Technical Manual

Contents

- Be sure that prior to starting the machine, all controls are in neutral or off positions and that controls are in the position that will generate the least load upon the engine on start-up. Especially ensure the auto pulldown is off and rotation lever is in neutral.
- Be sure that the drill area is clear of all obstructions before operating the machine.
- Ensure that the safety chain is attached when using a towbar.
- Do not operate the machine with: a hydraulic leak, broken or damaged electrical wiring or damaged hydraulic hoses or fittings.
- Do not operate the machine without familiarising yourself with the location of all hand held fire extinguishers.
- Be sure the fire suppression system has not been activated, is still pressurised, and that lines and nozzles are in the correct place and not damaged.
- Do not operate the machine without familiarising yourself with the location of on-board fire suppression activation points.
- Do not operate the machine without first checking that all emergency stops are operational and familiarising yourself as to their location.

Auto Pulldown Off

Emergency Stop

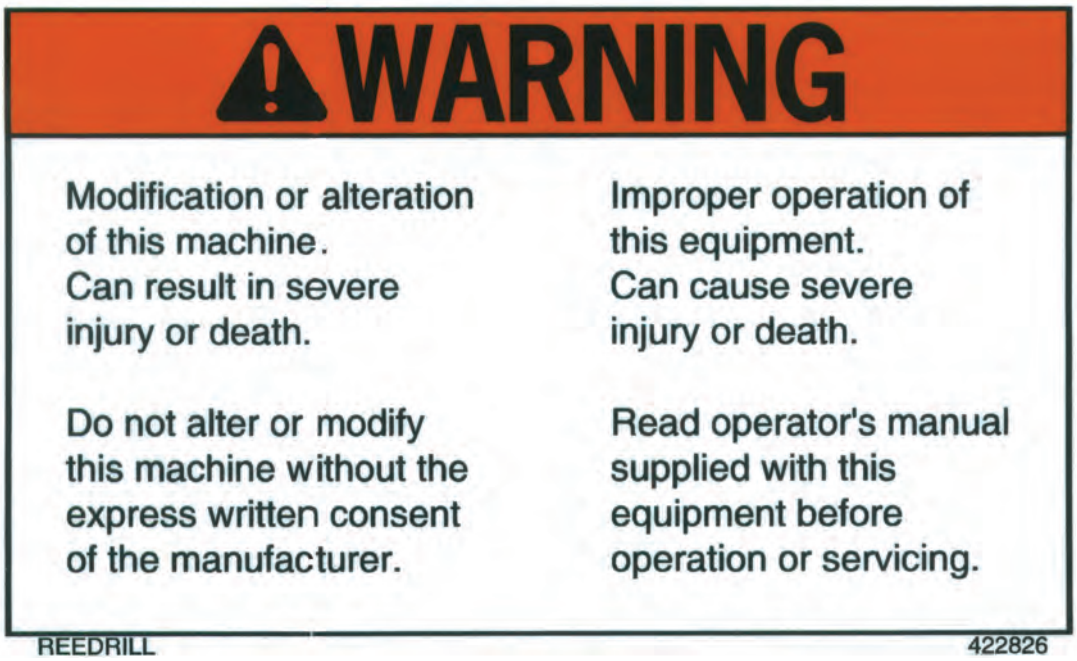
During Operation

- Do not use the machine for anything other than its designed purpose for blasthole drilling.
- Do not wear jewellery or loose fitting clothing when working on the machine. Keep clothing and hands clear of moving parts.
- Do not move the machine if the drill is in a potentially unstable position.
- Always be aware of the drill rigs automated functions and make sure people are clear of all components. The Rotary Drill has an automated function of the dust curtain raise/lower cylinders when the machine is switched from “Drill” to “Propel” mode.
- Do not propel the machine with the mast raised over undulating ground or across grades or over any distance other than short distances on a drill pattern.

Dust Curtain Raised

Warning Decals

Below and on the following pages is a listing of WARNING DECALS placed on the machine. If any warning decals are missing, or have become unreadable, order replacements at once and replace damaged or missing decals.



Part No. 422826

Part No. 422813

Part No. 422814

Part No. 422815

Part No. 426580

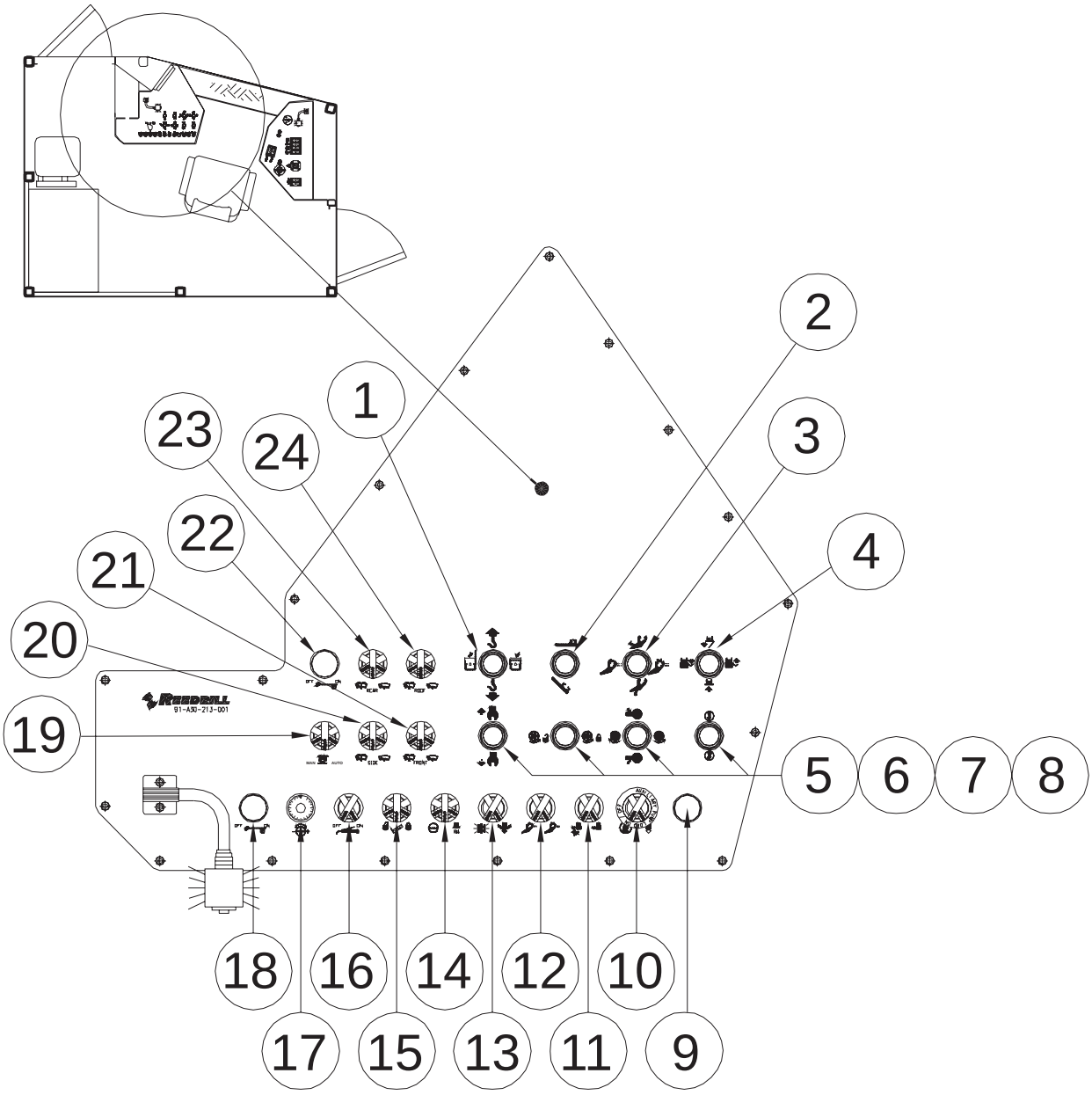


Fig. 2-5 Left Hand Control Panel

8. Drilling Air Control

Turns drilling air on and off for drilling operations.

DANGER: Always check for people standing near the machine BEFORE turning drill air ON.

- Push lever forward to turn drilling air ON.
- Pull lever back to turn drilling air OFF.

9. Plug (not in use)

8. When the evacuation is complete close both hand valves, switch off the pump and disconnect the service hose from the pump.
9. Fully back seat both compressor service valves.

2.5 SYSTEM CHARGING

The charging operation should be performed at air temperatures of 21^{0}C and above. Changes in ambient air temperatures, and to a lesser degree humidity, will affect the systems ability to take a charge and will vary gauge readings. Refer to the Temperature/Pressure Chart in section 4.1 (Table 4.1.1) for the suggested pressure readings in the ambient temperatures being experienced during system charging.

When adding partial charge to a system it is not necessary to discharge and evacuate if there is no evidence of air in the system and there are no system leaks.

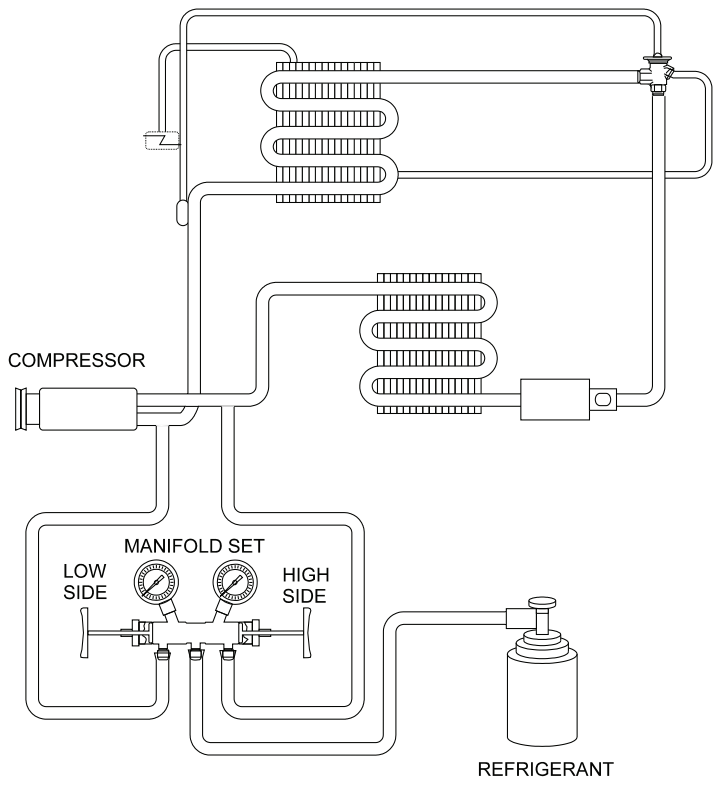
Note: Up to 0.2 kg of refrigerant loss per year is considered normal. Operating the unit periodically during the off-season will lubricate system seals and reduce the possibility of refrigerant loss.

To correctly charge the system refer to Fig. 4.7 and proceed as follows:

1. Install gauge set and purge hose if a partial charge is to be added. Gauge set should already be installed and holding a vacuum if a full charge is to be added. The manifold hand valves should be closed.
2. Loosely connect the charging line from the cylinder of R134a refrigerant to the manifold gauge set.
3. Ensure that the charging line connection to the cylinder is fully secured and that the cylinder stands vertically upwards, to ensure that only refrigerant vapour can be charged into the system.

WARNING: DO NOT invert the R134a container. Liquid refrigerant entering the lowside of the system will permanently damage the compressor.

FIGURE 4.7



4.2.8 THERMAL EXPANSION VALVE IS OBSTRUCTED

Unless the expansion valve is properly protected by a strainer or filter, foreign matter may obstruct the valve port. If the obstruction is small, the resulting operation will be much the same as though the valve were undersized as described in 4.2.7 above. If the obstruction holds the valve open during shutdown, the operation will be as described in 4.2.2 and 4.2.3. An obstructed expansion valve is usually indicated by a partly warm evaporator.

4.2.9 SHORTAGE OF REFRIGERANT

A shortage of refrigerant will be initially indicated by bubbles in the sight glass. Frequently there will be a hissing or whistle at the expansion valve. The coil and suction line will be relatively warm while the suction pressure will be low due to little or no liquid being supplied to the evaporator if the shortage is severe.

4.2.10 OVERCHARGE OF REFRIGERANT

An overcharge of refrigerant will cause high head pressure. Liquid will back up in the condenser and decrease the amount of surface available for condensing and as a result the head pressure will rise. In extreme cases, it may rise to a point where high pressure cut-out will stop the compressor. This may result in “short cycling”, (compressor cycles too frequently).

4.2.11 AIR IN SYSTEM

If air or other non-condensible gases are present in the system, they will tend to move toward and collect at the condenser. The head pressure will rise to a point above the pressure corresponding to the temperature at which the vapour is condensing. In extreme cases, the pressure may rise to a point where the high pressure cut-out may stop the compressor.

4.2.12 BROKEN VALVES IN COMPRESSOR

Broken or leaky discharge valves in a compressor are generally indicated by the suction pressure rising rapidly as soon as the machine is stopped. If the suction pressure rises faster than 13 kPa per minute, it is an indication that the compressor discharge valves are not holding. Before the compressor is opened, however, it should be determined that the pressure rise is not due to other causes such as a leaky expansion valve.

4.3 FAULT DIAGNOSIS FOR ELECTRONIC THERMOSTAT

Refer Electrical Schematic Drawing AE271515 or AE271551

As this is a fully sealed item it cannot be field checked for correct operation and should be returned to Sigma if suspected to be faulty. It is unlikely that the thermostat will fail due to internal causes and therefore external wiring should be checked prior to deeming if failed and especially when replacing with a new unit.

4.3.1 CAUTIONS

i) Always disconnect thermostat when testing circuit continuity or faults

ii) Always check all wiring prior to replacing a blown thermostat.

iii) Thermostat switches earth; internal contacts are NOT voltage free.

iv) Connecting output wires (blue, white) to power supply connects power to ground through thermostat and will blow internal 2 switches.

v) Never connect shield from potentiometer to earth.

Air International Transit

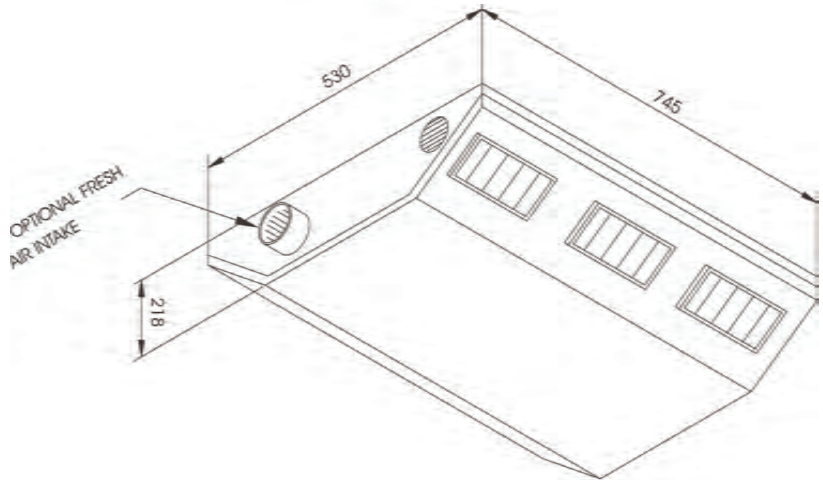
SIGMA
Innovative by design • Tough by nature

AIR CONDITIONERS
Severe-Duty Range

TFC8 Ceiling Evaporator

SPECIFICATION DATA		
Model No:	TFC8	
Unit Type:	Internal Ceiling Evaporator	
Cooling Capacity – KW:	8	
Heating Capacity – KW:	10	
Supply Airflow – l/s:	325	
Pressurised Fresh Air – l/s:	30 (if fitted)	
Current Draw:	12 V DC	24V DC
	45	22.5
Design Ambient:	Summer	Winter
	46°C Ambient	0°C Ambient
Refrigerant:	R134a	
Weight (Nominal kgs):	70	

For more information on the Sigma range of Air Conditioners, please contact one of our offices listed below. In the interests of product improvement, Air International Transit, reserves the right to alter specifications without notice.



Air International Transit

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WEB: www.airinter.com.au
EMAIL: ait@airinter.com.au

Mast Elevating Cylinders

The elevating cylinders have a built in cushioning design for full extension protection (Fig 3-2a). As the cylinder approaches full extension the rod end of the piston which has an extended back end, enters the Cylinder Gland and blocks off the normal oil porting. Oil then passes through a restricting orifice which slows down the flow leaving the cylinder, thus slowing the travel speed of the cylinder.

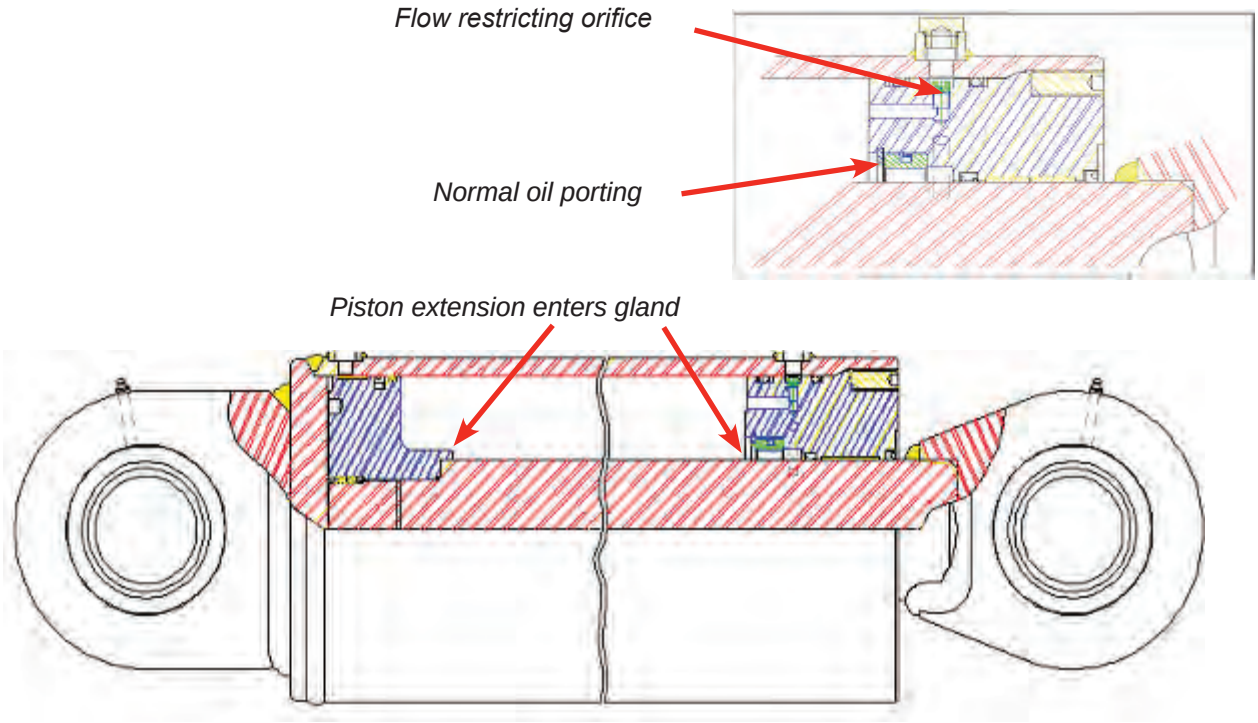


Fig. 3-2a. Mast Elevating Cylinders

Both mast elevate cylinders have a counterbalance valve fitted to the piston side of the cylinder (Fig 3-2b), to prevent uncontrolled descent of the mast. These two valves are located on the bottom of each cylinder. There is also a common counterbalance valve (fig 3-2c) tee'd to both cylinders to protect the mast from over balancing near vertical, this valve is located directly under the rear of the main pumps on a chassis cross member. Refer to SECTION 7 for counterbalance setting procedure

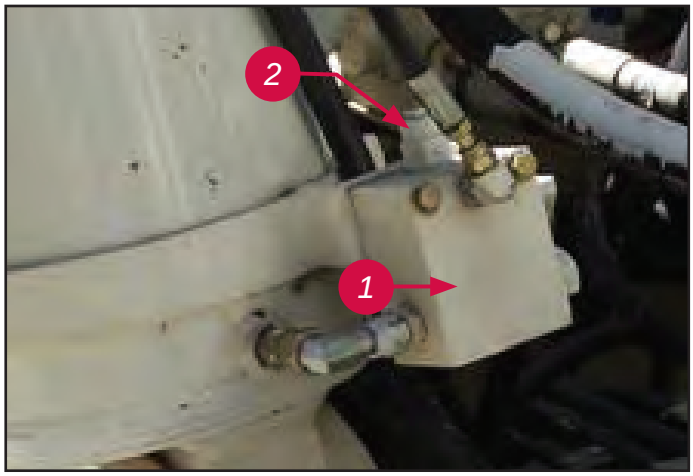


Fig. 3-2b
Individual cylinder counterbalance valve
1. Counterbalance valve
2. Valve adjuster

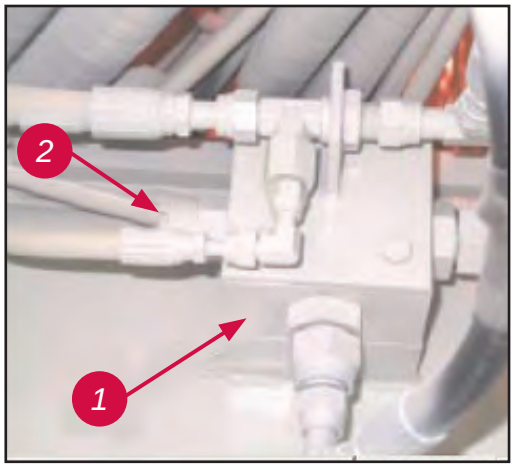


Fig. 3-2c
Common counterbalance valve
1. Counterbalance valve
2. Valve adjuster

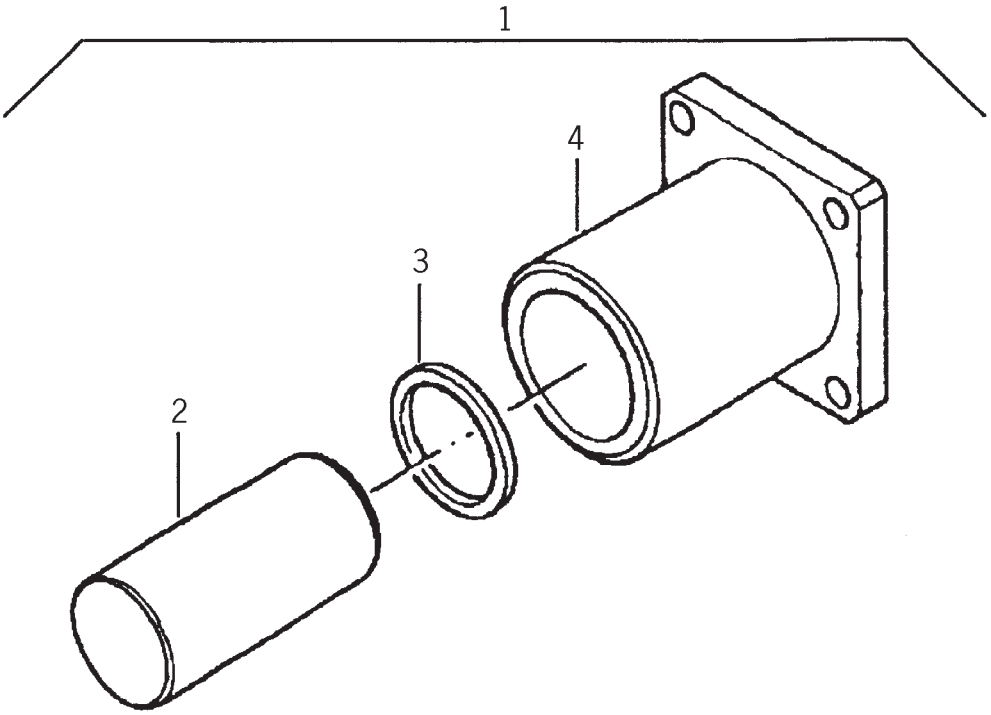


Fig. 3-9 Hydraulic Tensioner Assembly

1. *Hydraulic Tensioner Complete*
2. *Piston*
3. *Groove Seal*
4. *Cylinder*

Repair

Normally the hydraulic tensioner is not repairable.

If the cylinder is grooved, it will not seal and the entire unit must be replaced.

Track Shoe Bolt Torque (Direct Torque Method)

Bolt Torque KN111

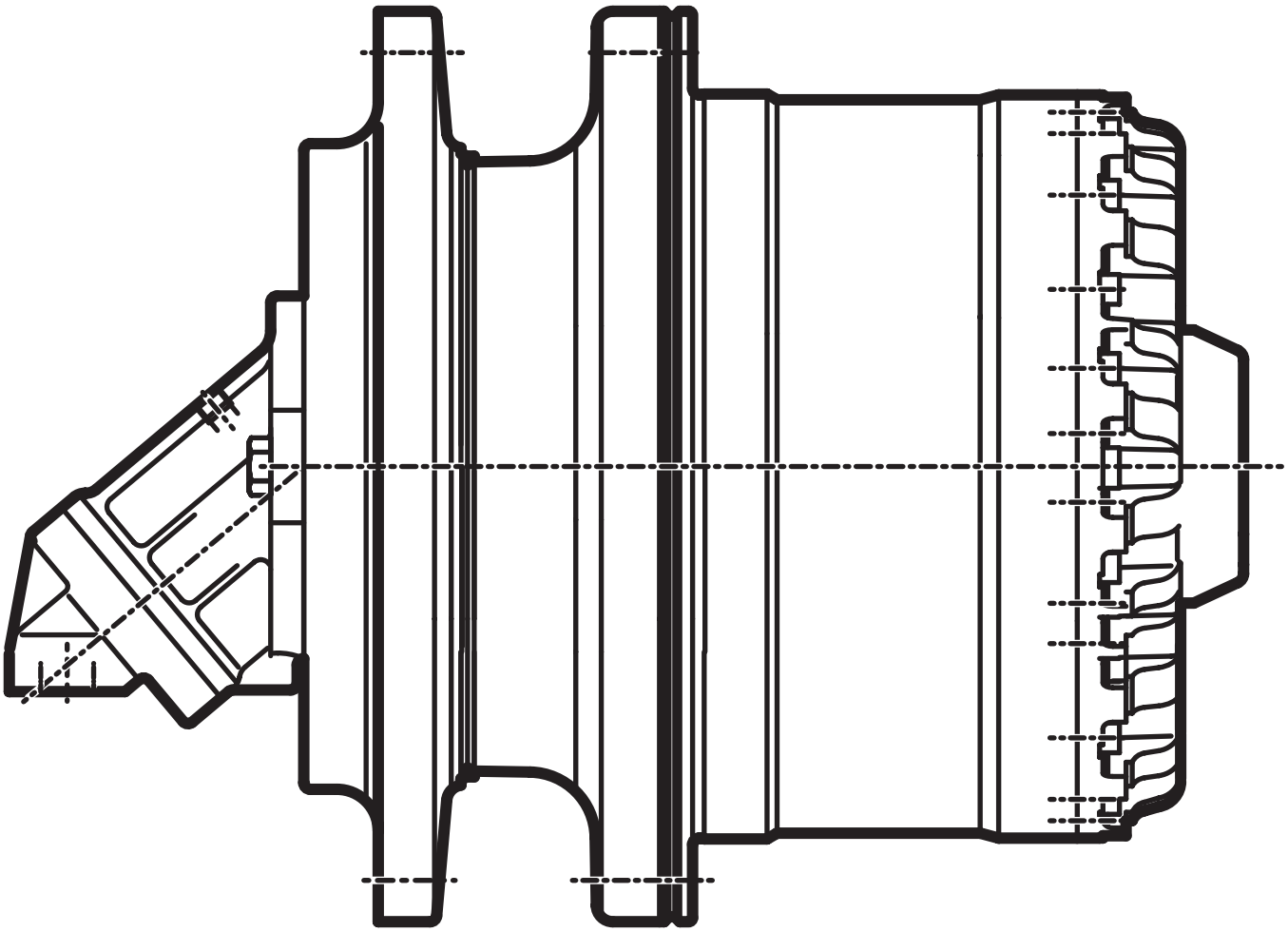
Range of applications: 1. Bolt torque for grouser shoe acc. to supply specifications.
2. Data on this page applies only to torque indicator method.

1. Method from next page to be used preferentially.
2. Check of bolt torque (e.g. unscrew) is not possible.

Thread metric	Bolt torque	
	Ma = Nm	Ma = ftlbs
M10 x 1	90 ± 5	66 ± 4
M12 x 1	160 ± 10	118 ± 7
M14 x 1,5	240 ± 15	177 ± 11
M16 x 1,5	370 ± 20	273 ± 15
M18 x 1,5	530 ± 30	391 ± 22
M19 x 1,5	640 ± 35	472 ± 26
M20 x 1,5	750 ± 40	553 ± 29
M24 x 1,5	1320 ± 65	973 ± 48
M27 x 1,5	1910 ± 95	1408 ± 70
M30 x 2	2570 ± 130	1895 ± 96
M32 x 2	3080 ± 150	2271 ± 111
M36 x 2	4540 ± 250	3347 ± 184

Unifiedfine Thread	Bolt torque	
	Ma = Nm	Ma = ftlbs
7/16" - 20UNF	120 ± 5	88 ± 4
1/2" - 20UNF	180 ± 10	133 ± 7
9/16" - 18UNF	260 ± 15	192 ± 11
5/8" - 18UNF	370 ± 20	273 ± 15
3/4" - 16UNF	640 ± 35	472 ± 26
7/8" - 14UNF	1070 ± 50	789 ± 37
1" - 14UNS	1560 ± 80	1150 ± 59
1 1/8" - 12UNF	2300 ± 115	1696 ± 85

F130 Final Drive



F130/206/K125/MB-A Final Drive

General description

The transmission should be checked and/or repaired only by qualified technicians, acquainted with its peculiar features and well aware of all safety instructions.

Before performing any operation it is advisable to carry out transmission cleaning accurately by removing oil/grease encrustations and accumulation.

All disassembled mechanical parts must be cleaned accurately with suitable products to avoid possible damage. Parts should be replaced if damaged, worn out, cracked, seized, etc. as they could affect proper functioning of the transmission.

Rotating parts (bearings, gears, shafts) and that of hardware/fasteners (O-Ring, oil seals) should be examined carefully, as they are subject to major stress, wearing and ageing. We advise replacing the seals after each maintenance or repair operation.

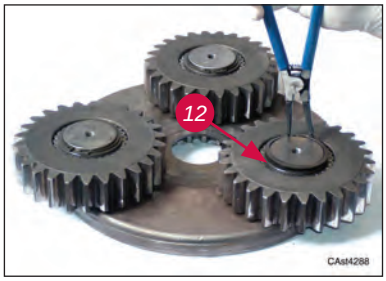
Use appropriate spare parts, nuts and bolts to avoid any other problems. Moreover, use metric tools for metric nuts and bolts and Imperial tools for the others.

Please read the disassembly instructions very carefully because some operations are destructive for some transmission components and that means that they should be replaced with new ones, because when dismantled, they are destroyed.

Please read carefully the description of the single steps, to avoid compromising the good operation of the whole unit.

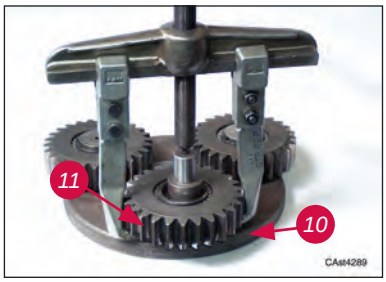
Planetary Gears F130/206-A

23.



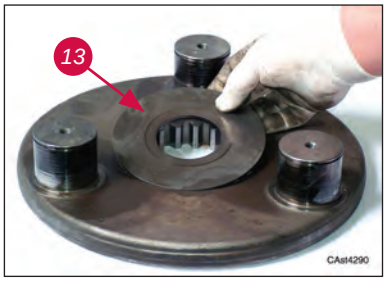
Disassemble snap ring (12).

24.



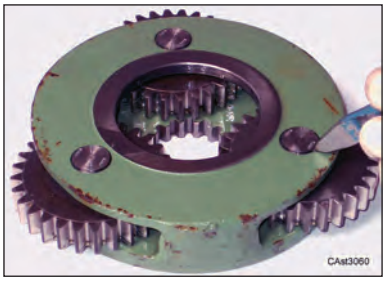
By means of an extractor remove planetary gears (11) from side gear carrier (10).

25.



Remove washer (13).

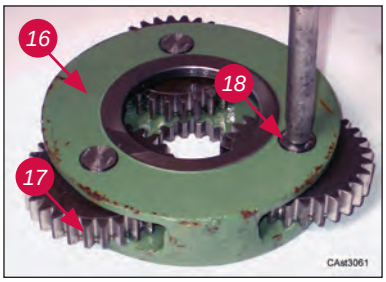
26.



Check its wear conditions.

Remove bulges in pins cautiously with a chisel or punch.

27.

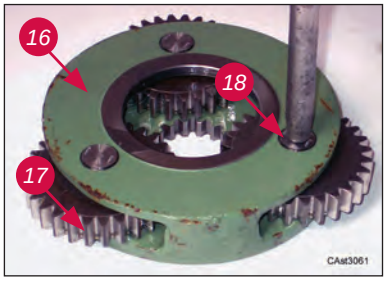


Strike on pins center (18) in order to let them come out of their seat.

Take the side gears (17) out of the side gears carrier (16).

Assembly

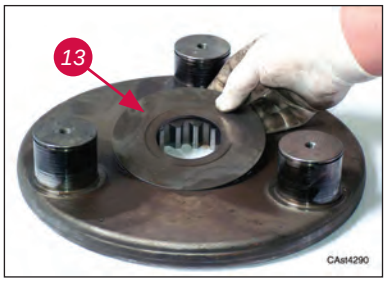
1.



Assemble the side gears (17) in the side gears carrier (16).

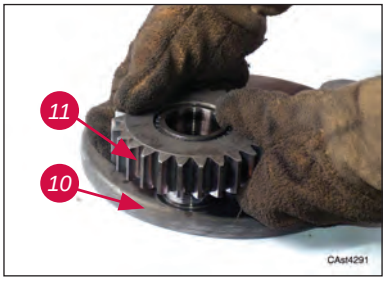
Fit pins (18) in the holes and lock them fitting 3 punchings in pin border.

2.



Assemble washer (13).

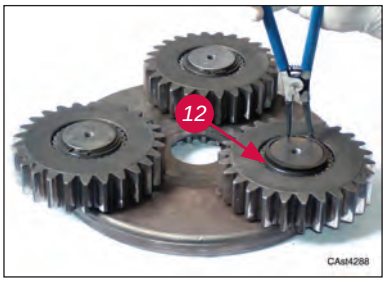
3.



Heat the bearings at 110°C.

Assemble planetary gear (11) on side gear carrier (10).

4.



Assemble snap ring (12).

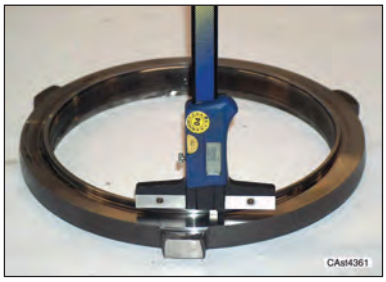
Bearings

7.

Assemble hub assembly (37) on beam assembly (32).

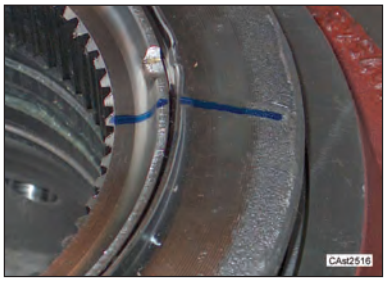
Assemble bearing (38). Heat the bearing at 110 °C.

8.



Measure the value (Y) on a new ring nut.

9.



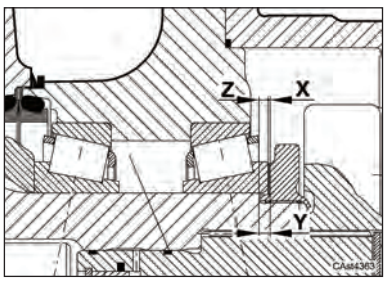
Screw completely the new ring nut without shims and draw a line of reference between the wheel hub carrier and the ring nut.

Unscrew the ring nut.

10.

Check the measure (Z) by means of tool 2897067 and press the bearing under a force of 00000 N.

11.



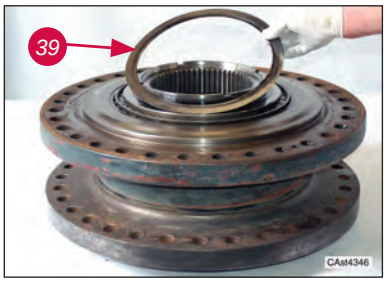
In order to determine the measure of the shim to be fitted under thering nut:

X=Y-Z

Note: if (X) is less than 0.1 mm, shims may brake.

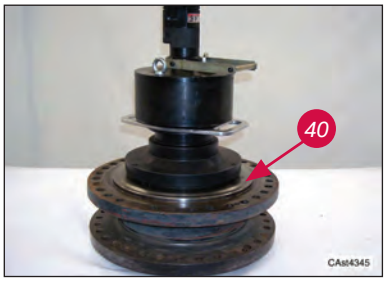
To avoid this possibility, slightly reface the ring nut and repeat the operations.

12.



Assemble shims (39).

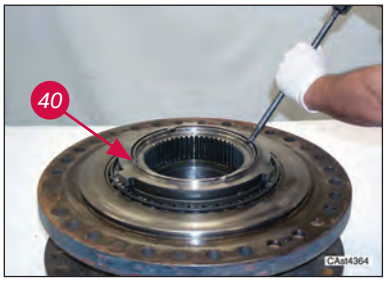
13.



Assemble and fasten ring nut (40) at XX Nm torque wrench.

Use tool 2897085.

14.



Punch for ring nut safety (40).

Idler Unit - Assembly

10. Screw the grease fitting into the back of the hydraulic tensioner and tighten.

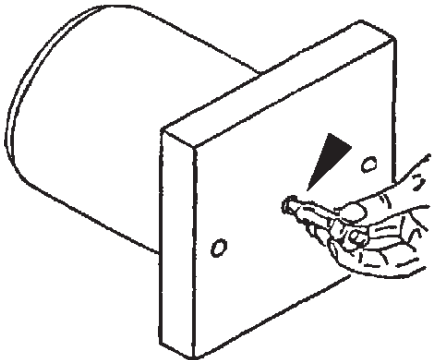


Fig. 3-64 Install Grease Fitting into Hydraulic Tensioner.

11. Position hydraulic tensioner to cross bulkhead from under track frame. Install with two capscrews and spring washers.

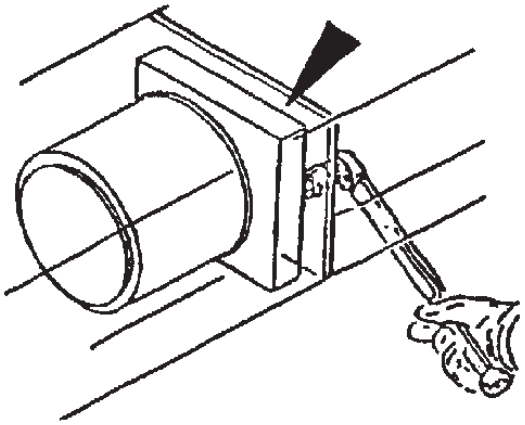


Fig. 3-65 Install Hydraulic Tensioner onto Cross Bulkhead.

12. Clean and grease the inside of the track frame channels where the sliding rails will ride. Using a suitable lifting device, push assembled idler unit into track frame. Push unit in until the nitrogen tensioner contacts the hydraulic tensioner.

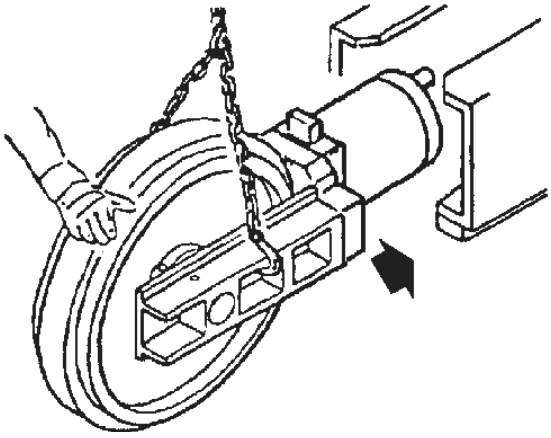


Fig. 3-66 Install Assembled Idler Unit into Track Frame.

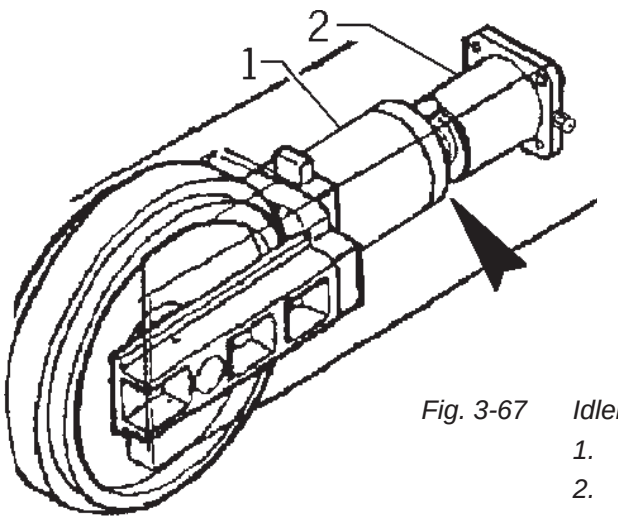


Fig. 3-67 Idler Unit Installed All The Way.
1. Hydraulic Tensioner
2. Nitrogen Tensioner

Hydraulic Crane (Auxiliary Crane)

The auxiliary crane is used to lift drilling tools and equipment on and off the drill deck. The crane operates via its own dedicated hydraulic circuit. Hydraulic pump supplying oil to the crane functions is driven by an electric motor.

Fig 3-90. Auxiliary Crane

CAUTION: Only trained and accredited personnel to operate the crane in accordance with site, and statutory regulations.

WARNING: The crane should never be used for lifting of equipment outside specifications indicated on the control panel.
Approved and inspected lifting shackles and cables must only be used.

Load Lift Capacities

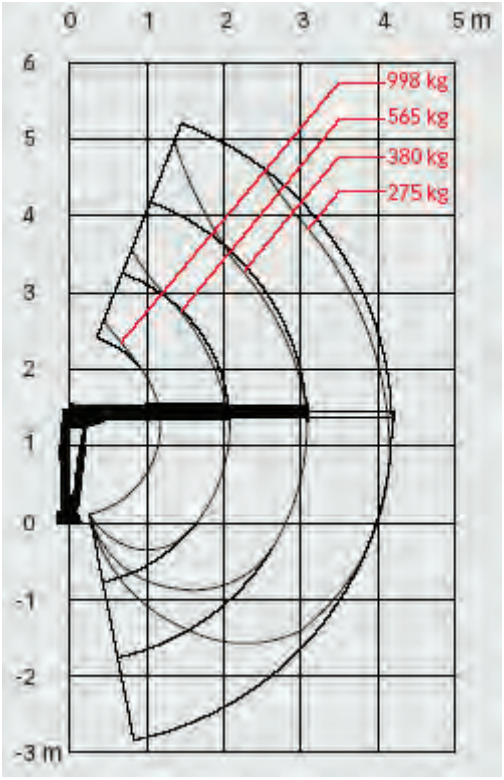


Fig 3-91. Auxiliary Crane Lift Capacities

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.

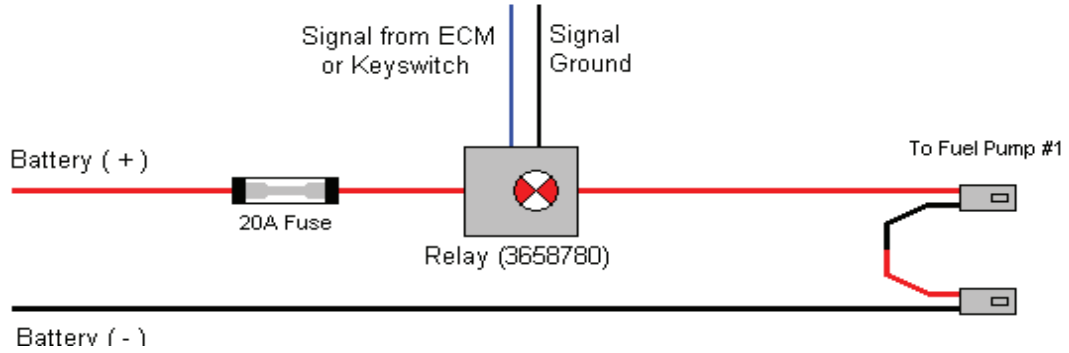


Figure 6: EFS Power Relay Circuit

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.

3” Input Shaft Assembly

The following instructions are for the 3” input shaft. Refer to fig. 4-21a.

Disassembly

1. Remove retaining ring (5) and spacer (3) from input shaft (6).
2. Press input shaft out of flange (2) using an arbor press or remove with a gear puller.
3. Remove and discard oil seal (4).
4. Remove retaining ring (9), then remove bearing (7).

Assembly

1. Install bearing (7) into flange bore, then install retaining ring (9). Be sure bearing is seated all the way in the bore and retaining ring is fully seated into groove.
2. Install oil seal (4) with the lip facing out as shown in fig. 4-21a. Coat seal lip with oil before installing input shaft.
3. Coat input shaft shoulder with oil where it will contact the oil seal, then press the input shaft into place using an arbor press. Be sure shaft is seated against the bearing.
4. Install spacer (3) and retaining ring (5). Be sure retaining ring is seated into the groove all the way.
5. Lubricate and install new O-ring (10) onto flange (2). Install input shaft assembly to pump drive housing. Use four new capscrews (8) and install with Loctite 262. Torque bolts to standard torque values.

Installation of Pump Drive Gearbox:

1. Refer to “Removal and Replacement” procedures as outlined previously.

Lubrication:

1. After installing pumps, fill gearbox with proper lubricant (see below). Oil level should be to bottom edge of oil level check plug (fig. 4-21b). DO NOT OVERFILL, this will result in overheating and possible malfunction of the unit.
2. If operating oil temperature is above 180° F (82° C) a synthetic oil is recommended.

   Use any oil which meets EP gear lubricant specification MIL-L-2105C or API-GL-5 of SAE J3083C.

Lubricant Grades:

Below -10° F (-23° C) ambient use 75W.

Above -10° F (-23° C) and up to 100° F (37.8° C) ambient use 80W-90 or EP90.

Above 100° F (37.8° C) ambient use 85W-140.

Optional: Mobil SHC 635 synthetic or equivalent (all temperature ranges).

Safety

General

Sullair Corporation designs and manufactures all of it products so they can be operated safely. However, the responsibility for safe operation rests with those who use and maintain these products. The following safety precautions are offered as a guide which, if conscientiously followed, will minimise the possibility of accidents throughout the useful life of this equipment.

The air compressor should be operated only by those who have been trained and delegated to do so, and who have read and understood this Operator's Manual. Failure to follow the instruction, procedures and safety precautions in this manual can result in accidents and injuries.

NEVER start the air compressor unless it is safe to do so. DO NOT attempt to operate the air compressor the air compressor with a known unsafe condition. Tag the air compressor and render it inoperative by disconnecting the battery so others who may not know of the unsafe condition will not attempt to operate it until the condition is corrected.

Use and operate the air compressor only in full compliance with all pertinent OSHA requirements and /or all pertinent Federal, State and Local codes or requirements.

DO NOT modify the compressor except with written factory approval.

Each day walk around the air compressor and inspect for leaks, loose or missing parts, damaged parts or parts out of adjustment. Perform all recommended daily maintenance.

Inspect for torn, frayed, blistered or otherwise deteriorated and degraded hoses. Replace as required.

NOTE: Estimated hose life based on a 5 day 8 hour work week is 3 years. These conditions exist on an 8 hour shift only. Any other operation of the equipment other than 8 hour shifts would shorten the hose life based on hours of operation.

Pressure Release

A. Flow-limiting valves are listed by pipe size and rated CFM. Select appropriate valve accordingly.

B. DO NOT use tools that are rated blow the maximum rating of this compressor. Select tools, air hoses, pipes, valves, filters and other fittings accordingly. DO NOT exceed manufacturer's rated safe operating pressures for these items.

C. Secure all hose connections by wire, chain or other suitable retaining device to prevent tools or hose ends from being accidentally disconnected and expelled.

D. Open fluid filler cap only when compressor is not running and is not pressurised. Shut down the compressor and bleed the sump (receiver) to zero internal pressure before removing the cap.

E. Vent all internal pressure prior to opening any line, fitting, hose, valve, drain plug, connection or other component, such as filters and line oilers

F. Keep personnel out of line with any away from the discharge opening of hosed, tools or other points of compressed air discharge.

F. DO NOT use air at pressures higher than 30 psig (2.1 bar) for cleaning purposes, and then only with effective chip guarding and personal protective equipment

G. DO NOT engage in horseplay with air hoses as death or serious injury may result.

H. If a manual blowdown valve is provided on the receiver, open the valve to insure all internal pressure has been vented prior to servicing any pressurised component of the compressor air/fluid system.

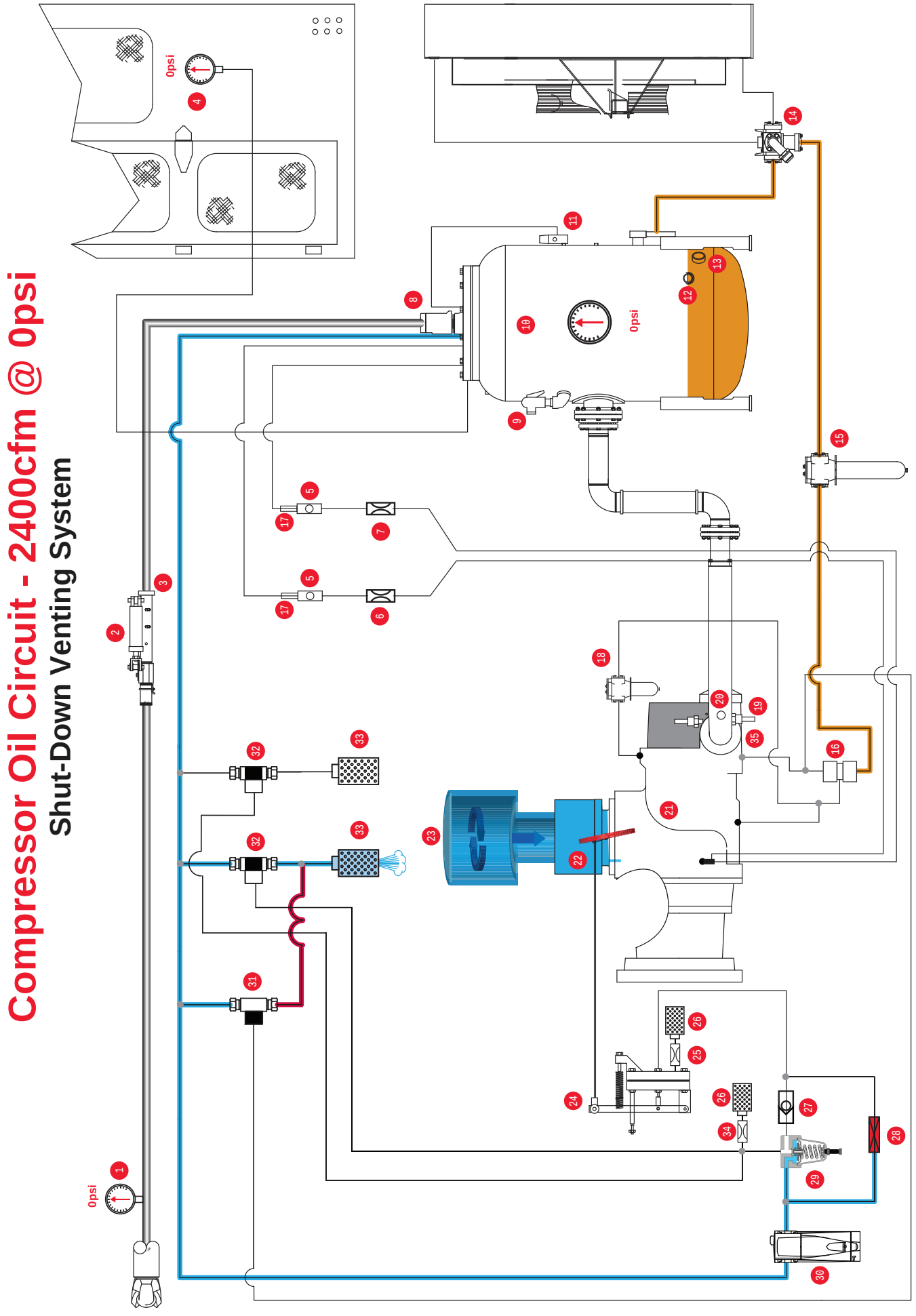

Compressor Oil Circuit - 2400cfm @ 0psi
Shut-Down Venting System
0psi
0psi
0psi
1
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Fig 4-30

Operation

General

While Sullair has built into this compressor a comprehensive array of controls and indicators to assure you that it is operating properly, you will want to recognise and interpret the reading which will call for service or indicate the beginning of a malfunction. Before starting your Sullair compressor, read this section thoroughly and familiarise yourself with the controls and indicators - their purpose, location and use.

Purpose Of Controls

Control Or Indicator	Purpose
Air Receiver/Sump Pressure Gauge.	Continually monitors the pressure inside the receiver sump at various load and unloaded conditions.
Compressor Discharge Temperature Gauge.	Monitors the temperature of the air/fluid mixture leaving the compressor unit. The normal reading should be approximately 180°F to 210°F (82°C to 99°C).
Fluid Level Gauge.	Monitors the fluid level in the receiver/sump. The sight glass is located on the side of the receiver/sump tank. The proper fluid level is halfway of the sight glass. DO NOT OVERFILL. Check the level when the compressor is shutdown.
Compressor High Discharge	Opens, the electrical circuit to shutdown the engine when the discharge temperature exceeds normal operating range. This will flag an alarm and shutdown the machine via the Vigilante system.
Discharge Check Valve.	Cuts off the reverse flow of air/fluid mixture through the compressor discharge system at compressor shutdown.
Fluid Stop Valve.	Cuts off flow of fluid to the compressor unit at compressor shutdown, and allows flow of fluid to the compressor unit on start-up.
Minimum Pressure Valve. 60psi	Maintains required minimum pressure in the receiver/sump tank. This valve restricts the air discharge from the receiver/sump when pressure falls below the minimum operating pressure. However, full flow is allowed at normal operating pressures.
Pressure Relief Valve (Receiver Sump).	Opens receiver/sump pressure to the atmosphere should pressure inside the receiver/sump tank exceed system rating (located on wet side of receiver/sump tank) 150psi (10.34bar).

Compressor discharge Temperature gauge, switch and sender

There is a temperature sender (refer Fig 4-36a) located at the compressor discharge which monitors the temperature of the air /oil mix leaving the compressor. The sender is connected to a gauge located in the operators cab. There is also a transducer fitted to the discharge which supplies the PLC and displays a readout on the Vigilante gauge screen 2.

The temperature discharge switch is N/C and is connected to the PLC, the switch will open at 240ºF and shut the machine down.

Fig 4-36. Compressor Temp Gauge.

1. *Comp Temperature Gauge Cab*
2. *Temp sender for the Cab Gauge*
3. *Temp Transducer (PLC)*
4. *Discharge Temp Shutdown Switch 240ºF-115ºC*

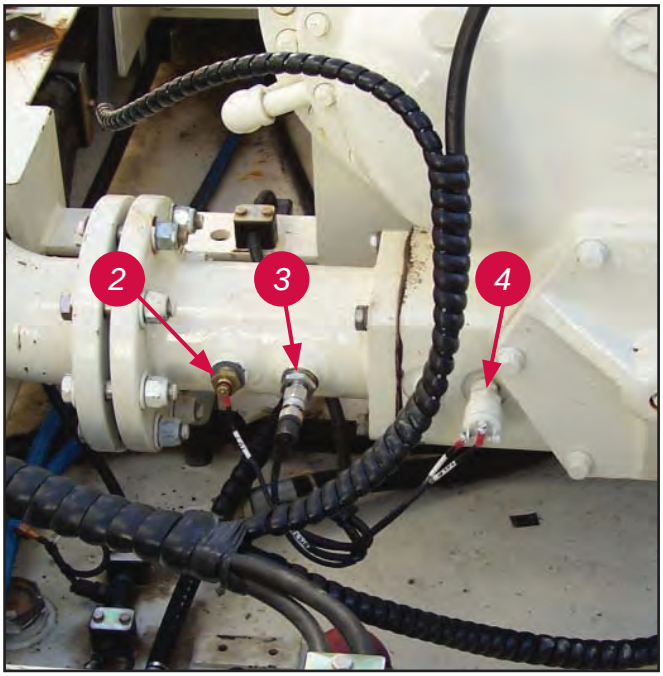


Fig 4-36a. Compressor Temp Switch, Sender and Transducer

Sullicon Control

The Sullicon control consists of a spring, a diaphragm and control arm and is connected to the butterfly inlet valve by a control rod. The spring holds the inlet open until the system pressure regulator setting is reached (100 psi). Air pressure from the regulator then acts on the diaphragm in the sullicon control, which then pushes on the control arm and the control rod closes the inlet valve. The spring should be adjusted to hold the control arm against the open position stop with no extra tension. Air exhausting from the back of the sullicon control would indicate that the diaphragm in the sullicon control requires replacing. The diaphragm can easily be replaced by removing the bolts around the perimeter of the Sullicon control housing.

Butterfly Inlet Valve

The Butterfly Inlet valve is used to load and unload the compressor by opening and closing on demand, A hole in the valve ensures that the Inlet is never completely closed. This would cause “rotor rattle” and serious damage to the compressor.

Adjusting stops on the Sulicon control limit the Inlet valve open and closed positions. The closed position should allow the Inlet valve to draw just enough air to continuously vent through the Running Blowdown valves when the system pressure regulator setting is reached (100 psi). If the Inlet valve is not adjusted correctly in the closed position, the receiver pressure will continue to rise after the system pressure regulator setting is reached, as the greater volume of air cannot vent through the Running blowdown valves.

For the initial set-up of Sulicon and Inlet butterfly, start by removing the control rod assembly from the Butterfly lever, move the Butterfly to the fully closed position (CW) loosen the clamping capscrew, then adjust the lever on the Butterfly to the vertical position and tighten the clamping capscrew.

Remove the spring from the Sulicon control lever and wind the max stop (mounted in the body) all the way in, push on the control lever until the diaphragm is fully depressed, adjust the max stop out until it touches the control lever, then adjust a further full turn out and lock up.

Fit the minimum stop (mounted in bracket) so the control lever will strike the hexagon head of the minimum stop screw and fit the lock nut to the outside of the bracket. Wind the minimum stop screw all the way away from the control lever, then wind back towards the control lever 3 full turns.

Fit the control rod (wound all the way in) with the butterfly in the closed position, adjust the control rod out until the control arm hits the minimum stop screw, then adjust a further 1/2 turn, this will usually stop the butterfly jamming in the housing.

Refit the spring and adjust it so that the control lever is held on the max stop with minimal force.

Some minor adjustments may need to be made to the stops once the machine is up and running, depending in individual conditions.

The max stop is usually set to allow the inlet to open to the full travel of the Sulicon control, but can be used to reduce the capacity of the compressor by restricting the inlet.

The spindle has grease nipples on each side of the butterfly and must be greased each service.

NOTE: One pump of grease is usually enough as any excess grease enters the system and contaminates the compressor.

Auxiliary Regulator Maintenance

Body Area Maintenance Procedures - Type 627

These procedures are for gaining access to the disk assembly, seat ring, diaphragm casing O-ring and stem assembly. All pressure must be released from the diaphragm casing before the performing these steps. While using the following procedures, refer to figure 4-48c for key number locations.

Replacing the Disk Assembly or Seat Ring

1. To inspect and replace the disk assembly (key 9) or seat ring (key 2), remove the cap screws (key 3, figure 4-48b), and separate the diaphragm casing (key 5) from the body (key 1).
2. Inspect and, if necessary, remove the seat ring (key 2). If removed, coat the threads of the replacement seat ring with lubricant (key 38) and torque to 25 foot-pounds (34 N.m).
3. Inspect the disk assembly and, if necessary, remove the hair pin clip (key 13) that holds the disk assembly (key 9) in place. If replacing the disk assembly is the only maintenance required, skip to step 4.

Replacing the Stem Assembly

If it is necessary to perform maintenance on the stem assembly, continue with steps 4.

4. Remove the boost body (key 6), stabilizer (key 7), and stem guide (key 8) from the diaphragm casing (key 5). Unhook and remove the stem (key 10) from the diaphragm casing (key 5).
5. Remove and inspect the diaphragm casing O-ring (key 4, figure 4-48b) and replace it if necessary.
6. Apply lubricant (key 42) to a replacement diaphragm casing O-ring (key 4, figure 4-48b) and install it onto the boost body (key 6).
7. Be sure to insert the pitot tube (tab) into the outlet side of the body (figure 4-48b).
8. Insert parts into the diaphragm casing (key 5) that were removed in steps 5 and 6 (figure 4-48b).
9. Install the the disk assembly (key 9), line up the hole in the disk assembly and stem (key 10) and insert the hair pin clip (key 13).
10. Position the diaphragm casing plus attached parts in relation to the body (key 1) so that they are correct for the application.
11. Secure the diaphragm casing to the body with the cap screws (key 3, figure 4-48b). For an aluminum diaphragm casing (key 5), torque the cap screws (key 3) to 16 foot-pounds (22 N.m). For ductile iron or steel diaphragm casings, torque the cap screws (key 3) to 25 foot-pounds (34 N.m).
12. It may be necessary to reposition the diaphragm spring case to prevent rain, ice, and foreign debris from entering the spring case. Refer to the diaphragm and spring case area maintenance procedures.

SEPTEMBER 1997

CONTENTS

MESABI® Aluminum Tube Air to Oil

Quick and Simple Service

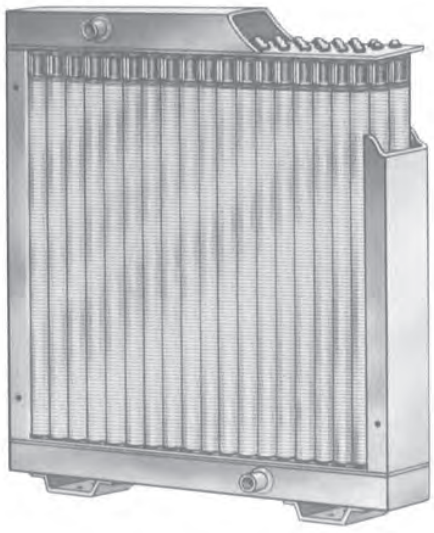
Whether down due to physical damage or for maintenance, MESABI® Aluminum Tube Air to Oil Coolers can be quickly and simply returned to service.

MESABI Oil Coolers use the replaceable tube concept and are similar in design to MESABI core engine radiators. They differ in that cooling tubes are lightweight aluminum with integral circular finning rolled from the tube wall.

Turbulators are placed in tubes to increase heat-transfer rate and are removable for cleaning.

Tubes are held in header sheets with MESABI fluorocarbon rubber seals; a retainer clip at top of the tube locks in place.

Removal of tubes for replacement or cleaning is accomplished in much the same manner as with MESABI core engine radiators.



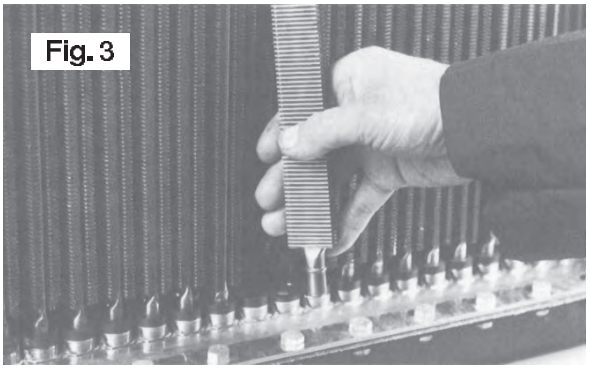
MESABI® Oil Coolers

MESABI® is a registered trademark of L&M Radiator, Inc.

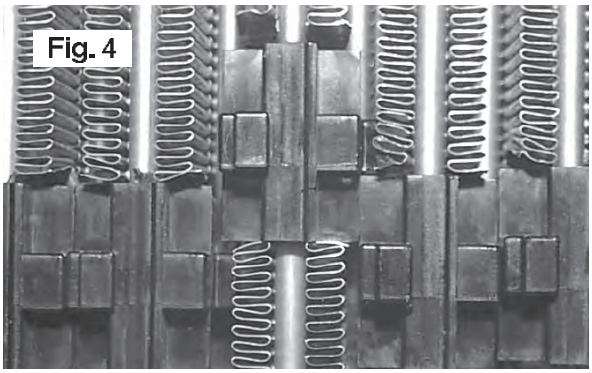
Tube Removal (continued)

STEP 3.
Put down tool and swing tube out just far enough to allow it to be pulled down and out of its top seal, as shown in **Fig. 3**.

Remove all tubes in the row, repeating the above procedure.



If you are working with an ITS core, the tube must be raised high enough so that the interlocking tab clears the adjacent dovetail groove, as shown in **Fig. 4**.



Cleaning Tube Ends

Before the original tubes are reinstalled, the tube ends must be clean of foreign material. L&M recommends polishing the tube ends with a polishing wheel (Grainger #5A725 - use Qty. 5 together) and a copper polishing compound (Grainger #3W769).

If the debris cannot be removed by polishing, L&M recommends using a piece of fine grit emery cloth or steel wool. If there is a lot of debris on the tube ends, use a 6" or 8" diameter wire wheel brush with a wire size of .006 or .008. Larger diameter wire sizes could damage the tube ends. Try installing a tube.

If it does not slide easily into the top and bottom seals, try polishing the tube ends as per above.

Seal Installation

HELPFUL HINTS:

- L&M recommends installing new MESABI seals when tubes are removed.
- After removing the old seals, clean the plate holes of any foreign debris. We recommend a McMaster Carr Chuck Grip with 3/4" brush #63505T65 (L&M P/N 64092).
- Clean out inside of tanks and blow out plate holes with air.
- Install new seals in clean dry holes.
- If the core has a center tank, do not install seals at the bottom of the top core until all the tubes are installed in the bottom core.
- For ease of seal installation soak seals in hot water just prior to installing.

With your thumb start the new MESABI seals into the holes and push them part way in. Care must be taken not to install seals too far into the header plate. A properly installed seal has a crowned or convex top surface, and the tube hole is slightly flared at the opening. A seal that is installed too far into the header has a concave top surface and the tube hole is noticeably smaller in diameter as shown in **Fig. 5**. Over installed seals will make tube installation more difficult and are much more likely to be damaged during tube installation.

The use of a hammer directly on the seal can easily cause seals to be installed too far into the header plate. L&M recommends the use of a flat plate 3/8" x 3"x 6" placed over the seals and hitting with a rubber mallet will allow the seals to be properly installed.

Fig. 5

ON THE LEFT:
Properly installed 35780 seal.

RIGHT:
35780 seal installed too far into header.

CORRECT INCORRECT

Lubricating Seals and Tube Ends

For ease of tube installation and to minimize the chance of scuffing or tearing rubber seals during tube installation, both top and bottom seals and both tube ends must be thoroughly lubricated, using L&M Radiator pre-mixed Lube/Release Agent, P/N 64217. The Lube/Release Agent should be brushed into each seal hole, using a 1/2" diameter brush, L&M P/N 63451.

For lubricating the tube ends, L&M recommends using a spray bottle to spray the Lube/Release Agent on both tube ends.

The water injection pump delivers water to the water injection solenoid which is switched on by the operator. The PLC will not switch the solenoid on until the bit air (20psi minimum) is turned on.

Water flow to the drill string is measured via a Flow meter which is situated in the transducer cabinet. Water flow can be monitored on the Vigilante Gauge Screen 1, and is measured in litres/min.

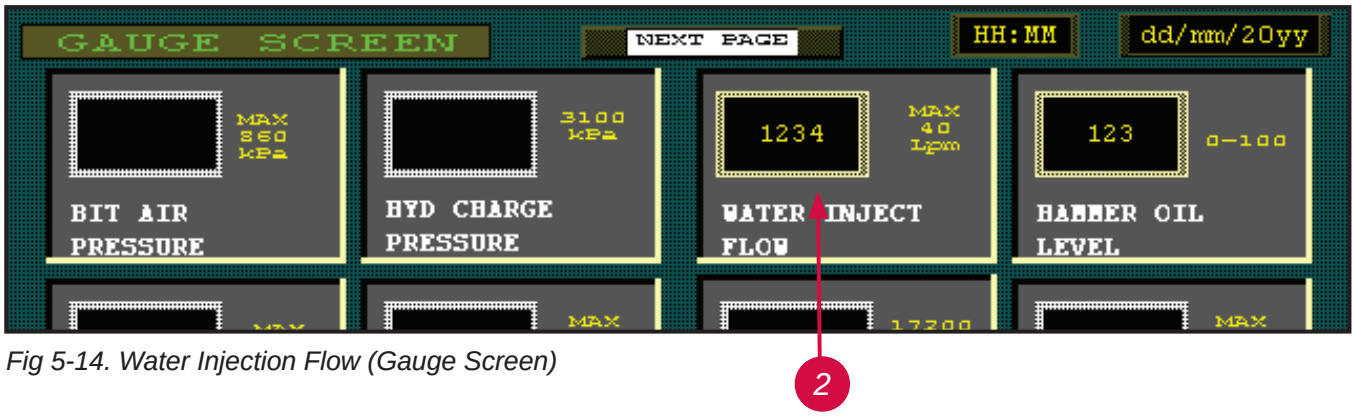


Fig 5-14. Water Injection Flow (Gauge Screen)

Fig 5-15. Water Injection Flow (Drill Mode Screen)

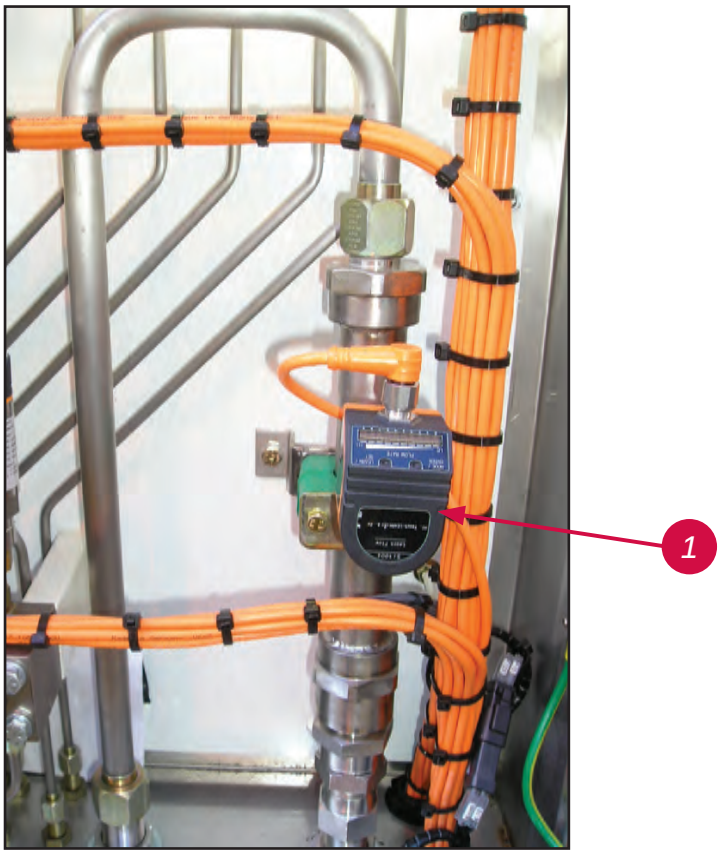


Fig 5-16. Water Injection Flow (Transducer Cabinet)

1. *Flow Meter*
2. *Water Injection flow rate shown on Gauge Screen 1 and also displayed on the Drill screen*

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).

CAUTION: Pulldown cables must be inspected every 250hrs. Report any damage or excessive wear. Pulldown cables are to be replaced if there are Ten (10) broken strands of wire within any One metre (1m) section of the cables.

WARNING: DO NOT climb on mast, serious injury or death can occur.

Hoist / Pulldown Cable Adjustment

The following procedure is used to adjust the tension in the hoist/pulldown cable system. Frequency of adjustment varies according to drilling methods and operational requirements. Proper and equal cable tension is required to prevent misalignment of the rotary head, as well as, limiting any undesired stress forces in the mast assembly.

Step 1: Ensure rig is jacked correctly and level

Step 2: Stow all drill pipes in the pipe rack and lower the rotary head to engage with bit sub then feed up slightly without disengaging the deck wrench to ensure the feed cable slack is in the lower cables. Lower the mast to the horizontal position. Check the lay/hang of the bottom ropes, if the bottom ropes do not hang exactly the same, adjust the most loose rope to match the tighter rope using the two pulldown adjusters (Fig 6-7 & 6-8).

CAUTION: Ensure that the drill bit is clear of the rear deck if the pipe in hole lockout has to be activated to lower the mast.

Step 3: Once the bottom ropes are hanging exactly the same apply minimal feed pressure (aprox 500-600psi) to bring the cable slack onto the hoist cables, then activate the Auto feed to maintain the determined pressure. Check the hang of the top ropes and adjust both ropes to exactly the same hang, using the hoist cable adjusting nuts (Fig 6-11).

Fig. 6-11 Mast Crown

29. Hoist Adjusting Nuts (4)

30. Flat Washers (2)

Rotary Drive Gearbox - Repair

(Refer to Figures 6-16 and 6-17.)

1. Repair of the gearbox is limited to the replacement of damaged or worn parts.
2. Inspect gear teeth for galling or heat discoloration and replace as necessary.
3. Inspect gear teeth for uneven wear patterns.
4. Inspect bearings and replace as necessary.
5. Replace seals and gaskets.

NOTE: Main shaft bearings are preloaded /.002”-.004”. Intermediate shaft bearings have .003”-.005” endfloat.

NOTE: Refer to parts manual for specific gearbox and part numbers.

Main Shaft Bearing Preload

If for any of the following reasons, **(1)** Rotary Head repairs **(2)** Scheduled service maintenance, or **(3)** Movement detected in Bull-shaft, the Pre-load of **0.002” - 0.004”** must be set on the Bull shaft bearings. This requires “Loosening or adjusting” of the pre-load **locknut** which is carried out as follows.

1. With the rotary head installed on the mast, place an 8” x 8” block of hardwood on top of the deck wrench, and lower the main shaft of the rotary head so it is against the block,
2. Apply 1500psi (103 bar) pulldown pressure, this serves to load up the bearings to achieve the desired pre-load.
3. Cover the exposed bearing with a sheet metal disc or cloth to avoid contamination of the rotary gearcase. The **locknut** has four kidney shaped slots machined into the face of the nut, Setscrews pass through these slots and when tightened, “clamp” the nut onto the main shaft. These set screws MUST be loosened off completely, then using a hammer and **steel** dolly firmly strike the outside of the locknut in the four areas that are between the slots (Fig 6-17).This will return the **locknut** to its original shape and allow the nut to turn freely on the thread.

NOTE: If the locknut is not freed up, it may catch on the thread and bind up. A steel dolly MUST be used, copper dollies might chip and put metal into the gearbox and bearings

4. Once the **locknut** has been loosened and can turn freely, tighten the nut by hand until it contacts the upper bearing cone, then turn (tighten) the **locknu**t another 15 degrees. This will place between 0.002” - 0.004” pre-load on the bearings.

5. Apply Loctite, tighten the set screws (50) in the locknut, that pass through the kidney shaped holes. They must be tightened evenly and opposite one another, gradually increasing torque to specifications, which is 100ft.lb. (136 Nm) minimum. DO NOT tighten screws prior to assembling locknut to shaft or before correct pre-load is achieved. The set screws push on the inside diameter of the nut and deform it so that it will lock on to the bull shaft.

6. After correct setting of main shaft bearing preload, install the seal housing (14), always replace oil seals (59), set crush on swivel seals as per instructions, fit hydraulic motors and all connections that were removed.

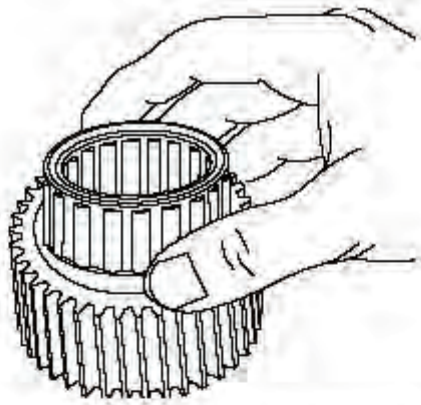
7. Install Loctite 515 (Master Gasket) sealant to all mating faces unless shim or gasket is used.

GENERAL SAFETY RECOMMENDATIONS

Safety for operators and ground personnel is of prime concern. Always take the necessary precautions to ensure safety to others as well as yourself. To ensure safety, the prime mover and winch must be operated with care and concern by the operator for the equipment and a thorough knowledge of the machine's performance capabilities. The following recommendations are offered as a general safety guide. Local rules and regulations will also apply.

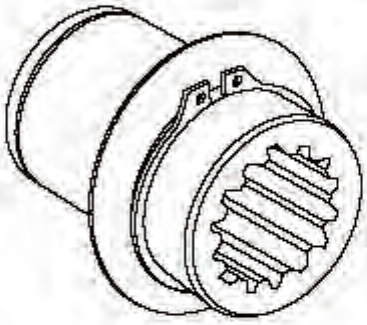
1. Read all warning and caution tag information and become familiar with all controls before operaitng winch.
2. Never attempt to clean, oil or perform any maintenance on a machine with the engine running, unless instructed to do so in this manual.
3. Never operate winch controls unless you are properly positioned at the operators station and you are sure personnel are clear of the work area.
4. Assure that personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
5. Ground personnel should stay in view of the operator and clear of winch drum. Do not allow ground personnel near winch line under tension. A safe distance of at least 1-1/2 times the length of the cable should be maintained. Never allow anyone to stand under a suspended load.
6. On machines having hydraulically, mechanically and/or cable controlled equipment, be certain the equipment is either lowered to the ground or blocked securely before servicing, adjusting and/or repairing the winch. Always apply the prime mover parking brakes and lower equipment before dismounting the prime mover.
7. Inspect rigging, winch and hydraulic hoses at the beginning of each work shift. Defects should be corrected immediately.
8. Keep equipment in good operating condition. Perform scheduled servicing and adjustments listed in the "Preventive Maintenance" section of this manual.
9. An equipment warm-up procedure is recommended for all start-ups and is essential at ambient temperatures below +40°F (4°C). Refer to "Warm-up Procedure" listed in the "Preventive Maintenance" section of this manual.
10. Be sure of equpment stability before operating winch.
11. The winches described herein are neither designed nor intended for use or application to equipment used in the lifting or moving of persons.
12. Do not exceed the maximum pressure or flow stated in the winch specifications.
13. Operate winch line speeds to match job conditions. Avoid sudden "shock" loads or attempting to "jerk" load free. This type of operation may cause heavy loads in excess of rated capacity, which may result in failure of cable and winch.
14. Leather gloves should be used when handling winch cable,
15. Never attempt to handle winch cable when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads and winch drum.
16. When winding winch cable on the winch drum, never attempt to maintain tension by allowing winch cable to slip through hands. Always use "Hand-Over-Hand" technique.
17. Install guarding to prevent personnel from getting any part of body or clothing caught at a point where the cable is wrapped onto the drum or drawn through fairlead guide rollers.
18. Do not weld on any part of the winch.
19. Do not use knots to secure or attach winch cable. Use correct size cable anchor for cable and pocket in winch drum.
20. Use recommended hydraulic oil and gear lubricant.
21. Keep hydraulic system clean and free from contamination at all times.
22. The BRADEN/GEARMATIC wire rope anchors are capable of supporting the rated load when installed properly. For additional safety, ALWAYS maintain a minimum of five (5) wraps of wire rope on the drum.

TROUBLE	PROBABLE CAUSE	REMEDY
F Winch "chatters" while raising rated load.	1. Same as D2. 2. Hydraulic oil flow to motor may be too low. 3. Controls being operated too quickly.	Same as remedies for Trouble D2. Same as remedies for Trouble E2. Conduct operator training as required.
G The wire rope does not spool smoothly on the drum.	1. The winch may be mounted too close to the main sheave, causing the fleet angle to be more than 1-1/2 degrees. 2. The winch may not be mounted perpendicular to an imaginary line between the center of the cable drum and the first sheave. 3. Could possibly be using the wrong lay rope. There is a distinct advantage in applying rope of the proper direction of lay. When the load is slacked off, the several coils on the drum will stay closer together and maintain an even layer. If rope of improper lay is used, the coils will spread apart each time the load is removed. Then, when winding is resumed, the rope has a tendency to criss-cross and overlap on the drum. The result is apt to be a flattened and crushed rope. 4. The winch may have been overloaded, causing permanent set in the wire rope.	Check mounting distance and fleet angle. Reposition winch as required. Refer to "Winch Installation". Consult wire rope manufacturer for recommendation of wire rope that best suits your application. Replace wire rope and conduct operator/rigger training as required.

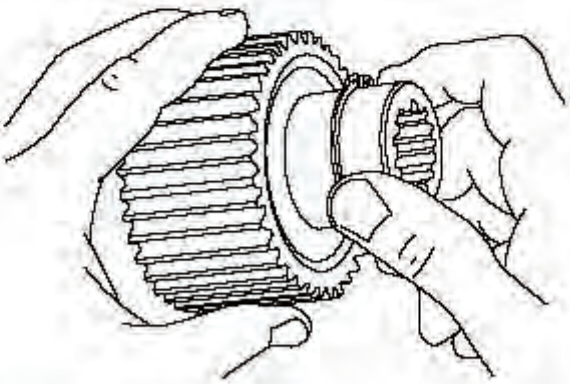


2. Turn the assembly over and install the sprag clutch in the bore of the outer race.

3. Press the remaining bushing into the race. Again, make sure the bushing is against the shoulder.

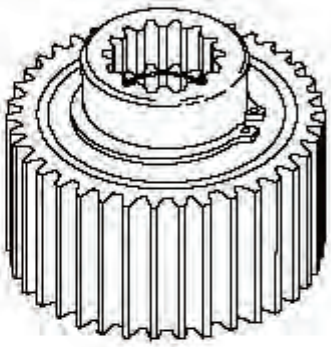


4. Next, install a sprag bushing retainer, then a snap ring on the inner race. Be sure the snap ring is seated in the snap ring groove.

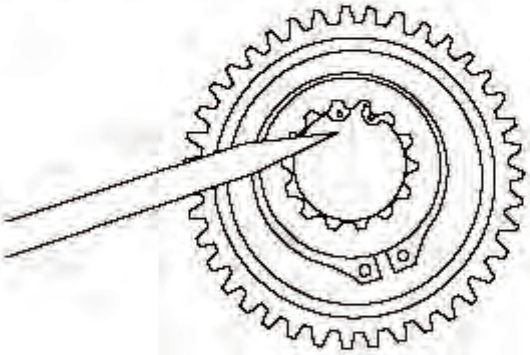


5. Slide the inner race through the bushings and sprag clutch (the race will have to be rotated in the free-wheeling direction to start it through the sprag clutch). If the inner race will not go through the bushings, the bushings have probably been damaged and should be replaced.

6. Turn the assembly over with the snap ring down. Install the second retainer and snap ring. Make certain the snap ring is seated in the groove properly.



7. This is a completed brake clutch assembly.



⚠ WARNING ⚠

Be certain the snap ring is seated in the groove in the splined bore of the inner race. This snap ring will keep the brake clutch assembly correctly positioned in the center of the friction brake pack. Binding of the brake or brake failure may occur if this snap ring is omitted.

Breakout System - HOBO

The **HOBO** has three dies which grip the drill pipe. They are secured by means of die holders which have a “female” dovetail shape that the dies then slide down into. The holders are bolted to the **HOBO** with two capscrews that must be checked regularly for tightness, as any movement will damage the cut-outs in the **HOBO** weldment and the die holders will continually come loose. The dies are made from hardened steel and should be a neat tap in fit to the holder. The die holders have a socket headed set screw at the top and bottom of the die which prevents the dies from slipping out. Whe the dies become worn they WILL NOT grip the pipe, so they must be checked regularly.

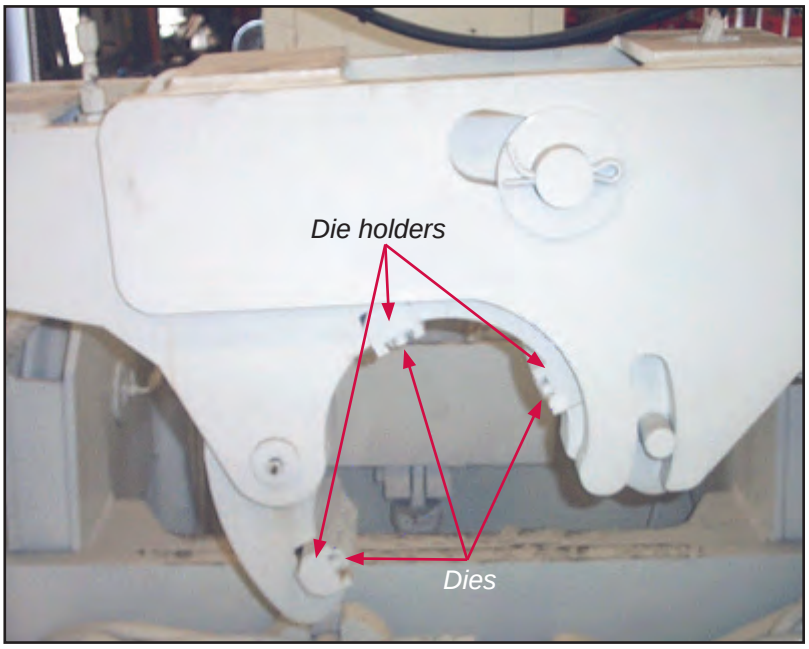


Fig 6-25a. Hobo Dies and Holders

NOTE: If the diameter of the drill string pipe is changed, then the HOBO die holders require changing to a size to match the drill string.

Pipe Safety Arm

The Pipe Safety Arm is to used to prevent a Drill pipe from falling out of the Mast if accidentally unscrewed from the top. It is controlled from the operators cab by the switch that also controls the Winch

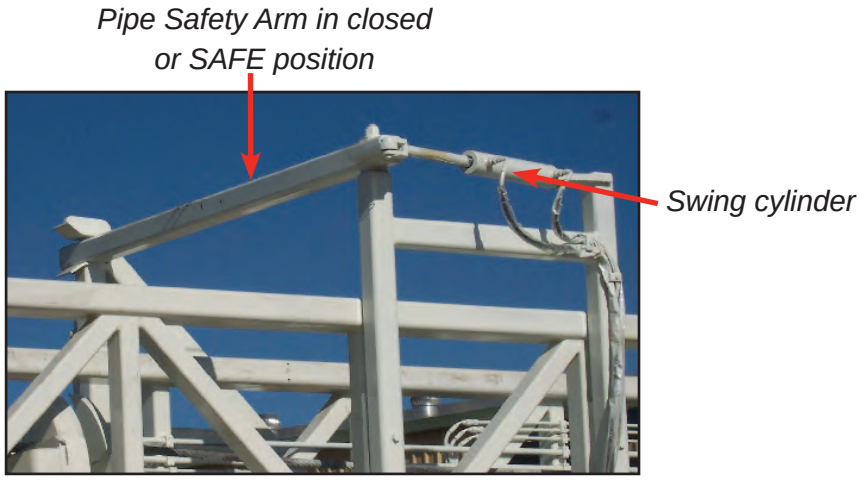


Fig 6-26. Pipe Safety Arm

Pipe Rack Roller - Remove and Replace

1. Lower mast to horizontal position, resting on mast rest.
2. Remove pipe rack roller from lower pipe rack support, by removing the two capscrews that hold the pipe rack roller shaft retainer plate (fig. 6-39). Then remove the retainer plate.
3. Remove grease fitting from end of roller shaft, and use a port-a-power to drive shaft out of lower pipe rack support. Repair or replace roller assembly.
4. Install roller shaft into bore far enough so retainer plate will fit into the slot.
5. Install the two capscrews and lock washers and tighten.
6. Grease bearings through grease fitting at end of shaft. Grease once each shift.

NOTE: To prevent premature failure of the Pipe Rack roller CHECK the torque on the retaining bolts regularly.

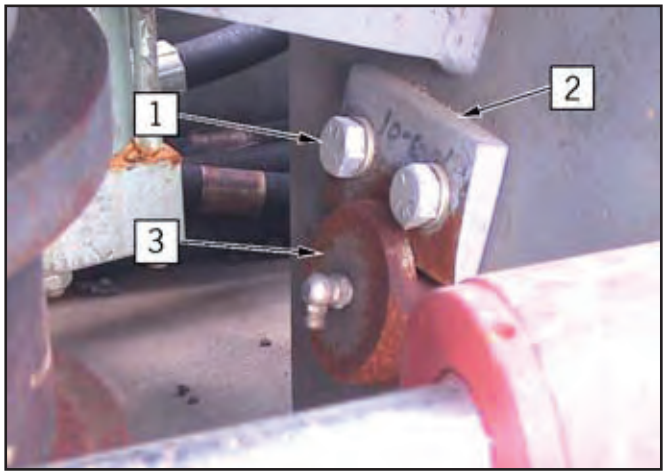


Fig. 6-39 Pipe Rack Roller

1. *Capscrew (2)*
2. *Retainer Plate, Pipe Rack Roller Shaft*
3. *Shaft, Pipe Rack Roller*

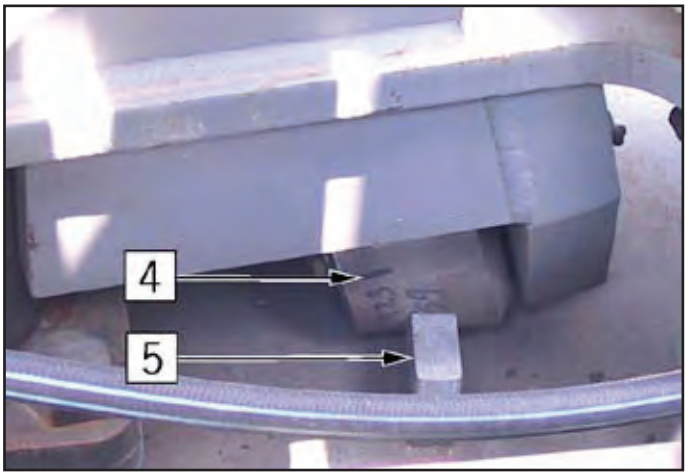


Fig. 6-40 Pipe Rack Roller (viewed from mast pivot end)

4. *Roller, Pipe Rack*
5. *Stop, Roller*

Main Return and Case Drain Filter

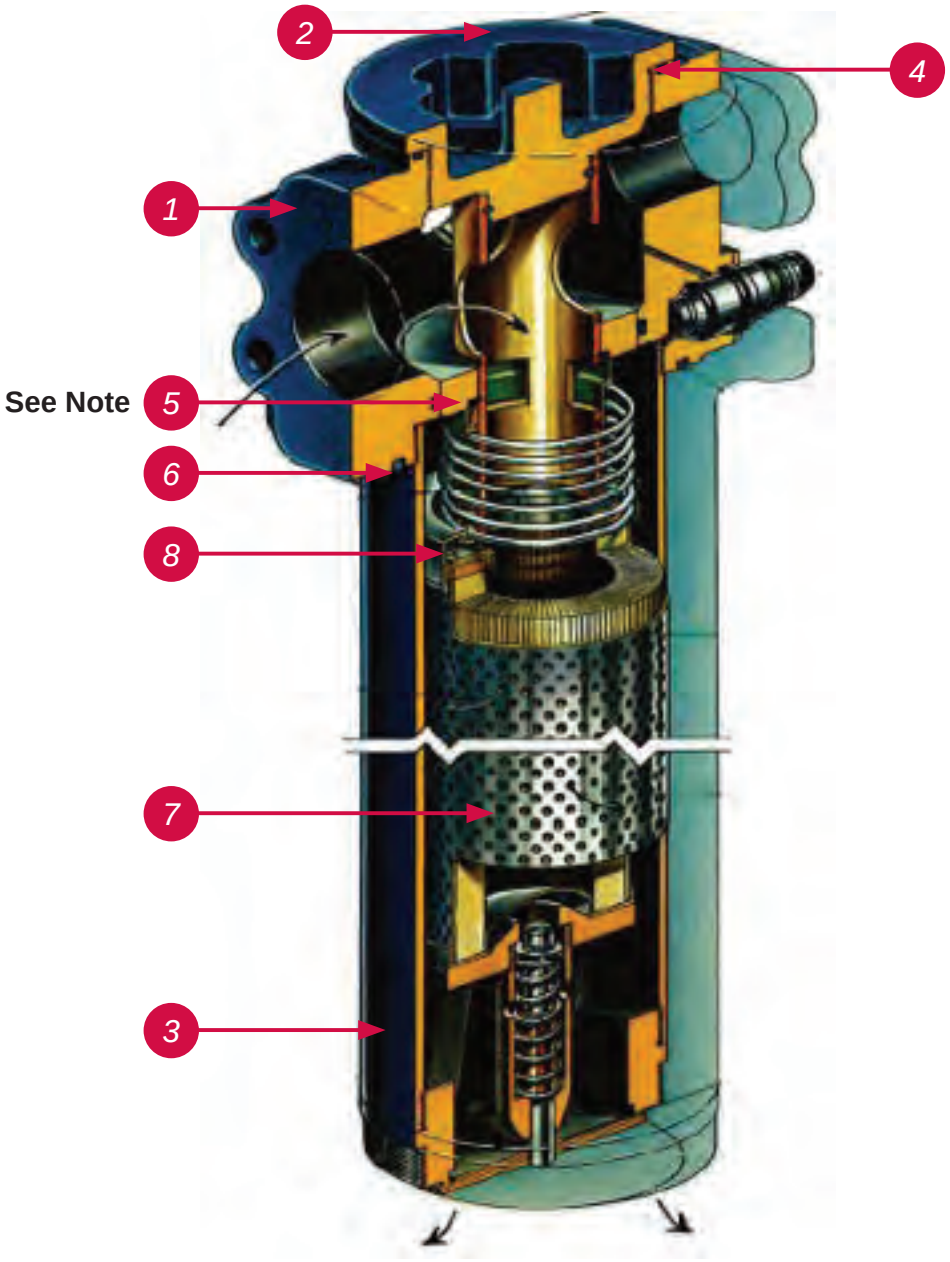


Fig. 7-2 Main Return and Case Drain Filter

1. *Head*
2. *Cover Assembly*
3. *Shell*
4. *Upper Cover O-Ring*
5. *Lower Cover O-Ring*
6. *Head to Reservoir O-Ring*
7. *Filter Element*
8. *Element O-Ring*

NOTE: To prevent premature failure of the hydraulic system always confirm that the lower cover O-ring (Item 5), has not been damaged or dislodged.

Port Locations

Mechanical centering adjustment

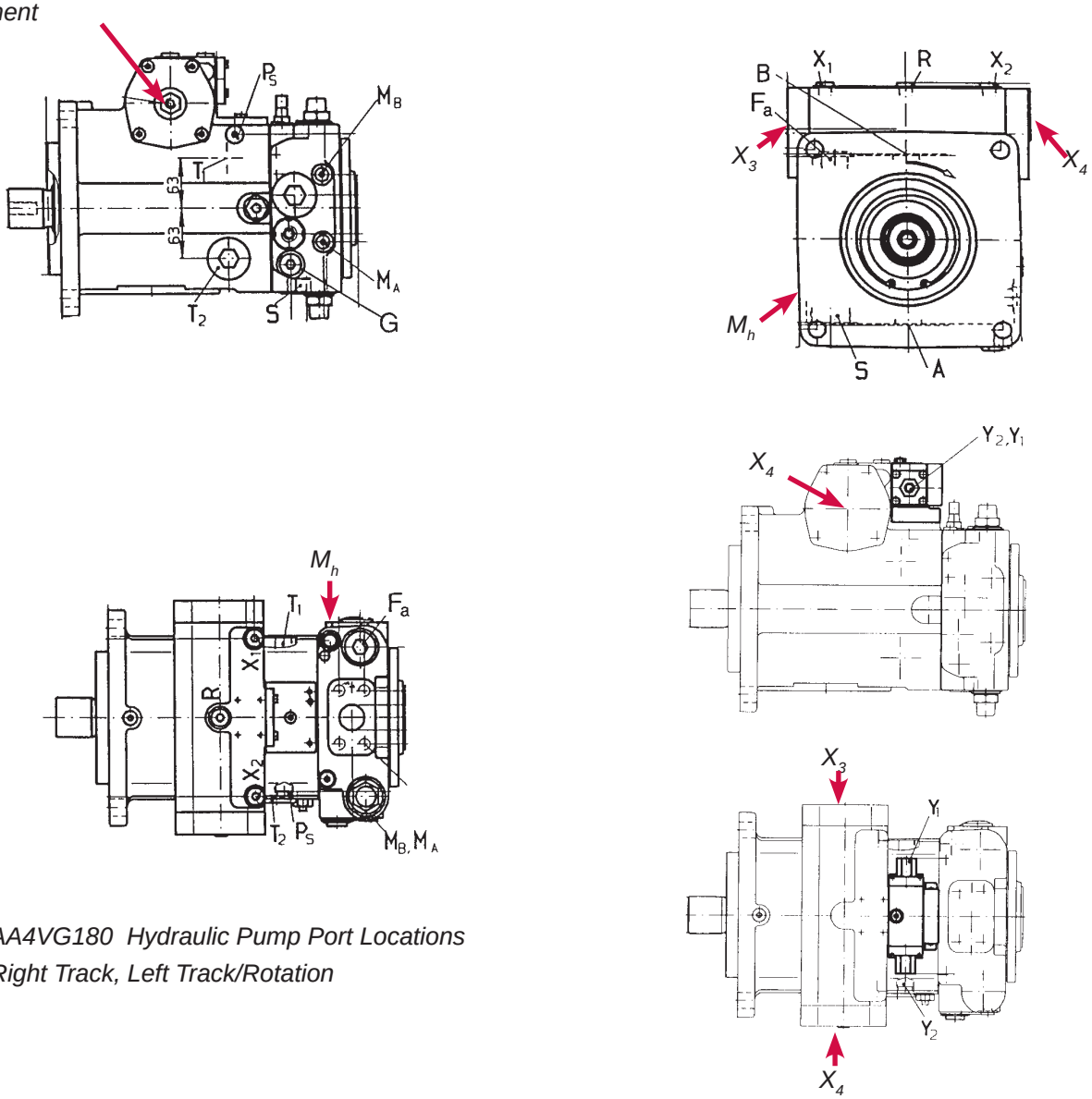


Fig. 7-4e AA4VG180 Hydraulic Pump Port Locations Right Track, Left Track/Rotation

Connections

A, B	High pressure ports	1¼" SAE 420 bar (6000 psi - Code 62)
T_1	Case drain or filling port	1⅝"-12 UN-2B; 20 deep
T_2	Case drain port	1⅝"-12 UN-2B; 20 deep
M_a	Gauge port-sys. pressure A	7/16"-20 UNF-2B; 12 deep
M_b	Gauge port-sys. pressure B	7/16"-20 UNF-2B; 20 deep
M_h	Gauge port-sys. pressure A or B	7/16"-20 UNF-2B; 20 deep
R	Case vent port	9/16"-12 UNF-2B; 20 deep
S	Charge suction port	1⅞"-12 UNF-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	9/16"-12 UNF-2B; 20 deep
G	Charge pressure gauge port	⅞"-12 UNF-2B; 20 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	9/16"-12 UNF-2B; 20 deep
P_S	Control pressure gauge port	9/16"-12 UNF-2B; 20 deep
X_3, X_4	Stroking pressure ports (after orifice)	7/16"-12 UNF-2B; 20 deep

Maintenance

Troubleshooting Procedure

3...Transmission Drives in One Direction Only

3.1	With control lines lines switched does pump drive in opposite direction only?	No Yes	Proceed to step 3.2. Control signal from one side does not work properly. Repair as necessary.
3.2	With control lines still switched does pump drive in initial direction only?	No Yes	proceed to step 3.3. Problem is one side of control module or the pump. Proceed to step 3.3.
3.3	Is there control pressure or current from both control lines?	No Yes	Correct control signal problem. Proceed to step 3.4.
3.4	Check flushing valve (If Installed). Is shuttle spool stuck in one position?	No Yes	(Not installed) Proceed to step 3.5. Remove flushing valve and clean or replace.
3.5	Switch relief valves. does transmission drive in other direction only?	No Yes	Proceed to step 3.6. Repair or replace relief valve on nondriving side.
3.6	Replace control module and reconnect control lines. Does pump operate properly?	No Yes	Replace or repair pump. Operate transmission.

4...Transmission Drives in the Wrong Direction

4.1	Pump with HD control.		Switch control lines on ports Y_1 and Y_2.
4.2	Pump with EP Control.		Switch electrical connectors on solenoids A & B.
4.3	Pump with HW Control.		Rework linkage or cable to give correct drive direction.

5...Pump Does Not Find or Hold Neutral (Also refer to pages 27 & 28)

5.1	Does pump return to neutral with control lines removed?	No Yes	Proceed to step 5.2. Check control for electrical signal problem (EP control) or back pressure in the pilot lines (HD Control).
5.2	Check mechanical centering of pump and control per pages 27 & 28. Does pump return to neutral with control lines removed?	No Yes	Repair or replace pump. Replace control module if needed. Operate transmission.

6...Transmission Drives at a High Noise Level

6.1	Are the drive gearboxes filled with correct grade of oil?	No Yes	Fill gearbox with correct grade of oil to the prescribed level. Proceed to step 6.2.
6.2	Is the drive coupling correctly installed and aligned?	No Yes	Install coupling per manufacturer's instructions and tolerances. Proceed to step 6.3.
6.3	Is rigid piping connected to the pump and motor?	No Yes	Proceed to step 6.4 Install short length of hose between pressure ports and the system piping.
6.4	Is the suction pressure at the charge pump inlet within recommended limits?	No Yes	Return to step 1.7. Proceed to step. 6.5.
6.5	Is there air in the hydraulic oil? This may be indicated by foaming or milky colored oil.	No Yes	Proceed to step 6.6. Deaerate the oil and inspect system for cause of air induction.
6.6	Is the hydraulic motor operating at excessive speed?	Yes	Check motor sizing in relation to available oil flow from the pump. Check motor minimum displacement. See page 20.

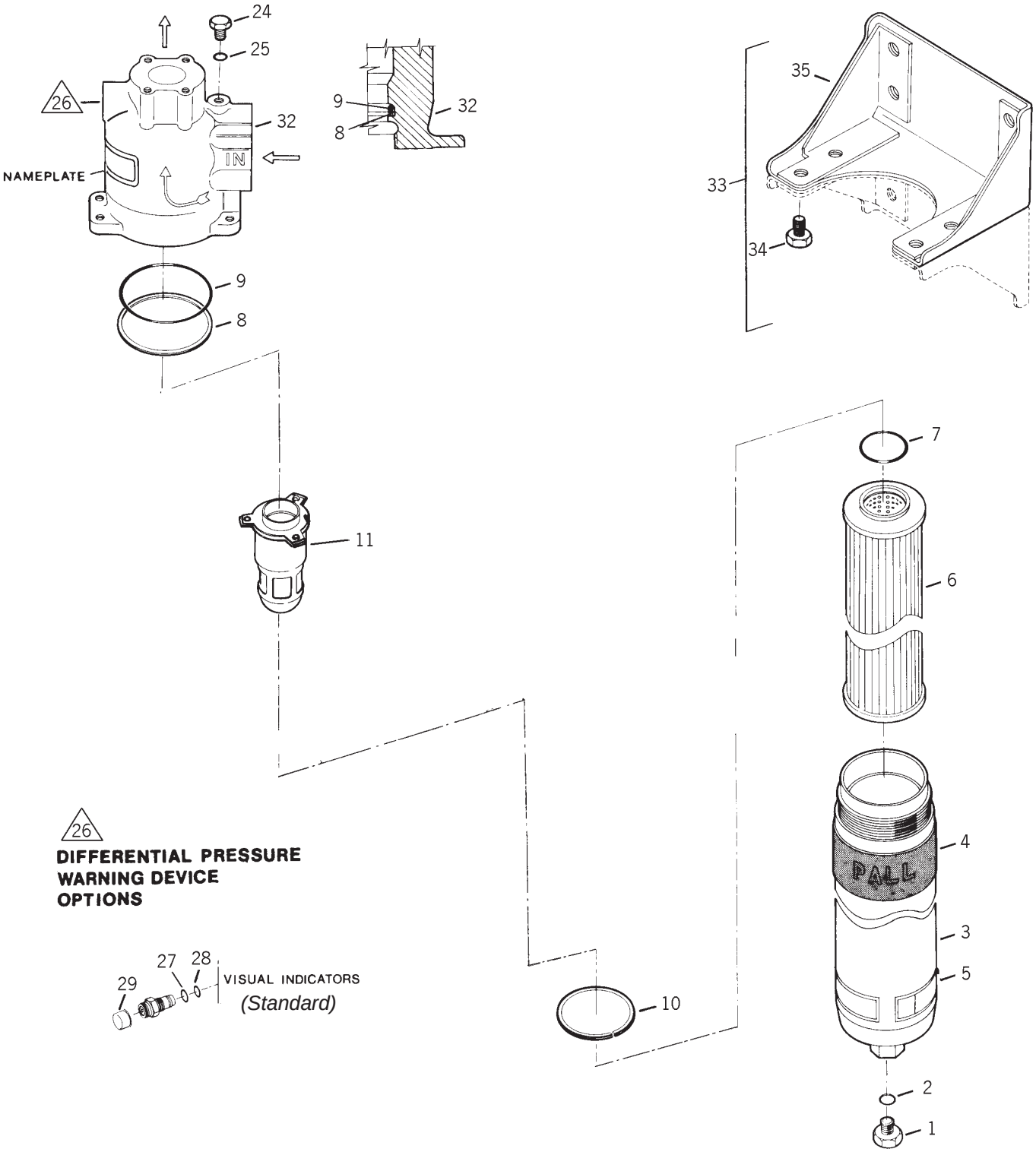


Fig. 7-14 Loop Filter - Exploded View (PIHC-SI-966B)

1. *Bleed Plug*
2. *O-Ring*
3. *Bowl*
4. *Safety Grip*
5. *Label, Element Change*
6. *Filter Element*
7. *O-Ring*
8. *Backup Ring*
9. *O-Ring*
10. *Retaining Ring*
11. *Reverse Flow Valve*
24. *Bleed Plug*
25. *O-Ring*
26. *Differential Pressure Device (Standard)*
27. *O-Ring*
28. *O-Ring*
29. *Dust Cover*
32. *Head*

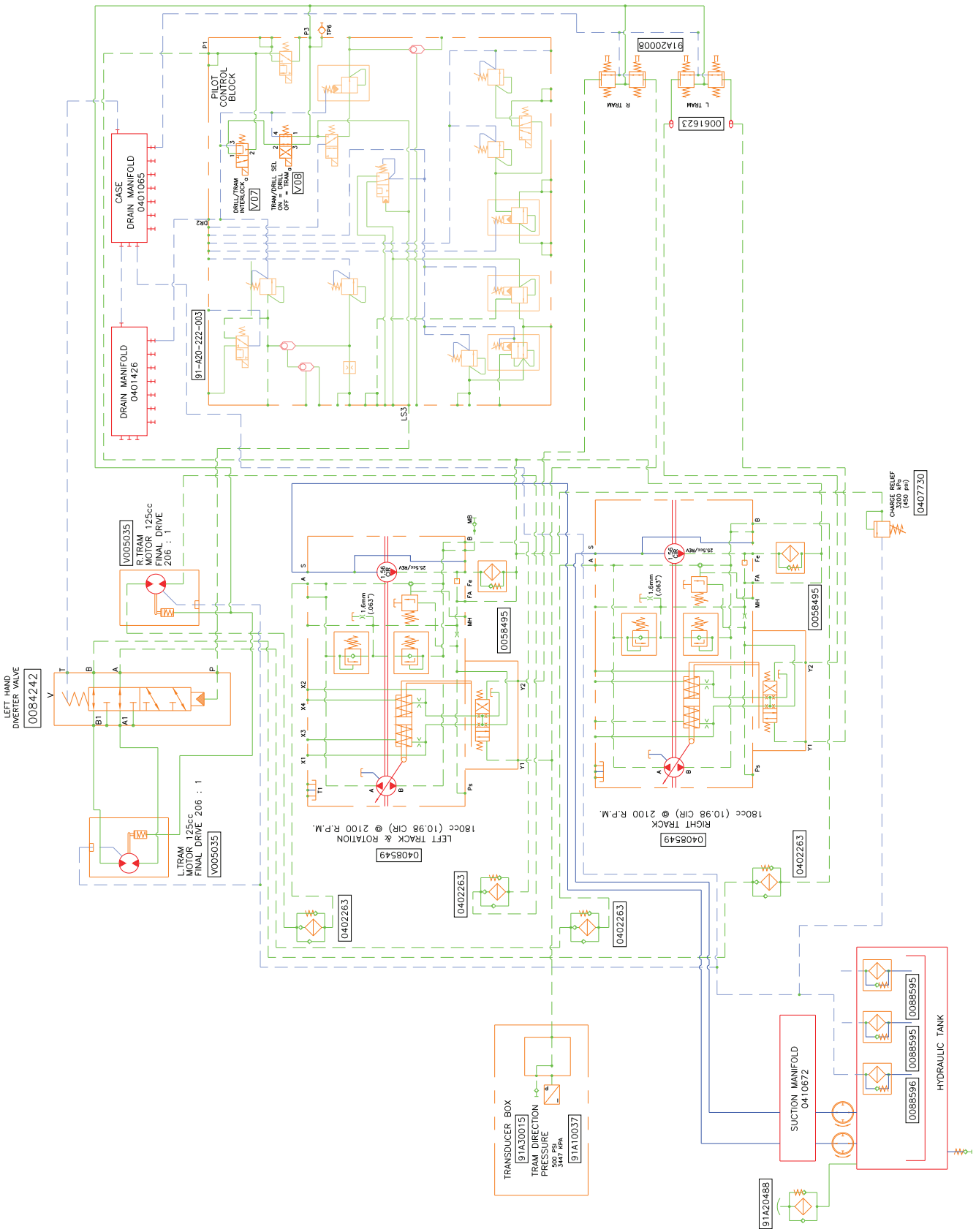


Fig. 7-22. Tram Circuit

MP18 Valve - Jack and Mast Raise Valve

- Parallel and series parallel valve with wide range of section circuitry, including, 3-way, 4-way, float, motor control, 3 and 4 position regenerative, and priority. Available with both flow and pressure control spools.
- May be combined with MP18 series 10 sections.
- Section compensator allows each section to operate at a predetermined flow rate independent of pump discharge flow and pressure.
- Low spool operating forces possible by elimination of series by-pass circuits through the valve. This lends itself to remote operation of valve spools.
- Variety of main spool operators including manual, hydraulic, electro-hydraulic (proportional or on-off control), and mechanical detents. Electro-hydraulic and hydraulic remote also available with manual handle override.
- Section with pressure regulator or remote regulator port allows each section to operate at a predetermined maximum pressure level independent of pump discharge pressure. Dual stage regulator also available.
- Open or closed center operation allows converting open center systems to closed center operation with no major modifications.
- Low neutral pressure drop with open center inlet section, pressure drop remains constant regardless of number of sections. Pump discharge flow is directed back to the reservoir at low pressure through the unloading valve located within inlet section.
- Primary relief in open center unloading inlet section and priority port relief in priority inlet section which provides accurate pressure control over a wide flow range

Series 20

Functional Description

MP18, series 10 mobile stack type valves are load sensing pressure compensated valves. They control the volume, direction of oil flow and maintain a constant flow regardless of changing load pressures.

An advantage of the MP18 is that the starting point for movement of the function always remains the same, i.e., a specified control spool position always has the same metering characteristics. This is accomplished by a compensating spool in each section.

While the main spool is in neutral, the primary shuttle and secondary shuttle are vented to tank. When the main spool is operated, the load pressure is directed via the primary shuttle to the spring end of the pressure compensator spool. The section compensator now moves to the open position. Dependent on the pressure drop between the section compensator and the control spool opening, a specific volume now flows to the function. The load signal also simultaneously communicates to the secondary shuttle and on to the system compensating device. The system compensating device can be either an inlet compensator (open center unloading inlet) in the case of a fixed pump system or a pump compensator control in the case of a variable pump system.

Technical Data

MP18 Specifications

Flow range		GPM (L/min)	35 (133) ***Note…Consult factory for higher flow rates***
Primary operating pressure	Port T	PSI (bar)	290 (20)*
	Port P	PSI (bar)	3625 (250)*
Secondary relief valve setting	Port A, B	PSI (bar)	4200 (290)*
Hydraulic fluid			Petroleum oils (HM, HL, HLP)
Fluid temperature range		° F (° C)	t_{min} = –4° F (–20) t_{max} = 158° F (70)
Viscosity range		SSU (mm ²/s)	35–1760 (10–380) (dependent upon fluid)
Cleanliness level			18/15 according to ISO 4406

*For applications outside these parameters, please consult Rexroth

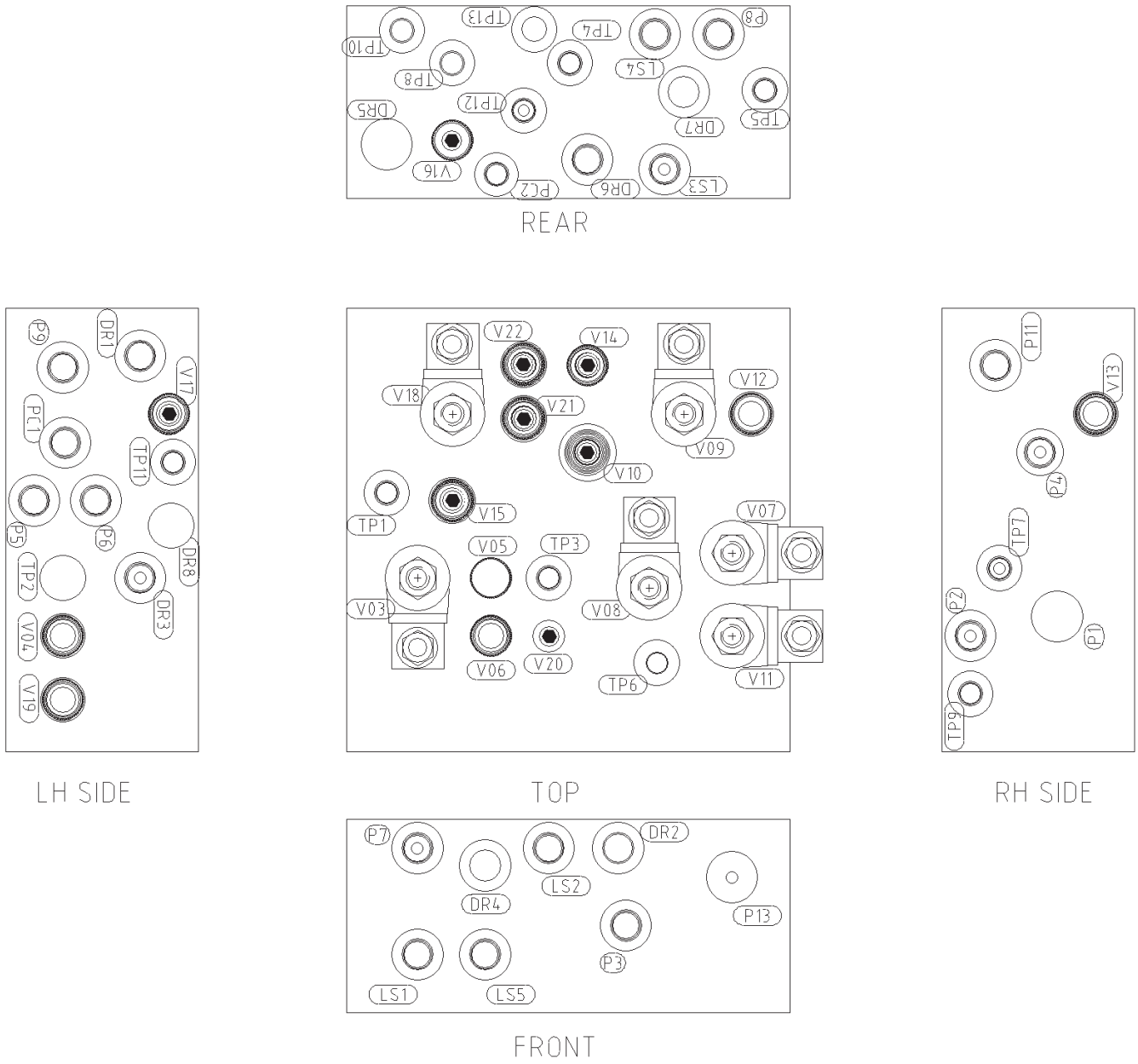
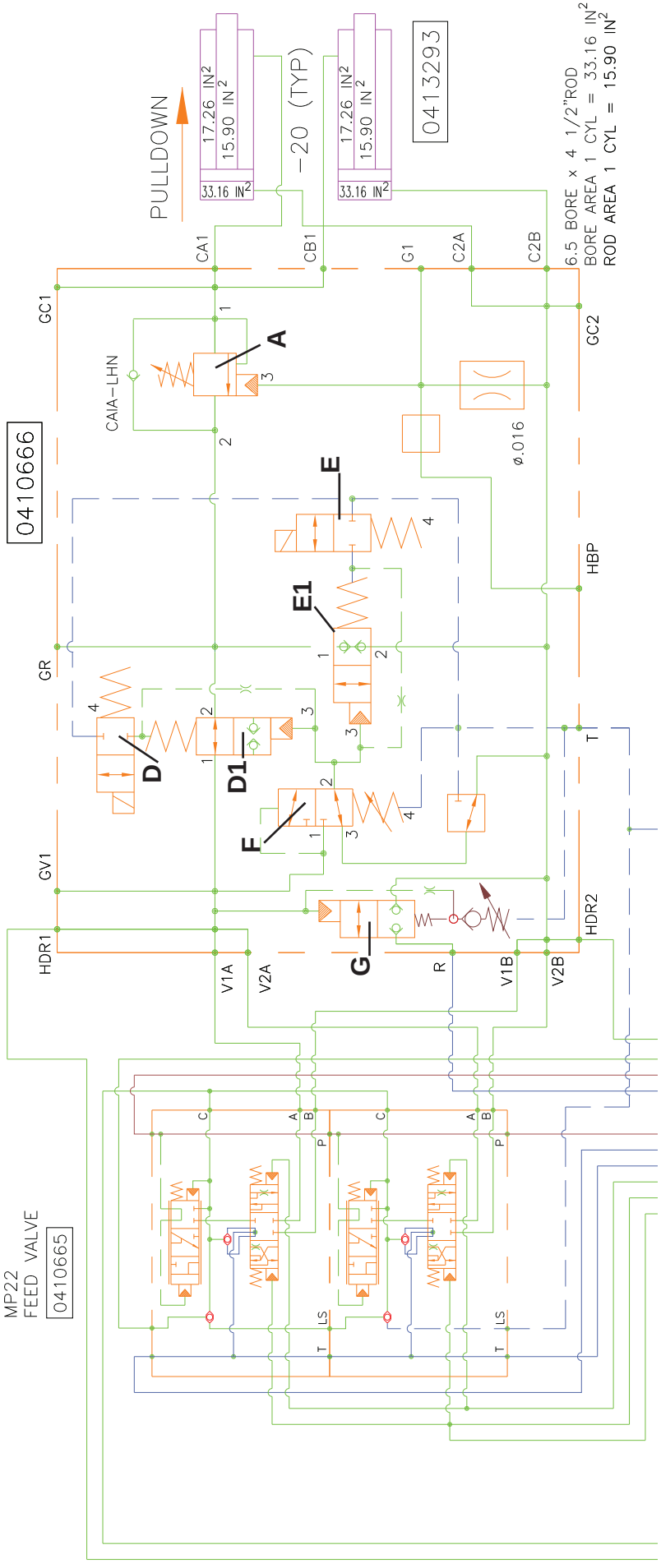


Fig. 7-33 Pilot Control Manifold (ref. 421879)

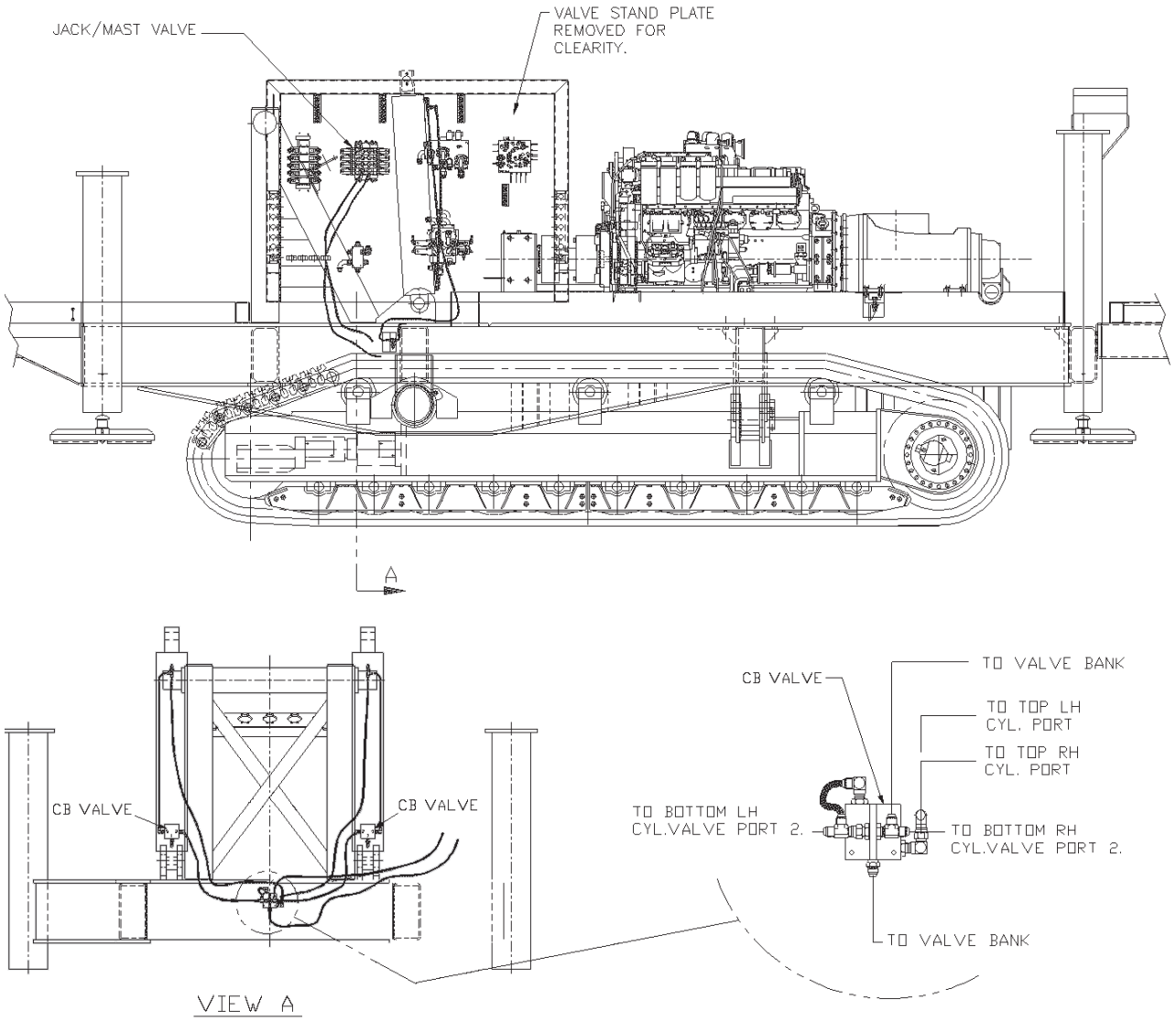
V03 Auxiliary Pump, OFF=LS, ON-HI
V04 Shuttle
V05 Aux. Press. Aux. Pump RV
V06 Jacks/Mast Raise RV
V07 Drill/Tram Interlock
V08 Drill/Tram Select, OFF=DRILL, ON=TRAM
V09 Auto Pulldown Solenoid
V10 Rotary Torque Switch
V11 Set-up Lock
V12 Auto Pulldown PRV
V13 Shuttle
V14 Rotary Torque Safety Relief
V15 Max. Pulldown RV
V16 Pulldown RV
V17 Pulldown Reduction RV
V18 Pulldown Reduction Solenoid
V19 Shuttle
V20 Orifice, 0.8mm
V21 Rotation Control RV
V22 Rotation Control PRV

RV = Relief Valve
PRV = Pressure Reducing Valve



NOTE: Refer to envelope in rear of manual for complete Feed circuit drawing

Fig. 7-34 Hydraulic Feed Circuit



The elevating cylinders have a built in cushioning design for full extension protection. As the cylinder approaches full extension the rod end of the piston which has an extended back end, enters the cylinder gland and blocks off the normal oil porting. Oil then passes through a restricting orifice which slows down the flow leaving the cylinder, thus slowing the travel speed of the cylinder.

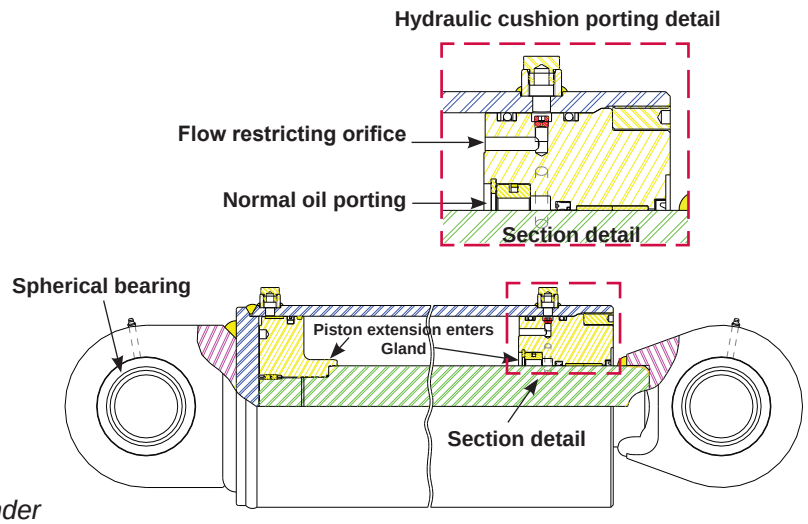


Fig 40a. Mast Elevating Cylinder

Hydraulic Motor

Specifications and Tools

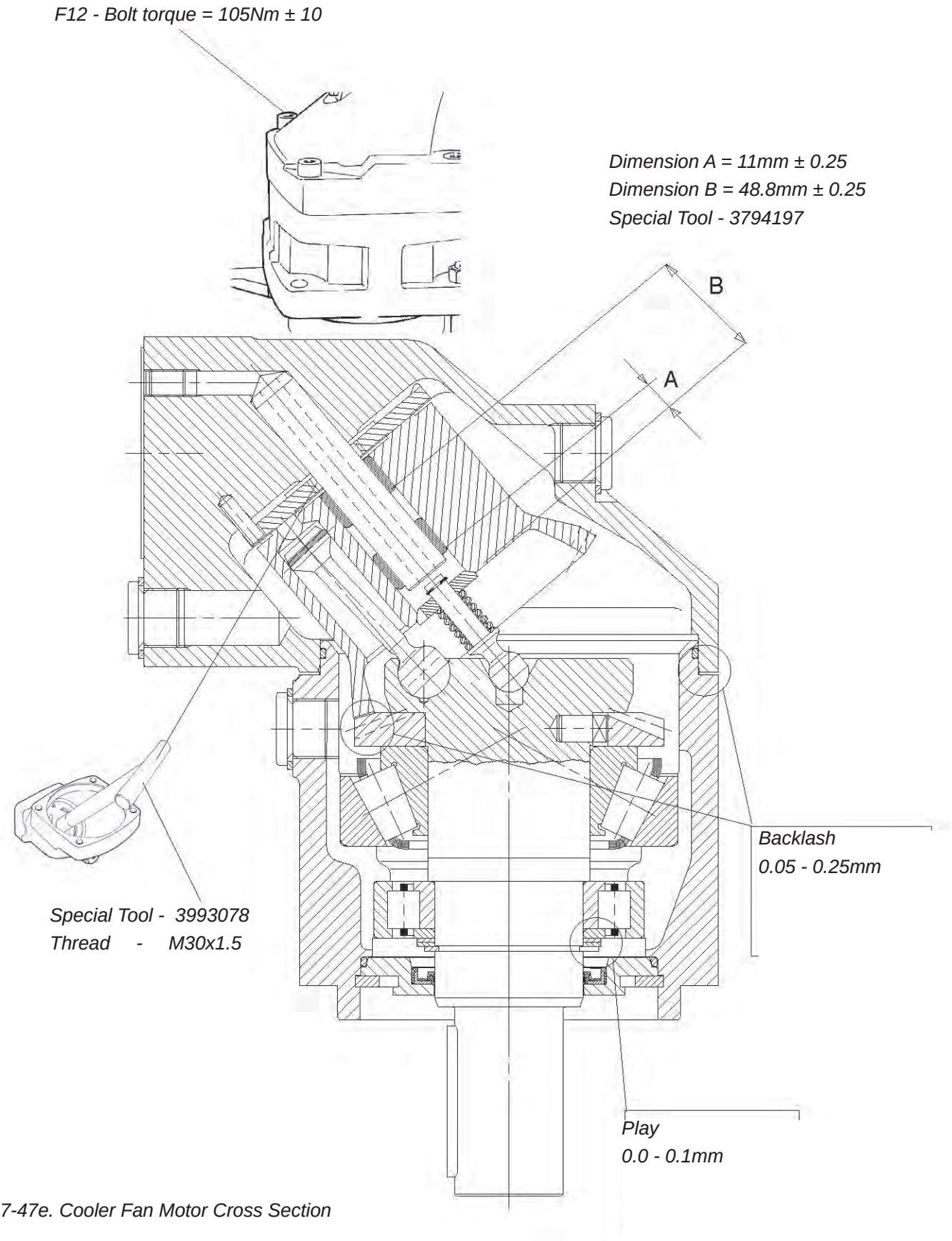


Fig 7-47e. Cooler Fan Motor Cross Section

Water Injection Circuit

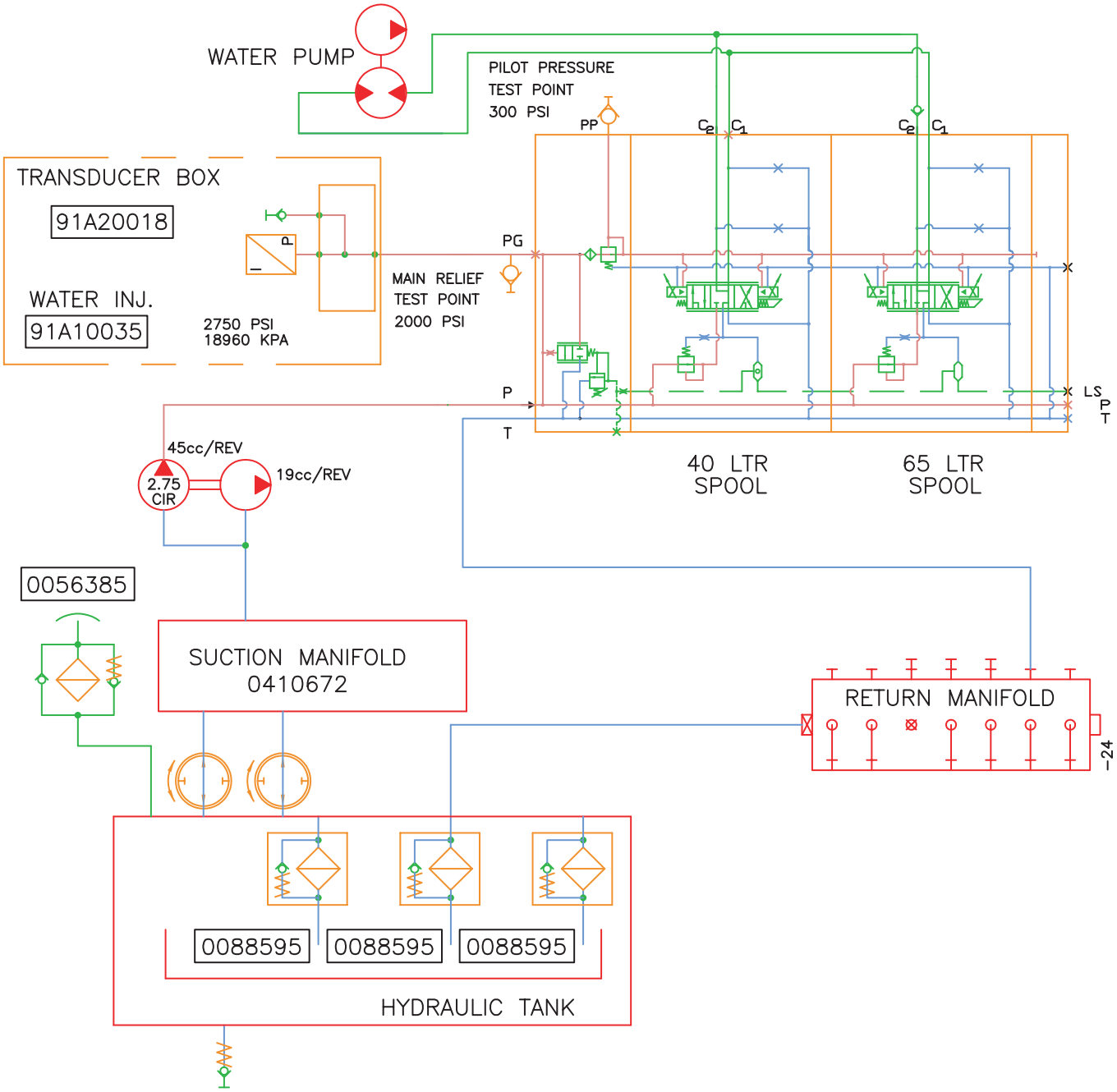


Fig. 7-52 Water Injection Circuit

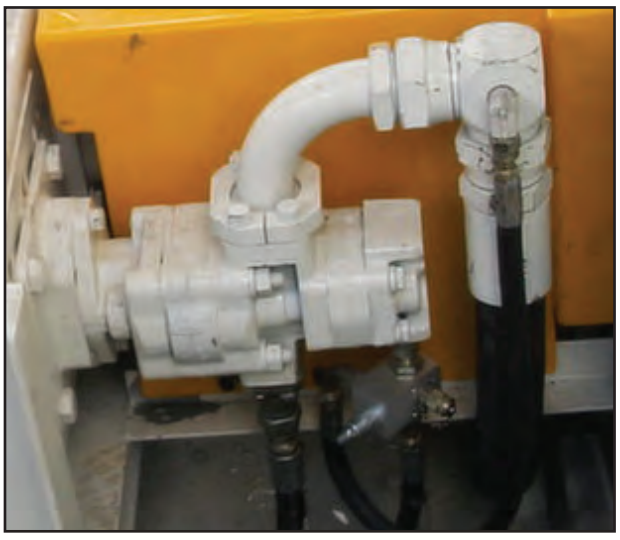
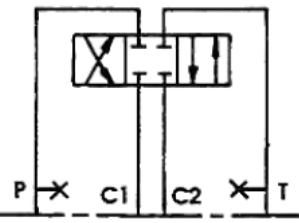


Fig 52a. Water Injection Pump

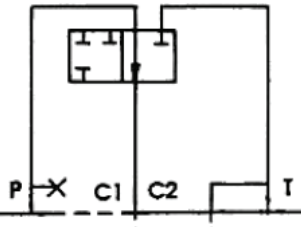
SECTION VALVE SPOOL
CONNECTIONS TO TEST STAND
(SHOWN IN FIGURE 1)

2 POSITION, 4-WAY
P→C1
3 POSITION, 4-WAY
P→C1/P→C2



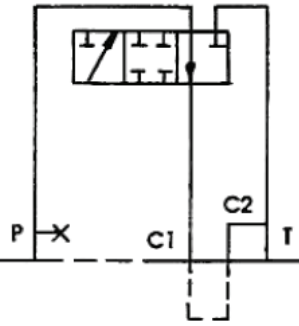
TEST STAND
FROM FIGURE 1

2 POSITION, 2-WAY
P→C1



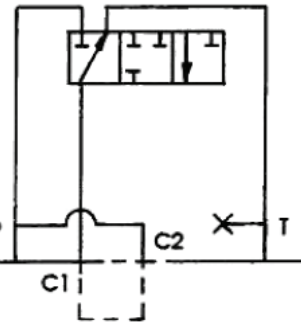
TEST STAND
FROM FIGURE 1

3 POSITION, 3-WAY
P→C1



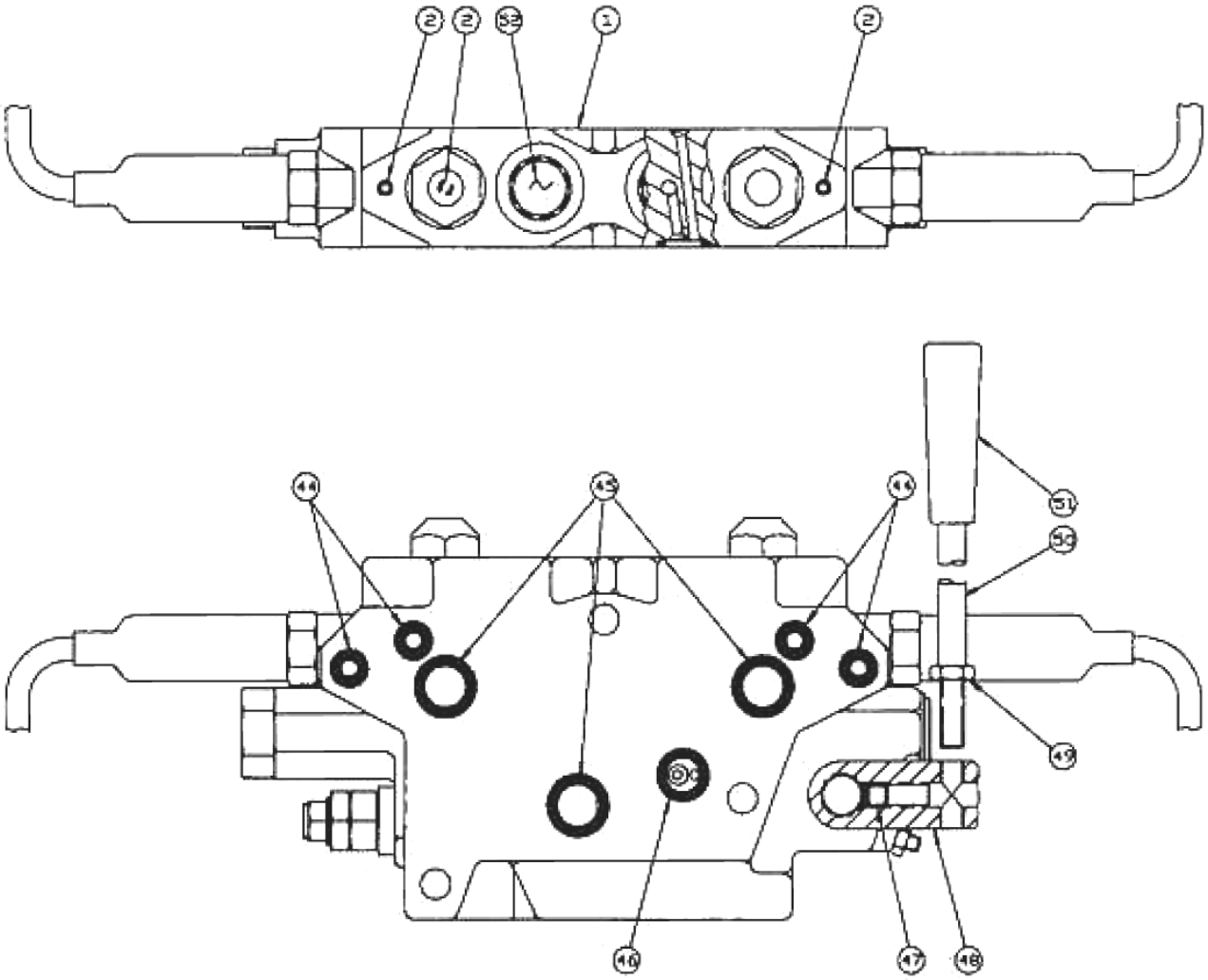
TEST STAND
FROM FIGURE 1

3 POSITION, 3-WAY
C1→T



TEST STAND
FROM FIGURE 1

Water Injection Valve

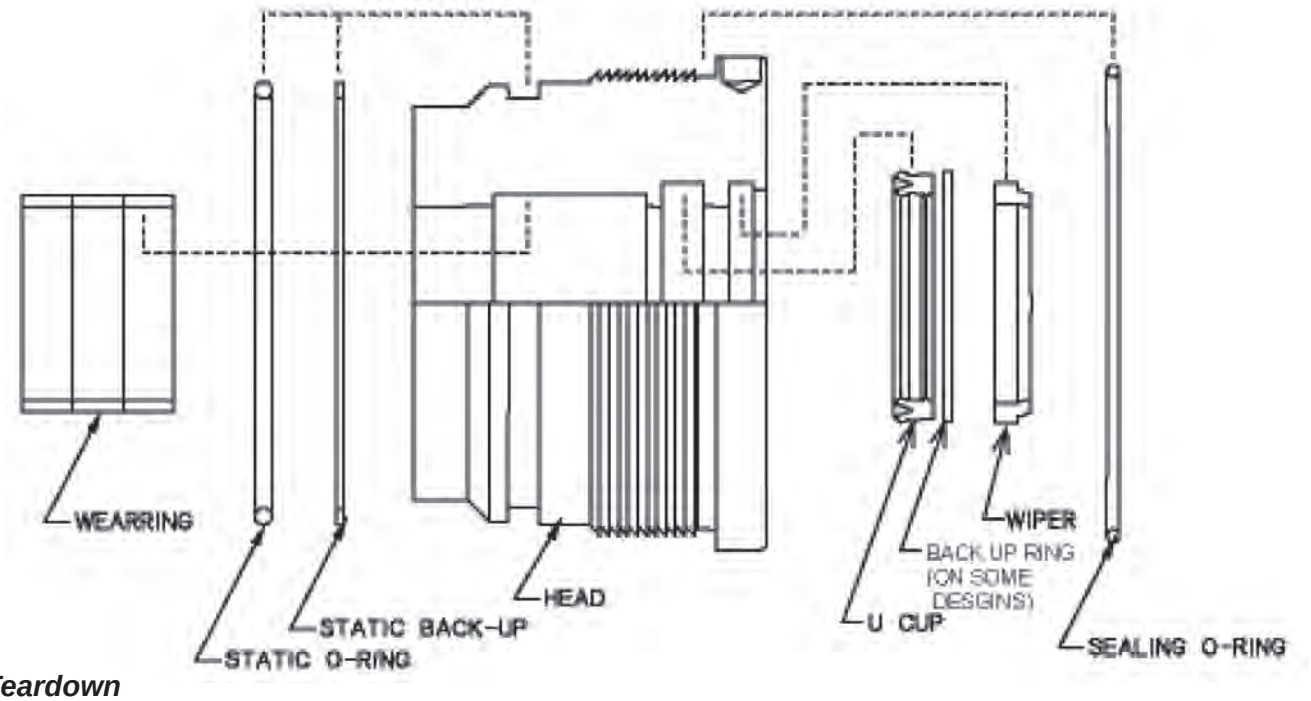


1. *Main Segment Valve Body*
2. *Construction Plug*
6. *Shaft*
7. *Shaft Seal*
8. *Linkage*
9. *Socket Hex Plug*
10. *Hook*
11. *F.L. Set Screw*
12. *Seal Nut*
13. *O'Ring*
17. *Pipe Plug*
20. *Compensator Spool*
21. *Comp Shim (0.025")*
22. *Comp Shim (0.008")*
23. *Comp Shim (0.003")*
24. *Compensator 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 Head

General

The Z series head uses ductile iron material and has a polyurethane u-cup as the primary sealing element. Cylinders rated for pressures above 3500 psi, may have a back up ring behind the u-cup. The wiper is a standard type D polyurethane. The head is retained within the tube by means of its own buttress threads. There is a sealing o-ring that prevents contaminant from reaching the threads and provides an anti-rotation function. 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

Remove the head as follows: Insert a spanner wrench into the holes provided. Turn the head counter clockwise (it is a right hand thread) to remove it. If the head is difficult to remove or moves erratically, tap the tube adjacent to the head with a brass or plastic mallet while turning it.

Rebuild

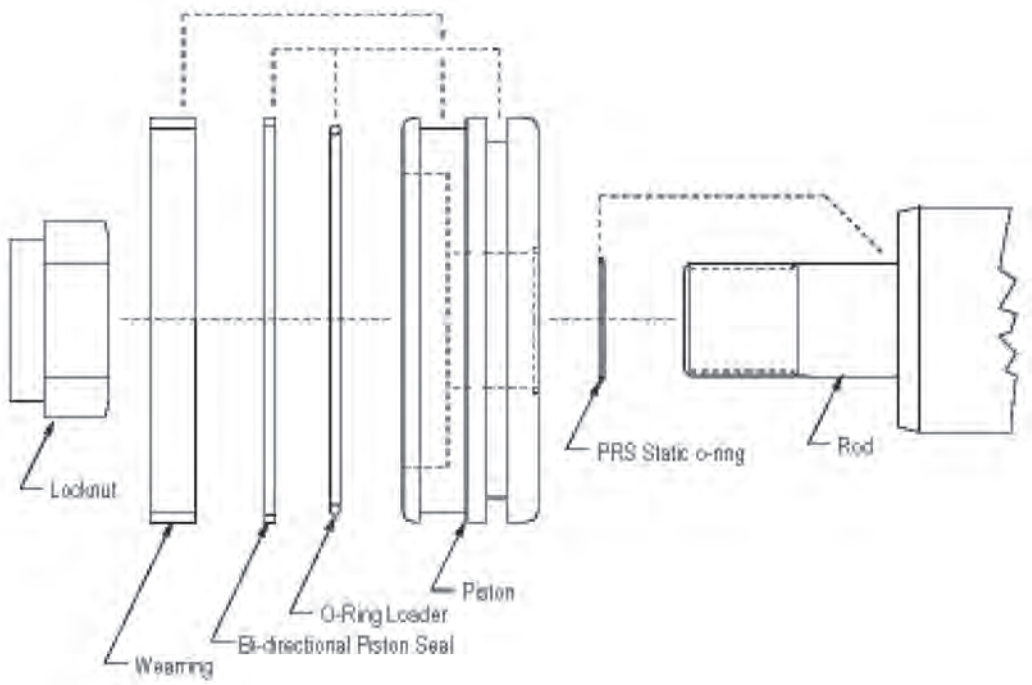
Lubricate the head and all seals with hydraulic fluid prior to installation. Using round nose pliers or special installation tools, twist the dual lip u-cup seal into a “C” shape and allow it to snap into groove. Use a similar technique for installing the wiper. Install the static o-ring and backup into the static seal groove verifying that the backup is closest to the threads. Install the sealing o-ring into the groove between the threads and the flange lip. If possible, the head/seal assembly should sit for at least one hour to allow the seals to elastically restore.

Slide the head into the tube and engage the threads. Turn the head counter clockwise until the first thread just passes the engagement point (the head will move noticeably) then turn the head clockwise until it is hand tight or fully seated. Insert a spanner wrench into the holes provided and tighten 1/8 to 1/4 turn past fully seated.

N Piston

General

The N series piston uses aluminium material and has both an o-ring energised bidirectional seal and a close tolerance wearing. Cylinders designed for use a pressures above 3500 psi may have a back-up ring on one or both sides of the bidirectional seal. See the engineering drawing to determine if your cylinder has this ring and which side of the seal it is located. A small o-ring is used to seal the static side. On some designs it is installed in a groove in the rod, for others, it fits in a groove on the edge of the piston in contact with 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 threaded portion of the rod. Remove the bidirectional piston seal and o-ring loader by means of blunt instruments of bronze or aluminium. Be sure there are no sharp edges on these tools. Be particularly careful of scratching the groove surface finish. Remove the wear ring by spreading the ring into a “C” shape at the split.

Rebuild

Lubricate the piston and all components with hydraulic fluid. Stretch the o-ring loader into the seal groove. Be extremely careful to avoid damaging the seal groove during installation. Scratching the groove may cause bypass leakage. Verify that the rubber o-ring is not pinched or twisted. Start one edge of the bidirectional piston seal into the seal groove. Use your thumb to push the remaining portion of the diameter over the edge of the piston and into the groove. Be very careful not to cut the OD of this seal. Spread the wear ring into a “C” shape only enough to fit over the outside of the piston and snap it onto its groove.

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 connection to the Electronic Control Module (ECM) on the engine before welding.

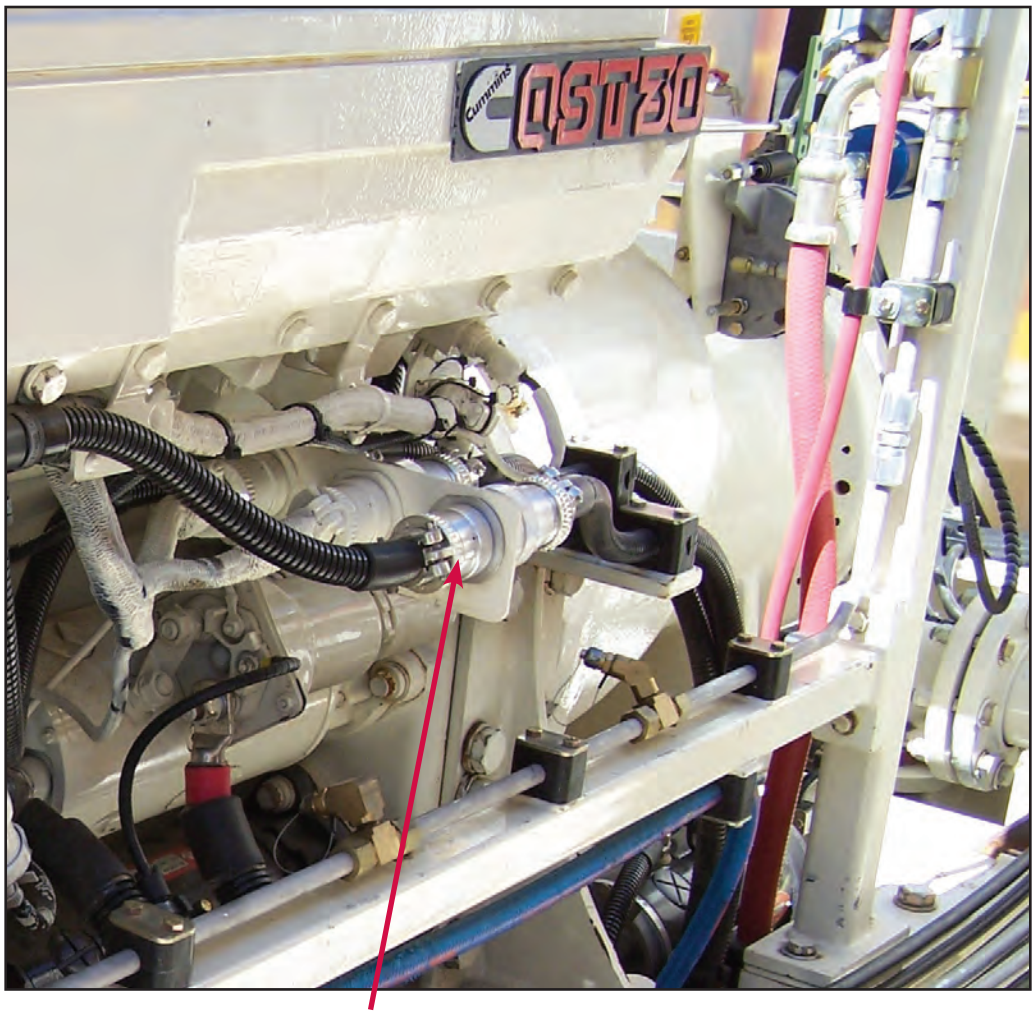


Fig. 8-4 Electronic Control Module - Disconnection Points

Whenever possible, remove component to be welded from machine. If this is not possible or practical, then follow the steps below to provide minimum risk of damage to electrical components.

1. Stop engine. Turn the switched power to the OFF position.
2. Disconnect negative battery cable from battery, or if equipped with a battery disconnect switch, place switch in OPEN position.
3. Disconnect the connectors from the ECM. Move the plug-ins so they can not accidently make contact with any of the ECM pins again.
4. Connect welder ground clamp directly to part being welded. If this is not done, any electronic components or bearings between the ground and the weld could be severely damaged by the current flow from the welder.
5. Protect wiring harness and wire rope from weld spatter.
6. Use standard welding practices to weld materials. All work is to be done by a certified welder.

Indication Only Alarms

The following alarms are display alarms, they can be reset when the fault is rectified. They are shown scrolling across the bottom of the Touch screen.

- Lube Fault
- Alternator
- Fuel Level Low (less than 5% for 3 minutes)
- Low Engine Coolant Level (5 second buffer before alarm)
- Water Tank Level Low (less than 20% for 20 seconds) Note: Water Injection will shut off when water tank level is reduced to 15%
- Engine Air Filter is Blocked
- Compressor Air Filter Blocked
- Hammer Oil System Has Failed (if the pump has failed to stroke 10 times in allotted time)
- Hammer Oil Level Low (less than 15%)
- Excessive Incline Alarm (Tram mode only)
- Fire suppression system pressure low
- Low Compressor Oil Pressure (less than 90psi)

Filter Bypass Indication Only Alarms

Hydraulic Oil temperature must be greater than 55^0 C before looking at filter bypass alarms to avoid false triggers. A differential pressure switch must open for 180 seconds to activate alarm.

- Right Charge Filter Bypass
- Left Charge Filter Bypass
- Aux Feed Pump Filter Bypass
- Right Tram Port A Filter Bypass
- Right Tram Port B Filter Bypass
- Rotation / Left Tram Port A Filter Bypass
- Rotation / Left Tram Port B Filter Bypass
- Main Return 1 Filter Bypass
- Main Return 2 Filter Bypass
- Case Return Filter Bypass
- Compressor Filter Bypass

Solenoid Control

Drill / Tram Solenoid (V08) (Off to Tram / On to Drill)

Solenoid will energise when....

Key is ON + Drill mode is selected.

Drill / Tram Interlock Solenoid (V07) (On to Tram / On to Drill)

Solenoid will energise when....

Key is on + Tram Mode is selected + Tram Conditions are OK + Hydraulic Function is enabled.

OR

Key is on + Drill Mode is selected + Drill Conditions are OK + Hydraulic Function is enabled.

Level Switches

When replacing a capacitive level switch, it is necessary to set the “zero point”. The level switch should be screwed into a spare adaptor bung and powered up. The zero point can then be set to ignore detecting the adaptor bung. If a spare adaptor bung is not available, then the tank medium must be below the level switch when setting the zero point.

Dust Suppression

Water Injection

Operation

Water Injection (water) solenoid will energise when...

Drill mode selected + engine oil press sw on + Bit air on (greater than 20psi) + Water Injection switch ON.

Water Flow Control will be enabled when...

Water Injection (water) solenoid is ON + Tank water level is NOT Low (greater than 15%).

NOTE: The water flow control module controls the rate of water delivered.

NOTE: The water flow control module will not be enabled to activate the Turkey Nest sprays if the water tank level is low (15% or below)

Turkey Spray

Operation

Tram Spray Solenoid will energise when...

Turkey Spray in Auto + Tram mode selected + engine oil press sw on + Distance meter greater than zero (but less than 4 metres) + maximum run time of 15 seconds when previous conditions are met + Tank water level is above 15%.

OR

Turkey spray in manual + Tram mode is selected.

Water Suppression Tank - Top Up

Opeation

Tank Water Level Top Up Solenoid will energise when...

Bit air is on (greater than 20 psi) + Tank level below 75%

Tank Water Level Top Up Solenoid will de-energise when...

Bit air is off

OR

Bit air is on (greater than 20 psi) + Tank level is 99% or greater

Working Principle

The LDM 40 A works based on comparative phase measurement. To achieve this, it emits visible laser beams in different frequencies. The target being measured returns diffusely reflected light that is subsequently compared with a reference signal. Finally, a microprocessor uses the recorded phase shift to calculate a required distance with mm accuracy.

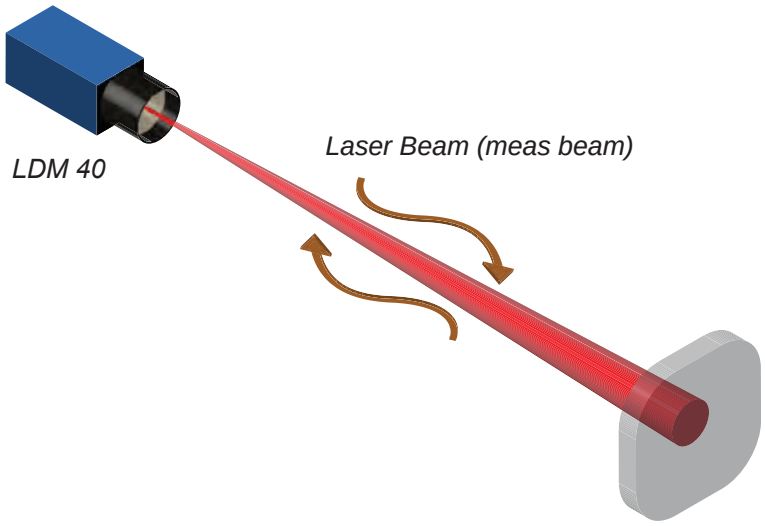


Fig. 1 Working principle

A distance measurement can be triggered in different ways:

- manually at the PC with terminal program
- automatically after parameterisation of Autostart command
- continuously by selecting distance tracking mode
- remotely controlled with external triggering

For a description of these trigger options, refer to sections 9 "Parameters" and 10 "Functions" of this Manual.

Setup

The laser distance measurement module is shipped together with aninterface cable (about 2 m in length) and a User Manual in a padded cardboard box which can also be used for safe transportation of the LDM 40 A.

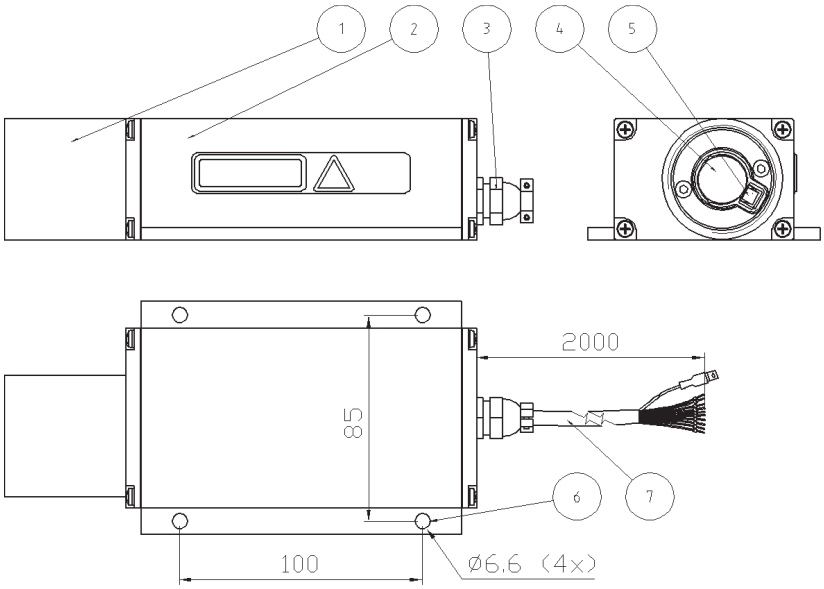


Fig. 2 Technical drawing

1 Choke at front cover

2 Casing

3 Gland seal for interface cable in back cover

4 Receiver optics

5 Transmitter optics

6 Holes for mechanical attachment (four)

7 Interface cable

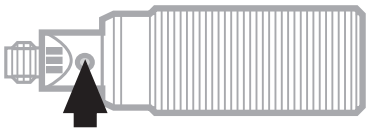
Electrical connection

Disconnect power before connecting the unit. Connect according to the indications on the type label.

Setting

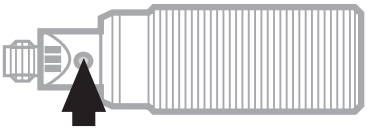
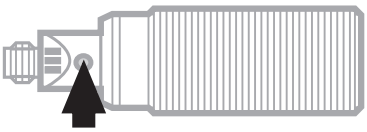
- With target medium absent

The setpoint is adjusted while the vessel is empty. When target medium is detected, the sensor's output switches. The switch-on and switch-off points are automatically generated.

 Press until the green LED flashes (max. 5s), then release the button.*		 LED green flashes (= unit is in the programming mode); after a short time the green LED lights (= unit is set and is in the operating mode).

- With target medium present

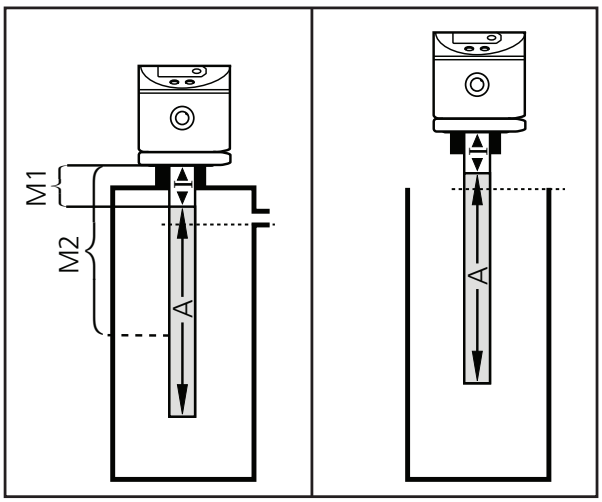
For most applications setting the sensor while the vessel is empty is sufficient. You can, if you wish, make an additional adjustment with the target medium present (e.g. to obtain an optimum excess gain for special applications).

1	 Press the button and keep it pressed (5 ... 10s).*		 The green LED flashes slowly (approx. 1 Hz), after approx. 5s it flashes faster (approx. 2 Hz) (= unit is in the programming mode).
2	 Now release the button.		 The yellow and green LED's are lit (= unit is set and is in the operating mode).

*You can adjust the setpoint via pin 2 (fc output).
(signal length = duration of pressing the button)
Type FPKG: ($+U_B$) to pin 2; type FNKG: ($-U_B$) to pin 2.

Installation

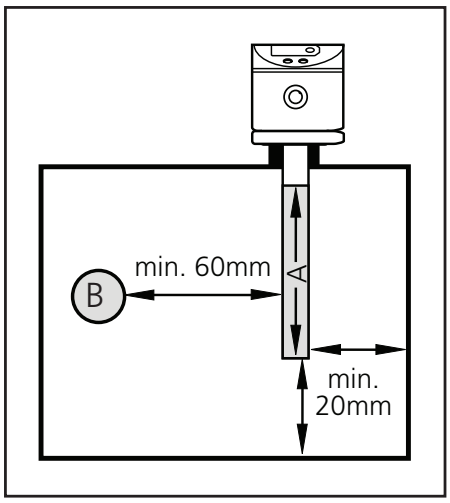
Mount the unit within the inactive zone, if possible (I; mounting area M1). The active zone (A) should be completely in the tank.
For an optimum function we recommend: A part of the active zone should be above the upper edge of the tank / above the overflow.



You can also fasten mounting elements in the two upper thirds of the active zone (possible mounting area, M2). This reduces the active zone to the area between mounting element and probe end. In this case the mounting element should be above the upper edge of the tank / above the overflow.

Special mounting conditions

- If possible, mount the unit in the middle of the tank when it is installed in small plastic tanks:
- For dirty media we recommend: Fasten the unit in a zone where there is much movement of the medium (e.g. at the supply inlet).
- When installed in metal rising pipes (bypass) the sensor must be mounted in the middle of the pipe. The inside diameter of the pipe must be min. 120 mm.
- Metal objects within the tank (e.g. metal pipes, components integrated into the tank) must observe a minimum distance of 60 mm to the active zone of the sensor. Otherwise, they are detected as mounting element (this reduces the active zone to the area between metal object and probe end).
- When installed in metal tanks the distance between sensor and tank wall / tank bottom must be min. 20 mm.



A = active zone
B = metal component

1. Function and features

- The pressure sensor **detects the system pressure**,
- shows the current system pressure on its **display**,
- and generates **2 output signals** according to the set output configuration.

output 1	output 2
hysteresis function / N.O. (**Hno**)	analog 4 ... 20 mA
hysteresis function / N.C. (**Hnc**)	
window function / N.O. (**Fno**)	
window function / N.C. (**Fnc**)	

Applications:

Order no.	Measuring range	Permissible overl. pressure	Bursting pressure
PN3xx0/PE3xx0	0 ... 400 bar	600 bar	1000 bar
PN3xx1/PE3xx1	0 ... 250 bar	400 bar	850 bar
PN3xx2/PE3xx2	0 ... 100 bar	300 bar	650 bar
PN3xx3/PE3xx3	0 ... 25 bar	100 bar	350 bar
PN3xx4/PE3xx4	0 ... 10 bar	50 bar	150 bar
PN3xx6/PE3xx6	0 ... 2.5 bar	20 bar	50 bar
PN3xx7/PE3xx7	0 ... 1 bar	10 bar	30 bar
PN3xx9/PE3xx9	-1 ... +1 bar	20 bar	50 bar

⚠ Avoid static and dynamic overpressure exceeding the given overload pressure.
Even if the bursting pressure is exceeded only for a short time the unit can be destroyed (danger of injuries)!
For gaseous media the application is limited to max. 25 bar.

⚠ Indication of the current system pressure as from 3% of the value of the measuring range. Display "0" does not mean that the system is free of pressure!

ture.
The LED display indicates the current system temperature.
The yellow LED indicates the switching state of the transistor output.
The green LESs indicate the set display unit (°C or °F).

Display mode:
Indication of parameters and the set parameter values
When the "Mode/Enter" button is pressed briefly, the unit passes to the Display mode which allows parameter values to be read. The internal sensing, processing and output functions of the unit continue as if in Run mode.

- The parameter names are scrolled with each pressing of the "Mode/Enter" button.
- When the "Set" button is pressed briefly, the corresponding parameter value is displayed for 15s. After another 15s the unit returns to the Run mode.

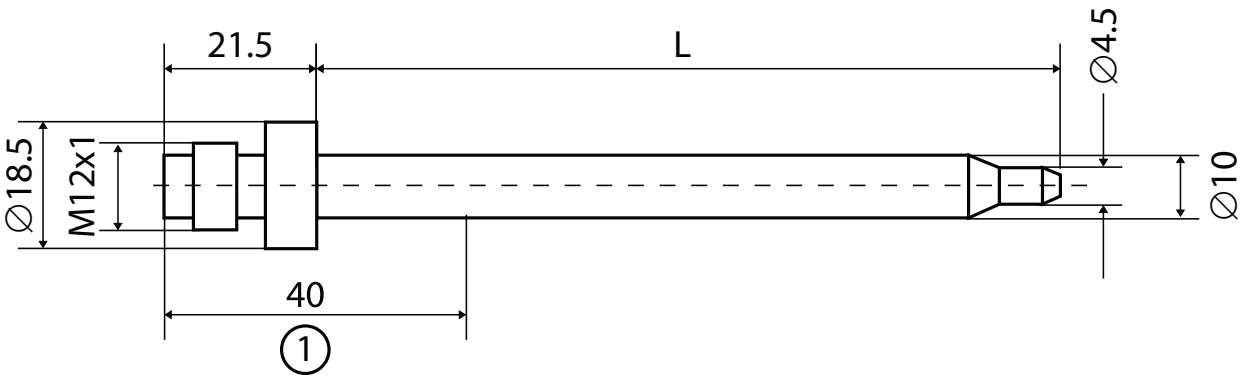
Programming mode:
Setting of the parameter values
While viewing a parameter value pressing the "Set" button for more than 5s causes the unit to enter the programming mode.You can alter the parameter value by pressing the "Set" button and confirm the new value by pressing the "Mode/Enter" button. The internal sensing, processing and output functions of the unit continue as if in Run mode with the original parameter values unless a new value is confirmed.
The unit returns to the Run mode when no button has been pressed for 15s.

Installation

Connect a temperature sensor to the unit and fix it to the process connection.

Temperature Sensor

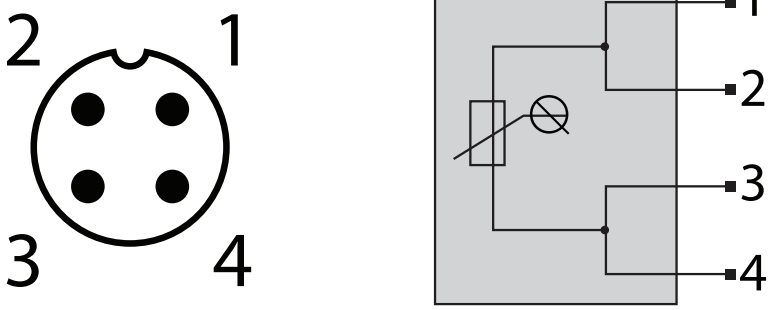
Temperature sensor



Gold-plated contacts
Connection to control monitor TR
Measuring range: -40 to +150C / -40 to 350F

Probe length	110mm
Accuracy	+ or - (PT 1000 + 0.2K)
Measuring element	1 x PT 1000 to DIN EN 60751, class A
Dynamic response T05 / T09 [s]	5 /14 *)
Nominal pressure [bar]	160
Operating temperature	-25 to +80**)
Protection	IP 67, III
Housing material	Stainless steel (316S12)
Materials (wetted parts)	Stainless Steel (316S12)
Connection	M12 connector, gold plated contacts

Wiring

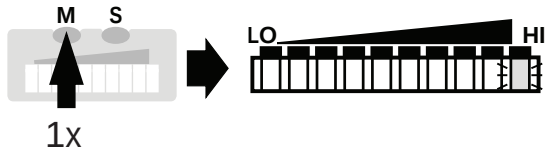
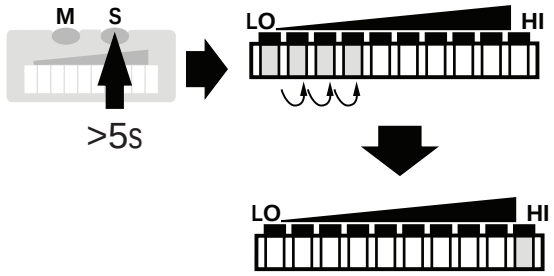
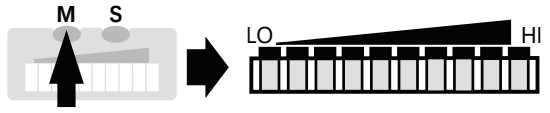


Remarks	*) according to DIN 60751 **) for the plug area The values for accuracy apply to flowing water.

Manual adjustment to maximum flow (HI-Teach)

a) Evaluation of flow decrease

The unit detects the current flow and sets this value as the maximum value for the LED display (LED 9).
In normal operation all LEDs are lit in green when the max. flow is reached. They go out step by step as the flow decreases.

1	Apply the operating voltage. After approx. 15s the unit is ready. Set the **maximum flow** and keep it constant.	
2		Press the **Mode/Enter** button briefly. LED 9 flashes.
3		Press the **Learn/Set** button and keep it pressed. After 5s the LEDs light step by step from left to right (**release the button** now), after this LED 9 is lit.
4		Press the **Mode/Enter** button briefly (acknowledgement). The unit stores the current flow as maximum flow and passes into the operating mode.

Operation

-40 °C < T_A <+70 ° C (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
Ambient temperature (no load), T_A	– 40		+70	°C	
Voltage supply, V_{BAT}	9		34	V	
Startup delay		250		ms	
Dither frequency	25		333	Hz	
Output voltage, VREF	4.9	5.0	5.1	V	
Maximum load current, VREF V_{BAT} =14V V_{BAT} = 28V			 50 30	mA	
Current supply V_{BAT} =14V V_{BAT} =28V		 40 55		mA	outputs = off, no load on VREF

Input

-40 °C < T_A< +70 °C (unless otherwise specified)

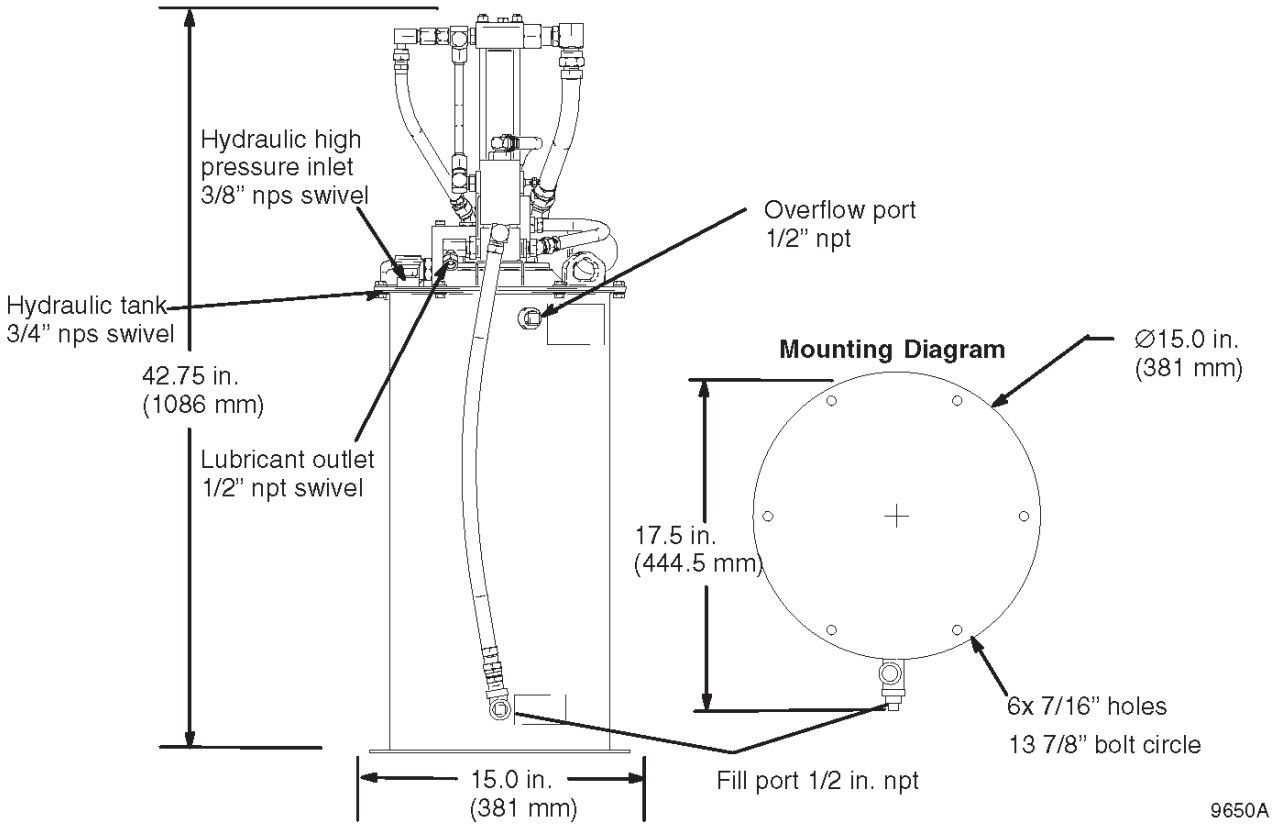
Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
VIN (Voltage input)					
Signal range low		0	0.05	V	
Signal range high	4.9	5.0	5.1	V	
Input resistance		62		kΩ	
Signal resolution		5		mV	
Total unadjusted error		15	35	mV	(VREF as source)
DIN (Digital input)					
Input level low			1.0	V	
Input level high	4.0			V	
Input hysteresis		1.7		V	
Input resistance		5.6		kΩ	

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.

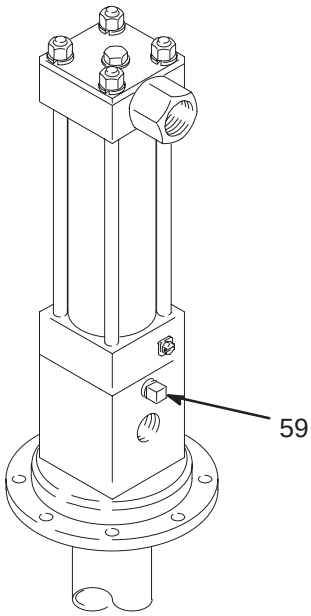


Fig. 2

- **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.

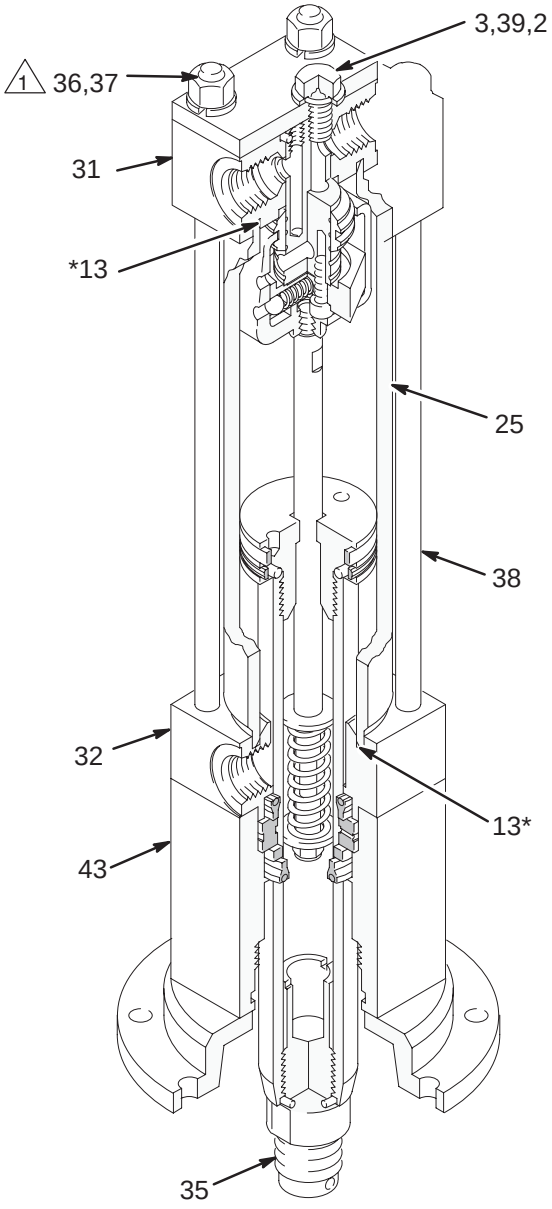


Fig. 11

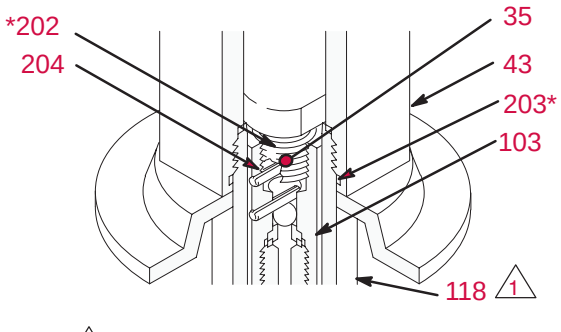
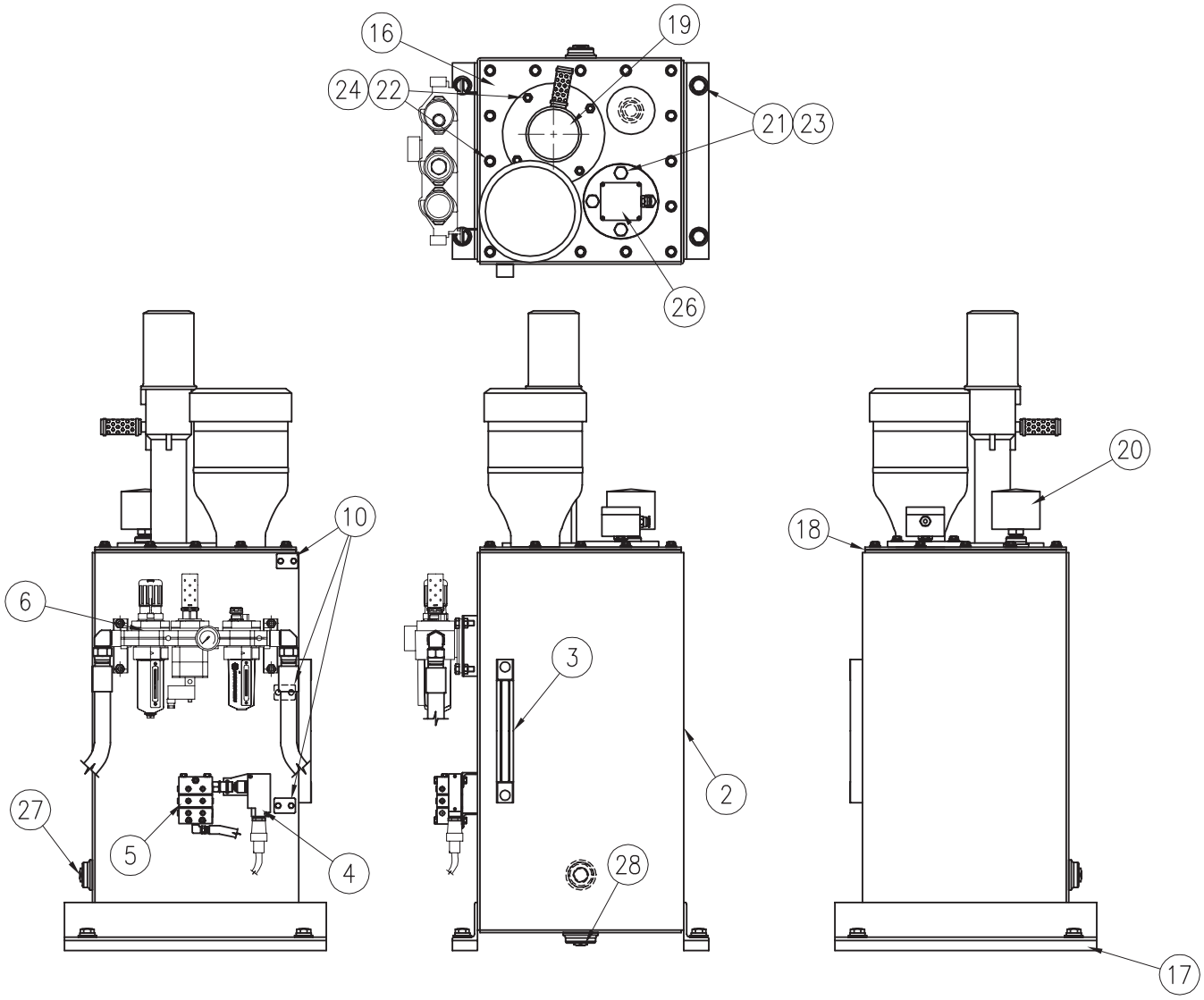


Fig. 12

Bit Oiler Tank Assembly



ITEM	DESCRIPTION
1	BIT OIL TANK ASSEMBLY (VARIENT 1)
2	BIT OIL TANK WELDMENT
3	LEVEL GAUGE
4	BIT OILER SWITCH – MICRO
5	BIT 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	BIT OIL TANK ASSEMBLY (VARIENT 2)

ITEM	DESCRIPTION
15	BIT OIL TANK LID WELDMENT (VARIENT 1)
16	BIT 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

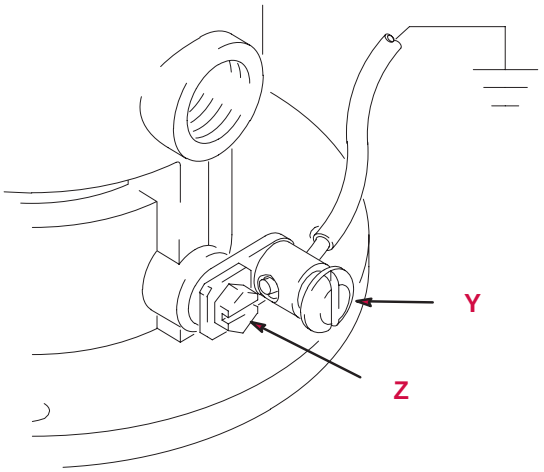
Grounding

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.*

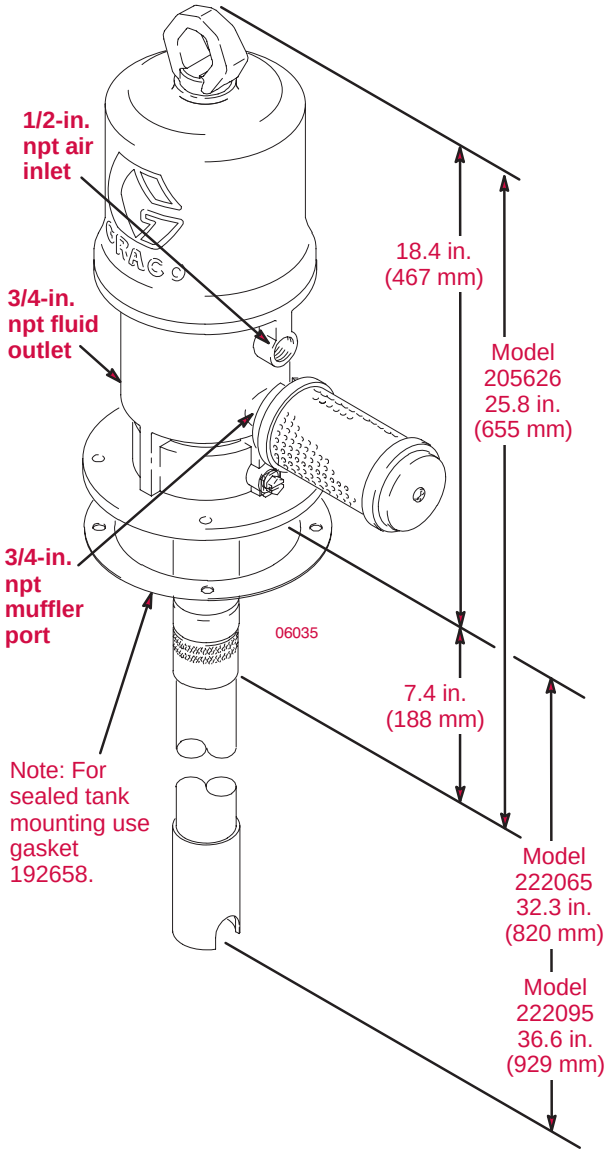


TI1052

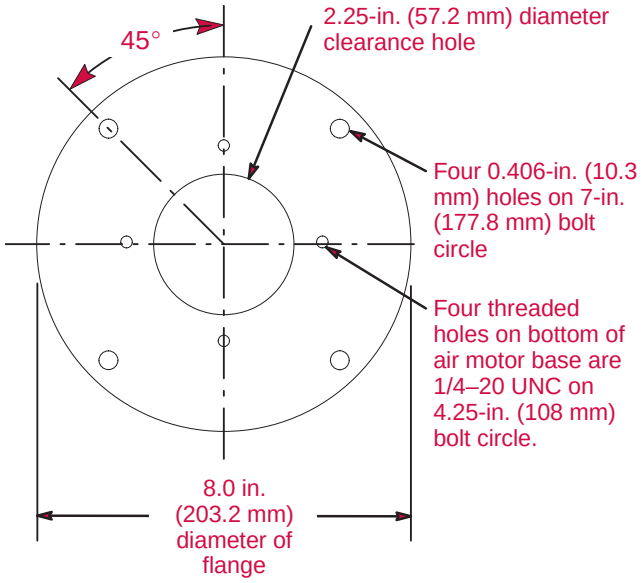
Fig. 2

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.

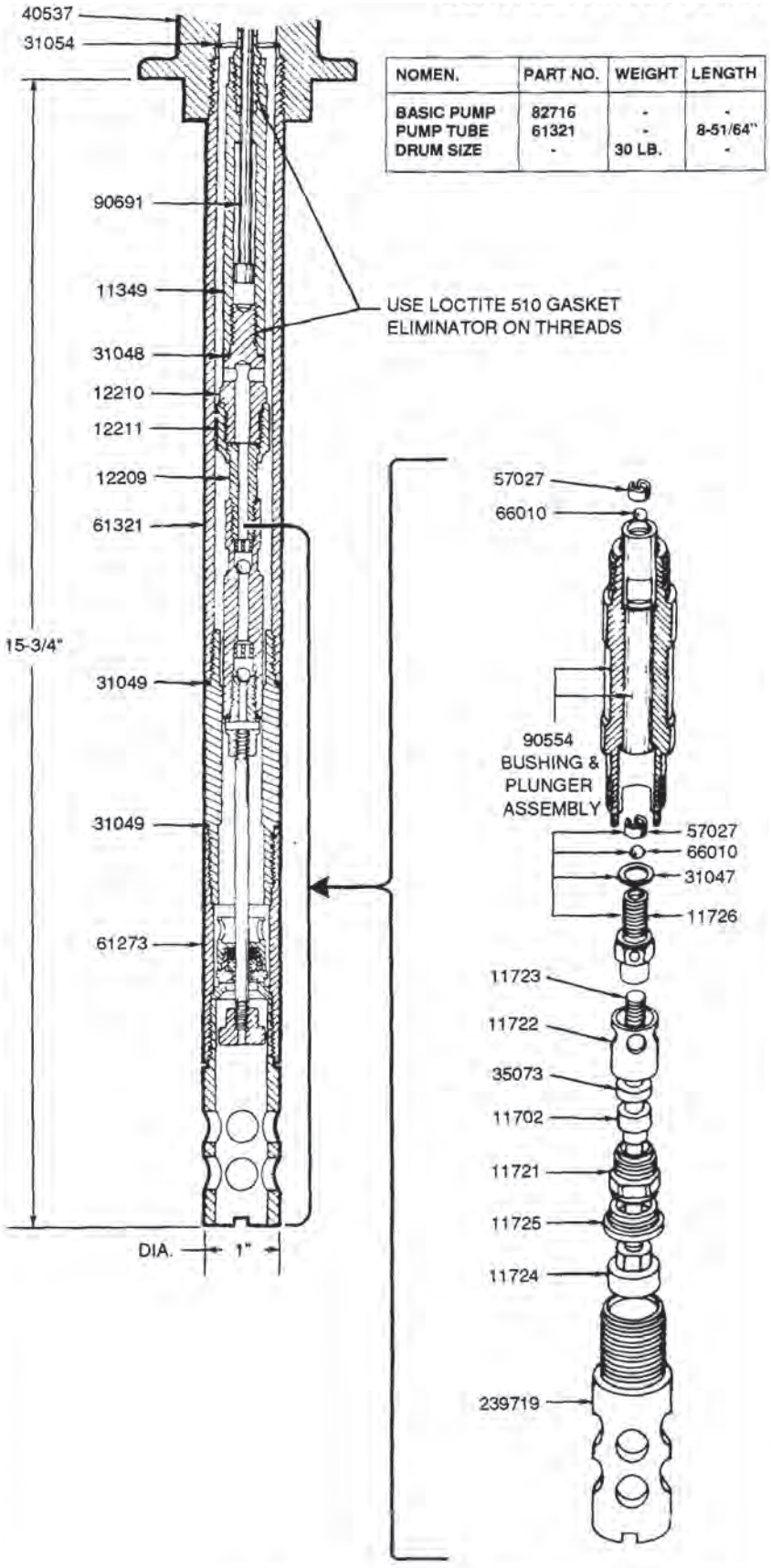
LUBRICANT LEAKING FROM WEEP HOLE IN OUTLET CASTING.

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.	-

Pump Drive And Drive Shaft Maintenance

10hrs/Daily
- Check/Refill Pump Drive Box Oil

250hrs
- Grease Drive-Shaft (1 pump ea: nipple)

500hrs
- Drain/Refill Pump Drive Oil (85W140- 13 Litres)
- Replace Pump Drive Breather

1000hrs
- Re-torque Drive Shaft Mounting Bolts
- Check for Cracks and General Condition of Rubber on Drive Shaft Assembly

Compressor Maintenance

10hrs/Daily
- Compressor Oil Check Level
- Check For Leaks Or Any Damaged Hose's
- Compressor Air Filter Check Indicator
- Drain condensation/water from Receiver tank

250hrs
- Replace Compressor Primary Air Filter
- Check/Replace If Required Compressor Safety Air Filter

500hrs
- Compressor Air Filter's/ Replace
- Clean Compressor Air Filter Housing
- Replace Compressor Main Oil Filter (Ensure That When Filter Is Replaced That The O-ring In The Filter Housing Is Replaced)
- Clean Compressor Scavenge Screen
- Check/Adjust Compressor Control
- Drain Water From Receiver Tank

1000hrs
- Service minimum pressure valve

2000hrs
- Replace Compressor Oil (Corena AS 46 -172 Litres) (Ensure All Stored Pressure Is Removed From The Compressor Receiver Tank Before Removing Filler Cap)
- Replace Compressor Separator
- Replace Compressor Scavenge Screen

Cooler Packs

WARNING: DO NOT remove radiator cap when coolant is hot. Steam or hot coolant can cause severe burns. Allow coolant to cool down below 120° F (50° C) before removing cap.

CAUTION: DO NOT use sealing additives to stop leaks. This can result in cooling system plugging and inadequate coolant flow, causing the engine to overheat.

CAUTION: DO NOT add cold coolant to a hot engine. Engine castings can be damaged. Allow engine to cool to below 120° F (50° C) before adding coolant.

10hrs/Daily
- Check Level Add As Required
- Check All Hose's For Wear And Damage
- Check/Clean As Required

500hrs
- Check Condition Of Radiator Cap
- Test Engine Coolant And Replace As Required
- Replace Engine Coolant Filters

1000hrs
- Wash Radiators And Coolers (External)

2000hrs
- Drain Refill Engine Coolant (Cummins PGXL 290litres)

Lubrication & Maintenance Chart - 250hr

SERVICE KIT INFORMATION					
Service Kit: 250 hr Reedrill Part No: YSKSS-250-*** Enter last 3 No's of S/N HI Stock No:					
Qty	Reedrill Part No (Preferred)	OEM or Alt Part No	ID	SAP No	Description
2 2	V007530 V007530	AF899M P182040	4 5		Filter, engine air cleaner (outer) Filter, compressor air cleaner (outer)
1	YF1242	FS1242	4		Filter, Primary Fuel
1	YSF1006	FS1006	4		Filter, Secondary fuel
1				40622188	Sample bottles
6	YPERMALUBE	SF01 Classic			Grease, lube canisters

OEM or Alternative ID
1 = Caterpillar
2 = Pall
3 = Parker
4 = Fleetguard
5 = Donaldson
6 = Sullair
7 = Cummins

FOLLOW ISOLATION PROCEDURE BEFORE COMMENCING WORK
RECORD ALL FAULTS ON JOB CARD

RUNNING INSPECTIONS (Machine not Isolated)

Instructions
WARNING • The machine must not be isolated and a commissioning and testing tag placed as detailed in the isolation regulations. • The machine must be cleaned properly, including cooler packs & track frames. • The rods broken out & everything stowed properly with only the saver subs / shock sub attached to head • The task SHALL be completed using the appropriate safe work procedure. • Maintainers who have achieved the required competencies can perform functional CHECKS. 1. Park the machine in a dry area with level surface. 2. The observer must be visible to the machine operator at all times. 3. All other maintainers should remain clear of the machine during operational tests. 4. The engine is running to perform these CHECKS. NOTE; Do Not rely on the gauges in the cab for these checks, if any adjustments are to be made the pressures need to be taken with calibrated test gauges

RUNNING INSPECTIONS (Machine not Isolated) Continued

Water injection pump ☐ Check water pressure while dead headed, 700 psi max, 600psi min NOTE; Use gauge in touch screen & turn down flow via the potentiometer to smooth out the reading Check for leaks		
Air conditioner ☐ Check operation.		
Auto lube system ☐ Check operation & cycle		
Thread lube system ☐ Check operation & function		
Hydraulics ☐ Check auxiliary pressure 2500 psi Adjust only if required.		
Check mast / jack pressure 2750 psi ☐ Adjust only if required		
Check feed pressure reduction with carousel in load position ☐ Adjust only if required.		
Check the function of rotation torque controller thru its range ☐ Forward 4000 psi Reverse 5000 psi Adjust only if required		
Check the function of the feed pressure controller thru its range ☐ Pull down 1800 psi Hoist 3000psi Adjust only if required		
Check rotary head spindle Pre-load, .002”-.004” ☐ NOTE; Refer to Workshop manual.		

Instructions
NOTE; BEFORE THE MACHINE IS SHUTDOWN & ISOLATED • Raise machine until the tracks are just clear of the ground; rotate tracks for a couple of minutes so a good oil sample can be taken then line up final drives. • Make sure mast is up & rotary head is all the way down

Lubrication & Maintenance Chart - 1000hr

FOLLOW ISOLATION PROCEDURE BEFORE COMMENCING WORK
RECORD ALL FAULTS ON JOB CARD

RUNNING INSPECTIONS (Machine not Isolated)

Instructions
WARNING • The machine must not be isolated and a commissioning and testing tag placed as detailed in the isolation regulations. • The machine must be cleaned properly, including cooler packs & track frames. • The rods broken out & everything stowed properly with only the saver subs / shock sub attached to head • The task SHALL be completed using the appropriate safe work procedure. • Maintainers who have achieved the required competencies can perform functional CHECKS. 1. Park the machine in a dry area with level surface. 2. The observer must be visible to the machine operator at all times. 3. All other maintainers should remain clear of the machine during operational tests. 4. The engine is running to perform these CHECKS. NOTE; Do Not rely on the gauges in the cab for these checks, if any adjustments are to be made the pressures need to be taken with calibrated test gauges

Checks	Comments	Initial
With the assistance of an observer Check the following.		
Check all functions & interlocks. ☐		
Check all lights. ☐		
Check all gauges ☐		
Check all emergency stops ☐		
Check alarm log ☐		
Check for engine flash codes ☐		
Down load ECM's & clear faults. Email to reliability engineer. ☐		
Check ROS tank light on dash ☐		
Compressor ☐ Check main control regulator pressure 105 PSI max.		
With air on full & nothing attached to head do the following		
Check the tell tale & operation of the minimum pressure valve. ☐ Receiver pressure 50 psi min		
Check the scavenge line sight glasses have flow but not excessive ☐		
Check the tell tale holes for the flushing seals on top of the rotary head ☐ Change as necessary P/N V004571V		