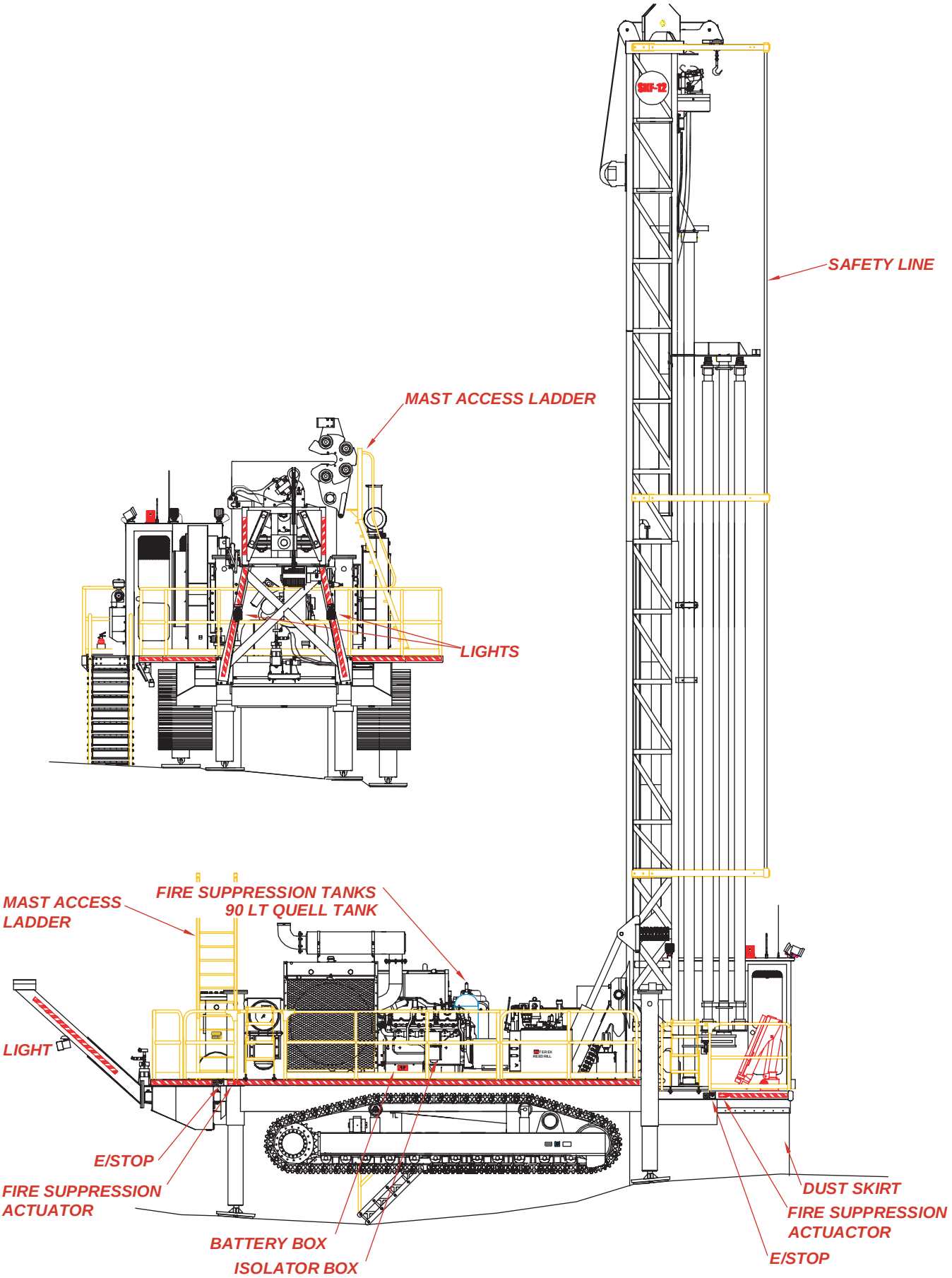
Technical Manual

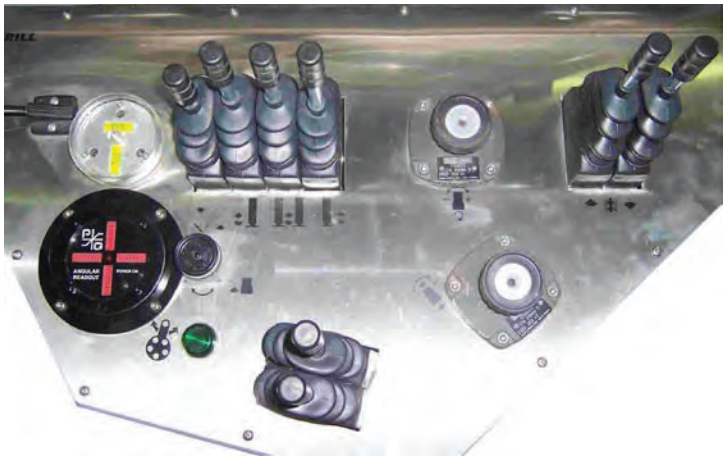
Contents

Safety Locator



Control Panels

Although there is very little service to perform on the control panels, the indicator readings are vital to other diagnostic operations for the subsystems. The control descriptions on this and following pages are to help the service technician whom may be unfamiliar with the control functions.



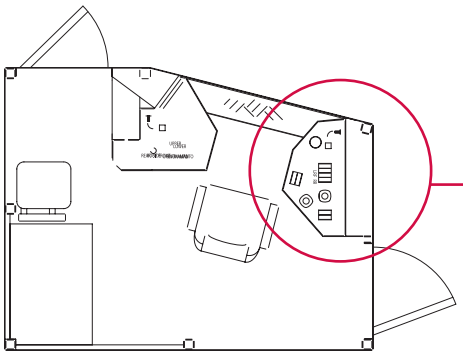


Fig. 2-1 Operator's Cab - Major Components

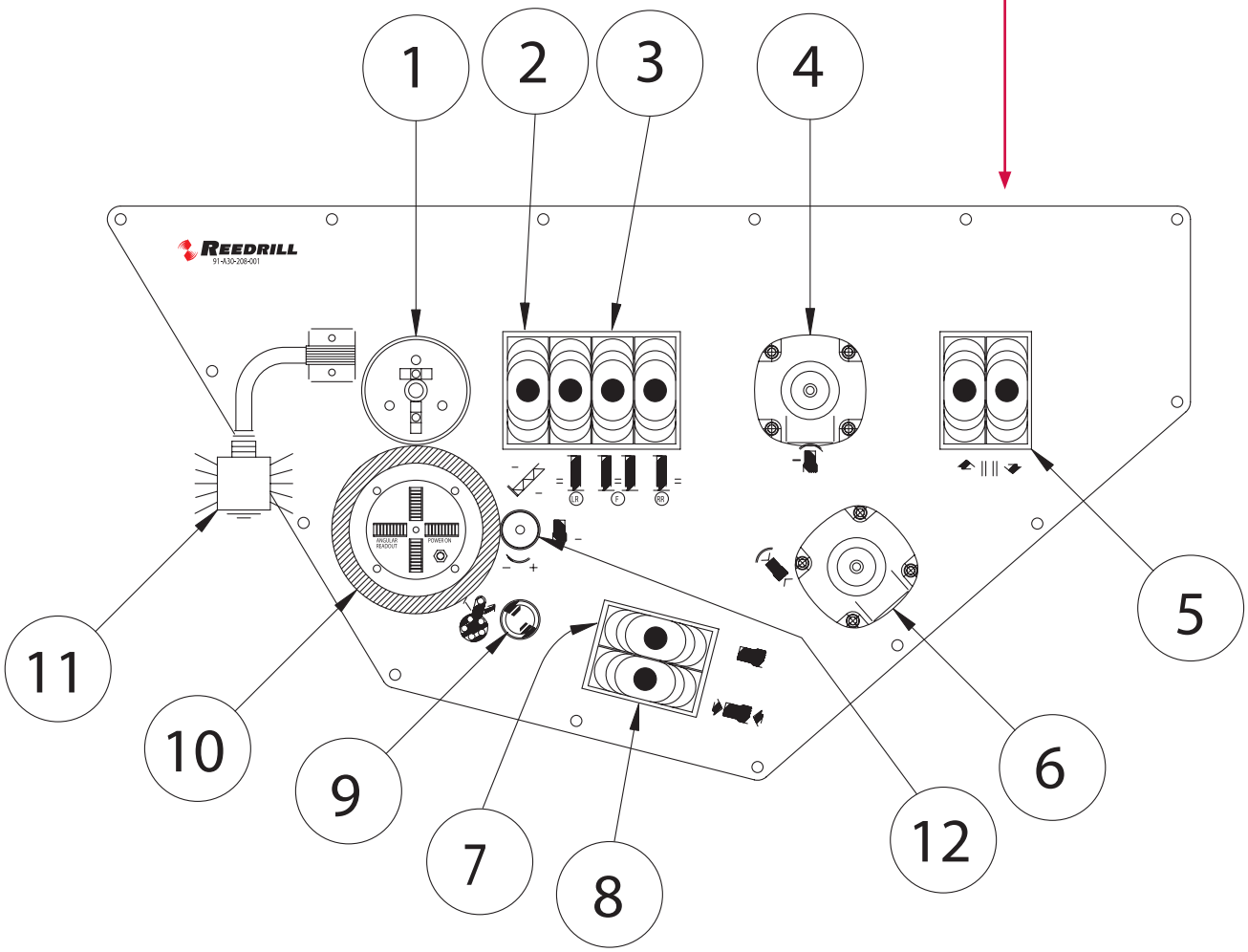


Fig. 2-2 Right Hand Control Panel

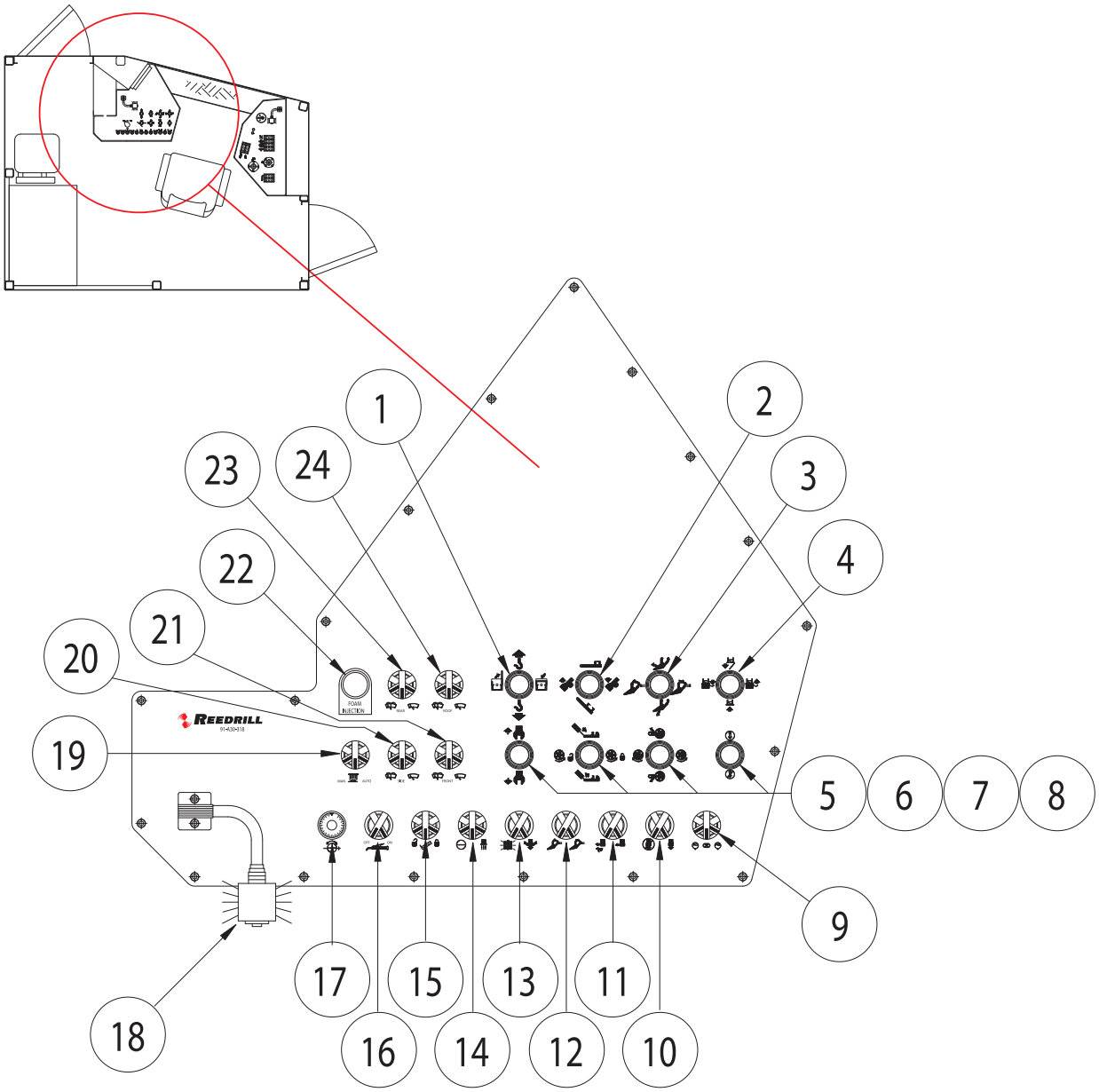


Fig. 2-5 Left Hand Control Panel

16. **Auto Lube Switch**

Enables operator to manually activate the automatic lubrication for grease points.

- Move switch to the left to automatically lubricate grease points.
- PLC will turn the Auto Lube System off after 30 seconds or when the grease pressure limit is reached. (2500psi - standard setting)
- This switch stays automatically in the right position.

17. Water Injection Flow Control

Controls the volume of water being injected into the air line.
Turn control clockwise to decrease volume. Turn counterclockwise to increase volume.

18. Snake Light

4. Crack the cylinder valve sufficiently to purge the charging line and then tighten the charging line connection onto the manifold.
5. Return the compressor suction service valve to the midway position to open the charging port.
6. Run the engine at 1500 r.p.m., select HIGH COOL on the Main Control Switch.
7. Slowly open the low pressure gauge manifold hand valve allowing the system to draw refrigerant vapour from the charging cylinder.

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

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

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

SECTION 3.0 ROUTINE MAINTENANCE PROCEDURES

3.1 REPLENISHING REFRIGERANT

“Flashing” in the liquid line sight glass of a previously charged system indicates an inadequate charge of refrigerant and replenishment is accomplished with the plant running. Before replenishing a thorough leak test with a halogen leak detector is required so that the offending leak can be located and rectified.

To replenish proceed as follows:-

1. Loosely connect the charging line from the cylinder of refrigerant to the suction service valve situated on the compressor. Purge the charging line.
2. Ensure that the charging line connection to the cylinder is fully secure and that the cylinder is vertical.
3. Tighten the charging valve/charging line connection.
4. Open the charging valve slowly.
5. Add refrigerant until a steady liquid flow in the sight glass indicates a fully charged condition. This can be accomplished by adding a small mount of refrigerant at a time.

CAUTION: Particular care should be taken when adding refrigerant as an overcharge of refrigerant causes excessive head pressures which in turn can cause considerable damage.

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

4.3.2 WIRING CHECK

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

TEST	REASON
Power present at P1.1 in LO-MED-HI (Note - P1.1 refers to terminal No. 1)	Ensures power supply to thermostat
Continuity between P1.5 and earth.	Ensures circuit to earth.
No continuity between P1.7 and earth.	
No power at P1.6 and P1.8.	Power on potentiometer (POT) control lead will blow thermostat.
Switch to COOL, connect wire No. 9 of thermostat to earth. Clutch should activate.	Checks cooling operation
Switch to HEAT, connect P1.2 to earth. Heater solenoid should activate.	Checks heating operation.

4.3.3 FAULT FINDING

COMPLAINT	POSSIBLE CAUSE	REMEDY
Continuously operates in cooling.	Potentiometer control lead open circuit. Internal contacts welded closed.	Repair Lead Check wiring, find fault and replace.
Continuously operates in heating.	Temperature probe lead open circuit. Internal contacts welded closed.	Replace thermostat. Check wiring, find fault and replace.
Thermostat inactive.	Circuit breaker tripped.	Check wiring, find fault and reset circuit breaker.
Coil ices up.	De-ice probe incorrectly placed.	Place in sensor tube attached to U-Tubes of evaporator coil.
Unit lacks capacity. air.	Return air probe in de-ice probe location.	Place in air stream of return
Works in HEAT mode but not in COOL .	Probes overheated (+150^{0}C)	Replace thermostat.

Transit Refrigeration & A/C Services

SECTION 9.1

JOB No M0246

3 Tipping Road
KEWDALE WA 6105

TR7BX1WA1200 ROOF MOUNT EVAPUNIT 7KW CUSTOM MADE
SPARE PARTS LISTING

PART No	ITEM NAME	NO PARTS USED	PARTS CHANGED
TP1106	DECAL TWIN HOLE BLUE FAN COOL	1	
TP1107	DECAL 3 HOLE BLCB1 CB2 CB3 CB4	1	
T0145	PLENIUM RERT SUP KOMATS WA1200	1	
T0144	EVAP CASING TR6BX1WA1200	1	
663562	ROT SW CG16 AUP350 *	1	
UC027	EVAP MOTOR MOUNT SUIT UE22/23	1	
S5006030	FAN SET BRACE	2	
692105	RES 2 OHM 25HAAD038200KH1 *	1	
681925	TAT L&Z 1H1C 12-24VDC THERM&R/	1	
UE016	TAT EATON 9533N397	1	
S5006029	MOTOR MOUNT CLAMP	1	
UF049	BLOWER HOUSING HD171-146-007 *	2	
120954	EVAP COIL TDR6 7KW #10229001 *	1	
UE023	MOTOR UNIVERSAL 24VDC VZ1R242	1	
521509	TX VAL DANFOSS TEN2 #0683348*	1	
521505	ORIFICE DFOS TX NO 5	1	
UF048	- BLOWER	2	
821300	RND DIFFUSER 100MM #3342200008	4	
TP1060	CRIMP CONNECTOR 8 WAY	2	
TP1061	CRIMP CONNECTOR 3 WAY	1	
641C111	BREAKER 5A W23-X1A1G-5	1	
641065	BREAKER 25A W23-X1A1G-25	2	
641C110	BREAKER 15A W23-X1A1G-15 *	1	
853507	"LEAF SPRING 1/2"" WIDE"	1	
AS502003	T SERIES SS RETURNAIR ASSEMBLY	1	
UC064	ELB PLASTIC 13MM BARB TAIL E12	4	
TP1062	CONNECTOR PLUG 50 AMP MALE	4	
661485	24V 80A H/DUTY RELAY(3062)	1	

FVV50HDB3 PRESSURISER
SPARE PARTS LISTING

PART No	ITEM NAME	NO PARTS USED	PARTS CHANGED
TP1071	16 INCH CANISTER FVV50HDB3	1	
TP1072	CLAMP 16INCH CANISTA FVV50HDB3	2	
TP1073	PRECLEANER BOWL FVV50HDB3	1	
TP1074	FILTER ELEMENT FVV50HDB3	1	
410605	BLOWER R120800-R05-11 *	1	
AS184902	F/A MOTOR MTG PLATE ASSY	1	
AM184909	F/AIR BLOWER W/ASSY	1	
S1616219	F/A FAN MTR DOME (GLOSS BLACK)	1	

Removal

1. Removal of mast cylinders is easier with mast in up position.

WARNING: BE SURE mast lock pins are engaged before removing mast elevating cylinders. Relieve pressure on hydraulic and pneumatic systems before loosening connections or parts.

2. With mast lock pins engaged and machine shut down, tag and remove hydraulic hoses and grease lines. Cap fittings and hose ends.
3. Support cylinder with suitable lifting device and remove upper and lower pins. Lift cylinder free of mountings.

Repair

Refer to parts manual for specific cylinder and repair parts. Refer to cylinder repair information in section 7 of this manual.

Replace

1. With cylinder supported, install lower pivot pin, and retaining bolts (fig. 3-4a).

WARNING: BE SURE to cycle cylinder at least six times to remove trapped air before installing on mast, otherwise mast may fall suddenly when lowered.

2. Connect hoses, start up machine and cycle cylinders at least six times to remove trapped air, then slowly extend cylinder to line up rod end with clevis on mast.
3. Install upper pivot pin and retaining bolts on each side (fig. 3-4).
4. Install the grease lines to each cylinder pivot end.

Fig. 3-3 SKF-12 Mast Raising Cylinders

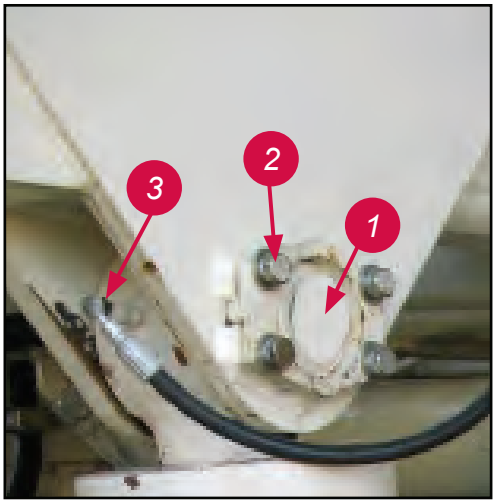


Fig. 3-4 Upper Cylinder Pin
1. Pin
2. Pin Retaining Bolts
3. Grease Line

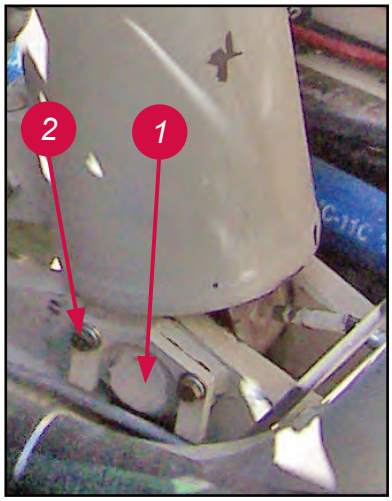


Fig. 3-4a Lower Cylinder Pin
1. Pin
2. Pin Retaining Bolts

Assembly and Installation

(refer to fig. 3-45 for complete assembly and reference to item numbers.)

1. Clean all parts thoroughly and be sure all mounting surfaces are free of nicks or burrs. Press bushings (8) into idler wheel (7). Fig. 3-50.
2. Place seals (11) into bores of idler wheel (7) and sliding block (9). Fig.3-51. Be sure the lip of the seal faces the direction shown in fig. 3-51.

NOTE: If reusing the old seals, be sure to mark them, so they go back into the same bore they came out of. Otherwise they may not seal properly.

3. Place the two o rings (13) in the grooves on the shaft (10). Connect shaft with one sliding block (9).

NOTE: The oil groove (A) must face towards the rear.

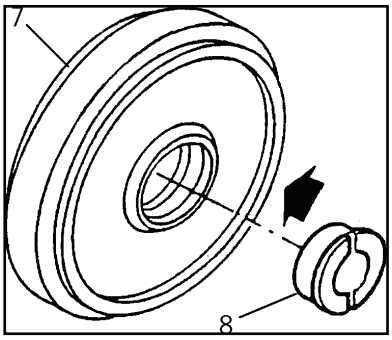


Fig. 3-50
7. Idler Wheel
8. Bushing

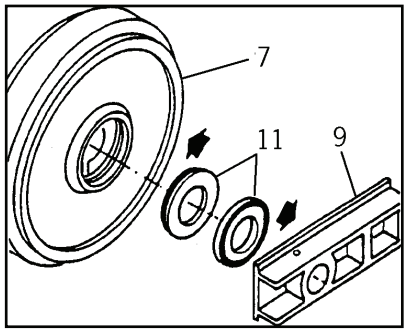


Fig. 3-51
7. Idler Whee
9. Sliding Block
11. Seal Group

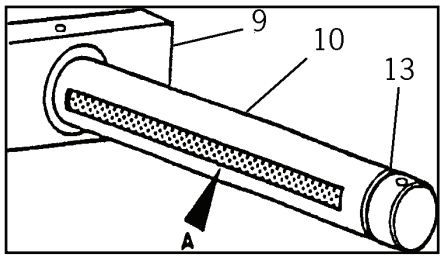


Fig. 3-52
9. Sliding Block
10. Shaft
13. O Ring

4. Align hole in shaft with hole in slide bar (9) and install roll pin (12). Fig. 3-53.

NOTE: Some units may have the hole drilled through the side of the rail and some may have the hole drilled through the front of the rail.

5. Install the idler wheel onto the shaft (fig. 3-54).

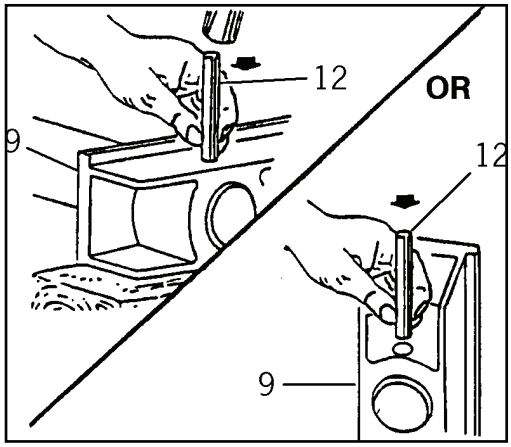


Fig. 3-53 Shaft - install into sliding rail
9. Sliding Block
12. Clamping Sleeve

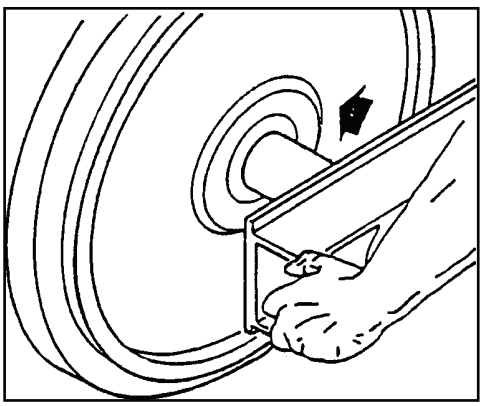


Fig. 3-54 Idler Wheel - install onto shaft

Support Roller Assembly

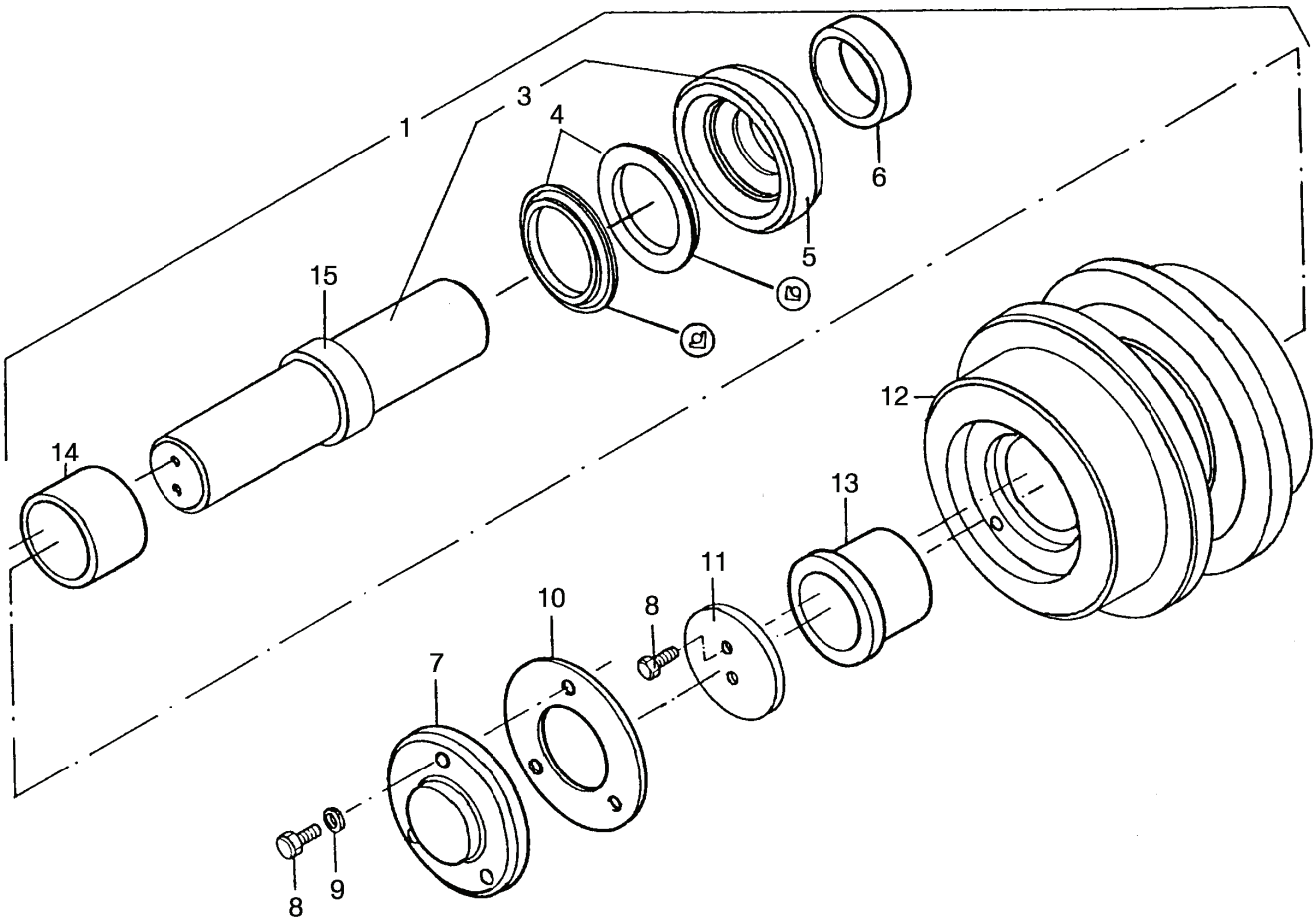


Fig. 3-80 Support Roller Assembly

ITEM	QTY.	DESCRIPTION	ITEM	QTY.	DESCRIPTION
1	1	Support Roller (complete)	9	5	Washer
3	1	Shaft with Collar	10	1	Gasket
4	1	Seal (set of 2)	11	1	Thrust Washer
5	1	Collar	12	1	Roller Body
6	1	Distance Washer	13	1	Bronze Bushing
7	1	Cover	14	1	Bronze Bushing
8	5	Capscrew, M12X30 DIN 933-8.8	15	1	Shaft

Track Shoe Bolt Torque (Torque Turn Method)

Bolt Torque KN111

Range of applications: 1. Bolt torque for grouser shoe acc. to supply specifications.
2. a) Data on this page applies only to torque turn method.
b) Initial torque (data from chart 2) plus an add. 1/3 turn.

Thread metric	Bolt torque	
	Ma = Nm	Ma = ftlbs
M10 x 1	30 ± 5	20 ± 5
M12 x 1	50 ± 10	35 ± 10
M14 x 1,5	80 ± 20	60 ± 15
M16 x 1,5	180 ± 30	130 ± 25
M18 x 1,5	260 ± 40	190 ± 35
M19 x 1,5	320 ± 40	235 ± 35
M20 x 1,5	300 ± 40	220 ± 35
M24 x 1,5	440 ± 50	325 ± 35
M27 x 1,5	630 ± 60	465 ± 45
M30 x 2	850 ± 70	625 ± 50
M32 x 2	1000 ± 80	740 ± 60
M36 x 2	2270 ± 120	1670 ± 90

Unifiedfine Thread	Bolt torque	
	Ma = Nm	Ma = ftlbs
7/16" - 20UNF	40 ± 5	30 ± 5
1/2" - 20UNF	60 ± 10	45 ± 10
9/16" - 18UNF	90 ± 20	65 ± 15
5/8" - 18UNF	180 ± 30	130 ± 25
3/4" - 16UNF	320 ± 40	235 ± 35
7/8" - 14UNF	350 ± 60	255 ± 45
1" - 14UNS	520 ± 60	385 ± 45
1 1/8" - 12UNF	760 ± 70	560 ± 50
*7/8" - 14UNF	650 ± 70	480 ± 50
*1" - 14UNS	870 ± 70	650 ± 50

*These values are only for bolts in connection with semicircular nuts.

Final Drive - General Description

The final drive is a 3-stage planetary gear drive which is totally enclosed. The bearings are protected by special slide ring packings.

It has an internal multi-disc brake which is spring applied and released by hydraulic pressure. The brake is therefore, maintenance free and no repair work should be done on the brake except by factory authorized specialists. The brake unit should be exchanged for a complete unit.

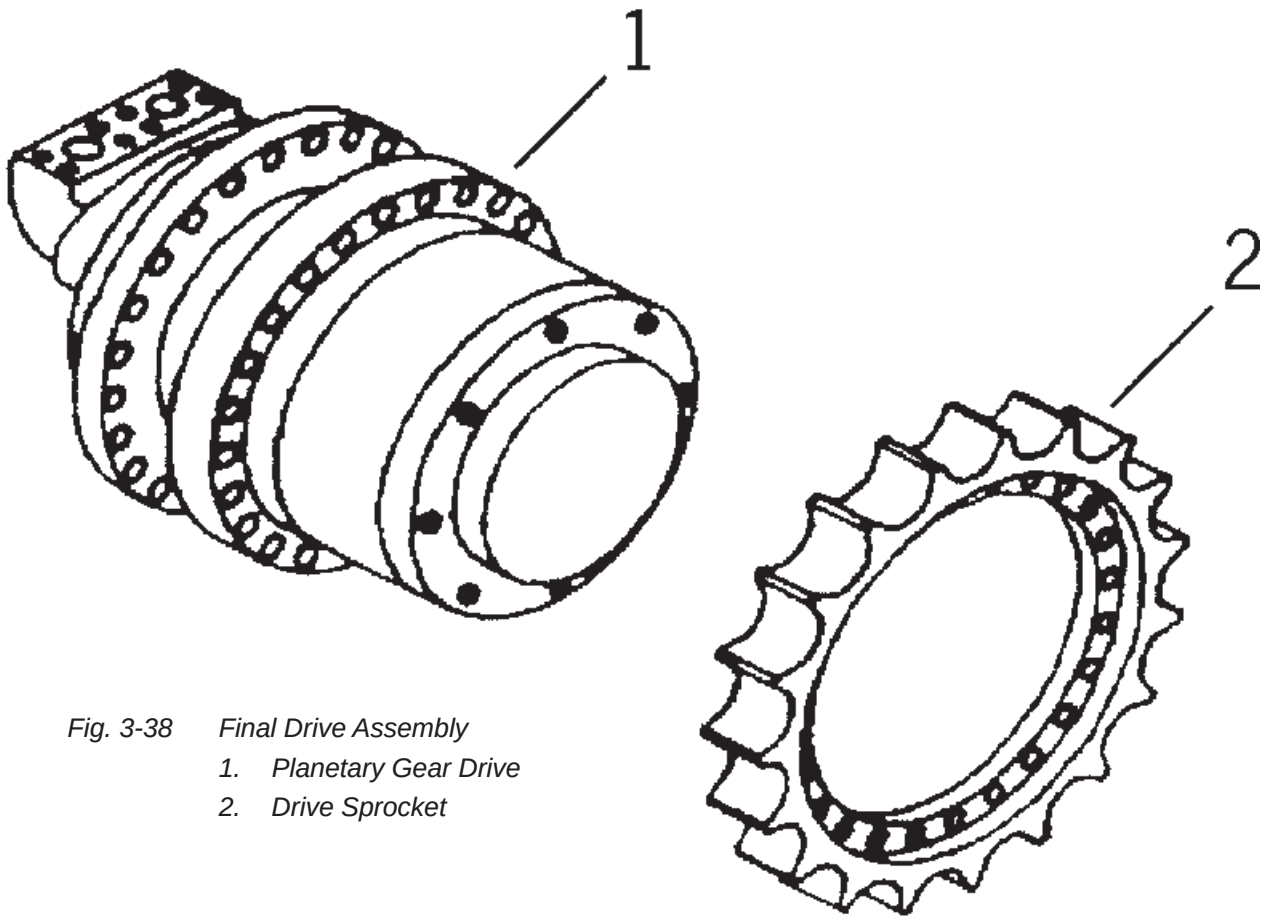
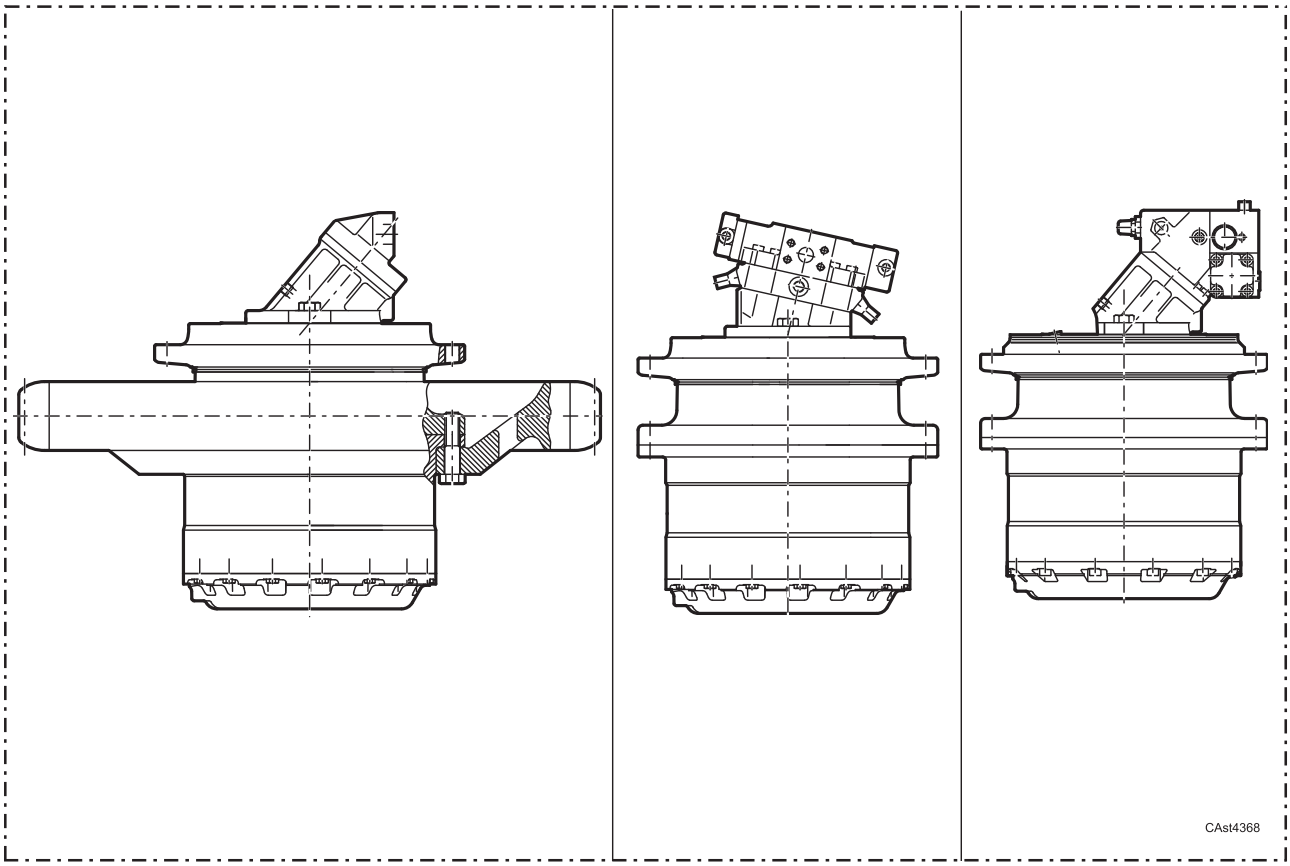


Fig. 3-38 Final Drive Assembly

1. *Planetary Gear Drive*
2. *Drive Sprocket*

O&K Antriebstechnik



REPAIR MANUAL

FINAL DRIVE

Mod. F100

1st Edition date: 02/2004

Revision date: 00/00

GRUPPO CARRARO

P/N: 2896989

st26102

C - GENERAL SPECIFICATIONS

C.1 Foreseen uses

This final drive has been designed and manufactured to be mounted on industrial machines.

The final drive is a component that transmits the power from the engine to the wheels.

The final drive, manufactured according to the customer’s technical specifications, allows:

• increasing of tractive force, reducing the number of revolutions.

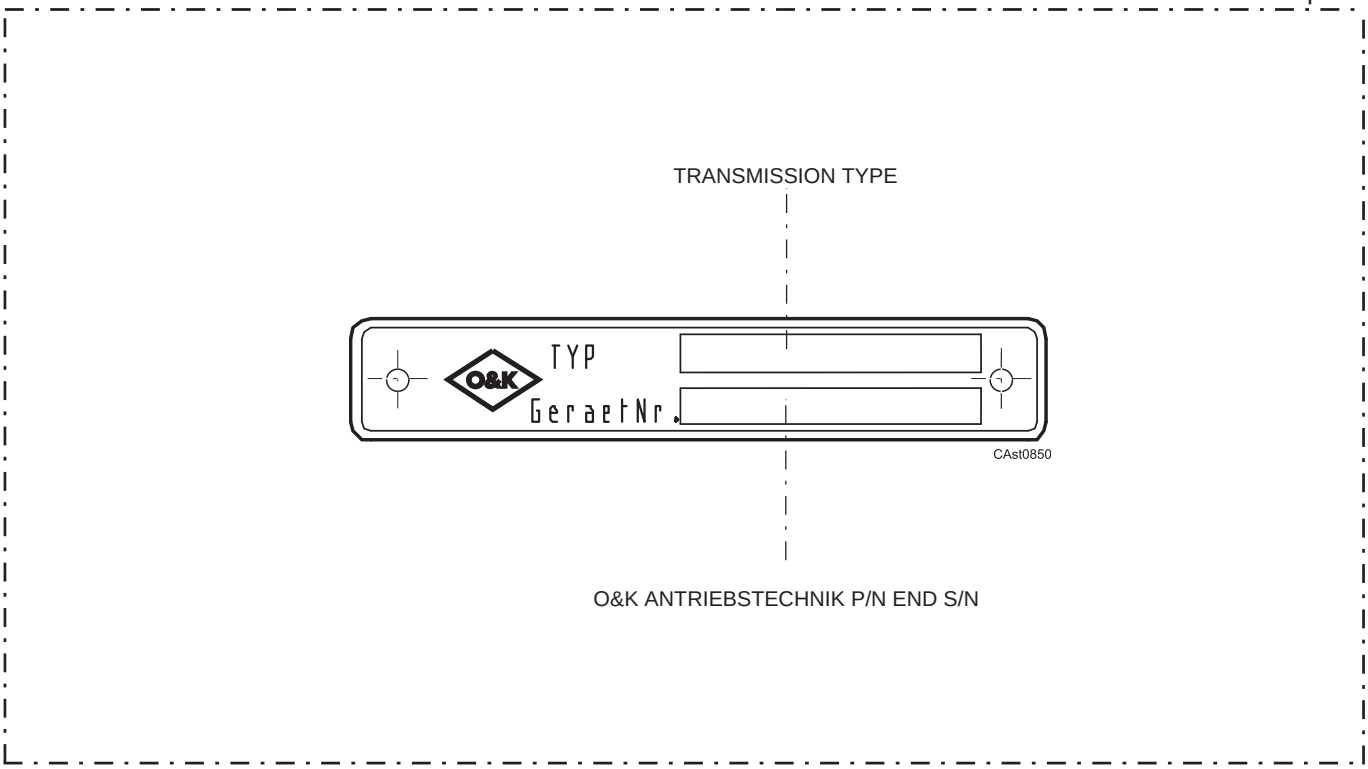
Never mount this final drive on machines different from the ones for which it has been designed and manufactured

If the final drive is used for any other purpose than the one foreseen, O&K Antriebstechnik GmbH & Co. KG declines any responsibility regarding damages or accidents caused by it. All consequences will be at the expense of the client.

However, when used as foreseen, operational formalities as well as regular maintenance repair specifications given by O&K Antriebstechnik GmbH & Co. KG are to be observed strictly.

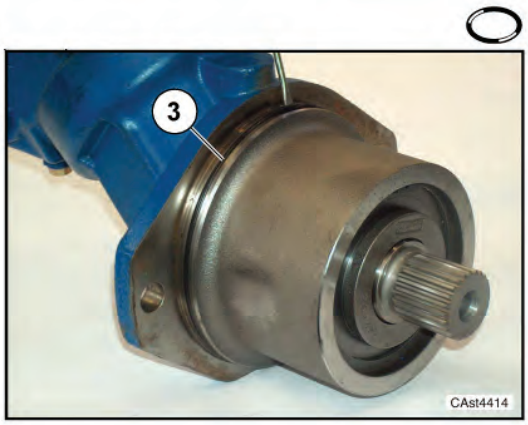
C.2 Product identification

Transmission serial plate

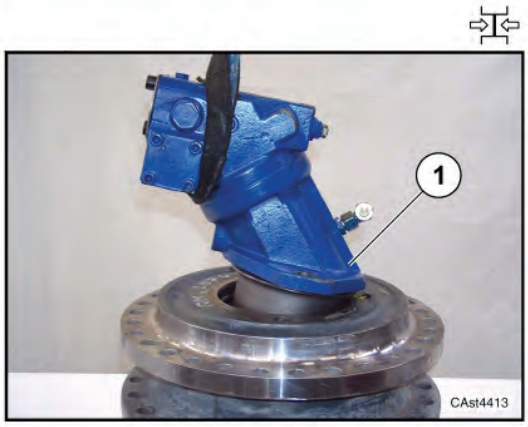


D.4.2 Assembly

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

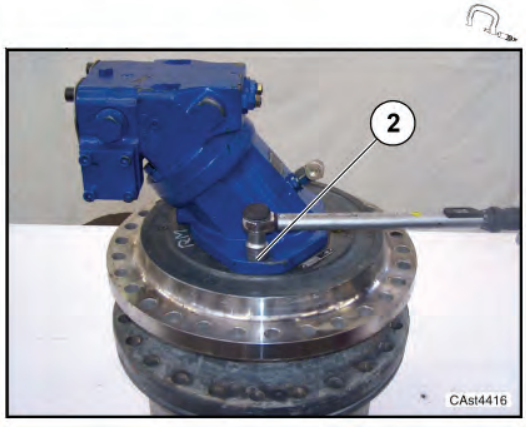


Assemble O-Ring (3).

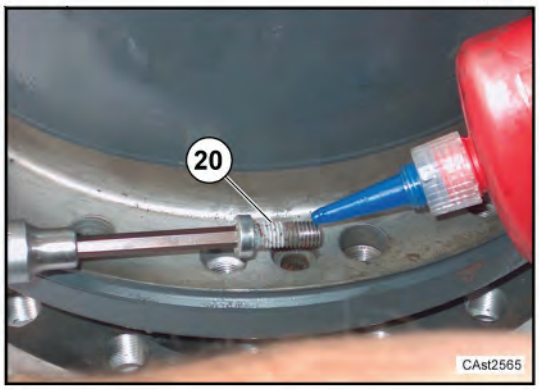


Install motor (1).

Apply Loctite® 242 on screws (2).

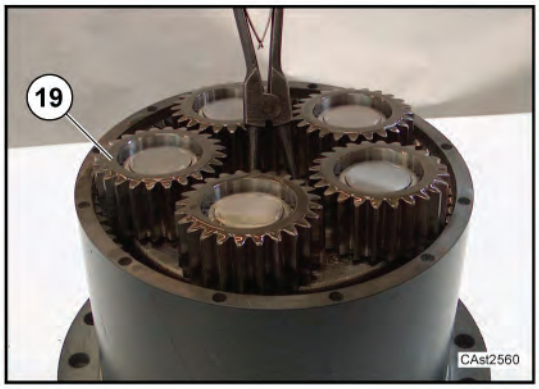


Screw in screws (2) and tighten at the prescribed torque wrench (Sec. C.8).

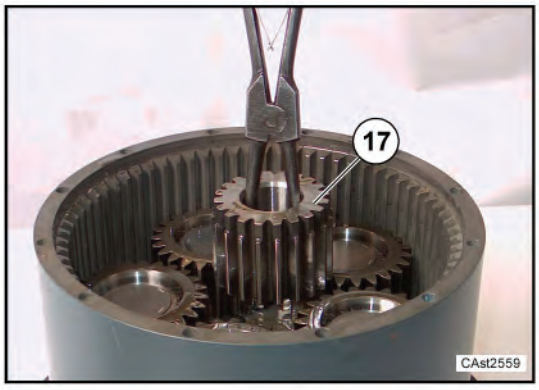


Apply Loctite®242 on screws (20).

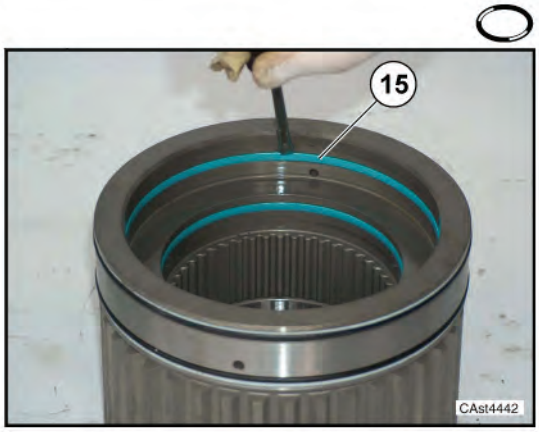
Screw in the screws (20) and tighten at the prescribed torque wrench (Sec. C.8).



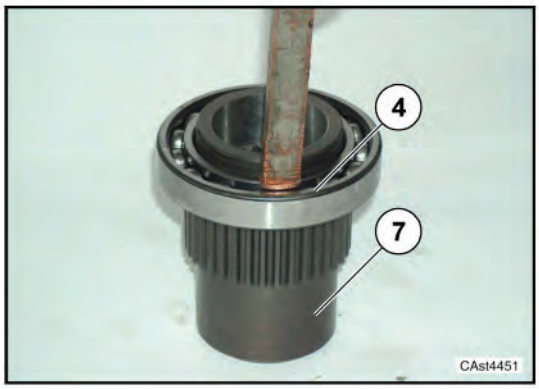
Assemble side gear carrier assembly (19).



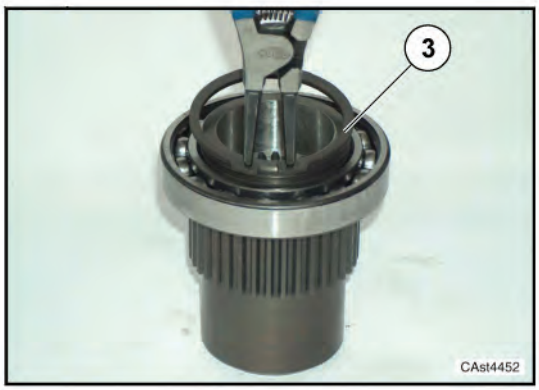
Assemble gear (17).



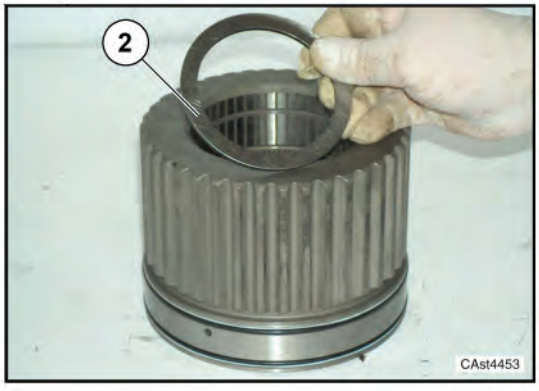
Assemble the gasket (15).



Assemble bearing (4) on shaft (7).

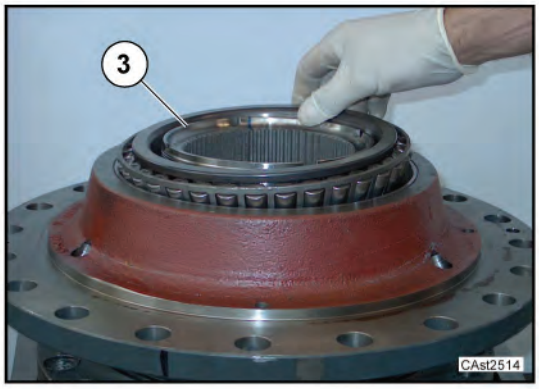


Assemble snap ring (3).

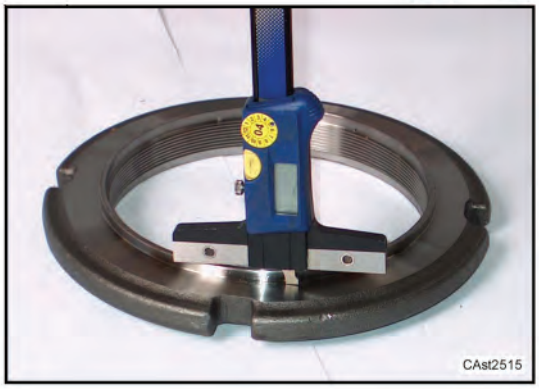


Insert the shim (2).

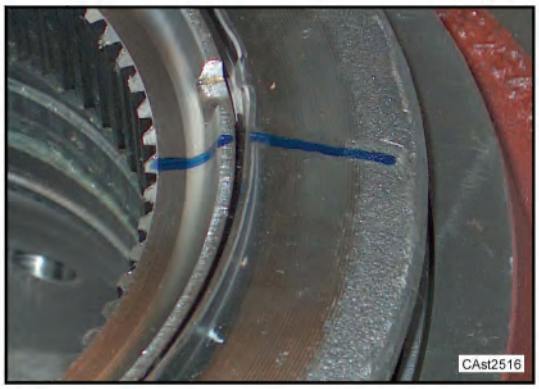
Assemble hub assembly (4) on beam assembly (9).



Assemble bearing (3).



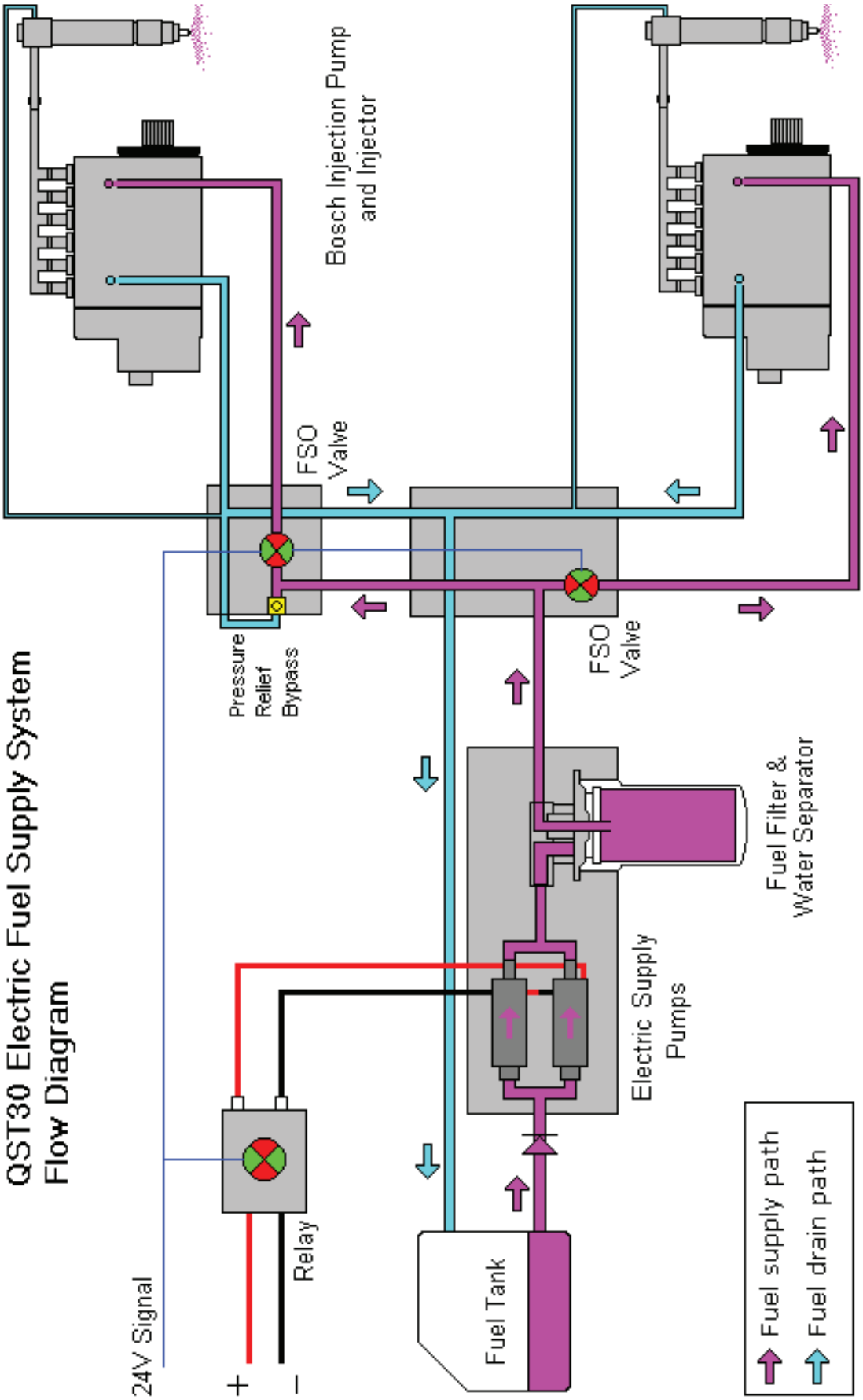
Measure the value (Y) on a new ring nut.

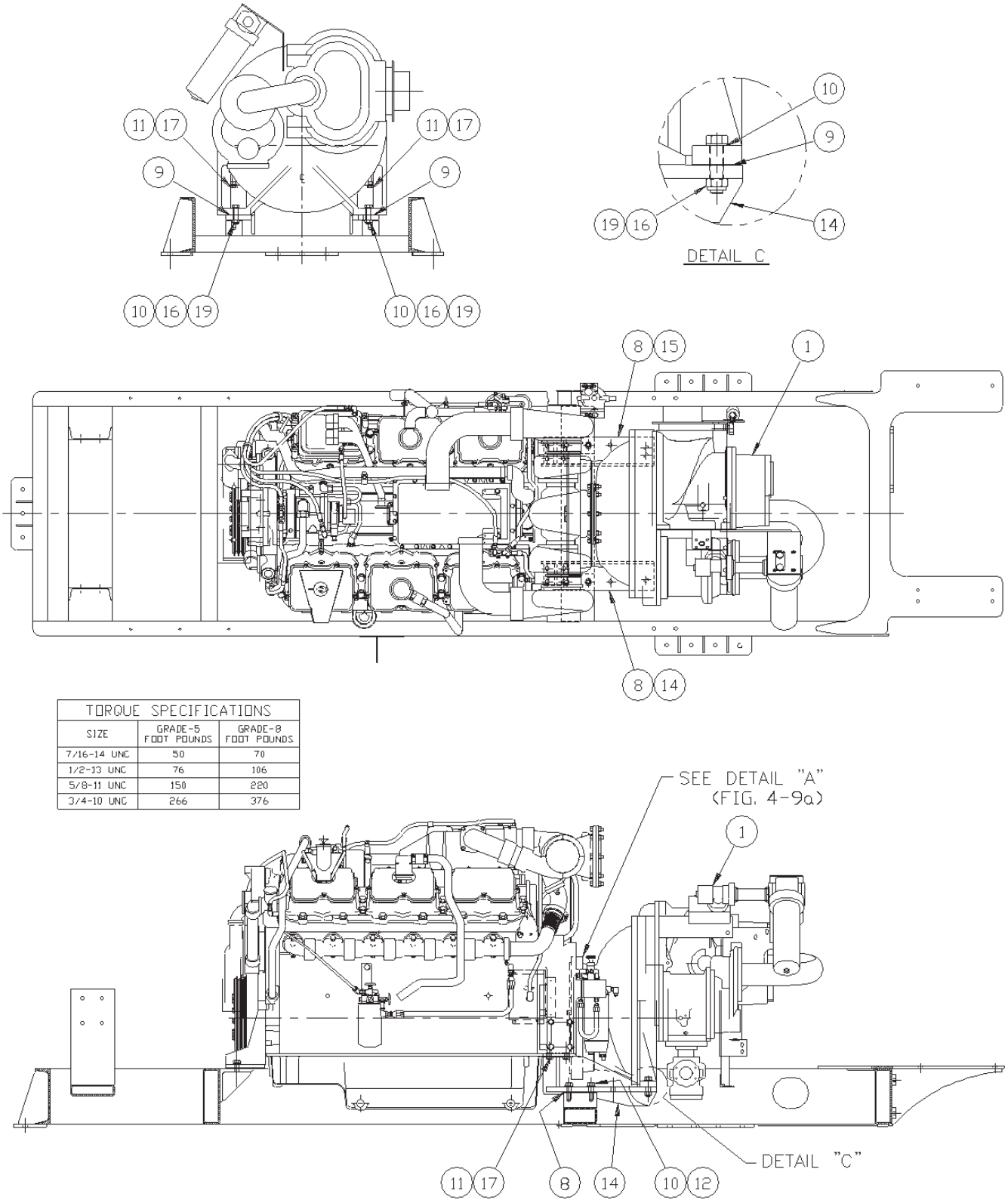


Screw completely the new ring nut without shims and draw a line of reference between the wheel hub carrier and the ring nut.

Unscrew the ring nut.

Section 4 Contents


QST30 Electric Fuel Supply System
Flow Diagram
Bosch Injection Pump
and Injector
FSO
Valve
FSO
Valve
Pressure
Relief
Bypass
Fuel Filter &
Water Separator
Electric Supply
Pumps
Relay
24V Signal
+
–
Fuel Tank
Fuel supply path
Fuel drain path



TORQUE SPECIFICATIONS		
SIZE	GRADE-5 FOOT POUNDS	GRADE-8 FOOT POUNDS
7/16-14 UNC	50	70
1/2-13 UNC	76	106
5/8-11 UNC	150	220
3/4-10 UNC	266	376

Fig. 4-9 Compressor Assembly

1. *Compressor*
2. *Coupling, Torsional*
3. *Bushing, Taper-Loc*
4. *Capscrew, Hex Head (8)*
5. *Washer, Flat (9)*
6. *Capscrew, Hex Head (24)*
7. *Washer, Lock (24)*
8. *Shim Set, 2 holes, 3 x 6 (2)*
9. *Shim Set, with slot, 2 x 2 (2)*
10. *Washer, Flat (6)*
11. *Washer, Flat (8)*
12. *Capscrew, Hex Head (4)*
14. *Support, Engine/Compressor*
15. *Support, Engine/Compressor*
16. *Nut, Flexlock (2)*
17. *Capscrew, Hex Head (8)*
19. *Capscrew, Hex Head (2)*

Taper-Loc Bushing Installation - Model AC-T5.SN. F2. V1. 3535

When installing taper-loc bushing on compressor shaft, outer surface of bushing should be flush with end of shaft, or not more than 3/8" (9.5mm) beyond end of shaft.

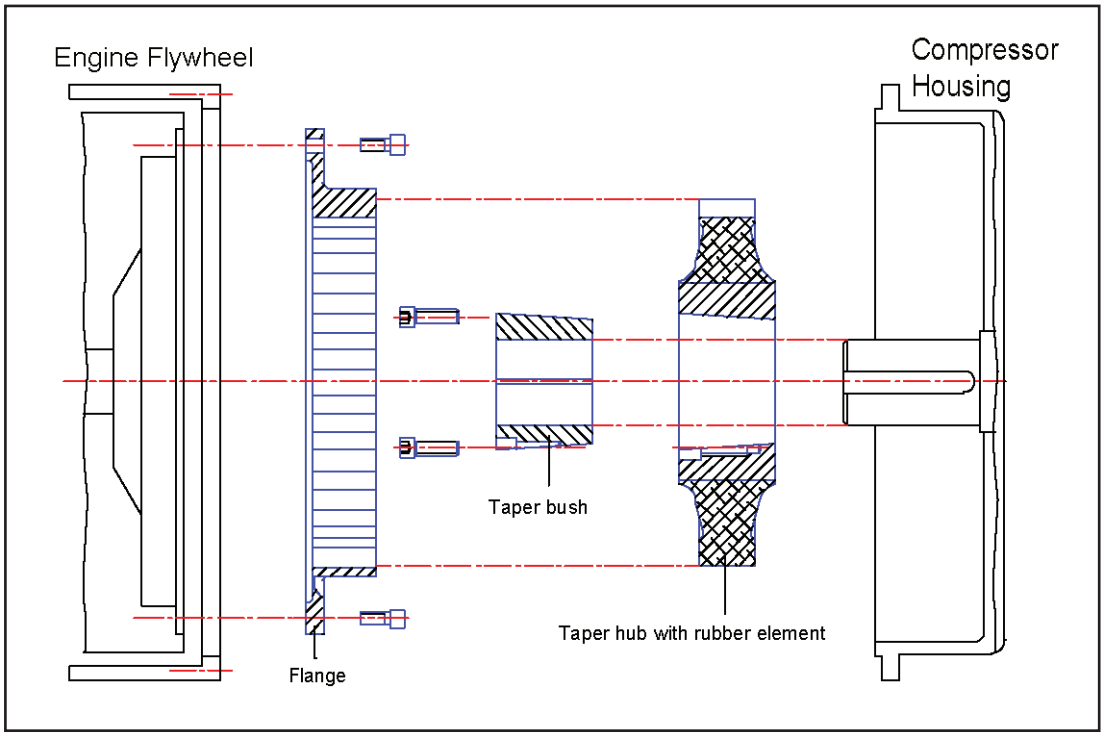


Fig. 4-10a Flywheel Coupling with Taper-Loc Bushing Components

Tightening torques for ARCUSAFLEX™ flywheel couplings

All bolts and screws must be tightened to the specified torques in order to ensure a reliable torque transmission. Prior to putting the machinery into operation, all bolts and screws of the coupling must be checked for proper fit.

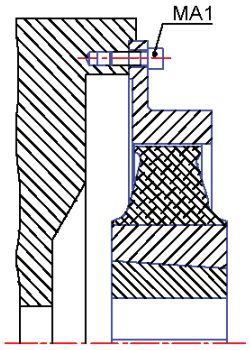


Table 1

Tightening torques for the bolted flange connection to the engine flywheel (grade 8.8)

SAE flywheel flange		6 ½	7 ½	8	10	11 ½	14	16	18	21	24
Metric bolts		M8		M10			M12		M16		M20
Tightening torque MA1	Nm	25		50			85		210		420
	lb in	221		442			752		1860		3720
Imperial size bolts		$^{5}/_{16}$ - 18		$^{3}/_{8}$ - 16			$^{1}/_{2}$ - 13		$^{5}/_{8}$ – 11		$^{3}/_{4}$-10
Tightening torque MA1	Nm	24		42			102		203		340
	lb in	212		372			903		1800		3010

Fig. 4-10b Tightening Torques for Flange to Engine Flywheel Bolts

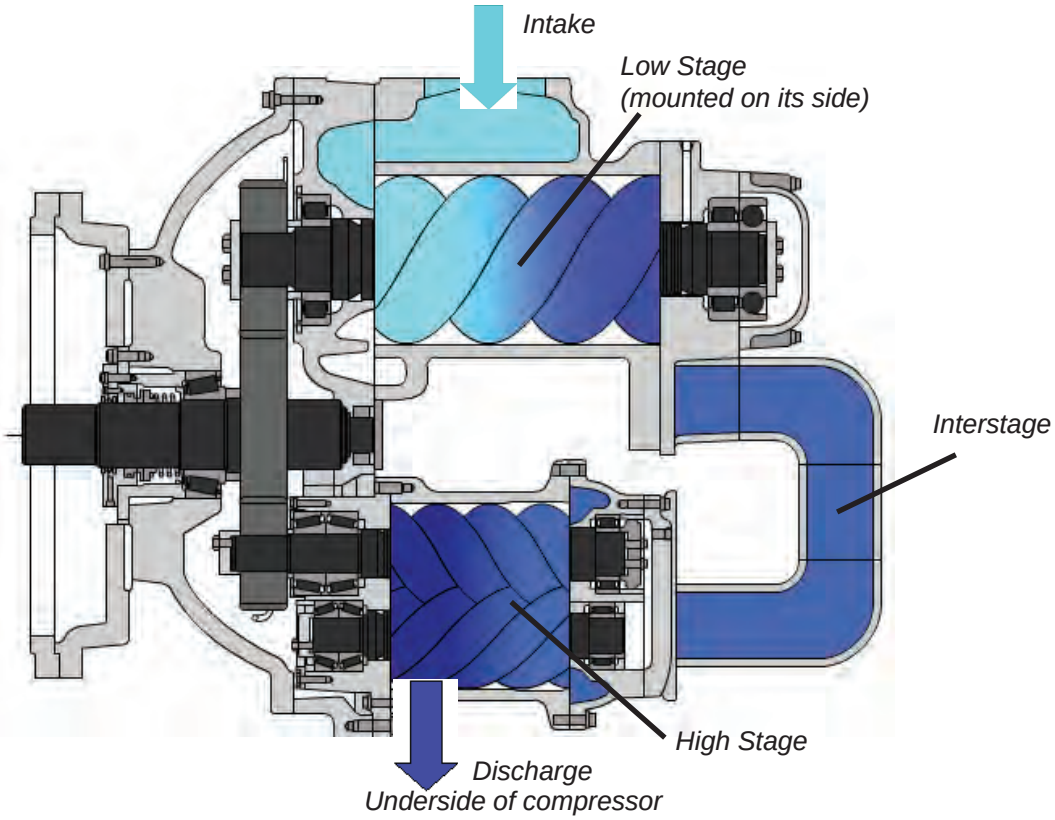


Fig. 4-3. Compressor Unit Air End (2 Stage only)

Compressor Discharge System, Functional Description

The Sullair compressor unit discharges a compressed air/fluid mixture into the sump. The discharge check valve prevents discharge air returning from the fluid sump to the compression chamber.

From the discharge valve the air/fluid mixture is directed to the sump. The sump has three basic function:

1. It acts as a primary fluid separator.
2. Serves as the compressor fluid sump.
3. Houses the final fluid separator.

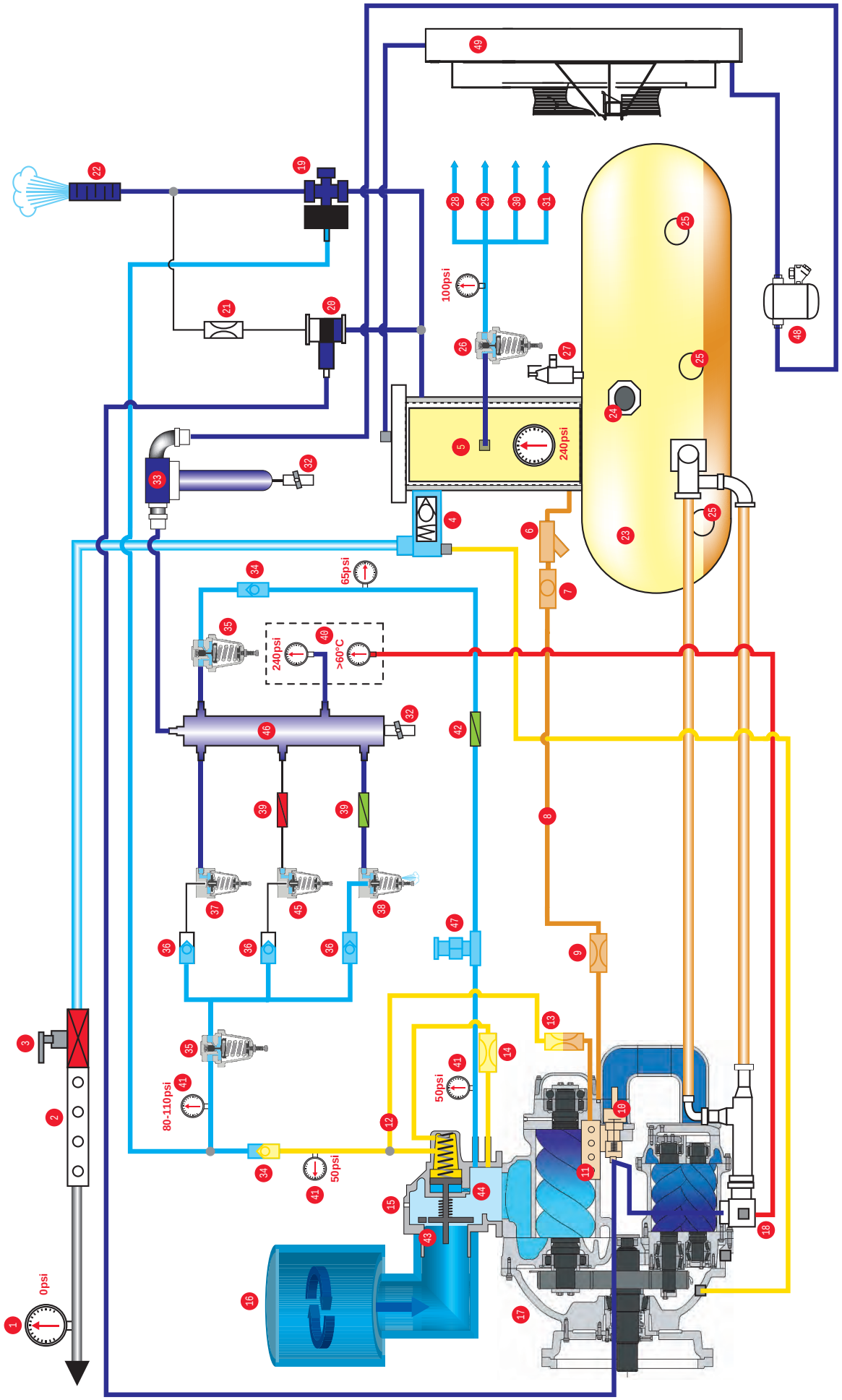
The compressed air/fluid mixture enters the sump. Change of direction and reduction in velocity by the air/fluid mixture results in the larger droplets of fluid to fall to the bottom of the sump. The fractional percentage of fluid remaining in the compressed air collects on the surface of the final separator element as the compressed air flows through the separator. As more and more fluid collects in the element surface, the fluid descends to the bottom of the separator. a return line (or scavenge tube) leads from the bottom of the separator element to the gearcase of the compressor unit. Fluid collecting on the bottom of the separator element is returned to the compressor gearcase. An orifice (protected by a strainer) is included in this return line to assure proper flow.

The sump is ASME code rated at 600psig (41.4 bar) as required by operating pressure. A minimum pressure valve is located downstream from the separator to assure the required minimum receiver pressure during all conditions. This pressure is necessary for proper fluid circulation and air/fluid separation.

A pressure relief valve (located on the wet side of the separator) is set to open if the sump pressure exceeds system rating. Also, a switch will shut down the compressor when the discharge or interstage temperature exceeds normal operating range. This is to be wired into the Vigilante control.Fluid is added to the sump via a capped fluid fill opening placed low on the tank to prevent overfilling the sump. A sight glass enables the operator to visually monitor the fluid sump level. The proper fluid level is halfway of the sight glass when unit is shutdown. DO NOT OVERFILL.

Compressor Air Circuit - 1475cfm @ 500psi

Run Unloaded (Low Mode)



Compressor Air Circuits - 1475cfm @ 500psi

Initial Start-up Procedure

The follow procedure should be used to make the initial start-up of your compressor:

Regulator Set Up

1. Ensure Inlet valve spring chamber is filled to the top of spring with compressor oil (AS 46)
2. On start up ensure Low/Medium/High mode switch is set to Low mode
3. Adjust Run/Start pilot regulator to 65psig (measure at regulator)
4. Adjust Low pressure regulator to hold 170psig (Run/Start off)
5. Do not load the compressor via the Start/Run valve until the 60°C is reached.

NOTE: Some PLC controlled machines will control start/run using PLC. See Vigilanti guide in the electrical section for more information.

6. Re-Adjust Run/Start pilot regulator to achieve 50psig at Port 2 on Inlet valve (measured at Port 2)
7. Switch to Medium mode and adjust Medium regulator to hold 350psig
8. Switch back to Low mode, adjust 80psig Reducing regulator to 80psig whilst blowing down to Low pressure (measure at Port 1 on Inlet valve)
9. Switch to High mode, set High pressure regulator to hold 500psig.
10. Set in Low mode, set at full eng revs, turn flushing air on, check that no air is exhausting from vent on Low pressure regulator (Increase slightly if exhausting)
11. Turn air off, check pressure, should be 230-240psig (Low mode)
12. While switch in the Low mode position, run compressor for 5 minutes before shutdown.
13. After initial run, check for loose fittings and leaks. Check fluid levels in engine and compressor fluid receiver/sump and refill as required.

Subsequent Start-up Procedure

On subsequent start, follow the procedure explained below:

1. Check engine oil, water and fuel levels, and check compressor fluid level.
2. Close service valve. Place selector in low pressure position.
3. Start engine as outlined.
4. Do not load the compressor via the Start/Run valve until the 60°C is reached.

NOTE: Some PLC controlled machines will control start/run using PLC. See Vigilanti guide in the electrical section for more information.

Shutdown Procedure

To shut the compressor down, follow the procedure explained below:

1. Close service valve and place selector in low pressure position.
2. Run compressor unloaded for 5 minutes before shutdown.

General Operating Instructions

1. DO NOT operate compressor at reduced speed (under 1200 RPM).
2. DO NOT operate with receiver/sump pressure less than 140 psig (9.6 bar)
3. At low air requirements, place selector in “low pressure” position.

NOTE: NEVER restart compressor until Receiver tank has completely blown down/vented (sump pressure 0 psig).

Separator/Receiver Tank

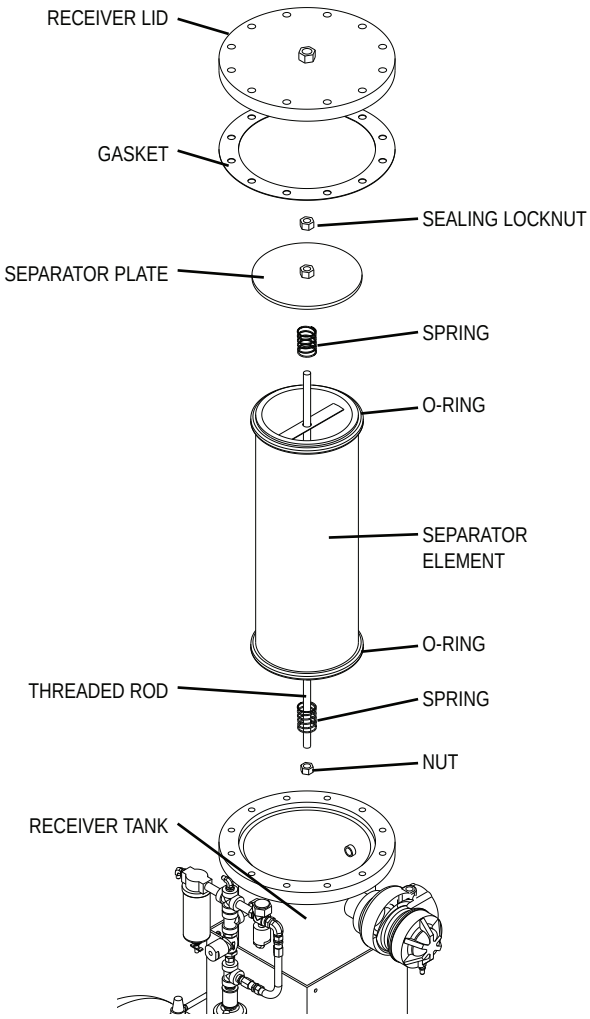
This is a sump for the compressor oil and a reservoir for the compressed air. The air / oil mixture is also separated within the tank. The primary separation occurs when the mixture enters the tank. The air / oil mix is directed towards the tank wall, which it hits, allowing the air velocity to slow and the oil to separate from the air and fall to the bottom of the tank. The air remains within the tank, with just a small amount of oil mist mixed with it. Once the main air discharge is opened, the air will pass up and through the inside of the separator element to the outside, which separates the remaining oil mist from the compressed air before being discharged down the air line.

The outside of the element is referred to as the ‘dry-side’, whereas the inside of the element is referred to as the ‘wet-side’.

The separated oil passes back through the circuit to the compressor via the thermal valve, cooler pack and the main filter.

Receiver Tank Assembly

Fig. 4-3 Separator



NOTE: Whenever the separator filter/element is replaced the 2 springs must be refitted as shown and there must be a staple in the gasket of the Top cover. This is to provide an earth in order to prevent static electricity building up and potentially causing the compressed air/oil mixture to ignite.

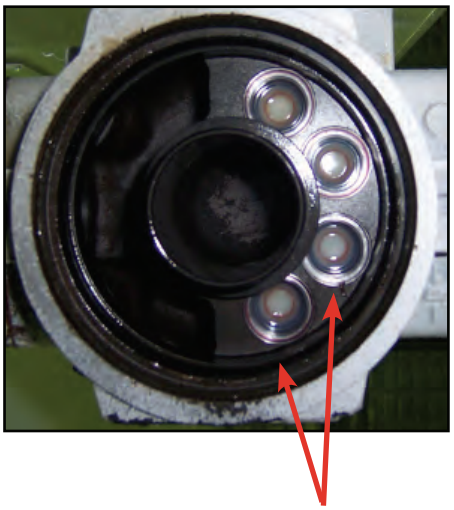
The Gasket is supplied with a staple in it.

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

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

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

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



Bypass check valves (4)

Changing Filter Elements

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

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

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

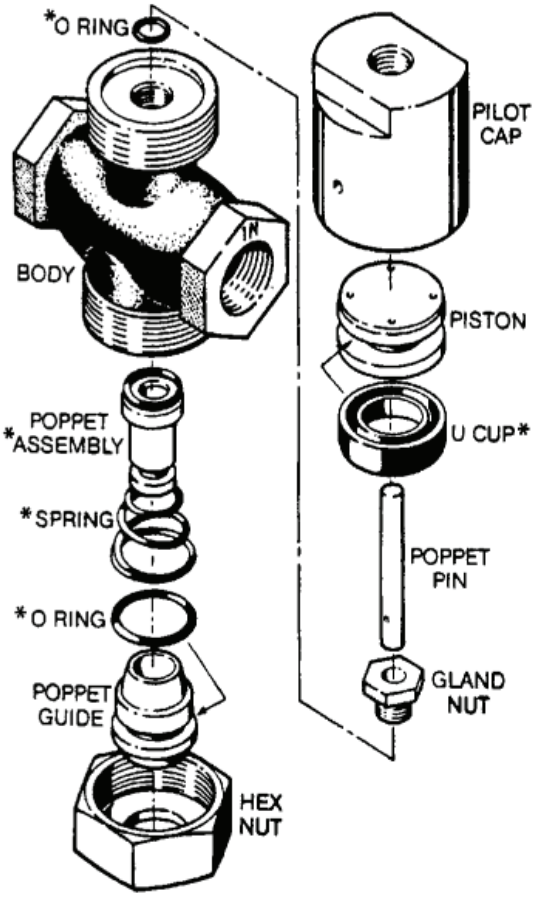
5. Lubricate element O-ring (2) with clean system fluid and push open end of filter element (5) straight onto the nipple in the head assembly (7). Clean out filter bowl (6) and lightly lubricate threads of filter cover assembly with clean system fluid. Screw cover assembly onto head assembly until it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

Running Blowdown Maintenance

When it is necessary to make repair on the running blowdown valve use repair kit and follow the instructions provided below.

1. Remove the hex nut from the bottom of the valve. The poppet guide which is secured by the hex nut is under slight spring tension.
2. Remove the poppet guide, poppet assembly and spring form the valve body.
3. Remove and discard the old O-ring on the poppet guide and replace it with the new O-ring provided in the kit. Be sure to lubricate the O-ring with a silicone base lubricant such as Parker Super “O” lube or an equivalent quality silicone grease.
4. Place the new spring and poppet assembly in the valve body as shown. Then place the poppet guide (with the O-ring in position) over the poppet assembly.
5. Push the hex nut down over the poppet guide and compress the spring while turning the hex nut until tight. Tighten securely with a wrench.
6. Remove the pilot cap from the top of the valve body and pull the piston out of the cap.
7. Remove the U-cup from the piston and replace it with the now one provided in the kit. The U-cup should be lubricated with a silicone base lubricant also.
8. Remove the gland nut from the valve body and pull the poppet pin out to allow access to the small O-ring in the top of the body.
9. Remove the small O-ring and replace it with the new one provided in the repair kit. The O-ring must be lubricated with a silicone base lubricant.
10. Replace the poppet pin and gland nut.
11. Place the piston with the new U-cup in position back in the pilot cap with the recessed centre showing at the valve body end of the cap.
12. Replace the pilot cap and tighten securely with a wrench. At this time the running blowdown valve is ready for operation.

NOTE: * Indicates item is in repair kit



Running Blowdown valve

Hydraulic Oil / Radiator Cooler Assembly

The Hydraulic Oil Cooler is mounted with the Radiator Cooler

NOTE: The Hydraulic Oil Cooler is the same model as the Compressor Oil Cooler. Therefor the service manual for the Compressor Oil Cooler also applies to the Hydraulic Oil Cooler.

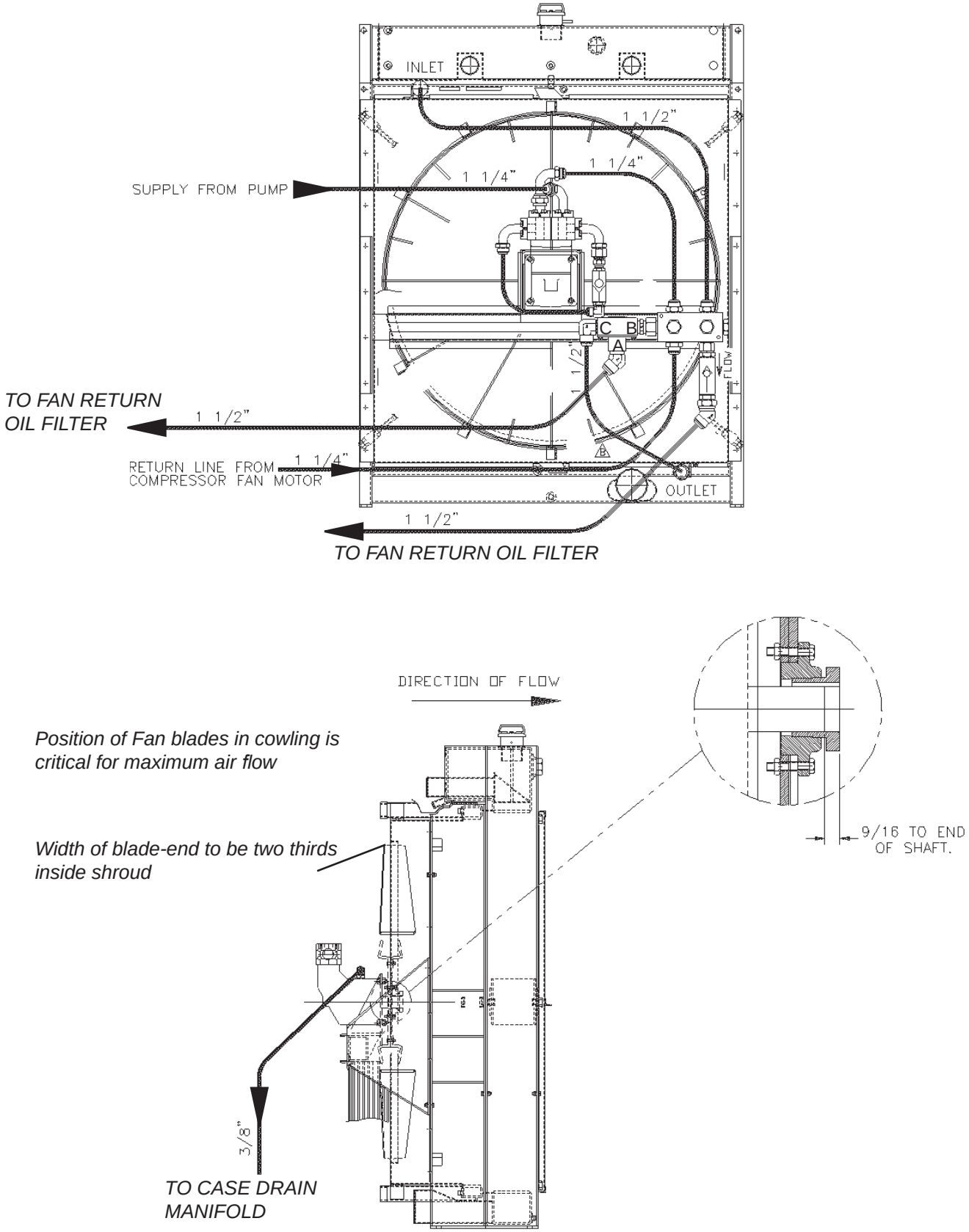
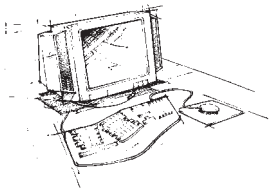


Fig. 4-42 Hydraulic Oil / Radiator Cooler Assembly

FEBRUARY 2004

CONTENTS

MESABI® Radiator Cores



This Service Manual is Available TO PRINT Online at WWW.Mesabi.com. A Service Video IS Also Available for viewing online, or request a copy from L&M Radiator.

DO NOT VOID WARRANTY. CONTACT L&M's CUSTOMER SERVICE DEPARTMENT PRIOR TO REPAIRS WHERE WARRANTY IS A POSSIBILITY.

MESABI® RADIATOR AND CORE 48-MONTH WARRANTY

L&M Radiator warrants the MESABI® Core and framework manufactured by L&M for a period of 18 months from date of invoice. Under this warranty, our obligation is limited to the repair or replacement (at our option) of products or parts manufactured by L&M that are proven to be defective in workmanship or material. L&M further warrants the MESABI® Core against seal leakage during normal use for 48 months from date of invoice on new cores with MESABI® fluorocarbon seals installed. Damage or leakage due to accidents, misuse, or corrosion is not warranted.

Warranty on components not manufactured by L&M Radiator shall be that of the individual manufacturers. Individual manufacturers operational and maintenance requirements must be met and their policies regarding shipment and inspection of claimed defective parts will apply.

L&M is not liable for consequential or incidental damages or costs. Consult factory before proceeding with warranty claims. This warranty supersedes all previously published warranties.

Water Tanks

The water for Dust suppression is stored in three (3) tanks. The main water tank (1,500 litres) is mounted to the mainframe under the Pump drive, the two (2) auxiliary water tanks (500 litres ea) are mounted behind each air filter assembly bracket. The water tanks are filled via a Y stainer (item No 3) and a 3 way valve (item no 4). Water from the auxiliary tanks is vented into the main tank via a solenoid valve (item 6) which is controlled by the PLC. The PLC will open the solenoid valve when the level in the main tank is at 75% and closes off the solenoid when the main tank level reaches 99%. The bit air must also be activated for the PLC to activate (open) the solenoid and allow transfer of water from the auxiliary tanks to the main tank. The Level sensor (item no 1) is an electronic level sensor which via the PLC monitors the tank water level (see section 8 for information)

An alarm will be flagged on the Vigilante alarm screen when the water level reaches 20% (for 20secs) in the main tank, the PLC will completely shut down the water injection, turkey's nest sprays and high pressure washer circuits when the main water tank level reaches 15%.

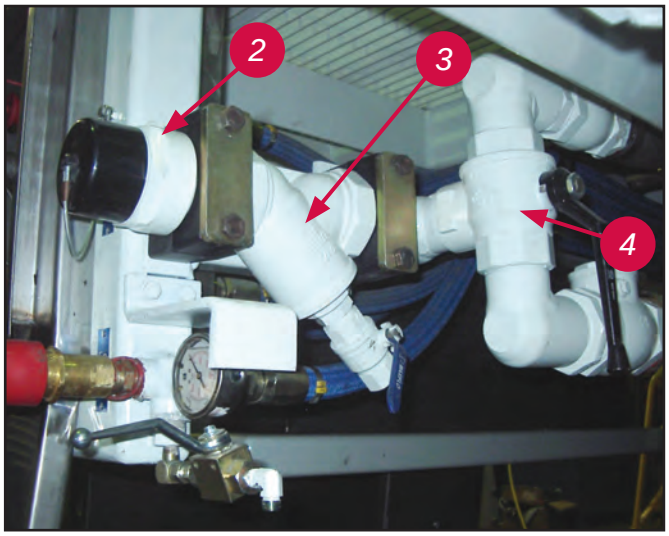


Fig 5-3. Water Tank Fill Point

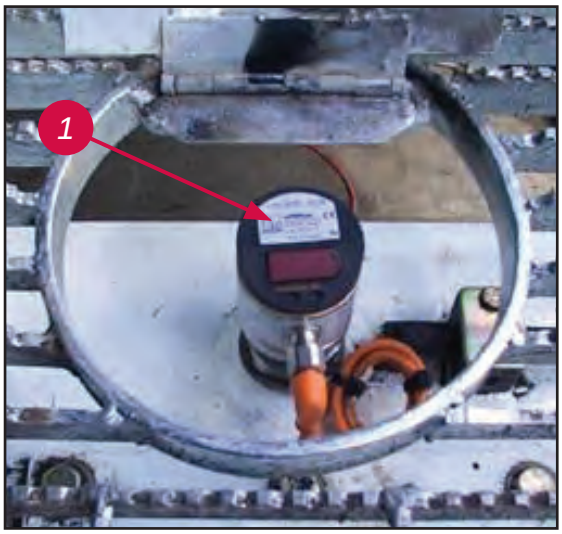


Fig 5-4. Water Level Transducer

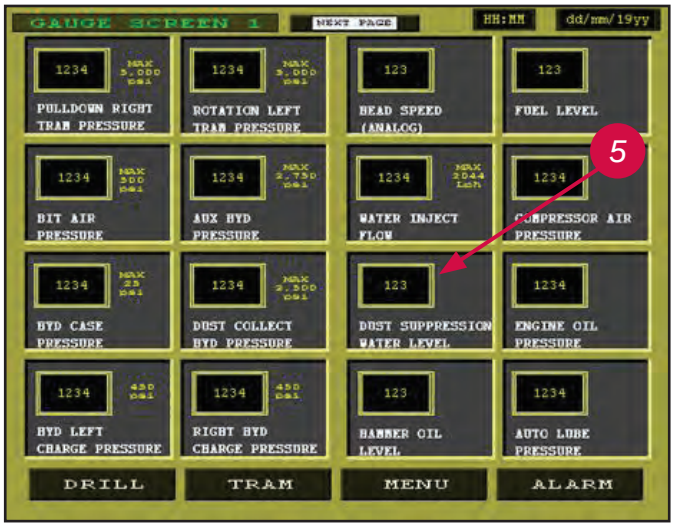


Fig 5-5. Water Level (Gauge Screen)

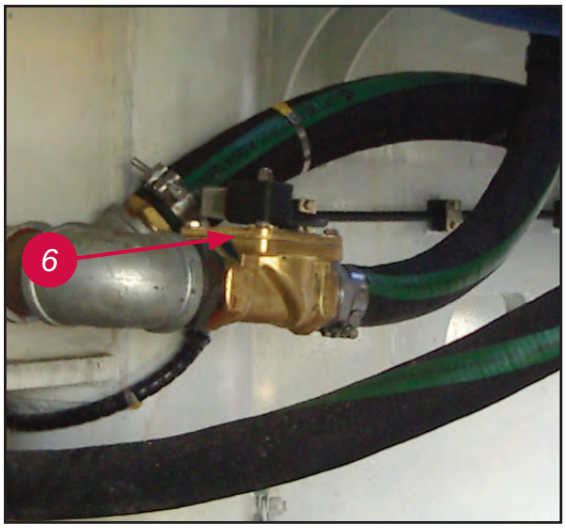


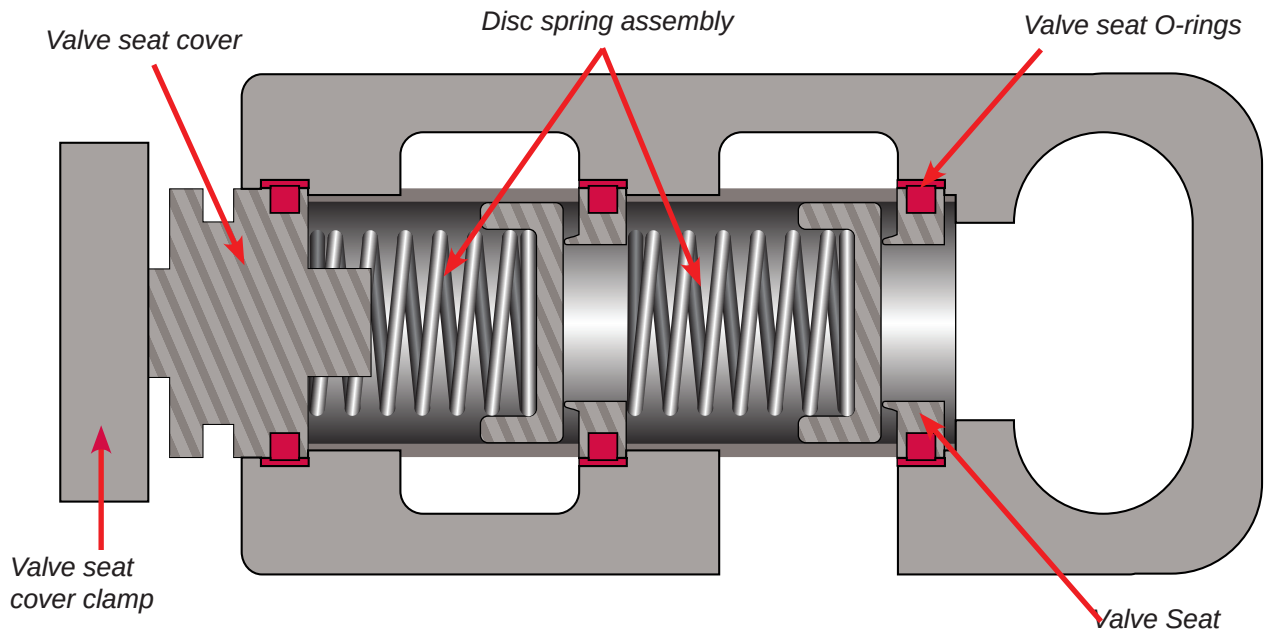
Fig 5-6. Water Solenoid Valve

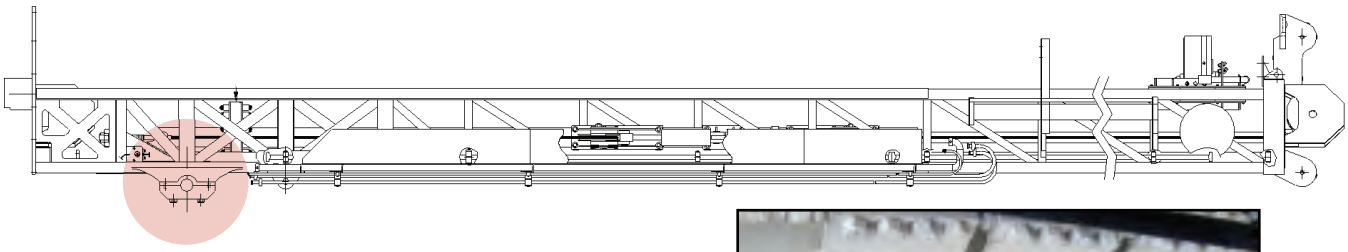
1. *Water Level transducer on main tank*
2. *Water Tanks Fill Point Front of Machine*
3. *Y strainer*
4. *Three way valve*
5. *Water injection tank level Gauge*
6. *Water tank top up Solenoid valve*

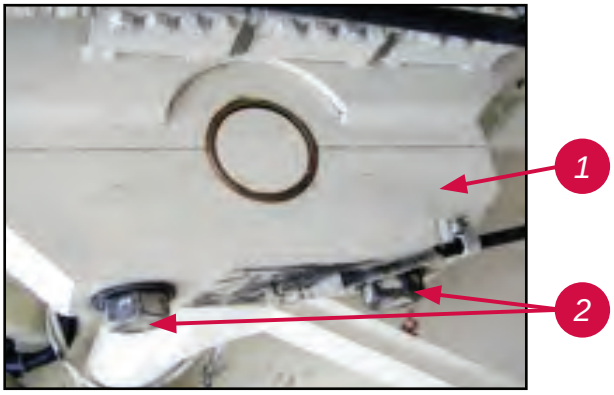
Replacing Suction and Discharge Valves

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

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





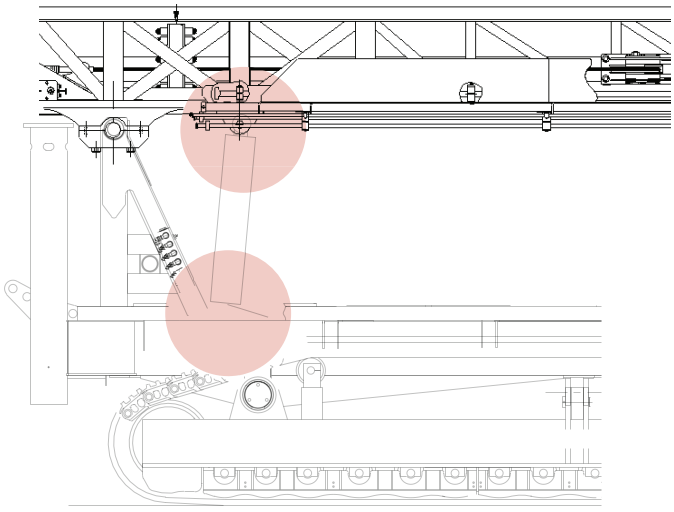


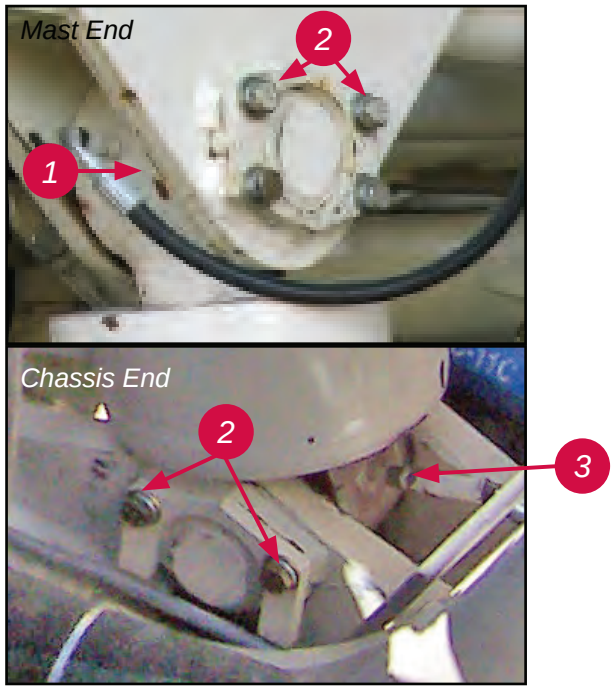
1. Mast Pivot Cap
2. Pivot Cap Bolts - 1 1/2" UNC - Torque setting 2371 ft/lb

Mast Pivot Caps

The pivot caps hold the mast assembly onto the 'A' frame. **Each service it is imperative that their bolt tension is checked, the bolts should be replaced if any movement is encountered to achieve the correct tension.** The 'A' frame pivot and the pivot cap must also be checked regularly for signs of wear. It is important that the pivot cap is greased, so make daily checks that the grease line is connected and supplying grease to the pivot cap.

WARNING: The bolts need to be checked daily to ensure that they have not come loose. The pivot cap has a pivot bush inside it, that the pivot pin rotates in. Every time the mast is removed these bushes MUST be checked and replaced if they are worn.





1. Rod end of elevate cylinder
2. Bolts
3. Counter balance valve

Check bolt tension each service

Mast Elevate Cylinders

The two cylinders are held by pins through a clevis and eye. Each service it is imperative that the bolt tension on the keeper plates is checked, and both the cylinder and rod ends. It is also important that the pins are regularly greased, so ensure that the grease lines are attached and are working.

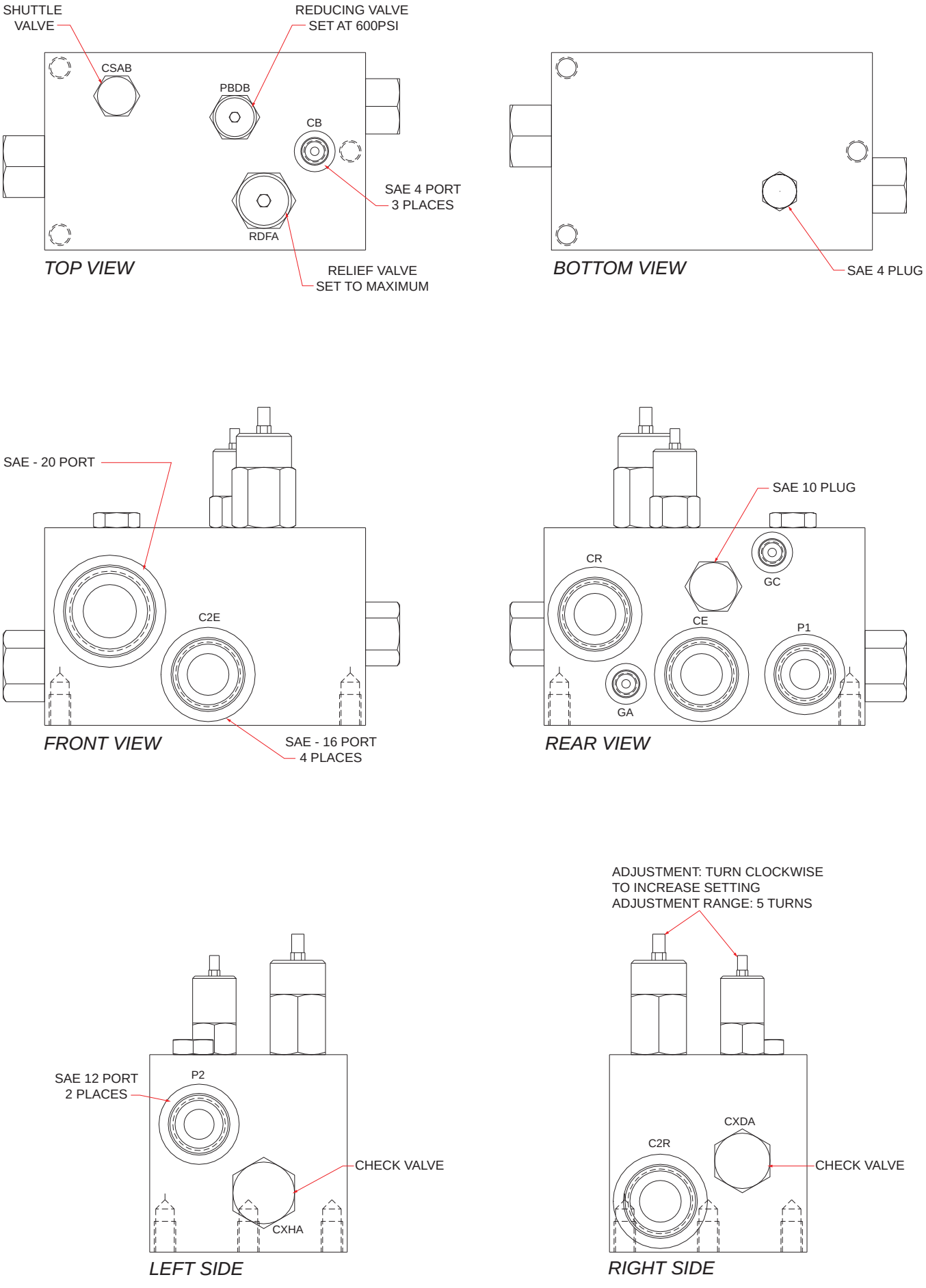


Fig. 6-4a Tensioner Manifold Port Identification (ref. 416113)

COTTA TOP MAST DRIVE

TM2132-4

INFORMATION CONCERNING THE REPAIR INSTRUCTIONS.

The disassembly and reassembly instructions are based on the design and manufacturing level of the Cotta transmission at the time of preparation of the repair manual.
Any different technical development of the product regarding design may require differing steps, which can be carried out by qualified personnel, with the help of assembly drawings.

The present disassembly and reassembly manual will lose it's legal liability with the publication of a new succession edition.

For any installation as well as start-up procedures of the unit, consult the information of the vehicle manufacturer!

COTTA TRANSMISSION COMPANY, LLC

1301 Prince Hall Drive

Beloit WI. 53511-4439

Edition 1.0

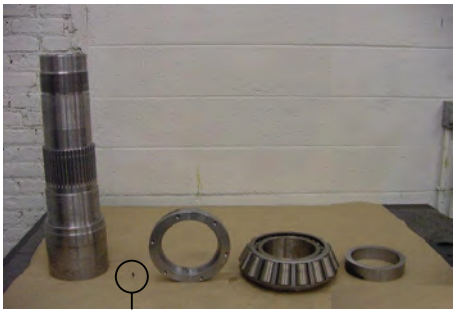
Cotta Service	Repair Manual	Cotta Service

TORQUE LIMIT TABLE GRADE 8 UNC

Bolt Torques									Grade 8 UNC Hex Head Cap Screws	
2A Threads				Non Plated		CAD Plated				
Bolt Size	Clamping Force, Lbs	Nominal Diameter	Safety Factor	Dry Seating torque ft-lbs	Lubed seating torque ft-lbs	Dry Seating torque ft-lbs	Lubed seating torque ft-lbs	Tensile Area, sq in	Width Across Flats	Area under head, sq in
8 - 32	1260	0.1640	1.75	3	3	3	3	0.0140		
10 - 24	1575	0.1900	1.75	5	4	4	4	0.0175		
1/4 - 20	2862	0.2500	1.75	12	11	10	9	0.0318	0.438	0.1170
5/16 - 18	4716	0.3125	1.75	24	22	20	18	0.0524	0.500	0.1398
3/8 - 16	6975	0.3750	1.75	43	39	35	33	0.0775	0.562	0.1631
7/16 - 16	9567	0.4375	1.75	68	63	56	52	0.1063	0.625	0.1880
1/2 - 13	12771	0.5000	1.75	104	96	85	80	0.1419	0.750	0.2908
9/16 - 12	16380	0.5625	1.75	150	138	123	115	0.1820	0.812	0.3225
5/8 - 11	20340	0.6250	1.75	207	191	170	159	0.2260	0.937	0.4535
3/4 - 10	30060	0.7500	1.75	366	338	301	282	0.3340	1.125	0.6542
7/8 - 9	41580	0.8750	1.75	591	546	485	455	0.4620	1.312	0.8894
1 - 8	54540	1.0000	1.75	886	818	727	682	0.6060	1.500	1.1631
1 1/8 - 7	68670	1.1250	1.75	1255	1159	1030	966	0.7630	1.687	1.4706
1 1/4 - 7	87210	1.2500	1.75	1771	1635	1454	1363	0.9690	1.875	1.8173
1 3/8 - 6	103950	1.3750	1.75	2323	2144	1906	1787	1.1550	2.062	2.1972
1 1/2 - 6	126450	1.5000	1.75	3082	2845	2529	2371	1.4050	2.250	2.6170
Coefficient of friction for dry, nonplated bolts =				0.195						
Coefficient of friction for oil lubed, nonplated bolts =				0.18						
Coefficient of friction for dry, CAD plated bolts =				0.16						
Coefficient of friction for oil lubed, CAD plated bolts				0.15						
Clamping force = (Proof tensile load) *(tensile area)/(safety factor)										
Torque = (Clamping force)*(Coefficient of friction)*(Nominal diameter)										
Nominal diameter & tensile area from " Mechanical Engineering Design", by Shigley/Minske 5th ed., pg. 328										
Shear area of threads = (Minor diameter)^2 * (pi/4)										
#8 - 1 1/2" proof tensile load = 120,000 psi (150 KSI min. tensile)										

Cotta Service	Repair Manual	Cotta Service

2. ASSEMBLY TRANSMISSION:



1 2 3 4 5

Fig.1

Output Shaft Assembly Components:

1. Output Shaft (itm. 03) 2. Roll Pin (itm. 30),
3. Spacer (itm. 10), 4. Bearing Cone (itm. 28),
5. Spacer (itm. 09)

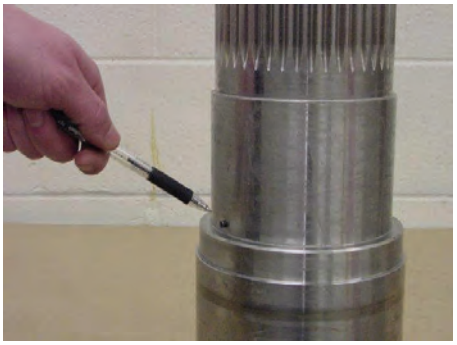


Fig.2

Pre-assemble Output shaft :

Drive Roll pin into hole until it stops.

Fig.3

Install spacer onto shaft until contact with the shoulder is obtained.

Heat or press spacer.
(See general working instructions.)

Note: Pay attention to orientation of spacer. Counter bore faces the shoulder of the shaft. Align notch in spacer with roll pin in shaft.

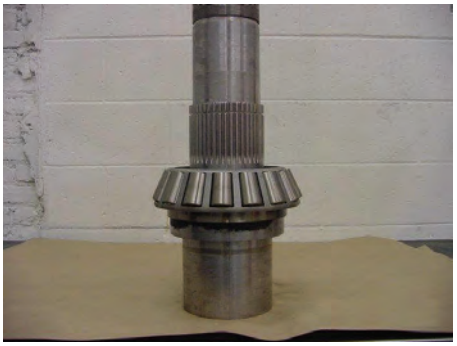


Fig.4

Install bearing cone onto shaft until contact with spacer is obtained.

Cotta Service	Repair Manual	Cotta Service

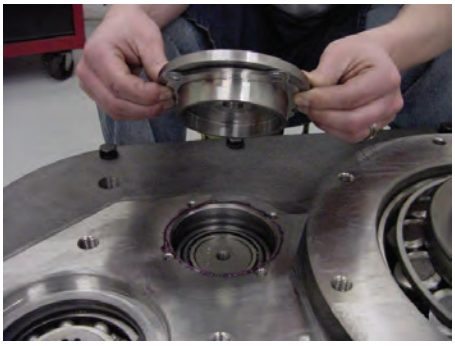


Fig. 39

Install and align needed shims onto end cover. Install end cover onto gearbox.

Fig. 40

Wet hex head bolts with sealing compound.
(Loctite no. 242)
Screw in hex head bolts and lock washers and tighten firmly.

Torque limit (3/8 x 16)……28 ft. lbs.

Fig. 41

Wet threads of plug with sealing compound.
(Loctite no. 545)
Install plug in bearing cover and tighten firmly.

Fig. 42

<u>Output seal Housing:</u> (Upper)

Install seal spacer into counter bore of output shaft until contact with the shoulder is obtained.

It is required to under cool the seal spacer prior to installation!

In addition, the following more detailed inspection should be performed monthly or at more frequent intervals dependent upon operating conditions and usage:

WARNING: When running out the wire rope, exercise care that the drum stops at the end of the rope run-out and does not begin rewinding in the reverse direction. Stop run-out before you reach the dead lays on the drum.

1. Run out wire rope completely and note conditions such as the number of broken wires in one lay, the reduction in rope diameter, corrosion, shortening of the lay and lubrication.
2. Run a soft cloth (preferably cotton) over the entire length of wire rope and examine rope lays which pick up threads of cloth. Determine the extent of damage due to broken wires or nicks.
3. Examine sheaves and drums for abnormal wear, breakage or deterioration. Replace any sheave or drum contributing to rope wear.
4. Examine the wire rope closely at the equalizer sheave location. Where wear is noted, the rope can be shortened from the dead end to change the point of wear. (However, two dead wraps must be maintained on the drum and required lift or operating range not reduced.)
5. Examine socketed fittings; if one broken wire is noted adjacent to the socket, resocket the wire rope.

The length and type of service and the severity of operation must be taken into consideration before determining the disposition of a wire rope which shows signs of damage. Where failure might endanger life of equipment, the rope must be condemned and replaced if any of the following conditions are discovered: (refer Fig 6-20)

1. Six wires broken in one rope lay.
2. Three wires broken in one strand in one rope lay
3. Wear of 1/3 the original diameter of outside individual wires.
4. Rope severely kinked, crushed, cut, or unstranded, or any other damage resulting in distortion of rope structure.
5. Considerable corrosion in the valleys between strands.
6. Reduction from nominal rope diameter of more than 1/16” (1.6mm) for 1” to 1-1/8” (25.4-28.6mm)

   When any of the above conditions exist, the wire rope must be condemned and replaced.

Procedures for the proper socketing and seizing of wire rope are pictorially shown in ANSI Standard M11. 1-1960.

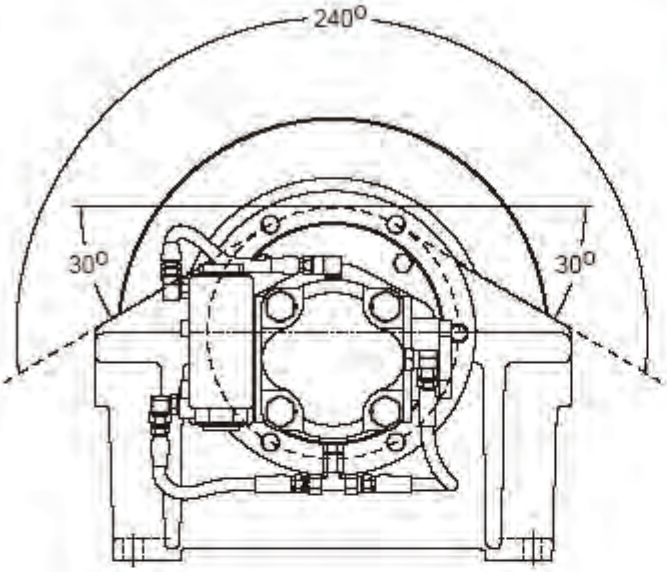
Lubrication is also important in the life of wire ropes, and can be accomplished with little trouble and expense. Regular, frequent applications of lubricant are preferred to infrequent heavy applications. Brush, spray, or dip the wire rope with cable lubricant M-2C-10 as required, depending on service conditions. The lubricant must be applied properly to coat the entire cable, not just the portion in most frequent use. Wire rope subjected to high operating temperatures or corrosive atmosphere should be lubricated semi-monthly.

Keep all wire ropes, including those infrequently used or those in storage, free of contaminants and well protected with lubricant. Dirty cables should be cleaned and flushed with M-99C30 penetrating oil; after one week, the entire surface should be brushed to remove all excess grease, accumulated dirt, metal rust, or other harmful contaminants.

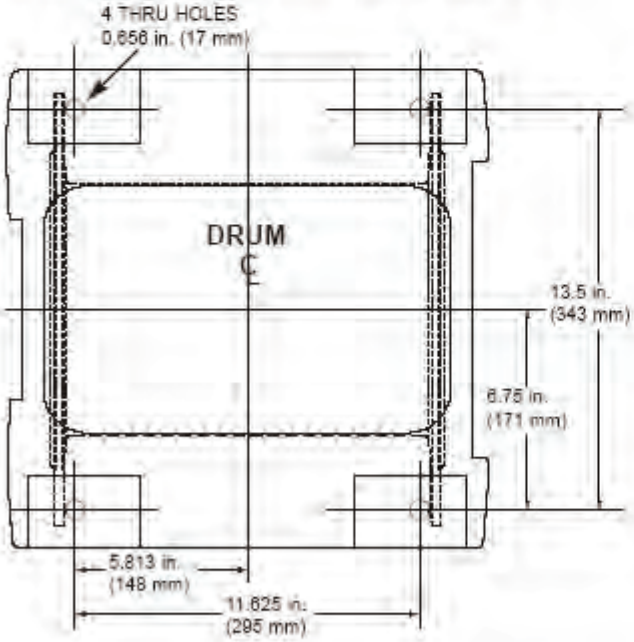
NOTE: NEVER subject a wire rope to shock loads or loads exceeding the safe load rating.

WINCH INSTALLATION

1. The winch should be mounted with the centerline of the drum in a horizontal position. The mounting plane of the base may be rotated in any position around this centerline.

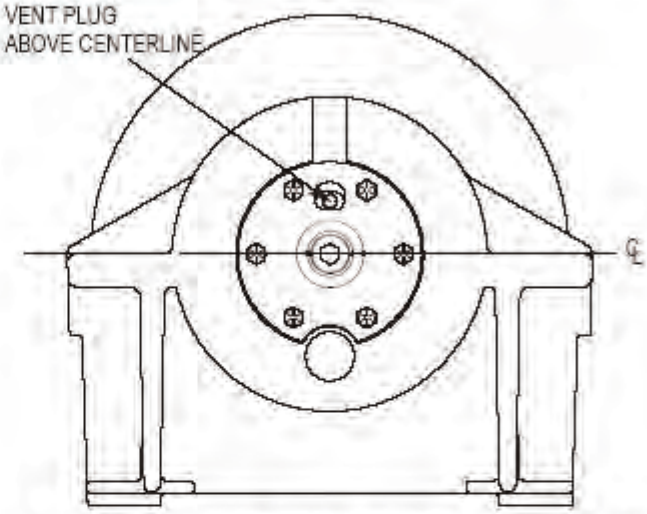


2. Because of the design of the mounting base, the direction of line pull should only be as shown in the above illustration. Line pulls in any other direction must be approved by BRADEN Engineering.



3. When mounting the winch, use all four (4) mounting holes and grade 5 (8.8) or better bolts and nuts. Tighten to recommended torque.

It is important that the winch is mounted on a surface that will not flex when the winch is in use, and cause binding of the gear train. Binding in the gear train will result in accelerated wear and heat. Also, be sure the winch is mounted on a flat surface. If necessary, use shim stock to insure the mounting surface is flat within 0.020 in. (0.5 mm).



4. The vent plug must always be located above the horizontal centerline. If the winch is mounted on a pivoting surface, be sure vent plug remains above the centerline in all positions. If necessary, reposition bearing support and vent plug as follows:

   A. Remove bearing support bolts.
   B. Rotate bearing support until vent plug is positioned correctly and bolt holes are aligned.
   C. Evenly tighten bolts to recommended torque.

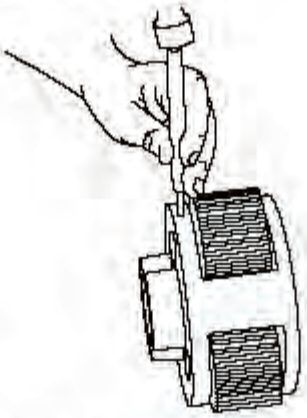
5. Hydraulic lines and components that operate the winch should be of sufficient size to assure minimum back pressure at the winch. The motor manufacturer recommends that the back pressure not to exceed 100 psi (690 kPa) for optimum motor seal life. 150 psi (1,030 kPa) is the maximum allowable back pressure. The standard winch is supplied with the motor internally drained. If high back pressures are encountered, the motor may be externally drained directly to tank to improve motor seal life. For back pressures exceeding 150 psi (1,030 kPa) consult BRADEN Service Department.

6. The winch should be mounted perpendicular to an imaginary line from the center of the drum to the first sheave to insure even spooling. Make certain the fleet angle does not exceed 1-1/2 degrees.

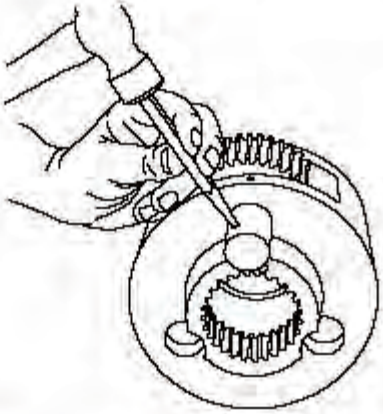
PLANETARY CARRIER SERVICE

OUTPUT PLANET CARRIER

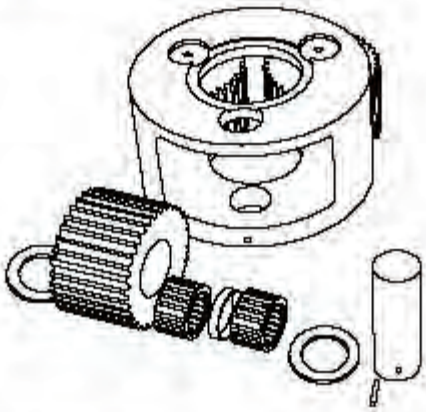
DISASSEMBLY



1. Remove the planet gears by driving the roll pins into the center of the planet shafts.

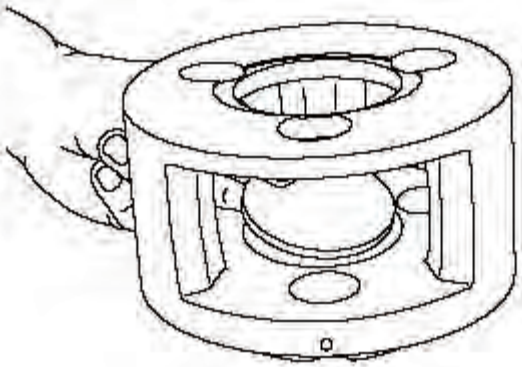


2. Use a punch to drive the roll pins from the planet shafts. Do not reuse the roll pins.

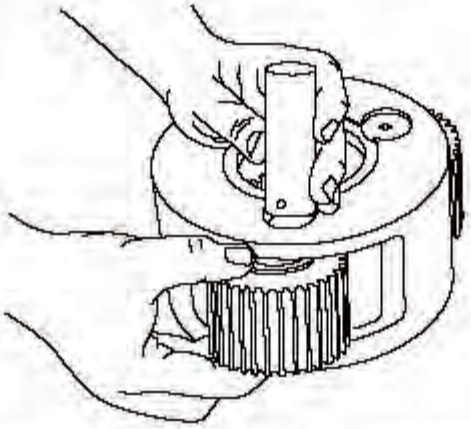


3. Now you can remove the planet shafts, bearings, spacer, thrust washers and gears. Thoroughly clean all parts and inspect for damage and wear. The bearing rollers should not exhibit any irregularities. If the rollers show any sign of spalling, corrosion, discoloration, material displacement or abnormal wear, the bearing should be replaced. Likewise, the cage should be inspected for unusual wear or deformation, particularly the cage bars. If there is any damage that will impair the cage's ability to separate, retain and guide the rollers properly, the bearing should be replaced. The thrust washer contact areas should be free from any surface irregularities that may cause abrasions or friction. The gears and shafts should be inspected for abnormal wear or pitting. Replace if necessary.

ASSEMBLY



1. Place the output planet carrier on workbench with splined coupling side down. Install output thrust plate in center of carrier.



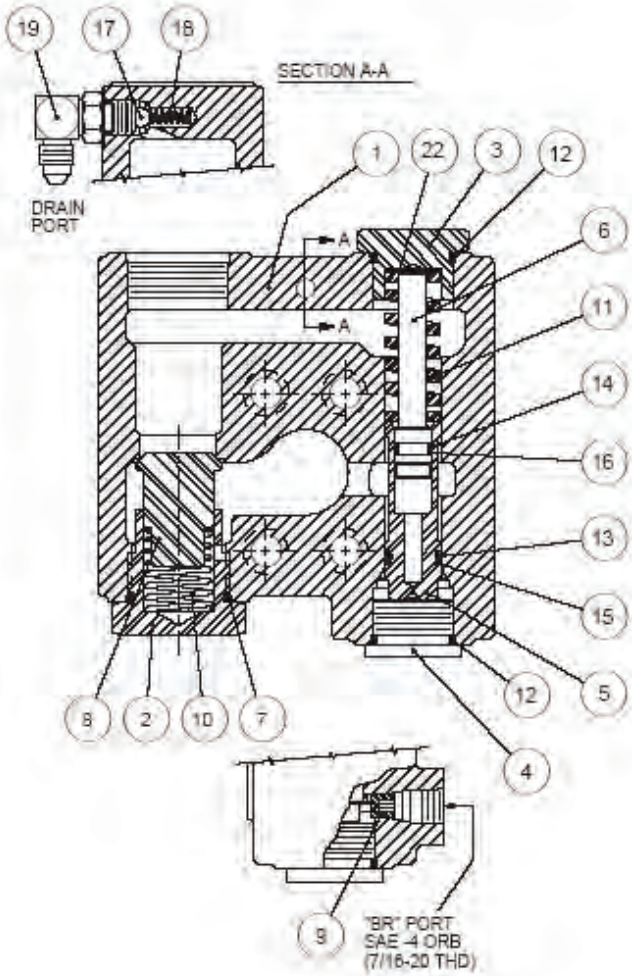
2. Insert two (2) bearings and a bearing spacer into a gear with the spacer between the bearings. Place a thrust washer on each side of the gear and position in a carrier opening. Slide the shaft through the carrier, thrust washer, bearing-gear sub-assembly and remaining thrust washer.

BRAKE VALVE SERVICE

The BRADEN brake valve is a reliable hydraulic valve with internal components manufactured to close tolerances. Due to the close tolerances and mating of components, the valve housing, spool, piston and check poppet are not available as replacement parts.

Before disassembling the brake valve, be sure you have conducted all applicable troubleshooting operations and are certain the brake valve is causing the malfunction.

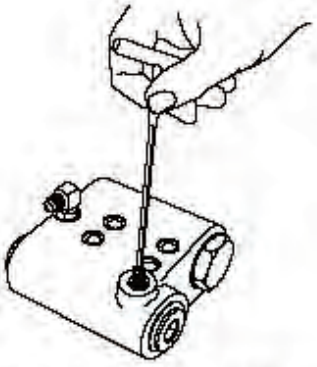
Thoroughly clean the outside surfaces of the valve and work in a clean dust free area, as cleanliness is of utmost importance when servicing hydraulic components.



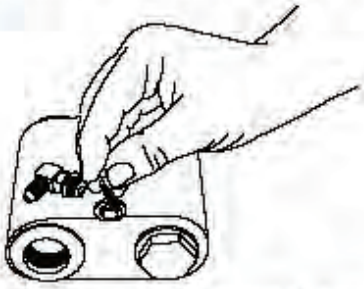
BRAKE VALVE ASSEMBLY		
ITEM	DESCRIPTION	QTY.
1	Valve Housing (NSS)	1
2	Check Valve Retainer (NSS)	1
3	Spring Retainer (NSS)	1
4	Plug (NSS)	1
5	Spool (NSS)	1
6	Damper Piston (NSS)	1
7	O-Ring	1
8	Check Valve Poppet (NSS)	1
9	Pilot Orifice	1
10	Check Valve Spring	1
11	Spool Spring	1
12	O-Ring	2
13	O-Ring	1
14	O-Ring	1
15	Back-up Ring	1
16	Back-up Ring	1
17	Check Ball (1/4 in.)	1
18	Check Ball Spring	1
19	Elbow Fitting	1
22	Shim	A.R.

NSS - NOT SERVICED SEPARATELY. REPLACE COMPLETE VALVE ASSEMBLY

DISASSEMBLY



1. Remove the pilot orifice from the brake release (BR) port using a 5/32 in. Allen wrench.



2. Remove the elbow fitting, motor drain check ball and spring.

3. Remove the spool spring retainer and spool spring. Check spring free length. Replace spring if less than 1-15/16 in. (49.2 mm) long.

Pipe Rack Bearings - Replace

This page is used to show the main components of the pipe rack assembly. The following pages show details of the various components for disassembly and assembly purposes. All reference numbers on the photo's correspond to the parts book drawings. Use the parts book for your specific machine for ordering parts and for detail views of the components shown here.

The photo's here show a 30 ft. (9 m) pipe rack. The only difference between this other versions is that the top tube (3) will be a different length.

1. Make sure machine is on solid level ground. Remove all pipe from carousel pipe rack and lower mast to horizontal position, resting on mast rest.
2. Support carousel top tube (3) and carousel pipe support (2) with a suitable lifting device. If you are only replacing the top carousel bearing, you can separate the top tube (3) from the carousel pipe support (2), see fig. 6-20.
3. Refer to following pages for individual bearing replacement procedures.

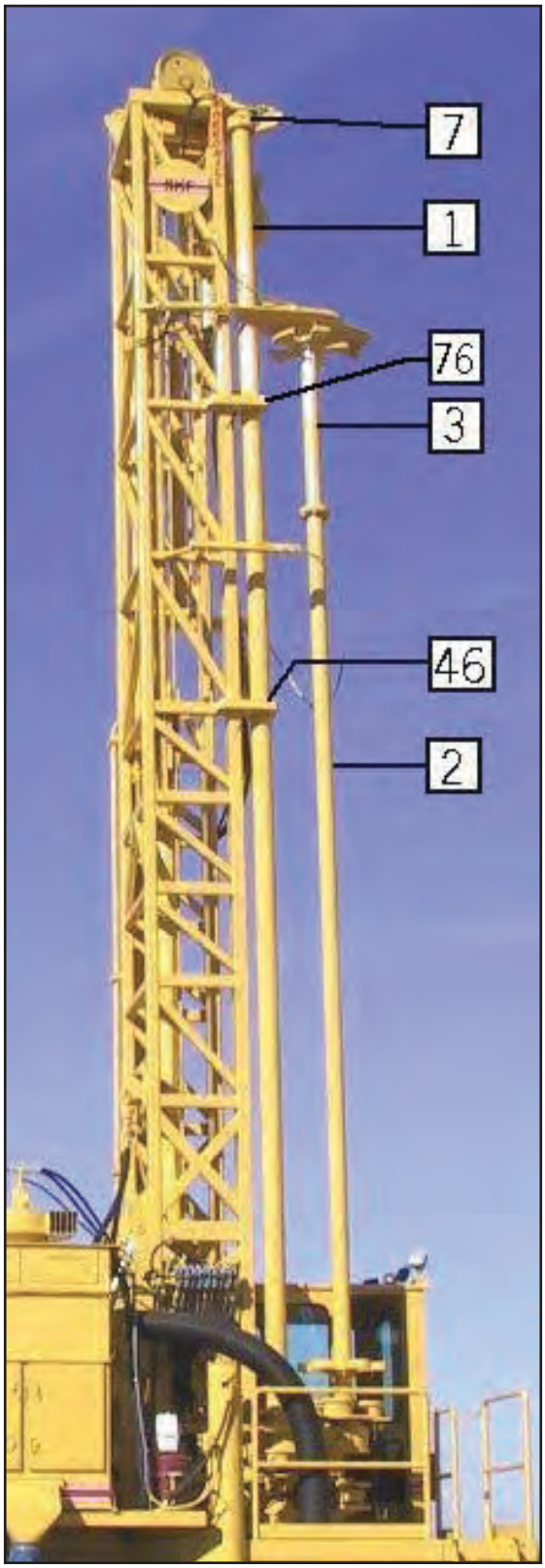


Fig. 6-19 Carousel Pipe Rack

1. Carousel Pivot Support
2. Carousel Pipe Support
3. Carousel Top Tube
7. End Cap, Upper Carousel Pipe Support
46. Mid-Point Support bracket
76. Mid-Point Support bracket with bushing

Section 7
Hydraulic Systems

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).

Routine Maintenance

Main Return and Case Drain filters do not normally require special attention except for periodic monitoring of the differential pressure warning device. Schedule replacement of filter element every six months or sooner, and have ample supply of spare elements available.

1. If external leaking is noted, replace O-ring at leak. For cover seal (4) and reservoir to head seal (6) leaks, replace O-rings. If leakage persists, check sealing surfaces for scratches or cracks; replace any defective parts.
2. Differential pressure devices actuate when the element needs changing or because of high fluid viscosity in “cold start” conditions. If visual indicator is fitted and actuates during “cold start”, reset by depressing the rubber button when the normal operating temperature is reached. If indicator actuates after resetting, replace element.

Changing Filter Elements

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

1. Shutdown machine and depressurize the system. Open shutoff valve on top of hydraulic tank (item 4, fig. 7-1). After pressure has bled off, close valve.
2. Unscrew and remove filter cover assembly (2) from head assembly (1), counterclockwise when viewed from above. Use a socket wrench on the hexagon on the filter cover assembly (2) to loosen the cover.

CAUTION: DO NOT attempt to clean or reuse element.

3. Remove filter element (7) and carefully inspect the surface for visible contamination. Normally no dirt should show, but visible dirt or particles can be an early warning of system component breakdown and can indicate potential failure. Discard both the filter element and its O-ring. The filter element is not cleanable. Any attempt to clean the filter element can cause degradation of the filter medium and allow contaminated fluid to pass through the filter element.
4. DO NOT run the system without a filter element (7) installed. Check that the O-ring (4 and 5) on the head assembly (1) is not damaged. Refer to parts manual for your specific machine for filter element part numbers.

NOTE: Item 5, lower cover O-ring must be in undamaged condition to ensure all return oil is filtered.

5. Lubricate element O-ring (8) with clean system fluid and push open end of filter element (7) straight onto the nipple in the head assembly (1). Lightly lubricate threads of filter cover assembly with clean system fluid. Screw cover assembly onto head assembly until it bottoms. O-ring sealing in not improved by overtightening.
6. After element change, start machine and check for leaks. When system reaches normal operating temperature, check that the electrical switch has not actuated.

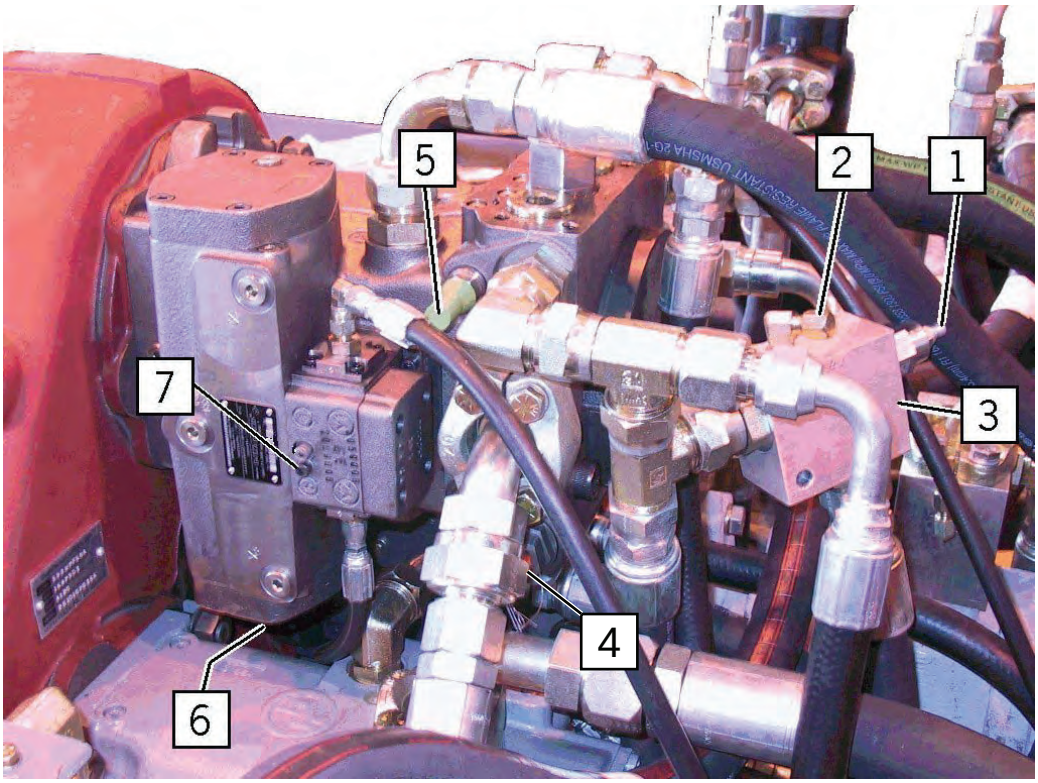


Fig. 7-7 AA4VG125 Left Track & Rotation Pump

1. *Charge Pressure Adjustment*
2. *Gauge Port (Charge Pressure)*
3. *Relief Valve*
4. *High Pressure Adjustment (for. & rev.)*
5. *Pressure Cutoff (POR) Adjustment*
6. *Mechanical Zero Adjustment (at bottom)*
7. *Hydraulic Centering Adjustment*

NOTE: Adjustments for Right Track & Pulldown pump, are same as Left Track & Rotation pump shown in fig. 7-3.

NOTE: This troubleshooting procedure applies to the AA4VG series pumps. All references to settings and port locations refer to the AA4VG pumps. However the basic troubleshooting procedure will apply to all hydraulic piston pumps.

1…Transmission does not Drive with the Prime Mover Running

1.1	Is there oil in the reservoir?	No	Fill reservoir.
		Yes	Proceed to step1.2.
1.2	Is engine clutch engaged?	No	Engage clutch.
		Yes	Proceed to step 1.3.
1.3	Is the hydraulic piping in accordance with the hydraulic circuit?	No	Correct the piping.
		Yes	Proceed to step 1.4.
1.4	Is the pump direction of rotation correct?	No	Fit pump having the correct direction of rotation.
		Yes	Proceed to step 1.5.
1.5	Is there a broken pipe, loose fitting or burst hose?	No	Proceed to step 1.6.
		Yes	Repair the fault.
1.6	Are the brakes released?	No	Check brake release circuit or mechanism.
		Yes	Proceed to step 1.7.
1.10	Is the suction line shut-off?	No	Proceed to step 1.11.
		Yes	Open valve
1.11	Is the charge pump suction pressure within the recommended limits? (0.8 bar abs or 6.3 in-Hg.)	No	Proceed to step 1.12.
		Yes	Proceed to step 1.16.
1.12	Is the suction filter element plugged.	No	Proceed to step 1.13.
		Yes	Replace filter element
1.13	Does the reservoir design ensure that suction pipe is always covered with oil.	No	Correct the reservoir design.
		Yes	Proceed to step 1.14.
1.14	Is the suction pipe size adequate for the flow?	No	Run at lower speed and return to point 1.7, or rework suction piping.
		Yes	Proceed to step 1.15.
1.15	Is the reservoir air breather blocked or undersized?	No	Proceed to step 1.16.
		Yes	Clean or Replace air breather.
1.16	Remove charge pressure relief valve cartridge and inspect. Is it damaged?	No	Refit cartridge and proceed to step 1.17.
		Yes	Fit a new cartridge and return to step 1.7.
1.17	Remove and inspect charge pump assembly. Is it damaged?	No	Proceed to step 1.18.
		Yes	Repair or replace damaged components and return to step 1.7.
1.18	Is the charge pump installed for correct direction of rotation?	No	Refit charge pump. Return to step 1.7.
		Yes	With proper charge pressure, and transmission still does not operate, proceed to step 1.19.

Pump Control

1.19	Is control medium connected to pump control? HD…pilot pressure HW…mechanical cable or linkage. EP…12 or 24 volts dc, electrical current.	No	Connect appropriate medium and check that control signal is actually being applied to the pump control valve.
		Yes	Proceed to step 1.20.
1.20	If variable displacement motors are installed, is maximum displacement selected? (If not done automatically).	No	Select maximum displacement.
		Yes	Proceed to step 1.21.
1.21	Actuate the control in both directions. Does pump stroke? Does it go to full stroke?	No	Refer to the pump service manual and then proceed to step 1.22.
		Yes	Operate the transmission.
1.22	Remove stroking orifices in X_1 and X_2. Stroke the pump in both directions. Do the pressures at X1 and X2 Alternate between 30 and 250 psi during cycle?	No	Remove control module and replace it with a new unit. Repeat step 1.21.
		Yes	Proceed to step 1.23

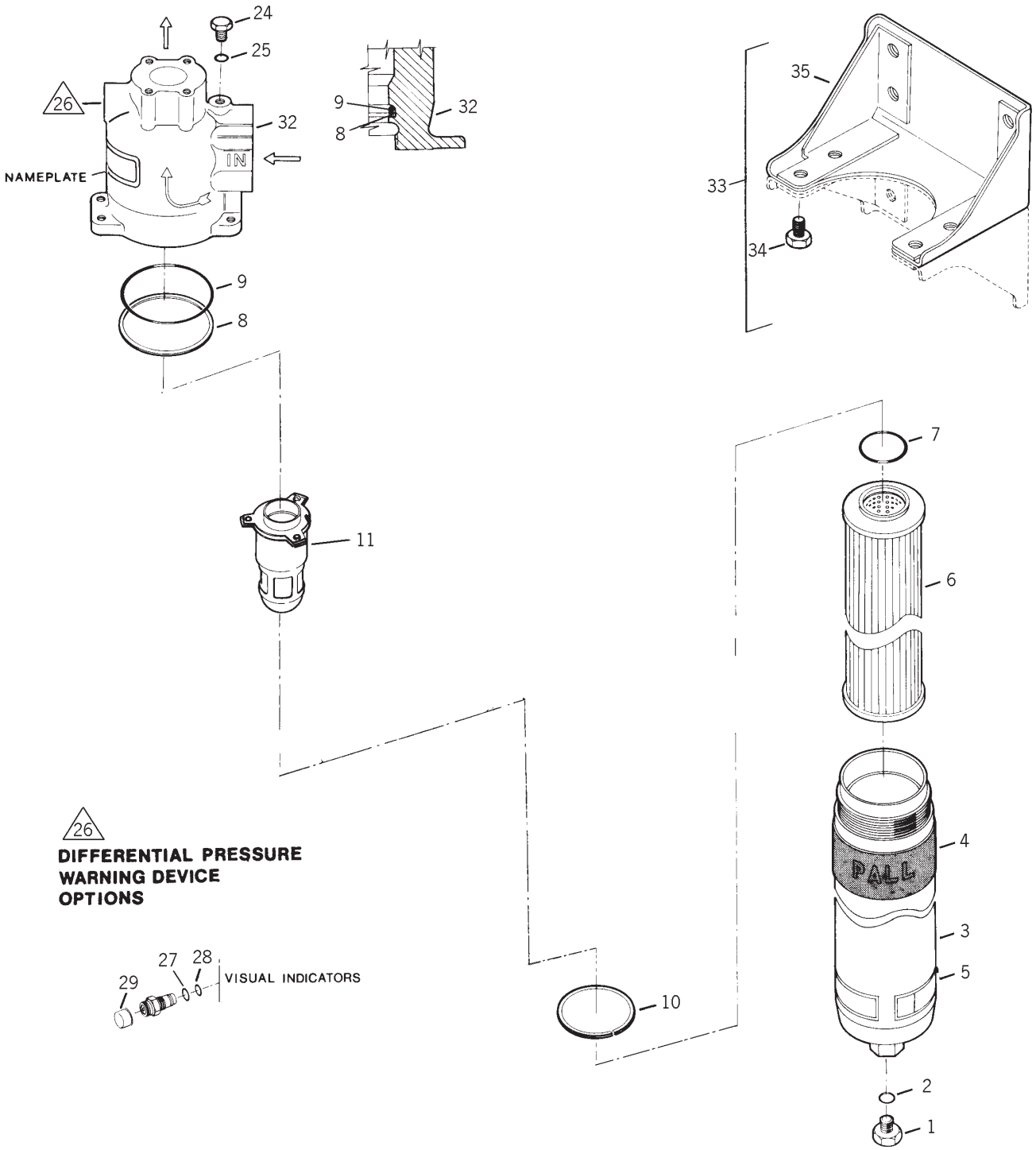
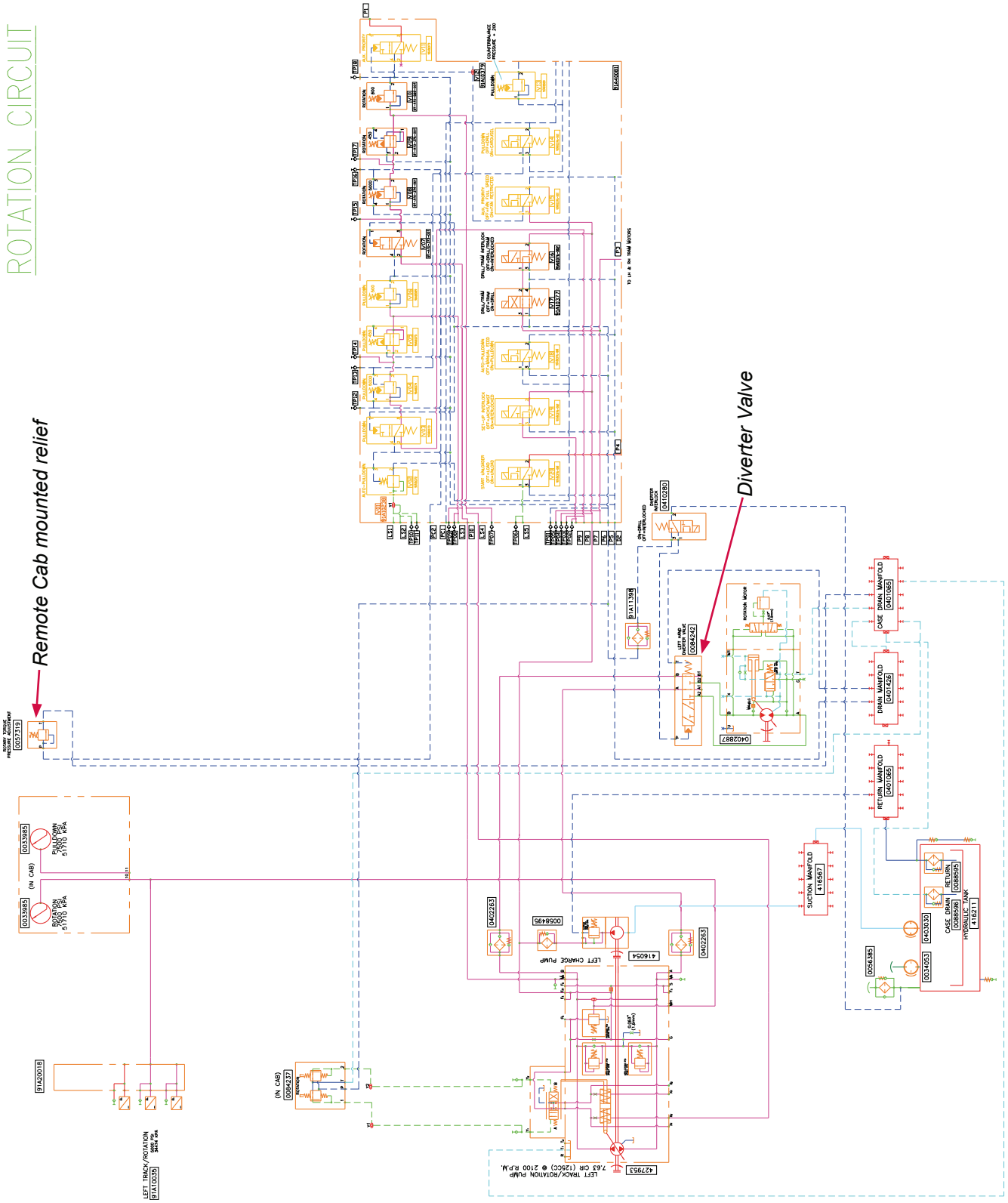


Fig. 7-28 Loop Filter - Exploded View (PIHC-SI-966B)

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*
27. *O-Ring*
28. *O-Ring*
29. *Dust Cover*
32. *Head*


ROTATION CIRCUIT
Remote Cab mounted relief
Diverter Valve

Variable Displacement Motor AA6VM

Start-Up Procedure

The following procedure has been developed based on experience with most types of applications, however certain applications may require a departure from or variation to this procedure.

For the start-up of new or overhauled installations.

1. If the prime mover is:

   Internal combustion engine: (Diesel, gasoline or LP)- Remove the coil wire, close the injector rack or leave the gas turned off and turn the engine over until the charge pressure reaches 50 psi or more.

   Electric Motor: Jog the starting circuit until the charge pressure reaches 50 psi or more.

2. Start the prime mover, and if possible, maintain a pump speed of approximately 750 rpm for 5 minutes. This will allow the system to be filled.

3. Listen for any abnormal noises.

4. Check for oil leaks.

5. Run prime mover to 1800 rpm. (Adjust to the design speed if less than 1800 rpm.)

6. Set charge and pilot pressure as required for the application. (Refer to circuit schematic)

7. Bleed the pilot lines by loosening the connections on the motor "X" port(s) and then actuate the remote control unit in both directions until oil seeps from the connections. Also bleed the pilot lines to the pump (if any).

8. Retighten all connections.

9. Operate the control to work the hydrostatic transmission at approximately 20% of maximum speed.

10. Deaerate system by venting a bleed valve or by cracking the highest connection until fluid seeps out without bubbles.

11. Check fluid level and add fluid if necessary.

12. Continue operating transmission and gradually increase to full speed, still with no load.

13. With controls neutralized, check for creep in neutral. If evident, center the control in accordance with the instructions in the pump service manual.

14. Check that the controls are connected so that the transmission operates in the correct direction related to the control input.

15. Continue to monitor all pressure gauges and correct any irregularities.

16. Apply brakes and set high pressure relief valves (and pressure override if installed) to levels required for the application by stroking the pump to approximately 20% of maximum displacement.

17. Check security of high pressure connections.

18. Check oil level and temperature.

19. Remove and inspect high pressure filter elements, if so equipped. Replace with new elements.

20. Operate transmission under no load conditions for about 15 minutes to stabilize the temperature and remove any residual air from the fluid.

21. Again remove and inspect high pressure filter elements, "if so equipped." If clean, the high pressure, bi-direction filters may be removed from the circuit. If contamination is still evident, fit new elements and continue flushing until the system is clean.

22. Replace the elements in the charge pump suction or pressure filter, whichever is installed.

23. Operate the transmission under full and normal load conditions.

24. Erratic operation may indicate there is still air trapped in the system. By working the pump control to one or both sides the remaining air can be eliminated. The system is free of air when all functions can be operated smoothly and when the oil in the reservoir is no longer aerated. (Usually less than 1 hour of operation)

Note:
If, after following the Pre-Start and Start-up procedures, the transmission does not perform correctly, refer to the relevant sections of the trouble-shooting procedures on pages 17, 18 & 19.

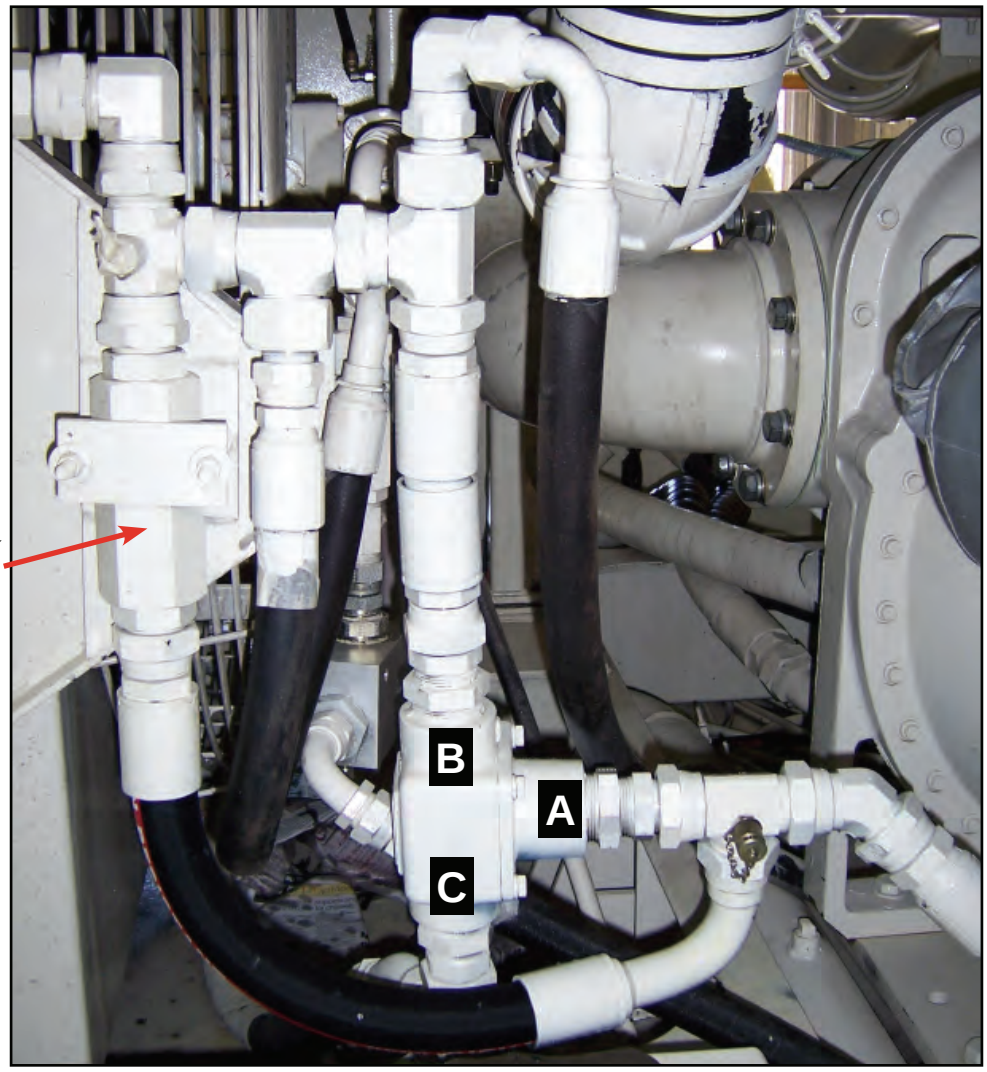
Start-Up Procedure

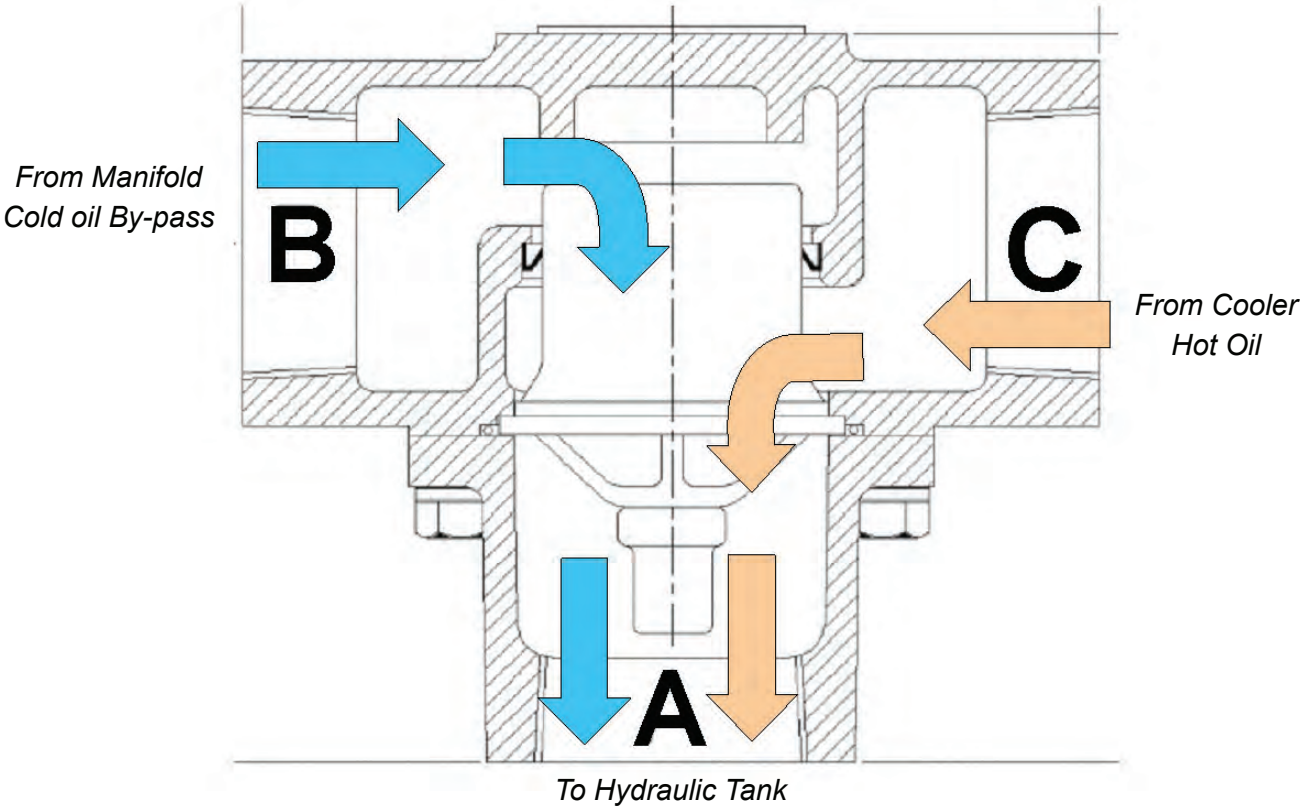
The following procedure has been developed based on experience with most types of applications, however certain applications may require a departure from or variation to this procedure.

For the start-up of new or overhauled installations.

1. If the prime mover is:

   Internal combustion engine: (Diesel, gasoline or LP) - Remove the coil wire, close the injector rack or leave the gas turned off and turn the engine over until the charge pressure reaches 50 psi (3.5 bar) or more.
2. Start the prime mover, and if possible, maintain a pump speed of approximately 750 rpm for 5 minutes. This will allow the system to be filled.
3. Listen for any abnormal noises.
4. Check for oil leaks.
5. Run prime mover to 1800 rpm. (Adjust to the design speed if less than 1800 rpm).
6. Set charge and pilot pressure as required for the application (Refer to circuit schematic).
7. For the HD control, bleed the pilot lines by loosening the connections at Y1 and Y2 (Model AAVG pumps) and then actuate the remote control unit in both directions until oil seeps from the connections.
8. Retighten all connections.
9. Operate the control to work the rotation, feed or tram function at approximately 20% of maximum speed.
10. Deaerate system by venting a bleed valve or by cracking the highest connection on the pumps until fluid seeps out without bubbles.
11. Check fluid level and add fluid if necessary.
12. Continue operating transmission and gradually increase to full speed, still with no load.
13. With controls neutralized, check for creep in neutral. If evident, center the control in accordance with the instructions in the pump service manual.
14. Check that the controls are connected so that the transmission operates in the correct direction related to the control input.
15. Continue to monitor all pressure gauges and correct any irregularities.
16. Apply brakes and set high pressure relief valves (and pressure override if installed) to level required for the application by stroking the pump to approximately 20% of maximum displacement.
17. Check security of high pressure connections.
18. Check oil level and temperature.
19. Remove and inspect high pressure filter elements, if so equipped. Replace with new elements.
20. Operate transmission under no load conditions for about 15 minutes to stabilize the temperature and remove any residual air from the fluid.
21. Again remove and inspect high pressure filter elements, if so equipped. If clean, the high pressure, bi-direction filters may be removed from the circuit. If contamination is still evident, fit new elements and continue flushing until the system is clean.


By-pass Check
Valve 45 PSI
B
A
C


From Manifold
Cold oil By-pass
B
C
From Cooler
Hot Oil
A
To Hydraulic Tank

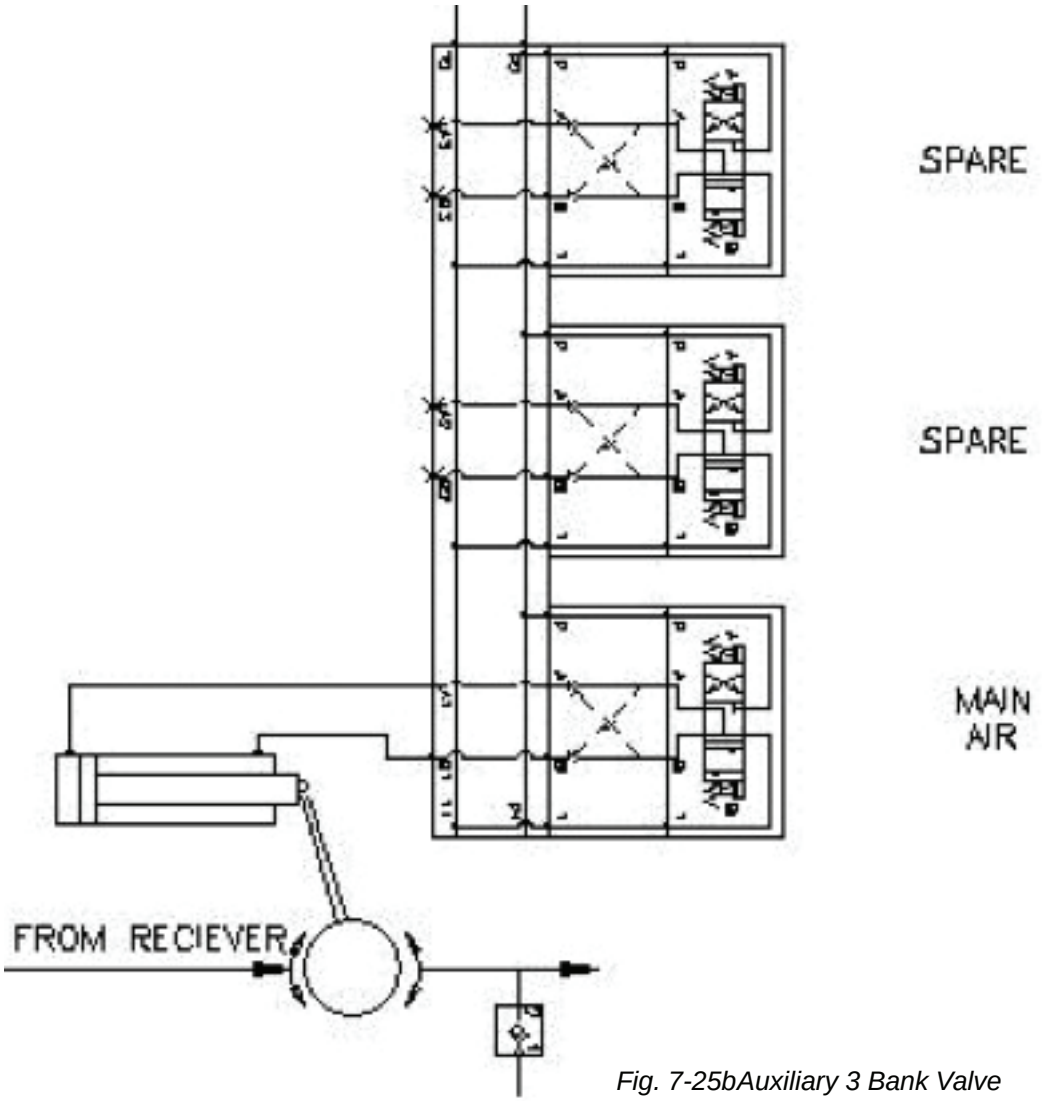
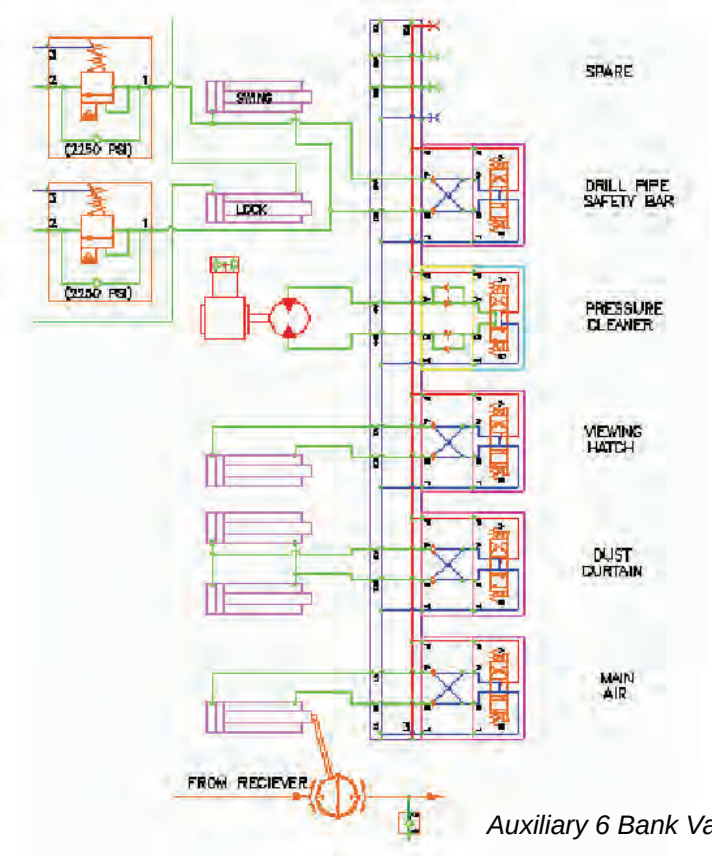


Fig. 7-25bAuxiliary 3 Bank Valve



Auxiliary 6 Bank Valve (Optional)

Reassembly

40 Install tie bolts. If you use alignment Studs, install 2 bolts opposite the studs. Finger tighten the bolts. Remove the alignment studs and replace with the two remaining bolts. Torque all four bolts alternately to 50 Nm [450 lb-in].

41 Install seal on case drain plug then install in valve housing. Torque to 6 Nm [50 lb-in.]

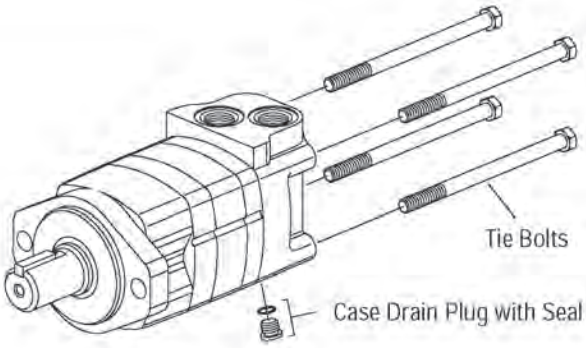
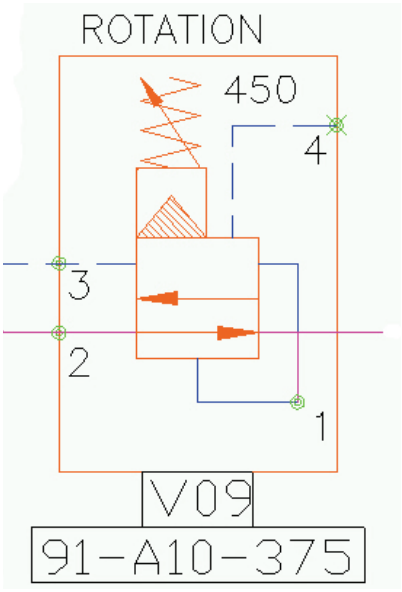


Figure 18

V09. Surge Protection Pressure Reducing/Relieving Valve

This valve prevents over pressure of the servo when **V08** valve pressure is reached. Setting is equal to charge pressure - 450psi, so this prevents pressure at **X3** on the L/H tram/rotation pump from surging higher than charge pressure, which would reverse the rotation. Flow is from Port 2 to Port 1 but is set using the relieving feature, which is from Port 1 to Port 2.



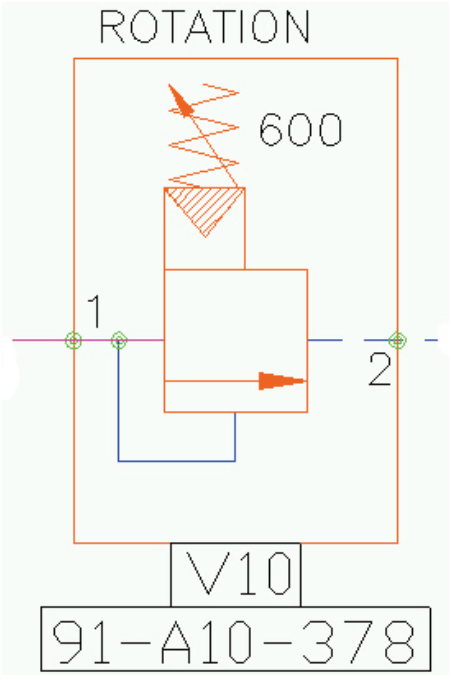
V09. Setting

1. Jack the machine until the tracks are clear of the ground.
2. Connect a pressure gauge (0-580psi) to test point TP07.
3. Activate tram lockout override.
4. With engine RPM at maximum, operate the left track at full speed in the direction which indicates pressure at TP07.
5. Reduce the setting of V09 until the pressure drops then increase until the pressure stops rising. The pressure should read 450psi. If 450psi cannot be reached the charge pressure may be low, V10 may set to low, or the pump controller is not allowing the pump to reach full stroke.

Fig. 7-10L V09 Surge Protection Pressure Reducing/Relieving Valve

V10 Surge Protection Relief Valve

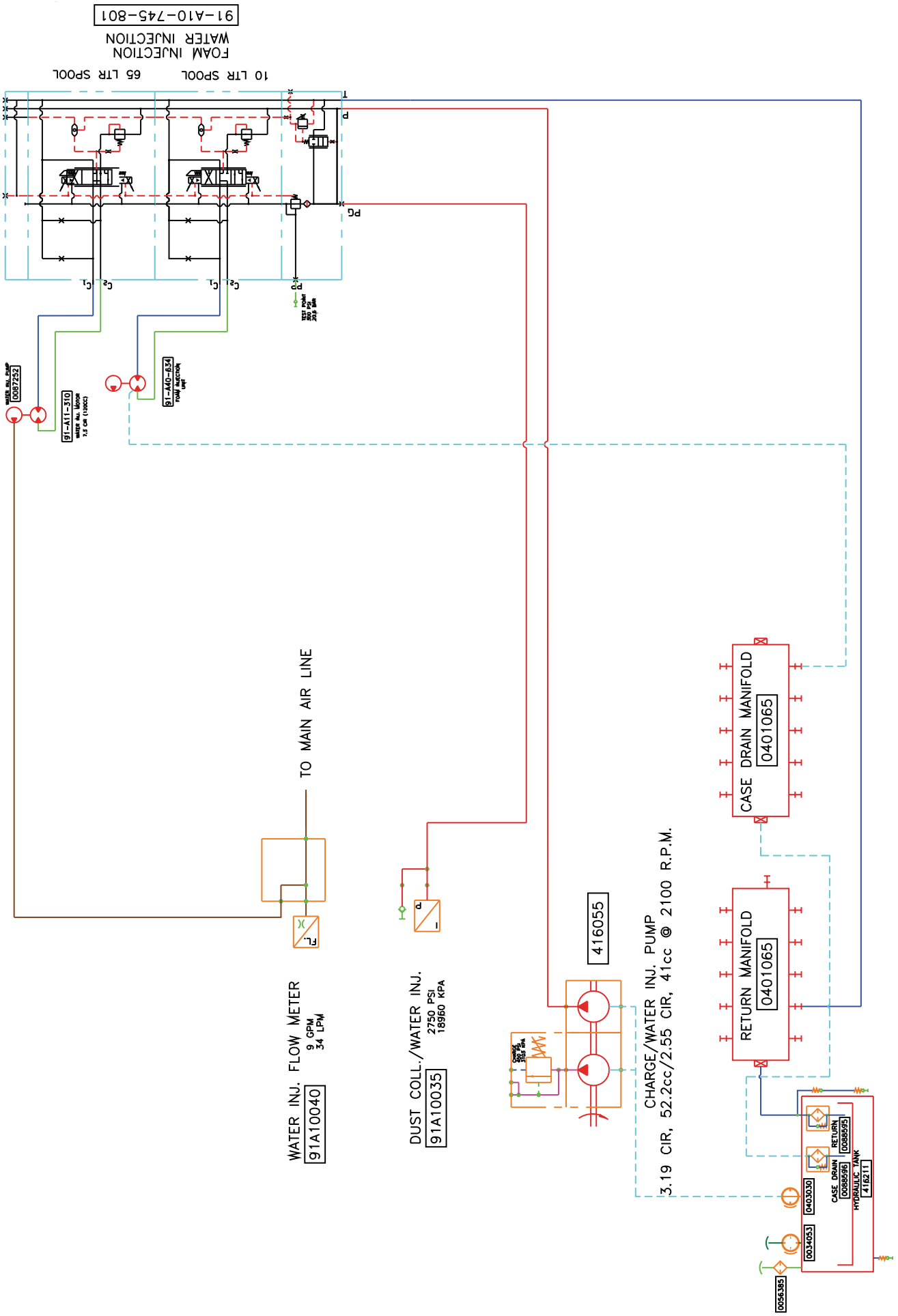
This valve provides back up protection for the **V09** Valve to prevent over-pressure at **X3**. Setting is 500psi and the valve relieves from Port 1 to Port 2.



V10. Setting

1. Jack the machine until the tracks are clear of the ground.
2. Connect a pressure gauge (0-580psi) to test point TP07.
3. Activate tram lockout override.
4. With engine RPM at maximum, operate the right track at full speed in the direction which indicates pressure at TP07.
5. Reduce the setting of V10 until the pressure drops then increase until the pressure stops rising. The pressure should read 450psi. If 450psi cannot be reached the charge pressure may be low, V09 may set to low, or the pump controller is not allowing the pump to reach full stroke.

Fig. 7-10m V10 Surge Protection Relief Valve


91-A10-745-801
FOAM INJECTION
WATER INJECTION
10 LTR SPOOL
65 LTR SPOOL
TO MAIN AIR LINE
WATER INJ. FLOW METER
9 GPM
34 LPM
91A10040
DUST COLL./WATER INJ.
2750 PSI
18960 KPA
91A10035
416055
CHARGE/WATER INJ. PUMP
3.19 CIR, 52.2cc/2.55 CIR, 41cc @ 2100 R.P.M.
CASE DRAIN MANIFOLD
0401065
RETURN MANIFOLD
0401065
HYDRAULIC TANK
416211
0056385
0034053
0403030
CASE DRAIN
0085695
RETURN
0085695

Final Stack Adjustments

Bypass/Relief Inlet Adjustment

Bypass Adjustment

Bypass pressure is set at the factory and is not adjustable.

Relief Valve Adjustment Procedure

1. To set main inlet relief, a work segment must be deadheaded. This segment must not have any option ports or pressure limiters with a setting lower than the main relief setting.
2. NOTE: Test stand pressure relief must be higher than the specified setting for the valve.
3. To change the setting, a gauge must be plumbed in a supply line. The adjustment screw is behind a #2 SAE plug in the relief cartridge. Use a 1/8’ alien wrench to remove the #2 SAE plug and a 5/32’ allen wrench to adjust the relief setting.

NOTE: Adjustment screw is not self-contained. Adjustment is not limited to a maximum pressure setting. Do not adjust the screw all the way in or out.

4. When finished, re-install the #2 SAE plug.

Individual Segment Pressure Compensator Adjustment

Before beginning adjustment it is advised to review this entire procedure first

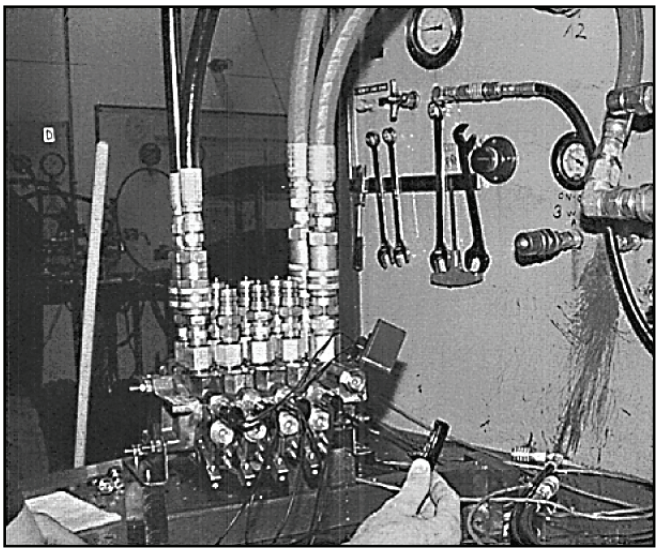
General

Proportional work segments are adjusted to deliver the indicated flow rate, i.e., the main spool is specific to the rated flow, and the individual compensator spool is adjusted/shimmed in accordance with the flow rate. All on/off (VQLO) segments contain the same main spool and have individual compensators which are adjusted the same. As a standard, on/off segments are set at 15 GPM (57 L/min). Therefore, proportional and an/off (VQLO) segments are discussed individually.

Have on hand:

- 3/4’ socket or open end wrench
- 5/16’ alien wrench

WARNING Always use safe work habits. Hydraulic oil is under high pressure.



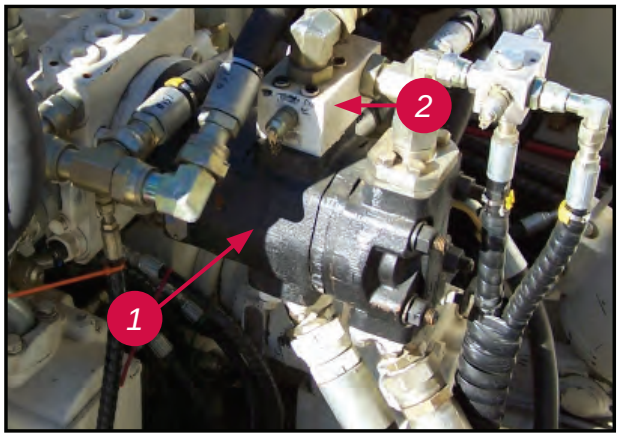


Fig 7-50. Air Conditioner Compressor Pump
1. Air Conditioner Pump
2. Circuit Relief Valve

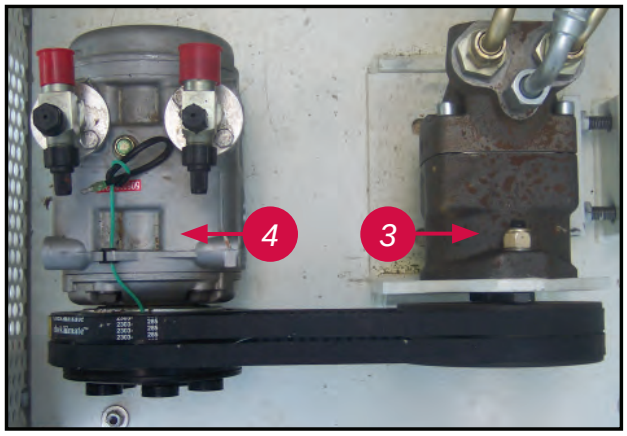


Fig 7-50a. Air Conditioner Comp and Drive Motor
3. Drive Motor
4. Air conditioner Compressor

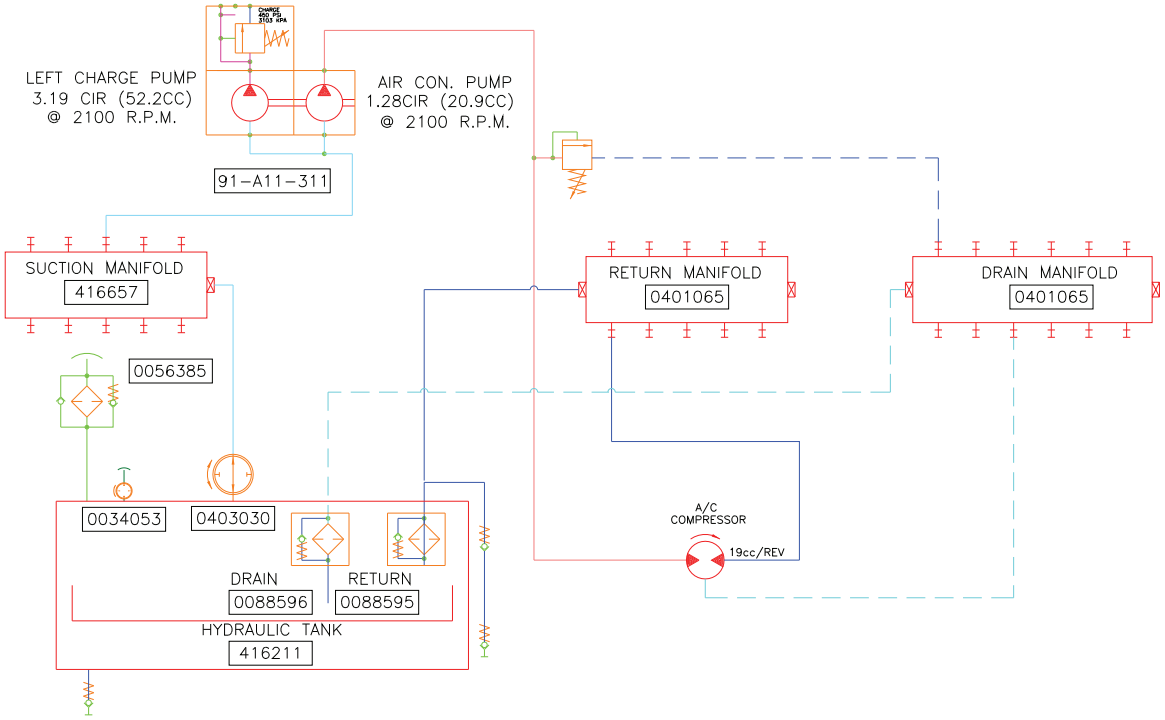


Fig 7-50b. Air Conditioner Drive circuit

The Air Conditioner drive circuit is supplied by the smaller section of the R/H double gear pump. It is 19cc and is plumbed directly onto the drive motor. A relief valve that is mounted on the pump discharge, limits the pressure to just above running pressure (approximately 1400psi [96.5bar]), this is to protect the circuit from pressure spikes when the Air Conditioner compressor clutch is engaged.

The setting for the relief valve is theroretical (approx 1800psi [124bar]), because, to be able to positively define what the relief valve setting is, would require stalling of the drive motor or deadheading the drive motor pressure lines, which is not recommended.

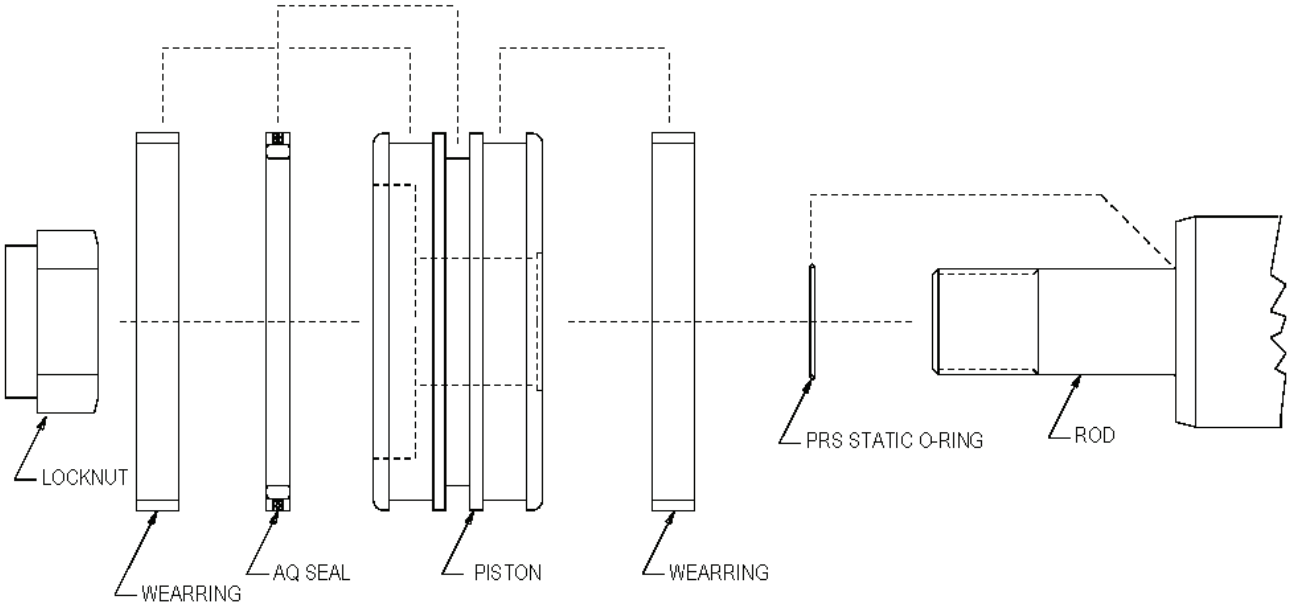
The relief valve is set with the Air Conditioner unit running and the engine at full RPM. Adjust the relief valve fully out (anti-clockwise), then begin to adjust the relief valve back down (clockwise) until the pressure stops rising on your pressure gauge (this is the normal running pressure of the circuit [approx 1400psi]). Continue to adjust the relief adjuster down (clockwise) a further 1/2 turn which is the “theoretical” setting of 1800psi (124bar).

NOTE: 1/4 turn of the adjuster equals 200psi (13.8bar)

Z Piston

General

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



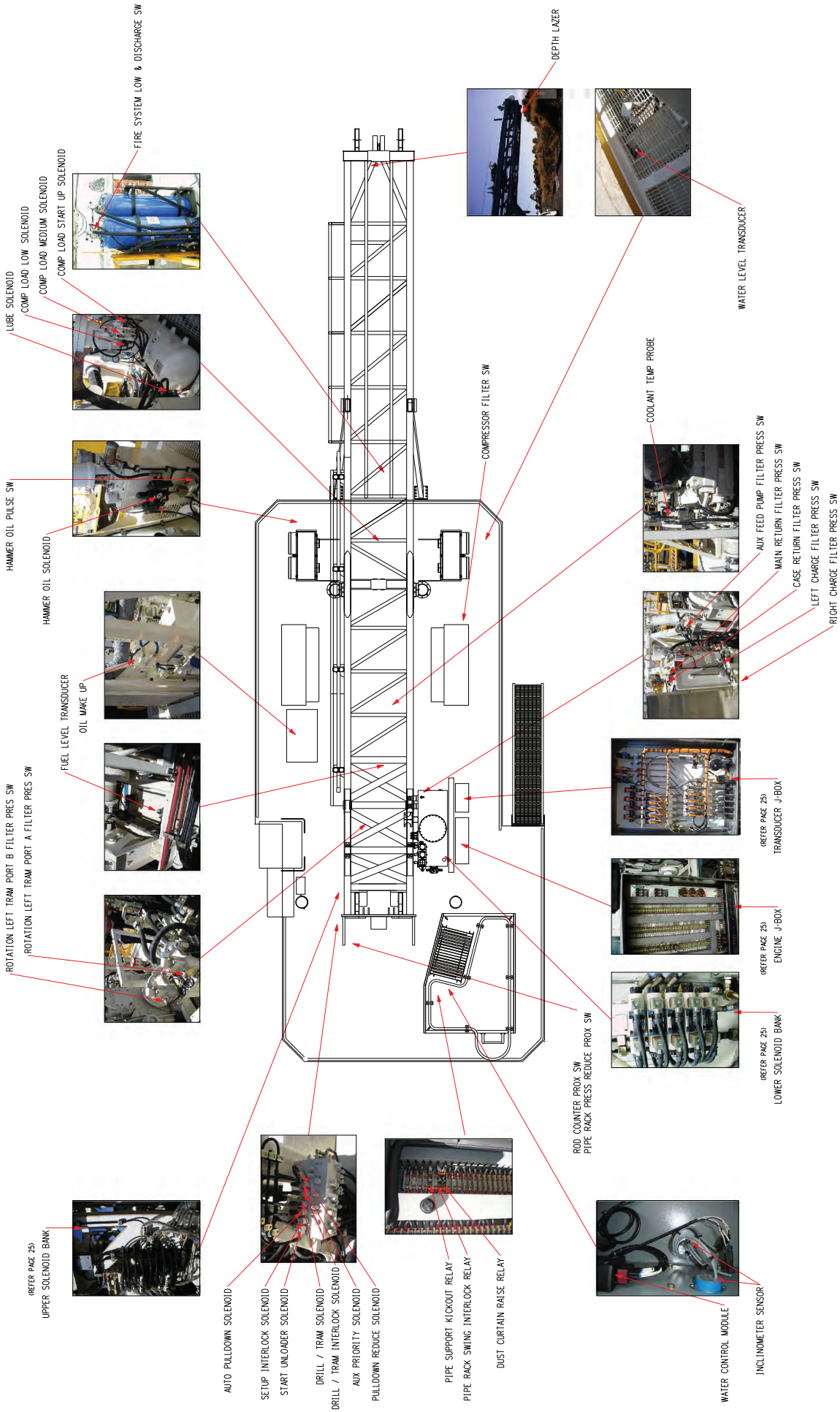
Teardown

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

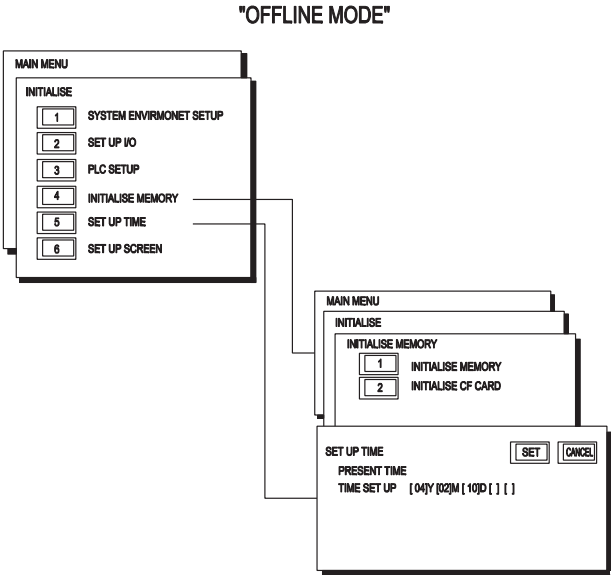
Rebuild

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

See the next page for information on the alternative style.


FIRE SYSTEM LOW & DISCHARGE SW
COMP LOAD START UP SOLENOID
COMP LOAD MEDIUM SOLENOID
COMP LOAD LOW SOLENOID
LUBE SOLENOID
HAMMER OIL PULSE SW
HAMMER OIL SOLENOID
FUEL LEVEL TRANSDUCER
OIL MAKE UP
ROTATION LEFT TRAM PORT B FILTER PRES SW
ROTATION LEFT TRAM PORT A FILTER PRES SW
(REFER PAGE 25)
UPPER SOLENOID BANK
AUTO PULLDOWN SOLENOID
SETUP INTERLOCK SOLENOID
START UNLOADER SOLENOID
DRILL / TRAM SOLENOID
DRILL / TRAM INTERLOCK SOLENOID
AUX PRIORITY SOLENOID
PULLDOWN REDUCE SOLENOID
PIPE SUPPORT KICKOUT RELAY
PIPE RACK SWING INTERLOCK RELAY
DUST CURTAIN RAISE RELAY
ROD COUNTER PROX SW
PIPE RACK PRESS REDUCE PROX SW
(REFER PAGE 25)
LOWER SOLENOID BANK
(REFER PAGE 25)
ENGINE J-BOX
(REFER PAGE 25)
TRANSDUCER J-BOX
WATER CONTROL MODULE
INCLINOMETER SENSOR
COMPRESSOR FILTER SW
DEPTH LAZER
WATER LEVEL TRANSDUCER
COOLANT TEMP PROBE
AUX FEED PUMP FILTER PRESS SW
MAIN RETURN FILTER PRESS SW
CASE RETURN FILTER PRESS SW
LEFT CHARGE FILTER PRESS SW
RIGHT CHARGE FILTER PRESS SW

Touchscreen



Setting Date & Time

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

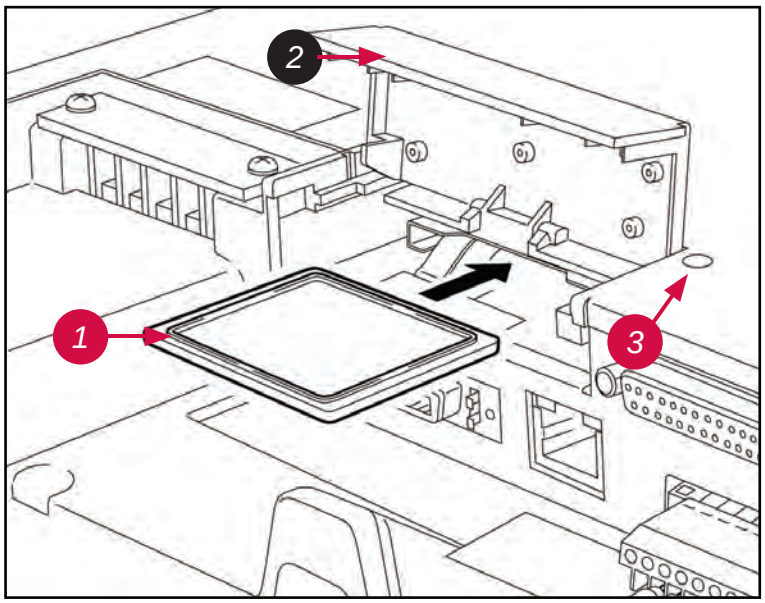
Once the Time and Date are set, return to the 'MAIN MENU' and select 'RUN' mode

Setting Brightness

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

Changing and Programming the CF Card

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



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

Temperature Transducer

Error code table for error codes as seen on transmitter display

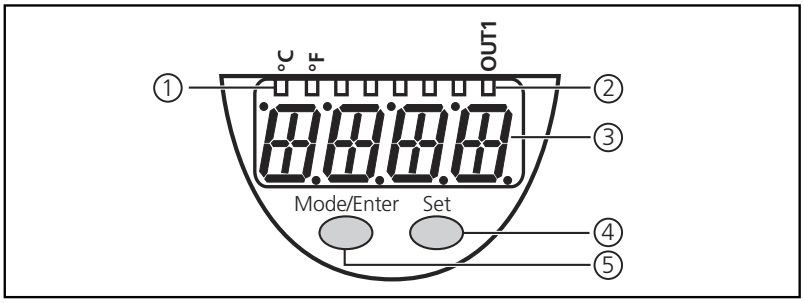
OL Above measuring range by more than 3% of the maximum value.

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

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

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

Controls and visual indication



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

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

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

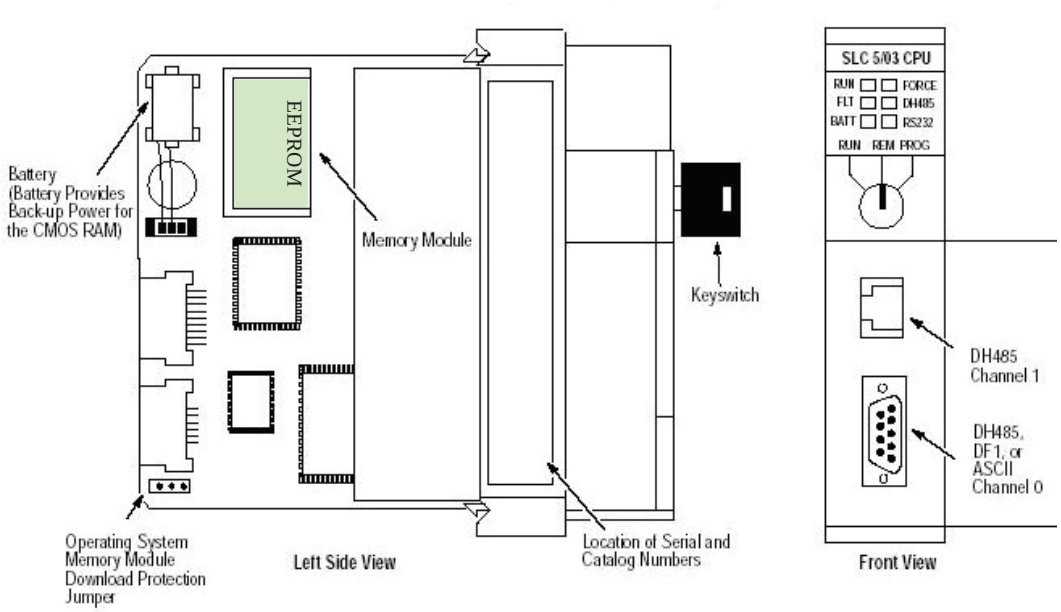
PLC

Run / Rem / Program Key-switch

RUN Position
This position places the processor in the Run mode. The processor scans/executes the ladder program, monitors input devices, energizes output devices, and acts on enabled I/O forces. You can only change the processor mode by changing the key-switch position. You cannot perform online program editing. To change the processor mode to RUN, toggle the key-switch from PROG or REM to RUN. When the key-switch is left in the RUN position, you cannot use a programmer/operator interface device to change the processor mode.

PROG Position
This position places the processor in the Program mode. The processor does *not* scan/execute the ladder program, and the controller outputs are de-energized. You can perform online program editing. You can only change the processor mode by changing the key-switch position. To change the processor mode to Program, toggle the key-switch from REM or RUN to PROG. When the key-switch is left in the PROG position, you cannot use a programmer/operator interface device to change the processor mode.

REM Position
This position places the processor in the Remote mode: either the REMote Run, REMote Program, or REMote Test mode. You can change the processor mode by changing the key-switch position or by changing the mode from a programmer/operator interface device. You can perform online program editing in this position. To change the processor mode to REM, toggle the key-switch from RUN or PROG to REM.
When the key-switch is in the REM position, you can use a programmer/operator interface device to change the processor mode.



SOLENOID CONTROL

*Drill / Tram Solenoid V17 (*Off to Tram / On to Drill)

Solenoid will energise when….

Key is ON + Drill mode is selected.

*Drill / Tram Interlock Solenoid V16 (*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.

Tram Conditions OK

Tram conditions are OK when……..

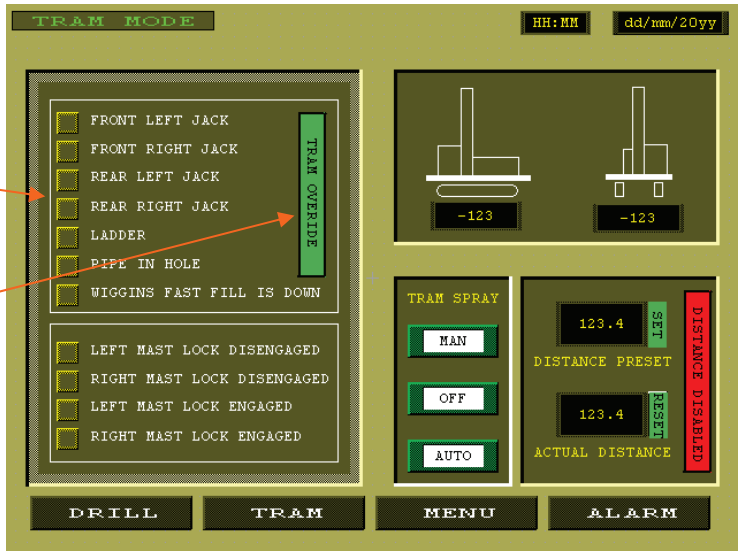
Tram mode is selected + pipe is out of hole + all steels are racked + head is at top of mast + jacks are raised + ladder is up.
OR
Tram mode is selected + Tram Override has been SET.
(Tram Override activation will be logged. Tram Override will automatically clear when put into Drill mode.)

NOTE: All "OVERRIDE" operations and buttons are operated with the full understanding and acceptance of the system or operation to be overridden.
Overriding any system has the potential for component or machine damage, this procedure must be done only after fault evaluation and with due care.

Note: There is a 2.5 second delay when first selecting tram mode to allow spool time to port.

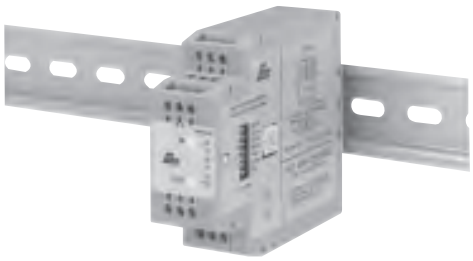
Any item in this section flagged with a YELLOW BOX will PREVENT taming.

Tram Override Button



Head Speed Module

MODEL IFMA - DIN-RAIL FREQUENCY TO ANALOG CONVERTER



- *SIMPLE ON-LINE RANGE SETTING (Using Actual Input Signal or Signal Generator)*
- *USER SETTABLE FULL SCALE FREQUENCY FROM 1 Hz to 25 KHz*
- *FOUR OUTPUT OPERATING RANGES (0 to 5 V, 0 to 10 V, 0 to 20 mA, and 4 to 20 mA)*
- *PROGRAMMABLE INPUT CIRCUIT ACCEPTS OUTPUTS FROM A VARIETY OF SENSORS*
- *85 to 250 VAC and 9 to 32 VDC POWERED VERSIONS AVAILABLE*
- *LOW FREQUENCY CUT-OUT AND OVERRANGE INDICATION*
- *3-WAY ELECTRICAL ISOLATION (POWER/INPUT/OUTPUT)*
- *INPUT AND OUTPUT INDICATION LED's*

and **UL Recognized Component, File #E137808**

DESCRIPTION

The Model IFMA accepts a frequency input, and outputs an analog voltage or current in proportion to the input frequency, with 0.1% accuracy. The full scale input frequency can be set to any value from 1 Hz to 25 KHz, either with a frequency source, or digitally with the on-board rotary switch and push-button.

The IFMA utilizes a seven position DIP switch, a rotary switch, a push button and two indication LED's to accomplish input circuit configuration, operational parameter set-up, and Input/Output indication. The input circuitry is DIP switch selectable for a variety of sources.

The indication LED's are used during normal operation to display the input and output status of the IFMA. These LED's are also used to provide visual feedback to the user of the existing parameter settings during parameter set-up.

The IFMA operates in one of four output modes. The programmable minimum and maximum response times provide optimal response at any input frequency.

The unit is equipped with a universal mounting foot for attachment to standard DIN style mounting rails, including top hat profile rail according to EN 50 022 - 35 x7.5 and 35 x 15, and G profile rail according to EN 50 035 - G 32.

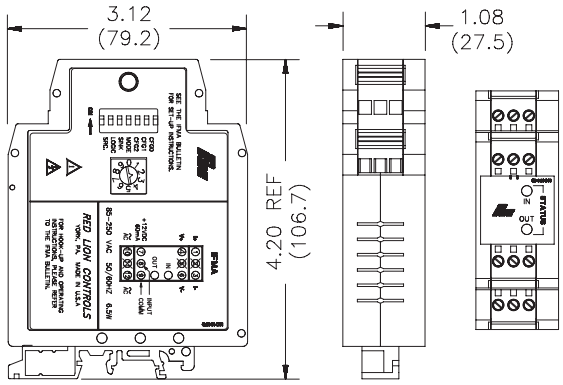
SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

SPECIFICATIONS

1. **POWER:**
   AC Operation: 85 to 250 VAC, 48 to 62 Hz; 6.5 VA
   DC Operation: 9 to 32 VDC; 2.5 W
   Power Up Current: Ip = 600 mA for 50 msec. max.
2. **SENSOR POWER**: (AC version only) +12 VDC ±25% @ 60 mA max.
3. **OPERATING FREQUENCY RANGE:**
   From 0 Hz to 25 KHz; user selectable.
4. **SIGNAL INPUT:** DIP switch selectable to accept signals from a variety of sources, including switch contacts, outputs from CMOS or TTL circuits, magnetic pickups, and all standard RLC sensors.
   Current Sourcing: Internal 1 KΩ pull-down resistor for sensors with current sourcing output. *(Max. sensor output current = 12 mA @ 12 V output.)*
   Current Sinking: Internal 3.9 KΩ pull-up resistor for sensors with current sinking output. *(Max. sensor current = 3 mA.)*
   Low Bias: Input trigger levels V_{IL} = 0.25 V, V_{IH} = 0.75 V; for increased sensitivity when used with magnetic pickups.
   Hi Bias: Input trigger levels V_{IL} = 2.5 V, V_{IH} = 3.0 V; for logic level signals.
   Max. Input Signal: ±90 V; 2.75 mA max. *(With both Current Sourcing and Current Sinking resistors switched off.)*
5. **SIGNAL VOLTAGE OUTPUT (Selectable):**
   0 to 5 VDC @ 10 mA max.
   0 to 10 VDC @ 10 mA max.
6. **SIGNAL CURRENT OUTPUT (Selectable):**
   0 to 20 mA @ 10 VDC min.
   4 to 20 mA@ 10 VDC min.
7. **OUTPUT COMPLIANCE:**
   Voltage: 10 V across a min. 1KΩ load (10 mA). Factory calibrated for loads greater than 1 MΩ.
   Current: 20 mA through a max. 500Ω load (10 VDC).
8. **ACCURACY:** ±0.1% of full scale range (±0.2% for 0 to 5 VDC range).

DIMENSIONS "In inches (mm)"



The casing consists of a robust, non-corroding continuously cast aluminum part with front and back cover, also non-corroding. The baseplate contains four holes for mechanical attachment of the LDM 40 A.

To protect the optical components from dust, physical contact, mechanical impacts, etc., a choke is fixed to the casing. Depending on the customer's request, the LDM 40 A may be shipped with a choke of any greater length or with no choke at all[11]. In the event of unqualified choke removal, measurement can no more be warranted to function correctly!

The back cover contains a gland seal port for the interface cable (2 m inlength) as required by IP 65 standards.

Where local conditions necessitate a greater distance between the actual measuring location and the PC / voltage supply, an extended interface cable[12] can be provided. You should however consult us in any case before you start working under modified operating conditions!

[11] *please get in touch with your contact person!*

[12] *may deviate from interfacing specifications!*

Interface Cable Wire Assignments

CAUTION: The cable ends are uncovered! It's the user's responsibility to prevent shorts!

Interface cable wiring assignments are as follows:

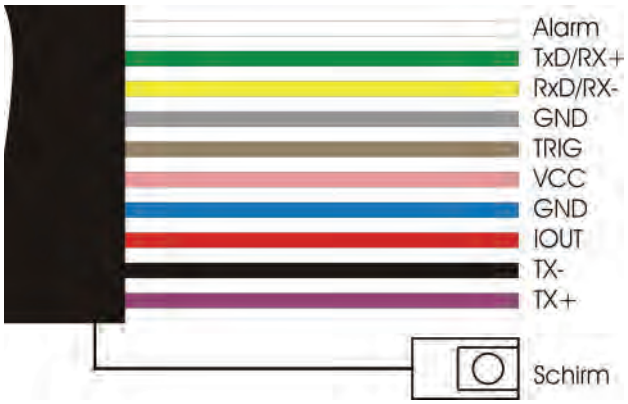


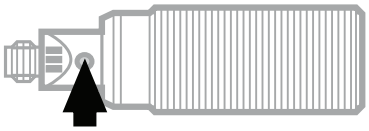
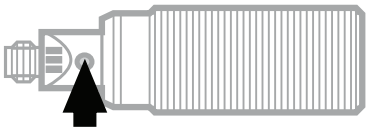
Fig. 3 Interface cable colour codes

No.	Colour code	Designation	Function if RS232	Function if RS422
1	white	ALARM	Digital switching output	Digital switching output
2	green	TxD / RX+	RS 232 send data	RS 422 receive data +
3	yellow	RxD / RX-	RS 232 receive data	RS 422 receive data -
4	grey	GND	Ground potential	Ground potential
5	brown	TRIG	External synchronisation	External synchronisation
6	pink or orange	VCC	Supply voltage	Supply voltage
7	blue	GND	Ground potential	Ground potential
8	red	IOUT	Current output	Current output
9	black	TX-	RS 422 send data -	RS 422 send data -
10	violet	TX+	RS 422 send data +	RS 422 send data +

The setpoint values made with an empty vessel are not overwritten by automatic setting while the vessel is full. You can update adjustment with the vessel full as often as you wish. (Automatic setting with the vessel full will return the "full" setting to the factory default.)

⚠ If adjustment is not possible (e.g. "empty" signal strength and "full" signal strength are almost the same), the red LED flashes after setting (in addition the function check output provides a 2Hz signal).
Press the button briefly (= acknowledgement) and repeat setting.

Locking / Unlocking:

1	 Press for at least 10s*	➡	At first the green LED flashes slowly, then faster. After 10s it goes out. The unit is locked.
2	 Press for at least 10s*	➡	After 10s all LED's go out for a short time. The unit is unlocked and the LED's indicate the current operating status.

*You can also lock/unlock the unit 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.

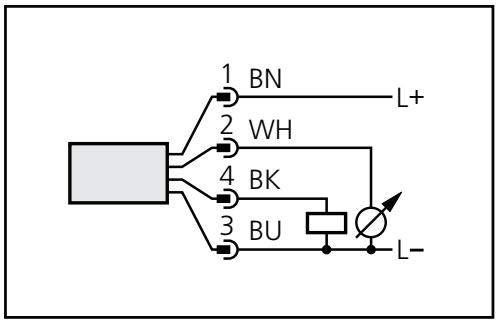
Installation

Mounting accessories

For safe and easy mounting use the ifm mounting accessories (Order no. E43000 - E43006).
NOTE: Maximum vessel pressure when mounted with mounting accessories: 0.5 bar.
An overpressure of 3 bar is possible for a short time (max. 1 min.).

Electrical connection

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



Core colours of ifm sockets:
1 = BN (brown),
2 = WH (white),
3 = BU (blue),
4 = BK (black).

EMC / CE guidelines

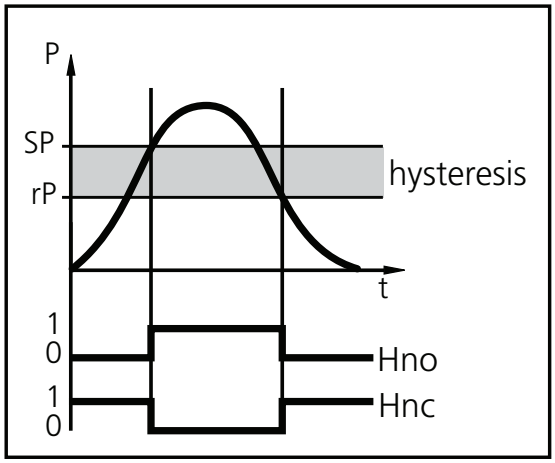
To meet the CE guidelines according to the EMC Act the sensor housing must be electrically connected to ground,
- either mechanically by means of a bracket which is electrically connected to ground
- or by means of the earthing ring supplied.

The sensor uses the ground or the tank potential as a reference. This means that a measured current must flow from the sensor probe back to the sensor through the medium to be detected. If the sensor housing is not grounded, the measured current can flow back to ground via electrical cables in an undefined way. This may influence other measuring components.

The level sensor conforms to the standard EN 50081-2.
It **must not be used** in domestic areas, commercial premises and small businesses.

Hysteresis:

The hysteresis keeps the switching state of the output stable if the system pressure varies about the preset value. When the system pressure is rising, the output switches when the switch-on point has been reached (SP1); when the system pressure is falling again, the output switches back when the switch-off point (rP1) has been reached.

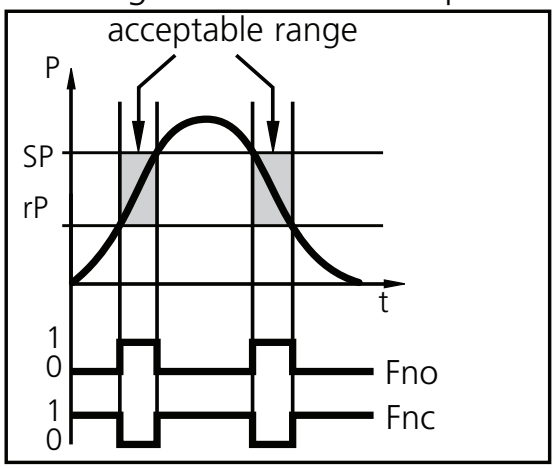


The hysteresis can be set: First the switch-on point is set, then the switch-off point with the requested difference.

Window function:

The window function enables the monitoring of a defined acceptable range. When the system pressure varies between the switch-on point (SP1) and the switch-off point (rP1), the output is switched (window function / NO) or not switched (window function / NC).

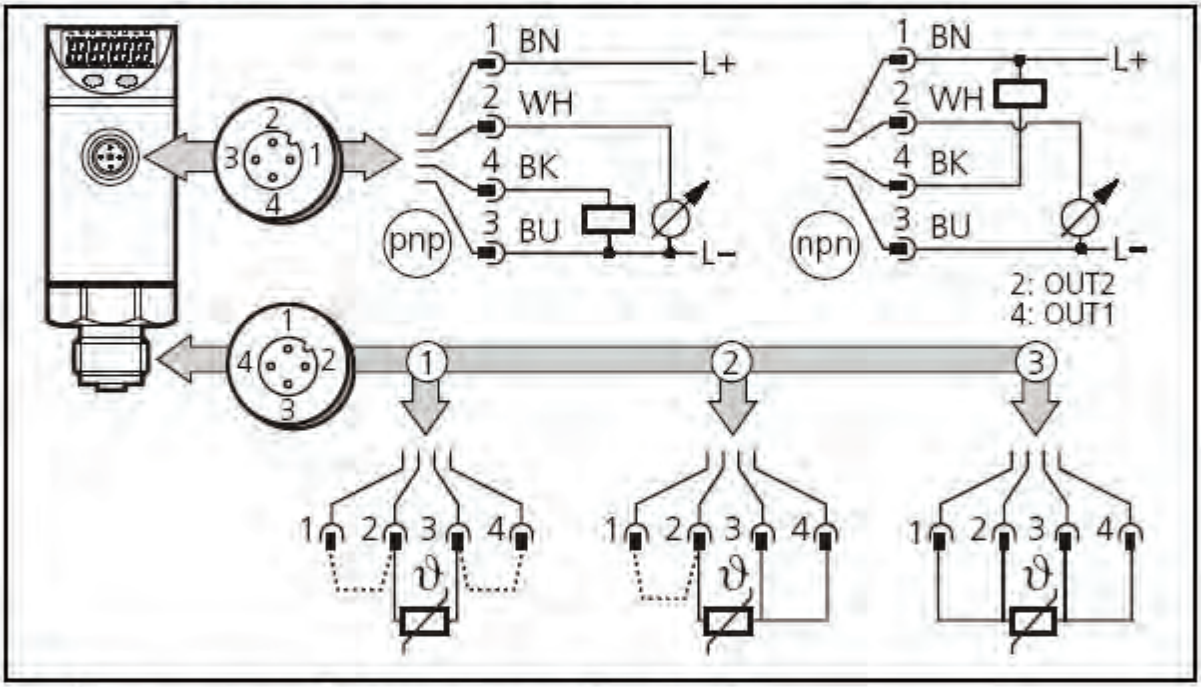
The width of the window can be set by means of the difference between SP1 and rP1. SP1 = upper value, rP1 = lower value.



Electrical connection

The unit must be connected by a suitably qualified electrician.
The national and international regulations for the installation of electrical equipment must be observed.
Voltage supply to EN50178, SELV, PELV.
Referring to UL: For use on a low voltage circuit with overcurrent protection in accordance with UL873 Tab. 28.1 or Imax = 100/Ub (Ub = voltage of the circuit).

Disconnect power before connecting the unit as follows:

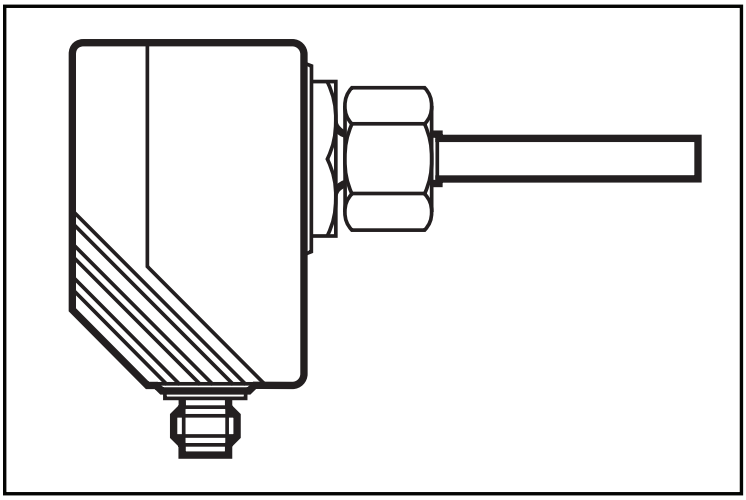


①	Two-wire sensor	Menu setting: **Mmod** = **4w**, links between 1 / 2 and 3 / 4. A wiring fault can be corrected in the menu **COF**.
②	Three-wire sensor	Menu setting: **Mmod** = **3w**, link between 1 / 2. The maximum cable resistance of 10Ω per core must not be exceeded (this corresponds to a cable length of approx. 80m for a wire cross-section of 0.14mm²).
③	Four-wire sensor	Menu setting: **Mmod** = **4w**.

Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

Water Flow Transducer - Flow Sensor Analog

Operating Instructions



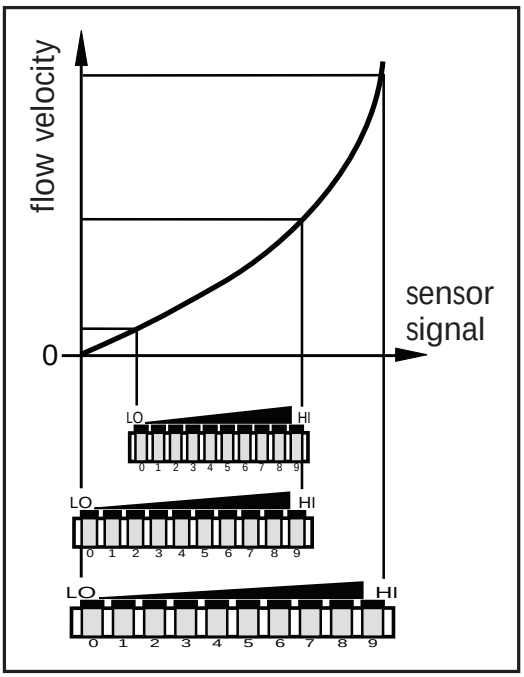
1. Function and features

The flow sensor

- detects the **flow velocity** in liquid and gaseous media,
- converts it into an **analog output signal** (4 ... 20 mA),
- and indicates the relative flow value within the adjustable detection range by means of **LEDs**:
  - LED 0 = lower limit of the detection range (maximum value / **LO**)
  - LED 9 = upper limit of the detection range (minimum value / **HI**)
- It is also possible to indicate:
  - Excess flow: LED 9 flashes if the flow is considerably higher (2 LEDs) than the display range; output current > 20mA.
  - Underflow / flow standstill: LED 0 flashes if the flow is lower than the display range.

The **detection range** (window) is determined by

- adjustment to maximum flow (HI-Teach) = upper limit of the window and
- minimum flow / flow standstill (LO-Teach) = lower limit of the window.

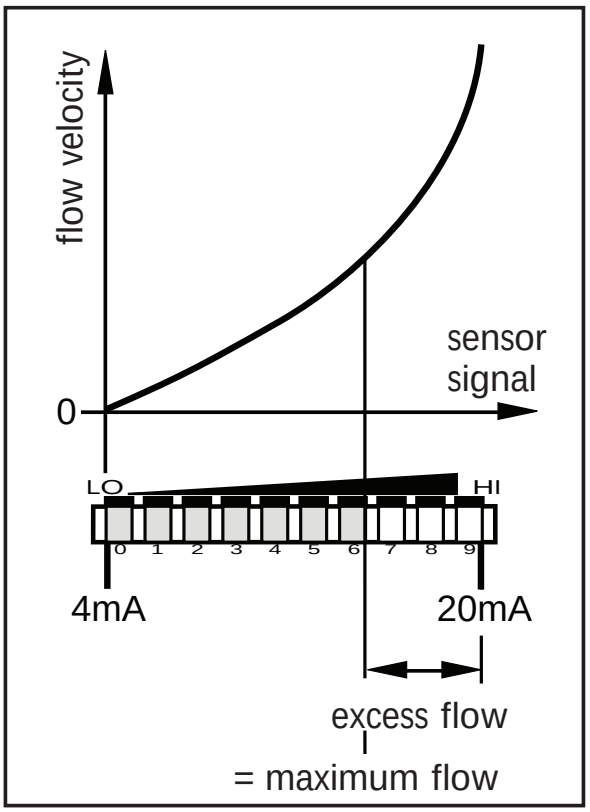


Manual adjustment to maximum flow (HI-Teach)

b) Evaluation of excess flow

The unit detects the current flow and sets this value as the maximum value for the LED display.

In addition the display width can be defined: Shift the LED for the maximum display value to position 8, 7, 6 or 5. In the case of maximum flow all LEDs from 0 up to this LED are lit. The LEDs above the range signal excess flow.



In addition to the maximum flow the **output signal** also indicates excess flow. The output current for maximum flow/excess flow depends on the position to which the LED for the maximum display value has been shifted.

LED for maximum value	output signal for maximum flow [mA]	output signal for excess flow [mA]
LED 5	12.0 ... 13.6	13.6 ... 20
LED 6	13.6 ... 15.2	15.2 ... 20
LED 7	15.2 ... 16.8	16.8 ... 20
LED 8	16.8 ... 18.4	18.4 ... 20

4 Safety

General

In order to fulfill the highest safety demands, the TOC8 control uses a real-time operating system for fault tolerant embedded systems. The TOC8 control has an internal watchdog function. If the watchdog detects any software errors, necessary precautions will be activated.

Input/ output Protection

All inputs on the TOC8 control are designed to withstand the maximum specified supply voltage. The outputs are protected against short circuit. Furthermore, an error on one input/output will not influence other inputs/outputs.

Current check

For the *current outputs*, a current check is performed. The TOC8 control compares the return current with the output's set-value. If current deviation occurs, the user will be notified through an appropriate error code on the unit's LED.

If the TOC8 control detects short-circuit to -BAT (GND), the unit will shut-off the outputs in order to increase safety.

CAN-bus interruption

The TOC8 module monitors the CAN-bus (used for SAE J1939). The module also indicates the error with an error code ref, see Heading &2, on page 7.

Memory test

The TOC8 control will execute a self-test during operation to verify the software. The test includes a processor and memory verification and an internal signal verification. If any software error is detected, appropriate precautions will be activated.

Frequency inputs

Connecting sensors to the frequency inputs

For the frequency ranges, see Appendix A, on page 24. The signal amplitude must be > 4,0 V. The trigger levels for the input signal are defined according to the following table:

Trigger level < 2,0 V	Trigger level > 4,0 V
"Low"	"High"

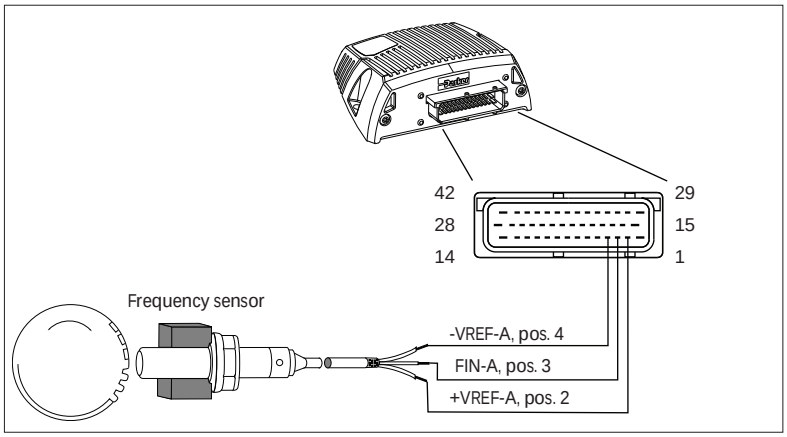
Simple frequency sensor

The positive terminal of the frequency sensor is connected to the +VREF and the negative terminal to the -VREF respectively.
The sensor signal is connected to a FIN position.

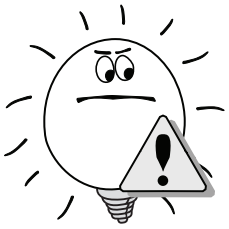
If the current consumption for the sensor exeeds the maximum load for the VREF, the sensor could be connected to the BAT positions.

EXAMPLE

Connect the positive and negative terminals of the frequency sensor to +VREF-A, position 2, and -VREF-A, position 4, respectively. Then connect the sensor signal to FIN-A, position 3.



Connecting of frequency sensor.



OBSERVE

The negative terminal of the sensor must not be connected to the chassis.
Maximum load for each VREF position, see Appendix A, on page 24.

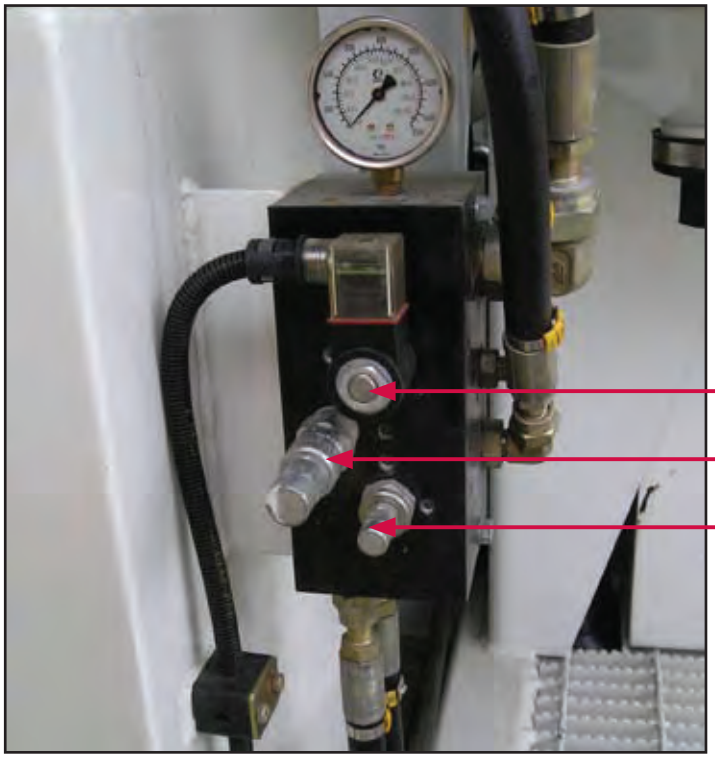
I/O (cont.)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
DOUT (Digital output)					
Load current each channel active (A,B,C,D,E,F)			3	A	
Load current one channel in each group (A or B, C or D, E or F)			4	A	The DOUT are divided into three groups.
Voltage drop (V_{BAT} -V_{DOUT}) load I_L = 0,5A load I_L = 3A		0.2 0.8		V	
Short Circuit current limit		6		A	
PWMOUT (Pulse Width Modulation output)					
Load current each channel active (A,B,C,D,E,F)			3	A	
Load current one channel in each group (A or B, C or D, E or F)			4	A	The PWMOUT are divided into three groups.
Voltage drop (V_{BAT} -V_{DOUT}) load I_L = 0,5A load I_L = 3A		0.2 0.8		V	
Short Circuit current limit		6		A	
PWM frequency	25		2000	Hz	
COUT (Current out)					
Signal range	50		1800	mA	
Resolution		0.7		mA	
Load	4			W	
Total unadjusted error			±5	mA	T_A= 25°C
Deviation between modules[a]		±2		mA	
Power supply rejection V_{BAT}= 9... 18V V_{BAT}= 24... 34V		1 1		mA	R_L=6 W -25 W
Load regulation V_{BAT}=14V, R_L=4... 9 W V_{BAT}=28V,R_L=22... 34 W		±1 ±3		mA	
Dither frequency	25		150	Hz	
Dither amplitude	0		500	mA	

a. In case of switching modules, note that the current values differs between different modules.

The fan circuit supplies the pressure for the central lube system. A pressure reducing valve is fitted into the supply before it continues to the control module. The grease pump is hydraulic driven and the timing for the system is controlled by the Vigilante system.

1. *Vent Valve*
2. *Hydraulic driven Pump*
3. *Hydraulic Control*



1. *Solenoid valve Controlled by the Vigilante system*
2. *Pressure reducing valve set at 1400 psi*
3. *Flow control valve, set to enable grease pressure to reach 2500 psi in under 30 seconds*

Installation

Reservoir

Mount reservoir [Fig. 2, item (P)] on sturdy flat surface with 6, 3/8 in. diameter bolts. Note location of fill port (K), hydraulic lines, and lubricant outlet port (G) for easy access once installed.

⚠ WARNING

Hydraulic system must depressurized before connecting high pressure hydraulic supply line.

⚠ CAUTION

Hydraulic supply must be 10µ filtered or better and supply 0.5 – 3.0 gpm (1.9 – 11.4 lpm) at 800 psi – 3500 psi (55 bar – 241 bar, 5.5 MPa – 24 MPa).

1. Read instruction manual 308156 (included) before installing this product.
2. Install ball valve (Fig. 2, item AA) (user provided) in the 3/8” hydraulic supply line (X).
3. Connect the 3/8” hydraulic supply line (X) to the swivel (Y).
4. Connect the 3/4” hydraulic tank line (T) to the swivel (Z).
5. Connect the 24 VDC timer controlled signal to the 3–way solenoid valve (F).
6. Connect supply line (G) to the lubricant swivel (C).
7. Ground system (see **Grounding** below). Mount reservoir to grounded chassis member.

Grounding (for non–mobile installation)

Loosen grounding lug locknut [Fig. 1 item (A)] and washer (B). Insert one end of a 12 ga (1.5 mm^2) minimum ground wire (C) into slot in lug (D) and tighten locknut securely. Connect other end of wire to true earth ground. To order a ground wire and clamp, order part number 222011.

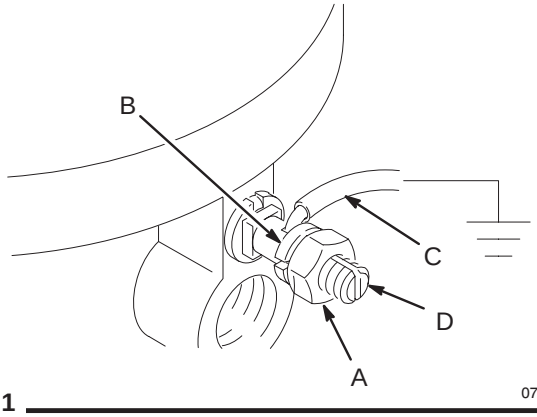


Fig. 1 0720

Vent Valve Kit for Custom Tank (Part Number 243170) Installation (See Figure 3)

1. Weld the bracket (see Fig.5) in place per recommended configuration for mounting the vent valve . Paint the bracket if desired.
2. Connect the hydraulic control line (Fig. 3, item A) to the control module vent valve hydraulic control line (Fig. 4, item J).
3. Connect the high pressure lubricant line (Fig. 3, item C) feeding the injector system to the lubricant output (E).
4. Connect the vent line (F) to the lubricant reservoir.

Control Module Kit for Custom Tank (Part Number 243501) Installation (See Figure 4)

1. Mount the control module on a flat, sturdy surface per the recommended configuration (see Fig.2)
2. Connect the hydraulic tank line (Fig. 4, item G) to the pump hydraulic outlet port.
3. Connect the vent valve hydraulic control (J) connection to the hydraulic control line (Fig. 3, item A).
4. Connect the pump high pressure hydraulic line (Fig. 4, item H) to the pump hydraulic input port.
5. Connect the high pressure hydraulic supply to the high pressure hydraulic supply connection (L) and the tank lines to the hydraulic tank connection (K).
6. Connect the 3–way solenoid valve (P) to the timer.

Note: Coil should always be installed with lettering facing out.

Central Lube Pump

Symbols

Warning Symbol

⚠ WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the corresponding instructions.

Caution Symbol

⚠ CAUTION

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the corresponding instructions.

⚠ WARNING

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are not sure, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated component in your system. This equipment has a **1500 psi (10 MPa, 102 bar) maximum hydraulic input pressure and 7500 psi (51 MPa, 517 bar) maximum fluid outlet pressure.**
- Use fluids and solvents that are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Handle hoses carefully. Do not pull on hoses to move equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 82°C (180°F) or below –40°C (–40°F).
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

Service

Disconnecting the Reciprocator and Displacement Pump

See Fig. 6.

NOTE: When displacement pump 224914 is purchased separately, it comes with the priming piston (112) and priming cylinder (111) unassembled. Connect the displacement pump to the hydraulic reciprocator before assembling the priming piston and cylinder. Torque the priming piston to 35 ft-lb (47 N-m).

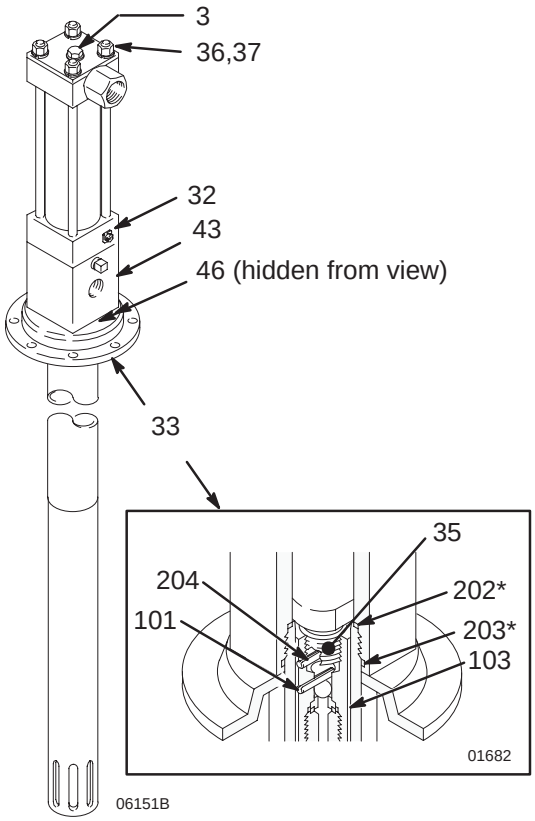


Fig. 6

⚠ CAUTION

Keep The Hydraulic System Clean
It is essential to keep the hydraulic oil system clean and free of contaminants to reduce the risk of damaging the hydraulic reciprocator. Always install a plug in each tube fitting and on each hose end whenever fluid lines are disconnected to prevent contamination.

1. Flush the pump if possible and stop it with the displacement rod in the lowest position.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. Relieve the pressure.
3. Disconnect the outlet hose from the displacement pump.
4. Slowly loosen the hydraulic supply (58) and return (5) fittings to relieve any pressure, and then remove the hoses. Install plugs on the tube fittings and in the hose ends. Check the o-rings (5a, 58a) on the fittings and replace them if they are worn or damaged. See Fig. 4 and the Parts Drawing.
5. Using a strap wrench on the displacement cylinder (108), screw it out of the pump adapter (43), and slide it down as far is it will go.
6. Pull the connecting rod (35) down as far as it will go. Remove the cotter pin (204).

NOTE: For the 35 lb. length pump, the priming cylinder (111) and the priming piston (112) must be completely removed before you can pull down the displacement cylinder (108) far enough to remove the cotter pin (204).

7. Unscrew the piston coupling (103) to remove the pump.

Pump Parts

Model 224752, Series C
400 pound drum size

Ref. No.	Part No.	Description	Qty.
201	239883	RECIPROCATOR, see page 21	1
202*	183715	GASKET, copper	1
203*	108993	O-RING	1
204	108992	PIN	1
205	223514	DISPLACEMENT PUMP see page 19	1
206	183741	LABEL, identification	1

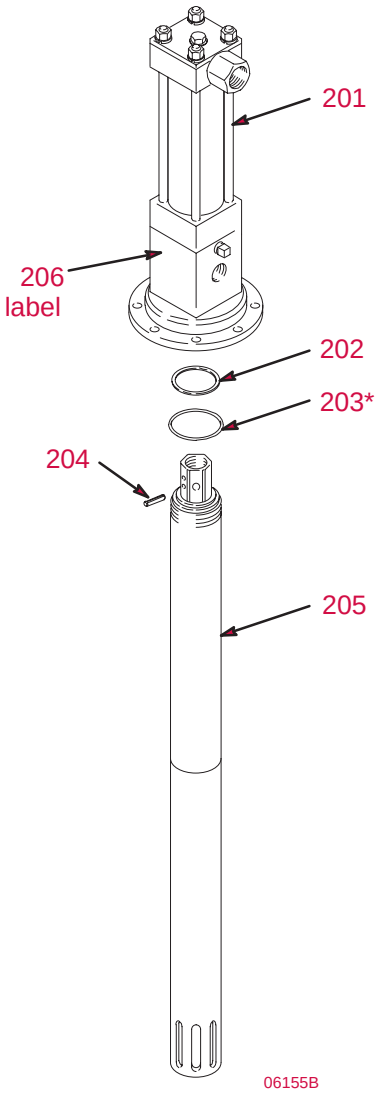
Model 224751, Series C
120 pound drum size

Ref. No.	Part No.	Description	Qty.
201	239883	RECIPROCATOR, see page 21	1
202*	183715	GASKET, copper	1
203*	108993	O-RING	1
204	108992	PIN	1
205	223513	DISPLACEMENT PUMP see page 19	1
206	183741	LABEL	1

Model 224912, Series C
35 pound drum size

Ref. No.	Part No.	Description	Qty.
201	239883	RECIPROCATOR, see page 21	1
202*	183715	GASKET, copper	1
203*	108993	O-RING	1
204	108992	PIN	1
205	224914	DISPLACEMENT PUMP see page 19	1
206	183741	LABEL	1

* *These parts are included in Repair Kits 223426 and 223427, which may be purchased separately.*



Symbols

Warning Symbol

⚠ WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the instructions.

Caution Symbol

⚠ CAUTION

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the instructions.

⚠ WARNING

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before you operate this equipment.
- Use the equipment only for its intended purpose. If you are not sure, call your Graco distributor.
- Do not alter or modify this equipment.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure stated on the equipment or in the **Technical Data** for your equipment. Do not exceed the maximum working pressure of the lowest rated component in your system.
- Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Do not use 1,1,1–trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids that contain such solvents in pressurized aluminum equipment. Such use could result in a chemical reaction, with the possibility of explosion.
- Handle hoses carefully. Do not pull on hoses to move equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 82°C (180°F) or below –40°C (–40°F).
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

Air Motor and Throat Service

12. Grease and reinstall the seal (2*) with the lips down, thread the throat bearing (36) into the air motor base (28), and torque the throat bearing to 30 to 40 ft-lb (41 to 54 N.m) using a 1 5/8-in. socket.

13. Slide the piston rod (29) down through the packing, and lower the piston assembly (27) into the air motor base (28).

14. Carefully lower the cylinder (30) straight down onto the piston assembly (27). Tighten the eight screws (3) that hold the cylinder to the base (28).

⚠ CAUTION

To avoid damaging the cylinder wall, lower the cylinder straight down onto the piston. Do not tilt the cylinder while you lower it.

15. Grip the trip rod (31) with padded pliers, screw the lift ring (24) onto the trip rod, push the lift ring down, and screw it into the top of the cylinder.

16. Install the seal (107*) with the lips up, and place the seal retainer washer (113) on the piston/valve seat (109). *Make sure the lips of the seal face up*. See Fig. 3.

17. Place the piston ball (103) in the displacement rod (29).

18. Clean the threads of the piston/valve seat (109), Apply Loctite® to the threads, and thread the assembly from Step 16 onto the displacement rod (29).

19. Clamp the flats of the piston/valve seat (109) in a vise, and torque the displacement rod (29) to the piston valve seat to 45 to 55 ft-lb (61 to 75 N.m).

20. Clamp the air motor base (28) in a vise horizontally by closing the vise jaws on the flange

21. Thread piston assembly tool (A) (included in repair kit 238751) onto the threads of the displacement pump cylinder (110). See Fig. 5.

22. Insert the piston assembly (B) into the displacement pump cylinder.

23. Unscrew the piston assembly tool from the displacement pump cylinder. Clip the piston assembly tool with a diagonal cutter (C), and discard it.

NOTE: Be careful that you do not scratch the rod.

24. Use a strap wrench to screw the displacement pump cylinder (110) to the air motor base (28). See Fig. 3.

25. Before you remount the pump, connect an air hose and run the air motor slowly, starting with just enough air pressure to make the air motor run, and make sure that it operates smoothly.

26. Reconnect the ground wire before regular operation of the pump.

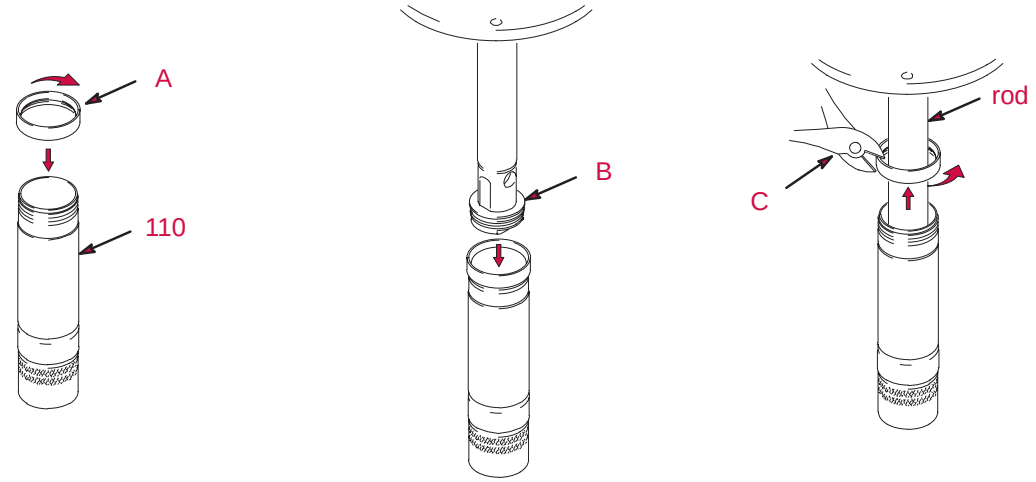


Fig. 5

⚠ WARNING

FAILURE TO HEED THE FOLLOWING WARNINGS INCLUDING MISUSE, OVER PRESSURIZING, MODIFYING PARTS, USING INCOMPATIBLE CHEMICALS AND FLUIDS, OR USING WORN OR DAMAGED PARTS, MAY RESULT IN EQUIPMENT DAMAGE AND/OR SERIOUS PERSONAL INJURY, FIRE, EXPLOSION, OR PROPERTY DAMAGE.

- Do not exceed the stated maximum working pressure of the pump, or of the lowest rated component in your system.
- Do not alter or modify any part of this equipment.
- Do not operate this equipment with combustible gas.
- Do not attempt to repair or disassemble the equipment while the system is pressurized.
- Make sure all grease connections are securely tightened before using this equipment.
- Always read and follow the grease manufacturer's recommendations regarding grease compatibility, and the use of protective clothing and equipment.
- Check all equipment regularly and repair or replace worn or damaged parts immediately.
- Never point the dispensing valve at any part of the body or at another person.
- Never try to stop or deflect material from dispensing valve or leading connection or component with your hand or body.
- Always check equipment for proper operation before each use, making sure safety devices are in place and operating properly.
- Always follow the pressure relief procedure after shutting off the pump, when checking or servicing any part of the system, and when installing, cleaning or changing any part of the system.

INSTALLATION

Typical drum and pail hookups are described as follows only as a guide in selecting and installing a system. Contact a Lincoln factory representative for assistance in designing a system for a specific requirement.

⚠ WARNING

This pump can develop 7500 PSI working pressure at 150 PSI maximum incoming air pressure. Be sure that all system equipment and accessories are rated to withstand the maximum working pressure of this pump. DO NOT exceed the maximum working pressure of the lowest rated component in the system.

IMPORTANT: Accessory item "whip" hoses for dispensing valve are rated 4500 PSI. DO NOT exceed 90 PSI air pressure to pump when using "whip" hoses.

TYPICAL SYSTEM HOOKUP

Determine the drum or pail system for your requirement.

Obtain an air line filter/regulator/lubricator to use with the inlet air supply and the correct sized air and grease lines/hoses with any required reducers, connectors and accessories.

Clean/flush the supply lines, hoses, reducers, connectors and accessories with mineral spirits or oil based solvent to purge any contaminants such as dirt, moisture, or metal shavings that could damage the pump or system components. Blow dry with air.

⚠ CAUTION

The pump was tested in lightweight oil which was left in to protect the pump from corrosion. Flushing the pump before connecting it to the system might be desired to prevent possible contamination of the grease you are pumping

⚠ WARNING

To reduce the risk of injury from splashing or static sparking when flushing the pump with solvents, always hold a metal part of the dispensing valve firmly to the side of a grounded metal pail and operate pump at lowest possible fluid pressure.

Clean/flush the pump with mineral spirits or oil based solvents if necessary.

Assemble the cleaned pump and supply line together with any required accessory.

Mount the assembled pump to the drum or pail.

Connect the material output line/hose to the pump.

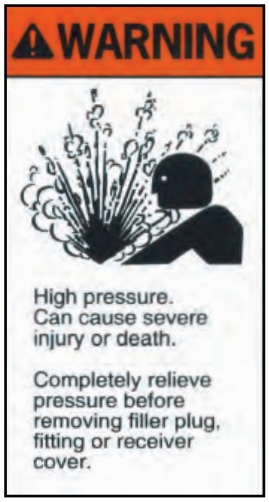
Connect the air regulator to the pump.

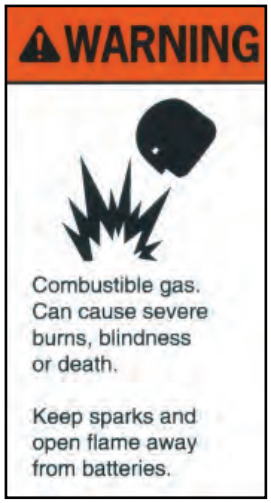
Make sure all connections are securely tightened.

Maintenance and day to day lubrication is essential to smooth running, and will ensure that the drill will perform to it's full potential. This section will cover the points on the drill that will require daily/250/500/1000 and 2000hr lubrication and servicing. These service intervals are set out to give optimal component life and to keep the drill in Excellent Working Condition.

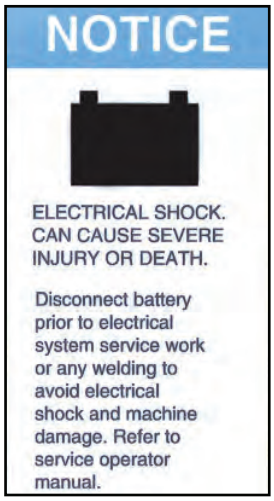
CAUTION: Ensure the correct personal protective equipment is worn when performing any service or maintainance tasks

Safety

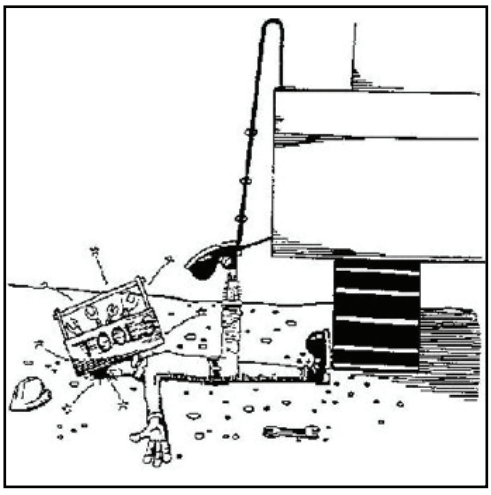




Ensure all stored pressure has been released from the hydraulic and pneumatic systems.

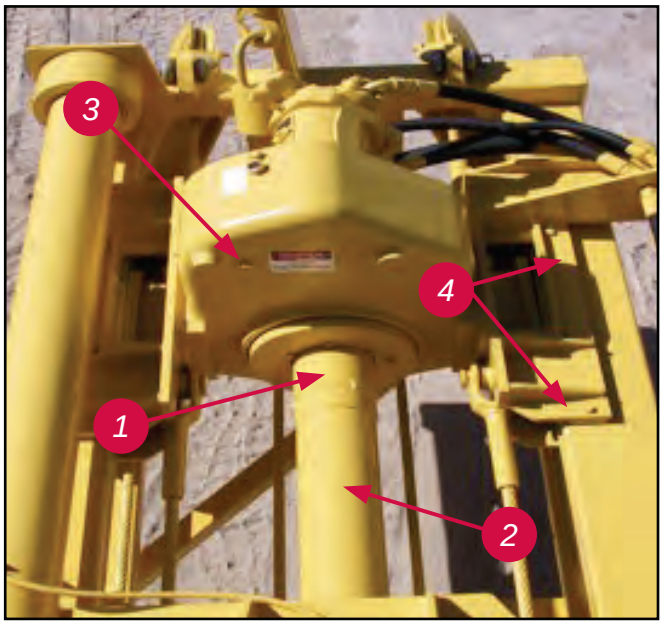


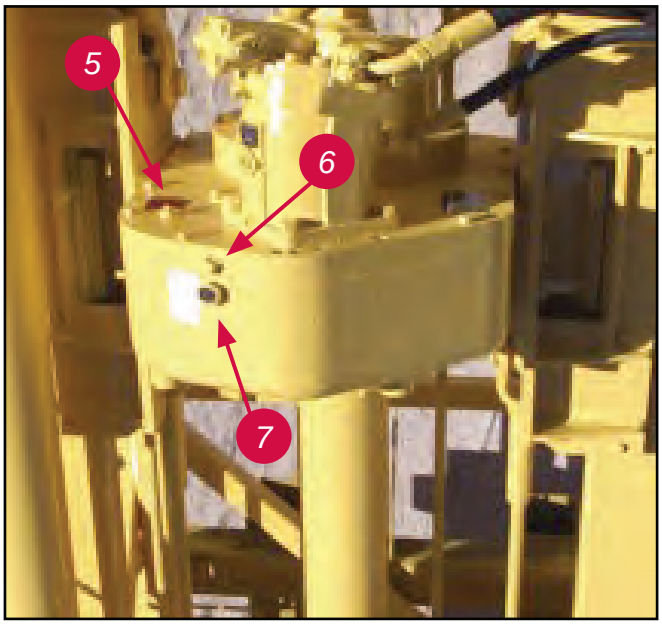
Isolate machine by using the correct lock out procedure, ensuring the machine cannot be started.



Ensure that when refilling any oil's that any oil spillage is cleaned up before starting the machine.

Caution must also be taken around hot surfaces and oils which may also be at temperatures which may be potentially dangerous.





1. *Spindle*
2. *Top Sub*
3. *Drain Point*
4. *Wear Pads*
5. *Rotary Head Breather*
6. *Fill Point*
7. *Sight Glass*

Rotary Head Check And Service Points

10hrs/Daily

- Lubricate Air Swivel
- Check Rotary Head Mounting Bolts For Security
- Check For Leaks
- Check Oil level In Sight Glass (85/140)

250hrs

- Check/Replace Rotary Head Wear Pads/Shim’s

500hrs

- Drain/Refill Rotary Head Oil (85W140 54 Litres)
- Check Rotary Head Spindle For End Float
- Re-torque Rotary Head Mounting Bolts

1000hrs

- Re-torque Pre-load On Spindle Bearings In Rotary Head (Pre-load .002”-.004”)

2000hrs

- All Previous Checks To be Carried Out As Required By Maintenance Schedule

Item	Task	Comments & Initials
	10. Auto-lube system – CHECK operation.	
	11. CHECK the air cleaner restriction indicator for the compressor and engine. These gauges are located on the right hand cab wall panel.	
	12. Check the operator's seat for condition, correct function and control.	
	13. CHECK the machine for loose bolts, clamps and oil leaks.	
	14. RECORD the down hole water pump pressure.	
	15. RECORD the cleaning pump pressure.	
	16. CHECK the rotary drive preload. **Procedure** 1. Place an 8" x 8" wood block under the rotary head. 2. Load the pulldown to 1500 PSI, 10342 kPa on the pulldown pressure gauge. 3. There should be no visible movement.	
	Procedure to adjust the Rotary Drive Preload to eliminate visible movement. 1. Place an 8" x 8" wood block under the rotary head. 2. Load the pulldown to 1500 PSI, 10342 kPa on the pulldown pressure gauge. 3. Turn the locknut until it contacts the bearing cone, and then turn another 15º. 4. Tighten the screws evenly and opposite to one another, gradually increasing the torque. Do not tighten the screws prior to assembling the locknut to the shaft. 5. Install Loctite 515 Master Gasket at all split lines unless a shim or gasket is used. Replace seals back to back (2 x V004566).	

SKF – 500 Hour Service Sheet			
Fleet Number		Date	
Time Started		Time Finished	
SAP Document #		Engine Hours	
Revised		SAP Document #	

A Job Hazard Analysis is required before commencing these tasks.

Definitions	
CAUTION	Precedes steps that may cause equipment or property damage.
CHECK	Requires the maintainer to physically view the condition or RECORD the specification / tolerance of a component.
DANGER	Identifies a specific or potential hazard, which will result in either injury or death if proper precautions are not taken.
HISTORY	Information that must be recorded for historical or analytical purposes.
INSPECT	Examine for wear, faults or obvious damage.
NOTES	General information relating to the next procedure or group of procedures.
RECORD	Preserve in writing on the service sheets the condition, specification or tolerance of a component.
REPORT	NOTIFY your Supervisor so that maintenance can be planned.
SHALL	SHALL is understood as mandatory.
SHOULD	SHOULD is understood as recommended but not mandatory.
WARNING	Precedes steps that may cause PERSONAL INJURY.

	Please print your name clearly	*Initial*
Maintainer		
Maintainer		
Maintainer		
Maintainer		
Maintainer		
Maintainer		
Maintainer		
Maintainer		
Supervisor		
Supervisor		

Item	Task	Comments & Initials
7	**Compressed Air System – Air Cleaner**	
	1. CHANGE secondary elements (2 x 0065320).	
	2. CHANGE primary elements (2 x 0065322)	
	3. Remove the vacuator cups (3 used) clean & refit.	
	4. CHECK induction pipe-work for cracks, splits and dust intrusion.	
8	**Compressor Oil Cooler & Hoses**	
	1. CHECK the condition of the compressed air system oil cooler and clean if required.	
	2. CHECK all hose socks, safety shackles, and mountings.	
9	**Compressor**	
	1. Change compressor oil filter, cooler mounted. (1 x 0401857)	
	2. Change the silencer, compressor blowdown. (1 x V007132)	
	3. Change the water trap element. (1 x V007128E)	
	4. Clean the scavenge screen mounted at the base of the vertical tube on the Tee tank.	
	5. CHECK the compressor for oil leaks	
	6. Drain off water from the receiver if required.	
	7. CHECK compressor receiver oil levels Corena AS46.	
	8. Fill the compressor inlet poppet valve via the 1/4” NPT plug with Corena AS46. This oil is required to fill the cavity, lubricate the O-Ring and assists in dampening the spring reaction. The valve is located opposite the air cleaner induction pipe inlet to the compressor.	

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

Item	Task	Comments & Initials
19	**Air Conditioner**	
	1. CHECK the condition of the drive belts (2 x 91-A20-464-003).	
	2. Adjust the belts – if required.	
	3. Change the pressuriser filter (YP182052).	
	4. Check the condition of the re circulation filters. (YAS271535A)	
20	**Electrical System**	
	1. CHECK the condition of the alternator drive belt (part # 0421319)	
	2. Adjust the alternator belt - if required.	
	3. CHECK the condition of wiring harnesses, wiring code identification, condition of DIN plugs including seals and harness retaining clamps.	
	4. CHECK the electrical cabinets for cleanliness, condition of door seals, wiring terminal condition, wiring code identification condition, cabinet condition and door sealing.	
21	**Batteries** **Warning** • Wear eye protection. • Batteries emit hydrogen gas. To avoid explosion and personal injury, do not smoke or allow ignition sources in the area when servicing batteries.	
	1. Clean terminals and lubricate with Vaseline.	
	2. Top up batteries with distilled water.	

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