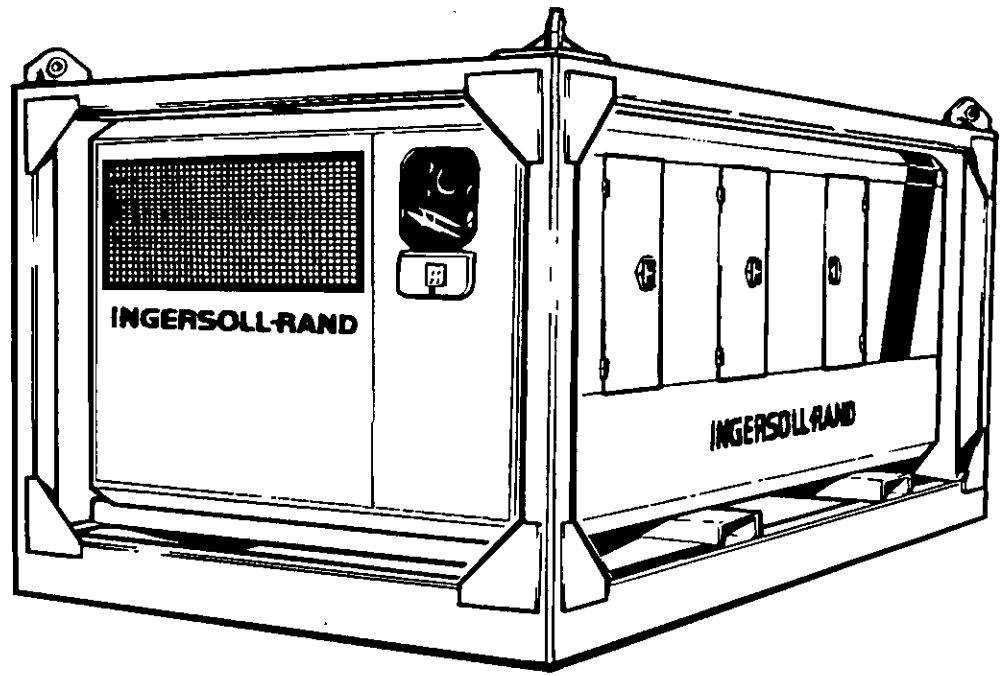
INGERSOLL-RAND

HP400 COMPRESSOR

CATERPILLAR ENGINE

COMPRESSOR CATERPILLAR ENGINE
OPERATION AND MAINTENANCE MANUAL
with parts catalogue



Doosan purchased Bobcat Company from Ingersoll-Rand Company in 2007. Any reference to Ingersoll-Rand Company or use of trademarks, service marks, logos, or other proprietary identifying marks belonging to Ingersoll-Rand Company in this manual is historical or nominative in nature, and is not meant to suggest a current affiliation between Ingersoll-Rand Company and Doosan Company or the products of either.

C.P.N. : 92908482
ISSUE : 1
DATE : December 1991 Revised (09-12)

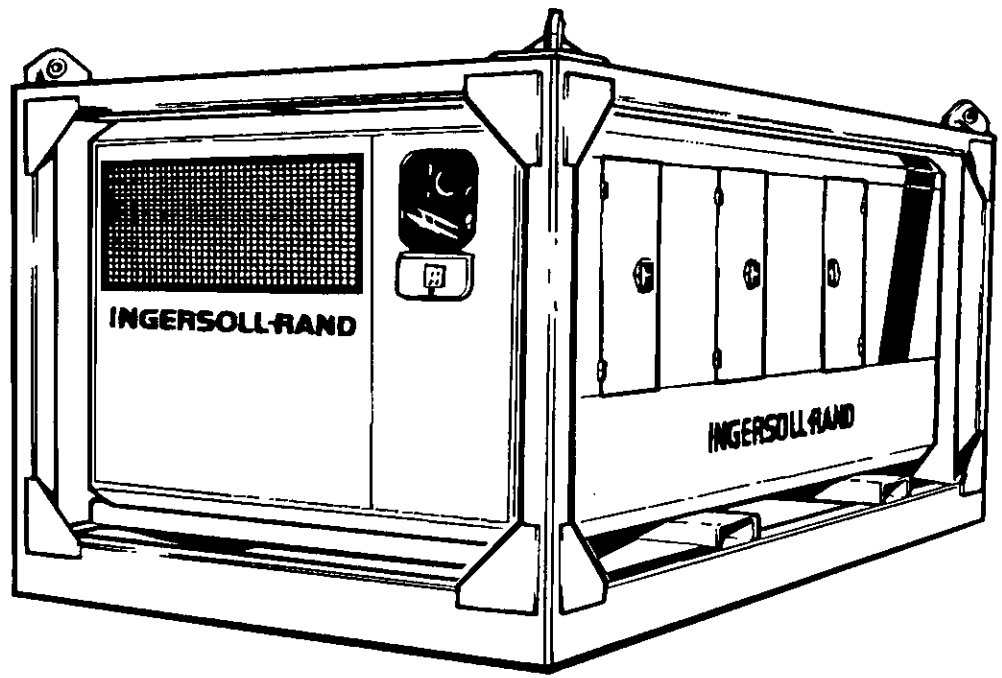
SERIAL NUMBER RANGE 790001 **TO** 790006

INGERSOLL-RAND

HP400 COMPRESSOR

CATERPILLAR ENGINE

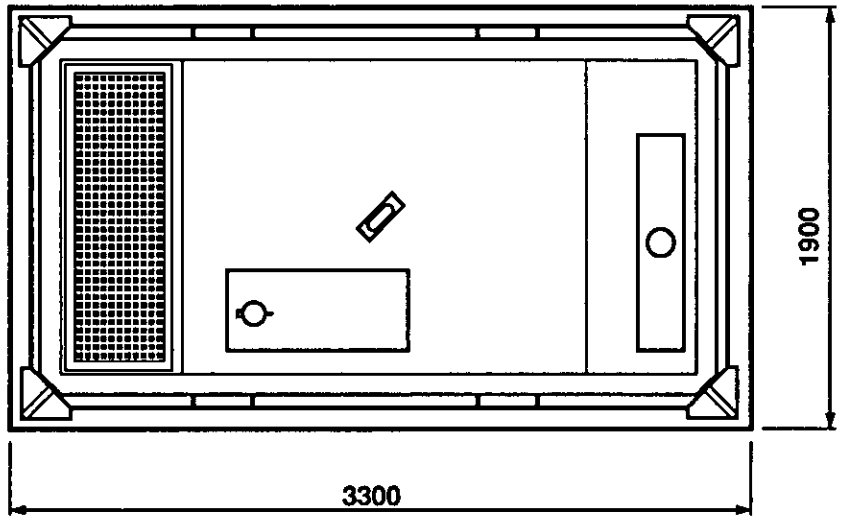
OPERATION AND MAINTENANCE MANUAL

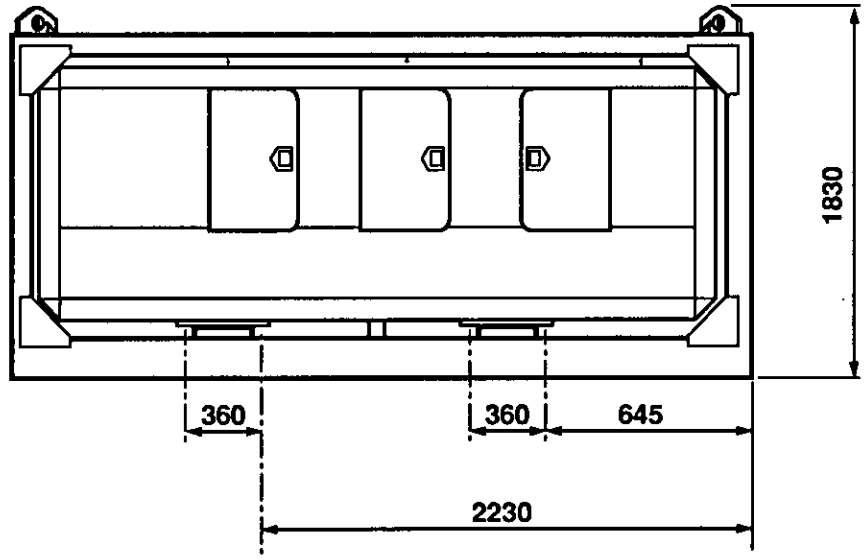


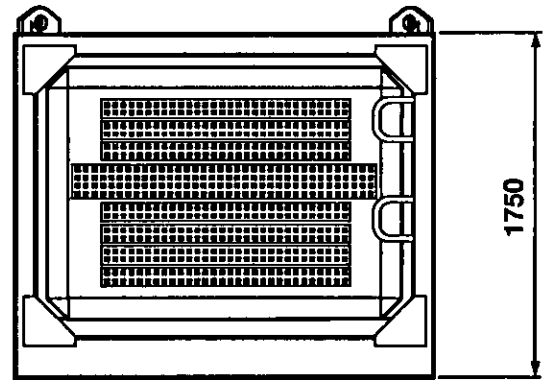
In preparing this publication, every effort has been made to provide sufficient information to permit an operator to perform his duties so as to receive maximum performance and trouble free service from the compressor. All classes of equipment, regardless of how well built, require a certain amount of attention. The purpose of this publication is to acquaint an operator with the functions, operation and servicing of the various components, which were built with the very best of materials and workmanship, to obtain maximum life from the compressor.

Before starting the compressor, the instructions should be carefully read to obtain a thorough knowledge of the duties to be performed. Take pride in the compressor, keep it clean, and in good mechanical condition. For major servicing, not covered in this publication, consult your nearest Ingersoll–Rand Company branch office, or the distributor from whom the compressor was purchased.

Correspondence with a distributor must always specify the serial number of the compressor as well as the model.


1900
3300


1830
360
360
645
2230

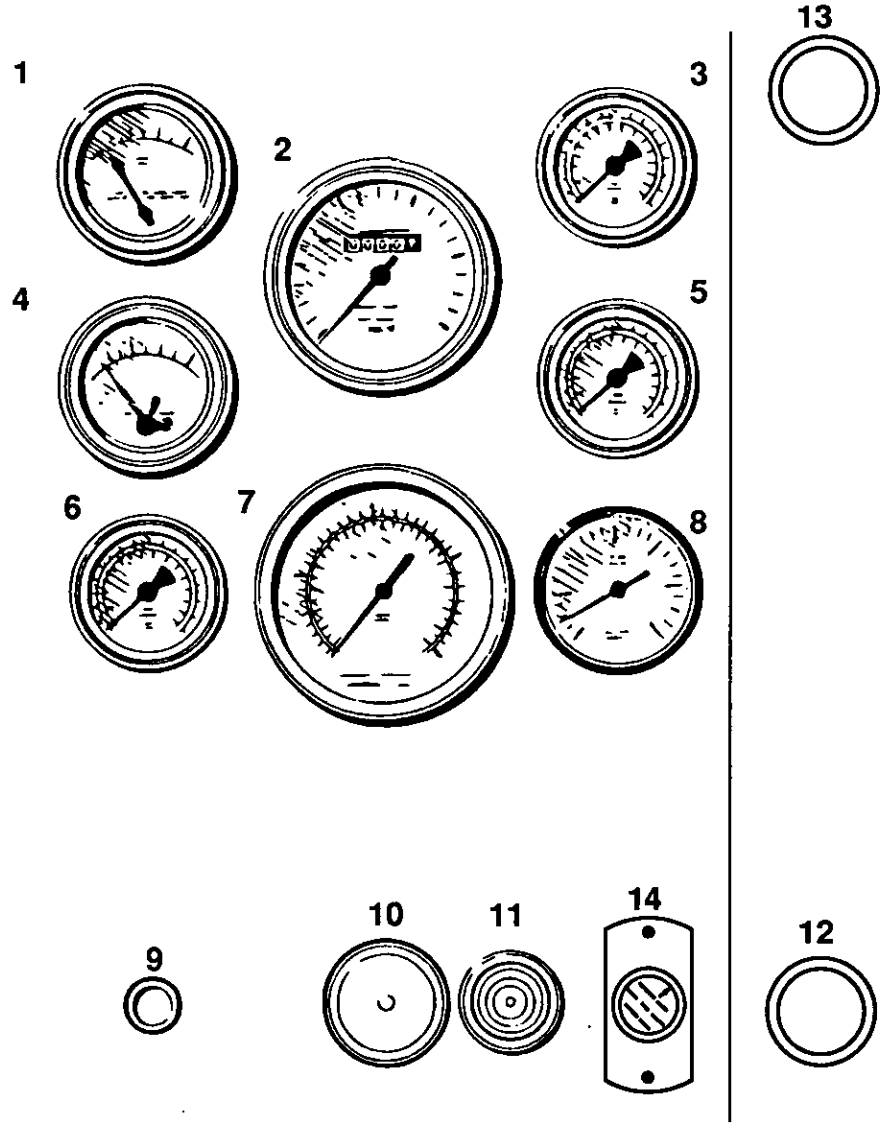

1750

COMPRESSOR

Model	: HP400
Actual Free Air Delivery	: 400 cfm
Normal Operating Pressure	: 150 psig/10.3 bar
Maximum Pressure	: 160 psig/11 bar
Cooling System	: Oil Injection
Lubricant/Coolant Capacity	: 45 litres

ENGINE

Model	: Caterpillar 3116
Number of Cylinders	: 6
Displacement	: 6.6 litres
Compression Ratio	: 15:1
Oil Capacity	: 14 litres
Speed at Full Load	: 2500 rpm
Speed at Idle	: 1200 rpm
Fuel Tank Capacity	: 220 litres
Flame Trap	: 44kg
Cooling System Capacity	: 80 litres
Anti–freeze Capacity	: 40 litres


1
2
3
4
5
6
7
8
9
10
11
12
13
14

1. Engine Water Temperature Gauge.
Maximum temperature 100 deg.C.

2. Engine R.P.M. and Hour Counter.
Measures engine speed and the number of hours the machine has been operating. This gauge should be used to give service intervals

3. Engine Oil Pressure Gauge.
Depending on type of engine and efficiency of engine. This gauge should read approximately 60 p.s.i.

4. Compressor Oil Temperature Gauge.
Maximum temperature 120 deg.C.

5. Air Start Pressure Gauge.
Measures air pressure in air start system. At 130 lb.sq.in. will start the engine three times. A minimum of 50 lb.sq.in. is required to start the engine once.

6. Safety System Pressure Gauge.
Should show a pressure of 80 p.s.i. plus.

7. Air Discharge Pressure gauge.
Shows air pressure available at service valve.

8. Exhaust Temperature Gauge.
Measures temperature at surface of exhaust system (maximum 200 deg.C.).

9. Push After Warm–up Button.
Refer to 'Starting'.

10. Engine Start Button.
Refer to 'Starting'.

11. Reset Button for Safety circuit.
Re–charges pneumatic safety circuit after shutdown.

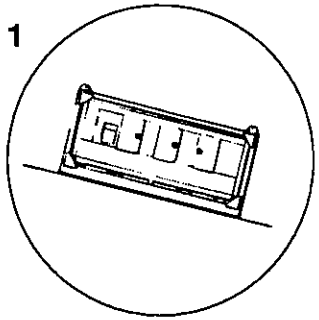
12. Normal Stop Button.
Refer. to 'Stopping'.

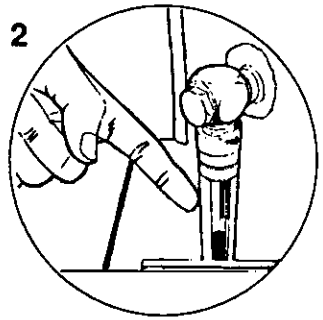
13. Horn Silencer.
Silences horn which will sound every time the machine stops.

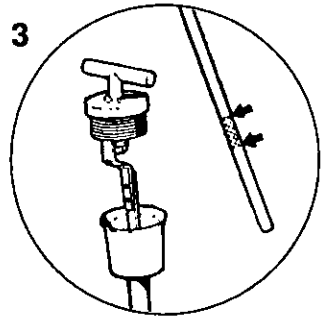
14. Override Button.
Enables the machine to be started by overriding the safety circuit.

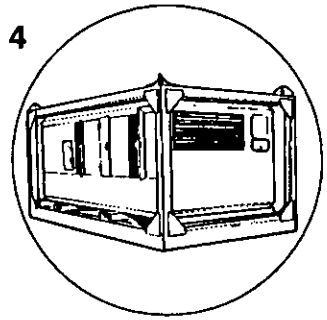
INGERSOLL-RAND.

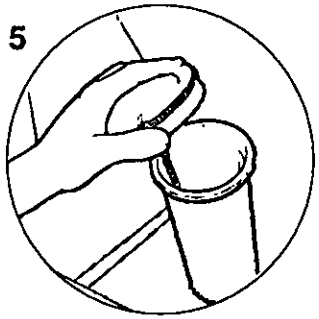
USE ONLY GENUINE INGERSOLL–RAND PARTS

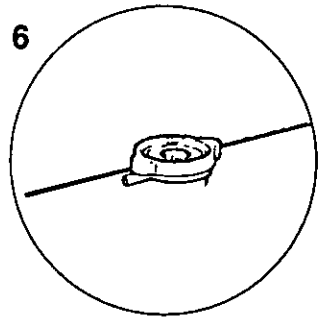
1


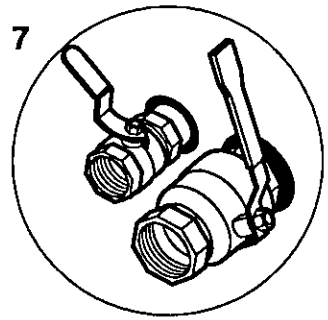
2


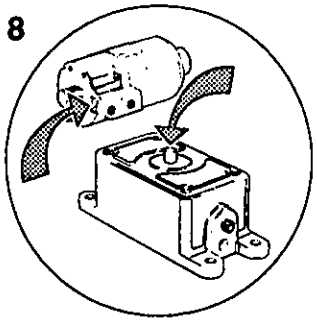
3


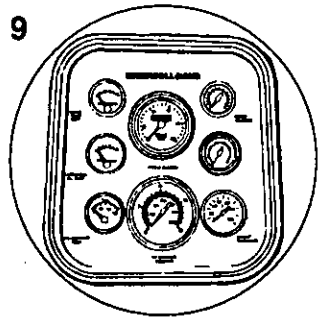
4


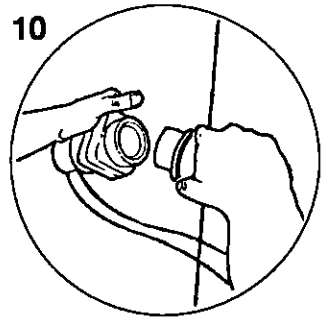
5


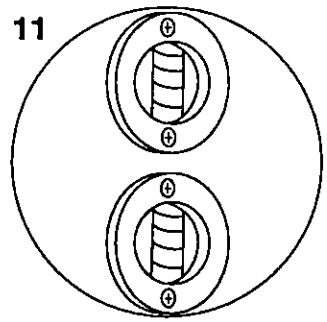
6


7


8


9


10


11


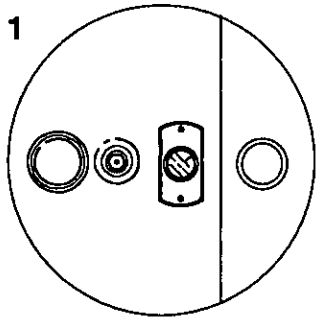
OPERATION FONCTIONNEMENT BEDIENUNG NORME PER L'USO FUNCIONAMIENTO

BEFORE STARTING

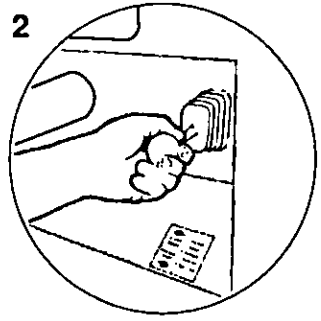
1. Place the unit in a level position.
2. Check the compressor oil level in the sight glass situated on the side of the receiver/separator. Oil level should be between maximum and minimum marks.
3. Check engine oil level and add oil if necessary up to "full" mark on dipstick.
4. Check all doors are closed.
5. Check fuel level. If unit has stood for a period without running, turn fuel valve to start position and pump fuel hand pump until pressure shows green on fuel pressure gauge.
6. Check radiator coolant level.
7. Close service valves.
8. Check that speed valve and vibration valve have been reset by pressing reset button on each valve.
9. Check the air–start receiver is charged.
10. Check that yellow alert power supply is connected.
11. Check tell tales are green.

N.B. Engine oil pressure and water loss indicators may show red after normal stopping If system is functioning correctly the indicators will go to green on start up.

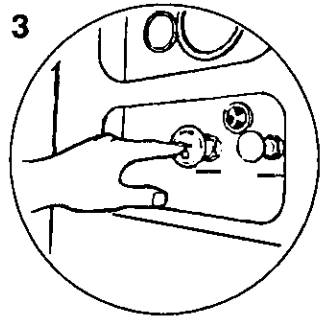
1



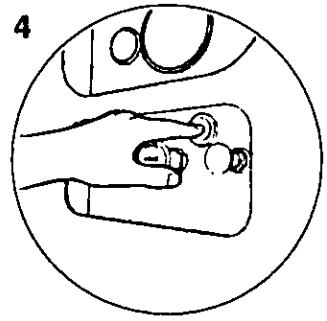
2



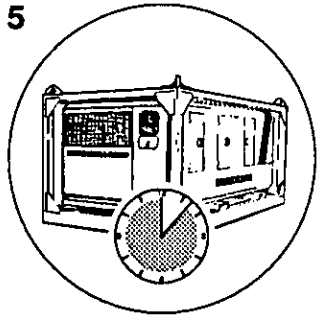
3



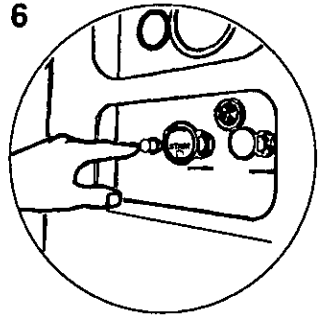
4



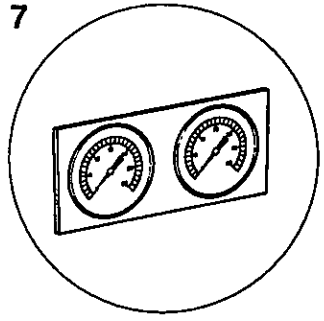
5



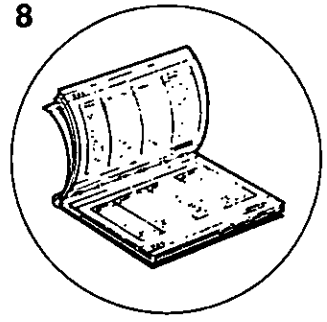
6



7



8



STARTING

1. Turn knob on override valve to start position.

2. Lift the Start/Reset/Emergency Stop lever to the Start/Reset position, and hold in position.

3. Press engine Start button. Release Start button when engine fires.

4. Press Reset green button and after 20 seconds release Start/Reset/Emergency Stop lever to central position.

5. Allow machine to warm up for several minutes.

6. Press Start–Run button to engage regulation system.

7. When machine is running at full load check if air filter restriction gauges show less than 30". If not, air filter element service is required.

8. If unit fails to run or shuts down, refer to trouble shooting section of this manual.

STOPPING

1. Close service valve.

2. Allow machine to idle for several minutes.

3. Press normal Stop button.

4. Push Horn Stop button to silence shutdown warning horn.

EMERGENCY STOP

5. Move Start/Reset/Emergency Stop lever down to stop position.

N.B. Never use Emergency Stop lever for normal stopping as this practice can lead to mechanical damage.

WARNING

If the engine safety system trips whilst the engine is being used in a hazardous area (indicated by a tell tale showing red/white), do not attempt to restart until advice has been obtained from the safety officer or plant supervisor.

NOTE

To prevent condensation building up in fuel tank, refill the tank at the end of every shift.

INGERSOLL-RAND.

USE ONLY GENUINE INGERSOLL–RAND PARTS

GENERAL

The compressor is initially supplied with Ingersoll–Rand compressor lubricating oil sufficient for the first 500 hours of operation.

Check the compressor and engine oil levels before starting a new compressor.

If for any reason the compressor oil has been drained, it must be refilled with clean new oil recommended by Ingersoll–Rand.

CAUTION

Some oil mixtures are incompatible and result in the formation of varnishes, shelacs or lacquers which may be insoluble. Such deposits can cause serious damage. To avoid such problems always specify Ingersoll–Rand compressor lubricating oil (5 litre container CPN 92735109, 25 litre container CPN 92735117).

ENGINE LUBRICATING OILS

Normal lubricating oil for engine is SAE 10W 30 (MIL–L–2104C–CD).

COMPRESSOR LUBRICATING AND COOLING OIL RECOMMENDATIONS

Ingersoll–Rand compressor lubricating oil is recommended for use in Ingersoll–Rand Portable Compressors, 5 litre container CPN 92735109, 25 litre container CPN 92735117.

This oil conforms to the specifications found in section a) of the following table. If alternate lubricants are used they too should conform to these specifications.

CAUTION:

Care should be taken to ensure that all downstream components will be compatible with synthetic lubricants.

a) AMBIENT TEMPERATURE

125 DEG. F 51.7 DEG. C
–10 DEG. F –23.3 DEG. C
USE LUBRICANT:
MIL–L–46152 – SAE 10W
or
MIL–L2104B – SAE 10W
or
DEXRON or DEXRON II AUTOMATIC TRANSMISSION FLUID

b) AMBIENT TEMPERATURE

–10 DEG. F –23.3 DEG. C
–50 DEG. F –45.6 DEG. C
USE LUBRICANT
**** MIL–L–23699B**

SERVICE HOURS	INTERVAL PERIOD	DESCRIPTION	MAINTENANCE REQUIRED
12		Exhaust flame arrestor Check engine & air end lubricant level	Clean element
	daily	Air filters	Clean dust collector boxes
	daily	Fuel tank	Refill to prevent condensation
50	weekly	Temperature probes	Visually Check tightness
50	weekly	Fuel shut off valve	Check reset knob
		Compressor oil filter	Replace after first 50 hours from new
100	2 weeks	Shutdown valve and linkage	Inspect lubricate and shutdown test
		Radiator	Check for build up of foreign matter Clean if necessary by blowing out with air or pressure wash
500	6 months	Compressor oil filter	Replace after first 150 hours from new
500	6 months	Compressor oil filter	Replace
500	–	Compressor oil	Replace
500	6 months	Fan belt	Engine
	6 months	Hoses	Inspect
1000	6 months	Engine breather	Clean element
1000	1 year	Air filter elements	Replace
	2 years	Heat exchanger	Clean interior
	2 years	Spark arrestor	Clean interior
As required		Cooling system	Add antifreeze and inhibitor
		Inlet flame trap	Clean element

COMPRESSOR OIL CHANGE

Replace after 500 hours, or every six months of operation, whichever comes first.

NOTE

If compressor has been operated under adverse conditions, or has had long shutdown periods, an earlier oil change may be necessary as oil deteriorates with time as well as by operating conditions.

WARNING

DO NOT under any circumstances remove any drain plug or open any drain valves from the compressor lubricating/cooling system without first checking all air pressure has been released, by checking discharge pressure gauge and by opening manual blowdown valve located on air regulation manifold behind air inlet filter.

CHANGE PROCEDURE

1. Check that there is no pressure in the system.
2. Remove the plug and drain into a suitable container.
3. When receiver separator tank, piping and oil cooler are completely drained, close the coolant drain valve.
4. Replace the drain plug.
5. Remove the oil filler plug situated on the side of the receiver/separator.
6. Re–fill the lubricating/cooling system until the oil level is between Maximum. and minimum marks on the oil level gauge.
7. See 'Section 2 – Operation (Before Starting)'
8. Start compressor (See 'Section 2 – Operation')
9. Check for leaks.

COMPRESSOR OIL FILTERS

Replace after the first 50 hours, 150 hours and thereafter every 500 hours or every six months of operation, whichever comes first.

CHANGE PROCEDURE

1. Wipe off any external dirt from the filters to prevent any contamination from entering the lubricating/cooling system.
2. Turn the filters anti–clockwise and remove from housing.
3. Clean gasket seat on the housing.
4. Install new Ingersoll–Rand replacement filters by offering up to the housing and turning clockwise until seal makes initial contact.
5. Tighten a $^{1}/_{2}$ to $^{3}/_{4}$ of a turn.
6. See 'Section 2 – Operation (Before Starting)'
7. Start compressor (See 'Section 2 – Operation')
8. Check for leaks.

SCAVENGE TUBE

It is good preventative maintenance to check that the scavenge tube is clear of any obstructions each time the compressor lubricant is changed (a blocked scavenge will cause oil carryover).

COMPRESSOR OIL SEPARATOR ELEMENT

Normally the separator element will not require periodic replacement provided that the air and oil filters are properly maintained.

ENGINE FILTERS

All must be serviced in accordance with the instructions found in the engine operator's manual.

AIR INTAKE VALVE

At 100 hours or 2 weeks operation (whichever comes first), inspect the valve linkage and control arm mechanism. Ensure that the roller on the trip lever is free to spin. Lubricate the valve spindle and all pivot points with thin oil.

Carry out an emergency stop test using the Stop/Reset lever byhand or cable. Ensure that the valve moves freely, closes correctly and shuts down the engine.

If the operation of the valve appears satisfactory but the engine does not stop within a few seconds, then the inlet system, including the manifold, should be checked for leaks. Any leaks should be suitably sealed.

AIR INTAKE VALVE SETTING INSTRUCTIONS

Slacken the adjuster until the trip lever spring is just loose. Tighten it nine complete turns, secure the locknut and wirelock the adjuster. Run the engine to maximum speed and check that there is no tendency for the SVD valve to vibrate excessively and shutdown.

When running the engine to check the operation of the valve, restrain the mechanism so that the valve is not allowed to fully close.

When testing shutdown, ensure that this is done at low speed and is not more often than necessary.

FLAME ARRESTOR

Fit a clean element every 12 hours or more frequently if necessary. To remove the element, slacken all six captive bolts, draw two captive bolts into loading bracket and half turn anti–clockwise to secure. Pivot flame trap element to approximately 45 deg. and remove. Clean by soaking in carbon removing solvent e.g. Applied Chemicals 8–77, 8–38 or Castrol ICP 140 or similar.

CAUTION

Do not place a hot flame arrestor In the cleaning fluid.

HEAT EXCHANGER

On major overhaul, or in the event of shutdown due to excessive exhaust temperature not reconciled by other checks, clean the heat exchanger interior with a carbon solvent: e.g. Applied Chemicals 8–77, 8–38 or Castrol ICP 140.

Remove the heat exchanger from the machine, blank off the gas inlet ports, and with the outlet uppermost, fill the casing with solvent and allow to soak for four hours. Empty and thoroughly hose out the interior. Remove all fluid from the heat exchanger, repeat if necessary. During this operation, **do not allow solvent into water passages.**

The heat exchanger gas parts should be blown out, refit the cooler and run the engine until warm. Top up the water system and check for leaks. A clean exhaust flame arrestor element must be fitted. It should be noted that after cleaning the heat exchanger, loose carbon particles may be released during the initial period, after which it is necessary to clean the exhaust flametrap.

AIR FILTER ELEMENTS

The air filters should be inspected and maintained daily.

Dust collector boxes should be cleaned daily; this will become more frequent in dusty operating conditions. Dust collector boxes must not be allowed to become more than half full.

It is recommended that air filter elements be replaced by new Ingersoll–Rand elements. However, if new elements are not at hand, the blocked elements may be cleaned and reused. For cleaning, the following instructions must be adhered to:

NEVER REMOVE AND REPLACE ELEMENTS WHEN COMPRESSOR IS RUNNING

REMOVAL AND CLEANING

1. Clean exterior of filter housing.
2. Remove end cap and empty dust collector box.
3. Unscrew hexagon nut main element to housing.
4. Remove element.
5. Clean inside housing.
6. Clean element by directing a jet of dry compressed air at no more than 5 bar (73 p.s.i.) at an angle of 45 deg. to the outside of element. Carefully blow any dust from each fold of the element.

NEVER USE COMPRESSED AIR TO BLOW THROUGH THE ELEMENT MEDIA.

7. Mark the number of services to the main element on the end of the safety element, which should be replaced at least every five (5) services of the main element.
8. Elements must not be cleaned and re–used.

INSPECTION

1. Check for cracks, holes or any other damage to the element by holding it up against a light or by passing a lamp inside.
2. Check the seal at the end of the cartridge and replace if any sign of damage is evident.
3. Renew safety element if inspection reveals damage to main element.

REPLACEMENT

1. Assemble the new or cleaned elements into the filter housing.
2. Ensure that the seal seats properly on the bottom of the housing.
3. Secure the element in housing by hand tightening the hexagon nut.
4. Assemble the dust collector box parts ensuring they are correctly positioned with the lug interlocked with the slot in the cover rim.
5. Ensure that the arrow and 'top' marking on the collector box is correctly positioned.
6. Reset restriction indicator by depressing rubber diaphragm.
7. Before starting machine, check all clamps are tight.

AIR STARTER MOTOR

Normally the motor requires no maintenance except for topping up of the lubricator reservoir. But should the motor need to be removed for repairs, the following points should be noted;

1. When disassembling, always mark adjacent parts on the motor housing cover, cylinder housing gear case and drive housing so that these items can be located in the same position when the motor is re-assembled.
2. Do not disassemble the motor any further than necessary to replace a worn or damaged part.

3. Do not remove any part which is a press fit in or on a sub–assembly unless the removal of that part is necessary for replacement or repairs.
4. Always have a complete set of vanes, seals and O–rings on hand before commencing any overhaul of a starter.

Never re–use old seals or O–Rings.

TESTING THE STARTER MOTOR

1. Turn the Drive Pinion by hand in the direction of starter rotation. The clutch should ratchet smoothly with a slight 'clicking' action

NOTE: Proper Starter rotation is indicated when facing the Drive Pinion. That is, a Starter having the letter "R" in the model number is designated as a right–hand rotation model, and the Drive Pinion will rotate clockwise when facing the Drive Pinion.

2. Turn the Drive Pinion in the opposite direction of the Starter rotation. The gearing and motor should rotate freely with no binding.
3. Attach an air hose to the "IN" port on the Drive Housing, and apply 50 psig (3.4 bar/345 kPa) air pressure. The Drive Pinion should remove outward and air should escape from the "OUT" port.

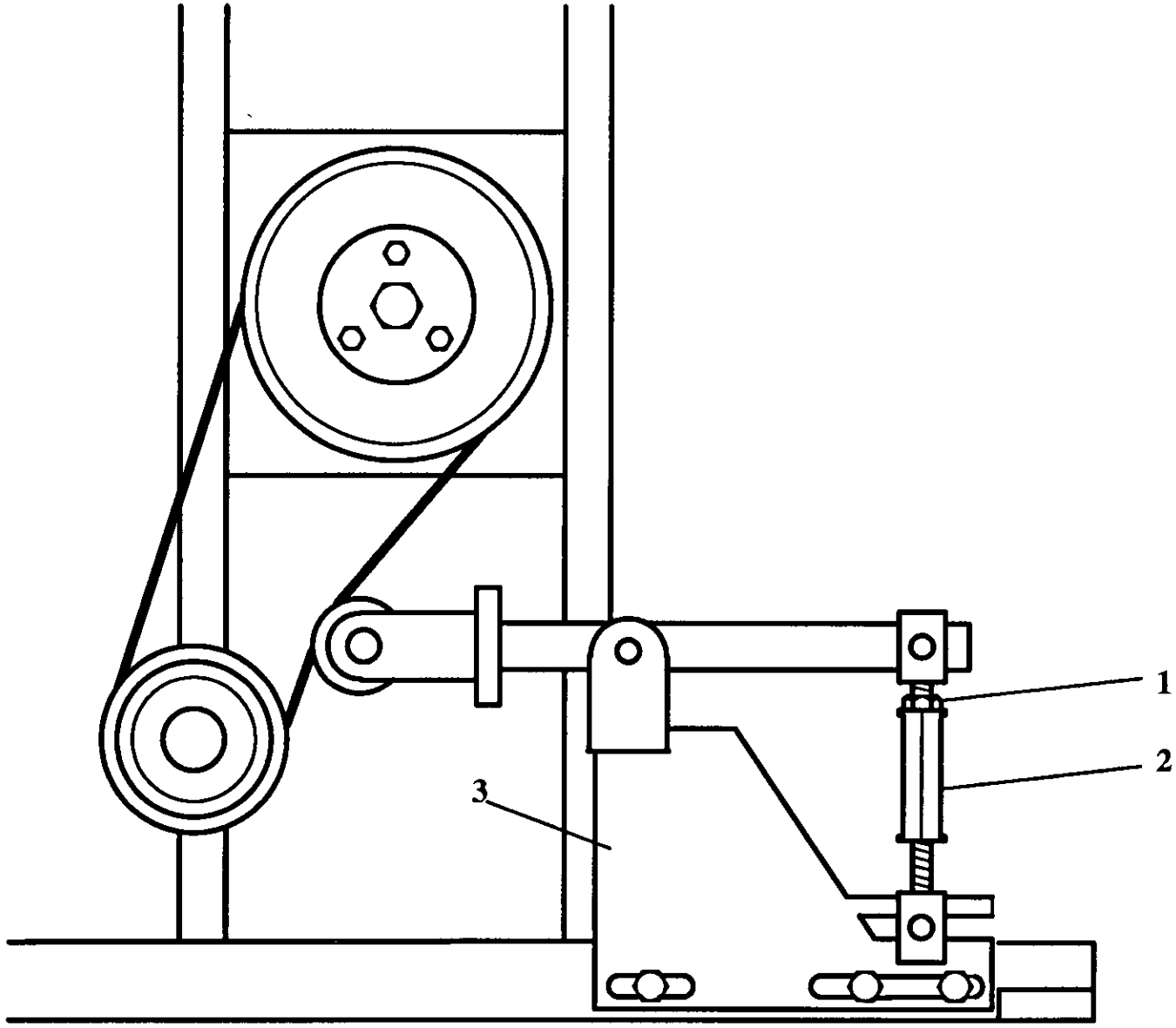
4. Plug the "OUT" port and apply 150 psig (10.3 bar/1034 kPa) air pressure to the "IN" port. Check to make certain no air is escaping. Measure the distance from the face of the Drive Pinion farthest from the mounting flange to the machined face of the mounting flange. It should be 2.75" (70.0 mm +/– 1.5 mm). With the air pressure on and the Drive Shaft extended, push the Drive Pinion toward the Drive Housing until the Pinion rotates slightly and comes to a solid stop. While holding the Drive Pinion against the stop, measure again the distance from the face of the Drive Pinion to the machined face of the mounting flange. The difference between the two measurements must be 0.47" (12.0 mm +/– 0.9 mm). Remove the pressure from the "IN" port and measure again the distance from the face of the Drive Pinion to the machined face of the mounting flange. It should be 1.82" (46.2 mm +/–1.5 mm).
5. Attach a $^{3}/_{8}$" (9 mm) air hose to the inlet of the motor and apply 90 psig (6.2 bar/620 kPa) air pressure. The Starter motor should run smoothly.
6. Plug the exhaust port and apply 30 psig (2.1 bar/207 kPa) air pressure to the inlet of the motor. Immerse the Starter for thirty seconds in a non–flammable solvent. If the Starter is properly sealed, no bubbles will appear.

RADIATOR AND OIL COOLER

Each month it is recommended that the radiator be cleaned. When grease, oil and dirt accumulate on the cooling faces, the efficiency of the radiator becomes impaired.

HOSES

At regular intervals, inspect all of the intake lines to and from the air cleaners, and all flexible hoses used for air lines, oil lines and fuel lines.


1
2
3

FAN BELT TENSIONING

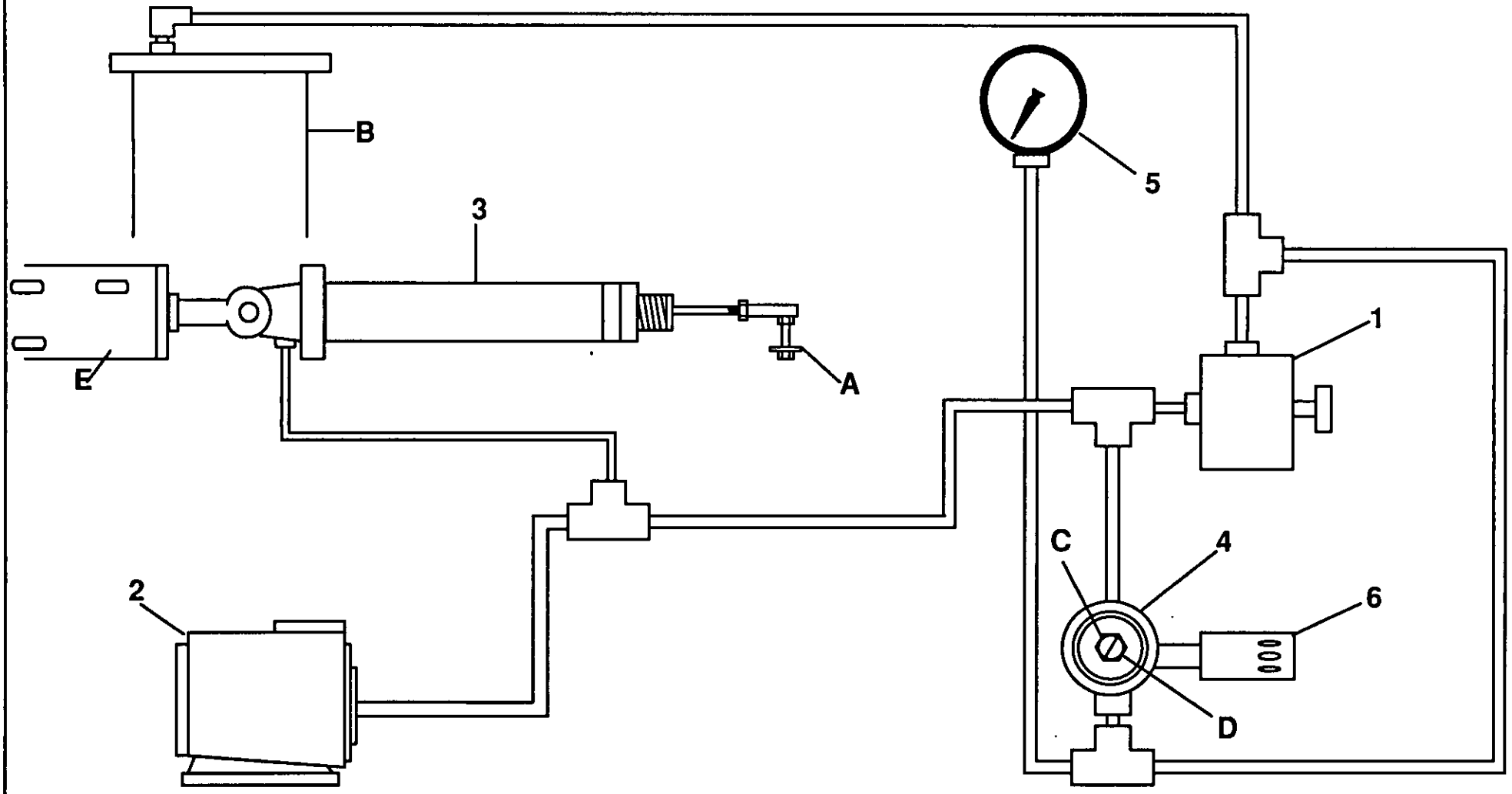
The cooling fan is driven from the compressor male rotor by a poly–vee drive belt.

It is important that this belt is correctly tensioned to prevent it from slipping. To adjust the tension of the belt, the following instructions must be adhered to:

A. Release turnbuckle locknut (1) and slacken turnbuckle body (2).
B. Slacken the screws securing support plate (3).
C. Ensure support plate (3) is pushed fully forward towards the pulley.
D. Tighten screws to secure support plate (3).
E. Hand tighten turnbuckle body (2) and run machine.
CORRECT BELT TENSION IS WHEN NO SLIPPAGE OCCURS ON CHANGE OF SPEED.
F. If belt squeals on change of speed or stopping of machine, increase the belt tension.
G. When correct tension is achieved, tighten turnbuckle locknuts (1).

PERIODICALLY CHECK TIGHTNESS OF ALL FAN MOUNTING BOLTS AND DRIVE PARTS. THE FAN MOUNTING NUT SHOULD BE TIGHTENED TO A TORQUE VALUE OF 260 LB.FT/80Nm.

N.B. Fan drive belt must be replaced after 500 hours to maintain anti–static properties



T1567

A Engine Throttle Arm

B Separator Tank

C Locknut

D Adjusting Screw

E Air Cylinder Bracket

1 Start–Run Valve

2 Unloader

3 Air Cylinder

4 Regulator

5 Discharge Air Pressure Gauge

6 Silencer/Orifice

Normally regulation requires no adjusting, but if correct adjustment is lost, proceed as follows.

Before Starting Engine

1. Inspect Engine Throttle Arm '**A**' on engine governor to see that it is resting against Full Speed Stop .

2. Loosen Locknut '**C**' and turn Adjusting Screw '**D**' anti–clockwise until no tension is felt on screw. Now turn screw one full turn clockwise.

After Starting Engine

3. Allow unit to warm up then press Start–Run Valve '**1**'

4. Open and adjust service valve on outside of machine to maintain normal operating pressure at discharge pressure gauge.

5. Ensuring that pressure is maintained at 100psi (6.9 bar), turn Adjusting Screw '**D**' until Engine Throttle Arm '**A**' just lifts off Full Speed Stop.

NOTE: Turning Adjusting Screw '**D**' clockwise will raise full speed pressure.

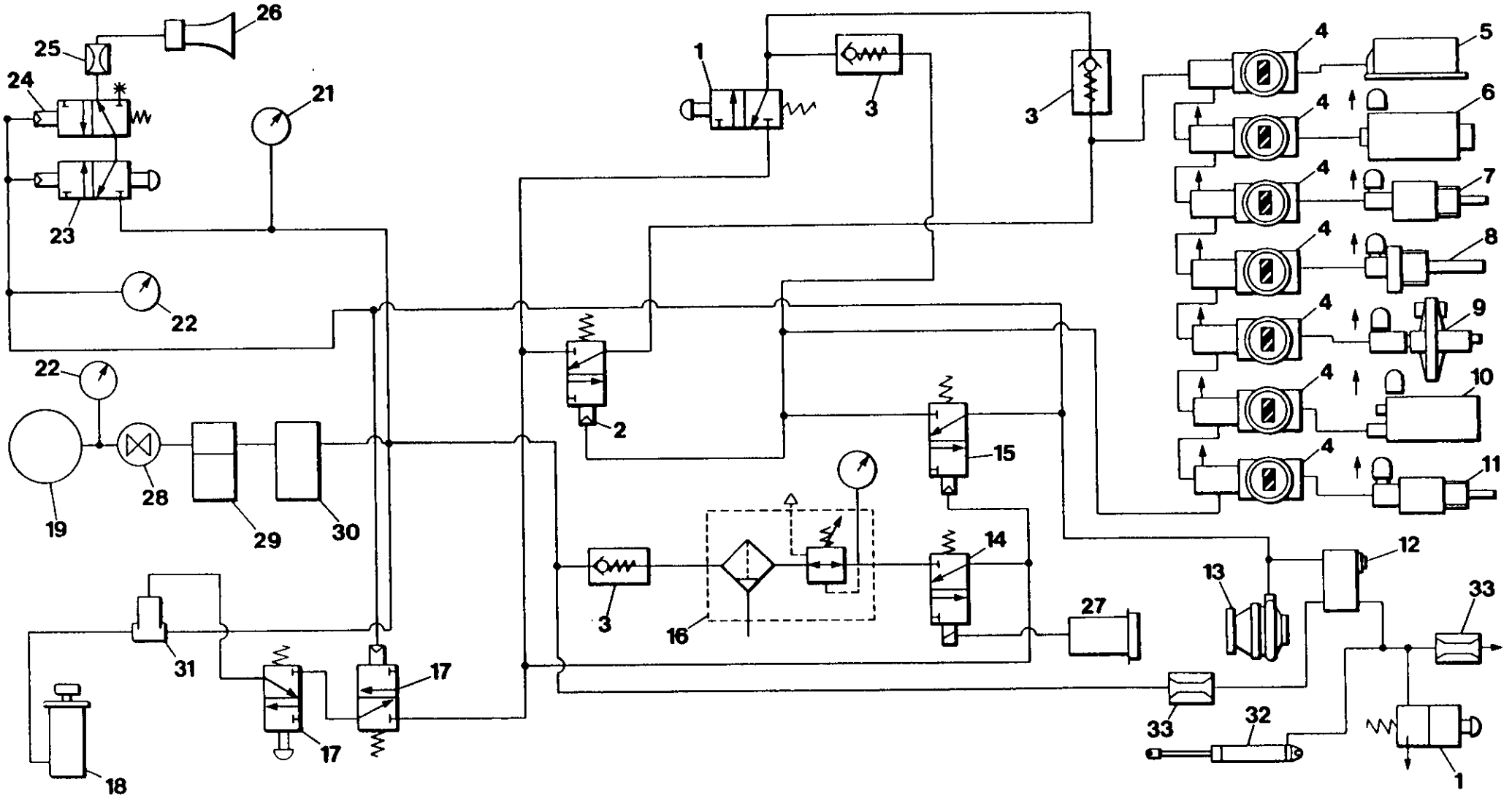
6. Close service valve, engine will slow to idle speed Loosen locknut on Air Cylinder '3'and rotate to adjust idle speed to 1200 rpm. Repeat steps 5–6 if required.

INGERSOLL-RAND

USE ONLY GENUINE INGERSOLL–RAND PARTS

1. Engine Will Not Crank	a) Insufficient pressure in air start tank. b) Relay Valve seized. c) Yellow alert not connected or faulty.
2. Engine Will Not Start	a) Low fuel level. b) Fuel system water trap full of water. Drain off water and press button on top to return float. c) Reset on. Overspeed and vibration valves not pressed. d) Fuel valve not reset. Turn clockwise to start position. e) Normal stop button not pulled out or fuel pump lever stuck in stop position. f) Air entrapped in fuel system.
3. Engine Will Not Continue To Run After Pressing 'Reset' Button	a) Safety system reset button not pressed for long enough to allow air pressure to build up. Watch safety system pressure gauge rising before releasing button. b) Air leak in safety system. See pneumatic diagram. c) Fault on machine indicated by Tell–Tales or faulty safety system valves.
4. Unit Prematurely Shuts Down	a) Fault on machine indicated by Tell–Tales. b) Loss of air in safety system – check for leaks. c) Fuel starvation. Check water trap in fuel system. Check fuel level.
5. Excessive Vibration	a) Engine idle speed too low. Should be 1000/1100 r.p.m. b) Mechanical fault, e.g. broken fan or coupling.
6. Engine Stalls on Idle	a) Idle speed too low. b) Unloader not closing properly.
7. Air Discharge Capacity Too Low	a) Engine speed too low. Maximum 2100 r.p.m. b) Blocked air cleaner. Check gauge. c) High pressure air escaping.
8. Excessive Oil Carry Over in Discharge Air	a) Blocked scavenge line. Check scavenge line and orifice. b) Punctured separator element.
9. Safety Valve Blows	a) Operating pressure too high. b) Regulator out of adjustment. c) Faulty regulator valve.
10. Engine Speed Too Low	a) Incorrect setting of throttle arm. b) Blocked fuel filter. c) Faulty regulator valve. d) Blocked silencer on regulator valve.

FAULT	PROBABLE CAUSE	SOLUTION
Loss of power	Worn motor parts	Remove the motor from the Motor Housing and disassemble the motor. Examine all parts and replace any that are worn or damaged. Use the following guidelines for determining unserviceable parts: 1. **Vanes** – Install a set of new vanes if any vane is cracked, spalled or worn to the extent that it's width is 0.67" (17 mm) or less at either end. 2. **Rotor Bearings** – Replace if any roughness or looseness is apparent. 3. **Rotor** – Replace if the body has deep scoring that cannot be removed by polishing with emery cloth. 4. **Cylinder Housing** – Replace if there are any cracks or deep scoring. 5. **End Plates** – Clean up scoring by rubbing it with emery cloth placed on a flat surface.
	Inadequate Lubrication	Check the lubricator, inlet hose, fitting and oil supply hose to make sure they are vacuum tight and free of leaks. Tighten all joints and replace the lubricator if necessary.
Air or Gas leakage	Worn 'O' rings	Check the End Plate O–rings and Drive Housing O–ring plug the exhaust. Apply 30 psig (2.1 bar/207 kPa) air to the inlet and immerse the unit for 30 seconds in nonflammable solvent. If bubbles appear, replace the O–ring, Gaskets or seals.
Pinion does not engage the flywheel	Broken clutch jaws or other broken parts	**Disassembly of the Piston and Clutch**
Motor runs, pinion engages but does not rotate	Broken shafting, Gearing or Clutch Jaws	**Disassembly of the Piston and Clutch**
Excessive butt engagement	Dry helical spline	**Disassembly of the Piston and Clutch.** Lubricate the helical spline with Ingersoll–Rand Grease No.28.


26
25
24
21
23
22
22
19
28
29
30
31
18
17
17
1
3
3
2
3
16
15
14
27
4
5
6
7
8
9
10
11
12
13
33
33
32
1

Item	Description
1	Safety System Reset Button
2	Safety System Energising Relay
3	Check Valve.
4	Tell–Tale Indicator Relays
5	Engine Vibration Sensor
6	Engine Overspeed Sensor
7	Engine Water Temperature Sensor
8	Engine Exhaust Temperature Sensor
9	Engine Water Loss Sensor
10	Engine Oil Pressure Sensor
11	Compressor Discharge Temperature Sensor
12	Fuel Shutoff Valve
13	Air Intake Shut–off Valve
14	'Yellow Alert' Solenoid Valve
15	'Yellow Alert' Shutdown Relay
16	Filter Regulator
17	Starter Inhibitor Relay
18	Starter Motor
19	Start System Air Reservoir
20	Start Button
21	Start System Pressure Gauge
22	Safety System Pressure Gauge
23	Horn Isolate Button
24	Horn Relay
25	Orifice (1 mm)
26	Horn
27	'Yellow Alert' Electrical Socket
28	Ball Valve
29	Filter
30	Lubricator
31	Relay Valve
32	Cylinder
33	Orifice

TORQUE VALUE CHART

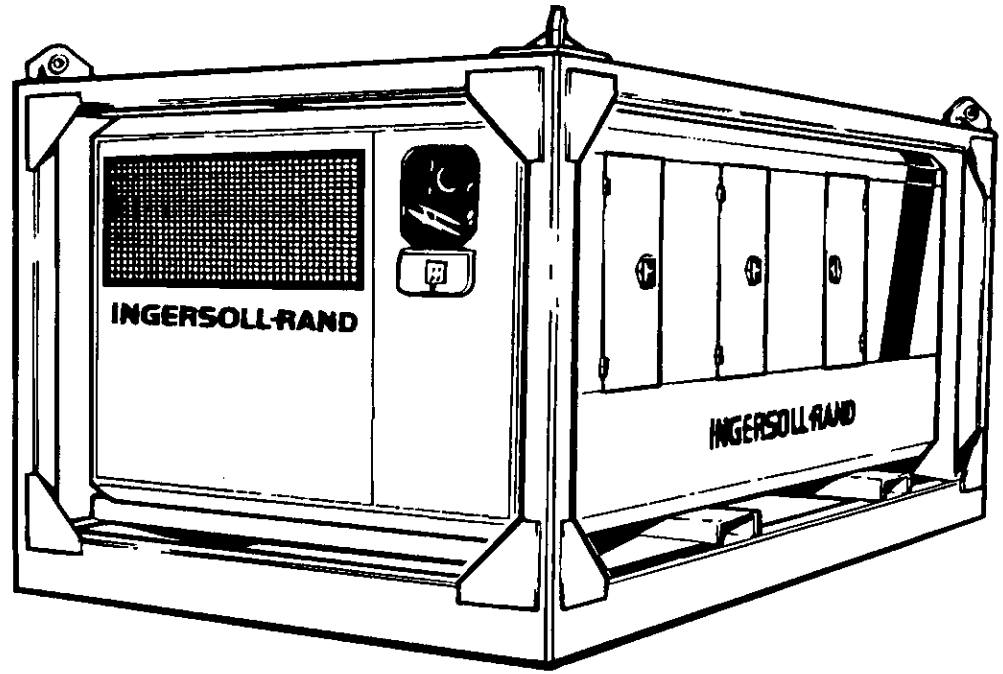
FASTENING	lb ft.	Nm
Drive Pins to Flywheel	340	500
Element to Airend Hub	340	500
Drive Ring to Flywheel	18	24
Airend to Engine	20	27
Rear Mounting Brackets to Engine	140	190
Mounting Bracket to Airend	140	190
Resilient Mounts to Frame	140	190
Cylinder Bracket to Engine	20	27
Engine Exhaust Manifold Connector	20	27
Autella Clamps	35	47
Unloader Valve to Airend	140	190
Oil Manifold to Airend	63	85
Lifting Bail to Truck Frame	260	352
Cover to Separator Tank	140	190
Separator Tank to Truck Frame	63	85
Fan to Fan Hub	63	85
Nut on Fan Shaft	260	352
Taper Lock Bushes	35	47
Discharge Pipe to Airend	140	190
Discharge Pipe to Separator Tank	63	85
Exaust Pipe to Turbo	25	35
Exhaust Pipe to Engine & Cooler	175	230

INGERSOLL-RAND

HP400 COMPRESSOR

CATERPILLAR ENGINE

PARTS CATALOGUE



ITEM	CPN	QTY	DESCRIPTION
1	92870179	1	Cradle, Lifting
2	92548833	1	Extinguisher, Fire
3	91112185	1	Separator, Water
4	01204015	1	Motor, Air
5	92900992	1	Yellow alert 24 Volt
6	92901008	1	Yellow alert 110 Volt
7	92894989	1	Element, Water separator
8	92887009	1	Belt, Water pump drive
9	03719127	1	Valve, Relay
10	01242890	1	Motor, Air starter
11	03810728	1	Lubricator, Air start
12	03831864	1	Muffler, Air start
13	03457280	1	Valve, Check
14	92870922	1	Pipe, Water cooled exhaust
15	92276096	1	Mount, Exhaust rubber
16	92870880	1	Cooler, Exhaust gas
17	92657030	1	Trap, Flame
18	92870187	1	Arrestor, Exhaust spark
19	92546431	1	Arrestor, Exhaust flame
20	92517846	1	Gasket, Exhaust
21	92892512	1	Fan
22	92887017	1	Belt, Drive
23	92895598	1	Pulley, Drive
24	92895614	1	Ring, Locking
25	92895606	1	Pulley, Driven
26	92699198	1	Element, Separator
27	92870385	1	Radiator
28	92041664	1	Cap, Radiator
29	92870237	1	Cooler
30	92118678	1	Element, Oil

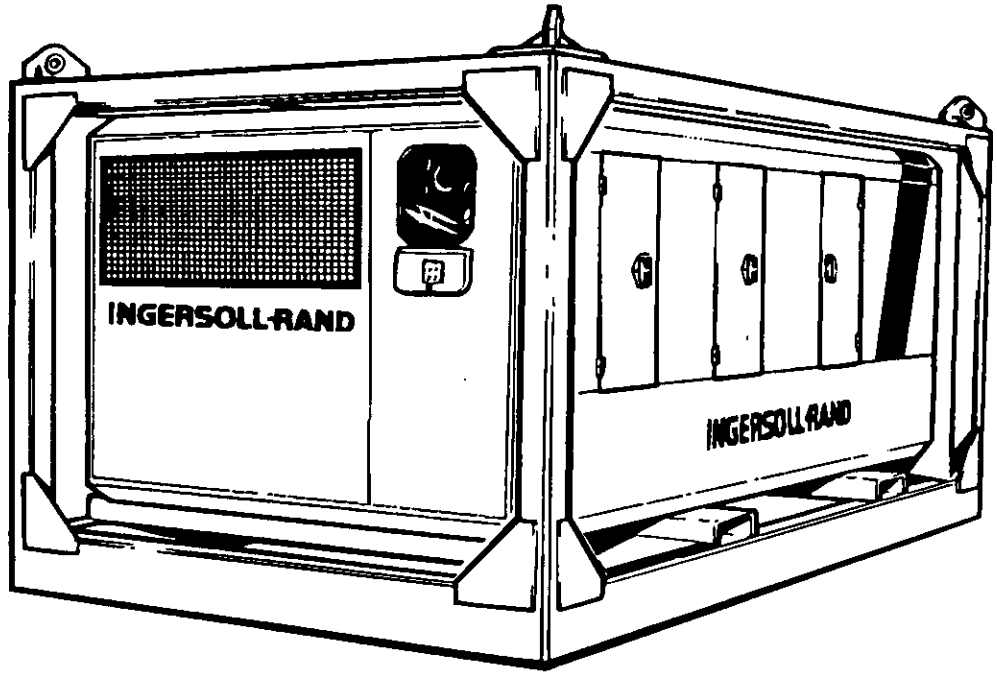
ITEM	CPN	QTY	DESCRIPTION
31	92698257	1	Gauge, Temperature
32	92293497	1	Tachometer
33	92866565	1	Cable, Tachometer
34	03517232	1	Valve, Air start control
35	92546779	1	Valve, Fuel shut–off
36	92657444	1	Valve, Engine oil pressure
37	92686948	1	Element, Compressor air (main)
38	92686955	1	Element, Compressor air (safety)
39	92686922	1	Element, Engine air (main)
40	92686930	1	Element, Engine air (safety)
41	92827880		Oil, Engine
42	91822569		Fluid, Automatic transmission
43	92827914		Antifreeze
44	92828482		Grease
45	92828490		Fluid, Corrosion protection

INGERSOLL-RAND

HP400 COMPRESSOR

CATERPILLAR ENGINE

COMPRESSOR CATERPILLAR ENGINE
OPERATION AND MAINTENANCE MANUAL
with parts catalogue



C.P.N. : 92908482
ISSUE : 1
DATE : December 1991

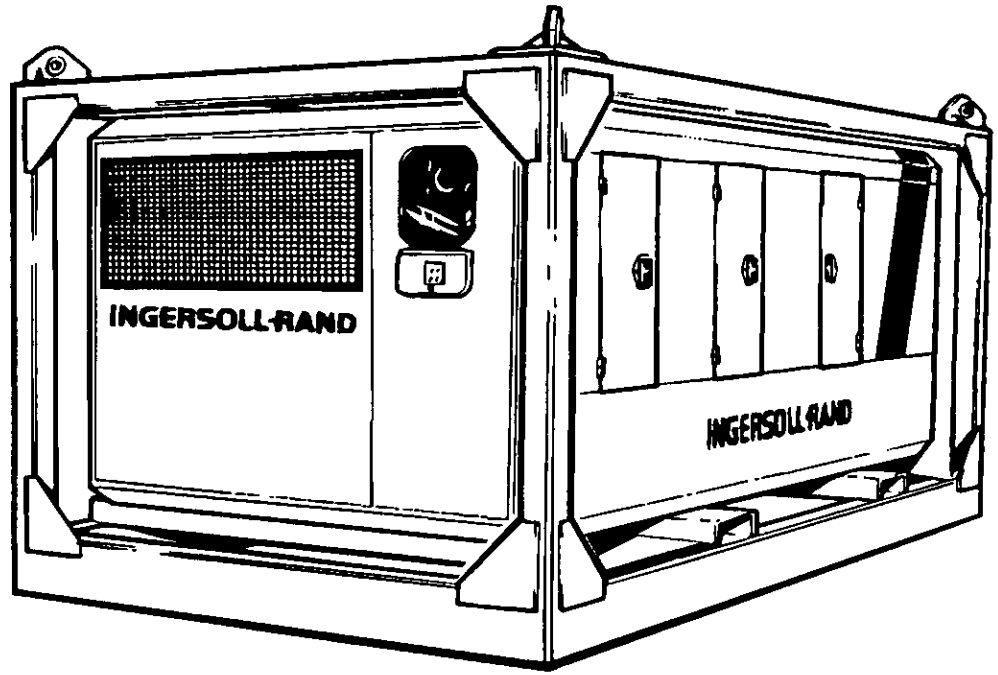
SERIAL NUMBER RANGE | 790001 | TO | 790006

INGERSOLL-RAND

HP400 COMPRESSOR

CATERPILLAR ENGINE

OPERATION AND MAINTENANCE MANUAL



In preparing this publication, every effort has been made to provide sufficient information to permit an operator to perform his duties so as to receive maximum performance and trouble free service from the compressor. All classes of equipment, regardless of how well built, require a certain amount of attention. The purpose of this publication is to acquaint an operator with the functions, operation and servicing of the various components, which were built with the very best of materials and workmanship, to obtain maximum life from the compressor.

Before starting the compressor, the instructions should be carefully read to obtain a thorough knowledge of the duties to be performed. Take pride in the compressor, keep it clean, and in good mechanical condition. For major servicing, not covered in this publication, consult your nearest Ingersoll–Rand Company branch office, or the distributor from whom the compressor was purchased.

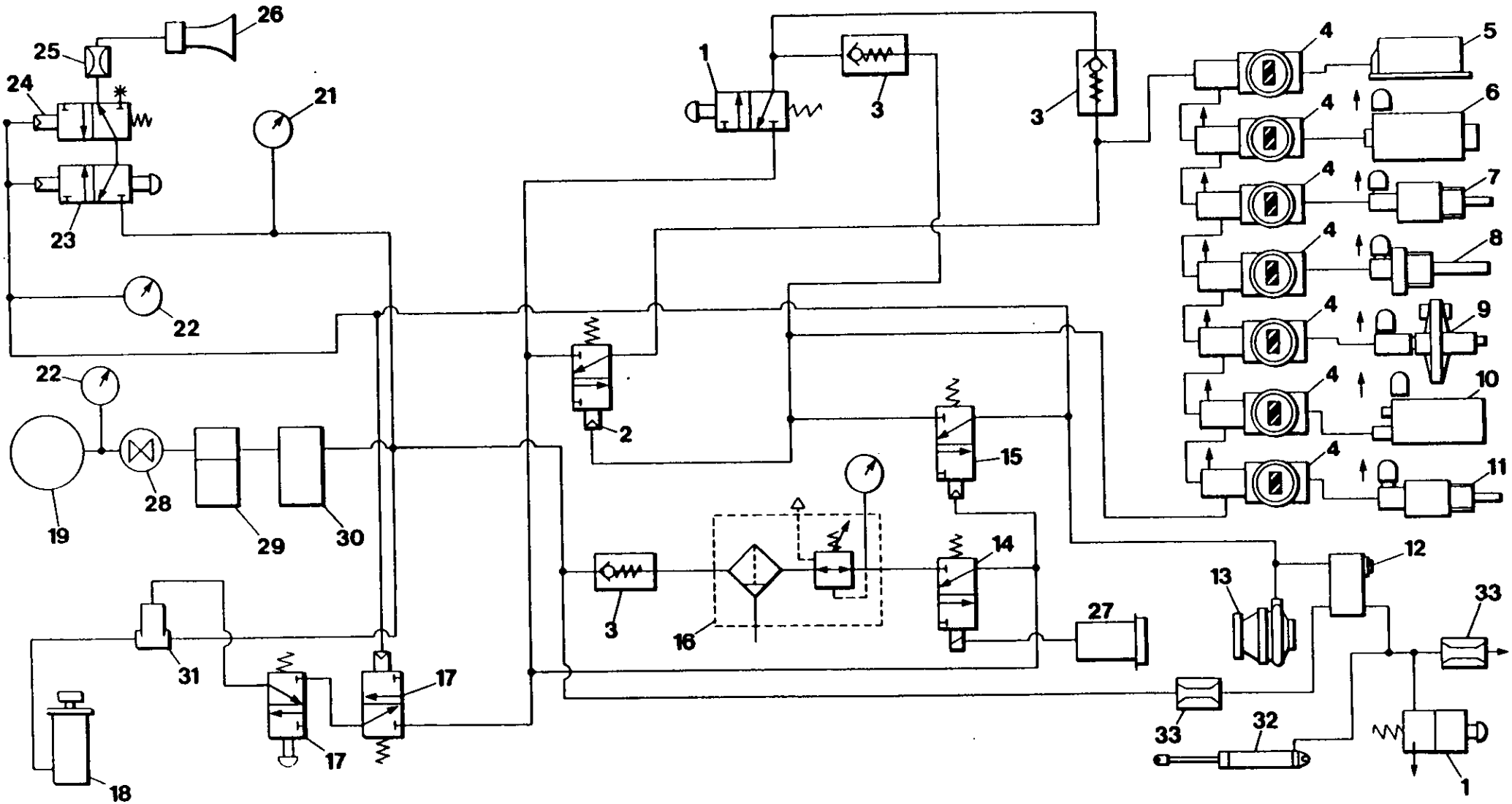
Correspondence with a distributor must always specify the serial number of the compressor as well as the model.

INGERSOLL-RAND.

USE ONLY GENUINE INGERSOLL–RAND PARTS

1. Engine Will Not Crank	a) Insufficient pressure in air start tank. b) Relay Valve seized. c) Yellow alert not connected or faulty.
2. Engine Will Not Start	a) Low fuel level. b) Fuel system water trap full of water. Drain off water and press button on top to return float. c) Reset on. Overspeed and vibration valves not pressed. d) Fuel valve not reset. Turn clockwise to start position. e) Normal stop button not pulled out or fuel pump lever stuck in stop position. f) Air entrapped in fuel system.
3. Engine Will Not Continue To Run After Pressing 'Reset' Button	a) Safety system reset button not pressed for long enough to allow air pressure to build up. Watch safety system pressure gauge rising before releasing button. b) Air leak in safety system. See pneumatic diagram. c) Fault on machine indicated by Tell–Tales or faulty safety system valves.
4. Unit Prematurely Shuts Down	a) Fault on machine indicated by Tell–Tales. b) Loss of air in safety system – check for leaks. c) Fuel starvation. Check water trap in fuel system. Check fuel level.
5. Excessive Vibration	a) Engine idle speed too low. Should be 1000/1100 r.p.m. b) Mechanical fault, e.g. broken fan or coupling.
6. Engine Stalls on Idle	a) Idle speed too low. b) Unloader not closing properly.
7. Air Discharge Capacity Too Low	a) Engine speed too low. Maximum 2100 r.p.m. b) Blocked air cleaner. Check gauge. c) High pressure air escaping.
8. Excessive Oil Carry Over in Discharge Air	a) Blocked scavenge line. Check scavenge line and orifice. b) Punctured separator element.
9. Safety Valve Blows	a) Operating pressure too high. b) Regulator out of adjustment. c) Faulty regulator valve.
10. Engine Speed Too Low	a) Incorrect setting of throttle arm. b) Blocked fuel filter. c) Faulty regulator valve. d) Blocked silencer on regulator valve.

FAULT	PROBABLE CAUSE	SOLUTION
Loss of power	Worn motor parts	Remove the motor from the Motor Housing and disassemble the motor. Examine all parts and replace any that are worn or damaged. Use the following guidelines for determining unserviceable parts: 1. **Vanes** – Install a set of new vanes if any vane is cracked, spalled or worn to the extent that it's width is 0.67" (17 mm) or less at either end. 2. **Rotor Bearings** – Replace if any roughness or looseness is apparent. 3. **Rotor** – Replace if the body has deep scoring that cannot be removed by polishing with emery cloth. 4. **Cylinder Housing** – Replace if there are any cracks or deep scoring. 5. **End Plates** – Clean up scoring by rubbing it with emery cloth placed on a flat surface.
	Inadequate Lubrication	Check the lubricator, inlet hose, fitting and oil supply hose to make sure they are vacuum tight and free of leaks. Tighten all joints and replace the lubricator if necessary.
Air or Gas leakage	Worn 'O' rings	Check the End Plate O–rings and Drive Housing O–ring plug the exhaust. Apply 30 psig (2.1 bar/207 kPa) air to the inlet and immerse the unit for 30 seconds in nonflammable solvent. If bubbles appear, replace the O–ring, Gaskets or seals.
Pinion does not engage the flywheel	Broken clutch jaws or other broken parts	**Disassembly of the Piston and Clutch**
Motor runs, pinion engages but does not rotate	Broken shafting, Gearing or Clutch Jaws	**Disassembly of the Piston and Clutch**
Excessive butt engagement	Dry helical spline	**Disassembly of the Piston and Clutch.** Lubricate the helical spline with Ingersoll–Rand Grease No.28.


26
25
24
21
23
22
22
19
28
29
30
31
18
17
17
1
3
3
2
3
16
15
14
27
4
5
6
7
8
9
10
11
12
13
33
33
32
1

Item	Description
1	Safety System Reset Button
2	Safety System Energising Relay
3	Check Valve.
4	Tell–Tale Indicator Relays
5	Engine Vibration Sensor
6	Engine Overspeed Sensor
7	Engine Water Temperature Sensor
8	Engine Exhaust Temperature Sensor
9	Engine Water Loss Sensor
10	Engine Oil Pressure Sensor
11	Compressor Discharge Temperature Sensor
12	Fuel Shutoff Valve
13	Air Intake Shut–off Valve
14	'Yellow Alert' Solenoid Valve
15	'Yellow Alert' Shutdown Relay
16	Filter Regulator
17	Starter Inhibitor Relay
18	Starter Motor
19	Start System Air Reservoir
20	Start Button
21	Start System Pressure Gauge
22	Safety System Pressure Gauge
23	Horn Isolate Button
24	Horn Relay
25	Orifice (1 mm)
26	Horn
27	'Yellow Alert' Electrical Socket
28	Ball Valve
29	Filter
30	Lubricator
31	Relay Valve
32	Cylinder
33	Orifice

TORQUE VALUE CHART

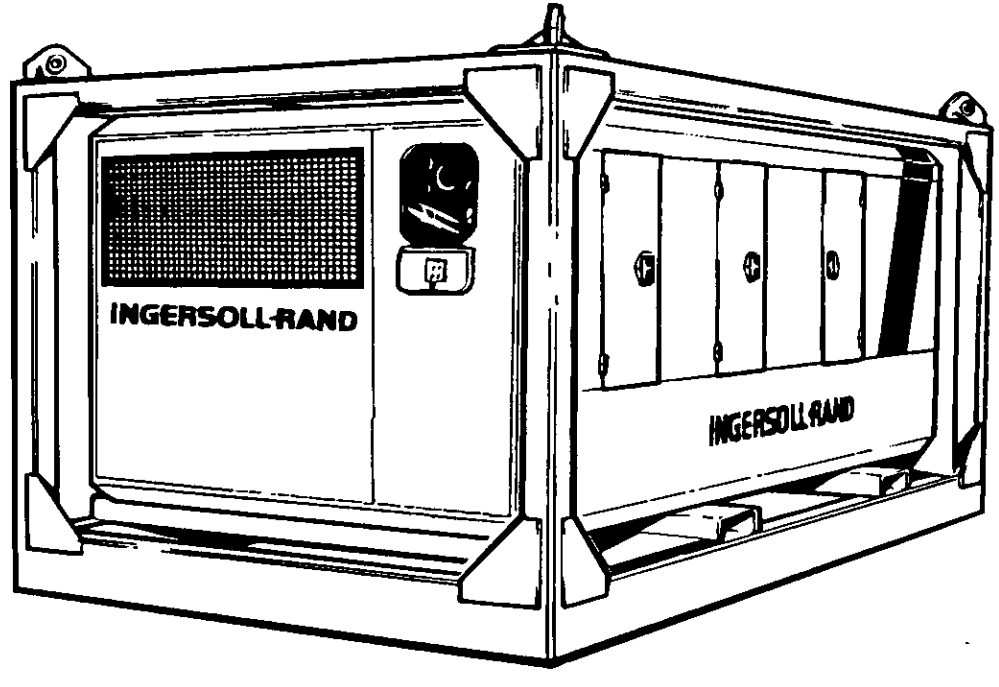
FASTENING	lb ft.	Nm
Drive Pins to Flywheel	340	500
Element to Airend Hub	340	500
Drive Ring to Flywheel	18	24
Airend to Engine	20	27
Rear Mounting Brackets to Engine	140	190
Mounting Bracket to Airend	140	190
Resilient Mounts to Frame	140	190
Cylinder Bracket to Engine	20	27
Engine Exhaust Manifold Connector	20	27
Autella Clamps	35	47
Unloader Valve to Airend	140	190
Oil Manifold to Airend	63	85
Lifting Bail to Truck Frame	260	352
Cover to Separator Tank	140	190
Separator Tank to Truck Frame	63	85
Fan to Fan Hub	63	85
Nut on Fan Shaft	260	352
Taper Lock Bushes	35	47
Discharge Pipe to Airend	140	190
Discharge Pipe to Separator Tank	63	85
Exaust Pipe to Turbo	25	35
Exhaust Pipe to Engine & Cooler	175	230

INGERSOLL-RAND

HP400
COMPRESSOR

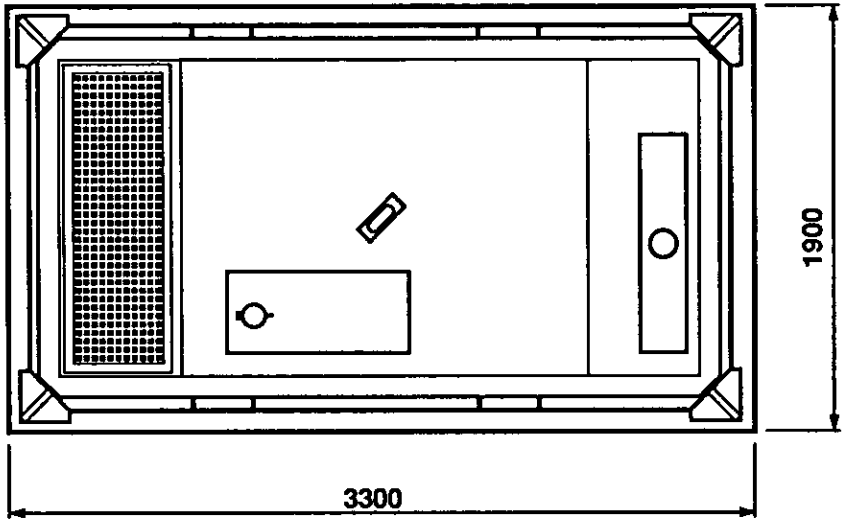
CATERPILLAR ENGINE

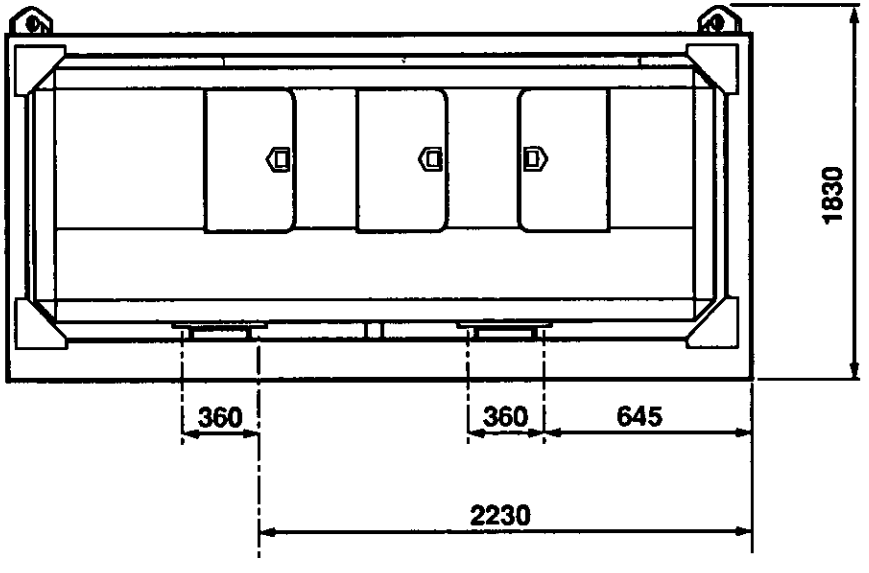
PARTS CATALOGUE

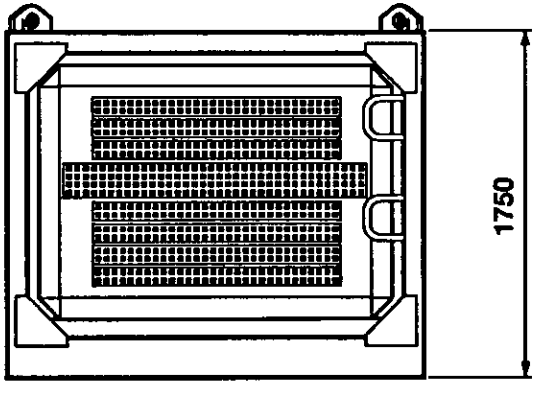


ITEM	CPN	QTY	DESCRIPTION
1	92870179	1	Cradle, Lifting
2	92548833	1	Extinguisher, Fire
3	91112185	1	Separator, Water
4	01204015	1	Motor, Air
5	92900992	1	Yellow alert 24 Volt
6	92901008	1	Yellow alert 110 Volt
7	92894989	1	Element, Water separator
8	92887009	1	Belt, Water pump drive
9	03719127	1	Valve, Relay
10	01242890	1	Motor, Air starter
11	03810728	1	Lubricator, Air start
12	03831864	1	Muffler, Air start
13	03457280	1	Valve, Check
14	92870922	1	Pipe, Water cooled exhaust
15	92276096	1	Mount, Exhaust rubber
16	92870880	1	Cooler, Exhaust gas
17	92657030	1	Trap, Flame
18	92870187	1	Arrestor, Exhaust spark
19	92546431	1	Arrestor, Exhaust flame
20	92517846	1	Gasket, Exhaust
21	92892512	1	Fan
22	92887017	1	Belt, Drive
23	92895598	1	Pulley, Drive
24	92895614	1	Ring, Locking
25	92895606	1	Pulley, Driven
26	92699198	1	Element, Separator
27	92870385	1	Radiator
28	92041664	1	Cap, Radiator
29	92870237	1	Cooler
30	92118678	1	Element, Oil

ITEM	CPN	QTY	DESCRIPTION
31	92698257	1	Gauge, Temperature
32	92293497	1	Tachometer
33	92866565	1	Cable, Tachometer
34	03517232	1	Valve, Air start control
35	92546779	1	Valve, Fuel shut–off
36	92657444	1	Valve, Engine oil pressure
37	92686948	1	Element, Compressor air (main)
38	92686955	1	Element, Compressor air (safety)
39	92686922	1	Element, Engine air (main)
40	92686930	1	Element, Engine air (safety)
41	92827880		Oil, Engine
42	91822569		Fluid, Automatic transmission
43	92827914		Antifreeze
44	92828482		Grease
45	92828490		Fluid, Corrosion protection


1900
3300


1830
360
360
645
2230

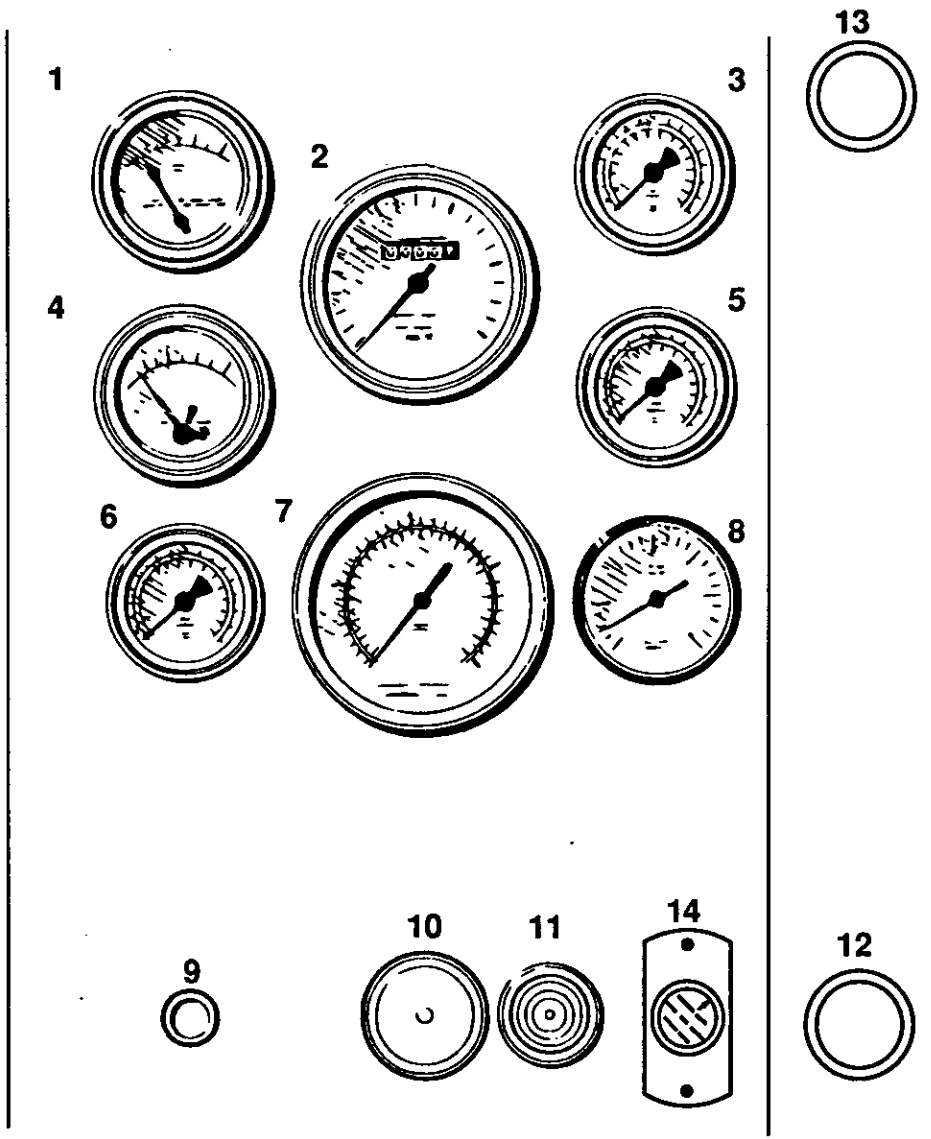

1750

COMPRESSOR

Model	: HP400
Actual Free Air Delivery	: 400 cfm
Normal Operating Pressure	: 150 psig/10.3 bar
Maximum Pressure	: 160 psig/11 bar
Cooling System	: Oil Injection
Lubricant/Coolant Capacity	: 45 litres

ENGINE

Model	: Caterpillar 3116
Number of Cylinders	: 6
Displacement	: 6.6 litres
Compression Ratio	: 15:1
Oil Capacity	: 14 litres
Speed at Full Load	: 2500 rpm
Speed at Idle	: 1200 rpm
Fuel Tank Capacity	: 220 litres
Flame Trap	: 44kg
Cooling System Capacity	: 80 litres
Anti–freeze Capacity	: 40 litres


1
2
3
4
5
6
7
8
9
10
11
12
13
14

1. Engine Water Temperature Gauge.
Maximum temperature 100 deg.C.

2. Engine R.P.M. and Hour Counter.
Measures engine speed and the number of hours the machine has been operating. This gauge should be used to give service intervals

3. Engine Oil Pressure Gauge.
Depending on type of engine and efficiency of engine. This gauge should read approximately 60 p.s.i.

4. Compressor Oil Temperature Gauge.
Maximum temperature 120 deg.C.

5. Air Start Pressure Gauge.
Measures air pressure in air start system. At 130 lb.sq.in. will start the engine three times. A minimum of 50 lb.sq.in. is required to start the engine once.

6. Safety System Pressure Gauge.
Should show a pressure of 80 p.s.i. plus.

7. Air Discharge Pressure gauge.
Shows air pressure available at service valve.

8. Exhaust Temperature Gauge.
Measures temperature at surface of exhaust system (maximum 200 deg.C.).

9. Push After Warm–up Button.
Refer to 'Starting'.

10. Engine Start Button.
Refer to 'Starting'.

11. Reset Button for Safety circuit.
Re–charges pneumatic safety circuit after shutdown.

12. Normal Stop Button.
Refer. to 'Stopping'.

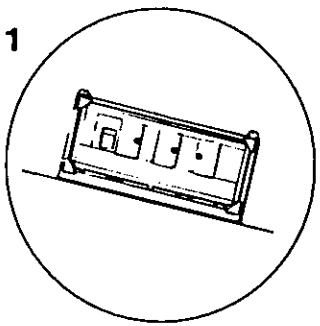
13. Horn Silencer.
Silences horn which will sound every time the machine stops.

14. Override Button.
Enables the machine to be started by overriding the safety circuit.

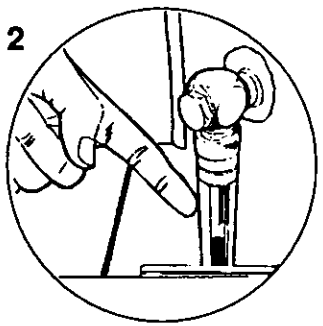
INGERSOLL-RAND.

USE ONLY GENUINE INGERSOLL–RAND PARTS

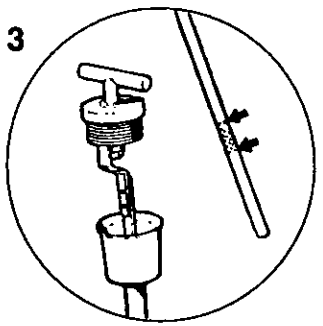
1



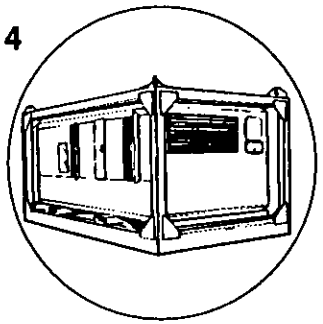
2



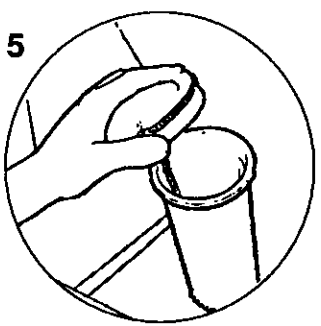
3



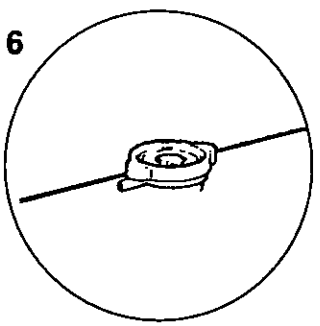
4



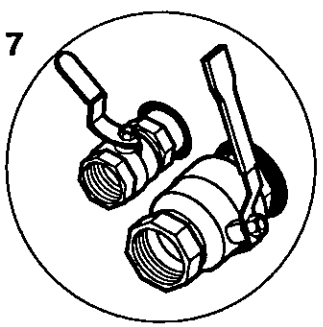
5



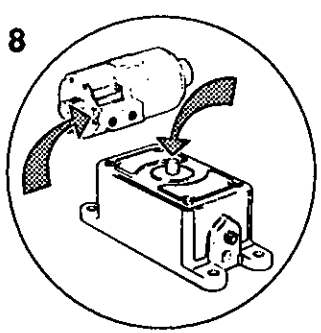
6



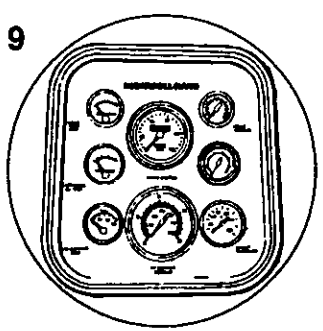
7



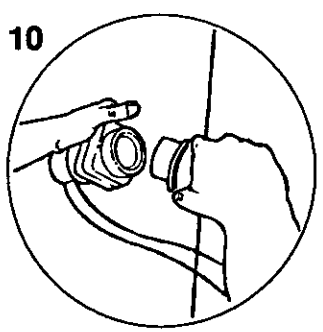
8



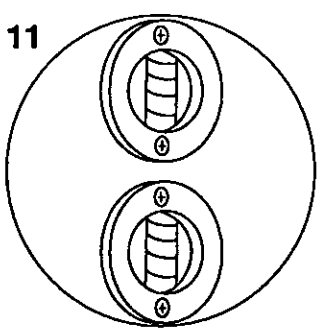
9



10



11



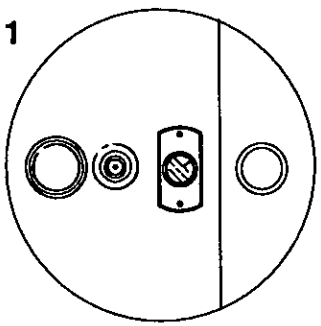
OPERATION FONCTIONNEMENT BEDIENUNG NORME PER L'USO FUNCIONAMIENTO

BEFORE STARTING

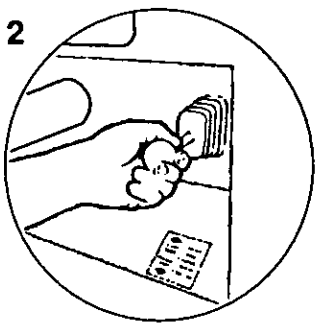
1. Place the unit in a level position.
2. Check the compressor oil level in the sight glass situated on the side of the receiver/separator. Oil level should be between maximum and minimum marks.
3. Check engine oil level and add oil if necessary up to "full" mark on dipstick.
4. Check all doors are closed.
5. Check fuel level. If unit has stood for a period without running, turn fuel valve to start position and pump fuel hand pump until pressure shows green on fuel pressure gauge.
6. Check radiator coolant level.
7. Close service valves.
8. Check that speed valve and vibration valve have been reset by pressing reset button on each valve.
9. Check the air--start receiver is charged.
10. Check that yellow alert power supply is connected.
11. Check tell tales are green.

N.B. Engine oil pressure and water loss indicators may show red after normal stopping If system is functioning correctly the indicators will go to green on start up.

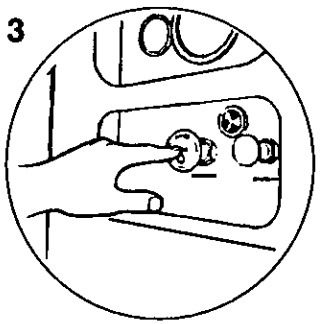
1



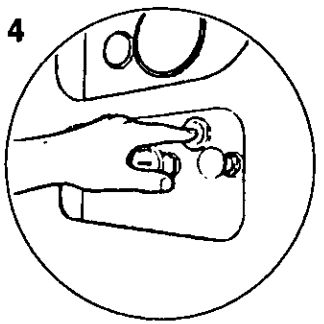
2



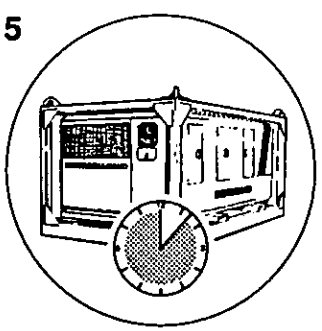
3



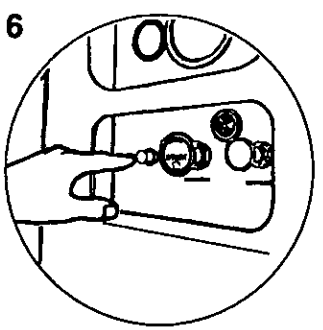
4



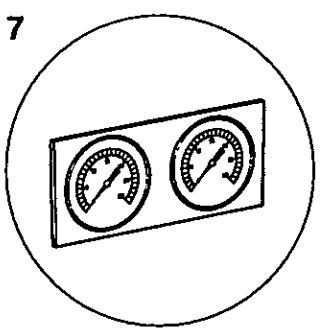
5



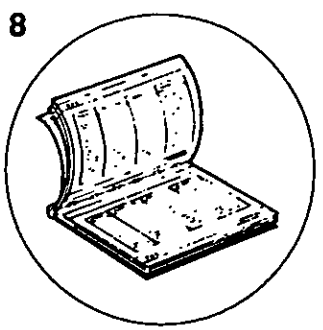
6



7



8



STARTING

1. Turn knob on override valve to start position.

2. Lift the Start/Reset/Emergency Stop lever to the Start/Reset position, and hold in position.

3. Press engine Start button. Release Start button when engine fires.

4. Press Reset green button and after 20 seconds release Start/Reset/Emergency Stop lever to central position.

5. Allow machine to warm up for several minutes.

6. Press Start–Run button to engage regulation system.

7. When machine is running at full load check if air filter restriction gauges show less than 30". If not, air filter element service is required.

8. If unit fails to run or shuts down, refer to trouble shooting section of this manual.

STOPPING

1. Close service valve.

2. Allow machine to idle for several minutes.

3. Press normal Stop button.

4. Push Horn Stop button to silence shutdown warning horn.

EMERGENCY STOP

5. Move Start/Reset/Emergency Stop lever down to stop position.

N.B. Never use Emergency Stop lever for normal stopping as this practice can lead to mechanical damage.

WARNING

If the engine safety system trips whilst the engine is being used in a hazardous area (indicated by a tell tale showing red/white), do not attempt to restart until advice has been obtained from the safety officer or plant supervisor.

NOTE

To prevent condensation building up in fuel tank, refill the tank at the end of every shift.

INGERSOLL-RAND.

USE ONLY GENUINE INGERSOLL–RAND PARTS

GENERAL

The compressor is initially supplied with Ingersoll–Rand compressor lubricating oil sufficient for the first 500 hours of operation.

Check the compressor and engine oil levels before starting a new compressor.

If for any reason the compressor oil has been drained, it must be refilled with clean new oil recommended by Ingersoll–Rand.

CAUTION

Some oil mixtures are incompatible and result in the formation of varnishes, shelacs or lacquers which may be insoluble. Such deposits can cause serious damage. To avoid such problems always specify Ingersoll–Rand compressor lubricating oil (5 litre container CPN 92735109, 25 litre container CPN 92735117).

ENGINE LUBRICATING OILS

Normal lubricating oil for engine is SAE 10W 30 (MIL–L–2104C–CD).

COMPRESSOR LUBRICATING AND COOLING OIL RECOMMENDATIONS

Ingersoll–Rand compressor lubricating oil is recommended for use in Ingersoll–Rand Portable Compressors, 5 litre container CPN 92735109, 25 litre container CPN 92735117.

This oil conforms to the specifications found in section a) of the following table. If alternate lubricants are used they too should conform to these specifications.

CAUTION:

Care should be taken to ensure that all downstream components will be compatible with synthetic lubricants.

a) AMBIENT TEMPERATURE

125 DEG. F 51.7 DEG. C
–10 DEG. F –23.3 DEG. C
USE LUBRICANT:
MIL–L–46152 – SAE 10W
or
MIL–L2104B – SAE 10W
or
DEXRON or DEXRON II AUTOMATIC TRANSMISSION FLUID

b) AMBIENT TEMPERATURE

–10 DEG. F –23.3 DEG. C
–50 DEG. F –45.6 DEG. C
USE LUBRICANT
**** MIL–L–23699B**

SERVICE HOURS	INTERVAL PERIOD	DESCRIPTION	MAINTENANCE REQUIRED
12		Exhaust flame arrestor Check engine & air end lubricant level	Clean element
	daily	Air filters	Clean dust collector boxes
	daily	Fuel tank	Refill to prevent condensation
50	weekly	Temperature probes	Visually Check tightness
50	weekly	Fuel shut off valve	Check reset knob
		Compressor oil filter	Replace after first 50 hours from new
100	2 weeks	Shutdown valve and linkage	Inspect lubricate and shutdown test
		Radiator	Check for build up of foreign matter Clean if necessary by blowing out with air or pressure wash
500	6 months	Compressor oil filter	Replace after first 150 hours from new
500	6 months	Compressor oil filter	Replace
500	–	Compressor oil	Replace
500	6 months	Fan belt	Engine
	6 months	Hoses	Inspect
1000	6 months	Engine breather	Clean element
1000	1 year	Air filter elements	Replace
	2 years	Heat exchanger	Clean interior
	2 years	Spark arrestor	Clean interior
As required		Cooling system	Add antifreeze and inhibitor
		Inlet flame trap	Clean element

COMPRESSOR OIL CHANGE

Replace after 500 hours, or every six months of operation, whichever comes first.

NOTE

If compressor has been operated under adverse conditions, or has had long shutdown periods, an earlier oil change may be necessary as oil deteriorates with time as well as by operating conditions.

WARNING

DO NOT under any circumstances remove any drain plug or open any drain valves from the compressor lubricating/cooling system without first checking all air pressure has been released, by checking discharge pressure gauge and by opening manual blowdown valve located on air regulation manifold behind air inlet filter.

CHANGE PROCEDURE

1. Check that there is no pressure in the system.
2. Remove the plug and drain into a suitable container.
3. When receiver separator tank, piping and oil cooler are completely drained, close the coolant drain valve.
4. Replace the drain plug.
5. Remove the oil filler plug situated on the side of the receiver/separator.
6. Re–fill the lubricating/cooling system until the oil level is between Maximum. and minimum marks on the oil level gauge.
7. See 'Section 2 – Operation (Before Starting)'
8. Start compressor (See 'Section 2 – Operation')
9. Check for leaks.

COMPRESSOR OIL FILTERS

Replace after the first 50 hours, 150 hours and thereafter every 500 hours or every six months of operation, whichever comes first.

CHANGE PROCEDURE

1. Wipe off any external dirt from the filters to prevent any contamination from entering the lubricating/cooling system.
2. Turn the filters anti–clockwise and remove from housing.
3. Clean gasket seat on the housing.
4. Install new Ingersoll–Rand replacement filters by offering up to the housing and turning clockwise until seal makes initial contact.
5. Tighten a $^{1}/_{2}$ to $^{3}/_{4}$ of a turn.
6. See 'Section 2 – Operation (Before Starting)'
7. Start compressor (See 'Section 2 – Operation')
8. Check for leaks.

SCAVENGE TUBE

It is good preventative maintenance to check that the scavenge tube is clear of any obstructions each time the compressor lubricant is changed (a blocked scavenge will cause oil carryover).

COMPRESSOR OIL SEPARATOR ELEMENT

Normally the separator element will not require periodic replacement provided that the air and oil filters are properly maintained.

ENGINE FILTERS

All must be serviced in accordance with the instructions found in the engine operator's manual.

AIR INTAKE VALVE

At 100 hours or 2 weeks operation (whichever comes first), inspect the valve linkage and control arm mechanism. Ensure that the roller on the trip lever is free to spin. Lubricate the valve spindle and all pivot points with thin oil.

Carry out an emergency stop test using the Stop/Reset lever byhand or cable. Ensure that the valve moves freely, closes correctly and shuts down the engine.

If the operation of the valve appears satisfactory but the engine does not stop within a few seconds, then the inlet system, including the manifold, should be checked for leaks. Any leaks should be suitably sealed.

AIR INTAKE VALVE SETTING INSTRUCTIONS

Slacken the adjuster until the trip lever spring is just loose. Tighten it nine complete turns, secure the locknut and wirelock the adjuster. Run the engine to maximum speed and check that there is no tendency for the SVD valve to vibrate excessively and shutdown.

When running the engine to check the operation of the valve, restrain the mechanism so that the valve is not allowed to fully close.

When testing shutdown, ensure that this is done at low speed and is not more often than necessary.

FLAME ARRESTOR

Fit a clean element every 12 hours or more frequently if necessary. To remove the element, slacken all six captive bolts, draw two captive bolts into loading bracket and half turn anti–clockwise to secure. Pivot flame trap element to approximately 45 deg. and remove. Clean by soaking in carbon removing solvent e.g. Applied Chemicals 8–77, 8–38 or Castrol ICP 140 or similar.

CAUTION

Do not place a hot flame arrestor In the cleaning fluid.

HEAT EXCHANGER

On major overhaul, or in the event of shutdown due to excessive exhaust temperature not reconciled by other checks, clean the heat exchanger interior with a carbon solvent: e.g. Applied Chemicals 8–77, 8–38 or Castrol ICP 140.

Remove the heat exchanger from the machine, blank off the gas inlet ports, and with the outlet uppermost, fill the casing with solvent and allow to soak for four hours. Empty and thoroughly hose out the interior. Remove all fluid from the heat exchanger, repeat if necessary. During this operation, **do not allow solvent into water passages.**

The heat exchanger gas parts should be blown out, refit the cooler and run the engine until warm. Top up the water system and check for leaks. A clean exhaust flame arrestor element must be fitted. It should be noted that after cleaning the heat exchanger, loose carbon particles may be released during the initial period, after which it is necessary to clean the exhaust flametrap.

AIR FILTER ELEMENTS

The air filters should be inspected and maintained daily.

Dust collector boxes should be cleaned daily; this will become more frequent in dusty operating conditions. Dust collector boxes must not be allowed to become more than half full.

It is recommended that air filter elements be replaced by new Ingersoll–Rand elements. However, if new elements are not at hand, the blocked elements may be cleaned and reused. For cleaning, the following instructions must be adhered to:

NEVER REMOVE AND REPLACE ELEMENTS WHEN COMPRESSOR IS RUNNING

REMOVAL AND CLEANING

1. Clean exterior of filter housing.
2. Remove end cap and empty dust collector box.
3. Unscrew hexagon nut main element to housing.
4. Remove element.
5. Clean inside housing.
6. Clean element by directing a jet of dry compressed air at no more than 5 bar (73 p.s.i.) at an angle of 45 deg. to the outside of element. Carefully blow any dust from each fold of the element.

NEVER USE COMPRESSED AIR TO BLOW THROUGH THE ELEMENT MEDIA.

7. Mark the number of services to the main element on the end of the safety element, which should be replaced at least every five (5) services of the main element.
8. Elements must not be cleaned and re–used.

INSPECTION

1. Check for cracks, holes or any other damage to the element by holding it up against a light or by passing a lamp inside.
2. Check the seal at the end of the cartridge and replace if any sign of damage is evident.
3. Renew safety element if inspection reveals damage to main element.

REPLACEMENT

1. Assemble the new or cleaned elements into the filter housing.
2. Ensure that the seal seats properly on the bottom of the housing.
3. Secure the element in housing by hand tightening the hexagon nut.
4. Assemble the dust collector box parts ensuring they are correctly positioned with the lug interlocked with the slot in the cover rim.
5. Ensure that the arrow and 'top' marking on the collector box is correctly positioned.
6. Reset restriction indicator by depressing rubber diaphragm.
7. Before starting machine, check all clamps are tight.

AIR STARTER MOTOR

Normally the motor requires no maintenance except for topping up of the lubricator reservoir. But should the motor need to be removed for repairs, the following points should be noted;

1. When disassembling, always mark adjacent parts on the motor housing cover, cylinder housing gear case and drive housing so that these items can be located in the same position when the motor is re–assembled.
2. Do not disassemble the motor any further than necessary to replace a worn or damaged part.

3. Do not remove any part which is a press fit in or on a sub–assembly unless the removal of that part is necessary for replacement or repairs.
4. Always have a complete set of vanes, seals and O–rings on hand before commencing any overhaul of a starter.

Never re–use old seals or O–Rings.

TESTING THE STARTER MOTOR

1. Turn the Drive Pinion by hand in the direction of starter rotation. The clutch should ratchet smoothly with a slight 'clicking' action

NOTE: Proper Starter rotation is indicated when facing the Drive Pinion. That is, a Starter having the letter "R" in the model number is designated as a right–hand rotation model, and the Drive Pinion will rotate clockwise when facing the Drive Pinion.

2. Turn the Drive Pinion in the opposite direction of the Starter rotation. The gearing and motor should rotate freely with no binding.
3. Attach an air hose to the "IN" port on the Drive Housing, and apply 50 psig (3.4 bar/345 kPa) air pressure. The Drive Pinion should remove outward and air should escape from the "OUT" port.

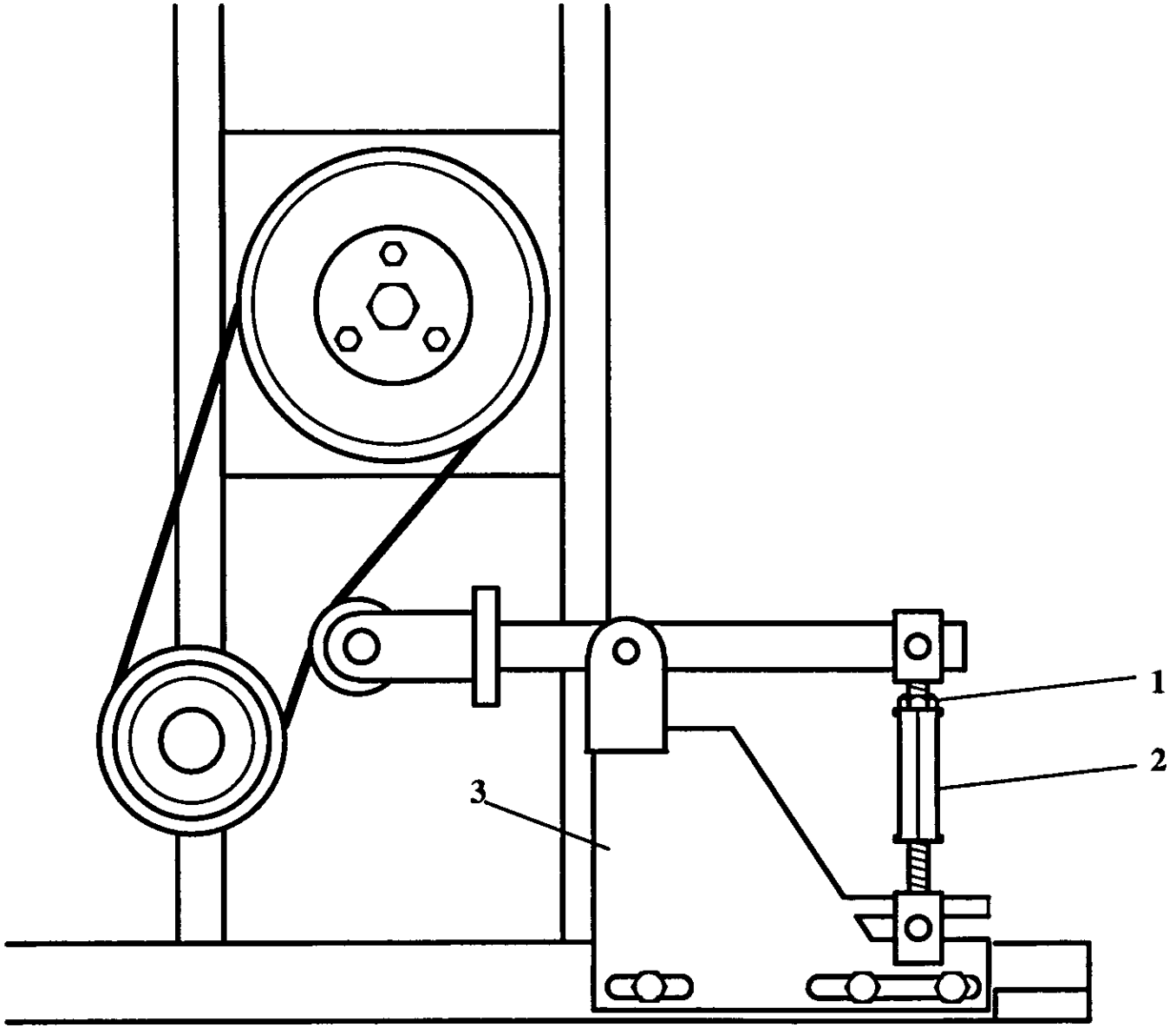
4. Plug the "OUT" port and apply 150 psig (10.3 bar/1034 kPa) air pressure to the "IN" port. Check to make certain no air is escaping. Measure the distance from the face of the Drive Pinion farthest from the mounting flange to the machined face of the mounting flange. It should be 2.75" (70.0 mm +/– 1.5 mm). With the air pressure on and the Drive Shaft extended, push the Drive Pinion toward the Drive Housing until the Pinion rotates slightly and comes to a solid stop. While holding the Drive Pinion against the stop, measure again the distance from the face of the Drive Pinion to the machined face of the mounting flange. The difference between the two measurements must be 0.47" (12.0 mm +/– 0.9 mm). Remove the pressure from the "IN" port and measure again the distance from the face of the Drive Pinion to the machined face of the mounting flange. It should be 1.82" (46.2 mm +/–1.5 mm).
5. Attach a $^3/_8$" (9 mm) air hose to the inlet of the motor and apply 90 psig (6.2 bar/620 kPa) air pressure. The Starter motor should run smoothly.
6. Plug the exhaust port and apply 30 psig (2.1 bar/207 kPa) air pressure to the inlet of the motor. Immerse the Starter for thirty seconds in a non–flammable solvent. If the Starter is properly sealed, no bubbles will appear.

RADIATOR AND OIL COOLER

Each month it is recommended that the radiator be cleaned. When grease, oil and dirt accumulate on the cooling faces, the efficiency of the radiator becomes impaired.

HOSES

At regular intervals, inspect all of the intake lines to and from the air cleaners, and all flexible hoses used for air lines, oil lines and fuel lines.


1
2
3

FAN BELT TENSIONING

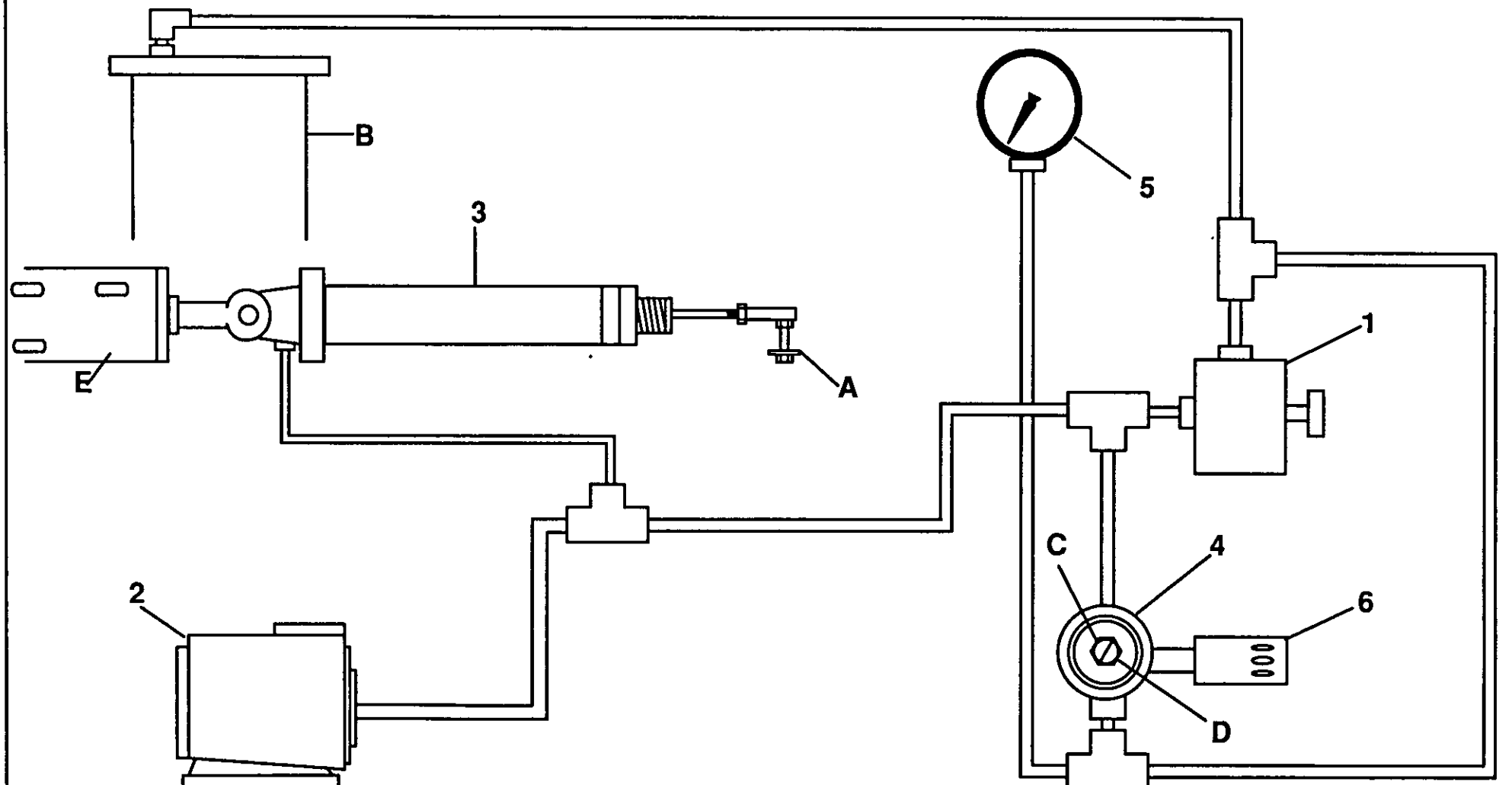
The cooling fan is driven from the compressor male rotor by a poly–vee drive belt.

It is important that this belt is correctly tensioned to prevent it from slipping. To adjust the tension of the belt, the following instructions must be adhered to:

A. Release turnbuckle locknut (1) and slacken turnbuckle body (2).
B. Slacken the screws securing support plate (3).
C. Ensure support plate (3) is pushed fully forward towards the pulley.
D. Tighten screws to secure support plate (3).
E. Hand tighten turnbuckle body (2) and run machine.
CORRECT BELT TENSION IS WHEN NO SLIPPAGE OCCURS ON CHANGE OF SPEED.
F. If belt squeals on change of speed or stopping of machine, increase the belt tension.
G. When correct tension is achieved, tighten turnbuckle locknuts (1).

PERIODICALLY CHECK TIGHTNESS OF ALL FAN MOUNTING BOLTS AND DRIVE PARTS. THE FAN MOUNTING NUT SHOULD BE TIGHTENED TO A TORQUE VALUE OF 260 LB.FT/80Nm.

N.B. Fan drive belt must be replaced after 500 hours to maintain anti–static properties


B
3
5
E
A
1
2
C
4
6
D
T1567

A Engine Throttle Arm

B Separator Tank

C Locknut

D Adjusting Screw

E Air Cylinder Bracket

1 Start–Run Valve

2 Unloader

3 Air Cylinder

4 Regulator

5 Discharge Air Pressure Gauge

6 Silencer/Orifice

Normally regulation requires no adjusting, but if correct adjustment is lost, proceed as follows.

Before Starting Engine

1. Inspect Engine Throttle Arm 'A' on engine governor to see that it is resting against Full Speed Stop .

2. Loosen Locknut 'C' and turn Adjusting Screw 'D' anti–clockwise until no tension is felt on screw. Now turn screw one full turn clockwise.

After Starting Engine

3. Allow unit to warm up then press Start–Run Valve '1'

4. Open and adjust service valve on outside of machine to maintain normal operating pressure at discharge pressure gauge.

5. Ensuring that pressure is maintained at 100psi (6.9 bar), turn Adjusting Screw 'D' until Engine Throttle Arm 'A' just lifts off Full Speed Stop.

NOTE: Turning Adjusting Screw 'D' clockwise will raise full speed pressure.

6. Close service valve, engine will slow to idle speed Loosen locknut on Air Cylinder '3'and rotate to adjust idle speed to 1200 rpm. Repeat steps 5–6 if required.