OPERATION and MAINTENANCE MANUAL

AIRSOURCE-IR AIRSOURCE PLUS-IR

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.

Ingersoll-Rand Utility Equipment
501 Sanford Ave
Mocksville, N.C. 27028

Book 22498711 (3/05)
Revised (09-12)

CALIFORNIA

Proposition 65 Warning

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

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FOREWORD

Foreword

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

This manual contains instructions and technical data to cover all routine operation and scheduled maintenance tasks by operation and maintenance staff. Major overhauls are outside the scope of this manual and should be referred to an authorized Ingersoll-Rand 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 Ingersoll-Rand.
- 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 Ingersoll-Rand Service departments. The use of repair parts other than those included within the Ingersoll-Rand approved parts list may create hazardous conditions over which Ingersoll-Rand has no control. Therefore, Ingersoll-Rand cannot be held responsible for equipment in which non-approved repair parts are installed.

Ingersoll-Rand 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, Ingersoll-Rand cannot anticipate every application or work situation that may arise. **If in doubt, consult supervision.**

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

This machine should not be used:

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

B. Outside the ambient temperature range of minus 20°F to 115°F.

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

D. With other than Ingersoll-Rand approved components.

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

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

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

To Convert From Shipping Position to Towing Position

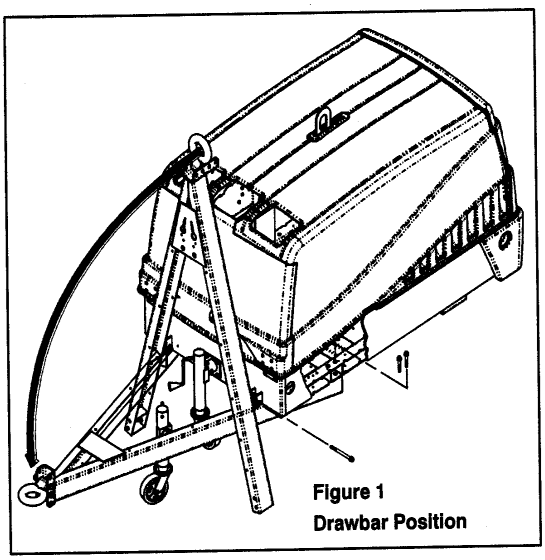


Figure 1
Drawbar Position

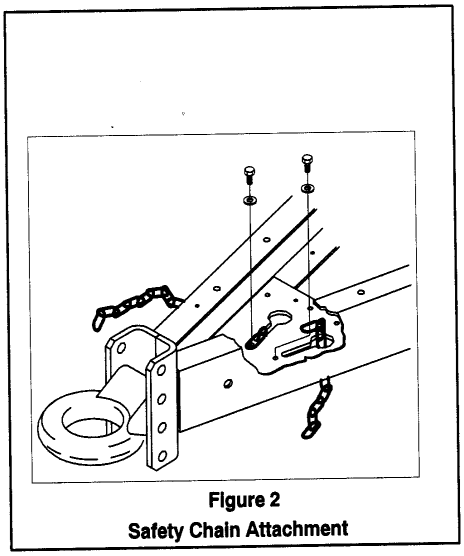


Figure 2
Safety Chain Attachment

Following Tools are required	Hardware Included
Ratchet	(4) 12mm bolts with pre-applied thread lock
13mm socket to fit ratchet	(2) 8mm Taptite Bolts
Torque wrench set to 68 foot pounds (9.4 kg-meters)	(2) Washers
16mm socket to fit torque wrench	(2) Safety Chains
12 inch extension for torque wrench	

1. Remove hardware box from compressor toolbox.

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

3. Raise the front of the unit 50 that the legs are approximately 1" above the ground and support front of unit.

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. Ibs. (9.4 kg-m}. (See Figure 1).

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 Figure 2).

Support the Drawbar at the Pintle Eye:

8. Pull the pin out of the jack located at the front of the enclosure. Remove the jack by sliding it off the mounting tube. Relocate and install the jack to the mounting tube on the side of the drawbar.

Section 1 - 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.

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.

Look for these signs on machines. They 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.

⚠ DANGER

DANGER (Red Background) indicates the presence of a hazard which <u>will</u> cause werious injury, death or property damage if ignored.

⚠ WARNING

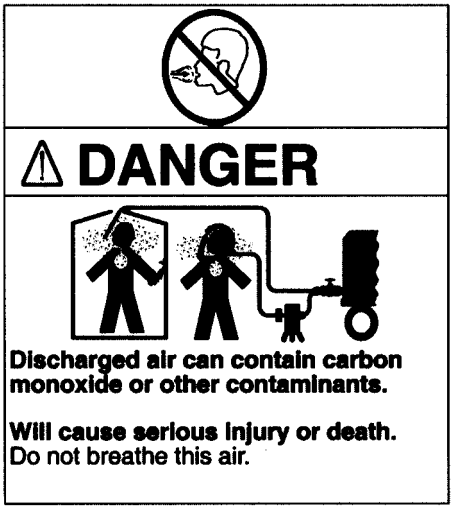
WARNING (Orange Background) indicates the presence of a hazard which <u>can</u> cause serious injury, death or property damage if ignored.

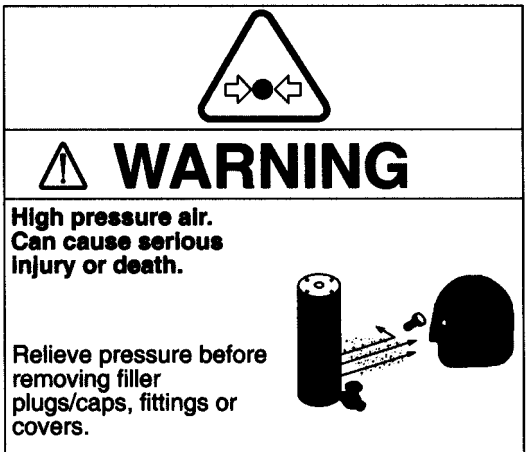
⚠ CAUTION

CAUTION (Yellow Background) indicates indicates the presence of a hazard which <u>will</u> or <u>can</u> cause serious injury or property damage if ignored.

NOTICE

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

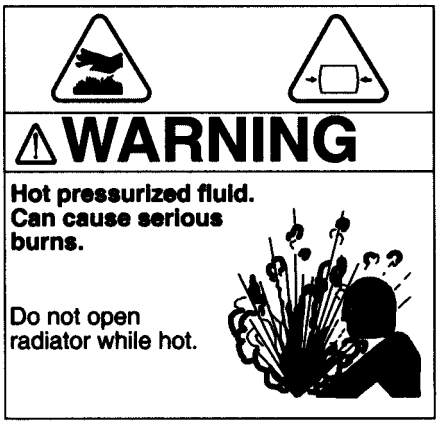

⚠ DANGER
Discharged air can contain carbon monoxide or other contaminants.
Will cause serious injury or death.
Do not breathe this air.

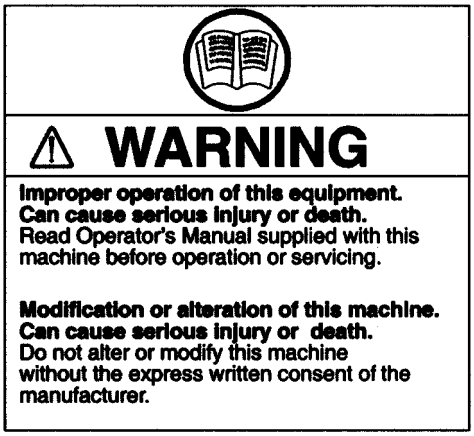

⚠ WARNING
High pressure air.
Can cause serious injury or death.
Relieve pressure before removing filler plugs/caps, fittings or covers.


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


105
km/h
⚠ WARNING
Collapsing jackstand.
Can cause serious injury.
Insert locking pin completely.
Excessive towing speed.
Can cause serious injury or death.
Do NOT exceed 65 mph (105 km/hr.)


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


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.

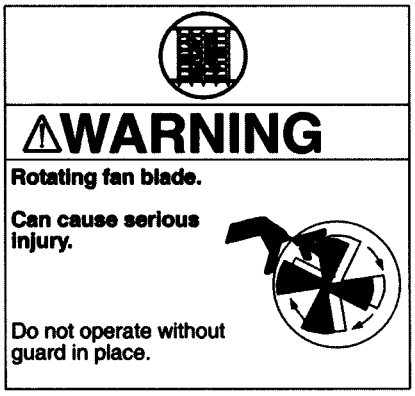

WARNING
Rotating fan blade.
Can cause serious injury.
Do not operate without guard in place.

Table 1:

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 Mocksville 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.

Section 1 - WARRANTY

WARRANTY

Ingersoll-Rand, through its distributors, warrants to the initial user that each **portable air compressor** manufactured by it, will be free of defects in material and workmanship for a period of the earlier of twelve (12) months from shipment to or the accumulation of 2,000 hours of service by the initial user.

Portable compressor airends will be free of defects in material and workmanship for a period of the earlier of twenty four months from shipment to or the accumulation of 4,000 hours of service by the initial user. The warranty against defects will include replacement of the complete airend, provided the original airend is returned assembled and unopened.

Portable Compressor Airend Limited Optional Warranty - The earlier of sixty (60) months from shipment to or the accumulation of 10,000 hours of service. The optional warranty is limited to defects in rotors, housings, bearings and gears and is automatically available when meeting the following conditions:

1. The original air end is returned assembled and unopened.
2. Continued use of genuine Ingersoll-Rand parts, fluids, oil and filters.
3. Maintenance is performed at prescribed intervals.

Oil-Free airends are fee-based and may require a maintenance agreement. Formal enrollment is required.

Ingersoll-Rand engines will be free of defects in material and workmanship for a period of the earlier of twenty four months from shipment to or the accumulation of 4,000 hours of service by the initial user.

Ingersoll-Rand Platinum Drive Train Warranty (Optional) – Platinum drive train (Ingersoll-Rand Engine and Airend combination) will be free of defects in material and workmanship for a period of the earlier of sixty (60) months from shipment to, or the accumulation of 10,000 hours of service. The starter, alternator, fuel injection system and all electrical components are excluded from the extended warranty. The airend seal and drive coupling are included in the warranty (airend drive belts are not included). The optional warranty is automatically available when meeting the following conditions:

1. The original airend is returned assembled and unopened.
2. Continued use of genuine Ingersoll-Rand parts, fluids, oil and filters.
3. Maintenance is performed at prescribed intervals.

It is the obligation of the user to provide verification that these conditions have been satisfied when submitting warranty claims.

Limited Corrosion Warranty (Optional) - The earlier of sixty (60) months from shipment to or the accumulation of 10,000 hours of service. The optional warranty is limited to corrosion of canopy, exterior sheet metal (sidewalls) and belly pans. The Corrosion warranty is available at an additional fee, only for models AirSource and AirSource Plus. Consult the authorized Sales or Service representative for availability and pricing. **Formal enrollment is required.**

Ingersoll-Rand will provide a new part or repaired part, at its election, in place of any part, which is found upon its inspection to be defective in material and workmanship during the period prescribed above. Such part will be repaired or replaced without charge to the initial user during normal working hours at the place of business of an Ingersoll-Rand distributor authorized to sell the type of equipment involved or other establishment authorized by Ingersoll-Rand. User must present proof of purchase at the time of exercising warranty.

The above warranty does not apply to failures occurring as a result of abuse; misuse, negligent repairs, corrosion, erosion and normal wear and tear, alterations or modifications made to the product without express written consent of Ingersoll-Rand; or failure to follow the recommended operating practices and maintenance procedures as provided in the product's operating and maintenance publications.

Accessories or equipment furnished by Ingersoll-Rand, but manufactured by others, including, but not limited to, engines, shall carry whatever warranty the manufacturers have conveyed to Ingersoll-Rand and which can be passed on to the initial user.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, (EXCEPT THAT OF TITLE),AND THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

WARRANTY REGISTRATION

Complete Machine Registration

Machines shipped to locations within the United States do not require a warranty registration unless the machine status changes (i.e. change of ownership).

Machines shipped outside the United States require notification be made to initiate the machine warranty.

Fill out the Warranty Registration Form in this section, keep a copy for your records and mail form to:

Ingersoll-Rand Company

Portable Compressor Division

P.O. Box 868

Mocksville, North Carolina 27028

Attn: Warranty Department

NOTE: Completion of this form validates the warranty.

Selling Distributor	**Servicing Distributor**	**WARRANTY REGISTRATION**
Name _____	Name _____	Owner/User Name _____
Address _____	Address _____	Address _____
City _____	City _____	City_____
County _____	County _____	County _____
State _____	State _____	State _____
Zip Code _____	Zip Code _____	Zip Code_____
Telephone _____	Telephone _____	Telephone _____

Complete the Applicable Blocks Owner / User Type of Business (check one only)

☐ Construction-Heavy (highway, excavation, etc.)	☐ Asphalt Contractor	☐ Coal Mining	☐ Other Mining
☐ Construction-Light (carpentry, plumbing, pools, mason, etc.)	☐ Government (municipal, state, county, etc.)	☐ Quarry	☐ Shallow Oil & Gas
☐ Rental (rental center, rental fleet, etc.)	☐ Building Contractor	☐ Waterwell	☐ Utility Company
☐ Industrial (plant use)	☐ Other specify	☐ Exploration	☐ Utility Contractor

Model	**Unit S/N**	**Engine S/N**	**Date Delivered**
Model	**Unit S/N**	**Engine S/N**	**Date Delivered**

SERVICING DISTRIBUTOR/USER ACKNOWLEDGEMENT

1. The Purchaser has been instructed and/or has read the manual and understands proper preventative maintenance, general operation and safety precautions.
2. The warranty and limitation of liability has been reviewed and understood by the owner/user.
3. In the event that this unit is to be used within a nuclear facility, the owner/user shall notify Ingersoll-Rand of such use so that Ingersoll-Rand may arrange for appropriate nuclear liability protection from the owner-licensee of the facility.
4. Ingersoll-Rand reserves the right to make design changes or modifications of Ingersoll-Rand products at anytime without incurring any obligation to make similar changes or modifications on previously sold units.

Attention: Warranty Department

Ingersoll- Rand Company
Portable Compressor Division
P.O. Box 868
Mocksville, North Carolina 27028

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Section 3 - 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.

Ingersoll-Rand Company 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 Ingersoll-Rand Company 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)

Section 4 - GENERAL DATA

General Data

Unit Model:

UNIT MODEL	Air Source	Air Source Plus
CFM	160	185
Engine Speed - RPM (Full Load)	2600	2500
Engine Speed - RPM (No Load)	1700	1700
COMPRESSOR		
Rated Operating Pressure - psi (kPa)	100 (689)	- - -(861)
Safety Valve Setting - psi (kPa)	150 (1034)	150 (1034)
Net Weight (less fuel) pounds	1700	1700
ENGINE (Diesel)		
Manufacturer	Ingersoll-Rand	
Model	4IRX3N	4IRX3T
Electrical System	12VDC	12VDC

FLUID CAPACITIES

Compressor Lubricant.....10 quarts (9.5 litres)
Engine Crankcase Lubricant .....10.0 quarts (9.5 litres)
Fuel Tank .....20 U.S gal. (76 litres)
Radiator .....2.5 U.S. gal. (9.5 litres)

RUNNING GEAR

Tire Size.....205/75D15
Inflation Pressure (Cold) .....50 psi
Towing Speed (Maximum).....65 mph (105 km/hr)

UNITS MEASUREMENTS WEIGHTS

Overall Length.....11.0 feet (5.2 meters)
Overall Height .....4.9 feet (2.3 meters)
Overall Width .....5.6 feet (2.6 meters)
Track Width.....4.5 feet (2.1 meters)

Weight (with fuel) .....1850 lbs
Weight (less fuel) .....1700 lbs

EXPENDABLE SERVICE PARTS

Compressor Oil FIlter Element.....Part No. 22436323
Compressor Oil Separator Element.....Part No. 22436331
Air Cleaner Element (Compressor) primary.....Part No. 35393685
Air Cleaner Element (Engine) primary .....Part No. 35393685
Air Cleaner Element (Compr) secondary - optional ..Part No. 35393651
Air Cleaner Element (Engine) secondary - optional .Part No. 35393651
Engine Oil Filter Element .....Part No. 22496905
Fuel Water Separator Element .....Part No. 22532378
Fuel/Water Filter Assembly.....Part No. 22528228
In-Line Fuel Filter.....Part No. 36845493
Protec Compressor Fluid (1 gal).....Part No. 36899698
500 hour Maintenance Kit (without fluids).....Part No. 36096170
500 hour Maintenance Kit (with fluids).....Part No. 36096188
1000 hour Maintenance Kit (without fluids).....Part No. 36096196
1000 hour Maintenance Kit (with fluids).....Part No. 36096204

⚠ 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 Ingersoll-Rand Company.

SECTION 5 - 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 canopy 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.

- Ensure that tires, wheels and running gear are in good condition and secure, and ensure hat tires are inflated to 50 psi.
- Do not tow this unit in excess of 65 mph (104 km/hr).
- Use a tow vehicle whose towing capacity is greater than the gross weight of this unit.

DISCONNECT

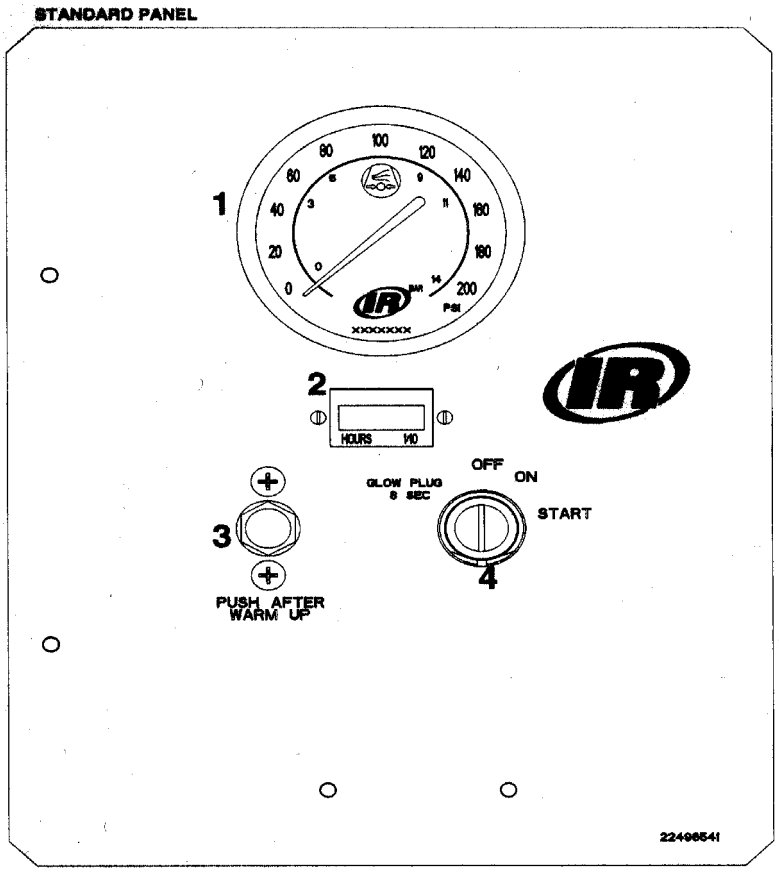
- Engage tow vehicle parking brake.
- Chock tires of compressor.
- Set the vehicle parking brake. Chock wheels of unit.
- Standing to the side, remove pin from tube of jack.
- Disconnect safety chains. Crank jack to raise eye or coupler from hitch. Tow vehicle can be moved.

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.

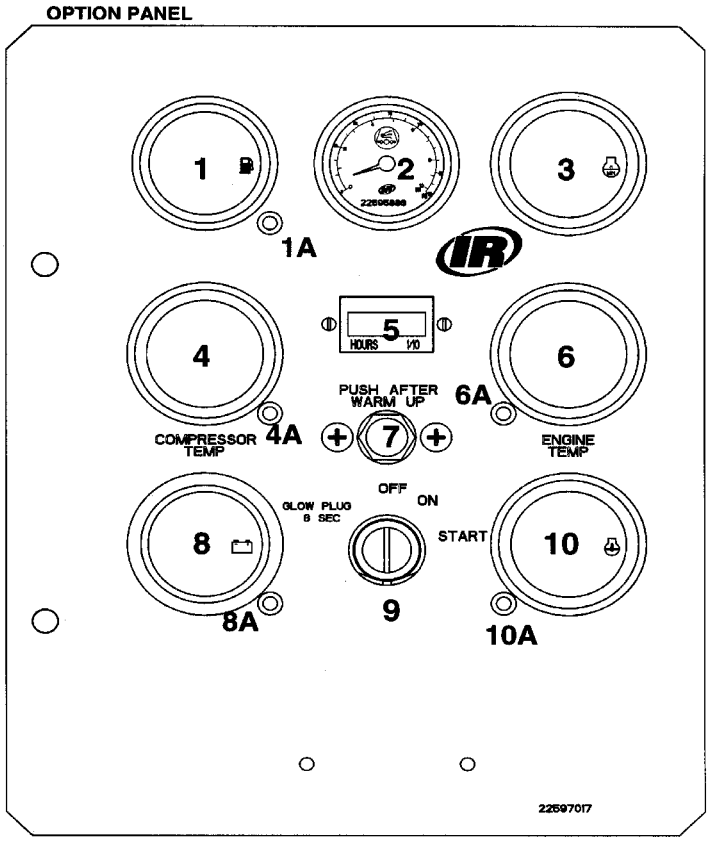
STANDARD CONTROL PANEL



Instruments & Controls

1. **Discharge Pressure Gauge -** Indicates pressure in receiver tank, psi (kPa).
2. **Hourmeter -** Records running time for maintenance.
3. **Start/Run Valve -**
4. **Key Start Switch -**

OPTION PANEL



1. Fuel Level - Indicates fuel level

1A. Low fuel level shutdown indicator light

2. Discharge Pressure Gauge

3. Tachometer - Indicates engine speed

4. Airend Temp Gauge

4A. High A/E temperature shutdown indicator light

5. Hourmeter - Records running time for maintenance

6. Engine Water Temperature - Indicates coolant temperature with normal operating range from 180°F (82°C) to 210°F (99°C).

6A. High engine water temperature shutdown indicator light

7. Start/Run Valve - N

8. Voltmeter - Indicates battery condition

8A. Low accelerator output indicator light

9. Ignition Switch

10. Engine Oil Pressure Gauge

10A. Low engine oil pressure shutdown indicator light.

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

a. Turn power switch to the glow plug position and hold 8 seconds. Then turn to start.

NOTICE

Engine is equipped with glow plugs for cold starting aid. Do not use ETHER/ starting fluid. Engine damage can occur.

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.
- In separator tank.
- Low fuel level shutdown only with optional controls and instruments.

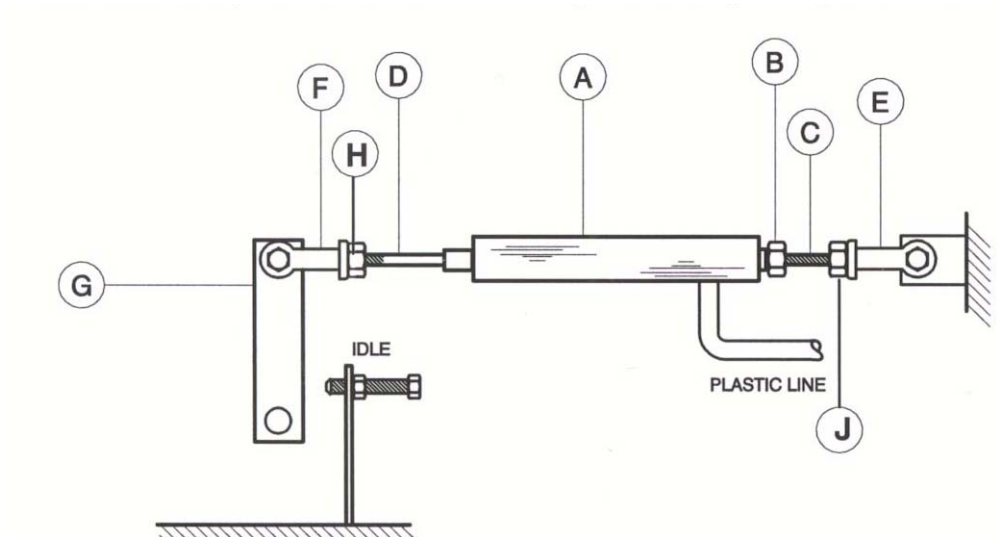
Units with Optional Controls and Instrument Panel

The optional control and instrument panel provides an added shutdown feature for low fuel level. This option also includes shutdown indicator lights adjacent to gauges.

In a shutdown situation, the function of the lights is to indicate what specific failure caused the unit to shut down. These lamps will remain illuminated until the Power Switch is turned “OFF”.

Test the lights by turning the ignition switch “ON”. All lights should be OFF during machine operation.

Speed and Pressure Regulator Adjusting Instructions



The engine idle and full speed settings are set and sealed at the factory, and should not be adjusted. Serious injury may result if the full speed is increased. Removal of the seals without authorization could affect the warranty. If speed settings are lost due to engine fuel pump service or other repairs, the speed settings can be reset as follows:

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).
3. Inspect throttle arm (G) on engine governor to see the arm is resting against the governor stop. Loosen jam nut on air actuating cylinder (A) and then turn cylinder rod (D) until throttle arm (G) is forced against the governor stop.

After Starting Unit

4. 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. Tighten the pressure regulator jam nut. Replace cover.
5. With the service valve closed, adjust IDLE speed (*). Adjust speed using adjusting rod (D). Tighten jam nut (H).
6. Open the service valve and adjust the discharge pressure to 100 psi (700 kPa). Now turn adjusting rod (C) until the proper engine FULL speed setting (*) is reached. Tighten jam nuts (B & J).
7. 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.

Section 6 - 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. Maintain the fluid level between bottom and midway of the sight glass on the separator tank.

Air Cleaner

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 clips 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.

Table 1:

Wheel Torque Chart	
M12 Bolts	**Torque (Ft-Lbs)**
13” wheel	60-70
1/2” lug nuts	
13” wheel	80-90
15” wheel	105-115
16” wheel	105-115
16.5” wheel	105-115
5/8” lug nuts	
16” wheel	190-210
17.5” wheel	190-210

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 near bottom of separator tank to drain compressor oil.

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

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.
- Unscrew separator element from manifold.
- 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 manifold 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.

FIELD REPLACEMENT OF CANOPY DECALS

1. The decal area should be wiped with 70% isopropyl alcohol and a lint free cloth, in a well ventilated area.

2. Allow sufficient time for drying, but not enough time for dust to resettle on surface.

3. Align decals prior to removing the backing.

4. Peel (1) section of backing from decal, while still aligned, and squeegy decal from center the the edges, to remove air.

5. Remove the remaining backing and repeat squeegy process.

6. Repeat squeegy process over entire decal surface to assure a tight bond, allow 24 hours for permanent bond.

7. Any air bubbles may be removed by pricking the bubble center with a pin and squeegy air toward the hole.

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@ 3000hrs
Valve Clearance Check						C@ 800 hrs
Adjust Intake and Exhaust Valves						C@ 800 hrs
Lights (running, brake, & turn)	CBT					
Pintle Eye Bolts	CBT					

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

Engine Fluid

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

Section 7 - LUBRICATION

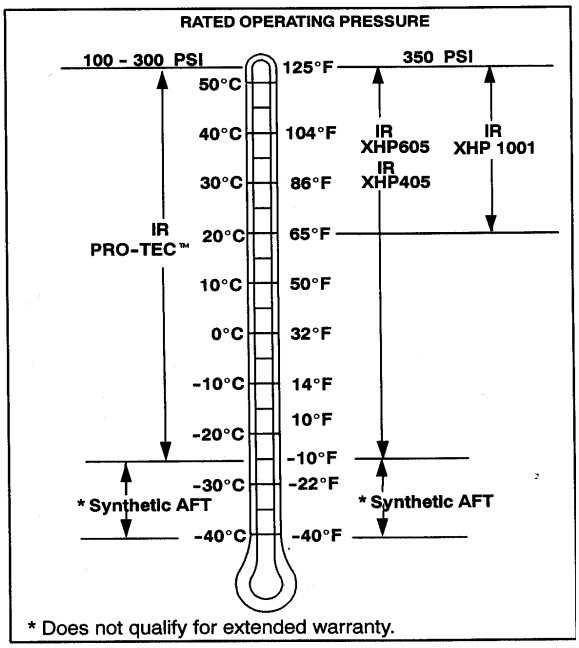
Lubrication

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.



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**

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.

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**	

Section 8 - 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 10
Engine Water Temp. Too High	Check coolant level. If necessary, Add.
Loose Wire Connection	Check all connections. 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 3 and Table 4.
Defective Shutdown Solenoid	Replace solenoid.
Malfunctioning Relay	Replace relay.
Blown Fuse	Replace fuse/Check for Short.
* < 10 Volts at Shutdown Solenoid	Check battery and alternator. Make repairs.
Engine Malfunctioning	See Trouble Shooting in Engine Section.
Airend Malfunctioning	See Table 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.
* <10 Volts at Shutdown Solenoid	Charge battery and alternator. Make repairs.
Defective Alternator	Replace/Repair Alternator
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 Shutdown Solenoid	Replace solenoid.

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 10.

Table 3: Engine Temperature Lamp Stays On:

Complaint	**Corrective Action**
Dirty Cooler	Clean exterior of cooler.
Operating Pressure Too High	Reduce pressure to spec.
Recirculation of Cooling Air	Close all 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.
Malfunctioning Controller	Replace Controller.

Table 4: Engine Oil Pressure Lamp 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.
Malfunctioning Controller	Replace Controller.
Engine Malfunctioning	See Trouble Shooting in Engine Section.

Table 5: Engine Temperature Lamp Stays Off:

Complaint	**Corrective Action**
Bulb Burned Out	Replace Controller.
Shorted Wire (Hot)	Repair short.
Malfunctioning Controller	Replace Controller.

Table 6: Engine Oil Pressure Lamp Stays Off:

Complaint	**Corrective Action**
Bulb Burned Out	Replace Controller.
Shorted Wire (Hot)	Repair short.
Malfunctioning Controller	Replace Controller.

Table 7: Alternator Lamp Stays On:

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

Table 8: Alternator Lamp Stays Off:

Complaint	Corrective Action
Bulb Burned Out	Replace Controller.
Loose Wire Connection	Repair or replace connector.
Malfunctioning Controller	Replace Controller.

Table 9: 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.
Defective Shutdown Solenoid	Carefully block air inlet to stop engine.
Malfunctioning Relay	Replace relay.
Defective Start Switch	Pull wire off shutdown solenoid. Replace Start Switch.
Wire Shorted Hot	Repair short.

Table 10: 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 all doors. Replace belly pan if missing.
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 11: 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.
Wrong Air Filter Element	Install correct element.
Operating Pressure Too High	Reduce pressure to spec limit.
Incorrect Pressure Regulator Adjustment	Adjust regulator.
Malfunctioning Pressure Regulator	Replace regulator.
Incorrect Linkage Adjustment	Adjust linkage.
Malfunctioning Air Cylinder	Replace air cylinder and adjust.
Defective Separator Element	Install new element.
Engine Malfunctioning	See Trouble Shooting in Engine Section.
Airend Malfunctioning	Consult Dealer.

Table 12: Excessive Vibration

Complaint	Corrective Action
Dirty Fuel/Filters	Replace filters/fuel.
Engine idle speed too low.	Raise “No Load” speed by adjusting air cylinder.
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	See Table 15 and 17.

Table 13: Low CFM

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

Table 14: 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 15: 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 16: 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 17: 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 18: Oil In Air Cleaner

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

Table 19: 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.

Section 9 - 4IRY3N-4IRY3T Engine

Engine

Servicing of the Engine

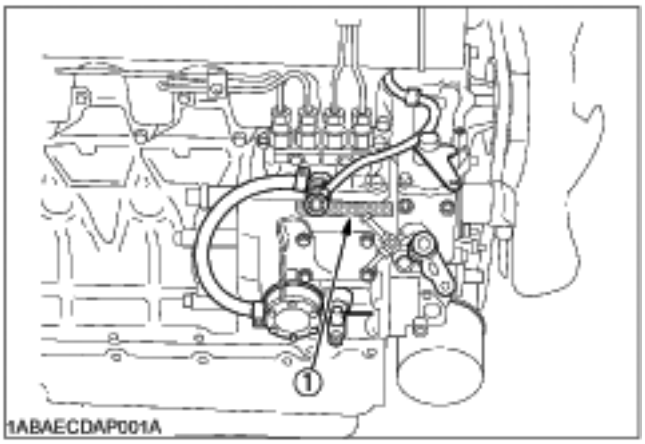
Your dealer is interested in your new engine and has the desire to help you get the most value from it. After reading this manual thoroughly, you will find that you can do some of the regular maintenance yourself.

However, when in need of parts or major service, be sure to see your dealer.

For service, contact the Ingersoll-Rand Dealership from which you purchased your engine or your local IR dealer. When in need of parts, be prepared to give your dealer the engine serial number.

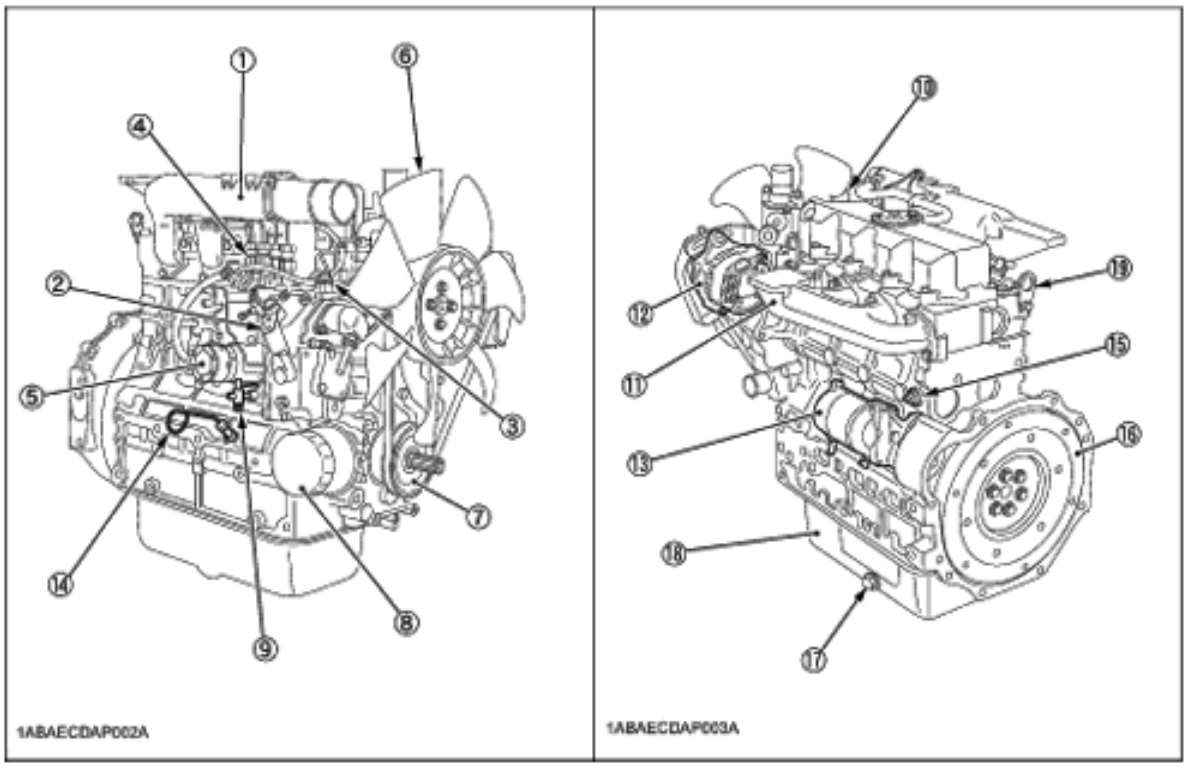
Locate the serial number now and record them in the space provided.

Machine Serial No.	
Engine Serial No.	
Date of Purchase	



(1) Engine serial number

Names of Parts



(1) Intake manifold
(2) Speed control lever
(3) Engine stop lever
(4) Injection pump
(5) Fuel feed pump
(6) Cooling fan
(7) Fan drive pulley
(8) Oil filter cartridge
(9) Water drain cock
(10) Oil filler plug
(11) Exhaust manifold
(12) Alternator
(13) Starter
(14) Oil level gauge
(15) Oil pressure switch
(16) Flywheel
(17) Oil drain plug
(18) Oil pan
(19) Engine hook

Pre-Operation Check

Break-in

During the engine break-in period, observe the following by all means:

1. Change engine oil and oil filter cartridge after the first 50 hours of operation (See "ENGINE OIL" in Periodic Service Section).
2. When ambient temperature is low, operate the machine after the engine has been completely warmed up.

Daily Check

To prevent trouble from occurring, it is important to know the conditions of the engine well. Check it before starting.

⚠ CAUTION

To avoid personal injury:

Be sure to install shields and safeguards attached to the engine when operating.

Stop the engine at a flat and wide space when checking.

Keep dust or fuel away from the battery, wiring, muffler and engine to prevent a fire.

Check and clear them before operating everyday. Pay attention to the heat of the exhaust pipe or exhaust as so that it can not ignite trash.

Checks During Operation

While running, make the following checks to see that all parts are working correctly.

Radiator Cooling Water (Coolant)

⚠ WARNING

To avoid personal injury:

Do not remove radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop position, to relieve any pressure, before removing cap completely.

When the engine overheats and hot coolant overflows through the radiator and hoses, stop the engine immediately and make the following checks to determine the cause of trouble:

Check item

1. Check to see if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fins and tube;
4. Check to see if the fan belt is too loose;
5. Check to see if radiator water pipe is clogged; and
6. Check to see if anti-freeze is mixed to a 50/50% mix of water and anti-freeze.

Fuel

⚠ CAUTION

To avoid personal injury:

Fluid escaping from pinholes may be invisible. Do not use hands to search for suspected leaks; Use a piece of cardboard or wood, instead. If injured by escaping fluid, see a medical doctor at once. This fluid can produce gangrene or a severe allergic reaction.

Check any leaks from fuel pipes or fuel injection pipes. Use eye protection when checking for leaks.

Be careful not to empty the fuel tank. Otherwise air may enter the fuel system, requiring fuel system bleeding. (See "FUEL" in Maintenance Section).

Color of Exhaust

While the engine is run within the rated output range:

- The color of exhaust remains colorless.
- If the output slightly exceeds the rated level, exhaust may become a little colored with the output level kept constant.
- If the engine is run continuously with dark exhaust emission, it may lead to trouble with the engine.

Immediately Stop the Engine If;

- The engine suddenly slow down or accelerates.
- Unusual noises suddenly appear.
- Exhaust fumes suddenly become very dark.
- The oil pressure lamp or the water temperature alarm lamp lights up.

Reversed Engine Revolution and Remedies

⚠ CAUTION

To avoid personal injury:

Reversed engine operation can make the machine reverse and run it backwards. It may lead to serious trouble.

Reversed engine operation may make exhaust gas gush out into the intake side and ignite the air cleaner; It could catch fire.

Reversed engine revolution must be stopped immediately since engine oil circulation is cut quickly, leading to serious trouble.

How to Tell When the Engine Starts Running Backwards

1. Lubricating oil pressure drops sharply. Oil pressure warning light, if used, will light.
2. Since the intake and exhaust sides are reversed, the sound of the engine changes, and exhaust gas will come out of the air cleaner.
3. A louder knocking sound will be heard when the engine starts running backwards.

Remedies

1. Immediately set the engine stop lever to the "STOP" position to stop the engine.
2. After stopping the engine, check the air cleaner, intake rubber tube and other parts and replace parts as needed.

Maintenance

⚠ CAUTION

To avoid personal injury:

Be sure to conduct daily checks, periodic maintenance, refueling or cleaning on a level surface with the engine shut off and remove the key.

Before allowing other people to use your engine, explain how to operate, and have them read this manual before operation.

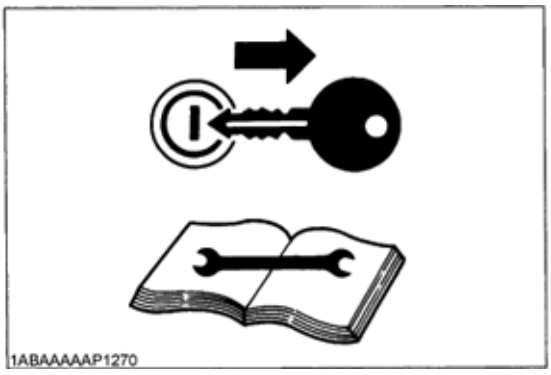
When cleaning any parts, do not use gasoline but use regular cleanser.

Always use proper tools, that are in good condition. Make sure you understand how to use them, before performing any service work.

When installing, be sure to tighten all bolts lest they should be loose. Tighten the bolts by the specified torque.

Do not put any tools on the battery, or battery terminals may short out. Severe burns or fire could result. Detach the battery from the engine before maintenance.

Do not touch muffler or exhaust pipes while they are hot; Severe burns could result.



Service Intervals

Observe the following for service and maintenance.

The lubricating oil change intervals listed in the table below are for Classes CF, CE and CD lubricating oils of API classification with a low-sulfur fuel in use. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals than recommended in the table below depending on the operating condition.

Interval	Item			
Every 50 hours	Check of fuel pipes and clamp bands			@
See NOTE	Change of engine oil (depending on the oil pan)		#	
Every 100 hours	Cleaning of air cleaner element		*1	@
	Cleaning of fuel filter			
	Check of battery electrolyte level			
	Check of fan belt tightness			
Every 200 hours	Check of radiator hoses and clamp bands			
	Replacement of oil filter cartridge, using standard oil pan		#	
	Check of intake air line			@
Every 400 hours	Replacement of oil filter cartridge, using standard oil pan		#	
	Replacement of fuel filter cartridge			@
Every 500 hours	Removal of sediment in fuel tank			
	Cleaning of water jacket (radiator interior)			
	Replacement of fan belt			
Every one or two months	Recharging of battery			
Every year	Replacement of air cleaner element		*2	@
Every 800 hours	Check of valve clearance			
Every 1500 hours	Check of fuel injection nozzle injection pressure		*3	@
Every 3000 hours	Check of turbo charger		*3	@
	Check of injection pump		*3	@
Every two years	Change of radiator coolant (L.L.C.)			
	Replacement of battery			
	Replacement of radiator hoses and clamp bands			
	Replacement of fuel pipes and clamp bands		*3	@
	Replacement of intake air line		*4	@

Important

- The jobs indicated by # must be done after the first 50 hours of operation.

*1 Air cleaner should be cleaned more often in dusty conditions than in normal conditions.

*2 After 6 times of cleaning.

*3 Consult your local dealer for this service.

*4 Replace only if necessary.

- When the battery is used for less than 100 hours in a year, check its electrolyte yearly. (for refillable battery's only)
- The items listed above (@ marked) are registered as emission related critical parts in the U.S. EPA non-road emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.

NOTE: Changing interval of engine oil

Ingersoll-Rand Engine Oil	
1 gallon	34480918
5 gallon	36875938
55 gallon	36866903

- With Ingersoll-Rand Engine Oil - 500 hrs
- With non-Ingersoll-Rand Engine Oil - 200 hrs

NOTE: Lubricating oil

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

O : Recommendable X : Not recommendable

Lubricating oil class	Fuel		Remarks
	Low-sulfur	High-sulfur	
CF	O	O	TBN ≧10
CF-4	O	X	
CG-4	O	X	

Periodic Service

Fuel

⚠ CAUTION

To avoid personal injury:

Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.

Be careful not to spill fuel during refueling. If fuel should spill, wipe it off at once, or it may cause a fire.

Do not fail to stop the engine before refueling. Keep the engine away from the fire.

Be sure to stop the engine while refueling or bleeding and when cleaning or changing fuel filter or fuel pipes. Do not smoke when working around the battery or when refueling.

Check the above fuel systems at a well ventilated and wide place.

When fuel and lubricant are spilled, refuel after letting the engine cool off.

Always keep spilled fuel and lubricant away from engine.

Fuel Level Check and Refueling

1. Check to see that the fuel level is above the lower limit of the fuel level gauge.
2. If the fuel is too low, add fuel to the upper limit. Do not overfill.

No.2-D is a distillate fuel oil of lower volatility for engines in industrial and heavy mobile service.

(SAE J313 JUN87)

Grade of Diesel Fuel Oil According to ASTM D975

Flash Point, °C (°F)	Water and Sediment, volume %	Carbon Residue on, 10 percent Residuum, %	Ash, Weight %
Min	Max	Max	Max
52 (125)	0.05	0.35	0.01

Distillation Temperatures, °C (°F) 90% Point		Viscosity Kinematic cSt or mm /s at 40° C		Viscosity Saybolt, SUS at 37.8° C (100° F)	
Min	Max	Min	Max	Min	Max
282 (540)	338 (640)	1.9	4.1	32.6	40.1

Sulfur, weight %	Copper Strip Corrosion	Cetane Number
Max	Max	Min
0.50	No. 3	40

The cetane number is required not to be less than 45.

IMPORTANT:

- Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble in the fuel injection pump.
- For fuel, always use diesel fuel. You are required not to use alternative fuel, because its quality is unknown or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely affects the engine. Diesel fuel differs in grades depending on the temperature.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before next engine start.

Air Bleeding the Fuel System

⚠ CAUTION

To avoid personal injury:

Do not bleed a hot engine as this could cause fuel to spill onto a hot exhaust manifold creating a danger of fire.

Air bleeding of the fuel system is required if;

- after the fuel filter and pipes have been detached and refitted;
- after the fuel tank has become empty; or
- before the engine is to be used after a long storage.

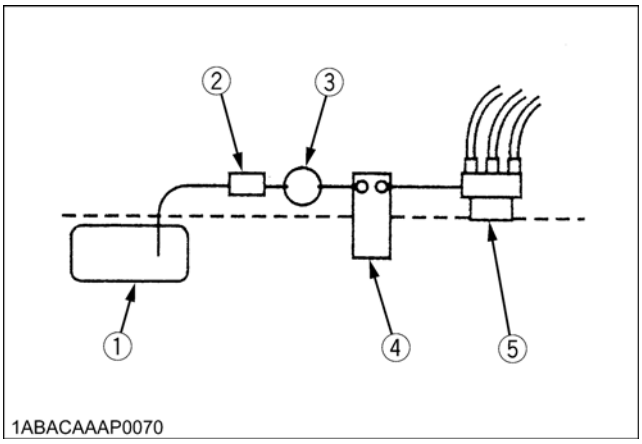
Air Bleeding Procedure

1. For fuel tanks that are lower than the injection pump. The fuel system must be pressurized by the fuel system electric fuel pump.
2. If an electric fuel pump is not used, you must manually actuate the pump by lever to bleed.
3. The primary fuel filter must be on the pressure side of the pump if the fuel tank is lower than the injection pump.
4. Open the air vent cock on top of the fuel injection pump.
5. Turn the engine, continue it for about 10 seconds, then stop it, or move the fuel feed pump lever by hand (optional).
6. Close the air vent cock on top of the fuel injection pump.

IMPORTANT:

- Tighten air vent plug of the fuel injection pump except when bleeding, or it may stop the engine suddenly.

[Tank Below Injection Pump System]



(1) Fuel tank below injection pump

(2) Pre-filter

(3) Electric or Mechanical pump

(4) Main Filter

(5) Injection pump

Checking the Fuel Pipes

⚠ CAUTION

To avoid personal injury:

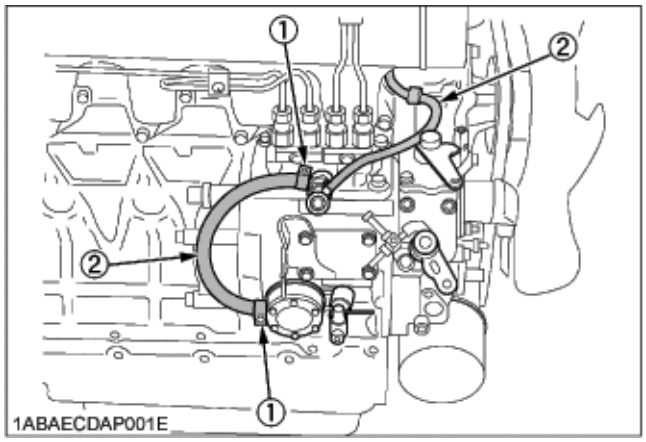
Check or replace the fuel pipes after stopping the engine. Broken fuel pipes can cause fires.

Check the fuel pipes every 50 hours of operation. When if;

1. If the clamp band is loose, apply oil to the screw of the band, and tighten the band securely.
2. If the fuel pipes, made of rubber, became worn out, replace them and clamp bands every 2 years.
3. If the fuel pipes and clamp bands are found worn or damaged before 2 years' time, replace or repair them at once.
4. After replacement of the pipes and bands, air-bleed the fuel system.

IMPORTANT:

- When the fuel pipes are not installed, plug them at both ends with clean cloth or paper to prevent dirt from entering. Dirt in the pipes can cause fuel injection pump malfunction.



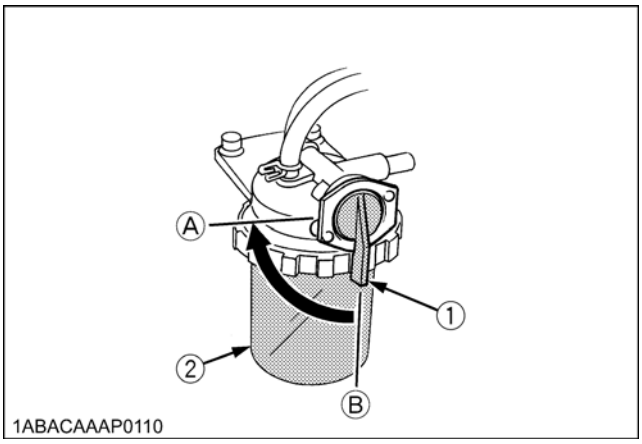
(1) Clamp band

(2) Fuel pipe

Cleaning the Fuel Filter Pot

Every 100 hours of operation, clean the fuel filter in a clean place to prevent dust intrusion.

1. Close the fuel filter lever.

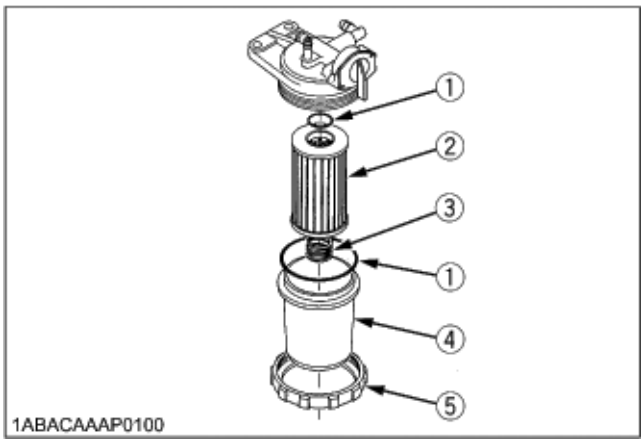


(1)	Fuel filter lever	(A)	"OFF"
(2)	Fuel filter pot	(B)	"ON"

2. Remove the top cap, and rinse the inside with diesel fuel.
3. Take out the element, and rinse it with diesel fuel.
4. After cleaning, reinstall the fuel filter, keeping out of dust and dirt.
5. Air-bleed the injection pump.

IMPORTANT:

- Entrance of dust and dirt can cause a malfunction of the fuel injection pump and the injection nozzle. Wash the fuel filter cup periodically.



(1)	O-Ring	(4)	Filter bowl
(2)	Filter element	(5)	Screw ring

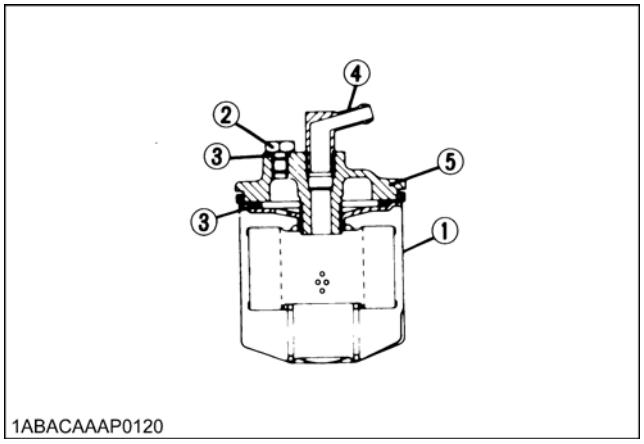
(3) Spring

Fuel Filter Cartridge Replacement

1. Replace the fuel filter cartridge with a new one every 400 operating hours.
2. Apply fuel oil thinly over the gasket and tighten the cartridge into position by hand-tightening only.
3. Finally, vent the air.

IMPORTANT:

- Replace the fuel filter cartridge periodically to prevent wear of the fuel injection pump plunger or the injection nozzle, due to dirt in the fuel.



(1) Fuel filter cartridge

(2) Air vent plug

(3) O-Ring

(4) Pipe joint

(5) Cover

Engine Oil

⚠ CAUTION

To avoid personal injury:

Be sure to stop the engine before checking and changing the engine oil and the oil filter cartridge.

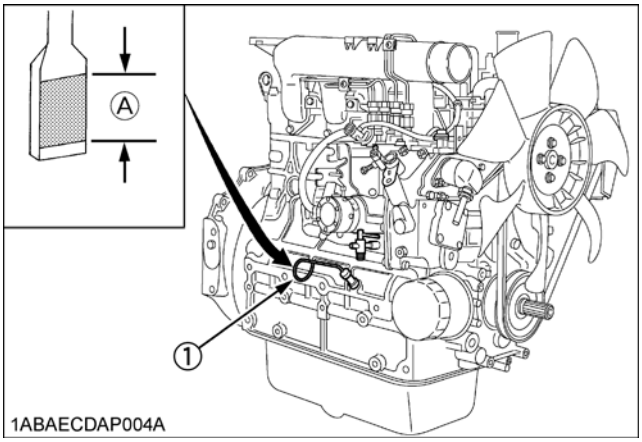
Do not touch muffler or exhaust pipes while they are hot; Severe burns could result. Always stop the engine and allow it to cool before conducting inspections, maintenance, or for a cleaning procedure.

Contact with engine oil can damage your skin. Put on gloves when using engine oil. If you come in contact with engine oil, wash it off immediately.

NOTE: Be sure to inspect the engine, locating it on a level place. If placed on gradients accurately, oil quantity may not be measured.

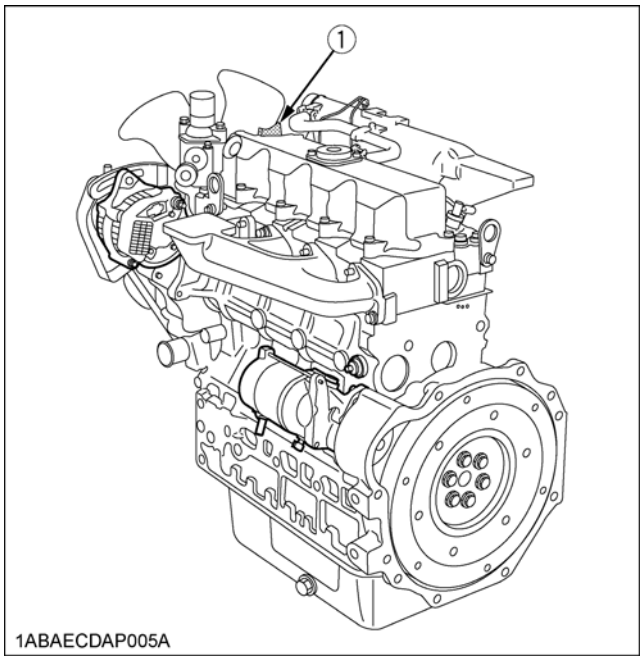
Checking Oil Level and Adding Engine Oil

1. Check the engine oil level before starting or more than 5 minutes after stopping the engine.
2. Remove the oil level gauge, wipe it clean and reinstall it.
3. Take the oil level gauge out again, and check the oil level.



(1) Oil level gauge [Lower end of oil level gauge]

(A) Engine oil level within this range is proper.



4. If the oil level is too low, remove the oil filler plug, and add new oil to the prescribed level.
5. After adding oil, wait more than 5 minutes and check the oil level again. It takes some time for the oil to drain down to the oil pan.

Engine oil quantity: 9.5 L (2.51 U.S. gal)

IMPORTANT:

- Use Ingersoll-Rand Engine oil or engine oil should be MIL-L-2104C or have properties of API classification CD grades or higher.
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.

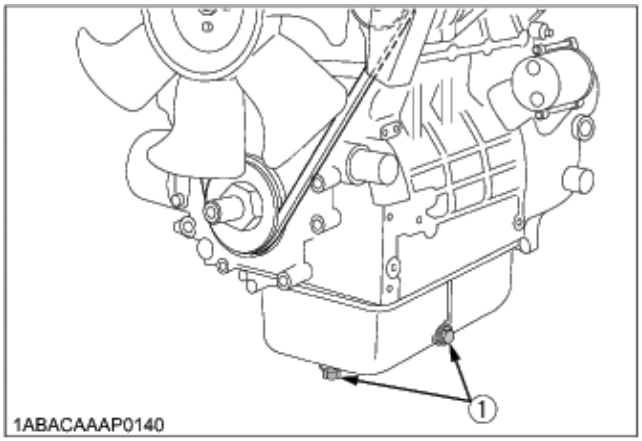
Changing Engine Oil

⚠ CAUTION

To avoid personal injury: Be sure to stop the engine before draining engine oil. When draining engine oil, place some container underneath the engine and dispose of it according to local regulations.

Do not drain oil after running the engine. Allow engine to cool down sufficiently.

1. Change oil after the initial 50 hours of operation and every 500 hours thereafter.
   - API service classification: above CD grade
   - Ambient temperature: below 35° C (95° F)
2. Remove the drain plug at the bottom of the engine, and drain all the old oil. Drain oil will drain easier when the oil is warm.



(1) Oil drain plug

3. Add new engine oil up to the upper limit of the oil level gauge.

Replacing the Oil Filter Cartridge

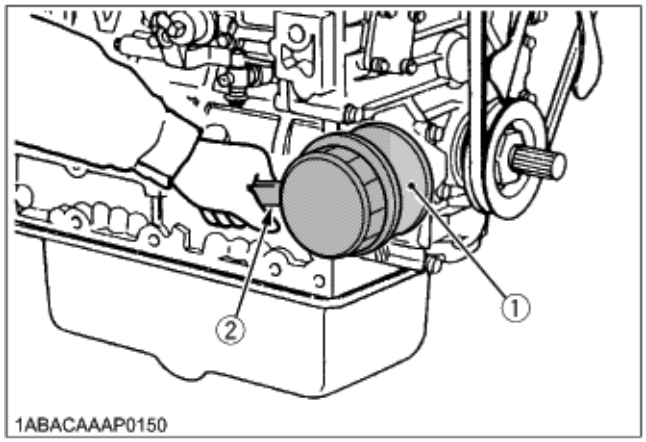
⚠ CAUTION

To avoid personal injury:

Be sure to stop the engine before changing the oil filter cartridge.

Allow engine to cool down sufficiently, oil can be hot and cause burns.

1. Replace the oil filter cartridge. Oil filter cartridge should be replaced every 500 hours. Use Oil Filter Element 22496905.
2. Remove the old oil filter cartridge with a filter wrench.
3. Apply a film of oil to the gasket for the new cartridge.
4. Screw in the cartridge by hand. When the gasket contacts the seal surface, tighten the cartridge enough by hand. Because, if you tighten the cartridge with a wrench, it will be tightened too much.



(1) Oil filter cartridge

(2) Remove with a filter wrench (Tighten with your hand)

5. After the new cartridge has been replaced, the engine oil level normally decreases a little. Thus, run the engine for a while and check for oil leaks through the seal before checking the engine oil level. Add oil if necessary.

NOTE: Wipe off any oil sticking to the machine completely.

Radiator

Coolant will last for one day's work if filled all the way up before operation start. Make it a rule to check the coolant level before every operation.

⚠ WARNING

To avoid personal injury:

Do not stop the engine suddenly, stop it after about 5 minutes of unloaded idling.

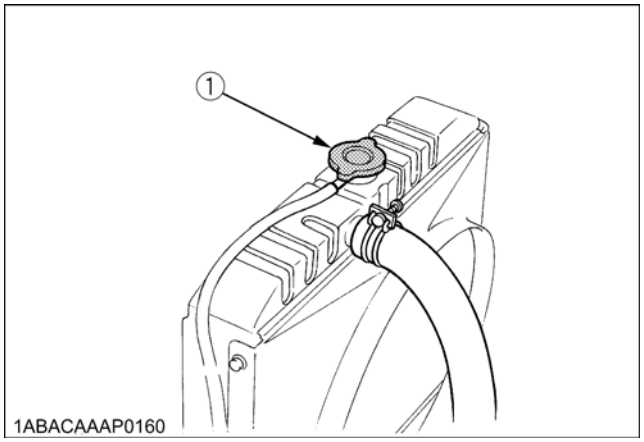
Work only after letting the engine and radiator cool off completely (more than 30 minutes after it has been stopped).

Do not remove the radiator cap while coolant is hot. When cool to the touch, rotate cap to the first stop to allow excess pressure to escape. Then remove cap completely.

If overheat should occur, steam may gush out from the radiator or reserve tank; Severe burns could result.

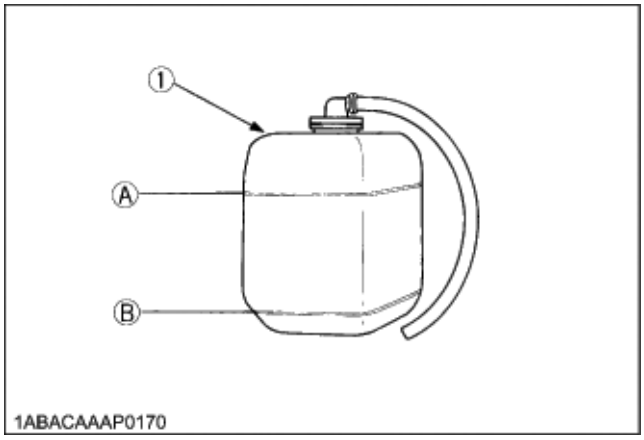
Checking Coolant Level, Adding Coolant

1. Remove the radiator cap, after the engine has completely cooled, and check to see that coolant reaches the supply port.



(1) Radiator pressure cap

2. Check the coolant level of the reserve tank. When it is between the "FULL" and "LOW" marks, the coolant will last for one day's work.

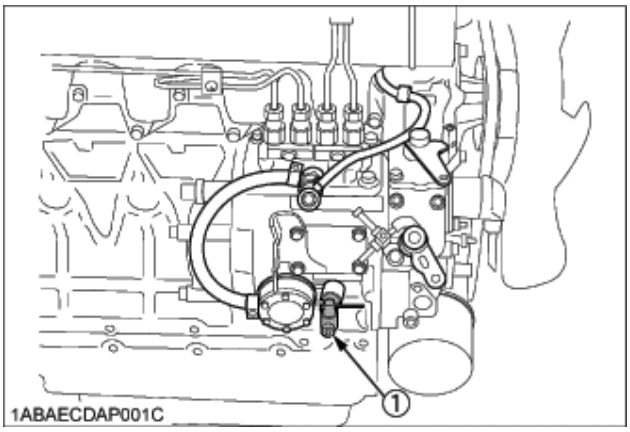


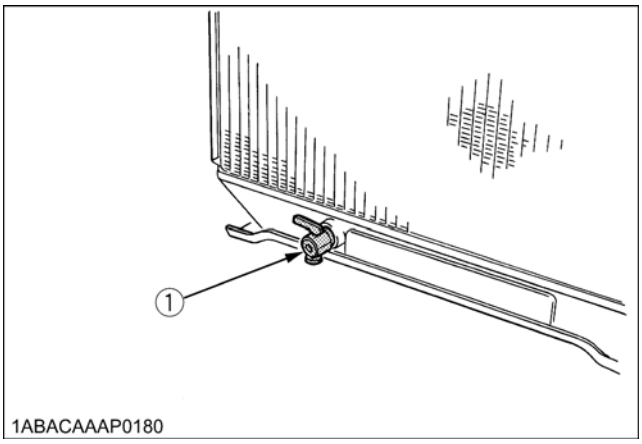
(1) Reserve tank (A) "FULL"

(B) "LOW"

3. When the coolant level drops due to evaporation, add water only up to the full level.
4. Check to see that two drain cocks; one is at the crankcase side and the other

is at the lower part of the radiator as figures below.





(1) Coolant drain cock

IMPORTANT:

- If the radiator cap has to be removed, follow the caution and securely retighten the cap.
- If coolant should be leak, consult your local KUBOTA dealer.
- Make sure that muddy or sea water does not enter the radiator.
- Use clean, fresh water and 50% anti-freeze to fill the recovery tank.
- Do not refill reserve tank with coolant over the "FULL" level mark.
- Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and decrease quickly.

Changing Coolant

1. To drain coolant, always open both drain cocks and simultaneously open the radiator cap as well. With the radiator cap kept closed, a complete drain of water is impossible.
2. Remove the overflow pipe of the radiator pressure cap to drain the reserve tank.
3. Prescribed coolant volume is 8.1L (2.14 U.S.gallons)
4. An improperly tightened radiator cap or a gap between the cap and the seat quickens loss of coolant.
5. Coolant (Radiator cleaner and anti-freeze)

Season	Coolant
Summer	Pure water and radiator cleaner
Winter (when temperature drops below 0° C (32° F) or all season	Pure water and anti-freeze (See "Anti-freeze" in RADIATOR Section)

Remedies for Quick Decrease of Coolant

1. Check any dust and dirt between the radiator fins and tube. If any, remove them from the fins and the tube.
2. Check the tightness of the fan belt. If loose, tighten it securely.
3. Check the internal blockage in the radiator hose. If scale forms in the hose, clean with the scale inhibitor or its equivalent.

Checking Radiator Hoses and Clamp

⚠ CAUTION

To avoid personal injury:

Be sure to check radiator hoses and hose clamps periodically. If radiator hose is damaged or coolant leaks, overheats or severe burns could occur.

Check to see if radiator hoses are properly fixed every 200 hours of operation or 6 months, whichever comes first.

1. If hose clamps are loose or water leaks, tighten hose clamp securely.
2. Replace hoses and tighten hose clamps securely, if radiator hoses are swollen,

hardened or cracked.

Replace hoses and hose clamps every 2 years or earlier, if checked and found that hoses are swollen, hardened or cracked.

Precaution at Overheating

Take the following actions in the event the coolant temperature is nearly or more than the boiling point, what is called "Overheating". Take these actions:

1. Stop the engine operation in a safe place and keep the engine unloaded idling.
2. Do not stop the engine suddenly. Stop it after about 5 minutes of unloaded idling.
3. If the engine stalls within about 5 minutes of running under no load, immediately leave and keep yourself away from the machine. Do not open the hood and any other part.
4. Keep yourself and others well away from the engine for further 10 minutes or while the steam blown out.
5. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see "Troubleshooting" section. And then, start again the engine.

Cleaning Radiator Core (Outside)

If dust is between the fin and tube, wash it away with running water.

IMPORTANT:

- Do not clean radiator with firm tools such as spatulas or screwdrivers. They may damage specified fin or tube. It can cause coolant leaks or decrease cooling performance.

Anti-Freeze

⚠ CAUTION

To avoid personal injury:

When using anti-freeze, put on some protection such as rubber gloves (Anti-freeze contains poison).

If should drink anti-freeze, throw up at once and take medical attention.

When anti-freeze comes in contact with the skin or clothing, wash it off immediately.

Do not mix different types of anti-freeze. The mixture can produce chemical reaction causing harmful substances.

Anti-freeze is extremely flammable and explosive under certain conditions. Keep fire and children away from anti-freeze.

When draining fluids from the engine, place some container underneath the engine body.

Do not pour waste onto the grounds, down a drain, or into any water source.

Also, observe the relevant environmental protection regulations when disposing of anti-freeze.

If it freezes, coolant can damage the cylinders and radiator. If the ambient temperature falls below 0° C (32° F) or before a long-term storage, let out cooling water completely, or mix fresh water with long-life coolant and fill the radiator and reserve tank with the mixture.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed cooling water, fill the radiator with fresh water and empty it again. Repeat this procedure 2 or 3 times to clean up the inside.
3. Mixing the LLC

   Put the LLC in cooling water in the percentage (%) for a target temperature. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and anti-freeze differs according to the make of the anti-freeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.

IMPORTANT:

- When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50%.

Vol % Anti-freeze	Freezing Point		Boiling Point *	
	°C	°F	°C	°F
40	-24	-12	106	222
50	-37	-34	108	226

*At $1.013X10^5$ Pa (760 mm Hg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

5. Adding the LLC

   1. Add only water if the mixture reduces in amount by evaporation.
   2. If there is a mixture leak, add the LLC of the same manufacturer and type in the same mixture percentage.

   *Never add any long-life coolant of different manufacturer. (Different brands may have different additive components, and the engine may fail to perform as specified.)

6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anti-corrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

   NOTE: The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.
   When the coolant level drops due to evaporation, add water only to keep the anti-freeze mixing ratio less than 50%. In case of leakage, add anti-freeze and water in the specified mixing ratio before filling into the radiator.

Radiator Cement

As the radiator is solidly constructed, there is little possibility of water leakage. Should this happen, however, radiator cement can easily fix it. If leakage is serious, contact your local dealer.

Fan Belt

Adjusting Fan Belt Tension

⚠ CAUTION

To avoid personal injury:

Be sure to stop the engine and remove the key before checking the belt tension.

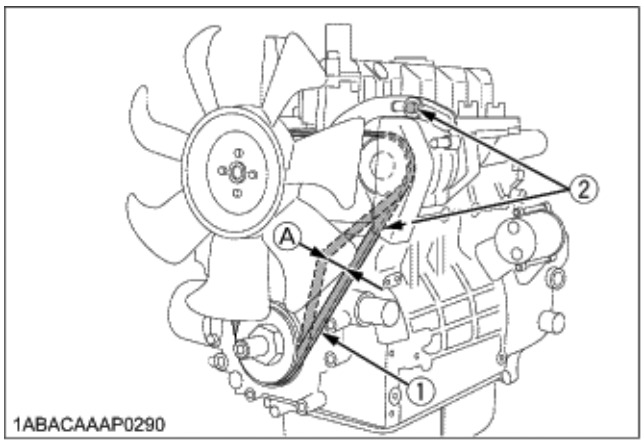
Be sure to reinstall the detached safety shield after maintenance or checking.

Proper fan belt tension	A deflection of between 7 to 9 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span.

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between the pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

IMPORTANT:

- If belt is loosen or damaged and the fan is damaged, it could result in overheats or insufficient charging. Correct or replace belt.



(1) Fan belt
(2) Bolt and nut
(A) 7 to 9 mm (0.28 to 0.35 in.) (under load of 10 kgf (22.1 lbs))

Carriage and Storage

Carriage

⚠ CAUTION

To avoid personal injury:

Fix the engine securely not to fall during operation.

Do not stand near or under the engine while carrying it.

The engine is heavy. In handling it, be very alert not to get your hands and body caught in.

1. Use carrier such as crane when carrying the engine, or hurt your waist and yourself. Support the engine securely with rope not to fall while carrying it.
2. When lifting the engine, put the hook securely to metal fittings attached to the engine. Use strong hook and fittings enough to hang the engine.

Storage

⚠ CAUTION

To avoid personal injury:

Do not clean the machine with engine running.

To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.

When storing the engine just after running, let the engine cool off.

Before storing the engine for more than a few months, remove any dirt on the machine, and:

1. Drain the coolant in the radiator. Open the cock at the bottom of the radiator, and remove the pressure cap to drain water completely. Leave the cock open. Hang a note written "No water" on the pressure cap. Since water may freeze when the temperature drops below 0° C (32° F), it is very important that no water is left in the machine.
2. Remove dirty engine oil, fill with new oil and run the engine for about 5 minutes to let the oil penetrate to all the parts.
3. Check all the bolts and nuts, and tighten if necessary.

4. Remove the battery from the engine, adjust the electrolyte level, and recharge it. Store the battery in a dry and dark place.
5. When the engine is not used for a long period of time, run it for about 5 minutes under no load every 2 to 3 months to keep it free from rust. If the engine is stored without any running, moisture in the air may condense into dew over the sliding parts of the engine, resulting in rust there.
6. If you forget to run the engine for longer than 5 to 6 months, apply enough engine oil to the valve guide and valve stem seal and make sure the valve works smoothly before starting the engine.
7. Store the engine in a flat place and remove the key from engine.
8. Do not store the engine in a place where has flammable materials such as dry grass or straw.
9. When covering the engine for storage, let engine and muffler cool off completely.
10. Operate the engine after checking and repairing damaged wirings or pipes, and clearing flammable materials carried by mouse.

Troubleshooting

If the engine does not function properly, use the following chart to identify and correct the cause.

When it is difficult to start the engine

Cause	Countermeasures
Fuel is thick and doesn't flow.	*Check the fuel tank and fuel filter. *Remove water, dirt and other impurities. *As all fuel will be filtered by the filter, if there should be water or other foreign matters on the filter, clean the filter with kerosene.
Air or water mixed in fuel system	*If air is in the fuel filter or injection lines, the fuel pump will not work properly. To attain proper fuel injection pressure, check carefully for loosened fuel line coupling, loose cap nut, etc. *Loosen joint bolt stop fuel filter and air vent screws of fuel injection pump to eliminate all the air in the fuel system.
Thick carbon deposits on orifice of injection nozzle.	*This is caused when water or dirt is mixed in the fuel. Clean the nozzle injection piece, being careful not to damage the orifice. *Check to see if nozzle is working properly or not. If not, install a new nozzle.
Valve clearance is not as specified.	*Adjust valve clearance to 0.18 to 0.22 mm (0.007 to 0.0087 in.) when the engine is cold.
Leaking valves	*Grind valve.
Fuel injection timing is not as specified.	*Check injection timing *The injection timing 0.19 rad(11) before top dead center.
Engine oil becomes thick in cold weather and engine cranks slow.	*Change grade of oil according to the weather (temperature.)
Low compression	*Bad valve or excessive wear of rings, pistons and liners cause insufficient compression. Replace with new parts.
Battery is discharged and the engine will not crank.	*Charge battery. *In winter, always remove battery from machine, charge fully and keep indoors. Install in machine at time of use.

NOTE: If the cause of trouble cannot be found or if you cannot adjust by yourself, contact your IR dealer.

When output is insufficient

Cause	Countermeasures
Carbon stuck around orifice of nozzle piece	*Clean orifice and needle valve, being very careful not to damage the nozzle orifice. *Check nozzle to see if good. If not, replace with new parts.
Compression is insufficient. Leaking valves	*Bad valve and excessive wear of rings, pistons and liners cause insufficient compression. Replace with new parts. *Grind valves.
Fuel is insufficient.	*Check fuel system.
Overheating of moving parts	*Check lubricating oil system. *Check to see if lubricating oil filter is working properly. *Filter element deposited with impurities would cause poor lubrication. Change element. *Check the clearance of bearing are within factory specs. *Check injection timing. *Check timing 0.19 rad(11°) before top dead center.
Valve clearance is not as specified.	*Adjust to proper valve clearance of 0.18 to 0.22 mm (0.007 to 0.0087 in.) with engine cold.
Air cleaner is dirty	*Clean the element every 100 hours of operation.
Fuel injection pressure is not as specified.	*Check injection pressure. 1st Stage 18.6 MPa (190 kgf/cm^2; 2702 psi) 2nd Stage 22.6 MPa (230 kgf/cm^2; 3271 psi)
Injection pump wear	*Do not use poor quality fuel as it will cause wear of the pump. Only use No. 2-D diesel fuel. *Check the fuel injection pump element and delivery valve assembly and replace as necessary.

NOTE: If the cause of trouble cannot be found or if you cannot adjust by yourself, contact your IR dealer.

When engine suddenly stops

Cause	Countermeasures
Lack of fuel	*Check the fuel tank and refill the fuel, if necessary. *Also check the fuel system for air or leaks.
Bad nozzle	*If necessary, replace with a new nozzle.
Moving parts are overheated due to shortage of lubrication oil or improper lubrication.	*Check amount of engine oil with oil level gauge. *Check lubricating oil system. *At every 2 times of oil change, oil filter cartridge should be replaced. *Check to see if the engine bearing clearances is within factory specs.

NOTE: When the engine has suddenly stopped, turn the engine lightly by pulling on the fan belt. If the engine turns easily without abnormalities, the cause of the trouble is usually lack of fuel or bad nozzle.

When color of exhaust is especially bad

Cause	Countermeasures
Fuel governing device bad	*Contact dealer for repairs.
Fuel is of extremely poor quality.	*Select good quality fuel. Use No. 2-D diesel fuel only.
Nozzle is bad.	*If necessary, replace with new nozzle.
Combustion is incomplete.	*Cause is poor atomization, improper injection timing, etc. Because of trouble in injection system or in poor valve adjustment, or compression leakage, poor compression, etc. Check for the cause.

When engine must be stopped immediately

Cause	Countermeasures
Engine revolution suddenly decreases or increases.	*Check the adjustments, injection timing and the fuel system.
Unusual sound is heard suddenly.	*Check all moving parts carefully.
Color of exhaust suddenly turns dark.	*Check the fuel injection system, especially the fuel injection nozzle.
Bearing parts are overheated.	*Check the lubricating system.
Oil lamp lights up during operation.	*Check the lubricating system. *Check, if the engine bearing clearances are within factory specs. *Check the function of the relieve valve in the lubricating system. *Check pressure switch. *Check filter base gasket.

When engine overheat

Cause	Countermeasures
Engine oil insufficient	*Check oil level. Replenish oil as required.
Fan belt broken or elongated	*Change belt or adjust belt tension.
Coolant insufficient	*Replenish coolant.
Excessive concentration of antifreeze	*Add water only or change to coolant with the specified mixing ratio.
Radiator net or radiator fin clogged with dust	*Clean net or fin carefully.
Inside of radiator or coolant flow route corroded	*Clean or replace radiator and parts.
Fan or radiator or radiator cap defective	*Replace defective parts.
Thermostat defective	*Check thermostat and replace if necessary.
Temperature gauge or sensor defective	*Check temperature with thermometer and replace if necessary.
Overload running	*Reduce load.
Head gasket defective or water leakage	*Replace parts.
Incorrect injection timing	*Adjust to proper timing.
Unsuitable fuel used	*Use the specified fuel.

Specifications

Model	4IRY3N	4IRY3T
Type	Vertical, water-cooled, 4-cycle diesel engine	
Number of cylinders	4	
Bore and stroke mm (in.)	87 x 102.4	
Total displacement cm^3 (cu.in.)	4-98x110 (148.53)	
Combustion chamber	Re-entrant Type (Direct Injection)	
SAE NET Intermittent kW/rpm	36.6/2600	
H.P (SAE J1349) (HP/rpm)	(49.1/2600)	
SAE NET Continuous	31.8/2600	
H.P (SAE J1349) (HP/rpm)	(42.6/2600)	
Maximum Bare Speed - RPM	2800	
Order of firing	1-3-4-2	
Direction of rotation	Counter-clockwise (viewed from flywheel side)	
Injection pump	Bosch "K" Type mini pump	
Injection pressure	1st Stage 18.6 Mpa (190 kgf/cm^2, 2702 psi) 2nd Stage 22.6 Mpa (230 kgf/cm^2, 3271 psi)	
Injection timing (Before T.D.C.)	0.113 rad (6.5°)	
Compression ratio	20	
Fuel	Diesel Fuel No.2-D or No.2-DLS	
Lubricant (API classification)	above CD grade	
Dimension mm (in.) (length X width X height)	667.1 X 507.1 X 635.0 (26.3 X 20.0 X 25.0)	667.1 X 507.1 X 698.3 (26.3 X 20.0 X 27.5)
Dry weight (BB Spec.) kg (lbs.)	184 (406)	
Starting system	Cell starter (with glow plug)	
Starting motor	12 V, 2.0 kW	
Charging generator	12 V, 480 kW	
Recommended battery capacity	12 V, 100 to 120 AH	

NOTE: Specifications are subject to change without notice.

Always use Ingersoll-Rand Replacement parts!*

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