	1
49	.....	V-BELT, SEE 1805 REF. 63	1

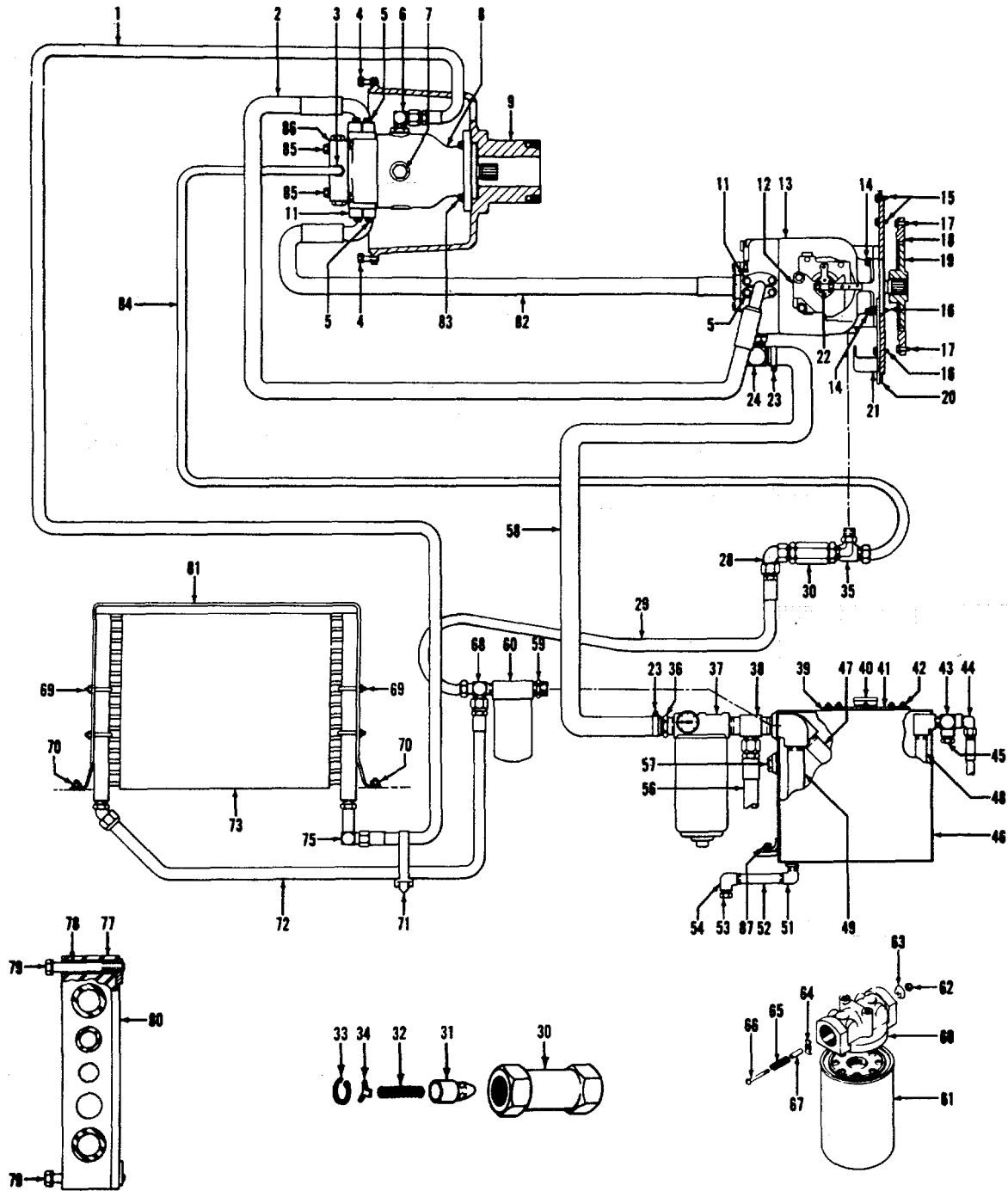
FIRST USED ON SERIAL NO. 809C-3303

TRANSMISSION AND POWER TRAIN

CONTROL LINKAGE2A09
FINAL DRIVE-C3508 2805
~~FINAL DRIVE 6340A.....2807~~
HYDRAULIC MOTOR2A11
HYDRAULIC PUMP2A13 & 2803
HYDRAULIC SYSTEM2A05
OIL FILTER 2802
SERVO CONTROL VALVE 2801

2A07

HYDRAULIC SYSTEM
FIRST USED ON SERIAL NO. 889C-3401 AND A146C-1700



HYDRAULIC SYSTEM

FIRST USED ON SERIAL NO. 889C-3401 AND A146C-1700

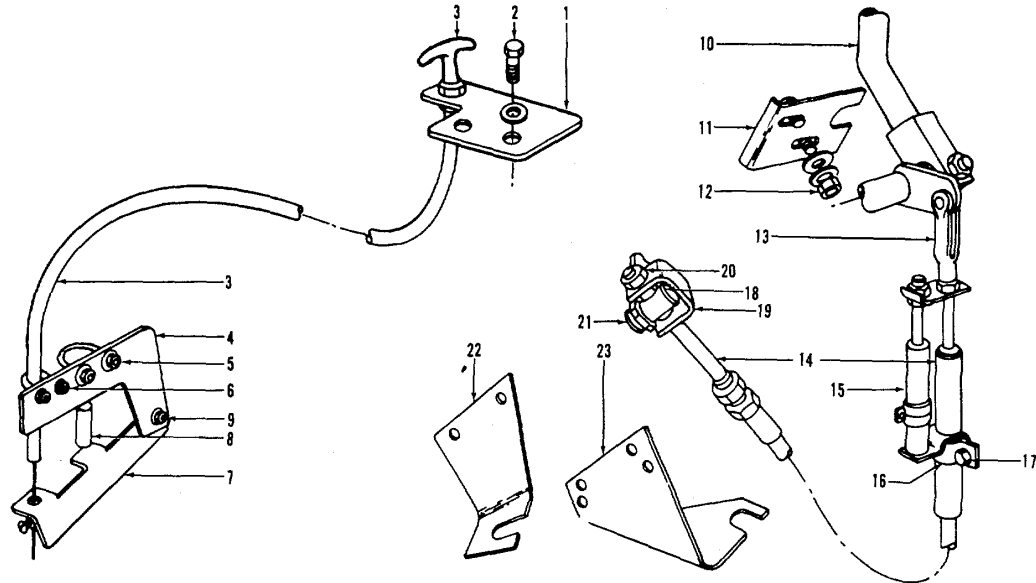
KEY
~~A - FOR GAS ENGINE,~~
~~B - FOR 1-53 DIESEL ENGINE,~~
 C - FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	C
1	393079	HOSE			1
1	393082	HOSE			1
2	393087	HOSE			1
2	393078	HOSE			
3	111331	CONNECTOR			1
4	.....	CAPSCREW-PG. 2806 REF. 62	12	12	12
5	18559	CAPSCREW-7/16 UNC X 1 3/4 G5	16	16	16
5	15157	LOCKWASHER-7/16	16	16	16
6	112475	ELBOW			1
7	14603	PLUG			2
8	.....	MOTOR-HYDRAULIC, PAGE 2A12			1
9	.....	CARRIER-MOTOR, PAGE 2806 REF. 2			1
11	156690	FLANGE-SPLIT			8
11	169787	O-RING			4
13	.....	PUMP-HYDRAULIC, PAGE 2804			1
14	221565	CAPSCREW-1/2 UNC X 1 1/4			4
15	14805	CAPSCREW-3/8 UNC X 1 G5			
15	16828	CPSCR.-3/8 UNC X 1 1/4 G5			8
15	15156	LOCKWASHER-3/8	16	16	8
16	16828	CPSCR. 3/8 UNC X 1 1/4 G5			2
16	16815	CPSCR. 3/8 UNC X 1 1/2 G5			2
16	15156	WASHER-3/8			4
17	15913	BOLT-3/8 UNC X 1 1/2			
17	17112	BOLT-3/8 UNC X 1 1/4			8
18	15112	PLATE-DRIVE			
18	15112	PLATE-DRIVE			
18	169144	PLATE-DRIVE			1
19	392092	HUB			1
20	213621	PLATE-MOUNTING			
20	213627	PLATE-MOUNTING			
20	214931	PLATE-MOUNTING			1
21	.....	BRACKET-PAGE 2A10 REF. 8			1
22	.....	LEVER-PAGE 2A10 REF. 2			1
23	130845	CLAMP-HOSE			2
24	186227	NIPPLE			1
26	15995	REDUCER			1
28	17301	ELBOW			1
29	393080	HOSE			1
30	187282	VALVE-CHECK			1
31	190004	POPPET			1
32	190003	SPRING			1
33	190001	SNAP RING			1
34	190002	WASHER			1
35	186228	FITTING			1
36	17585	NIPPLE			1
37	.....	FILTER-OIL, SEE PAGE 2802			1
38	177457	TEE-SPECIAL			1
38	168812	FITTING-SPECIAL			1
39	156607	GASKET			1
40	164227	CAP-OIL FILLER			1
40	118742	GASKET			1
41	156670	COVER-TANK			1
42	15055	NUT-5/16 UNC			8
42	15155	LOCKWASHER-5/16			8
43	156696	TEE			1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	C
44	17300	ELBOW			1
45	14588	PLUG			
45	17345	CONNECTOR			1
46	393156	TANK-HYDRAULIC			1
47	180442	PIPE			1
48	156655	PIPE			1
49	156656	PIPE			1
50	14683	CONNECTOR			1
51	17324	ELBOW			1
52	15346	NIPPLE			1
53	14387	PLUG			1
54	12818	ELBOW			1
56	.....	HOSE-SEE PAGE 2D02 REF.26			1
57	146073	GAUGE-VIEW			1
58	393254	HOSE			1
59	17697	NIPPLE-REDUCER			1
60	180441	FILTER-OIL, RETURN LINE			1
60	182291	HEAD			1
61	180595	ELEMENT			1
62	182293	LOCKNUT			1
63	182292	VALVE-BY PASS			1
64	182290	GUIDE-BY PASS			1
65	182288	SPRING			1
66	182287	SCREW			1
67	182289	SPACER			1
68	14596	TEE			1
69	190517	J-BOLT			2
69	190515	U-BOLT			2
69	221341	NUT-1/4 UNC			4
69	197068	WASHER-1/4			4
70	146441	NUT-3/8 UNC			
70	15137	LOCKWASHER-3/8			
71	129563	CLAMP-STRAP			1
71	176451	CLAMP			1
71	15512	CAPSCREW-1/2 UNC X 3/4			1
71	15158	LOCKWASHER-1/2			1
72	393080	HOSE			
72	393081	HOSE			1
73	186259	COOLER-OIL			1
75	82426	ELBOW			2
77	391075	BLOCK-RUBBER			1
78	391076	SPACER			2
79	18540	CAPSCREW-3/8 UNC X 3 G5			2
79	15056	NUT-3/8 UNC			2
80	215041	CHANNEL			1
81	186360	BRACKET-SUPPORT			
82	393086	HOSE			1
82	393071	HOSE			
83	.....	CAPSCREW-PG. 2806 REF. 61			4
84	393078	HOSE			1
85	.....	CAPSCREW-PG. 2A11 REF. 2			6
86	.....	VALVE-SEE PG. 2A11 REF. 1			1
87	145641	NUT-3/8 UNC			4
87	15134	LOCKWASHER-3/8			4

2A10
CONTROL LINKAGE

FIRST USED ON SERIAL NO. B89C-3401 AND A146C-1700



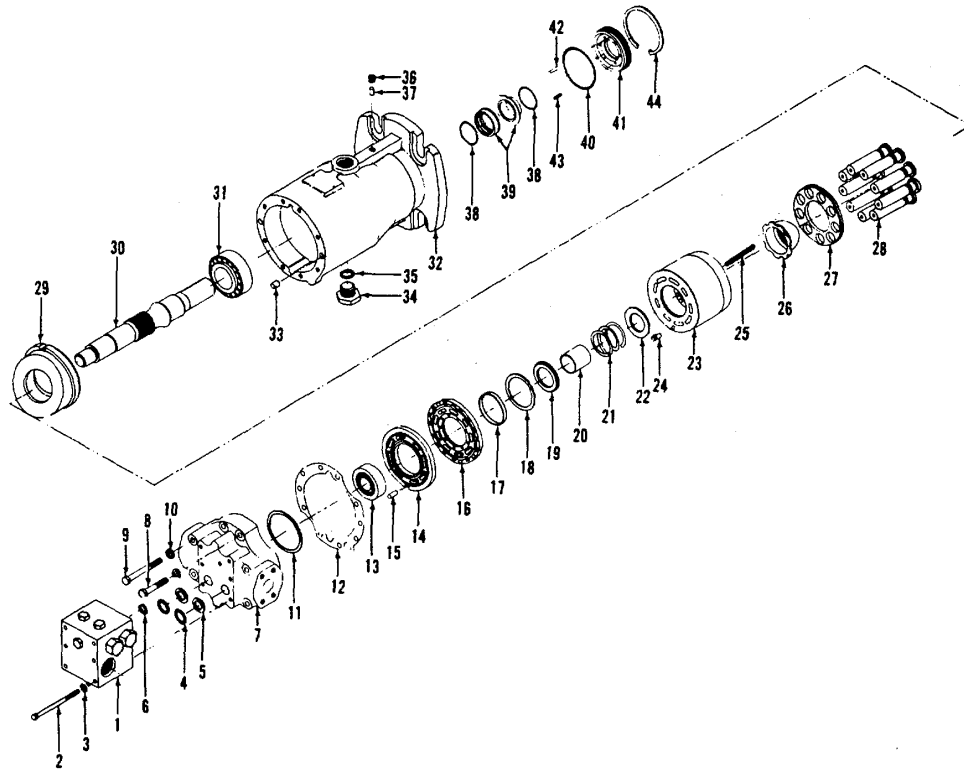
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	393531	PLATE	1
1	.....	BRACKET-BATTERY, SEE 1F05	1
2	15155	WASHER-5/16	2
3	391471	CABLE-PULL	1
4	393529	PLATE	1
5	393532	U-BOLT	1
5	15175	WASHER-5/16	2
6	213897	U-BOLT	1
6	15155	WASHER-5/16	2
7	393530	LEVER	1
8	222707	PIN	1
9	85749	SCREW-SHOULDER	1
9	15175	WASHER-5/16	1
9	18515	WASHER-5/16	1
9	15154	WASHER-1/4	1
9	15000	NUT-1/4 UNC	1
10	.....	LEVER-SEE 1D10 REF. 1	1
11	393305	PLATE-LOCK	1
12	85749	SCREW-SHOULDER	2
12	18515	WASHER-5/16	2
12	393307	WASHER-SPRING	2

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
12	18500	WASHER-#12	2
12	15154	WASHER-1/4	2
12	15000	NUT-1/4 UNC	2
13	125	ROD END	1
13	213896	PIN-ROD	1
13	15200	PIN-COTTER	1
14	393085	CABLE-PUSH PULL	1
15	392015	SWITCH	1
16	392016	CLAMP	1
17	220501	SCREW-#10 UNC X1	2
17	15002	NUT-#10 UNC	2
17	391727	SPACER	2
18	382019	SWIVEL	1
19	392018	BRACKET	1
20	15024	NUT-1/4 UNF	2
21	54115	SNAP RING	1
22	393304	BRACKET	1
23	393322	BRACKET	1

~~*USED ON GAS ENGINE ONLY~~
~~**USED ON 1-236 OR 3-53 DIESEL ENGINE~~

2A12
HYDRAULIC MOTOR

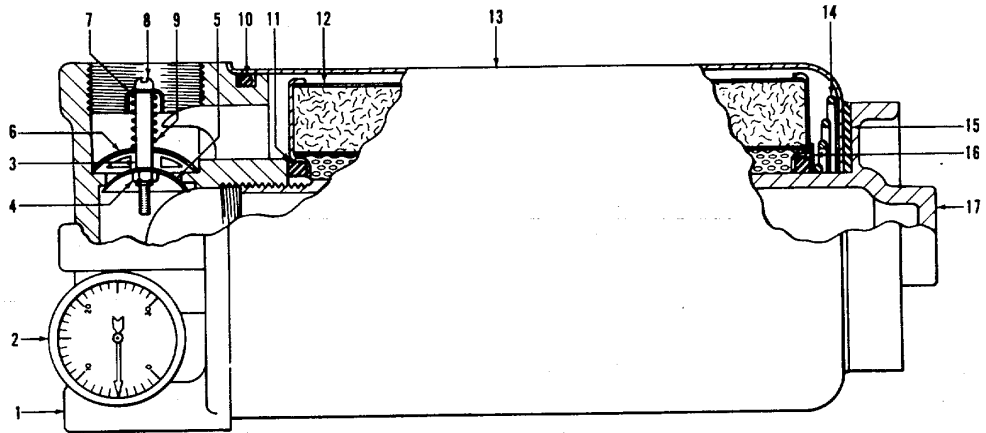
FIRST USED ON SERIAL NO. B89C-3401 AND A146C-1700



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
	393467	MOTOR-HYDRAULIC	1	25	# 267030	SPRING-RETAINER	6
1	* 267026	VALVE-MANIFOLD	1	26	# 190601	GUIDE-SLIPPER RETAINER	1
2	* 18524	CAPSCREW-5/16 UNC X 3 3/4	6	27	# 190602	RETAINER-SLIPPER	1
3	* 194402	WASHER	6	28	# 267031	PISTON	9
4	□ 265732	O-RING	2	29	194396	SWASHPLATE-FIXED	1
5	□ 165064	RING-BACK UP	2	30	194397	SHAFT-MOTOR	1
6	□ 39767	O-RING	1	31	190625	BEARING-FRONT	1
7	194394	END CAP-MOTOR	1	32	194398	HOUSING-FIXED	1
8	16376	CAPSCREW-3/8 UNC X 2	3	33	222719	PIN	2
9	18540	CAPSCREW-3/8 UNC X 3	5	34	216590	PLUG	1
10	190583	WASHER	8	35	16485	O-RING	1
11	190585	SHIM	AR	36	15483	PLUG	1
12	190586	GASKET-END CAP	1	37	184055	PIN	1
13	190587	BEARING-REAR	1	38	‡ 265788	O-RING	2
14	194395	PLATE-VALVE	1	39	‡ 190643	SEAL SET	1
15	222710	PIN	1	40	‡ 15880	O-RING	1
16	# 190591	PLATE-BEARING	1	41	‡ 190647	RETAINER-SEAL	1
17	# 267028	PILOT-BEARING PLATE	1	42	‡ 226832	PIN-GROOVE	1
18	# 190593	RING-RETAINING	1	43	‡ 190644	SPRING-SEAL	6
19	# 190594	RETAINER-SPRING	1	44	‡ 190648	RING-RETAINING	1
20	# 190595	GUIDE-SPRING	1				
21	# 267029	SPRING-CYLINDER BLOCK	1				
22	# 190597	SEAT-SPRING	1				
23	#	BLOCK-CYLINDER	1				
24	# 190599	PIN	1				

*INCLUDED IN MANIFOLD VALVE KIT 267025.
 □INCLUDED IN VALVE SEAL KIT 194393.
 †INCLUDED IN CYLINDER BLOCK KIT 267027.
 ‡INCLUDED IN SEAL KIT 190641.

OIL FILTER

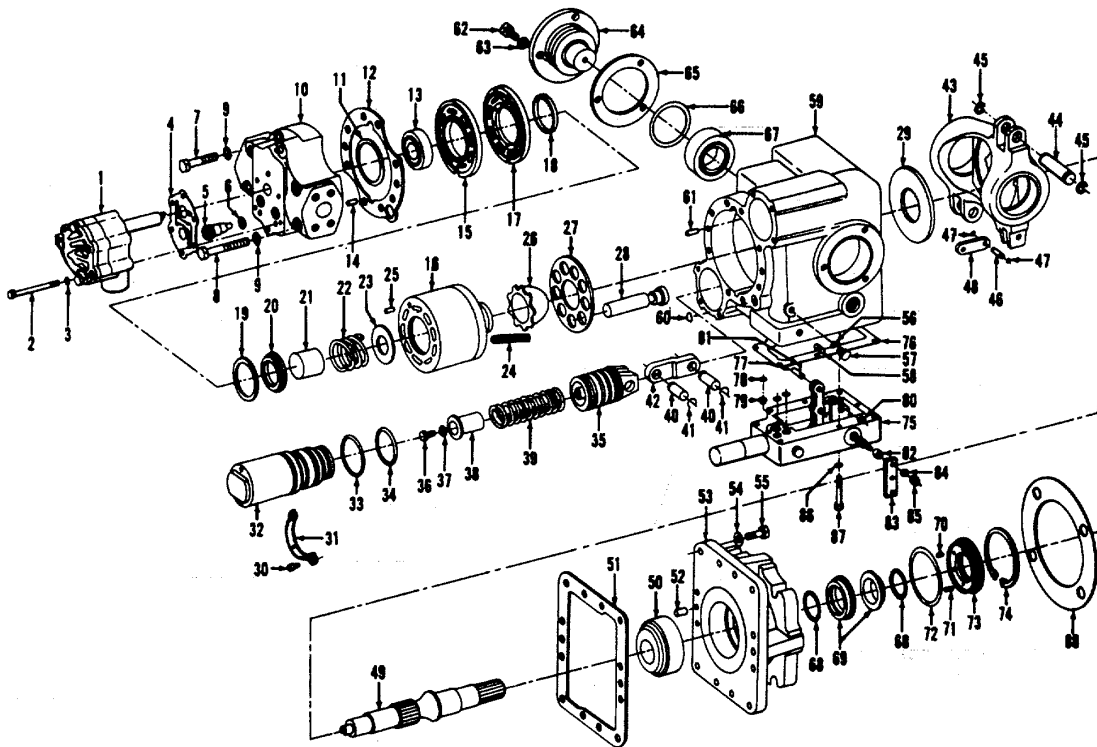


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
	215015	FILTER-OIL	1	10	* 161154	O-RING, HOUSING	1
1	161146	HEAD & PLUG	1	11	* 161150	SEAL-OIL	2
2	161152	INDICATOR	1	12	* 161155	ELEMENT	1
3	195033	SPACER-BY-PASS VALVE	1	13	161148	HOUSING	1
3	237017	SPACER-BY-PASS VALVE, 5 PSI	1	14	161149	SPRING-ELEMENT	1
4	161161	LOCKNUT-BY-PASS	1	15	* 161153	GASKET-CENTER POST	1
5	161160	VALVE-BY-PASS	1	16	161151	WASHER-BACK UP	1
6	161156	GUIDE-BY-PASS	1	17	161147	POST-CENTER	1
7	161158	CAP-STEM, BY-PASS	1	20	237011	POST-CENTER, HEAVY DUTY	1
8	161159	SCREW-BY-PASS	1				
9	.....	SPRING-BY-PASS	1				

*INCLUDED IN SEAL AND ELEMENT KIT 237014.

HYDRAULIC PUMP

FIRST USED ON SERIAL NO. B89C-3401 AND A146C-1700



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	185902	PUMP-HYDRAULIC	1	27	190602	RETAINER-SLIPPER	1
1	190573	PUMP-CHARGE	1	28	190603	PISTON	9
1	190576	PUMP	1	29	190604	PLATE-THRUST	1
2	18478	CAPSCREW-1/4 UNC X 3 G5	4	30	190605	CAPSCREW	4
3	221763	WASHER	4	31	190606	RETAINER-SLEEVE	2
4	190577	GASKET	1	32	190607	SLEEVE-SERVO	1
5	190578	VALVE-CHECK	2	32	218051	SLEEVE	2
6	190580	O-RING	1	33	39673	O-RING	1
7	190581	CAPSCREW	3	34	39671	O-RING	1
8	190582	CAPSCREW	5	35	190611	PISTON-SERVO	2
9	190583	WASHER	8	35	190616	PISTON	2
10	190584	CAP-END	1	36	190612	CAPSCREW	1
11	190585	SHIM	AR	37	190613	WASHER	1
12	190586	GASKET-END CAP	1	38	190614	GUIDE-SPRING	1
13	190587	BEARING	1	39	190615	SPRING	1
14	190588	PIN	1	40	190617	PIN	2
15	190589	PLATE-VALVE	1	41	190618	RING-RETAINING	4
16	190590	CYLINDER BLOCK	1	42	190619	LINK	1
16	190600	BLOCK	1	43	190620	PLATE-SWASH	1
17	190591	PLATE-BEARING	1	44	190617	PIN	1
18	190592	PILOT	1	45	190618	RING-RETAINING	4
19	190593	RING-RETAINING	1	46	190621	PIN	1
20	190594	RETAINER-SPRING	1	47	190622	RING-RETAINING	2
21	190595	GUIDE-SPRING	1	48	190623	LINK	1
22	190596	SPRING-CYLINDER BLOCK	1	49	190624	SHAFT-DRIVE	1
23	190597	SEAT-SPRING	1	50	190625	BEARING	1
24	190598	SPRING-RETAINER	9	51	190626	GASKET	1
25	190599	PIN	1	52	190627	PIN	2
26	190601	GUIDE-RETAINER	1	53	190628	COVER-FRONT	1

HYDRAULIC PUMP

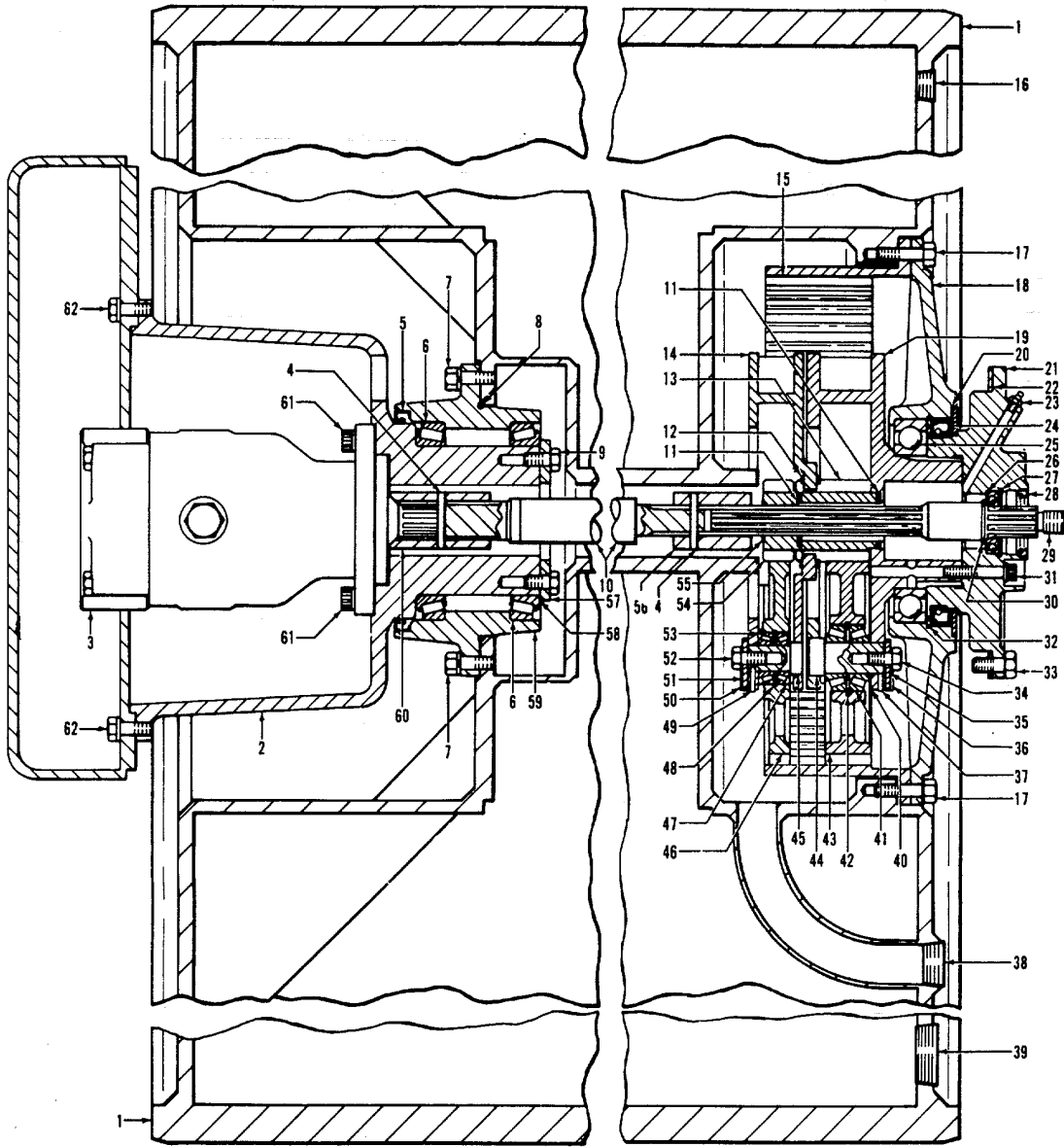
FIRST USED ON SERIAL NO. 889C-3401 AND A146C-1700

REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.
		1	2	3	4				1	2	3	4	
54	190583					12	73	* 190647					1
55	190629					12	74	* 190648					1
56	190630					1	75	190649					1
57	14591					1	75	190653					1
58	15483					1	76	190650					1
59	190633					1	77	190651					1
60	39347					1	78	39347					3
61	190635					2	79	190652					1
62	190636					6	80	221763					1
63	190583					6	81	190654					1
64	190637					2	82	190655					1
65	190638					AR	83	.....					1
66	190639					2	84	15923					1
67	190640					2	85	190658					1
68	* 190642					2	86	190575					9
69	* 190643					1	87	18473					9
70	* 190645					1	88	185903					1
71	* 190644					6							
72	* 190646					1							

*INCLUDED IN SEAL KIT 190641.

2805
FINAL DRIVE

FOR C3508



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	178149	DRUM-DRIVE	1	6	155370	CUP-BEARING	2
2	313600	CARRIER-MOTOR	1	7	16823	CAPSCREW-5/8 UNF X 1 1/2 G5	8
2	390453	CARRIER-MOTOR	1	7	15160	LOCKWASHER-5/8	8
3	.....	MOTOR-HYDRAULIC-SEE 2A11 & 2A12	1	8	94086	O-RING	1
4	189547	PIN	2	9	56998	BOLT-1/2 UNC X 1 1/4 G8	6
4	198214	PIN	2	10	393059	SHAFT-DRIVE	1
5	150194	SEAL-OIL	1	10	393059	SHAFT-DRIVE	1
6	155369	CONE-BEARING	2				

FINAL DRIVE

FOR C3508

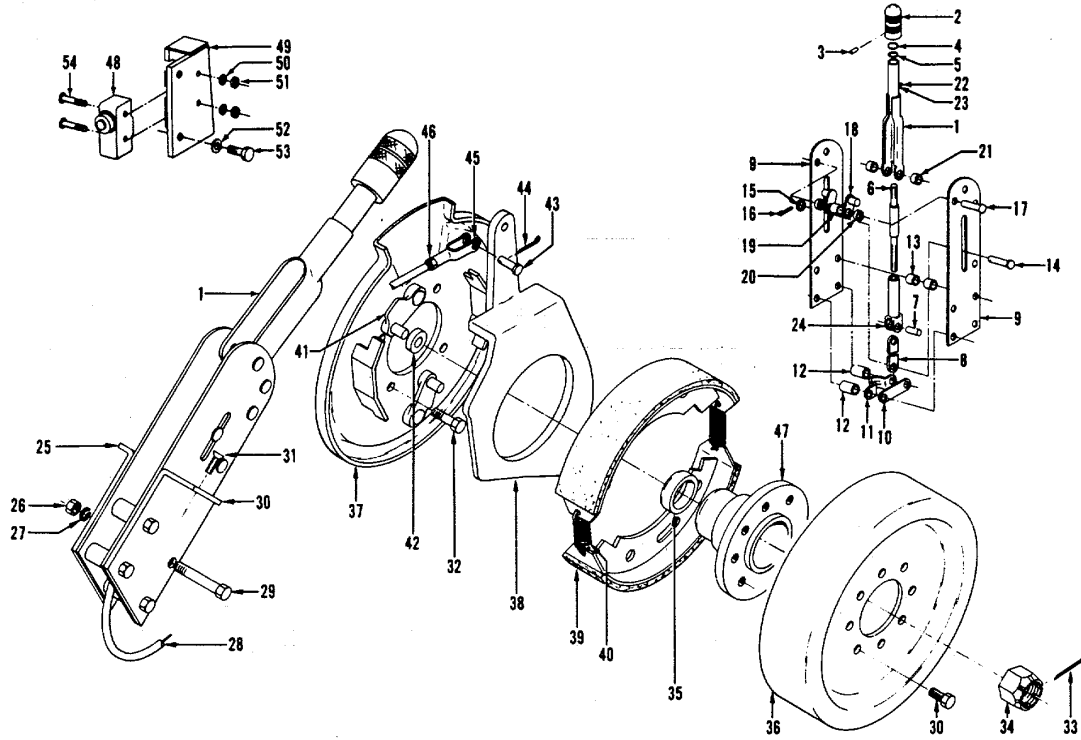
REF. NO.	HYSTER		NAME OF PART	QTY.	REF. NO.	HYSTER		NAME OF PART	QTY.
	PART NO.	1 2 3 4				PART NO.	1 2 3 4		
11	167458		WASHER	2	39	15320		PLUG	1
11	78826		BEARING-THRUST	2	40	156197		WASHER	3
12	156201		SNAP RING	2	41	156194		CUP-BEARING	6
13	167459		GEAR-SUN	1	41	156195		CONE-BEARING	6
14	156174		CARRIER-PLANETARY	1	42	156193		SNAP RING	3
15	154029		GEAR-RING	1	43	154023		GEAR-PLANETARY PINION	3
16	15316		PLUG	1	44	156196		PIN	3
17	97577		BOLT-1/2 UNF X 1 3/4 G8	16	45	156183		PIN	3
18	154028		HUB	1	46	154026		GEAR-PLANETARY PINION	3
19	156187		CARRIER-PLANETARY	1	47	156181		CUP-BEARING	6
20	156204		PLATE	1	47	156182		CONE-BEARING	6
20	391462		PLATE	1	48	156180		SNAP RING	3
21	213275		FLANGE	1	49	180397		PIN-GROOVE	3
21	390494		FLANGE	1	50	156185		PLATE-LOCK	3
22	390460		SHIM-.005	AR	51	156186		PLATE	3
22	390461		SHIM-.020	AR	52	16820		CAPSCREW-1/2 UNF X 1 G5	3
22	390462		SHIM-.062	AR	53	156184		WASHER-THRUST	3
23	16748		FITTING-LUBE	1	54	167457		GEAR-SUN	1
23	16049		FITTING-LUBE	1	55	34507		SNAP RING	1
24	156200		SEAL-OIL	1	56	183543		COUPLING	1
25	44326		BEARING-BALL	1	57	161246		PLATE	1
26	44307		BEARING-BALL	1	58	161244		SHIM-.005	AR
27	12921		SNAP RING	1	58	161245		SHIM-.020	AR
28	156205		SEAL-OIL	1	59	178144		CARRIER-BEARING	1
29	213274		SHAFT	1	60	213500		COUPLING	1
30	37065		SNAP RING	1	60	392189		COUPLING	1
31	156206		CAPSCREW-1/2 UNF X 2 1/4	4	61	213611		CAPSCREW-1/2 UNC X 1 1/4	4
32	156192		SNAP RING	1	62	18588		CAPSCREW-1/2 UNC X 1 1/2 G5	12
33	128528		BOLT-5/8 UNC X 1 1/4 G8	16	62	15158		LOCKWASHER-1/2	12
34	37562		CAPSCREW-1/2 UNF X 1 1/4 G5	3					
35	156186		PLATE	3					
36	156185		PLATE-LOCK	3					
37	180397		PIN-GROOVE	3					
38	15318		PLUG	1					

BRAKE AND LINKAGE

PARKING BRAKE AND LINKAGE2C03



PARKING BRAKE AND LINKAGE



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	204773	LEVER-PARKING BRAKE	1	29	16782	CAPSCREW-5/16 UNC X 2 1/4 G5	4
1	210614	LEVER-HANDLE	1	30	156242	PLATE-SUPPORT, LH	1
2	204966	KNOB	1	31	16080	CAPSCREW-3/8 UNC X 3/4	2
3	.....	PIN-ROLL	1	32	163739	CAPSCREW-SPECIAL	12
4	.....	WASHER-SPRING	1	33	15225	COTTER-1/8 X 1	1
5	.....	O-RING	1	34	21110	NUT-CASTLE	1
6	.....	SCREW-ADJUSTING	1	35	156245	SPACER	1
7	54871	PIN	1	36	191140	BRACE	1
8	54863	LINK	1	36	191341	DRUM-BRAKE	1
9	77584	BRACKET-MOUNTING	2	37	163734	PLATE-BACKING	1
10	119878	SPACER	1	38	172264	LEVER-OPERATING	1
11	127876	CLAMP	1	39	191345	BRAKE SHOE AND LINING	2
12	127875	SPACER	2	40	77717	SPRING-RETURN	1
13	127874	SPACER	2	41	194190	KIT-PAWL	2
14	54861	PIN	1	42	164199	ROLLER	1
15	18515	WASHER	1	43	142	PIN-ROD END	1
16	15213	COTTER-3/32 X 1	1	44	15212	COTTER-3/32 X 3/4	1
17	54872	RIVET	1	45	141	ROD END	1
18	54864	BRACKET-PIVOT	2	46	15026	NUT-JAM, 3/8 UNF	1
19	54865	SPACER	1	47	213276	HUB	1
20	54873	SPACER	2	47	390721	HUB	1
21	210615	SPACER	2	47	390697	SEAL	1
22	210616	FITTING	1	47	391326	WASHER	1
23	210617	SPACER	1	48	139773	SWITCH-MICRO	1
24	54860	TUBE-ADJUSTING	1	49	165786	COVER	1
25	156243	PLATE-SUPPORT, RH	1	50	16743	LOCKWASHER-#6	2
26	15055	NUT-5/16 UNC	4	51	12425	NUT-#6 UNF	2
27	15155	LOCKWASHER-5/16	4	52	15155	LOCKWASHER-3/16	2
28	191342	CABLE-PARKING BRAKE	1	53	17484	CAPSCREW-5/16 UNF X 3/8 G5	2
28	128408	CLAMP	1	54	18815	SCREW-#6 UNF X 1 1/4	2
28	15155	LOCKWASHER-5/16	1				
28	15055	NUT-5/16 UNC	1				

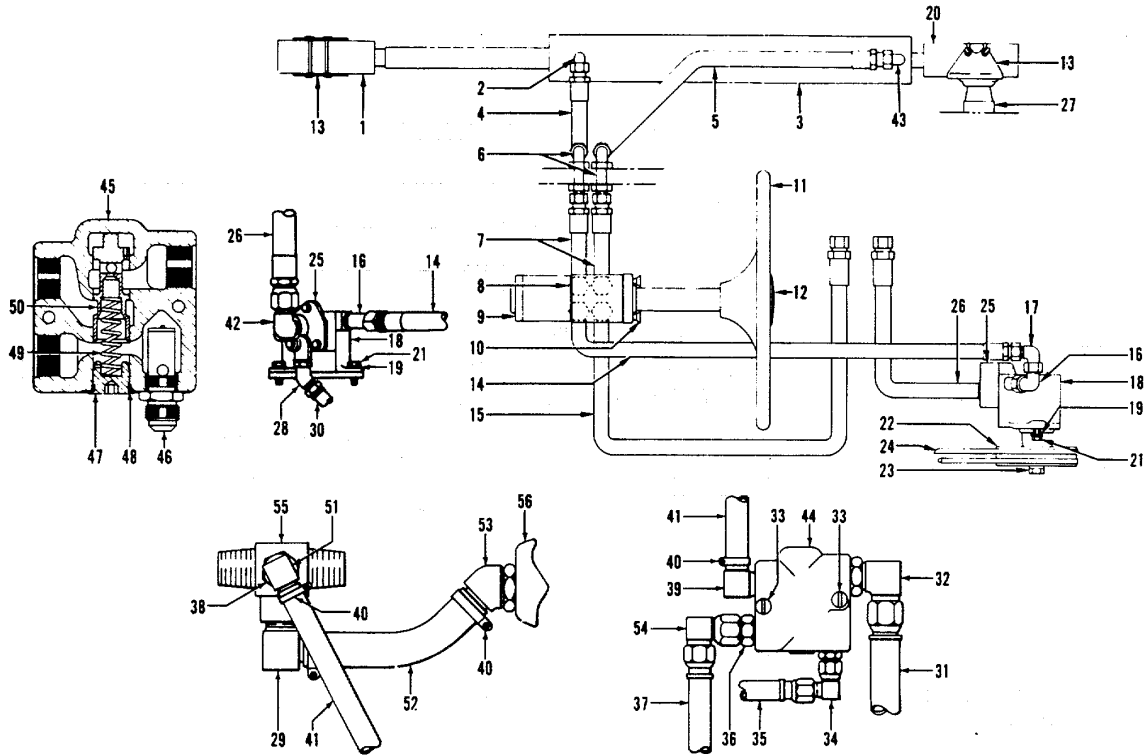
~~USED ONLY ON CS40A~~

STEERING SYSTEM

STEERING CONTROL	2D04
STEERING CYLINDER AND SOCKETS ..	2D07
STEERING PUMP-0A3 AND 4 236 DL	2D0L
STEERING PUMP-3-53 DSL	2D07
STEERING SYSTEM	2D03
STEERING TRUNNION AND DRUMS	2D05



2D03
STEERING SYSTEM



KEY

- ~~A - FOR GAS ENGINE.~~
- ~~B - FOR 1-236 DIESEL ENGINE.~~
- C - FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	3
1	.....	SOCKET-ROD END, SEE 2007			
1	.....	REF. 17	1	1	1
2	17306	ELBOW	1	1	1
3	.....	CYLINDER-STEERING, SEE 2007			
3	.....	REF. 1	1	1	1
4	96522	HOSE-HYDRAULIC	1	1	1
5	73470	HOSE-HYDRAULIC	1	1	1
6	16458	ELBOW	2	2	2
6	14761	NUT	1	1	1
7	155164	HOSE-HYDRAULIC	2	2	2
8	16541	CONNECTOR	4	4	4
8	16484	O-RING	1	1	1
9	.....	CONTROL-STEERING, 2004	1	1	1
10	139140	CAPSCREW-3/8 UNC X 1 1/2	2	2	2
11	155387	WHEEL-STEERING	1	1	1
12	155459	PLUG-BUTTON	1	1	1
13	141916	COVER-DUST	2	2	2
14	76230	HOSE TO TEE	1	1	1
14	155464	HOSE TO STEERING CONTROL	1	1	1
15	158406	HOSE-TO OIL COOLER	1	1	1
16	163723	ELBOW SPECIAL	1	1	1
16	14586	LOCKNUT	1	1	1
16	14484	O-RING	1	1	1
17	16989	ELBOW	1	1	1
18	.....	PUMP STEERING, 2006	1	1	1
19	15134	WASHER 3/8	2	2	2
19	15924	LOCKWASHER-1/2	..	..	4
19	15156	LOCKWASHER-3/8	2	2	2

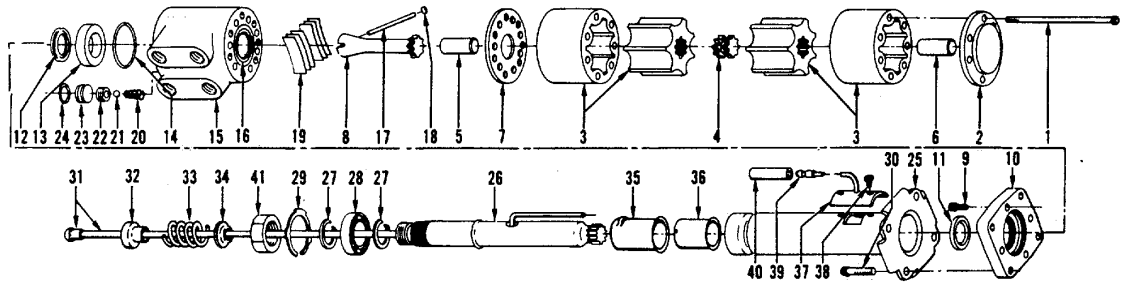
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	3
20	.....	SOCKET-ANCHOR END, 2007			
20	.....	REF. 17			1
21	16806	CAPSCREW-3/8 UNC X 1 GF	..	..	..
21	16834	CAPSCREW-3/8 UNC X 1 G5	..	..	..
21	18549	CAPSCREW-3/8 UNC X 5 G5	..	..	2
22	156940	SHEAVE	..	..	..
23	15135	WASHER-1/2	..	..	..
23	17408	LOCKNUT-1/2 UNF	..	..	..
24	.....	V-BELT SET, 1806 REF. 72	..	..	..
25	169948	MANIFOLD-PUMP INLET	..	..	..
25	169947	MANIFOLD-PUMP INLET	..	..	..
25	179805	GASKET-MANIFOLD	..	..	..
25	12949	CAPSCREW-1/4 UNC X 3/4	..	..	..
25	164368	WASHER	..	..	..
25	18425	LOCKWASHER-1/4	..	..	2
26	177455	HOSE-TO FILTER	..	..	..
26	177456	HOSE-TO FILTER	..	..	..
26	177458	CONNECTOR	..	..	..
26	16486	O-RING	..	..	..
26	176452	CLAMP	..	..	..
27	.....	STUD-BALL, 2005 REF. 9			1
28	131461	ELBOW 15 DEGREE	..	..	..
28	14585	LOCKNUT	..	..	..
28	16489	O-RING	..	..	..
29	110177	NIPPLE-FILTER END	..	..	1
30	76230	HOSE-TO HYDRAULIC TANK	..	..	..
30	155069	CLAMP	..	..	..

STEERING SYSTEM

REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.			REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.				
		1	2	3	4	A	B	C			1	2	3	4	A	B	C		
31	181366	HOSE-FROM STEERING PUMP						1	42	16485	O-RING								
32	16561	ELBOW						2	43	15306	PLUG						1		
32	16588	LOCKNUT						1	43	175873	ELBOW						1		
32	16486	O-RING						1	44	169128	VALVE-FLOW DIVIDER						1		
33	18347	SCREW-1/4 UNC X 2 1/2						2	45	.....	BODY						1	
33	15154	LOCKWASHER-1/4						2	46	161878	VALVE-RELIEF						1		
33	15054	NUT-1/4 UNC						2	47	191873	CAP-END						1		
34	16989	ELBOW						1	48	161874	O-RING						1		
35	89440	HOSE-TO TEE						1	49	187436	SPRING						1		
36	16542	CONNECTOR						1	50	.....	PISTON						1	
36	16587	LOCKNUT						1	51	16165	ELBOW-HOSE TO TEE						1		
36	16485	O-RING						1	52	157532	HOSE						1		
37	126121	HOSE-TO STEERING CONTROL						1	53	141908	ELBOW-45 DEGREE						1		
38	15343	BUSHING						1	53	16487	O-RING						1		
39	17775	NIPPLE						1	54	16882	ELBOW						1		
39	16588	LOCKNUT						1	55	.....	YEE-SPECIAL, SEE 2A05						1	
39	16486	O-RING						1	55	.....	REF. 32						1	
40	127045	CLAMP						4	56	.....	PUMP-STEERING, 2D07						1	
41	169130	HOSE-TO TEE						1											
42	177459	ELBOW																	
42	16587	LOCKNUT																	

FOR TRUCKS WITHOUT HORN

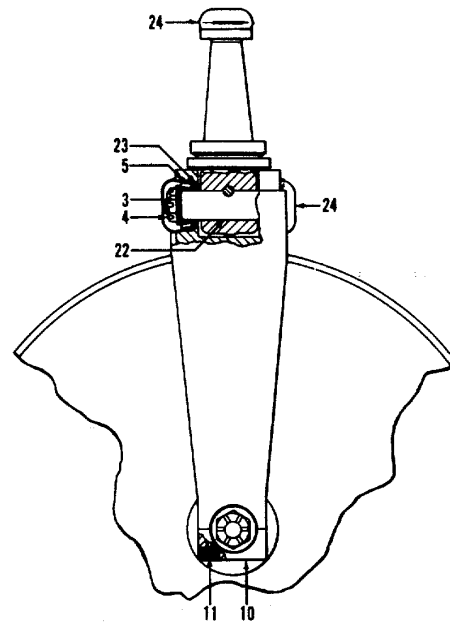
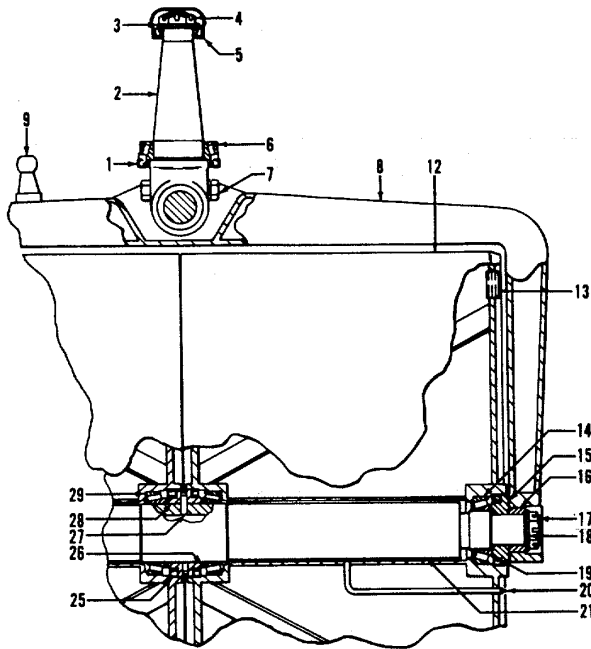
STEERING CONTROL



REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.		
		1	2	3	4				1	2	3	4			
	163616	CONTROL-STEERING				1	21	189586	BALL-STEEL, 1/4				1		
	241103	CONTROL				1	22	158843	SEAT-CHECK				1		
1	158826	CAPSCREW				7	23	158844	PLUG-SEAL				1		
2	158827	CAP-END				1	24	*158845	O-RING				1		
3	158828	GEAR SFT				2	25	165316	COLUMN-STEERING				1		
4	158829	SPLINE				1	25	165317	TUBE AND FLANGE				1		
5	158830	SPACER				1	26	165318	SHAFT				1		
6	138907	SPACER				1	27	159764	SNAP RING				2		
7	158831	PLATE				1	28	159703	BEARING				1		
8	158832	DRIVE				1	29	138145	RING-RETAINING				1		
9	138145	CAPSCREW				4	30	159812	CAPSCREW-3/8 UNC X 3/4				2		
10	158833	CAP-HOUSING				1	31	165201	TERMINAL AND WIRE				1		
11	158834	SEAL-OTL				1	32	194851	INSULATOR-CONTACT				1		
12	*158835	SEAL-QUAD RING				1	33	165203	SPRING-CONTACT				1		
13	158836	BUSHING-CAP LOCATER				1	34	165204	WASHER-CONTACT				1		
13	198028	RACE-BEARING				2	35	194847	RING-CONTACT				1		
13	198029	LOCATOR-BEARING				1	36	194846	INSULATOR-CONTACT RING				1		
13	209627	NEEDLE BEARING-THRUST				1	37	241102	KIT-HORN BRUSH				1		
14	*158837	O-RING				1	38	16606	SCREW				2		
15	.....	HOUSING-VALVE				1	39	165314	TERMINAL-WIRE				1	
16	.....	SLEEVE AND SPOOL				1	40	165313	CONNECTOR				1	
17	158839	PIN-CENTERING				1	41	161865	NUT-13/16 NEF				1		
18	158846	PIN-DISC				2									
19	158840	SPRING-CENTERING				6									
20	158841	SPRING				1									

*INCLUDED IN SEAL KIT 158847.
 #INCLUDED IN CONTROL PARTS KIT 189585.

STEERING TRUNNION AND DRUMS

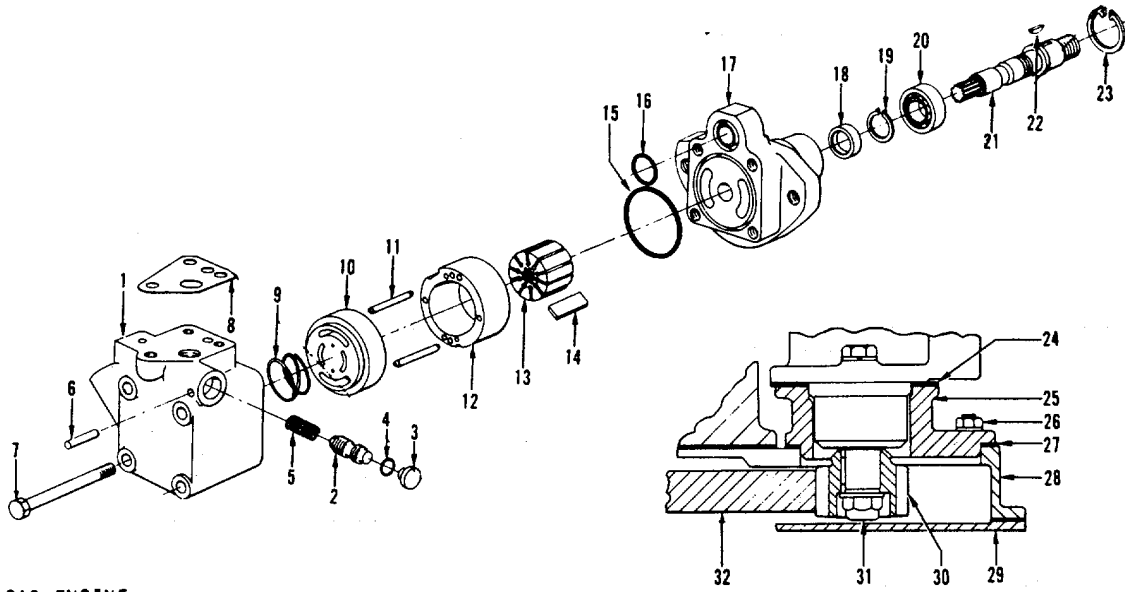


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	156220	SEAL-OIL	1
2	191400	PIN-KING	1
2	391352	PIN-KING	1
3	192427	WASHER	5
4	193006	NUT-JAM	3
5	15250	COTTER-3/16 X 3	3
5	230324	CUP-BEARING	3
5	230325	CONE-BEARING	3
6	230389	CUP-BEARING	1
6	230390	CONE-BEARING	1
7	18667	CAPSCREW-1/8 UNC X 2 1/4	2
7	15166	WASHER-1	2
8	390084	YOKES-STEERING	1
9	390673	YOKES-STEERING	1
9	390122	STUD-BALL	1
10	.....	CAP	2
11	187238	CAPSCREW-5/8 UNF X 2 1/2	4
12	390088	DRUM-STEERING	2
12	390679	DRUM-STEERING	2
12	15316	PLUG	2
13	15320	PLUG	2
14	390104	CONE-BEARING	2
14	390105	CUP-BEARING	2
15	390107	SPACER	2
16	390108	SPACER	2

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
17	193006	NUT-JAM	2
17	15250	COTTER-3/16 X 3	2
18	191412	WASHER	2
19	390106	SEAL-OIL	2
20	16007	FITTING-LUBE	2
21	390096	SHAFT-AXLE	1
21	390077	SHAFT-AXLE	1
22	209090	PIN	1
22	391351	PIN	1
23	156223	SEAL-OIL	2
24	156224	CAP	3
25	44525	SEAL-OIL	2
26	390101	SHIM	AR
26	390102	SHIM	AR
26	390103	SHIM	AR
27	19960	PIN-1/2 X 1 3/4	2
28	390099	SPACER	1
29	97623	CONE-BEARING	2
29	97626	CUP-BEARING	2

~~*FIRST USED ON S/N 0090-3155-C-11160-1510~~
~~*FIRST USED ON S/N 0090-3154-C-11160-1509~~
~~*FIRST USED ON SERIAL NUMBER 0090-3001~~
~~SUCCESSOR ON C340A ONLY.~~

2D06
STEERING PUMP



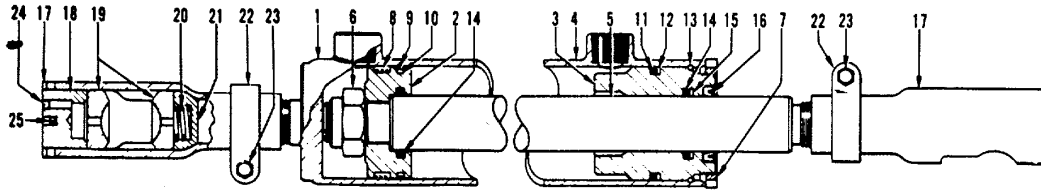
KEY
A-FOR GAS ENGINE.
B-FOR 4-236 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			A	B
	191756	PUMP-STEERING	1	..
	191757	PUMP-STEERING	..	1
1	192327	COVER	1	1
2	147990	VALVE-CONTROL	1	1
3	192326	PLUG	1	1
4	* 176037	O-RING	1	1
5	236024	SPRING	1	1
6	236026	PIN	1	1
7	133820	CAPSCREW	4	4
8	* 119963	GASKET	1	1
9	96952	SPRING	1	..
9	155056	SPRING	..	1
10	133816	PLATE-PRESSURE	1	1
11	54767	PIN	2	..
11	236011	PIN	..	2
12	159064	KIT-CARTRIDGE	1	..
12	133817	KIT-CARTRIDGE	..	1
12	192319	RING	1	..
12	164525	RING	..	1
13	147528	ROTOR	1	..
13	164526	ROTOR	..	1
14	147527	KIT-VANE, 10 VANES	1	..
14	236012	KIT-VANE	..	1
15	* 176038	O-RING	1	1
16	* 176039	Ø-RING	1	1
17	.....	BODY	1	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			A	B
18	* 176040	SEAL-OIL	1	1
19	169009	SNAP RING	1	1
20	97847	BEARING	1	1
21	97846	SHAFT	1	1
22	236018	KEY	1	1
23	97850	SNAP RING	1	1
24	982161	GASKET-STEERING PUMP TO DRIVE ADAPTER	..	1
24	168889	ADAPTER-STEERING PUMP	..	1
26	983271	STUD-ADAPTER TO TIMING GEAR HOUSING	..	4
26	15005	NUT-5/16 UNF	..	4
26	15155	WASHER-SPRING, 5/16	..	4
27	168890	GASKET-ADAPTER TO TIMING GEAR HOUSING	..	1
28	.....	HOUSING-TIMING GEAR, 1C03	..	1
28	.....	REF. 30	..	1
29	.....	COVER-TIMING GEAR HOUSING, 1C03 REF. 2	..	1
29	.....	REF. 2	..	1
30	168887	GEAR-STEERING PUMP	..	1
31	983331	NUT-STEERING PUMP RETAINING	..	1
31	992633	WASHER	..	1
32	.....	GEAR-IDLER, 1C03 REF. 26	..	1

*INCLUDED IN SEAL KIT 133821.

STEERING CYLINDER AND SOCKETS



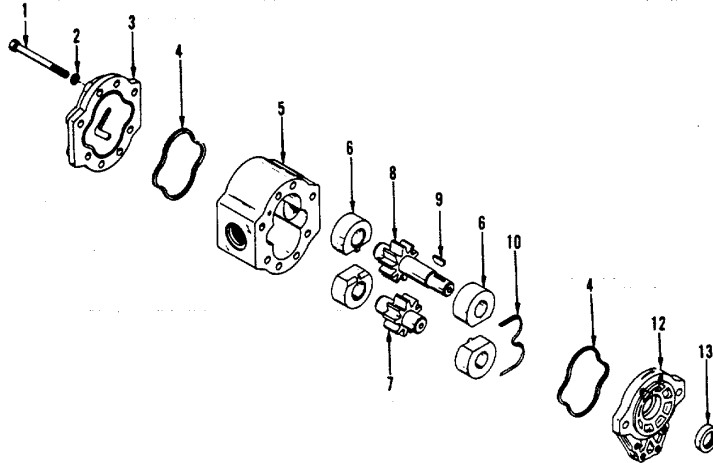
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	157079	STEERING CYLINDER	1
1	390663	STEERING CYLINDER	1
2	162065	PISTON	1
3	162066	BEARING	1
4	162067	BARREL	1
5	162068	ROD-PISTON	1
5	223640	ROD-PISTON	1
6	162069	LOCKNUT	1
7	162070	NUT-BEARING	1
8	* 162073	RING-BEARING	1
9	* 162076	RING-PISTON	1
10	* 162074	O-RING	1
11	* 57664	O-RING	1
12	* 162075	RING-BACK UP	1
13	* 165615	RING-LOCK	1
14	* 79974	O-RING	2
15	* 155105	RING-BACK UP	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
16	* 162072	SEAL-WIPER	1
17	* 390124	SOCKET	1
17	157823	SOCKET-BALL	1
18	133535	PLUG-ADJUSTMENT	1
20	132546	SPRING	1
21	132547	SEAT-SPRING	1
22	14122 A	CLAMP	1
23	15517	CAPSCREW-1/2 UNF X 2-1/2	1
23	15158	LOCKWASHER-1/2	1
23	15008	NUT-1/2 UNF	1
24	15483	PLUG	2
25	15284	COTTER-1/4 X 3 1/2	2

*INCLUDED IN SEAL KIT 223641.
~~*FIRST USED ON SERIAL NUMBER 8096 3001~~
~~*FIRST USED ON SERIAL NO. 8096 3105.~~

STEERING PUMP

FOR 3-53 DIESEL ENGINE



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
	169150	PUMP-STEERING	1
1	* 129446	CAPSCREW	6
2	* 129447	WASHER	6
3	170078	COVER-REAR	1
4	□ 168941	GASKET-SEAL	2
5	.....	BODY	1
6	* 168947	BEARING	4
7	* 984513	GEAR-DRIVEN	1
8	*	GEAR-DRIVE	1
9	* 206	KEY	1

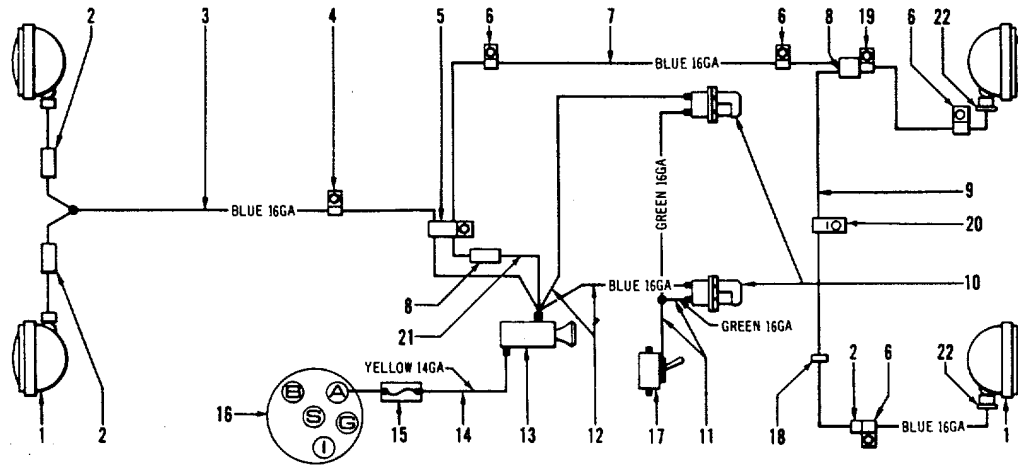
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
10	□ 155806	GASKET-SEAL	1
12	158908	COVER-FRONT	1
13	□ 235933	SEAL-SHAFT	1
	129445	KIT-MAJOR	1
	158913	KIT-MINOR	1
	129444	KIT-GEAR	1

*INCLUDED IN MAJOR KIT.
 □INCLUDED IN MINOR KIT.
 *INCLUDED IN GEAR KIT.

OPTIONAL EQUIPMENT

LIGHTING SYSTEM 2E03

2E03
LIGHTING SYSTEM



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4				1 2 3 4	
	159563	LIGHTING GROUP	1	10	182677	BULB-12 VOLT.	1
1	139646	HEAD LIGHT	4	10	164301	LENS	1
1	156776	ELEMENT-SEALED BEAM	1	10	164302	BASE	1
1	149519	RETAINER-ELEMENT	1	11	159570	WIRE-PANEL LIGHT GROUND	1
1	156777	SHELL	1	12	159569	WIRE-SWITCH TO PANEL LIGHT	1
1	149513	BUSHING-PIVOT	1	13	62886	SWITCH-LIGHT	1
1	149514	WASHER	1	14	60416 A	WIRE-FUSED	1
1	149516	NUT	1	15	21778	FUSE-20 AMP.	1
2	42958	CONNECTOR-FEMALE	3	16	.....	SWITCH-IGNITION AND START, 1F03	
3	159566	WIRE-FRONT LIGHTS	1	16	.....	REF. 29 AND 1F05 REF. 20	1
4	124359	CLAMP	1	17	....	SWITCH-TOGGLE, 1F03 REF. 26	
5	132131	CLAMP	1	17	.....	AND 1F05 REF. 16	1
6	132131	CLAMP	4	18	107173	GROMMET	1
6	15913	LOCKWASHER-5/16	4	19	124359	CLAMP	1
6	15055	NUT-5/16 UNC	4	20	124359	CLAMP	1
7	159567	WIRE-REAR LIGHTS	1	20	15913	LOCKWASHER-5/16	1
8	73510	CONNECTOR-FEMALE, 2 TO 1 WIRE	2	20	15055	NUT-5/16 UNC	1
9	159568	WIRE-REAR LIGHT TO CONNECTOR	1	21	166197	WIRE-LIGHT SWITCH TO CONNECTOR	1
10	159565	LIGHT-PANEL	2	22	16637	WASHER-0.562	2

NUMERICAL INDEX

125	-	30368	G03
30375	-	134936	G04
134938	-	58447	G05
158452	-	164134	G06
164141-	-	172885	G07
173218 -	-	196285	G08
196431-	-	243606	G09
243608	-	984275	G10
984326	-	L199287	G11



NUMERICAL INDEX

PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
158452	1A05	3	160374	1806	25	161405	1813	17	161531	1E01	24	162688	1F04	11
158676	1807	12	160376	1806	70	161406	1813	9	161532	1814	13	162726	1F04	14
158677	1807	7	160378	1806	70	161407	1813	10	161533	1814	14	162728	1F04	13
158678	1807	10	160379	1806	70	161409	1813	26	161535	1E01	37	162730	1F04	13
158682	1807	8	160381	1804	66	161411	1813	39	161536	1E01	39	162731	1F04	17
158760	1814	17	160382	1804	67	161412	1813	43	161537	1E01	41	162732	1F04	20
158826	2004	1	160445	1809	1	161416	1813	30	161539	1D12	3	162766	1804	24
158827	2004	2	160600	1803	10	161418	1813	1	161540	1D12	8	162768	1804	30
158828	2004	3	160601	1803	10	161419	1813	2	161543	1D12	16	162772	1806	3
158829	2004	4	160602	1803	10	161420	1813	4	161544	1D12	17	162773	1806	13
158830	2004	5	160603	1803	9	161422	1813	45	161545	1D12	18	162774	1806	71
158831	2004	7	160604	1803	9	161423	1813	44	161546	1D12	19	162775	1804	67
158832	2004	8	160622	1E03	7	161424	1C02	15	161548	1D12	33	163202	1803	3
158833	2004	10	160650	1803	9	161425	1C02	17	161550	1D12	34	163256	1E01	2
158834	2004	11	160773	1D03	5	161429	1C02	17	161551	1D12	36	163257	1E01	2
158835	2004	12	161094	1D04	5	161430	1C02	17	161552	1D12	31	163258	1E01	7
158836	2004	13	161145	1809	17	161431	1C02	17	161553	1D12	29	163259	1E01	1
158837	2004	14	161146	2802	1	161440	1C02	7	161598	1D08	47	163260	1E01	16
158839	2004	17	161147	2802	17	161446	1C01	1	161606	1D08	33	163262	1E01	11
158840	2004	19	161148	2802	13	161448	1C01	15	161607	1D08	34	163263	1E01	12
158841	2004	20	161149	2802	14	161449	1C01	6	161613	1D07	11	163264	1E01	13
158843	2004	22	161150	2802	11	161451	1C01	16	161648	1C02	9	163265	1E01	
158844	2004	23	161151	2802	16	161452	1C01	21	161665	1D13	2	163266	1E01	5
158845	2004	24	161152	2802	2	161453	1C01	22	161666	1D13	17	163267	1E01	1
158846	2004	18	161153	2802	15	161454	1C01	22	161670	1D13	27	163269	1E01	17
158847	2004		161154	2802	10	161455	1C01	20	161671	1D13	30	163270	1E01	14
158908	2007	12	161155	2802	12	161456	1C01	12	161675	1D14	80	163616	2D04	
158913	2007		161156	2802	6	161457	1C01	10	161678	1D14	69	163725	2D03	16
159064	2D06	12	161158	2802	7	161459	1814	12	161680	1D14	66	163730	1D04	15
159105	1D12	2	161159	2802	8	161460	1814	11	161682	1D14	73	163734	2C03	37
159563	2E03		161160	2802	5	161461	1814	10	161683	1D14	73	163739	2C03	32
159565	2E03	10	161161	2802	4	161462	1814	7	161865	2D04	41	163762	1F03	28
159566	2E03	3	161195	1806	31	161463	1C03	18	161874	2D04	48	163910	1F08	6
159567	2E03	7	161200	1806	24	161489	1C03	7	161878	2D04	46	164005	1F04	4
159568	2E03	9	161201	1806	22	161491	1C04	36	162065	2D07	2	164015	1806	48
159569	2E03	12	161244	2806	58	161492	1C04	35	162066	2D07	3	164017	1803	8
159570	2E03	11	161245	2806	58	161493	1C04	1	162067	2D07	4	164021	1803	2
159701	2004	29	161246	2806	57	161494	1C04	34	162068	2D07	5	164022	1803	5
159703	2004	28	161252	1D07	19	161495	1C04	30	162069	2D07	6	164023	1803	4
159708	1804	54	161291	1C02	19	161496	1C04	29	162070	2D07	7	164025	1808	1
159764	2004	27	161292	1C02	18	161500	1C04	7	162072	2D07	16	164026	1808	12
159812	2004	30	161296	1C02	19	161501	1C04	8	162073	2D07	8	164027	1804	35
159942	1806	60	161297	1C02	18	161502	1C04	9	162074	2D07	10	164029	1804	37
159944	1D03	17	161381	1812	1	161503	1C04	10	162075	2D07	12	164030	1804	37
159945	1807	13	161382	1812	2	161504	1C04	6	162076	2D07	9	164031	1804	
159973	1803	4	161383	1812	11	161505	1C04	14	162278	1C02	14	164034	1804	45
159975	1803	5	161385	1812	21	161506	1C04	14	162532	1D13	5	164038	1806	34
159976	1803	6	161388	1812	9	161509	1C04	17	162533	1D13	19	164043	1806	64
159977	1803	7	161389	1812	10	161513	1C05	25	162534	1D13	26	164050	1806	39
159979	1803	9	161390	1812	8	161514	1C05	24	162535	1D13	28	164056	1806	1
159980	1803	10	161395	1812	39	161515	1C05	24	162536	1D13	51	164065	1A05	12
159981	1803	9	161396	1812	46	161517	1810	21	162537	1D14	63	164083	1F09	34
159982	1803	10	161397	1813	14	161518	1810	16	162538	1D14	63	164084	1804	25
159992	1804	22	161398	1813	15	161519	1810	3	162539	1D14	81	164085	1804	25
159993	1804	25	161399	1D12	5	161520	1810	22	162540	1D14	81	164086	1804	25
160248	1804	25	161400	1813	17	161522	1810	18	162541	1D14	58	164087	1804	48
160250	1806	32	161401	1813	17	161524	1810	6	162542	1D14	65	164091	1806	65
160251	1804	34	161402	1813	17	161527	1809	18	162543	1D14	78	164097	1806	66
160252	1804	47	161403	1813	17	161529	1E01		162544	1D13	36	164128	2A06	18
160372	1806	64	161404	1813	17	161530	1E01	22	162545	1D13	45	164134	1809	5

NUMERICAL INDEX

PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
164141	1811	5	165877	1E04	5	166828	1F07	34	168897	1D12	9	169873	1D11	9
164144	1811	10	165878	1E04	6	166829	1F07	34	168898	1F09	40	169938	1804	16
164151	1811	19	165879	1E04	8	166830	1F07	20	168899	1F09	35	169939	1804	16
164152	1F03	36	165880	1E04	9	166831	1F07	35	168901	1B12		169940	1804	16
164154	1811	20	165881	1E04	10	166832	1F07	35	168904	1C04	4	169941	1804	31
164156	1811	16	165882	1E04	11	166845	1F07	24	168941	2D07	4	169942	1806	52
164186	1D03	22	165888	1E04	18	166857	1B06	41	168947	2D07	6	169943	1804	26
164187	1D03	21	165889	1E04	25	167005	1F07	9	169009	2D06	19	169944	1806	19
164188	1D03	28	165890	1E04	26	167009	1F07	13	169092	1D05	2	169947	2D03	25
164189	1803	2	165892	1E04	28	167010	1F08	60	169095	1D05	4	169948	2D03	25
164199	2C03	42	165894	1E04	30	167051	1E04	44	169096	1D05	8	169949	1806	64
164221	1D07	21	165895	1E04	31	167054	1C04	16	169098	1D05	6	169953	1804	
164222	1D04	9	165897	1E04	35	167055	1C04	19	169099	1D05	9	170078	2D07	3
164227	2A06	40	165898	1E04	36	167056	1C04	18	169100	1D05	5	170079	1C02	16
164235	1B12		165899	1E04	37	167090	1F04	23	169105	1B09	1	170080	1C02	16
164280	1C07	4	165900	1E04	39	167457	2B06	54	169107	1B09	5	170081	1C02	16
164281	1811	7	165904	1E04	46	167458	2B06	11	169109	1C08	10	170082	1C02	16
164293	1F05	21	165906	1E04	48	167459	2B06	13	169112	1C06	6	170306	1D05	13
164301	2E03	10	165910	1E04	32	167486	1C01	9	169114	1C08	8	170551	1A06	30
164302	2E03	10	165911	1E04	40	167492	1C03	6	169115	1C08	7	170607	1F07	11
164359	1B13	27	165915	1E04	23	167506	1E01	18	169116	1C08	1	170682	1D08	5
164363	1D03	13	165918	1E04	20	167532	1E04	47	169118	1E03	20	170686	1A05	40
164368	2D03	25	165920	1D03	25	167549	1E01	20	169119	1E03	6	170687	1D11	12
164399	1804	59	165921	1E04	34	167657	1D03	20	169120	1E03	11	170688	1D11	13
164400	1D07	18	165922	1E04	24	168068	1C05	25	169122	1E03	14	170689	1D11	14
164473	1D07	12	165924	1E04	7	168069	1C05	12	169128	2D04	44	170690	1D11	15
164488	1F04	53	165925	1E04	42	168390	1E02	12	169130	2D04	41	170693	1D11	16
164507	1F07	12	166021	1F05	9	168421	1F03	26	169134	1D07	12	170694	1D11	17
164508	1F07	9	166118	1D03	24	168694	1B12	54	169135	1D08	23	170695	1D11	18
164510	1F07	13	166119	1D03	23	168696	1B10	17	169136	1D08	31	170750	1806	54
164524	1A05	5	166169	1F08	6	168697	1B13	18	169140	1D07	11	170805	1F03	31
164525	2D06	12	166170	1F08	12	168698	1B13	52	169144	2A06	18	171226	1806	38
164526	2D06	13	166171	1F08	8	168699	1C02	5	169150	2D07		171928	1D07	1
164746	1804	39	166172	1F08	10	168700	1C02	4	169152	1F05	9	171974	2A06	84
164747	1804	39	166173	1F08	9	168701	1C02	3	169155	1F05	42	172007	1B13	41
164758	1F08	25	166174	1F08	7	168702	1C02	11	169156	1F05	38	172010	1B14	11
164766	1F08	13	166175	1F08	11	168703	1C02	20	169240	1E01	8	172115	1D03	25
164767	1F08	22	166195	1F05	42	168704	1C03	26	169241	1E01	6	172116	1E04	16
165064	2A12	5	166196	1F05	38	168705	1C03	30	169299	1D08	1	172117	1E04	17
165201	2D04	31	166197	2E03	21	168706	1C03	31	169307	1D08	8	172118	1E04	27
165203	2D04	33	166216	1F04	1	168810	1A08		169308	1F07	41	172119	1E04	29
165204	2D04	34	166296	1A05	39	168811	1A08		169391	1D13	9	172120	1E04	33
165278	1C04	40	166336	1F08	57	168812	2A06	38	169428	1D05	2	172121	1E04	1
165282	1809	1	166337	1F08	56	168830	1C07	10	169446	1E03	18	172122	1E04	12
165287	1D04	1	166479	1F08	58	168835	1C07	5	169693	1A07	13	172123	1E04	13
165295	1D11	28	166538	1F07	6	168836	1C07	3	169694	1A06	1	172124	1E04	15
165298	1D04	2	166541	1F08	50	168838	1C07	19	169695	1A06	10	172125	1E04	41
165308	1D08	23	166557	1F07	29	168841	1C07	20	169697	1A06	20	172126	1E04	45
165313	2D04	40	166558	1F07	40	168842	1B07	22	169698	1A06	53	172127	1E04	49
165314	2D04	39	166566	1F07	25	168843	1D05	10	169699	1A06	21	172128	1D03	25
165316	2D04	25	166567	1F07	40	168846	1D05	15	169708	1A07	12	172129	1E04	19
165317	2D04	25	166572	1F07	39	168887	2D06	30	169718	1B03	1	172130	1E04	43
165318	2D04	26	166578	1F07	28	168889	2D06	25	169719	1B03	1	172131	1E04	38
165382	1F07		166643	1F07	36	168890	2D06	27	169758	1F03	35	172264	2C03	38
165615	2D07	13	166645	1F07	37	168891	1C03	2	169759	1F03	32	172699	1A08	5
165786	2C03	49	166655	1F07	27	168892	1C03	1	169776	1F04	41	172812	1F08	50
165804	1806	1	166700	2A06	31	168893	1D13		169779	1F03	34	172833	1E03	8
165874	1E04	2	166702	2A06	34	168894	1D12	3	169787	2A06	11	172851	1D11	21
165875	1E04	3	166824	1F07	21	168895	1F09	39	169827	1B09	18	172852	1D11	25
165876	1E04	4	166825	1F07	5	168896	1C02	11	169828	1B12	39	172885	1806	64

NUMERICAL INDEX

PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
173218	1F07	19	180257	1C06	6	184841	1A08	2	190580	2B03	6	190646	2B04	72
173247	1F03	22	180313	1A05		184842	1A08	2	190581	2B03	7	190647	2A12	41
173255	1B12	13	180397	2B06	37	185699	1B04	33	190582	2B03	8	190648	2A12	44
173307	1B11	6	180441	2A06	60	185902	2B03		190583	2A12	10	190649	2B04	75
173897	1B13	51	180442	2A06	47	185903	2B04	88	190584	2B03	10	190650	2B04	76
173910	1C01	26	180444	2A06	46	185917	2A11	44	190585	2A12	11	190651	2B04	77
173994	1E01	29	180595	2A06	61	185918	2A11	39	190586	2A12	12	190652	2B04	79
174019	1D14		181077	1B04	57	185919	2A11	41	190587	2A12	13	190653	2B04	75
175321	1F03	4	181329	1D04	16	186155	1B09	8	190588	2B03	14	190654	2B04	81
175347	1D03	33	181366	2D04	31	186227	2A08	24	190589	2B03	15	190655	2B04	82
175825	1D13	11	181763	1D03	37	186228	2A08	35	190590	2B03	16	190658	2B04	85
175873	2D04	43	181770	1D03	4	186259	2A06	73	190591	2A12	16	190725	1D03	38
176037	2D06	4	181771	1D03	3	186260	2A06	81	190592	2B03	18	190726	1D03	31
176038	2D06	15	181774	1D11	26	186304	1F03	29	190593	2A12	18	190731	1F03	25
176039	2D06	16	181859	1A05	37	186305	1F03	29	190594	2A12	19	190735	1D03	32
176040	2D06	18	181898	1F03	27	186420	1B12	45	190595	2A12	20	191140	2C03	36
176451	2A06	71	182287	2A06	66	187157	1B14	1	190596	2B03	22	191194	1B09	17
176452	2D03	26	182288	2A06	65	187238	2D05	11	190597	2A12	22	191341	2C03	36
176454	1B04	59	182289	2A06	67	187282	2A08	30	190598	2B03	24	191342	2C03	28
176510	1B14	19	182290	2A06	64	187436	2D04	49	190599	2A12	24	191345	2C03	39
176511	1D12	27	182291	2A06	60	188426	1B03		190600	2B03	16	191409	2D05	2
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176538	1C01	16	182293	2A06	62	189280	1D08	48	190602	2A12	27	191414	2A06	32
176892	1F07	17	182483	2B08	56	189281	1D07	1	190603	2B03	28	191416	1A08	5
176893	1F07	14	182645	1D06	3	189282	1D08	42	190604	2B03	29	191421	1A08	6
177308	1D03	29	182677	2E03	10	189283	1D07	4	190605	2B03	30	191756	2D06	
177407	1D11	19	182943	1D13	12	189286	1A05	4	190606	2B03	31	191757	2D06	
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177456	2D03	26	183067	1B04	55	189288	1A05	4	190611	2B03	35	191873	2D04	47
177457	2A06	38	183075	1B06	67	189303	1A05	32	190612	2B03	36	192205	1C08	11
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177561	1B04	21	183543	2B06	56	189332	1F04	12	190616	2B03	35	192327	2D06	1
177562	1B04	23	183547	2B05	4	189333	1F04	10	190617	2B03	44	192335	1A07	27
177563	1B08	11	183569	1C05	18	189334	1F04	3	190618	2B03	41	192427	2D05	3
177564	1B04	41	183570	1C05	18	189335	1B04	37	190619	2B03	42	193006	2D05	4
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177568	1F04	45	183572	1C05	25	189586	2D04	21	190621	2B03	46	194393	2A12	
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177575	1C04	23	184055	2A12	37	189612	1B06	4	190624	2B03	49	194396	2A12	29
177576	1C04	25	184313	1A07	2	189613	1B06	4	190625	2A12	31	194397	2A12	30
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177989	1A05	22	184324	1A07	31	190003	2A08	32	190630	2B04	56	194851	2D04	32
177991	1A05	22	184325	1A07	33	190004	2A08	31	190633	2B04	59	194882	1A08	7
178144	2B06	59	184327	1A07	19	190047	1F09	30	190635	2B04	61	195033	2B02	3
178149	2B05	1	184331	1A06	39	190515	2A06	69	190636	2B04	62	195341	1B12	15
178215	1E01	4	184335	1A06	25	190516	2A06	75	190637	2B04	64	195342	1B12	16
179641	2B08	42	184337	1A06	25	190517	2A06	69	190638	2B04	65	195343	1B12	17
179644	2B08	45	184814	1A05	24	190519	1B09	13	190639	2B04	66	195344	1B12	18
179645	2B08	46	184818	1A05	26	190520	1B09	17	190640	2B04	67	195856	1C02	21
179646	2B08	48	184819	1A05	26	190573	2B03	1	190641	2A12		196154	1B12	
179647	2B08	49	184820	1F05	28	190575	2B04	86	190642	2B04	68	196281	1A07	33
179648	2B08	50	184824	1F03	15	190576	2B03	1	190643	2A12	39	196283	1A07	36
179667	2B08	57	184825	1F05	28	190577	2B03	4	190644	2A12	43	196284	1A07	35
179805	2D03	25	184837	1A08	2	190578	2B03	5	190645	2B04	70	196285	1A07	38

NUMERICAL INDEX

PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
196431	1A07	34	213626	2A06	1	219921	2A11	36	229895	1E02	1	235950	1F09	21
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197068	2A06	69	213628	2A06	1	219923	2A11	31	229897	1E02	3	236012	2D06	14
197549	1B10	20	213683	1B10		219924	2A11	35	229898	1E02	5	236018	2D06	22
197551	1B10	2	213684	1B03	1	219925	2A11	32	229899	1E02	8	236024	2D06	5
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197862	1A07	33	213686	1B04	14	219928	2A11	8	229932	1E02	20	236066	1F07	11
198028	2D04	13	213687	1B04	14	219929	2A11		230324	2D05	5	236068	1F07	10
198029	2D04	13	213689	1B04	41	219930	2A11	29	230325	2D05	5	236069	1F07	3
198214	2B05	4	213690	1B04	46	219931	2A11	28	230389	2D05	6	236070	1F07	4
198881	1B04	70	213692	1B06	4	219932	2A11	27	230390	2D05	6	236074	1F07	43
199398	1A07	20	213693	1B06	5	219933	2A11	26	230504	2A14	65	236075	1F07	44
199400	1A07	4	213694	1B06	5	219934	2A11	24	230505	2A14	66	236078	1F08	51
199401	1A07	26	213695	1B06	5	219936	2A11	22	230506	2A14	67	236081	1F08	53
199562	2A09	17	213696	1B06	5	219937	2A11	21	230507	2A14	68	236082	1F08	54
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204121	1A05	16	213889	2A09	27	219946	2A11	11	230516	2A14	43	242166	2B01	33
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205698	2A08	72	213898	2A09	30	219952	2A14	87	230521	2A14	37	243575	2B01	18
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209830	2D05	22	215007	2A09	14	221341	1A05	22	230524	2A14	96	243578	2B01	10
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210616	2C03	22	215011	2A09	7	221573	2B08	60	230528	2A13	34	243582	2B01	25
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213276	2C03	47	215043	2A06	78	223640	2D07	5	230538	2A14	50	243592	2B01	49
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213614	2A13		219911	2A11	2	229081	1B12	4	230545	2A14	41	243598	2B01	41
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213616	2A06	82	219913	2A11	3	229802	1B12	2	233155	1A05	8	243600	2A14	45
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213619	2A06	24	219916	2A11	6	229875	1C03	28	233163	1A05	17	243603	2B01	45
213620	2A06	35	219917	2A11	7	229879	1E01		234718	1D05	8	243604	2B01	43
213621	2A06	30	219918	2A11	9	229880	1E01	37	234719	1D05	8	243605	2B01	34
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NUMERICAL INDEX

PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
243608	2B01	39	267031	2A12	28	390512	1B08	1	391369	1B09	17	393970	2A08	2
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243611	2B01	36	390022	1A08	1	390677	2D05	21	391471	2A10	3	982143	1B12	45
243612	2B01	36	390052	1D08	59	390679	2D05	12	391486	1A08	10	982161	2D06	24
243613	2B01	36	390084	2D05	8	390681	1A06	38	391487	1A08	10	982197	1B14	17
243614	2B01	35	390088	2D05	12	390682	1A06	22	391488	1A08	10	982198	1B14	17
243616	2B01	29	390096	2D05	21	390683	1A06	8	391489	1A08	10	982211	1B12	12
243620	2B01	31	390099	2D05	28	390684	1A07	20	391490	1A08	10	982222	1C03	28
243621	2B01	24	390101	2D05	26	390686	1A06	38	391491	1A08	10	982226	1C03	24
243622	2B01	27	390102	2D05	26	390693	1A06	30	391492	1A08	10	982235	1E01	26
243623	2B01	23	390103	2D05	26	390697	2C03	47	391493	1A08	10	982302	1C04	12
243624	2B01	21	390104	2D05	14	390698	2B08	40	391494	1C06	2	982352	1D12	4
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245782	1C01	5	390106	2D05	19	390721	2C03	47	391497	1C06	5	983271	1C04	32
249291	1A07	40	390107	2D05	15	390722	1A05	1	391520	2C03	47	983283	1C04	43
249292	1A07	39	390108	2D05	16	390723	1A05	1	391569	1D10	2	983288	1B13	50
249466	1B12	10	390122	2D05	9	390786	1A08	11	391570	2A09	15	983331	2D06	31
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254050	2A11	13	390288	1B08	15	390791	1A08	11	391729	1D10	3	983553	1C03	23
254051	2A11	20	390325	1B09	4	390792	1A08	11	391734	1D06	1	983561	1C05	8
254052	2A11	23	390364	1B08	14	390793	1A08	11	391750	1F04	48	983563	1C05	5
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254056	2A11	33	390427	2B08	53	390879	1A08	5	392018	2A10	19	983820	1E02	14
254057	2A11	34	390429	2B07	10	390880	1A08	4	392092	2A08	19	983825	1E02	19
254058	2A11	1	390430	2B08	14	390881	1A08	4	392189	2B06	60	983827	1E01	15
254059	2A11		390431	2B08	13	390882	1A08	3	392954	2B07	2	983956	1B13	53
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254065	2A11	16	390440	2B08	55	390895	1A08	8	393080	2A08	29	984214	1D13	42
254066	2A11	2	390442	2B08	19	390896	1A08	8	393081	2A08	72	984217	1D13	49
254067	2A11	18	390443	2B08	19	390897	1A08	8	393082	2A08	1	984218	1D13	16
255610	1B12	41	390444	2B08	19	390898	1A08	8	393083	1A05	1	984219	1D13	18
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259964	1C05	1	390458	2B07	9	390944	1B12		393086	2A08	82	984236	1D14	86
259965	1C05	4	390460	2B06	22	390946	2A06	2	393087	2A08	2	984237	1D13	38
259966	1C05	10	390461	2B06	22	390974	2A11		393089	2B08	59	984248	1D13	20
259967	1C05	11	390462	2B06	22	391051	1D06	6	393091	1F04	51	984250	1D14	82
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262280	1D08	2	390494	2B06	21	391076	2A06	78	393094	2B08	14	984253	1D14	85
262281	1D08	3	390497	2A06	82	391080	1D07	9	393156	2A08	46	984254	1D13	57
262282	1D08	4	390500	1A08	4	391081	1A05	20	393254	2A08	58	984256	1D13	22
262283	1D08	7	390501	1A08	4	391083	1D11	25	393305	2A10	11	984257	1D13	25
265732	2A12	4	390502	1A08	3	391095	2B08	14	393307	2A10	12	984261	1D13	48
265788	2A12	38	390503	1A08	3	391096	2B05	10	393322	2A10	23	984262	1D13	49
267025	2A12		390504	1A08	3	391097	2B08	14	393467	2A12		984268	1D13	37
267026	2A12	1	390505	1A08	5	391248	1A05	20	393474	2B08	35	984270	1D13	38
267027	2A12		390506	1A08	5	391263	2A09	17	393529	2A10	4	984271	1D13	35
267028	2A12	17	390507	1A08	5	391272	1D08	61	393530	2A10	7	984273	1D13	44
267029	2A12	21	390508	1A08	5	391351	2D05	22	393531	2A10	1	984274	1D13	44
267030	2A12	25	390511	1B08	4	391352	2D05	2	393532	2A10	5	984275	1D13	44

By Order of the Secretary of the Army:

Official:

E. C. MEYER
General, United States Army
Chief of Staff

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25B, Organizational maintenance requirements for Roller, Vibratory, Selfpropelled.

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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

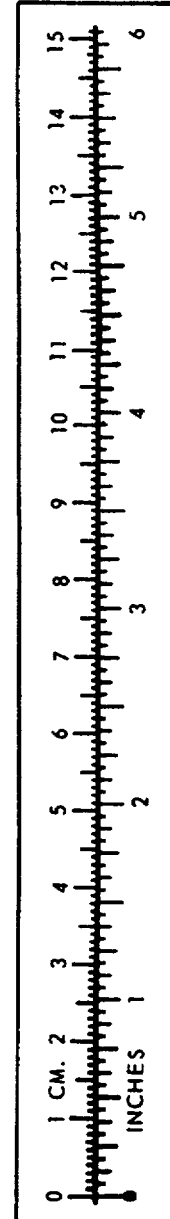
TEMPERATURE

$\frac{5}{9}(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $\frac{9}{5}^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

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	2.471
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



PIN: 048458-000