OPERATION & MAINTENANCE MANUAL

XP185WIR P260WIR

COMPRESSOR MODEL

Code: D14 Code: D13

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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.

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Doosan Infracore
Portable Power

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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 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 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/lubricants/fluids other than those included within the Portable Power approved parts list may create hazardous conditions over which Portable Power 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 use only in the following specified conditions and applications:

- Compression of normal ambient air containing no known or detectable additional gases, vapors or particles.
- Operation within the ambient temperature range specified in the *GENERAL INFORMATION* section of this manual.

UNITS MANUFACTURED IN NORTH AMERICA: Generation of electricity at 120V (1ph) at 60 Hertz.

The use of the machine in any of the situation types listed in table 1:–

a) Is not approved by Portable Power,

b) May impair the safety of users and other persons, and

c) May prejudice any claims made against Portable Power.

TABLE 1
Use of the machine to produce compressed air for: a) direct human consumption b) indirect human consumption, without suitable filtration and purity checks.
Use of the machine outside the ambient temperature range specified in the *GENERAL INFORMATION SECTION* of this manual.
This machine is not intended and must not be used in potentially explosive atmospheres, including situations where flammable gases or vapors may be present.
Use of the machine fitted with non Portable Power approved components/lubricants/ fluids.
Use of the machine with safety or control components missing or disabled.
Use of the machine for storage or transportation of materials inside or on the enclosure except when contained within the toolbox.
GENERATOR
Use of the generator to supply load(s) greater than those specified.
Use of unsafe or unserviceable electrical equipment connected to the generator.
Use of electrical equipment: (a) Having incorrect voltage and/or frequency ratings. (b) Containing computer equipment and/or similar electronics.

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

DRAWBAR NOTICE

DRAWBAR NOTICE (Important)

This machine may have been shipped from the factory with the drawbar positioned upright.

To Convert From Shipping Position to Towing Position

The following tools are required:

Ratchet
13mm socket to fit ratchet
Torque wrench set to 68 foot pounds (9.4 kg-meters)

16mm socket to fit torque wrench
5 inch extension for torque wrench

Hardware Included:

(4) 12mm bolts with pre-applied thread lock

(2) 8mm Taptite Bolts

(2) Washers

(2) Safety Chains

1. Remove hardware box from compressor toolbox.

2. Open box and remove the bag containing hardware, safety chains and assembly instructions.

3.Using the jack, raise the front of the unit so that the legs are approximately 1” above the ground.

4.Remove the temporary retaining bolts from both sides of the frame at the drawbar connection (See Figure 1).

5.Carefully lower drawbar to the Level Position.

6.Install the four bolts (with pre-applied thread lock) to the four points inside the enclosure and torque to 68 ft. lbs.(9.4kg-m) (See Figure 2).

7.Install safety chains by sliding the second link of one chain into the slot in drawbar plate. Fasten chain to plate using taptite and washer. Repeat for the other chain (See Sketch).

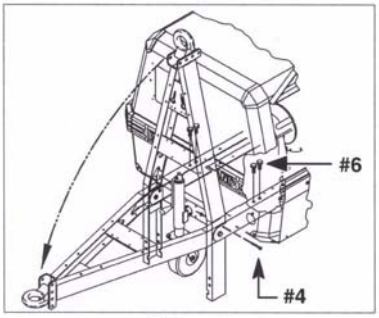


Figure 1
Drawbar Position

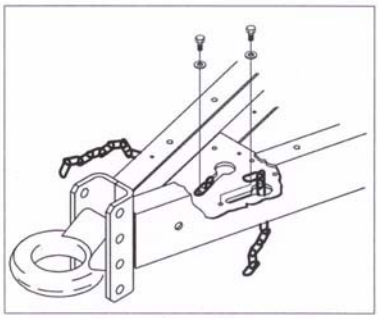


Figure 2
Safety Chain Attachment

Safety

Safety Precautions

General

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

Ensure that the Operation and Maintenance manual, and manual holder if equipped, are not removed permanently from the machine.

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

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

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 feed to any form of breathing apparatus or mask.

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.

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

Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine. Do not alter or modify this machine.

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.

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.

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.

This machine produces loud noise with 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 remove the pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap.

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).

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).

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 flammable gas. USE SPARINGLY! DO NOT use ETHER if unit has GLOW Plug starting aid. Engine damage will result.

Never allow the unit to sit stopped with the pressure in receiver-separator system. As a precaution, open manual blowdown valve.

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

Make sure wheels, tires and tow bar connectors are in safe operating condition and tow bar is properly connected before towing.

Steps for determining correct load limit -

1. Locate the statement “The weight of cargo should never exceed xxx kg or xxx lbs” on your vehicle’s placard.
2. This figure equals the available amount of cargo and luggage load capacity.

1. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo.

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 event of an unexpected shutdown when the service valve is open. Stop machine to add fuel.

Hazardous Substance Precaution

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly.Avoid ingestion, skin contact and breathing fumes for the following substances:Antifreeze, Compressor Oil, Engine Lubricating Oil, Preservative Grease, Rust Preventative, Diesel Fuel and Battery Electrolyte.

Corrosion risk

Hot Surface

Lifting point

WARNING: Electrical shock risk.

Parking Brake

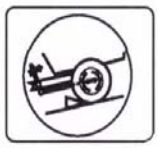
No open flame

Diesel Fuel.
No open flame.

Do not operate the machine without guard being fitted.

Lifting point

WARNING - Flammable liquid.



When parking use prop stand, handbrake and wheel chocks.

Air/gas flow or Air discharge.

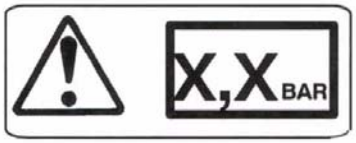
WARNING - Hot and harmful exhaust gas.

Tie down point

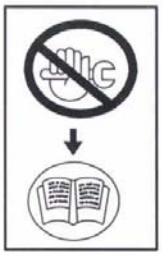
Do not breathe the compressed air from this machine.

Look for these signs on machines shipped to markets in North America, which point out potential hazards to the safety of you and others. Read and understand thoroughly. Heed warnings and follow instructions. If you do not understand, inform your supervisor.

Read the Operation and Maintenance manual before operation or maintenance of this machine is undertaken.



WARNING - Maintain correct tire pressure. (Refer to the *GENERAL INFORMATION* section of this manual).



WARNING: Consult the operation and maintenance manual before performing any maintenance.

Rough Service Designation
Wet Location Operation

Do not stack

Do not use fork lift truck from this side

Replace any cracked protective shield.

WARNING - Before connecting the tow bar or when preparing to tow, consult the operation and maintenance manual.

Do not operate with the doors or enclosure open.

On (power).

Off (power).

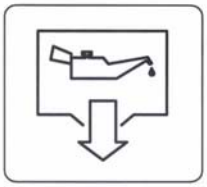
Emergency stop.

DANGER (Red Background) indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING (Orange Background) indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION (Yellow Background) indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

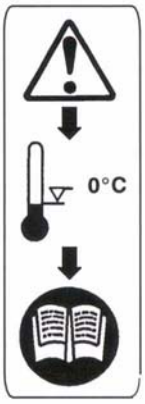
NOTICE (Blue Background) indicates important set-up, operating or maintenance information.



Oil Drain

Do not exceed the speed limit.

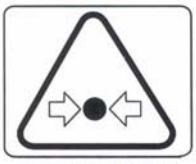
WARNING - Do not undertake any maintenance on this machine until the electrical supply is disconnected and the air pressure is totally relieved.



WARNING - For operating temperature below 0°C, consult the operation and maintenance manual.

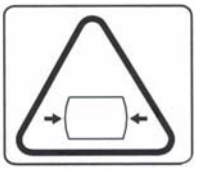
Read the Operation and Maintenance manual before operation or maintenance of this machine is undertaken

Do not remove the Operating and Maintenance manual and manual holder from this machine.



Pressurized vessel.

Use fork lift truck from this side only.



Pressurized component or system.


DANGER
Discharged air can contain carbon monoxide or other contaminants.
Will cause serious injury or death.
Do not breathe this air.


WARNING
Trapped air pressure.
Can cause serious injury or death.
Close service valve and operate tool to vent trapped air before performing any service.


WARNING
Hot pressurized fluid.
Can cause serious burns.
Do not open radiator while hot.


WARNING
High pressure air.
Can cause serious injury or death.
Relieve pressure before removing filler plugs/caps, fittings or covers.


⚠ WARNING
Improper operation of this equipment.
Can cause serious injury or death.
Read Operator's Manual supplied with this machine before operation or servicing.
Modification or alteration of this machine.
Can cause serious injury or death.
Do not alter or modify this machine without the express written consent of the manufacturer.


⚠ WARNING
Falling off machine.
Can cause serious injury or death.
Access lifting bail from inside machine.


⚠ WARNING
Rotating fan blade.
Can cause serious injury.
Do not operate without guard in place.


⚠ WARNING
Disconnected air hoses whip.
Can cause serious injury or death.
When using air tools attach safety device (OSHA Valve) at source of air supply for each tool.


⚠ WARNING
Door under pressure.
Can cause serious injury.
Use both hands to open door when machine is running.


⚠ WARNING
Combustible gas.
Can cause serious burns, blindness or death.
Keep sparks and open flames away from batteries.


CAUTION
DO NOT WELD.
ELECTRONIC DAMAGE WILL OCCUR.
This engine is equipped with an electronic engine controller and other electronic components.

Free Safety Decals
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 safety! Assure that decals are present on the machines. Replace decals that are not readable.

NOISE EMISSION

Noise Emission

This section pertains only to machines distributed within the United States.

⚠ WARNING

Tampering with Noise Control System Prohibited

Federal law prohibits 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 any 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.

Among those acts included in the prohibition against tampering are these:

3. Removal or rendering inoperative any of the following:
   a.the engine exhaust system or parts thereof
   b.the air intake system or parts thereof
   c.enclosure or parts thereof
4. Removal of any of the following:
   a.fan shroud
   b.vibration mounts
   c.sound absorption material
5. Operation of the compressor with any of the enclosure doors open.

Compressor Noise Emission Control Information

A. The removal or rendering inoperative, other than for the purpose of maintenance, repair, or replacement of any noise control device or element of design incorporated into this compressor in compliance with noise control act;

B. The use of this compressor after such device or element of design has been removed or rendered inoperative.

NOTE: The above information applies only to units that are built in compliance with the U.S. Environmental Protection Agency.

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

The Purchaser is urged to include the above provisions in any agreement for any resale of this compressor.

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.

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 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 Portable Power and Engine Manufacturer’s Operator and Maintenance Manuals.

Maintenance Record For Noise Emission Control And Extended Warranty					
Item No.	Description Of Work	Hourmeter Reading	Maint/inspect Date	Location City/state	Work Done By (Name)

GENERAL DATA

General Data

Unit Model:

UNIT MODEL	P260WIR	XP185WIR
CFM (litres/sec)	260(123)	185 (87)
Engine Speed - RPM (Full Load)	2300	2500
Engine Speed - RPM (No Load)	1700	1700
COMPRESSOR		
Rated Operating Pressure - psi (kPa)	100 (689)	125 (861)
Safety Valve Setting - psi (kPa)	150 (1034)	200 (1379)
Net Weight (less fuel) pounds	2510	2130
ENGINE (Diesel)		
Model	4IRI8TE	4IRI8TE
Electrical System	12VDC	12VDC

FLUID CAPACITIES

Compressor Lubricant.....12 quarts (11.4 litres)
Engine Crankcase Lubricant .....10.8 quarts (10.2 litres)
Fuel Tank .....27 U.S gal. (103 litres)

RUNNING GEAR

Tire Size.....ST205/75D15
Inflation Pressure (Cold) .....50 psi
Towing Speed (Maximum).....65 mph (105 km/hr)

UNITS MEASUREMENTS WEIGHTS

Overall Length.....11.5 (3.5 meters)
Overall Height .....5.2 feet (1.46 meters)
Overall Width .....5.7 feet (1.74 meters)
Track Width.....4.9 feet (1.49 meters)

EXPENDABLE SERVICE PARTS

Description	XP185WIR Part No.	P260WIR Part No.
Compressor Oil Filter Element	22436323	36897353
Compressor Oil Separator Element	54625942	92754688
Air Cleaner Element (Compressor)	35393685	54415377
Air Cleaner Element (Engine)	35393685	35393685
Engine Oil Filter Element	22226351	22226351
Engine Fuel Filter Element	16539462	16539462
Fuel Water Separator Element	22926737	22926737

⚠ WARNING

Modification or alteration of this machine. Can result in severe injury or death. Do not modify or alter without the express written consent of Doosan Infracore Portable Power.

OPERATION

BEFORE TOWING

⚠ WARNING

Failure to follow these instructions CAN cause severe injury or death.

- Assure tow vehicle has towing capacity for weight of this unit as stated on general data decal.
- Position the tow vehicle to align its hitch with the pintle eye or coupler of the compressor.
- Engage the parking brake and chock the tires of the tow vehicle.
- Stand to the side and ensure pin is FULLY inserted (secure) in tube of jack. .
- Crank jack to seat pintle eye or coupler onto hitch. Latch and lock hitch. Cross safety chain(s) under drawbar. Attach to vehicle
- Crank jack to raise pad off the ground. Pull pin from tube of jack.
- Fold jack handle down and forward. Swing up jack tube and FULLY insert pin in tube.
- Remove tire chocks.
- Test brakes, if so equipped.
- Test lights (running, stop, and turn signals).

⚠ WARNING

Always raise (or remove) jack for maximum ground clearance before towing.

SETTING UP (ALL UNITS)

- Position as level as possible. The design of these units permits a 15 degree sidewise limit on out-of-level operation.
- When the unit is to be operated out-of-level, it is important:

1. To keep the engine crankcase oil level near the high level mark (with the unit level).
2. To have the compressor oil level gauge show no more than mid-scale. Do not overfill either the engine crankcase or the compressor lubricating oil system.
3. The side doors must be closed to maintain a cooling air path and to avoid recirculation hot air.

TOWING

⚠ WARNING

Failure to follow these instructions CAN cause severe injury or death.

DISCONNECT

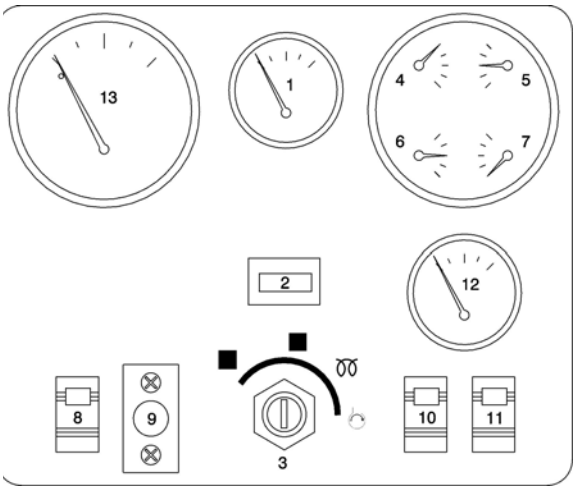
- Engage tow vehicle parking brake.
- Chock tires of compressor.
- Set the vehicle parking brake. Chock wheels of unit.
- Standing to the side, remove pin from tube of jack.
- Disconnect safety chains. Crank jack to raise eye or coupler from hitch. Tow vehicle can be moved.

UTILITY PACKAGE SET-UP (no running gear)

This unit must be located on vehicle bed to allow access for normal servicing and maintenance.

The air going into the inlet must be relatively free of oil, dirt, soot and other debris. It must be no more than 10 degrees F. (5 degrees C) over the ambient temperature.

CONTROL PANEL



1. **Compressor Discharge Pressure Gauge -** Indicates pressure in receiver tank, psi (kPa).
2. **Hourmeter -** Records running time for maintenance.
3. **Power Switch -** Flip “ON” to activate system prior to Starting. Flip “OFF” to stop engine.
4. **Discharge Air Temperature (Optional)** - Indicates in °F (82°C) to 210°F (99°C).
5. **Engine Oil Pressure Gauge (Optional) -** Indicates engine oil pressure.
6. **Engine Water Temp Gauge (Optional) -** Indicates coolant temperature, with normal operating range from 180°F (82°C) to 210°F (99°C)
7. **Voltmeter (Optional)** - Indicates battery condition.
8. **Spare**
9. **Service Air Button** - After warm-up, PUSH. Provides full air pressure at the service outlet.
10. **Spare**
11. **Spare**
12. **Fuel Level Gauge (Optional) -** Indicates amount of fuel in tank.
13. **Tachometer (Optional) -** Indicates engine speed

Before Starting

- Open service valve(s) to ensure pressure is relieved in receiver-separator system. Close valve(s) in order to build up full air pressure and ensure proper oil circulation.
- Check battery for proper connections and condition.
- Check battery for proper connections and condition.
- Check engine coolant level.

⚠ WARNING

Do not remove pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap. Use extreme care when removing a pressure cap from a liquid cooling system for the engine. The sudden release of pressure from a heated cooling system can result in a loss of coolant and possible severe personal injury.

- Check the engine oil level. Maintain per marks on dipstick.
- Check the fuel level. Add only CLEAN DIESEL fuel for maximum service from the engine.
- Check the compressor lubricating fluid level between bottom and midway of the sight glass on the separator tank.

⚠ WARNING

This machine produces loud noise with doors open. Extended exposure to loud noise can cause hearing loss. Wear hearing protection when doors or valve (s) are open.

- Close all doors to maintain a cooling air path and to avoid recirculation of hot air. This will maximize the life of the engine and compressor and protect the hearing of surrounding personnel.
- Be sure no one is IN or ON the compressor unit.

⚠ WARNING

Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause severe injury or death. A safety device must be attached to the hose at the source of supply to reduce pressure in case of hose failure or other sudden pressure release. Reference: OSHA regulation 29 CFR Section 1926.302 (b).

Starting

- Turn the POWER switch to “ON”.
- Turn Power switch to “START” position to crank engine. Hold switch in “START” position for approximately 5 seconds after engine starts.

NOTICE

Do not operate the starter motor for more than 10 seconds without allowing at least 30 seconds cooling time between start attempts.

Release Power Switch (it will automatically move to the “ON” position) when the engine starts and sustains running.

- Allow engine to warm up 5 to 10 minutes.
- If so equipped, press the “Service Air Button”. Open air service valve(s)

Cold Weather Starting

- Turn power switch to the glow plug position and hold 10 seconds. Then turn to start.

NOTICE

Exercise extreme caution when using a booster battery to start. To jump start: Connect the ends of one booster cable to the positive (+) terminals of each battery. Then connect one end of the other cable to the negative (-) terminal of the booster battery and the other end to the engine block. Not to the negative (-) terminal of the weak battery.

Stopping

NOTICE

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 event of an unexpected shutdown when the service valve is open.

Close air service valves.

- Allow the unit to run at idle for 3 to 5 minutes to reduce the engine temperatures.
- Turn Power Switch to “OFF” position.
- When the engine stops, automatic blowdown valve should relieve system air pressure. If automatic blow-down valve malfunction is suspected, open manual blowdown valve.
- Never allow unit to sit under pressure when engine is not running.

⚠ WARNING

Since the service valve is closed, air downstream of the valve may be trapped. A vent hole in the service valve will slowly bleed air from the hose. Do not disconnect hoses until all pressure has been vented.

NOTICE

Do NOT wire around or bypass a shutdown sensor or switch.

Machine has shutdown and sensors as follows:

- Low Engine oil pressure, in the engine.
- High engine coolant temperature, in the engine.

Compressor Air/Oil Temperature:

- At the airend outlet.
- Discharge tube.

Pressure Regulator Adjusting Instructions

Before Starting

1. At the Pressure Regulator (on service pipe near receiver tank), remove the cover to expose the adjusting screw. Loosen the jam nut and turn screw counterclockwise until tension is no longer felt at the screw. Then, turn screw clockwise one full turn.
2. Close service valve(s).

After Starting Unit

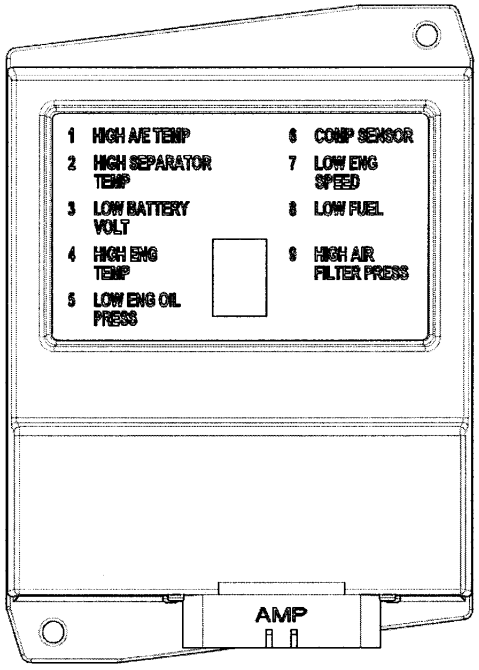
3. If equipped, push the SERVICE AIR button on the control panel, making certain the button does not pop back out. The unit should speed up and then unload (and drop back to IDLE). With the unit unloaded, turn the adjusting screw on the pressure regulator clockwise until the discharge pressure gauge indicates 125-130 psi (P260) or 150-155 psi (XP185).Tighten the pressure regulator jam nut. Replace cover.
4. To obtain maximum CFM at any pressure between 80 psi (550kPa) and maximum pressure rating (*), make adjustment at the pressure regulator to obtain desired discharge pressure at FULL engine speed. Lock adjusting screw and replace cover.

* See General Data Specifications.

Small Electronic Control Unit (SECU)

Display Panel

The SECU display panel is arranged as shown below. A description of each diagnostic indicator is as follows:



1. **High A/E Temp:** Indicates shutdown due to high compressor temperature.
2. **High Separator Temp:** Indicates shutdown due to high temperature at separator tank discharge.
3. **Low Battery Voltage:** Alarm indicator. Indicates battery or charging system requires service.
4. **High Engine Coolant Temp:** Indicates shutdown due to high engine water temperature.
5. **Low Engine Oil Pressure:** Indicates shutdown due to low engine oil pressure.
6. **Compressor Sensor Failure:** Indicates pressure sensor malfunction. Compressor will not start.
7. **Low Engine Speed:** Indicates shutdown due to low engine speed.
8. **Low Fuel Level:** Indicates shutdown due to low fuel level. (Optional)
9. **Restricted Air Filter:** Alarm indicator. Indicates engine/ compressor air inlet filters need service. (Optional).

A. Engine Communication Error: Engine Model was not recognized. Compressor will start and operate with a 1700-2300 rpm range.

C. CAN Communication Error: CAN communication failure.

Normal Conditions

Center Bar Blinking: Compressor is ready to start (no faults).

H. Crank Signal Detected: Displayed while start switch is in the pre-heat or crank position.

During SECU/power up, the 8 digit lights to check the display. Next the display will step through the 3 digit software revision number.

MAINTENANCE

Maintenance

⚠ CAUTION

Any unauthorized modification or failure to maintain this equipment may make it unsafe and out of factory warranty.

If performing more than visual inspections, disconnect battery cables and open manual blowdown valve.

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

Never operate this machine with any guards removed.

Inch and metric hardware was used in the design and assembly of this unit. Consult the parts manual for clarification of usage.

NOTICE

Disregard any maintenance pertaining to components not provided on your machine.

General

In addition to periodic inspections, many of the components in these units require periodic servicing to provide maximum output and performance. Servicing may consist of pre-operation and post-operation procedures to be performed by the operating or maintenance personnel. The primary function of preventive maintenance is to prevent failure, and consequently, the need for repair. Preventive maintenance is the easiest and the least expensive type of maintenance. Maintaining your unit and keeping it clean at all times will facilitate servicing.

Scheduled Maintenance

The maintenance schedule is based on normal operation of the unit. This page can be reproduced and used as a checklist by the service personnel. In the event unusual environmental operating conditions exist, the schedule should be adjusted accordingly.

Compressor Oil Level

Check the compressor fluid level when the machine is not operating. Always check the oil level while the unit is level, the engine off, and there is zero pressure in the separator tank. Maintain the fluid level between bottom and midway of the sight glass on the separator tank.

P260WIR: The optimum oil level is with the pointer at the top of the green section on the level gauge. Add oil if the pointer reaches the bottom of the green section.

Air Cleaner

If this unit is equipped with the Optional Air Filter Restriction Indicators, it has a Restricted Air Filter Alarm (9) on the SECU Display Panel.

This should be checked daily during operation. If the indicator displays the digit:T9 with the unit operating at full speed, servicing of the cleaner element is necessary.

Also weekly squeeze the rubber valve (precleaner dirt dump) on each air cleaner housing to ensure that they are not clogged.

The air filters restricted sensor will automatically reset after the main power switch is turned to “OFF.”

To service the air cleaners on all units proceed as follows:

1. Loosen outer wing nut and remove with cover. Remove Element.
2. Inspect air cleaner housing for any condition that might cause a leak and correct as necessary.
3. Wipe inside of air cleaner housing with a clean, damp cloth to remove any dirt accumulation, especially in the area where the element seals against the housing.
4. Install new elements in the reverse order to the above. Tighten wing nut firmly.
5. Inspect to ensure that end cap seals tightly 360° around air cleaner body.

In addition, the air cleaner system (housing and piping) should be inspected every month for any leakage paths or inlet obstructions. Make sure the air cleaner mounting bolts and clamps are tight. Check the air cleaner housing for dents or damage which could lead to a leak. Inspect the air transfer tubing from the air cleaner to the compressor and the engine for leaks.

Make sure that all clamps and flange joints are tight.

Gauges

The instruments or gauges are essential for safety, maximum productivity and long service life of the machine. Inspect the gauges and test any diagnostic lamps prior to start-up. During operation observe the gauges and any lamps for proper functioning. Refer to Operating Controls, for the normal readings.

Fuel Tank

CLEAN fuel in the fuel tanks is vitally important and every precaution should be taken to ensure that only clean fuel is poured or pumped into the tank.

When filling the fuel tank on this unit, by methods other than a pump and hose, use a CLEAN non-metallic funnel.

Battery

Keep the battery posts-to-cable connections clean, tight and lightly coated with a grease. Also the electrolyte level in each cell should cover the top of the plates. If necessary, top-up with clean distilled water.

Tires

A weekly inspection is recommended. Tires that have cuts or cracks or little tread should be repaired or replaced. Monthly check the wheel lug nuts for tightness.

Fasteners

Visually check entire unit in regard to bolts, nuts and screws being properly secured. Spot check several capscrews and nuts for proper torque. If any are found loose, a more thorough inspection must be made. Take corrective action.

Radiator

NOTICE

The use of water alone in this engine can result in major engine failure. Refer to engine section for coolant recommendation.

Hoses

Each month it is recommended that all of the intake lines to and from the air cleaners, the engine cooling system hoses and all of the flexible hoses used for air, oil, and fuel be inspected.

To ensure freedom from air leaks, all rubber hose joints and the screw-type hose clamps must be absolutely tight. Regular inspection of these connections for wear or deterioration is necessary.

Premature wear of both the engine and compressor is ASSURED whenever dust-laden air is permitted to enter the engine's combustion chamber or compressor intake.

The flexible hoses used in the fuel, oil and air lines on these units are primarily used for their ability to accommodate relative movement between components. It is important they be periodically inspected for wear and deterioration. It is also important the operator does not use the hoses as convenient hand hold or steps. Such use can cause early cover wear and hose failure.

NOTICE

Some of the airlines are nylon tubing. The associated fittings are "push-in" design. Features are as follows:

Pulling on the tubing will cause the inner sleeve to withdraw and compress, thus tightening the connection. The tubing can be withdrawn only while holding the sleeve against the fitting. The tubing can be removed and replaced numerous times without losing its sealing ability.

To install the nylon tubing, make a mark (with tape or grease pencil) approximately 7/8 inch from the end of the tubing. Insert the tubing into the sleeve and "push-in" past the first resistance to the bottom. The mark should be approximately 1/16 inch from the sleeve, for the 3/8 inch O.D. tubing; 1/8 inch for the 0.25 inch O.D. tubing. This will ensure that tubing is fully engaged in the sealing mechanism.

Compressor Oil Filters

The oil filter must be replaced every 500 hours of operation or six (6) months, whichever comes first.

To service oil filters it will first be necessary to shut the unit down. Wipe off any external dirt and oil from the exterior of the filter to minimize any contamination from entering the lubrication system. Proceed as follows:

⚠ WARNING

High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurized air system.

1. Open the service air valve(s) to ensure that system is relieved of all pressure. Close the valve(s).
2. Turn the spin-on filter element counterclockwise to remove it from the filter housing. Inspect the filter.
3. Inspect the oil filter head to be sure the gasket was removed with the oil filter element. Clean the gasket seal area on the oil filter head.

NOTICE

Installing a new oil filter element when the old gasket remains on the filter head, will cause an oil leak and can cause property damage.

4. Lubricate the new filter gasket with the same oil being used in the machine.

5. Install new filter by turning the element clockwise until gasket makes initial contact. Tighten an additional 1/2 to 3/4 turn.

6. Start unit and allow to build up to rated pressure. Check for leaks before placing unit back into service.

Compressor Oil Cooler

The compressor lubricating and cooling oil is cooled by means of the fin and tube-type oil cooler, located beside the radiator. The lubricating and cooling oil, flowing internally through the core section, is cooled by the air stream from the cooling fan flowing past the core section. When grease, oil and dirt accumulate on the exterior surfaces of the oil cooler, its efficiency is impaired.

Each month it is recommended that the oil cooler be cleaned by directing compressed air which contains a nonflammable, non-caustic safety solvent through the core of the oil cooler. This should remove the accumulation of grease, oil and dirt from the exterior surfaces of the oil cooler core so that the entire cooling area can transmit the heat of the lubricating and cooling oil to air stream.

In the event foreign deposits, such as sludge and lacquer, accumulate in the oil cooler to the extent that its cooling efficiency is impaired, a resulting high discharge air temperature is likely to occur, causing shut down of the unit. To correct this situation it will be necessary to clean it using a cleaning compound in accordance with the manufacturer's recommendations.

Compressor Oil

The lubricating and cooling oil must be replaced every 500 hours of operation or six (6) months, whichever comes first. Refer to warranty section about extended warranty.

Receiver-Separator Systems

⚠ WARNING

High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurized air system.

- Open service valve at end of machine.
- Ensure pressure is relieved, with BOTH:
  - — Discharge air pressure gauge reads zero (0).
  - — No air discharging from service valve.

Remove plug in bottom of separator tank to drain compressor oil.

When adding oil, remove and replace (make tight) plug on side of separator tank.

In the compressor lubricating and cooling system, separation of the oil from the compressed air takes place in the receiver-separator tank. As the compressed air enters the tank, the change in velocity and direction drop out most of the oil from the air.

Additional separation takes place in the oil separator element which is located in the top of the tank.

Any oil accumulation in this separator element is continuously drained off by means of a scavenge tube which returns the accumulated oil to the system.

The life of the oil separator element is dependent upon the operating environment (soot, dust, etc.) and should be replaced every twelve months or 1000 hours. To replace the element proceed as follows:

- Ensure the tank pressure is zero.
- Disconnect the hose from scavenge tube.
- Remove scavenge tube from tank cover.
- Disconnect service line from cover.

- Remove cover mounting screws.
- Remove cover and element.
- Remove any gasket material left on cover or tank.
- Install new element.

Scavenge Line

⚠ WARNING

High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurized air system.

The scavenge line originates at the receiver-separator tank cover and terminates at the compressor air-end near the oil filter element. An orifice check valve is located on the scavenge tube.

Once a year or every 1000 hours of operation, whichever comes first, replace the separator element and clean the scavenge orifice/check valve.

NOTE: Excessive oil carry-over may be caused by an oil-logged separator element. Do not replace element without first performing the following maintenance procedure:

1. Check oil level. Maintain as indicated earlier in this section.
2. Thoroughly clean scavenge line, any orifice and check valve.
3. Assure minimum pressure valve/orifice is operational.
4. Run unit at rated operating pressure for 30 to 40 minutes to permit element to clear itself.

Exterior Finish Care

This unit was painted and heat cured at the factory with a high quality, thermoset polyester powder coating. The following care will ensure the longest possible life from this finish.

1. If necessary to remove dust, pollen, etc. from housing, wash with water and soap or dish washing liquid detergent. Do not scrub with a rough cloth, pad, etc.
2. If grease removal is needed, a fast evaporating alcohol or chlorinated solvent can be used. Note: This may cause some dulling of the paint finish.
3. If the paint has faded or chalked, the use of a commercial grade, non-abrasive car wax may partially restore the color and gloss.

Field Repair of Texture Paint

1. The sheet metal should be washed and clean of foreign material and then thoroughly dried.
2. Clean and remove all grease and wax from the area to be painted using Duponts 3900S Cleaner prior to sanding.
3. Use 320 grit sanding paper to repair any scratches or defects necessary.
4. Scuff sand the entire area to be painted with a red scotch brite pad.
5. Wipe the area clean using Duponts 3900S.
6. Blow and tack the area to be painted.
7. Apply a smooth coat of Duponts 1854S Tuffcoat Primer to all bare metal areas and allow to dry.
8. Apply 2 medium - wet coats of Duponts 222S Adhesion Promoter over the entire area to be painted, with a 5 minute flash in between coats.

9. To apply the texture coat, use Duponts 1854S Tuffcoat Primer. The proper technique to do this is to spray the Tuffcoat Primer using a pressure pot and use about 2-5 pounds of air pressure. This will allow the primer to splatter causing the textured look.

NOTE: You must be careful not to put too much primer on at one time, this will effect the amount of texture that you are trying to achieve. Allow the texture coat to flash for 20 minutes or until dry to touch.

10. Apply any of Duponts Topcoat Finishes such as Imron™ or Centari™ according to the label instructions.

NOTE: To re-topcoat the textured surfaces when sheet metal repairs are not necessary, follow steps 1, 2, 4, 5, 6, 8 and 10.

MAINTENANCE SCHEDULE

	Daily	Weekly	Monthly	3 MOS.	6 MOS.	12 MOS.
				250 hours	500 hours	1000 hours
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				DRAIN	
Fuel Water Separator (Drain)	C					
Oil Leaks	C					
Fuel Leaks	C					
Drain Water From Fuel Filters	DRAIN					
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 Test			C			
Air Cleaner System Visual			C			
Compressor Oil Cooler Exterior			C	CLEAN		
Engine Radiator Exterior			C	CLEAN		
Fasteners, Guards				C		
Air Cleaner Elements					R	
Fuel/Water Separator Element					R	
Compressor Oil Filter Element					R	
Compressor Oil					R	
Engine Oil Change (initial change @ 50 hrs)				R -non IR fluids	R*	
Engine Oil Filter (initial change @ 50 hrs)				R - non IR fluids	R*	
Wheels (bearings, seals, etc)					C	
Engine Coolant Test					C	R
Fuel Filter Element					R	
Injection Valve Pressure						C
Shutdown Switch Settings Test						C
Scavenge Orifice & related parts						CLEAN
Oil Separator Element						R
Injection Pump (check & adjust)						C@2000hrs
Valve Clearance Check						C
Adjust Intake and Exhaust Valves						C@ 2000 hrs
Lights (running, brake, & turn)	CBT					
Pintle Eye Bolts	CBT					

R=replace, C=check (adjust if necessary) CBT = check before towing.

*** Applies only when using IR Protec™ Engine Fluid**

LUBRICATION

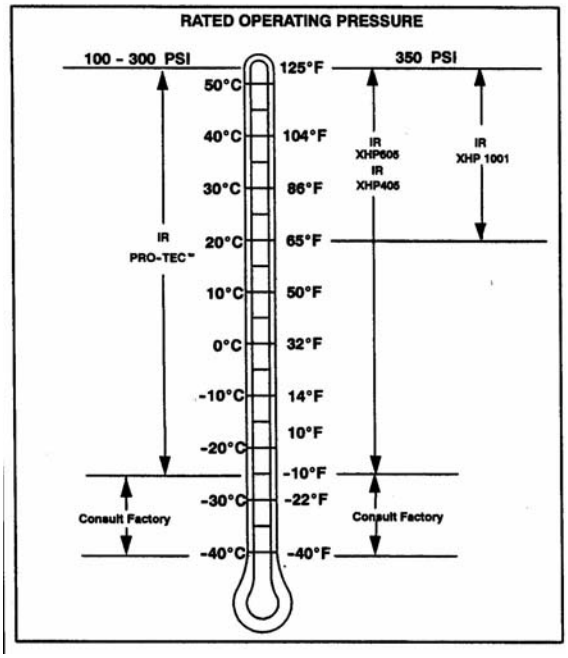
Lubrication

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.

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



Preferred Ingersoll-Rand Fluids - Use of these fluids with original I-R filters can extend airend warranty. Refer to operator's manual warranty section for details or contact your IR representative.

Design Operating Pressure	Ambient Temperature	Specification
100 psi to 300 psi	-10^{0}F to 125^{0}F (-23^{0}C to 52^{0}C)	Preferred: **IR Pro•Tec™** Alternate: ISO Viscosity Grade 46 with rust and oxidation inhibitors, designed for air compressor service.
350 psi	(-23^{0}C to 52^{0}C) -10^{0}F to 125^{0}F	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^{0}F to 125^{0}F (-18°C to 52°C)	Preferred: **XHP605** **IR XHP1001**

Ingersoll-Rand Preferred Fluids	1 gal. (3.8 Litre)	5 gal. (19.0 Litre)	55 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**	

Trouble Shooting

Trouble Shooting

Introduction

Trouble shooting for a portable air compressor is an organized study of a particular problem or series of problems and a planned method of procedure for investigation and correction. The trouble shooting chart that follows includes some of the problems that an operator may encounter during the operation of a portable compressor.

The chart does not attempt to list all of the troubles that may occur, nor does it attempt to give all of the answers for correction of the problems. The chart does give those problems that are most apt to occur. To use the trouble shooting chart:

A. Find the “complaint” depicted as a bold heading.

B. Follow down that column to find the potential cause or causes. The causes are listed in order (1,2,3 etc.) to suggest an order to follow in trouble shooting.

Action Plan

A. Think Before Acting

Study the problem thoroughly and ask yourself these questions:

1. What were the warning signals that preceded the trouble?
2. Has a similar trouble occurred before?
3. What previous maintenance work has been done?
4. If the compressor will still operate, is it safe to continue operating it to make further checks?

B. Do The Simplest Things First

Most troubles are simple and easily corrected. For example, most complaints are “low capacity” which may be caused by too low an engine speed or “compressor over-heats” which may be caused by low oil level.

Always check the easiest and most obvious things first; following this simple rule will save time and trouble.

NOTE: For trouble shooting electrical problems, refer to the Wiring Diagram Schematic found in Parts List Section.

C. Double Check Before Disassembly

The source of most compressor troubles can be traced not to one component alone, but to the relationship of one component with another. Too often, a compressor can be partially disassembled in search of the cause of a certain trouble and all evidence is destroyed during disassembly. Check again to be sure an easy solution to the problem has not been overlooked.

D. Find And Correct Basic Cause

After a mechanical failure has been corrected, be sure to locate and correct the cause of the trouble so the same failure will not be repeated. A complaint of “premature breakdown” may be corrected by repairing any improper wiring connections, but something caused the defective wiring. The cause may be excessive vibration.

Trouble Shooting Chart

Bold Headings depict the COMPLAINT - Subheadings indicate CAUSES

NOTE: Subheadings suggest sequence to follow troubleshooting.

Table 1: Unit Shutdown

Cause	Corrective Action
Out of Fuel	Add CLEAN diesel Fuel
Compressor Oil Level Too Low	Add correct oil
Compressor Oil Temp. Too High	See Table 7
Engine Water Temp. Too High	Check coolant level. If necessary, Add.
Loose Wire Connection	Wiggle wires at switches & connector blocks. Make repairs.
Low Fuel Level Shutdown Switch	Replace switch.
Defective Discharge Air Temp. Switch	Replace switch.
Defective Engine Oil Pressure Switch	Replace switch.
Broken Engine Fan Belt	Replace fan belt.
Engine Oil Pressure Too Low	See Table 4.
Malfunctioning Relay	Replace relay.
Blown Fuse	Replace fuse/Check for Short.
Engine Malfunctioning	See Trouble Shooting in Engine Section.
Airend Malfunctioning	See Table 7 & 10.

Table 2: Won't Start/Run:

Cause	Corrective Action
Out of Fuel	Add CLEAN diesel Fuel
Clogged Fuel Filters	Service filters.
Compressor Oil Level Too Low	Add corrected oil
Loose Wire Connection	Repair or replace connection.
Low Battery Voltage	Check electrolyte level. Check connections.
Defective Alternator	Replace/Repair Alternator
Out of Fuel	Add CLEAN fuel.
Engine Water Temp. Too High	Check fluid level. If necessary, Add.
Malfunctioning Start Switch	Replace switch.
Defective D2 Diode	Replace D2 Diode.
Blown Fuse	Replace fuse/Check for Short.
Engine Oil Pressure Too Low	See Table 3 and Table 4.
Compressor Oil Temp. Too High	See Table 10.
Defective Discharge Air Temp. Switch	Replace switch.
Defective Engine Oil Pressure Switch	Replace switch.
Defective Engine Temp. Switch	Replace Switch
Defective Separator Tank Temp Switch	Replace Switch
Defective Low Fuel Shutdown Switch	Replace Switch
Malfunctioning Relay	Replace relay.
Engine Malfunctioning	See Trouble Shooting in Engine Section.
Airend Malfunctioning	See Table 7 & 10.

Table 3: High Engine Temperature Indicator (4) Stays On:

Complaint	Corrective Action
Dirty Cooler	Clean exterior of cooler.
Operating Pressure Too High	Reduce pressure to spec.
Recirculation of Cooling Air	Close side doors.
Dirty Operating Conditions	Move unit to cleaner environment.
* Out of Level >15 degrees	Relocate or reposition unit.
* Ambient Temp. >125×F (52×C)	Above spec limit.
Loose Wire Connection	Repair or replace.
Broken Engine Fan Belt	Replace fan belt set.

Table 4: Low Engine Oil Pressure Indicator (5) Stays On:

Complaint	Corrective Action
Low Oil Level	Add oil.
Clogged Oil Filter Element(s)	Replace element(s).
Out of Level >15 degrees	Relocate or reposition.
Loose Wire Connection.	Repair or replace.
Wrong Lube Oil	See Engine Oil Spec. Change oil.
Engine Malfunctioning	See Trouble Shooting in Engine Section.

Table 5: Low Battery Voltage Indicator (3) Stays On:

Complaint	Corrective Action
Low Battery Voltage	Check electrolyte level. Add if necessary.
Loose or Broken Belts	Tighten or replace belt set.
	Check connectors. Clean & tighten.
	Recharge battery.
Malfunctioning Alternator	Repair or replace alternator.
Shorted wire (ground)	Repair short.

Table 6: Unit Fails To Shutdown:

Complaint	Corrective Action
Defective Low Fuel Shutdown Switch	Pull wire off shutdown solenoid. Replace switch.
Defective Discharge Air Temperature Switch	Pull wire off. Replace switch.
Defective Sep. Temp. Switch	Replace switch.
Defective Engine Temp. Switch	Replace switch.
Defective Engine Oil Pressure Switch	Pull wire off. Replace switch.
Malfunctioning Relay	Replace relay.
Defective Start Switch	Replace defective item.
Wire Shorted Hot	Repair short.

Table 7: Excessive Compressor Oil Temperature:

Complaint	Corrective Action
Dirty Cooler	Clean exterior surfaces.
Low Oil Level	Add oil. Look for any leaks.
Clogged Oil Filter Elements	Replace elements. Change oil.
Operating Pressure Too High	Reduce pressure to spec.
Dirty Operating Conditions	Move unit to cleaner environment.
Ambient Temp. > 125°F (52°C)	Above spec limit.
Out of Level > 15 degrees	Relocate or reposition unit.
Wrong Lube Oil	Check spec in this manual.
Recirculation Of Cooling Air	Close side doors. Replace belly pan.
Malfunctioning Thermostat	Replace thermostat in bypass valve.
Loose or Broken Belts	Tighten or replace belt set.
Defective Oil Cooler Relief Valve	Replace valve.
Defective Minimum Pressure Valve	Repair or replace valve.
Malfunctioning Fan	Check fan belt tension. Tighten or replace belt set.
Blocked or Restricted Oil Lines	Clean by flushing or replace.
Airend Malfunctioning	See Tables 11, 12, 13, 15, 16 or 18.

Table 8: Engine RPM Down

Complaint	Corrective Action
Clogged Fuel Filter	Clean primary filter. Replace final filter. Drain tanks. Add CLEAN fuel.
Dirty Air Filter	Clean or replace elements.
Operating Pressure Too High	Reduce pressure to spec limit.
Incorrect Pressure Regulator Adjustment	Adjust regulator.
Wrong Air Filter Element	Install correct element.
Malfunctioning Pressure Regulator	Replace regulator.
Defective Separator Element	Install new element.
Engine Malfunctioning	See Trouble Shooting in Engine Section.
Airend Malfunctioning	Consult Dealer.

Table 9: Excessive Vibration

Complaint	Corrective Action
Dirty Fuel/Filters	Replace filters/fuel.
Engine idle speed too low.	Raise “No Load” speed.
Rubber Mounts, Loose or Damaged	Tighten or replace.
Anti-rumble valve not working.	Repair or Replace.
Drive Coupling Defective	Replace coupling.
Defective Fan	Replace fan.
Engine Malfunctioning	See Trouble Shooting in Engine Section.
Airend Malfunctioning	Consult Dealer

Table 10: Low CFM

Complaint	Corrective Action
Engine RPM too Low	Adjust RPM
Malfunctioning Inlet Unloader	Inspect valve.
Dirty Air Filter	Clean or replace elements.
Incorrect Pressure Regulator Adjustment	Adjust linkage.
Malfunctioning Pressure Regulator	Replace regulator.
Wrong Air Filter Element	Install correct element.
Defective Separator Element	Install new element.
Defective Minimum Pressure Valve	Repair or replace valve.

Table 11: Short Air Cleaner Life

Complaint	Corrective Action
Inadequate Element Cleaning	Install new element.
Dirty Operating Conditions	Move unit to cleaner environment.
Incorrect Stopping Procedure	Read procedure in this manual.
Wrong Air Filter Element	Install proper element.

Table 12: Excessive Oil In Air

Complaint	Corrective Action
High Oil Level	Read procedure in this manual.
Clogged Scavenge Orifice	Remove scavenge orifice. Clean and Replace.
Incorrect Oil	Replace by spec. in this manual.
Defective Scavenge Check Valve	Remove check valve. Replace with new valve.
Out of Level > 15 degrees	Relocate or reposition unit.
Defective Separator Element	Remove element. Install new.
Scavenge Tube Blocked	Remove scavenge tube. Clean and Replace.
Sep. Tank Blow Down Too Quickly	Allow unit to blow down automatically.
Defective Minimum Pressure Valve	Remove valve. Repair valve and replace.

Table 13: Oil Seal Leak

Complaint	Corrective Action
Contaminated Lube Oil	Drain and flush system. Add new CLEAN oil. Replace seal.
Blocked or Restricted Oil Line(s)	Remove, clean and replace line(s). Replace seal.
Malfunctioning Seal	Consult dealer. Replace seal.
Scored Shaft	See instructions in new seal kit.

Table 14: Will Not Unload

Complaint	Corrective Action
Incorrect Pressure Regulator Adjustment	Adjust regulator.
Leak in Regulator Piping	Find and repair leak(s).
Malfunctioning Pressure Regulator	Replace regulator.
Malfunctioning Inlet Valve Unloader	Inspect valve. Repair/Replace.
Defective Separator Element	Remove element. Install new.
Ice in Regulation Lines/Orifice	Apply heat to line(s) and or orifice.

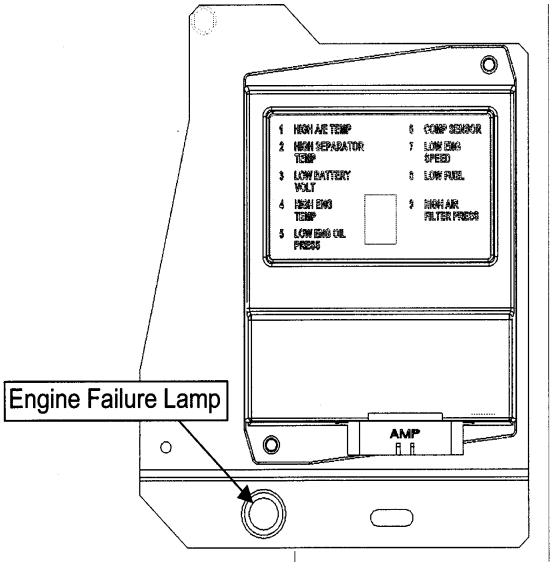
Table 15: Oil In Air Cleaner

Complaint	Corrective Action
Incorrect Stopping Procedure	Read Procedure in this manual.
Malfunctioning Unloader	Repair/Replace.

Table 16: Safety Valve Relieves

Complaint	Corrective Action
Operating Pressure Too High	Reduce pressure to spec limit.
Incorrect Pressure Regulator Adjustment	Refer to Section 6 in this manual.
Malfunctioning Pressure Regulator	Replace regulator.
Leak In Regulator Piping	Repair leak(s).
Malfunctioning Inlet Unloader	Inspect valve. Repair/Replace.
Defective Separator Element	Remove element. Install new.
Defective Safety Valve	Replace safety valve.
Ice in Regulation Lines/Orifice	Remove ice.

Engine Diagnostic Codes:



- Failure Flashes can be read on the Engine Failure Lamp when the on/off power switch is “ON” or when the unit is running.

- The Engine Failure Lamp is located behind the front end panel (see figure).

- The Failure Lamp is luminated for 2 seconds when the ECU is powered on.

- A lamp flash duration of 0.5 second is a “Short” flash.

- A lamp flash duration of 1.5 seconds is a “Long” flash.

- A failure flash sequence of “1 Long and 3 Short” would be displayed by flashing the lamp one time with a duration of 1.5 seconds and three times with a duration of .5 seconds.

- When two or more failures have occurred simultaneously, the failure lamp will pause for 3 seconds between flash sequences.

- Failure flash sequences continuously repeat with 3 second pauses between flash sequences until the failure is corrected.

Failure	Failure Flashes	Remark
Coolant temperature sensor failure	4 Short	
Speed sensor failure	6 Short	
Rack position sensor failure	7 Short	
Rack actuator failure	8 Short	
EGR valve failure	1 Long and 3 Short	
CSD solenoid valve failure	1 Long and 4 Short	
Main relay failure	1 Long and 6 Short	
Rack actuator relay failure	1 Long and 7 Short	
ECU temperature alarm	2 Long and 5 Short	ECU temp >221°F
Coolant temperature alarm	3 Long and 6 Short	Coolant temp >230°F
ECU failure	4 Long and 1 Short	

4IRI8NE-2 / 4IRI8TE ENGINE

ENGINE - General Information

The Portable Power industrial diesel engines are a product of long years of experience, advanced technology, and up-to-date production facilities. Portable Power takes great pride in the superior durability and operating economy of these engines.

In order to get the fullest use and benefit from your engine, it is important that you operate and maintain it correctly. This section is designed to help you do this. Please read this section carefully and follow the operating and maintenance recommendations. This will ensure many years of trouble-free and economical engine operation.

Should your engine require servicing, please contact your nearest Portable Power branch or distributor.

All information, illustrations, and specifications contained in this manual are based on the latest product information available at the time of publication.

Portable Power reserves the right to make changes in this manual at any time without prior notice.

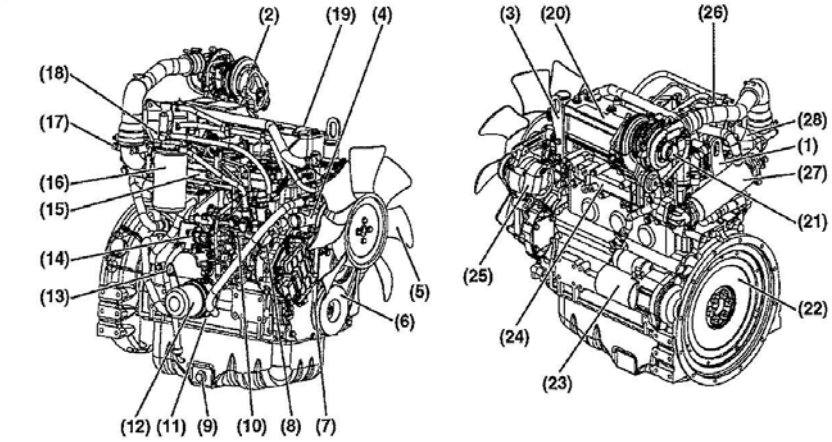


Table 1:

Item	Description	Item	Description
1	Lifting Eye (Flywheel End)	15	Intake Manifold
2	Turbocharger*	16	Fuel Filter
3	Lifting Eye (Engine Cooling Fan End)	17	Fuel Inlet
4	Engine Coolant Pump	18	Fuel Return to Fuel Tank
5	Engine Cooling Fan	19	Top Filler Port (Engine Oil)
6	Crankshaft V-Pulley	20	Rocker Arm Cover
7	V Belt	21	Air Intake Port (From Air Cleaner)
8	Side Filler Port (Engine Oil)	22	Flywheel
9	Drain Plug (Engine Oil)**	23	Starter Motor
10	Fuel Injection Pump	24	Exhaust Manifold
11	Engine Oil Cooler***	25	Alternator
12	Engine Oil Filter	26	EGR Valve
13	Dipstick (Engine Oil)	27	EGR Cooler****
14	Eco-governor	28	EGR Pipe

Table 2:

Engine model name	4IRI8NE-2 / 4IRI8TE
Engine type	Vertical inline water cooled diesel engine
Combustion type	Direct injection
Aspiration	Natural/Turbocharged
No. of cylinders - bore x stroke	4-98x110
Engine displacement L	3.319
Compression ratio	18.5:1 / 18.1:1
Firing order	1 -3 - 4 - 2
Exhaust emission control system	Fuel injection nozzles, fuel injector pump
Governor	Electronic
Specified fuel	Diesel fuel (ISO 8217 DMX, BS2869 A1/ A2) No. 2-3, No. 1-D, ASTM D975-94
Starter (V-kW)	12-2.3
Alternator	12-40
Specified engine oil (API grade) (SAE grade)	CI-4+ (15W40)
Coolant volume (Engine only) L	4.2
Engine dry weight kg	235/245
Overall length mm	719
Overall width mm	508
Overall height mm	717
Nozzle injection pressure MPa	21.6

Engine Identification

Serial Number Location

The engine serial number is stamped on engine name plate on top of rocker cover. See illustration on Table 1.

Confirmation of Engine Number

It is advisable to quote the engine serial number together with the machine serial number, as it is required when you contact the Portable Power branch or distributor for repair, service or parts ordering.

ENGINE AFTER SERVICE

Contact your Portable Power dealer for periodical inspection and maintenance.

Portable Power parts are identical with those used in the engine production, and accordingly, they are warranted by Portable Power.

Genuine Ingersoll Rand parts are supplied by your Portable Power branch or distributor.

Please ensure that only genuine Ingersoll Rand parts, lubricants and fluids are used for service and/or repair.

⚠ WARNING

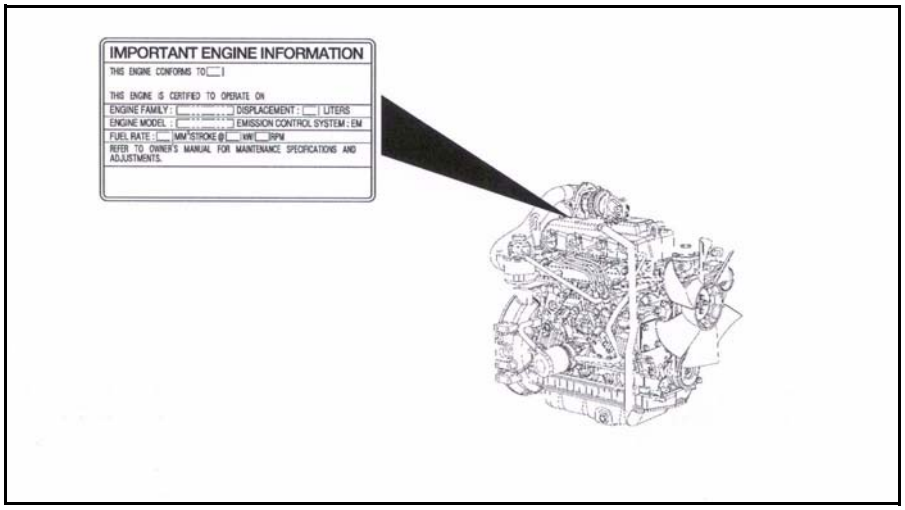
Conduct confirmation of engine serial number with the engine stopped. To avoid being injured, do not check it while the engine is still hot.

Engine Label (for EPA) Emission Control Label

Emission control label is attached on the “top of rocker arm cover.”

The location of emission control label attached on the engine may vary depending on the engine specification.

The following is the sample of a label required for engine emission control information, along with location.



Fluid, Lubricants, and Coolant

Fuel Selection

The following properties are required of the diesel fuel.

- The fuel cetane number should be equal to 45 or higher.
- The sulfur content must not exceed 0.5% by volume. A higher sulfur content fuel may cause sulfuric acid corrosion in the cylinders of the engines.
- NEVER mix kerosene, used engine oil, or residual fuels with the diesel fuel.
- Water and sediment in the fuel should not exceed o.05% by volume.
- Keep the fuel tank and fuel-handling equipment clean at all times.
- Poor quality fuel can reduce engine performance and/or cause engine damage.
- Fuel additives are not recommended. Some fuel additives may cause poor engine performance. Consult your Portable Power representative for more information.
- Ash content not to exceed 0.01% by volume.
- Carbon residue content not to exceed 0.35% by volume. Less than 0.1% is preferred.
- Total aromatics content should not exceed 35% by volume. less than 30% is preferred.
- PAH (polycyclic aromatic hydrocarbons) content should be below 10% by volume.
- Metal content of Na, Mg, Si, and AI should be equal to or lower than 1 mass ppm. (Test analysis method JPI-5S-44-95).
- Lubricity: Wear mark of WS1.4 should be Max. 0l018 in (460 um) at HFRR test.

Diesel fuel should comply with the specifications listed in Table 3 below. The table lists several worldwide specifications for diesel fuels.

Table 3: Diesel Fuel Specifications

Diesel Fuel Specification	Location
No. 2-D, No. 1-D, ASTM D975-94	USA
EN590:96	European Union
ISO 8217 DMX	International
BS (BRITISH STANDARD) BS2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan
KSM-2610	Korea
GB252	China

Fuel Requirements

The fuel injection pump, injector or other parts of the fuel system and engine can be damaged if you use an fuel or fuel additive other than those specifically recommended by Portable Power.

If any fuel other than the one specified is used, engine operation will be impaired. Engine failure or malfunction resulting from use of such improper fuel will not be warranted by Portable Power.

To help avoid fuel system or engine damage, please read the following:

Do not use diesel fuel which has been contaminated with engine oil. Besides causing engine damage, such fuel can also affect emission control. Before using any diesel fuel, check with the fuel supplier to see if the fuel has been mixed with engine oil.

Your engine is designed to use either Number 1-D or Number 2-D diesel fuel. However, for better fuel economy, use Number 2-D diesel fuel whenever possible. At temperatures less than -7°C, (20°F), Number 2-D fuel may pose operating problems (see “Cold Weather Operation” which follows).

At colder temperatures, use Number 1-D fuel (if available) or use a “winterized” Number 2-D (a blend of Number 1-D and Number 2-D). THis blended fuel is usually called Number 2-D also, but can be used in colder temperatures than Number 2-D fuel which has not been “winterized.”

Check with the fuel supplier to be sure you get the properly blended fuel.

NOTICE

Do not use home heating oil or gasoline in your diesel engine. Either may cause engine damage.

Handling of Fuel

Any fuel containing dust particles or water might cause engine failure. Therefore, the following must be observed:

- Take care to protect the fuel from entry of dust particles or water when filling the tank.
- If refueling is done from an oil drum directly, ensure that is has been kept stationary to allow any dust, sediment or water to settle at the bottom. Do not draw fuel direct from the bottom of the drum to prevent pickup of any settled foreign material.
- Always fully fill the fuel tank. Drain the sedimentary particles in the fuel tank frequently.

Water In Fuel

During refueling, it is possible for water (and other contaminants) to be pumped into your fuel tank along with the diesel fuel. This can happen if a fuel provider does not regularly inspect and clean its fuel tanks, or receives contaminated fuel from its supplier(s). To protect your engine from contaminated fuel, there is a fuel filter system on the engine which allows you to drain excess water.

⚠ CAUTION

The water/diesel fuel mixture is flammable, and could be hot. To avoid personal injury and/or property damage, do not touch the fuel coming from the drain valve, and do not expose the fuel to open flames or sparks.

Be sure you do not overfill the fuel tank. Heat (such as from the engine) can cause the fuel to expand. If the tank is too full, fuel could be forced out. This could lead to a fire and the risk of personal injury and/or equipment.

Biocides

In warm or humid weather, fungus and/or bacteria may form in diesel fuel if there is water in the fuel.

NOTICE

Fungus or bacterial can cause fuel system damage by plugging the fuel lines, fuel filters or injector. They can also cause fuel system corrosion.

If fungus or bacteria has caused fuel system problems, you should have your authorized dealer correct these problems. Then, use a diesel fuel biocide to sterilize the fuel system (follow the biocide manufacturer's instructions),

Biocides are available from your dealer, service stations, parts stores and other automotive places. See your authorized dealer for advise on using biocides in your area and for recommendations on which biocides you should use.

Smoke Suppressants

The use of a smoke suppressant additive is not allowed because of the greater possibility of stuck rings and valve failure, resulting from excessive ash deposits.

Lubricant

The quality of engine oil can affect engine performance, start ability and engine life.

Use of unsuitable engine oil will result in piston ring, piston and cylinder seizure and accelerate surface wear causing increased oil consumption, lowered output and, finally engine failure.

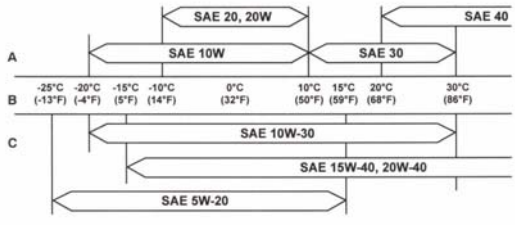
To avoid this, use the specified engine oil.

1) Engine Oil Selection ProTec™

2) Oil Viscosity

Engine oil viscosity affects engine start ability, performance, oil consumption, wear and the potential for seizure, etc.

Always ensure that lubricants with the correct viscosity for the operating temperature are used. Refer to SAE Chart below.



NOTICE

Using a mixture of different brands or quality of oils will adversely affect the original oil quality; therefore, never mix different brand or different type oils.

Do not use API, CA, CB grade and reconstituted Engine damage due to improper maintenance, or using oil of the improper quality and/or viscosity, is not covered by the warranty.engine oil.

Coolant

All Portable Power compressor engines are factory filled with a 50/50 Ethylene glycol base antifreeze/water mix. which provides protection to -33°C (-27°F).

- Be sure to add Long Life Coolant Antifreeze (LLC) to soft water. In cold season, the LLC is especially important. Without LLC, cooling performance will decrease due to scale and rust in the cooling water line. Without LLC, cooling water will freeze and expand to break the cooling line.
- Be sure to use the mixing ratios specified by the LLDC manufacturer for your temperature range.
- Do not mix different types (brand) of LLC. Chemical reactions may make the LLC useless and engine trouble could result.
- Replace the cooling water once a year.

⚠ CAUTION

When handling Long Life Coolant Antifreeze, wear protective rubber gloves. If contact with the eyes or skin should occur, wash with clean water.

Engine Operation

Engine Exhaust Gas (Carbon Monoxide)

⚠ WARNING

Do not breathe exhaust gas because it contains carbon monoxide, which by itself has no color or odor. Carbon monoxide is a dangerous gas. It can cause unconsciousness and can be lethal.

Check Before Operation

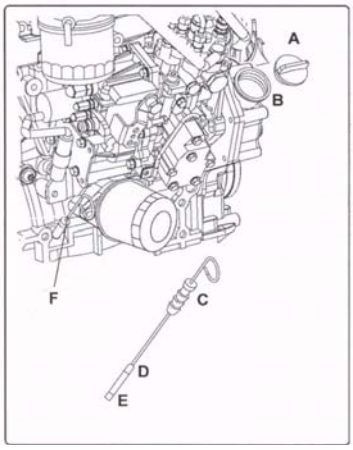
⚠ CAUTION

Conduct the inspection with the engine stopped.

Engine Oil Level

- Place the engine or the machine on a level surface.
- Remove the dipstick, wipe with a cloth. Insert it fully and take it out again.
- Check the oil level against the marks on the dipstick.

The oil level must be between the upper level mark and the lower level mark as illustrated.



A. Filler Cap

B. Filler Port (Engine Oil)

C. Dipstick

D. Upper Limit

E. Lower Limit

F. Dipstick

Remove filler cap “yellow colored) on the rocker arm cover side of engine.

Fill with engine oil up to the upper limit on the dipstick.

Manually tighten the filler cap. Do not use a tool such as pliers to tighten it.

Engine oil pan capacity (oil pan) (L) - 10.2 (10.8 quarts).

A certain period of time is required before the engine oil completely flows down from the oil filler to the crankcase. Wait at least ten minutes before checking the oil level.

Note: Take care to avoid engine oil being splashed on the fan drive belt because it causes belt slippage or slackness.

⚠ CAUTION

When adding oil, take care not to spill it. If you spill oil on the engine or equipment, wipe it off, to prevent the risk of fire, personal injury, and/or equipment damage.

Fan Belt Check

Check the fan belt for tension and abnormalities.

When the belt is depressed 7 - 10 mm with the thumb (about 100 N [10 kg] pressure) midway between the fan pulley and alternator pulley, the belt tension is correct.

If the belt tension is too high, it will result in alternator failure.

A loose belt will cause belt slippage which may result in a damaged belt, abnormal noise, poor battery charging and engine overheating.

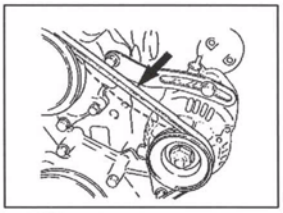


Fig. 16

Coolant Level Check

The coolant level must be between MAX “COLD" and MIN" marks on the reserve tank depending on the temperature of the engine. Check and ensure that the level is correct.

⚠ CAUTION

When removing the radiator filler cap, while the engine is still hot, cover the cap with cloth, then turn it slowly to gradually release the internal steam pressure. This will prevent anyone from being scalded by hot steam spurting out from the filler neck.

Add coolant mixed to the correct ratio: 50/50 ethylene glycol/water.

Radiator Cap Condition

After the replenishment of the coolant, install the radiator filler cap. Make sure the cap is securely installed.

Battery Cable Connection

Check the battery cable connections for looseness or corrosion. A loosened cable connection will result in hard engine starting or insufficient battery charge. The battery cables must be tightened securely. Never reverse +" and -" terminals when reconnecting cables after disconnection. Even a short period of reverse connection will damage the electrical parts.

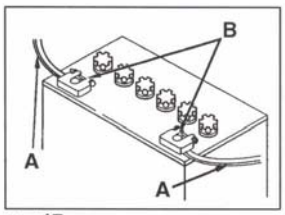


Fig. 17

A. Battery Cable

B. Connections

Battery Electrolyte Level

The amount of electrolyte in the batteries will be reduced after repeated discharge and recharge. Check the electrolyte level in the batteries, replenish with a commercially available electrolyte such as distilled water, if necessary. The battery electrolyte level checking procedure will vary with battery type.

NOTE: Do not replenish with dilute sulfuric acid in the daily service.

⚠ CAUTION

When inspecting the batteries, be sure to stop the engine first.

As dilute sulfuric acid is used as electrolyte, be careful not to contaminate your eyes, hands, clothes, and metals with the electrolyte. If it gets in your eyes, flush with water immediately and seek medical attention.

⚠ CAUTION

As highly flammable hydrogen gas is released from the batteries, do not create a spark or allow any naked flame near the batteries.

When handling such metallic articles as tools near the batteries, be sure not to contact the "+" terminal because the compressor body is "-" and a dangerous short circuit might result.

When disconnecting the terminals, start with "-" terminal. When connecting them, connect the "-" terminal last.

Fuel Level

Check the remaining fuel oil level in the fuel tank and re-fuel if necessary.

CHECKS and OPERATION AFTER START-UP

After engine start-up, check the following items in the engine warming-up operation:

- Listen to the engine and, if any abnormal noise is heard, check to determine the cause.
- Check the fuel combustion condition by observing the exhaust smoke color. The exhaust smoke color after engine warm-up and at no-load condition should be colorless or light blue. Black or white smoke indicates incorrect combustion.

Note: After start-up from cold, the engine might be noisier and the exhaust smoke color darker than when it has warmed up. However, the condition will disappear after warm-up.

Leakage in the System

Check the following items:

- Lubrication oil leakage - Check the engine for oil leaks, paying particular attention to oil filter and oil pipe joints.
- Fuel leakage - Check the fuel injection pump, fuel lines and fuel filter for leakage.
- Coolant leakage - Check the radiator and water pump hose connections and the water drain cock on the cylinder block for leakage.
- Check for exhaust smoke or gas leakage.

Checking Coolant Level

The coolant level could drop because any mixed air is expelled in about 5 minutes after the engine started.

Stop the engine, remove radiator cap, and add coolant.

⚠ CAUTION

HOT STEAM. Do NOT remove radiator cap when the engine is hot. Cover the radiator cap with a thick cloth and loosen the cap slowly to reduce the pressure, then remove the cap.

OPERATION AND CARE OF A NEW MACHINE

Your Portable Power engine is carefully tested and adjusted in the factory, however, further run-in is necessary. Avoid any harsh engine operation within the initial 100 operating hours.

Do not operate the unit at full load until the engine is warmed-up.

Do not allow the engine to run unloaded for extended periods so as to minimize the risk of cylinder bore glazing.

During operation, pay attention to the following points if the engine shows any sign of abnormalities.

Engine Oil Pressure - The engine oil pressure is monitored by a switch that will stop the engine if the pressure falls below a pre-set value.

Coolant Temperature - The engine performance will be adversely affected if engine coolant temperature is too hot or too cold. The normal coolant temperature is 75 to 85°C (167°to 185°F).

Overheating

⚠ CAUTION

If you see or hear escaping steam or suspect a serious overheating condition, stop the engine immediately.

If the Engine Coolant Temperature Gauge (where fitted) shows an overheat condition, or you have reason to suspect the engine may be overheating, take the following steps.

- Close the service valve to reduce the load.
- Let the engine run at normal idle speed for two or three minutes. If the engine coolant temperature does not start to drop, turn off the engine and proceed as follows:

To avoid being burned -

⚠ CAUTION

Do not open the canopy or door if you see or hear steam or engine coolant escaping. Wait until no steam or engine coolant can be seen or heard before opening the engine canopy or door.

⚠ CAUTION

Do not remove the radiator filler cap if the engine coolant in the reserve tank is boiling. Also do not remove the radiator filler cap while the engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.

If no steam or engine coolant can be seen or heard, open the canopy or door. If the engine coolant is boiling, wait until it stops before proceeding. The engine coolant level should be between the MAX COLD" and MIN" marks on the reserve tank.

Make sure the fan belt is not broken, or off the pulley, and that the fan turns when the engine is started. If the engine coolant level in the reserve tank is low, look for leaks at the radiator hoses and connections, radiator, and water pump. If you find major leaks, do not run the engine until these problems have been corrected. If you do not find a leak or other problem, WAIT UNTIL THE ENGINE HAS COOLED DOWN then carefully add engine coolant to the reserve tank.

(Engine coolant is a mixture of ethylene glycol antifreeze and water. (See Engine Care in Cold Season for the proper antifreeze and mixture).

⚠ CAUTION

To avoid being burned, do not spill antifreeze or engine coolant on the exhaust system or hot engine parts. Under some conditions, the ethylene glycol in engine coolant is combustible.

If the engine coolant level in the reserve tank is at the correct level but there is still an indication of an overheat condition and no cause was found, please consult your local branch or dealer.

Overcooling

Operating the engine at low coolant temperature will not only increase the oil and fuel consumption but also will lead to premature parts wear which may result in engine failure. Ensure that the engine reaches normal operating temperature 75 to 85°C (167 to 185°F) within ten minutes of starting.

Hourmeter

This meter indicates the machine operation hours. Make sure that the meter is always working during engine operation. Periodical machine maintenance is scheduled on the operation hours indicated on the hourmeter.

Liquid and Exhaust Smoke Leakage

Make regular checks for lubricant, fuel, coolant and exhaust smoke leakage.

Abnormal Engine Noise

In the event of any abnormal engine noise, please consult your local branch or dealer.

Engine Stopping

Close the service valves.

Before stopping the engine, cool down the engine by operating it at reduced load about three minutes. In this period, check the engine noise for abnormalities.

Long Term Storage

If the equipment is to be out of operation for an extended period, it should be started at least once per week and run on load for about 15 minutes after it has reached normal operating temperature.

If this is not possible:

- Do not drain the cooling water.
- Clean dust or oil from the engine extension.
- Either fill completely or drain the fuel tank.
- Grease accelerator joints and electrical connections.
- Disconnect the negative battery terminal.

ENGINE MAINTENANCE

Periodical Inspection and Maintenance

Inspection after initial 50 hours of operation

Replacing the engine oil and engine oil filter (1st time):

When the engine oil is still hot, be careful with a splash of engine oil which may cause burns. Cool the engine to replace engine oil until the engine oil becomes warm. It is most effective to drain the engine oil while the engine is still warm.

In early period of use, the engine oil gets dirty rapidly because of the initial wear of internal parts. Replace the engine oil earlier.

Engine oil filter should also be replaced when the engine oil is replaced.

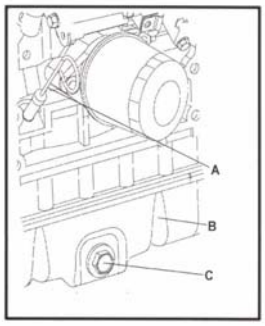
Engine oil and engine oil filter replacing procedures are as follows:

1. Prepare a waste oil container collecting waste oil.
2. Loosen the drain plug using a wrench (customer procured) to drain the engine oil).
3. Securely tighten the drain plug after draining the engine oil.
4. Turn the engine oil filter counter-clockwise using a filter wrench (customer procured) to remove it.
5. Clean the engine oil filter mounting face.
6. Moisten the new engine oil filter gasket with the engine oil and install the new engine oil filter manually turning it clockwise until it comes into contact with the mounting surface, and tighten it further to 3/4 of a turn with the filter wrench.
7. Tightening torque: 19.6~23.5N•m (2.0~2.4kgf•m)
8. Applicable engine oil filter part no: 22226351
9. Fill with the new engine oil until it reaches the specified level as explained in OPERATION section.
10. Warm up the engine by running for 5 minutes while checking any oil leakage.
11. Stop the engine after warming up and leave it stopped for about 10 minutes to recheck the engine oil level with dipstick and replenish the engine oil. If any oil is spilled, wipe it away with a clean cloth.
12. Resume engine oil and filter changes at 250 our intervals (with non IR fluids) or 500 hour intervals with Ingersoll Rand Protec™ engine fluid and filters.

Note: The use of genuine Ingersoll Rand oil and filters will qualify for extended warranty coverage. Refer to Warranty Section of the manual.

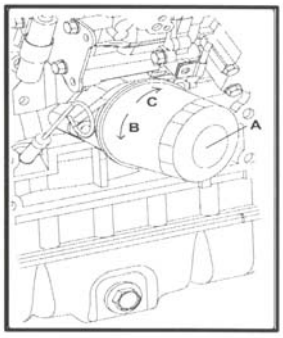
Ingersoll Rand Protec™ Engine Fluid Part No. 54480918 (1 gallon).

Important: Do not overfill the oil pan with engine oil. Be sure to keep the specified level between upper and lower limit on the dipstick.



The location depends on the engine installed on the machine unit.

(A) Dipstick (B) Oil Pan (C) Drain Plug



(A) Engine Oil Filter (B) Loosen (C) Tighten

Draining Water from Filter/Separator

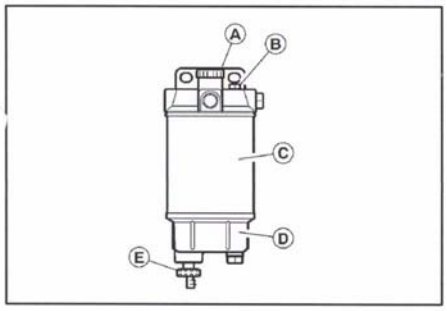
The fuel filter/separator is provided to allow water to be drained from the fuel system. Water is heavier than fuel so any water contained in the system will collect in the bottom of the bowl.

The clear bowl “D” should be checked on a daily basis and if water is present, it should be drained from the separator.

Place a suitable container under the separator to prevent any spillage inside the machine.

Slacken the drain valve “E” until water drains from the vent tube.

When all the water has been evacuated, tighten the drain valve “E” and follow the “fuel system air bleeding” procedure below.



Fuel System Air Bleeding

The entry of air into the fuel system will cause difficult engine starting or engine malfunction.

When carrying out service procedures such as emptying the fuel tank, draining the filter/ separator, and changing the fuel filter element be sure to bleed air from the fuel system.

To activate the “automatic air-bleeding system”, turn the key switch to the “ON” position and energize the electromagnetic pump to bleed the air.

Air Bleeding Method:

When the “starter switch” is set to the “ON” position to activate the electromagnetic pump, fuel is forced to the fuel valve of each injector nozzle, so that any air in the fuel system bleeds off automatically to the fuel tank.

Note: Although the fuel system can bleed air automatically when the key switch is in the “ON" position, air can also be manually bled by use of the primer pump facility in the filter/ separator assembly.

By unscrewing the plastic primer pump head `A' and stroking it up and down, any air bubbles in the system will be purged back to the fuel tank.

When this has been completed, the pump head must be screwed back into the filter/ separator assembly.

Start the engine and visually check the fuel system for leaks.

Replacing Fuel Filters

Replace the fuel filter at specified intervals before it is clogged with dust to adversely affect the fuel flow. Also, replace the fuel filter after the engine has fully been cooled.

1) Remove the fuel filter using a filter wrench (customer procured). When removing the fuel filter, hold the bottom of the fuel filter with a piece of rag to prevent the fuel oil from dropping. Wipe up any fuel spillage.

2) Clean the filter mounting surface and slightly apply fuel oil to the gasket of the new fuel filter.

3) Install the new filter, manually turning until it comes into contact with the mounting surface, and tighten it further to 1/2 at a turn, using a filter wrench.

Tightening torque:

11.8 ~15.6N•m (1.2~1.6kgf•m)

Applicable Fuel Filter Part No. 16539462.

4) Bleed the fuel system. Refer to Inspection at 50 hours.

IMPORTANT: Use genuine IR part (super fine mesh filter). Otherwise, it will result in engine damage, uneven engine performance and shorter engine life.

Changing Oil/Water Separator Element

Note: the cartridge and bowl contain fuel. Take care not to spill it during disassembly and reassembly.

The fuel filter/separator also provides primary filtration and the element “C” should be changed every 500 operating hours or 6 months, whichever comes first.

Change Procedure:

- Unscrew the element “C” from the head taking care not to spill fuel inside the machine. Drain any fuel within into a suitable container, then unscrew the clear bowl “D” from the element.
- Discard the old element.
- Remove the old “O” ring from the bowl “D” and install the new one supplied with the element. Apply a light coat of clean engine oil to the “O” ring and screw the bowl “D” onto the new element “C”.
- Using a clean cloth, wipe the sealing face of the filter/separator head to ensure correct seating of the sealing ring.
- Fill the element/bowl assembly with clean fuel oil then apply a light coat of clean engine oil to the new element seal ring.
- Screw the new element onto the head firmly by hand.
- Follow the “fuel system air bleeding” procedure.

Every 1000 Hours of Operation

Replacing Cooling Water

Cooling water contaminated with rust or water scale reduces the cooling effect. Even when antifreeze agent (LLC) is mixed, the cooling water gets contaminated due to deteriorated ingredients. Replace the cooling water at least once a year. Procedure:

- Remove the header tank cap.
- Remove the bottom radiator hose of the radiator and drain the cooling water.
- After draining the cooling water, reconnect the hose.
- Fill radiator and engine with cooling water via the header tank.

⚠ CAUTION

Beware of scalding hot water.

Wait until the temperature goes down before draining the Cooling water. Otherwise, hot water may splash to cause scalding.

Adjusting Intake/Exhaust Valve Clearance- As this adjustment requires specialized knowledge and skill, consult your Portable Power dealer. The adjustment is necessary to maintain the correct timing for the opening and closing of valves. Neglecting the adjustment will cause the engine to run noisily and result in poor engine performance and other damage.

Every 1500 Hours of Operation

Inspect, Clean and Test Fuel Injectors - As the adjustment requires specialized knowledge and skill, consult your Portable Power dealer. This adjustment is needed to obtain the optimum injection pattern for full engine performance.

Inspect Turbocharger (Blower Wash as Necessary) - Turbo charger service is required by the EPA/ARB every 1500 hours. Your authorized Portable Power dealer or distributor will inspect and blower wash the unit if necessary.

Inspect, Clean and Test EGR Valve - The EGR valve is a key component for cleaning exhaust gas.

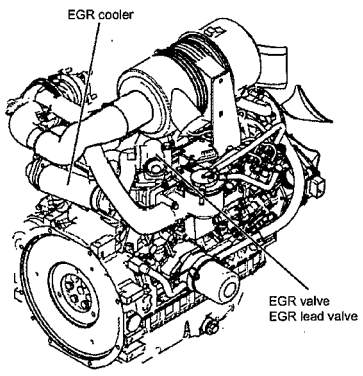
To prevent the valve from deteriorating in exhaust gas recirculation performance due to carbon accumulation, inspect, clean and test the valve at least every 1500 hours. Consult your local Portable Power dealer for this service.

Inspect and Clean EGR Lead Valve - The EGR lead valve is located in the passage of recirculated gas.

To prevent carbon accumulation in or clogging of the lead valve, inspect and clean the lead valve at regular intervals. Consult your local Portable Power dealer for this service.

Clean EGR Cooler - The EGR cooler is apt to be contaminated with rust and scale that deteriorate the cooling performance. Carbon accumulation in the exhaust gas passage of the cooler hinders circulation of exhaust gas, resulting in deterioration in exhaust gas cleanup performance.

To prevent such a problem, clean the cooler at least every 1500 hours. Consult your local Portable Power dealer for this service.



Inspect Crankcase Breather System - Proper operation of the crankcase breather system is required to maintain the emission requirements of the engine. The EPA/ARB requires that you have the crankcase breather system inspected every 1500 hours. See your authorized Portable Power dealer or distributor for this service.

Every 2000 Hours of Operation

Flushing the cooling system and checking the cooling system parts -

As this adjustment requires specialized knowledge and skill, consult yourPortable Power dealer. Rust and water scale will accumulate in the cooling system through many hours of operation. This lowers the engine cooling effect.

Checking and replacing fuel hoses and cooling water hoses - As this adjustment requires specialized knowledge and skill, consult your Portable Power dealer. Regularly check the rubber hoses of the fuel system and cooling water system. If cracked or degraded, replace them with new one. Replace the rubber hoses at least every 2 years.

Lapping the intake and exhaust valves - As this maintenance requires specialized knowledge and skill, consult your Portable Power dealer. The adjustment is necessary to maintain proper contact of the valves and seats.

Checking and adjusting the fuel injection timing - As this maintenance requires specialized knowledge and skill, consult your Portable Power dealer.

Checking and Adjusting the EPA emission related parts.

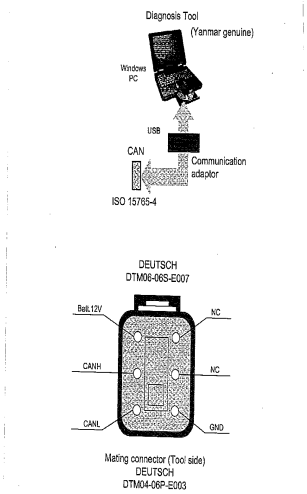
The inspection and servicing require specialized knowledge and techniques. Consult your Portable Power dealer or distributor.

Apply maintenance schedule for emission related parts as follows:

Diagnosis Tool

A connector is provided at an end of the harness of the driven machine so that the diagnosis tool can be loaded with data from the E-ECU.

When the fuel injection pump is replaced, data in the E-ECU must also be replaced for accomodating the new pump. When the E-ECU is replaced, the fuel injection data in the existing unit must be migrated to the new unit. The diagnosis tool can be used for the data replacement or migration. Contact your local Portable Power dealer for replacement of the fuel injection pump or E-ECU.



SIMPLE ENGINE TROUBLESHOOTING

Table 4: Engine Does Not Start

Cause	Corrective Action
Starter Does Not Turn	Battery discharged. Bad cable connections. Starter or starter switch failure.
Starter Turns but engine does not fire (No Fuel Injection)	No fuel in fuel tank
	Clogged fuel filter element
	Air in fuel system
	Control rack stuck at no fuel position
Starter Turns (Fuel Injected but engine does not fire)	Incorrect preheating operation
	Faulty air heater
	Incorrect injection timing
	Low cylinder compression pressure
Engine fires but stalls immediately	Air in the fuel system

Table 5: Unstable Engine Running

Cause	Corrective Action
Unstable Low Idling	Crack in injection pipe
	Injection nozzle failure
	Uneven compression pressure between cylinders
Incorrect High Idle Speed	Software/Electronic malfunction
Engine Hunting in Medium Speed Range	Software/Electronic malfunction
Insufficient Fuel Supply	Air in the fuel system
	Clogged fuel filter element
	Piping failure (squeezed, restricted)
Engine Malfunction in High Speed Range	Uneven fuel injection amount between cylinders
	Incorrect valve clearance adjustment
	Deteriorated valve spring
Engine Speed Stuck at High Idle	Engine control restriction or seizure

Table 6: Engine Overheat

Cause	Corrective Action
Cooling System Defect	Insufficient coolant volume
	Fan belt slippage
	Thermostat malfunction
	Radiator filler cap malfunction
	Cooling system interior fouled
	Radiator clogged
Improper Servicing	Engine overload
	Air cleaner element clogged
	Insufficient airflow/restriction
	Restricted coolant flow (high concentration of antifreeze, etc).

Table 7: Low Oil Pressure

Cause	Corrective Action
Lack of Oil	Oil leakage
	High oil consumption
Wrong Oil	Wrong type and viscosity
High Coolant Temperature	Overheat
Clogged Filter and Strainer	Clean and/or replace
Worn Bearings and Oil Pump	Replace
Faulty Relief Valve	Replace

Table 8: Low Engine Output

Cause	Corrective Action
Incorrect Injection Timing	Too far advanced
	Too far retarded
Injection Nozzle Malfunction	Incorrect injection pressure
	Incorrect spray condition
Incorrect Injection Pump Adjustment	Lack of fuel in tank
Insufficient Fuel Supply to the Injection Pump	Air in the injection pump
	Fuel filter clogged
	Overflow valve malfunction
Governor Malfunction	Incorrect engine control adjustment
	Deteriorated governor spring
Cylinder Compression Leakage	Incorrect valve clearance adjustment
	Injector nozzle misalignment
Low Cylinder Compressor Pressure	Cylinder bore wear
Insufficient Air Intake Volume	Air cleaner clogged
	Restricted air flow

Table 9: Excessive Oil Consumption

Cause	Corrective Action
Incorrect Oil	Wrong selection of type and viscosity
Engine Burning Oil	Faulty piston rings/damaged cylinder bores
	Faulty valve stem seal
Oil Leakage	Damaged seal/ Damaged turbocharger seal
	Loose joints/gaskets
	Improper installation of filter and piping

Table 10: Excessive Fuel Consumption

Cause	Corrective Action
Excessive Injection Volume	Injection pump defective

Table 11: Improper Exhaust

Cause	Corrective Action
Excessive Black Smoke	Clogged air cleaner
	Damaged injector nozzle
	Faulty EGR Valve
	Injection timing incorrect
	Excessive injection volume
	Incorrect fuel
Excessive White Smoke	Water mixing in fuel
	Low compression pressure
	Injection timing incorrect
	Low coolant temperature
	Faulty turbocharger

Table 12: Battery Over Discharge

Cause	Corrective Action
Low Electrolyte Level	Crack in battery body
	Natural Consumption
Charging Failure	Loose or damaged belt
	Faulty alternator
	Damaged wiring or contact failure
Excessive electrical loads	Insufficient battery capacity for the application

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