Doosan Infracore
Portable Power

OPERATING & MAINTENANCE MANUAL

P1060/XP950/HP900/MHP825
VHP750/SHP825/RHP750

COMPRESSOR MODELS

This manual contains important safety information.

Do not destroy this manual.

This manual must be available to the personnel who operate and maintain this machine.

Doosan Infracore Portable Power (Shanghai) Co., Ltd.
88 Guanghua road, Songjiang District, Shanghai
Code: 201614

www.doosanportablepower.com

Book:46623600 (2012-10) Rev.A

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

TABLE OF CONTENTS
Operation & Maintenance Manual

TABLE OF CONTENTS
Operation & Maintenance Manual

TABLE OF CONTENTS
Operation & Maintenance Manual

"Always Use DOOSAN Replacement Parts"

Foreword

Foreword

The contents of this manual are considered to be proprietary and confidential to Doosan Infracore Portable Power (herein referred to as “Portable Power”), and should not be reproduced without the prior written permission of Portable Power.

Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding the Portable Power products described herein. Any such warranties or other terms and conditions of sale of products shall be in accordance with the standard terms and conditions of sale for such products, which are available upon request.

This manual contains instructions and technical data to cover all routine operation and scheduled maintenance tasks by operation and maintenance staff. Major overhauls are outside the scope of this manual and should be referred to an authorized Portable Power Service department.

All components, accessories, pipes and connectors added to the compressed air system should be:

- of good quality, procured from a reputable manufacturer and, wherever possible, be of a type approved by Portable Power.
- clearly rated for a pressure at least equal to the machine maximum allowable working pressure.
- compatible with the compressor lubricant/coolant.
- accompanied with instructions for safe installation, operation and maintenance.

Details of approved equipment are available from the Portable Power Service departments. The use of repair parts other than those included within the approved parts list may create hazardous conditions over which **DOOSAN (DIPP)** has no control. Therefore, Portable Power cannot be held responsible for equipment in which non-approved repair parts are installed.

Portable Power reserves the right to make changes and improvements to products without notice and without incurring any obligation to make such changes or add such improvements to products sold previously.

The intended uses of this machine are outlined below and examples of unapproved usage are also given. However, Portable Power cannot anticipate every application or work situation that may arise. **If in doubt, consult supervision**.

This machine has been designed and supplied for above ground operation to be used for compression of normal ambient air containing no additional gases, vapors or particles within the ambient temperature range specified in the general data section of this manual.

This machine should not be used:

A. For direct or indirect human consumption of the compressed air.

B. Outside the ambient temperature range specified in the general data section of this manual.

C. When an actual or foreseeable risk of hazardous levels of flammable gases or vapors exists.

D. With other than Portable Power approved components.

E. With guards, or controls or switches missing or disabled.

F. For storage or transportation of materials inside or on the enclosure.

This company accepts no responsibility for errors in translation of this manual from the original English version.

You as the customer are expected to provide certain service and maintenance items. Your Portable Power dealer will provide all other more detailed service and maintenance items on a special preventive maintenance schedule for each machine. It is very important that the minimum service and maintenance requirements explained in this manual be performed at the required intervals. Exceeding these intervals may reduce the reliability of the machine.

The purpose of this manual is to train the operator with functions, operation, and basic service and maintenance requirements of the compressor. During the preparation of this manual, every effort was made to ensure the adequacy and accuracy of the contents.

Your Portable Power dealer will assist with setup and initial startup of the compressor. He will also provide brief operating and service instructions and will insure that a copy of this manual is included with the machine. Before starting the compressor, this manual and instructions should be carefully read to obtain a thorough knowledge of the duties to be performed. Please take pride in the compressor, keep it clean, and in good mechanical condition.

"Always Use DOOSAN Replacement Parts"

Safety

Safety

Safety Precautions

General Information

Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

Ensure that the operator reads and understands the decals and consults the manuals before maintenance or operation.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Make sure that all protective covers are in place and that the canopy/doors are closed during operation.

The specification of this machine is such that the machine is not suitable for use in flammable gas risk areas. If such an application is required then all local regulations, codes of practice and site rules must be observed. To ensure that the machine can operate in a safe and reliable manner, additional equipment such as gas detection, exhaust spark arrestors, and intake (shut-off) valves may be required, dependent on local regulations or the degree of risk involved.

A weekly visual check must be made on all fasteners/fixing screws securing mechanical parts. In particular, safety-related parts such as coupling hitch, drawbar components, road-wheels, and lifting bail should be checked for total security.

All components which are loose, damaged or unserviceable, must be rectified without delay.

Air discharged from this machine may contain carbon monoxide or other contaminants which will cause serious injury or death. Do not breathe this air.

This machine produces loud noise with the doors open or service valve vented. Extended exposure to loud noise can cause hearing loss. Always wear hearing protection when doors are open or service valve is vented.

Never inspect or service unit without first disconnecting battery cable(s) to prevent accidental starting.

Do not use petroleum products (solvents or fuels) under high pressure as this can penetrate the skin and result in serious illness. Wear eye protection while cleaning unit with compressed air to prevent debris from injuring eye(s).

Rotating fan blade can cause serious injury. Do not operate without guard in place.

Use care to avoid contacting hot surfaces (engine exhaust manifold and piping, air receiver and air discharge piping, etc.).

Ether is an extremely volatile, highly inflammable gas. When it is specified as a starting aid, use sparingly. DO NOT USE ETHER IF THE MACHINE HAS GLOW PLUGS OR INLET HEATER STARTING AIDS OR ENGINE DAMAGE WILL RESULT.

Never operate unit with guards, covers or screens removed. Keep hands, hair, clothing, tools, blow gun tips, etc. well away from moving parts.

Compressed Air

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

Ensure that the machine is operating at the rated pressure and that the rated pressure is known to all relevant personnel.

All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine safety valve setting.

If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurized or over pressurized by another.

Compressed air must not be used for a direct feed to any form of breathing apparatus or mask.

High Pressure Air can cause serious injury or death. Relieve pressure before removing filler plugs/caps, fittings or covers.

Air pressure can remain trapped in air supply line which can result in serious injury or death. Always carefully vent air supply line at tool or vent valve before performing any service.

The discharged air contains a very small percentage of compressor lubricating oil and care should be taken to ensure that downstream equipment is compatible.

If the discharged air is to be ultimately released into a confined space, adequate ventilation must be provided.

When using compressed air, always use appropriate personal protective equipment.

All pressure containing parts, especially flexible hoses and their couplings, must be regularly inspected, be free from defects and be replaced according to the Manual instructions.

Avoid bodily contact with compressed air.

The safety valve located in the separator tank must be checked periodically for correct operation.

Whenever the machine is stopped, air will flow back into the compressor system from devices or systems downstream of the machine unless the service valve is closed. Install a check valve at the machine service valve to prevent reverse flow in the vent of an unexpected shutdown when the service valve is open.

Disconnected air hoses whip and can cause serious injury or death. Always attach a safety flow restrictor to each hose at the source of supply or branch line in accordance with OSHA Regulation 29CFR Section 1926.302(b).

Never allow the unit to sit stopped with pressure in the receiver-separator system.

Materials

The following substances may be produced during the operation of this machine:

- brake lining dust
- engine exhaust fumes

Avoid inhalation

Ensure that adequate ventilation of the cooling system and exhaust gases is maintained at all times.

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly:

- anti-freeze
- compressor lubricant
- engine lubricant
- preservative grease
- rust preventative
- diesel fuel
- battery electrolyte

Avoid ingestion, skin contact and inhalation of fumes

Should compressor lubricant come into contact with the eyes, then irrigate with water for at least 5 minutes.

Should compressor lubricant come into contact with the skin, then wash off immediately.

Consult a physician if large amounts of compressor lubricant are ingested.

Consult a physician if compressor lubricant is inhaled.

Never give fluids or induce vomiting if the patient is unconscious or having convulsions.

Safety data sheets for compressor and engine lubricants should be obtained from the lubricant supplier.

Do NOT start or operate this machine in a confined area. Avoid breathing exhaust fumes when working on or near the machine.

This machine may include such materials as oil, diesel fuel, antifreeze, brake fluid, oil/air filters and batteries which may require proper disposal when performing maintenance and service tasks. Contact local authorities for proper disposal of these materials.

Battery

A battery contains sulfuric acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes and clothing. In case of contact, flush area immediately with water.

⚠ WARNING

Do not attempt to slave start a frozen battery since this may cause it to explode.

Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of each battery. Connect one end of other cable to the negative (-) terminal of the booster battery and other end to a ground connection away from dead battery (to avoid a spark occurring near any explosive gases that may be present). After starting unit, always disconnect cables in reverse order.

Radiator

Hot engine coolant and steam can cause injury. Ensure that the radiator filler cap is removed with due care and attention.

Do not remove the pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap.

Transport

When loading or transporting machines ensure that the specified lifting and tie down points are used.

When loading or transporting machines ensure that the towing vehicle, its size, weight, towing hitch and electrical supply are all suitable to provide safe and stable towing at speeds either, up to the legal maximum for the country in which it is being towed or, as specified for the machine model if lower than the legal maximum.

Do not exceed gross vehicle weight rating.

Before towing the machine, ensure that:-

- the tires and towing hitch are in a serviceable condition.
- the canopy is secure.
- all ancillary equipment is stored in a safe and secure manner.
- the brakes and lights are functioning correctly and meet necessary road traffic requirements.
- break-away cables/safety chains are connected to the towing vehicle.

The machine must be towed in a level attitude in order to maintain correct handling, braking and lighting functions. This can be achieved by correct selection and adjustment of the vehicle towing hitch and, on variable height running gear, adjustment of the drawbar.

1. Make sure wheels, tires and tow bar connectors are in safe operating condition and tow bar is properly connected before towing.
2. When parking always use the handbrake and, if necessary, suitable wheel chocks.

Safety chains/connections and their adjustment where fitted:

Ensure that the breakaway cable is securely coupled to the trailer and also to a substantial point on the towing vehicle.

Loop the chains onto the towing vehicle using the towing vehicle hitch as an anchorage point, or any other point of similar strength.

Ensure that the effective chain length is as short as possible while still allowing normal articulation of the trailer and effective operation of the breakaway cable.

Decals

Decals are located on the machine to point out potential safety hazards. Read and follow these instructions. If you do not understand the instructions, inform your supervisor.

Note that there are different decal headings:

(Red Background)

Indicates the presence of a hazard which WILL cause serious injury, death or property damage, if ignored.

(Orange Background)

Indicates the presence of a hazard which CAN cause serious injury, death or property damage, if ignored.

(Yellow Background)

Indicates the presence of a hazard which WILL or can cause injury or property damage, if ignored.

(Blue Background)

Indicates important set-up, operating or maintenance information.

FREE SAFETY DECALS

To promote communication of Safety Warnings on products manufactured by the Portable Power Division in Statesville, N.C. Safety Decals are available free of charge. Safety decals are identified by the decal heading: DANGER, WARNING or CAUTION. Decal part numbers are on the bottom of each decal and are also listed in the compressor's parts manual. Submit orders for Safety Decals to the Statesville Parts Service Department. The no charge order should contain only Safety Decals. Help promote product safety! Replace decals that are not readable.

Noise Emission

Noise Emission Control Maintenance Log

COMPRESSOR MODEL_____

SERIAL NO. _____

USER UNIT NO. _____

UNIT IDENTIFICATION	**DEALER OR DISTRIBUTOR FROM WHOM PURCHASED:**
Engine Make & Model:_____	
Serial No.:_____	_____
Purchaser or Owner:_____	_____
Address: _____	Date Purchased:_____
_____	

The Noise Control Act of 1972 (86 Stat. 1234) prohibits tampering with the noise control system of any compressor manufactured and sold under the above regulations, specifically the following acts or the causing thereof:

(1) The removal or rendering inoperative by any persons, other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into new compressor for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use; or (2) the use of the compressor after such device or element of design has been removed or rendered inoperative by any person.

Noise Emission Warranty

The manufacturer warrants to the ultimate purchaser and each subsequent purchaser that this air compressor was designed, built and equipped to conform at the time of sale to the first retail purchaser, with all applicable U.S. EPA Noise Control Regulations.

This warranty is not limited to any particular part, component, or system of the air compressor. Defects in the design, assembly or in any part, component, or system of the compressor which, at the time of sale to the first retail purchaser, caused noise emissions to exceed Federal Standards are covered by this warranty for the life of the air compressor. (40FR204.58-1).

Introduction

The unit for which this Maintenance Log is provided conforms to U.S. E.P.A. Regulations for Noise Emissions, applicable to Portable Air Compressors.

The purpose of this book is to provide (1) the Maintenance Performance Schedule for all required noise emission controls and (2) space so that the purchaser or owner can record what maintenance was done, by whom, where and when. The Maintenance Schedule and detailed instructions on the maintenance items are given on the following page.

Maintenance Schedule

Item	Area	Period
A.	Compressed Air Leaks	As Detected
B.	Safety and Control Systems	As Detected
C.	Acoustic Materials	Daily
D.	Fasteners	100 hours
E.	Enclosure Panels	100 hours
F.	Air Intake & Engine Exhaust	100 hours
G.	Cooling Systems	250 hours
H.	Isolation Mounts	250 hours
I.	Engine Operation	See Operator's Manual
J.	Fuels & Lubricants	See Operator's Manual

A. Compressed Air Leaks

Correct all compressed air leaks during the first shutdown period after discovery. If severe enough to cause serious noise problems and efficiency loss, shut down immediately and correct the leak(s).

B. Safety and Control Systems

Repair or replace all safety and control systems or circuits as malfunction occurs. No compressor should be operated with **either** system bypassed, disabled, or nonfunctional.

C. Acoustic Materials

In daily inspections, observe these materials. Maintain all acoustic material as nearly as possible in its original condition. Repair or replace all sections that have: 1) sustained damage, 2) have partially separated from panels to which they were attached, 3) are missing, or have otherwise deteriorated due to severe operating or storage conditions.

D. Fasteners

All fasteners such as hinges, nuts, bolts, clamps, screws, rivets and latches should be inspected for looseness after each 100 hours of operation. They should be retightened, repaired, or - if missing - replaced immediately to prevent subsequent damage and noise emission increase.

E. Enclosure Panels

Enclosure panels should also be inspected at 100 hour operational intervals. All panels that are warped, punctured, torn, or otherwise deformed, such that their noise containment function is reduced, should be repaired or replaced before the next operation interval. Doors, access panels, and hatch closures especially, should be checked and adjusted at this time to insure continuous seating between gasket or acoustic material and the mating frame.

F. Air Intake and Engine Exhaust

Engine and compressor air intake and engine exhaust systems should be inspected after each 100 hours of operation for loose, damaged, or deteriorated components. Repairs or replacements should be made before the next period of use.

G. Cooling Systems

All components of the cooling system for engine water and compressor oil should be inspected every 250 hours of use. Any discrepancies found should be corrected before placing the unit back in operation. Unrestricted airflow over the radiator and oil cooler must be maintained at all times during operation.

H. Isolation Mounts

Engine/airend isolation mounts should be inspected after each 250 hours of operation. Those mounts with cracks or splits in the molded rubber, or with bent or broken bolts due to operation or storage in severe environments, all should be replaced with equivalent parts.

I. Engine Operation

Inspect and maintain engine condition and operation as recommended in the manuals supplied by the engine manufacturer.

J. Fuels and Lubricants

Use only the types and grades of fuels and lubricants recommended in the **DOOSAN (DIPP)** Company and Engine Manufacturer’s Operator and Maintenance Manuals.

Table 1:

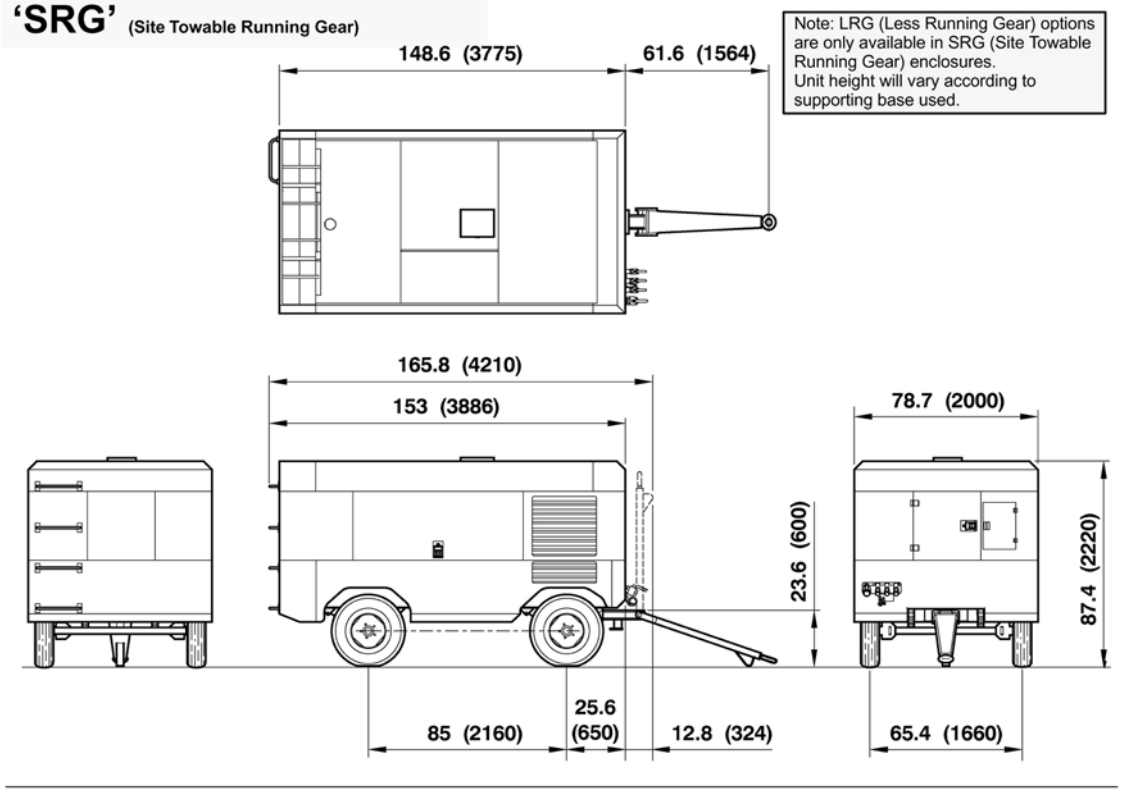
MAINTENANCE RECORD FOR NOISE EMISSION CONTROL AND EXTENDED WARRANTY					
ITEM NO.	DESCRIPTION OF WORK OR COMMENTS	HOURMETER READING	MAINT/ INSPECT DATE	LOCATION CITY/STATE	WORK DONE BY (NAME)

"Always Use DOOSAN Replacement Parts"

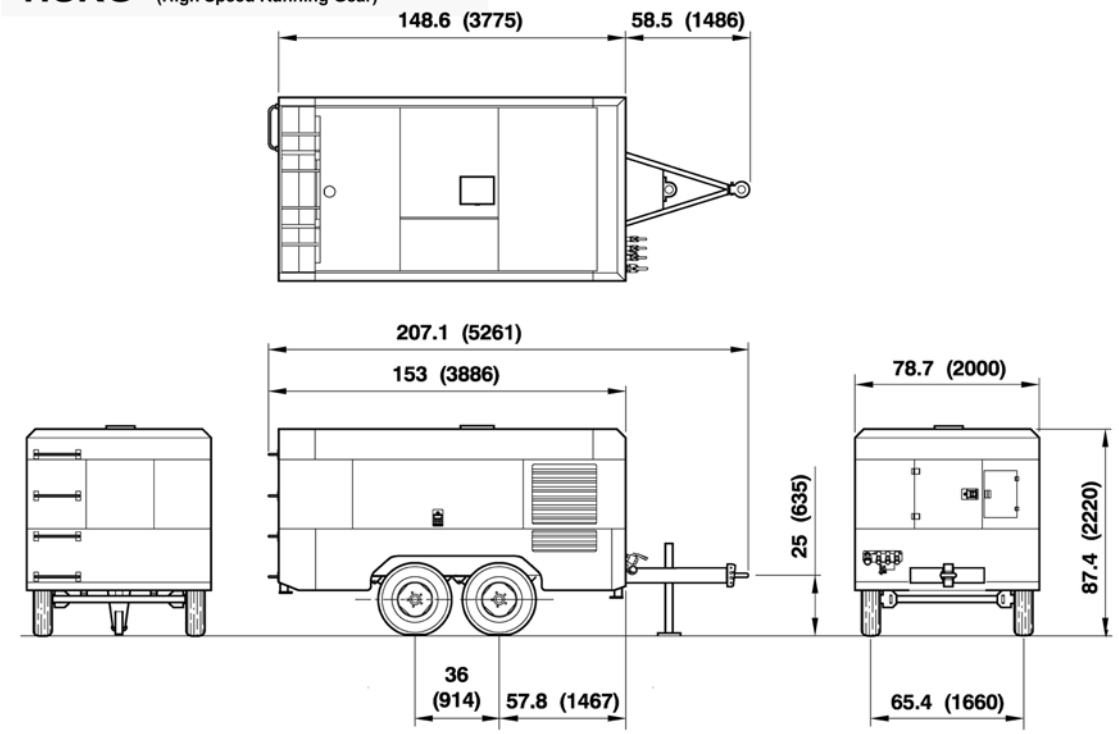
General Information

General Information - MSA (SRG/HRG)

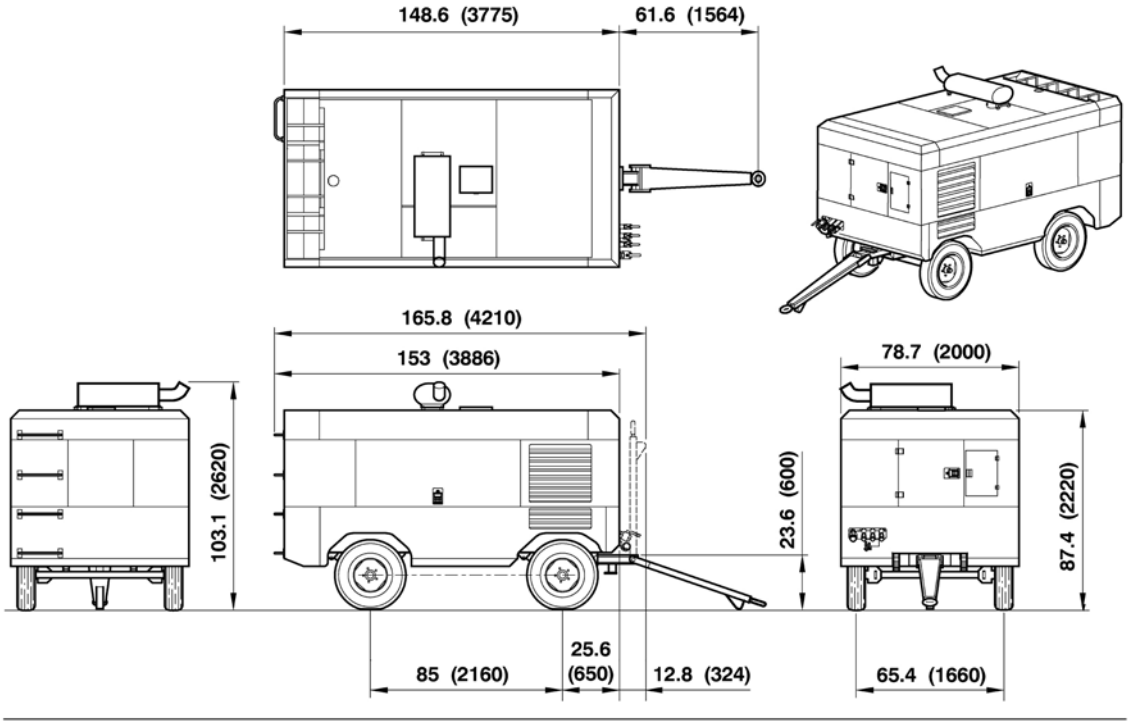
'SRG' (Site Towable Running Gear)



'HSRG' (High Speed Running Gear)



'HA' (High Ambient)
FOR MSA EXPORT ONLY



MODEL		XHP750	**VHP750**
COMPRESSOR			
Actual free air delivery.	cfm (m^3/min)	750 (21,2)	750 (21,2)
Normal operating discharge pressure.	psi (bar)	300 (21)	200 (14)
Safety valve setting	psi (bar)	362 (25)	250 (17)
Whisperized (W) operating ambient temperature range	°F (°C)	14/120 (-10/+49)	14/120 (-10/+49)
High Ambient (HA) operating ambient temperature range	°F (°C)	14/125 (-10/+52)	14/125 (-10/+52)
Maximum discharge temperature	°F (°C)	248 (120)	248 (120)
COMPRESSOR			
Cooling system.	Oil Injection		
Oil capacity.	Gallons/ Litres	19.8 (75)	18.5 (70)
Maximum oil system temperature	°°F (°C)	248 (120)	248 (120)
Maximum oil system pressure	psi (bar)	362 (25)	250 (17)
LUBRICATING OIL SPECIFICATION (for the specified ambient temperatures)**.**	**SEE NOTE**	Protec	Protec
ENGINE			
MODEL		**XHP750**	**VHP750**
Engine Type (Displacement)	/litre	CAT C9(8.9)	CAT C9(8.9)
Number of cylinders		6	6
Oil capacity.	gal (litre)	6.3 (24)	6.3 (24)
Speed at full load.	RPM	1800	1800
Speed at idle.	RPM	1350	1200
Electrical system.	V DC	24	24
Power available at rated speed	hp (KW)	300 (224)	350 (261)
Fuel tank capacity	gal (litre)	145/110 (550/416)	145/110 (550/416)
Coolant capacity	gal (litre)	12.7 (48)	12.7 (48)
Max. gross weight (srg)	lb	10,900	10,560
Shipping weight (srg)	lb	9920	9370

Note: Refer to Compressor Lubrication Chart. NA= not available

Sound Level Data (’W’ Model)

- Meets U.S EPA - 76dB(A) @ 7 meters

RUNNING GEAR/TIRE DATA	Site Running Gear (SRG)	High Speed Running Gear (HSRG)
Number of wheels.	4	4
Tire size	750x16 LT/E	8-14.5 LT/G
Tire pressure	75 psi (5.2 bar)	110 psi (7.6 bar)
Maximum towing speed	20 mph (35kph)	65 mph (105kph)

Further information may be obtained by request through **DOOSAN (DIPP)** ***customer services department.***

"Always Use DOOSAN Replacement Parts"

Operating Instructions

Operating Instructions

Commissioning

Upon receipt of the unit, and prior to putting it into service, it is important to adhere strictly to the instructions given below in *PRIOR TO STARTING*.

Ensure that the operator reads and *understands* the decals and consults the manuals before maintenance or operation.

Ensure that the position of the *emergency stop* device is known and recognised by its markings. Ensure that it is functioning correctly and that the method of operation is known.

Before towing the unit, ensure that the tire pressures are correct (refer to the *GENERAL INFORMATION* section of this manual) and that the handbrake is functioning correctly (refer to the *MAINTENANCE* section of this manual). Before towing the unit ensure that the lights are functioning correctly (where fitted).

Ensure that all transport and packing materials are discarded.

Ensure that the correct fork lift truck slots or marked lifting / tie down points are used whenever the machine is lifted or transported.

When selecting the working position of the machine ensure that there is sufficient clearance for ventilation and exhaust requirements, observing any specified minimum dimensions (to walls, floors etc.).

Adequate clearance needs to be allowed around and above the machine to permit safe access for specified maintenance tasks.

Ensure that the machine is positioned securely and on a stable foundation. Any risk of movement should be removed by suitable means, especially to avoid strain on any rigid discharge piping.

Attach the battery cables to the battery(s) ensuring that they are tightened securely. Attach the negative cable before attaching the positive cable

⚠ WARNING

All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine rated pressure, and materials compatible with the compressor lubricant (refer to the GENERAL INFORMATION section).

⚠ WARNING

If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidently be pressurised/over pressurised by another.

⚠ WARNING

If flexible discharge hoses are used, it is recommended that safety retaining wires are used on the hoses.

Prior to Starting

1. Place the unit in a position that is as level as possible. The design of the unit permits a 15 degree lengthways and sideways limit on out of level operation.

   When the unit has to be operated out of level, it is important to keep the engine oil level near the high level mark (with the unit level).

⚠ CAUTION

Do not overfill either the engine or the compressor with oil.

2. Check the engine lubrication oil in accordance with the operating instructions in the Engine Operator's Manual.
3. Check the compressor oil level in the sight glass located on the separator tank. Liquid level should be in the green zone.
4. Check the diesel fuel level. A good rule is to top up at the end of each working day. This prevents condensation from occurring in the tank.

⚠ CAUTION

Use only a No. 2–D diesel fuel oil with a minimum octane number of 45 and a sulphur content not greater than 0,5%.

⚠ CAUTION

When refuelling:-

- switch off the engine.
- do not smoke.
- extinguish all naked lights.
- do not allow the fuel to come into contact with hot surfaces.
- wear personal protective equipment.

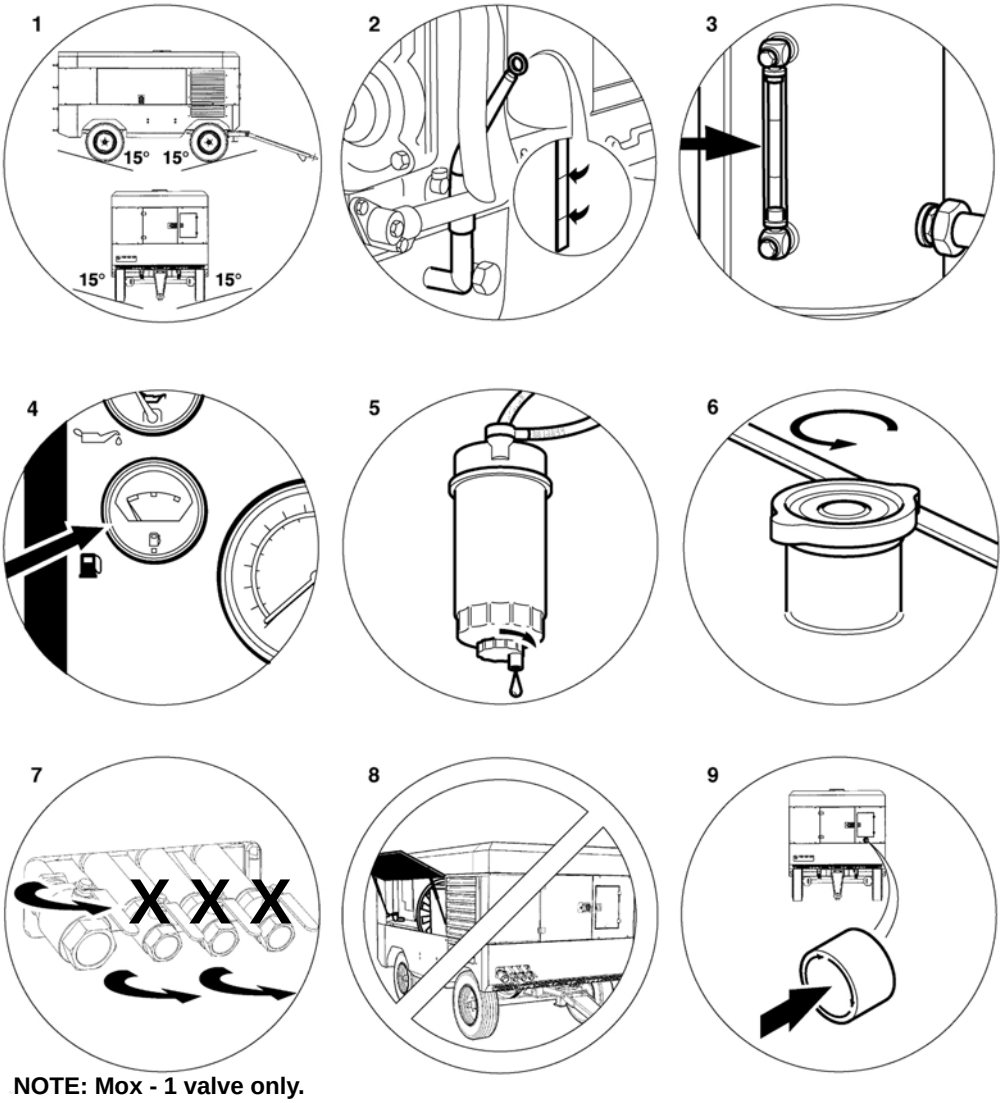
5. Drain fuel filter water separator of water ensuring that any released fuel is safely contained.
6. Check the radiator coolant level (with the unit level).
7. Open the service valve(s) to ensure that all pressure is relieved from the system. Close the service valve(s).

⚠ CAUTION

8. Do not operate the machine with the canopy/doors in the open position as this may cause overheating and operators to be exposed to high noise levels.

9. Check the emergency stop. Rotate knob as indicated to release.
10. Close the manual relief valve inside the service door near the emergency stop.

When starting or operating the machine in temperatures below or approaching 0°C (32°F), ensure that the operation of the regulation system, the unloader valve, the safety valve, and the engine are not impaired by ice or snow, and that all inlet and outlet pipes and ducts are clear of ice and snow.



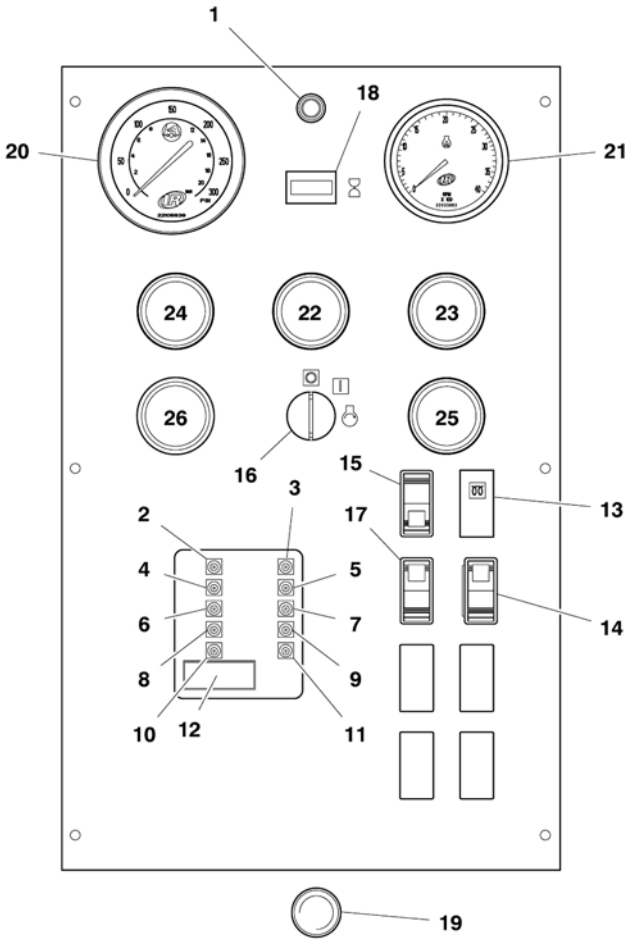
NOTE: Mox - 1 valve only.

Operating Controls and Instruments

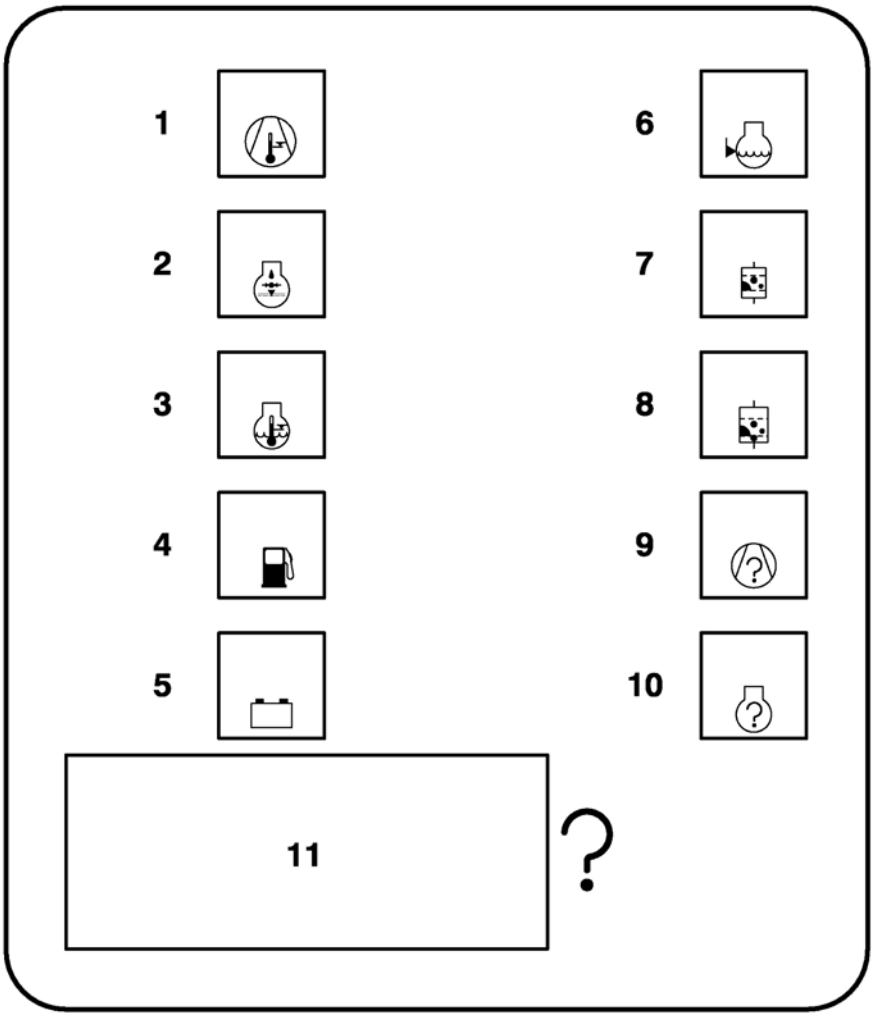
The operating controls and instruments are arranged on the control panel as shown above. A description of each panel device is as follows:

1. **Panel Light:** Illuminates the instrument control panel controlled by Switch 14.
2. **High Compressor Temp:** Fault indicator lamp. Indicates shutdown due to high compressor temperature.
3. **Low Radiator Coolant Level:** Alarm indicator lamp. Indicates engine coolant needs service.
4. **Low Engine Oil Pressure:** Fault indicator lamp. Indicates shutdown due to low engine oil pressure.
5. **Restricted Air Filter:** Alarm indicator lamp. Indicates engine/compressor air inlet filters need service.
6. **High Engine Coolant Temp:** Fault indicator lamp. Indicates shutdown due to high engine water temperature.
7. **Restricted IQ Air Filters:** Fault indicator lamp. Indicates shutdown due to high pressure in "IQ" air filters (if equipped).
8. **Low Fuel Level:** Fault indicator lamp. Indicates shutdown due to low fuel level. Lamp blinks at low fuel warning.
9. **Compressor Malfunction:** Fault indicator lamp. Indicates shutdown due to compressor system fault. Refer to Fault Code List.
10. **Low Battery Voltage:** Alarm indicator lamp. Indicates battery or charging system requires service.
11. **Engine Malfunction:** Engine Fault code. Refer to service card or engine manual for codes and service requirements.
12. **Malfunction Code (4 Digit):** Compressor or engine fault. Refer to manual for list of codes and service requirements.
13. **Inlet Heater/Wait to Start Lamp:** Indicates engine manifold pre heater is energized. Wait until lamp extinguishes before engaging starter.
14. **Panel Light Switch:** Controls panel lamp # 1.
15. **Service Air Switch:** Momentary contact switch. Allows engine to warm up at low compressor pressure.
16. **ON/OFF Start Switch:** Main Power Control Switch.
17. **Heater Switch:** ON/OFF Power Switch for regulation and IQ heaters. Prevents freeze up in cold weather.
18. **Hourmeter:** Indicates machine operating hours.
19. **E-STOP:** Emergency Stop Push Button. Push to stop, turn to release.

20. **Discharge Air Pressure Gage:** Indicates pressure in receiver tank, normally from 0 psi(kPa) to the rated pressure of the machine.
21. **Engine Tachometer:** Indicates engine speed in RPM from 0 when stopped to full speed.
22. **Fuel Level Gage:** Indicate fuel level in tank.
23. **Engine Water Temp Gage**
24. **Compressor Oil Temp Gage**
25. **Engine Oil Pressure Gage**
26. **Battery Voltage Gage**



Wedge Diagnostic Display Codes



1. **High Compressor Temp:** Fault indicator lamp. Indicates shutdown due to high compressor temperature.
2. **Low Engine Oil Pressure:** Fault indicator lamp. Indicates shutdown due to low engine oil pressure.
3. **High Engine Coolant Temp:** Fault indicator lamp. Indicates shutdown due to high engine water temperature.
4. **Low Fuel Level:** Fault indicator lamp. Indicates shutdown due to low fuel level. Lamp blinks at low fuel warning.
5. **Low Battery Voltage**: Alarm indicator lamp. Indicates battery or charging system requires service.
6. **Low Radiator Coolant Level:** Alarm indicator lamp. Indicates engine coolant needs service.

7. **Restricted Air Filter:** Alarm indicator lamp. Indicates engine/compressor air inlet filters need service.
8. **Restricted IQ Air Filters:** Fault indicator lamp. Indicates shutdown due to high pressure in “IQ” air filters (if equipped).
9. **Compressor Malfunction:** Fault indicator lamp. Indicates shutdown due to compressor system fault. Refer to Fault Code List.
10. **Engine Malfunction:** Engine Fault code. Refer to service card or engine manual for codes and service requirements.
11. **Malfunction Code (4 Digit):** Compressor or engine fault. Refer to manual for list of codes and service requirements.

WEDGE DIAGNOSTIC DISPLAY CODES

	ALERT		SHUTDOWN		
Condition	**Code**	**Light (Blinks)**	**Code**	**Light (Steady)**	**Delay (Sec)**
Engine Speed < Min. RPM			1	CPRSR Malf	30
Engine Speed > Max. RPM			2	CPRSR Malf	30
Engine Crank Time Exceeded			3	CPRSR Malf	0
High Engine Oil Temp	5	CPRSR Malf			
High Intake Manifold Temp	6	CPRSR Malf			
Water in Fuel	8	CPRSR Malf			
Engine Not Responding to Throttle Command	10	CPRSR Malf			
Too Many Start Attemps During Autostart			11	CPRSR Malf	0
Engine Shuts Itself Down: reason unknown			29	CPRSR Malf	0
Low AE oil pressure			31	CPRSR Malf	20
Disch. Temp (RT2) Sensor Fault			32	CPRSR Malf	10
Sep. Tank Temp (PT1) Sensor Fault	33	CPRSR Malf			
Sep. Tank Press. >20 psi during start attempt (engine will not crank)			34	CPRSR Malf	0
Machine Over Pressure			35	CPRSR Malf	1

	ALERT		SHUTDOWN		
Condition	**Code**	**Light (Blinks)**	**Code**	**Light (Steady)**	**Delay (Sec)**
Safety Valve Open			36	CPRSR Malf	2
Sep. Tank Temp > 247 deg F			50	CPRSR Malf	3
Machine ID Not Valid			51	CPRSR Malf	0
Sep. Tank Temp (RT1) Sensor Fault			53	CPRSR Malf	10
Reg. Sys. Pressure (PT2) Sensor Fault	54	CPRSR Malf			
Estop Button Pushed	55	CPRSR Malf	55	CPRSR Malf	3
Minimum Pressure Not Met	56	CPRSR Malf			
Serial Comm. Problem	70	CPRSR Malf			
CAN Bus Problem	71	CPRSR Malf			
Auto Start/Stop Module Failure - No Comm for 17 sec.	73	CPRSR Malf			
Low Fuel Level		Fuel level		Fuel level	3
Air Filter Restriction		Soiled filter			
Low Battery Voltage		Batt charging cond.			
Low Engine Oil Pressure		Low eng. oil pressure			
Low Coolant Level		Eng. coolant level			
High Engine Coolant Temp.		High engine temp		High eng. temp.	10
IQ FIlter Restriction				IQ filter restriction	3
High Discharge Temp. (RT2> 247 deg. F)				High comp. temp.	3

CATERPILLAR C-9 Engine Diagnostic and Event Flash Codes

Displayed Code	Definition
21	5 volt sensor DC power supply short to + batt
	5 volt sensor DC power supply short to ground
	8 volt DC supply short to + batt
	8 volt DC supply short to ground
24	Engine oil pressure open/short to + batt
	Engine oil pressure short to ground
	Engine oil pressure abnormal rate of change
25	Boost pressure sensor abnormal rate of change
	Boost pressure sensor open/short to + batt
	Boost pressure sensor short to ground
26	Atmospheric pressure open/short + batt
	Atmospheric pressure short to ground
27	Engine coolant temperature open/short to + batt
	Engine coolant temperature short to ground
28	Throttle position calibration required
32	Throttle position signal abnormal
34	Engine speed signal abnormal
	Secondary engine speed signal abnormal
35	Engine overspeed WARNING
	Engine overspeed shutdown
37	Fuel pressure open/short + batt
	Fuel pressure short to ground
38	Intake manifold air temperature open/short + batt
	Intake manifold air temperature short to ground
39	Injector actuation pressure signal erratic
	Injector actuation pressure voltage high
	Injector actuation pressure voltage low
	Injector actuation pressure system fault

Displayed Code	Definition
42	Engine timing calibration required
46	Low engine oil pressure WARNING
	Low engine oil pressure derate
	Low engine oil pressure shutdown
49	Air inlet heater relay open/current below normal
	Air inlet heater relay grounded/current above normal
51	System voltage intermittent/erratic/high/low
56	Check programmable parameters
58	J1939 Data Link Communications
61	High engine coolant temperature WARNING
	High engine coolant temperature derate
	High engine coolant temperature shutdown
62	Low engine coolant level WARNING
	Low engine coolant level derate
	Low engine coolant level shutdown
63	High fuel pressure WARNING
64	High inlet air temperature WARNING
	High inlet air temperature shutdown
65	High fuel temperature WARNING
	High fuel temperature derate
	High fuel temperature shutdown
71	Injector cylinder #1 fault
72	Injector cylinder #2 fault
73	Injector cylinder #3 fault
74	Injector cylinder #4 fault
75	Injector cylinder #5 fault
76	Injector cylinder #6 fault

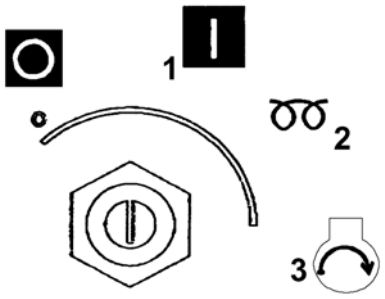
Starting the Machine

Ensure emergency stop button is reset.

⚠ WARNING

Under no circumstances should volatile fluids such as ether be used for starting this machine.

All normal starting functions are incorporated in the key operated switch.



Turn the keyswitch to (position 1);

- The auxiliary start compressor will operate to close the inlet valve.
- The wedge controller will execute a lamp test.
- The low engine oil pressure and low battery lamps will flash indicating proper communication between wedge and engine ECM.

Inlet heater/Wait to start light

- Turn the key switch to on (position *1*) until the inlet heater warning light **13** extinguishes.

NOTE: Position *2* is not used

- Turn the key switch to crank position *3* (engine start position).
- Release to on (position *1*) when the engine starts. The engine will now be running at a reduced speed.
- During warm up, the engine will idle at 1500RPM. After warm up the engine will idle at a lower speed.

NOTE: In order to allow the machine to start at a reduced load, a valve, which is operated by a service air switch located on the instrument panel, is incorporated in the regulation system. (The valve automatically returns to the start position when the machine is switched off and air pressure relieved from the system).

- Allow the engine to reach its operating temperature - then press the pressure control button **15**.
- At this point in the operation of the machine it is safe to apply *full load* to the engine.

⚠ CAUTION

If the engine does not start, repeat the above procedure after waiting for a minimum of one minute.

If the engine fails to start, refer to the *MAINTENANCE* section of this manual, and to the *ENGINE MANUFACTURER'S MANUAL*.

Stopping the Machine

- Close the service valve.
- Allow the machine to run unloaded for a short period of time to reduce the engine temperature.
- Turn the ON/OFF start switch to the *0* (off) position.

NOTE: As soon as the engine stops, the automatic blowdown valve will relieve all pressure from the system, except for the discharge pipe/ manifold area. This area should be depressurised by opening the discharge valve, keeping clear of any airflow from it.

If the automatic blowdown valve fails to operate, then pressure must be relieved from the system by means of the service valve(s).

⚠ WARNING

WARNING: When relieving system pressure by means of the service valve(s), a small amount of pressure will remain in the system. No maintenance work should be carried out if this situation exists. Relieve this pressure by opening the manual blowdown valve.

⚠ CAUTION

Never allow the machine to stand idle with pressure in the system.

Emergency Stopping

In the event that the unit has to be stopped in an emergency, **PRESS THE EMERGENCY STOP SWITCH ON THE FRONT OF THE MACHINE.**

If the unit is not fitted with an emergency stop switch, rotate the start switch to the (0) off position.

Re-Starting After an Emergency

Disengage emergency stop control from engaged (depressed) position. (IF FITTED)

If the machine has been switched off because of a machine malfunction, then identify and correct the fault before attempting to re-start.

If the machine has been switched off for reasons of safety, then ensure that the machine can be operated safely before re-starting.

Refer to the *PRIOR TO STARTING* and *STARTING THE UNIT* instructions earlier in this section before re-starting the machine.

Monitoring During Operation

Should any of the safety shut-down conditions occur, the unit will stop. Refer to the wedge diagnostic display codes table for a listing of shutdown conditions.

⚠ CAUTION

CAUTION: To ensure an adequate flow of oil to the compressor at low temperature, never allow the discharge pressure to fall below 50 psig bar.

Decommissioning

When the machine is to be permanently decommissioned or dismantled, it is important to ensure that all hazard risks are either eliminated or notified to the recipient of the machine. In particular:-

- Do not destroy batteries or components containing asbestos without containing the materials safely.
- Do not dispose of any pressure vessel that is not clearly marked with its relevant data plate information or rendered unusable by drilling, cutting etc.
- Do not allow lubricants or coolants to be released into land surfaces or drains.
- Do not dispose of a complete machine without documentation relating to instructions for its use.

"Always Use DOOSAN Replacement Parts"

Maintenance

Maintenance

Maintenance Interval Chart

Maintenance Interval Chart							
	Initial 500 miles /850 km	**Daily**	**Weekly**	250 hours	**3 Months 500 hrs.**	**6 Months 1000 hrs**	**12 Months 2000 hrs**
Compressor Oil Level		**C**					
Engine Oil Level		**C**					
*Radiator Coolant Level		**C**					
Gauges/Lamps		**C**					
*Air Cleaner Service Indicators		**C**					
Fuel Tank (Fill at end of day)		**C**				**D**	
*Fuel/Water Separator Drain		**C**					
Oil Leaks		**C**					
Fuel Leaks		**C**					
Drain Water From Fuel Filters		**D**					
Coolant Leaks		**C**					
Radiator Filler Cap		**C**					
Air Cleaner Precleaner Dumps			**C**				
Fan/Alternator Belts			**C**				
Battery Connections/Electrolyte			**C**				
Tire Pressure and Surface			**C**				
*Wheel Lug Nuts				**C**			
Hoses (Oil, Air, Intake, etc.)				**C**			
Automatic Shutdown System				**C**			
Air Cleaner System				**C**			
Compressor heat exchanger exterior				**C**			
* Engine heat exchanger exterior				**C**			
Fasteners, Guards					**C**		
Air Cleaner Elements						**R/WI**	

	Initial 500 miles/ 850 km	Daily	Weekly	250 hrs	3 Months 500 hrs	6 Months 1000 hrs	12 Months 1500 hrs	12 Months 2000 hrs
Engine coolant conditioner					**R**			
Fuel/Water Separator Element				**R**				
Compressor Oil Filter Element					**R**			
Compressor Oil						**R**		
Engine Oil Change				**R**				
Engine Oil Filter				**R**				
*Water Pump Grease.						**R**		
*Wheels (Bearings, Seals, etc.)								**C**
*Engine Coolant						**C**		**R**
Fuel Filter Element (Service interval varies with fuel quality)				**R**				
*Injection Nozzle Check							C	
Shutdown Switch Settings								**T**
Scavenger Orifice & Related Parts								**C**
Oil Separator Element								**R**
Lights (running, brake, & turn)		**CBT**						
Pintle Eye Bolts		**CBT**						
*Brakes		**CBT**						
*Brake linkage	**C**							
Emergency stop				**T**				
Fasteners				**C**				
Running gear linkage				**G**				
Running gear bolts(1)				**C**				

	Initial 500 miles/ 850 km	Daily	Weekly	250 hrs	3 Months 500 hrs	6 Months 1000 hrs	12 Months 1500 hrs	12 Months 2000 hrs
Separator tank (2) exterior								CR
Lubricator (fill) *		C						
	2 yrs	4 yrs	6 yrs					
Safety valve	C							
Hoses		R						
Separator Tank (2) interior			C					

*Disregard if not appropriate for this particular machine.

(1) or 3000 miles/5000km whichever is the sooner

(2) or as defined by local or national legislation

C = Check (adjust, clean or replace as necessary)

CBT = check before towing.

CR = Check and report

D = Drain

G = Grease

R = Replace

T = Test

W I = or when indicated if earlier.

Refer to specific sections of the operator’s manual for more information.

Routine Maintenance

This section refers to the various components which require periodic maintenance and replacement.

The *SERVICE MAINTENANCE INTERVAL CHART* indicates the various components' descriptions and the intervals when maintenance has to take place. Oil capacities, etc., can be found in the *GENERAL INFORMATION* section of this manual.

For any specification or specific requirement on service or preventative maintenance for the engine, refer to the *Engine Manufacturer's Manual*.

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

If the automatic blowdown fails to operate, then pressure must be gradually relieved by operating the manual blowdown valve. Suitable personal protective equipment should be worn.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Prior to attempting any maintenance work, ensure that:-

- All air pressure is fully discharged and isolated from the system. If the automatic blowdown valve is used for this purpose, then allow enough time for it to complete the operation.

  NOTE: Pressure will always remain in the part of the system between the minimum pressure valve and the discharge valve after operation of the auto blowdown valve.

  THIS PRESSURE MUST BE RELIEVED BY CAREFULLY:

  a. DISCONNECTING ANY DOWNSTREAM EQUIPMENT.

  b. OPENING THE DISCHARGE VALVE TO ATMOSPHERE.

  (USE HEARING PROTECTION IF NECESSARY).

- The machine cannot be started accidently or otherwise, by posting warning signs and/or fitting appropriate anti–start devices.
- Disconnect batteries.

Prior to opening or removing panels or covers to work *inside* a machine, ensure that:-

- anyone entering the machine is aware of the reduced level of protection and the additional hazards, including hot surfaces and intermittently moving parts.
- the machine cannot be started accidently or otherwise, by posting warning signs and/ or fitting appropriate anti-start devices.

Prior to attempting any maintenance work on a *running* machine, ensure that:-

- the work carried out is limited to only those tasks which require the machine to run.
- the work carried out with safety protection devices disabled or removed is limited to only those tasks which require the machine to be running with safety protection devices disabled or removed.
- all hazards present are known (e.g. pressurised components, electrically live components, removed panels, covers and guards, extreme temperatures, inflow and outflow of air, intermittently moving parts, safety valve discharge etc.).
- appropriate personal protective equipment is worn.
- loose clothing, jewellery, long hair etc. is made safe.
- warning signs indicating that *Maintenance Work is in Progress* are posted in a position that can be clearly seen.

Upon completion of maintenance tasks and prior to returning the machine into service, ensure that:-

- the machine is suitably tested.
- all guards and safety protection devices are refitted.
- all panels are replaced, canopy and doors closed.
- hazardous materials are effectively contained and disposed of.

Protective Shutdown System

Refer to the Wedge diagnostic display codes table for a listing of shutdown conditions.

Low Engine Fuel Level Switch

At three month intervals, test the low engine fuel level switch circuit as follows:

- Start the machine.

NOTE: Do not press the load button.

- Disconnect the switch, the machine should shutdown.
- Re-connect the switch.

At twelve month intervals, test the low engine fuel level switch by removing and operating the float manually.

⚠ CAUTION

Never remove or replace switches when the machine is running.

Scavenge Line

The scavenge line runs from the combined orifice/drop tube in the separator tank, to the orifice fitting located in the airend.

Examine the orifice, check valve and hoses at every service or in the event of oil carryover into the discharge air.

It is good preventative maintenance to check that the scavenge line and tube are clear of any obstruction each time the compressor lubricant is changed as any blockage will result in oil carryover into the discharge air.

Compressor Oil Filter

Refer to the *MAINTENANCE INTERVAL CHART* in this section for the recommended servicing intervals.

Removal

⚠ WARNING

Do not remove the filter(s) without first making sure that the machine is stopped and the system has been completely relieved of all air pressure. (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

Clean the exterior of the filter housing and remove the *spin-on* element by turning it in a counter-clockwise direction.

Inspection

Examine the filter element.

⚠ CAUTION

If there is any indication of the formation of varnishes, shellacs or lacquers on the filter element, it is a warning that the compressor lubricating and cooling oil has deteriorated and that it should be changed immediately. Refer to *LUBRICATION* later in this section.

Reassembly

Clean the filter gasket contact area and install the new element by screwing in a clockwise direction until the gasket makes contact with the filter housing. Tighten a further 1/2 to 3/4 of a revolution.

⚠ CAUTION

Start the machine (refer to *PRIOR TO STARTING* and *STARTING* THE UNIT in the *OPERATING INSTRUCTIONS* section of this manual) and check for leakage before the machine is put back into service.

Compressor Oil Separator Element

Refer to the *SERVICE MAINTENANCE INTERVAL CHART* in this section for service intervals.

Removal

⚠ WARNING

***Do not remove the filter(s) without first making sure that the machine is stopped and the system has been completely relieved of all air pressure.* (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).**

Disconnect all hoses and tubes from the separator tank cover plate. Remove the drop–tube from the separator tank cover plate and then remove the cover plate. Remove the separator element.

Inspection

Examine the filter element. Examine all hoses and tubes, and replace if necessary.

Reassembly

Thoroughly clean the orifice/drop tube and filter gasket contact area before reassembly. Install the new element.

⚠ WARNING

Do not remove the staple from the anti-static gasket on the separator element since it serves to ground any possible static build-up. Do not use gasket sealant since this will affect electrical conductance.

Reposition the cover plate, taking care not to damage the gasket, and replace the cover plate screws tightening in a *criss-cross* pattern to the recommended torque (refer to the *TORQUE SETTING TABLE* later in this section).

Replace the drop-tube and reconnect all hoses and tubes to the separator tank cover plate.

Replace the compressor oil (refer to *LUBRICATION* later in this section).

⚠ CAUTION

Start the machine (refer to *PRIOR TO STARTING* and *STARTING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual) and check for leakage before the machine is put back into service.

Compressor Oil Cooler & Engine Radiator Air Charge Cooler

When grease, oil and dirt accumulate on the exterior surfaces of the oil cooler and radiator, the efficiency is impaired. It is recommended that each month the oil cooler and radiator be cleaned by directing a jet of compressed air, (carrying if possible a non-flammable cleaning solvent) over the exterior core of the cooler/radiator. This should remove any accumulation of oil, grease and dirt from the exterior core of the cooler so that the entire cooling area can radiate the heat of the lubricating and cooling oil/water into the air stream.

⚠ WARNING

Hot engine coolant and steam can cause injury. When adding coolant or antifreeze solution to the engine radiator, stop the engine at least one minute prior to releasing the radiator filler cap. Using a cloth to protect the hand, slowly release the filler cap, absorbing any released fluid with the cloth. Do not remove the filler cap until all excess fluid is released and the engine cooling system fully depressurised.

⚠ WARNING

Follow the instructions provided by the antifreeze supplier when adding or draining the antifreeze solution. It is advisable to wear personal protective equipment to prevent skin and eye contact with the antifreeze solution.

Air Filter Element

The air filter should be inspected regularly (refer to the *SERVICE MAINTENANCE INTERVAL CHART*) and the element replaced when the restriction indicator lamp illuminates. The dust collector box(es)should be cleaned daily (more frequently in dusty operating conditions) and not allowed to become more than half full.

Removal

⚠ CAUTION

Never remove and replace element(s) when the machine is running.

Clean the exterior of the filter housing and remove the filter element by releasing the nut.

If the safety element is to be renewed, thoroughly clean the interior of the filter housing prior to removing the safety element.

Inspection

Check for cracks, holes or any other damage to the element by holding it up to a light source, or by passing a lamp inside.

⚠ CAUTION

If inspection reveals damage to the main element, the safety element *must* be replaced.

Check the seal at the end of the element and replace if any sign of damage is evident.

Reassembly

Assemble the new element into the filter housing ensuring that the seal seats properly.

Secure the element in the housing by hand tightening the nut.

Assemble the dust collector box parts, ensuring that they are correctly positioned.

Before restarting the machine, check that all clamps are tight.

Ventilation

Always check that the air inlets and outlets are clear of debris etc.

⚠ CAUTION

NEVER clean by blowing air inwards.

Cooling Fan Drive

Periodically check that the fan mounting bolt in the fan hub has not loosened. If, for any reason, it becomes necessary to remove the fan or re-tighten the fan mounting bolt, apply a good grade of commercially available thread locking compound to the bolt threads and tighten to the torque value shown in the *TORQUE SETTING TABLE* later in this section.

The fan belt(s) should be checked regularly for wear and correct tensioning.

Fuel System

The fuel tank should be filled daily or every eight hours. To minimise condensation in the fuel tank(s), it is advisable to top up after the machine is shut down or at the end of each working day. At six month intervals drain any sediment or condensate that may have accumulated in the tank(s).

Fuel Filter Water Separator

The fuel filter water separator contains a filter element which should be replaced at regular intervals (see the *SERVICE/MAINTENANCE CHART*).

Charge Cooler Pipework:-

Inspect all hoses and clips on the charge cooler pipe work.

Engine damage will occur if the charge cooling system leaks.

Hoses

All components of the engine cooling air intake system should be checked periodically to keep the engine at peak efficiency.

At the recommended intervals, (see the *SERVICE MAINTENANCE INTERVAL CHART*), inspect all of the intake lines to the air filter, and all flexible hoses used for air lines, oil lines and fuel lines.

Periodically inspect all pipework for cracks, leaks, etc. and replace immediately if damaged.

Electrical System

⚠ WARNING

Always disconnect the battery cables before performing any maintenance or service.

Inspect the safety shutdown system switches and the instrument panel relay contacts for evidence of arcing and pitting. Clean where necessary.

Check the mechanical action of the components.

Check the security of electrical terminals on the switches and relays i.e. nuts or screws loose, which may cause local hot spot oxidation.

Inspect the components and wiring for signs of overheating i.e. discolouration, charring of cables, deformation of parts, acrid smells and blistered paint.

Battery

⚠ WARNING

Always disconnect the battery cables before performing any maintenance or service.

Keep the battery terminals and cable clamps clean and lightly coated with petroleum jelly to prevent corrosion.

The retaining clamp should be kept tight enough to prevent the battery from moving.

Pressure System

At 3 month intervals it is necessary to inspect the external surfaces of the system (from the airend through to the discharge valve(s) including hoses, tubes, tube fittings and the separator tank, for visible signs of impact damage, excessive corrosion, abrasion, tightness and chafing. Any suspect parts should be replaced before the machine is put back into service.

Tire Pressure

See the *GENERAL INFORMATION* section of this manual.

Running Gear/Wheels

Check the wheel nut torque 20 miles (30 kilometres) after refitting the wheels. Refer to the *TORQUE SETTING TABLE* later in this section.

The bolts securing the running gear to the chassis should be checked periodically for tightness (refer to the *SERVICE/MAINTENANCE CHART* for frequency) and re-tightened where necessary. Refer to the *TORQUE SETTING TABLE* later in this section.

Lubrication

The engine is initially supplied with engine oil sufficient for a nominal period of operation (for more information, consult The *Engine Manufacturer's Manual*).

⚠ CAUTION

Always check the oil levels before a new machine is put into service.

If, for any reason, the unit has been drained, it must be re-filled with new oil before it is put into operation.

Engine Lubricating Oil

The engine oil should be changed at the engine manufacturer's recommended intervals. Refer to the *SERVICE/MAINTENANCE CHART*.

Engine Lubricating Oil Specification

Refer to the *Engine Manufacturer's Manual or Portable Compressor Fluid Chart.*

Engine Oil Filter Element

The engine oil filter element should be changed at the engine manufacturer's recommended intervals. Refer to the *SERVICE/MAINTENANCE CHART*.

Compressor Lubricating Oil

Refer to the *SERVICE / MAINTENANCE CHART* in this section for service intervals.

NOTE: If the machine has been operating under adverse conditions, or has suffered long shutdown periods, then more frequent service intervals will be required.

⚠ WARNING

DO NOT, under any circumstances, remove any drain plugs or the oil filler plug from the compressor lubricating and cooling system without first making sure that the machine is stopped and the system has been completely relieved of all air pressure *(refer to STOPPING THE UNIT in the OPERATING INSTRUCTIONS section of this manual).*

Completely drain the receiver/separator system including the piping and oil cooler by removing the drain plug(s) and collecting the used oil in a suitable container.

Replace the drain plug(s) ensuring that each one is secure.

NOTE: If the oil is drained immediately after the machine has been running, then most of the sediment will be in suspension and will therefore drain more readily.

⚠ CAUTION

Some oil mixtures are incompatible and result in the formation of varnishes, shellacs or lacquers which may be insoluble.

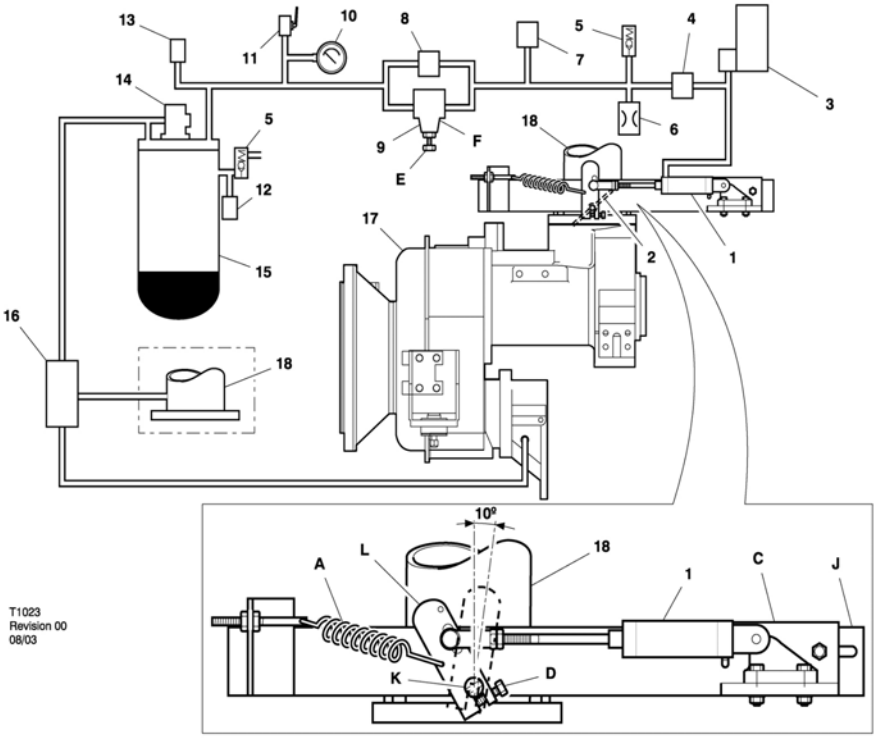
NOTE: Always specify DOOSAN (DIPP) Pro-Tec™ oil for use at all ambient temperatures above -23°C.

For extended warranty use only IR fluids. Refer to portable compressor fluids chart.

Running Gear Wheel Bearings

Wheel bearings should be packed with grease every 6 months. The type of grease used should conform to specification *MIL-G-10924*.

SPEED and PRESSURE REGULATION ADJUSTMENT



XHP,SHP

1	Air cylinder	**7**	Regulation pressure transducer	**13**	Pressure transducer
2	Butterfly valve	**8**	Start/Run solenoid	**14**	Minimum pressure valve
3	Mini compressor	**9**	Pressure regulator	**15**	Separator tank
4	Unloader Solenoid	**10**	Panel pressure guage	**16**	Auto blowdown valve
5	Relief valve	**11**	Manual blowdown valve	**17**	HR2 Airend
6	Orifice	**12**	Temperature sensor	**18**	Air inlet

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

Refer to the diagram above.

With the unit stopped, disconnect ballast spring **'A'** from the butterfly lever. Loosen the two screws securing bracket '**C**' to main bracket **'J'**.

Loosen screw **'D'** and rotate the butterfly valve pivot shaft **'K'** fully clockwise until the valve is closed. Position lever **'L'** approximately 10° after vertical and tighten screw **'D'**.

Keep the butterfly lever in the closed position and with the air cylinder fully contracted tighten the screws holding

bracket **'C'** to the main bracket **'J'**. (continued on next page).

Allow the cylinder to return to its extended position and reconnect the ballast spring **'A'**.

⚠ CAUTION

Ensure all components are aligned and move freely.

Start engine: Note receiver pressure. Warm up pressure should be 3,5-5,0 bar (50-70 p.s.i.).

To increase the warm up pressure, turn the air cylinder rod in an anti-clockwise direction to open the butterfly valve.

To reduce warm up pressure, turn air cylinder rod in clockwise direction to close butterfly valve.

When the engine is warmed up, press the service air switch on the control panel to commence normal regulation.

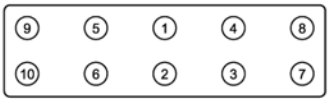
Set pressure by adjusting the screw **'E'** on the pressure regulator **'F'**. Turn the screw clockwise to increase pressure and anticlocwise to reduce pressure.

RATED OPERATING PRESSURE: XHP - 300 psig, SHP - 250 psig

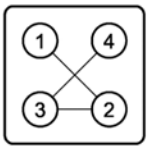
Torque Values

TABLE 1 INCH FASTENERS

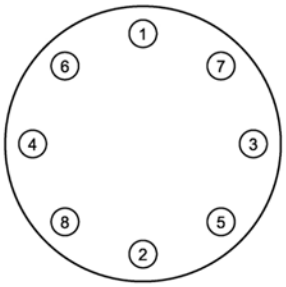
CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE			
	8AE J249 GRADE 5 (HEAD MARKING)		8AE J249 GRADE 8 (HEAD MARKING)	
	(Nm.)	(FT–LBF)	(Nm.)	(FT–LBF)
1/4 – 20	11	8	16	12
5/16 – 18	24	17	33	25
3/8 – 16	42	31	59	44
7/16 – 14	67	49	95	70
1/2 – 13	102	75	144	106
9/16 – 12	148	109	208	154
5/8 – 11	203	150	287	212
3/4 – 10	361	266	509	376



TYPICAL RECTANGULAR TORQUE PATTERN



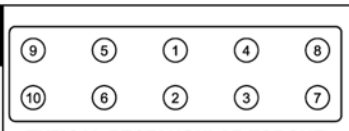
TYPICAL SQUARE TORQUE PATTERN



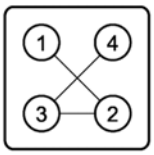
TYPICAL CIRCULAR TORQUE PATTERN

TABLE 2 METRIC FASTENERS

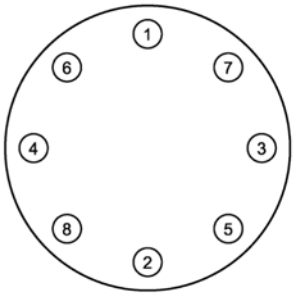
CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE					
	PROPERTY GRADE 8.8 (HEAD MARKING)		PROPERTY GRADE 10.9 (HEAD MARKING)		PROPERTY GRADE 12.9 (HEAD MARKING)	
	(Nm.)	(FT–LBF)	(Nm.)	(FT–LBF)	(Nm.)	(FT–LBF)
M6 X 1.0	11	8	15	11	18	13
M8 X 1.25	26	19	36	27	43	31
M10 X 1.5	52	38	72	53	84	62
M12 X 1.75	91	67	126	93	147	109
M14 X 2	145	107	200	148	234	173
M16 X 2	226	166	313	231	365	270
M20 X 2.5	441	325	610	450	713	526



TYPICAL RECTANGULAR TORQUE PATTERN



TYPICAL SQUARE TORQUE PATTERN



TYPICAL CIRCULAR TORQUE PATTERN

Table 3

Wheel Torque Chart - Inch			Wheel Torque Chart - Metric		
1/2” lug nuts	Torque (Ft-Lbs)			Torque (N-m)	Torque (ft-Lbs)
13” Wheel	80-90				
15” Wheel	105-115		M12 Bolts	85-95	62-70
16” Wheel	105-115		M14 Bolts	145-155	107-115
16.5” Wheel	105-115		M16 Bolts	175-185	129-137
5/8” Lug Nuts			M18 Bolts	205-215	151-159
16” Wheel	190-210				
17” Wheel	190-210				
9/16” Clamp nuts/Demountable Wheels					
14.5” Wheel	105-115				

Portable Compressor Fluid Chart

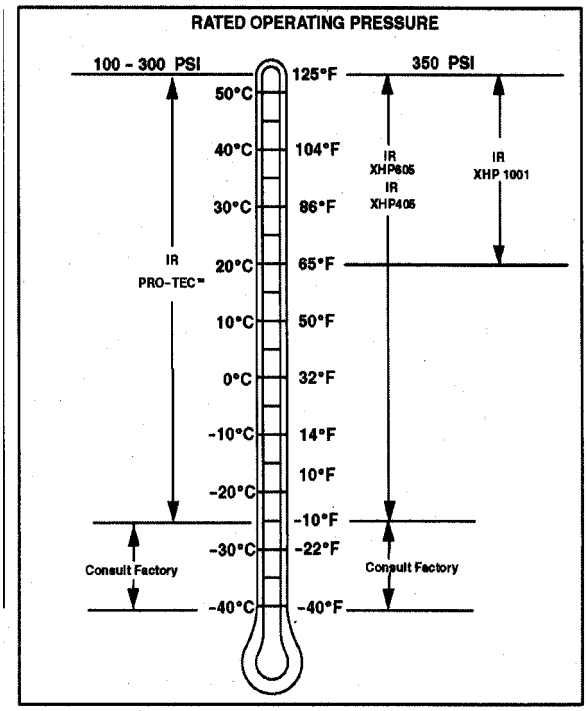
Refer to these charts for correct compressor fluid required. Note that the selection of fluid is dependent on the design operating pressure of the machine and the ambient temperature expected to be encountered before the next oil change.

NOTE: Fluids listed as “preferred” are required for extended warranty.

NOTE: Compressor oil carryover (oil consumption) may be greater with the use of alternative fluids.

Design Operating Pressure	Ambient Temperature	Specification
100 psi to 300 psi	-10°F to 125°F (-23°C to 52°C)	Preferred: **IR Pro-Tec™** Alternate: ISO Viscosity Grade 46 with rust and oxidation inhibitors, designed for air compressor service
350 psi	-10°F to 125°F (-23°C to 52°C)	Preferred: **IR XHP 605** Alternate: IR XHP405 ISO Viscosity Grade 68 Group 3 or 5 with rust and oxidation inhibitors designed for air compressor service.
	65°F to 125°F (18°C to 52°C)	Preferred: **XHP605, IR XHP1001**

Recommended **DOOSAN (DIPP)** Fluids - Use of these fluids with original IR filters can extend airend warranty. Refer to operator's manual warranty section for details or contact your IR representative.



DOOSAN (DIPP) Preferred Fluids	1 gal. (3.8 Litre)	5 gal. (19.0 Litre)	5 gal. (208.2 Litre)	220 gal. (836 litre)
Preferred:				
IR Pro-Tec™	36899698	36899706	36899714	36899722
IR XHP605	--	22252076	22252050	22252068
IR XHP1001	--	35612738	35300516	--
XHP405	--	22252126	22252100	22252118
Engine Oil	54480918	36875938	36866903	--

"Always Use DOOSAN Replacement Parts"

Machine Systems

General Information and Operational Theory

General

The mid-range machine has an electronic monitor and control system to provide discharge air pressure control and engine and package monitor functions. The system uses the WEDGE controller to perform these functions. The electrical system connects all the necessary switches, sensors and transducers to the WEDGE controller in order for it to perform the monitor and control functions. See drawing 22839609 for an overview of the control schematic.

Wedge Controller

The WEDGE controller is the heart of the machine monitor and control system. It provides data collection, alarming and control functions for compressor operations. It is a microcontroller based unit with analog and digital inputs and outputs.

The WEDGE controller is attached to the back of the control panel. The LED annunciators are part of the front panel of the WEDGE. They can be seen through the laminate on the front of the control panel.

The WEDGE is attached to the control panel with four #10 size nuts.

The first function of the WEDGE controller is to scan all analog and digital inputs at a fixed interval. These inputs are scanned every 50 milliseconds. The analog values are then compared against minimum and maximum values and an ALERT or SHUTDOWN is issued, if a value is out of range. The various ALERTS and SHUTDOWNS are listed in the Operation Instructions Section of this manual.

The second function of the WEDGE controller is machine discharge pressure control. The WEDGE monitors the regulation system air pressure and varies the engine throttle to maintain the setpoint discharge air pressure. The setpoint pressure is set using the regulator on the separator tank.

The third function of the WEDGE controller is to communicate with the diesel engine via theJ1939 CAN network. It retrieves diagnostic information over J1939.

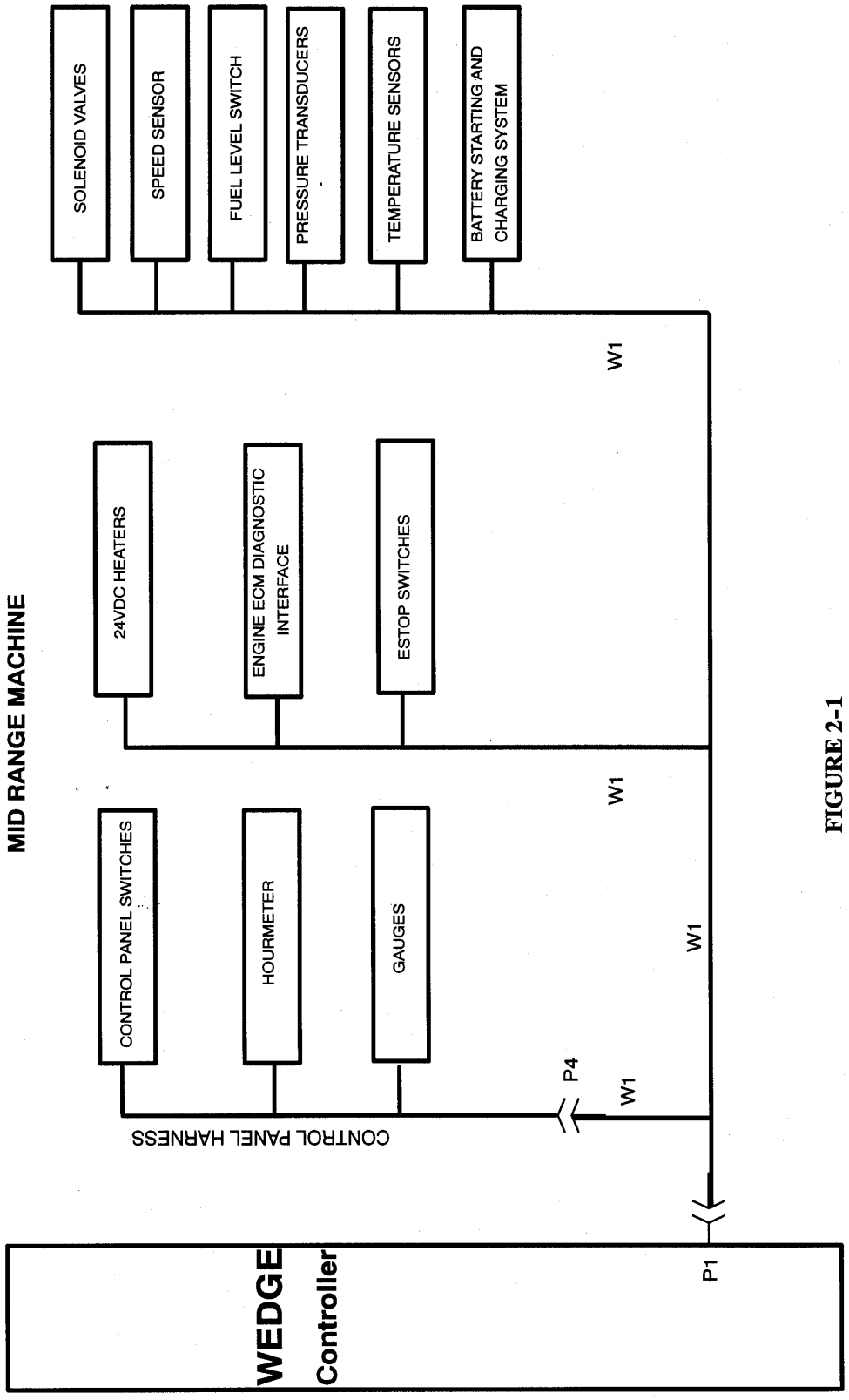

MID RANGE MACHINE
SOLENOID VALVES
SPEED SENSOR
FUEL LEVEL SWITCH
PRESSURE TRANSDUCERS
TEMPERATURE SENSORS
BATTERY STARTING AND CHARGING SYSTEM
W1
24VDC HEATERS
ENGINE ECM DIAGNOSTIC INTERFACE
ESTOP SWITCHES
W1
CONTROL PANEL SWITCHES
HOURMETER
GAUGES
W1
P4
W1
CONTROL PANEL HARNESS
P1
WEDGE
Controller

FIGURE 2-1

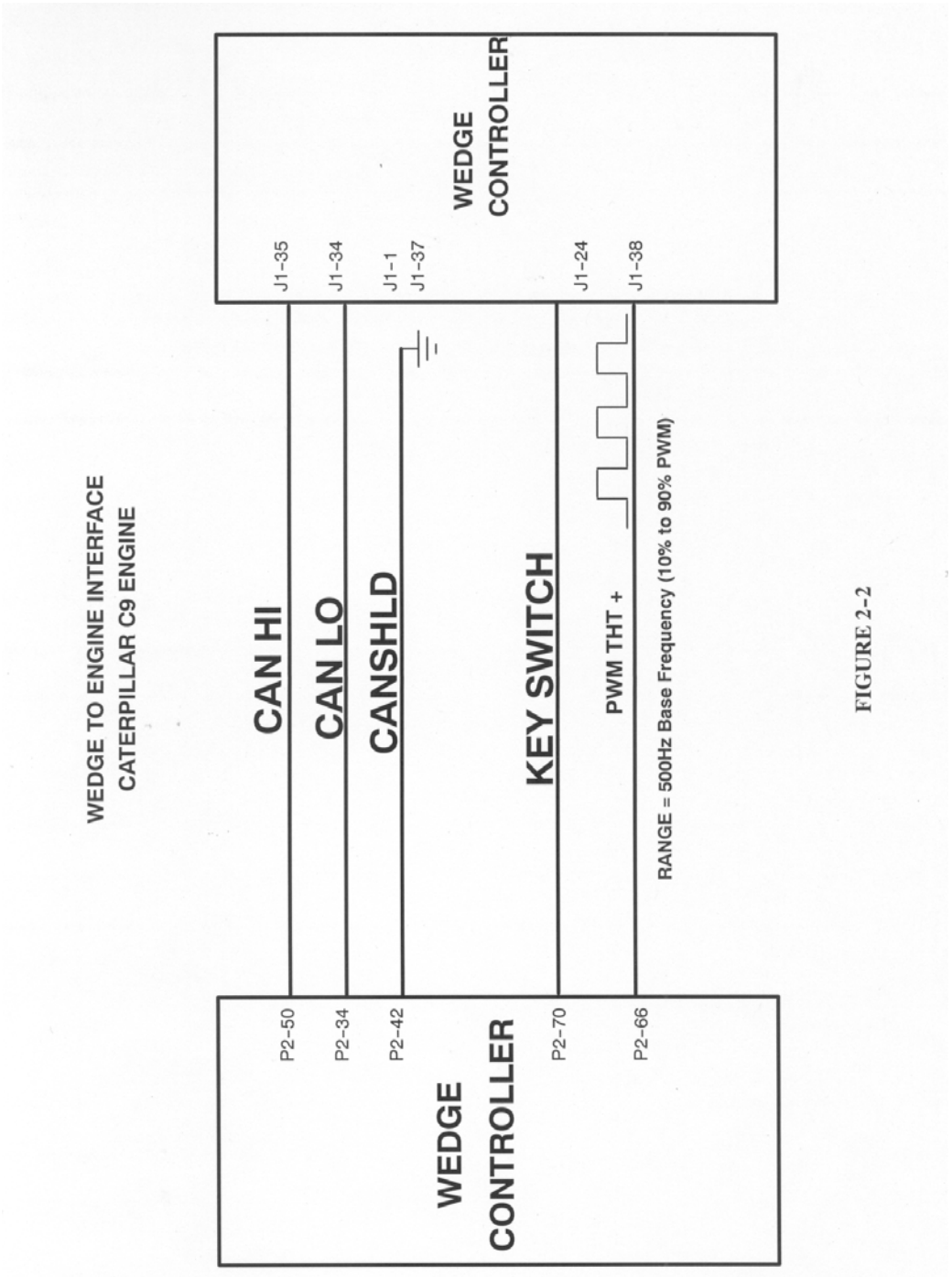

WEDGE TO ENGINE INTERFACE
CATERPILLAR C9 ENGINE
WEDGE CONTROLLER
J1-35
J1-34
J1-1
J1-37
J1-24
J1-38
CAN HI
CAN LO
CANSHLD
KEY SWITCH
PWM THT +
RANGE = 500Hz Base Frequency (10% to 90% PWM)
WEDGE CONTROLLER
P2-50
P2-34
P2-42
P2-70
P2-66

FIGURE 2-2

A PWM (Pulse Width Modulated) throttle is used to communicate with the CAT engine. The WEDGE controller receives diagnostic and run time data from the engine over the J1939 CAN network. A PWM throttle interface is used with the engine. Figure 2-2 shows the connections between the WEDGE controller and the engine controller.

It has a base frequency of 500 Hz and the duty cycle varies from 10% to 90%.

Figure 2-2 shows the signals between the engine controller and the WEDGE controller.

Sensors and Transducers

The electronics system contains sensors and transducers that are used to collect data from the compressor. The temperature is measured by a thermistor. This device exhibits a change in resistance as the temperature changes. The resistance causes an input voltage change to the WEDGE controller input and is interpreted as a temperature change.

The electronics system also uses pressure transducers to measure compressor pressure changes. These devices have an output signal of .45 VDC to 4.5 VDC, corresponding to 0 psi and the maximum measured psi for a particular device. The maximum pressure transducer ranges are 100, 225 and 500 psi. The 100, 225 and 500 psi devices are gauge pressure devices. These transducers are provided with 5 VDC excitation to power the device. These are three wire devices: excitation, signal and ground.

Digital Inputs and Outputs

The WEDGE controller scans digital inputs such as switch contacts. These are either "ON" (24VDC) or "OFF" (0 VDC). These digital inputs are connected to switches within the package such as the key start switch, air filter switches and IQ filter switches.

The WEDGE controller provides 24 VDC digital outputs to control solenoids, start compressor and DC heaters. These are 24 VDC "ON" and 0 VDC "OFF". They are current limited and short circuit protected.

Controller Outputs

The WEDGE controller has three types of outputs: frequency, pulse width modulated (PWM) and 24 VDC digital (ON /OFF). The frequency output is used as a throttle signal for the engine.

The PWM signal is used as a throttle signal for the Caterpillar engine. It has a base frequency of 500 Hz and the duty cycle varies from 10% to 90%.

Pressure Control

The discharge pressure is controlled by manipulating the engine speed and compressor inlet valve position. The inlet valve position is controlled pneumatically and the engine speed is determined by the WEDGE controller. The WEDGE measures the pneumatic system regulation pressure and computes an engine throttle setting. This throttle setting is sent to the engine via the frequency throttle, PWM or J1939 throttle, depending on which technique is used. The engine controller will control engine speed to this throttle setting.

Electronic Engine

The mid-range machine contains an emissions certified diesel engine. In order to meet the emissions requirements, the engine has an electronic control system.

The control system handles all monitor, alarm and control functions for the engine. The WEDGE controller communicates with the engine controller over the J1939 CAN network.

J1939 Data Link

The CAN network is a single pair shielded cable located with the W1 main harness. Figure 2-3 shows a layout of the CAN harness or "backbone" as it is referred to. The termination resistors (Terminator) are important to prevent reflections on the transmission line and must be in place for the network to function properly. The shield from the cable is connected to the machine metal at the WEDGE controller end.

This connection must be properly made with good metal-to-metal contact between the wire terminal and the machine metal.

The engine diagnostics connector is located on the left side of the engine. This is used to connect the engine manufacturer's service tools to the CAN network. This connector also provides 24 VDC to power these service tools.

Electrical System

The electrical system consists of the wiring harnesses and associated electrical devices such as relays, switches, lights, solenoids and alarm horn. There are two wiring harnesses in the mid range machine. They are as follows:

22801021 W1 Chassis Main Harness

22108690 Control Panel Harness (Before S/N 375132)

22817829 Control Panel Harness (After S/N 375131)

The schematic diagrams show the connections for these harnesses. Figure 2-1 is a system schematic showing harness connection with devices and controllers.

The electrical circuits are protected using ATC style fuses. A fuse should only be replaced with one of the same rating. Replacing a fuse with one of a large rating could lead to harness damage. If a fault occurs and the circuit does not have the appropriate size fuse, wires could be burned in the harness and damage other circuits.

Fault Finding

Fault Finding

FAULT	CAUSE	REMEDY
No reaction from instrument panel when key turned to (I) position.	*Emergency stop actuated.*	Reset emergency stop button.
	Batteries not connected.	Connect batteries.
	Fuse at starter motor 'blown'.	Replace fuse.
Engine fails to start.	*Low battery charge.*	Check the fan belt tension, battery and cable connections.
	Bad earth connection.	Check the earth cables, clean as required.
	Loose connection.	Locate and make the connection good.
	Fuel starvation.	Check the fuel level and fuel system components. Replace the fuel filter if necessary.
	Relay failed.	Replace the relay.
	Faulty stop solenoid	Check the stop solenoid
Engine stops while in service or is reluctant to start.	*Low fuel level.*	Fill fuel tank and bleed air from fuel system if necessary. (Refer to *MAINTENANCE SECTION*).
	Safety shut-down system in operation.	Check the safety shut-down switches.
Engine starts but stalls when the switch returns to position	*Electrical fault*	Test the electrical circuits.
	Low engine oil pressure.	Check the oil level and the oil filter(s).
	Low water level	Check if the low water lamp is extinguished.
	Faulty relay	Check the relays.
	Faulty key-switch	Check the key-switch.

FAULT	CAUSE	REMEDY
Engine starts but will not run or engine shuts down prematurely.	*Electrical fault.*	Test the electrical circuits.
	Low engine oil pressure.	Check the oil level and oil filter(s).
	Safety shut-down system in operation.	Check the safety shut-down switches.
	Fuel starvation.	Check the fuel level and fuel system components. Replace the fuel filter if necessary.
	Switch failure.	Test the switches.
	High compressor oil temperature.	Check the compressor oil level and oil cooler. Check the fan drive.
	Water present in fuel system.	Check the water separator and clean if required.
	Faulty relay.	Check the relay in the holder and replace if necessary.
Engine Overheats.	*Low water level*	Check the level and replenish if necessary.
	Blocked radiator.	Stop the machine and clean the cooling fins with compressed air or steam. Use reduced pressure for cleaning the fins.
	Reduced cooling air from fan.	Check the fan and the drive belts. Check for any obstruction inside the cowl.
	Faulty thermostat	Check the thermostat and replace if necessary.
Engine speed too low.	*Blocked fuel filter.*	Check and replace if necessary.
	Blocked air filter.	Check and replace the element if necessary.
	Faulty regulator valve.	Check the regulation system.
	Premature unloading.	Check the regulation and the operation of the air cylinder.
Excessive vibration.	*Engine speed too low.*	See *"Engine speed too low"*
Leaking oil seal.	*Improperly fitted oil seal.*	Replace the oil seal.
Refer also to the *Engine Manufacturer's Manual.*		

FAULT	CAUSE	REMEDY
Air discharge capacity too low.	*Engine speed too low.*	Check the air cylinder and air filter(s).
	Blocked air cleaner.	Check the restriction indicators and replace the element(s) if necessary.
	High pressure air escaping.	Check for leaks.
	Incorrectly set regulation system.	Reset the regulation system. Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual.
Compressor overheats.	*Low oil level.*	Top up the oil level and check for leaks.
	Dirty or blocked oil cooler.	Clean the oil cooler fins.
	Incorrect grade of oil.	Use **DOOSAN (DIPP)** recommended oil.
	Defective by-pass valve.	Check the operation of the element and replace if necessary.
	Recirculation of cooling air.	Move the machine to avoid recirculation.
	Reduced cooling air from fan.	Check the fan and the drive belts. Check for any obstruction inside the fan cowl.
Excessive oil present in the discharge air.	*Blocked scavenge line.*	Check the scavenge line, drop tube and orifice. Clean and replace.
	Perforated separator element.	Replace the separator element.
	Pressure in the system is too low.	Check the minimum pressure valve.

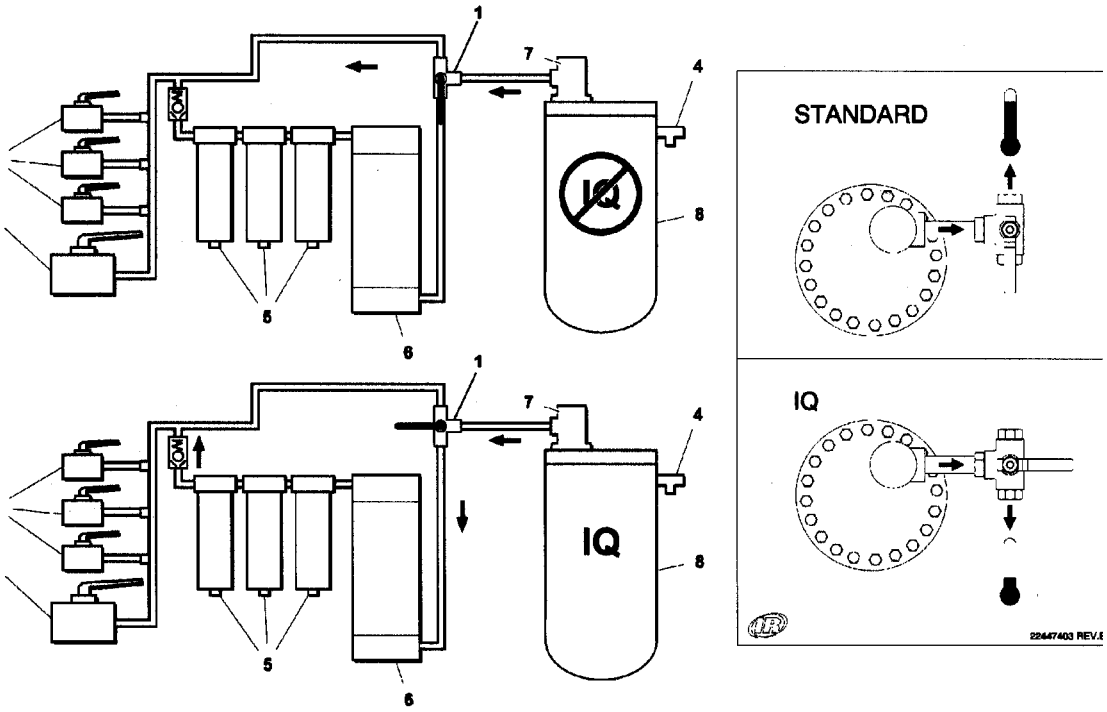
FAULT	CAUSE	REMEDY
Safety valve operates.	*Operating pressure too high.*	Check the setting and operation of the regulator valve piping.
	Incorrect setting of the regulator.	Adjust the regulator.
	Faulty regulator.	Replace the regulator.
	Inlet valve set incorrectly.	Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual.
	Loose pipe/hose connections.	Check all pipe/hose connections.
	Faulty safety valve.	Check the relieving pressure. Replace the safety valve if faulty. **DO NOT ATTEMPT A REPAIR**.
Oil is forced back into the air filter.	*Incorrect stopping procedure used*	Always employ the correct stopping procedure. Close the discharge valve and allow the machine to run on idle before stopping.
	Faulty inlet valve.	Check for free operation of the inlet valve(s).
Machine goes to full pressure when started.	*Inlet valve set incorrectly.*	Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual.
	Faulty load valve.	Replace the valve.
Machine fails to load when the load button is pressed.	*Faulty load valve.*	Replace the valve.

"Always Use DOOSAN Replacement Parts"

Options

Options

IQ System Operating Diagram



Key

1	Three way valve	**5**	Filters
2	Ball valve1¼”	**6**	Aftercooler
3	Ball valve2”	**7**	Minimum pressure valve
4	Safety valve	**8**	Separator tank

IQ System - General

The IQ System is a complete, self-contained system which provides cooler, cleaner air than from a standard portable compressor. The system utilizes an integral aftercooler, high-efficiency filtration, and a patented condensate disposal system to provide the cool, clean air. The condensate disposal system injects all liquid condensed from the moisture separator and filters into the engine exhaust system where it is vaporized by heat. This eliminates the need for collecting the condensate, and the added cost of disposing of the condensate, which is often regulated by local, state, and/or federal regulations.

When equipped with the low ambient feature, the IQ System automatically adjusts movable louvers to control airflow through the aftercooler, ensuring that the compressed air temperature always remains above freezing temperatures (typically 45°F (7°C)) at any ambient temperature down to -10°F (-23°C). This prevents the need for 120V AC heat tracing systems, or any manual adjustment to prevent freezing of the compressed air system. All drain points for the condensate handling system are heated with 24VDC heaters, which are integral to the compressor heater system.

The standard, Non-Louvered configuration ,is not to be operated below freezing ambient temperature.

IQ System Operating Instructions

The compressed air exits the separator tank through the top cover piping, and can then travel along one of two paths, selectable via manual valving.

One path allows Standard Operation, which bypasses the IQ System, and delivers air quality equivalent to a standard oil-flooded portable compressor. If the IQ System is enabled by proper setting of the selector valve, the compressed air first enters the aftercooler.

The aftercooler is cooled by the incoming compressor package air, which is controlled by movable louvers mounted on the aftercooler (if equipped with low ambient option). At most conditions, the louvers are fully open, and maximum aftercooling is available. The compressed air and condensate (water with a small amount of compressor lubricant) exits the aftercooler and enters the moisture separator, where most of the condensate is removed. The compressed air then flows through two stages of filtration, where the aerosol water and oil is removed down to approximately 0.01 ppm, and all particulates are removed down to 0.01 micron.

At the bottom of the moisture separator and both filters are strainers and constant-bleed orifices, which are sized to allow the maximum flow of condensate while minimizing compressed air loss.

The condensate lines are then piped together, and the condensate is injected at a single point into the engine exhaust piping. The compressed air then travels through the minimum pressure valve, and out through the service air valve. The air pressure gauge on the instrument panel indicates the pressure inside the separator tank. A service air pressure gauge is located inside the front door of the compressor on the filter support.

If the IQ System is bypassed (Standard Operation selected), the delivered air pressure will be approximately equal to the separator tank pressure. If the IQ System operation is selected, the delivered air pressure will be slightly less, depending on the restriction of the filters.

Low Ambient Option Operation

When the ambient temperature falls to the point that the aftercooler outlet temperature is approaching 45°F (7°C), the Temperature Control Unit (TCU), mounted on the rear of the control panel, will automatically adjust the louvers to control the cooling airflow through the aftercooler.

In the event that the unit is operating under abnormal conditions (very low compressed air flow), which would cause excessive cooling of the aftercooler, a temperature sensor in the aftercooler outlet header will signal the TCU to further close the louvers if the compressed air temperature falls to approximately 36°F (2°C) or lower.

There are no user selectable or serviceable components in the TCU. Contact **DOOSAN (DIPP)** Service if any abnormal operation of the freeze protection control system occurs.

Maintenance

Daily Maintenance:

Verify, during full-load (maximum compressed air delivery) that the IQ System filter restriction indicators do not show excessive restriction. Restriction indicators for the filters are mounted inside the control panel, and will shut down the compressor if restriction exceeds recommended values.

Weekly Maintenance:

- Remove Y-strainer screens at the bottom of the moisture separator and both filters and clean out any residue.
- Verify that the orifices below the Y-strainers are not clogged.
- Verify that the piping from the orifice purge points to the exhaust system is not clogged.

Yearly Maintenance:

The normal maintenance interval on the primary and secondary IQ System filters is one year, or earlier if pressure drop becomes excessive. Restriction indicators for the filters are mounted on the filter support inside the front door, and will shut down the compressor if restriction exceeds recommended values.

Filter Replacement

- With engine stopped, ensure pressure is relieved from air system.
- Remove all wires and hoses connected to drains on bottom of each filter housing. Inspect fittings and hoses for any blockage. Clean if necessary.
- Using a chain wrench or similar tool, loosen the housing. The housing should be removed by hand after loosening, taking care to prevent the housing from falling to the floor panel.
- Lower the housing to floor panel and lean it against the airend.

- Remove and replace the filter element, being careful not to damage outer wrap.

Verify the part number of new element vs. old element, as the two IQ filters are of different media.

Safety

⚠ CAUTION

The compressor regulation system is adjusted to maintain regulated pressure at the separator tank. DO NOT adjust regulation to provide full regulation pressure at the service valve when the IQ System is enabled. This will result in operation at excessive horsepower levels, causing overheating, reduced engine life, and reduced airend life.

⚠ CAUTION

Excessively restricted filter elements may cause an increase in the amount of aerosol water and oil carryover, which could result in damage to downstream equipment. Normal service intervals should not be exceeded.

⚠ CAUTION

Blockage of the condensate will result in flooding of the vessels. If flooding occurs, excessive condensate may enter the air stream and could result in damage to downstream equipment.

NOTICE

Do not operate at temperatures less that 2°C (36°F) unless equipped with low ambient IQ option.

"Always Use DOOSAN Replacement Parts"

Doosan Infracore Portable Power （Shanghai） Co., Ltd.
88 Guanghua road，Songjiang District, Shanghai
Hotline：400 920 2829

www.doosanportablepower.com

Doosan Infracore
Portable Power