

ALPHA

SEISMIC COMPRESSORS

Offshore Rentals | Air Source Solutions



ASC425D Operator Manual

Containerized Direct Drive Diesel Powered High Pressure Air Compressor

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A. Introduction

The ASC 425D Containerized Direct Drive Diesel Powered High Pressure Air Compressor is comprised of several components, two of which are the Hamworthy air compressor and the John Deere 6135 engine. This manual will focus on the ASC 425D machine as a whole detailing what is required prior to, during and post operation. For in-depth information on each of the major components refer to the following links:

Hamworthy Compressor:

[ASC 425D Hamworthy Compressor.pdf](#)

John Deere Engine:

[ASC 425D John Deere 6135 Operators Manual.pdf](#)

Throughout this manual, when applicable, references to the above manuals will also be included along with page numbers.

B. Specifications

Weight: 25,800 LBS



Hamworthy Compressor

Type	Closed loop water cooled opposed designed pressure lubricated 4 stage
Make/Model	Hamworthy Model 425 compressor
Medium	Air
Cooling Method	Liquid
Maximum Working Pressure	5000psi
Compressor Speed	1200 Rpm
Absorbed Power	100 HP
Direction Of Rotation (Facing Flywheel)	Counter Clockwise
Number Of Stages	4
1st Stage Running Pressure	50-200 PSI
2nd Stage Running Pressure	200-800 PSI
3rd Stage Running Pressure	800-900 PSI
4th Stage Running Pressure	900-5000 PSI
Final Stage Relief Valve Setting	5500 PSI
Interstage Drain System	Automatic Diaphragm
Pressure Maintaining Valve Setting	1800 PSI

John Deere Engine

Type	Open Industrial Diesel Engine
Make/Model	John Deere 6135 PowerTech® Tier 3
Operating Range	1700-2400 RPM
Number And Configuration Of Cylinders	Inline 6 Cylinder
Power Rating	550 HP
Displacement	13.5 Liter
Rotation	CCW
Electrical System	12 VDC
Emissions Standards	Tier 3

Package Features

Drive Type	Hydraulic transmission
Storage Cylinders/Accumulators	None
Outlet Connections	1 Inch FNPT
Control System Voltage	12 VDC
Cooling Fan Drive	Hydraulic
Lifting	Constructed of A606 Corten – self contained seismic

Capacities

Fuel	300 Gallons
Compressor Oil	30 Gallons
Engine Oil	4 Gallons
Coolant	15 Gallons
Hydraulic Fluid	5 Gallons
Waste Water/Oil	10 Gallons
Dry Weight	25,800 LBS

Fluids

Compressor Oil	Ultrachem 500
Engine Oil	PLUS50
Hydraulic Fluid	Shell Type R&O
Coolant	Glycol

C. Precautions



A full Safety list can be found in the John Deere manual on [page number 18](#), section [05-01](#).

- ✓ Prior to operation of the unit the following considerations should be reviewed:
- ✓ Handle fuel with care: it is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks.
- ✓ Always stop engine before refueling machine. Fill fuel tank outdoors.
- ✓ Prevent fires by keeping machine clean of accumulated trash, grease, and debris. Always clean up spilled fuel.
- Service Machines Safely**
- ✓ Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.
- ✓ Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.

Protect Against Noise

- ✓ Prolonged exposure to loud noise can cause impairment or loss of hearing.
- ✓ Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Practice Safe Maintenance

- ✓ Understand service procedure before doing work. Keep area clean and dry.
- ✓ Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.
- ✓ Securely support any machine elements that must be raised for service work.
- ✓ Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or



broken parts. Remove any buildup of grease, oil, or debris.

- ✓ On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.
- ✓ On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.

Service Cooling System Safely

- ✓ Explosive release of fluids from pressurized cooling system can cause serious burns.
- ✓ Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



A full Safety list can be found in the John Deere manual on [page number 18](#), section [05-01](#).

**SYNTHETIC LUBRICANTS MUST NOT BE MIXED WITH
CONVENTIONAL HYDRO-CARBON OILS.**

**REFER TO THE LUBRICANT SUPPLIERS RECOMMENDATIONS
FOR HANDLING PROCEDURES, COMPATIBILITY WITH PIPELINE
MATERIALS AND FITTINGS AND SERVICE LIFE.**



Hamworthy compressor related warnings are found on [pages 3 and 4](#) of the [Hamworthy manual](#). Please review all warnings prior to operation.

- ✓ Keep the unit clear of any other objects; do not lay anything on it or in close proximity.
- ✓ Check pressure gauges hourly to proactively identify any possible issues.
- ✓ Walk around the unit to ensure no wires are loose or appear damaged.
- ✓ Ensure no water or oil leaks are visible.
- ✓ Check compressor oil level.
- ✓ Check coolant level at the top of the unit above the fan.
- ✓ Check engine oil via the dipstick for proper level.

Daily Prestaring Checks

Do the following **BEFORE STARTING THE ENGINE** for the first time each day:

IMPORTANT: DO NOT add makeup oil until the oil level is **BELOW** the crosshatch marks on the dipstick.

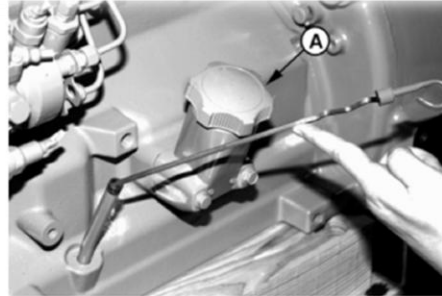
1. Check engine oil level on dipstick. Add as required, using seasonal viscosity grade oil. (See **DIESEL ENGINE OIL** in Fuels, Lubricants, and Coolant Section for oil specifications.)

Depending on application, oil may be added at left (A) or right (B) side oil filler cap and rocker arm cover filler cap (C) locations.

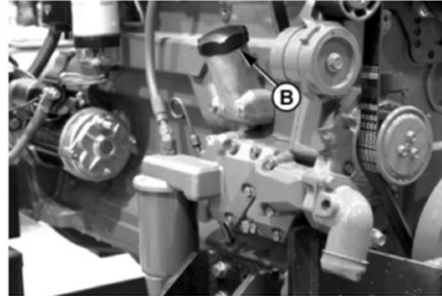
IMPORTANT: DO NOT fill above the top mark on the dipstick. Oil levels anywhere within crosshatch (D) are considered in the acceptable operating range.

A—Left Side Oil Filler Cap
B—Right Side Oil Filler Cap

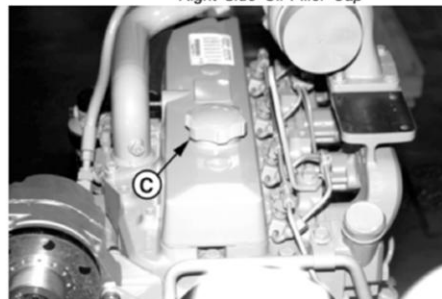
C—Cover Oil Filler Cap
D—Crosshatch On Dipstick



Left Side Oil Filler Cap

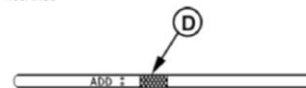


Right Side Oil Filler Cap



Rocker Arm Cover Filler Cap

RG8028B —UN—15JAN99



Crosshatch on Dipstick

RG8009A —UN—16JUN00

RG8054A —UN—16JUN00

RG8025B —UN—16JUN00

Read and understand all **WARNINGS, CAUTION AND MANDATORY LABELS** on the unit before operating or carrying out maintenance or servicing.



RISK OF DANGER



RISK OF HIGH PRESSURE



RISK OF GAS EXHAUST



RISK OF ELECTRIC SHOCK



RISK OF HOT SURFACE



CONSULT MANUAL

WARNING

Misuse of compressed air can be dangerous. It cannot be stressed too strongly the importance of taking every precaution in the use of compressed air and its associated equipment.

Remember to always release all air pressure from the whole system before carrying out any repairs or maintenance work on the compressor.

- NEVER Screw down a pipe union that is under pressure.
- NEVER Screw down a safety valve beyond the manufacturers setting. A safety valve is fitted to prevent overloading the air compressor. To interfere with its setting could result in serious injury or damage.
- NEVER Carry out any work whatsoever unless the power supply has been isolated and warning notices attached to the starter.
- NEVER Pass in front of an air receiver wheel valve when compressed air is being released. This is particularly dangerous as any particles of iron scale in the air stream could become embedded in the skin and cause a serious wound.
- NEVER Attempt to straighten badly bent pipes or re-use damaged union fittings.
- NEVER Use worn or damaged components that particularly rely on threads for security - i.e. nuts, bolts, nipples and drain taps etc.
- NEVER Tamper with a live electrical circuit. If in doubt call on the services of a qualified electrician.

REMEMBER To firmly secure all externally fitted installation pipe work. This will prevent undue vibration and possible fracture under pressure.

REMEMBER COMPRESSED AIR CAN KILL - TREAT IT WITH RESPECT.

NOTE: In the case of engine driven sets the operator must ensure that the fuel and lubricant are of the correct type before starting the set.

D. Gauges

The ASC 425D was built with several fail-safe features in place. However, monitoring the gauges often is recommended and required to ensure optimum performance. The recommended interval is hourly. Each gauge and its recommended range are discussed below.

D.1 Water Temperature Gauge

Location: Top of compressor, refer to Figure 1
Use: Used to measure compressor water temperature
Reading: 10° over ambient temperature



Figure 2:Compressor Water Temp. Gauge Location



Figure 2: Compressor Water Temp. Gauge Close-up

D.2 Water PSI Gauge

Location: Top of compressor, refer to Figure 3
Use: Used to measure compressor water pressure
Reading: 5 PSI

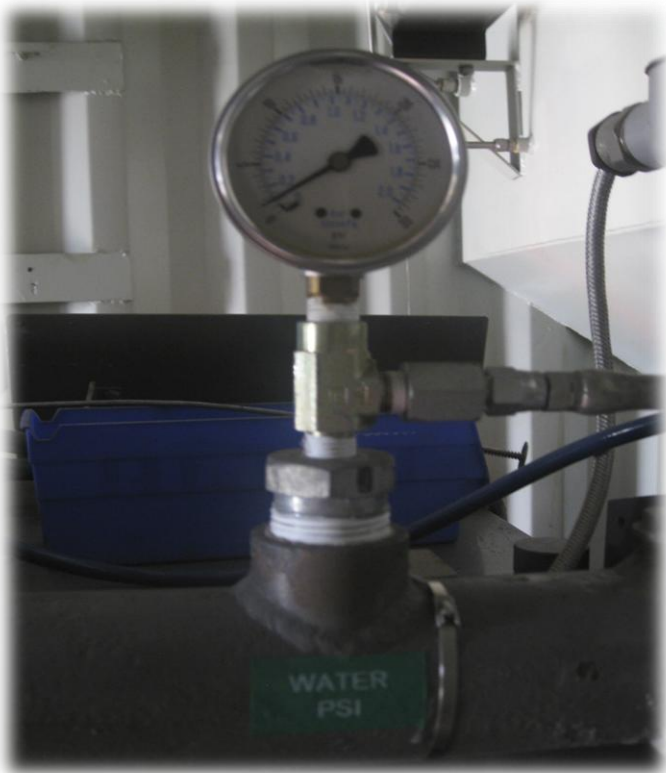


Figure 3: Water PSI Gauge



Figure 4: Water PSI Gauge Close-Up

D.3 Oil Level Gauge

Location: When facing compressor it is on the left side, refer to Figure 5

Use: Used to measure the compressor's oil level

Reading: Ensure it is $\frac{3}{4}$ full at all times



Figure 5: Oil level Gauge

D.4 Main Gauges Panel

The main control panel is located on the left hand side of the ASC425 D when facing the door opening. It is comprised of 6 (six) gauges; each is explained in detail below.



Figure 6: Main Gauges Panel



Figure 7: Location of Main Gauges Panel

The six gauges on the main controller panel are as follows:

Name: 1st Stage Gauge

Location: Main Control Panel

Use: Used to measure the compressor's first stage pressure

Reading: 50-200 PSI



Figure 31: 1st Stage Gauge



Figure 42: 2nd Stage Gauge

Name: 2nd Stage Gauge

Location: Main Control Panel

Use: Used to measure the compressor's second stage pressure

Reading: 200-800 PSI

Name: 3rd Stage Gauge
Location: Main Control Panel
Use: Used to measure the compressor's third stage pressure
Reading: 800-900 PSI



Figure 53: 3rd Stage Gauge



Figure 64: 4th Stage Gauge

Name: 4th Stage Gauge
Location: Main Control Panel
Use: Used to measure the compressor's fourth stage pressure
Reading: 900-5000 PSI

Name: Water Gauge

Location: Main Control Panel

Use: Used to measure the compressor's Water pressure

Reading: 30-50 PSI



Figure 75: Water Gauge



Figure 86: Oil Gauge

Name: Oil Gauge

Location: Main Control Panel

Use: Used to measure the compressor's Oil pressure

Reading: 30-50 PSI

D.5 Transmission Oil Pressure Gauge

Name: Transmission Oil Gauge

Location: it is located behind the engine, midway.

Use: Used to measure the Transmission's Oil pressure

Reading: 20-60 PSI



Figure 37: Transmission Oil Gauge

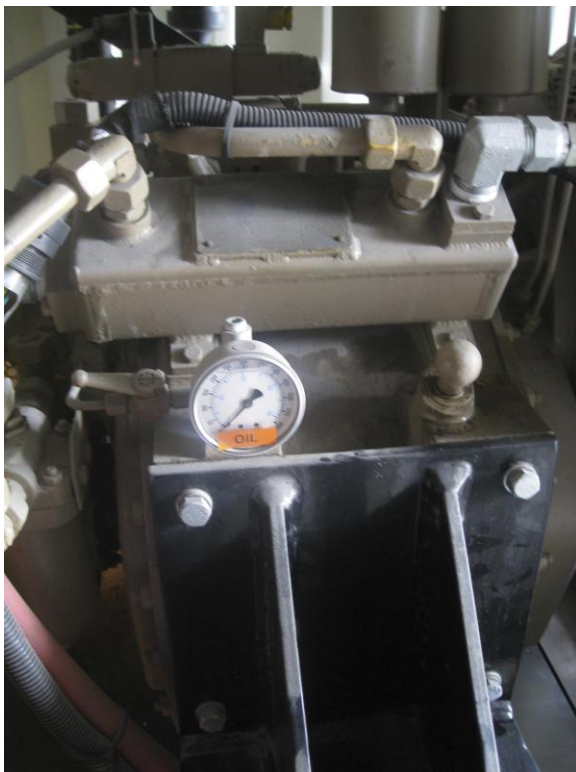


Figure 37: Transmission Oil Gauge Location

E. Operation

All of the panels required to operate the machine are located at the front of the unit and discussed in detail below.

Engine Diagnostic Gauge:

This panel may be used to view engine information such as RPM, Engine hours, Oil Pressure, Fuel consumption, etc. It is not used to configure the ASC 425D. To learn more about this panel refer to the [John Deere manual, section 15-1 on page 37.](#)

Using Diagnostic Gauge to Access Engine Information

The diagnostic gauge (A) allows the operator to view readouts of engine functions and trouble codes (DTCs).

The gauge is linked to the electronic control system and its sensors. This allows the operator to monitor engine functions and to troubleshoot the engine systems when needed.

Press the menu key (B) to access the various engine functions in sequence. The displays can be selected as either customary English or metric units.

- A- Diagnostic Gauge
- B- Menu Key
- C- Arrow Keys
- D- Enter Key
- E- Red “STOP ENGINE” Indicator Light
- F- Amber “WARNING” Indicator Light

The following menu of engine parameters can be displayed on the diagnostic gauge window:

- Engine hours • Engine rpm • System voltage •
- Percent engine load at the current rpm • Coolant temperature • Oil pressure • Throttle position • Intake manifold temperature • Current fuel consumption •
- Active service (diagnostic) codes • Stored service (diagnostic) codes from the engine •
- Set the units for display • View the engine configuration parameters

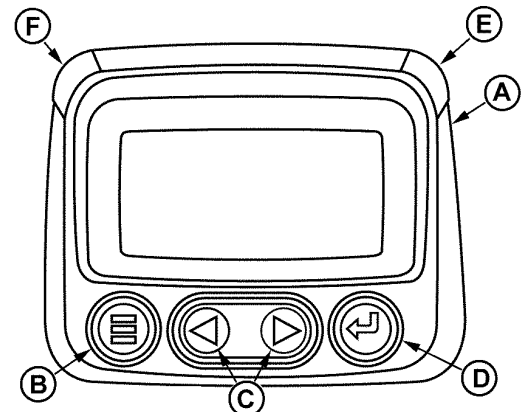


Figure 38: Engine Diagnostic Gauge



Note

NOTE: Engine parameters, which can be accessed, will vary with the engine application. The diagnostic gauge includes a graphical backlit Liquid Crystal Display (LCD) screen. The display can show either a single parameter or a quadrant display showing four parameters simultaneously. The diagnostic gauge uses two arrow keys (C) for scrolling through the engine parameter list and viewing the menu list and an enter key (D) for selecting highlighted items. The red (E) and amber (F) lights are used to signal active trouble code received by the diagnostic gauge.

There are two panels, which are important for starting the unit.



Figure 39: ASC425D Engine Control Module

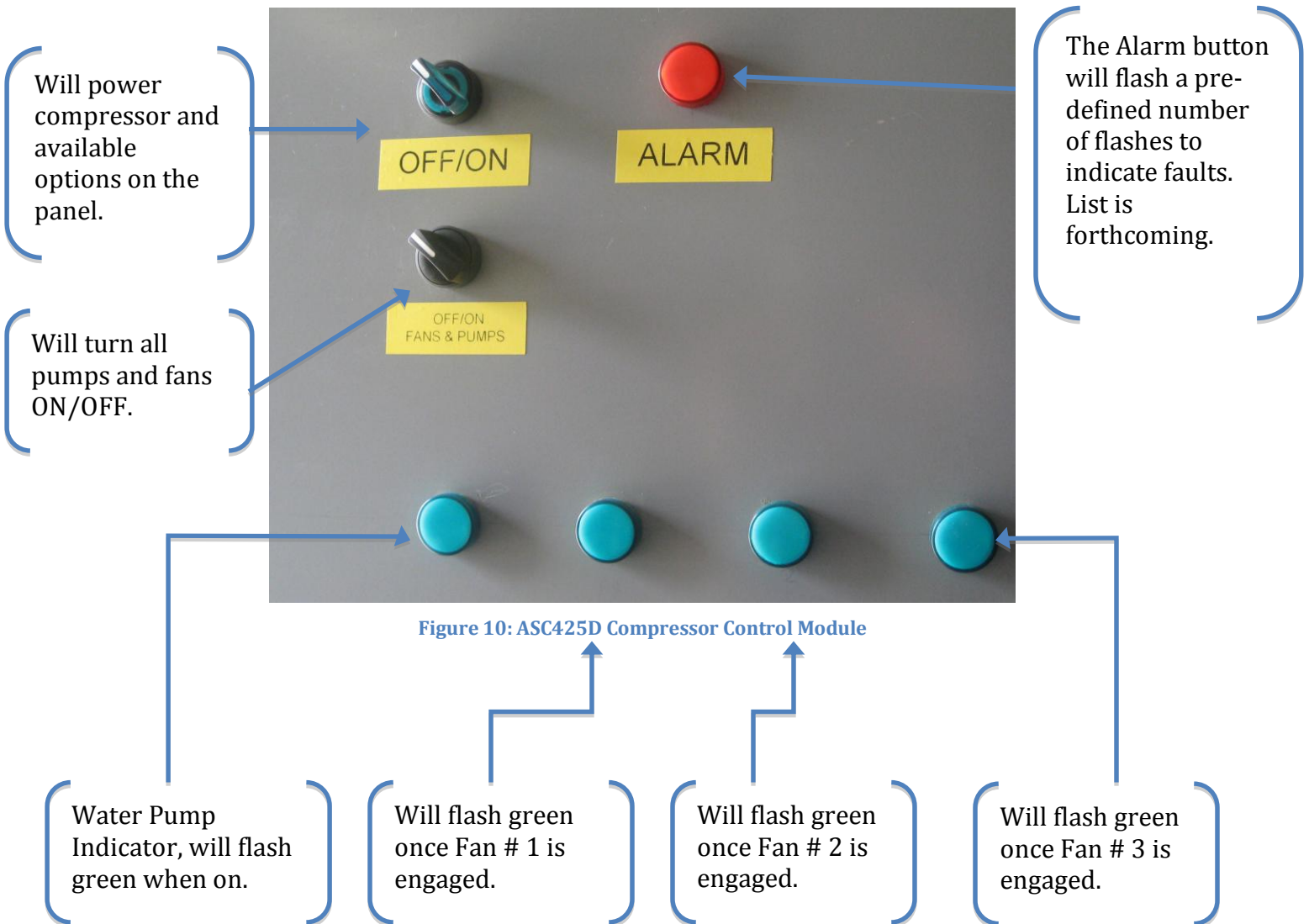


Figure 10: ASC425D Compressor Control Module

Generator Information Gauge:

The Generator Information Gauge is located on the Engine Control panel and is used to display the AC output. No modifications or settings are performed on this gauge, it is used for reading AC output only.

E.1 Starting the ASC 425D

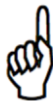
1. Turn the Battery switch to the ON position, Figure 41.
2. Turn ON the Cargo Lights switch if operating at night.
3. Insert the key into the Ignition switch.
4. Turn the ignition key all the way to the right until the engine turns ON.
5. The Diagnostic Gauge Panel (Figure 8) will illuminate, be sure the RPM is ramping up.
6. Turn the Generator switch, located on Engine Control Module, to the ON position. The Generator panel will light up indicating power is received.
7. Turn the Fans & Pumps switch to the ON position. Water Pump will turn ON first causing the left most green indicator to flash green. There is approximately a 15 second delay between each subsequent FAN engagement at which point the last 3 lights will turn on one at a time.
8. Only after ALL 4 lights appear green (should remain lit for the duration of the operation of the machine) should the Compressor switch be turned to the ON position.
9. The red Alarm button (Figure 42) will flash red for a few seconds and then immediately cease.



Figure 11: Battery Switch



Figure 42: Alarm Switch



Note

Note: Should any of the fans engagements fail; it will cause the ASC 425D to shutdown as a failsafe feature.

E.2 Stopping the ASC 425D

1. Turn the Compressor switch to the OFF position
2. Turn off the Fans & Pumps switch to the OFF position – notice each of the green lights should turn off in sequence as those components are shutting down one by one.
3. Turn the Generator switch to the OFF position
4. Turn the ignition switch to the OFF position
5. Turn the battery switch to the OFF position

F. Maintenance



BEFORE PROCEEDING WITH MAINTENANCE ON THE COMPRESSOR IT MUST BE STOPPED, ISOLATED ELECTRICALLY AND MECHANICALLY AND VISIBLE WARNING NOTICES DISPLAYED. ADDITIONALLY, ALL INTERNAL PRESSURE MUST BE RELEASED WITH THE UNIT ISOLATED FROM THE STORAGE RESERVOIR AND THE WATER SUPPLY SHUT OFF.

NOTE: A safety valve opening indicates excessive pressure and under NO CIRCUMSTANCES must a safety valve be screwed down to accommodate excessive pressure. THIS IS DANGEROUS. If safety valve opens or appears faulty shut down compressor immediately and investigate. If fault appears immediately or shortly after a service, first examine those parts disturbed during the service.

F.1 General

Observe Service Intervals using hour meter (Figure 8) on diagnostic gauge as a guide, perform all services at the hourly intervals indicated on following pages. At each scheduled maintenance interval, perform all previous maintenance operations in addition to the ones specified. Keep a record of hourly intervals and services performed, using charts provided in Lubrication and Maintenance Records section.



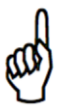
Figure 8: Diagnostic Gauge

IMPORTANT: Recommended service intervals are for normal operating conditions. Perform maintenance at interval which occurs first, for example, either at 500 hours of operation OR every 12 months. Service MORE OFTEN if engine is operated under adverse conditions. Neglecting maintenance can result in failures or permanent damage to the engine.

Use Correct Fuels, Lubricants, and Coolant



IMPORTANT: Use only fuels, lubricants, and coolants meeting specifications outlined in Fuels, Lubricants, and Coolant section when servicing your John Deere Engine.



[Refer to the Lubrication and Maintenance section on page 75, Chapter 25-1 in the John Deere manual.](#)

F.2 Parts

	Component	Part Number	Notes	How To
Compressor	1 st Stage Valve	45402138	It is recommended to change the whole valve and not just a sub-component.	Refer to Appendix C: Valve Replacement section on page 62 And Appendix C on page 62.
	2 nd Stage Valve	4540718	It is recommended to change the whole valve and not just a sub-component.	Refer to Appendix D: Valve Replacement section on page 52 And Appendix D on page 52.
	3 rd Stage Valve	45407129	It is recommended to change the whole valve and not just a sub-component.	Refer to Appendix E: Valve Replacement section on page 57 And Appendix E on page 57.
	4 th Stage Valve	456407228	It is recommended to change the whole valve and not just a sub-component.	Refer to Appendix F: Valve Replacement section on page 62 And Appendix F on page 62.
	Oil Filter	Filter	Should be replaced every 500 hours.	Refer to Replacing Compressor Oil and Filter on page 1360F/6 in the Hamworthy manual. Refer to section F.8 in this manual on page 33.
	Air Intake Filter	TBA	Should be replaced every 500 hours.	Refer to Replacing Compressor Oil and Filter on page 1360F/6 in the Hamworthy manual. Refer to section F.9 in this manual on page 33.
	Oil	Castrol Aircol SN100, Esso SYNESSTIC 100, Corroless Nuodex Anderol 500, or Ultrachem 500 Compressor Lubricant	Should be replaced every 500 hours.	Refer to Replacing Compressor Oil and Filter on page 1360F/6 in the Hamworthy manual. Refer to section F.8 in this manual on page 33.
	Oil Pump Assembly	Oil Pump	As Needed	Refer to section F.10 in this manual on page 33 for Oil Pump Removal and section F.11 on page 33 for Oil Pump reassembly.

	Coolant	Glycol	As Needed	The coolant sight glass is located at the back of the container on the back wall close to the ceiling; Filling it can be done by opening a hatch on the roof.
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	Component	Part Number	Notes	How To
Engine	Engine Oil	PLUS50, ACEA E7 or ACEA E6	John Deere PLUS50 oil is preferred. Oil type will vary depending on air temperature.	Refer to the John Deere Manual and locate section 35-4 on page 84 for details. Refer to section F.3 on page 25.
	Engine Oil Filter	JDP-RE530107	Should be replaced every 500 hours.	Refer to the John Deere Manual and locate section 35-4 on page 84 for details. Refer to section F.3 on page 25.
	Crank Case Vent System	RE530972	If working in dusty environment check often.	Refer to the John Deere Manual and locate section 35-11 on page 91 for details. Refer to section F.6 on page 30.
	Engine Coolant	R522179, COOLGARD	If COOLGARD is used, the flushing interval may be extended to 3000 hours of operation or every 36 months.	Refer to the John Deere Manual and locate section 35-14, 35-17, 40-2 on page 97 for details. Refer to section F.4 on page 27 and section F.7 on page 30.
	Fuel Filter	JDP-RE532952	Replace fuel filters at 12-month intervals (or every 500 hours) if no alarm/code indications occur.	Refer to the John Deere Manual and locate section 35-9 on page 83 for details. Refer to section F.5 on page 27.

F.3 Changing Engine Oil and Replacing Oil Filter

IMPORTANT: Changing engine oil and filter every 500 hours or 12 months depends on the following requirements:

- Engine equipped with an extended drain interval oil pan.
- Use of diesel fuel with sulfur content less than 0.50% (5000 ppm) is strongly recommended.
- Use of premium oil John Deere PLUS50, ACEA E7 or ACEA E6.
- Perform engine oil analysis to determine the actual extended service life of ACEA E7 and ACEA E6 oils.
- Use of the approved John Deere oil filter.

The oil and filter change interval is reduced if ANY of the above listed requirements are not followed.

1. Run engine approximately 5 minutes to warm up oil. Shut off engine.
2. Remove oil pan drain plug (Figure 9).
3. Drain crankcase oil from engine while warm.
4. Remove and discard oil filter element using a suitable filter wrench (Figure 10).
5. Remove oil filter packing and clean filter mounting pad.

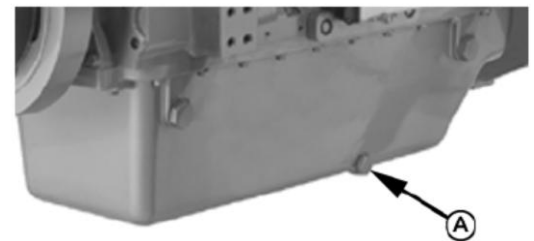


Figure 9: Engine Oil Drain Plug

IMPORTANT: Filtration of oils is critical to proper lubrication. Always change filter regularly. Use filter meeting John Deere performance specifications.



Important

6. Oil new packing and install new filter element onto filter housing. Hand tighten element according to values printed on filter element. If values are not provided, tighten element approximately 1/2—3/4 turn after packing contacts filter housing. **DO NOT** over tighten filter element (Figure 11)
7. Inspect drain plug O Ring. Replace if necessary.
8. Install oil pan drain plug. Torque plug to specifications.

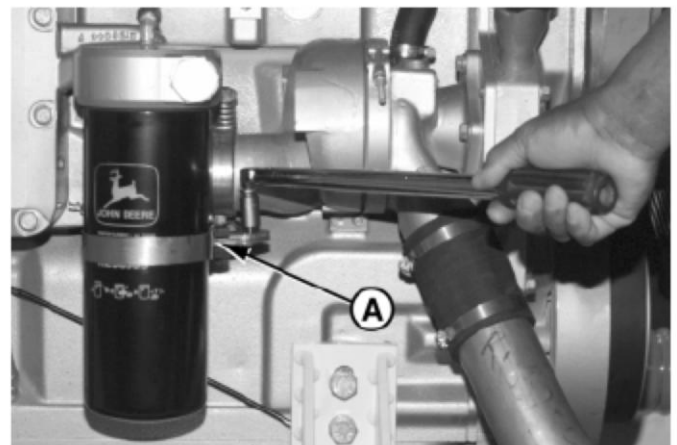


Figure 10: Filter Element

Oil drain plug (1-1/4 in.)—Torque.....	46 N-m (34 lb-ft)
Oil drain plug (1-1/2 in.)—Torque.....	64 N-m (47 lb-ft)

Figure 11: Oil Drain Plug Torque Specifications

9. Fill engine crankcase with correct John Deere engine oil through timing gear cover fill port (Figure 12, A) or oil pan fill port (Figure 13, B) depending on engine application.

**Note**

NOTE: Crankcase oil capacity may vary slightly. ALWAYS fill crankcase to full mark or within crosshatch on dipstick, whichever is present. DO NOT overfill.

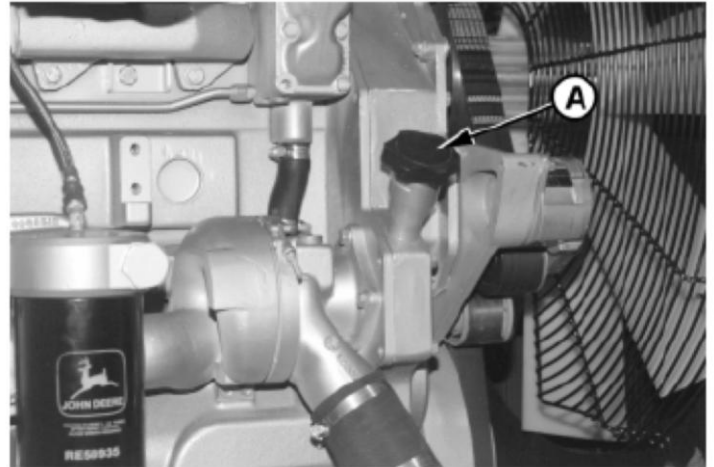


Figure 12: Cover Fill Port

**Important**

IMPORTANT: Immediately after completing any oil change, crank engine for 30 seconds without permitting engine to start. This will help ensure adequate lubrication to engine components before engine starts.

10. Start engine and run to check for possible leaks.
11. Stop engine and check oil level after 10 minutes. Oil level reading should be within crosshatch of dipstick.

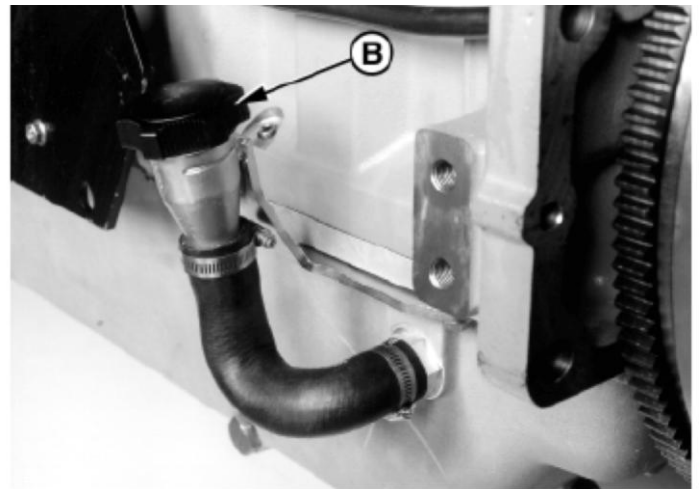


Figure 112: Oil Pan Adapter Fill Port

F.4 Visually Inspecting Coolant Pump

1. Remove foam filter (if equipped) from coolant pump weep hole (A) as shown.
2. Inspect weep hole for oil or coolant leakage.
 - Oil leakage indicates a damaged rear seal.
 - Coolant leakage indicates a damaged front seal.
3. Repair or replace complete coolant pump assembly if leakage is detected.

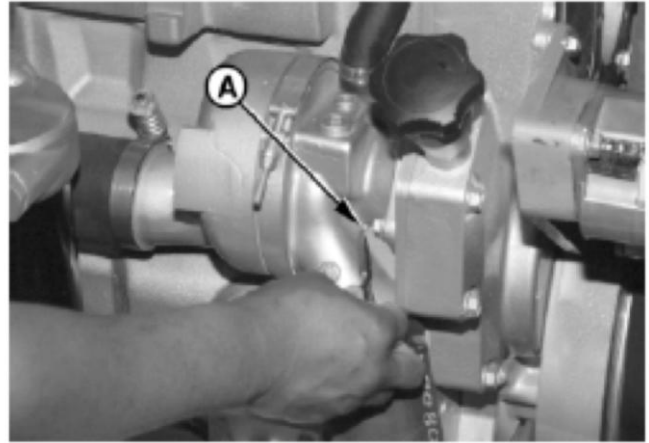
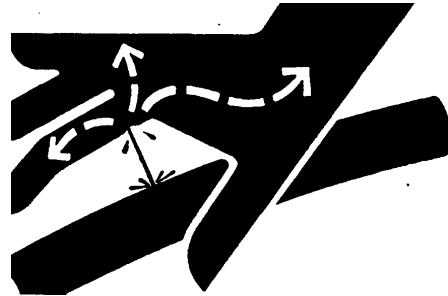


Figure 113: Coolant Pump Weep Hole

F.5 Replacing Fuel Filters/Cleaning Water Separator (Later Engines)

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles, which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.



If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

IMPORTANT: Primary fuel filter (Figure 15, B) and final fuel filter (Figure 15, A) must both be replaced whenever audible alarm sounds and trouble code indicates plugged filter (fuel supply pressure moderately/extremely low).

CAUTION: If engine has been running, engine and fuel filter housing may be hot.

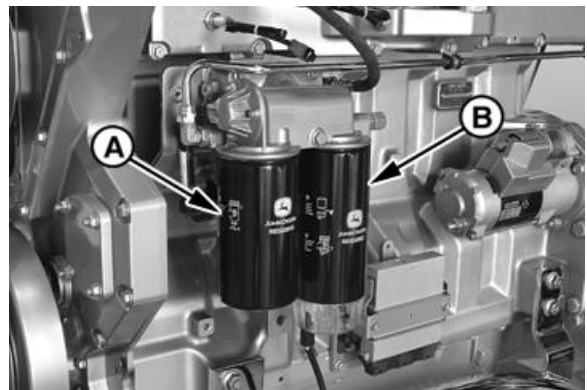


Figure 114: Engine Fuel Filters



Important

1. Close fuel shut-off valve (if equipped).
2. Clean entire area surrounding fuel filter assembly to keep debris from entering fuel system.
3. Disconnect wiring connector from water-in-fuel sensor (Figure 16, B).
4. Drain fuel from separator bowl into suitable container.
5. Remove primary fuel filter by turning counterclockwise by hand or using suitable filter wrench.

Remove And Clean Water Separator Bowl (Later Engines)

1. Remove water separator bowl (Figure 16, A) from primary fuel filter by turning counterclockwise by hand or using a suitable strap wrench.
2. Clean separator bowl and dry it.
3. Lubricate new water separator bowl seal with thin film of oil or fuel, and hand tighten to primary fuel filter.

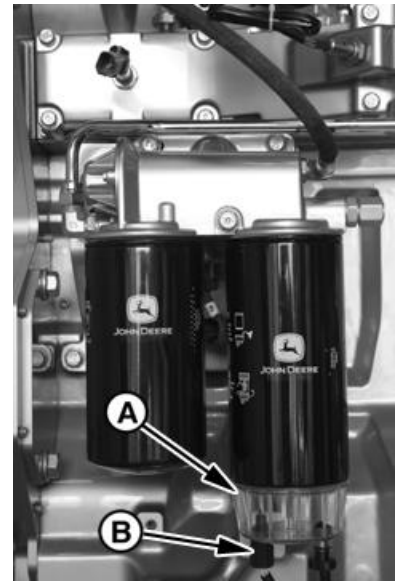


Figure 115: Fuel Water Separator

Water Separator	
Bowl-To-Primary Fuel	
Filter—Torque.....	Hand Tighten to Primary Fuel Filter

Figure 116: Water Separator Specifications

Install New Primary Fuel Filter (Later Engines)

1. Lubricate new primary fuel filter seal with thin film of oil or fuel.
2. Screw filter into header by turning clockwise until the seal contacts the header.
3. When seal contacts the header, tighten clockwise to the following specification:

Primary Fuel Filter—Torque.....	Seal Contact + 1/2 to 3/4 Turn, Lubricated with Oil or Fuel
------------------------------------	--

Figure 117: Primary Fuel Filter Torque

4. Connect water-in-fuel sensor connector.

Replace Final Fuel Filter (Later Engines)



IMPORTANT: Always replace both filters at the same time.

1. Clean entire area surrounding fuel filter assembly to keep debris from entering fuel system.
2. Remove final fuel filter using a suitable filter wrench.
3. Lubricate new final fuel filter seal with thin film of oil or fuel, and screw filter into header by turning clockwise until the seal contacts the header.
4. When seal contacts the header, tighten clockwise to the following specification:

Final Fuel Filter—Torque.....	Seal Contact + 1 Turn, Lubricated with Oil or Fuel
----------------------------------	---

Figure 118: Fuel Filter Seal Torque Specifications

1. Open fuel supply shut-off valve (if equipped).
2. Turn ignition key to the ON position for 120 seconds to allow the system to prime itself.
3. Restart engine and allow running for five minutes minimum.



NOTE: Under normal conditions, fuel system bleeding is not required. The auto prime feature is normally sufficient.

F.6 Checking Crankcase Vent Tube and Valve

1. Loosen clamp on crankcase vent hose (Figure 20, A).
2. Remove crankcase vent valve (not shown) from rocker arm cover.
3. Remove crankcase vent valve from crankcase vent hose and clean hose. Ensure hose is not plugged.
4. Shake crankcase vent valve. If free movement of valve is heard while shaking, valve can be reused. Replace valve if rattle is not heard.
5. Install the valve and vent hose. Attach valve with two screws. Tighten hose clamp securely.

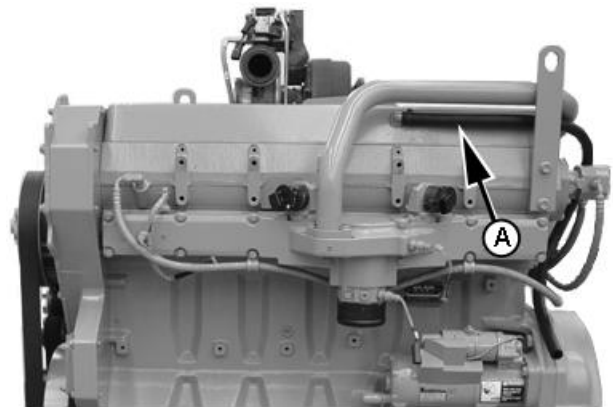


Figure 19: Crankcase Vent Tube

F.7 Flushing and Refilling Cooling System

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

NOTE: When John Deere COOL-GARD is used, the drain interval is 3000 hours or 36 months. The drain interval may be extended to 5000 hours or 60 months of operation, provided that the coolant is tested annually AND additives are replenished, as needed, by adding a supplemental coolant additive (SCA).

If COOL-GARD is not used, the flushing interval **remains at 2000 hours or 24 months** of operation.

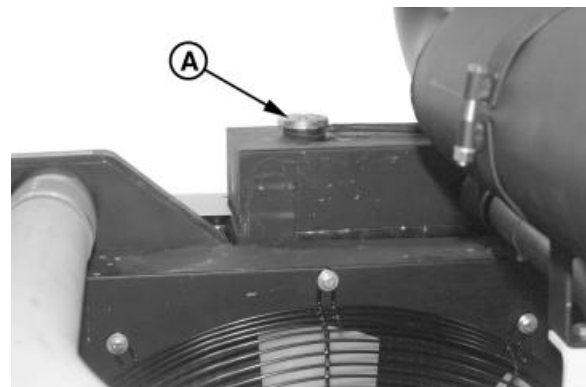


Figure 20: Radiator Cap

1. Pressure test entire cooling system and pressure cap if not previously done.
[Refer to John Deere Manual on pages 96-97 to learn how.](#)
2. Slowly open the engine cooling system filler cap or radiator cap (Figure 21, A) to relieve pressure and allow coolant to drain faster.
3. Open oil cooler housing drain valve (Figure 22, A) on right side of engine. Drain all coolant from engine block.
4. Open radiator drain valve (Figure 23, B) and drain all coolant from radiator.



Figure 22: Oil Cooler Housing Drain Valve

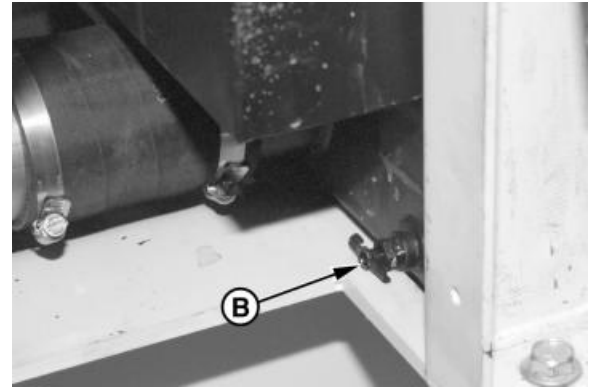


Figure 21: Radiator Drain Valve

5. Remove six cap screws (Figure 25, A) from thermostat housing and remove housing. Remove three thermostats. Install housing (without thermostats) using old gasket and tighten cap screws to specifications.

Thermostat Cover Cap
Screws—Torque..... 50±10 N·m (37±7 lb-ft)

Figure 23: Thermostat Cap crews Torque

6. Test thermostat-opening temperature. [Refer to John Deere Manual to learn how.](#)
7. Close all drain valves after coolant has drained.

CAUTION: Do not run engine longer than 10 minutes. Doing so may cause engine to overheat, which may cause

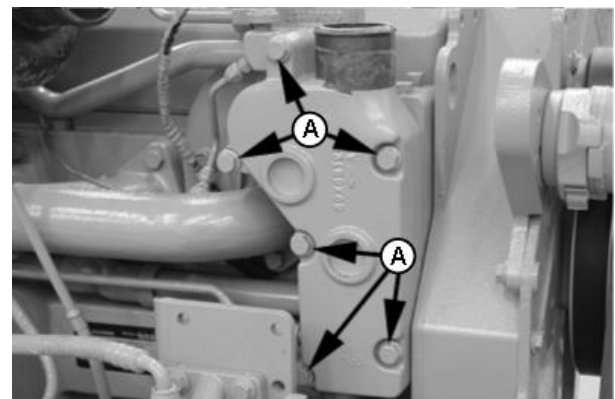


Figure 25: Engine Thermostat

burns when radiator water is draining.

8. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
9. Stop engine, pull off lower radiator hose and remove radiator cap. Immediately drain the water from system before rust and sediment settles.
10. After draining water, close drain valves. Reinstall radiator cap and radiator hose and clamp. Fill the cooling system with clean water and a heavy duty cooling system cleaner such as FLEETGUARD® RESTORE™ and RESTORE PLU™. Follow manufacturer's directions on label.
11. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run the engine about 10 minutes, remove radiator cap and pull off lower radiator hose, then drain out flushing water.
12. Close all drain valves on engine and radiator. Reinstall radiator hose and tighten clamps securely. Install thermostats using a new gasket.

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug after filling cooling system. Cooling system must be free of air by time engine coolant temperature reaches 80°C (176°F) or damage to EGR cooler may result.

13. Refill cooling system with fresh coolant until coolant touches bottom of filler neck. (See following specification, Figure 26, for cooling system capacity.) Install radiator cap.

6135HF—Capacity..... 18.3 L (19.3 qt)

Figure 26: Cooling System Capacity

14. Run engine until it reaches operating temperature. This mixes the solution uniformly and circulates it through the entire system. The normal engine coolant temperature range is 82°—92°C (180°—197°F).
15. After running engine, check coolant level and entire cooling system for leaks.
16. Inspect fan belt for wear and check belt tension (See Checking Belt Tensioner in Lubrication And Maintenance 500 Hour/12 Months).



There are many more services and maintenance tasks that are discussed in the John Deere manual with greater in-depth detail. Be sure to refer to the John Deere 6135

manual on the Alpha Seismic website or click the following link:

[http://www.alphaseismiccompressors.com/wp-content/uploads/2010/10/ASC 425-D John Deere 6135 Operators Manual.pdf](http://www.alphaseismiccompressors.com/wp-content/uploads/2010/10/ASC_425-D_John_Deere_6135_Operators_Manual.pdf)

F.8 Changing Compressor Lubricating Oil and Filter

The compressor lubricating oil should be drained whilst the machine is very warm after running.

1. Obtain a suitable receptacle and remove the drain plug and joint from the base of the oil tank and drain the oil from the tank.
2. Remove the drain plug, filter and joint from the compressor crankcase and drain the oil from the crankcase. This will only be a small quantity.
3. Refit the two drain plugs and fill the tank with flushing oil.
4. Run the machine briefly and then drain out the flushing oil and thoroughly clean the filter. When the crankcase drain plug and joint are removed, also remove the filter and thoroughly clean it.
5. Unscrew the oil filter; fit a new oil filter to the oil pump body.
6. Fit the drain plug and filter to the compressor crankcase and drain plug to the oil tank.
7. Fill the oil tank with new oil to the correct level and fit the tank filler cap/dipstick.

F.9 Changing Compressor Air Inlet Filters

To clean and lubricate the air filter element:

1. Remove the round-headed screws at the air intake end and withdraw the element.
2. Wash the element in a suitable solvent and allow draining.
3. Immerse the element in lubricating oil and again, allow draining.
4. Refit the element and secure with screw.

F.10 Removal of Oil Pump

1. Remove plug to drain oil from tank.
2. Remove oil delivery and return pipes from pump and oil tank.
3. Remove bolts and washers and withdraw pump together with joint.

F.11 Assembly of Oil Pump

1. Locate joint on pump flange and fit pump to crankcase ensuring the drive collar engages with drive pin.

2. Fit bolts and spring washers
3. Torque bolts to 3.2 kgf m (23 lbf ft)

G. Data Collection

H. Appendices

Appendix A: Engine Troubleshooting Guide

Symptom	Problem	Solution
Engine Will Not Crank	Weak battery	Replace battery.
	Corroded or loose battery connections	Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.
Hard to Start or Will Not Start	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Slow cranking speed	Check for problem in the charging/starting system.
	Too high viscosity crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Engine Misfiring or Runs Irregularly	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Lack of Engine Power	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Plugged fuel filter	Replace fuel filters.
	Engine overloaded	Reduce engine load.
	Improper crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
	Poor EGR valve (if equipped) wiring harness connection	Check EGR valve wiring harness for good connection (make sure it clicks).
Black or Gray Exhaust Smoke	Engine overloaded	Reduce engine load.
	Engine burning oil	See <u>LUBRICATION SYSTEM TROUBLESHOOTING</u> , later in this section.

Symptom	Problem	Solution
White Exhaust Smoke	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Defective muffler/exhaust piping (causing back-pressure)	Replace muffler or defective piping.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
	Engine compression too low	Determine cause of low compression and repair as required. See your John Deere engine distributor or servicing dealer.
Engine Idles Poorly	Defective thermostat(s) (does not close)	Test thermostats; replace thermostats as required. (See Service as Required section.)
	Coolant entering combustion chamber (failed cylinder head gasket or cracked cylinder head)	Repair or replace as required. See your John Deere engine distributor or servicing dealer.
	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Air leak on suction side of air intake system	Check hose and pipe connections for tightness; repair as required.
	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.

Symptom	Problem	Solution
Excessive Fuel Consumption	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Engine overloaded	Reduce engine load.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Compression too low	Determine cause of low compression and repair as required.
	Leaks in fuel supply system	Locate source of leak and repair as required.
Abnormal Engine Noise	Worn main or connecting rod bearings	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Excessive crankshaft end play	Check crankshaft end play. See your John Deere engine distributor or servicing dealer.
	Loose main bearing caps	Check bearing clearance; replace bearings and bearing cap screws as required. See your John Deere engine distributor or servicing dealer.
	Worn connecting rod bushings and piston pins	Inspect piston pins and bushings. See your John Deere engine distributor or servicing dealer.
	Scored pistons	Inspect pistons. See your John Deere engine distributor or servicing dealer.
	Worn timing gears or excess backlash	Check timing gear backlash. See your John Deere engine distributor or servicing dealer.
	Excessive valve clearance	Check and adjust valve clearance. See your John Deere engine distributor or servicing dealer.

Symptom	Problem	Solution
Abnormal Engine Noise <i>NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.</i> <i>Do not confuse the whine heard during turbocharger run down with noise which indicates a bearing failure. The whine heard during turbocharger run down is normal.</i>	Worn camshaft lobes	Inspect camshaft. See your John Deere engine distributor or servicing dealer.
	Worn rocker arm shaft(s)	Inspect rocker arm shafts. See your John Deere engine distributor or servicing dealer.
	Insufficient engine lubrication	See <u>LUBRICATION SYSTEM TROUBLESHOOTING</u> , later in this section.
	Turbocharger noise	See <u>AIR INTAKE SYSTEM TROUBLESHOOTING</u> , later in this section.

Electrical Troubleshooting

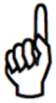
Symptom	Problem	Solution
Undercharged system	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter, or alternator.	Inspect and clean as necessary.
	Defective battery.	Test batteries.
	Defective alternator.	Test charging system.
Battery used too much water	Cracked battery case.	Check for moisture and replace as necessary.
	Battery charging rate too high.	Test charging system.
Batteries will not charge	Loose or corroded connections.	Clean and tighten connections.
	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
Starter will not crank	Stretched belt or defective belt tensioner.	Adjust belt tension or replace belts.
	Engine drivelines engaged.	Disengage engine drivelines.
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output voltage or discharged battery.	Charge or replace batteries.
	Faulty start circuit relay.	See your authorized servicing dealer or engine distributor.
	Blown fuse.	Replace fuse.
		Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.
Starter cranks slowly	Low battery output.	Charge batteries.
	Crankcase oil too heavy.	Use proper viscosity oil.
	Loose or corroded connections.	Clean and tighten loose connections.
Symptom	Problem	Solution
Starter and hour meter functions; rest of electrical system does not function	Blown fuse on magnetic switch.	Replace fuse.
Entire electrical system does not function	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries.	Replace batteries.
	Blown fuse.	Replace fuse.

Lubrication System Troubleshooting

Symptom	Problem	Solution
Low Oil Pressure	Low crankcase oil level	Fill crankcase to proper oil level.
	Crankcase oil level too high	Fill crankcase to proper oil level.
	Faulty pressure sensor	Replace sensor. See your John Deere engine distributor or servicing dealer.
	Clogged oil cooler or filter	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Excessive oil temperature	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Defective oil pump	Remove and inspect oil pump. See your John Deere engine distributor or servicing dealer.
	Incorrect oil	Drain crankcase and refill with correct oil.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Broken piston spray nozzle	Replace piston spray nozzle. See your John Deere engine distributor or servicing dealer.
	Clogged oil pump screen or cracked pick-up tube	Remove oil pan and clean screen/replace pick-up tube.
High Oil Pressure	Excessive main or connecting rod bearing clearance	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Improper oil classification	Drain crankcase and refill with correct oil.
	Faulty pressure sensor	Replace sensor. See your John Deere engine distributor or servicing dealer.
	Oil pressure regulating valve bushing loose (wanders)	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Improperly operating regulating valve	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.

Symptom	Problem	Solution
Excessive Oil Consumption	Plugged piston spray nozzle	Replace piston spray nozzle. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged filter bypass valve	Remove and inspect filter bypass valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged oil cooler bypass valve	Remove and inspect oil cooler bypass valve. See your John Deere engine distributor or servicing dealer.
	Too low viscosity crankcase oil	Drain crankcase and refill with correct viscosity oil.
	Crankcase oil level too high	Drain oil until oil level is correct.
	External oil leak(s)	Determine source of oil leak(s) and repair as required.
	Oil control rings not seated	See your John Deere engine distributor or servicing dealer.
	Oil control rings worn or broken	Replace piston rings. See your John Deere engine distributor or servicing dealer.
	Scored cylinder liners or pistons	Remove and inspect cylinders and liners; replace as required. See your John Deere engine distributor or servicing dealer.
	Worn valve guides or stems	Inspect and measure valve stems and valve guides; repair as required. See your John Deere engine distributor or servicing dealer.
	Excessive oil pressure	See High Oil Pressure above.
	Piston ring grooves excessively worn	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston rings sticking in ring grooves	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Insufficient piston ring tension	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston ring gaps not staggered	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.

Symptom	Problem	Solution
	Front and/or rear crankshaft oil seal faulty	Replace oil seals. See your John Deere engine distributor or servicing dealer. See LOW PRESSURE FUEL SYSTEM TROUBLESHOOTING later in this section.
Fuel in Oil		See LOW PRESSURE FUEL SYSTEM TROUBLESHOOTING later in this section.
Coolant in Oil		See COOLING SYSTEM TROUBLESHOOTING later in this section.

**Note**

Electrical System Layout and drawings can be found in the John Deere manual in [sections 55-24 through 55-25](#). Listing of Diagnostic Panel Trouble Codes (DTCs) can be found on pages 115- 119, sections 55-2 through 55-9.

Cooling System Troubleshooting

Symptom	Problem	Solution
Engine Overheats	Lack of coolant in cooling system	Fill cooling system to proper level.
	Radiator core and/or side screens dirty	Clean radiator as required.
	Engine overloaded	Reduce engine load.
	Too low crankcase oil level	Fill crankcase to proper oil level.
	Loose or defective fan belt	Replace fan belt as required. Check belt tensioner. (See Lubrication and Maintenance 500 Hour/12 Month section.)
	Defective thermostat(s)	Test thermostat opening temperature; replace thermostats as required. (See Lubrication and Maintenance 2000 Hour/24 Month section.)
	Damaged cylinder head gasket	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Defective coolant pump	Replace coolant pump. See your John Deere engine distributor or servicing dealer.
	Defective radiator cap	Replace radiator cap as required.
Coolant in Crankcase	Cylinder head gasket defective	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Cylinder head or block cracked	Locate crack, repair/replace components as required.
	Cylinder liner seals leaking	Remove and inspect cylinder liners. See your John Deere engine distributor or servicing dealer.
	Leaking oil cooler	Pressure test oil cooler; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Defective oil cooler O-rings	Remove and inspect oil cooler O-rings; replace as required. See your John Deere engine distributor or servicing dealer.
	Faulty coolant pump seal; weep hole plugged; coolant leaking through bearing	Replace coolant pump seals. See your John Deere engine distributor or servicing dealer.
Symptom	Problem	Solution
	Faulty injector sleeve O-ring and EUI O-rings faulty	Remove suspected EUI; replace O-rings as required. See your John Deere engine distributor or servicing dealer.
Coolant Temperature Below Normal	Defective thermostat(s)	Test thermostats; replace thermostats as required. (See Service as Required section.)

Air Intake and Exhaust System Troubleshooting

If turbocharger requires replacement, determine what caused the failure of the defective unit, and correct the

condition. This will prevent an immediate repeat failure of the replacement unit.

Symptom	Problem	Solution
Hard to Start or Will Not Start		See ENGINE TROUBLESHOOTING earlier in this section.
Engine Misfiring or Runs Irregularly		See ENGINE TROUBLESHOOTING earlier in this section.
Black or Grey Exhaust Smoke		See ENGINE TROUBLESHOOTING earlier in this section.
Lack of Engine Power		See ENGINE TROUBLESHOOTING earlier in this section.
Turbocharger "Screams"	Air leak in intake manifold.	Check intake manifold gasket and manifold; repair as required. See your John Deere engine distributor or servicing dealer.
Turbocharger Noise or Vibration <i>NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.</i> <i>Do not confuse the whine heard during run down with noise which indicates a bearing failure.</i>	Bearings not lubricated (insufficient oil pressure)	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
	Air leak in engine intake or exhaust manifold	Check intake and exhaust manifold gaskets and manifolds; repair as required. See your John Deere engine distributor or servicing dealer.
	Improper clearance between turbine wheel and turbine housing	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Broken blades (or other wheel failures)	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
Oil on Turbocharger Compressor Wheel or in Compressor Housing (Oil Being Pushed or Pulled through Center Housing)	Excessive crankcase pressure.	Determine cause of excessive crankcase pressure; repair as required. See your John Deere engine distributor or servicing dealer.
	Air intake restriction	Determine cause of intake restriction; repair as required. See your John Deere engine distributor or servicing dealer.

Symptom	Problem	Solution
Oil in Intake Manifold or Dripping from Turbocharger Housing	Drain tube restriction	Determine cause of drain tube restriction; repair as required. See your John Deere engine distributor or servicing dealer.
	Excessive crankcase pressure	Determine cause of excessive crankcase pressure; repair as required. See your John Deere engine distributor or servicing dealer.
	Air intake restriction	Determine cause of intake restriction; repair as required. See your John Deere engine distributor or servicing dealer.
	Drain tube restriction	Determine cause of drain tube restriction; repair as required. See your John Deere engine distributor or servicing dealer.
	Damaged or worn housing bearings	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Unbalance of rotating assembly	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Damage to turbine or compressor wheel or blade	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Dirt or carbon build-up on wheel or blade	Check for air intake leaks (post air filter). Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Bearing wear	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Oil starvation or insufficient lubrication	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
Turbocharger Turbine Wheel Drag	Shaft seals worn	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Carbon build-up behind turbine wheel caused by coked oil or combustion deposits	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
Symptom	Problem	Solution
	Dirt build-up behind compressor wheel caused by air intake leaks	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Bearing seizure or dirty, worn bearings	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

Low Pressure Fuel System Troubleshooting

Symptom	Problem	Solution
Fuel in Oil	Cracked or worn electronic unit injector (EUI) O-ring	Remove suspected EUI; replace EUI O-ring as required. See your John Deere engine distributor or servicing dealer.
	Cracked cylinder head	Locate crack; repair/replace components as required. See your John Deere engine distributor or servicing dealer.
Fuel Aeration	EUI hold-down clamp loose	Tighten hold-down clamp cap screw to proper torque. See your John Deere engine distributor or servicing dealer.
	Cracked or worn electronic unit injector (EUI) O-ring	Remove suspected EUI; replace EUI O-ring as required. See your John Deere engine distributor or servicing dealer.
Fuel Pressure Low	Plugged fuel filter	Replace fuel filter.
	Restricted fuel line	Locate restriction; repair as required.
	Faulty fuel transfer pump	Remove fuel transfer pump; repair/replace pump as required. See your John Deere engine distributor or servicing dealer.

Appendix B: Compressor Troubleshooting Guide

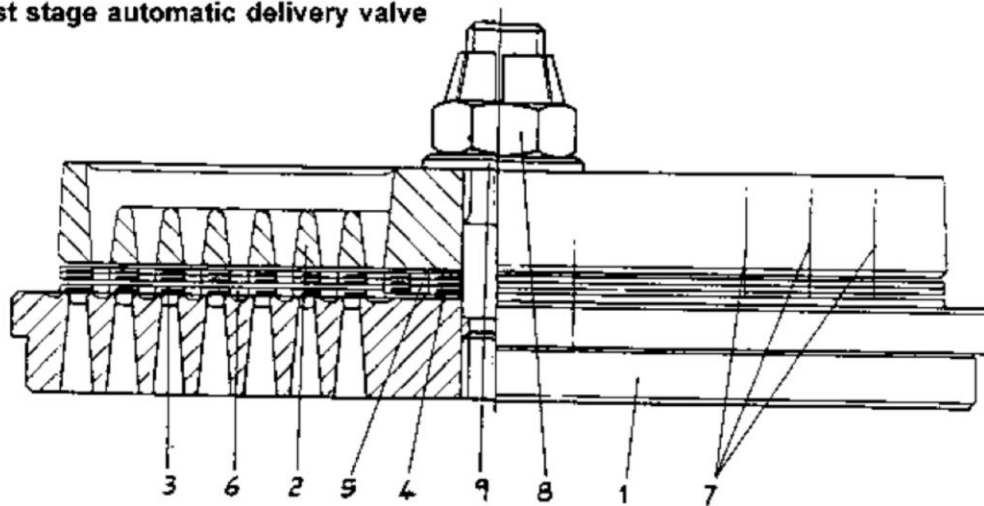
FAULT	CAUSE	REMEDY
FINAL STAGE RELIEF SAFETY VALVE BLOWING	Manifold, bottle or facility supply valves closed	Open required valve
	Reservoir system full	Stop compressor
	Relief safety valve faulty	Inspect valve
	Delivery hose squashed or kinked	Ensure hose has not sharp bends and is not flattened
OTHER THAN FINAL STAGE SAFETY RELIEF VALVE BLOWING	Next stage suction or delivery valves damaged or dirty	Remove valves, strip, clean and inspect, renewing damaged parts as necessary
	Relief safety valve faulty	Inspect valve
	Cooler tubes damaged or dirty	Clean, inspect and renew damaged parts
	'O' rings adjacent to valves not sealing	Clean seatings and renew 'O' rings
COMPRESSOR WILL NOT OPERATE AT FULL PRESSURE OR AT FULL CAPACITY	Suction filter dirty	Clean or renew element
	Compressor overheating	Check cooling water flow. Water circulating pump drive pin broken. Air in cooling system.
	Belt slipping	Re-tension belt
	Valves damaged or dirty (reduced capacity indicates trouble with 1st stage valve)	Remove, strip clean and inspect, renewing damaged components
	System leak	Renew parts, joints and seals as necessary
	Leaking piston rings	Ensure that rings are free in grooves. Renew worn or distorted rings
	Excessive wear to cylinders/rings	Renew as necessary

FAULT	CAUSE	REMEDY
VALVES REQUIRE CLEANING TOO OFTEN	Overheating	Keep valves, piston rings in good order and cooling surfaces of cylinders and coolers clear of dirt deposits
	Excessive moisture in air passages	Insufficient use of drains
	Dirt drawn into compressor	Perform routine maintenance on air filter
	Excessive oil carry over from 1st stage piston	Ensure that oil control piston ring at base of 1st stage piston not worn or slack in its groove and that oil holes in the groove are not blocked. Renew parts as necessary
KNOCK IN THE MOTION WORK	Loose connecting rod cap or excessive clearance in small or big end bearings	Tighten fasteners or renew the bearing concerned
LOW OIL PRESSURE	Insufficient oil in reservoir	Check oil level, top up with correct grade of oil if necessary (see recommended lubricants)
	Oil pump dowel broken	Replace drive pin
	Oil pump requires overhaul	Overhaul pump
	Bearing clearances excessive	Renew bearing(s)

Appendix C: First Stage Valve Servicing

Item No.	Description	Qty.
1	Guard	1
2	Seat assembly	1
3	Valve plate	1
4	Upper lift washer	1
5	Lower lift washer	1
6	Damper plate	2
7	Closing spring	8
8	Nut	1
9	Washer	1

First stage automatic delivery valve



Servicing Automatic Delivery Valve

Dismantling Delivery Valves

Note: A valve must not be held directly between the jaws of a vice. A hammer must not be used when loosening or tightening the valve nut (8).

1. Remove the valve from the cylinder as detailed in the appropriate cylinder maintenance instructions.
2. Unscrew and remove the nut (8), the washer (9) and seat assembly (2).
3. Withdraw the valve plate (3), lower the lift washer(5) the two damper plates (6), the eight closing springs (7) and the upper lift washer (4) from the guard (1).
4. Clean all components thoroughly. Remove grease and carbon deposits with a soft brush using hot water and a soda solution. Care must be taken during the cleaning operation as any scratch may cause leakage and ultimately a breakage.

Assembling Delivery Valves

1. Each component should be inspected and any items which appear to be defective, worn or damaged must be renewed.

The valve ring and valve seats on the seat assembly (2) and guard (1) can be lightly "lapped" by means of a fine carborundum paste. Before re-assembly clean all components and ensure that all traces of grinding paste have been removed.

Note: The preferred method of this operation is to lightly "lap" the valve ring and valve seat to a surface plate. It should be ensured that when this operation is complete, the surfaces are "flat" when in an un-stressed condition.

2. Assemble the valve components on the guard assembly and seat assembly in the reverse order to their removal, and ensure that the components are correctly located on the locating pins.
3. Fit a new self-locking nut (9) and tighten the nut to 7.6 kgf m (55 lbf ft).
4. Check that the valve can function correctly and that plate movement exists. Extreme care must be taken to ensure that the valve is not scraped or damaged during this operation.
5. Install the valve as detailed in the cylinder maintenance instructions.

Note: Irrespective of hours running time, when a valve is disturbed for any reason, the O-rings must be discarded and new O-rings fitted having checked that the grooves and sealing surfaces are clean and in good condition.

Appendix D: Second Stage Valve Servicing

Servicing Automatic Concentric Valve

Note: A valve assembly must not be held directly between vice jaws. Never hammer a spanner when loosening or tightening the valve nut (10).

Dismantling

1. Remove the valve from the cylinder as detailed under the appropriate cylinder maintenance instructions.
2. Unscrew and remove nut (10).

When dismantling valve as in 3 below, take particular note of the method and order of removal of each component to facilitate reassembly. Reference must always be made to the illustration of the valve being assembled to ensure that the components are rebuilt in their correct order.

3. Withdraw the upper body (1), three spring plates (8), valve plate (6), middle lift washer (5), valve plate (3), lower lift washer (4), spring plate (7) and damper plate (9) from the lower body assembly (2) and centre stud.
4. Clean all components thoroughly. Remove grease and carbon deposits with a soft brush using a hot water and soda solution. Care must be taken during the cleaning operation as any surface scratch may cause leakage and ultimately a breakage.
5. Each component should be inspected and any items which appear defective, worn or damaged must be renewed.
6. The valve ring and valve seats on the lower body and upper body can be lightly "lapped" by means of a fine carborundum paste. Before re-assembly clean all components and ensure that all traces of grinding paste have been removed.

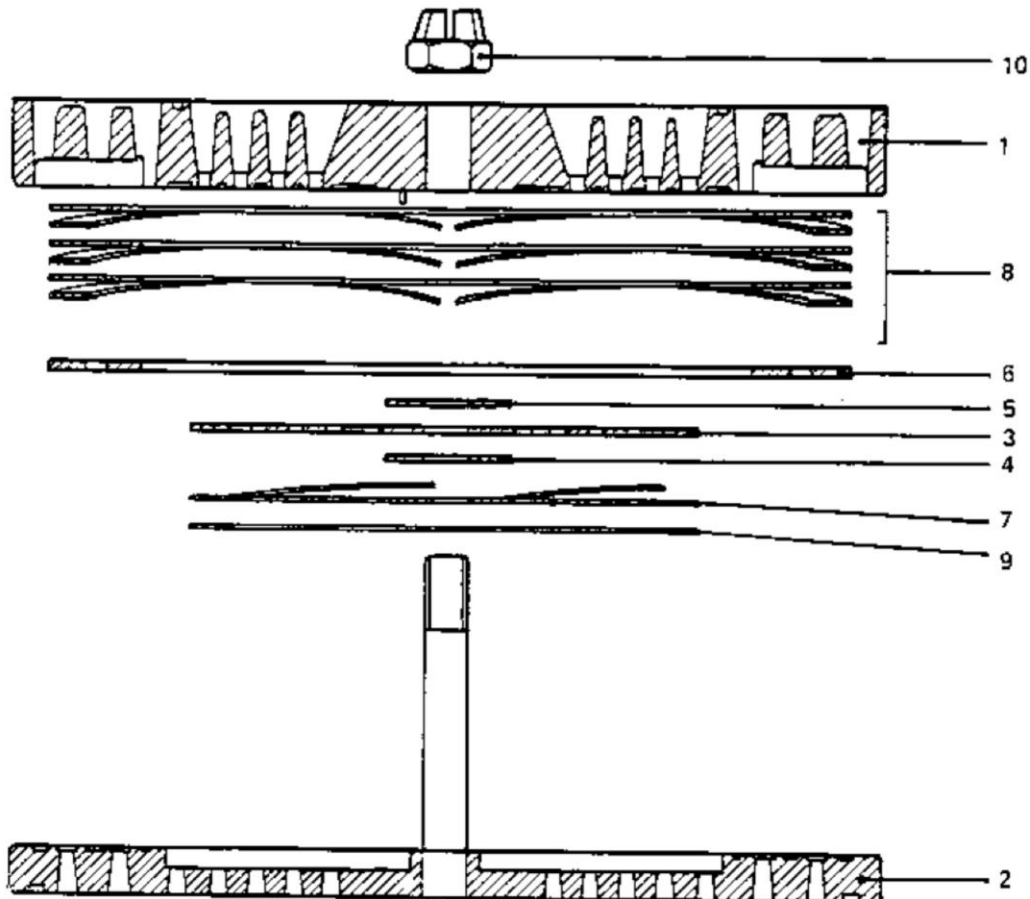
Assembly

1. Assemble the valve components on the lower body assembly and centre stud in the reverse order to their removal and ensure that the components are correctly positioned on the locating pins.
2. Fit the upper body assembly (1) in position and fit nut (10) and torque to 4 kgf m (28.9 lbf ft.)
3. Check that the valve can function correctly and that plate movement exists. Extreme care must be taken to ensure that the valve is not scraped or damaged in this operation. The automatic valve is now ready for fitting to the machine.
4. Install the valve as detailed in the cylinder maintenance paragraph.

Note: Irrespective of hours running time, when a valve is disturbed for any reason, the O-rings must be discarded and new O-rings fitted, having checked that the grooves and sealing surfaces are clean and in good condition.

Item No.	Description	Qty.
1	Upper body assembly	1
2	Lower body assembly	1
3	Valve plate	1
4	Valve plate lower lift washer	1
5	Spring plate middle lift washer	1
6	Valve plate	1
7	Spring plate	1
8	Spring plate	3
9	Damper plate	1
10	Nut	1

Concentric Automatic Valve



Removal of Automatic Valve

1. Remove bolts (187) and nuts (188) to disconnect transfer pipe (185).
2. Remove bolts (146), spring washers (147) and withdraw valve cage (140) from the cylinder. Take care not to damage the joint (186).
3. Withdraw the valve assembly (135).
4. Remove O-rings (138, 139 and 142).

Refer to separate sheet for servicing automatic valve.

Removal of Cylinders, Pistons and Cylinder Liner

1. Remove bolts (182) and washers (183) to free transfer flange (180).
2. Slacken hose clamps (1063) on hose adaptor (1061) and remove hose to drain cylinder.
3. Slacken hose clamp (1028) and remove hose.
4. With lifting gear take weight of the cylinder using an eyebolt (156) provided.
5. Remove nuts (154), spring washers (155) and withdraw cylinder (125) from crankcase and piston.

Note: Care must always be taken not to damage piston and rings.

6. Remove bolts (133) and washers (134) and withdraw piston (128).
7. The liner (126) is a sliding fit in the cylinder and can be pushed out by hand.
8. Record position and direction of piston rings on piston. Remove piston rings.

Inspection

Thoroughly clean all dismantled parts and examine for damage, wear, corrosion, cracks or distortion and replace as necessary.

Joints, gaskets and O-ring seals should be examined and replaced as necessary.

It is important when replacing joints that the correct thickness and type are used to maintain correct assembly clearances.

Assembly of Piston, Cylinder Liner and Cylinder

1. Attach piston (128) to yoke (28) and secure with bolts (133) and washers (134).

Torque bolts to 3.2 kgf m (23 lbf ft).
2. Insert piston rings in bore of cylinder liner (126) and check that the ring gaps are within the tolerances shown on the Technical Data sheet.
3. Remove piston rings from liner and assemble in piston grooves.

Oil control ring (129)
Taper face rings (130)

4. The gaps for adjacent rings are to be fitted 180° apart.

If the original rings are being refitted, they must be in the same position and direction as before dismantling.
5. Lightly lubricate O-rings (127) and fit on liner. Push liner into cylinder bore.
6. Turn crankshaft until piston is at maximum protrusion from crankcase.
7. Lightly lubricate O-ring (145) and fit on cylinder spigot.
8. Lightly lubricate liner chamfer and bore.
9. Take weight of cylinder and liner with lifting gear and fit into position over piston taking care not to damage piston rings. (A gentle rocking movement of the cylinder will help ease the piston rings into the liner bore.)
10. Fit spring washers (155) and nuts (154) but do not tighten. Fit joint (181) between transfer flange and cylinder. Check that mating faces of transfer flange and cylinder are flush. Fit spring washers (183) and bolts (182).

Torque nuts (154) to 26.2 kgf m (190 lbf ft)
Torque bolts (182) to 3.2 kgf m (23 lbf ft).
11. Fit hose (1062) and secure with hose clamp.
12. Fit hose (1027) and secure with hose clamp (1028).

Fitting Automatic Valve Assembly

1. Lightly lubricate O-ring (142) and fit on the valve cage (140).
2. Fit O-rings (138 and 139) to automatic valve (135) and locate automatic valve in valve cage.
3. Position valve cage assembly in cylinder and fit bolts (146) and spring washers (147) but do not tighten. Fit joint (186) between valve cage and transfer pipe. Check that mating faces of valve cage and transfer pipe are flush. Fit the bolts (187), spring washers (189) and nuts (188).

Torque bolts (146) to 13.6 kgf m (98 lbf ft)
Torque bolts (187) to 3.2 kgf m (23 lbf ft)

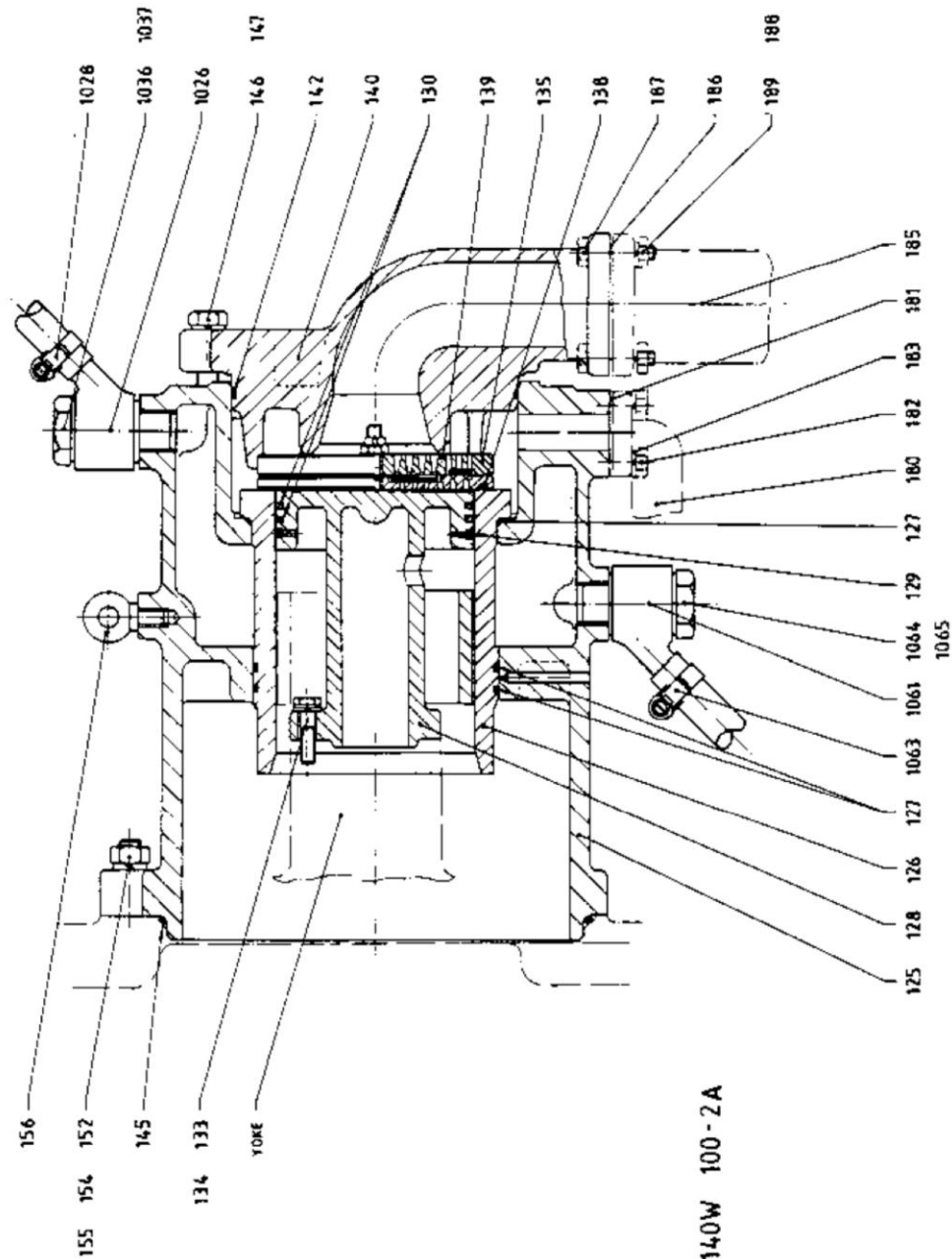


Fig. 140W 100-2A

Fig. 140W 100-2A

Appendix E: Third Stage Valve Servicing

Servicing Automatic Concentric Valve

NOTE: *A valve assembly must not be held directly between vice jaws. Never hammer a spanner when loosening or tightening the valve nut (7).*

Dismantling

1. Remove the valve from the cylinder as detailed under the appropriate cylinder maintenance instructions.
2. Unscrew and remove nut (7).

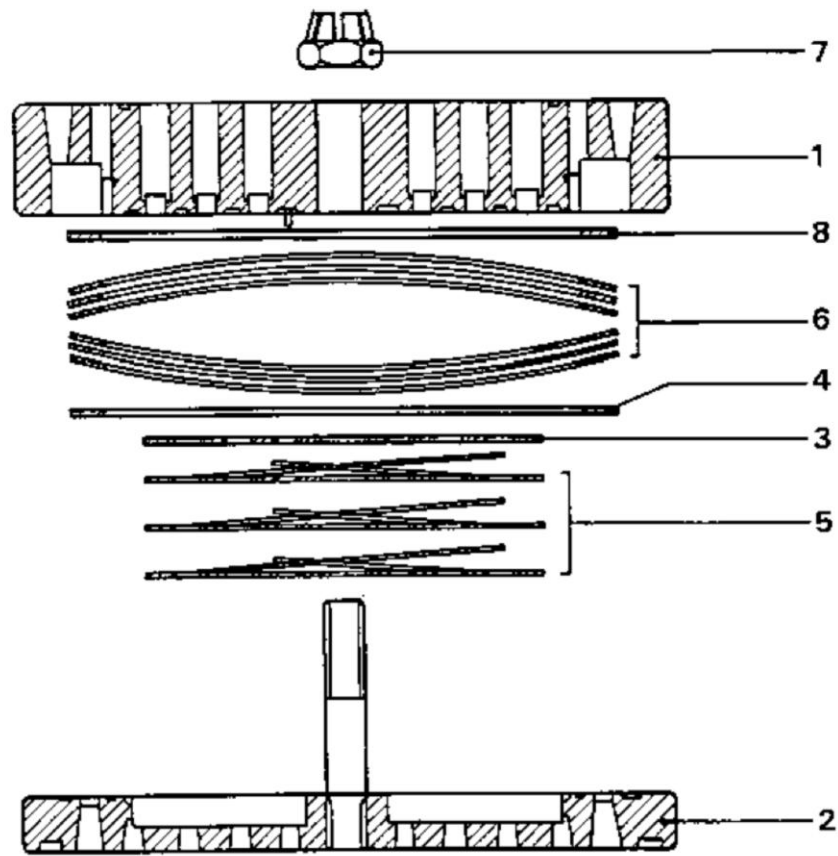
NOTE: *When dismantling the valve take particular note of the method and order of each valve component to facilitate re-assembly. Reference must always be made to the illustrations of the valve being assembled to ensure that the components are rebuilt in their correct order.*

3. Withdraw the upper body (1), backing ring (8), six spring rings (6), valve ring (4), valve plate (3) and three spring plates (5) from lower body assembly (2) and centre stud.
4. Clean all components thoroughly. Remove grease and carbon deposits with a soft brush and a hot water and soda solution. Care must be taken during the cleaning operation as any surface scratch may cause leakage and ultimately a breakage.
5. Each component should be inspected and any item which appear defective, worn or damaged must be renewed.
6. The valve ring and valve seats on the lower body can be lightly "lapped" by means of a fine carborundum paste. Before re-assembly clean all components and ensure that all traces of grinding paste have been removed.

Assembly

1. Assemble the valve components on the lower body assembly and centre stud in the reverse order to their removal and ensure that the components are correctly positioned on their locating pins.
2. Fit the upper body assembly (1) in position and fit nut (7) and torque to 1.1 kgf m.
3. Check that the valve can function correctly and that plate movement exists. Extreme care must be taken that the valve is not scraped or damaged in this operation. The automatic valve is now ready for fitting to the machine.
4. Install the valve as detailed in the cylinder maintenance paragraph.

NOTE: *Irrespective of hours running time, when a valve is disturbed for any reason, the O-rings must be discarded and new O-rings fitted, having checked that the grooves and sealing surfaces are clean and in good condition.*

**Automatic Concentric Valve**

Item No.	Description	Qty.
1	Upper Body Assembly	1
2	Lower Body Assembly	1
3	Valve Plate	1
4	Valve Ring	1
5	Spring Plate	3
6	Spring Ring	6
7	Nut	1
8	Backing Ring	1

Removal of Automatic Valve

1. Unscrew bolts (247) and spring washers (249) to release transfer elbow (669).
2. Remove bolts (221) and washers (222) and withdraw valve cage (207) together with O-ring (209).
3. Automatic valve assembly can now be removed.
4. Remove O-rings (203 and 205) from valve.

Refer to separate sheet for servicing automatic valve.

Removal of Cylinder, Piston and Cylinder Liner

1. Remove bolts (242) and spring washers (243) to release cooler inlet cover (240).
2. Drain cylinder by unscrewing hoseclamps (1028 and 1063) and disconnecting hoses.
3. Remove nuts (218) and washers (219).
4. With lifting gear, take weight of the cylinder using eyebolt (220).
5. Remove cylinder (190) from crankcase and piston (193), taking care not to damage piston and rings (194 and 195). Remove O-ring (210).
6. Record position and direction of rings on piston and remove rings.
7. Remove bolts (197) and spring washers (198). Withdraw piston from yoke (29).
8. Push cylinder liner (191) from cylinder by hand and remove O-rings (192).

Assembly of Piston, Cylinder Liner and Cylinder

1. Attach piston (193) to yoke (29) and secure with bolts (197) and spring washers (198). Torque bolts to 3.2 kgf m (23 lbf ft).
2. Assemble piston rings (194 and 195) in bore of liner (191) and check that ring gaps are within the tolerances shown on the Technical Data sheet.
3. Withdraw piston rings from liner and assemble in the piston grooves.

Oil control ring (194), Plain faced rings (195)

The ring gaps for adjacent rings must be fitted 180° apart.

(If original rings are being refitted, they must be fitted in the same direction and position as before dismantling).
4. Lightly lubricate O-ring (192) and fit on liner. Push liner by hand into cylinder bore.

5. Lightly lubricate liner bore and chamfer at crankshaft end. Lubricate O-ring (210) and fit on cylinder spigot.
6. Turn crankcase until piston protrusion from crankcase is maximum.
7. Take weight of cylinder with lifting gear and fit in position over piston and rings. (A gentle rocking movement of the cylinder will help ease the piston rings into the liner bore).
8. Fit washers (219) and nuts (218) but do not tighten. Locate joint (241) between cylinder and cooler inlet cover (240). Check that mating faces of cylinder and inlet are flush. Fit bolts (242) and spring washers (243).
9. Torque nuts (218) to 26.2 kgf m (190 lbf ft).
Torque bolts (242) to 5.4 kgf m (39 lbf ft).
10. Place hoseclamp (1028) over hose and fit hose to hose adaptor. Tighten hoseclamp.
11. Place hoseclamp (1063) over hose and fit hose to hose adaptor. Tighten hoseclamp.

Fitting Automatic Valve Assembly

1. Lightly lubricate O-ring (209) and fit on valve cage (207).
2. Locate O-rings (203) and (205) in valve assembly grooves and fit valve assembly in valve cage.
3. Fit joint (246) to transfer elbow (669).
4. Position valve cage and valve assembly in cylinder and secure with washers (222) and screws (221). Do not tighten.
5. Secure transfer elbow (669) in position with bolts (247), nuts (248) and spring washers (249). Do not tighten.

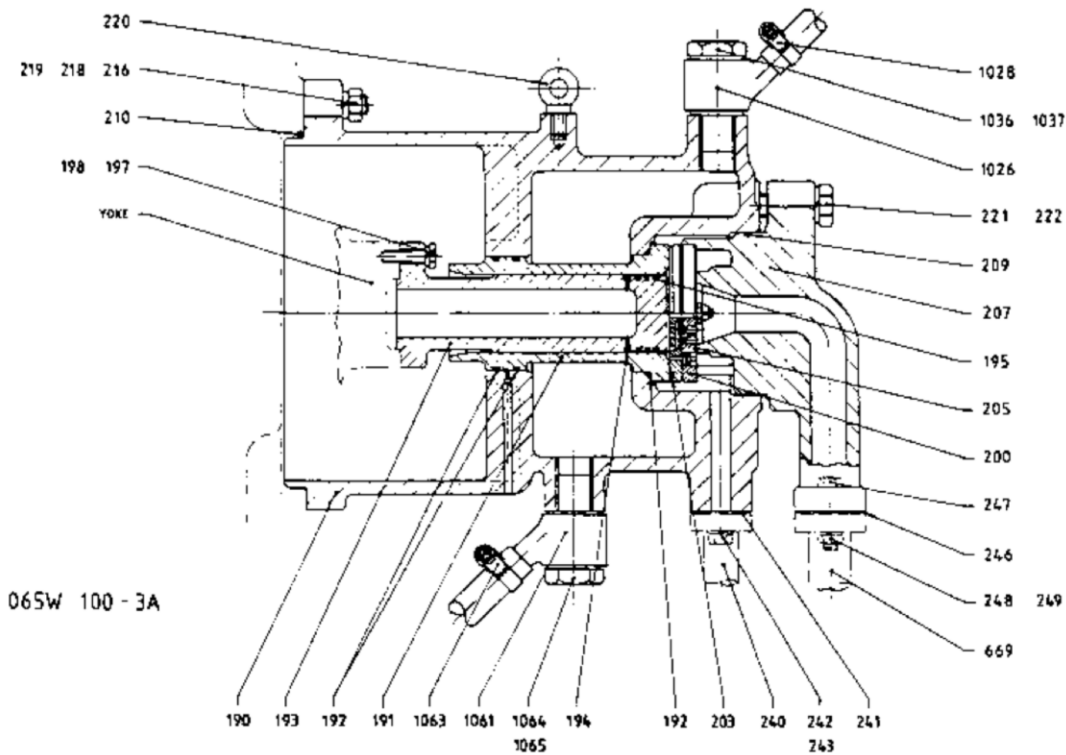
Check that mating faces of valve cage and transfer tube are flush.

Torque bolts (221) to 26.2 kgf m (190 lbf ft).

Torque bolts (247) to 3.2 kgf m (23 lbf ft).

LIST OF PARTS - Fig. 065W 100-3A

Item No.	Description	Qty.	Item No.	Description	Qty.
190	Cylinder	1	222	Washer	4
191	Liner	1	240	Inlet Cover	1
192	O-ring	3	241	Joint	1
193	Piston	1	242	Bolt	2
194	Piston Ring		243	Spring Washer	2
	S.O.C.	1	246	Joint	1
195	Piston Ring		247	Bolt	4
	Taper Faced	3	248	Nut	4
197	Bolt	4	249	Spring Washer	4
198	Washer	4	669	Transfer Elbow	1
200	Valve	1	1026	Adaptor	1
203	O-ring	1	1028	Hoseclamp	1
205	O-ring	1	1036	Banjo Bolt	1
207	Valve Cage	1	1037	Joint	1
209	O-ring	1	1061	Adaptor	1
210	O-ring	1	1063	Hoseclamp	1
216	Stud	4	1064	Banjo Bolt	1
218	Nut	4	1065	Joint	2
220	Eyebolt	1			
221	Bolt	4			



Appendix F: Fourth Stage Valve Servicing

NOTE: *A valve assembly must not be held directly between vice jaws. Never hammer a spanner when loosening or tightening the valve nut (10).*

Dismantling

1. Remove the valve from the cylinder as detailed under the appropriate cylinder maintenance instructions.
2. Unscrew and remove nut (10).

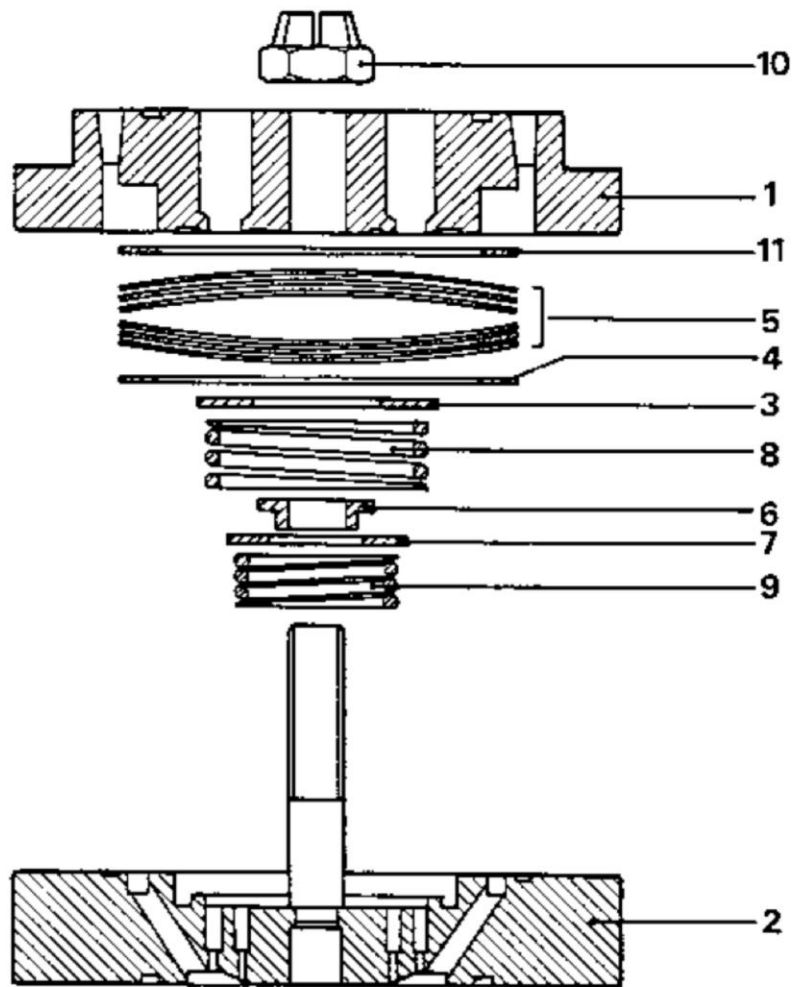
NOTE: *When dismantling the valve take particular note of the method and order of each valve component to facilitate re-assembly. Reference must always be made to the illustration of the valve being assembled to ensure that the components are rebuilt in their correct order.*

3. Withdraw the upper body (1), backing ring (11), six spring rings (5), valve ring (4), valve ring (3), guide ring (7), damper ring (6), closing spring (8) and damping spring (9) from the lower body assembly (2) and centre stud.
4. Clean all components thoroughly. Remove grease and carbon deposits with a soft brush and a hot water and soda solution. Care must be taken during the cleaning operation as any surface scratch may cause leakage and ultimately a breakage.
5. Each component should be inspected and any items which appear defective, worn or damaged must be renewed.
6. The valve ring and valve seats on the lower body can be lightly "lapped" by means of a fine carborundum paste. Before re-assembly clean all components and ensure that all traces of grinding paste have been removed.

Assembly

1. Assemble the valve components on the lower body assembly and centre stud in the reverse order to their removal and ensure that the components are correctly positioned on their locating pins.
2. Fit the upper body assembly (1) in position and fit nut (10) and torque to 2.2 kgf m (15.9 lbf ft).
3. Check that the valve can function correctly and that plate movement exists. Extreme care must be taken to ensure that the valve is not scraped or damaged in this operation. The automatic valve is now ready for fitting to the machine.
4. Install the valve as detailed in the cylinder maintenance paragraph.

NOTE: *Irrespective of hours running time, when a valve is disturbed for any reason, the O-rings must be discarded and new O-rings fitted, having checked that the grooves and sealing surfaces are clean and in good condition.*

**Concentric Automatic Valve**

Item No.	Description	Qty.
1	Upper Body Assembly	1
2	Lower Body Assembly	1
3	Valve Ring	1
4	Valve Ring	1
5	Spring Ring	6
6	Damper Ring	1
7	Guide Ring	1
8	Closing Spring	1
9	Damping Spring	1
10	Nut	1
11	Back Ring	1

Removal of Automatic Valve

1. Remove bolts (312), and spring washers (314) to release adaptor plate (332).
2. Remove bolts (285) and spring washers (286). Withdraw valve cage (271) together with O-ring (273) and anti-extrusion ring (274).
3. Remove automatic valve assembly (265) together with corruseal gasket (268) and O-ring (269), discard corruseal gasket (268).

Refer to separate sheet for servicing automatic valve.

Removal of Cylinder, Piston and Cylinder Liner

1. Remove bolts (307) and spring washers (308) to release transfer pipe (305).
2. Drain cylinder by unscrewing hoseclamps (1028 and 1063) and disconnecting hoses.
3. Remove nuts (281) and spring washers (282).
4. With lifting gear, take weight of cylinder using eyebolt (283).
5. Withdraw cylinder from crankcase and piston taking care not to damage the piston or piston rings. Remove O-ring (275).
6. Record position and direction of fitting of rings on piston and remove rings from piston.
7. Remove bolts (262) and spring washers (263) and withdraw piston from yoke.
8. Push cylinder liner (251) from cylinder by hand and remove O-rings (252).

Inspection

Thoroughly clean all dismantled parts and examine for damage, wear, corrosion, cracks or distortion and replace as necessary.

Assembly of Piston, Cylinder Liner and Cylinder

1. Attach piston (253) to yoke and secure with bolts (262) and spring washers (263). Torque bolts to 3.2 kgf m (23 lbf ft).
2. Assemble rings (255, 256 and 257) in bore of cylinder liner (251) and check that ring gaps are within the tolerances shown on Technical Data sheet.
3. Withdraw rings from liner and assemble in piston grooves. Ring gaps for adjacent rings must be 180° apart.

(If original rings are being refitted, they must be fitted in the same direction and position as before dismantling).

4. Lightly lubricate O-rings (252) and fit on liner. Push liner by hand into cylinder bore.
5. Lightly lubricate liner bore and chamfer at crankshaft end. Lubricate O-ring (275) and fit on cylinder spigot.
6. Turn crankcase until piston protrusion from crankcase is maximum.
7. Fit O-ring (306) to transfer pipe (305).
8. Take weight of cylinder assembly with lifting gear and fit in position over piston and rings. (A gentle rocking movement of the cylinder will help ease the piston rings into the liner bore).
9. Fit spring washers (282) and nuts (281) but do not tighten. Check that coupling faces of cylinder and transfer pipe are flush. Fit bolts (307) and spring washers (308).

Torque nuts (281) to 26.2 kgf m (190 lbf ft).

Torque bolts (307) to 5.4 kgf m (39 lbf ft).

10. Fit hoses (1027) and (1062) and secure with hose clamps (1028 and 1063).

Fitting Automatic Valve Assembly

1. Fit O-ring (311) to adaptor plate (332).
2. Lightly lubricate O-ring (273) and fit on valve cage (271), with anti-extrusion ring (274).
3. Fit new corruseal gasket (268) and O-ring (269) in valve assembly grooves, fit valve assembly in valve cage.
4. Position valve cage and valve assembly in cylinder and secure with washers (286) and bolts (285). Do not tighten.
5. Fit adaptor plate (332) to valve cage with bolts (312) and spring washers (314).
6. Check that mating faces of valve cage and adaptor plate are flush.

Torque bolts (312) to 5.4 kgf m (39 lbf ft).

Torque bolts (285) to 53.8 kgf m (390 lbf ft).

