Operation & Maintenance Manual

Compressor Model

NHP-1500WCU
10/425

Code: B

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 Company
P.O. Box 868
501 Sanford Ave
Mocksville, NC 27028 USA

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Revised (09-12)

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Always use Ingersoll Rand Replacement parts!

Foreword

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Machine models represented in this manual may be used in various locations worldwide. Machine sold and shipped into European common market countries requires that the machine display the EC Mark and conform to various directives. In such cases, the design specification of this machine has been certified as complying with EC directives. Any modification to any part is absolutely prohibited and would result in the CE certification and marking being rendered invalid.
A declaration of that conformity follws:

Declaration of Confirmity

CE

WITH EC DIRECTIVE

98/37/EC, 93/68/EEC, 89/336/EEC

Ingersoll Rand Company
P.O. Box 868
501 Sanford Avenue
Mocksville, North Carolina 27028

Declare that, under our sole responsibility for manufacture and supply, the product(s)

10/425

To which this declaration relates, is (are) in confirmity with the provisions of the above Directives using the following principal standards.

EN1012-1, EN29001, EN292, En60204-1
PN8NTC2, EN 50081, EN50082

Issued at Mocksville on 1-1-02

Ric Lunsford
Manager of Quality Control

EC Pressure Equipment Directive and Related Regulations

We declare that this product has been assessed according to the Pressure Equipment Directive (97/23/EC) and, in accordance with the terms of this Directive, has been excluded from the scope of this Directive.
It may carry "CE" marking in compliance with other applicable EC Directives.

The contents of this manual are considered to be proprietary and confidential to Ingersoll Rand and should not be reproduced without the prior written permission of Ingersoll Rand.

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 authorised Ingersoll Rand service department.

The design specification of this machine has been certified as complying with EC directives. As a result:

a. Any machine modifications are strictly prohibited, and will invalidate EC certification.

b. This machine may be used in USA / Canada, when configured with components bearing the appropriate certification. (Where ASME certification is valid).

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 / lubricants / fluids 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 use only in the following specified conditions and applications:

- Compression of normal ambient air containing no known or detectable additional gases, vapours or particles
- Operation within the ambient temperature range specified in the "General Information" section of this manual.

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

a. **Is not approved by Ingersoll Rand,**

b. **May impair the safety of users and other persons, and**

c. **May prejudice any claims made against Ingersoll Rand.**

Table 1:

Use of the machine to produce compressed air for: a. direct human consumption b. indirect human consumption, without suitable filtration and purity checks.
Use of the machine outside the ambient temperature range specified in the "General Information" of this manual.
THIS MACHINE IS NOT INTENDED AND MUST NOT BE USED IN POTENTIALLY EXPLOSIVE ATMOSPHERES, INCLUDING SITUATIONS WHERE FLAMMABLE GASES OR VAPOURS MAY BE PRESENT.
Use of the machine fitted with non Ingersoll Rand approved components / lubricants / fluids.
Use of the machine with safety or control components missing or disabled.

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

Abbreviations & Symbols	
####	Contact Ingersoll Rand for serial number
->####	Up to Serial No.
####->	From Serial No.
*****	Not illustrated
†	Option
WDG	Generator option
AR	As required
BR	Brazil
CN	China
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GB	Great Britain (English)
HA	High ambient machine
IT	Italy
NL	Holland
NO	Norway
PT	Portugal
SE	Sweden
US	United States
S.R.G.	Site running gear
H.R.G.	High speed running gear

Always use Ingersoll Rand Replacement parts!

Safety

Safety

DANGER

(Red Background)

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

WARNING

(Orange Background)

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

CAUTION

(Yellow Background)

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

NOTICE

(Blue Background)

Indicates important set-up, operating or maintenance information.

General Information

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 the manual holder, are not removed permanently from the machine.

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

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

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

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

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

Compressed Air

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

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

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

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

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

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 discharge piping must be checked periodically for correct operation.

Materials

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

- brake lining dust
- engine exhaust fumes

Avoid Inhalation

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

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

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

Avoid Ingestion, Skin Contact and Inhalation of Fumes

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

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

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

Consult a physician if compressor lubricant is inhaled.

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

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

Battery

Batteries contain corrosive liquid and produce explosive gas. Do not expose to naked lights. Always wear personal protective clothing when handling. When starting the machine from a slave battery ensure that the correct polarity is observed and that connections are secure.

DO NOT ATTEMPT TO SLAVE START A FROZEN BATTERY SINCE THIS MAY CAUSE IT TO EXPLODE.

Radiator

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

Engine Starting Fluid (Ether)

Use and recharge system only with suppliers instructions and replacement parts.

Some machines are fitted with an ether cold starting aid.

Do NOT use on engines which are provided with inlet heaters.

AVOID INGESTION, INHALATION, HOT SURFACES AND NAKED LIGHTS

Transport

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

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

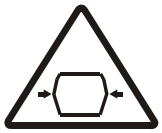
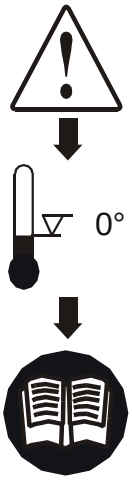
Before towing the machine, ensure that:-

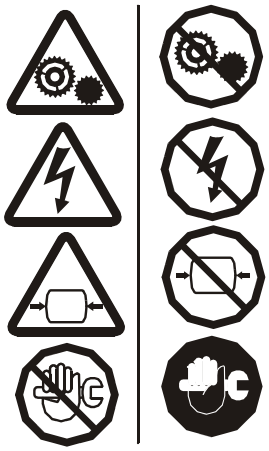
- the tires and towing hitch are in a serviceable condition.
- the canopy is secure.
- all ancillary equipment is stored in a safe and secure manner.

When parking always use the handbrake (if equipped) or, if necessary, suitable wheel chocks.

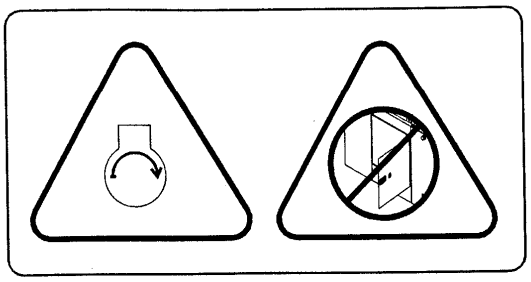
ISO Symbols

GRAPHIC FORM AND MEANING OF ISO SYMBOLS

Prohibition / Mandatory	Information / Instructions	Warning
 WARNING: Electrical shock risk	 WARNING - Pressurised component or system	 WARNING - Hot surface.
 WARNING - Pessure control.	 WARNING - Corrosion risk.	 WARNING - Air/gas flow or Air discharge.
 WARNING - Pressurised vessel.	 WARNING - Hot and harmful exhaust gas.	 WARNING - Maintain correct tyre pressure (Refer to the GENERAL INFORMATION section of this manual
 WARNING - Flammable liquid	 WARNING - Before connecting the tow bar or commenting to tow consult the operation and maintenance manual.	 WARNING - For operating temperature below 0° C, consult the operation and maintenance manual

 WARNING - Do not undertake any maintenance on this machine until the electrical supply is disconnected and the air pressure is totally relieved.	 WARNING - Consult the operation and maintenance manual before commencin g any maintenance .	 Do not breathe the compressed air from this machine.
 Do not remove the Operating and Maintenance manual and manual holder from this machine.	 Do not stack.	 Do not operate the machine without the guard being fitted.
 Do not stand on any service valve or other parts of the pressure system.	 Do not operate with the doors or enclosure open.	 Do not use fork lift truck from this side
 Do not exceed the trailer speed limit.	 No naked lights.	 Do not open the service valve before the air hose is attached.
 Use fork lift truck from this side only.	 Emergency stop.	 Tie down point.

 Lifting point.	 On (power).	 Off (power).
 Read the Operation and Maintenance manual before operation or maintenance of this machine is undertaken.	 When parking use prop stand, handbrake and wheel chocks.	 Compressor oil filling



Keep door closed when engine is running.

General Information

General Information

Unit Models

Unit Models	**NHP1500WCU 10/425**
Air Delivery - cfm (litres/sec)	1500 (708)

Compressor

Rated Operating Pressure - psi (kPa)	60-150 (41-1050)

Engine (Diesel)

Manufacturer	Cummins
Model	QSX-15
Rated Horsepower at 1800 rpm	600
Electrical System	24 VDC
Full Load Speed - rpm	1800
No Load Speed - rpm	1200

Fluid Capacities - U.S. Gallons (litres)

Hydraulic Oil	27 (102)
Compressor Lubricant	25 (95)
Engine Lube (including filter)	24 (90.8)
Engine Coolant (Radiator)	25.5 (97)
Fuel Tank (Clean DIESEL fuel)	300 (1135)

Units Measurements/Weights (feet (meters)

Overall Length	19.6 (5.97)
Overall Height	8 (2.44)
Overall Width	7.4 (2.25)
Gross Weight - pounds (kg) (all fluids)	22,040 (9995)

Running Gear

Tire Size (turntable running gear)	16x5
Tire Size (standard running gear)	18x9
Towing Speed (Maximum) mph (km/hr)	15 (24)
Inflation Pressure	Solid

Expendable Service Parts

Part Number	Description	Where Used	Quantity
39911615	Filter, Oil	Hyd & Airend	2
36864361	Filter, Inlet Primary	Engine & AE inlet	2
36864379	Filter, Inlet Secondary	Engine & AE inlet	2
54662028	Filter Oil, Engine	QSX15	1
54662051	Filter Coolant, Engine	QSX15	1
54662036	Filter, Fuel Engine	QSX15	1
54661590	Filter, Fuel Primary	Fuel/Water Filter	2
54758339	IR Hydraulic Fluid, 55 gallon		
54758321	IR Hydraulic Fluid, 5 gallon		
54758347	275 gallon tote		

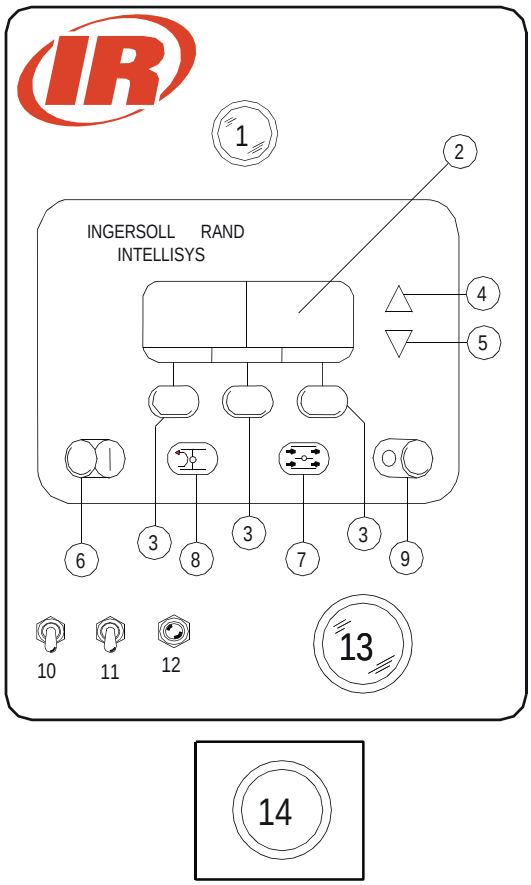
⚠ CAUTION

Any departure from the specifications may make this equipment unsafe.

Always use Ingersoll Rand Replacement parts!

Operating Instructions

Operating Instructions



Operating Controls and Instruments

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

1. **Lamp:** Controlled by switch 11.
2. **Message Display:** Provides operator with diagnostics and status messages as well as name of measured parameter (temperature, pressure, etc.)
3. **Menu Selection:** Buttons used to select different menus viewed in message display. (status, main menu, etc).
4. **Scroll Up Button:** Press this button to scroll up the parameter menu as shown in the Message Display.
5. **Scroll Down Button**: Press this button to scroll down the parameter menu as shown in Message Display.
6. **Start Button:** Press this button to start machine.
7. **Load Button:** Press this button to load machine after warm-up period is complete.

8. **Unload Button:** Press this button to “unload” machine prior to stopping.

   NOTE: Pressing this button will close air intake and decrease engine speed to idle condition.

9. **Stop Button:** Press this button to initiate a controlled stop to the machine following “unload”.
10. **Power On-Off Switch:** Use this switch to turn power “ON” or “OFF” to controller. Switch must be in ON position for machine to operate.

    NOTE: Always use Stop button (item 9) to stop machine before switching to “OFF.”

11. **Lights Switch:** Operates Lamp.
12. **Ether Inject Button:** Injects a measured shot of ether for aid in cold weather starting of engine.

⚠ CAUTION

Use sparingly.

13. **Hourmeter:** Indicates running time for maintenance purposes.
14. **Emergency Stop Button:** Press this button to immediately stop machine. Use this button **ONLY** during emergency conditions. The Stop button (item 9) should be used for normal stops.

    Another emergency stop is located on drawbar end of machine.

15. **Warning Lights (flashing):** Located on each end of machine. Indicates alert, shutdown condition, or starting.

⚠ WARNING

Do not climb on top of unit.

Lifting Unit

Fork Tubes

— drawbar vertical stowing position.

— fork truck lifting capacity per gross weight (see general data).

Four Corner Lifting Pockets

— Use 2 spreader bars.

— Hoist/crane per machines gross weight (see general data).

Wheel Chock

— Located inside of front door.

— Secure unit with chocks before disconnecting drawbar from tow vehicle.

Before Towing

- When lifting or lowering drawbar, always grasp drawbar firmly and stand to one side.
- Ensure that the tires, wheels and running gear are in good condition and secure.

Towing

- Do not tow this unit in excess of 15 mph (24km/hr).
- Use a tow vehicle whose towing capacity is greater than the gross weight of this unit. (see general data).
- Machine is not designed to be Highway Towable.

Setting up (All Units)

Place the unit in an open, well-ventilated area. Position as level as possible. The design of these units permits a maximum 5 degree limit on out-of-level operation.

When the unit is to be operated out-of-level it is important to keep the engine crankcase oil level and the compressor oil sump level at the high level mark (with the unit level). Do not overfill either the engine crankcase or the compressor lubricating oil system.

Chock wheels.

This unit is equipped with on-board fuel tanks with a total capacity of 300 gallons which provides 10-11 hours of full load operation.

Compressor Mounting

Portable compressors, which are modified to remove the running gear and mount the machine direct to trailers, truck beds or frames, etc. may experience failure of the enclosure, frame, and/or other components. It is necessary to isolate the compressor package from the carrier base with a flexible mounting system. Such a system must also prevent detachment of the package from the carrier base in the event the isolators fail. Contact Ingersoll Rand representative for flexible mounting kits.

Warranty does not cover failures attributable to mounting of the compressor package to the carrier base unless it is an Ingersoll Rand provided system.

For Remote Fueling

— one 3/4” female connector (supply)

— one 3/4” male connector (return)

Open rear door and locate fuel manifold.

Lever handle in the vertical position permits fueling from onboard tanks.

Lever handle in the horizontal position allows remote fueling.

⚠ WARNING

Do not connect the air discharge on this unit onto a common header with any other unit of any description, or any other source of compressed air, without first making sure a check-valve is used between the header and the unit. If this unit is connected in parallel with another unit of higher discharge pressure and capacity, a safety hazard could occur in a back-flow condition.

⚠ WARNING

Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause serious 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).

Air Hose Restraining Cable Installation:

Secure hose restraining cable at each end to prevent accidental hose whipping. At the machine-side of the air hose, install and secure one end of the hose restraining cable on the 3” nipple on the inlet side of the 3” service valve. Install the other end of the hose restraining cable over the main hose connector.

Install suitable 3” air hose between service valve on unit and point of air use. The air hose must be rated for outdoor use and for pressurized air service. Minimum rating is 200 psig (1379 kPa) and 250° F (121° C).

For plant air systems, adhere to the following additional setup guidelines:

Insure that a isolation valve is installed at the header where the 3” hose is connected. This allows a machine to be removed without shutting down the plant.

⚠ WARNING

Before removing a machine or disconnecting the air hose, first close the isolation valve at the plant air header. Allow machine to self vent after shutdown and assure output pressure is 0 psi. Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause severe injury or death.

If a check valve is installed at the customer header and if one of the two automatic line pressure modulation modes will be used, an additional pressure signal line must be used to provide the unit control system with air pressure on the plant-side of the check valve. INTELLISYS Controller remote pressure must be on.

If no check valve is installed at the customer header, plant air pressure will be sensed in the on-board discharge pipe. Therefore, it is not necessary to install the additional pressure sense line.

NOTE: The NHP1500 unit has a check valve installed at the outlet side of the 2nd stage piping in order to prevent large backflow of plant air when the machine is idling or shutdown.

Make a final inspection of the machine and all connections before starting the unit. Insure that all connections are tight and that proper hose restraining cables and isolation valve are installed.

Setting up Multiple Units

Many applications will require multiple machines operating in parallel in order to meet the flow requirements of the application. Use the following guidelines in setting up multiple machines.

1. Position each unit in an open, well-ventilated area. Position and space each unit sufficiently apart from each other so that doors can be opened fully for service and maintenance. Recommended minimum clearance between multiple machines is 8 feet (2.4m).
2. Perform the “single-unit” setup steps above.
3. For two or three NHP1500 machines, recommended combined flow hose size is 4”. It is important that air pressure drop from each machine to the plant air header be properly balanced for best operation. Thus, plumbing of the air lines should be given close attention.
4. For only two NHP1500 machines, plumb the 3” air hose from each machine into either a 3” X 3” X 4” tee or Y-lateral fitting. Each 3” air hose should ideally be of equal length in order to match pressure drops. Be sure to install a 3” isolation valve at both inlets to the tee or Y-lateral. This will allow one machine to be moved or disconnected without shutting down the other machine. Be sure to use a hose restraining cable at each end of each 3” hose to prevent accidental hose whipping.
5. For three NHP1500 machines, plumb the 3” air hose from each machine into a 3-unit manifold (IR Kit #36012243). Each 3” air hose should ideally be of equal length in order to match pressure drops. Be sure to install a 3” isolation valve at all three inlets to the manifold to allow one machine to be moved or disconnected without shutting down the other machines. Be sure to use a hose restraining cable at each end of each 3” hose to prevent accidental hose whipping.
6. Install a suitable 4” air hose between the manifold and the point of air use. The air hose must be rated for outdoor use and for pressurized air service. Minimum rating is 200 psig (1379 kPa) and 250° F (121° C). Be sure that a hose restraining cable is installed at both ends of the 4” air hose to prevent accidental hose whipping.
7. For more than 3 machines in parallel, use multiples of the above as required to insure balanced pressure drops from each machine to the point of use.
8. Insure that a isolation valve is installed at the plant air header where the main outlet hose is connected.

⚠ WARNING

Before removing a machine or disconnecting the air hose, first close the isolation valve at the air header. Allow machine to self vent after shutdown and assure output pressure is 0 psi. Unrestricted air flow from a hose will result in a whipping motion of the hose which can cause severe injury or death.

9. If a check valve is installed at the customer header, an additional pressure signal line must be used to provide the unit control system with air pressure on the plant-side of the check valve. One pressure signal line must be plumbed to each machine. Each machine must have remote pressure selection through INTELLISYS Controller User Options Menu.
10. If no check valve is installed at the customer header, plant air pressure will be sensed in the on-board discharge pipe. Therefore, it is not necessary to install the additional pressure sense line. Note: the NHP1500 unit has a check valve to prevent backflow of plant air into the airend when the machine is idling or shutdown.
11. Make a final inspection of the machines and all connections before starting the units. Insure that all connections are tight and that proper hose restraining cables and isolation valves are installed.

Setting up the Plant Air Pressure Signal

A separate plant air pressure signal line must be used when a check valve is installed at the customer plant air header and if one of the two automatic line pressure modulation modes is to be used. This allows each machine to automatically modulate as required to maintain the desired plant air pressure. Use the following guidelines in installing this signal air line.

1. Install a hose restraining cable at each end of the signal pressure line to prevent accidental hose whipping.
2. Connect a #4 pressure hose (1/4”) from a connection port on the plant air side of the check valve to each machine. Note; This signal air line should be maintained as short as possible for optimum response to changing plant air pressure.
3. Install an isolation valve at the pressure source to each signal air line. This allows a machine to be moved without affecting operation of other machines.
4. Connect the #4 hose to the signal air port on each machine. This port is located above the discharge valve on the machine and is factory-fitted with a -4 JIC plug. Remove the pipe cap and install #4 hose with -4 JIC connections.
5. It will be necessary to program the INTELLISYS Controller to use this pressure port for pressure control and regulation. These instructions are provided in “USER OPTIONS MENU”.

   NOTE: When the Controller is turned on, the default selection is chosen.

Before Starting

Open service valves.

Inspect the complete installation including remote fuel lines (if any) and air hose routing and connections.

Check battery for proper connections and condition.

⚠ WARNING

Combustible gas can cause severe burns, blindness or death. Keep sparks and open flame away from battery.

- Check the compressor lubricating oil level. The proper oil level is labeled on the compressor sump dipstick. Add oil when required. Do not overfill.
- Check the hydraulic oil level. The proper oil level is mid-way on the sight gauge. Add oil if the level falls to the bottom of the sight gauge. Do not overfill.
- Check engine oil level. The proper level is labeled on the engine sump dipstick. Add oil when required. Do not overfill.
- To jump-start, connect the positive booster/charger cable to the 24 VDC positive (+) terminal of the battery. Then connect the negative booster/charger cable to the engine block. Not to the negative (-) terminal of the weak battery. After starting, disconnect the negative (-) cable from engine block; then from the booster battery/charger. Disconnect positive (+) cable from both batteries.

⚠ WARNING

Do not remove the cap from a HOT engine radiator. The sudden release of pressure from a heated cooling system can result in a loss of coolant and possible severe personal injury.

⚠ WARNING

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

Check coolant bottle to assure coolant level is at minimum level when the unit is cold.

Check engine coolant level by removing the radiator top cap and looking for coolant in the filler neck of the radiator. Add coolant as required. Insure that radiator cap is installed properly and tightened.

NOTE: This machine will not allow engine starting if engine coolant is low.

NOTICE

If the appropriate mixture of antifreeze is not used during freezing temperatures, failure to drain the engine may cause costly engine damage. Never use water only as corrosion inhibitors are required in engine coolant fluid.

⚠ CAUTION

No smoking, sparks, or open flame near fuel.

Check the fuel level. Add only CLEAN DIESEL fuel for maximum service from the engine. Refer to the Engine Operator's Section for fuel specifications.

NOTICE

To minimize condensation (water) in the fuel tank, it is recommended to fill the tank at the end of each day.

⚠ 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 the side 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.
- Make sure no one is IN or ON the compressor unit.
- Turn battery disconnect switch to the ON position.

Starting

1. Flip the POWER switch to “ON”. INTELLISYS Controller display will be activated.
2. Insure that the “EMERGENCY STOP” switch is not depressed. Reset this switch by pulling out the knob.
3. Insure that the service valve is open and make sure side doors are closed.
4. Press the START button to initiate the start sequence. If certain conditions exist that would prevent a normal start, the engine will not be allowed to start and the condition will be displayed in the Message Display.

   NOTE: PRESS “STOP” BUTTON TO ABORT A START SEQUENCE.

The AUDIBLE ALARM will sound for 10 seconds to alert the operator or anyone around or in the machine that the machine is about to start. At the end of the 10 second alarm period, the engine will begin cranking.

The INTELLISYS Controller will allow up to three automatic start attempts with a 10 second wait between each start attempt. If the engine has not started after the 3rd try, the START sequence must be manually reinstated by the Operator. If after two complete start sequences the engine has still not started, begin troubleshooting to determine the cause of the problem.

⚠ CAUTION

Ether is an extremely volatile, high flammable gas. Use Sparingly! If too much is injected, the uncontrolled explosion may result in costly damage to the engine.

5. In cold weather, as required, press the ETHER INJECT button once or twice only while the engine is cranking. This injects a measured amount of ETHER to the engine.
6. Following a successful start, the engine will accelerate to idle speed of 1200 RPM for warm-up. “UNLOADED MANUAL” will be displayed in the Message Display. If this message is not displayed or any other diagnostic message is shown, the machine should be stopped and the cause of the diagnostic message investigated.
7. Press the LOAD button. “WARMING UP” will be displayed until coolant temperature reaches above 80° F. “LOADING” will be displayed and the engine will increase speed up to 1800 rpm until the pressure reaches the desired set point (default to 150 psi).

Normal Operation

The Operator may observe and monitor operating parameters using the STATUS and SCROLL buttons. In the event the machine controller detects a parameter outside normal operating limits, first an ALERT message will appear on the Message Display.

In the event the machine controller detects a parameter at a dangerously high or low level, the machine will be automatically unloaded and stopped with the cause of the SHUTDOWN shown on the Message Display and warning lights will flash.

Delivered air volume at set point pressure is accomplished by two methods:

1. Compressor inlet butterfly valve and blowdown valve are controlled by a solenoid which directs oil to a cylinder by the INTELLISYS Controller logic (valves syncronized together).

   The compressor is either loaded (inlet valve fully open/blowdown valve fully closed) or unloaded (inlet valve fully closed/blowdown valve fully open).

2. Engine speed varies between 1200 RPM and 1800 RPM while compressor is loaded to match the required volume flow.

   Full flow at set point pressure at 1200 RPM is approximately 1000 CFM.
   Full flow at set point pressure at 1800 RPM is 1500 CFM.

Operation-Loaded

Assume engine has been started and is running in the unload state at 1200 RPM. If there is air demand (pressure falls below the load point pressure), compressor will load at 1200 RPM by oil pressure to the cylinder (opens the butterfly valve and closes the blowdown valve). This provides 1000 CFM of air. As air demand rises and falls, engine speed is controlled between 1200 RPM and 1800 RPM to match the required flow while maintaining rated pressure. Full flow is 1500 CFM at 1800 RPM.

⚠ CAUTION

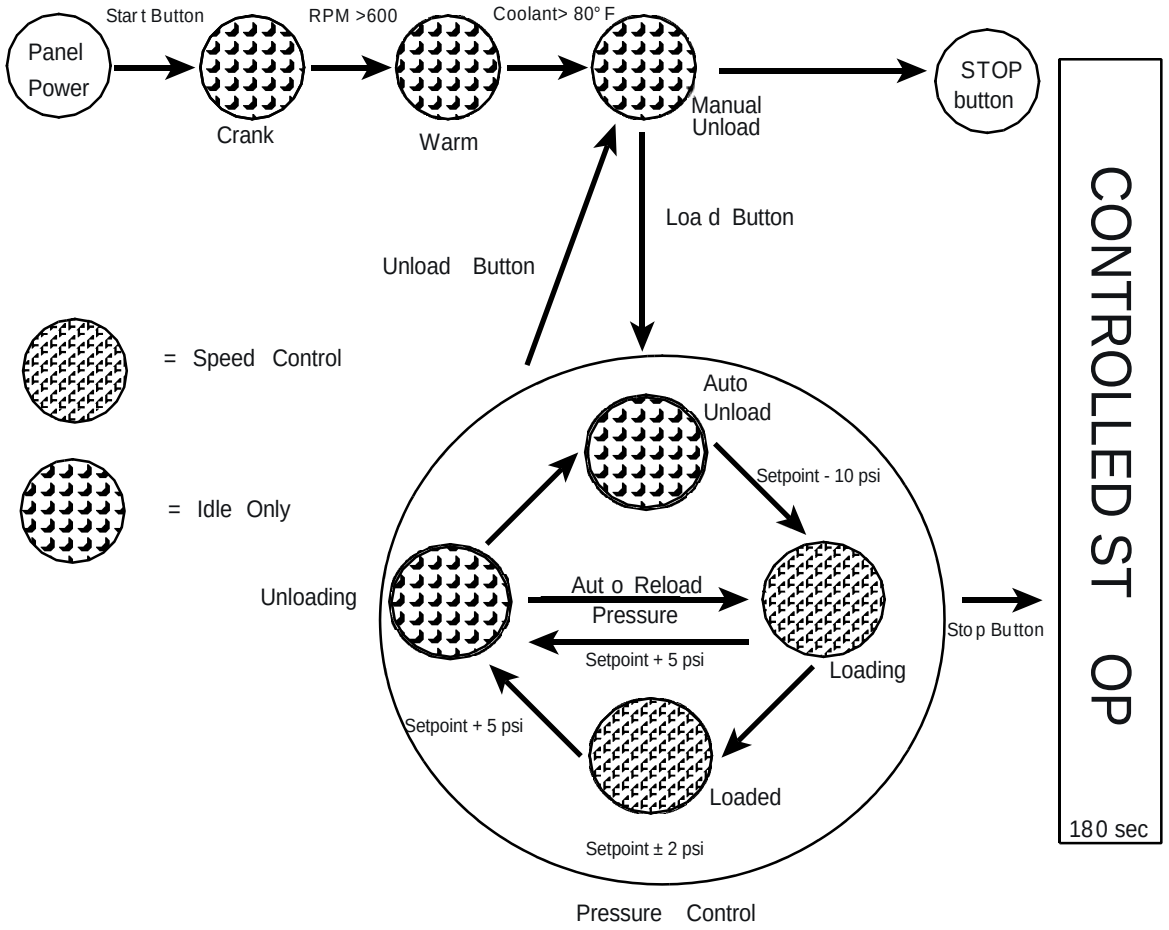
Keep side door closed or engine overheating will occur.

Operation-Unloaded

If air demand falls below 1000 CFM at 1200 RPM (Pressure rises above the unload point pressure), the compressor will unload by relieving the oil pressure in the cylinder, thereby closing the inlet valve and opening the blowdown valve. The unit then runs at 1200 RPM unloaded with no air delivery. If air demand increases (pressure falls to below the load point pressure), the compressor reloads as stated in (1) above to meet the required air demand.

See following page for INTELLISYS CONTROLLER LOGIC Diagram.

Intellisys Controller Logic



Special information and operating guidelines for certain normal applications of the NHP1500 machine are given below:

1. **PRIMARY AIR FOR PLANT AIR SYSTEMS:** In these applications, the compressor is used to provide primary air for a plant air system. The PRESSURE setpoint should be set at the desired system pressure and other backup compressors (if any) set at lower pressures in order that they sequence on as required by the operational profile of the plant.
2. **EMERGENCY OR BACKUP AIR FOR PLANT AIR SYSTEMS:** In these applications, the compressor is operated in a “standby” mode and is set to load and furnish air if plant air pressure falls to a certain value.

Typically, the PRESSURE setpoint would be set at value lower than the desired operating pressure of the plant with the primary stationary compressors set at a higher range.

Auto Start/Stop Operation

The NHP1500 compressor may include an Automatic Start/Stop feature as an option from the factory. This feature is selectable from the USERS MENU under the MAIN MENU on the Intellisys Controller (See Intellisys Controller Display section). This feature is an extension of the automatic load/unload described under NORMAL OPERATION section of the manual. This mode is selectable at any machine state, but is not engaged until the compressor is started and loaded (Note: The controller display will show Autostart - OFF until the unit is started and loaded). This mode provides improved fuel economy and automatic start and load when required.

NOTICE

Set the line pressure to REMOTE or ONBOARD based on your application prior to using AUTOSTART/STOP. Ingersoll Rand recommends the use of a check valve and REMOTE PRESSURE in all AUTO START/STOP applications.

The compressor has two methods of autostart/stop control.

1. **AUTO START/STOP - PRESSURE** - This mode uses the line pressure either onboard or remote pressure signal (based on user selected option). When line pressure drops below AUTO START PRESSURE, the compressor will automatically start and load.

   The compressor will then perform as stated in the Normal Operation Section, loading and unloading based on customer demand requirements. If the compressor remains in the unloaded state continuously for a time greater than AUTOSTOP TIME, the compressor will stop and the display will read Autostart Engaged, Autostart ON.

   If the SETPOINT PRESSURE is changed while AUTO START/STOP is ON, the RELOAD PRESSURE and AUTO START PRESSURE reset to the default values. Note: If the user presses the unload button, autostart is suspended until the load button is pushed. This is true while the unit is running or stopped.

2. **AUTO START/STOP - REMOTE** - This mode uses a customer-supplied signal applied to the remote contact closure terminal strip. When the remote signal is CLOSED, the compressor will automatically start and load. The compressor will then perform as stated in the Normal Operation section, loading and unloading based on customer demand requirements. If the contact switch OPENS, the compressor will unload and wait for the AUTO STOP TIME to expire.
   The compressor will stop and then display will read Autostart Engaged, Autostart-On. If during the AUTO STOP TIME, the contacts CLOSE, the compressor will load and perform normal operation.

Stopping

Press the STOP button. The unit will unload and begin timed cool down (180 seconds). Once the timed cool down is complete, the engine will shutdown.

During a normal “non-emergency” stop, the following stopping procedure should be followed:

1. Press STOP button. the compressor will unload and engine speed will go to idle.
2. A three minute cool down will begin.
3. When the cool down is complete, the engine will stop.
4. Switch the POWER switch to “OFF”.
5. Turn battery disconnect switch to the “OFF” position.

NOTICE

Once the engine stops, the automatic blowdown valve will continue to relieve all pressure from the check valve to discharge valve piping.

⚠ WARNING

Even after pressure is relieved from the piping system, any air supply line from the compressor to a tool or machine could remain under pressure and cause serious personal injury or death. After the compressor stops, carefully open a valve at any tool or machine to exhaust the pressure in any line prior to removal or servicing.

Remote Start Stop and Enuciation Kit

The NHP1500 compressor may include an Automatic Start/Stop feature as an option from the factory. This option includes a box which contains 3 terminal blocks. The three blocks are defined as follows:

REMOTE CONTACTS - used as part of the Autostart/Stop features if required. (See Section Auto Start & Stop, Item 2).

SHUTDOWN CONTACTS - used to signal that the compressor has been stopped due to a shutdown and needs to be reviewed by operator.

MACHINE STATE CONTACTS - indicates if machine is running or stopped.

The intent of these contacts is to allow the user a method of connecting the machine to a plant system for communication purposes. Any additional requirements, consult the factory.

INTELLISYS Controller Display

The Message Display program is based on a top-level menu structure with various sub-menus for more informational detail. The menu structure is accessed by three buttons on the front panel and built around the following screens and commands.

SCREENS
HOME: The top-level screen, displays discharge pressure, pressure setpoint, and fuel level. It gives access to the “MAIN MENU” and “STATUS” screens and the “SET” command, which can be used to adjust the pressure setpoint.
MAIN MENU: Sub screen that gives access to sub menus.

COMMANDS
STATUS: Used to access compressor and engine operating parameters.
SELECT: Used to select an option.
SET: Used to set the value displayed for the selected option.
CALIBRATE: Used to calibrate the selected pressure transducer.

Main Menu:

Displays a link to the following sub-menus:

1. **User options:** Displays the following options:

   A. **Pressure Setpoint:** Press “SELECT” then adjust using the toggle up and down buttons and pressing “SET”.

   B. **Auto ReLoad Pressure:** Setpoint-140 psi (default).

   C. **Pressure Signal:** Press “SELECT” then using the toggle up and down buttons “SET” either Onboard or Remote.

   D. **Auto Start/Stop:** OFF (default). Press “SELECT” then using the toggle up and down buttons “SET” either PRESSURE or REMOTE.

   E. **Auto Re-Start Pressure:** Auto Reload Pressure - 5 psi (default). Selectable from default to 15 psi.

   F. **Auto Stop Time**: 10 minutes (default). Selectable from 2 minutes to 60 minutes.

   G. **Screen Contrast**: Press “SELECT” then adjust between 0 and 9 using the toggle up and down buttons and pressing “SET”.

2. **Sensor calibration**: Displays the pressure transducers (PT1 through PT8) that can be selected and calibrated using the “SELECT” and “CALIBRATE” buttons (the unit must be completely cooled down so that all temperatures and pressures are equivalent to ambient conditions).

3. **Factory setpoints**: Displays the selection options for language and units of measure.

A. **Compressor Status -** Displays the following compressor sensor values:

   1. **Package Discharge Temp:** Displays package discharge air temperature measured at the service valve.

   2. **Package Discharge Pressure:** Displays package discharge air pressure measured at the service valve.

   3. **Stg 1 Inlet Temp:** Displays airend stage 1 inlet temperature measured in the inlet duct before the inlet valve.

   4. **Stg 1 Disch Temp:** Displays airend stage 1 discharge temperature measured in the venturi elbow.

   5. **Stg 1 Inlet Vacuum:** Displays airend stage 1 inlet suction pressure measured in the inlet valve.

   6. **Stg 2 Inlet Pressure:** Displays the airend stage 2 inlet pressure measured in the interstage moisture separator.

   7. **Stg 2 Inlet Temp:** Displays the airend stage 2 inlet temperature measured in the interstage moisture separator.

8. **Stg 2 Disch Temp:** Displays the airend stage 2 discharge temperature measured in the stage 2 discharge venturi.
9. **Remote Press:** Displays the pressure from an external tap measured downstream of the package discharge. If REMOTE PRESS is selected from user menu.
10. **Comp Filter In Press:** Displays the pressure at the compressor oil filter inlet.
11. **Comp Filter Out Press:** Displays the pressure at the compressor oil filter outlet.
12. **Comp Oil Inject Temp:** Displays the airend injected oil temperature.
13. **Eng Speed:** (rpm) Displays the rotational speed of the engine flywheel.
14. **Eng Coolant Temp:** Displays the engine coolant temperature entering the radiator.
15. **Battery Voltage:** (volts) Displays the onboard battery voltage.
16. **Software Version**

B. **Engine Status**- Displays the following engine sensor values:

1. **Engine Oil Pressure:** Displays engine oil pressure.
2. **Engine Oil Temp:** Displays engine oil temperature.
3. **Boost Pressure:** Displays air pressure at engine intake manifold.
4. **Intake Manifold Temp:** Displays engine intake manifold temperature.
5. **Engine Coolant Temp:** Displays engine coolant temperature.
6. **Percent Load:** Displays approximate engine load as a percent of full engine rated H.P.
7. **Percent Throttle:** Displays approximate engine throttle position as a percent of full throttle position.
8. **Barometric Pressure:** Displays barometric pressure.
9. **Engine Speed**: (RPM) Displays the rotational speed of the engine.
10. **Fault 1 - Fault 5:** Displays last 5 engine shutdowns.

Maintenance

Maintenance

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

The oil level is most consistent when the unit is NOT running and should be checked at this time. Remove the dipstick located on the right side of the airend. The oil level should be between the high/low indicators on the dipstick.

Compressor Oil

This machine was factory filled with Ingersoll Rand IR Hydraulic Fluid.

Air Cleaner

This unit is equipped with an AIR FILTERS RESTRICTED message on the instrument panel.

When this message is viewed, both the engine and airend filters should be replaced.

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

NOTICE

Holes or cracks downstream of the air cleaner housing will cause the restriction indicators to be ineffective.

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

1. Loosen outer wing nut and remove with outer element. Inspect red window on special inner wing nut to find small dot. If dot is not visible, remove cotter pin and special wing nut and inner (safety) 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. Inspect the primary element by placing a bright light inside and rotating slowly. If any holes or tears are found in the paper, discard this element. If no ruptures are found, the element can be cleaned by one of the following procedures.
5. If a new air filter element is to be used check it closely for shipping damage. To reset the signal indicator in the special wing nut, apply suction to the red window.
6. Install cleaned or new elements in the reverse order to the above. Tighten wing nuts firmly and replace cotter pin.
7. Inspect to ensure that the end cap seals tightly 360° around the air cleaner body.

   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 holes. 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

This unit is equipped with dual tanks that can be filled from either side. Using clean fuel in the fuel tanks is important and every precaution should be taken to ensure that only clean fuel is either 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.

Every six months the drain plugs should be removed from the tanks so that any sediment or accumulated condensate may be drained. When replacing the drain plugs, make sure they are tightened securely.

Battery

Heavy-duty, diesel cranking type batteries were installed at the factory and these should be inspected weekly. 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.

Compressor Oil, Hydraulic Oil and Fuel Coolers

The coolers are cooled by means of the fin and tube-type oil cooler. The hydraulic oil, compressor oil and fuel flow internally through the core sections. Fluid 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 coolers, their efficiency is impaired.

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

If foreign deposits, such as sludge and lacquer, accumulate in the coolers, high temperature is likely to occur, causing shut down of the unit.

Radiator

⚠ WARNING

Do not remove the cap from a HOT engine radiator. The sudden release of pressure from a heated cooling system can result in serious personal injury.

The engine cooling system is filled at the factory with a 50/50 mixture of water and ethylene glycol. This permanent type antifreeze contains rust inhibitors and provides protection to -35° F (-37° C).

The use of such a mixture is recommended for both summer and winter operation. When using water alone, be sure to add a reputable brand of rust inhibitor to prevent internal corrosion.

It is recommended to test the freezing protection of the coolant every six months or prior to freezing temperatures. Replenish with a fresh mixture every twelve months. A drain for the system is located in the bottom radiator tank.

Each month, inspect the radiator exterior for obstructions (dirt, bugs, etc.). If present, blow water or compressed air containing a nonflammable solvent between the fins in a direction opposite the normal air flow. Should the radiator be clogged internally, standard automotive practices should be followed.

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 prevent leaks, regular inspection of these connections for wear or deterioration is a definite “must” if regulator servicing of the air cleaners is not to prove futile.

Premature wear of both the engine and compressor is ASSURED if dust-laden air is permitted to enter the engine or the compressor.

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 extremely important they be periodically inspected for wear and deterioration. Clamps are used to prevent hose cover abrasion through vibration. This abrasion may occur when two hose lines cross, or when a hose line rubs against a fixed point; therefore, it is necessary that all clamps be replaced if missing. 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

Piping systems operating at less than 150 psi (1050 kPa) may use a special nylon tubing. The associated fittings are also of a special “push-in” design.

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 the tubing is fully engaged in the sealing mechanism.

NOTICE

The flex joint that isolates the water separator from the airend does require periodic re-torque of the fasteners to 10 ft-lbs.

Compressor Oil Filters

The compressor lubrication and hydraulic oil systems include spin-on, throw away type oil filters, each with an internal bypass valve. With a clean, new filter element, all of the oil flows through the full element area, from the outside/inside. As each element becomes contaminated with dirt, a pressure differential is created in the filter housing between the oil inlet and outlet ports. As this differential approaches 25 psi (175 kPa), the bypass valve starts to open, thus permitting a small quantity of oil to bypass the filter. As the contaminants continue to build up, more and more of the oil bypasses the filter media itself.

This bypass does not provide any filtration but does allow a maximum flow of compressor lubricating and hydraulic oil to preclude any possible damage from loss of oil. Also the design of the filter prevents any washing-off of any dirt during oil bypassing.

NOTICE

The oil filter must be replaced every 1000 hours of operation.

To service the 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 element and then discard.

   NOTE: If there is any indication of formation of varnishes, shellacs or lacquers on the oil filter element, it is a warning the compressor lubricating oil has improper characteristics and should be immediately changed.

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.

   Installing a new oil filter element when the old gasket remains on the oil 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 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.

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.

Compressor and Hydraulic Oil

The lubricating and cooling oil must be replaced every 1000 hours of operation or six (6) months, whichever comes first.

Engine Cooling Fan Drive

The heat exchanger or cooling fan is driven by a single belt arrangement from the engine. Inspect the cooling fan belt weekly. These belts should be maintained at the proper tension by the auto tension system on the engine.

Air Cooling Fan Drive

Hydraulically operated fan requires maintenance. Grease fittings every 3 months, 500 hours.

⚠ 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.

NOTICE

Drain the frame after power-washing/cleaning or heavy rains.

Maintenance Schedule

These time periods should be reduced if operating in extreme conditions (very hot, cold, dusty or wet).

	Initial 500 Miles	Daily	Weekly	Monthly	3 MOS.	6 MOS.	12 MOS.
	850 Km				500 hrs	1000 hrs	2000 hrs
Compressor Oil Level		C					
Engine Oil Level		C					
*Radiator Coolant Level		C					
Gauges/Lamps		C					
*Air Cleaner Service Indicators		C					
Fuel Tank (fill at end of day)		C				D	
*Fuel/Water Separator Drain		C					
Oil Leaks		C					
Fuel Leaks		C					
Drain Water from Fuel Filters		D					
Coolant Leaks		C					
Radiator Filler Cap		C					
Air Cleaner Pre-cleaner Dumps			C				
Fan/Alternator Belts			C				
Battery Connections/Electrolyte			C				
Tire Pressure and Surface			C				
*Wheel Lug Nuts				C			
Hoses (oil, air, intake, etc.)				C			
Automatic Shutdown System				C			
Air Cleaner System				C			
Compressor heat exchanger exterior				C			
*Engine heat exchanger exterior				C			
Fasteners, Guards					C		
Air Cleaner Elements						R/WI	

*Disregard if not appropriate for this particular machine.

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

(2) or as defined by local or national legislation

C = check (adjust, clean or replace if necessary)

CBT = check before towing

CR = Check and report

D = Drain

G = Grease

R = replace

T = Test

WI = OR when indicated if earlier

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

	Initial 500 Miles	Daily	Weekly	Monthly	3 MOS.	6 MOS.	12 MOS.	12 MOS.
	850 Km				500 hrs	1000 hrs	1500 hrs	2000 hrs
*Fuel/Water Separator Element					R			
Compressor Oil Filter Element					R			
Compressor Oil						R		
Engine Oil Change					R			
Engine Oil Filter					R			
*Water Pump Grease						R		
*Wheels (Bearings, Seals, etc.)								C
*Engine Coolant						C		R
Fuel Filter Element					R			
Innerstage Moisture Separator Strainer				C				
Shutdown Switch Settings								T
Discharge Moisture Separator Strainer				C				
*Feed Pump Strainer Cleaning								C
*Valve Clearance Check								C
Lights (running, brake, & turn)		CBT						
Pintle Eye Bolts		CBT						
*Brakes		CBT			C			
*Brake linkage	C							
Emergency stop		T						
Fasteners		C						
Running gear linkage				G				
Safety valve					C			
Running gear bolts(1)					C			

*Disregard if not appropriate for this particular machine.

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

(2) or as defined by local or national legislation

C = check (adjust, clean or replace if necessary)

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G = Grease

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WI = OR when indicated if earlier

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

	Initial 500 Miles	Daily	Weekly	Monthly	3 MOS.	6 MOS.	12 MOS.
	850 Km				500 hrs	1000 hrs	2000 hrs
Pressure system						C	
Engine breather element							C
Lubricator (Fill)		C					

	2 yrs.	4 yrs.	6 yrs.				
Safety valve	C						
Hoses		R					

*Disregard if not appropriate for this particular machine.

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

C = check (adjust, clean or replace if necessary)

CBT = check before towing

CR = Check and report

D = Drain

G = Grease

R = replace

T = Test

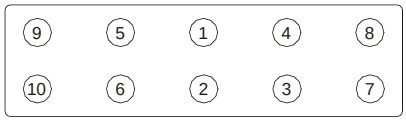
WI = OR when indicated if earlier

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

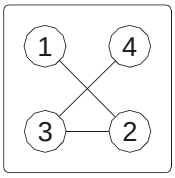
Torque Values

TABL E 1 INCH FASTENERS

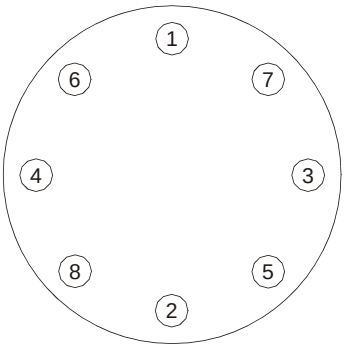
CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE			
	8AE J249 GRADE 5 (HEAD MARKING)		8AE J249 GRADE 8 (HEAD MARKETING)	
	(Nm.)	(FT-LBF)	(Nm.)	(FT-LBF)
1/4 - 20	11	8	16	12
5/16 - 18	24	17	33	25
3/8 - 16	42	31	59	44
7/16 - 14	67	49	95	70
1/2 - 13	102	75	144	106
9/16 - 12	148	109	208	154
5/8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



TYPICAL RECTANGULAR TORQUE PATTERN

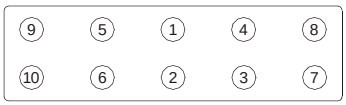


TYPICAL SQUARE TORQUE PATTERN

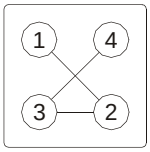


TYPICAL CIRCULAR TORQUE PATTERN

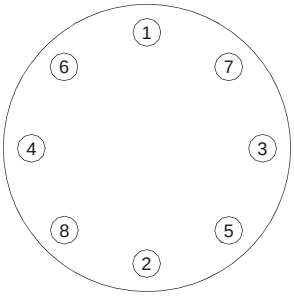
TABL E 2	METRIC FASTENERS					
CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE					
	PROPERTY GRADE 8.8 (HEAD MARKING) 8.8 8.8 8.8		PROPERTY GRADE 10.9 (HEAD MARKING) 10.9 10.9 10.9		PROPERTY GRADE 12.9 (HEAD MARKING) 12.9 12.9 12.9	
	(Nm.)	(FT-LBF)	(Nm.)	(FT-LBF)	(Nm.)	(FT-LBF)
M6 X 1.0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



TYPICAL RECTANGULAR TORQUE PATTERN



TYPICAL SQUARE TORQUE PATTERN



TYPICAL CIRCULAR TORQUE PATTERN

Always use Ingersoll Rand Replacement parts!

Lubrication

Lubrication

General Information

Lubrication is an essential part of preventive maintenance, affecting to a great extent the useful life of the unit. Different lubricants are needed and some components in the unit require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and the frequency of their application be explicitly followed. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

The Preventive Maintenance Schedule shows those items requiring regular service and the interval in which they should be performed. A regular service program should be developed to include all items and fluids. These intervals are based on average operating conditions. In the event of extremely severe (hot, cold, dusty or wet) operating conditions, more frequent lubrication than specified may be necessary. Details concerning lubrication of the running gear are in Maintenance Section.

All filters and filter elements for air and compressor lubricant must be obtained through Ingersoll Rand to assure the proper size and filtration for the compressor.

Compressor & Hydraulic Oil Change

These units are normally furnished with an initial supply of oil sufficient to allow operation of the unit for approximately 6 months or 1000 hours, whichever comes first. If a unit has been completely drained of all oil, it must be refilled with new oil before it is placed in operation. Refer to specifications in Lubrication Table.

NOTICE

Some oil types are incompatible when mixed and result in the formation of varnishes, shellacs, or lacquers which may be insoluble. Such deposits can cause serious troubles including clogging of the filters. Where possible, do NOT mix oils of different types and avoid mixing different brands. A type or brand change is best made at the time of a complete oil drain and refill.

Compressor Lubrication

Recommended Fluids	Usage	5 Gal. (18.9 liters)	55 Gal. (208 liters)	275 Gal. (1039.5 liters)
IR Hydraulic Fluid -10° - 125° F (-23° C to 52° C)	Compressor Oil Hydraulic Oil	54758321	54758339	54758347
Pro-Tec™	Engine Oil	36875938	36866903	

Premium grade oils API, CH -4 or CI-4 are recommended for the QSX15 engine.

If the unit has been operated for the time/ hours mentioned above, it should be completely drained of oil. If the unit has been operated under adverse conditions, or after long periods in storage, an earlier change period may be necessary as oil deteriorates with time as well as by operating conditions.

⚠ 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. Ensure the following conditions are met:

Discharge air pressure gauge reads zero (0).

No air discharging from an "open" manual blowdown valve.

An oil change is good insurance against the accumulation of dirt, sludge, or oxidized oil products.

Completely drain the reservoir, piping, and cooler. If the oil is drained immediately after the unit has been run for some time, most of the sediment will be in suspension and, therefore, will drain more readily. However, the fluid will be hot and care must be taken to avoid contact with the skin or eyes.

After the unit has been completely drained of all old fluid, close the drain valve. Add oil in the specified quantity at the filler plug. Tighten the filler plug and run the machine to circulate the oil. Check the oil level when unit is warm and not running. If not near the middle of the sight tube, stop the unit and make corrections. DO NOT OVERFILL.

NOTICE

Ingersoll Rand provides compressor oil specifically formulated for Portable Compressors and requires the use of these fluids in order to obtain extended limited airend warranty.

Always use Ingersoll Rand Replacement parts!

Fault Finding

Fault Finding

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.

Fault Finding Chart

Bold Headings depict the COMPLAINT - Subheadings suggest the CAUSE

NOTE: Subheadings suggest sequence to follow troubleshooting.

	Unit Shutdown:	**Corrective Action**
	Out of Fuel	Add CLEAN diesel Fuel
	Compressor Oil Temp. Too High	See Complaint 10
	Engine Water Temp. Too High	Check coolant level. If necessary, Add.
	Engine Oil Pressure Too Low	See Complaint 3 and Complaint 4.
	Broken Engine Fan Belt	Replace fan belt.
	Loose Wire Connection	Wiggle wires at switches & connector blocks. Make repairs.
	Low Fuel Level Shutdown	Replace fuel sender.
	Defective Sensor	Replace sensor.
	Malfunctioning Relay	Replace relay.
	Blown Fuse	Replace fuse.
	Engine Malfunctioning	See Trouble Shooting in Engine Manual.
	*Airend Malfunctioning	See Complaint 10.

	Won't Start/Run:	
	Low Battery Voltage	Check electrolyte level. Check connections.
	Blown Fuse	Replace fuse.
	Blown Fuse Malfunctioning Start Switch	Replace switch.
	Clogged Fuel Filters	Service filters. See Engine Operator's Manual.
	Out of Fuel	Add CLEAN fuel.
	Compressor Oil Temp. Too High	See Complaint 10.
	Engine Water Temp. Too High	Check fluid level. If necessary, Add.
	Engine Oil Pressure Too Low	See Complaint 3 and Complaint 4.
	Loose Wire Connection	Repair or replace connection.
	Defective Sensor	Replace sensor.
	Malfunctioning Relay	Replace relay.
	Engine Malfunctioning	See Trouble Shooting in Engine Manual.
	Airend Malfunctioning	See Complaint 10.

	High Engine Temperature:	
	Broken Engine Fan Belt	Replace fan belt set.
	*Ambient Temp. >120°F	Above spec limit.
	Dirty Operating Conditions	Move unit to cleaner environment.
	Dirty Cooler	Clean exterior of cooler.
	*Out of Level >5 degrees	Relocate or reposition unit.
	Operating Pressure Too High	Reduce pressure to spec.
	Recirculation of Cooling Air	Close side doors.
	Loose Wire Connection	Repair or replace.
	Side Doors Open (no CAC cooling air)	Close Doors

* : > = greater than, < = less than

	Low Engine Oil Pressure:	
	Low Oil Level	Add oil.
	Out of Level >15 degrees	Relocate or reposition.
	Wrong Lube Oil	See Engine Oil Spec. Change oil.
	Clogged Oil Filter Element(s)	Replace element(s).
	Engine Malfunctioning	See Trouble Shooting in Engine Manual.

Loose Wire Connection.	Repair or replace.
5. Alternator Low Volltage:	**Corrective Action**
Loose or Broken Belts	Tighten or replace belt set.
Loose Wire Connection	Repair or replace connection.
Low Battery Voltage	Check electrolyte level. Add if necessary.
	Check connectors. Clean & tighten.
	Recharge battery.
Malfunctioning Alternator	Repair or replace alternator.
6. High Compressor Oil Temperature:	
Ambient Temp. > 115° F	Above spec limit.
Out of Level > 5 degrees	Relocate or reposition unit.
Low Oil Level	Add oil. Look for any leaks.
Wrong Lube Oil	Check spec in this manual.
Dirty Cooler	Clean exterior surfaces.
Dirty Operating Conditions	Move unit to cleaner environment.
Clogged Oil Filter Elements	Replace elements. Change oil.
Loose or Broken Belts	Tighten or replace belt set.
Operating Pressure Too High	Reduce pressure to spec.
Recirculation Of Cooling Air	Close side doors. Replace belly pan.
Malfunctioning Thermostat	Replace thermostat in bypass valve.
Malfunctioning Fan	Check fan belt tension. Tighten or replace belt set.
Defective Oil Cooler Relief Valve	Replace valve.
Defective Minimum Pressure Valve	Repair or replace valve.
Blocked or Restricted Oil Lines	Clean by flushing or replace.
Airend Malfunctioning	See Complaint 11, 12, 13, 15, 16 or 18.
7. Low Compressor Oil Pressure:	
Low Oil Level	Add Oil. Check for leaks.
Wrong Lube Oil	Check spec in manual.
Clogged Oil Filter	Replace element. Change Oil.
Low Relief Valve Setting	Adjust pressure relief valve to 43 psi @ 1800 RPM.
8. Engine RPM Down:	
Clogged Fuel Filter (primary)	Replace primary filter. Replace final filter. Drain tanks. Add CLEAN fuel.
Operating Pressure Too High	Reduce pressure to spec limit.
Dirty Air Filter	Clean or replace elements.
Wrong Air Filter Element	Install correct element.
Engine Malfunctioning	See Trouble Shooting in Engine Manual.
Airend Malfunctioning	Refer to Factory.
9. Excessive Vibration:	
Rubber Mounts, Loose or Damaged	Tighten or replace.
Defective Fan	Replace fan.
Drive Coupling Defective	Replace coupling.
Engine Malfunctioning	See Trouble Shooting in Engine Manual.
Airend Malfunctioning	See Complaint 15 and 17.
Engine idle speed too low.	See Engine Manual.

10. Low CFM:	**Corrective Action**
Dirty Air Filter	Clean or replace elements.
Incorrect Linkage Adjustment	Make adjustment per Section 6.
Malfunctioning Inlet Unloader/Butterfly Valve	Inspect valve. Make adjustment per Section 6.
Malfunctioning Hydraulic Cylinder	Replace hydraulic cylinder.
Wrong Air Filter Element	Install correct element.
11. Short Air Cleaner Life:	
Dirty Operating Conditions	Move unit to cleaner environment.
Inadequate Element Cleaning	Install new element.
Incorrect Stopping Procedure	Read procedure in this manual.
Wrong Air Filter Element	Install proper element.
12. Will Not Unload:	
Malfunctioning Inlet Butterfly Valve	Inspect valve fit. Re-adjust per Section 6.
Ice in Regulation Lines/Orifice	Apply heat to line(s) and or orifice.
Load Solenoid Leak	Replace load solenoid.
Plugged Vent Leak	Clean and/or replace.
13. Safety Valves Relieves:	
Operating Pressure Too High	Reduce pressure to spec limit.
Malfunctioning Inlet Unloader/Butterfly Valve	Inspect valve fit. Readjust per Section 6.
Defective Safety Valve	Replace safety valve.
Unit Will Not Unload Fast Enough	Apply heat to lines and/or orifice.
14. Low Hydraulic Fan Speed:	
Low Ambient Temperature	Normal operation.
Low Hydraulic Pressure	Remove diode on proportional cartridge on manifold block. Set pressure with relief valve to 2250 psi @ 1800 rpm. Install Diode
Dirty Filter	Replace filter and change oil.
Blocked or restricted oil lines	Clean by flushing and replace.
Bypass in manifold block	Inspect O-rings on cartridges, replace if required.
Worn pump	Replace pump.
Worn motor	Replace motor.

Alerts and Shutdowns

Software V3.02						
			ALERT		SHUTDOWN	
AIREND	**Parameters**	**Units**	**Value**	**Type**	**Value**	**Type**
High Inlet Restriction	PT1	psiv (bar)	0.69 (0.05)	1	>3.05 (0.21)	3
					>13.5 (0,93)	3
Hi Stg 2 Inlet Press	PT2	psig (bar) deg F(C)	>43 (3) & RT1>430° (221°)	2	>5 (0,34) & PT1>5° (034°)	2
Hi Stg 2 Disch Press	PT3	psig (bar)			>200 (13.8)	4
					>100[2] (6.9)	3
Lo Compr Oil Inj Press	PT6	psig (bar)			<20[2] (1.38)	1
Hi Stg 1 Disch Temp	RT1	deg F(C)	>450° (232°)	1	>460° (238°)	2
Hi Stg 2 Inlet Temp	RT2	deg F(C)	>135° (5°7)	1		
Hi Stg 2 Disch Temp	RT3	deg F(C)	>510° (265°)	1	>520° (271°)	2
Hi Compr Oil Inj Temp	RT5	deg F(C)	>165° (74°)	1	>170° (77°)	1
Change Compr Oil Filter	PT5-PT6	psid (bar) deg F(C)	>18 (1,2) & RT5>115° (46°)	1		
PACKAGE						
Low Fuel Level	FL	Counts	=1	1	= 0	1
Low Battery Volts	G2	Volts	<24	1		
Too many start attempts	Nstarts				>3	4
Low Speed @ startup		time/rpm			>10 & 0< RPM<950	4
Low Speed	G1	rpm	<1000	1	950	1
Overspeed	G1	rpm			2050	4
Low Hydraulic Oil Level					ON or OFF	2
E-STOP pushed					Pushed	4
Hi Coolant Temp	RT7	deg F(C)	>220° (104°)	1	>240° (116°)	1

Type 1 = 30 second delay, Type 2 = 5 second delay, Type 3 = 3 second delay, Type 4 = 0 second delay.

NOTE 1: 10 sec is measure from starter disengagement (check right after the beep)

NOTE 2: 30 sec is delay upon entering unloaded modes.

Always use Ingersoll Rand Replacement parts!

Electrical

Electrical

Intellisys Controller

The INTELLISYS Controller is the heart of the NHP1500 machine monitor and control system. It provides data collection, alarming and control functions for compressor operations. It is an Intel microcontroller based unit with analog and digital inputs and outputs.
The first function of the INTELLISYS Controller is to scan all analog and digital inputs at a given time interval. The analog and digital inputs are scanned every 100 milliseconds. The analog values are then compared against minimum and maximum values and an ALERT or SHUTDOWN is issued, if a value is out of range. The various ALERTS and SHUTDOWNS are listed in Fault Finding section of this manual.

The second function of the INTELLISYS Controller is machine speed control based upon air demand. The INTELLISYS monitors discharge air pressure, PT4, and varies the engine speed to maintain the discharge air pressure at the desired setpoint.

The third function of the INTELLISYS Controller is to communicate with the diesel engine via the J1939 CAN network. The INTELLISYS Controller provides the engine speed setpoint (software versions 2.0 and greater) to the engine controller and retrieves diagnostic information from the engine.

Software versions under 2.0 use the frequency throttle to communicate with the engine. A square wave frequency signal from 150 Hz to 375 Hz is sent from the INTELLISYS controller to the engine controller. The signal is a linear signal from 150 Hz at engine idle (1200 RPM) to 375 Hz at maximum run speed (1800 RPM).

Figure 2 shows signals between the engine controller and the INTELLISYS Controller.

Sensors and Transducers

The electronics system contains sensors and transducers that are used to collect process data from the compressor. There are two types of temperature sensors, RTD’s and thermistors. Both of these devices exhibit a change in resistance as the temperature changes. This resistance change causes an input voltage change to the INTELLISYS controller input and is interpreted as a temperature change. The temperature probes look similar but have different connectors. They are not interchangeable.

The electronics system also contains pressure transducers to measure process pressure changes. These devices have an output signal of .45 VDC to 4.5 VDC, corresponding to 0 psi and the maximum psi for a selected transducer which will be 100, 225, or 15. The 0-15 psi transducer is a vacuum transducer and the 100 and 225 psi units are gauge pressure devices. A 5 VDC excitation signal is provided to power the transducers. There are three wire devices: excitation, signal and ground connections.

Digital Inputs and Outputs

The controller scans digital inputs or switch contacts. These are either on (24 VDC) or off (0 VDC). They are the emergency stop buttons (ESTOP) and the inputs associated with the autostart function.

Controller Outputs

The INTELLISYS Controller has three different types of outputs: frequency, pulse width modulated (PWM) and 24 VDC digital (ON / OFF). The frequency output is used as a throttle signal for the engine (software revisions less than 2.0). The INTELLISYS Controller varies the frequency from 150 Hz to 375 Hz, corresponding to 1200 to 1800 RPM. The frequency signal is a 50% duty cycle, 24 VDC, square wave.

The PWM signal is used to control the speed of the aftercooler fan. It is a 125 Hz frequency signal, 24 VDC with a duty cycle of 5% to 90%.

The INTELLISYS controller provides 24 VDC digital outputs to control solenoids, alarm horn, strobe lights, DC heaters and fuel pump. These are 24 VDC ON and 0 VDC OFF. They are current limited and short circuit protected. They may have a voltage level of .5 VDC to 1.4 VDC in the OFF state due to transistor leakage of the darlington drivers in the controller.

Pressure Control Loop

The INTELLISYS controls discharge pressure by modulating engine speed. The discharge pressure setpoint is entered at the controller front panel. The control loop will modulate the engine speed between 1200 and 1800 RPM to maintain the selected discharge pressure.

Electronic Engine

The NHP1500 machine contains an emissions certified diesel engine. In order to meet the emissions requirements, the engine has an electronic control system.

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

The INTELLISYS controller sends speed setpoints to the engine (software versions 2.0 and greater) and receives diagnostic and run time data from the engine over the J1939 CAN network. A frequency throttle interface with the engine is used for software versions earlier then 2.0. Figure 2 shows the connections between the engine and INTELLISYS controller.

Ref: J1939 Data Link - The CAN network is a single pair shielded cable located with or attached to the W1 main harness. Figure 3 shows a layout of the CAN harness or backbone as it is referred to. The termination resistors (Terminator) are important to prevent reflections on the transmission line and must be in place for the network to function properly. The shield from the cable is connected to the machine frame at the INTELLISYS controller end.

The engine diagnostics connector is located inside the control panel. This is used to connect the engine manufacturer’s service tools to the CAN network. This connector also provides 24 VDC to power these service tools.

Electrical System

The electrical system consists of the wiring harness and associated electrical devices such as relays, switches, lights, solenoids and alarm horn. There are two wiring harnesses in the NHP1500 machine. They are as follows:

23047020 W1 Chassis Main Wiring Harness

54633003 W3 Fuse Box Wiring Harness

The schematic diagrams show the connections for these harnesses. Figure 1 is a system diagram showing harness connection with devices and controllers. The troubleshooting section includes information on how to make harness repairs and information on the connectors used.

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

Aftercooler Fan Control Loop

The NHP1500 machine has a variable speed aftercooler fan control loop. This control loop varies the speed of a hydraulically driven fan, using a pulse width modulated (PWM) signal. The signal has a base frequency of 125 Hz and a duty cycle of 5% to 90%. The fan speed range is from 300 to 1640 RPM.

Electronic Control Systems

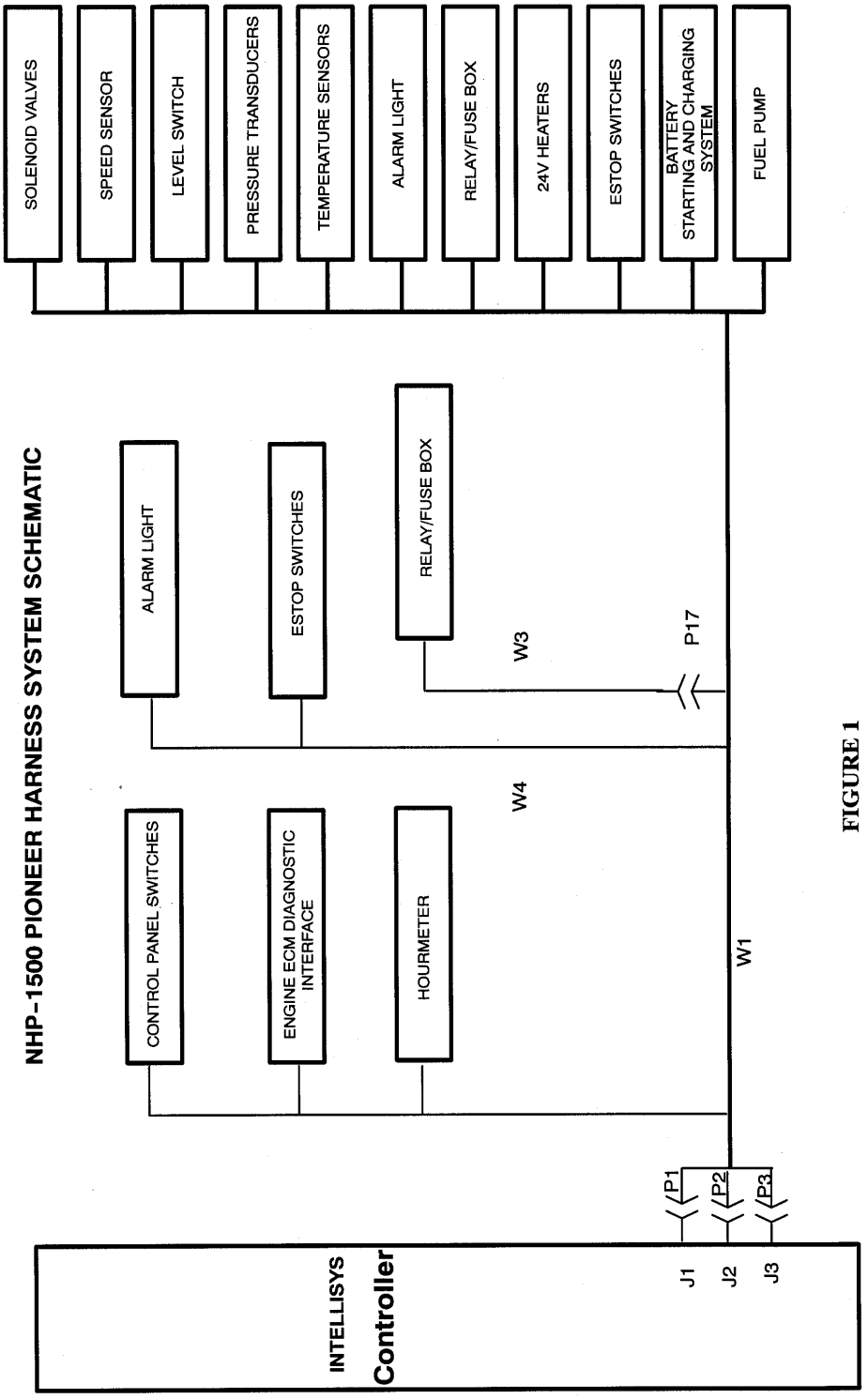


FIGURE 1

SGP TO ENGINE INTERFACE
CUMMINS ENGINE

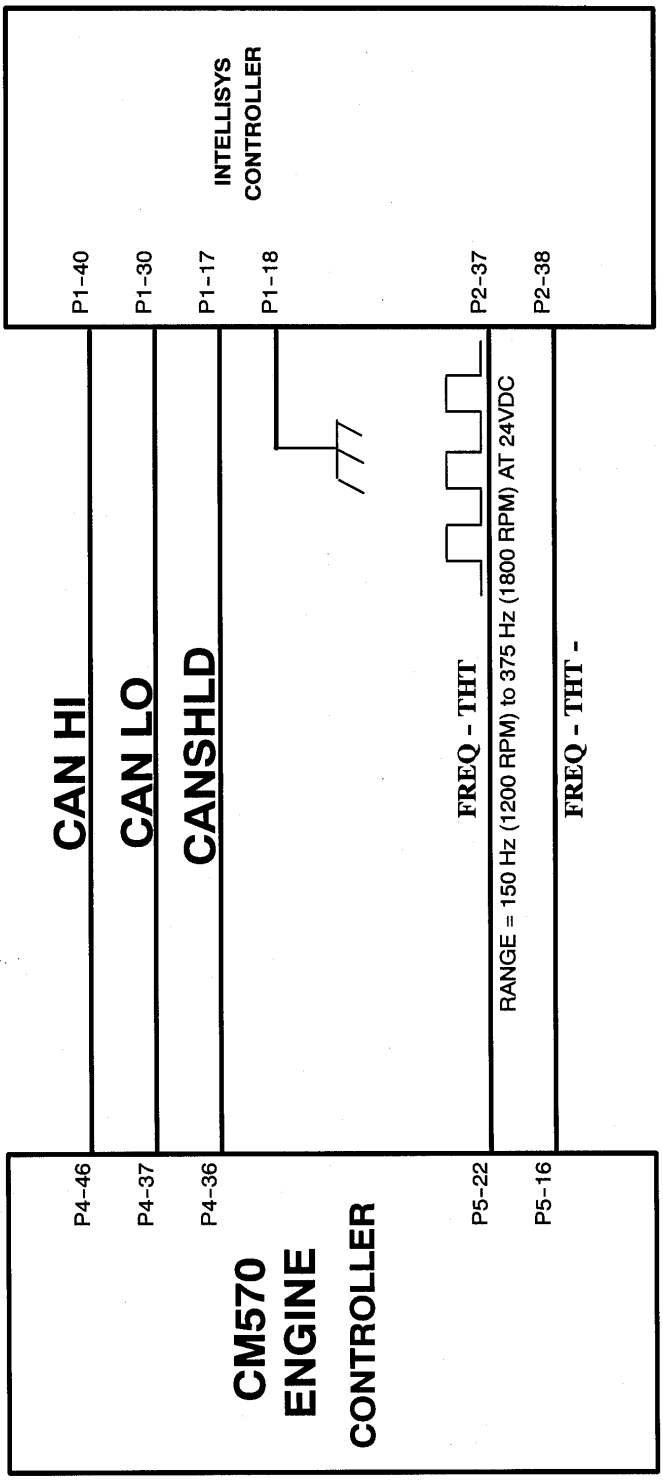


FIGURE 2

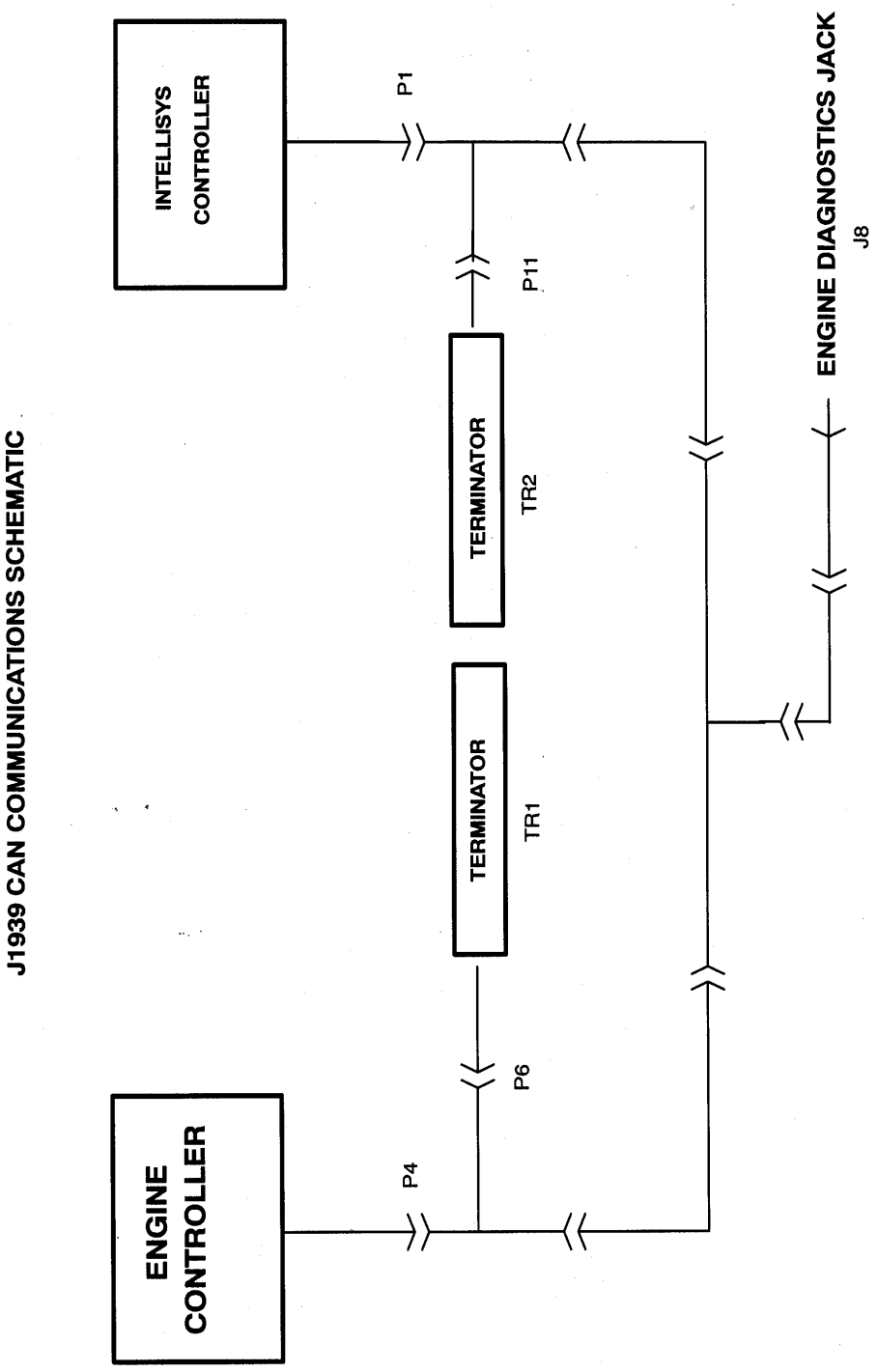

J1939 CAN COMMUNICATIONS SCHEMATIC
INTELLISYS CONTROLLER
P1
P11
TERMINATOR
TR2
TERMINATOR
TR1
P6
ENGINE CONTROLLER
P4
ENGINE DIAGNOSTICS JACK
J8

FIGURE 3

FAULT FINDING

Problem	Correction
Control Panel Power Switch On, Intellisys Controller Does Not Come On	Make sure battery disconnect switch is ON
	Check Fuse F4
	Check Seating of P3 Connector at SGP
	Battery Voltage too Low
	Check Control Panel ON / OFF Switch
	Check Wiring from BAT to SGP
Intellisys Controller ON But Start Button does not Work	Defective Membrane Panel Switch
The Machine will not load when the Load Button is Pressed	Defective Membrane Panel Switch
	24 VDC Signal not being Supplied to Inlet Valve Solenoid
The Machine will not unload when the Unload Button is Pressed	Defective Membrane Panel Switch
	24 VDC Signal not being removed from Inlet Valve Solenoid
Engine Speed will not increase when Load Button is Pressed	Defective Switch on Membrane Panel
	Intellisys Controller J1939 Throttle Command to Engine not working or
	Intellisys Controller Frequency Throttle Signal not working
Engine Idle Speed is less than 1200 RPM	Intellisys Controller Frequency Throttle
	Intellisys Controller J1939 Throttle Command Engine Fueling
Engine Cranks but will not start after Multiple Crank Cycles	Ensure the Engine Keyswitch Signal is 24 VDC
	If Low Ambient, may need Ether Assisted Start Estop Button(s) Pressed
Machine Shuts Down on Sensor Fault	Perform Transducer Calibration
	Replace Suspect Transducer

System Diagrams

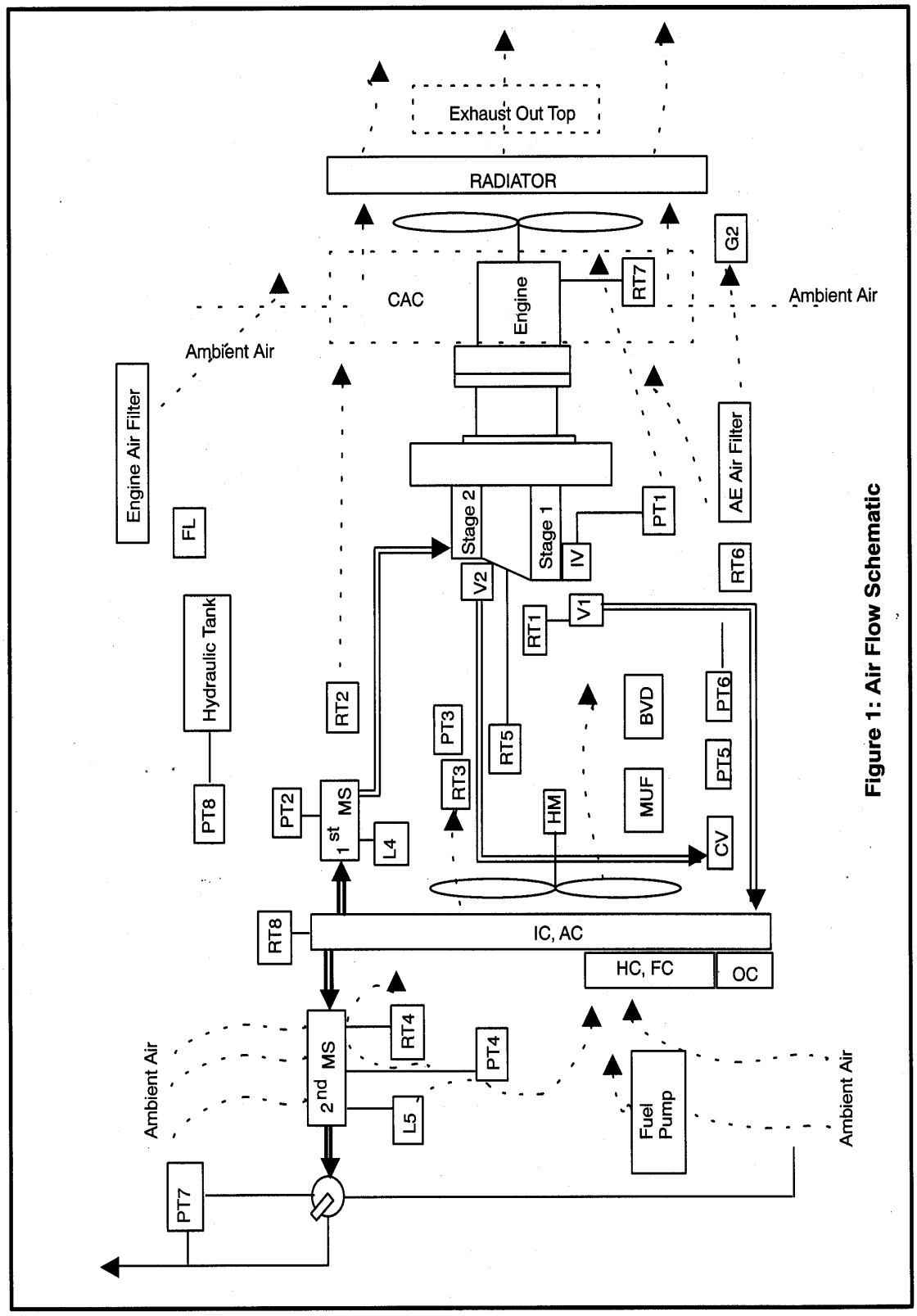


Figure 1: Air Flow Schematic

Legend: Electrical Components	
PT1	Stg 1 Inlet Vacuum
PT2	2nd Stg Inlet Pressure
PT3	2nd Stg Discharge Pressure
PT4	Package Discharge Pressure
PT5	Oil Filter In Pressure
PT6	Oil Filter Out Pressure
PT7	Remote Pressure
PT8	Hyd. Level Switch
RT1	1st Stg Out Temp
RT2	2nd Stg In Temp
RT3	2nd Stg Out Temp
RT4	Package Discharge Air Temp
RT5	Oil Injection Temp
RT6	1st Stg Inlet Temp
RT7	Coolant Temp
RT8	Intercooler Out Temp
FL	Fuel Level
G2	Battery Voltage
L4	Condensate Solenoid Valve (IC)
L5	Condensate Solenoid Valve (AC)

Legend: Mechanical Components	
IV	Inlet Valve
BDV	Blowdown Valve
MUF	Blowdown Muffler
V1	1st Stage Venturi
1st MS	1st Stage Moisture Separator
V2	2nd Stage Venturi
2nd MS	2nd Stage Moisture Separator
CV	Check Valve
HM	Hydraulic Motor
HC	Hydraulic Cooler
CAC	Engine Charge Air Cooler
FC	Fuel Cooler

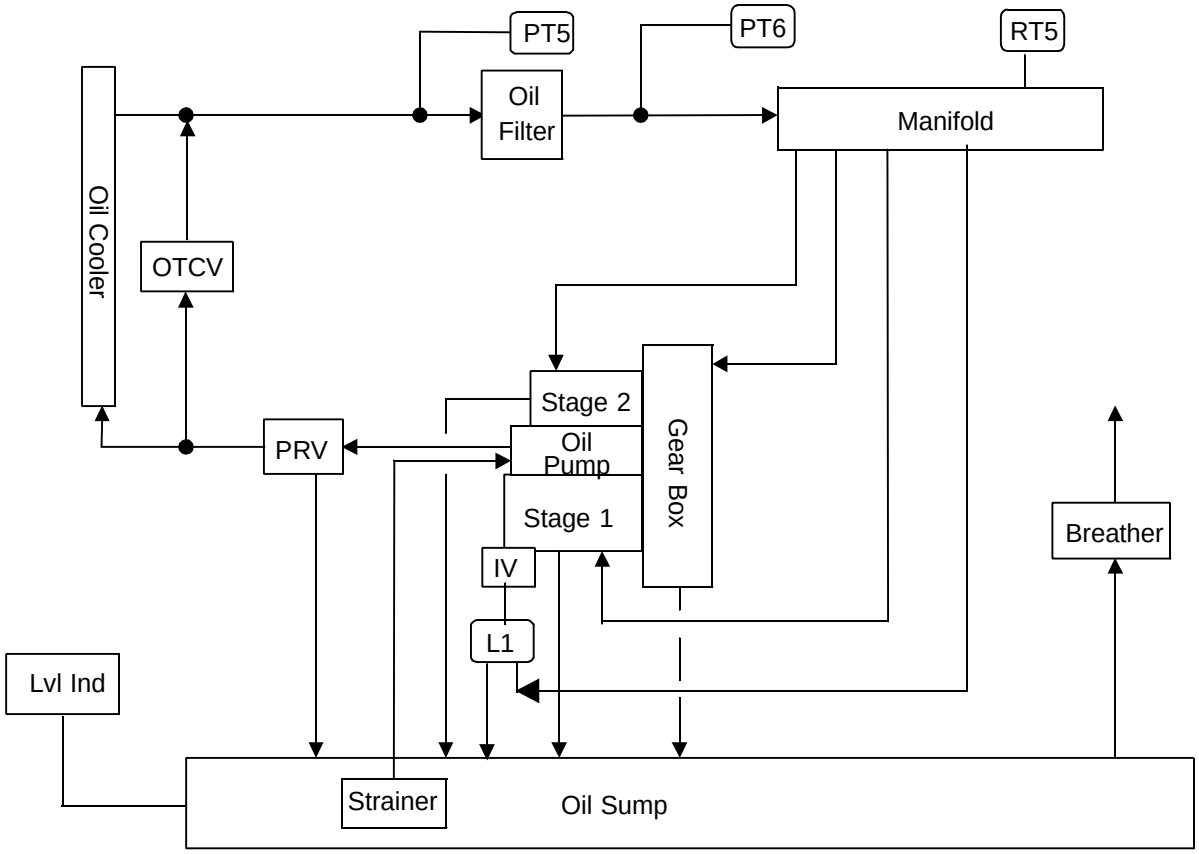


Figure 2: Lube Oil System Schematic

Legend: Electrical Components
PT5 - Oil Filter Inlet Pressure
PT6 - Oil Filter Outlet Pressure
RT5 - Comp Oil Injection Temp
L1 - 3 Way Solenoid Valve (Optional, 2 Valves)

Legend: Mechanical Components
OTCV - Oil Temp Control Valve
PRV - Pressure Relief Valve
Lvl Ind - Oil Level Indicator
IV - Inlet Valve

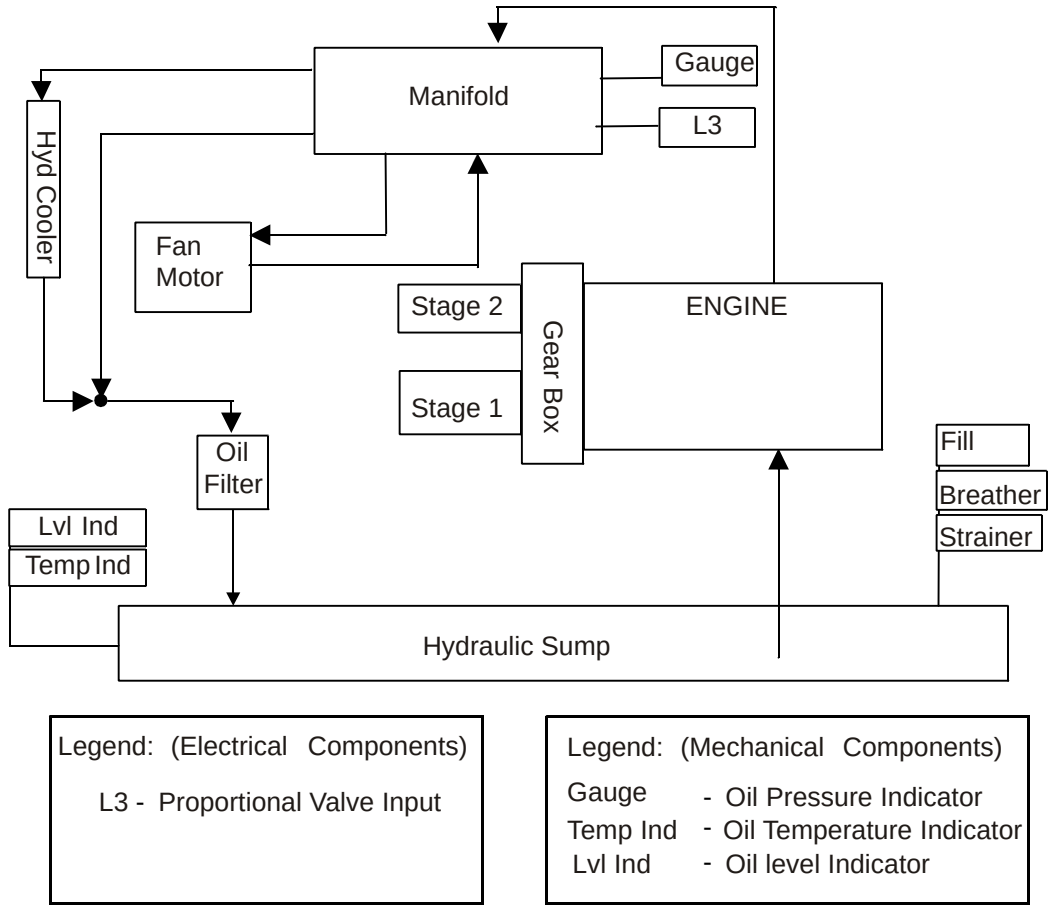
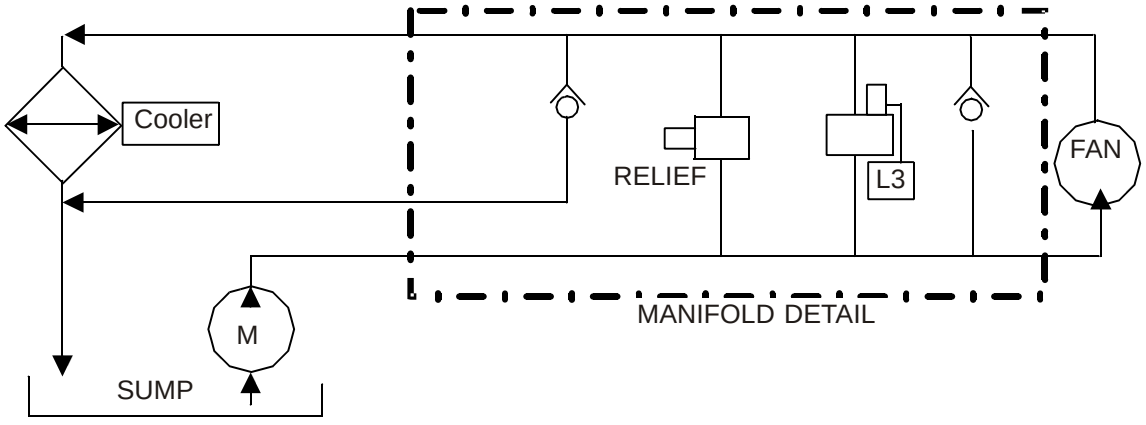


Figure 3: Hydraulic System Schematic



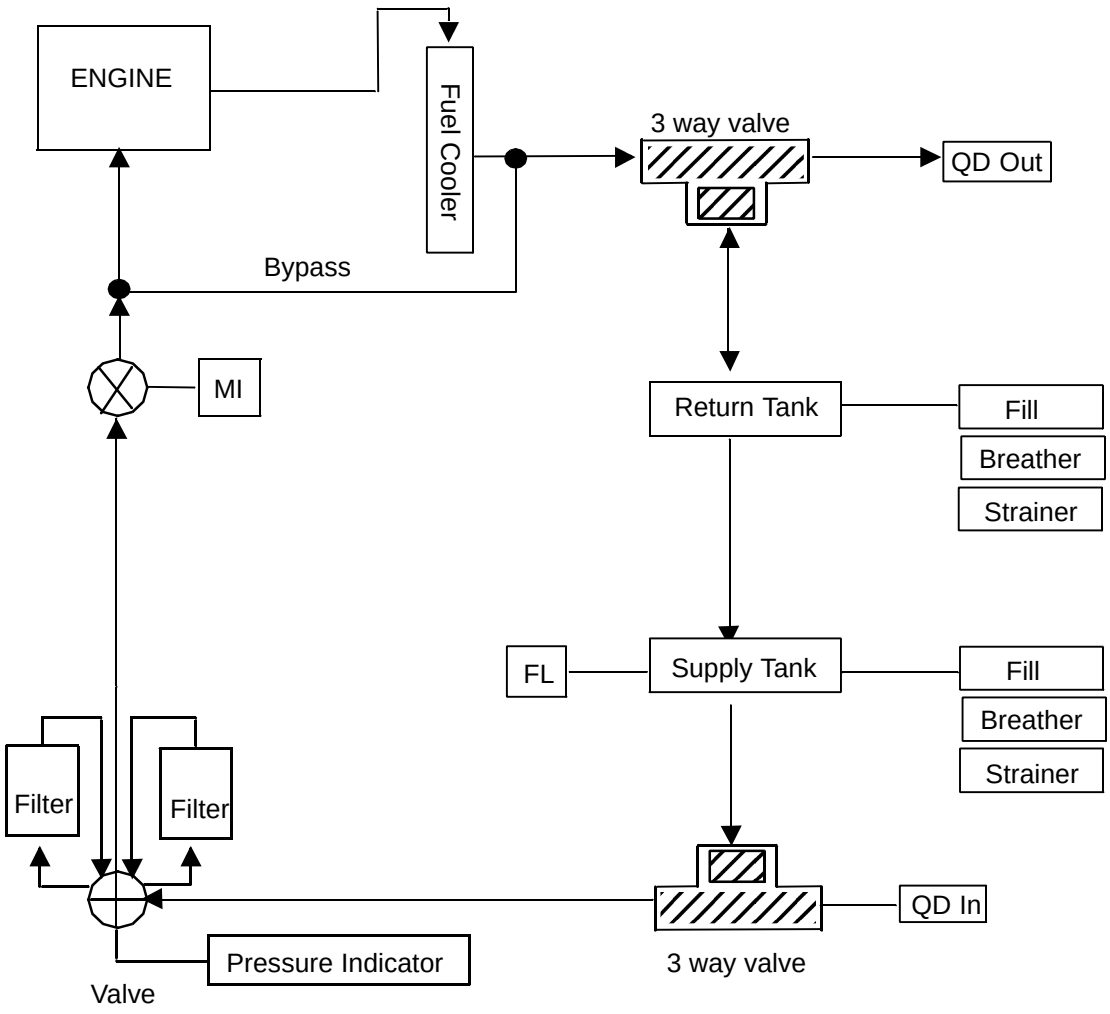


Figure 4: Fuel System Schematic

Legend: Electrical Components
FL - Fuel Level
MI - Run Fuel Pump

Legend: Mechanical Components
Gauge - Oil Pressure Indicator
Temp Ind - Oil Temperature Indicator
Lvl Ind - Oil Level Indicator

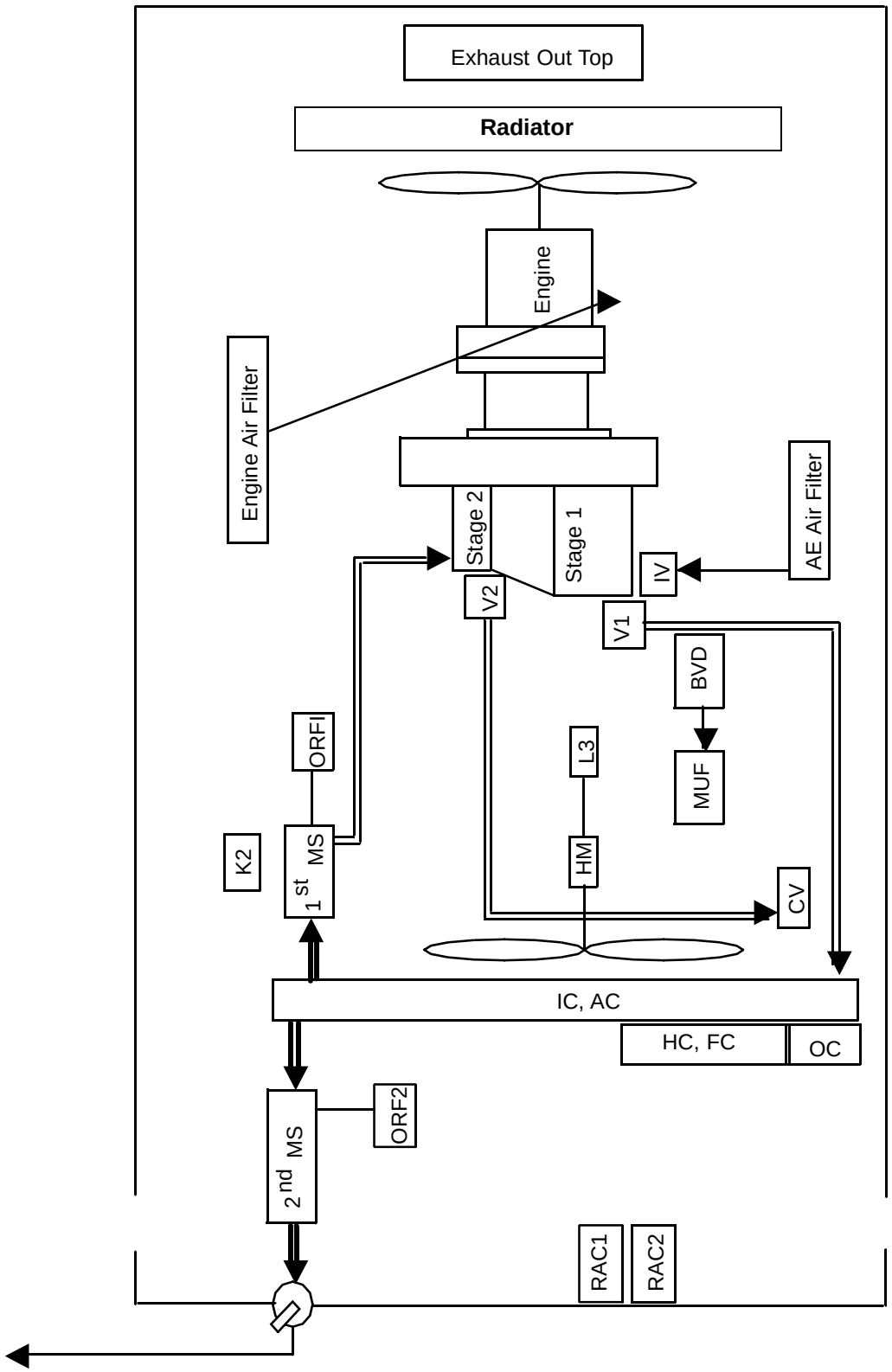


Figure - 5: Standard Product 24 Volt DC Heating Schematic

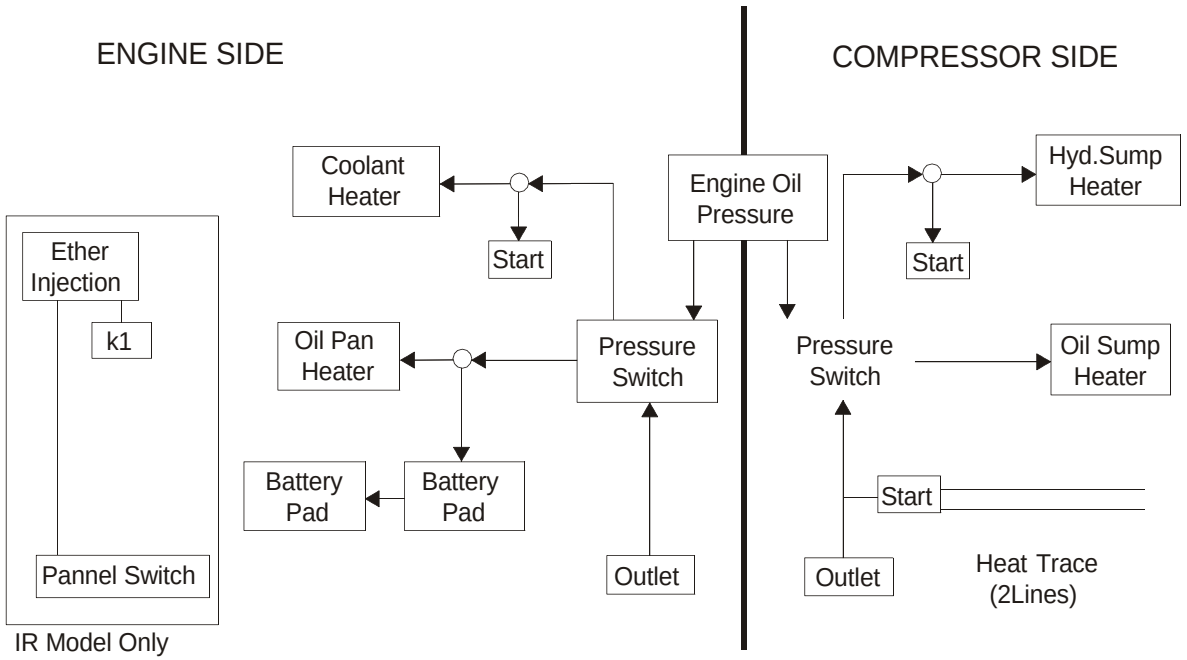


Figure 6 : AC Cold Start System Schematic

Legend: (Electrical components)

k1 - Aux. Start Relay

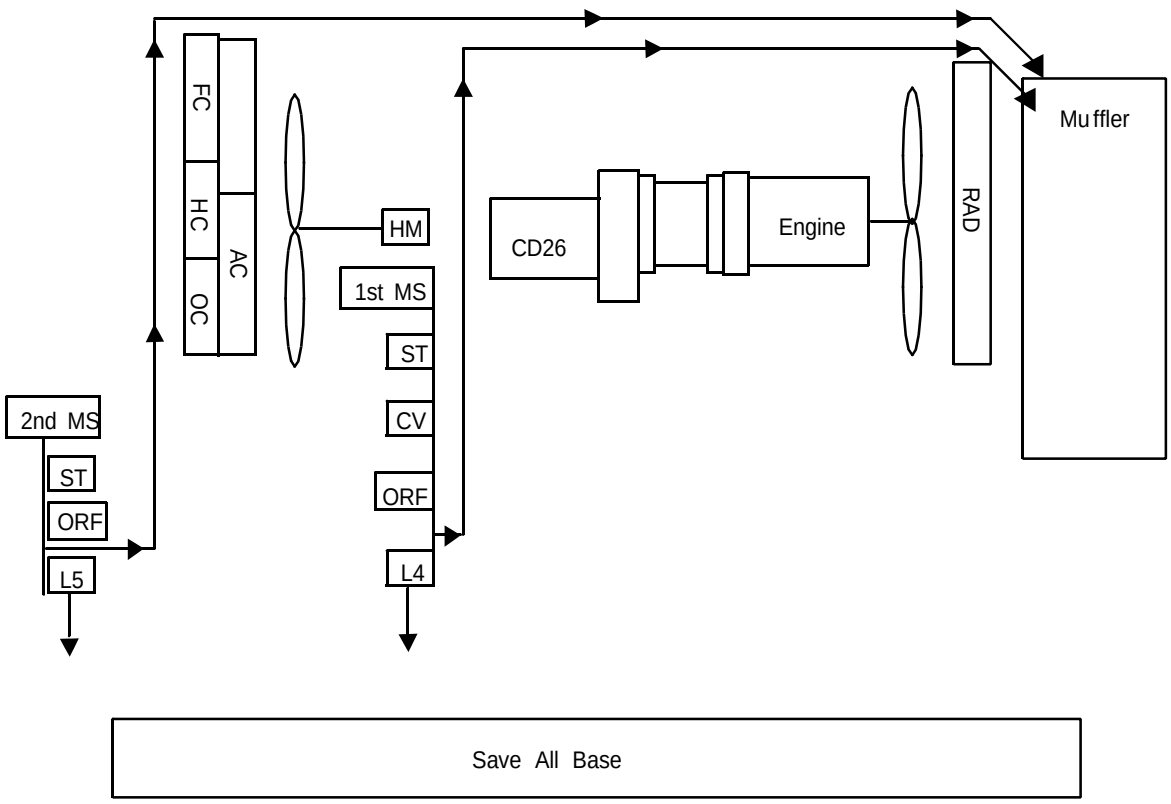


Figure - 7 Condensate Flow Schematic

Legend: Electrical Components

ORFI - IC Orifice Heater

ORF2 - AC Orifice Heater

L3 - Hydraulic Fan Motor Speed

RAC1 - Fuel Heater

RAC2 - Fuel Heater

K2 - DC Heater Relay

Legend: Mechanical Components

IV - Inlet Valve

BDV - Blowdown Valve

MUF - Blowdown Muffler

V1 - 1st Stage Venturi

1st MS - 1st Stage Moisture Separator

V2 - 2nd Stage Venturi

2nd MS - 2nd Stage Moisture Separator

CV - Check Valve

HM - Hydraulic Motor

HC - Hydraulic Cooler

CAC - Engine Charge Air Cooler

FC - Fuel Cooler

Legend: Electrical Components

L4 - Condensate Solenoid Valve (IC)

L5 - Condensate Solenoid Valve (AC)

Legend: Mechanical Components

1st MS - 1st Stage Moisture Separator

2nd MS - 2nd Stage Moisture Separator

HM - Hydraulic Motor

HC - Hydraulic Cooler

CAC - Engine Charge Air Cooler

FC - Fuel Cooler

TP - Tail Pipe

CV - Check Valve

ST - Strainer

ORF - Bleed Orifice

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