



# Technical Manual

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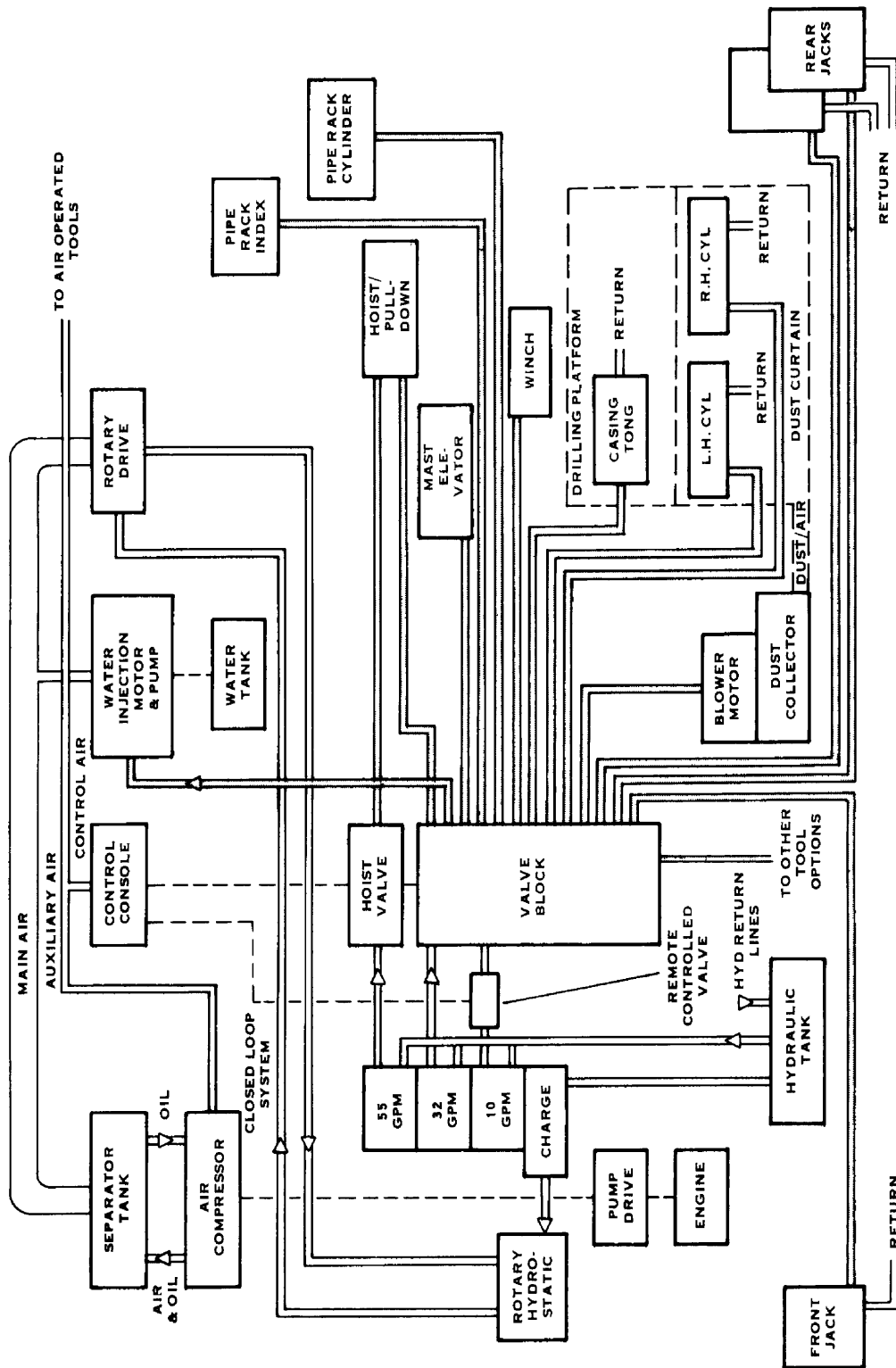


Figure 1-2. Functional Block Diagram, SK-35 Subsystems

# **SECTION 4**

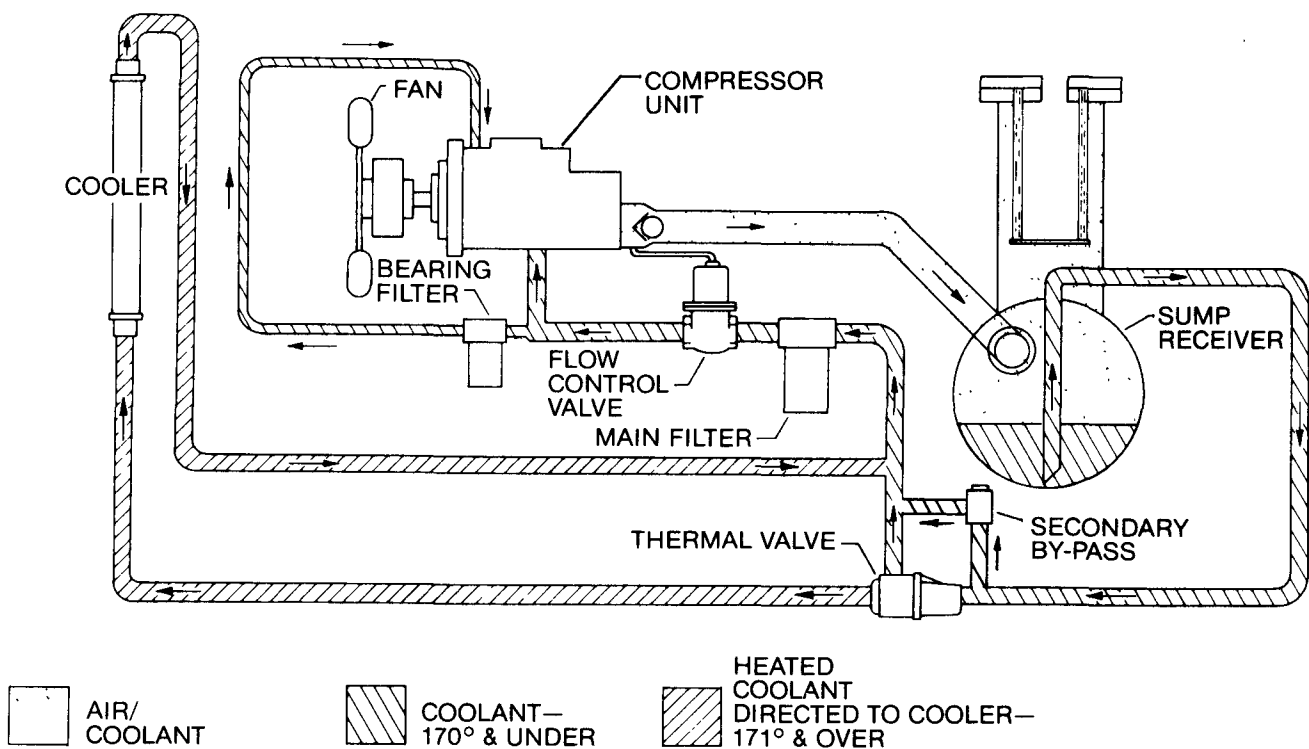


Figure 5-2. Compressor Cooling and Lubrication System, Functional Diagram

## B. COMPRESSED AIR FUNCTIONS

The main function of the compressed air system is to provide air to the drill bit to propel the particles out of the hole. A secondary function of the system is to provide auxiliary air for control functions and for operation of air tools, etc.

An air cleaner assembly on the intake to the air compressor cleans the air before it goes into the compressor. Similar to the air cleaner for the diesel engine, the unit has the same type of filter elements. The lower element traps the larger particles and a double filter unit that filters out the fine particles. Both the safety (inner) element and the primary (outer) element are disposable. The lower permanent element is designed to be removed for cleaning, while the upper safety (inner) element and the primary (outer) element are disposable. Although cleaning of these elements is possible, replacement is recommended. Refer to the parts manual for installation and assembly details and to Part II of this manual for service instructions.

## Section 7

### MAST/ROTARY DRIVE

The mast and rotary drive subsystem components are illustrated in Figure 7-1. This subsystem consists of the mast structure having the drill platform as its base, the rotary drive, the hoist with its pulldown cylinders, mast elevating cylinders, casing tong, and the dust curtains associated with the dust control subsystem.

#### A. MAST ASSEMBLY

The mast assembly is a steel frame-work 24 feet in length containing a base assembly which becomes the drill platform when the mast is elevated to a drilling position. The mast structure contains the rotary drive subsystem, hoist and pulldown subsystem, casing tong and a hydraulically driven wrench with related cable and sheaves.

The mast assembly pivots from a point a few feet above its base so that it may be tilted to the vertical position or lowered to the horizontal position by means of the mast elevating cylinders. In the lowered position, the mast rests on a mast rest incorporated with the front jack. When the mast is fully elevated, an automatic latch mechanism locks the mast into place. Then, before the mast may be lowered, the lock must be released. (Note that earlier models had two locking pins to secure the mast in the up-right position.)

#### B. ROTARY DRIVE ASSEMBLY

The rotary drive assembly consists of a gear case with a hydraulic drive motor and an air swivel connected to the top. The hydraulic motor operates the drive to rotate the drill stem during drilling operations. The swivel connects the stationary air input with the rotating drive. Refer to Section 8 for a description of the rotary drive subsystem.

#### C. HOIST AND PULLDOWN ASSEMBLY

The hoist and pulldown assembly consists of left-hand and right-hand hydraulic cylinders with a chain arrangement permitting elevation of the rotary drive assembly. The mechanics of this assembly can best be understood by considering the cylinder and chain arrangement for one side as shown in Figure 7-2.

Each chain is actually in two sections. One end of the upper chain is secured at the top of the mast and threaded over a roller sprocket, in a moveable cylinder guide frame then over a fixed roller

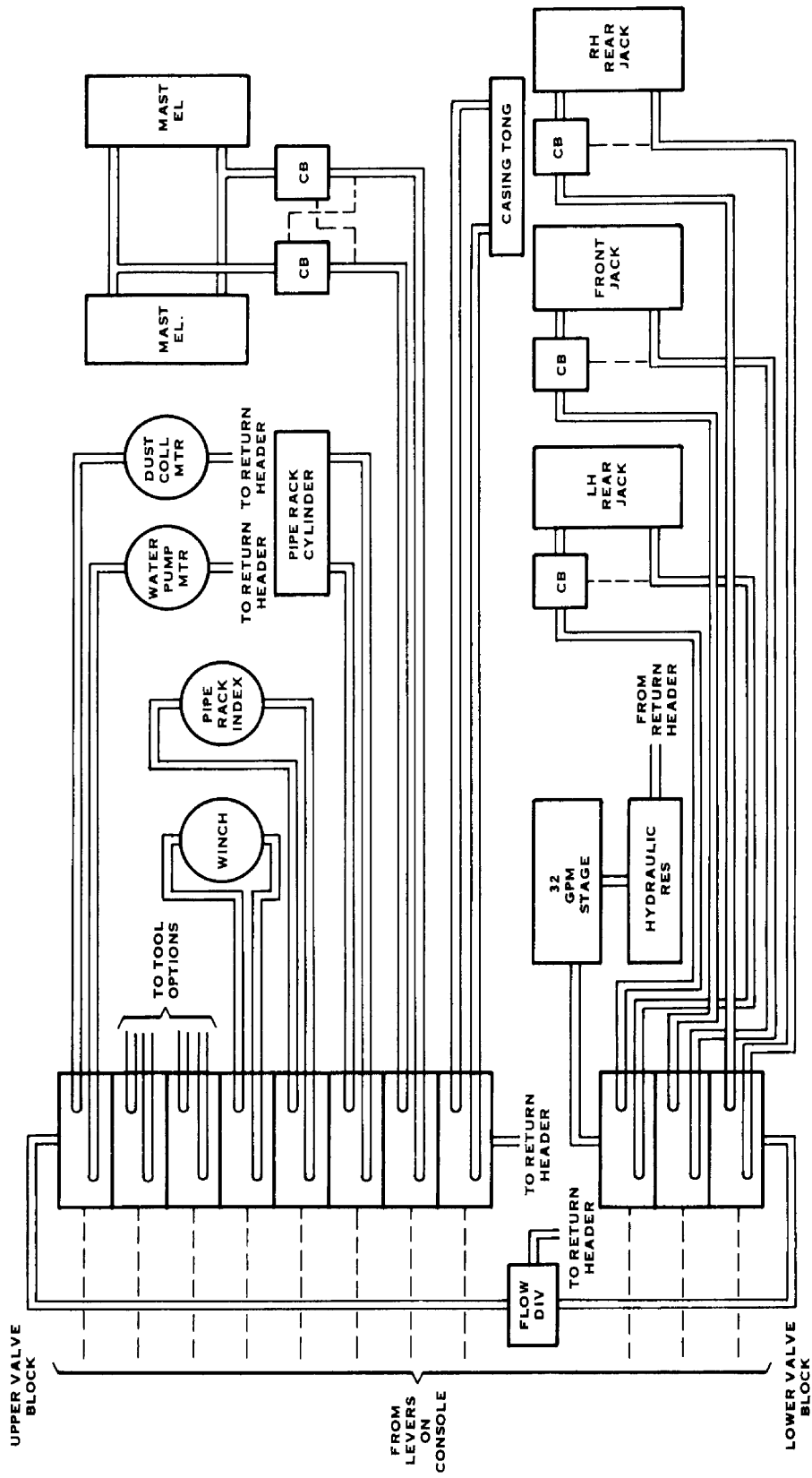


Figure 8-3a. General Hydraulics Subsystem, 32 GPM Pump Stage (early models)

gauge indicates the engine oil pressure whenever the engine is operating.

- c. Engine Water Temperature. The engine water temperature gauge is connected through the temperature sender mounted on the engine cylinder head. This gauge indicates the engine coolant temperature any time the ignition switch is turned on.
- d. Ammeter. The ammeter indicates the charge rate or current drain on the battery.

3. TACHOMETER. The electronic tachometer operates from a tach generator attached to the engine to indicate engine RPM at any time the engine is operating.

4. ENGINE HOURMETER. In the diagram, the engine hourmeter is shown connected directly to the ignition switch to operate whenever the ignition switch is turned on. In later units however, this meter is connected through the oil pressure sender so that the hour meter will operate only while the engine is running.

## B. FILTER WARNING SUBSYSTEM

This subsystem provides a visible indication to the operator in case one of the three filters in the hydraulic system becomes clogged.

1. WARNING LIGHT CIRCUITS. The hydraulic charge pump, loop and tank oil filters all have warning lights on the control panel to indicate when the filters are clogged. In these functions, battery voltage is applied to a warning light on the console through a pressure switch on the filter unit. Each pressure switch senses a high pressure differential across the filter when the filter becomes clogged, and duly indicates this condition on the instrument panel.

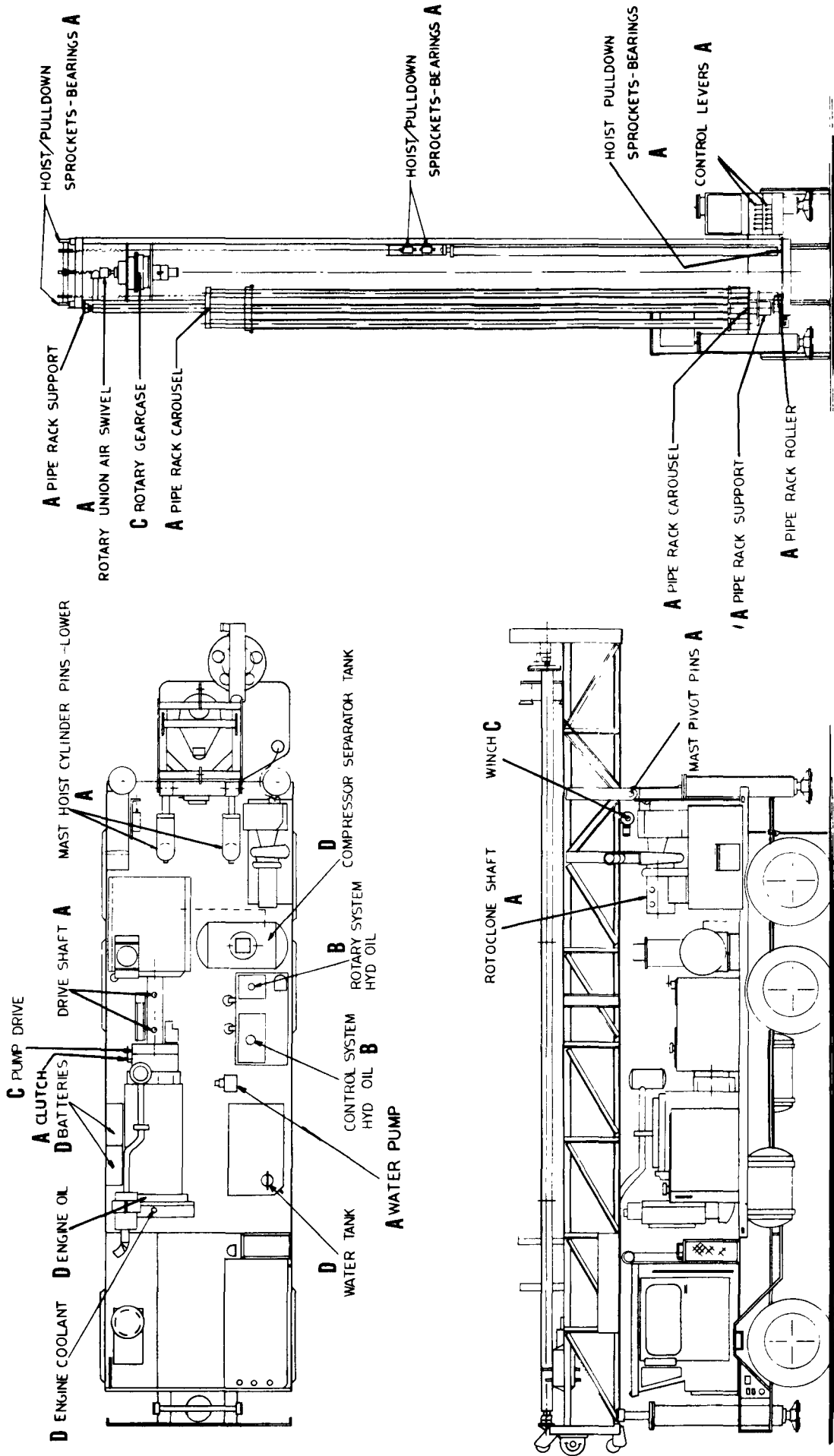
2. TEST CIRCUIT. A built-in test circuit checks the lights of the charge pump oil filter and loop oil filter circuits. For this circuit, the Filter Lights toggle switch on the indicator panel applies battery voltage to one contact of each pressure switch lights simultaneously, thus showing whether the bulbs are good. The switch contact arrangement is such that the filter switch circuit has no effect on the lamps when the Filter Lights switch is turned off. There is no built-in test circuit for the tank oil filter warning light.

## C. DRILL HOUR METER

A pressure switch, operated by main air pressure any time the

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NOTE. REFERENCE CODE LETTERS TO LUBRICATION/MAINTENANCE CHART

Figure 1-3. Overall System Lubrication and Maintenance Diagram

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## Section 2

### OPERATOR'S CONTROLS AND INDICATORS SERVICE

Although there is very little service to perform on the operator's console, the indicator readings are vital to other diagnostic operations for the subsystems. Also, manipulation of the controls is often necessary in order to obtain the required indications.

This section is not intended for use by the operator identifying control and indicator positions, etc. Rather, the information given here is slanted toward system diagnostics. For example, the specific point of takeoff for the pressure indication, etc., are given. For the locations and names of the controls and indicators refer to Figure 2-1.

#### A. UPPER PANEL INDICATORS AND CONTROLS

For application in system diagnostics, the indicators and controls located on the upper panel are discussed according to functional area.

1. ENGINE CONTROLS AND INDICATORS. The engine controls and indicators are essential to operating and monitoring the diesel engine.
  - a. Engine RPM Indicator. The engine RPM indicator is an electronic tachometer connected with the tachometer sender installed on the engine. This indicator displays the engine speed directly in RPM.
  - b. Engine Ammeter. This indicator is a conventional ammeter wired into the engine electrical system. The ammeter indicates battery charge or discharge.
  - c. Engine Fuel Level Gauge. The fuel level gauge is connected with a fuel sender in the fuel tank to indicate the fuel level in the tank. This gauge receives operating voltage only when the ignition switch is turned on.
  - d. Engine Oil Pressure. The oil pressure gauge is connected with an oil pressure sender tapped into the engine lubrication system, to indicate the engine oil pressure.

## Section 3

### MAIN FRAME COMPONENT/CARRIER SERVICE

Most of the service requirements for the main frame/carrier assembly are for the carrier vehicle. However, the other main frame elements should be inspected periodically and repaired as necessary.

#### A. CARRIER VEHICLE SERVICE AND MAINTENANCE

Only the routine preventive maintenance service for the carrier vehicle is outlined here. For detailed information on service and repair, refer to the manufacturer's manual.

1. CARRIER VEHICLE LUBRICATION. For lubrication of the carrier vehicle refer to Section 1 and to the carrier vehicle manufacturer's manual as applicable.

2. CARRIER ROUTINE SERVICE. The fluid levels and tire pressures should be maintained according to the manufacturer's recommendations, and any other routine maintenance performed as recommended by the manufacturer.

#### B. MAIN FRAME SERVICE AND MAINTENANCE

The following inspections and maintenance service should be performed as required.

1. PAINT AND FINISH TOUCHUP. The main frame deck structure, control cab, fuel tank, fuel box and other fixtures should be examined periodically for paint damage and repainted as necessary to inhibit rust and corrosion.

2. INSPECTION OF MAIN FRAME COMPONENTS. As a part of a general inspection procedure, the fuel tank, fuel lines, leveling jacks and associated plumbing should be inspected for damage or leaks and repaired as necessary.

#### C. REPOSITIONING CONTROL CAB

The operators cab may be moved inboard to decrease the overall vehicle width for legal road travel. To reposition the cab, refer to Figure 3-1 for details and proceed according to the procedure below.

a. Inspection and General Service

- 1) Inspect air transfer duct between air cleaner and engine to be sure all clamps and joints are tight and there are no cracks in ducting.
- 2) Verify that air cleaner mounting bolts and clamps are tight, holding air cleaner securely.
- 3) Check dust cup to make sure it is sealing completely around air cleaner body.
- 4) Be sure vacuator valve is in place, not inverted or damaged, and free from obstruction. Squeeze this valve daily to exhaust accumulated dust.
- 5) Check body of air cleaner for dents and damage which could cause a leak or damage the elements.
- 6) Make sure all inlet accessories are free from obstruction and securely mounted.

b. Element Replacements. To replace the elements refer to Figure 4-1 and proceed according to the steps below. Anytime the elements are replaced or cleaned, the dust cup and the lower body assembly should also be cleaned.

- 1) Release clamp assembly (12) and remove dust cup (13). Remove and wash lower body (11) and dust cup.
- 2) Release catches and remove cover and O-ring (7) from upper body assembly (1).
- 3) Remove wing nut (6) and gasket (3) securing outer (primary) element (5).
- 4) Remove primary element.
- 5) Remove inside nut (4) and gasket (3) and remove small (safety) element (2).
- 6) To replace elements with new components obtain correct replacement elements, together with O-ring and two gaskets, and replace them in reverse order of disassembly.
- 7) When replacing elements, gaskets and O-ring, it is a good idea to replace two O-rings (8) on lower element also.
- 8) If desired, it is possible to clean the elements rather than replace them at each change. However, you should always replace the elements annually or after each 6 cleanings whichever occurs first. Refer to SK-35/SK-40 Operator's Manual for cleaning procedure.

# SECTION 6

## INTRODUCTION & GENERAL RECOMMENDATIONS

The Dust Collector System on your drilling rig is designed to remove the dust from the drilling air prior to discharge to the atmosphere and the cleanliness of the air being discharged from the unit meets known environmental standards.

The fan, filter, filter cleaning, ducting, and dust box capacities have been sized to be compatible with the rig drilling rates in most known materials. A certain relation has been established to the volume of drilling air, hole size, depth and drill penetration rates.

In order for the dust collector to function properly over the life span of the drilling rig, periodic checks must be made of the fan, filters, filter cleaning system, ducting and dust box. Specifically, after every 160 hours of operation, fan speed, back flushing regulator pressure setting and back flushing cycle rate should be checked to agree with standards as set in the Preventative Maintenance section. In addition, at every 160 hours or sooner, inspection and maintenance under General Maintenance, Section I causes (1) through (4) should be performed.

The elements in the multiple filter system are designed for a life of 600 hours and up before replacement is required on Dust Collector systems and 300 hours and up on total collection systems.

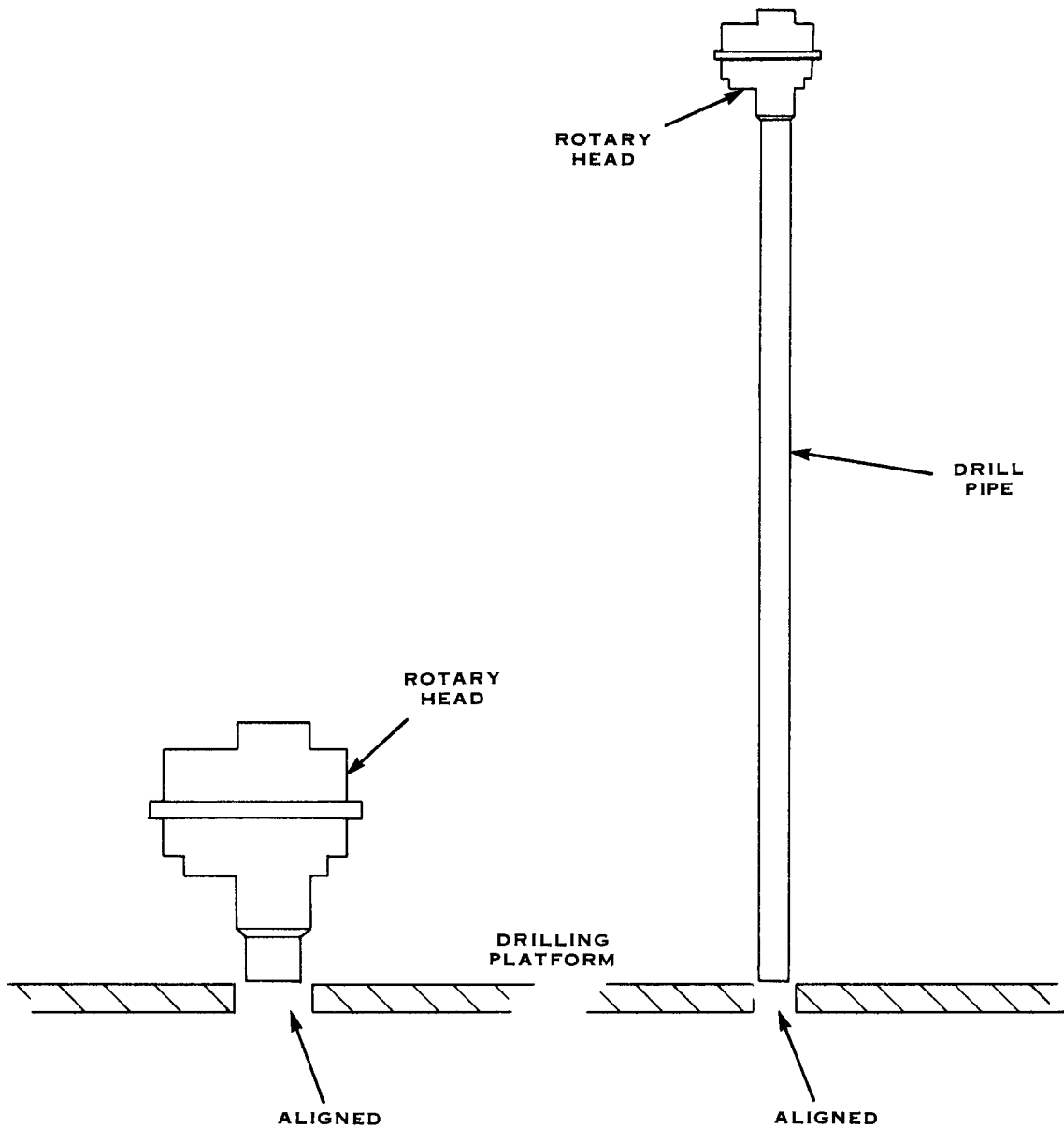
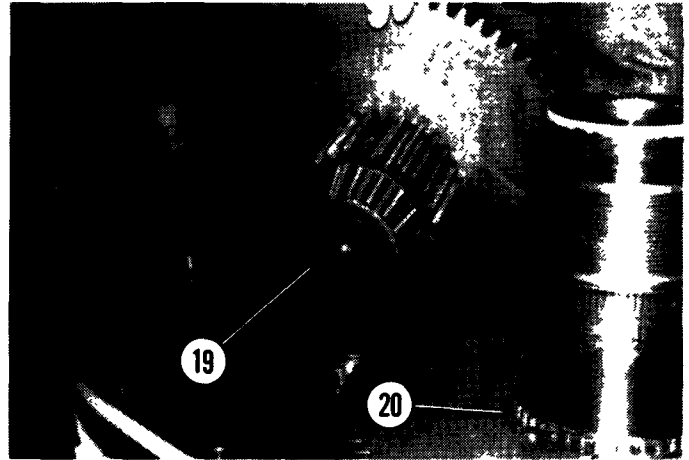


Figure 7-2. Rotary Head Alignment

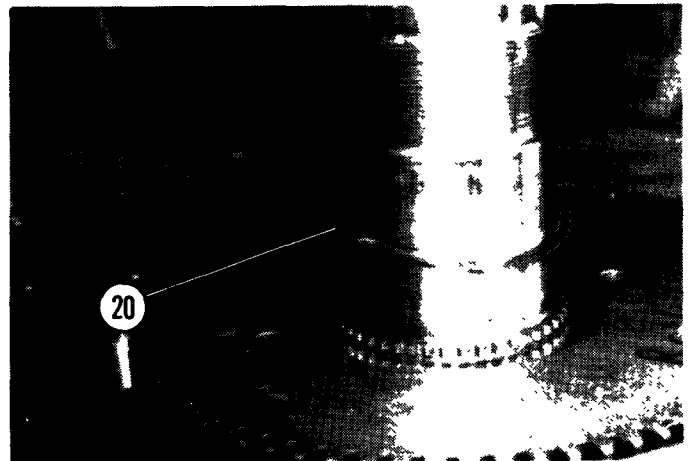
- 4) Tighten cap screws and nuts (Figure 7-2C) being careful to keep head in alignment.
- 5) Raise rotary head to the top of mast and install a section of drill pipe.
- 6) Lower head carefully to check alignment of drill in hole in drilling platform (Figure 7-2B).
- 7) If drill pipe does not align up so that it is centered in hole, readjust rotary head in guides and recheck the alignment.

- 11) Remove intermediate pinion shaft (19) and gear with both bearing cones. Disassemble pinion assembly as required.



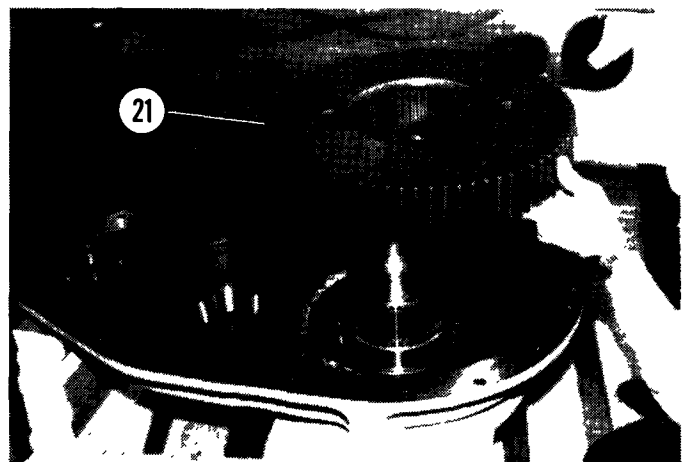
Disassembly, Plate 9.

- 12) Remove Snap Ring (20) from output shaft.



Disassembly, Plate 10.

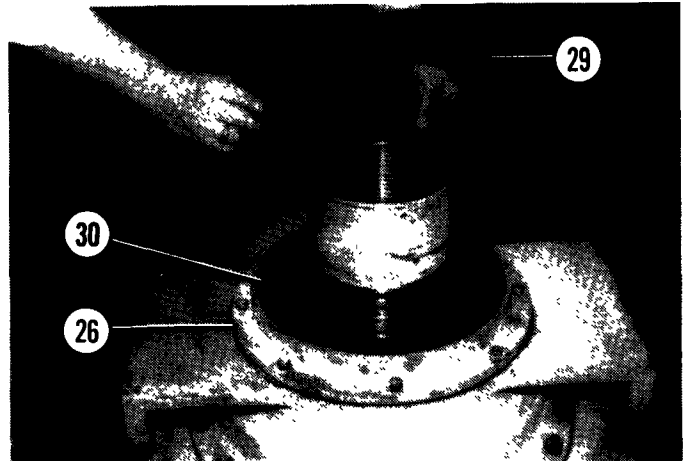
- 13) Remove output gear (21).



Disassembly, Plate 11.

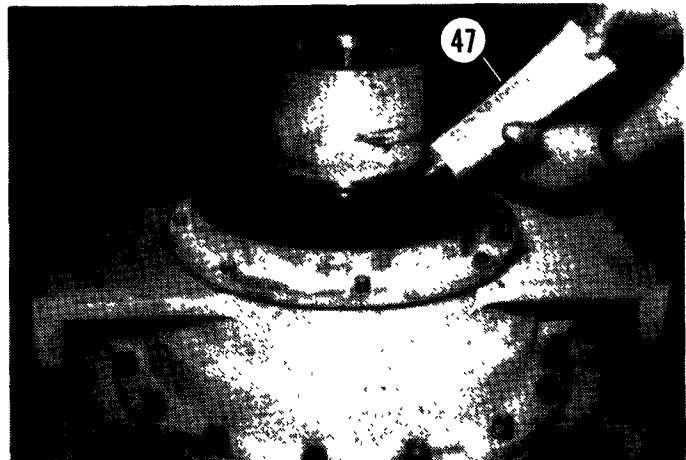
Figure 7-5. Rotary Gearcase Disassembly Procedure (Sheet 4).

- 55) In a similar manner, insert second half of seal (29) into outer seal retainer (26) in the same way.



Assembly, Plate 12.

- 56) Spread a thin uniform coat of RTV sealant (47) around shaft just behind spacer (37- Plate 7) and on end of spacer.



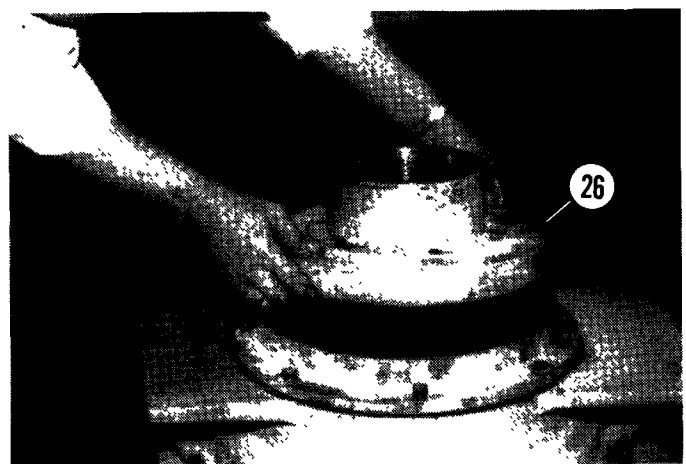
Assembly, Plate 13.

- 57) Press retainer (26) onto end of shaft behind spacer (37-Plate 7) making sure outside diameter of (26) does not interfere with inner retainer (32) so that retainer will turn freely.

- 58) Bolt retainer (26) to spacer (37) with hex cap-screws (28) and lockwashers torqued to 14-18 ft. lbs. (See Disassembly, Plate 8).

NOTE

This face type oil seal is hardened, ground, and lapped for application where extremely dirty conditions exist.



Assembly, Plate 14

Figure 7-6. Rotary Gearcase Assembly Procedure, Sheet 7.

- 2) Examine inlet check seats. Seats should be flush with back of pump. Should be tight.
- 3) Push on check balls to assure that they are seating properly. Seating against back of seat.
- 4) Do not attempt to remove or repair a loose check ball seat. The pump must be replaced.

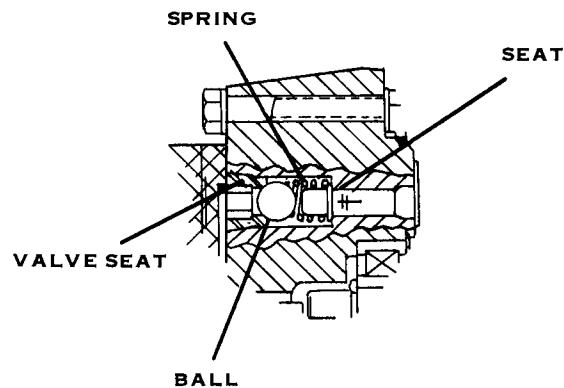


Figure 8-3. Pump Inlet Check Valve

- d. Rotary High Pressure Adjustment. Adjust the rotary pressure in accordance with the following procedure:

NOTE

If unable to obtain required results from this test, check cross-over relief poppets as in Topic e.

- 1) Engage table wrench with drill stem so that rotary drive can be blocked to build up full pressure. Screw in compensator adjustment screw approximately 2 turns.
- 2) Set engine speed at 1200 rpms.

**CAUTION**

To avoid damage to the system, do not stall rotary drive for long periods of time.

- 3) Stall rotary drive in forward direction with engine set at 1200 RPM.

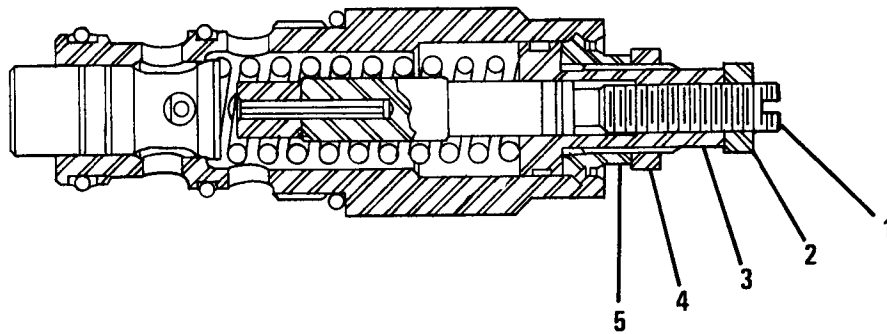


Figure 8-7. Counterbalance Valve Adjustment

- 4) When desired pressure is obtained, lock down stop nut (4) by holding cap adjustment (5) and seal adjustment (3) from turning and tighten stop nut (4).
- 5) Turn adjustable guide (1) into solid point and back out to original position. Hold adjustable seal (3) and adjustable guide (1) while tightening stop nut (2).

3. HOIST AND PULLDOWN SYSTEM TROUBLESHOOTING. Table 8-3 is a troubleshooting guide for the hoist and pulldown system. The guide may be used as a cause/remedy chart for troubles encountered during operation or during the pre-operation check in the operator's manual. Usage of this chart should help locate common problems in the hoist and pulldown hydraulic system.

4. HOIST AND PULLDOWN HYDRAULIC SYSTEM REPAIR. The normal field repair for a faulty component in the hoist and pulldown system is replacement of the components. However many of the components may be repaired under shop conditions.

In general, the repair procedures for purchased components are covered in the vendor manuals included in Part III; however certain repair procedures and information are given in Section 7 of this volume.

### C. GENERAL HYDRAULIC SYSTEM MAINTENANCE

Maintenance on the general hydraulic system includes pressure checks, relief valve adjustments, troubleshooting and repair procedures.

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