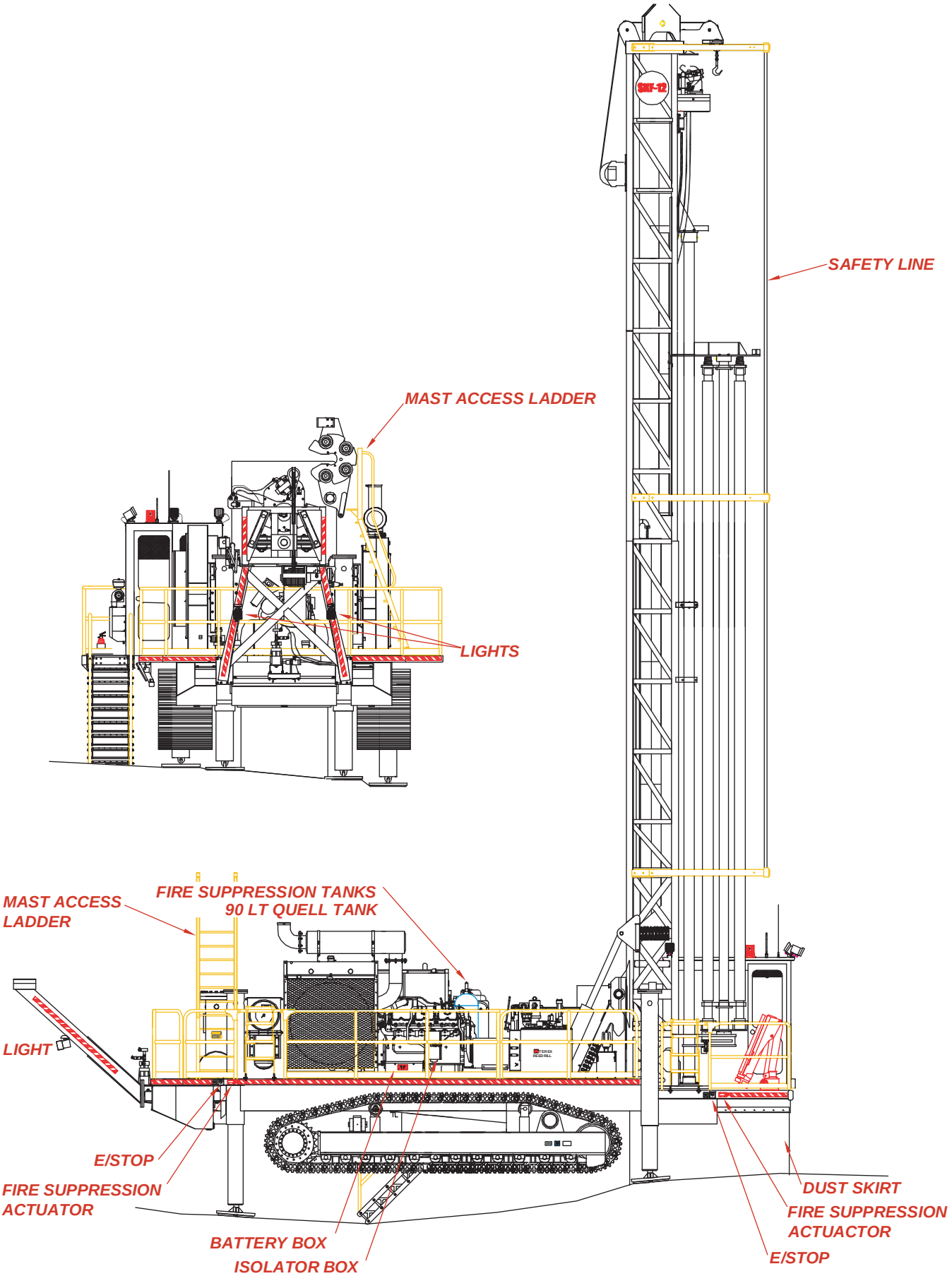
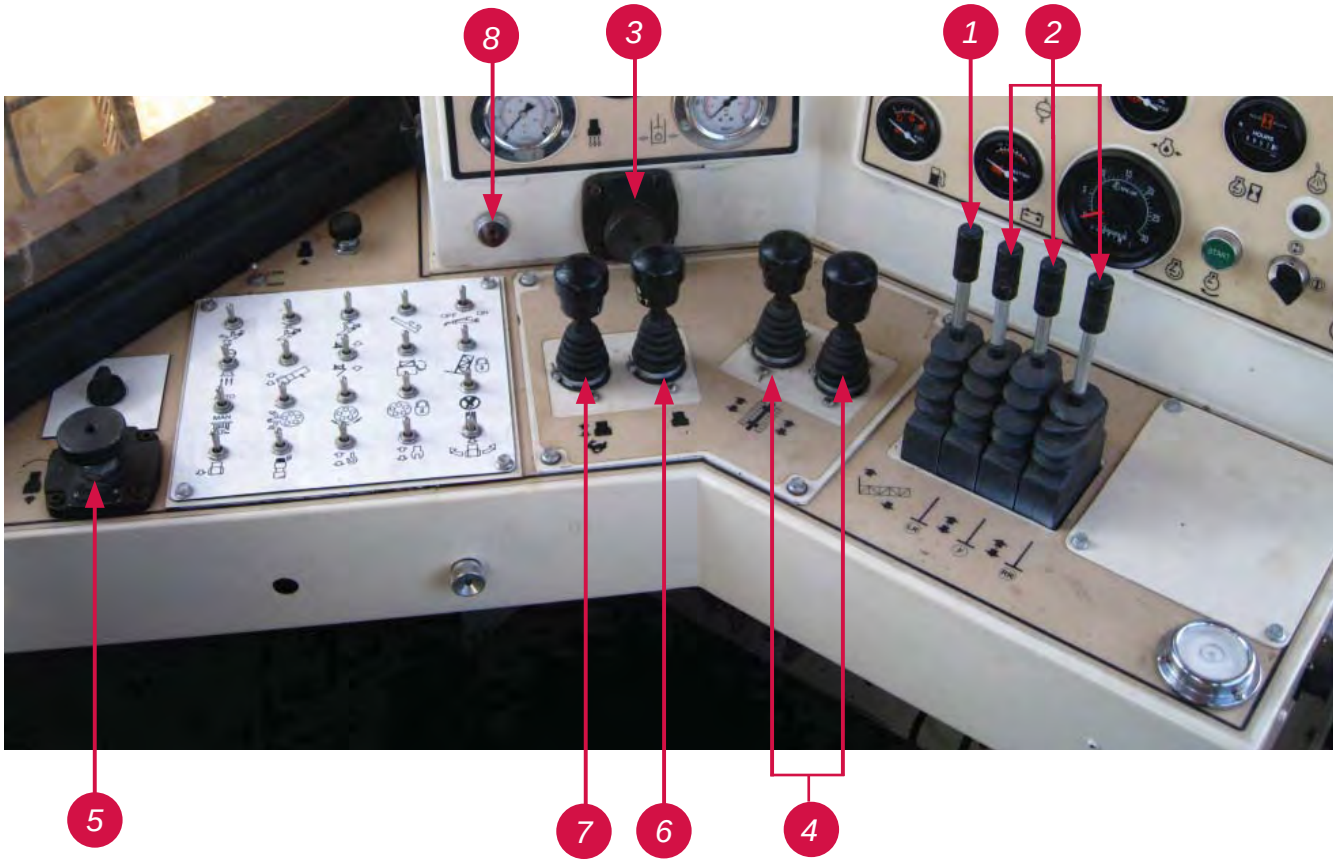
Technical Manual

Contents

Safety Locator



Operators Controls and Indicators



Right Hand Control Panel

T7 Series Split System Air Conditioning Manual

Contents

7. Slowly open the low pressure gauge manifold hand valve allowing the system to draw refrigerant vapour from the charging cylinder.

WARNING: DO NOT open the high pressure gauge hand valve while charging.

8. Continue charging until the bubbles disappear from the receiver drier sight glass. At this point the system should be fully charged with approximately 2 kg of R134a.
9. Close the low pressure gauge hand valve and switch off the engine.
10. Test the complete system for leaks, especially around hose connections.
11. Fully back-seat the compressor suction service valve, close the charging cylinder valve and disconnect the charging hose.
12. Fit the compressor suction valve sealing cap.

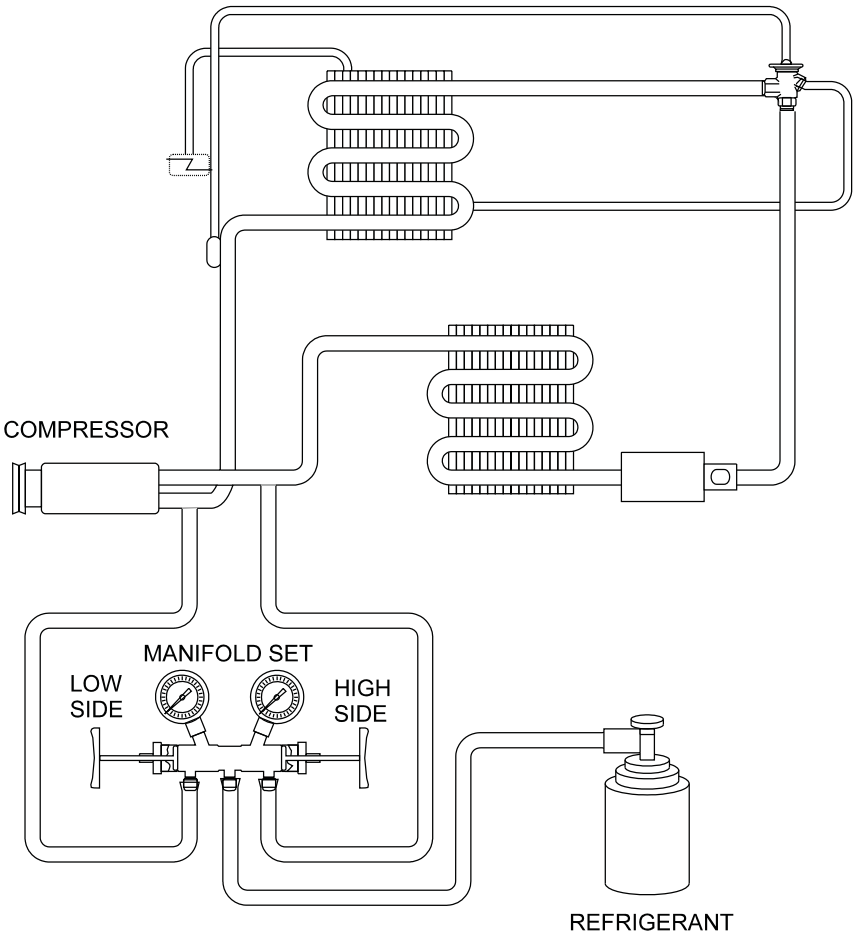


Figure 2.7

13. Adequately seal all hoses and fittings before storing.

Note: If it is necessary to change the refrigerant cylinder during the charging procedure, the low pressure gauge hand valve must be tightly closed before disconnecting the empty cylinder. On fitting the full cylinder it will be necessary to purge any air from the charging hose before opening the hand valve and continuing with the charging operation.

vi) If circuit breaker (CB3) has tripped, check for wiring fault prior to replacing.Bridging or increasing circuit breaker rating voids warranty.

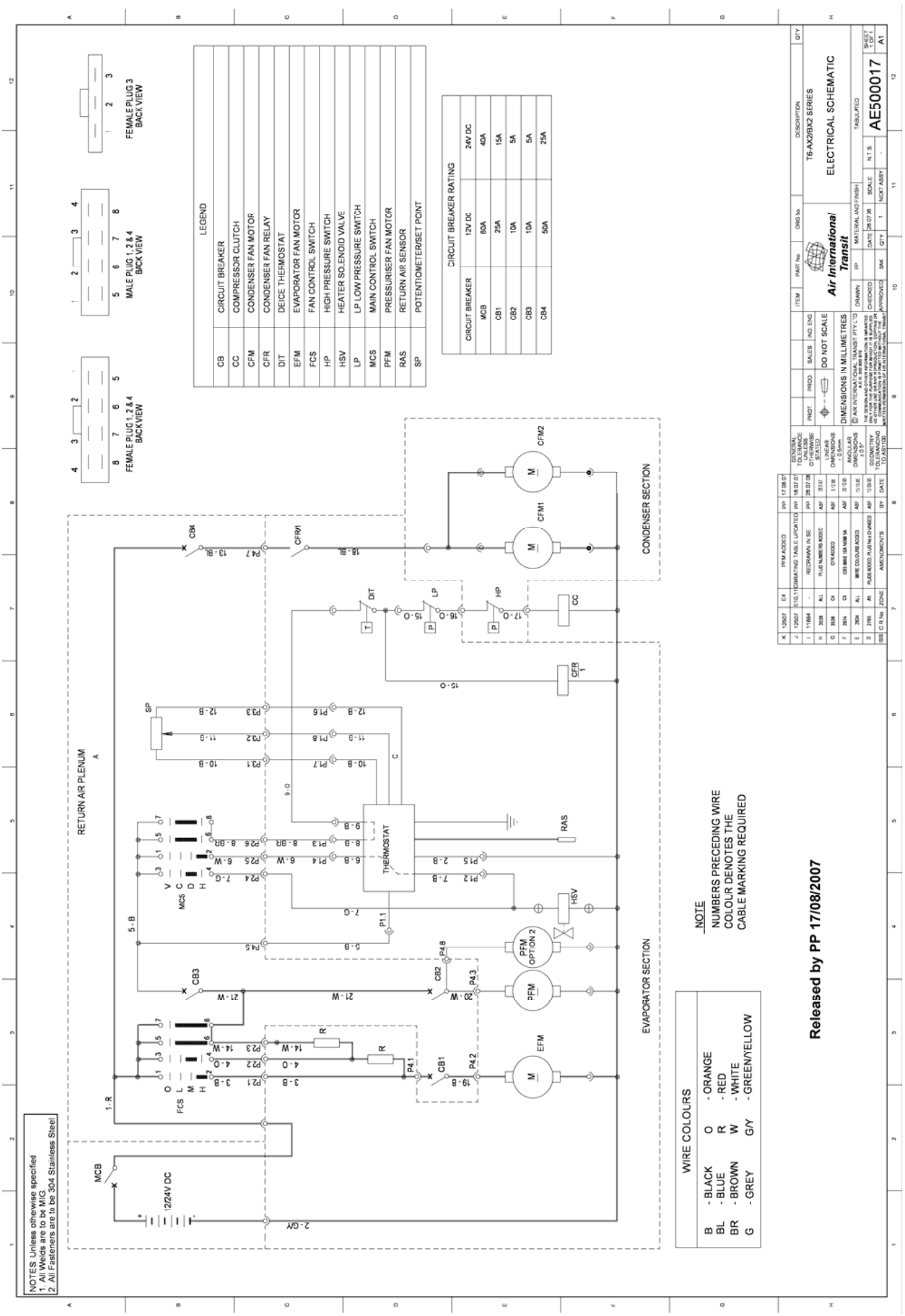
4.3.2 Wiring Check

In light of the above the following check can be performed to ensure wiring is correct and must be carried out prior to replacing a blown thermostat. Checks should be performed in OFF-LO-MED-HI and VENT-COOL-DEMIST-HEAT on the female supply plug (P1) to the thermostat from the loom.

TEST	REASON
Power present at P1.1 in LO-MED-HI (Note - P1.1 refers to terminal No. 1)	Ensures power supply to thermostat
Continuity between P1.5 and earth.	Ensures circuit to earth.
Switch to COOL, connect wire No. 9 of thermostat to earth. Clutch should activate.	Checks cooling operation
Switch to HEAT, connect P1.2 to earth. Heater solenoid should activate.	Checks heating operation.

4.3.3 Fault Finding

COMPLAINT	POSSIBLE CAUSE	REMEDY
Continuously operates in cooling.	Potentiometer control lead open circuit. Internal contacts welded closed.	Repair Lead Check wiring, find fault and replace.
Continuously operates in heating.	Temperature probe lead open circuit. Internal contacts welded closed.	Replace thermostat. Check wiring, find fault and replace.
Thermostat inactive.	Circuit breaker tripped.	Check wiring, find fault and reset circuit breaker.
Coil ices up.	De-ice T/S probe incorrectly placed.	Place sensor in evaporator coil towards end of coil and down into middle.
Unit lacks capacity.	Return air probe in incorrect probe location.	Place in air stream of return air.
Works in HEAT mode but not in COOL.	Probes overheated	Replace thermostat.


LEGEND
CB CIRCUIT BREAKER
CC COMPRESSOR CLUTCH
CFM CONDENSER FAN MOTOR
CFR CONDENSER FAN RELAY
DIT DEICE THERMOSTAT
EFM EVAPORATOR FAN MOTOR
FCS FAN CONTROL SWITCH
HP HIGH PRESSURE SWITCH
HSV HEATER SOLENOID VALVE
LP LP LOW PRESSURE SWITCH
MCS MAIN CONTROL SWITCH
PFM PRESSURISER FAN MOTOR
RAS RETURN AIR SENSOR
SP POTENTIOMETER/SET POINT
CIRCUIT BREAKER RATING
CIRCUIT BREAKER 12V DC 24V DC
MCB 80A 40A
CB1 25A 15A
CB2 10A 5A
CB3 10A 5A
CB4 50A 25A
FEMALE PLUG 3 BACK VIEW
MALE PLUG 1, 2 & 4 BACK VIEW
FEMALE PLUG 1, 2 & 4 BACK VIEW
RETURN AIR PLENUM
CONDENSER SECTION
EVAPORATOR SECTION
THERMOSTAT
MCB
12/24V DC
CB1
CB2
CB3
CB4
CFR1
CFM1
CFM2
EFM
PFM OPTION 2
PFM
HSV
RAS
DIT
LP
HP
CC
SP
FCS
MCS
NOTE
NUMBERS PRECEDING WIRE COLOUR DENOTES THE CABLE MARKING REQUIRED
WIRE COLOURS
B - BLACK
BL - BLUE
BR - BROWN
G - GREY
O - ORANGE
R - RED
W - WHITE
G/Y - GREEN/YELLOW
NOTES: Unless otherwise specified
1. All Welds are to be MIG
2. All Fasteners are to be 304 Stainless Steel
Released by PP 17/08/2007
T6-AX2/BX2 SERIES
ELECTRICAL SCHEMATIC
AE500017
Air International Transit
DO NOT SCALE
DIMENSIONS IN MILLIMETRES

Section 3 Contents

WARNING: DO NOT attempt to replace the recoil spring.
Replacement of the recoil spring must be done by an authorized Intertractor dealer.
The recoil spring assembly is assembled with a force of several tons.
DO NOT put the recoil spring assembly under compression or release the tension with the nut that holds the unit together.
Damaged threads on the spring carrier rod or nut can cause the assembly to come apart with force, resulting in personal injury or death.

General Description

The idler unit consists of three sub-groups:

1. Idler Wheel
2. Hydraulic Tensioner
3. Spring

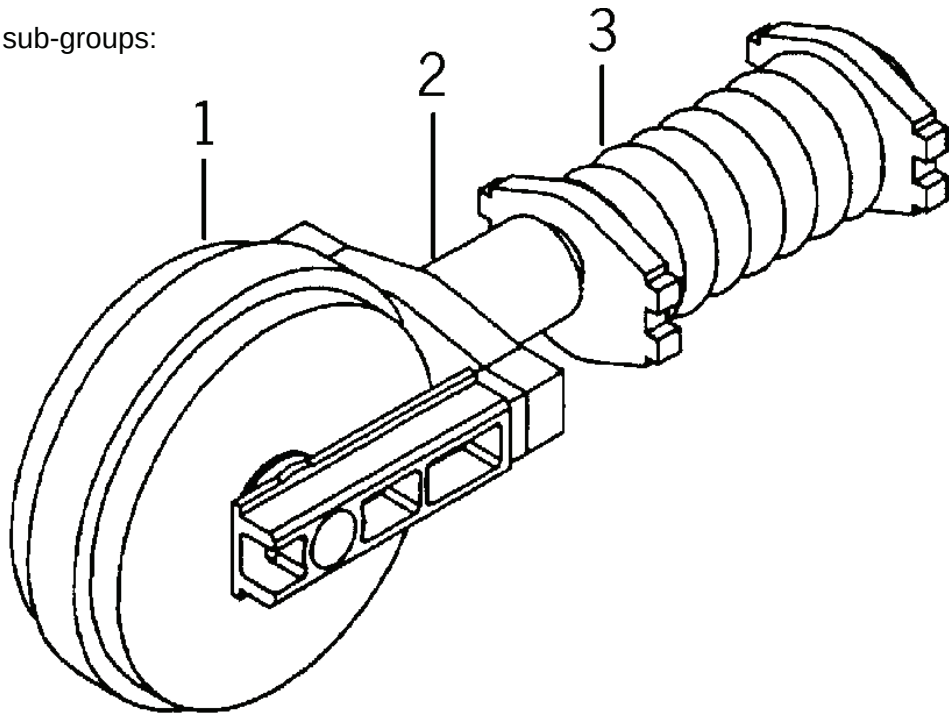


Fig. 3-44 Idler Unit

1. The idler wheel is filled with oil and the running surface is induction hardened for reduction in wear.
2. The sliding block is designed so no dirt can enter the idler.
3. The spring is fixed to a cross bulkhead at the crawler sides. The function is to absorb the extreme loading of the track chain. The spring is pre-tensioned
4. The hydraulic tensioner serves to tighten the track chain. When grease is pressed into the hydraulic tensioner, the idler will be pushed against the track chain.

WARNING: Grease in the track adjusting cylinder is under high pressure. Grease coming out of the relief valve of the track adjuster is under high pressure and can penetrate the body causing personal injury or death.
When loosening the tension on the track, loosen the relief valve only one turn.
DO NOT visually inspect the relief valve to see if grease is being released from the track adjuster. Instead, watch the track to see if it loosens. If the track does not loosen after opening the relief valve, move the machine forward and backward to release the tension.

Removal & Disassembly

1. Release track chain tension, by loosening the grease fitting on the track tensioner. Refer to "Track Tension Adjustment" at the front part of this section.
2. Using and adequate lifting device, lift crawler frame off of track chain high enough to gain access to the track rollers for removal (fig. 3-66). Support track frame with an adequate support so it can not fall.
3. Clean all dirt and debris from track rollers.
4. Remove attaching bolts and remove track roller from frame (fig. 3-67). If track frame is fitted with a chain guide, it will have to be removed first.

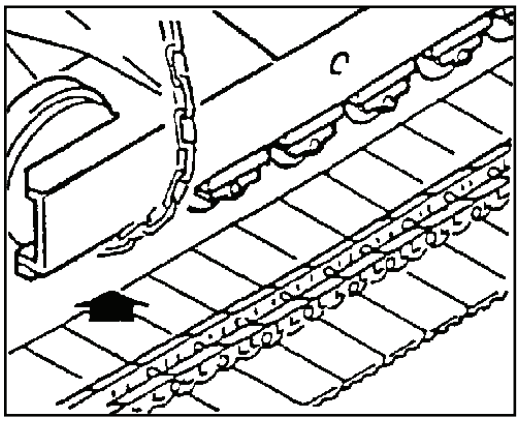


Fig. 3-66 Track Frame - lift

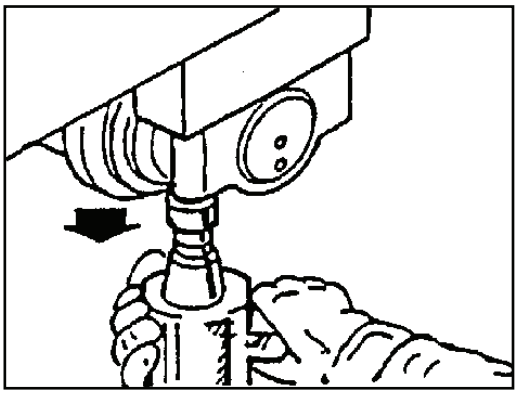
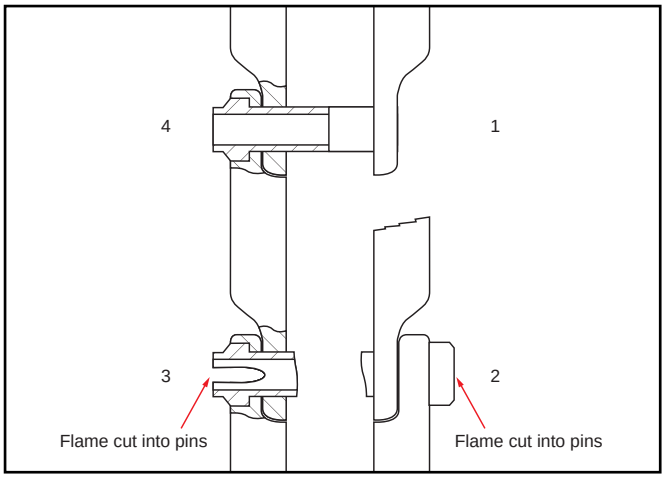
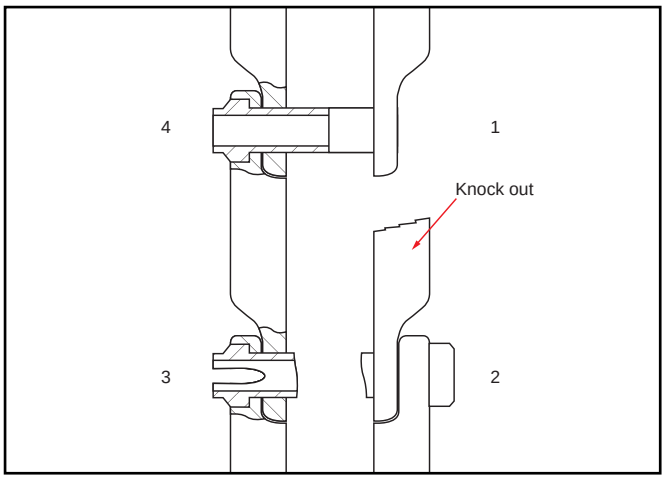


Fig. 3-67 Track Roller - remove

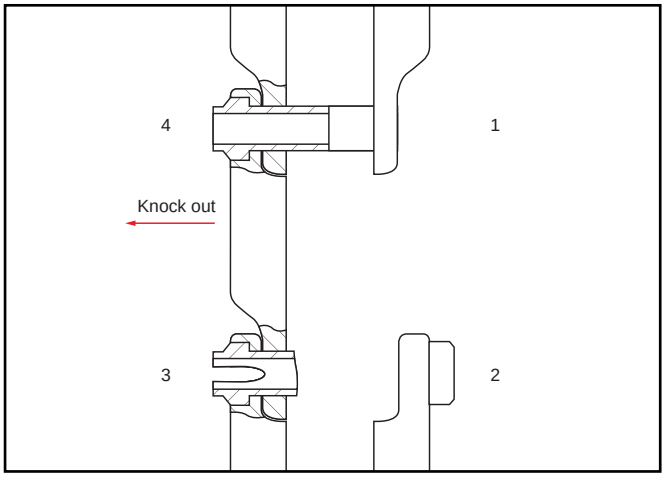
5. To disassemble track roller, refer to "Track Roller - Assembly" instructions and carry out procedure in reverse order.



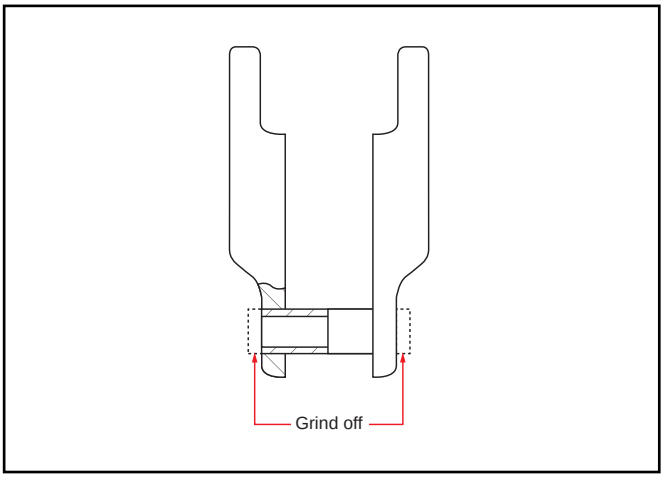
3. Flame cut into the pins in the middle on sides 2 and 3 by about 20 – 40 mm depending on the track size.



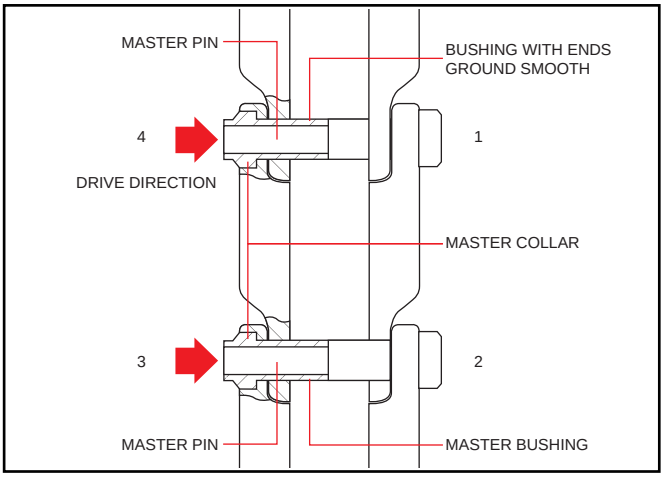
4. Knock out remaining track link with remaining bushing on side 2 inwards. Also knock out remaining pins.



5. Knock track link on side 3 from out to in until the bushing emerges from the track seat and the track link rotates around the hinge on side 4. Remove residual pins first if there is not enough play in the track. Then knock the track link with the residual pins on side 4 from in to out.



6. Grind off protruding bushing ends at the sides and grind flat any damage caused by flame cutting the track link at the side.



7. Assemble the new parts using the following procedure .Be sure the links are facing the proper direction.

A. Connect the track link by putting two master collars in place as shown.

B. Attach the two ends by driving in the master pin.

C. Place track chain onto track frame and join the two ends by putting two master collars in place as shown and driving in the master pin.

D. Assemble track shoe to track chain with the four bolts and nuts. Torque bolts according to specifications listed in Bolt Torque Chart in this section.

8. Tension track chain according to procedure outlined previously.

6. Install track roller assembly on track frame (fig. TSR-15). Torque capscrews according to "Metric Bolt Torque Specifications" in this section.

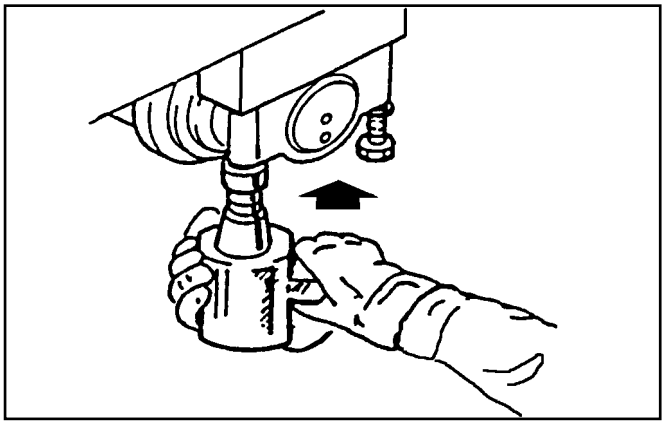


Fig. TSR-15Track Roller - install

7. Install support roller on track frame (fig. 3-89). Torque capscrews according to "Metric Bolt Torque Specifications" in this section.

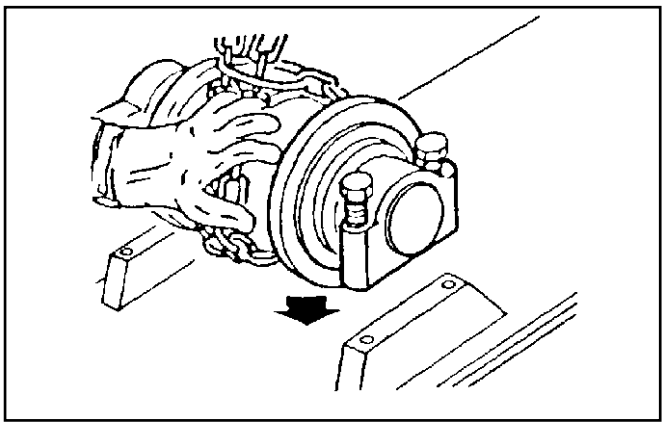


Fig. 3-89 Support Roller - install

8. Remove supports and lower track frame onto track chain. Adjust track tension according to "Track Tension Adjustment" at the front part of this section.

WARNING: DO NOT service, perform maintenance or make adjustments while machine is running. The parking brake is nonfunctional when the gear drive is disengaged for towing. BE SURE machine is on level ground and secured from movement, i.e. via tow bar to pulling vehicle prior to disengaging the gear drive and while reengaging the gear drive.

Parking Brake - Removal & Installation

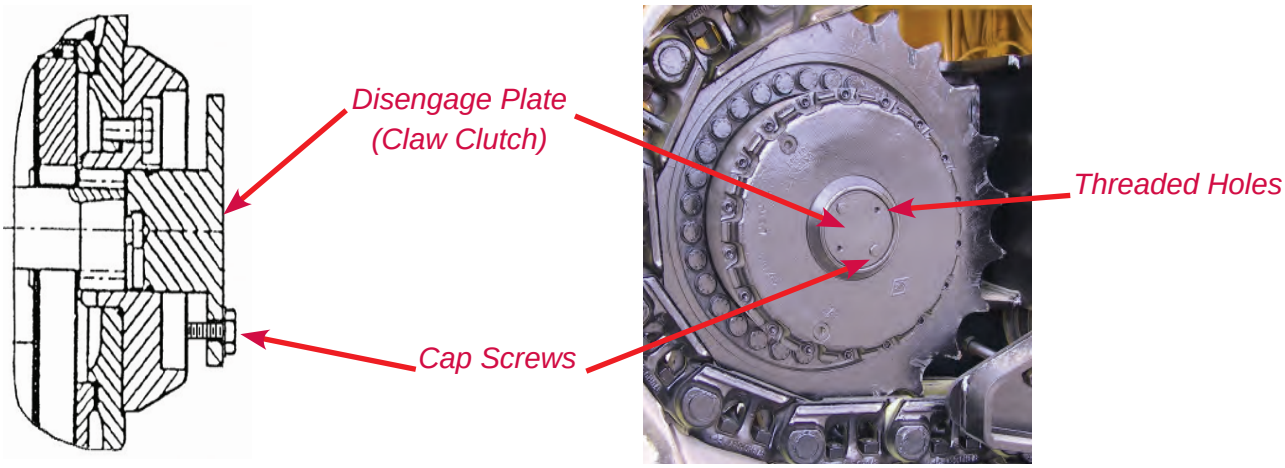
Refer to fig's. 3-43 and 3-43a

1. Be sure machine is on level ground and tracks are blocked to prevent movement of machine.
2. Drain oil from final drive into a suitable container. Dispose of old oil according to local regulations.
3. Remove capscrews (32) and hydraulic motor (31) from final drive.
4. Remove capscrews (24) and cover (23). Remove washer (21).
5. Remove pinion gear shaft (16).
6. Insert a brass drift through the opening where the pinion gear shaft was and drive out the brake assembly (47).
7. Installation is basically the reverse of removal. Be sure to check condition of o-ring (22).
8. Fill final drive with correct type of oil. See "Oil Check/Change" procedure in this section.

Towing Procedure - Gear Drive Disconnect

Refer to fig. 3-43.

1. Be sure machine is secured from movement before gear drive is disconnected, via tow bar attached to towing vehicle or by blocking tracks. When drive is disconnected the brakes are non- functional.
2. Remove the two capscrews (30) from the Claw Clutch (29). Install the screws into the two threaded holes in the Claw Clutch and screw in all the way. This will disengage the internal splines of the cover from the pinion gear shaft (16). Repeat on other side. Machine is now ready to tow. Do not exceed normal tram speed of machine when towing.
3. After towing, but before disconnecting from tow vehicle, replace capscrews (30) to their normal position on each track, so the pinion gear shaft is again connected to the cover.



Warning

Carry out all maintenance operations when the machine is stationary.

• Risk due to inhalation of poison gases that can be produced by heating the varnishes during any welding.

Warning

Use work stations equipped with dust and fume discharging systems. Let the fumes disperse for at least 15 minutes, before welding or reheating, or working on the group again. • Risk of fire due to the solvents used and to the oil in the product.

Warning

Keep away any heat sources from the working area. When solvents or paint removers are used, they should be removed with soap and water, before welding.

Remove any containers of solvent, paint remover or any other inflammable products from the working area.

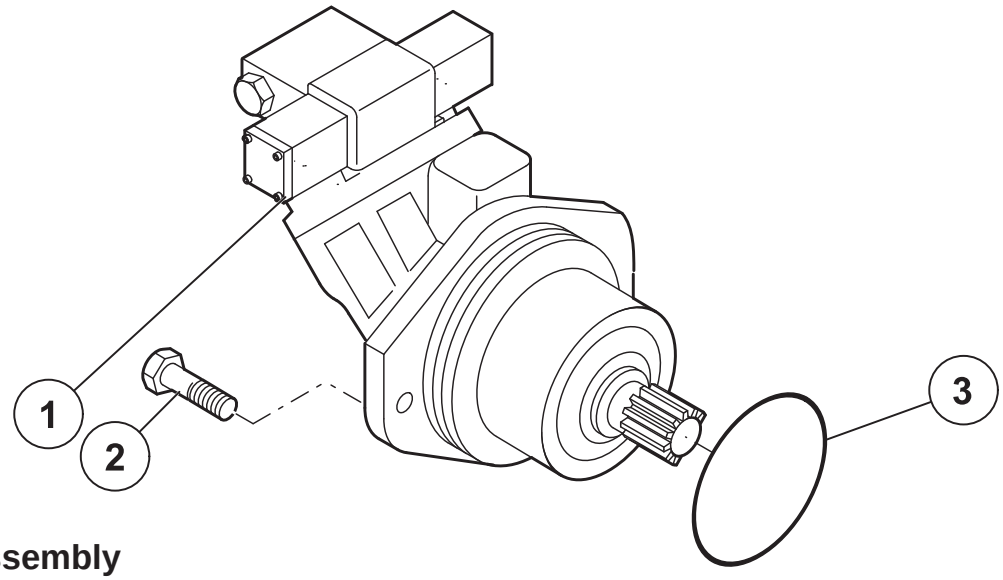
• Risk due to fall, drop or violent ejection of objects or oil from the product.

Warning

These residual risks and the suitable relative procedures to eliminate them completely are pointed out, in detail, in the assembly and disassembly procedures. During maintenance, follow carefully all the safety procedures indicated in the manual.

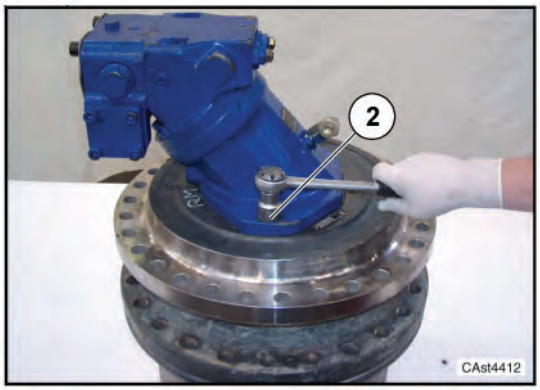
D - DISASSEMBLY AND ASSEMBLY OPERTIONS

D.4 Motor

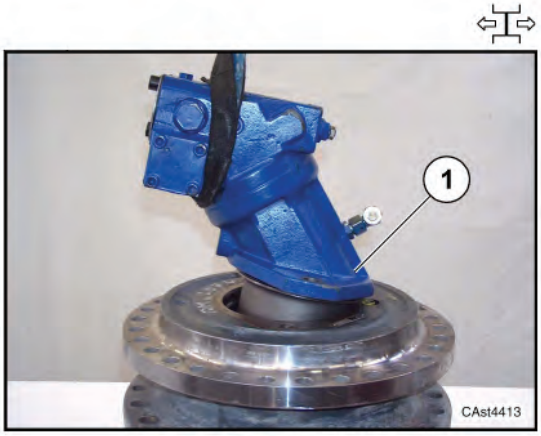


D.4.1 Disassembly

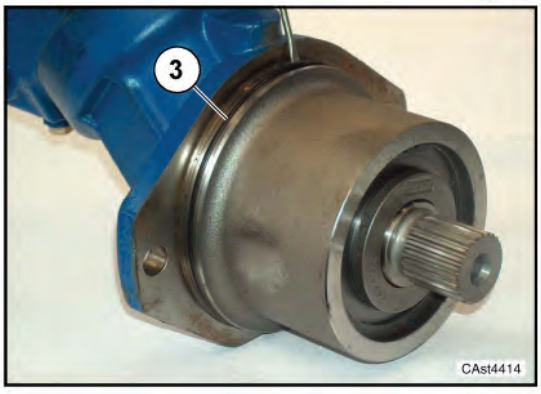
Some of the following pictures could not show exactly your transmission, but the procedure is the same.



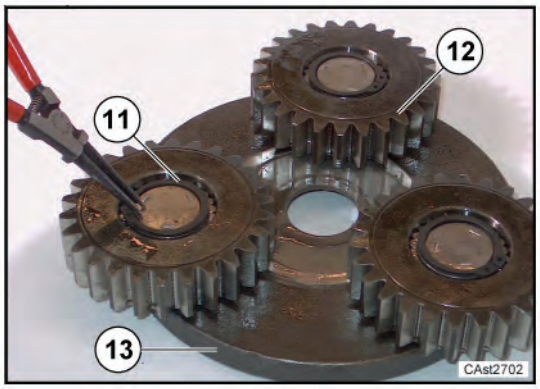
Untighten and remove screws (2).



Remove motor (1).

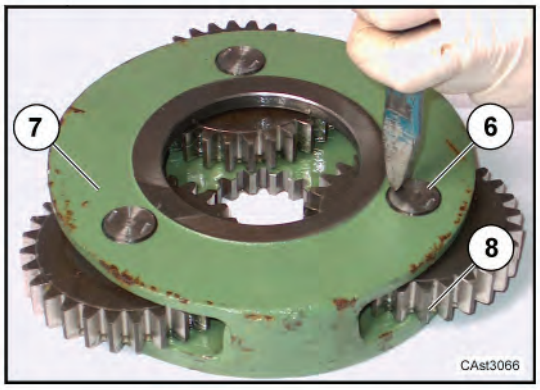


Remove O-Ring (3).



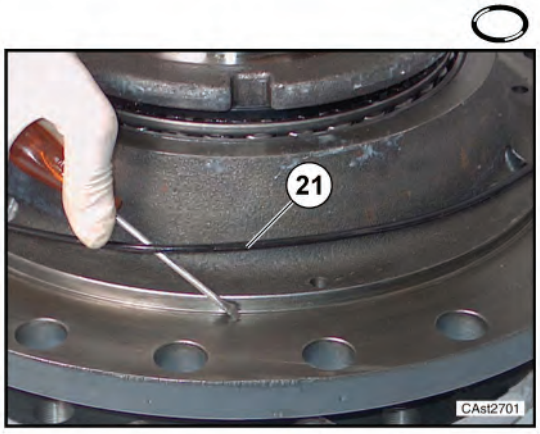
Assemble the planetary gears (12) on the side gears carrier (13)

Assemble snap rings (11).

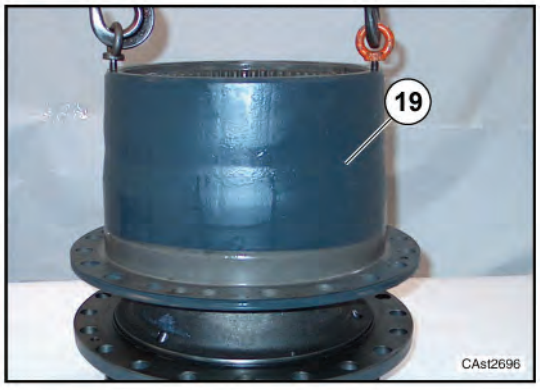


Assemble the planetary gears (8) in the planetary gears carrier (7).

Fit pins (6) in the holes and lock them fitting 3 punchings in pin border.



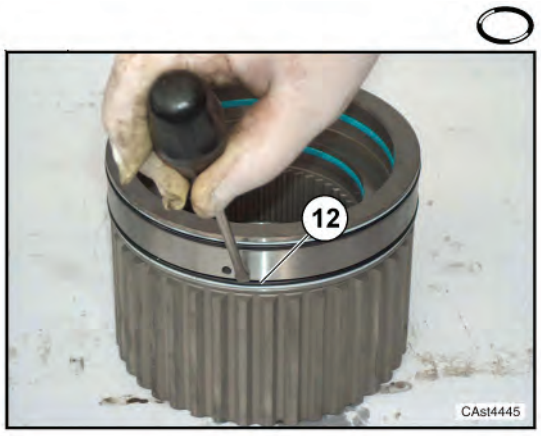
Assemble O-Ring (21).



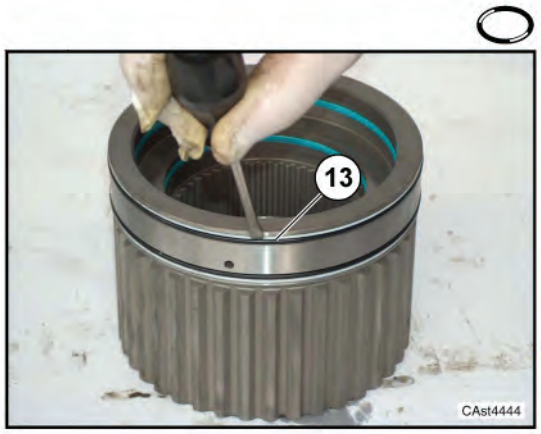
Assemble hollow wheel (19).

D.7.2 Assembly

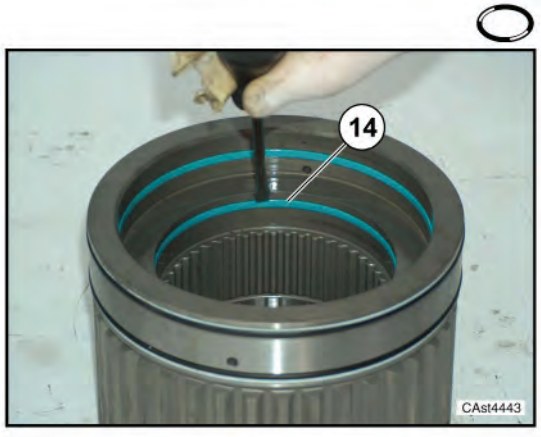
Some of the following pictures could not show exactly your transmission, but the procedure is the same.



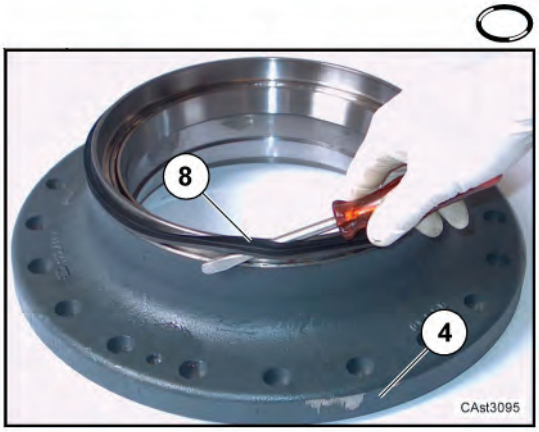
Assemble the gasket (12).



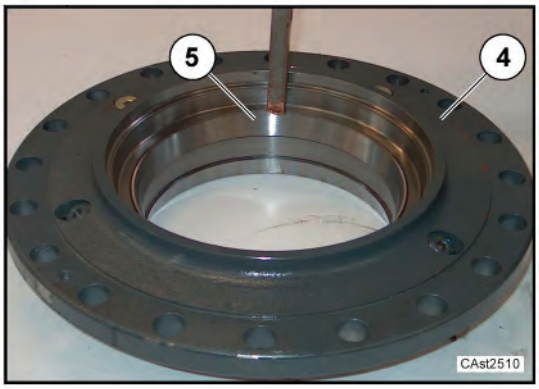
Assemble the gasket (13).



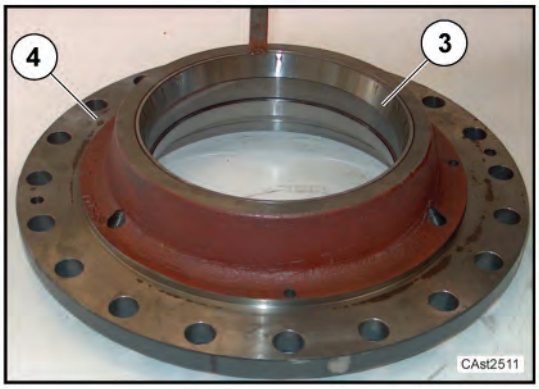
Assemble the gasket (14).



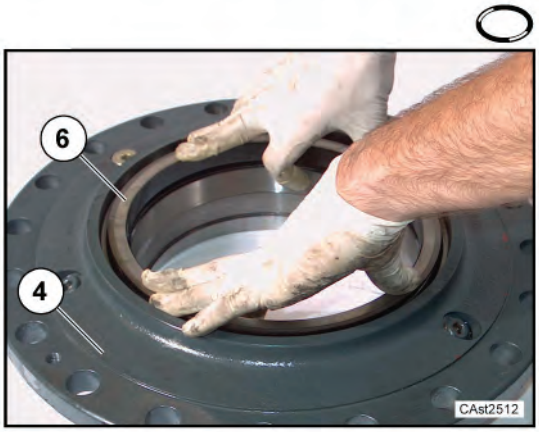
Assemble gasket (8) on hub (4).



Assemble bearing cup (5) on hub (4).



Assemble bearing cup (3) on hub (4).



Assemble half gasket (6) on hub (4).

Pre-filters

The electric fuel system requires the use of a 140-Micron (maximum) pre-filter. This pre-filter should be installed prior to the fuel inlet to the filter-head. Option FS5033 or equivalent.

Wiring with EFS Power Relay

The power to the electric fuel supply pumps is supplied from the 24V batteries through a power relay (see **Figure 6**). The circuit for the EFS power relay may either be contained in an external jumper harness that is added to the engine (Part Number 4068049) or it may be integrated into the base-engine harness (3093696 for Generator Drive engines, 4067866 for Industrial engines). On industrial engines the signal for the power relay comes directly from the keyswitch so that whenever the keyswitch is “on” the electric pumps will also be “on”. For Generator Drive engines using the GCS controller and the INPOWER service tool, the signal to the power relay comes from the ECM, so the pumps are energized whenever the generator is commanded to start. Wiring for the EFS is built into the engine wiring harness for these engines. No additional customer interface is required for these engines. Corporate Generator Sets and Generator Drive engines using the INSITE service tool will use the jumper harness with the EFS. No interface changes will be required for Corporate Generator Sets.

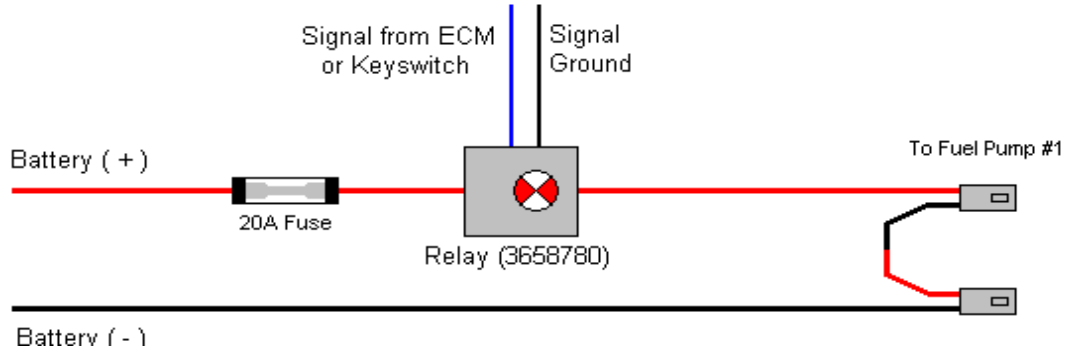


Figure 6: EFS Power Relay Circuit

Engines using the INSITE service tool will require OEMs purchase and install the jumper harness to use the EFS. Power to the EFS relay, in jumper harness equipped engines, will be provided by the signal to the FSO valves. When the FSO valves are commanded to open the EFS will be energized. The fuel pumps are wired in series so that two 12V pumps can be powered from a 24V supply.

Please be aware that the electric fuel supply pumps will draw 6 to 8 amps from the batteries at all times while the engine is running

Pressure and Temperature Sensors

Industrial and Generator Drive engines with the new version of the base-engine wiring harness (3093696 for Generator Drive engines, 4067866 for Industrial engines) will include a pressure sensor and a temperature sensor for the fuel supply. The sensors will be mounted into the fuel filter head (see **Figure 7**). The fuel supply temperature sensor will be in the flow path immediately after the fuel supply pumps and immediately before the fuel filter. The fuel supply pressure sensor will be in the flow path immediately after the fuel filter. This arrangement will allow the ECM to detect low system pressure due to plugged filters.

Engine and Compressor Air Cleaner Service

B. Air Cleaner Service

Proper air cleaner servicing will result in maximum engine protection against the ravages of dust, and can also save time and money by increasing filter life and dust cleaning efficiency. Two of the most common servicing problems are: 1) *Over-Servicing* - new filter elements increase in dust cleaning efficiency as dust builds up on the media. Don't be fooled by filter appearance, it should look dirty. By using proper filter restriction measurement tools, you will use the full life of the filter at maximum efficiency. 2) *Improper Servicing* - your engine is highly vulnerable to abrasive dust contaminants during the servicing process. The most common cause of engine damage is careless servicing procedures. By following the steps shown, unnecessary dust contamination to the engine can be avoided.

1. A filter indicator is used to measure the filter restriction. There are two indicators mounted on the operator control console to monitor the right and left filters.
2. Dust cups should be dumped when 2/3 full. Make sure it seals 360° around the air cleaner body. On Vacuator Valve equipped models, dust cup service is cut to a minimum; a quick check to see that the Vacuator Valve is not inverted, damaged, or plugged is all that is necessary.
3. Light dust plugging of tubes can be removed with a stiff fiber brush. If heavy plugging with fibrous material is evident, remove lower body section for cleaning with compressed air or water not exceeding 160° F (71.7°C).

CAUTION: NEVER clean tubes with compressed air unless both the primary and safety elements are installed in the air cleaner.
DO NOT steam-clean tubes.

C. Element Servicing

1. When restriction indicates that element servicing is required, loosen wing nut and remove primary element. Before installing new element, inspect the element and gasket for shipping or storage damage. Carefully install element and wing nut. Reset the restriction indicator to green. For minimum downtime, replace dirty filter with new or properly cleaned XLP filter element. If element is to be serviced for immediate re-use, reinstall outer cover to protect induction system while cleaning element.
2. Inspect and tighten all air cleaner induction system connections.
3. Inspect all gaskets and replace if worn or damaged. Annual replacement of all gaskets is recommended.

Compressor Drive Coupling

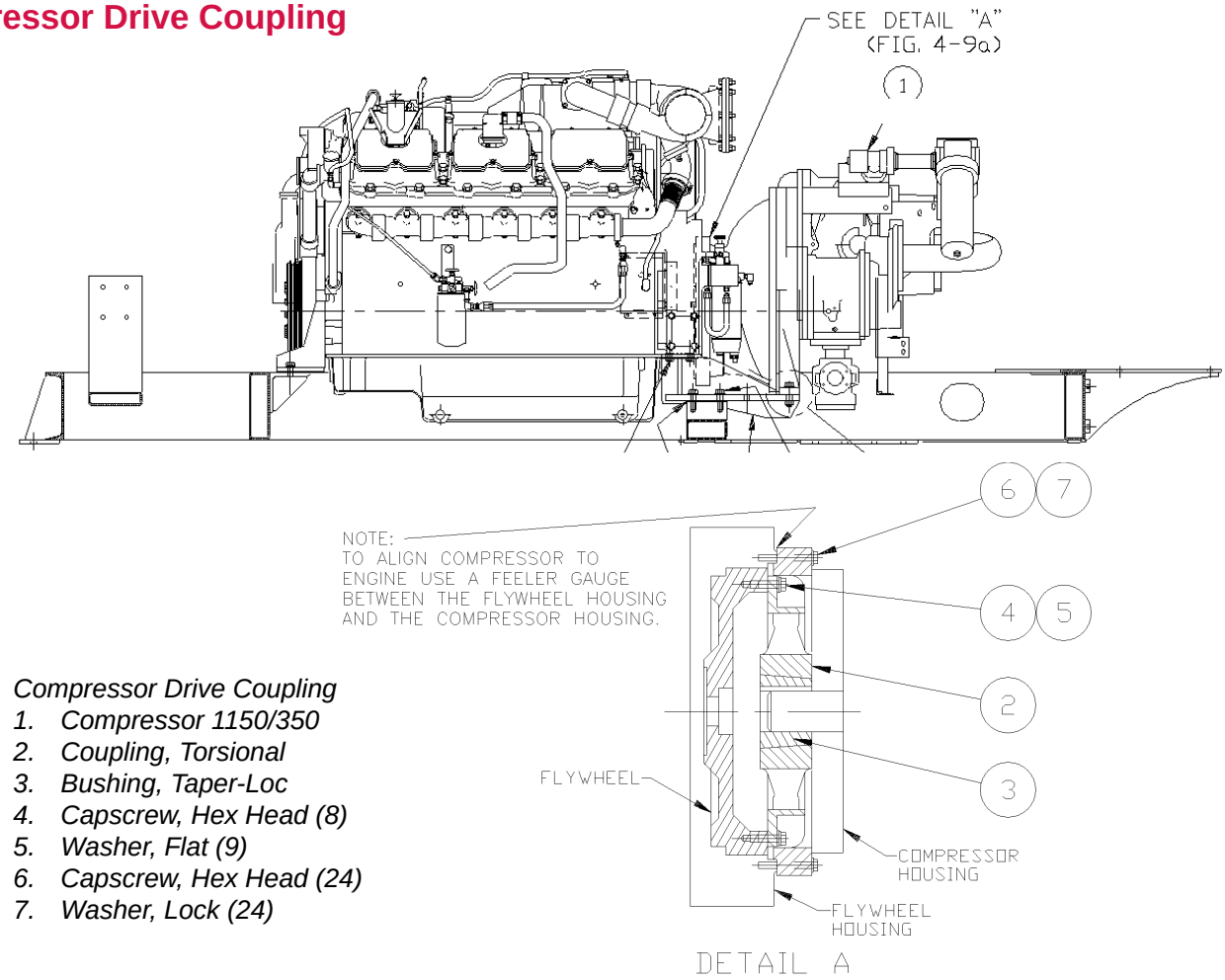


Fig. 4-9a Compressor Drive Coupling

1. *Compressor 1150/350*
2. *Coupling, Torsional*
3. *Bushing, Taper-Loc*
4. *Capscrew, Hex Head (8)*
5. *Washer, Flat (9)*
6. *Capscrew, Hex Head (24)*
7. *Washer, Lock (24)*

Compressor Drive Coupling - Removal and Replacement

The compressor is driven off the rear of the engine via a Torsional Drive Coupling (fig 4-9a). The coupling consists of a rubber element, flange, and taper lock bushing. Usually no service is required other than replacement when the rubber element is worn out. You can inspect the coupling through the openings in the side of the bell housing / adapter plate.

WARNING: Be sure to relieve pressure from hydraulic and pneumatic systems before loosening parts or connections.

Compressor Unit - Removal:

1. Support the compressor unit with a suitable lifting device.
2. Remove the two capscrews (19) that attach the compressor to the lower mountings.

NOTE: Be sure not to lose shims (9) at lower mounting.

3. Remove the twenty-four capscrews (6) from the compressor/engine flywheel adapter.
4. Loosen main air connection so compressor unit can be moved back far enough to allow access to drive coupling.
5. Note position of taper lock bushing on shaft before removing, and install in same position. Refer to following pages for installation and removal of bushing and flex drive hub.
6. Now is a good time to check the compressor shaft seal for leakage, and make any necessary repairs.

Description

Introduction

Your new Sullair Drill air compressor will offer superior performance and reliability along with a minimal amount of maintenance requirements.

The compressor is a 2 stage Sullair rotary screw compressor unit.

As you continue reading this manual and come to learn how the compressor operates and is cared for, you will see how surprisingly easy it is to keep a Sullair compressor in top operating condition.

The package includes a compressor unit, cooling and lubrication system, air inlet system, compressor discharge system, pressure control system and instruments.

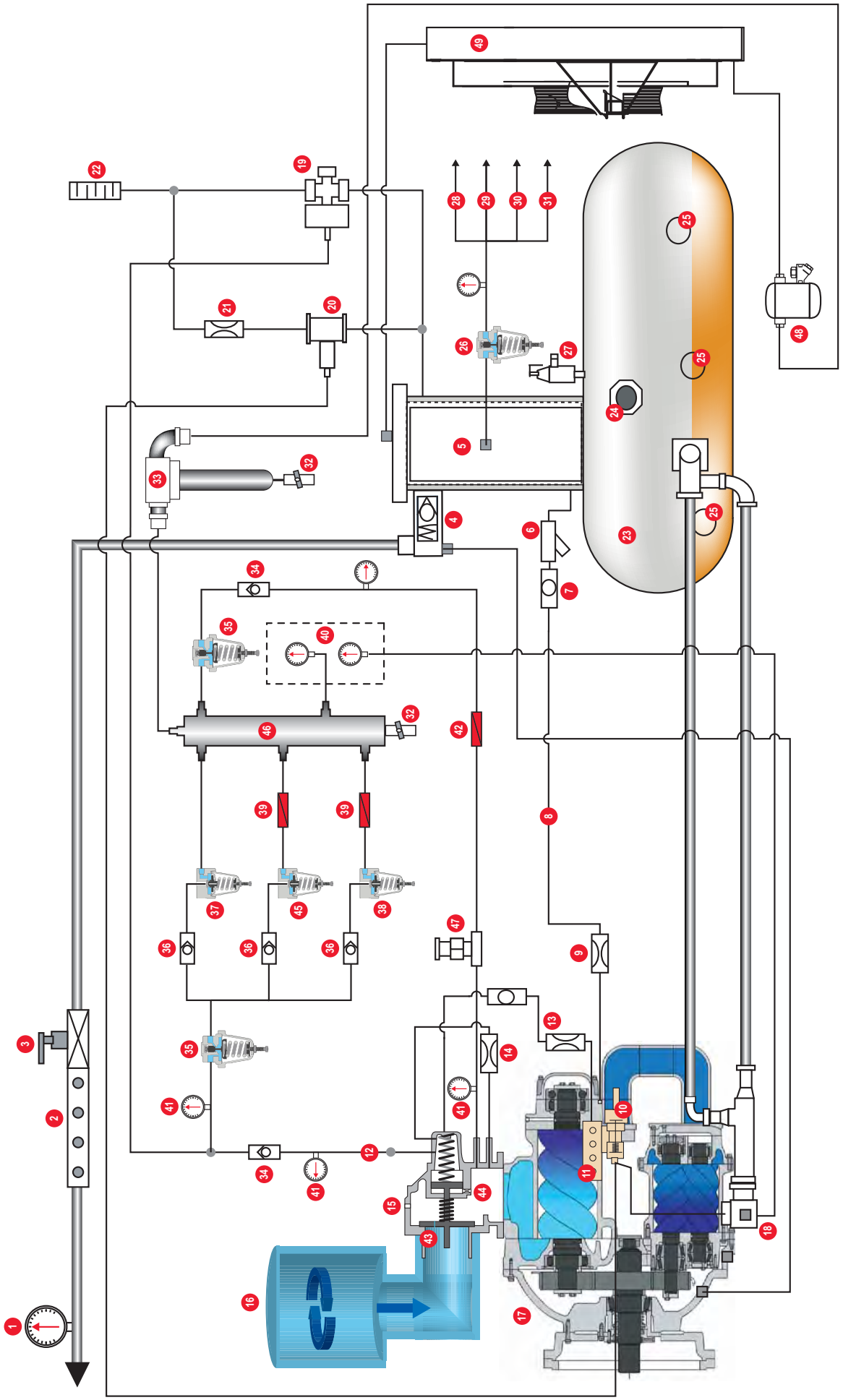
Compressed Air Functions

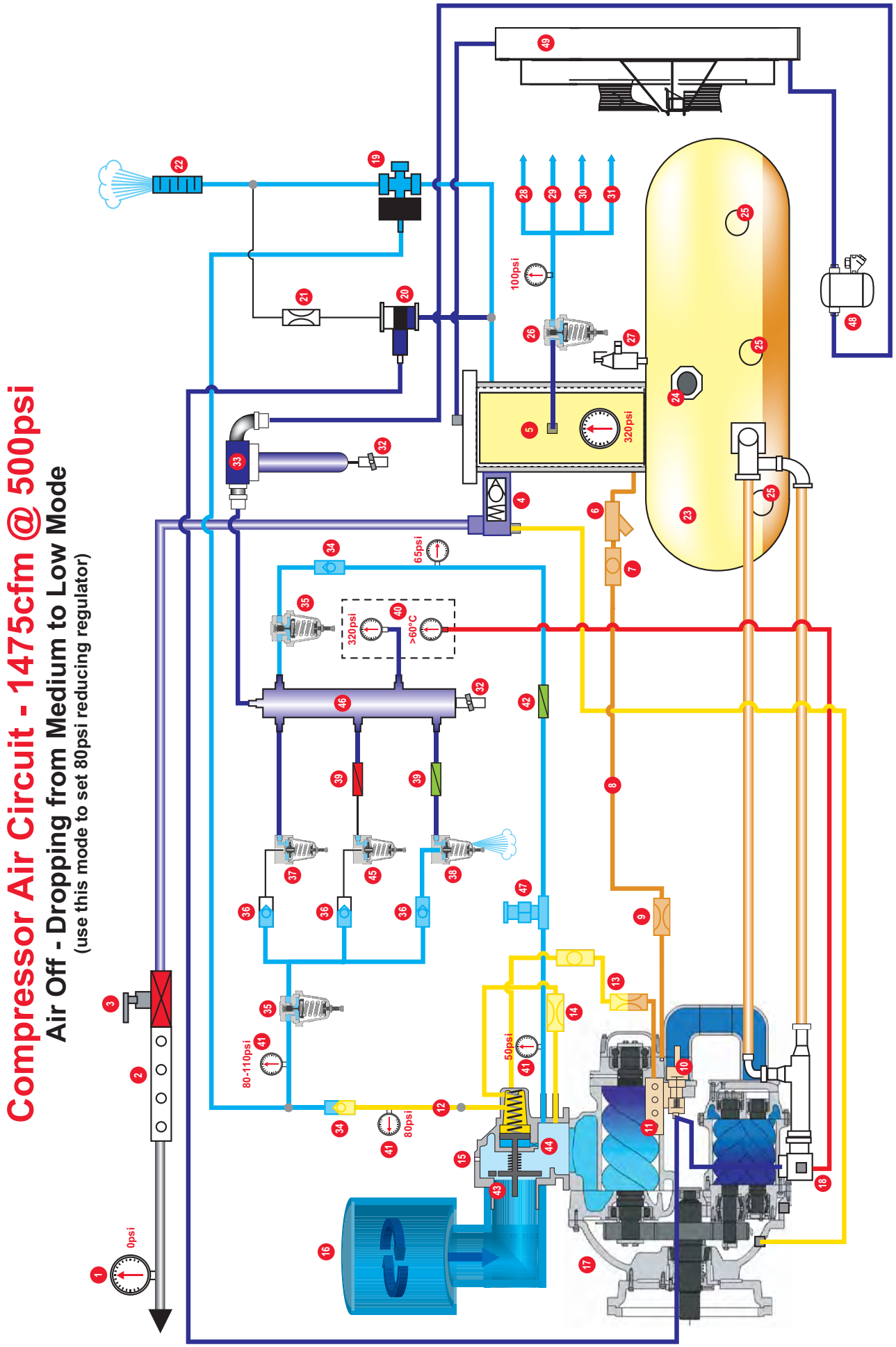
The main function of the compressed air system is to provide air to the drill bit to propel the particles out of the hole. A secondary function of the system is to provide auxiliary air for control functions and for operation grease pumps, air stairs, operator seat, etc.

Fig. 4-2. Sullair High Pressure Compressure

Compressor Air Circuit - 1475cfm @ 500psi

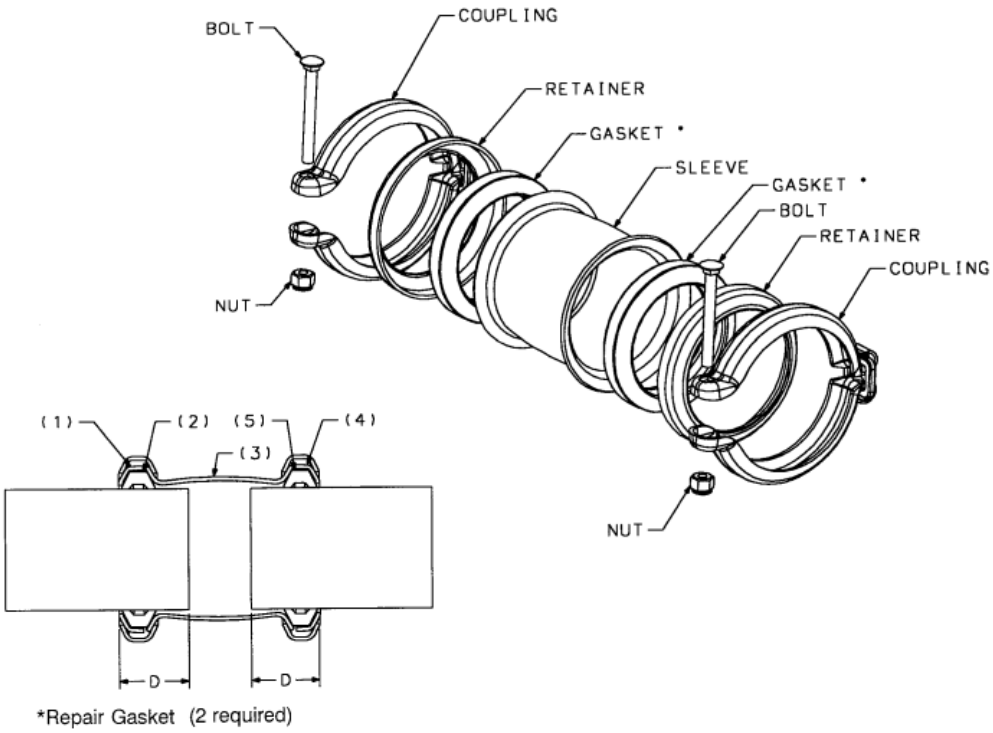
(Shut Down)




Compressor Air Circuit - 1475cfm @ 500psi
Air Off - Dropping from Medium to Low Mode
(use this mode to set 80psi reducing regulator)
0psi
80-110psi
65psi
320psi
>60°C
100psi
320psi
50psi
80psi

Interstage Tube

Flexible Pipe Coupling Maintenance



*Repair Gasket (2 required)

Pipe Size	Insertion Dept (D) Min.	Max.	Torque
3.5" (88.9mm)	1.70" (43.2mm)	2.40" (61mm)	180 to 200 in.–lbs. (20.3 to 22.5Nm)

(1) Tighten as shown in chart or optionally of 1/2" (12.7mm) clearance between coupling lugs, whichever comes first.

Coupler Installation

1. Install both couplings as shown, encompassing the retainer, gasket and sleeve. DO NOT tighten either coupling until the entire joint has been assembled.
2. Tighten the nuts to the torque value shown in Table 2. RECOMMENDED ASSEMBLY TORQUE MUST BE MAINTAINED. Retightening of the coupler will be necessary if leakage occurs.

Special Notes

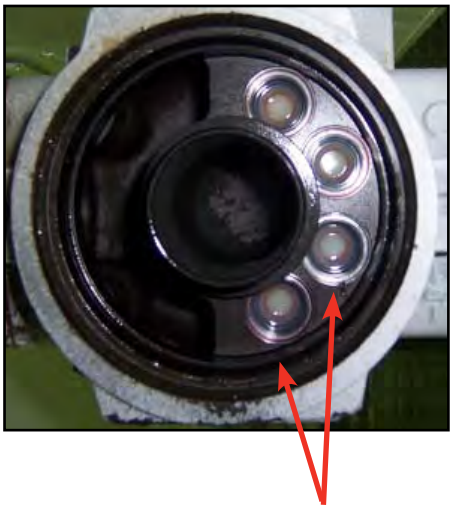
1. Assembly of the gaskets can be made easier by dipping the gaskets in water or the fluid to be sealed. DO NOT USE THE RUBBER LUBRICANTS.
2. Flexible joints are not intended to support end loads caused by internal pressure or other forces causing pipe separation.

NOTE: When filter element is changed, it is important to check that all four (4) Bypass check valves are in place.

This is done by looking up into the Filter head from the underneath side once the filter bowl and element have been removed.

Inspect/check all four (4) by-pass valves in housing for cracks, chips or damage.

There must be a by-pass check in all four (4) ports, if missing and the port is open then there will be no filtration occuring of the compressor fluid.



Bypass check valves (4)

Changing Filter Elements

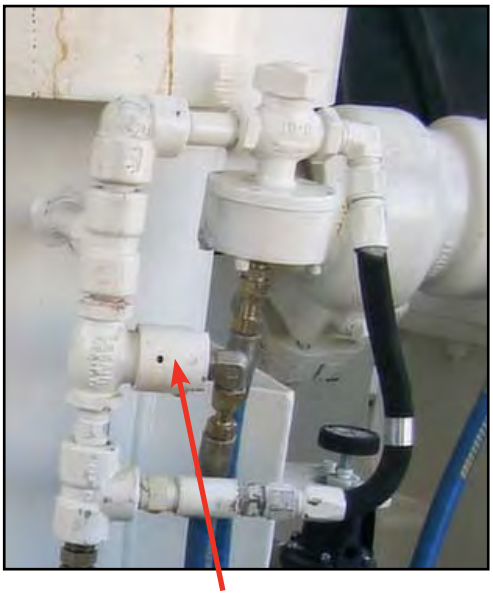
WARNING: Relieve pressure on hydraulic and pneumatic systems before loosening connections or parts.
Failure to depressurize system before proceeding could result in explosive loss of fluid, damage to equipment, or possible personal injury.

1. Shutdown and depressurize the system. Open bleed plug (if fitted) one and one half turns.
2. Unscrew and remove filter cover bowl (6) from head assembly (7), counterclockwise when viewed from above. It may be necessary to use a lever on the “Rotolok Ring” of the filter bowl (6) to loosen the bowl initially.
3. Remove filter element (5) and carefully inspect the surface for visible contamination. Normally no dirt should show, but visible dirt or particles can be an early warning of system component breakdown and can indicate potential failure. Discard both the filter element and its O-ring. The filter element is not cleanable. Any attempt to clean the filter element can cause degradation of the filter medium and allow contaminated fluid to pass through the filter element.
4. DO NOT run the system without a filter element (5) installed. Check that the O-ring (2) on the head assembly (7) is not damaged. Use replacement filter element part number called for on the element change label or in the parts book.

NOTE: The 4 bypass valves must be checked. A damaged bypass valve will allow fluid to pass unfiltered.

5. Lubricate element O-ring (2) with clean system fluid and push open end of filter element (5) straight onto the nipple in the head assembly (7). Clean out filter bowl (6) and lightly lubricate threads of filter cover assembly with clean system fluid. Screw cover assembly onto head assembly until it bottoms. O-ring sealing is not improved by overtightening.

System Blowdown Valve

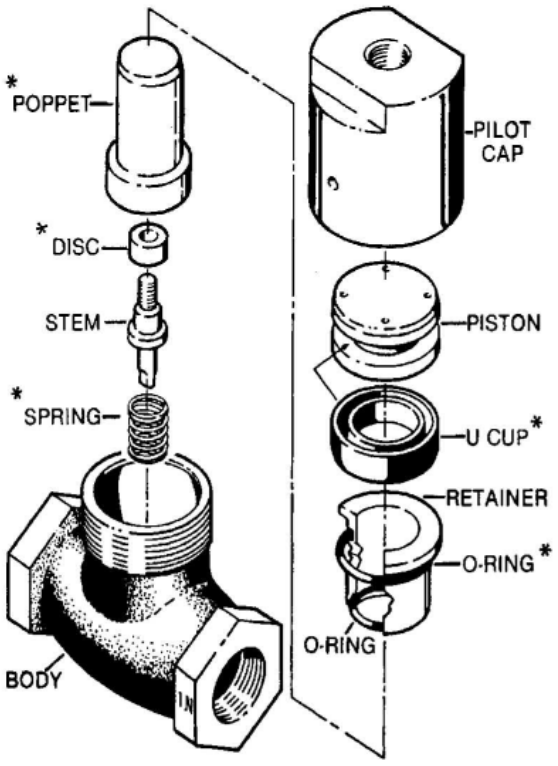


System (Shutdown) Blowdown valve

This is a 2-way normally opened (N.O.) valve that is piloted closed from the same pilot line that opens the oil stop valve. When the compressor firsts starts up the system blowdown is piloted closed which allows the receiver to build up pressure. When the compressor is shut down the valve opens and vents any remaining receiver pressure. The system blowdown valve will stay open until the compressor starts up again.

When necessary to make repairs on the system blowdown valve use repair kit and follow the instructions provided below.

1. Remove the pilot cap and push the piston out of the pilot cap.
2. Remove the U-cup from the piston and replace it with the new one provided in the kit. Lubricate the U-cup with Parker Super “O” lube or an equivalent quality silicone grease.
3. Thoroughly clean the cap. Place the piston (with the U-cup in position) in the cap so the recessed centre is showing at the valve body end of the cap.
4. Pull the retainer, poppet and spring out of the valve body. Discard the spring and separate the poppet from the retainer.
5. Remove the O-rings from the inside and outside diameters of the retainer.
6. Unscrew the stem portion of the poppet to allow removal of the disc. DO NOT mar the machined finish of the poppet when screwing the stem.
7. Remove the disc and replace it with the new one provided.
8. Replace the stem portion and tighten securely.
9. Clean the poppet and retainer thoroughly.
10. Replace the O-rings in the retainer and lubricate thoroughly with the silicone lubricant used above.
11. Place the poppet in the retainer as it was prior to separating it.
12. Clean the valve body and place the new spring in the valve body.
13. Place the poppet and retainer back in the valve body and replace the pilot cap.
14. Tighten the pilot cap securely with a wrench and the shutdown blowdown valve is ready for operation.



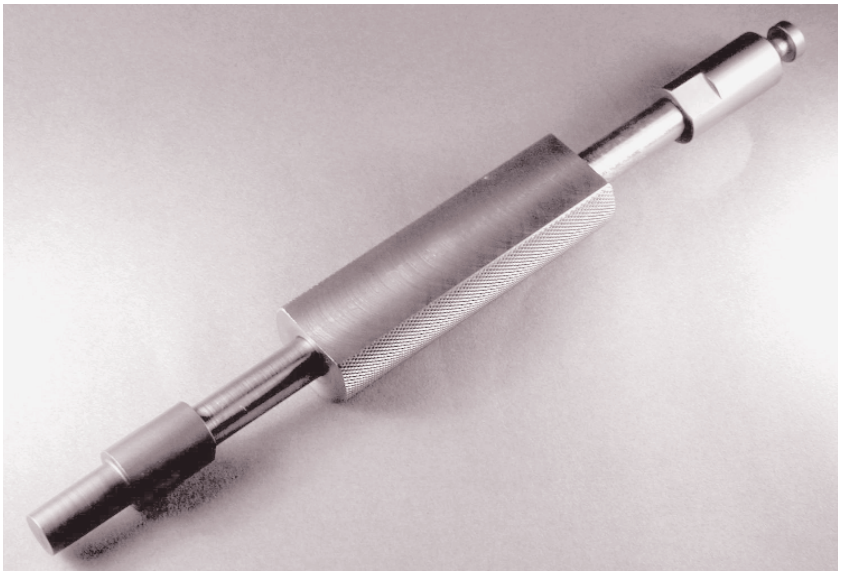
NOTE: * Indicates item is in repair kit

Compressor overheating	Dirty fluid cooler core	Clean core thoroughly.
	Faulty thermostat in thermal valve	Change thermostat element.
	Plugged fluid cooler tudes (internal)	Clean tubes thoroughly.
	Low sump fluid level	Fill.Change element.
	Plugged fluid return line	Clean orifice and strainer.
	Low fan speed	Check/Adjust
	Fluid filter blocked	Change element
	High stage air end failure	Replace air end
Gearcase relief opening	High stage of air end worn out	Check interstage pressure with main air on. Should be maximum 85psi (5.8bar).
	Faulty relief valve	Replace relief valve

Models CSC 350 and CSC 500

Repair Instructions:
Special Header Plate Repair

NOTE: The header plate on the CSC cooler is designed to withstand physical abuse. However, upon inspection, if a tube hole appears damaged, it can be repaired using the header plate repair tool shown below. Call L&M customer service for specific instruction.



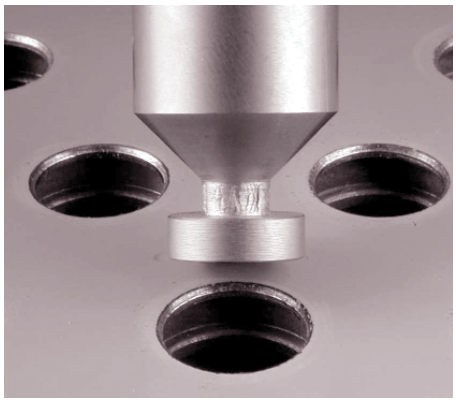


Fig. 1

The header plate repair tool serves two purposes. First, one end slips under the damaged lip (figure 1) and by gently tapping (or pulling) the integral slide hammer up, the tool brings the lip back up the the desired flatness (figure 2).

Once this is done, the other end of the tool is inserted into the hole (figure 3) and by gently tapping down with the slide hammer, the tool is forced into the hole. This action creates a hole of optimum diameter and roundness (figure 4).

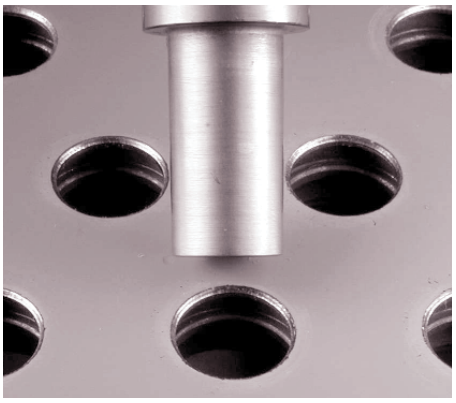


Fig. 3

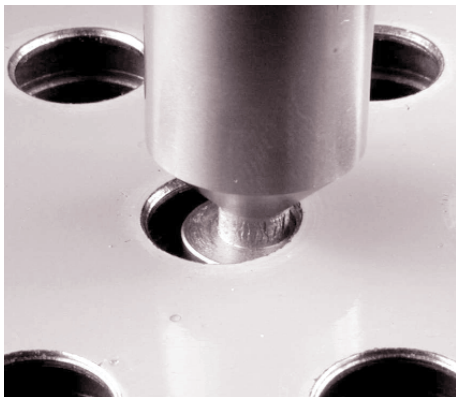


Fig. 2

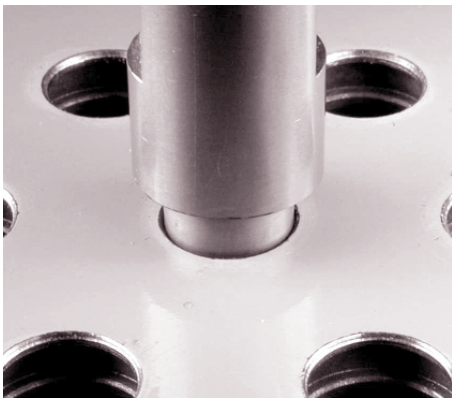
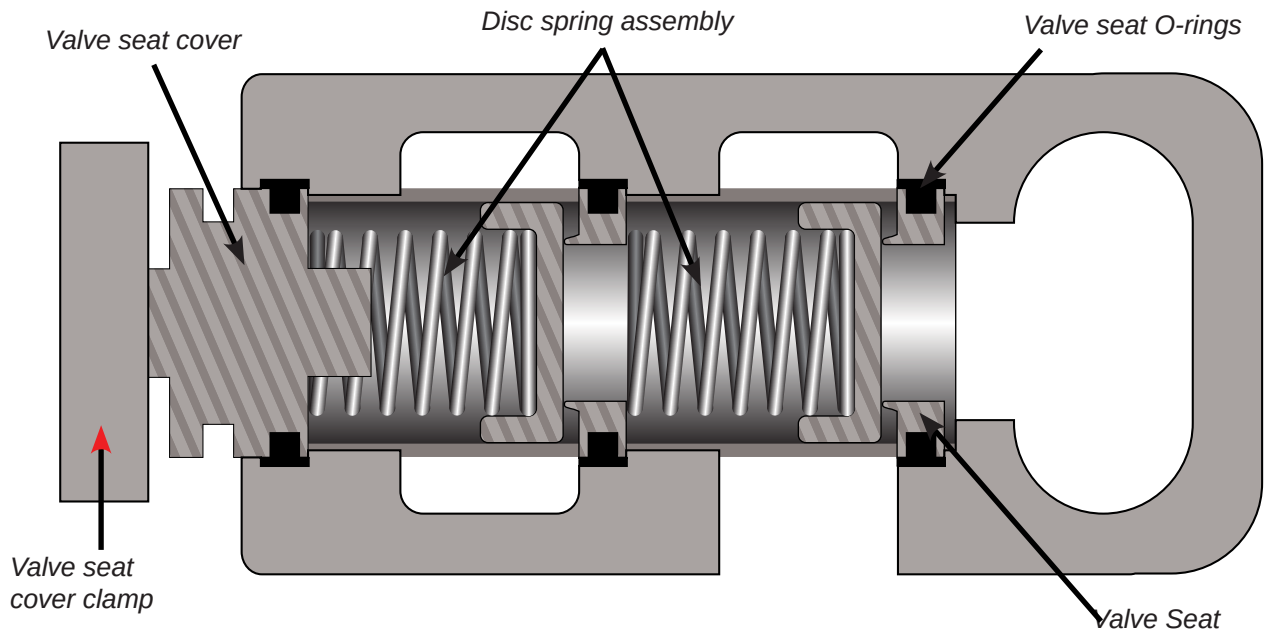


Fig. 4

Replacing Suction and Discharge Valves

1. Remove cap screw and valve cover clamp from the front of the fluid chamber.
2. Insert the end of a standard screwdriver into the valve cover groove and pry the valve cover away from the fluid chamber.
3. Remove the discharge valve disc-spring assembly and the perforated valve cage from each of the two-(2) pump cylinders.
4. Use a finger to reach through the opening at the center of the seat and work the seat loose from the chamber. Note, the optional valve seat removal tool (FMC part number 1250638) may be used to simplify this procedure.
5. Use the same procedure to remove the suction valve cage and valve seat, which are located directly under the discharge valve seat.
6. Inspect all valve components and replace as necessary. Note that even small damage or erosion to the sealing area of the valve or the O-ring can adversely affect the performance of the pump.
7. With the O-ring in place on each valve seat, place a few drops of light oil around the O-ring to aid in installation. Place each valve seat SQUARELY in the counterbore in the bottom of the fluid chamber.
8. Place the valve cage on the valve seat and insert the disc/spring assembly inside of the cage on the valve seat.
9. Repeat the previous two (2) steps to install the discharge valve seat and the discharge valve cage.
10. Place the valve covers (with O-rings on BOTTOM groove) in place over the valve assembly.
11. Replace clamp bar and cap screw and torque per specification.

NOTE: Over-tightening the cap screw can damage the valve components.



Mast Repair

WARNING: Consult Terex Reedrill factory before repairing any damage to the mast or mainframe structure of the machine.
All welding must be done by a certified welder. Reedrill can provide proper welding procedures and material specifications.

CAUTION: DO NOT weld on any part of the machine without first disconnecting the negative battery cable or place the battery disconnect switch in the open position. On machines equipped with electronic engine, disconnect the connections to the Electronic Control Module (ECM) on the engine before welding (see Section 8).

10. Remove all sheaves that the cable passes through. It is a good idea to check the sheave bearings and seals and replace any worn parts at this time. Remove cable.
11. Install new cables and existing sheaves. Install clevis on rotary head guide first, and then install cable end and adjusting nut.
12. The cables are now installed loose and sagging. Adjust the nuts so the hoist cables are sagging 2-4" at the mid-point. Do the same for the pull down cables.
13. Install a 6000 PSI (414 bar) gauge in port "GA" of tensioner manifold. Set the pressure on the RDFA-LAN relief valve to maximum. Start machine and feed down at 1000 PSI to pressurize the "P" port of the tensioner manifold. Set the pressure reducing valve between 600 PSI (41 bar).
14. There is now equal pressure in the four tensioning cylinders, and equal tension of the four cables. The rotary drive is also aligned with equal tension on all four cables.
15. If the Upper and Lower tensioner cylinders are retracted to different lengths, the needle valves can be opened and the feed moved up or down slightly to transfer oil from one cylinder to the other to centralise both cylinders.

Needle Valve with locking screw

a. If upper tensioner cylinders are extended further than lower cylinders, engage the deck wrench on the bit sub flats with the mast laid back enough for the hammer to clear the work deck, then fully lower the mast, unscrew the locking screw and open needle valves and apply pull down pressure (1200psi) until upper and lower tensioner cylinders are extended evenly are extended evenly.

b. If lower cylinders are extended further than the upper cylinders, unscrew the locking screw and open the needle valves and raise the mast. The weight of the drill pipe hanging on the rotary head will pull on the hoist cables which will extend the top tensioner cylinders to maximum. This will send the oil from the upper cylinders to the lower cylinders. The mast can then be lowered and the cylinder extensions can be adjusted using pull down. The needle valves must be closed tightly and the locking screw retightened before drilling can be commenced.

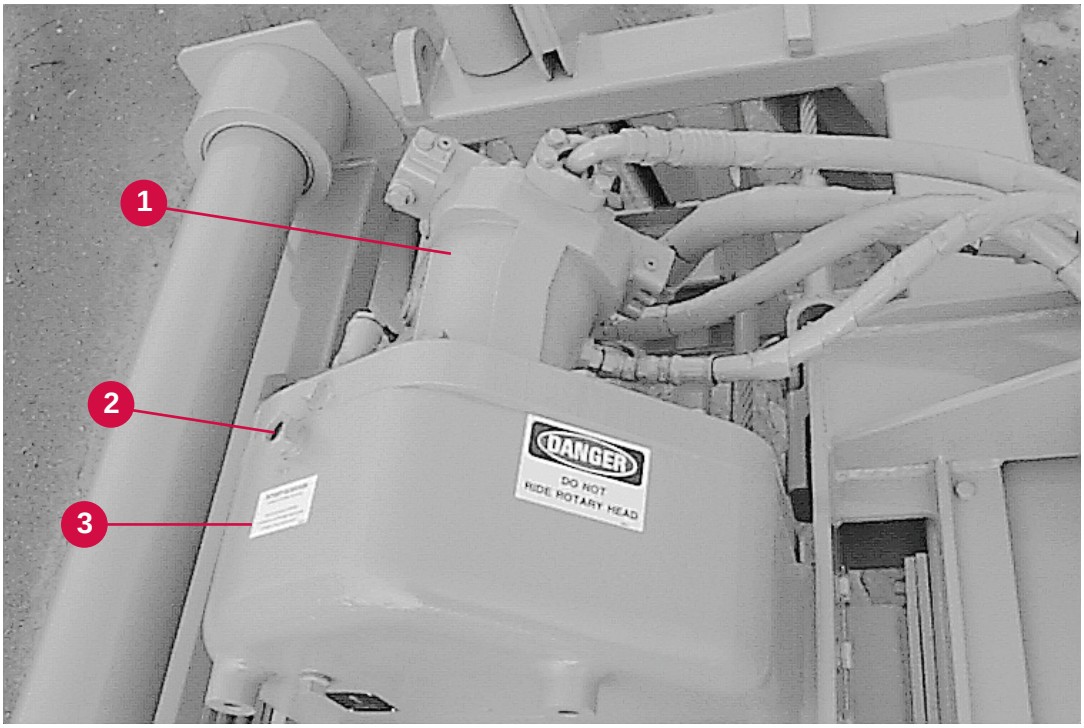


Fig. 6-8 Rotary Drive Assembly

1. *Rotary Drive Motor*
2. *Oil Level Sight Window*
3. *Rotary Gearcase*

Rotary Drive Motor - Repair

NOTE: It is not recommended that major repairs be made to hydraulic pumps and motors, as it will void the warranty. Usually, when a pump or motor is in need of major repair, it is more cost effective to replace it with a new or rebuilt unit.

Refer to the AA6VM Service Manual in Section 7 (Hydraulics) for complete information on adjustments and shaft seal repair.

The motor used for this application is 160 cc.

Control type is HA1.

Cotta Service	Repair Manual	Cotta Service

TORQUE LIMIT TABLE GRADE 5 UNC

Bolt Torques									Grade 5 UNC Hex Head Cap Screws	
2A Threads				Non Plated		CAD Plated				
Bolt Size	Clamping Force, Lbs	Nominal Diameter	Safety Factor	Dry Seating torque ft-lbs	Lubed seating torque ft-lbs	Dry Seating torque ft-lbs	Lubed seating torque ft-lbs	Tensile Area, sq in	Width Across Flats	Area under head, sq in
8 - 32	893	0.1640	1.75	2	2	2	2	0.0140		
10 - 24	1116	0.1900	1.75	3	3	3	3	0.0175		
1/4 - 20	2027	0.2500	1.75	8	8	7	6	0.0318	0.438	0.1170
5/16 - 18	3341	0.3125	1.75	17	16	14	13	0.0524	0.500	0.1398
3/8 - 16	4941	0.3750	1.75	30	28	25	23	0.0775	0.562	0.1631
7/16 - 16	6777	0.4375	1.75	48	44	40	37	0.1063	0.625	0.1880
1/2 - 13	9046	0.5000	1.75	73	68	60	57	0.1419	0.750	0.2908
9/16 - 12	11603	0.5625	1.75	106	98	87	82	0.1820	0.812	0.3225
5/8 - 11	14408	0.6250	1.75	146	135	120	113	0.2260	0.937	0.4535
3/4 - 10	21293	0.7500	1.75	260	240	213	200	0.3340	1.125	0.6542
7/8 - 9	29453	0.8750	1.75	419	387	344	322	0.4620	1.312	0.8894
1 - 8	38633	1.0000	1.75	628	579	515	483	0.6060	1.500	1.1631
1 1/8 - 7	42347	1.1250	1.75	774	715	635	595	0.7630	1.687	1.4706
1 1/4 - 7	53780	1.2500	1.75	1092	1008	896	840	0.9690	1.875	1.8173
1 3/8 - 6	64103	1.3750	1.75	1432	1322	1175	1102	1.1550	2.062	2.1972
1 1/2 - 6	77978	1.5000	1.75	1901	1754	1560	1462	1.4050	2.250	2.6170

Coefficient of friction for dry, nonplated bolts =	0.195
Coefficient of friction for oil lubed, nonplated bolts =	0.18
Coefficient of friction for dry, CAD plated bolts =	0.16
Coefficient of friction for oil lubed, CAD plated bolts	0.15

Clamping force = (Proof tensile load) *(tensile area)/(safety factor)
Torque = (Clamping force)*(Coefficient of friction)*(Nominal diameter)

Nominal diameter & tensile area from " Mechanical Engineering Design", by Shigley/Minske 5th ed., pg. 328
Shear area of threads = (Minor diameter)^2 * (pi/4)

#8 - 1" proof tensile load = 85,000 psi (125 KSI min. tensile)
1" - 1 1/2" proof tensile load = 74,000 psi (105 KSI min. tensile)

0. 6

Cotta Service	Repair Manual	Cotta Service

Fig.21

Press Intermediate gear off of the shaft.

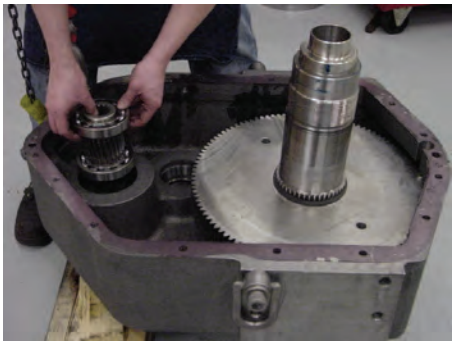


Fig.22

Remove Input shaft assembly.

Fig.23

Press ball bearing off input shaft.
Repeat process on other side.

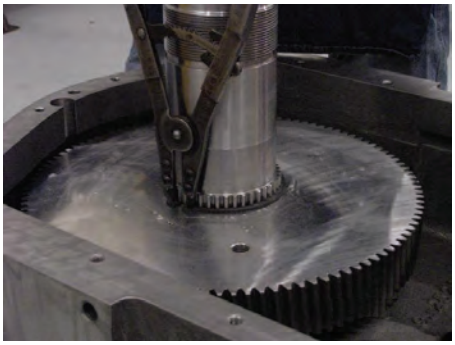


Fig. 24

Remove snap ring from output shaft.

1. 6

Cotta Service	Repair Manual	Cotta Service

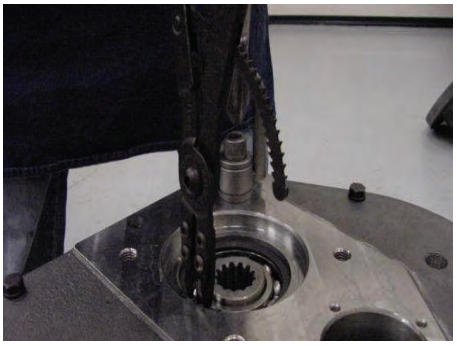


Fig. 33

Install snap ring.

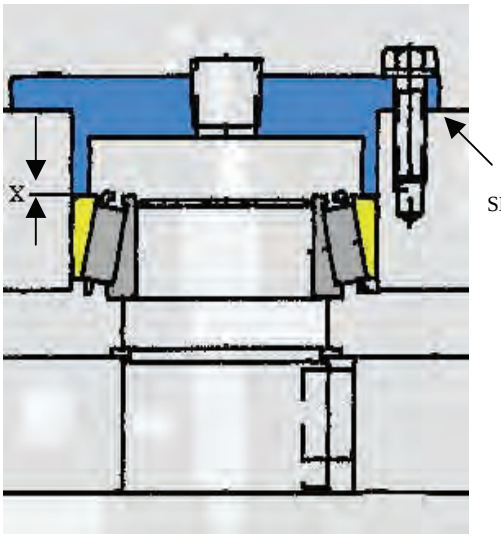


Fig. 34

Adjust / check end play intermediate shaft:

X = end play (0.003 / 0.005 in.)

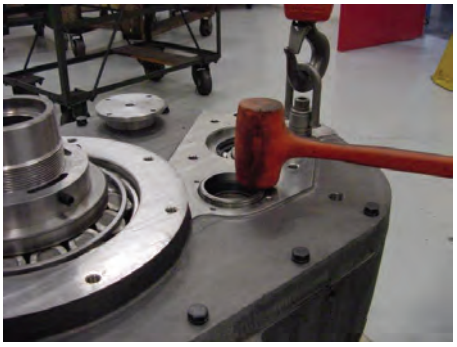
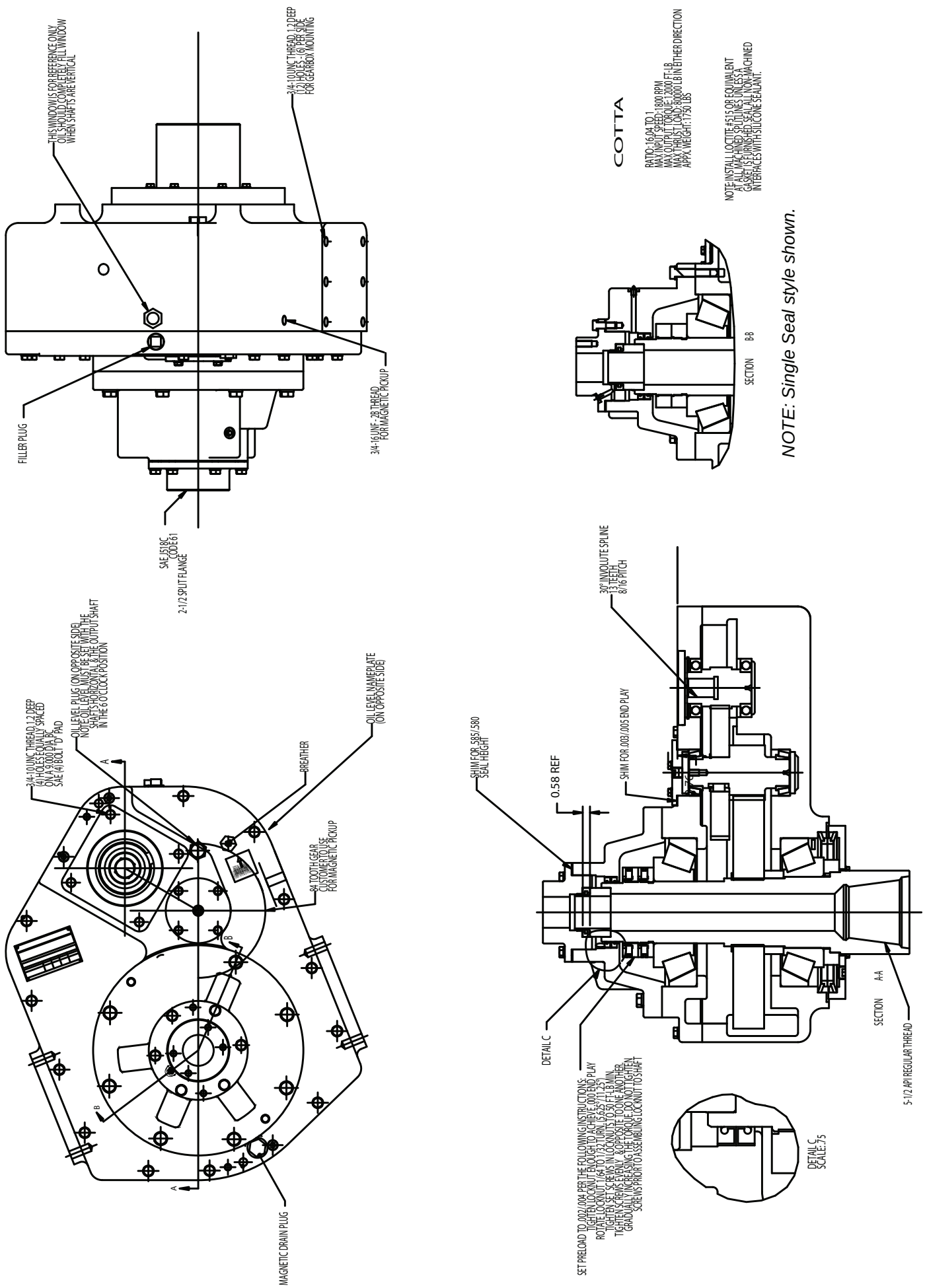


Fig. 35

Wet bearing cup with oil and install into bore until contact is obtained.


THIS WINDOW IS FOR REFERENCE ONLY.
OIL SHOULD COMPLETELY FILL WINDOW
WHEN SHAFTS ARE VERTICAL
3/4-10 UNC THREAD, 1.2 DEEP
(12) HOLES - (6) PER SIDE
FOR GEARBOX MOUNTING
FILLER PLUG
3/4-16 UNF - 2B THREAD
FOR MAGNETIC PICKUP
SAE J518C
CODE 61
2-1/2 SPLIT FLANGE
COTTA
RATIO: 16.04 TO 1
MAX INPUT SPEED: 1800 RPM
MAX OUTPUT TORQUE: 12000 FT-LB
MAX THRUST LOAD: 80000 LB IN EITHER DIRECTION
APPX. WEIGHT: 1750 LBS
NOTE: INSTALL LOCTITE #515 OR EQUIVALENT
AT ALL MACHINED SPLITLINES UNLESS A
GASKET IS FURNISHED. SEAL ALL NON-MACHINED
INTERFACES WITH SILICONE SEALANT.
SECTION B-B
NOTE: Single Seal style shown.
3/4-10 UNC THREAD, 1.2 DEEP
(4) HOLES EQUALLY SPACED
ON A 9.000 DIA BC
SAE (4) BOLT "D" PAD
OIL LEVEL PLUG (ON OPPOSITE SIDE)
NOTE: OIL LEVEL MUST BE SET WITH THE
SHAFTS HORIZONTAL & THE OUTPUT SHAFT
IN THE 6 O'CLOCK POSITION
BREATHER
OIL LEVEL NAMEPLATE
(ON OPPOSITE SIDE)
84 TOOTH GEAR
(CUSTOMER TO USE
FOR MAGNETIC PICKUP
MAGNETIC DRAIN PLUG
30° INVOLUTE SPLINE
13 TEETH
8/16 PITCH
SHIM FOR .585/.580
SEAL HEIGHT
0.58 REF
SHIM FOR .003/.005 END PLAY
DETAIL C
SECTION A-A
5-1/2 API REGULAR THREAD
SET PRELOAD TO .002/.004 PER THE FOLLOWING INSTRUCTIONS:
TIGHTEN LOCKNUT ENOUGH TO ACHIEVE .001 END PLAY
ROTATE LOCKNUT 1/64 TO 1/32 TURN (.565°/1.125°)
TIGHTEN SET SCREWS W/ 1/2 KNUTS TO 95 FT-LB MIN.
TIGHTEN SCREWS EVENLY W/ OPPOSITE SCREW ANOTHER
GRADUALLY TIGHTENING TO FINAL TORQUE TO NOT OVERTIGHTEN
SCREWS PRIOR TO ASSEMBLING LOCKNUT TO SHAFT
DETAIL C
SCALE: .75

THEORY OF OPERATION

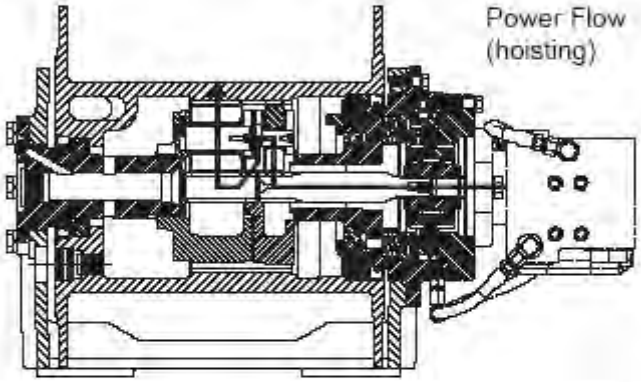
DESCRIPTION OF WINCH

The winch has three basic assemblies:

1. Hydraulic motor assembly and brake valve
2. Cable drum assembly
3. Brake cylinder and motor adapter

The hydraulic motor is bolted to the motor adapter which in turn is bolted to the brake cylinder and the winch base. The cable drum assembly is supported by anti-friction bearings which are located by the brake housing at one end and the bearing support at the other end. The ring gear for both planetary sets is machined on the inside surface of the cable drum.

PLANETARY GEAR TRAIN



The hydraulic motor shaft is directly coupled to the inner brake hub which is connected to the input shaft which acts as the sun gear for the primary planetary set. When driven by the input shaft, the primary planet gears walk around the ring gear machined in the cable drum and drive the primary planet carrier.

The primary planet carrier drives the output sun gear which drives the output planet gears. The output planet carrier is splined to the bearing support and cannot rotate. As the output planet gears are driven by the output sun gear, they drive the ring gear/cable drum.

DUAL BRAKE SYSTEM

The dual brake system consists of a dynamic brake system and a static brake system.

The dynamic brake system has two operating components:

1. Brake valve assembly
2. Hydraulic motor

The brake valve is basically a counterbalance valve. The counterbalance valve is mounted to the hoist port of the motor on units with 020, 029 and 039 motors. Units with the 071 motor use a counterbalance valve cartridge in the brake valve block which is bolted to the motor. The operational theory of both systems is the same. A check valve allows free flow of oil to the motor in the haul-in direction and a pilot operated, spring-loaded spool valve blocks the flow of oil out of the motor when the control valve is placed in neutral. When the control valve is placed in the pay-out position, the spool valve remains closed until sufficient pilot pressure is applied to the end of the spool to shift it against spring pressure and opan a passage. After the spool valve cracks open, the pilot pressure becomes flow-dependent and modulates the spool valve opening which controls the pay-out speed. .

The static brake system has three operating components:

1. Spring applied, multiple friction disc brake pack
2. Over-running brake clutch assembly
3. Hydraulic brake cylinder and spring plate

The static brake consists of alternately stacked friction and steel brake discs. The steel brake discs are externally splined to the motor adapter and cannot rotate. The friction discs are internally splined to the outer brake hub of the over-running brake clutch. When compressed by spring force, the brake pack locks the over-running brake clutch outer brake hub to the motor adapter.

The static brake is released by the pilot pressure at a pressure lower than that required to open the pilot operated brake valve. This sequence assures that dynamic braking takes place in the brake valve and that little, if any, heat is absorbed by the friciton brake.

The friction brake is primarily a load holding brake and will provide dynamic braking only during extremely slow operation when there is insufficient flow to open the brake valve.

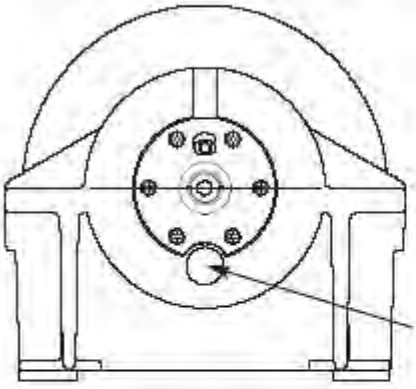
The sprag type over-running brake clutch is installed between the inner brake race and the outer brake hub. The over-running brake clutch, allows the inner brake race and input shaft to turn freely in the direction to haul in cable and locks up to force the friction brake discs to turn with the inner brake race and input shaft to pay out cable. The brake pack remains fully applied when hauling in cable and must be released by pilot pressure to allow the brake discs to turn freely and pay-out cable.

DISASSEMBLY OF WINCH

SERVICE PRECAUTIONS

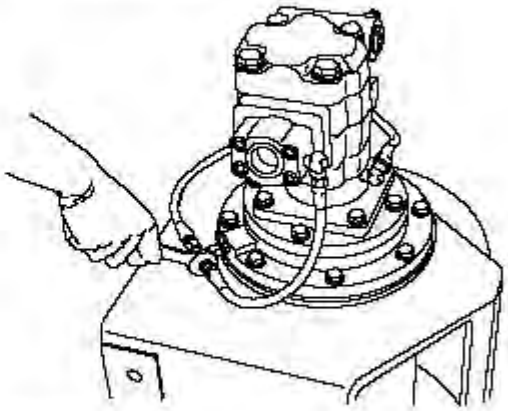
- Before any part is removed from the winch, all service instructions should be read and understood.
- Work in a clean, dust free area as cleanliness is of utmost importance when servicing hydraulic equipment.
- Inspect all replacements parts, prior to installation, to detect any damage which might have occurred in shipment.
- Use only genuine BRADEN replacement parts for optimum results. Never reuse expendable parts such as oil seals and O-rings.
- Inspect all machined surfaces for excessive wear or damage . . . before reassembly operations are begun.
- Lubricate all O-rings and oil seals with gear oil prior to installation.
- Use a sealing compound on the outside surface of oil seals and a light coat of thread sealing compound on pipe threads. Avoid getting thread compound inside parts or passages which conduct oil.
- Thoroughly clean all parts in a good grade of non-flammable safety solvent. Wear protective clothing as required.

After troubleshooting the winch and its hydraulic system as covered in the "Troubleshooting" section, and the problem is determined to be in the winch, use the following procedure to disassemble the winch.



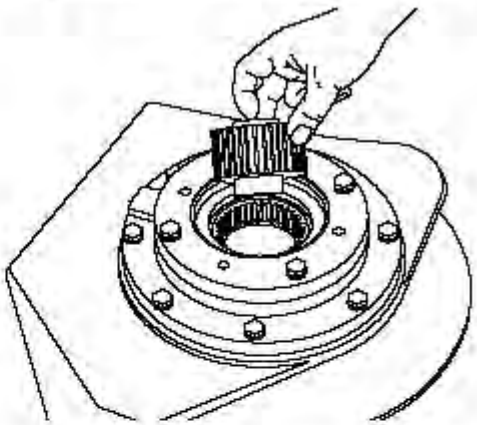
1. Remove the wire rope from the winch drum and align the drain hole in the drum with a hole in the support side plate before removing the hoses and mounting bolts. After the winch is removed from its mounting, thoroughly clean the outside surfaces. To drain the oil, install a short piece of 1 inch pipe in the larger threads of the drain hole. If necessary, insert a bar into the anchor pocket and manually rotate the drum in the direction to hoist a load until the drain holes are aligned.

2. Use a 5/16 inch Allen wrench to remove the drain plug through the pipe. Drain the oil into a suitable container and dispose of used oil in an environmentally friendly manner.



3. Begin disassembly by removing the oil level plug and standing the winch on the bearing support end. Tag and remove the hydraulic hoses that connect the brake valve and manifold to the brake cylinder.

4. Remove the capscrews securing the motor, and lift the motor off the winch. Remove and discard the O-ring installed on the pilot of the motor.

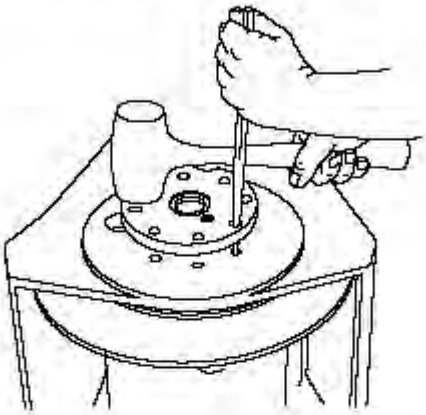


5. Remove the brake clutch assembly from the motor support. Refer to "Brake Clutch Service" for additional information.

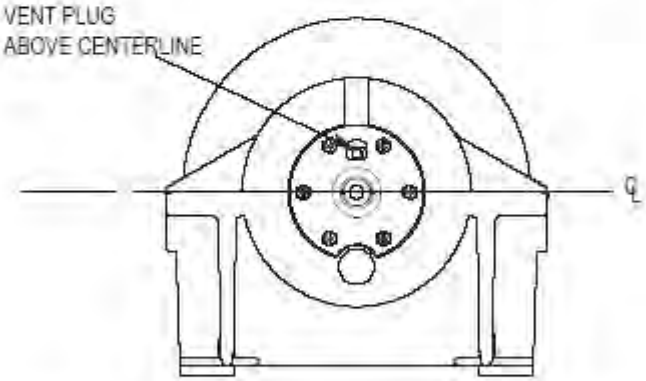
WINCH ASSEMBLY

1. Place winch base on side with bearing support end up.

2. Install a new bearing in the drum if replacement is necessary. Apply a non-hardening sealant on the outside diameter of a new seal. Install the spring side of the seal toward the bearing, then press into the drum, using a flat plate to avoid distortion. Be sure drain plug is installed securely.



3. Center the drum in the opening of the base. Lubricate the bearing support with petroleum jelly or gear oil and install in base and drum.



⚠CAUTION⚠

Be sure the vent plug is located above the horizontal centerline for the intended application. Oil leakage may occur if vent is positioned incorrectly

4. Tighten the bearing support capscrews to the recommended torque.

5. Stand winch on bearing support end and install snap ring on bearing support.

⚠CAUTION⚠

This snap ring will keep the output planet carrier correctly positioned in the winch. Gear train damage may occur if this snap ring is omitted.

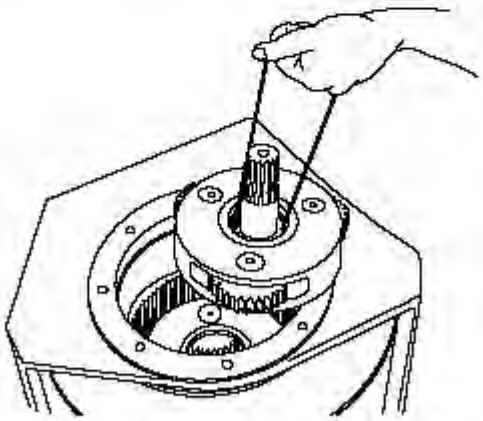
6. Install the output sun gear and thrust washer into the output planet carrier.

TIP: 2 pieces of stiff wire with an "L" shaped hook on one end can be used to lower the planet carrier assemblies into the drum.

7. Install the output planet carrier into the drum while meshing the planet gears with the ring gear and the planet housing with the bearing support.

8. Install the primary sun gear and thrust washer into the primary planet carrier.

NOTE: 23:1 gear ratio winches have a sun gear adapter in addition to sun gear shaft. The thrust plate between the primary and output sun gears is not captive within the carrier assembly. Apply a small amount of oil soluble grease or petroleum jelly to the thrust plate and center it on the output sun gear before installing the primary planet carrier assembly.



9. Install the primary planet carrier, meshing the planet gears with the ring gear and the planet housing with the output sun gear.

WARNING: BE SURE to relieve pressure on hydraulic or pneumatic systems before loosening connections or parts.

The function of the Pipe positioner is to stabilize and guide the drill pipe. It is especially needed when drill angle holes, and is also used to help guide when loading pipe to and from the carousel. The positioner consists of a hydraulic cylinder that attaches to a pivot arm. This in turn raises or lowers the positioner bracket and roller.

Service procedures for the pipe positioner are limited to replacing or repairing the cylinder. Refer to parts manual for specific repair part numbers, detailed drawings and cylinder repair kits.

Refer to Section 7 of this manual for repair procedures on hydraulics cylinders. When repairing hydraulic cylinders follow the "General Information" instructions, then follow the specific instructions for head and piston type that matches the cylinder.

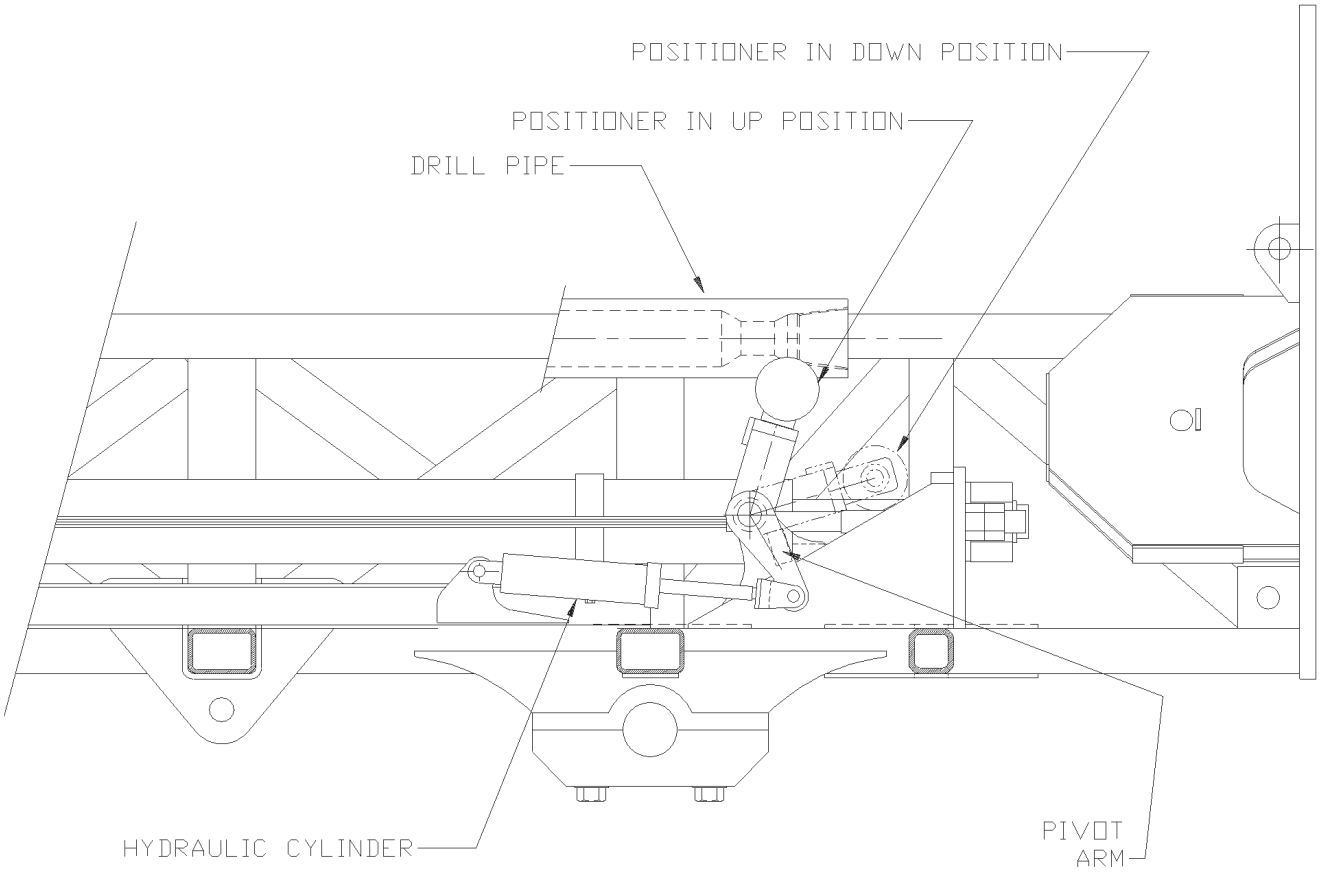
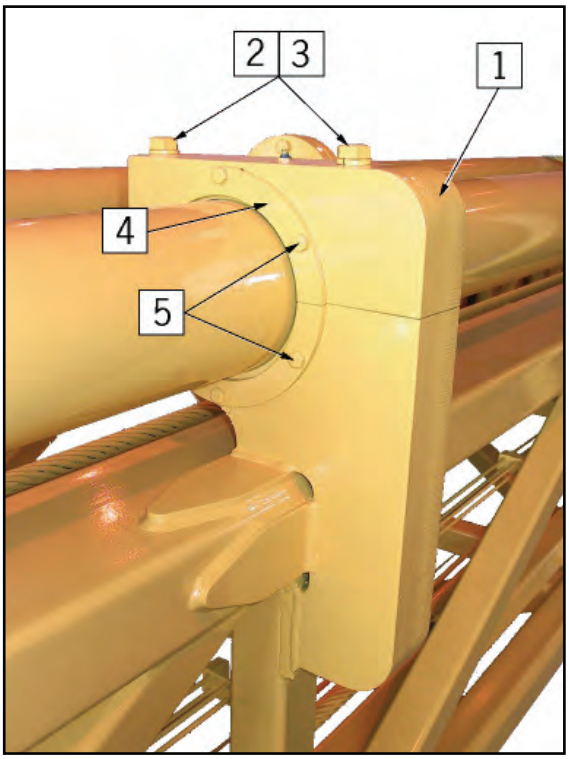


Fig. 6-17b Pipe Positioner (ref. 416095)

Mid-Point Carousel Pivot Support

Bearing - Removal and Replacement

1. Remove the two capscrews (2) and lock washers (3) and lift off the cap (1).
2. Remove upper half of bearing (7) and replace with a new one.
3. Lift up on carousel pivot pipe so as to take load off lower bearing half. Remove lower bearing half and grease and install new bearing. Let carousel pivot pipe back down.
4. Apply grease to upper bearing half and install bearing and cap. Install capscrews (2) and new lock washers (3). Torque capscrews to standard torque value. Apply grease to grease fittings until it comes out sides of bearing.



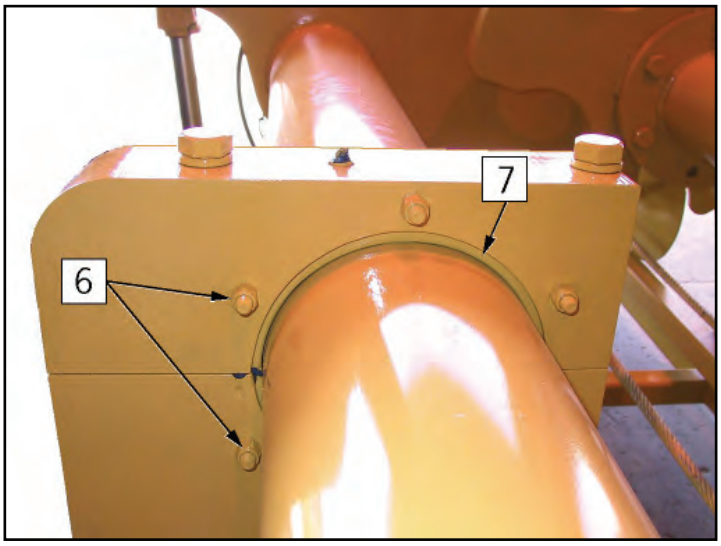


Fig. 6-30 Mid-Point Carousel Pivot Support

6. *Elastic Stop Nut (6)*
7. *Journal Bearing (split)*

Fig. 6-29 Mid-Point Carousel Pivot Support

1. *Cap*
2. *Capscrew (2)*
3. *Lock Washer (2)*
4. *Bearing Retainer (split)*
5. *Capscrew (6)*

Carousel Rotate Motor

Refer to Section 7 Char-Lynn Repair Information on 2000 Series motors for rebuild information. Refer to parts manual for your specific machine for repair parts numbers.

Pressure Setting Sequence

WARNING: Relieve pressure on hydraulic and pneumatic systems before loosening connections or parts. Failure to depressurize system before proceeding could result in explosive loss of fluid, damage to equipment, or possible personal injury.

The following sequence is recommended for checking and setting pressures. Be sure to relieve all pressure in system prior to installing gauges. Complete pressure setting procedures and locations are described in detail further in this section.

CAUTION: Each person performing service work must be satisfied that they have adequate knowledge and training to perform the required tasks. A thorough understanding of hydraulic and pneumatic systems as well as electrical and mechanical knowledge and experience is required.

Pressure Setting Sequence

The following sequence is recommended for checking and setting pressures. Be sure to relieve all pressure in system prior to installing gauges. If machine is equipped with a hydraulic pressure test station it will not be necessary to install gauges. The pressure setting procedures and locations are described fully in this section.

HYDRAULIC SYSTEM

FUNCTION	PRESSURE
1. Charge Pressure	450 PSI (31 bar)
2. RH / LH Tram	
Crossover (High Pressure)	5500 PSI (380 bar)
Pressure Override (P.O.R.)	5000 PSI (345 bar)
3. Auxiliary/Fan Pump	
Standby	300 PSI (20.1 bar)
Main Pressure	3400 PSI (234 bar)
4. Auxiliary/Fan Pump Load Sense Relief (Nominal)	1500 PSI (172 bar)
5. Control Manifold	
V04 Maximum Pulldown relief	4000 PSI (275 bar)
V05 Surge Protection Pressure Reducing/Relieving Valve	450 PSI (31 bar)
V06 Surge Protection Releif Valve	600 PSI (41 bar)
V08 Maximum Rotation Pressure Relief	4000 PSI (276 bar)
V09 Surge Protection Pressure Reducing/Relieving Valve	450 PSI (31 bar)
V10 Surge Protection Relief Valve	500 PSI (34.5 bar)
V13 Reduced Feed Relief	900PSI (62 bar)
6. Dust Collector/Water Injection	2000 PSI (138 bar)

See Section Contents for reference to complete sequence information.

EP (24VDC) Control

EP stands for **Electrical Proportional** control. Pump flow is infinitely varied from 0 to 100 percent, proportional to an electrical current in the range of 200 - 600 mA at 24VDC, supplied to solenoid A or B (see table 7-1). Electrical energy is converted to a force acting on the control spool. The spool then directs control oil in and out of the stroking piston to stroke the pump as required. A feedback lever, connected to the stroking piston, maintains the pump flow for any given current within the control range. The plugs to the solenoid valves are equipped with a green LED light (fig. 7-5). If the light is on, it indicates it is receiving power.

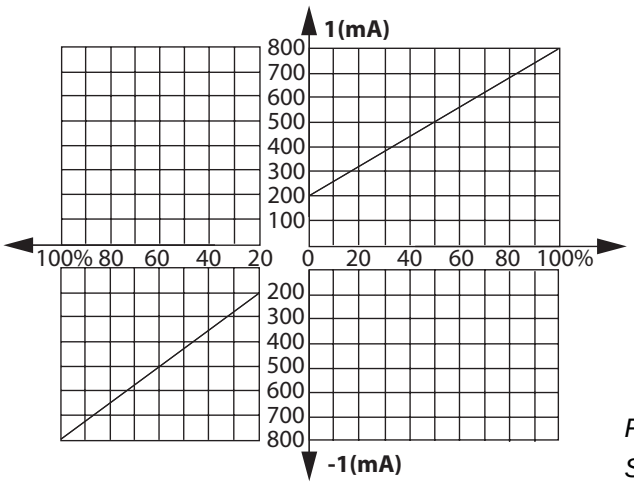


Table 7-1 Current vs. Flow
Control Current (24 VDC): I = 200 - 600 mA
Begin of control: I = 200 mA (V_{g0})
End of control: I = 800 mA ($V_{g\,max}$)

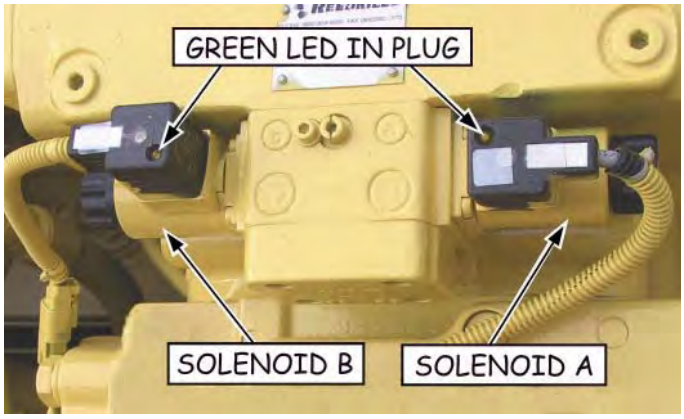


Fig. 7-5 EP Control 24VDC
Solenoids are receiving power if green LED is on.

Clockwise Direction of Rotation - Control - Output Flow Direction				
Size	**Solenoid**	**Control Pressure**	**Flow Direction**	**Operating Pressure**
125	a	X1	B to A	Ma
	b	X2	A to B	Mb

Pressure Cut-Off

The pressure cut-off valve varies the swashplate angle, as required, to limit the maximum pressure at port A or B.

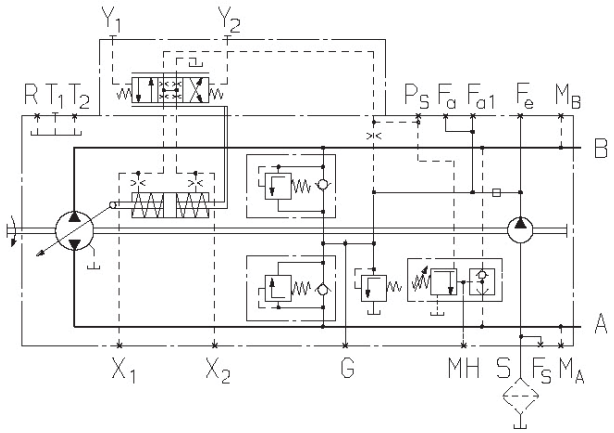
The pressure cut-off valve prevents continuous dumping of excessive flow, at load pressure, through the cross port relief valves in the pump. This eliminates unnecessary heating of the oil and protects the pump and motor during rapid acceleration or deceleration, or when the drive stalls, causing the pump to dead-head.

The pressure peaks that occur with rapid swivel angle changes, and also the maximum system pressure, are further protected by the high pressure relief valves.

The pressure cut-off valve should be set 20–30 bar (290–435 psi) less than the high pressure relief valve settings.

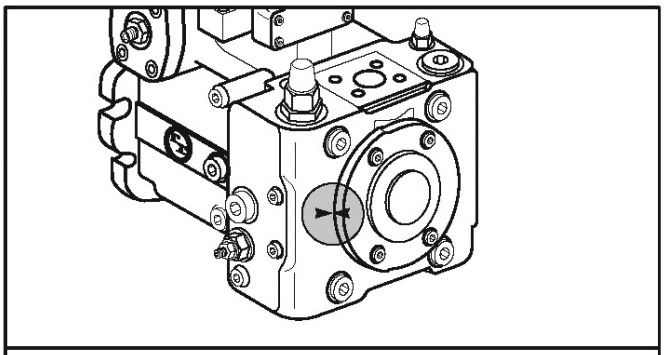
Standard Adjustment Range: 2175–6500 psi (150–450 bar)

Schematic Drawing - Standard model



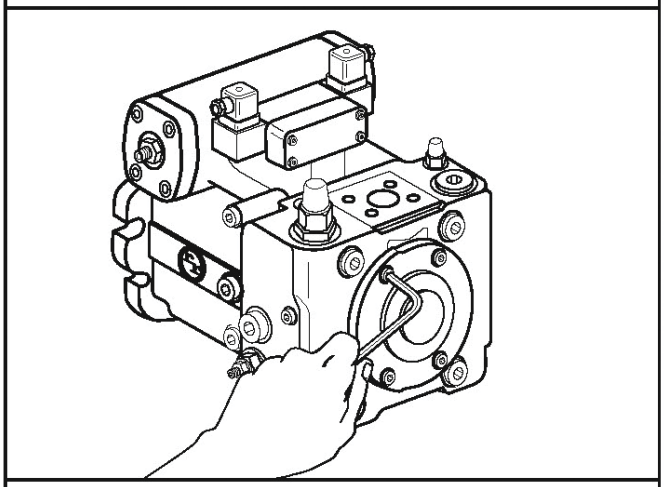
Removal and Inspection of Charge Pump

Before removing cap screws, mark the position of the charge pump housing and separator plate in relation to the port block.



Loosen screws with metric allen wrench.

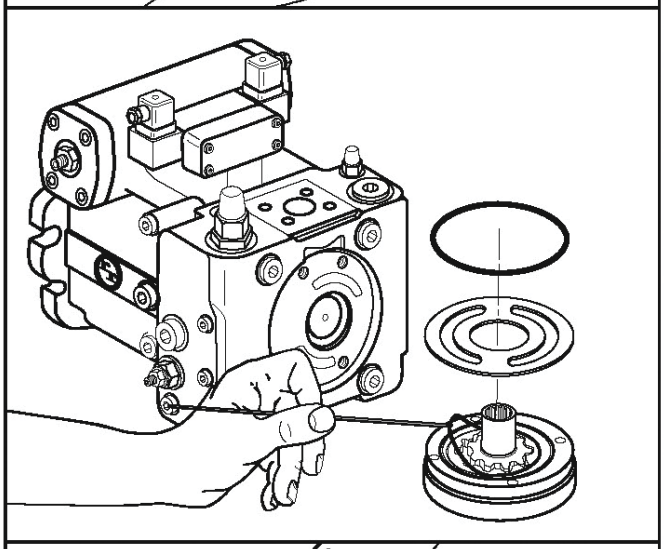
Pump Size	Allen Wrench
28…125	6 mm
180…250	10 mm



Remove charge pump housing and inspect for wear or damage to gear set and O-ring seals. Grease O-rings prior to reassembly. Make sure O-rings are completely seated in their grooves.

Withdraw pinion shaft and inspect gear teeth and bearing surfaces for abnormal wear.

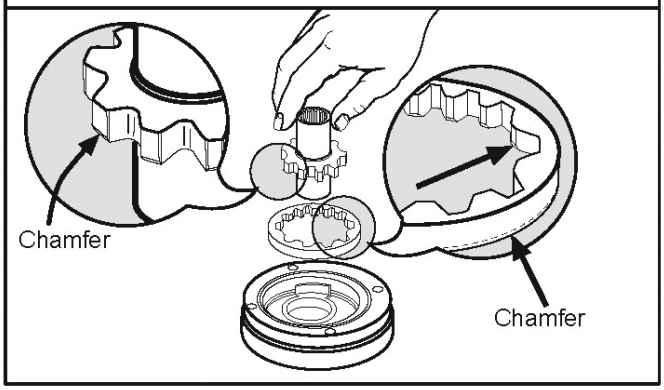
When reassembling, make sure chamfer (on outer edge of driven gear and drive gear) is installed into housing per illustration.

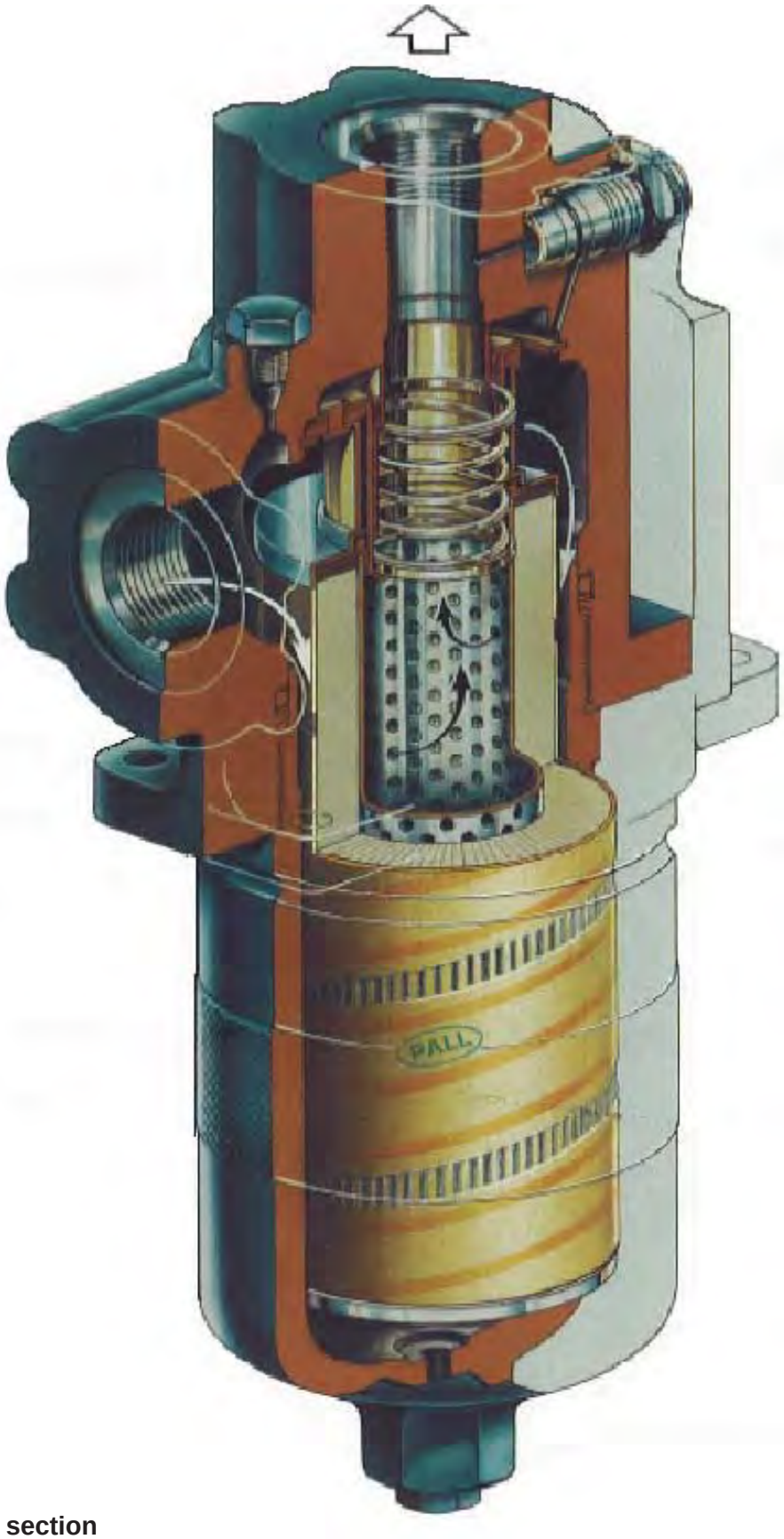


Torque value for bolts when replacing charge pump.

Pump Size	Torque
28…125	18 ft-lbs (24 Nm)
180…250	62 ft-lbs (24 Nm)

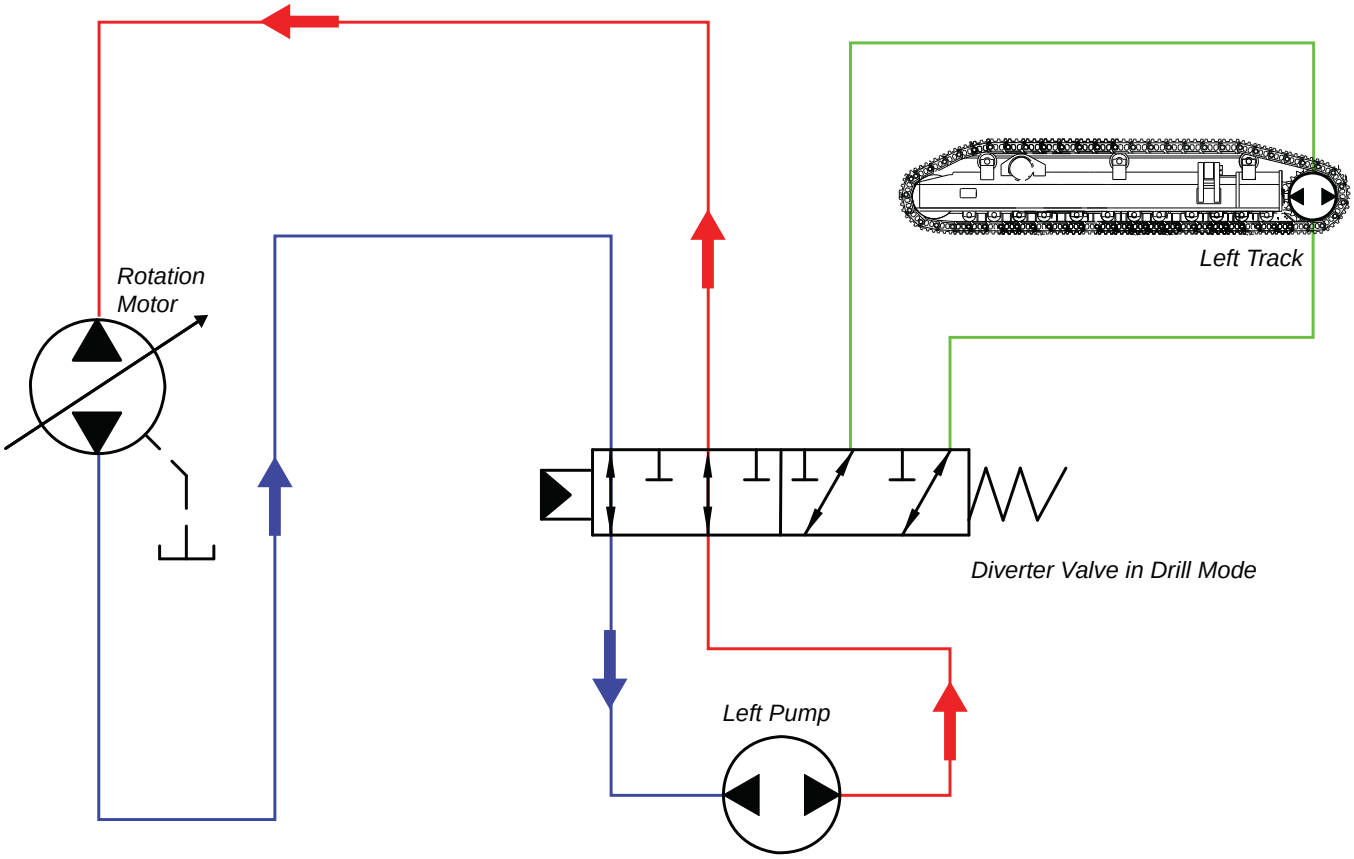
Note: If serious wear or damage has occurred to one component, the complete charge pump assembly must be replaced because they are matched components.





Loop Filter cross section

Basic Rotation Circuit



Rotation Circuit

The rotation circuit is a closed loop circuit. It is fed by the left hand main pump. The rotation circuit oil comes from the B (forward rotation) or A (reverse rotation) ports on the pump, through the loop filters, through the diverter valve then onto to the rotation motor. The rotation motor has an internal flushing valve. In other words the circuit is basically a closed loop, pump to motor circuit.

A relief valve V08 has been placed on the forward rotation circuit. This is to limit rotation torque in forward rotation. It is connected in the Mb port (common to B port), and when its relief setting is reached it sends pressure to the X3 port. This will cause the servo piston (large control piston) to move back towards centre, therefore de-stroking the pump. This provides a variable maximum rotation torque setting. This relief is a vented relief. The vent from this relief flows to another relief valve (2) which is remotely mounted in the cab (torque relief valve). This relief can be variably controlled by the operator in the cab. However the variation on relief (2) for the operator can only ever go as high as the maximum setting on (1).

Pressure at X3 is limited to 450 PSI by valve (V09) which is backed up by valve (V10). These valves prevent damage to the pump servo through overpressure.

Variable Displacement Motor AA6VM

Installation

The AA6VM motor may be mounted in any position. When mounting in a shaft up position, special considerations regarding the case drain line may be required to ensure the motor bearings are always immersed in oil.

The AA6VM is usually face mounted to a final drive gear box with the shaft engaging a mating female splined gear hub or spline adapter. The large drive shaft bearings permit vee or toothed belt pulleys, or gear pinions to be mounted directly to the drive shaft. (Consult Rexroth for radial and axial force limitations.) The motor may also be used to transmit power via a universal drive shaft. The case drain line should be connected to the highest case drain port so that the motor always remains full of oil.

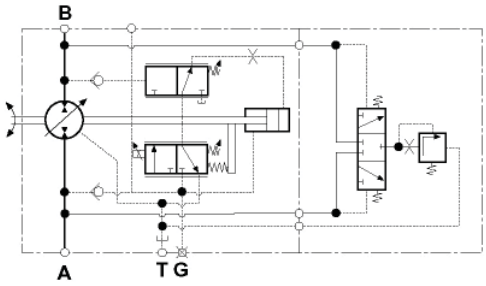
For mobile applications, the oil reservoir capacity required (in U.S. gallons) is generally .75 to 1 times the charge pump flow (in U.S. gallons per minute) for a one pump, one motor transmission. The heat exchanger should be located between the pump case drain and the reservoir, and sized to accept the full flow of the charge pump at the maximum anticipated drive speed.

To accommodate slight shaft misalignment and to dampen vibration, use of a flexible coupling is recommended. The motor user should work closely with the coupling manufacturer in selecting and applying a suitable coupling . When flexible couplings, Veebelts or toothed timing belts are to be used, the coupling halve, gear or pulley, should be secured to the drive shaft using a spacer between the coupling and the shoulder on the drive shaft, and locking the coupling to the shaft by using a set screw into the threaded hole in the end of the shaft. If this is not possible, as when mounting the motor to a drive gearbox, Optimoly Paste White T multipurpose lubricating paste or equivalent must be applied to the shaft to avoid fretting corrosion of the spline.

Motor Flushing

A flushing valve is usually required when a motor will be operated for extended periods of time at high speed and/or high pressure conditions.

A flushing valve is available for manifold mounting on the rear cover of an AA6VM motor. This valve provides a regulated flow of oil from the low pressure side of the loop into the motor case. This oil is used to cool and flush the motor bearings.
Note: Consult Rexroth application engineer to determine if a motor flushing valve is required for your application.



EP1 and EP2 Control with Flushing Valve

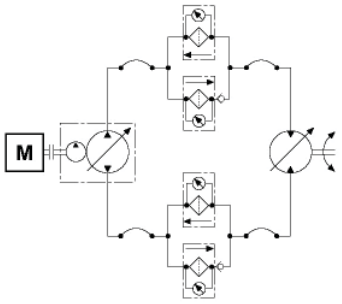
Filtration

The fluid should be filtered prior to system start-up, and continuously during operation to achieve and maintain a cleanliness level of ISO 18/15 (This corresponds approximately to NAS 1638 class 9, or SAE [1963] Class 6.) This recommendation should be considered a minimum, as better cleanliness levels will significantly increase component life.

Each application should be analyzed to determine the proper method of filtration needed to maintain the required cleanliness levels, as contaminant generation and ingression can vary greatly,depending on the configuration and complexity of the system. For particular system requirement, or for application outside these parameters, a Rexroth Applications Engineer should be consulted.

Pre-Start Procedure
This should be performed prior to start-up a new installation, or for a system in which new or overhauled components have been fitted.

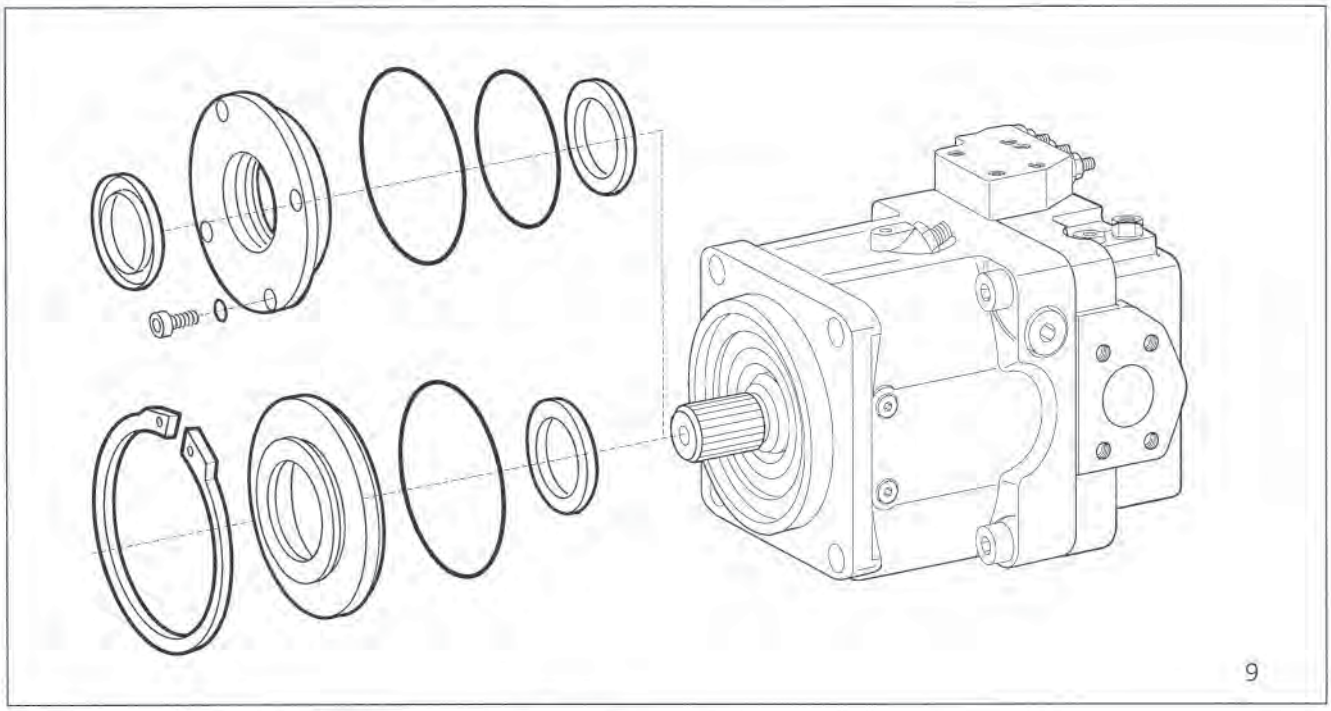
1. Ensure that hydraulic reservoir piping and pressure hoses are cleaned and flushed.
2. Fill the reservoir through fill pump and filter.
3. If there is any doubt regarding the absolute cleanliness of the system, fit high pressure bi-direction filters in high pressure lines as shown in following diagram. the filters are in addition to the installed suction and return filters.

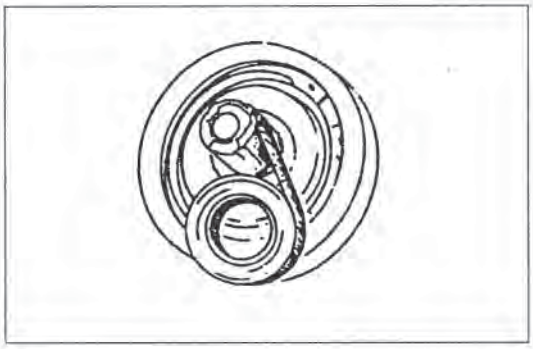


4. Check that all filters have elements of the correct rating and the filter housing are filled with the hydraulic fluid to be used in the system.
5. Where possible, fill the high pressure lines.
6. Open suction line valves.
7. Fill pump and motor case to the highest drain or vent port.
8. Check that all pressure connections are secure.
9. Ensure all mechanical gear boxes have the correct oil type and are filled to the prescribed level.
10. Fully back off all high pressure relief valves and then reset one half turn against the spring.
11. Fit 10,000 psi pressure gauges to each high pressure line.
12. Fit 500 psi pressure gauges to charge and pilot circuits.
13. Fit 100 psi pressure gauge to pump case drain port.
14. Fit vacuum gauge to the charge pump suction line, as close as possible to suction port.
15. Release brakes and jack up the driving wheels. Winches should be started without the cable fitted.
16. Ensure that the fluid temp. in the reservoir is 45°F or higher.
17. Ensure that the motor minimum displacement (maximum speed) is set correctly as shown on page 23.

Repair Instructions

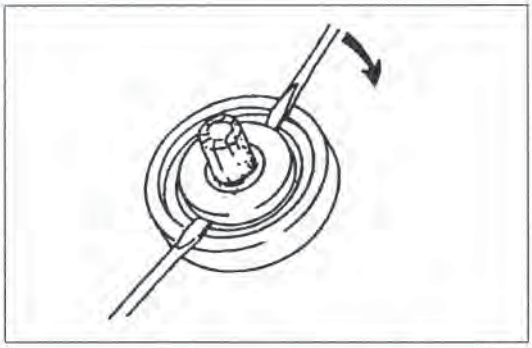
Shaft Seal Change



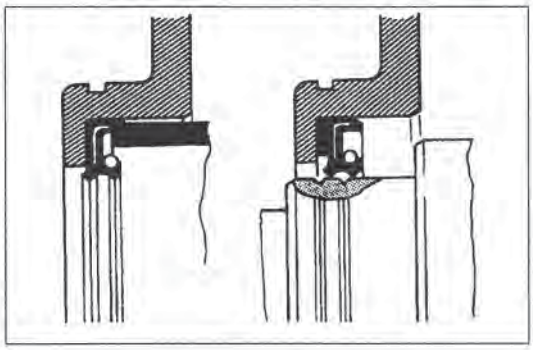


1 a. Protect drive shaft.

b. Remove snap ring or seal retaining screws



2 Loosen retaining ring and remove it, press away from cover.



3 a. Press in the shaft seal ring to the correct psition with a suitable sleeve.

b. If the shaft is deeply grooved, insert shim behind seal.

c. Refit snap ring.

The auxiliary pump operates the cooler fan circuit. Once the engine has been started and the override been released, full auxiliary pump pressure is supplied to the auxiliary manifold. It flows from there through a check valve and a 4mm orifice (see auxiliary priority function), before being teed to the two separate fan motors. After the tee, flow goes through a flow control valve, before entering the B port of the motor. The two flow controls are used to vary the fan speeds on each motor. Flow comes out of the A port of the two motors, and is again teed together before flowing partially through the cooler, and partially through the thermostat. Once the thermostat reaches 60'C (140 F), the thermostat closes and directs oil only through the cooler. If the cooler becomes partially or completely blocked, flow will be directed through a by-pass check valve. Oil flowing from the thermostat, cooler and/or check valve will go to the return manifold, before passing through the return filters into the tank.

A check valve has been connected between the B and A ports of the fan motors. Called the **wind down check**. When the engine is turned off, the inertia of the fans will still want to turn the motors. However because the auxiliary pump has been stopped, there is no flow into the B port of the motor. Therefore with no oil going into the motor and the fan still spinning the motor, the motor will cavitate. To avoid this a check valve has been put in place which will allow flow coming from A port to be circulated back through B port until the fan stops.

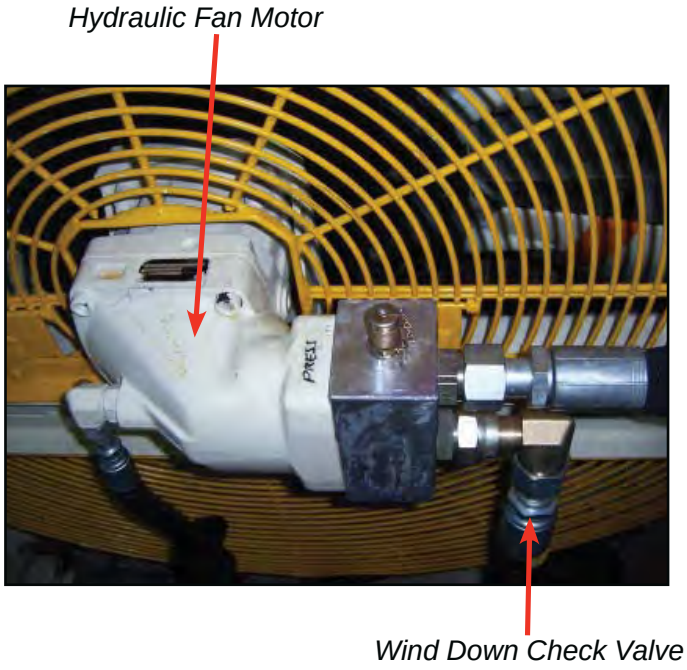


Fig. 7-25c Cooler Fan

Jack Counterbalance Valves

The function of the counterbalance valves on the leveling jacks (fig. 7-15) is to ensure that the drill stays in the intended position for drilling when the jacks are extended. To determine if the counterbalance valves are functioning correctly, the following procedure should be used.

1. Raise the machine off of the ground and level.
2. Shut down the engine.
3. Measure distance from some point on machine to ground. Check again after a couple hours or overnight if possible. If measurement is less, then valve needs to be adjusted or replaced.

Jack Counterbalance Valve Adjustment

While the valves are preset at the factory at 4500 PSI (310 bar) they may be adjusted if drifting is encountered. The counterbalance valves can be reached through the cutout in the jack casing (fig. 7-15). One is for RETRACT and the other for EXTEND. Be sure you are adjusting the right one.

1. Loosen the jam nut and back out the adjusting screw 1/4 turn (remember, COUNTERCLOCKWISE adjustment INCREASES PRESSURE on counterbalance valves). Tighten jam nut and retest. If no difference is noted after one full turn of the adjusting screw, then valve must be replaced. DO NOT exceed one full turn. If counterbalance valve is backed out too far, it will relieve pressure. When valve is adjusted correctly, tighten jam nut.
2. If drifting is still encountered, the valve must be replaced.

NOTE: If in the above test, the unit does not start lowering, but does so during normal operations, then the jack cylinder most likely is bypassing or leaking internally, and further diagnostics and repair or replacement will be necessary.

Fig. 7-15 Leveling Jack Cylinder Counterbalance Valves

Reassembly

34 Align the notch on the outside of the valve plate with the notch on the Geroler as shown in Figure 12.

Timing Step # 2 — Locate the slot opening in the valve plate which is in line with the largest open pocket of the Geroler.

Timing Step # 3 — Locate any one of the side openings of the valve and align this opening with the open slot of the valve plate that is in line with the largest open pocket of the Geroler. Install the valve by rotating it clockwise until the spine teeth engage (1/2 spine tooth max.). This will provide the proper rotation when pressurized as shown in Figure 13.

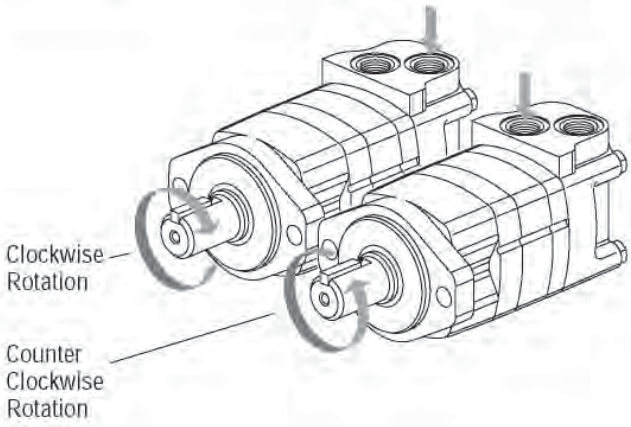


Figure 13

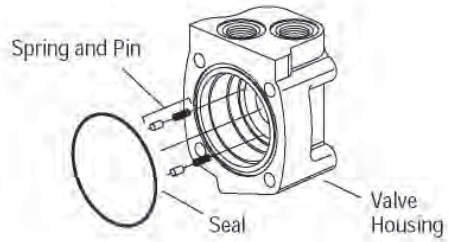


Figure 14

35 Install 2 springs and 2 pins in the holes located in the bore of the valve housing, as shown in Figure 14.

36 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in the valve housing.

37 Apply petroleum jelly to inner and outer face seals. Install seals on balance ring as shown in Figure 15.

Important: Install face seals in the positions shown in Figure 15, or the motor will not operate properly. Do not force or bend the face seals. Any damage to these seals will affect the operation of the motor.

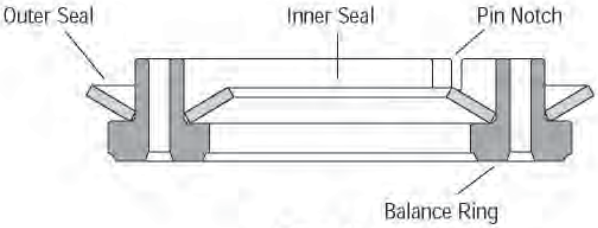


Figure 15

38 Align pin notches in balance ring with pins in bore of valve housing. Install balance ring assembly in valve housing.

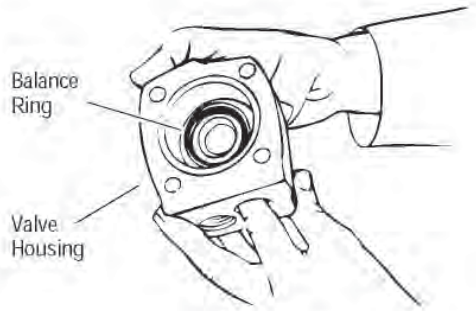


Figure 16

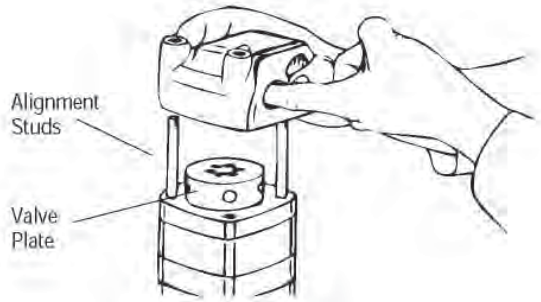


Figure 17

39 Insert your finger through port of valve housing. Apply pressure to side of balance ring as shown in Figure 16. Hold ring in position until valve housing is in place against valve plate (see Figure 17).

Note: After installing the valve housing on the valve plate check for proper placement. Push down on the valve housing. You should get a slight spring action.

V07 Pilot Operated Directional Valve (Rotation Torque Control On/Off)

Piloted at Port 1 from the drill tram solenoid **(V17)**, this valve switches the rotation pressure (Torque Control) on in the drill mode by allowing pressure from **Mb** Port on the L/H tram/rotation pump through Ports 2 &3, then on to the maximum rotation pressure relief.

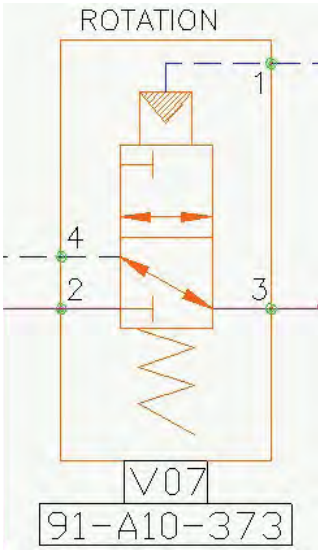
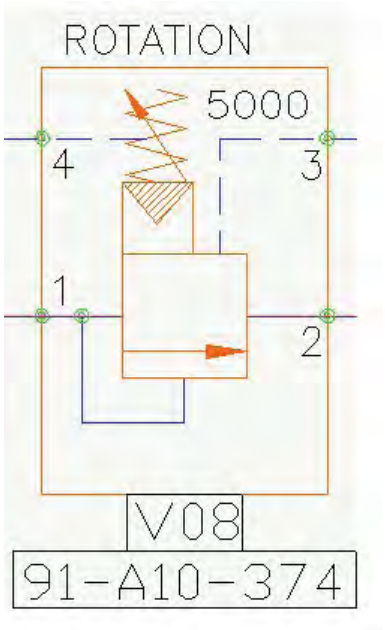


Fig. 7-10j V07 Piloted Operated Directional Vale (Rotation Torque Control ON/OFF)

V08 Maximum Rotation Pressure Relief

This pilot operated vented relief is set to the highest rotation pressure required to provide enough rotation torque to turn the drill bit during the drilling process. Usually set at 4000psi, this provides 80% of pump pressure in the forward direction only, so reverse rotation pressure (5000psi) is capable of breaking out pipe joints. Venting Port 3 through the rotation torque control relief in the cab can remotely lower this setting. When the relief setting is reached, pressure from **Mb** on the L'H tram/rotation pump is directed to **X3** on the servo of the L/H tram/rotation pump, which then de-strokes the pump.



V08. Setting to 4000psi

1. Engage the deck wrench onto the spanner flats of a drill pipe or sub adaptor.
2. Forward rotate to stall the rotation.
3. Increase the setting of the rotation torque control valve in the operators cab until the pressure stops rising or 4100psi rotation pressure is reached.
4. Adjust V08 relief until the rotation pressure gauge reads 4000psi.
5. Decrease the rotation torque control valve setting until the pressure begins to reduce. Any pressure up to 4000psi can now be selected.

Fig. 7-10K V08 Maximum Rotation Pressure Relief Valve

Water Injection / Foam Injection valve

Flow from the control valve is directed to the Water pump motor. The electronic control in the cab controls the valve movement for pump motor speed which controls Water flow. The system pressure is set to 2000psi, and pilot pressure is set at 300psi. Set by operating manual control lever to pressurize unused C1 ports.

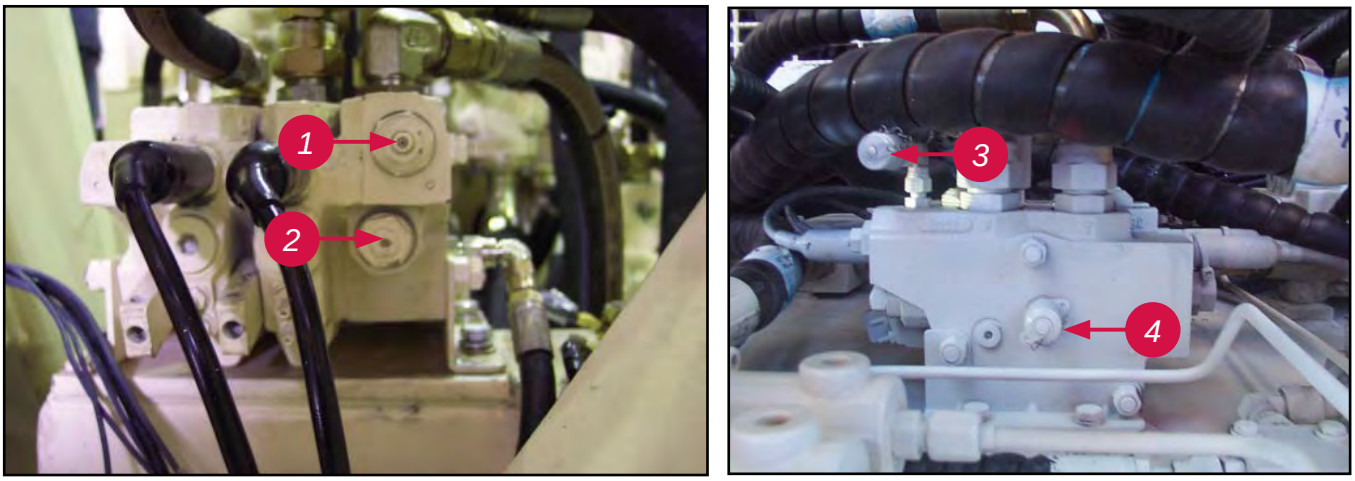


Fig 7-53. Water Injection / Foam Injection Valve

The Water and Foam Injection valve is a twin spool proprtional control valve. One spool supplies up to 90 litres per minute to the Water Injection pump drive motor and the second spool supplies a constant 10 litres per minute to the Foam Injection drive motor. The valve operates proportionally as the Water Injection controller in the operators cab is dialed from 0 through to 10.

The TOC 8 controller is programmed to start to shift the Water Injection spool as the control dial is turned and will proportionally increase the supply from 0 to 65 lt/min.

This valve design allows for much greater control of the Water Injection pump at lower supply requirements, then increasing to maximum Water supply to the Water Injection pump motor.

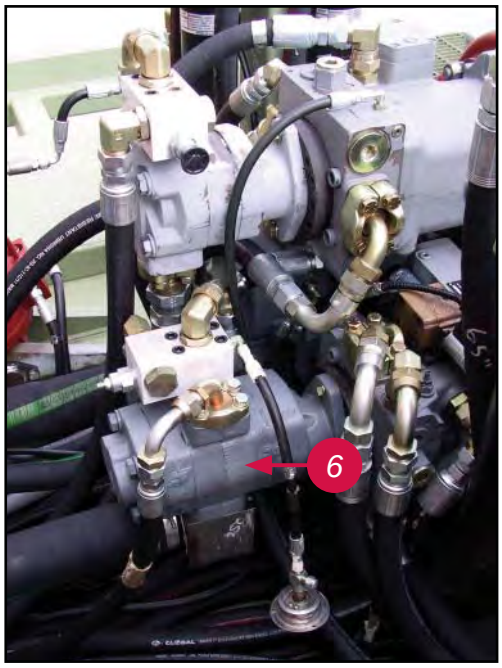


Fig 7-53a. Water Injection Controller Dial

1. Pilot pressure adjuster 300psi
2. Main pressure adjuster 2000psi
3. Pilot pressure test port 300psi
4. High pressure test port 2000psi
5. Water Injection Controller dial
6. Water Injection / Foam Injection Pump

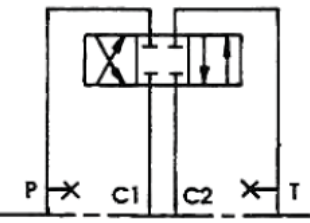
SECTION VALVE SPOOL
CONNECTIONS TO TEST STAND
(SHOWN IN FIGURE 1)

2 POSITION, 4-WAY

P→C1

3 POSITION, 4-WAY

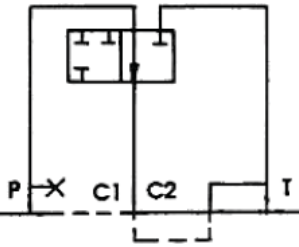
P→C1/P→C2



TEST STAND
FROM FIGURE 1

2 POSITION, 2-WAY

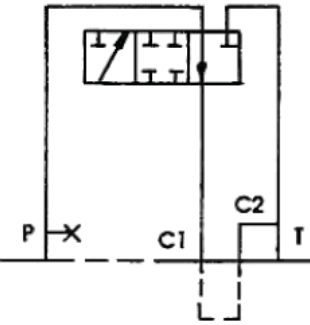
P→C1



TEST STAND
FROM FIGURE 1

3 POSITION, 3-WAY

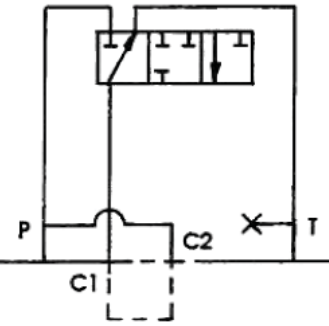
P→C1



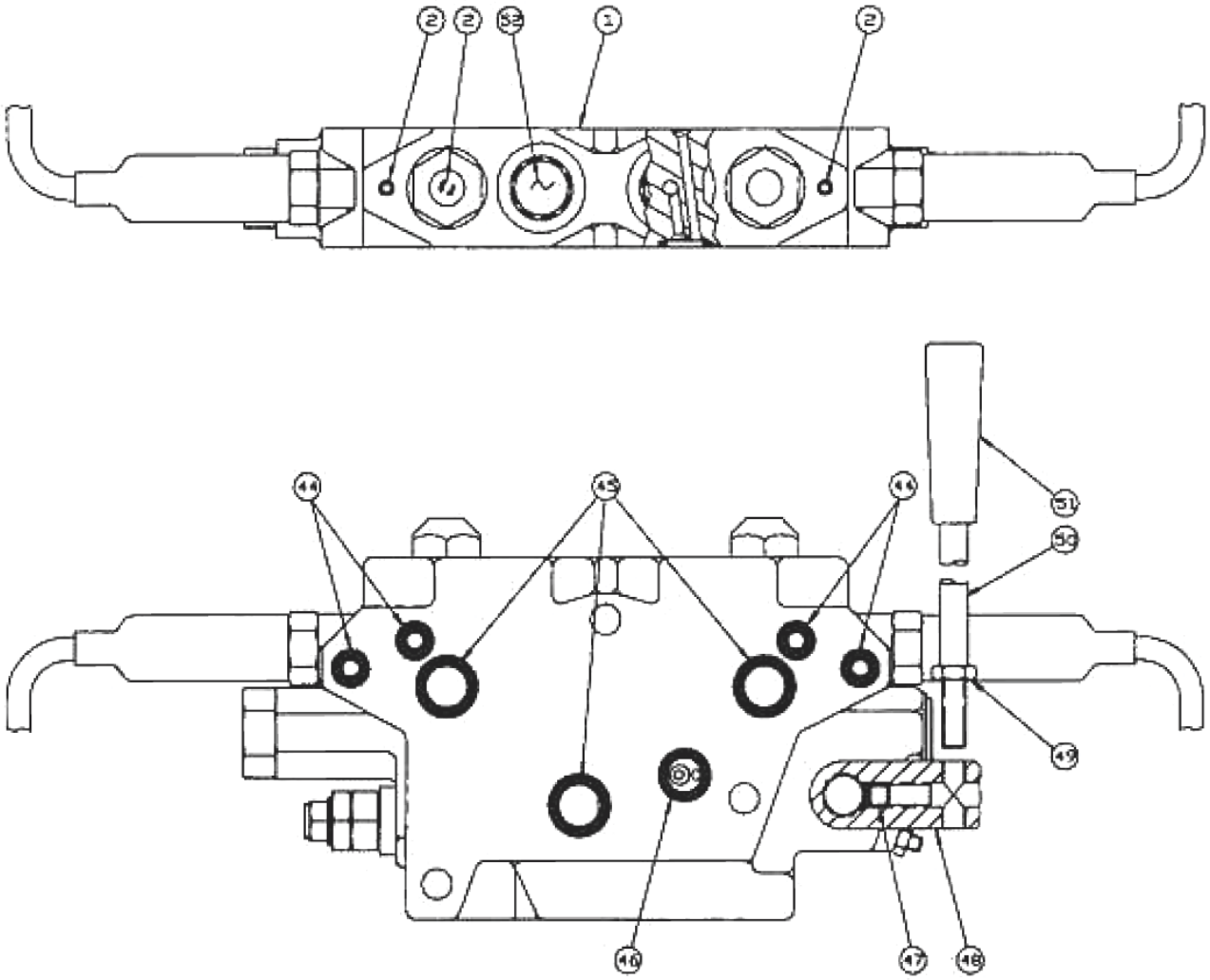
TEST STAND
FROM FIGURE 1

3 POSITION, 3-WAY

C1→T



TEST STAND
FROM FIGURE 1

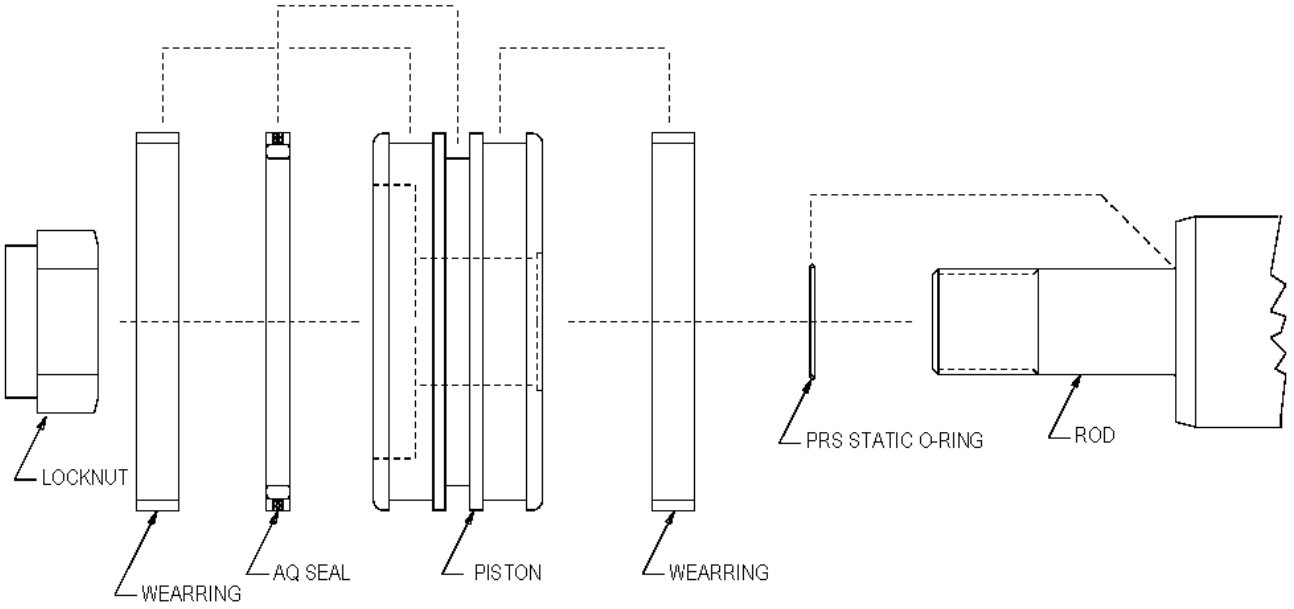


1. *Main Segment Valve Body*
2. *Construction Plug*
6. *Shaft*
7. *Shaft Seal*
8. *Linkage*
9. *Socket Hex Plug*
10. *Hook*
11. *F.L. Set Screw*
12. *Seal Nut*
13. *O'Ring*
17. *Pipe Plug*
20. *Compensator Spool*
21. *Comp Shim (0.025")*
22. *Comp Shim (0.008")*
23. *Comp Shim (0.003")*
24. *Compensator Spring*
25. *Secondary Comp Spring*
29. *Compensator Spring*
30. *Main Spool Spring*
31. *Centering Spring*
32. *Spring Guide*
33. *Retaining Ring*
36. *Solenoid Assembly*
37. *Solenoid Plug Sub Assembly*
39. *Relief / A.C. Cartridge*
40. *Relief / A.C. Cartridge*
41. *Check Ball (1/2")*
42. *Check Spring*
43. *Port Plug*
44. *O'Ring*
45. *O'Ring*
46. *O'Ring*
47. *Adaptor Screw*
48. *Handle Adaptor*
49. *Jam Nut*
50. *Handle Adaptor*
51. *Knob*
52. *Shipping Plug*
58. *Lock Nut*
60. *Defeat Spring*
61. *Delta Defeat Spring*
62. *Solenoid Valve S/A*

Z Piston

General

The Z series piston uses ductile iron material and glass-filled nylon wearrings (bearing rings). It is available in two basic design styles. The first uses a groove sized for a specially designed teflon seal called the AQ seal. The teflon sealing ring has a small groove on its outside diameter that houses a quad ring seal. The entire ring is energized by a square section rubber loader. The second series uses an interference fit split nylon sealing ring with an oval section rubber loader and is called a Chemcast seal. A small static o-ring seal is fitted to a groove in the piston and is held in place by the shoulder of the rod. General procedures for teardown, inspection, and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.



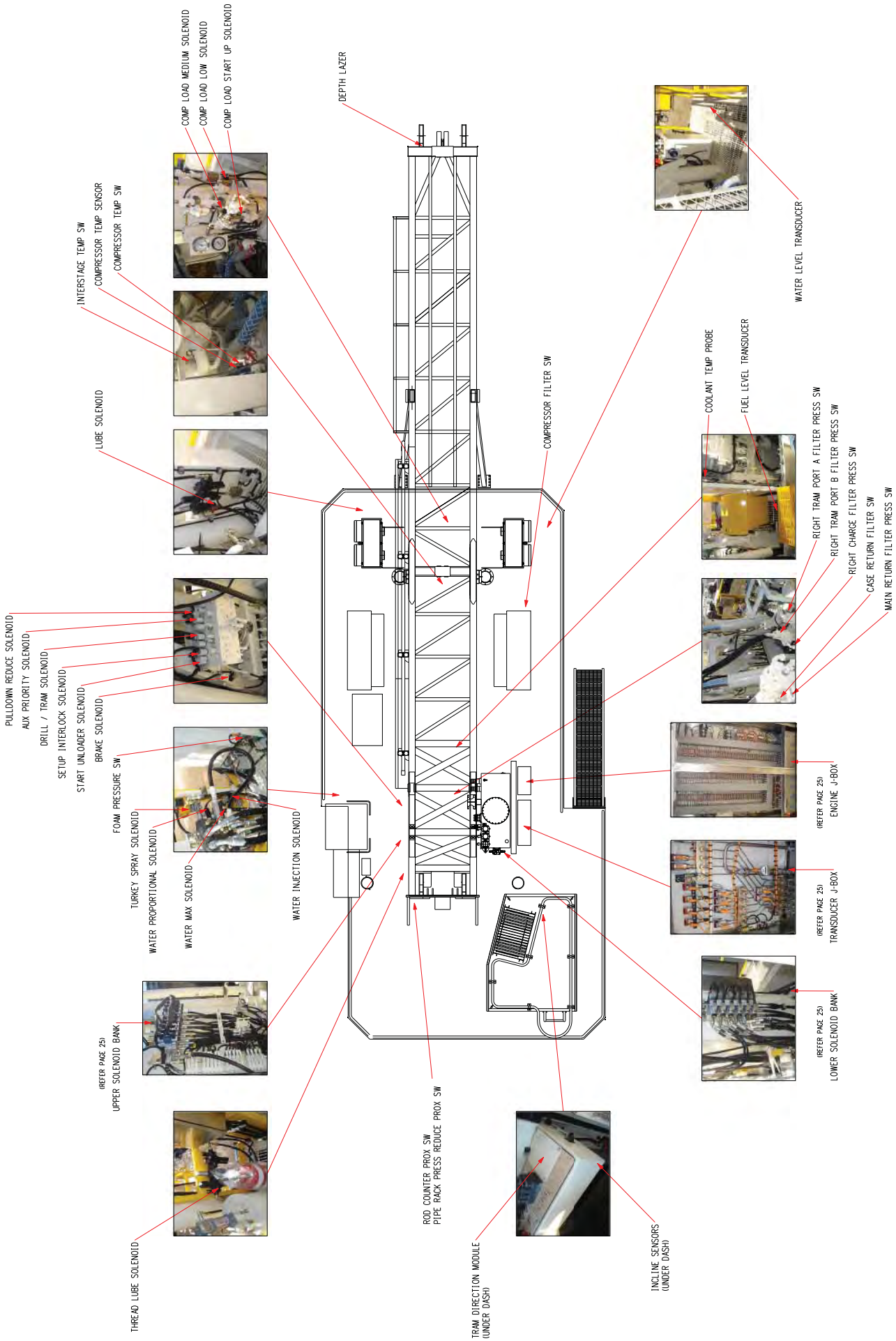
Teardown

After removing the piston, remove and discard the PRS static o-ring from the rod shoulder. Remove the AQ seal by means of blunt instruments of bronze or aluminum. Be sure there are no sharp edges on these tools. Be particularly careful of scratching the groove surface finish.

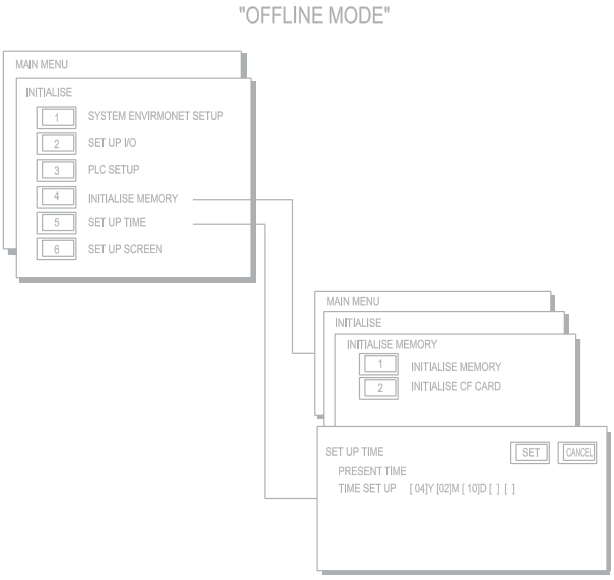
Rebuild

Separate the three components of the seal assembly. For easiest installation, warm the teflon outer ring in 150 to 200°F hydraulic fluid or water. Lubricate the piston and all components with hydraulic fluid. Stretch the inner rubber expander into the seal groove. Do not use sharp edged tools and verify that it has not twisted. Likewise, stretch the teflon outer ring into the groove. Be extremely careful to avoid damaging the seal grooves during installation. Scratching the groove may cause by-pass leakage. The teflon ring will have a memory and may take as long as 24 hours to return to the correct size. This can be accelerated by pushing the piston/seal assembly through a honed or polished tube with an ID equal to the nominal cylinder bore to plus .010 inches. Clean the groove in the teflon ring and install the rubber quad ring. Verify that it has not twisted. Install the wearrings into the wearring groove. If possible, allow the piston/seal assembly to sit at least one hour to allow the seals to elastically restore.

See the next page for information on the alternative style.


COMP LOAD MEDIUM SOLENOID
COMP LOAD LOW SOLENOID
COMP LOAD START UP SOLENOID
DEPTH LAZER
WATER LEVEL TRANSDUCER
INTERSTAGE TEMP SW
COMPRESSOR TEMP SENSOR
COMPRESSOR TEMP SW
LUBE SOLENOID
COMPRESSOR FILTER SW
COOLANT TEMP PROBE
FUEL LEVEL TRANSDUCER
RIGHT TRAM PORT A FILTER PRESS SW
RIGHT TRAM PORT B FILTER PRESS SW
RIGHT CHARGE FILTER PRESS SW
CASE RETURN FILTER SW
MAIN RETURN FILTER PRESS SW
PULLDOWN REDUCE SOLENOID
AUX PRIORITY SOLENOID
DRILL / TRAM SOLENOID
SETUP INTERLOCK SOLENOID
START UNLOADER SOLENOID
BRAKE SOLENOID
FOAM PRESSURE SW
TURKEY SPRAY SOLENOID
WATER PROPORTIONAL SOLENOID
WATER MAX SOLENOID
WATER INJECTION SOLENOID
(REFER PAGE 25)
ENGINE J-BOX
(REFER PAGE 25)
TRANSDUCER J-BOX
(REFER PAGE 25)
LOWER SOLENOID BANK
(REFER PAGE 25)
UPPER SOLENOID BANK
THREAD LUBE SOLENOID
ROD COUNTER PROX SW
PIPE RACK PRESS REDUCE PROX SW
TRAM DIRECTION MODULE
(UNDER DASH)
INCLINE SENSORS
(UNDER DASH)

Touchscreen



Setting Date & Time

To access the 'OFF LINE' mode. Simultaneously touch all four corners of the screen and then select' OFF LINE' from the displayed buttons. Now at the 'MAIN MENU' select 'INITIALISE'.

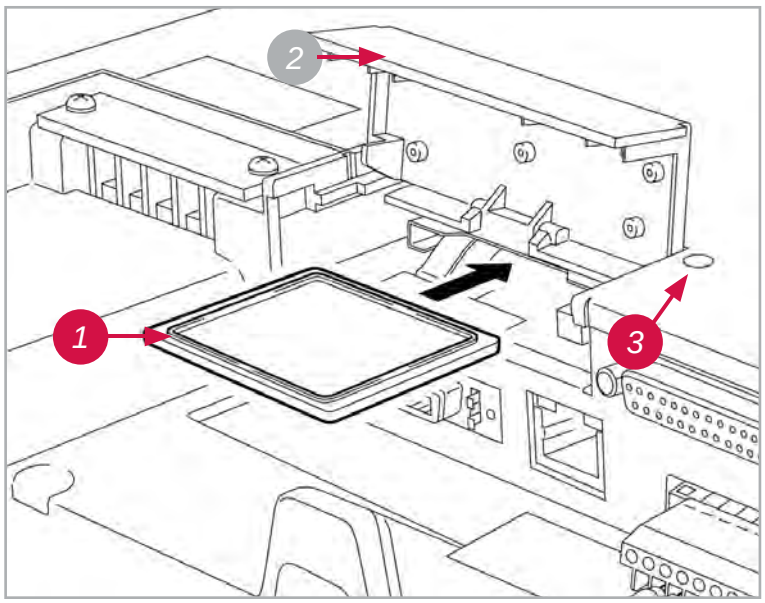
Once the Time and Date are set, return to the 'MAIN MENU' and select 'RUN' mode

Setting Brightness

To adjust the brightness of the Touchscreen, Simultaneously touch both bottom corners of the screen and then use the slider to adjust the brightness. Touch anywhere else on the screen to return to the run mode.

Changing and Programming the CF Card

1. Gain access to the rear of the touchscreen. Remove the screen and or mounting.
2. Open the CF card cover.
3. Slide the CF card into the slot, label side up, and close the cover.
4. At the front of the touchscreen. Touch all four corners of the screen simultaneously, select 'OFF LINE'.
5. At the MAIN MENU select '2' Screen Data Transfer.
6. At the Screen Data Transfer menu select '3' Copy From CF Card.
7. Enter the password 1101 and START.
8. Down load procedure now starts. Takes approx 5 min.
9. Once complete select the main menu by touching MAIN MENU on the screen.
10. At the MAIN MENU select '4' RUN to place the touchscreen into 'run mode'.
11. Open the CF Card cover, waiting for the green LED to go out indicating it is safe to remove the CF Card.
12. Remove the card, close the cover, and resecure the touchscreen / mounting.
13. Procedure is complete.



1. CF Card
2. Cover
3. Green LED Light

Temperature Transducer

Error code table for error codes as seen on transmitter display

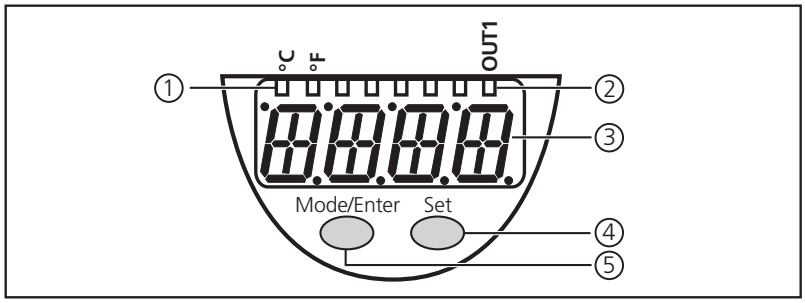
OL Above measuring range by more than 3% of the maximum value.

UL Below measuring range by more than 10% of the minimum value.

SC I Flashing: Short-circuit in the switching output (OUT 1). the output is switched off as long as the short circuit continues.

Err Flashing: No temperature sensor connected, fault or short circuit in the temperature sensor, wire break, evaluable range (T < -60°C or T > +320°C) exceeded.

Controls and visual indication



①	2 x LED green	Lithning LED = set display unit.
②	LED yellow	Switching status; lights if the switching output has switched.
③	4-digit alphanumerical	Display of the system temperature, display of parameters and parameter values.
④	Set button	Setting of the parameter values (scrolling by holding pressed; incremental by pressing briefly).
⑤	Mode / Enter button	Selection of the parameters and acknowledgement of the parameter values.

When commissioning temperature sensor, complete following procedure **ONLY** after reading safety instructions supplied with sensor:

1. Press the **Mode/Enter** button several times until the **Mmod** (Fig.2) parameter is displayed (Fig.1).
2. Press the **Set** button (Fig.1) and keep it pressed. The current parameter value (3w, factory default setting, Fig.2) **flashes** for 5 seconds. **Then** the value **is increased** (incremental by pressing briefly **or** scrolling by holding pressed).*
3. Press the **Mode/Enter** button **briefly** (= acknowledgement, Fig.1) when the 4w setting is displayed (Fig.2). The parameter is displayed again, and becomes effective.
4. To conclude, wait for 15 seconds before continuing.
   * – To decrease the value move the display of the parameter value to the maximum setting value, after which the cycle repeats from the minimum setting.
5. Using the above steps, repeat for the following parameter settings:
   a. **OU2:** set to ‘I’ (Fig.3).
   b. **ASP:** set to (-) 40 (Fig.4).
   c. **AEP:** set to (+) 150 (Fig.4).
   d. **FOU2:** set to ‘ON’ (Fig.5).

Inclinometer

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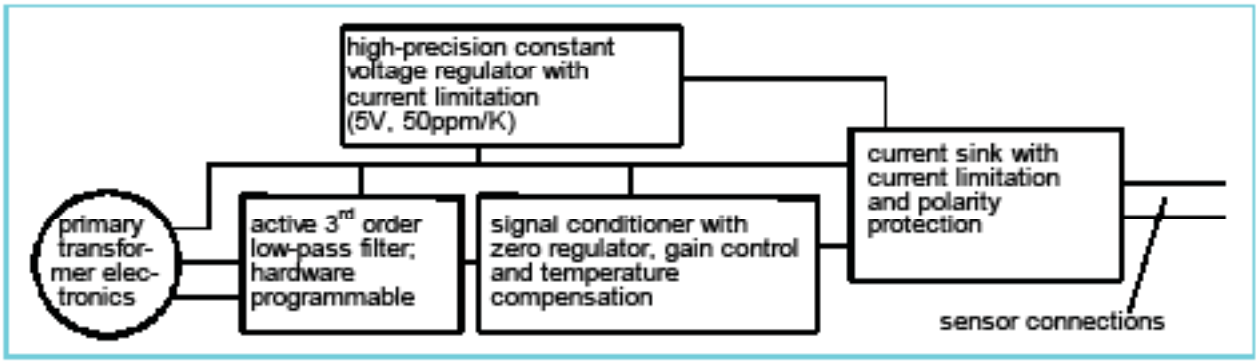
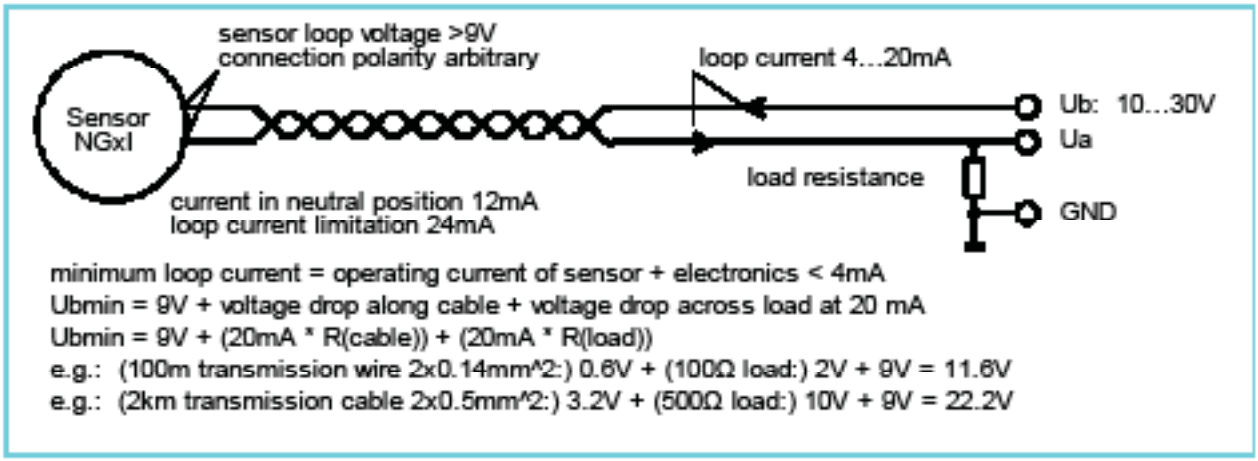
NG2I, NG3I, NG4I

Block diagram



Connections



minimum loop current = operating current of sensor + electronics < 4mA
Ubmin = 9V + voltage drop along cable + voltage drop across load at 20 mA
Ubmin = 9V + (20mA * R(cable)) + (20mA * R(load))
e.g.: (100m transmission wire 2x0.14mm^2:) 0.6V + (100Ω load:) 2V + 9V = 11.6V
e.g.: (2km transmission cable 2x0.5mm^2:) 3.2V + (500Ω load:) 10V + 9V = 22.2V

Alarm Centre (AC)

Alarm Centre corresponds to the distance threshold of the switching output. Alarm Centre is input in meters. On negative or positive excession of the pre-set switching threshold, the alarm output will switch from ¸High} to ¸Low} or vice versa depending on the alarm hysteresis setting.

¸High} corresponds to about VCC – 1 V, ¸Low} to 0 V.

Alarm Hysteresis (AH)

Alarm Hysteresis defines the response hysteresis of the switching output. Alarm Hysteresis settings are made in units of a meter. The value of a hysteresis setting corresponds to the delay in switching (in m), its mathematical sign describes the logic level.

Range Beginning (RB)

Range Beginning corresponds to the lower range limit of the analog output. Range Beginning settings are made in units of a meter. Range Beginning corresponds to a current of 4 mA.

Range End (RE)

Range End corresponds to the upper distance limit of the analog output. Range End settings are made in units of a meter. Range End corresponds to a current of 20 mA.

Trigger Delay (TD)

Trigger Delay consists of two sub-parameters – the actual delay, i.e. the waiting time, and the trigger level.

Delay corresponds to the time from the point when a trigger signal is received to the moment at which a measured value is output. It may take on a maximum value of 9999 ms. The trigger level allows you to define if measurement is to be triggered at a low-high flank (0) or a high-low flank (1).

Your selections for trigger delay and trigger level must be separated byspace (20h). (see section 11. “Transmission Protocol”)

Baud Rate (BR)

For baud rate, the following settings are available: 2400, 4800, 9600, 19200, 38400. Faulty inputs are automatically rounded to the nearest available baud rate. The data format is fixed. It includes eight data bits, no parity and one stop bit.

Autostart (AS)

Allows you to define a function which the LDM 40 A is to carry out when voltage supply becomes available. All inputs are possible. For example, if ASDT has been parameterised, the LDM 40 A will start with distance tracking immediately after power is available.

Distance Offset (OF)

With the help of this parameter the user may conveniently define a zeropoint of his/her measuring setup.Zero point of the LDM 40 A (OF = 0.000000e+00) coincides with the front edge of the receiving lens.

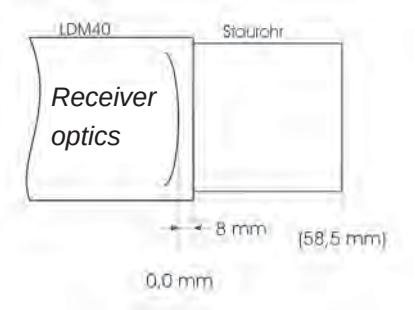


Fig. 4 Front edge of LDM 40 A

LEVEL SWICHGAGE® INSTALLATION (continued)

Figure 2:
Shallow Upper Tank

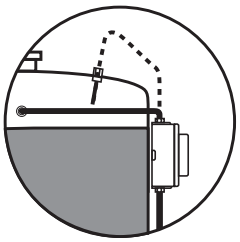
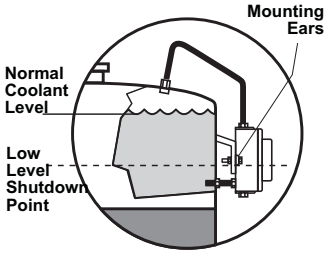


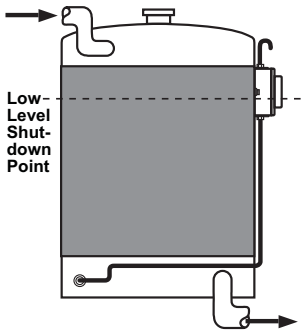
Figure 3:
Deep Upper Tank



For a PRESSURIZED system the tip of the copper tube will be the shutdown level.

3. For ATMOSPHERIC (non-pressurized) and PRESSURIZED CROSS FLOW COOLING SYSTEMS the shutdown point is determined by the mounting position of the L150/EL150K1 relative to the top tank of the radiator (see step 5).

Figure 4: Atmospheric System



4. For a **PRESSURIZED SYSTEM,** determine the point of entry (tube connection) in the radiator top tank (away from the top hose connection). Many radiators have a pipe nipple provided. If a connection is not provided, you must either weld or solder a fitting or use one of the Murphy PS fittings (see ***PS Fittings Installation*** page 2). This connection should be as close to the radiator core as possible.

For MARINE AND MOBILE EQUIPMENT installations, the top tank connection should be near the vertical centerline of the radiator. This will compensate for changing level due to roll and pitch of the machine during operation.

5. For an ATMOSPHERIC SYSTEM a tube connection in the top tank may not be required. Determine the lowest desired level of coolant in the top tank. Mount the L150/EL150K1 so that the mounting ears are approximately 1/4 in. (6 mm) above that level (Figure 3).
A back mounting option is available for the L150 and EL150K1 for radiators with fabricated steel top tank and/or for use with some condensor cooling systems.

For an ATMOSPHERIC system install a 1/4 in. (6 mm) diameter tube in the top fitting of the L150/EL150K1. This tube MUST EXTEND ABOVE the top tank. Form the tube into a cane so that the open end of the tube points down but still extends ABOVE the HIGHEST coolant level. The tube can be connected to the top tank if desired. Follow instructions for a PRESSURIZED SYSTEM.

6. For most applications, the bottom tube connection is made at the drain cock. Remove the drain cock and install a brass tee. Reinstall the drain cock into the tee. Attach a copper or other suitable tube to the remaining opening of the tee and to the bottom connection of the L150/EL150K1.

If a drain cock is not provided, you must attach a fitting or use a Murphy PS fitting the same as for the top tank instructions.

7. Wire according to appropriate alarm or shutdown circuits (see ***Standard Electrical Diagrams*** on page 4).

8. Refill the cooling system according to manufacturer's instructions.

9. Start the engine and allow it to run until the thermostat opens. Increase engine speed to the FULL operating speed and observe that the indicating pointer remains at or near the full position. If the pointer drops to the LOW position shutdown or alarm will occur due to coolant flow through the L150/EL150K1. If alarm or shutdown occurs, drain the coolant - or clamp off the upper and lower hoses.

CAUTION: **BE SURE SYSTEM PRESSURE IS RELIEVED AND HOT COOLANT CANNOT ESCAPE.** Remove the four (4) mounting screws holding the cover assembly. Invert the float chamber so that the 1/2 NPT connection is on top and the 1/4 NPT connection is on bottom. Reinstall the float and cover assembly in the upright position. Install larger I.D. tubing from the top of the float chamber (1/2 NPT) to the radiator top tank. The smaller 1/4 NPT connection on the bottom will restrict coolant outflow from the L150/EL150K1. Check for unrestricted float movement by rotating the switch test knob.

Refill the cooling system and repeat step 9.

10. Place a catch basin under the drain cock. Open the drain cock and observe that coolant is leaving the radiator.
For a PRESSURIZED cooling system, shutdown will occur when coolant drops below the entry point of the top tank tube connection.
For an **ATMOSPHERIC OR CROSS FLOW PRESSURIZED COOLING SYSTEM,** shutdown will occur when coolant drops approximately 1/4 in. (6 mm) below the level of the case mounting ears. If shutdown does not occur, adjust the L150/EL150K1 mounting as described above.

CAUTION: **DO NOT ALLOW ENGINE TO RUN WHEN COOLANT DRAINS BELOW THE UPPER TANK. ENGINE DAMAGE CAN OCCUR.**

11. Periodically test switch operation by rotating the test knob on the face of the L150/EL150K1. Rotating the knob forces the pointer mechanism against the contact screw (L150) or the snap switch actuator (EL150K1).

Condensor/Radiator System

1. Mount the L150/EL150K1 so that the horizontal center line of the L150/EL150K1 is approximately 1/4 in. (6 mm) above the minimum coolant level in the engine head.

NOTE: On some engines it is possible to use the back connection option and attach the L150/EL150K1 directly to the engine cylinder. Kits are also available for some engines.

2. Attach a copper tube from the top connection of the L150/EL150K1 to the radiator top tank.

3. Wire and test the system according to above instructions for Pressurized and Atmospheric systems.

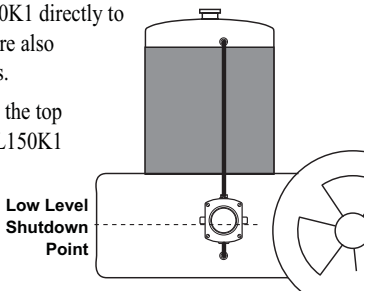


**Figure 5:
Condensor/Radiator System**

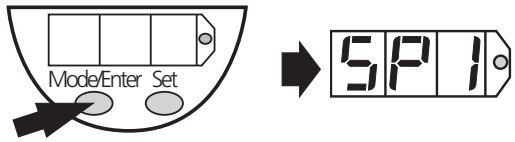
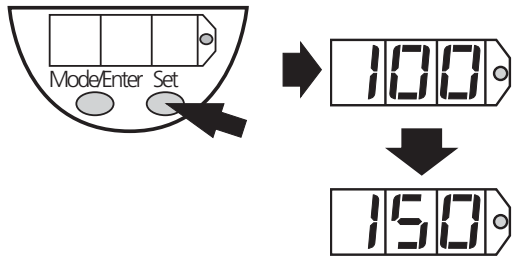
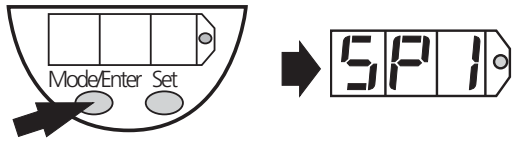
Technical information / Functioning / Parameters

Technical data

Operating voltag [V]	18 ... 30 DC
Current rating [mA]	200
	Short-circuit protection; reverse polarity protection / overload protection
Voltage drop [V]	< 2,5
Current consumption [mA]	< 80
Analog output	4 ... 20 mA (max. 500Ω)
	0 ... 10 V (min. 2000Ω)
Accuracy of switch point [% of value of measuring range]	5
Repeatability [% of value of measuring range]	± 2
Dielectric constant medium	> 1.8
Maximum vessel pressure [bar]	0.5
	(when mounted with mounting accessories)
Housing material	EPDM/X (Santoprene); FPM (Viton); Optalloy-plated brass; NBR (Buna N); PA; Pocan; PC (Macrolon); PP (polypropylene)
Materials (wetted parts)	PP (polypropylene)
Protection	IP 67, III
Operating temperature [°C]	0 ... +60
Medium temperature [°C]	0 ... +65
Storage temperature [°C]	-25 ... +80
Shock resistance	
- LK3022 [g]	12
- LK3023 / LK3024 [g]	10
Vibration resistance	
- LK3022 [g]	2.5
- LK3023 / LK3024 [g]	2.0
EMC	
EN 61000/4/2 ESD:	4/8kV
EN 61000/4/3 HF radiated:	10V/m
EN 61000/4/4 Burst:	2kV
EN 61000/4/5 Surge:	500V/1kV
EN 61000/4/6 HF conducted:	10V

6. Programming

Take the following 3 steps for programming:

1		Press the **Mode/Enter** button several times until the **respective parameter** is displayed.
2		Press the **Set** button and keep it pressed. The current **parameter value** is indicated for 5s, **then** the value **is increased*** (incremental by pressing briefly or scrolling by holding pressed).
3		Press the **Mode/Enter** button **briefly** (= acknowledgement). The parameter is displayed again, the set **parameter value becomes effective**.
Wait 5s (the unit passes to the **operating mode** and the current measured value is indicated again), or start again with **step 1** to program **other parameters**.		

*Decrease the value: Let the display of the parameter value move to the maximum setting value. Then the cycle starts again at the minimum setting value.

If no button is pressed for 20s during the setting procedure, the unit returns to the operating mode.

Locking / Unlocking

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: Press (in Run mode) both setting buttons for 10s. As soon as the indication goes out the unit is locked or unlocked. Units are delivered from the factory in the unlocked state.

Mmod	**Setting the measurement method** 2 settings can be selected: • **3w** : 3-wire measurement • **4w** : 2-wire and 4-wire measurement
EF	**Enhanced functions** This menu item contains a submenu with additional parameters. You can access these parameters by pressing the SET button briefly.
HI LO	**Min-Max memory for system temperature** • HI: displays the highest measured temperature • LO: displays the lowest measured temperature In case of a wire break or value above or below the measuring range "**Err**" is stored. Erase the memory: - Press the "Mode/Enter" button until **HI** or **LO** is displayed. - Press the "Set" button and keep it pressed until "- - - -" is displayed. - Then press the "Mode/Enter" button briefly. It is recommended to erase the memory as soon as the unit starts working under normal operating conditions.
COF	**Calibration offset** The internal measured value (operating value of the sensor) is offset against the real measured value.

	setting range	in steps of
°C	-10.0 ... +10.0	0.1
°F	-18.0 ... +18.0	0.1

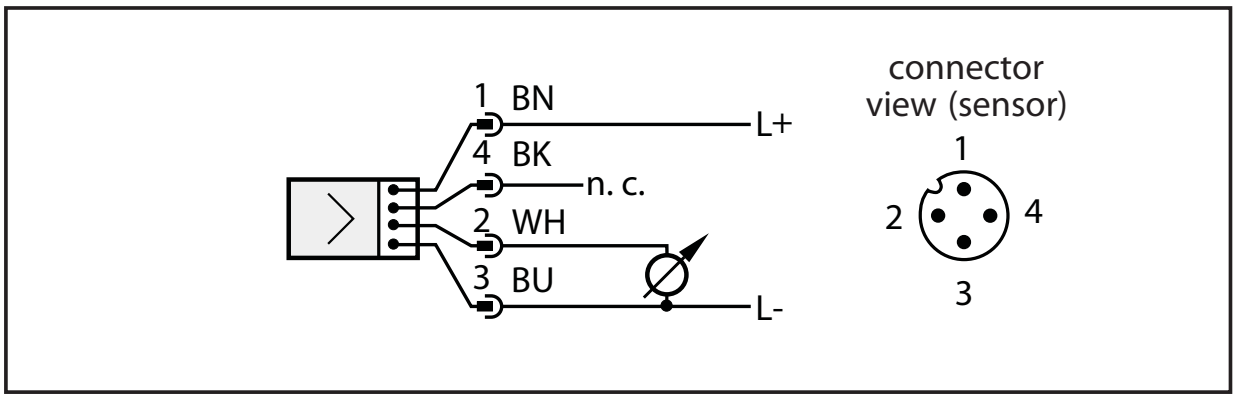
CAr	**Calibration reset** Resets the calibration set by **COF** - Press the "Mode/Enter" button until **CAr** is displayed. - Press the "Set" button and keep it pressed until "- - - -" is displayed. - Then press the "Mode/Enter" button briefly.
dS1 dr1	**Delay time for the switching output** **dS1** = switch-on delay; **dr1** = switch-off delay The output does not immediately change its switching status when the switching condition is met but when the delay time has elapsed. If the switching condition is no longer met when the delay time has elapsed, the switching state of the output does not change. • Setting range: 0 / 0.10 ... 50s in steps of 0.1s (0 = delay time is not active), • indicated in seconds.

3. Electrical connection

The unit must only be connected by an electrician.
The national and international regulations for the installation of electrical equipment must be observed.
Voltage supply to EN50178, SELV, PELV.

Disconnect power before connecting the unit.

Wiring:



Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white),
3 = BU (blue), 4 = BK (black)
n.c. = not connected

When the supply voltage is applied, all LEDs light and go off one after the other.* The unit is then ready for operation.
*During this time the output signal is 20 mA.

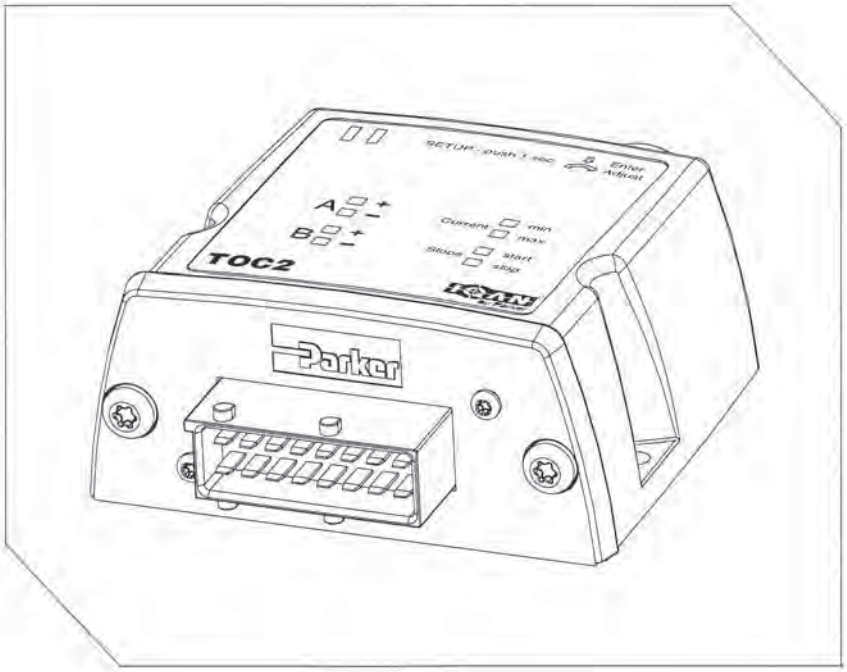
If the operating voltage is too low, the output signal passes to 0 mA.

Water Control Module

IQAN by Parker

Instruction book
IQAN-TOC2

Publ no HY17-8393/UK
Edition 0306



Parker

Supply voltage

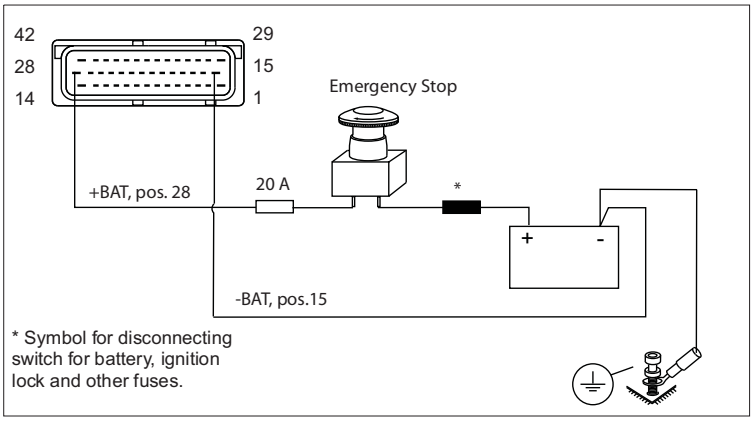
Before any installation of the IQAN system can take place, make sure the ignition lock is turned off and the battery is disconnected.

Emergency stop

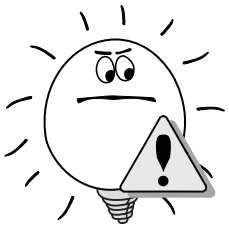
Make sure an *Emergency Stop* disconnecting the power supply, is easily accessible at any time. Further relevent regulations are to be found in Machinery Directives 9837/EC. The figure below shows how to connect the emergency stop.

Connecting of Supply Voltage

The supply voltage, should be within the operating interval, see Heading appendix, on page 24. Connect the supply voltage to +BAT, position 28 and -BAT, position 15. Protect the control by using a fuse. Requisite fuse level should be 20 A, fast (F).



Connecting the emergency stop and voltage supply.

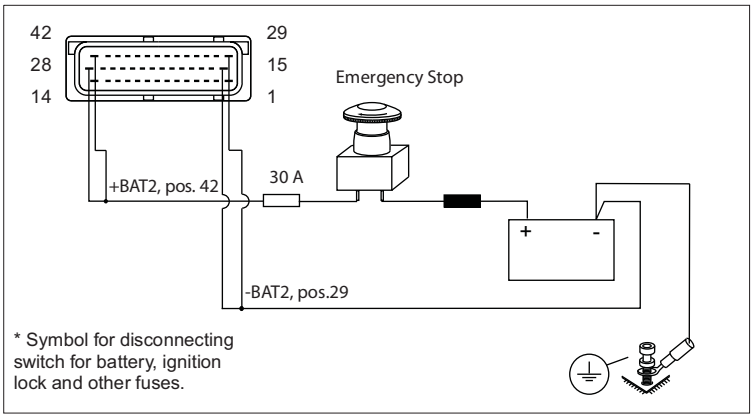


OBSER VE

Do not use the chassis as the negative terminal.

Supplying a high current draw system

If the TOC8 control is used to control several digital outputs simultaneously, it is recommended to source power thru the +BAT2 and -BAT2 positions in addition to the +BAT and -BAT. Change fuse to 30A, fast.



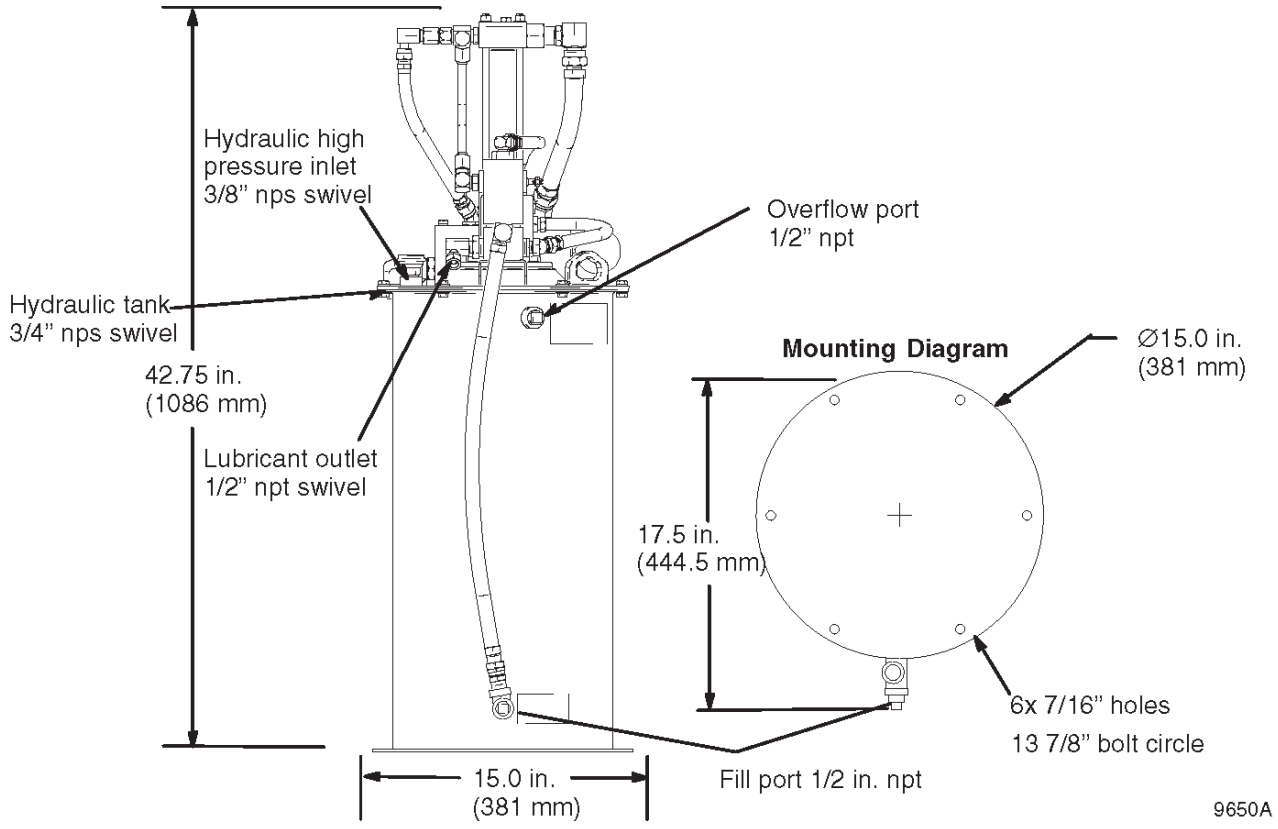
Connecting the emergency stop and voltage supply.

Technical Data

Maximum hydraulic input pressure	3500 psi (241 bar, 24 MPa
Pump wetted parts	See manual 308156
Vent valve wetted parts	See manuals 309099
Reservoir wetted parts	steel, buna–n rubber
Maximum delivery	66 oz/min (119 in^3/min, 1952 cm^3/min) at 3 gpm hydraulic flow rate
Hydraulic pressure operating range	800 to 1200 psi (5.5 to 8 MPa, 55 to 83 bar)
Hydraulic flow rate operating range	0.5 to 3.0 gpm (1.9 to 11.4 liter/ min)
Lubricant outlet pressure range	2500 to 3500 psi (17 to 24 MPa, 172 to 241 bar)
Reservoir overflow port size	$^1/_2$ npt (Figure 3, item L)
Reservoir fill port size	$^1/_2$ npt (Figure 3, item K)
Hydraulic inlet port size	3/8” nps swivel (Figure 3, item T)
Hydraulic tank line size	3/4” nps swivel (Figure 3, item X)
Lubricant outlet port size	$^1/_2$ nps swivel (Figure 3, item G)
Grease capacity	90 lb
Mounting holes for pump module	Six $^7/_{16}$” holes on 13 $^7/_8$” bolt circle
Reservoir diameter	12 $^3/_4$” (324 mm)
Pump module height	37 $^3/_4$” (959 mm)
Electrical requirements	Timed 24 VDC signal
Electrical power requirements	14.7 Watts
Filtration (hydraulic fluid)	10µ (microns) or better
Sound pressure*	77 dB (A)

*Sound pressure reading taken with pump operating at 66 cycles per minute.
*Sound pressure measured per CAGI–PNEUROP, 1971.

Dimensions



Operation

Shut Down.

1. For normal system shut down, disconnect power to lubricator controller (J) by turning off the ignition switch, and turn off hydraulic supply by closing the ball valve (Fig. 2, item AA).

⚠ CAUTION

Never allow the pump to run dry of the fluid being pumped. A dry pump will quickly accelerate to a high speed, possibly damaging pump. If your pump accelerates quickly, or is running too fast, stop the pump immediately and check the fluid supply.

Troubleshooting

Problem	Cause	Solution
System does not build sufficient pressure	Pump malfunction	Refer to manual 308156
	Pump turned off too soon	Increase timer “pump on” setting
		Increase hydraulic flow rate to pump
	Solenoid malfunction	Repair or replace
	Too low or no hydraulic supply	Turn pressure up or supply on
	Vent valve seal failure	Replace seal
	Vent valve needle/seat failure	Replace needle and seat
	Reservoir out of grease	Fill reservoir
	Broken or leaky supply/branch line	Tighten connections and/or replace line(s)
	Injector failure	Repair or replace
	Pressure in tank line too high due to restrictions in tank line or plumbing too small	Remove tank line restrictions
		Use larger plumbing
Lubricant dispensed from pressure relief valve	System pressure set too high	Decrease hydraulic pressure to pump
Pump runs too fast	Reservoir out of lubricant	Fill reservoir
	Pump cavitation	Install a follower plate
	Leak in distribution system	Repair leak
Lubricant coming out of breather	Reservoir overfilled	Drain lubricant until overflow stops
Pump will not start	No hydraulic supply	Verify/check hydraulic supply
	Solenoid malfunction	Replace solenoid
	No electrical supply to lubrication controller	Turn on electrical supply
	Lubrication controller malfunction	Refer to controller manual 308950
	Pump malfunction	Refer to pump manual 308156

Installation

⚠ WARNING

Mount the pump securely so that it cannot move around during operation. Failure to do so could result in personal injury or equipment damage.

NOTE: Refer to Fig. 1 to locate the parts mentioned below.

⚠ CAUTION

Keep the Hydraulic System Clean

The hydraulic supply system must be kept clean at all times to reduce the risk of damaging the reciprocator hydraulic power supply. Blow out all hydraulic lines with air, flush thoroughly with solvent, and then blow out with air again before connecting the lines to the reciprocator.

Always plug the hydraulic inlets, outlets and lines when disconnecting them for any reason to avoid introducing dirt and other contaminants into the system.

Carefully follow the manufacturer's recommendations on reservoir and filter cleaning, and periodic changes of hydraulic fluid.

Hydraulic Power Supply

⚠ WARNING

Limit Fluid Flow to Reciprocator
To reduce the risk of overpressurizing the hydraulic reciprocator, which could cause a rupture and serious injury, including fluid injection, the hydraulic system must have a means to limit the incoming fluid flow to the reciprocator to a maximum of 3 gpm (11 lpm) and 1500 psi (10 MPa, 102 bar). See the description below.

The hydraulic power supply system (U) must have a pressure reducing valve and a pressure-compensated flow control. A flow control valve (Q) is required to limit the incoming flow to the reciprocator to a *maximum of 3 gpm (11 lpm)*.

NOTE: A supply line shut-off valve (L), pressure gauge (M), pressure reducing valve (N), and a flow control valve (Q) are included in the Hydraulic Fluid Control Kit 236864, which can be ordered separately.

Hydraulic Lines

- **Shut-off valves (H and L)** are installed in the hydraulic supply and return lines. Order Part No. 108537.
- **Drain Line:** Remove the plug (59) from the pump adapter and install a 1/8" diameter weep tube (B), ending in a waste container. Monitor the weepage of hydraulic fluid. If it seems excessive or increases suddenly, the reciprocator/pump seals may need to be changed. See Fig. 2.

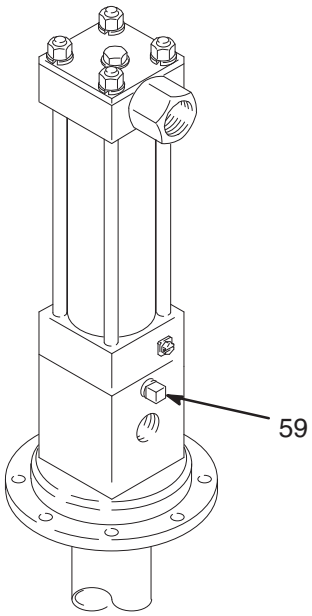


Fig. 2

- **Hoses:** Use a minimum 1/2" supply line (R) and minimum 3/4" return line (F) on the reciprocator. Contact your Graco representative for details of line sizing.
- **A pressure reducing valve (N)** circulates excess hydraulic fluid pressure back to the hydraulic power supply. Install this valve (N) in the hydraulic supply line with a drain hose (W) teed into the hydraulic return line (F). Limit supply pressure to a maximum of 1500 psi (10 MPa, 102 bar).
- **An accumulator (P)** reduces the hammering effect caused by the motor when it reverses direction.
- **A fluid-filled pressure gauge (M), Part No. 112567**, monitors hydraulic pressure to the reciprocator during startup. See Fig. 1. Use the gauge for initial adjustment of the reciprocator. It can be removed after adjustment is made.

Reciprocator Repair

21. Install the capscrew (3), o-ring (39) and washer (2). Install the lockwashers (37) and nuts (36). Torque the nuts to 28 to 32 ft-lb (36 to 43 N-m).

⚠ CAUTION

Never install the fluid tube (45) before torquing the tie rods. Doing so could cause misalignment and damage the reciprocator when it is operated.

22. Reinstall the fluid tube (45) and fittings (1). Torque the fittings to 25 to 35 ft-lb (34 to 48 N-m). See the Parts Drawing on page 20.

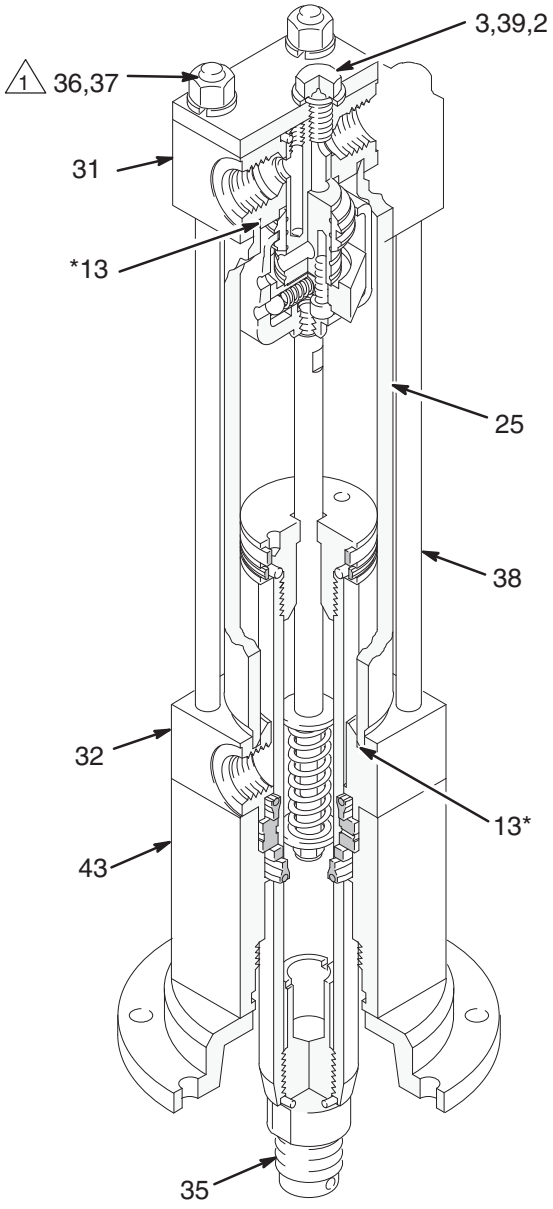
23. Pull the displacement rod (34) in and out to be sure it moves easily with only a little resistance from the rod seal.

24. To reconnect the reciprocator and pump, install the o-ring (17). Screw the connecting rod (35) into the displacement rod (34). Install the cotter pin (204). Install a new copper gasket (202*). Make sure the seal (203*) in the bottom of the adapter (43) is in good condition. Push the cylinder up into the adapter and engage the threads. Screw in the pump, using a strap wrench for the final tightening. See Fig. 12.

25. Connect the hydraulic supply and return hoses to the fittings (5, 60).

⚠ WARNING

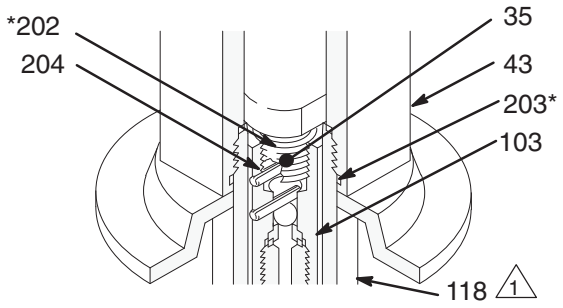
To reduce the risk of static sparking be sure to re-connect the ground wire before operating the pump.



1 Torque to 28 to 32 ft-lb (36 to 43 N-m)

06153

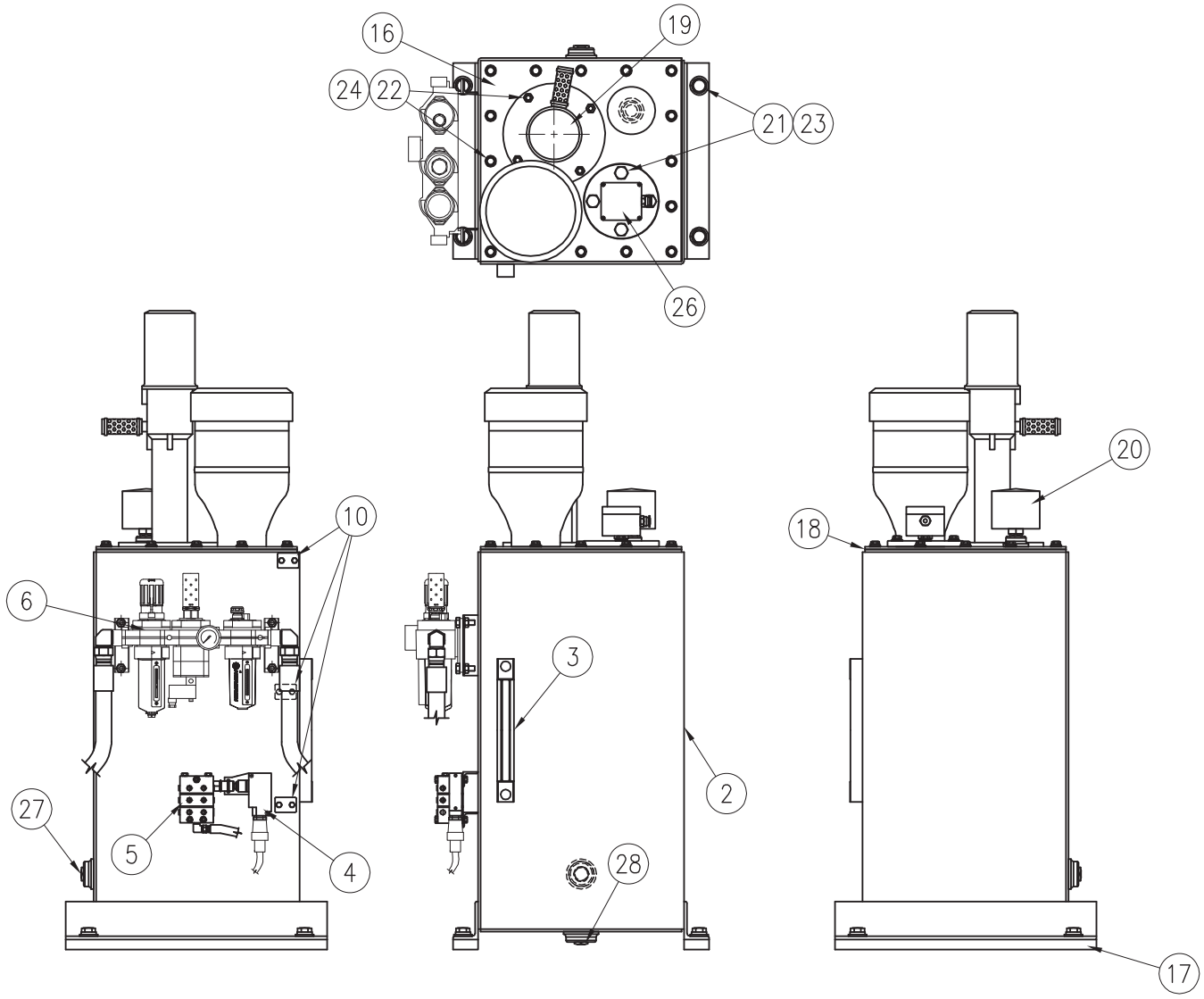
Fig. 11



1 Torque to 150 to 160 ft-lb (205 to 220 N-m)

01682

Fig. 12



ITEM	DESCRIPTION
1	AMMER OIL TANK ASSEMBLY (VARIENT 1)
2	HAMMER OIL TANK WELDMENT
3	LEVEL GAUGE
4	HAMMER OILER SWITCH – MICRO
5	HAMMER OILER DISTRIBUTOR VALVE
6	AIR SERVICE UNIT
7	PUMP, HIGH PRESSURE STRIPPED, ASSEMBLY
9	LEVEL TRANSMITTER
10	CLAMP
11	PUMP ASSEMBLY
12	AIR MOTOR & PUMP (REPAIR KIT–MAJOR)
13	MOTOR (REPAIR KIT– VALVE REPLACEMENT)
14	HAMMER OIL TANK ASSEMBLY (VARIENT 2)

ITEM	DESCRIPTION
15	HAMMER OIL TANK LID WELDMENT (VARIENT 1)
16	HAMMER OIL TANK LID WELDMENT (VARIENT 2)
17	BASE PLATE
18	LID GASKET
19	PUMP, GRACO PRESIDENT 10:1 ASSEMBLY
20	AIR FILTER
21	BOLT, HEX, 5/8"ø UNC X 1" LG
22	BOLT, HEX, 3/8"ø UNC X 1" LG
23	WASHER, 5/8"ø FLAT STD
24	WASHER, 3/8"ø FLAT STD
25	PUMP REPAIR KIT
26	LEVEL TRANSMITTER ASSEMBLY
27	PLUG, 1" BSPT
28	PLUG, 1 1/4" BSPT

Installation

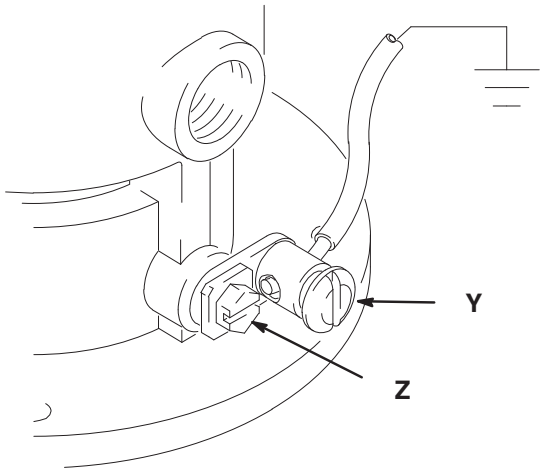
Grounding

Proper grounding is an essential part of maintaining a safe system.

To reduce the risk of static sparking, ground the pump. Check your local electrical code for detailed grounding instructions for your area and type of equipment. Be sure to ground this equipment:

- *Pump:* Use a ground wire and clamp as shown in Fig. 2.
- *Air and Fluid hoses:* Use only electrically conductive hoses.
- *Air compressor:* Follow the manufacturer's recommendations.
- *Fluid supply container:* Follow the local code.
- *Object being lubricated:* Follow the local code.
- *To maintain grounding continuity when flushing or relieving pressure,* always hold a metal part of the valve firmly to the side of a grounded metal pail, then trigger the valve.

To ground the pump, remove the ground screw (Z) and insert through the eye of the ring terminal at end of the ground wire (Y). Fasten the ground screw back onto the pump and tighten securely. Connect the other end of the ground wire to a true earth ground. See Fig. 2. *To order a ground wire and clamp, order Part No. 222011.*

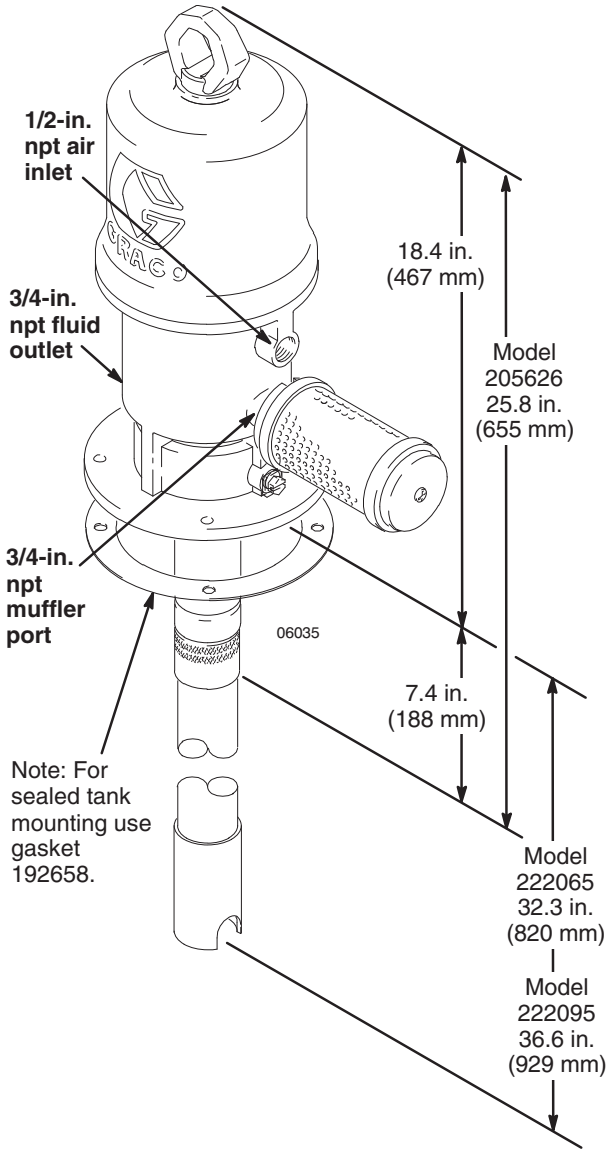


TI1052

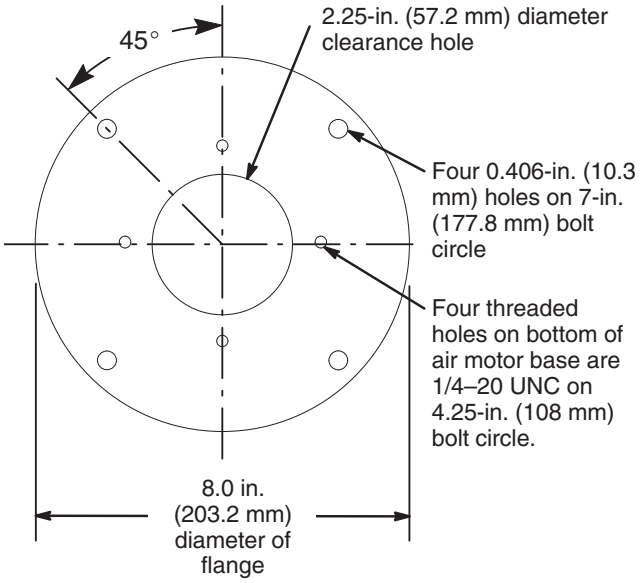
Fig. 2

Dimensions

MODEL 205626, Series J



Mounting Hole Layout



Technical Data

Maximum working pressure	1800 psi (124 bar)
Fluid pressure ratio	10:1
Air operating range	40 to 180 psi (2.8 to 12.4 bar)
Air consumption	Approximately 13 ft^3/min per gallon pumped, (6 m^3/hour per liter pumped) at 100 psi (6.9 bar)
Pump cycles per gallon (liter)	20 (5.3)
Maximum recommended continuous pump speed	60 cycles/min; 3 gpm (11.4 liter/min)
Recommended speed for optimum pump life	15 to 25 cycles per min
Sound data	78.0 dBA sound power at 100 psi air, 40 cycles per minute
Piston seals	polyurethane with nitrile spreader
Rod seals	polyurethane with nitrile spreader
Wetted parts	aluminum, steel, polyurethane, nitrile
Weight (Model 205626, Universal Pump)	28.7 lb (13.0 kg)

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TROUBLESHOOTING

If the following procedures do not correct the problem, contact a factory authorized service center. When submitting equipment to be repaired, be sure to state the nature of the problem and indicate if a repair cost estimate is required.

PROBLEMS

AIRMOTOR DOES NOT OPERATE.

- Check air supply to pump.
- Check for broken trip rod.
- Broken toggle or foreign object lodged in priming tube. Check for rust, worn or scored parts.

AIR SEEPAGE FROM AIR EXHAUST WHILE PUMP IS NOT OPERATING

- Check valve slide (83063), seat and gasket. Check trip rod packing (236835) and gasket (33039) for cut or damaged packing.

LOSS OF PRESSURE, VOLUME OR CONTINUOUS OPERATION OF PUMP WHEN NOT IN NORMAL USE.

- Remove and clean lower inlet checks. Check for foreign material.
- Inspect sealing surfaces between upper and lower inlet checks. Replace if rough or pitted.
- Replace shovel rod if rough or pitted. Replace shovel rod packing (35073).
- Inspect lubricant supply line for leaks or breaks.

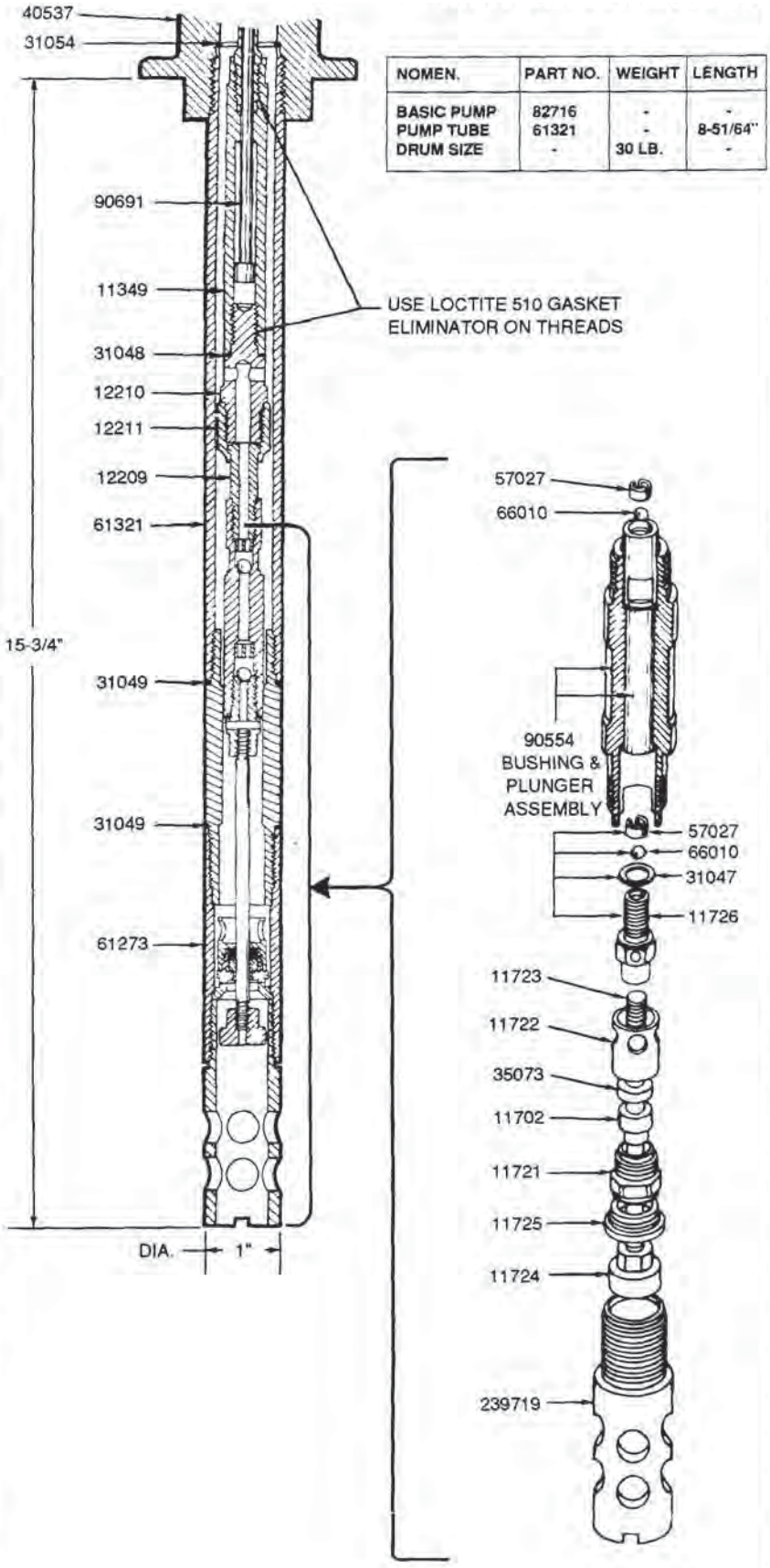
LUBRICANT LEAKING FROM WEEP HOLE IN OUTLET CASTING.

Replace O-ring (34572) and U-cup (38165). Make sure gland nut (12333) is tight.

EXCESSIVE AMOUNT OF AIR IN LUBRICANT OR EXCESSIVE AMOUNT OF LUBRICANT COMING FROM AIR EXHAUST.

> **NOTE**
> Some lubricant exhausts with air normally.

- Replace gland packing (34180), gland gasket (31050), O-ring (34572) and U-cup packing (38165).



NOMEN.	PART NO.	WEIGHT	LENGTH
BASIC PUMP	82716	-	-
PUMP TUBE	61321	-	8-51/64"
DRUM SIZE	-	30 LB.	-

Air Cleaners

The air cleaner should be inspected periodically to maintain engine and compressor protection and maximum service life. These inspections should include the following points:

1. Inspect the air transfer duct between the air cleaner and the engine to be sure all clamps are tight, all flange joints are tight, and there are no cracks in the ducting.
2. Air cleaner mounting bolts and clamps must be tight to hold the air cleaner securely.
3. Check the dust cup to make sure it is sealing 360° around the air cleaner body.
4. Vacuator valve must be in place, not inverted, and free from obstruction.
5. Check for dents and damage to the air cleaner which could mean a leak.
6. Make sure all accessories are free from obstructions and securely mounted.

Air Filter Elements

Replace air filter elements as required. Refer to Preventive Maintenance chart.

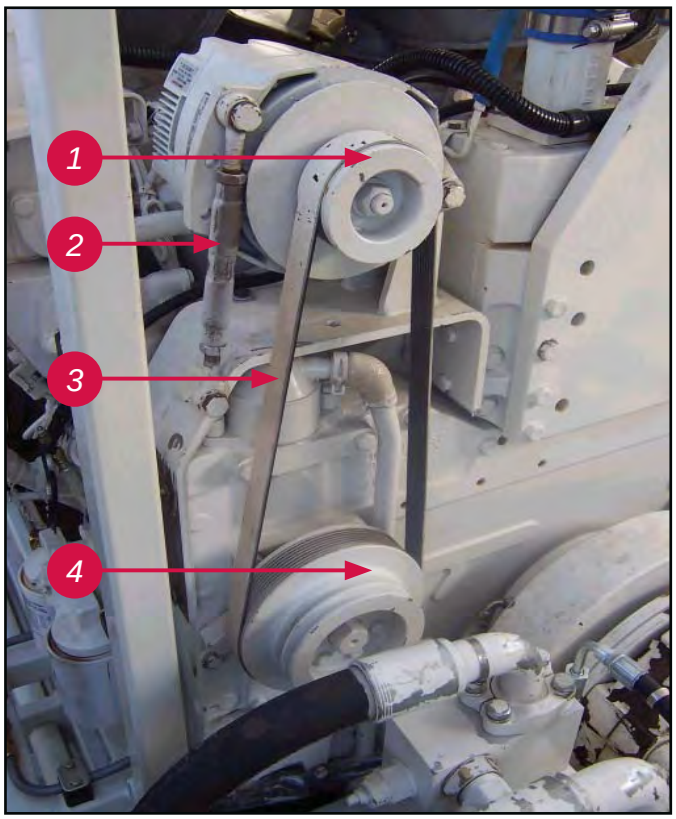
CAUTION: DO NOT clean filter element with high pressure air (30 PSI maximum). Advise replacement of filter element.
DO NOT start engine when the filter element(s) is removed from the air cleaner
NEVER attempt to clean the element by rapping it. Rapping the element will dent the metal covering. The inner paper element will in turn rub this dent, causing the element to puncture.

Alternator Maintenance

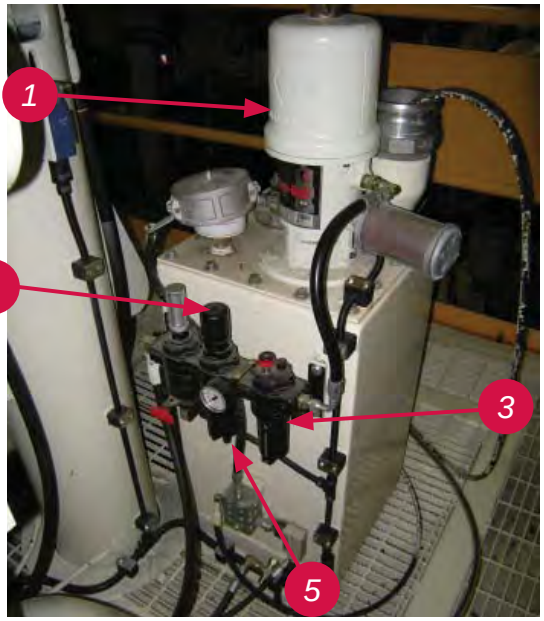
250hrs

- Check Alternator Condition And Belt Tension

1. *Alternator Pulley*
2. *Alternator Belt Tension Adjustment*
3. *Alternator Drive Belt*
4. *Alternator Drive Pulley*



WARNING: DO NOT OPERATE MACHINE WITH BELT OR PUMP DRIVE GUARDS REMOVED!



1. *Hammer Oiler Pump*
2. *Grease Pump*
3. *Lubricator*
4. *Pump Regulator*
5. *Water Trap*

Lubrication System Checks And Servicing

10hrs/Daily

- Check/Refill Grease Pump Lubricator (ISO-68 100ml)
- Check/Refill Pipe Thread Lubricator (ISO-68 100ml)
- Check/Refill Hammer Oil Pump Lubricator (ISO-68 100ml)

Item	Task	Comments & Initials
10	**Mast & A-Frame**	
	1. CHECK integrity of mast A-frame welded joints to the base for evidence of cracking.	
	2. CHECK mast pivot pins and bushes for wear and lubrication.	
	3. CHECK the mast pivot cap bolts 1315Nm (970 ft/lbs). Replace bolts if any movement occurs.	
	4. CHECK mast raise cylinder pivot pin bolts for integrity, and the pivot shaft for lubrication and wear.	
11	**Rotary Gearbox (head)**	
	1. CHECK the rotary gearbox oil (85/140).	
	2. CHECK the air swivel flushing seal for leaks.	
	3. CHECK the shock sub for damage and adequate lubrication.	
	4. CHECK the rotary motors mounting bolts for security and oil leaks.	
	5. Rotary head wear pads, CHECK wear, replace as required, part # 0410860K. Refer service manual and parts catalogue for details.	
	6. CHECK the rotary head mounting bolts for security.	
12	**Pulldown Assembly**	
	1. CHECK and REPORT on the condition of the pulldown ropes. Adjust the pulldown ropes (if required) as per the service manual.	
	2. Replace Permalube lubricators mounted on the travelling sheave block. Part (Y Permalube)	
	3. CHECK all pulleys for adequate lubrication.	
	4. CHECK the pull down cylinder pivot pin bolts for integrity, and the pivot pins for lubrication and wear.	

Additional Job Details		
Details of Additional Work Including Parts Requirements (Please include a copy of the parts page indicating the parts required).	Work Order Originator	Work Order Number

Item	Task	Comments & Initials
19	**Air Conditioner**	
	1. CHECK the condition of the drive belts (2 x V AX34).	
	2. Adjust the belts – if required.	
	3. Change the pressuriser filter (YP182052).	
	4. Check the condition of the re circulation filters.	
20	**Electrical System**	
	1. CHECK the condition of the alternator drive belt (part # 0421319)	
	2. Adjust the alternator belt - if required.	
	3. CHECK the condition of wiring harnesses, wiring code identification, condition of DIN plugs including seals and harness retaining clamps.	
	4. CHECK the electrical cabinets for cleanliness, condition of door seals, wiring terminal condition, wiring code identification condition, cabinet condition and door sealing.	
21	**Batteries** **Warning** • Wear eye protection. • Batteries emit hydrogen gas. To avoid explosion and personal injury, do not smoke or allow ignition sources in the area when servicing batteries.	
	1. Clean terminals and lubricate with Vaseline.	
	2. Top up batteries with distilled water.	

Item	Task	Comments & Initials
3	**Engine Cooling System**	
	1. CHECK coolant, if the reading is less than 0.7, add 19 litres of Maxitreat 3477 concentrate. If the pen reading is between 0.7 and 1.2, no action is required. If the reading is above 1.2 contact Nalco.	
	2. Change coolant filters (YWF2077).	
	3. CHECK radiator cap condition. (V007049).	
	4. CHECK coolant level.	
	5. CHECK system hoses & plumbing for any coolant leaks.	
	6. CHECK the condition of the radiator and clean if required.	
4	**Engine Air Cleaner**	
	1. CHANGE secondary elements (2 x V007531).	
	2. CHANGE primary elements (2 x V007530).	
	3. Remove the vacuator cups (3 used) clean & refit.	
	4. CHECK induction pipe-work for cracks, splits and dust intrusion.	

Samples			
Sample	Recommended Sample Point		
Rotary Head	Spirax 85W/140	54	54
Final Drive (Left and Right)	Spirax 85W/140	10.5	10.5
Winch Gearbox	Spirax 85W/140	0.5	0.5
Water Injection Pump	Rimula D Extra 15W40	0.95	0.95
Air (lube) Pumps	Tellus 100	0.25	0.25
Thread Lube	Malleus TC2	20	-
Auto Lube System - Grease	Retinax EPX2	115	-
Auto Lube Canisters	Permalube	125ml	125ml
Coolant	Maxitreat 3477	182	182

Reedrill SKF 12/15 2000 Hour Service Kit				
Part number: KIT2000SKFCPM				
Qty	Part Number	OEM Details	Description	Stock #
4	V010521		Filter, engine oil	
2	YLF777		Filter, reserve oil system	
1	YFS1006		Filter, fuel / water separator	
1	YFS1242		Filter, fuel, pre-filter strainer	
2	YWF2077		Filter, water	
1	0065322		Element Compressor outer	
1	0065320		Element, Compressor Inner	
2	V007530		Element engine outer	
2	V007531		Element, engine Inner	
2	V011135		Element Charge Filter	
1	V000577		Element Seperator	
1	YHC7500SKT4H		Element Tank Breather	
1	YAF4884		Air Filter Breather	
2	YAF4884		Element Pump Drive Box Breather	
2	YAS271535A		Element Return Air Media	
1	YP182052		Element Air Pressuriser Element	
1	YEK25		Element Air Pressuriser Pre Cleaner	
2	0088594		Element, hydraulic return oil	
5	V011136		Element Hyd Loop Filter	
1	YPROBE		Oil Sample Kit	
1	0401857		Element Compressor Oil Filter	
1	V007128E		Element Moisture Trap	