Technical Manual

Table of Contents

Section 1

Safety

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).

Section 2

Operator’s Cab/ Controls

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).

Left Hand Control Panel

10. Auto Pulldown Switch - On / Off

> **CAUTION: DO NOT engage this switch unless actually drilling. Once drilling is finished, this switch must be disengaged.**

The pulldown system switch engages and disengages the auto pulldown for drilling operations.

11. Rapid Feed / Holdback Switch

- Move switch to left to enable fast down mode.
  This switch is used to increase the speed of the rotary head coming down the mast.
- Move switch to right to engage holdback.

12. HOBO Reverse Switch

Reverses the direction of the Hydraulically Operated Breakout Wrench (HOBO).

13. Drill / Propel Switch

> **WARNING: Drill mode must be selected if not propelling the machine or when the machine is unattended. Drill mode engages the propel brakes.**

Engages the drilling controls or the propel system.
- Move switch to right for drill mode.
- Move switch to left for propel mode.

14. Water Injection Switch

This 3 position switch is used to engage the water injection system. Water injection is used for dust suppression and to help create drill hole stability.
- Move switch to far left to engage water injection.
- Move switch to middle position to disengage water injection.
- Move switch to far right for neutral or off position.

15. Mast Lock Switch

> **WARNING: BE SURE to visually check to see that the mast lock pins are fully engaged in the locating holes before drilling. Also be sure to visually check that the pins are fully retracted before lowering the mast.**

This switch unlocks and locks the mast in the vertical or angle drilling positions.
- Move and hold switch to left to unlock (retract) mast pins.
- Move and hold switch to right lock (engage) mast pins.
- Watch for indication on the PLC screen as to whether pins are engaged or disengaged.

2.4.5 CONTROL SWITCHES

Two fully rotational switches provide the following operational modes:

Fan Speed Switch: OFF-LOW-MED-HIGH
Main Control Switch: VENT-COOL-DEMIST-HEAT

These switches feature a quick release lever which enables the switch body to be removed leaving the knob behind.

2.4.6 HEATING ELEMENTS (TFC8BX2 ONLY)

Attached to the front of the evaporator coil are three heating elements of 2kW each. These heating elements supply a total heat capacity of 6kW to the cabin. A safety thermostat isused to stop the heating operation in case of excessive temperature.

2.4.7 CONTACTORS (CC, HC) (TFC8BX2 ONLY)

a) Compressor contactor (CC) – This contactor is switched by the thermostat. Also in the circuit to the compressor contactor are the LP and HP switches to deactivate the contactor coil when the system is low on gas or experiencing abnormally high headpressure.

b) Heater contactor (HC) - This contactor is also switched by the thermostat, however, inthe DEMIST mode it is by – passed and the heater is activated directly from the MainControl Switch (MCS).

2.5 REFRIGERANT COMPONENTS

NOTE: **To illustrate the change of state of the refrigerant as it travels through the system, the descriptions of the refrigeration components have been listed in the order which coincides with refrigerant flow.**

2.5.1 CONDENSER COIL

Condensing of the refrigerant is the change of state of the refrigerant from a vapour to a liquid. The condenser receives the high pressure, high temperature refrigerant vapour from the compressor and condenses it to a high temperature liquid. The cooling of the refrigerant, as it travels along the condenser tubes, changes the vapour to a liquid. The liquid refrigerant then flows to the receiver drier.

2.5.2 RECEIVER DRIER

The receiver drier utilised in these units is of fully welded construction, fitted with an integral sight glass. The receiver drier serves as a reservoir for the storage of high pressure liquid produced in the condenser. It also functions as a filter/drier by means of adehydrating agent combined with filtration system to trap minute particles of moisture and foreign material which may have entered the refrigeration system.

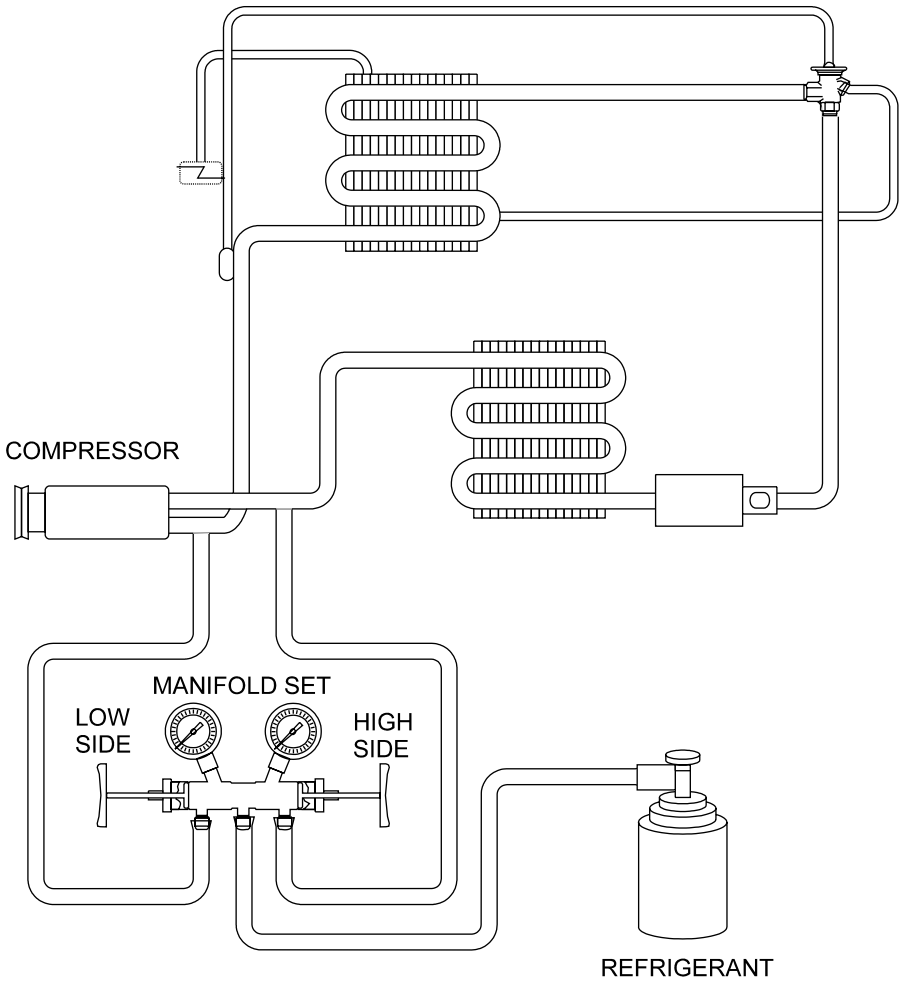
2.5.3 THERMOSTATIC EXPANSION VALVE

The expansion valve is located on the evaporator inlet line and provides the functions of throttling and controlling the flow of liquid refrigerant to the evaporator coil. This refrigerant flow is restricted creating a pressure drop across the valve. Thus, the refrigerant that enters the valve as a hot high pressure liquid exits it as a cold low pressure liquid.

The flow rate will vary according to the heat load, sensed by the diaphragm capillary, and the suction pressure at the evaporator.

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 drawrefrigerant 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 thispoint 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 anddisconnect the charging hose.
12. Fit the compressor suction valve sealing cap.

FIGURE 4.7

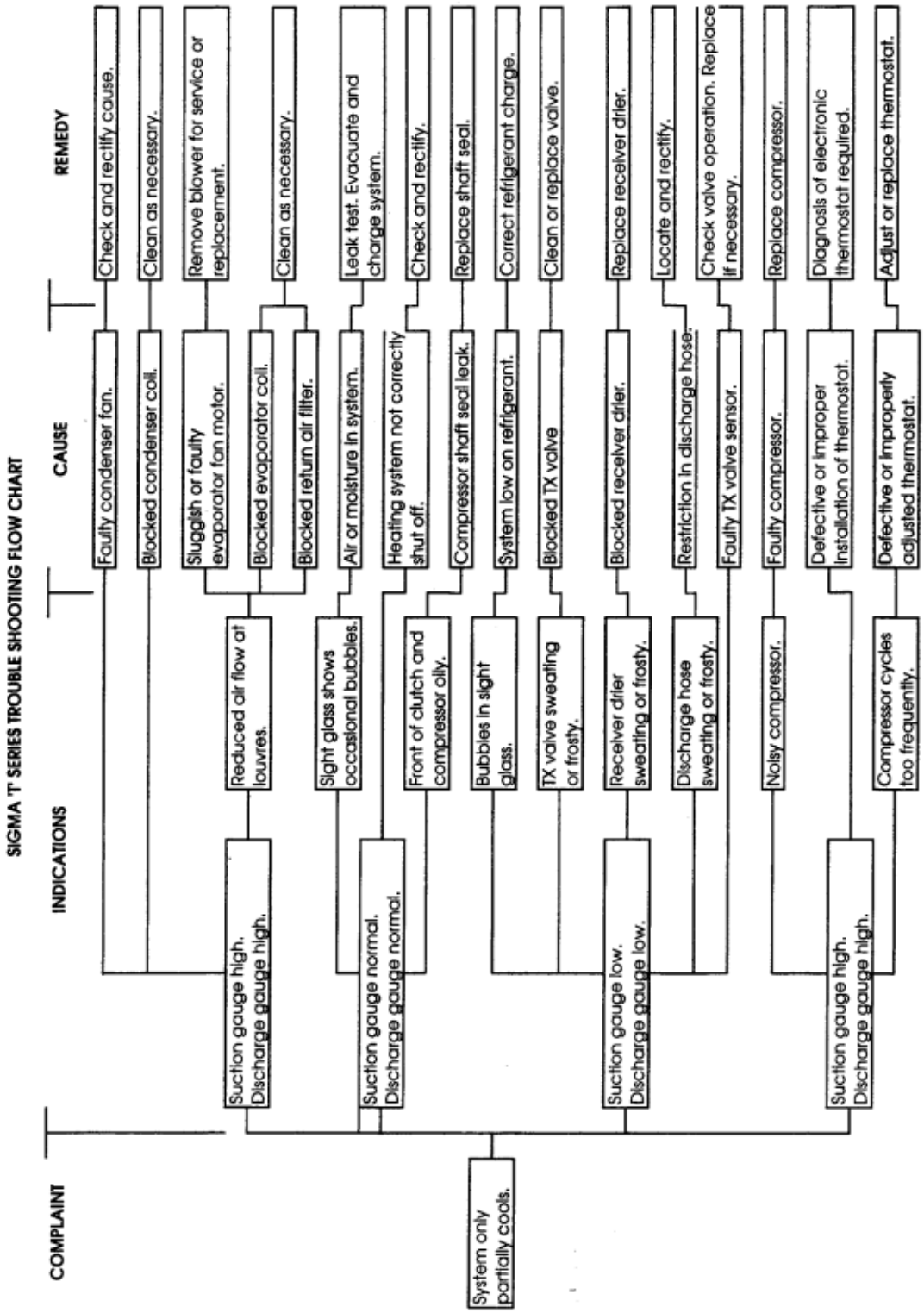


13. Adequately seal all hoses and fittings before storing.

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

7.1 FAULT ANALYSIS CHARTS Cont'd

SYSTEM ONLY PARTIALLY COOLS



9.5 FAN AND MOTOR SPARE PARTS

ITEM	DESCRIPTION	PART NO.	TCF8BX1	TCF8BX2
20	Motor – Evaporator	UE026	✓	✓
14	Motor - Condenser	UE026	✓	✓
-	Motor - Pressuriser (Option)	UE325	✓	✓
39	Brush Set - Evaporator Motor	320622	✓	✓
15	Brush Set - Condenser Motor	320622	✓	✓
21	Blower Wheel - Evaporator	410105	✓	✓
-	Blower Wheel - Pressuriser(Option)	410337	✓	✓
22	Blower Housing - Evaporator	AS198603	✓	✓
-	Blower Housing - Pressuriser(Option)	AS505607	✓	✓
-	Pre-Cleaner Bowl - Plastic	460725	✓	✓
-	Pre-Cleaner Bowl - Stainless Steel (Option)	460748	✓	✓
-	Fresh Air Filter - Canister Type	460720	✓	✓
-	Fresh Air Filter Canister	AM184935	✓	✓
16	Condenser Fan (Blade Type)	420229	✓	✓
23	Clamp - Evaporator Motor	553628	✓	✓
17	Motor Mount - Condenser	S2715043	✓	✓
24	Motor Mount - Evaporator	AS271518	✓	✓
25	Blower Housing Inlet Ring - Evaporator	410902	✓	✓
26	Shaft Extension - EvaporatorMotor	872135	✓	✓

SECTION 10.0 REFERENCE DRAWINGS

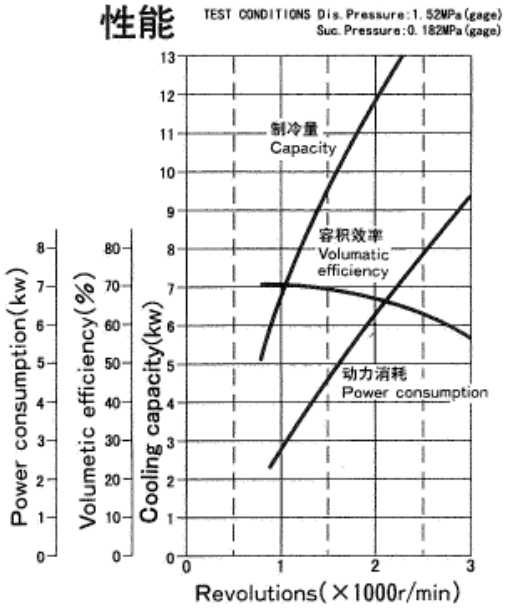
DRAWING NO	DESCRIPTION	REVISION
AS271546	TFC8 Exploded View - Evaporator	00
AS271547	TCF8 Exploded View - Condenser	A
T2715001	TFC8 Unit Parameters - Evaporator	00
T2517002	TCF8 Unit Parameters - Condenser	B
AR271514	T8 Series Refrigeration Schematic	A
AE271515	T8 Series Electrical Schematic	00
AE271551	TFC8BX2 Electrical Schematic	A
AS243041	Compressor General Arrangement	A

Air Conditioner

Specifications
规格

MODEL: 型号	DKS-32
Displacement 排量	313cm³/rev
Number of cylinders 气缸数	10
Maximum speed 最大速度	7000r/min
Refrigerant 制冷剂	HFC-134a
Lubricant 润滑油	ZXL 100PG(DH PS) 500cm³
Weight(without clutch) 重量(没有电磁阀)	10.0kg
Weight(with clutch) 重量(有电磁阀)	14.5kg
Voltage 电压	DC 12/24V
Power consumption 耗电量	48W

Performance Curve
性能

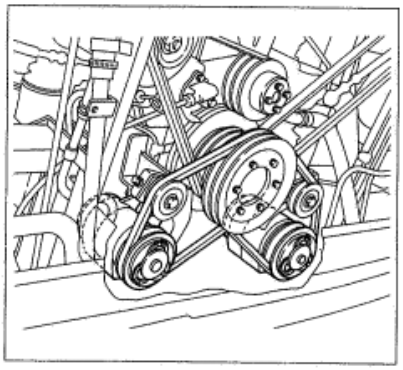


Mountings 安装

Example 1:

(Mounted directly on the engine)

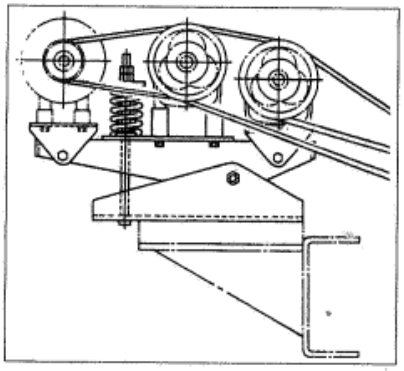
(直接安装在发动机上)



Example 2:

(Mounted on the chassis)

(安装在底盘上)



Remarks

- When mounting on the engine:
  Contact the engine maker for advice regarding mounting.
- 直接安装在发动机上
  和发动机厂家的技术人员联系，告诉他们你的想法。
  也许他们会提一些建议。
- When mounting on the chassis near the engine:
  Contact ZEXEL for optional mounting brackets.
  A crank pulley aod belt, etc., must be provided separately.
- 安装在发动机旁的底边盘上
  和我们联系，我们有可供选择的安装支架。
  但是，你需要自己准备曲轴皮带轮和皮带。

Mast Elevating Cylinders

Remove

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, or mast will fall.**
>
> **Relieve pressure on hydraulic and pneumatic systems before loosening connections or parts.**

2. Be sure mast lock pins are engaged in mast and shut down machine. If machine is fitted with a central lube system, remove and cap grease lines from cylinder pins.
3. Support both cylinders and remove upper pins (3). Start machine and retract mast cylinder rods all the way in. This will get all of the oil out of the cylinders, which allows you to save that much more oil and reduce excess oil in cylinder when dismantling. **DO NOT** touch mast lock switch! If mast lock pins are retracted, mast will fall ! Shut down machine and isolate the machine, then ensure that Personal Danger Tags or Locks are fitted to isolator.
4. Attach lifting strap to cylinder eye and support weight of cylinder while removing lower pin (5) and lift cylinder from machine for repair.

Repair

Refer to parts manual for specific cylinder and repair parts. Refer to cylinder repair information in SECTION 7 for type of cylinder on machine. The Mast Elevating cylinders have a N type head and a Z type piston.

Replace

1. With cylinder supported, install lower pivot pin and retainer bolts and grease fitting or grease line. **DO NOT** attach cylinders to mast yet.

> **WARNING: BE SURE to cycle cylinder at least SIX times up and down to remove trapped air before attaching to mast, otherwise mast may fall suddenly when lowered.**

2. Connect hoses, start up machine and cycle cylinders at least SIX times up and down to remove trapped air, then slowly extend cylinder to line up rod end with clevis on mast.
3. Install upper pivot pin and retainer bolt. Install grease fittings or grease line.
4. **DO NOT** stand under mast while lowering. Lower mast and raise up again. Check for leaks. Grease all pivot pins.

Nitrogen Tensioner Assembly

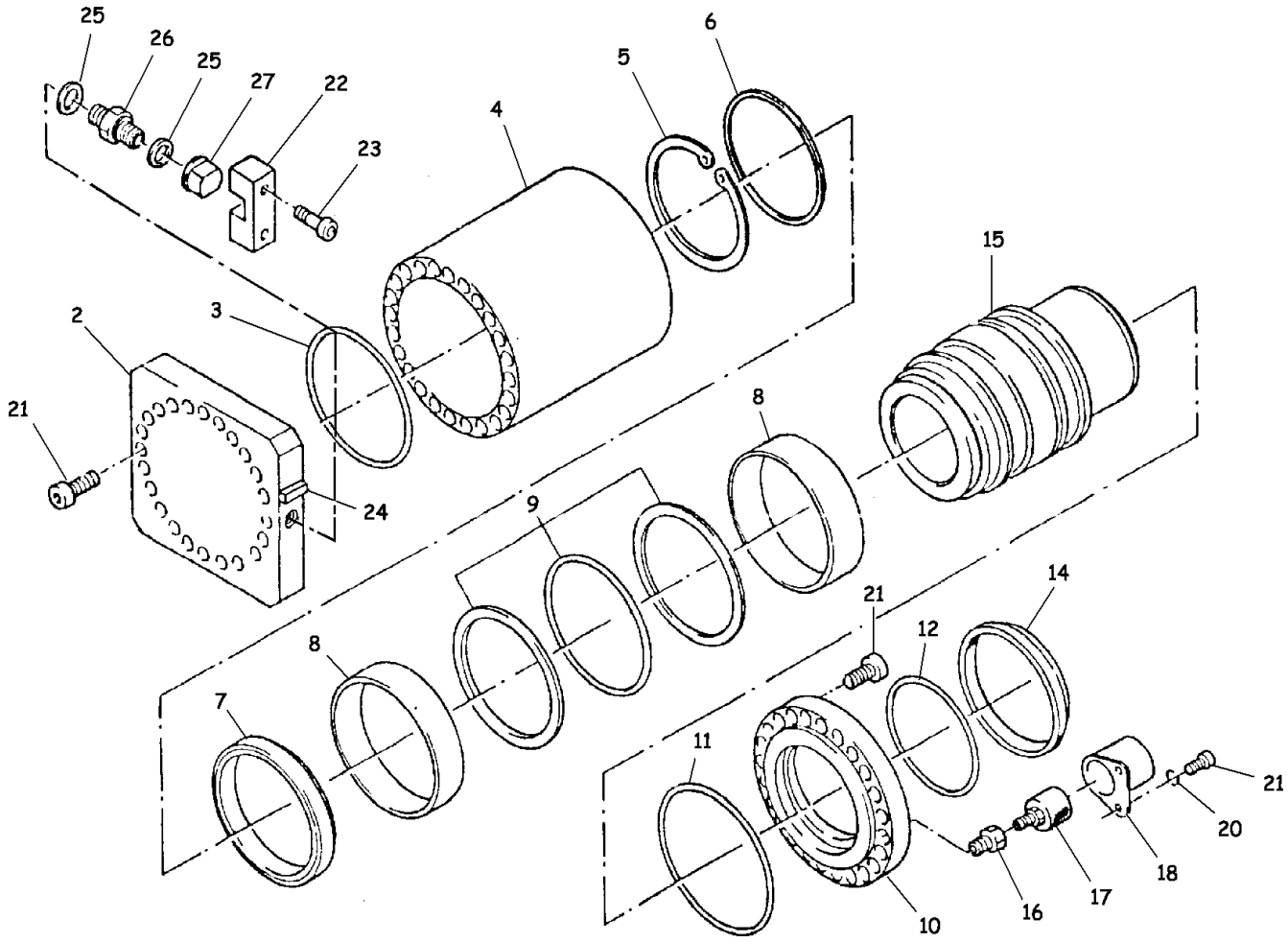


Fig. 3-10 Nitrogen Tensioner Assembly

2. Cover
3. O Ring
4. Cylinder
5. Circlip
6. Support Ring
7. Groove Ring Seal
8. Piston Guide Ring (2)
9. Piston Seal
10. Flange
11. O Ring
12. O Ring
14. Wiping Ring
15. Piston
16. Reduction Piece
17. Vent
18. Cap
19. Capscrew, M6x16 (2)
20. Spring Washer (2)
21. Capscrew, M20x50 (30)
22. Cap
23. Capscrew
24. Rail
25. Sealing Ring (2)
26. Gas Valve
27. Cap

Track Shoe - Mounting to Track Chain

3. Before assembly, verify that the track chain and shoe will accept the same bolt size. Align the track chain before starting.
4. Place track shoes on the track chain and insert bolts. Align the track shoes parallel with each other. Hand start the nuts, making sure the rounded corners of the nuts are showing towards the track link (fig. 3-27a) and the nuts are parallel to the securing edge of the nut seat.

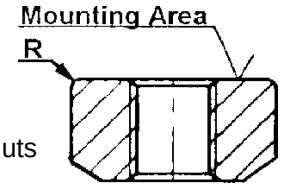


Fig. 3-27a Correct Mounting Position of Track Shoe Nuts

NOTE **When assembling in a workshop, the "straight torque" or "torque turn" methods can be used as an option.**
When assembling in the field, only the "torque turn" method can be used.
For either method, make sure the track shoes are not misaligned when torquing.
Use a criss-cross pattern when torquing the bolts.
After torquing all bolts, there is a possibility of contact between the track shoes on certain profiles, which by design have a small gap. The same applies to extremely wide shoes. The contact area is only permissible at the end of the shoes, in an area not exceeding 10% of the total width.

Direct Torque Method

With an air wrench or a torque wrench, tighten the bolts to 11 ft. lbs. (15 Nm). When starting, make sure to secure the nuts in the nut seat to keep from twisting. Next, proceed to torque the bolts with a torque wrench or computer controlled torque system to the specified torque value as listed in the Grouser Bolt Torque Chart (KN111) - Direct Method, in this section.

Torque Turn Method

With an air wrench or a torque wrench, tighten the bolts to 11 ft. lbs. (15 Nm). When starting, make sure to secure the nuts in the nut seat to keep from twisting. Next, proceed to torque the bolts with a torque wrench or computer controlled torque system to the specified torque value as listed in the Grouser Bolt Torque Chart (KN111) - Torque Turn Method, in this section.

Now tighten the bolts by a third of a turn (120 degrees).

When assembling the track shoes in the field, this method must be used because the final torque is not done with a calibrated torque wrench and although the deviation may be small, the tightening of a third of a turn more, gives the necessary clamping force independent for the required friction factor.

Track Shoe - Retightening

DO NOT merely retorque the bolts in the field. This would lead to failure of the joint due to the altered friction factor and a reduced preload of the bolts.

The CORRECT METHOD of retightening the bolts, is to loosen the bolts until they turn freely. Now torque the bolts using the "torque turn" method described above.

NOTE: **This can only be done once and only after a short time of machine operation (approximately 50 hours). After extended operation, loose bolts and nuts must be replaced with new ones for safety reasons.**

Final Drive Assembly

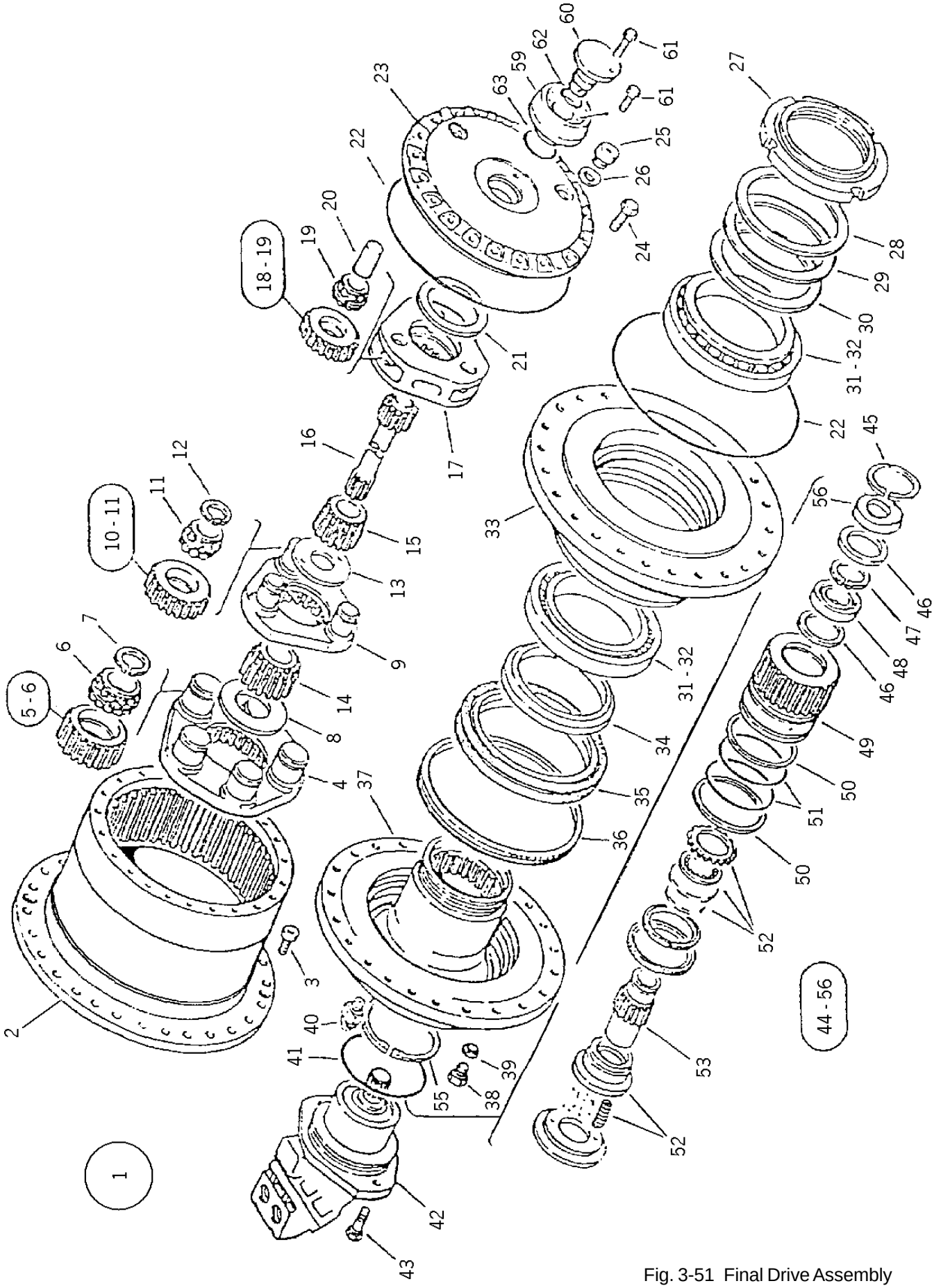


Fig. 3-51 Final Drive Assembly

Idler Unit Assembly

Idler Unit - Assembly

7. Position the idler wheel so the fill plug is 45° from vertical as shown in fig. 3-66. Remove plug using a 6mm allen wrench and fill the idler wheel with SAE 90 oil until it runs out the hole. Install plug and tighten.

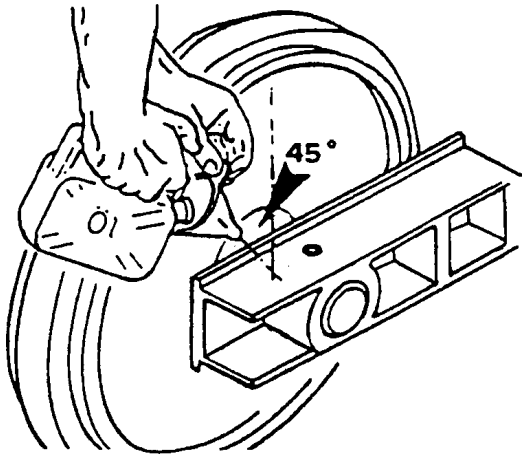


Fig. 3-66 Oil Fill Position

8. Place the sliding block (2) onto the sliding rails (7) and fasten with four capscrews and spring washers.

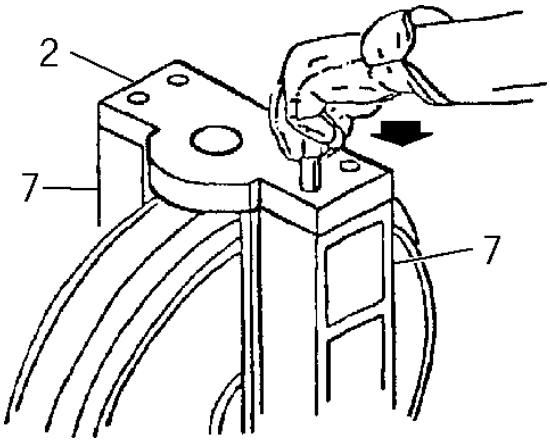


Fig. 3-67 Sliding Block Installation
2. Sliding Block
7. Sliding Rail

9. Place the nitrogen tensioner onto the sliding block and fasten with four cap-screws and spring washers.

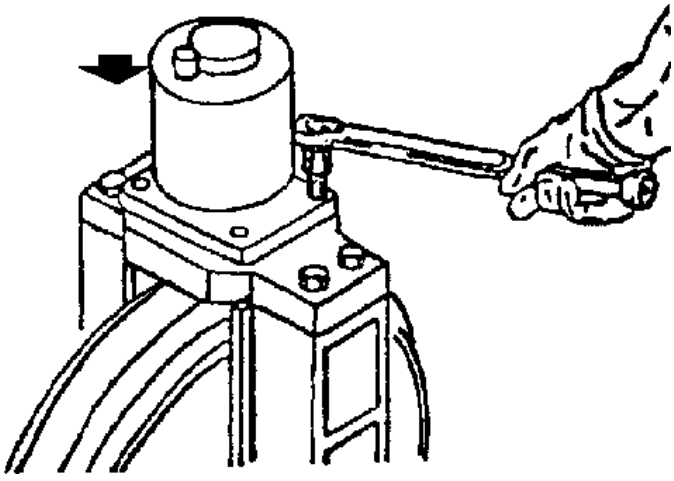


Fig. 3-68 Nitrogen Tensioner Installation

Auxiliary Crane

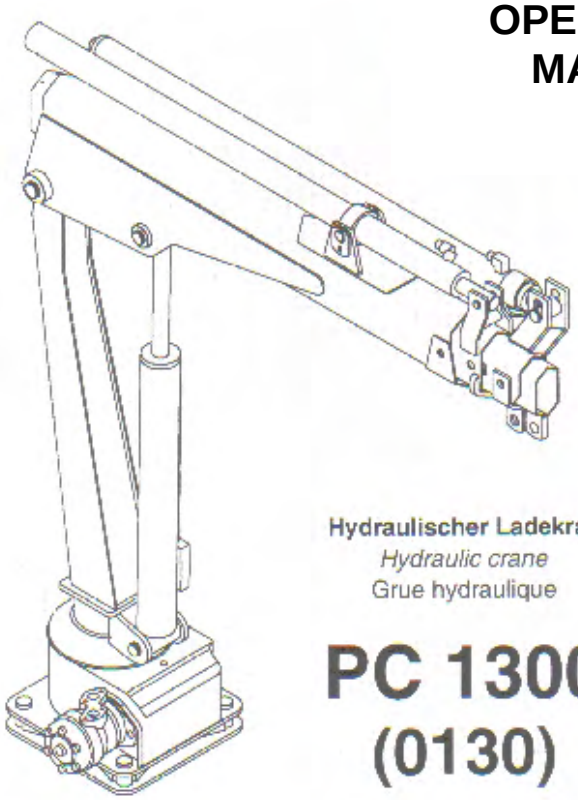
Palfinger Hydraulic Crane

PALFINGER

A-5101 Salzburg/Bergheim

KRAN

OPERATORS MANUAL



Hydraulischer Ladekran
Hydraulic crane
Grue hydraulique

PC 1300
(0130)

Gültig ab Krannummer
Valid from crane number
Valable a patir du nr. de grue

DE 643

Ausgabe
Edition
Edition 01/99

CE

Palfinger Hydraulic Crane
Crane Operation

Chapter 4

Contents

-3 Maintenance Chart

After the first 50 hours

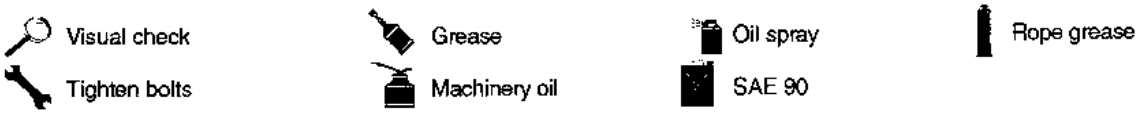
	1st Service	
11	Oil Filter	change

Every 50 hours

1.	Bolts of the stabizier cylinder	
2.	Catch pins on outrigger boxes	
3.	Ring gear (slew 360 degrees)	
4.	Column bearing (slew 360 degrees)	
5.	Main boom pivot	
7.	Boom ext. rams – guide parts	
8.	Extension booms – guide blocks	
9.	Controllevers and – rods	
10.	Fixation of crane base	
11.	Hydraulic oil level (unsupported)	
12.	Loader hook with chain	
13.	Stabilisation manual	

Every 1000 hours / at least 1 x yearly

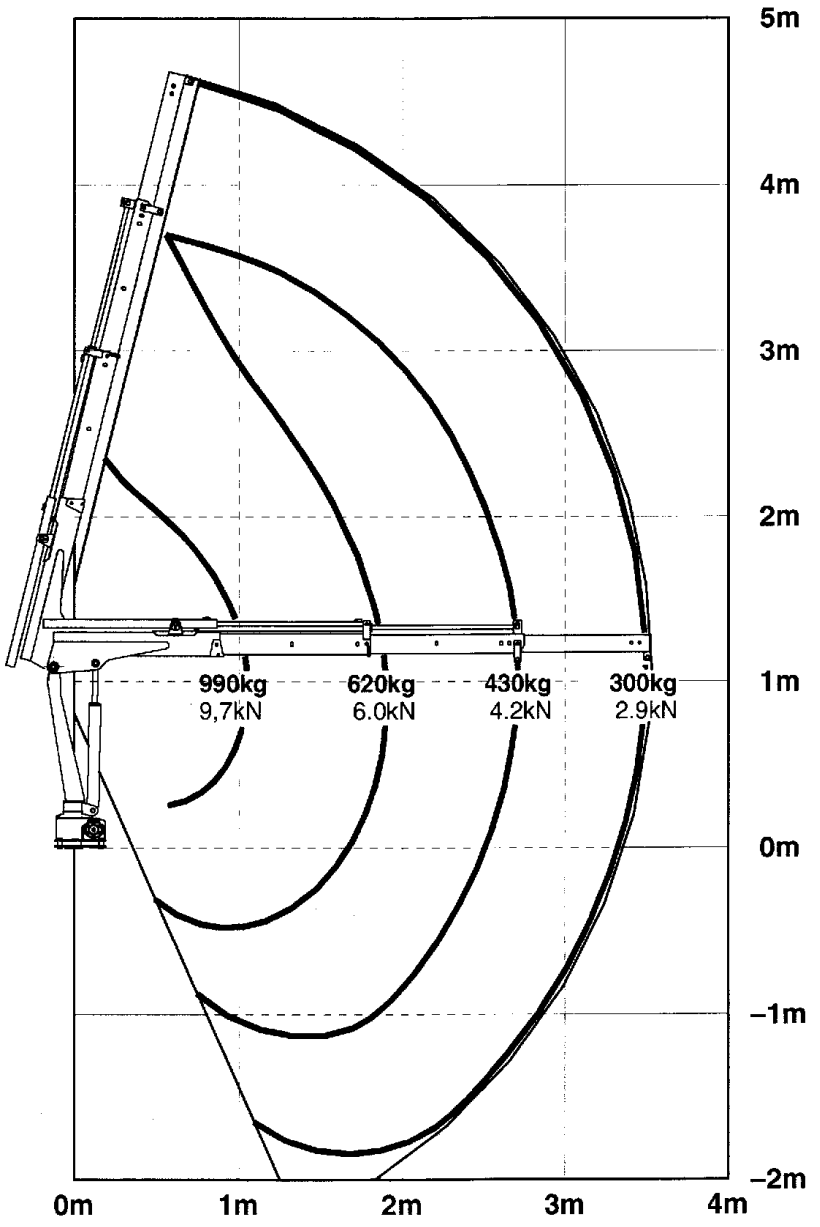
14.	Oil filter – Hydraulic Oil	Change ➡ 6.1-6



Auxiliary Crane

Palfinger Hydraulic Crane

PALFINGER Technical Information	PC 1300 A CE Lifting Capacity Diagram	Page DT0130/04
		Page 02
		Edition 1/03/99



Konstruktionsänderungen vorbehalten, fertigungstechn. Toleranzen müssen berücksichtigt werden.
Subject to change, production tolerances have to be taken into account.
Les tolerances relatives a la technique de production doivent etre prises en cons ideration.

Einstufung: H1/B3 nach DIN15018
classification: H1/B3 in DIN15018
classement: H1/B3 en mesure DIN15018

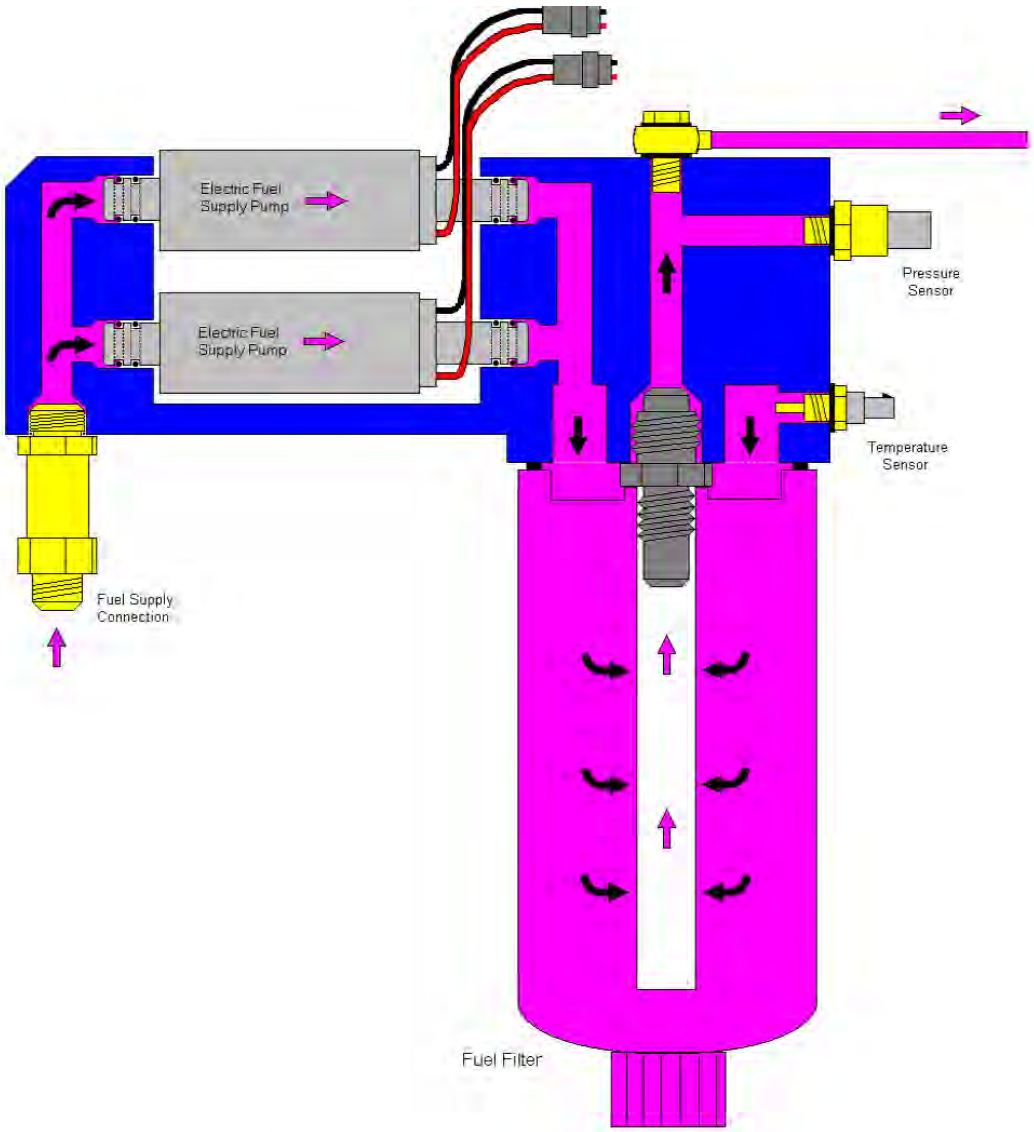


Figure 7: Fuel Filter Head Detail

Operation

When the ECM detects a start condition (for Generator Drive) or when the key switch is in the "on" position (for Industrial) the relay energizes. When the relay is energized the pumps are powered. With the relay energized the pump set delivers fuel to the injection pumps until the engine is shut down. In the event of short-circuit an integrated 20 amp fuse will open to prevent damage.

If the ECM commands a shut down (either planned or unplanned) the power to the FSO solenoid is interrupted. On industrial engines the electric pumps will continue to pump until the keyswitch is turned "off" but with the FSO valves closed there will be no fuel flow to the injection pumps. On Generator Drive engines, when the power to the FSO valves is interrupted the power relay will also de-energize and the electric pumps will stop.

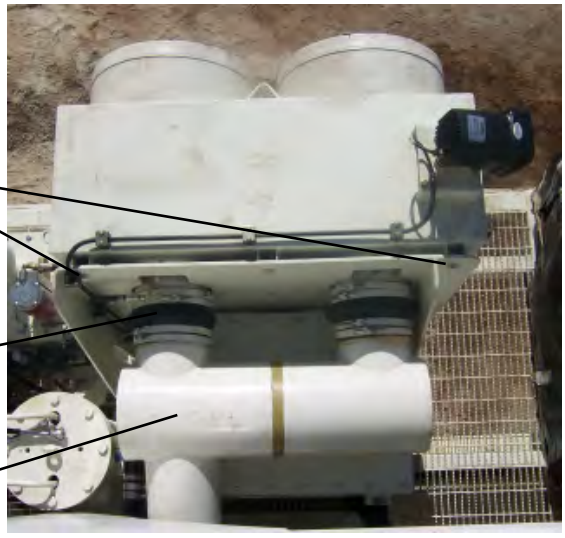
Engine and Compressor Air Cleaners

Engine and Compressor Air Cleaner Service

Service for the disposable-filter type air cleaner includes general inspection and replacing the elements as required.

A. Inspection and General Service

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



Pump Drive Gearbox

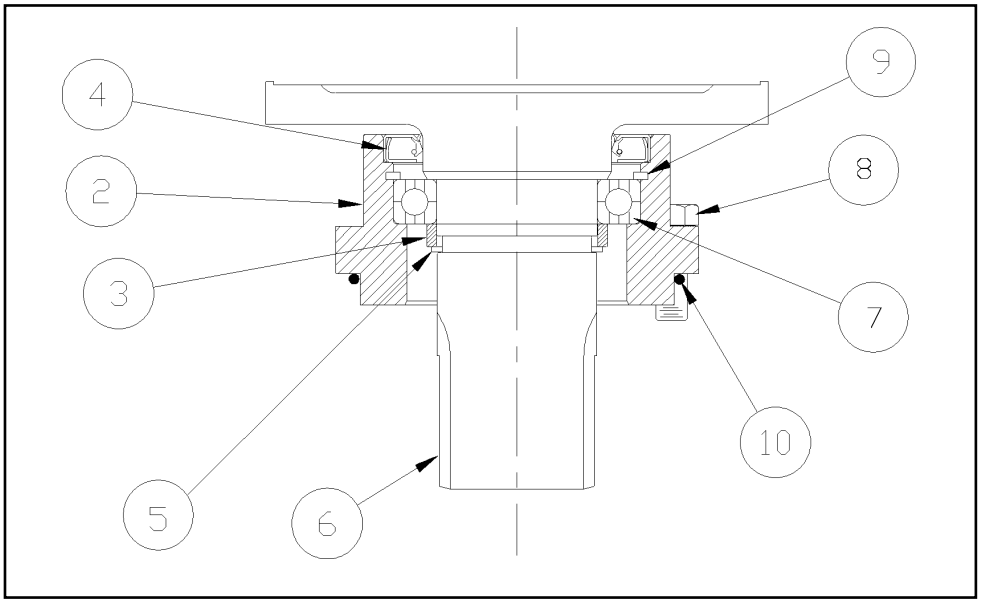


Fig. 4-5b 3" Input Shaft Assembly (item 18, fig. 4-5)

2. Flange	5. Ring, Retaining	8. Capscrew (4)
3. Spacer	6. Shaft, Input	9. Ring, Retaining
4. Seal, Oil	7. Bearing	10. O Ring

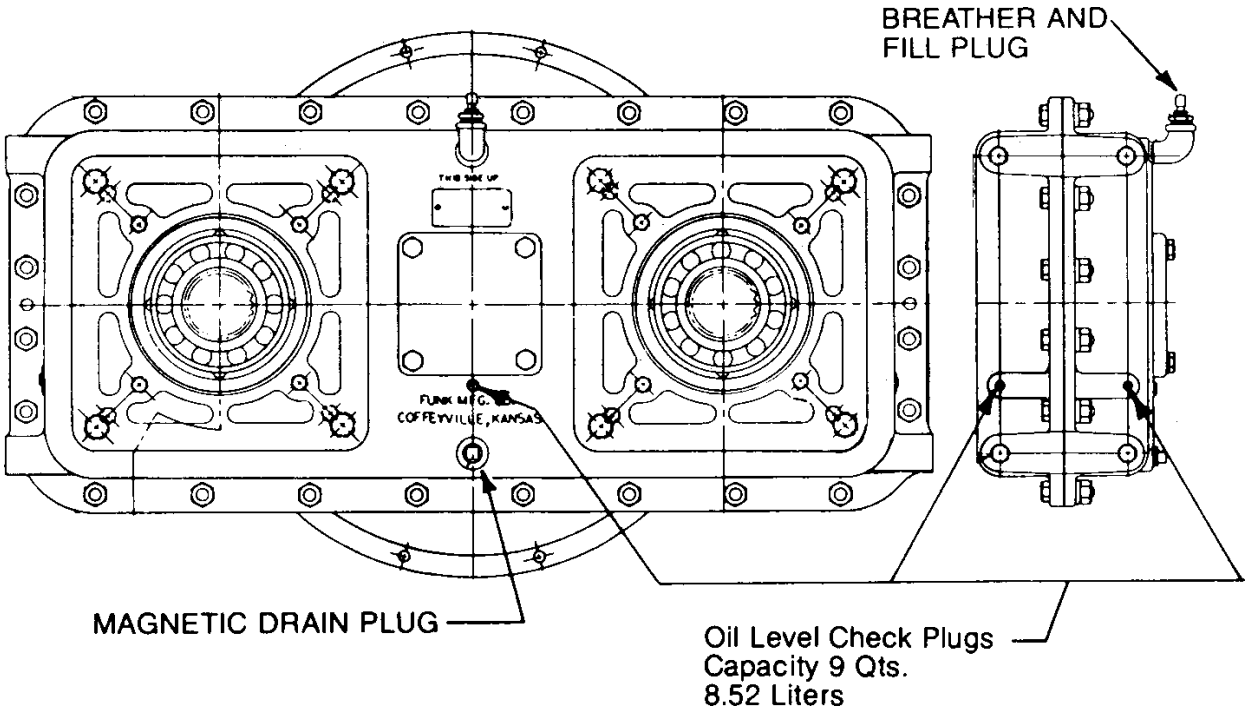


Fig. 4-5c Funk Pump Drive Gearbox (ref. 414347)

Variable Displacement Pump AA4VG, Series 3

Filtration Options

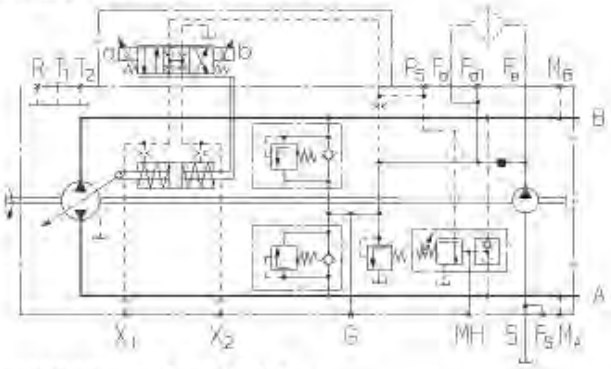
Charge Pressure Filtration...D (Ports Fe & Fa)

Filter type: . . . . . Filter **without** bypass

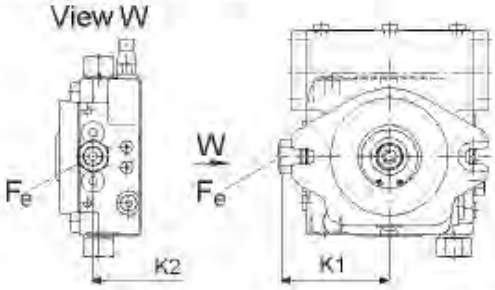
Filter element pressure drop (line mounted filter):
at V=141 SUS (30 cSt): n=n_{max} . . . . . $\Delta p \leq 1$ bar (14.5 psi)
at cold start . . . . . $\Delta p_{max} = 3$ bar (43.5 psi)
(valid for entire speed range n_{min}–n_{max})

Please note:
- With Direct Operated Hydraulic Control–Type DG, control pressure should be supplied from the P_S port.
- The filter should be fitted with a ΔP indicator and/or switch set at ≤3 bar (43.5 psid).

Circuit Diagram...D (Ports Fe & Fa)



Dimensions...D (Ports Fe & Fa)



Size	K1	K2	F_e
40	112	198.7	¾"-16 UNF-2B; 15 deep
56	115	215.4	¾"-16 UNF-2B; 15 deep
71	134	239.0	1 1/16"-12 UN; 20 deep
90	128	248.5	1 1/16"-12 UN; 20 deep
125	147	267.9	1 5/16"-12 UN-2B; 20 deep
180	148	311.9	1 5/16"-12 UN-2B; 20 deep

Charge Pressure Filtration...K (with cold start valve)

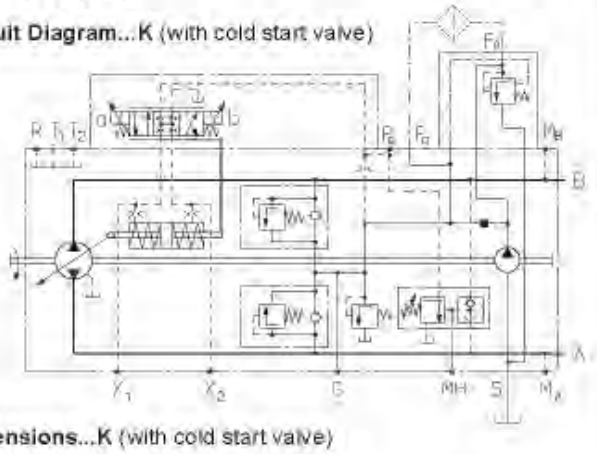
Similar to option D, except with cold start valve, providing filter bypass function and charge pump protection.

Bypass valve
Bypass setting . . . . . $\Delta p \geq 3.5$ bar (50 psi)
Bypass flow . . . . . To charge pump inlet

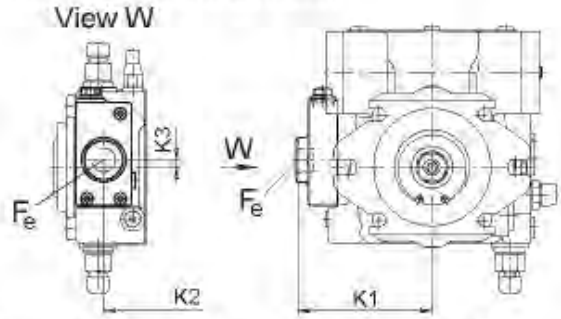
Port F_e . . . . . To line mounted filter
Port F_a . . . . . From line mounted filter

The filter should be fitted with a ΔP indicator and/or switch set at ≤3 bar (43.5 psid).

Circuit Diagram...K (with cold start valve)



Dimensions...K (with cold start valve)

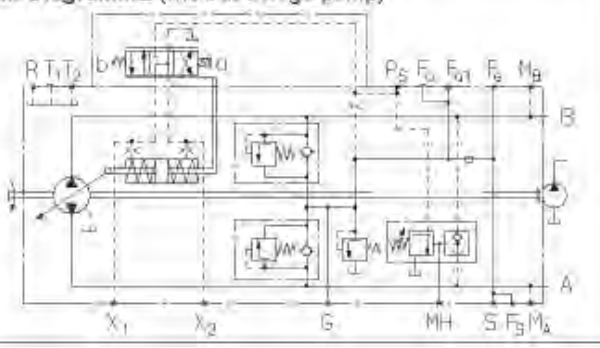


Size	K1	K2	K3	F_e
40	122.5	198.7	0	¾"-16 UNF-2B; 15 deep
56	125.5	215.4	0	¾"-16 UNF-2B; 15 deep
71	145.5	239.0	8	1 1/16"-12 UN; 20 deep
90	139.5	248.5	24	1 1/16"-12 UN; 20 deep
125	172.0	267.9	20	1 5/16"-12 UN-2B; 20 deep
180	173.0	311.9	3	1 5/16"-12 UN-2B; 20 deep

External Charge Supply...E (without charge pump)

On units supplied without an integrated charge pump (N00 or K...) the suction port (S) is plugged, and the external charge supply is connected at port F_a.
Please note that the externally supplied charge flow must be maintained at the cleanliness levels indicated on page 4.

Circuit Diagram...E (without charge pump)



Tram and Rotation Pumps

Variable Displacement Pump AA4VG, Series 3

Combination Pump

Combination pumps provide two independent closed circuits without the need for splitter gear boxes
When ordering combination pumps the individual model codes should be connected by a '+' sign:

Code: Pump #1 (front pump) + Code: Pump #2 (rear pump)

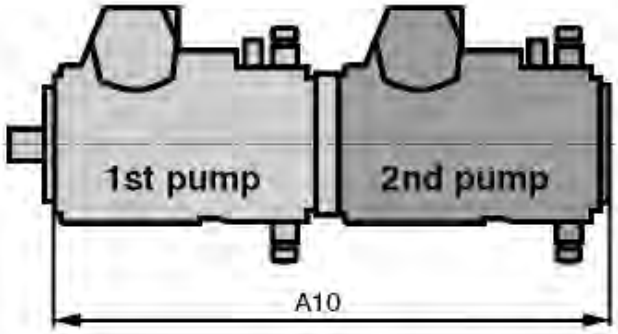
Code example: AA4VG 56 EP1D1/32 R – PTC 52 **F073S** + AA4VG 56 EP1D1/32 R – PSC 52 F003S

External support for combination pumps of the same frame size is not required, if the dynamic acceleration does not exceed 10g (=98.1 m/s²)

The 4-bolt mounting flange is recommended for size 71 and larger pumps

Combination pump of the same size
(2nd pump without through drive and with auxiliary pump, F00)

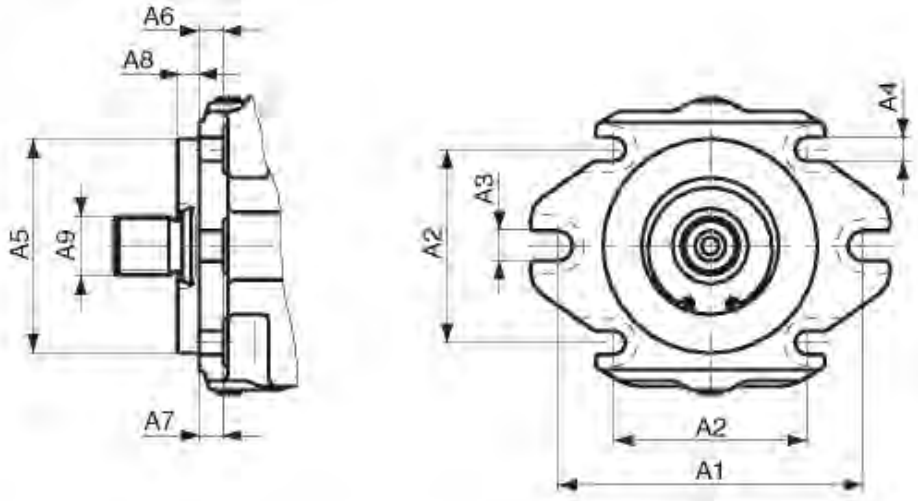
Size	40	56	71	90	125	180
A10	475.5	521.2	596.4	608.8	669.1	764



Mounting flanges & shaft options (of single and combination pumps)

										Combination pump of same size			
										Single pump	1st Pump		2nd Pump
Size	Mtg. flange	A1	A2	A3	A4	A5	A6	A7	A8	A9	A9	Through drive	A9
40	SAE C (2-Bolt)	181	–	18	–	ø127	–	15	12.7	S (SAE 1⅛")	S (SAE 1¼")	F09/K09	U (SAE 1")
56	SAE C (2-Bolt)	181	–	18	–	ø127	–	18	12.7	S (SAE 1⅛")	T (SAE 1⅜")	F07/K07	S (SAE 1¼")
71	SAE C (2+4-Bolt)	181	114.6	18	14	ø127	15	15	12.7	S (SAE 1¼")	T (SAE 1⅜")	F07/K07	S (SAE 1¼")
90	SAE D (2+4-Bolt)	228.6	161.4	22	21	ø152.4	17	20	12.7	S (SAE 1¾")	S (SAE 1¾")	F73/K73	Z (W35)
125	SAE D (2+4-Bolt)	228.6	161.4	22	21	ø152.4	20	20	12.7	S (SAE 1¾")	T (SAE 2")	F69/K69	S (SAE 1¾")
180	SAE E (4-Bolt)	–	224.5	–	21	ø165.1	22	–	15.9	S (SAE 1¾")	T (SAE 2¼")	F72/K72	S (SAE 1¾")

Mounting Flange



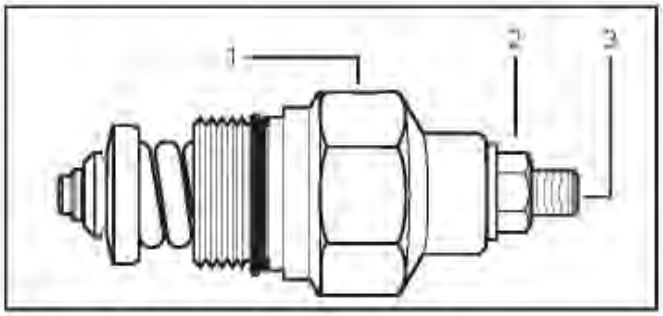
Variable Displacement Pump AA4VG, Series 3

Engagement of Relief Valve Tow Option

Tow Option Engagement for AA4VG40 and AA4VG56
To actuate tow option loosen lock nut (ref. item 2). Turn tow option engagement screw (ref item 3) in six turns and tighten lock nut.

To disengage tow option loosen lock nut and turn tow option screw all the way out until it stops.

Note: Use a 4 mm allen wrench and a 13 mm box wrench to adjust.

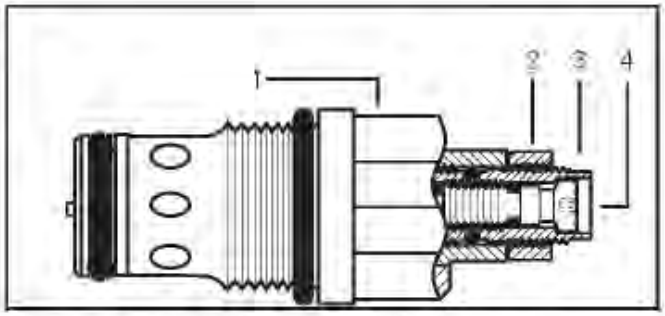


Relief valve for AA4VG40 and AA4VG56.
1.. Nut used to torque relief valve into port block.
2.. Lock nut for tow option engagement.
3.. Tow option engagement screw.

Tow Option Engagement for AA4VG71 and AA4VG90
To actuate tow option turn tow option engagement screw (ref. item 4) out three turns.

To disengage tow option turn tow option engagement screw in until it stops.

Note: Use a 4 mm allen wrench to adjust.



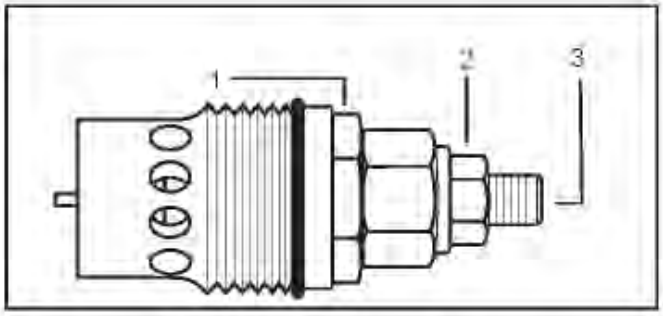
Relief valve for AA4VG71 and AA4VG90.
1.. Nut used to torque relief valve into port block.
2.. Lock nut for high pressure relief adjustment.
3.. Adjustment screw for high pressure adjustment.
4.. Tow option engagement screw.

Tow option Engagement for AA4VG125 and AA4VG180
To actuate tow option turn relief valve (ref. item 1) out two turns.

To disengage tow option tighten relief valve.

Note: Use a 36 mm box wrench to adjust.

Note: Tow options are meant to be used for a short time period only. Tow options are not to be used for extended tows.



Relief valve for AA4VG125 and AA4VG180.
1.. Nut used to torque relief valve into port block and engage-tow option.
2.. Lock nut for high pressure relief adjustment.
3.. Adjustment Screw for high pressure relief adjustment.

Torque Specs for Relief Valves into Port Block

Pump Size	Wrench Size	Torque
28,..56	32 mm	66 ft.lb. (90 Nm)
71,..90	32 mm	110 ft.lb. (150 Nm)
125,..180	36 mm	147 ft.lb. (200 Nm)

Warning: Tow option bypasses high pressure relief valves. Catastrophic motor damage can occur if hydraulic circuit empties or overheats.

Hydraulic Piston Pumps

Hydraulic Piston Pumps - Removal and Replacement

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

1. Tag and remove hoses from pump unit.
2. Cap or plug all connections.
3. Support pump with a suitable lifting device.
4. Remove mounting bolts and lift pump out.
5. Be sure to fill case of pump with oil before starting.

Replacement is the reverse of removal.

Hydraulic Piston Pumps - Repair

Pulldown & Auxiliary Pump - Model AA11VLO190DRS

Overhaul of hydraulic piston pumps in the field is not recommended. Special tools, expert knowledge and absolute cleanliness are essential. It is usually best to exchange the pump for a new or factory rebuilt unit. However, if you choose to do the work yourself, the following AA11VLO Series manual will be of help you.

Feed and Auxiliary Pump

RDE 92500-06-R/10.98

Reglergehäuse abdichten
Sealing of the regulator housing

Reparaturanleitung A11VLO
Repair Instructions A11VLO

Achtung!

Bei Regler mit Meßfeder: z. B. DRL, EP, LRDH

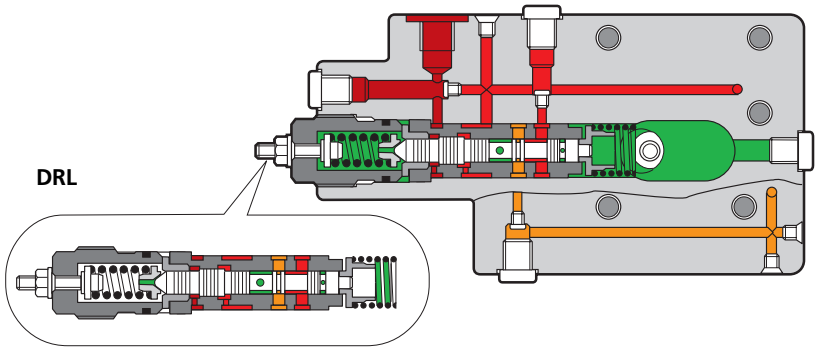
Zuerst Steuerbuchse mit Meßfeder ausbauen, dann Reglergehäuse abbauen!

Attention!

For control with measuring spring, for example DRL, EP, LRDH

At first remove control bush with measuring spring, than remove regulator housing!

DRL



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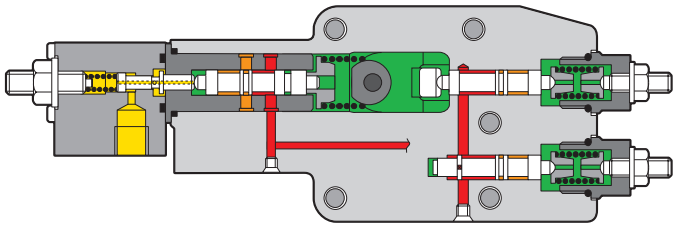
LRDH



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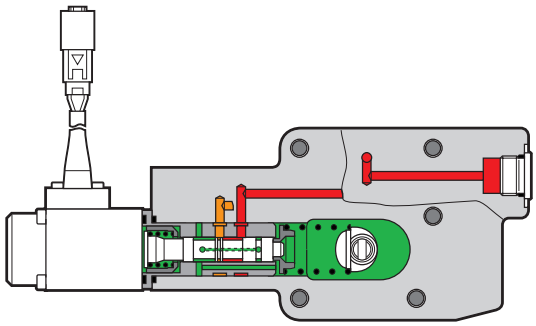
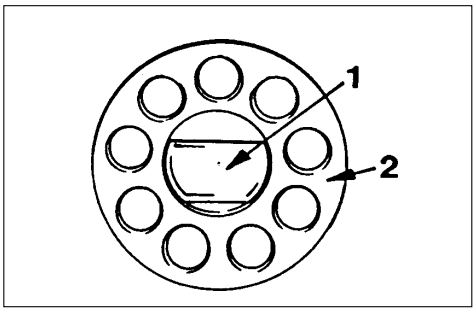
EP

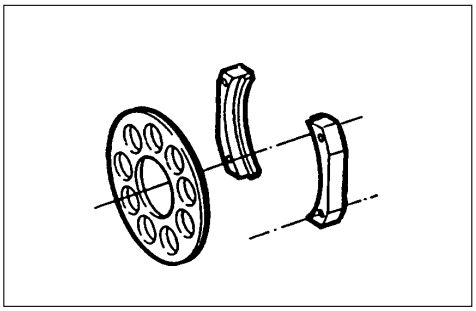


17



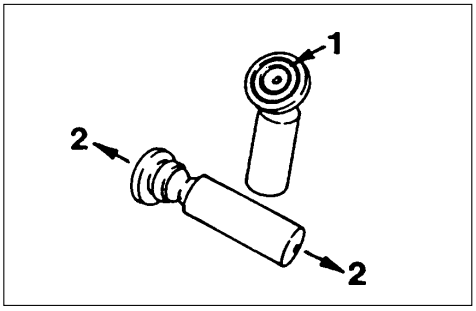
47 Kontrolle!
Rückzugkugel (1)
Rückzugplatte (2).

Inspection!
Retaining ball (1)
Retaining plate (2).



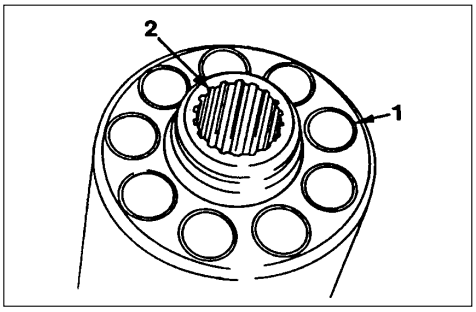
48 Kontrolle!
Haltesegmente

Inspection!
Fixing segments



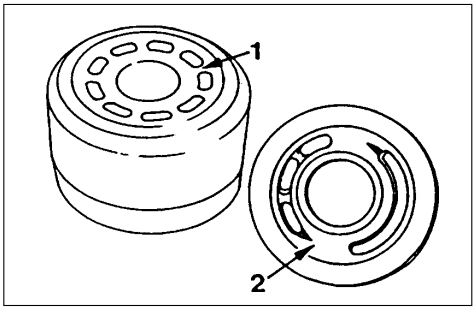
49 Kontrolle!
Gleitschuhe (1),
Axialspiel (2).

Inspection!
Slipperpads (1),
Axial backslash (2).



50 Kontrolle!
Zylinderbohrungen (1),
Verzahnung (2).

Inspection!
Cylinder boring (1),
Gears (2).



51 Kontrolle!
Zylindergleitfläche (1),
Gleitfläche Steuerplatte (2).

Inspection!
Cylinder contact area (1),
Contact area control plate (2).

RDE 92500-06-R/10.98

Sicherheitsbestimmungen
Safety regulations

Reparaturanleitung A11VLO
Repair Instructions A11VLO

Starten

- Beim Starten müssen alle Bedienhebel in "Neutralstellung" stehen.
- Die Maschine nur vom Fahrersitz aus Starten.
- Prüfen Sie die Anzeigeinstrumente nach dem Start, um sicher zu gehen, daß alles ordnungsgemäß funktioniert.
- Lassen Sie die Maschine nicht unbewacht, während der Motor läuft.
- Beim Start mit Batterieverbindungskabeln verbinden Sie Plus mit Plus und Minus mit Minus. Massekabel (Minus) immer zuletzt anschliesen und zuerst abtrennen.

Vorsicht

- Auspuffgase sind lebensgefährlich. Bei Start in geschlossenen Räumen für ausreichende Luftzufuhr sorgen!

Hydraulikanlage

1. Hydraulikanlage steht unter hohem Druck!

⚠ Unter hohem Druck austretende Hochdruck-Flüssigkeiten (Kraftstoff, Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen. Daher sofort einen Arzt aufsuchen, da anderenfalls schwere Infektionen entstehen können!

2. Bei der Suche nach Leckstellen wegen Ver letzungsgefahr geeignete Hilfsmittel verwenden!
3. Vor Arbeiten an der Hydraulikanlage diese unbedingt drucklos machen und angebaute Geräte absenken!
4. Bei Arbeiten an der Hydraulikanlage unbedingt Motor abstellen und Traktor gegen Wegrollen sichern (Feststellbremse, Unterlegkeil)!
5. Beim Anschließen von Hydraulikzylindern und -motoren ist auf vorgeschriebenen Anschluß der Hydraulikschläuche zu achten!
6. Bei Vertauschen der Anschlüsse umgekehrte Funktionen (z.B. Heben/Senken) - Unfallgefahr!
7. Hydraulikschlauchleitungen regelmäßig kontrollieren und bei Beschädigung und Alterung austauschen! Die Austauschschlauchleitungen müssen den technischen Anforderungen des Geräteherstellers entsprechen!

⚠ Öle, Kraftstoffe und Filter ordnungsgemäß entsorgen!

Start

- When starting all operating levers must be in "neutral position".
- Only start the machine from the driver's seat
- Check the indicating instruments after start to assure that all functions are in order.
- Do not leave the machine unobserved when the motor is running.
- When starting with battery connection cables connect plus with plus and minus with minus. Always connect mass cable (minus) at last and cut off at first.

Attention

- Exhaust gas is dangerous. Assure sufficient fresh air when starting in closed rooms!

Hydraulic equipment

1. Hydraulic equipment is standing under high pressure.

⚠ High pressure fluids (fuel, hydraulic oil) which escape under high pressure can penetrate the skin and cause heavy injuries. Therefore immediately consult a doctor as otherwise heavy infections can be caused.

2. When searching leakages use appropriate auxiliary devices because of the danger of accidents.
3. Before working at the hydraulic equipment, lower pressure to zero and lower working arms of the rnachine.
4. When working at the hydraulic equipment, absolutely stop motor and secure tractor against rolling away (parking brake, shim)!
5. When connecting hydraulic cylinders and motor pay attention to correct connection of hydraulic flexible hoses.
6. In case of exchanging the ports, the tunctions are vice versa (f. ex. lift-up/lower) - danger of accidents!
7. Check hydraulic flexible hoses regularly and replace them in case of dammage or wear! The new hose pipes must comply with the technical requirements of the machine manufacturer!

⚠ Orderly disposal or recycling of oil, fuel and filters!

Brueninghaus Hydromatik GmbH, Werk Elchingen, Glockeraustraße 2, D-89275 Elchingen, Tel. (07308) 820, Telex 712538, Fax (07308) 7274
Brueninghaus Hydromatik GmbH, Werk Horb, An den Kelterwiesen 14, D-72160 Horb, Tel. (07451) 920, Telex 765321, Fax (07451) 8221

PGP/PGM 300 Series

Service Manual HY09-SM300/US

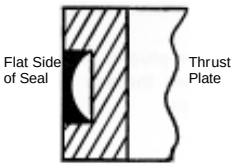
9) Before inserting a new lip seal in the shaft end cover, coat the outer edge of the lip seal and its recess with Permatex Aviation Form-A-Gasket™ No. 3 non-hardening sealant or equivalent. With the metal side of the lip seal up, press it into the mounting flange side of the shaft end cover with an arbor press and bar (see Tool List on page 4). Be careful not to damage the lip of the seal. Press in until flush with the recess. Wipe off excess sealant.

10) If the unit is equipped with an outboard bearing, guide the bearing into its recess in the shaft end cover. This is a light press fit. It may be necessary to lightly tap the bearing into the bore.

11) Install the snap ring in the groove to retain the outboard bearing.

12) Grease the new gasket seals and insert them into the grooves in both sides of all gear housings. Position the first gear housing over the shaft end cover and dowels. Tap it with a soft hammer until it rests tightly against the shaft end cover. Be careful not to pinch the gasket seal. Also be sure that the large rounded core is on the inlet side.

13) Assemble the channel seals into the grooves in the thrust plates with the flat side of the seal facing away from the thrust plate as shown below.

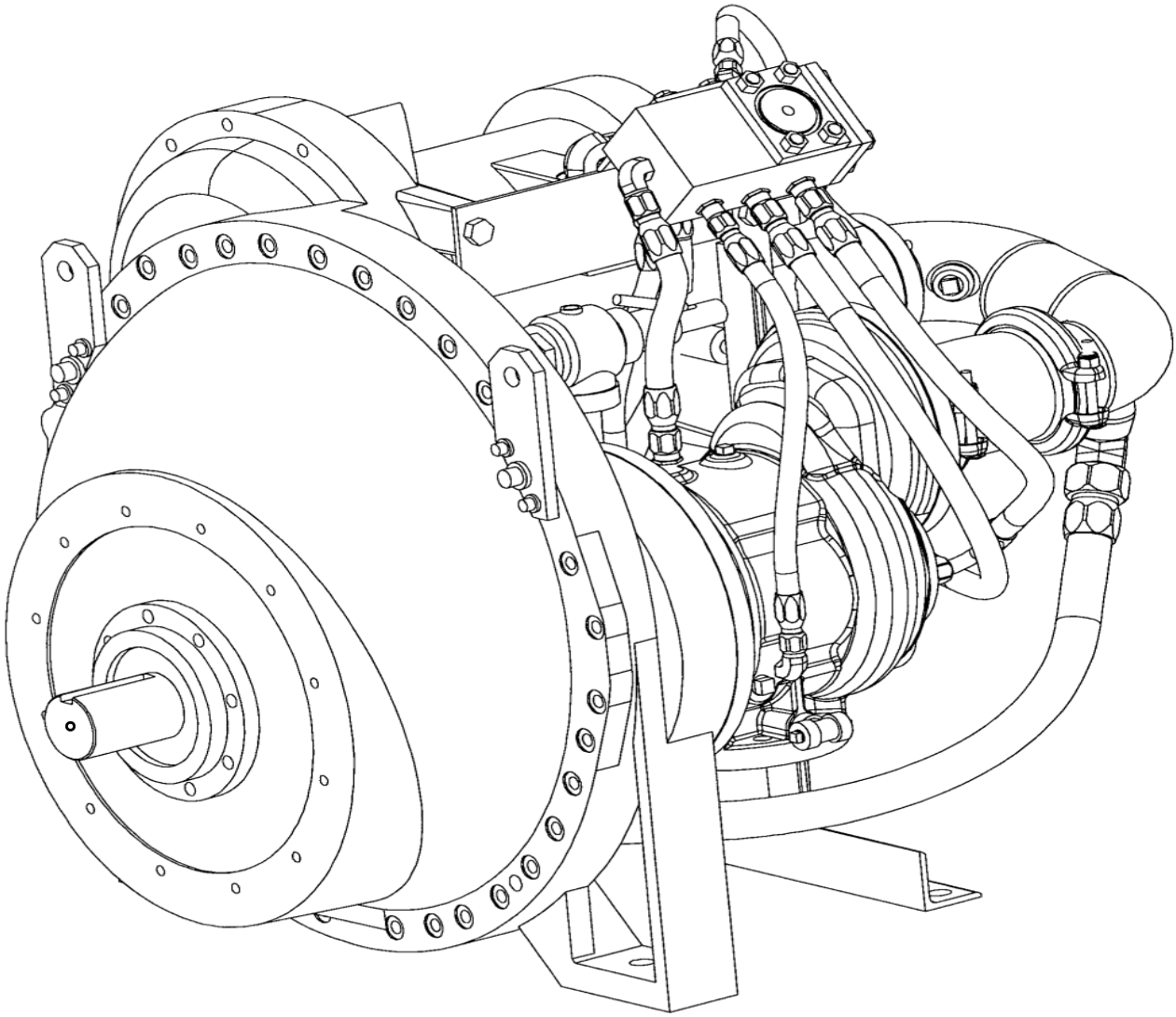


14) Gently slip the thrust plate through the gear housing and into place on the shaft end cover. The channel seal from Step #13 should face the shaft end cover. The relief groove in the plate should face the outlet side of the pump.

15) Slide the driven gear through the housing and into the bushing in the shaft end cover. Coat the steel sleeve tool with grease. Place the lightly-greased drive shaft inside the sleeve and slide both through the shaft end cover with a twisting motion, until the integral gear rests against the thrust plate. Avoid damaging the double lip seal. Remove the steel sleeve. Squirt clean oil over the gears.

16) Slip the thrust plate with the seal over the gear journals and into the housing bore. The flat side of the seal should face up with the relief groove facing the outlet side. (For single pump assemblies go directly to Step #21).

Drill Compressor
Model 20/12
1475cfm @ 500psi



Compressor Fluid Circuit

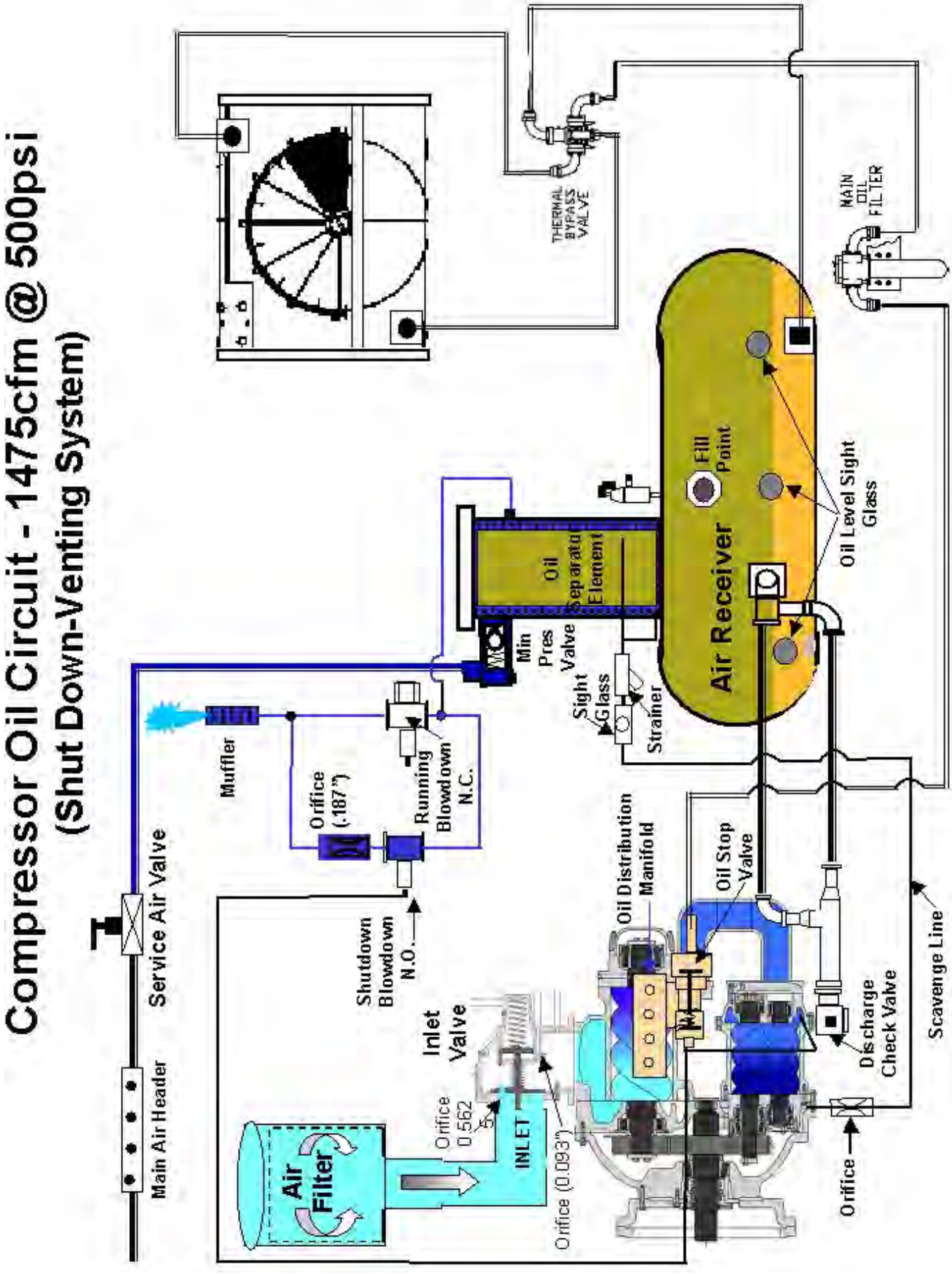
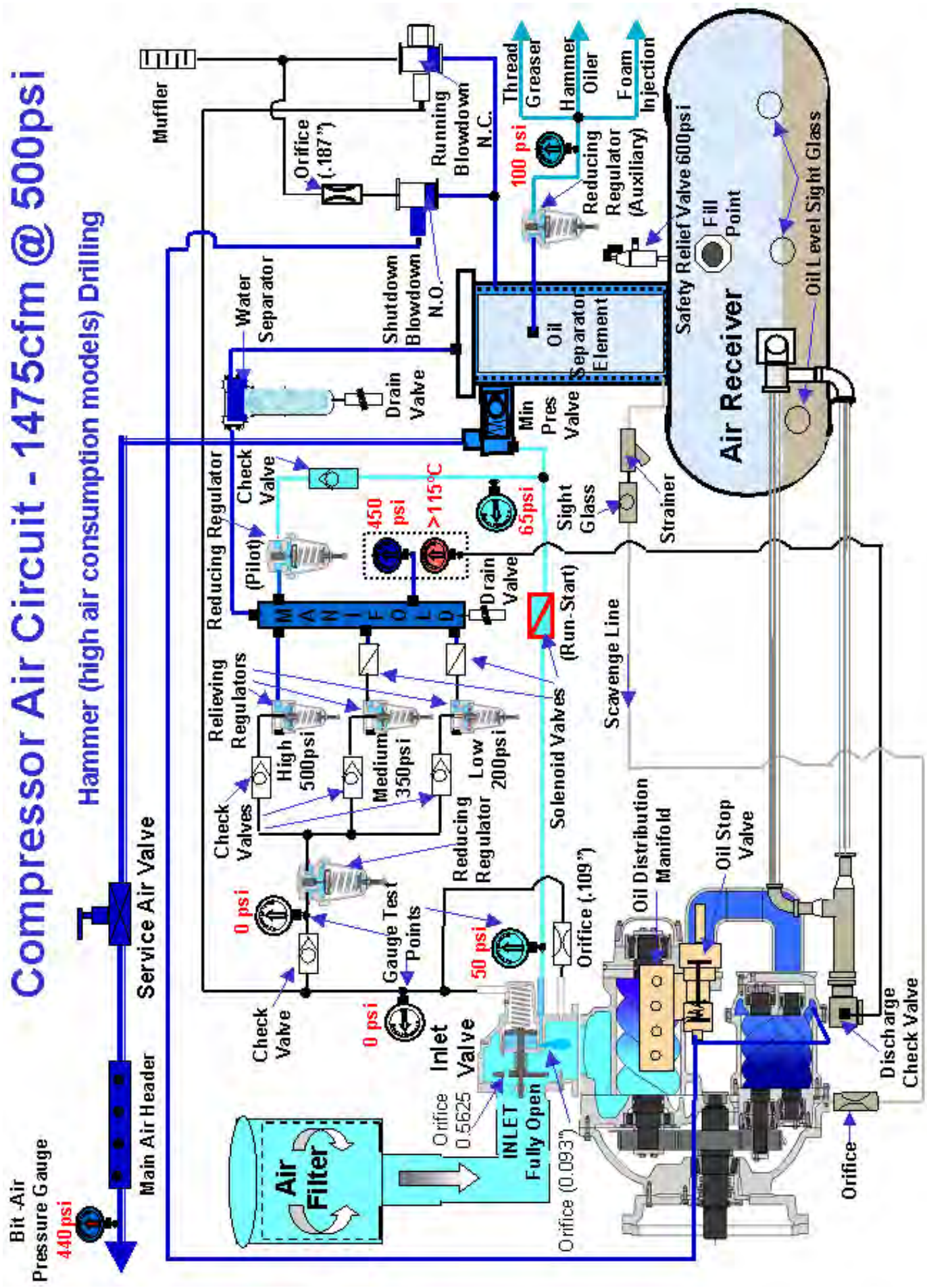


Fig. 2.5 Compressor Oil Circuit (Shutdown)

Compressor Air Circuit



Compressor Operation

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, 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 190-210psig (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.

3.4 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. When operating temperature reaches 60°C (140°F), the vigilante system will activate the Run/Start solenoid valve to load the compressor.

3.5 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.

3.6 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 (sump pressure 0 psig).**

Compressor Maintenance

Minimum pressure / check valve

This is a (100psi) check valve. Pilot pressure is directed into the spring chamber of the check valve. This pilot pressure is additive to the normal check valve setting (100psi) and will increase the setting of the check valve accordingly “approx” 60-70psi, to have a total check valve setting of 170psi.

The purpose of the check valve is to maintain the minimum of 170psi in the compressor receiver when the main air valve is opened, which causes a sudden drop in receiver pressure. This prevents the receiver from discharging all its air down the service air line before the compressor has a chance to re-pressurise the receiver. Without the minimum pressure valve the sudden pressure drop and re-pressurisation between the wet and dry side of the element would cause the element to fail. Low sump air pressure (means low oil pressure) will reduce the oil circulation and can cause the air end to fail.

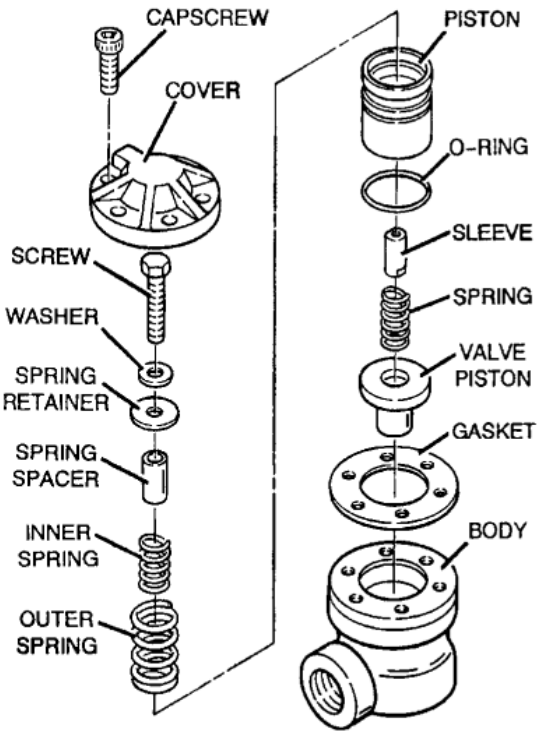
Minimum Pressure Check Valve

CAUTION: **When working down stream from the minimum valve, pressure may be trapped between the minimum valve and the main air valve. It is therefore necessary to manually vent this pressure by disconnect ing the hydraulic cylinder from the main air ball valve, and operating the ball valve manually, venting the air out through the drill string.**

Minimum Pressure Check Valve Maintenance

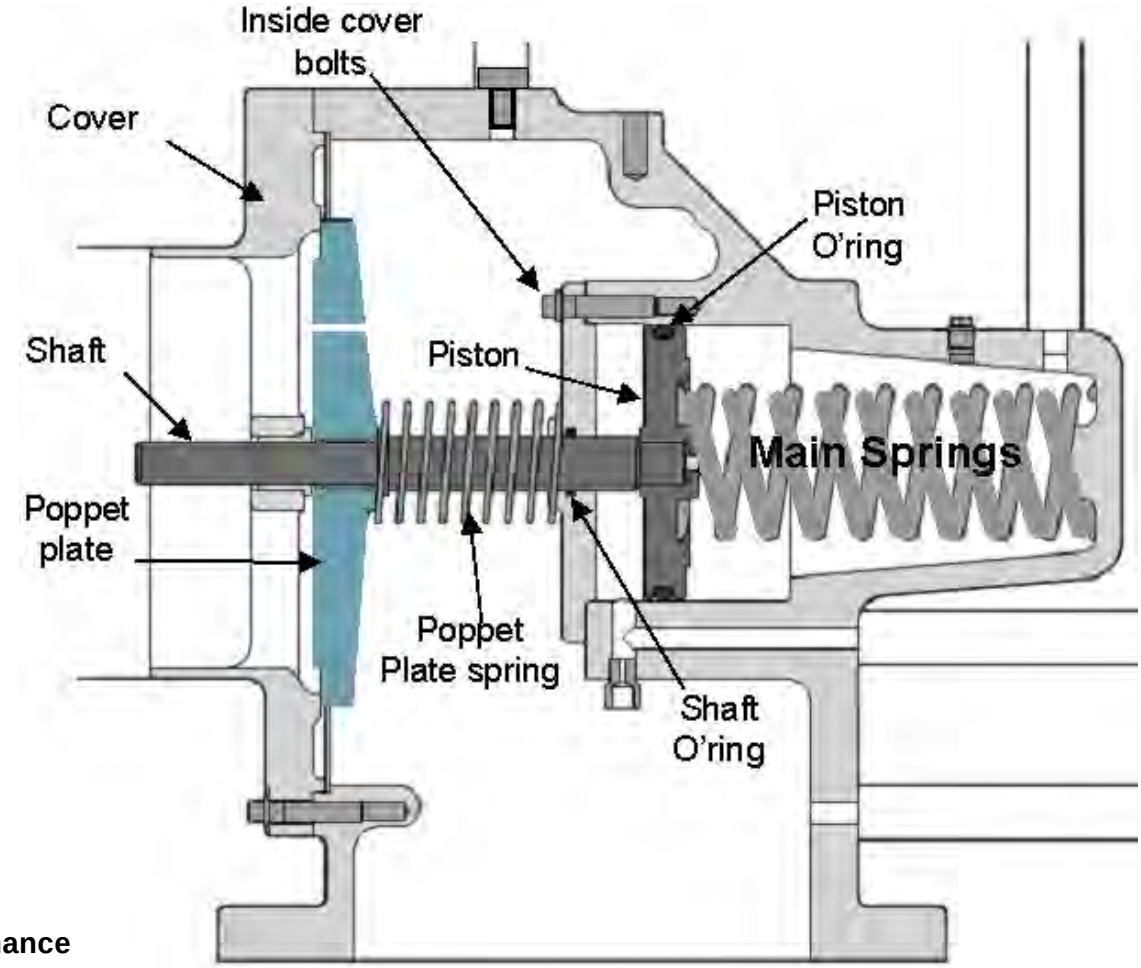
The minimum pressure check valve should be periodically disassembled, inspected for excessive wear, cleaned and reassembled.

1. Remove the six (6) capscrews in cover.
2. Remove cover, taking care not to damage the gasket.
3. Remove the piston assembly
4. Clean and inspect parts. Any excessively worn parts should be replaced. Contact Sullair Corpo ration Parts Department for individual part num bers of minimum pressure valve assembly for ordering purposes for replacement.



Note: **If the Piston O’ring fails, full tank pressure will escape into the pilot hose. This pressure will act on Port 2 of the Inlet valve, resulting in pres- sure buid up and the Safety relief valve on the Receiver tank discharging**

Compressor Maintenance



Maintenance

1. Disconnect all controls and piping from the Inlet valve
2. Remove valve from the compressor unit by removing the six (6) 3/4" bolts and two (2) nuts from the studs
3. Remove cover, care must be taken when removing the last screw as the cover is lightly spring loaded
4. Cover may be stuck to the housing and can be separated by threading two (2) 3/8" bolts into the tapped holes and jacking apart
5. Remove the six (6) bolts from the insde cover

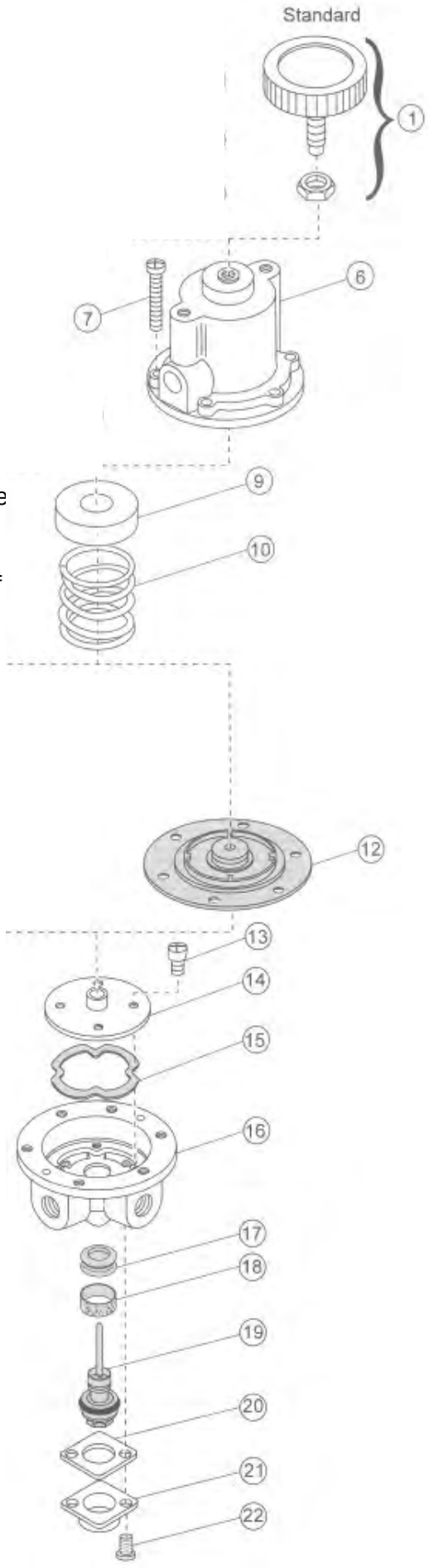
Note: **When disassembling the Inlet valve, the six (6) retaining bolts for the inside cover are long enough to allow the spring tension of the Main springs to be fully relaxed for removal of the piston and springs.**

6. Remove shaft and piston from assembly
7. Inspect piston bore in housing for pitting (erosion) and scoring. Replace if severely damaged
7. Remove and discard the piston O'ring
8. Clean shaft and piston throughly and re-install the piston and shaft O'rings
9. Clean housing bore and re-install shaft and piston with O'rings into housing. Apply light coat of sil-glyde provided in kit
10. All contact surfaces between cover, housing and inner cover must be cleaned with cleaning solution. Wipe dry all surfaces and apply gasket eliminator provided in kit.
11. Reassemble Inlet valve and fill spring chamber with compressor oil.
12. Reinstall Inlet valve back onto compressor unit and reconnect all controls and piping.

Compressor Maintenance

Auxiliary Regulator

The Auxiliary (reducing) regulator reduces 500psi tank pressure to 110psi, to provide a 110psi circuit for auxiliary air components. The auxiliary regulator is located at the receiver tank and has a test point for circuit pressure setting, downstream of the regulator.



Item	Qty	Description
1	1	Knob Assembly
6	1	Bonnet Assembly
7	6	Screw
9	1	Spring Seat
10	1	Spring
12	1	Diaphram Assembly
13	4	Screw
14	1	Seal Plate Assembly
15	1	Seal Plate Gasket
16	1	Body
17	1	Seat Ring Assembly
18	1	Screen
19	1	Inner Valve Assembly
20	1	Retainer Plate
21	1	Reatainer Cap
22	2	Screw

High Pressure Compressor Fluid Cooler

SERVICE MANUAL

CSC™

(CAPTURED SEAL COOLER™)

HIGH PRESSURE AIR-TO-OIL COOLERS

Model CSC 350 (Maximum 350 psi; 2400 KPa)
Model CSC 500 (Maximum 500 psi; 3400 KPa)

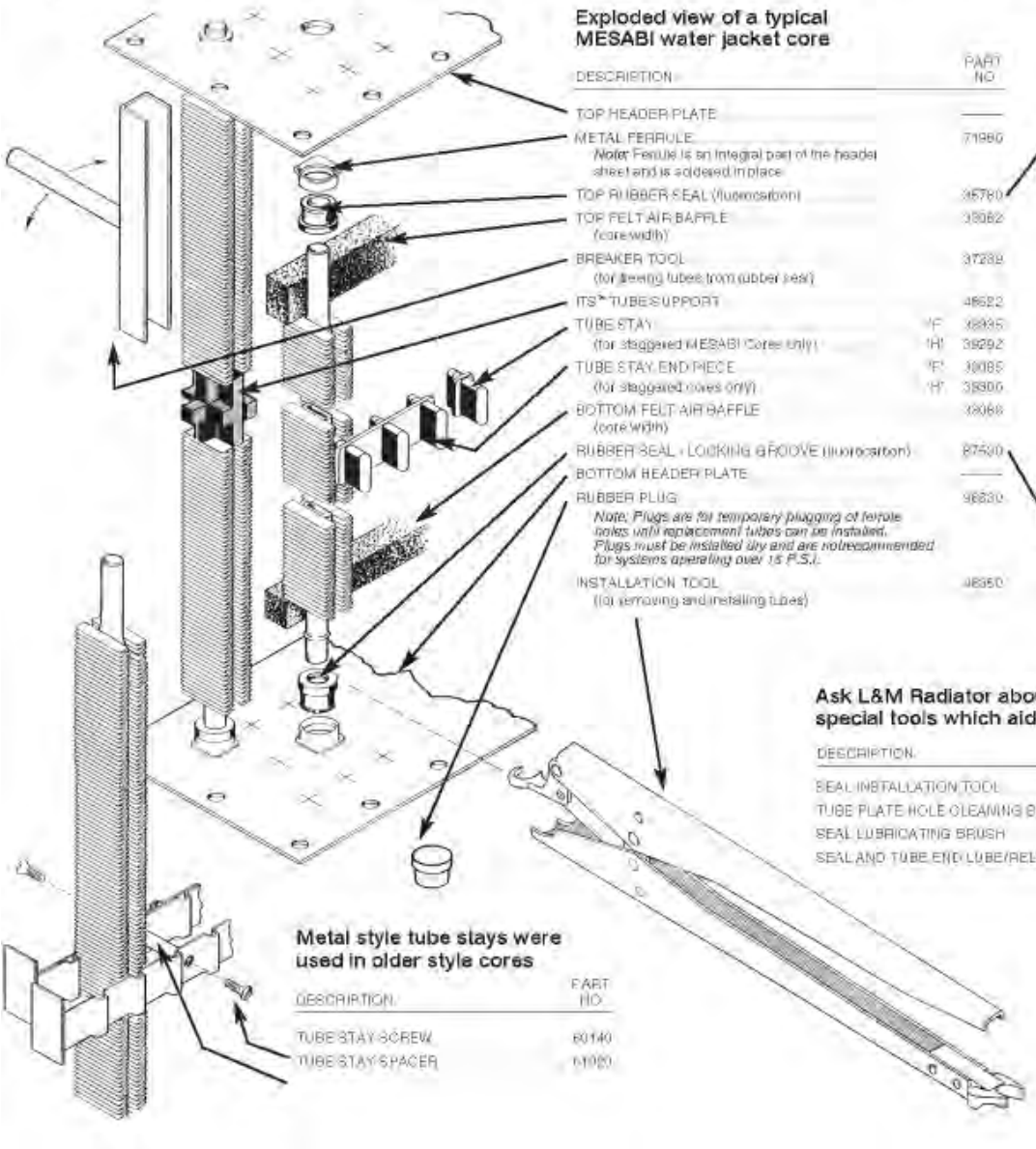
Please read and follow instructions carefully before installing the MESABI® CSC™ oil cooler. Service video available upon request.

Radiator Cooler

Standard Parts of a Typical MESABI® Radiator Core

SINGLE UPSET TUBE

LOCKING TUBE



Exploded view of a typical MESABI water jacket core

DESCRIPTION		PART NO.
TOP HEADER PLATE		——
METAL FERRULE *Note:* Ferrule is an integral part of the header sheet and is soldered in place		71980
TOP RUBBER SEAL (fluorocarbon)		87530
TOP FELT AIR BAFFLE (core width)		39082
BREAKER TOOL (for freeing tubes from rubber seal)		37239
ITS™ TUBE SUPPORT		46522
TUBE STAY (for staggered MESABI Cores only)	'F' 'H'	46335 39292
TUBE STAY END PIECE (for staggered cores only)	'F' 'H'	39085 39300
BOTTOM FELT AIR BAFFLE (core width)		39068
RUBBER SEAL - LOCKING GROOVE (fluorocarbon)		87530
BOTTOM HEADER PLATE		——
RUBBER PLUG *Note: Plugs are for temporary plugging of ferrule holes until replacement tubes can be installed. Plugs must be installed dry and are not recommended for systems operating over 15 P.S.I.*		96830
INSTALLATION TOOL (for removing and installing tubes)		46950

This tube design was discontinued April 1, 1997. See bottom of page.

LOCKING TUBE DESIGN

Ask L&M Radiator about the following special tools which aid repair.

DESCRIPTION	PART NO.
SEAL INSTALLATION TOOL	92371
TUBE PLATE HOLE CLEANING BRUSH	94092
SEAL LUBRICATING BRUSH	93451
SEAL AND TUBE END LUBE/RELEASE AGENT	94217

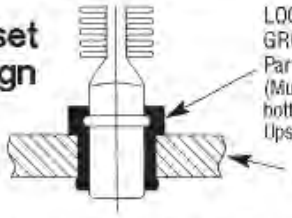
Metal style tube stays were used in older style cores

DESCRIPTION	PART NO.
TUBE STAY SCREW	60140
TUBE STAY SPACER	51060

ITS™ Tube Installation Tool P/N 77050 (See page 6, Figure 8)

MESABI® Water Radiator Tube and Seal Configurations

Single Upset Tube Design

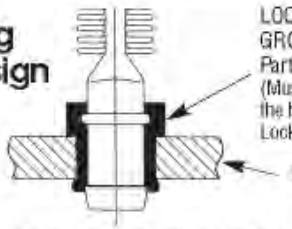


LOCKING GROOVE SEAL Part No. 87530 (Must be used at the bottom with Single Upset Tube)

Bottom Plate

Production of old style tube and seal design has been resumed beginning April 1,1997.

Locking Tube Design

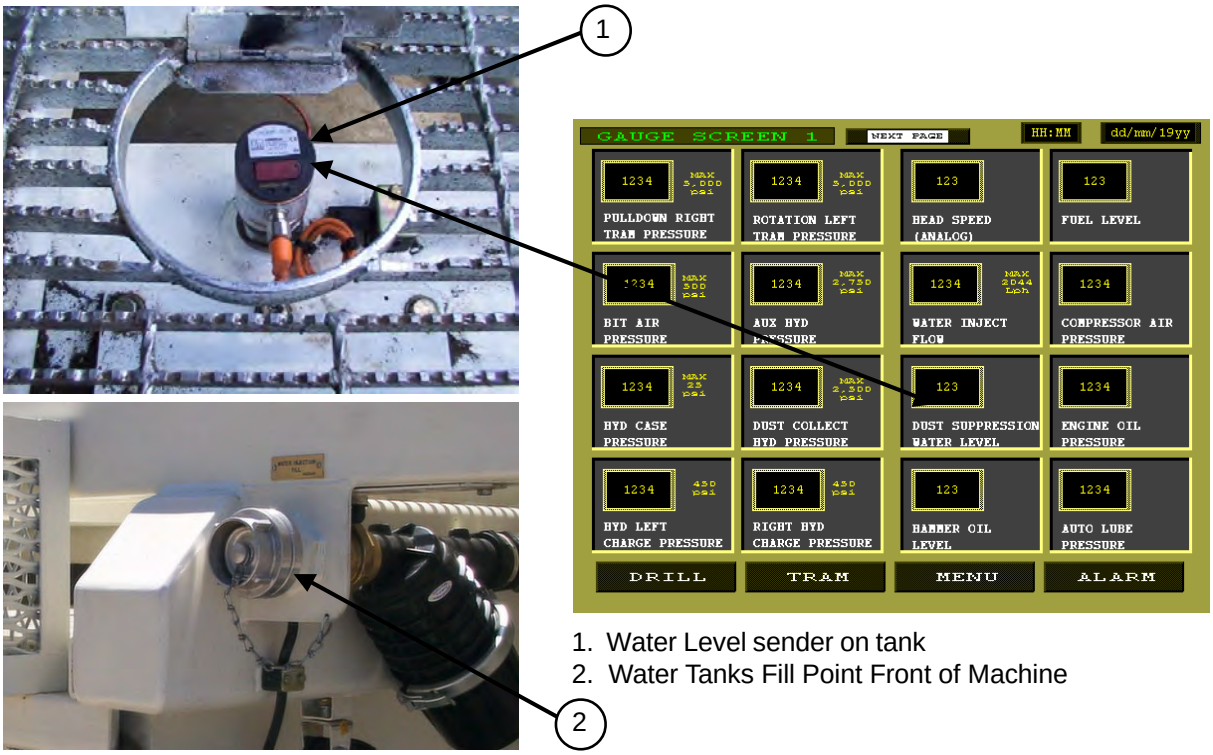


LOCKING GROOVE SEAL Part No. 87530 (Must be used at the bottom with the Locking Tube)

Bottom Plate

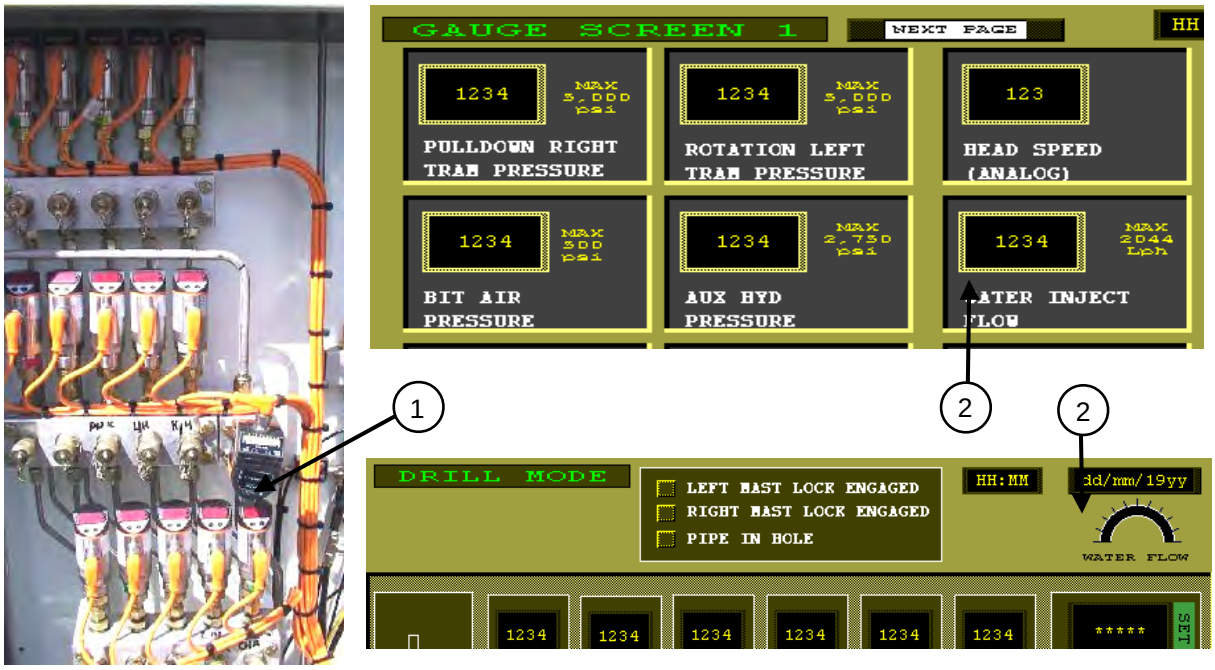
Production of Locking Tube design discontinued April 1,1997. See Service Bulletin No. 123 for more information.

Water Injection

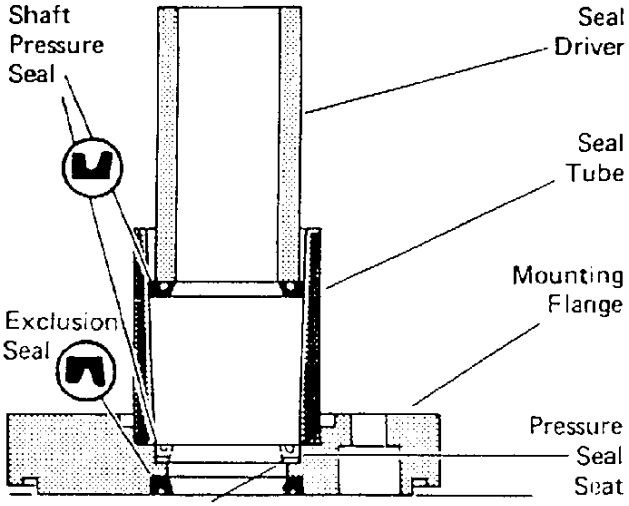


1. Water Level sender on tank
2. Water Tanks Fill Point Front of Machine

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



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



Seal Installation Tool
No. 600470 (007 Motors)
No. 600523 (008, 009 Motors)

Figure 12

21 Install exclusion seal in flange. See Figure 12. Carefully press exclusion seal into place.

22 Visually check seal seat in mounting flange for scratches or other marks that might damage the pressure seal. Check for cracks in flange that could cause leakage.

23 Lubricate I.D. of seal tube and O.D. of shaft pressure seal with light film of clean petroleum jelly. Align small I.D. end of seal tube with seal seat in mounting flange. Install back-up ring and pressure seal in tube with lips of seal face up. See Figure 12. Insert seal driver in tube and firmly push seal seat with a rotating action.

Important: After installing seal in flange, examine seal condition. If damaged or improperly installed, you must replace it before continuing with reassembly.

6

24 Install 1 15/16 in. [49 mm] I.D. seal in flange.

25 It is recommended to apply a light coat of Loctite Primer NF in tapped holes of housing. Allow primer to air dry for at least 1 minute. Do not force dry with air jet; the primer will blow away.

Use of primer is optional. With primer, Loctite curing time is approximately 15 minutes. Without primer, curing time is approximately 6 hours.

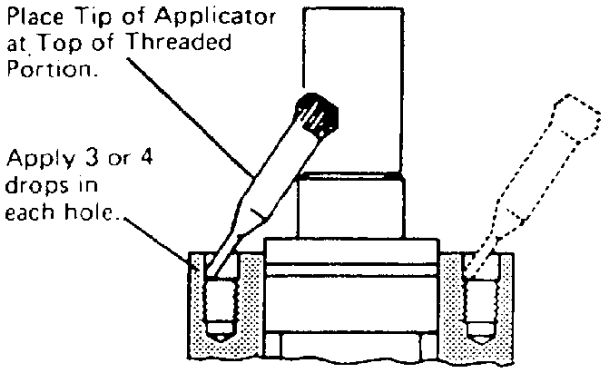


Figure 13

26 Apply 3 or 4 drops of Loctite sealant at top of thread for each of four holes in housing. See Figure 13. Do not allow parts with Loctite applied to come in contact with any metal parts other than those for assembly. Wipe off excess Loctite from housing face, using a non-petroleum base solvent.

Do not apply Loctite to threads more than 15 minutes before installing screws. If housing stands for more than 15 minutes, repeat application. No additional cleaning or removal of previously applied Loctite is necessary.

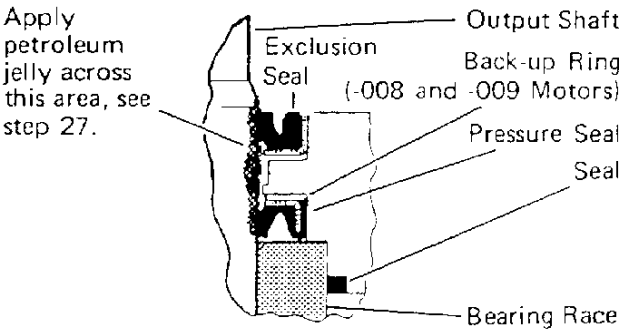


Figure 14

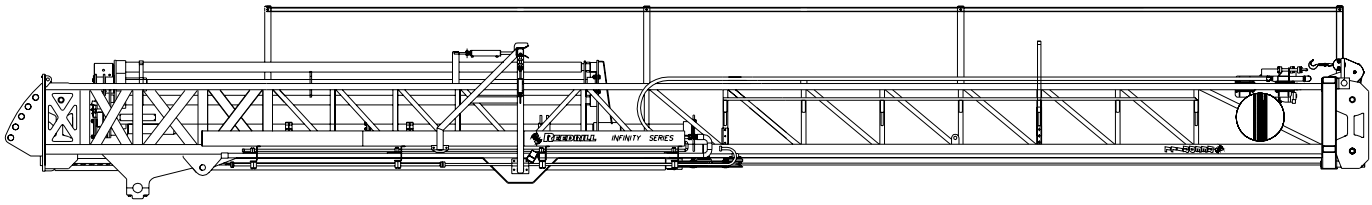
27 Before installing flange and seal assembly over shaft, place protective sleeve or bullet over shaft. Then lubricate space between exclusion seal and pressure seal, as well as lips of both seals. See Figure 14.

Install flange. Rotate flange slowly while pushing down over shaft. Be careful not to invert or damage seals.

Mast Assembly

Mast Assembly - 15m

The Mast assembly of lattice construction pivots on a fabricated support frame, which extends upwards from the machinery deck. Two large displacement hydraulic cylinders move the mast through 90 degrees to a vertical drilling position from the horizontal "at rest" or travel position. The mast assembly accommodates a standard 15.0 metre drill pipe, plus subs and driliing bits. The carousel can carry another four 7.5 metre drill pipes efficiently accommodating multiple pass applications.



Mast

Construction	ASTM A500 grade B rectangular tubing, welding
Main Cord Size	Front 8”x 4”x 3/8” , Rear 6”x 6”x 3/8”
Vertical and Diagonal Cord Size	3" x 4"x 1/4" Upper stages
	4"x 6"x 1/2" Lower stages (pivot and raising area)
Pivot and Raising Area	Rectangular tubing “A” frame, reinforced in high stress areas
Hydraulic Lines	Pressure rated steel hydraulic tubing
Hose Rack	Sheet steel trough for moving hoses
Carousel inside mast	4 rod capacity, 7-5/8" Dia

Hoist/Pulldown Cable Adjustment

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

Step 4: Disengage auto pulldown and hoist very slightly to bring the cable slack back to the lower cables.

Caution: Do not hoist far enough to damage the deck wrench assembly

Check the hang/lay of the lower cables and adjust to to even if not the same.

Step 5: Apply 1000 psi pulldown pressure and engage the auto feed switch. Check the hang of the top ropes and adjust both ropes to hang exactly the same. Then adjust each top rope so as they both hang approximately 50mm/2" below the bottom of the top mast rail. "See diagram below" Release the hydraulic pressure on the system. Ensure all lock nuts are tightened. The cables are now adjusted.

NOTE:

Over time, as the cables are adjusted, it will be noticed that the rotary head does not travel all the way to the bottom of the mast, potentially causing non-engagement of the breakout wrench on the flats of the drill stem.

At this point it will be necessary to loosen the top cable adjustment nuts and then tighten the lower cable adjustment nuts and lock nuts up, 3" to 4". "The lower cable adjusters may require removing, cleaning and lubricating to enable adjustment".

Once this is done, the normal cable adjustment procedure is to be followed.

Before removing locknut and adjusting nut, measure the amount of thread protruding from the locknut and record, this length can then be added to the 3" to 4" adjustment made.

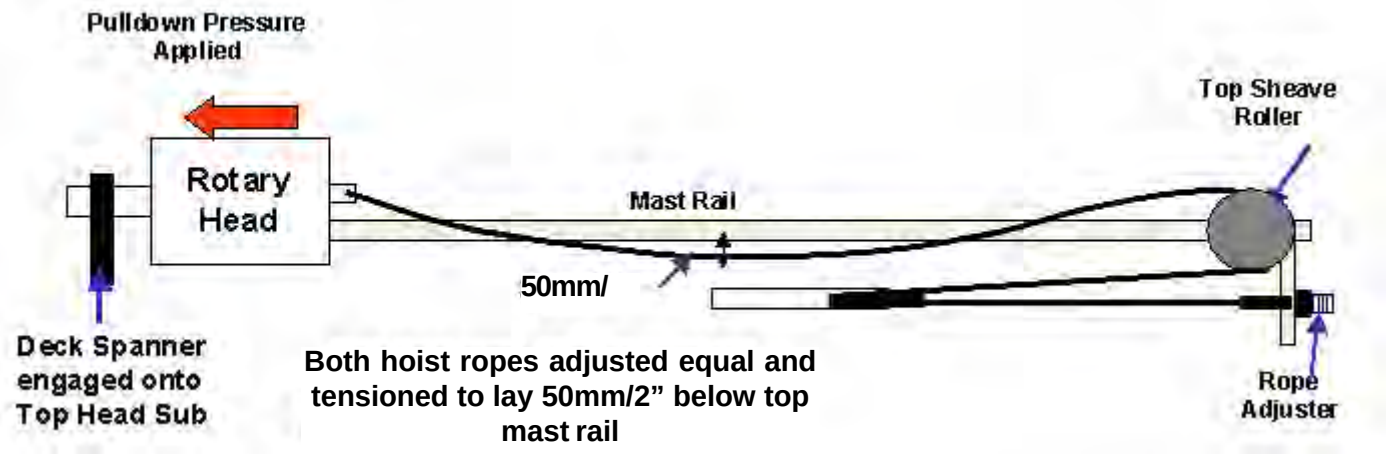
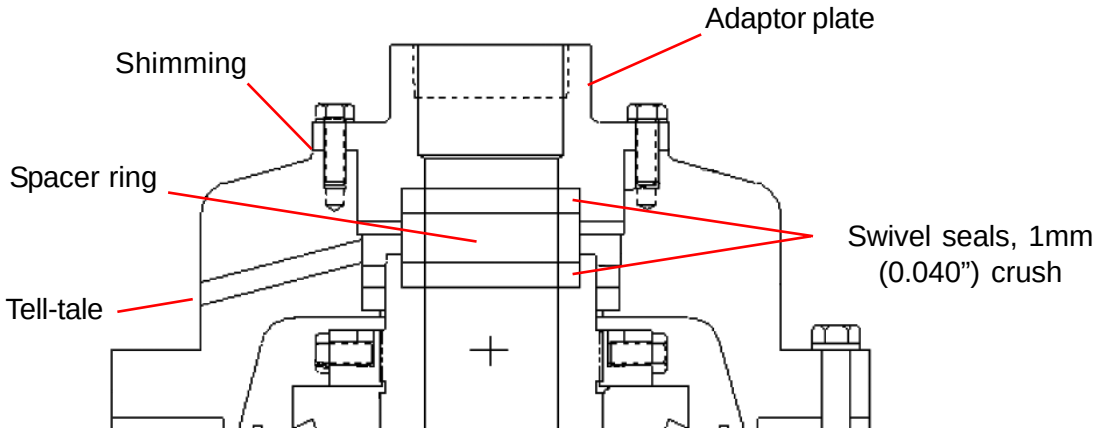


Fig. 6.6a Hoist Pulldown Cables

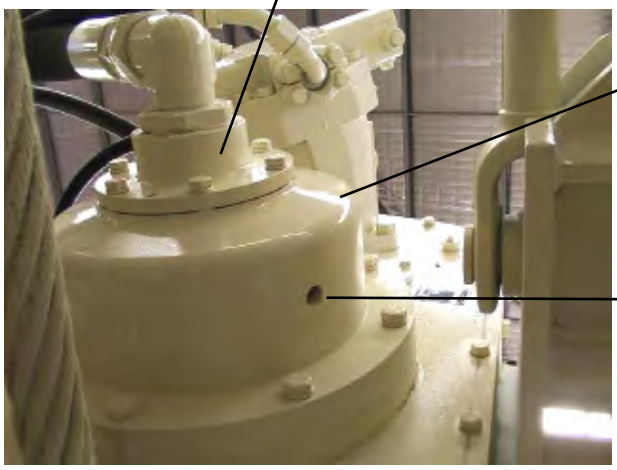
Rotary Drive Gearbox

Air Swivel

The Rotary head uses a swivel seal assembly to seal the rotary gear case from the rock oil, water and air flowing down through the bull hose and bull shaft.
The swivel seal assembly consists of two seals and a spacer that sits between them. When the seals fail, a mixture of air, water, and rock oil will be seen coming out the tell tale hole in the top hat. The seals may need more crush, or replacing. Seal crush is achieved by placing or removing shims under the swivel adaptor plate. New seals require about 1mm (0.040”) crush. . It is extremely important that the correct amount of shim and therefore crush is placed on the swivel seals. Too much and the seals will fail, too little and seals will not seal.



Shims placed under Swivel adaptor plate to achieve the correct “crush” on swivel seals



Service

When replacing the swivel seals, ensure that all parts are throughly cleaned, pay particular attention to shim surfaces, seal housings and the spacer ring. Check the surface of the spacer ring for burrs, erosion and excessive grooving, discard and replace if damaged or severley worn. Lubricate seals and spacer ring liberally with clean grease before reassenbly

THEORY OF OPERATION

DESCRIPTION OF WINCH

The winch has three basic assemblies:

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

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

PLANETARY GEAR TRAIN

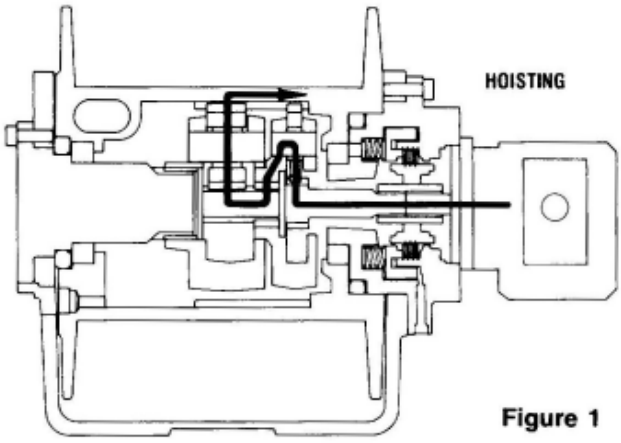


Figure 1

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

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

DUAL BRAKE SYSTEM

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

The dynamic brake system has two basic components.

1. Brake valve assembly
2. Hydraulic motor

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

The static brake system has three basic components:

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

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

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

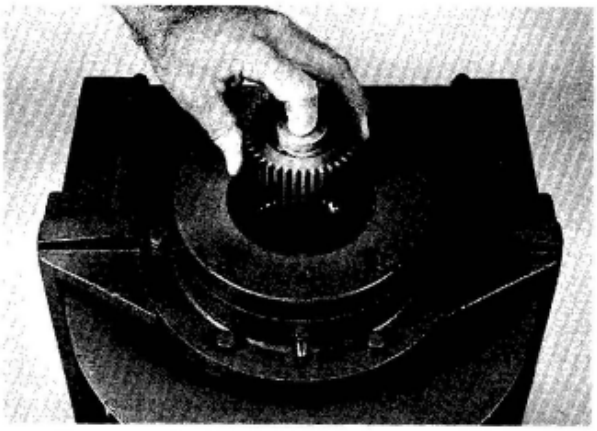
The friction brake is primarily a load holding brake and will provide dynamic braking only during extremely slow operation when there is insufficient flow to open the brake valve.

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

DUAL BRAKE SYSTEM – OPERATION

When hoisting or pulling a load, the brake clutch allows free rotation of the inner brake race and input shaft. The sprag cams lay over and permit the inner brake race

Winch Assembly



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

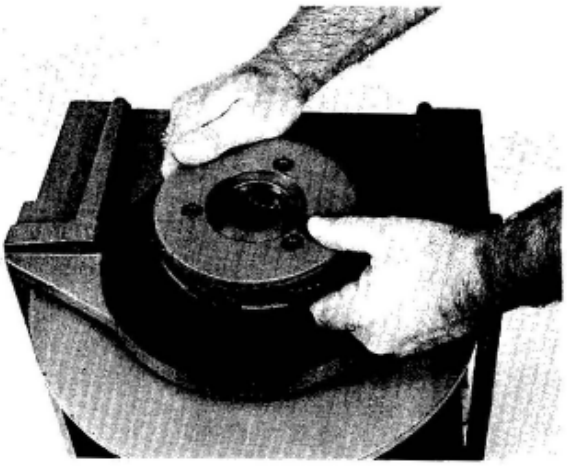
6. Remove the brake cylinder capscrews and install two (2) capscrews and a short piece of chain into the motor mounting bolt holes. Using the chain as a handle, lift the brake cylinder assembly out of the drum and base, being careful to avoid damaging the sealing or bearing surfaces. Refer to "Motor Support — Brake Cylinder Service" for additional information.

7. Remove the drum closure. Remove and discard the O-ring from the inside of the drum.

8. Remove the seal and bearing from inside of closure.

9. Remove the primary sun gear and thrust washer from the primary planet carrier.

   NOTE: 23:1 gear ratio winches have a sun gear adapter in addition to the sun gear shaft.



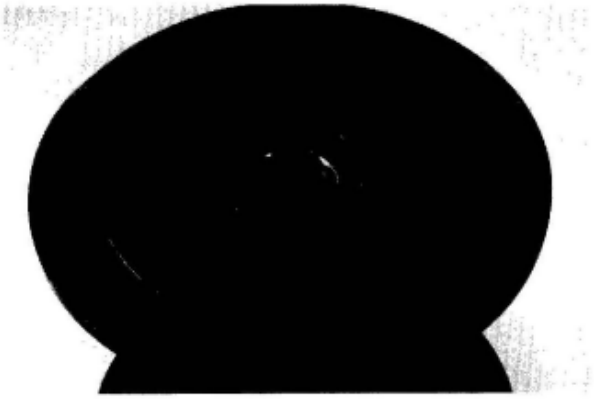
10. Remove the primary planet carrier from the drum. Refer to "Planet Carrier Service" for additional information.

11. Remove the output sun gear and thrust washer from the output planet carrier.

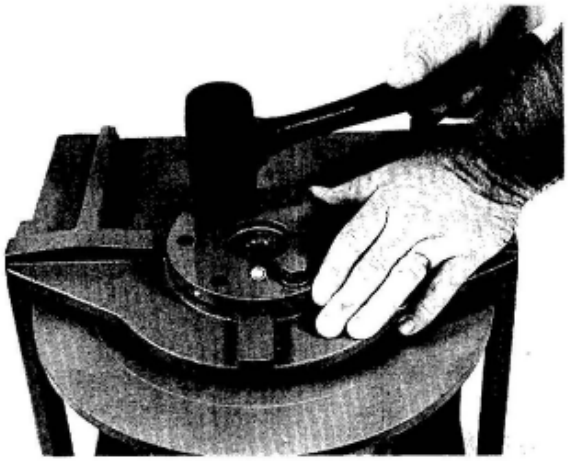
Winch Assembly

WINCH ASSEMBLY

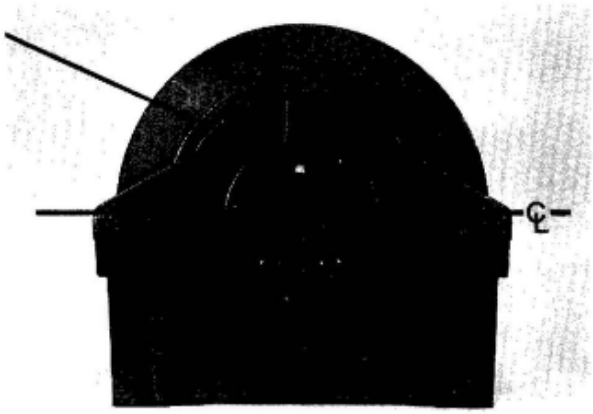
1. Place winch base on side with bearing support end up.



2. Install a new bearing in the drum if replacement is necessary. Use a good grade of sealant on the outside diameter of the new seal. Install with the spring side of the seal away from the bearing, then press into the drum, using a flat plate to avoid distortion. Be sure drain plug is installed securely.

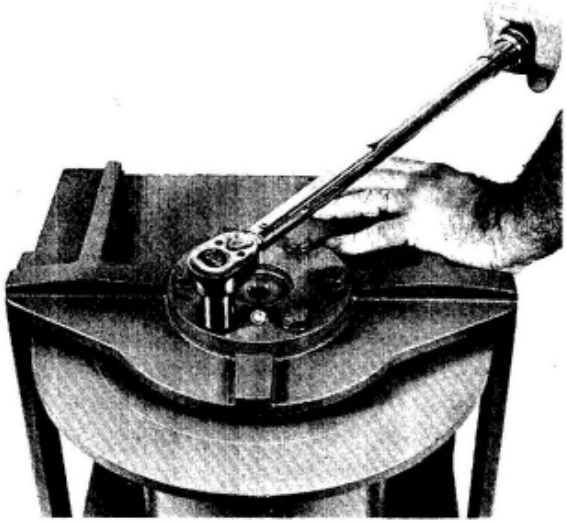


3. Center the drum in the opening of the base. Lubricate the bearing support with petroleum jelly or gear oil and install in base and drum.



⚠ CAUTION

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



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

Carousel Pipe Rack

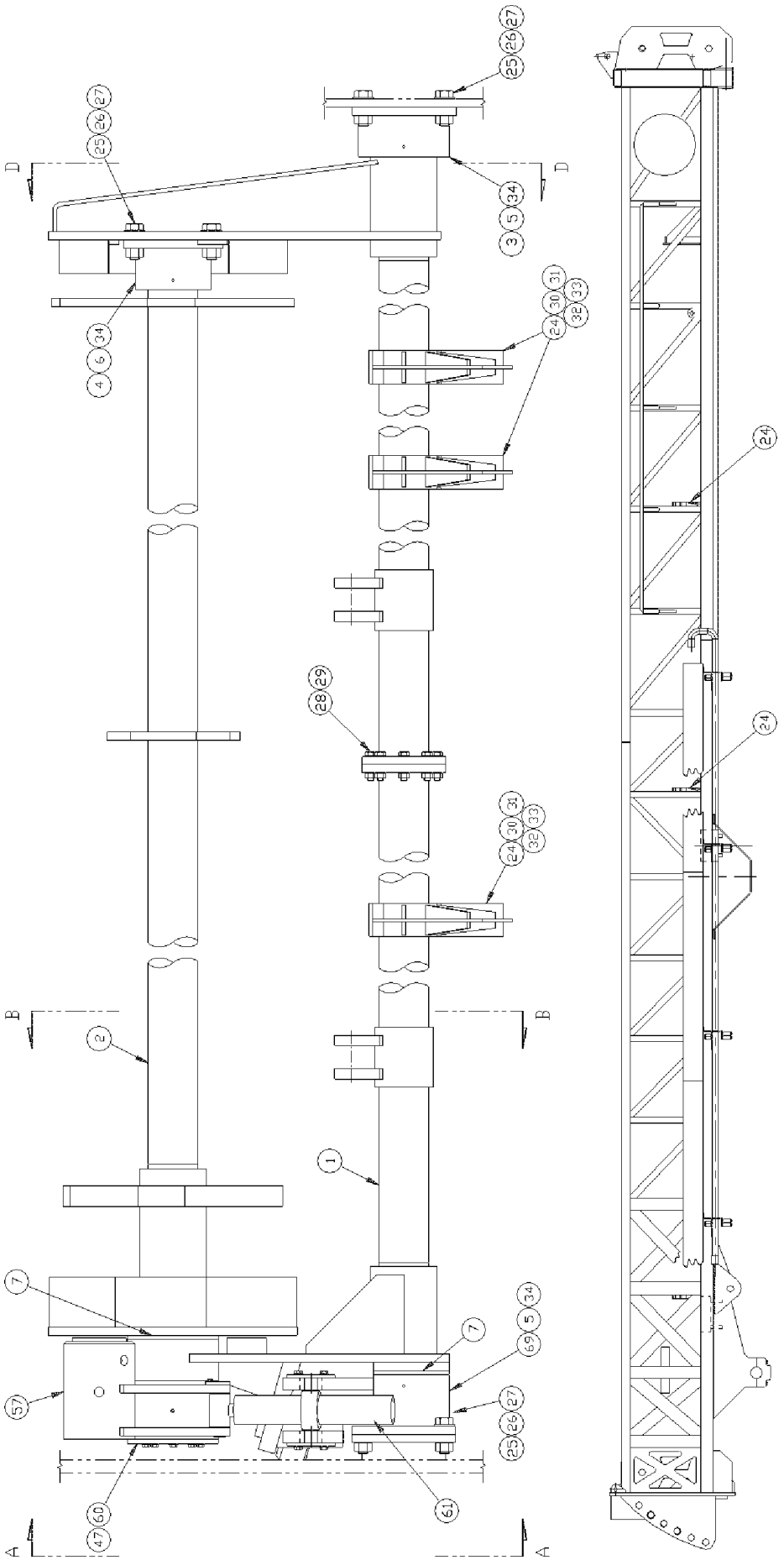


Fig. 6-21 Pipe Rack Assembly

1. Pipe Rack Support
2. Carousel Weldment
3. Bearing Cap, Support
4. Bearing Cap, Carousel
5. Bearing, Journal (4)
6. Bearing, Journal
7. Thrust Washer (2)
24. Mid-Support (2)
25. Capscrew (12)
26. Nut, Hex (12)
27. Washer, Flat (24)
30. Bushing (2)
31. Nut, Elastic Stop (4)
32. Washer, Flat (4)
33. Capscrew (4)
34. Grease Fitting (10)
47. Shim Kit
57. Index Plate
60. End Cap
61. Cylinder, Index
69. Bearing Cap, Support

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).

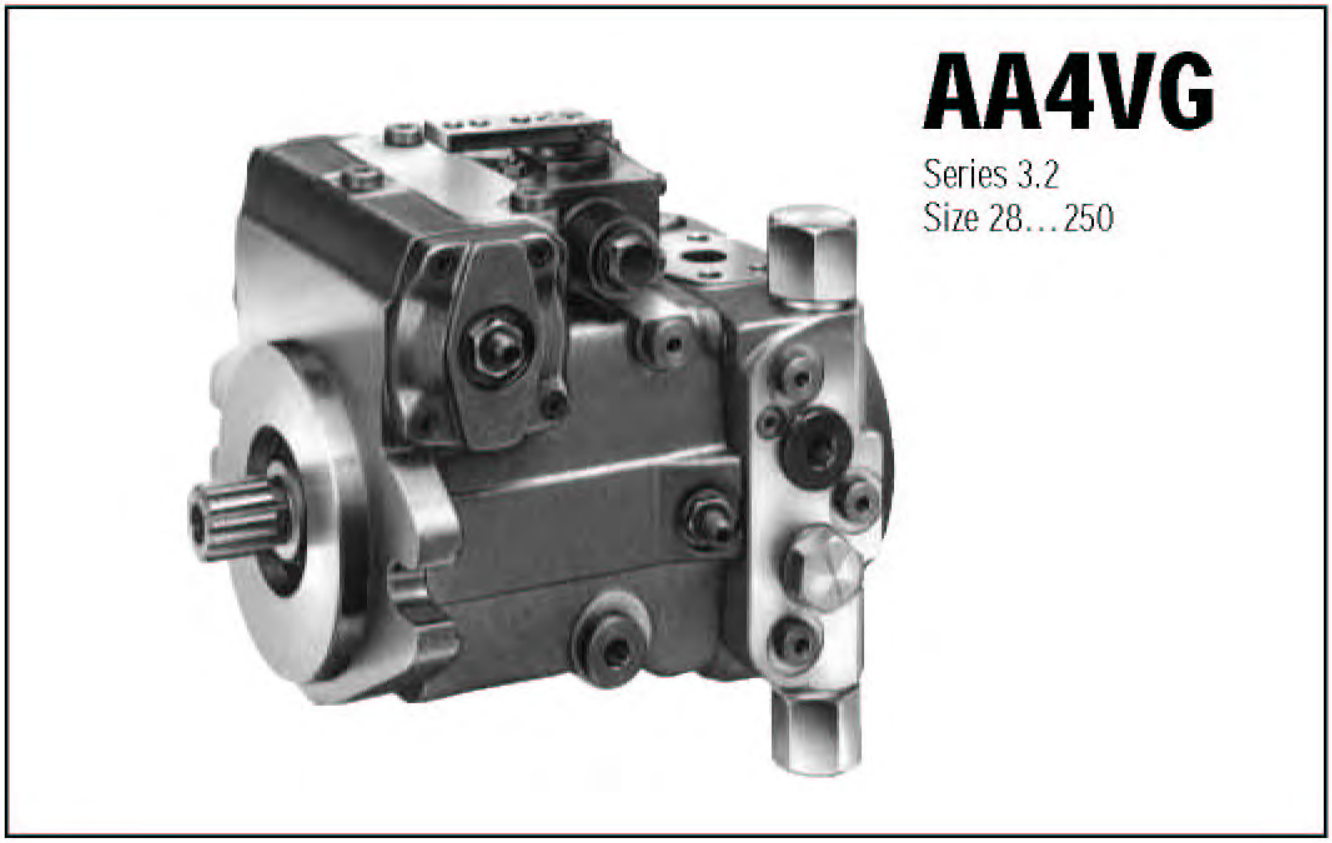
Right Track, Left Track/Rotation Pumps

Hydraulic Piston Pumps - Repair

Right Track Pump - Model AA4VG180HD

Left Track Pump - Model AA4VG180HD

Refer to Section 4 for AA4VG180HD repair manual



Right Track, Left Track/Rotation Pumps

WARNING: Relieve pressure on hydraulic and pneumatic systems before loosening connections or parts.

BE SURE machine is on level ground and block tracks before removing brake lines.

3. Set Pressure Override (P.O.R.) - 5000 psi (345 bar)

Function of Pressure Override

The pressure override valve varies the swashplate angle, as required to limit the maximum pressure at port A or B. The override valve prevents continuous dumping of excessive flow at load pressure through the cross port relief valves. This eliminates unnecessary heating of the oil and protects the pump and motor from heavy-handed operators or if the drive stalls, causing the pump to deadhead.

The pressure override is adjusted 500 PSI (35 bar) less than the high pressure crossover relief valves.

Adjustment Procedure

1. Shut down machine and relieve standing pressure.
2. Install a 6000 PSI (414 bar) gauge in ports M_a and M_b. Remove and plug the track brake release line at the tee connection (fig. 7-8a).
3. Be sure the pump control is in neutral. Loosen P.O.R. valve locknut with a 13mm wrench and back out the P.O.R. adjusting screw all the way with a 4mm allen wrench.
4. Start machine and allow time to warm up.
5. With machine in PROPEL MODE, slowly move the right or left tram lever (depending upon which pump you are setting) to full forward or reverse position, noting the pressure reading on the gauge. Turn screw in (clockwise) until you get a reading of 5000 PSI (345 bar).

   NOTE: One turn of the screw equals 1200 PSI (83 bar).
6. Now move the tram lever in the opposite direction and note the pressure reading on the gauge. It should be the same on both sides of center. When pressure setting is correct, tighten the locknut.
7. Repeat procedure for other pump.

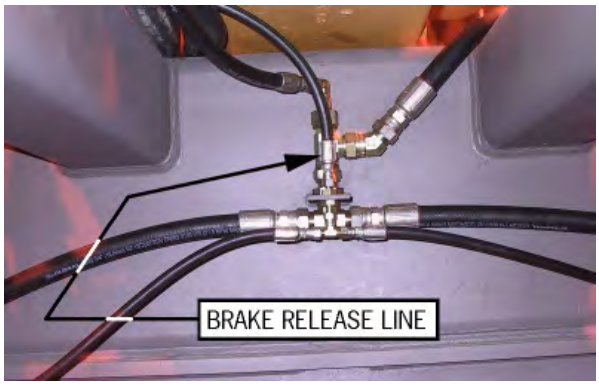
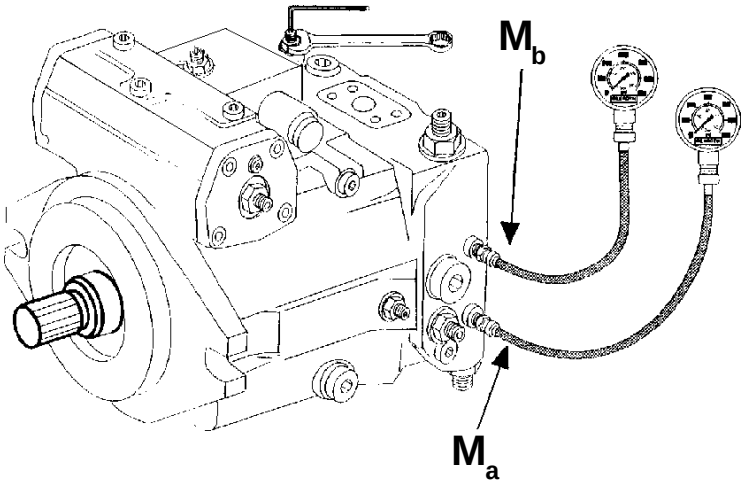


Fig. 7-8a Brake Release Line at Tee Fitting. Located just above axle pivot beam.



Loop Filters

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. Turn off and depressurize system. Open bleed plug (1 or 24) at top of filter one and one-half turns. Remove plug at bottom of filter and drain fluid into suitable container. Reinstall drain plug and tighten both plugs.
2. Remove bowl (3). Remove element (6) and carefully inspect the surface for significant visible contamination. Normally, no dirt should show but visible dirt can be an early warning of system component breakdown and can indicate potential failure. Discard both the 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.
3. Inspect filter housing and its bypass / reverse flow valve for possible damage or malfunction. Determine whether replacement of any components is necessary. Remove any accumulated dirt from filter housing, being careful to prevent contaminant from entering the outlet and washing downstream. Check that bowl o-ring (9) and backup ring (8) are not damaged. Use replacement filter element part number called for on assembly nameplate. Wet threads and sealing surfaces on bowl (3) and the o-ring (7) in element with clean system fluid.

CAUTION: Failure to replace damaged components, and operation without a properly functioning hydraulic filter can cause components downstream of the filter to fail or degrade in their performance.

4. Push open end of filter element straight onto nipple in head. Screw bowl to head until bottomed. O-ring sealing not improved by overtightening; do not exceed 15 ft-lbs (20 Nm) torque. Bleed system. Reset visual warning device by pushing in the red button; electrical switch is reset automatically.
5. Pressurize system fully and check for external leaks; if leaks occur, check o-rings and sealing surfaces. After system reaches normal operating temperature, check that electrical switch has not actuated or that visual warning button remains down.

MP18 Valve - Jack and Mast Raise Valve

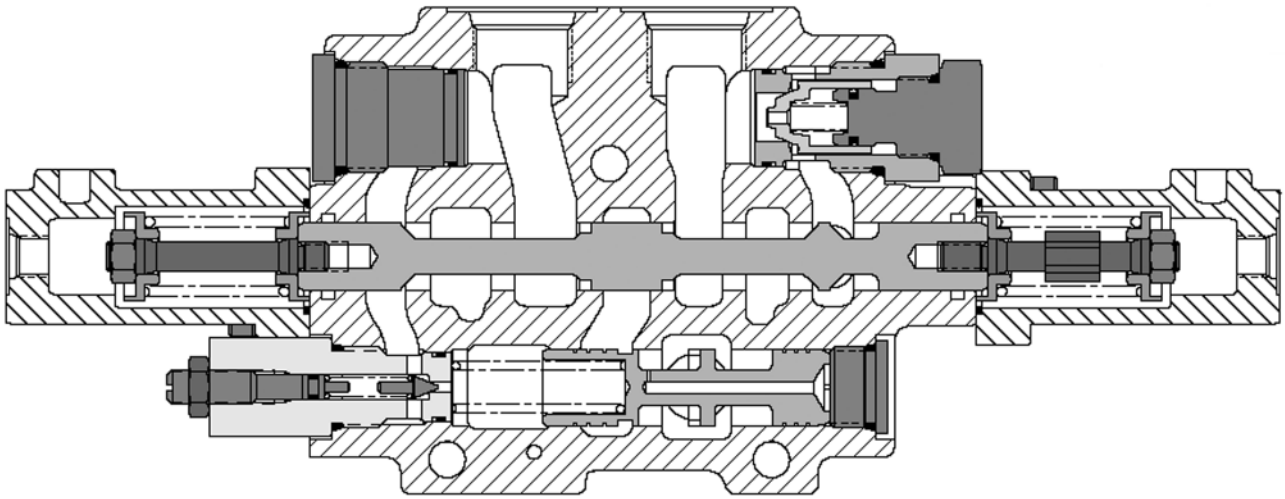


Fig. 7-21 MP18-2 Work Section Cross-Section View

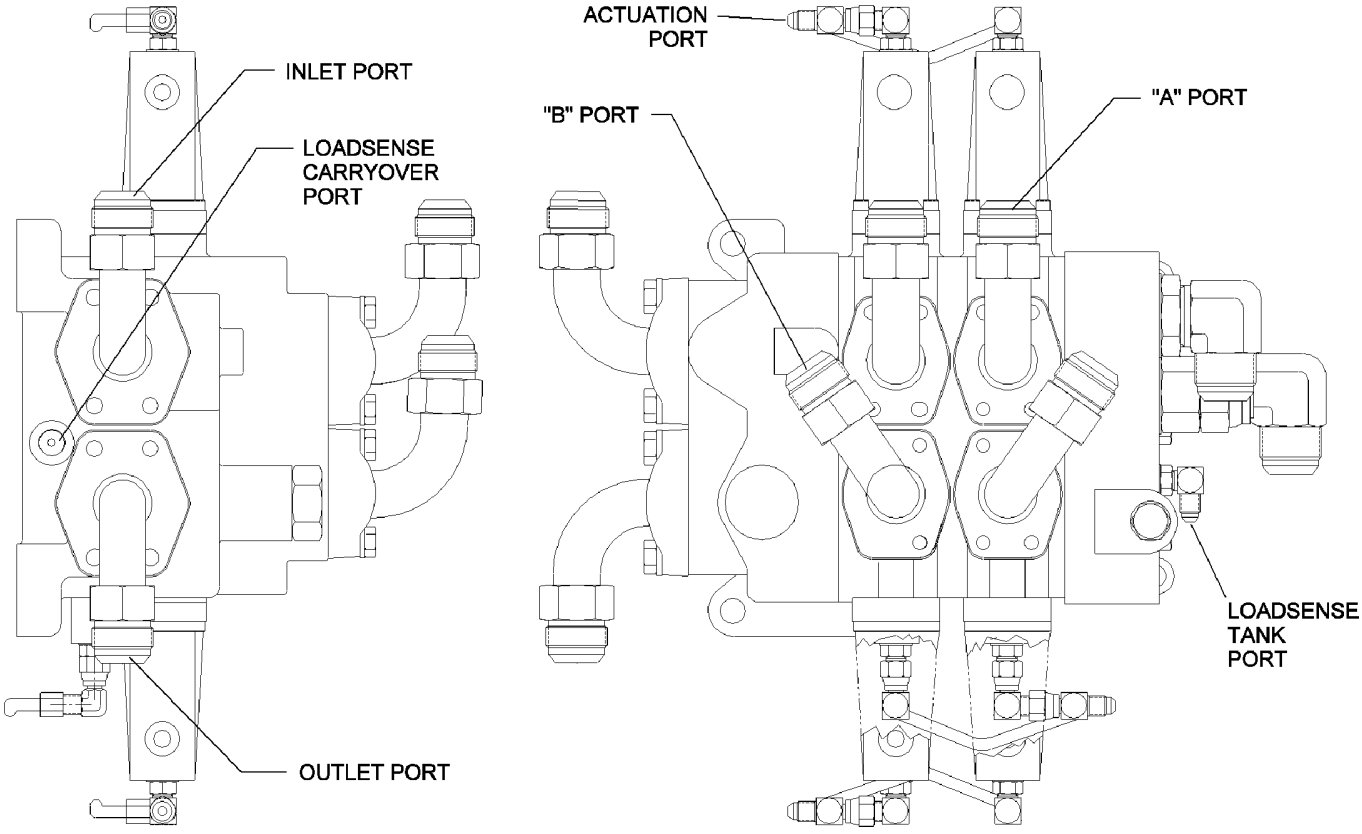
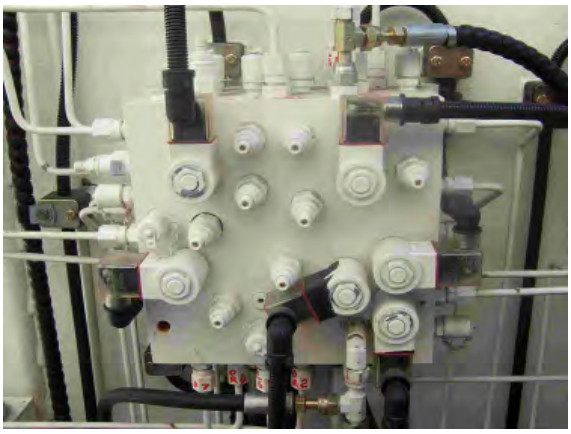


Fig. 7-21a MP18 Jack/Feed Control Valve (ref. 410091)

Pilot Control Manifold



This valve houses valving for

1 – Rotation torque control
2 – Pulldown pressure control and auto feed
3 – Auxiliary pump load
4 – Auxiliary function pressure limits
5 – Drill/tram and set-up interlocks

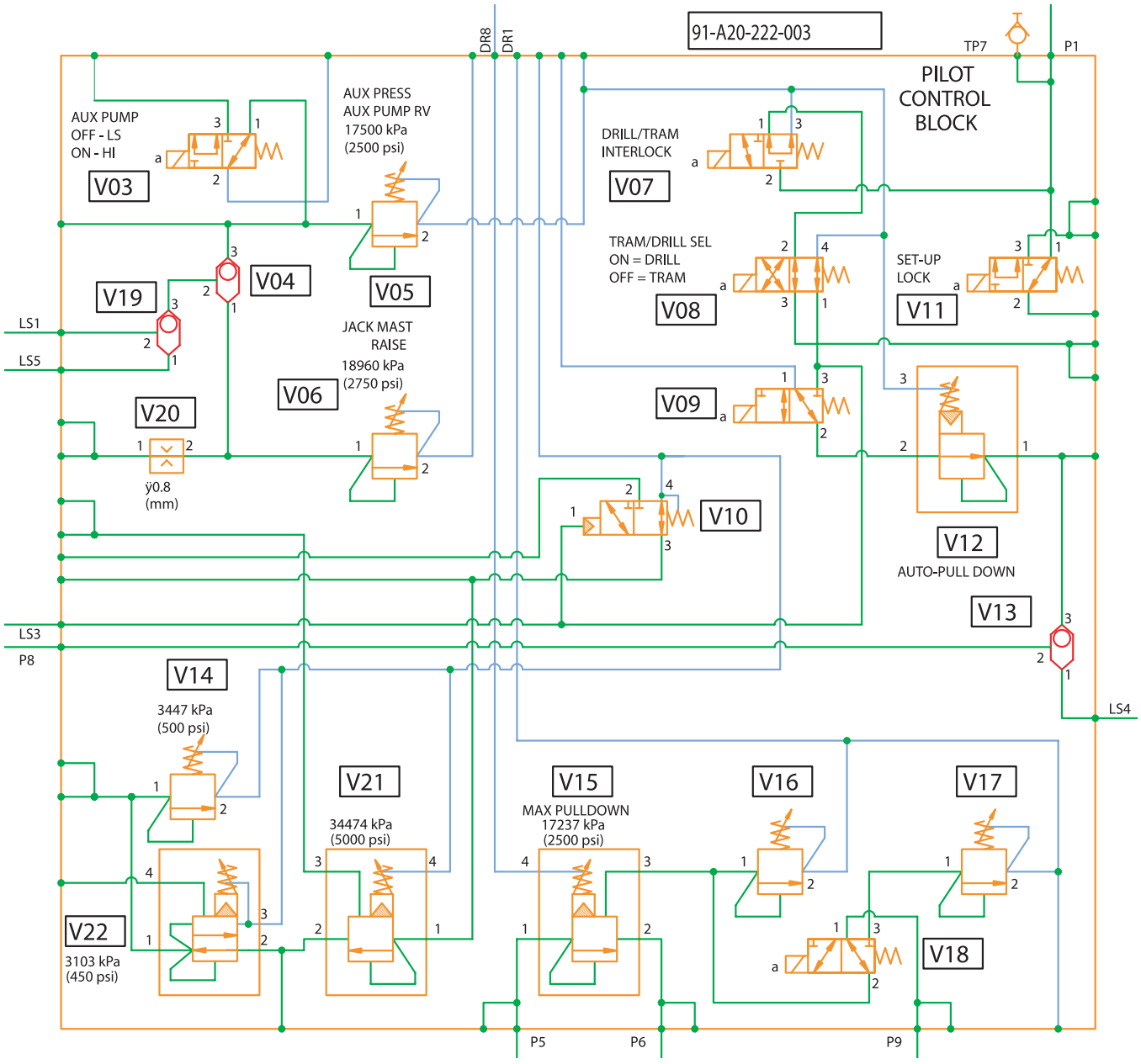


Fig 7-27a Pilot Control Manifold Schematic (ref. 421879)

Feed Control Valve (410666)

- Pulldown manifold contains Rotary Head counterbalance valve, Regeneration for fast down, and Hold-Back for hammer drilling.
- **(Valve “A”)** Rotary Head Counterbalance Valve (409206, item 2, fig. 7-29)

Normal operation the valve opens from a pilot signal from the pulldown pressure. This signal is dampened by the (0.016”) orifice. This orifice allows a pressure increase in the pulldown in order for the counterbalance valve to meter down. Please note that the tension on the counterbalance valve effects the amount of pulldown pressure required.

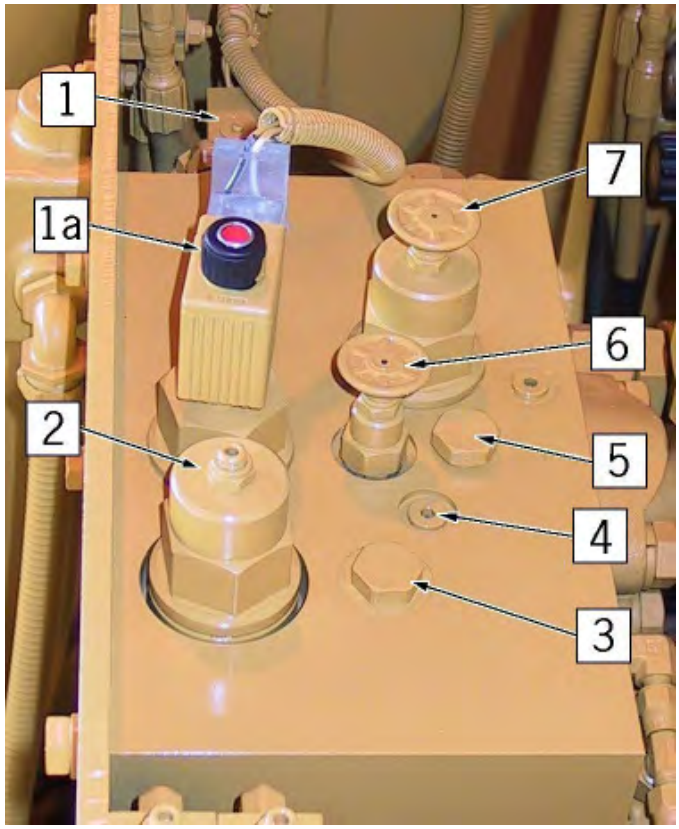


Fig. 7-29 Feed Control Valve 410666

1. Regeneration Valve "E" (Normally Closed) Cartridge "E1" (Normally Closed)
1a. Regeneration Valve "D" (Normally Closed) Cartridge "D1" (Normally Open)
2. Counterbalance Valve "A" (409206)
3. Plug
4. Orifice .016"
5. Plug
6. Hoist Control Valve "F"
7. Excess Flow Bypass Valve "G"

Leveling Jack Cylinders

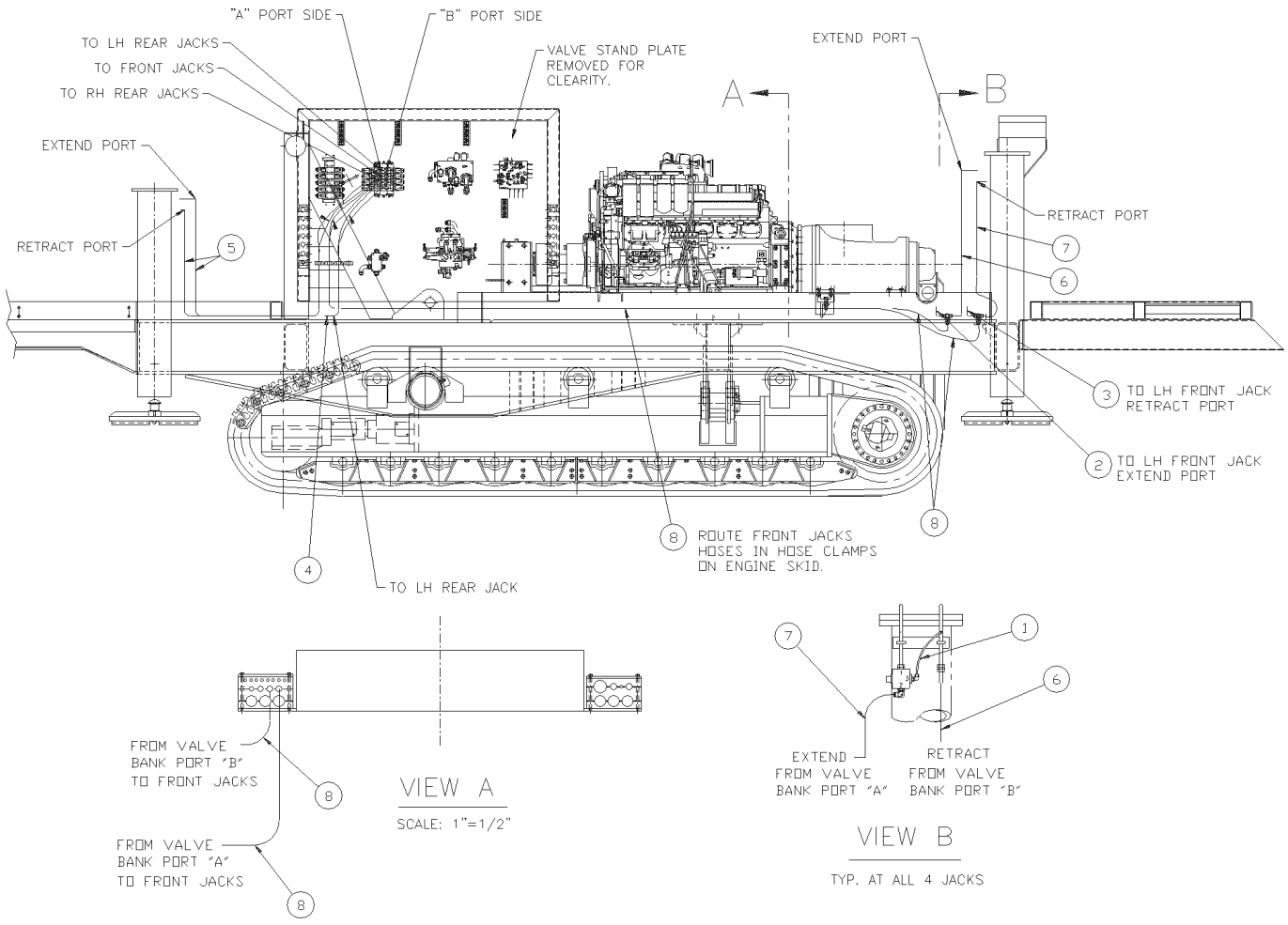


Fig. 7-31 Leveling Jack Circuit (ref. 421450)

1. Hose Assembly (4)
2. Hose Assembly (1)
3. Hose Assembly (1)
4. Hose Assembly (2)
5. Hose Assembly (2)
6. Hose Assembly (1)
7. Hose Assembly (1)
8. Hose Assembly (2)

Cooler Fan Circuit

Fan Motor Circuit

Cooler fan pressure and flow is supplied by a open loop gear pump. The cooling fan circuit is a open loop circuit. The fan pump pressure for each cooler is set by a Relief valve for each fan motor, mounted directly on the pump. A needle valve plumbed in parrallel to the Relief valve is used to control the Fan speed (RPM)
From the pump, oil flows to the fan motor and through the thermostat and onto the tank. When the thermostat reaches temperature it will start to move and divert flow through the coolers. The thermostat will be completely shifted at 150°F and oil will then flow through the coolers back to tank. A 45 psi bypass check valve is fitted in parallel with the cooler to enable oil to flow back to tank if the cooler is blocked.

A check valve, called the “Wind Down Check” has been connected between the B and A ports of the fan motors. When the engine is turned off the inertia of the fans will still want to turn the motors. The check valve enables oil from the return (cooler) side of the motor to circulate backthrough the motor to prevent cavitation.

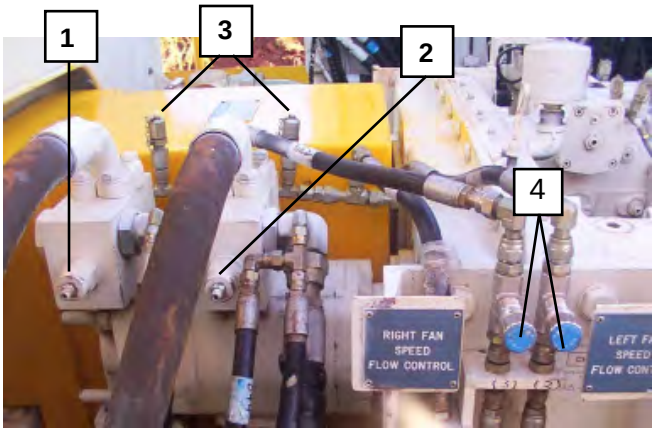


Fig. 7-41 Fan Motor Pump

1. Relief Valve for Compressor/ hydraulic Oil Cooler Fan
2. Relief Valve for Engine Radiator Fan
3. Test Point
4. Fan Flow Controls

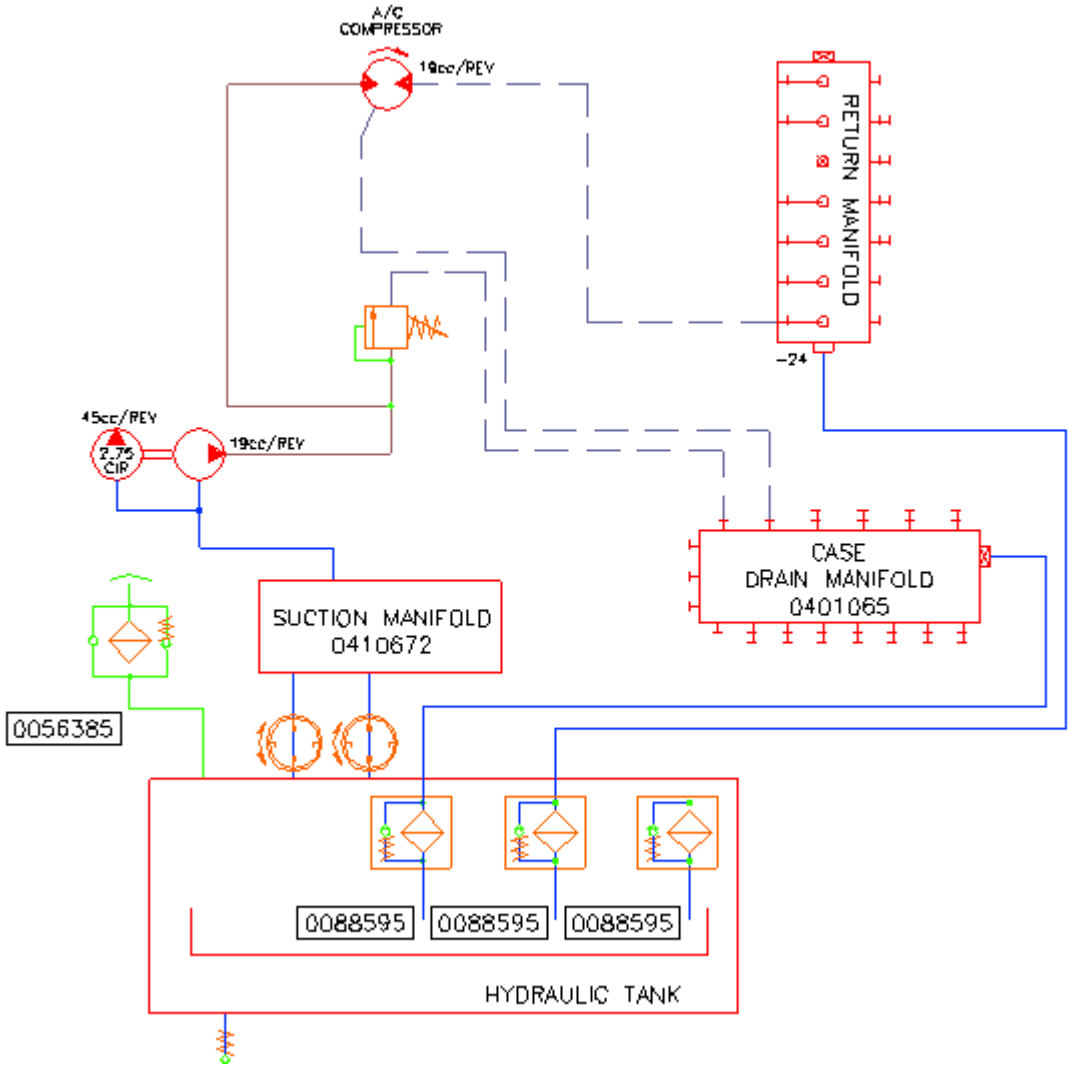
Adjustment

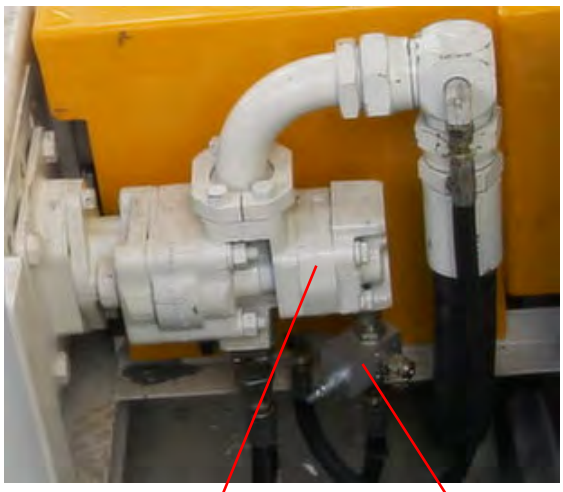
Fan speed is set by starting the machine with both relief valves (Fig 7-26) and flow controls backed off (anticlockwise), then adjust both relief valves to maximum (clockwise). Now adjust both flow controls to set the fan speed, 1400rpm is the usual setting, (1550rpm is the maximum for a 48" Multi-wing fan).

Once the fan speed is correctly set, the relief valves can be reduced until the pump pressure begins to drop. At this point readjust the relief valve slightly higher (1/8 turn), this now has the pump pressure (approximately 1600psi) set just above the running pressure required to acheive the 1400rpm fan speed.

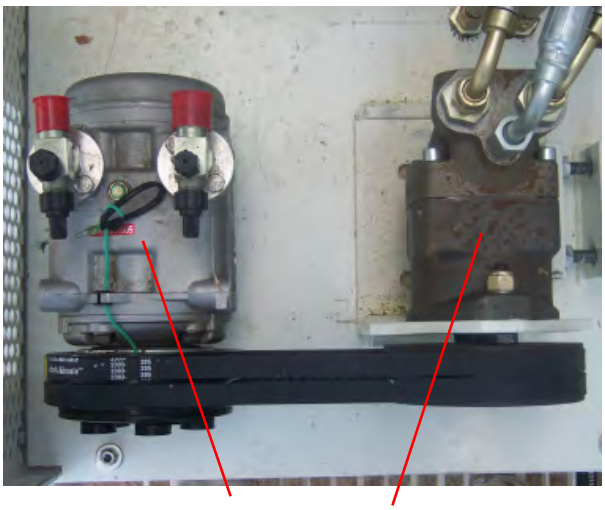
Air Conditioner Compressor Drive Circuit

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, mounted on the pump discharge, limits the pressure just above running pressure to protect the circuit from pressure spikes when the air conditioner compressor clutch is engaged. Approximately 1400psi.





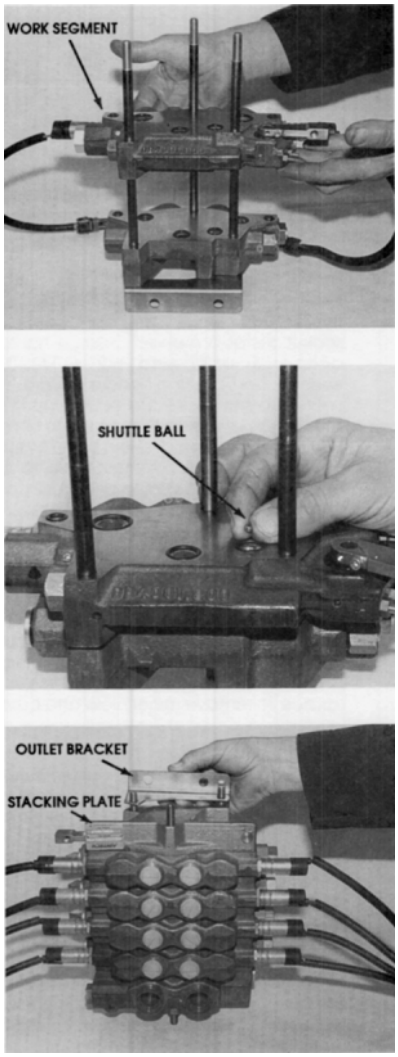
Air Conditioner Pump and circuit Relief Valve



Air conditioner Compressor and Drive Motor

Water Injection Valve

Work Segment



3. Prepare work segments for installation by verifying that all mating services are clean and free of foreign material. Slide the segment over the tie rods, taking care not to allow the tie rods to damage the surface of the segment. Install a shuttle ball, that is included in the VAL#K1 tie rod kit. If stack is being assembled in horizontal position, grease will be required in shuttle ball seat area, (Field Service).

   IMPORTANT!! Shuttle ball is installed if:

   Another work segment is NEXT to be installed.
   - OR -
   the stacking plate section to FOLLOW is machined with a load sensing seat and shuttle port is to be plumbed with downstream load sensing logic.

4. Repeat step 3 for additional spool sections.

Stacking Plate

5. Carefully install the stacking plate section.
6. Install the outlet bracket over the lower two (2) fle rods: then thread the three (3) large nuts from the tie rod kit onto the tie rods and hand tighten. Carefully lay the valve on the mounting brackets. Torque the nuts to 15-20 Lb-ft (20-27 Nm).
7. Thread all six (6) small nuts onto lie rods three (3) on inlet three (3) on outlet Torque to 15-20 Lb-ft (20-27 Nm) while holding the large nut underneath it with a 9/16' open end wrench.
8. Based upon the part number ordered. each packaged stacking plate comes configured for either an internal or external pilot drain. However during assembly it may be converted to the other configuration as described in the accompanying Product Advisory No. 041.
9 Install manual handle or 1/2" (11f321)fl open end wrench and shift each spool. Check that each spool operates freely in both directions.

* Shuttle balls are installed between all segments and between the last work segment and stacking plate only if load sensing is to be continued from downstream valves.

** Tool measurements in brackets are for the VPL 123 Series

SEGMENT ALTERATIONS

Main Spool Replacement

General

The main spool may be one of two types: proportional a on/off.' The main spool determines the segment type. Therefore, to change flow rates drastically, orb change from proportional to “on/Off’ operation, it is the main spool which needs to be exchanged.

Main Spool Replacement Procedure

1. Remove the hex head plug (Item 35) from the end of the work segment with a 1" socket. Install a manual override handle or use an open-end 1/2" (11/32') wrench, and bias the handle toward the valve. Do not move the handle hard or fast, for this will cause the linkage to hit the spool bore edge and raise a burr. The flow limiter on the bottom may have to be backed out to allow for rotation. Use care to pull the spool out as straight as possible, as side forces may damage the spool and/or bore.

Water Injection Valve

Adjustment Procedure

1. Four-way work segment adjustment:

With the flow meter connected to the segment cylinder ports and the test stand on, energize the PULSAR solenoid with 100% modulation ratio (MR.) to produce flow through the cylinder port to be adjusted. Check that pump relief valve is set high enough to saturate the cylinder port flow.
Use upper screw to adjust C_2 flow and lower screw to adjust C_1 flow. While holding the adjustment screw (item 11) turn the seal nut (item 12) until loose, then turn the adjustment screw in while holding the seal nut, until the output flow equals the specified flow setting. After adjustment, hold the adjustment screw and tighten the seal nut with a torque of 2-3 Lb-ft (3-4 Nm). To adjust flow through the other cylinder port, repeat this process with other solenoid and flow limiter.

2. Three-way (one cylinder port plugged) work segment adjustment:

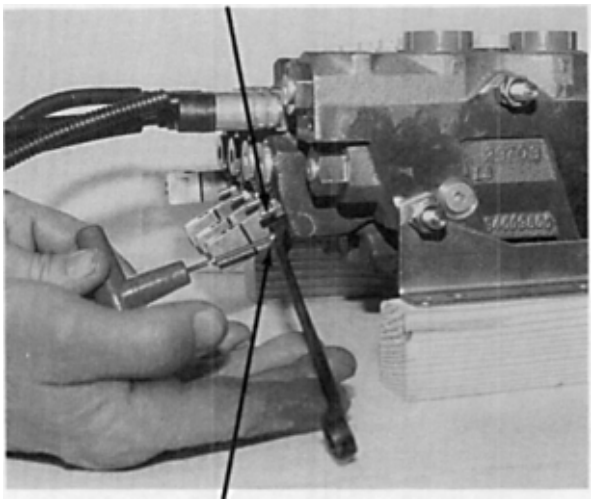
For three-way segments ft is necessary to furnish the singular cylinder port with access to a supply pressure line and flow meter toverify return flow. This access may be accomplished by (a) using a flow rectifier circuit, (b) by connecting a parallel pressure supply line to the cylinder port. Set supply pressure equal to load pressure on the application. Energize for 100% modulation ratio at the C_2 solenoid.

While holding the lower adjustment screw (item 11). turn the seal nut (item 12) until loose. Then turn adjustment screw in. while holding the seal nut until the output flow is equal to specified setting. After adjustment, hold the adjustment screw and tighten the seal nut with a torque of 2-3 Lb-ft (3-4 Nm).

3. For flow limiters which do not require adjustment:

All flow limiters are assembled at the factory in a retracted position, unless otherwise specified.

C_2 Flow Adjustment Screw



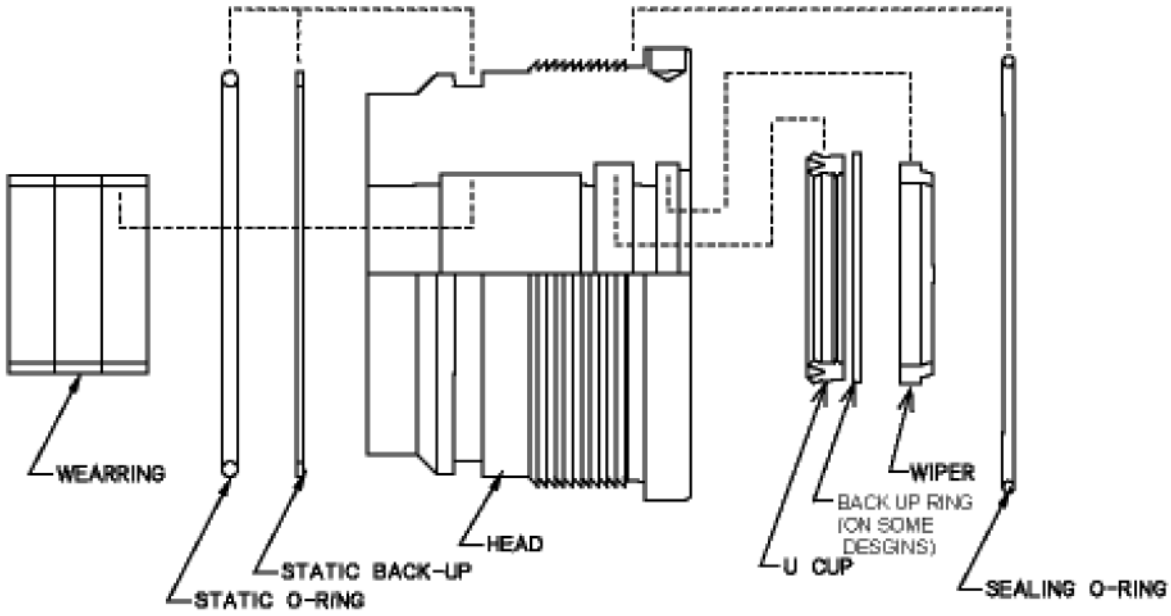
C_1 Flow Adjustment Screw

Hydraulic Cylinder Repair

Z Head

General

The Z series head uses ductile iron material and has a polyurethane u-cup as the primary sealing element. Cylinders rated for pressures above 3500 psi, may have a back up ring behind the u-cup. The wiper is a standard type D polyurethane. The head is retained within the tube by means of its own buttress threads. There is a sealing o-ring that prevents contaminant from reaching the threads and provides an anti-rotation function. General procedures for teardown, inspection and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.



Teardown

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

Rebuild

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

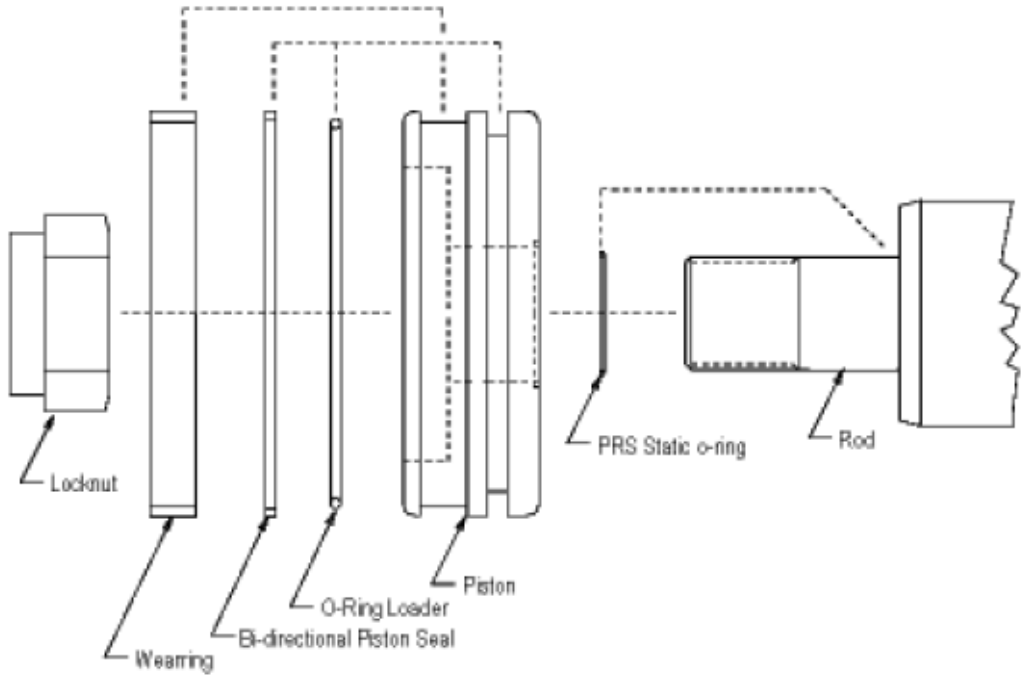
Slide the head into the tube and engage the threads. Turn the head counter clockwise until the first thread just passes the engagement point (the head will move noticeably) then turn the head clockwise until it is hand tight or fully seated. Insert a spanner wrench into the holes provided and tighten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

Hydraulic Cylinder Repair

N Piston

General

The N series piston uses aluminium material and has both an o-ring energised bidirectional seal and a close tolerance wearing. Cylinders designed for use a pressures above 3500 psi may have a back-up ring on one or both sides of the bidirectional seal. See the engineering drawing to determine if your cylinder has this ring and which side of the seal it is located. A small o-ring is used to seal the static side. On some designs it is installed in a groove in the rod, for others, it fits in a groove on the edge of the piston in contact with the rod. General procedures for teardown, inspection and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.



Teardown

After removing the piston, remove and discard the PRS static o-ring from the threaded portion of the rod. Remove the bidirectional piston seal and o-ring loader by means of blunt instruments of bronze or aluminium. Be sure there are no sharp edges on these tools. Be particularly careful of scratching the groove surface finish. Remove the wear ring by spreading the ring into a “C” shape at the split.

Rebuild

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

CONTENTS

Indication Only Alarms

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

* Lube Fault
* Alternator
* Fuel Level Low (less than 5% for 3 minutes)
* Low Engine Coolant Level (5 second buffer before alarm)
* Water Tank Level Low (less than 20% for 20 seconds)
* Engine Air Filter is Blocked
* Compressor Air Filter Blocked
* Hammer Oil System Has Failed (if the pump has failed to stroke 10 times in allotted time)
* Hammer Oil Level Low (less than 15%)
* Excessive Incline Alarm (Tram mode only)

Filter Bypass Indication Only Alarms

Hydraulic Oil Temperature must be greater than 55^0 C before looking at filter bypass alarms to avoid false triggers.

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

SOLENOID CONTROL

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

Solenoid will energise when....

Key is ON + Drill mode is selected.

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

Solenoid will energise when....

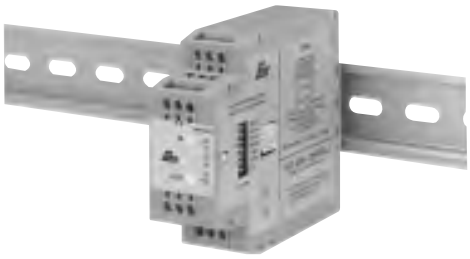
Key is on + Tram Mode is selected + Tram Conditions are OK + Hydraulic Function is enabled.

OR

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

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.

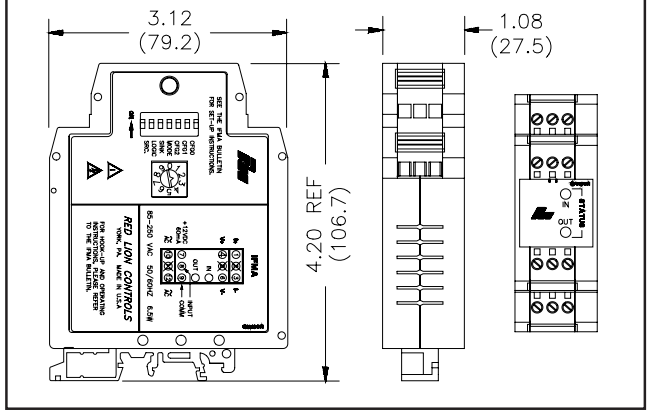
SAFETY SUMMARY

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:

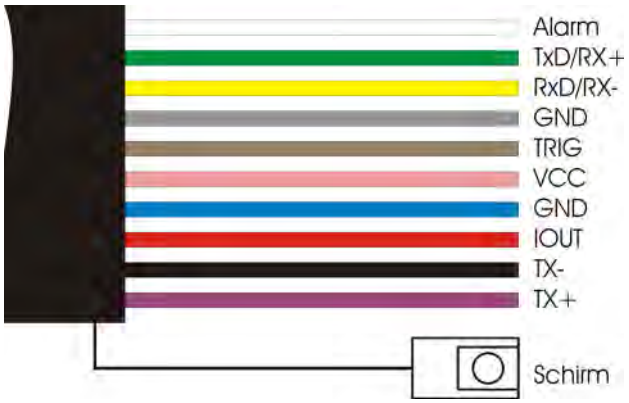


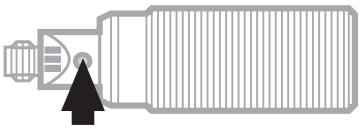
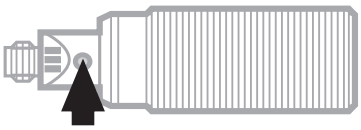
Fig. 3 Interface cable colour codes

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.

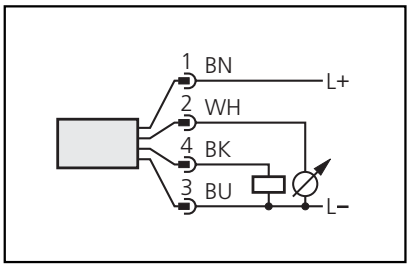
Installation

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.

3. Adjustable parameters

(Menu structure: see fold out page)

SP 1	**Switch-on point:** Upper limit value at which the output changes its switching status. • setting range: 5 ... 100% of the value of the measuring range • in steps of 1% of the value of the measuring range • indicated in bar
rP 1	**Switch-off point:** Lower limit value at which the output changes its switching status. • setting range: 3 ... 99% of the value of the measuring range • in steps of 1% of the value of the measuring range • indicated in bar rP1 is always lower than SP1. The unit only accepts values which are 1% lower than SP1. Changing the switch-on point also changes the switch-off point (the distance between SP1 and rP1 remains constant). If the distance is higher than the new switch point, it is automatically reduced (rP1 is set to the minimum setting value).
dS 1 dr 1	**Delay time for the switching output** dS1 = switch-on delay; dr1 = switch-off delay The output does not immediately change its switching status when the switching condition is met but when the delay time has elapsed. If the switching condition is no longer met when the delay time has elapsed, the switching state of the output does not change. • setting range: 0 - 0.2 - 0.4 ... 9.8 - 10 - 11 - ... - 49 - 50s • in steps of 0.2 or 1s • indicated in seconds
OU 1	**Switching functions of the switching output** 4 settings can be selected: **Hno** = hysteresis / normally open **Hnc** = hysteresis / normally closed **Fno** = window function / normally open **Fnc** = window function / normally closed

Temperature Transducer

5. Installation

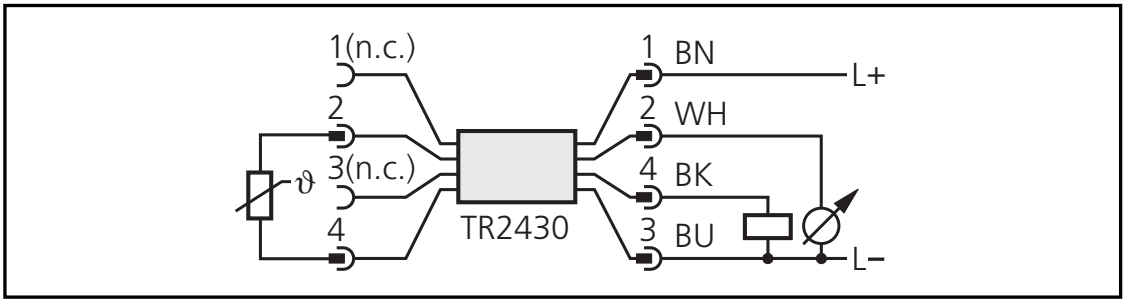
Connect a temperature sensor to the unit and fix it to the process connection.

6. Electrical connection

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

Disconnect power before connecting the unit.

Wiring:



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

Water Flow Transducer

Manual setting options

- Manual adjustment to maximum flow
  a) Evaluation of flow decrease (see page 29).
  b) Evaluation of excess flow (see page 30).
- Manual adjustment to minimum flow / flow standstill (see page 32).

The following applies to all setting procedures:

- If no button is pressed for 20s during the setting procedure, the unit returns to the operating mode with the parameter values unchanged.
- If adjustment has not been possible, all the red LEDs flash. The unit returns to the operating mode with the parameter values unchanged.

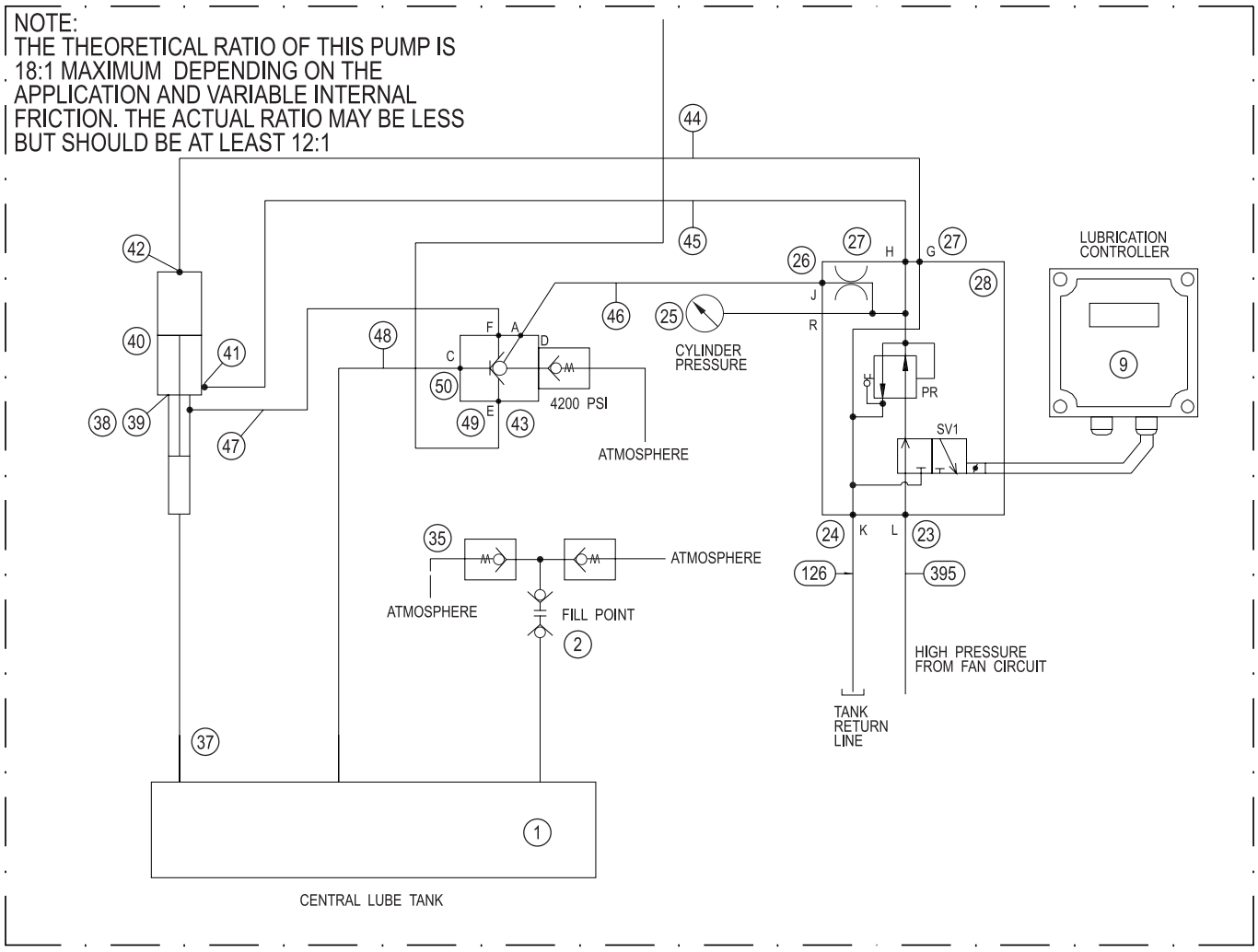
Locking / Unlocking:

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: Press both push buttons for 10s. Indication goes out briefly (acknowledgement of locking / unlocking). Units are delivered from the factory in the unlocked state.
With the unit in the locked state indication goes out briefl when you press the Mode/Enter button.

Failure Modes

Type of failure	Comments
VREF	
+VREF open	VIN out of range, will create a VIN error => VIN=Predefined error value
-VREF open	VIN out of range, will create a VIN error => VIN=Predefined error value
+VREF short-circuited to -VREF	VREF error, will shut off outputs
+VREF short-circuited to +BAT	VREF error, will shut off outputs
+VREF short-circuited to -BAT	VREF error, will shut off outputs
-VREF short-circuited to +BAT	External fuse (max 7.5A) on +BAT blows
-VREF short-circuited to -BAT	not detected
VIN	
VIN open	VIN out of range, will create a VIN error => VIN=Predefined error value
VIN short-circuited to +BAT	VIN out of range, will create a VIN error => VIN=Predefined error value
VIN short-circuited to -BAT	VIN out of range, will create a VIN error => VIN=Predefined error value
DIN	
DIN open	not detected
DIN short-circuited to +BAT	not detected
DIN short-circuited to -BAT	not detected
Current mode	
COUT open	COUT error will shut off output
CRET (active) open	COUT error will shut off output
CRET (passive) open	not detected, will not affect function
COUT short-circuited to CRET (active)	COUT error will shut off output
COUT short-circuited to CRET (passive)	not detected, will not affect function
COUT short-circuited to +BAT	COUT error will shut off output
COUT short-circuited to -BAT	COUT error will shut off output
CRET (active) short-circuited to +BAT	COUT error will shut off output
CRET (active) short-circuited to -BAT	not detected, will not affect function
CRET (passive) short-circuited to +BAT	not detected, will not affect function
CRET (passive) short-circuited to -BAT	COUT error will shut off output
COUT short-circuited to 2nd COUT (active)	COUT error on one of the outputs (indeterministic function)
COUT short-circuited to 2nd COUT (passive)	not detected, will not affect function
COUT short-circuited to 2nd CRET (active)	COUT error will shut off output
COUT short-circuited to 2nd CRET (passive)	not detected, will not affect function
CRET short-circuited to 2nd CRET (active)	COUT error will shut off output
CRET short-circuited to 2nd CRET (passive)	not detected, will not affect function
Insufficient voltage	COUT error will shut off output
H-side short-circuited to 2nd H-side (active)	

Central Lube System



Hydraulic Control Schematic

The Central lube system is controlled by the Vigilante system and is adjusted via the touch screen.

AUTO LUBE

Operation

The lube cycle time & lube pressure setting can be set from the password protected area.

The time is set in seconds.

If a 1200 second cycle is set. The lube solenoid is activated at the 1080 second mark.

(Lube solenoid will run for 2 minutes).

If the lube pressure switch is not up to pressure within 118 seconds.....a Lube Alarm will occur.

If the manual lube is activated. The lube solenoid will run for 30 seconds. If pressure is not reached in 30 seconds, a Lube Alarm will occur

If the Lube alarm continually occurs then inspect for broken grease lines or faulty field devices.

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.

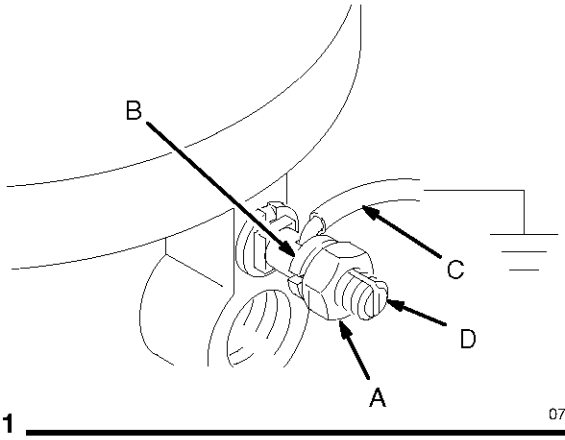


Fig. 1

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 System

Central Lube Pump

⚠ 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).

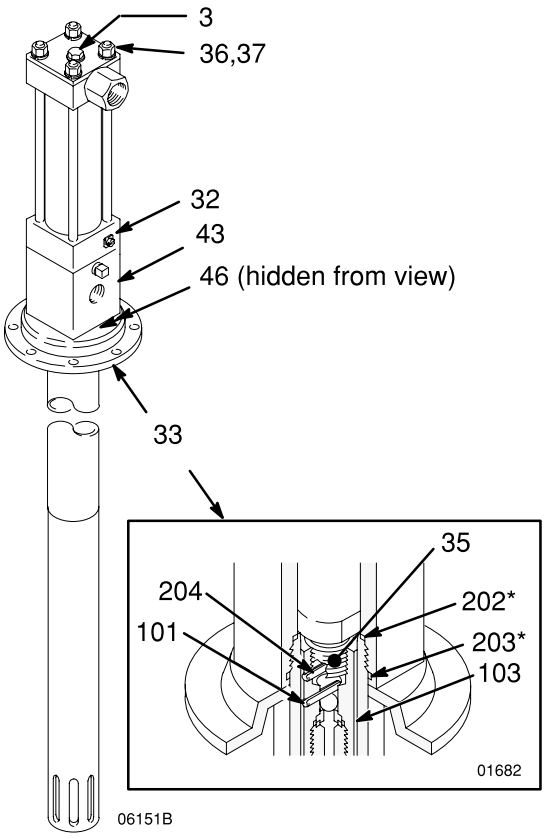


Fig. 6

⚠ 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 9-16.

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

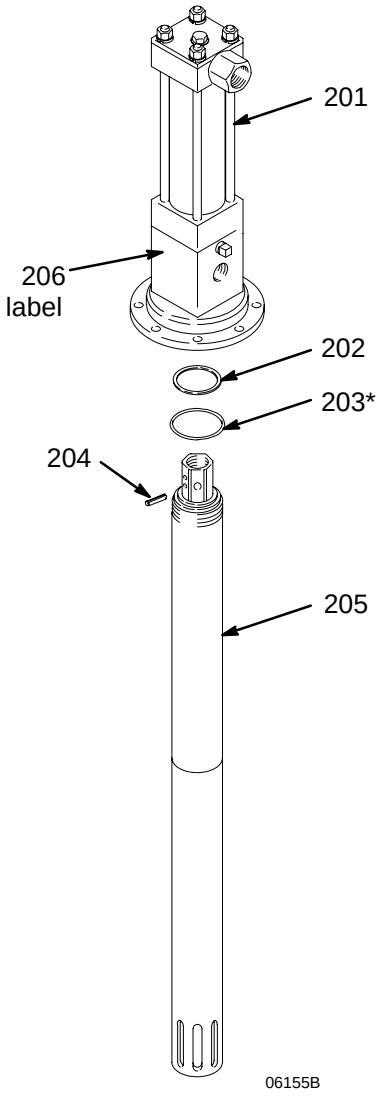
Model 224751, Series C
120 pound drum size

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.*



ALEMITE®

Service Guide

9911, 9911-R
9950, 9950-B
9950-C, 9950-D

High-Pressure Stripped Pump

Description

The major components of these stripped pump models consist of an air-operated motor and a pump tube. The air motor connects directly to the single-acting reciprocating pump tube.

These high-pressure stripped pumps (50:1 ratio) are designed to deliver a range of greases [up to NLGI # 2] and operate directly from their original drums or bulk containers.

Each pump model is designed with a pump tube length to accommodate different size containers. See **Figure 1**.

Specifications

Air Motor

Piston Diameter x Stroke		Air Inlet	Maximum Air Pressure	
Inches	Centimeters		psi	Bars
3 x 3-5/16	7.6 x 8.4	1/4 " NPTF (f)	150	10.3
For details on the air motor, refer to Service Guide SER **339413**				

Pump Tube

Material Outlet	Max. Material Pressure		Delivery/Minute (Approximate)*		Displacement per Cycle	
	psi	Bars	Pounds	Kilograms	In^3	Cm^3
3/8 " NPTF	7500	517	3	1.4	0.39	6.39
* For detailed information, refer to **Figure 3**						

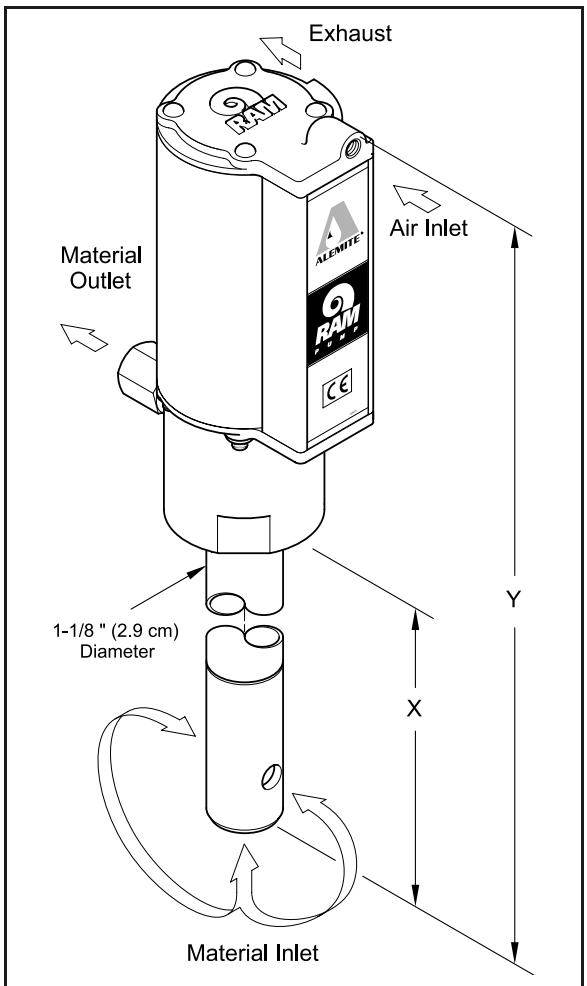
Table 1 *High-Pressure Stripped Pump Specifications*

Package Models

The usage for each model of stripped pump is indicated below.

Pump Model	Package Model	Pump Model	Package Model
9911	9911-H, 9911-Z	9950	9950-A, -HC, 9951, -S, -T
9911-R	9911-A, 9911-B	9950-B	9911-HA
		9950-C	9911-HB

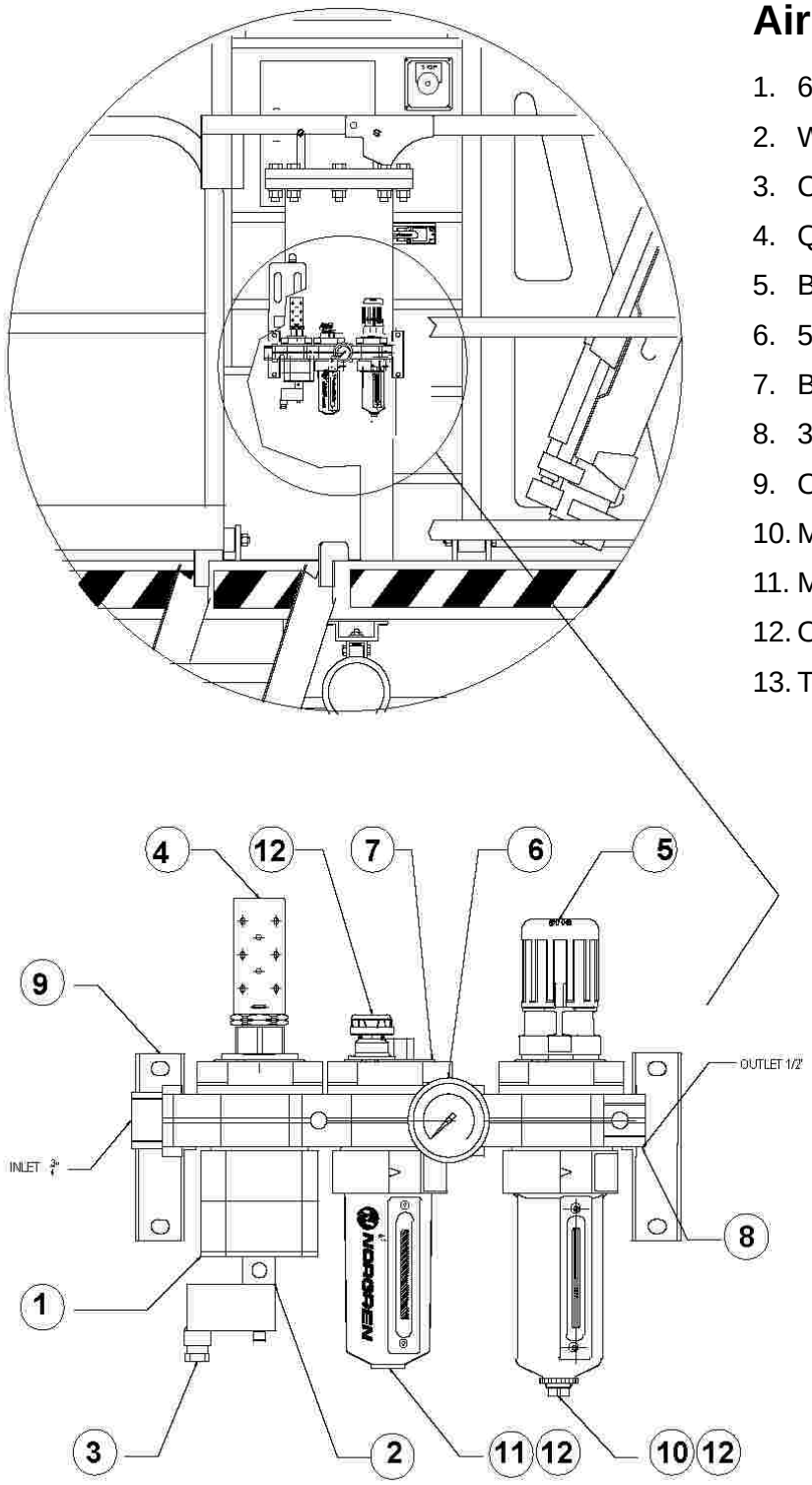
Table 2 *High-Pressure Stripped Pump Usage*



Stripped Pump Model	Container Size		X		Y	
	lbs	kg	Inches	Cm	Inches	Cm
9911	35	-	13.75	34.9	23.6	59.9
9911-R	70	-	17.68	44.9	27.53	69.9
9950	120	50	27.75	70.5	37.6	95.4
9950-B	-	12.5	15.50	39.4	25.35	64.3
9950-C	-	20	19.00	48.3	28.85	73.2
9950-D	400	180	37.06	94.1	46.91	119

Figure 1 *High-Pressure Stripped Pump Models 9911, 9950 Series*

Pipe Thread Lubricator



Air Service Unit

1. 64 Smooth Start Valve Sol OP
2. Webbe Stem SDMO 2 Watt
3. Coil 24V DC 6W
4. Quitaire Silencer 1/2" BSM Male
5. BAS Fil/Reg 40m AD REL 10 BAR
6. 50mm Guage 1/8" CB 1-10 BAR
7. BAS Micro Fog Lubricator
8. 3/4" Triple Yoke
9. Oly 64 Bracket Kit
10. Metal Bowl Assembly
11. Metal Bowl Assembly
12. O-Ring Sight Dome Assembly
13. Thread Grease Air Service Unit

Pipe Thread Lubricator

PARTS	QTY	DESCRIPTION
1	4	Tie rod
2	1	Air piston bolt
3	1	Air piston nut
4 ▲	1	Air motor piston rod
5	1	Piston rod connector
6	1	Valve cap
7	1	Trip rod collar
8 ▲	1	Trip rod pin
9 ✓	1	Trip shoe
10 ▲◆	1	Check washer
11 ▲◆	1	Priming check
12	1	Check stop
13 ▲◆	1	Plunger rod
14 ▲◆	1	Priming plunger
15 ▲◆	1	Priming check seat
16 ▲◆	1	Check seat
17	1	Packing nut
18	1	Packing cap
19	1	Trip sleeve
20	1	Coupling stud
21	1	Coupling adapter
22	1	Coupling nut
23	1	Gland packing nut
24	1	Gland packing spacer
25 ▲	1	Packing nut gasket
26 ▲	1	Valve cap gasket
27 ▲◆	1	Check seat gasket
28 ▲	1	Connector gasket
29	2	Bushing gasket
30 ▲	1	Gland gasket
31 ▲	1	Pump tube gasket
32 ▲	2	Air cylinder gasket
33 ▲	1	Gasket
34 ✓	1	Air piston packing
35 ▲	1	Plunger packing
36 ▲	1	Cover gasket
37 ▲	1	Gland packing
38 ▲	2	O-ring
39 ▲	1	O-ring

PARTS	QTY	DESCRIPTION
40 ▲◆	1	Priming check packing
41 ▲	1	Slide valve gasket
42 ▲	1	U-cup packing
43	1	Outlet body
44	1	Valve guide plate
45	2	Air piston washer
46	1	Gland pack'g washer
47	1	Plunger pack'g washer
48	1	Gland pack'g washer
49	4	Tie rod nut
50	4	Spring
51 ▲	2	Spring
52	2	Ball stop
53 ✓	1	Air cylinder
54	1	Bushing extension
55	1	Pump tube
56	1	Air passage tube
57 ▲◆	4	Ball
58	1	Eye bolt
59	1	Valve slide & seat
60	1	Plunger & bushing ass'y
61 ✓	1	Trip rod
62 ✓	1	Toggle plate
63	1	Cover
64	1	Muffler cover
65 ▲✓	1	Packing washer
66	1	Muffler
67 ▲✓	1	Trip rod packing
68	4	Valve cover screw
69	6	Toggle plate screw
70	4	Valve seat bolt
71	1	Extension adapter
72	1	Air valve casting
73	1	Priming tube
74	1	Trip rod packing nut

▲ Included in Pump Repair Kit.
◆ Included in Lower Pump Tube Repair Kit.
✓ Recommended service part.

LIMITED WARRANTY

Lincoln, A Pentair Company, warrants that lubrication equipment, materials dispensing equipment and other related equipment manufactured by it will be free from defects in material and workmanship during the one (1) year following the date of purchase If equipment proves to be defective during this warranty period, it will be repaired or replaced without charge, provided that factory examination indicates the equipment to be defective. To obtain repair or replacement, it must be shipped, transportation charges prepaid, with proof of date of purchase to a Lincoln authorized Warranty and Service Center, within the one (1) year following the date of purchase

This warranty is extended to the original retail purchaser only. This warranty does not apply to equipment damaged from accident, overload, abuse, misuse, negligence, faulty installation or abrasive or corrosive materials, or to equipment repaired or altered by anyone not authorized by Lincoln to repair or alter the equipment. This warranty applies only to equipment installed and operated according to the recommendations of Lincoln or its authorized field personnel. No other express warranty applies to lubrication equipment, materials dispensing equipment, and other related equipment manufactured by Lincoln

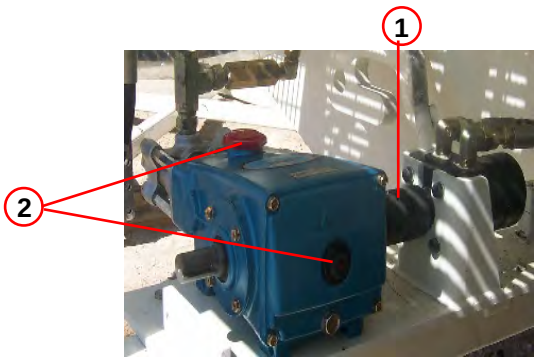
ANY IMPLIED WARRANTIES applicable to lubrication equipment, materials dispensing equipment, and other related equipment manufactured by Lincoln INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WILL LAST ONLY FOR ONE (1) YEAR FROM THE DATE OF PURCHASE SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

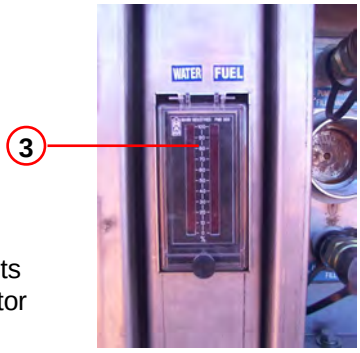
In no event shall Lincoln be liable for incidental or consequential damages. The liability of Lincoln on any claim for loss or damage arising out of the sale, resale, or use of lubrication equipment, materials dispensing equipment, and other related equipment shall in no event exceed the purchase price. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

Lubrication And Maintenance

Water Pump Maintenance





10hrs/Daily

- Check Water Tank Level 1500 Litre Capacity

250hrs

- Check Oil Level, Add If Required

500hrs

- Drain/Replace Oil In Water Pump (15W40 1 Litre)
- Clean Water Pump Strainer
- Check Water Pump Coupling
- Check Water Pump Pressure, Adjust If Required

2000hrs

- Replace Water Injection Strainer

1. Drive Coupling
2. Drain And Fill Points
3. Water Level Indicator

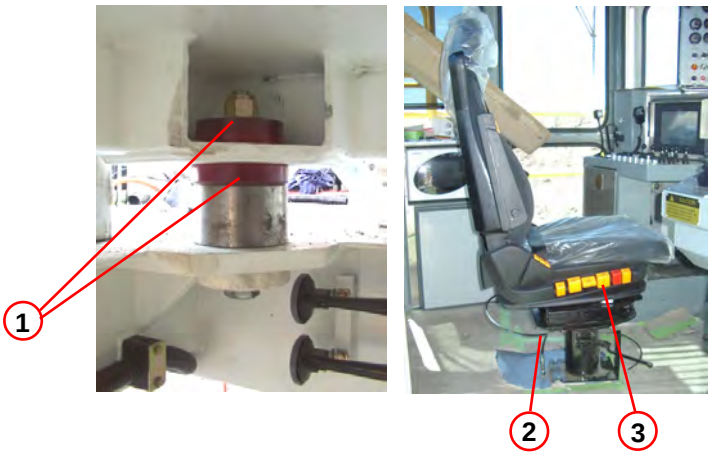
Cab Maintenance

10hrs/Daily

- Check Cab Mounts For Security Or Damage
- Check Operator Seat And Controls For Correct Function
- Check Deck And Walkways For Security Or Any Damage

500hr

- Lubricate Hinges And Catches On Operators Cabin Doors



1. Cab Mounts 2. Seat Air Supply 3. Seat Controls

Air Conditioner Maintenance

250hrs

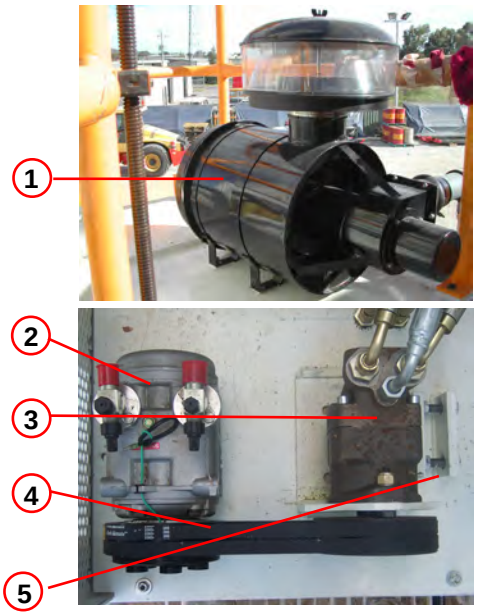
- Check Tension And Condition Of Air Conditioner Belts

500hrs

- Replace Air Filter

1000hrs

- Clean Air Conditioner Condenser
- Clean Air Conditioner Evaporator



1. Air Conditioner Filter And Housing
2. Air Conditioner Compressor
3. Drive Motor
4. Air Conditioner Belt
5. Belt Adjustment

Lubrication & Maintenance Chart - 250hr

Item	Task	Comments & Initials
12	**Pulldown Assembly**	
	1. CHECK and REPORT on the condition of the pulldown ropes. Adjust the pulldown ropes (if required) as per the service manual.	
	2. CHECK the mechanical condition and grease level in the Uniquip lubricators mounted on the travelling sheave block, top up with grease if required.	
	3. CHECK all pulleys for adequate lubrication.	
	4. CHECK the pull down cylinder pivot pin bolts for integrity, and the pivot pins for lubrication and wear.	
13	**Winch**	
	1. CHECK condition of the rope and hook.	
	2. CHECK oil level (85/140)	
14	**Water Pump - Drill System**	
	1. CHECK oil level (Rimula D Extra 15W40).	
	2. Clean the water pump strainer.	
	3. CHECK the condition of the coupling, (Part # 0043880K).	
15	**Undercarriage**	
	1. Clean and CHECK the condition of the, tracks, rollers, rock guards and sprockets.	
	2. CHECK the integrity of the track frame and axle mounting frame hardware.	
	3. CHECK the integrity of the equaliser pivot pin mounting bolts.	
		Left / Right
	4. CHECK the track drive gearbox oil level (Spirax 85W140)	
	5. CHECK track chain adjustment and RECORD current dimension.	
	6. RECORD adjusted dimension (refer service manual for details).	
17	**Palfinger Deck Crane** 1. CHECK crane for any damage or cracks on the weld seams.	
	2. Check hydraulic lines for any damage.	
	3. Check the hook for any damage.	
	4. Check the crane oil level in the transport position 20 mm below the height of the breather.	

Lubrication & Maintenance Chart - 500hr

Item	Task	Comments & Initials
5	**Hydraulic System**	
	1. Change the loop filters behind the mast. (5 x 0053200)	
	2. Change the charge filters in the pump bay. (2 x 0040983)	
	3. Change the return filters in the hydraulic tank. (3 x 0088594) CHECK the condition of the lower cover o-ring P/N 0019728.	
	4. Change the hydraulic tank breather. (YHC7500SKT4H)	
	5. CHECK hydraulic valves for oil leaks.	
	6. CHECK the hydraulic pumps and motors for oil leaks.	
	7. CHECK hydraulic hoses for oil leaks and abrasion damage.	
	8. CHECK hydraulic cylinders for oil leaks. INSPECT the rods for damage.	
	9. CHECK hydraulic oil level with the jacks up, mast down and the head up.	
	10. CHECK the hydraulic cooler and clean if required. Located in the front of the engine radiator, left hand side.	
6	**Hydraulic Pump Drive Gearbox**	
	1. Change oil - 13 litres 85W140.	
	2. Change the breather (1 x YAF4884)	
7	**Compressed Air System - Air Cleaner**	
	1. CHANGE secondary (safety) elements (2 x V007530).	
	2. CHANGE primary elements (2 x V007531)	
	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 the 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 1 1/2 - 2 litres of 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.	

Lubrication & Maintenance Chart - 1000hr

Lubrication and Inspection		
1. Park the machine on a level surface **2. Set parking brake** **3. Rack rods and lower the head** **4. Shut down engine** **5. Relieve all hydraulic system pressure** **6. Relieve all pneumatic (air system) pressure** **7. Isolate the machine**		
Item	**Task**	**Comments & Initials**
1	**Engine Oil & Lubrication**	
	1. Change engine oil (85 litres) and filters (4 x V010521). Pre-fill the filters with engine oil prior to assembly.	
	2. Change engine reserve oil (125 litres) and filters (2 x YLF777). Pre-fill the filters with engine oil prior to assembly.	
	3. CHECK for oil leaks.	
	4. CHECK crankcase breather tube for obstruction or sludge build-up.	
	5. Lubricate the front engine mounting trunnion grease nipple.	
2	**Engine Fuel System**	
	1. Change fuel/ water separator (YFS1006). Pre-fill the filter with fuel prior to assembly.	
	2. Change fuel/ pre-filter strainer (YFS19511).	
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 primary elements (2 x V007531)	
	2. Change secondary (safety) elements (2 x V007530)	
	3. Remove the vacuator cups (3 used) clean & refit.	
	4. CHECK induction pipe-work for cracks, splits and dust intrusion.	

Lubrication & Maintenance Chart - 2000hr

Item	Task	Comments & Initials	
16	CHECK the hydraulic pressures	Test	Adjust
	Auxiliary Pump Load 1. Operate any electrically controlled auxiliary function such as the Deck Wrench. Read pressure on the auxiliary gauge in the dash 2500 PSI, (17236 kPa).		
	2. Jack Load Sense Relief Valve Push the Jack to raise the jack cylinder. Read pressure on the auxiliary gauge 2800 PSI, (19305 kPa).		
	3. Rotation Pressure 1. Locate the Deck Wrench on to the flats of the drill pipe or sub. 2. Push the rotation lever fully forward 3. Fully wind in the rotation torque control knob down on the right hand operator's console. 4. The reading on the Left Hand Tram and Rotation Pump Gauge should be 4000 PSI, (27579 kPa). 5. Fully wind out the rotation torque control knob down on the right hand operators console.		
	17. CHECK the rotary drive preload. **Procedure** 1. Place an 8" x 8" hardwood 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" hardwood 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 15°. 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).		