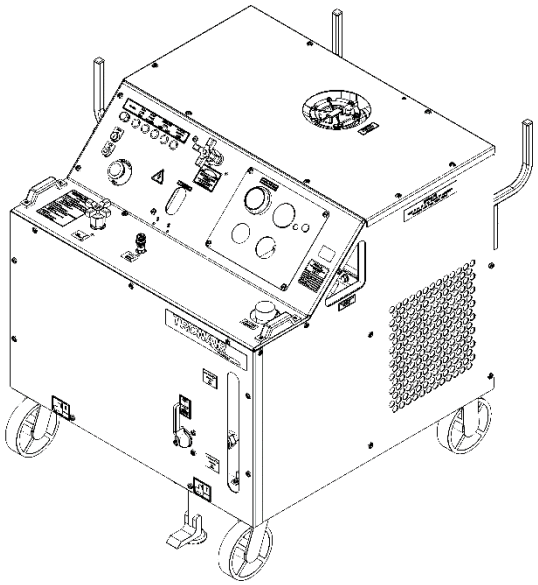
# OPERATION & SERVICE MANUAL



## 52X1 Series
## 5211, 5221, 5231, 5241
## Hydraulic Power Units

CE

01/2025 – Rev. 09

**For Spare Parts, Operations & Service Manuals or Service Needs**
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| REVISION | DATE | TEXT AFFECTED |
|---|---|---|
| 01 | 09/2016 | Original release |
| 02 | 12/2017 | Modified 9.2 Electric Motor |
| 03 | 11/2019 | Added 9.14.10 Hand Pump (Option M-7) |
| 04 | 08/2021 | Added section 5.14 Infrequent HPU Use and updated 9.0 Maintenance |
| 05 | 02/2022 | Major revision |
| 06 | 07/2023 | Modified 9.14.9 Hand Pump (Option M) |
| 07 | 06/2024 | Modified 9.14.11 Towing Trailer |
| 08 | 11/2024 | Modified 9.9 Return Manifold Assembly, 9.14.3 Split System (Option C), 9.14.4 Crossover Check (Option D) |
| 09 | 01/2025 | Modified 9.11.1 Electrical Components with 100 ft. input Cord Option |

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## 1.0 PRODUCT INFORMATION

### 1.1 DESCRIPTION

Hydraulic Power Unit

| Model Number | Fluid Type |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

### 1.2 MODEL & SERIAL NUMBER

Reference nameplate on unit

### 1.3 MANUFACTURER

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### 1.4 FUNCTION

The Hydraulic Power Unit (HPU) provides a source of clean, pressurized hydraulic fluid for performing required aircraft maintenance. An electric motor drives a pressure compensated piston pump. Filters are provided on the pressure and return systems. A bypass (dump) valve allows starting and stopping of the unit under a no-load, safe condition. The unit may use either the aircraft or on-board HPU reservoir. Cooling is provided for continuous operation.

### 1.5 REQUIREMENTS

Adequate electrical power must be provided for proper functioning of the HPU. See the unit nameplate for proper voltage and frequency. See the Operation & Service Manual for proper sizing of electrical supply and protection equipment in the facility.

## 2.0 SAFETY INFORMATION

### 2.1 USAGE AND SAFETY INFORMATION

The HPU provides pressurized hydraulic fluid for performing aircraft maintenance.

To ensure safe operations please read the following statements and understand their meaning. Also refer to your equipment manufacturer's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.

**WARNING!** — Warning is used to indicate the presence of a hazard that ***can cause severe personal injury, death, or substantial property damage*** if the warning notice is ignored.

**CAUTION!** — Caution is used to indicate the presence of a hazard that ***will or can cause minor personal injury or property damage*** if the caution notice is ignored.

### 2.2 EXPLANATION OF WARNING & DANGER SIGNS

**Accidental Starts!** Before servicing the HPU or equipment, always disconnect electrical power supply to prevent accidental starting.

**Rotating Parts!** Keep hands, feet, hair, and clothing away from all moving parts to prevent injury. Never operate the HPU with covers, shrouds, or guards removed.

**Electrical Shock!** Never touch electrical wires or components while the HPU is attached to the power source. They can be sources of electrical shock. DO NOT operate HPU with cabinet panels removed.

**Pressurized Fluid!** Before servicing the HPU or equipment, always open the bypass valve to relieve any residual pressure in the hydraulic system.

2.3 COMPONENT SAFETY FEATURES

- Pump/Motor coupling guard
- Sheet metal panels
- Pressure and return system relief valves
- Control circuit fuses
- Motor overload protection

2.4 FUNCTIONAL SAFETY FEATURES

- Emergency shut off switch
- Floor lock
- Calibration port shut off valve
- Fluid sample shut off valve

2.5 PERSONAL PROTECTION EQUIPMENT

- Safety glasses must be worn when operating the HPU
- Additional equipment recommended by the fluid manufacturer (gloves, etc.).

2.6 SAFETY GUIDELINES

- Operator must be properly trained prior to operating the HPU
- HPU power switch must be in "Off" position when connecting or disconnecting hoses to the aircraft.
- Bypass valve must be in the "Open" position when starting or stopping the HPU
- Electrical power must be disconnected from the HPU and the bypass valve must be in the "Open" position before servicing the HPU. (Reference Operation & Service Manual for details on servicing the HPU)

2.7 GENERAL COMMENTS

The HPU is intended to be operated by personnel trained in the proper use in conjunction with the aircraft maintenance manual.

The HPU must be used in accordance with the Operation & Service Manual and the intended aircraft.

## 3.0 PREPARATION PRIOR TO FIRST USE

3.1 GENERAL

Prior to operating the HPU, the user should become familiar with this Operation & Service Manual.

3.2 SERVICING RESERVOIR

Fill the reservoir with the correct fluid (see label next to reservoir fill for correct type of fluid) until fluid level is above the minimum fluid level mark but below the maximum fluid level. See 5.3.1 Front Panel Controls for reservoir fill location.

**NOTE: Leave the Reservoir Selector Valve in the Aircraft Reservoir position (as shipped) until the Hydraulic Power Unit reservoir has been filled.**

3.3 CONNECTING ELECTRICAL LEADS

**Electrical Shock!** Never touch electrical wires or components while electrical power is attached. Only qualified electricians should connect the electrical leads.

Install plug onto the electrical cord. If motor rotation is not correct, change any two of the three leads at the plug. Reference 11.0 Electrical Power and Protection Requirements for power requirements and fuse sizes. (See 5.4 Start up Procedures before starting HPU.)

**WARNING!**

**Balanced three phase voltage must be available to prevent overheating and damage to the motor.**

**Voltage unbalanced between phases occurs when the voltages differ from one another.**

**Some reasons for imbalance are:**

1. **Unequal loading of each phase**
2. **Poor connections in the supply**
3. **Single phase condition caused by blown fuses or bad connections**

**If these conditions occur in the incoming power system, a protective devise, such as a voltage monitor, should be installed on the machine to prevent motor damage.**

## 4.0 TRAINING

4.1 TRAINING REQUIREMENTS

The employer of the operator is responsible for providing a training program sufficient for the safe operation of the HPU.

4.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the HPU in and around the intended aircraft at the intended aircraft servicing location.

4.3 OPERATOR TRAINING

The operator training should provide the required training for safe operation of the HPU.

**NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.**

## 5.0 OPERATION

5.1 OPERATING PARAMETERS

- The user shall use the HPU in accordance with the aircraft manufacturer's instructions
- The user shall operate the HPU in accordance with the Operation & Service Manual
- The employer of the operator shall provide all necessary training
- The electrical power supply for the HPU must include a fused disconnect using Type J or Type R fuses or equivalent magnetic type circuit breakers designed for protecting an electrical motor. This necessary equipment is for protection of the HPU, power cord, and customer-supplied plug and receptacle. Reference the Table below*:*

**ELECTRICAL POWER AND PROTECTION REQUIREMENTS**

| **60 Hz Applications** | | | | | |
|---|---|---|---|---|---|
| Voltage | 208 | 230 | 380 | 460 | 575 |
| Full Load Amps | 44.2 | 40 | 24.2 | 20 | 16 |
| Locked Rotor Amps | 257 | 232 | 133 | 116 | 92.5 |
| Recommended Fuse Size | 60 | 50 | 30 | 25 | 20 |
| Maximum Fuse Size | 70 | 60 | 35 | 30 | 25 |

| **50 Hz Applications** | | | | | |
|---|---|---|---|---|---|
| Voltage | 200 | 220 | 380 | 415 | 440 |
| Full Load Amps | 48 | 41 | 23.7 | 23 | 22 |
| Locked Rotor Amps | 257 | 229 | 133 | 116 | 116 |
| Recommended Fuse Size | 60 | 50 | 30 | 30 | 30 |
| Maximum Fuse Size | 70 | 60 | 35 | 35 | 35 |

5.2 NUMERICAL VALUES

5.2.1 Fluid

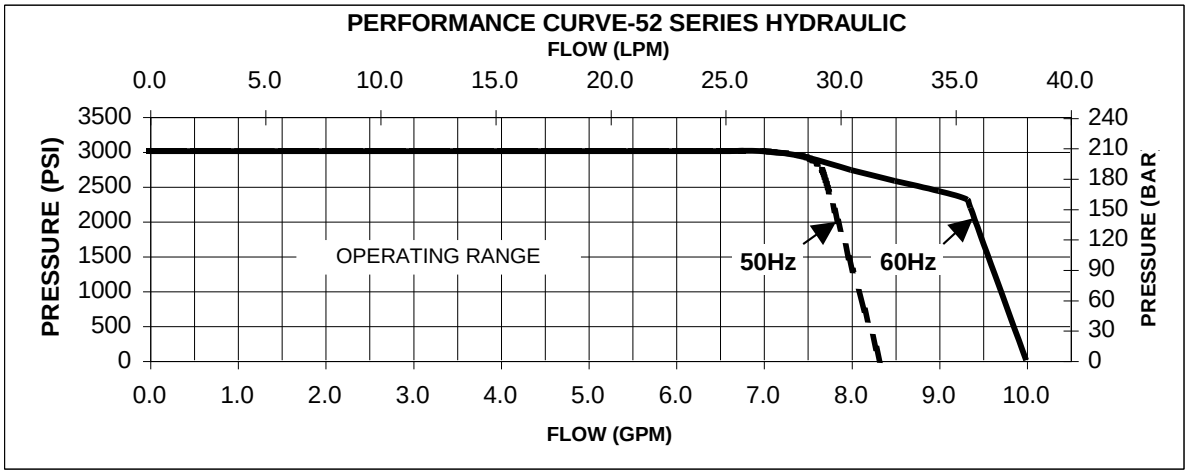
| **Model Number** | **Fluid Type** |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

5.2.2 Physical

Weight (Dry) .....1,200 lbs (544 kg)
Width .....51 in (129.5 cm)
Height.....48.75 in (124 cm)
Depth.....55 in (140 cm)
Power Cord .....50 ft (15.24 m) long
Pressure Hoses.....15 ft (4.57 m) ..... Standard Length
25 ft (7.62 m) ..... Optional Length
50 ft (15.24 m) ..... Optional Length
-8 (½ in, 12.7 mm) ..... Working Diameter
Return Hoses .....15 ft (4.57 m) ..... Standard Length
25 ft (7.62 m) ..... Optional Length
50 ft (15.24 m) ..... Optional Length
-12 (¾ in, 19.1 mm) ..... Working Diameter
Hand Pump Hose.....15 ft (4.57 m) ..... Standard Length
-4 (¼ in, 6.4 mm) ..... Working Diameter

5.2.3 Motor Driven Hydraulic Pump

A pressure compensated, adjustable maximum volume piston pump.
Maximum flow at 60 Hz ..... 10 gpm (37.8 lpm)
Maximum flow at 50 Hz ..... 8.3 gpm (31.4 lpm)
Maximum operating pressure at 50 Hz and 60 Hz ..... 3,000 psi (207 bar)
System pressure relief valve setting..... 3,250 psi (224 bar)
Performance Curve for 50 Hz and 60 Hz




5.2.4 Electric Motor

A 15 horsepower, TEFC electric motor is the prime mover for the HPU. This is attached to the hydraulic pump using a pump/motor adapter and a spider/coupling rotating interface.

**MOTOR POWER REQUIREMENTS**

| 60 Hz Applications | |
|---|---|
| **Voltage** | **Full Load Amps** |
| 208 | 44.2 |
| 230 | 40.0 |
| 380 | 24.2 |
| 460 | 20.0 |
| 575 | 16.0 |

| 50 Hz Applications | |
|---|---|
| **Voltage** | **Full Load Amps** |
| 200 | 48.0 |
| 220 | 41.0 |
| 380 | 23.7 |
| 415 | 23.0 |
| 440 | 22.0 |

5.2.5 Filters

| | |
|---|---|
| Pressure | 2 micron rating, non-bypass high collapse microglass type. Non-cleanable element |
| Return | 5 micron rating, 15 psi (1.03 bar) bypass microglass type. Non-cleanable element |
| Hand Pump (Option M) | 2 micron rating, non-bypass microglass type. Non-cleanable element |
| Air/Desiccant | 3 micron filter, silica gel desiccant type. Non-cleanable element |

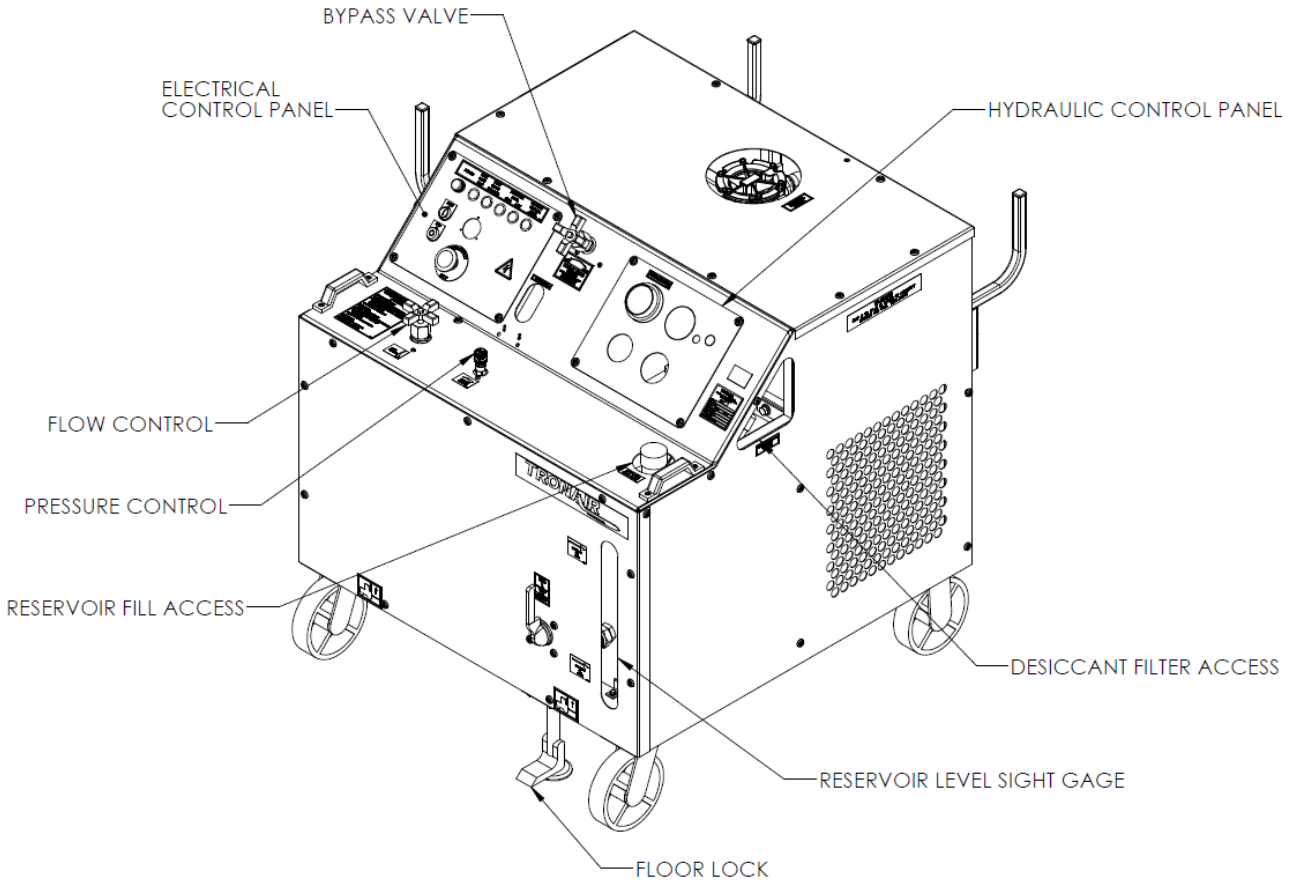
5.2.6 Hand Pump *(Option M)*

Two stage hand pump, low pressure stage 0–500 psi (0–34.47 bar) and 500–5,000 psi (34.47–344.74 bar) high pressure stage. Pump automatically changes stage internally based on system pressure.

| | | |
|---|---|---|
| Low Pressure Stage | Piston Diameter | 1½ in (38.1 mm) |
| | Working Pressure | 0–500 psi (0–34.47 bar) |
| | Displacement/Stroke | 2.1 in3 (34.4 cm3) |
| | Force/100 psi (6.89 bar) | 12.0 lbs/100 psi (7.74 N/bar) |
| High Pressure Stage | Piston Diameter | ⅝ in (15.88 mm) |
| | Working Pressure | 500–5000 psi (34.47–344.74) |
| | Displacement/Stroke | 0.4 in3 (6.55 cm3) |
| | Force/100 psi (6.89 bar) | 2.2 lbs/100 psi (1.42 N/bar) |
| Pressure Relief Setting | 5,250 psi (362.0 bar) | |

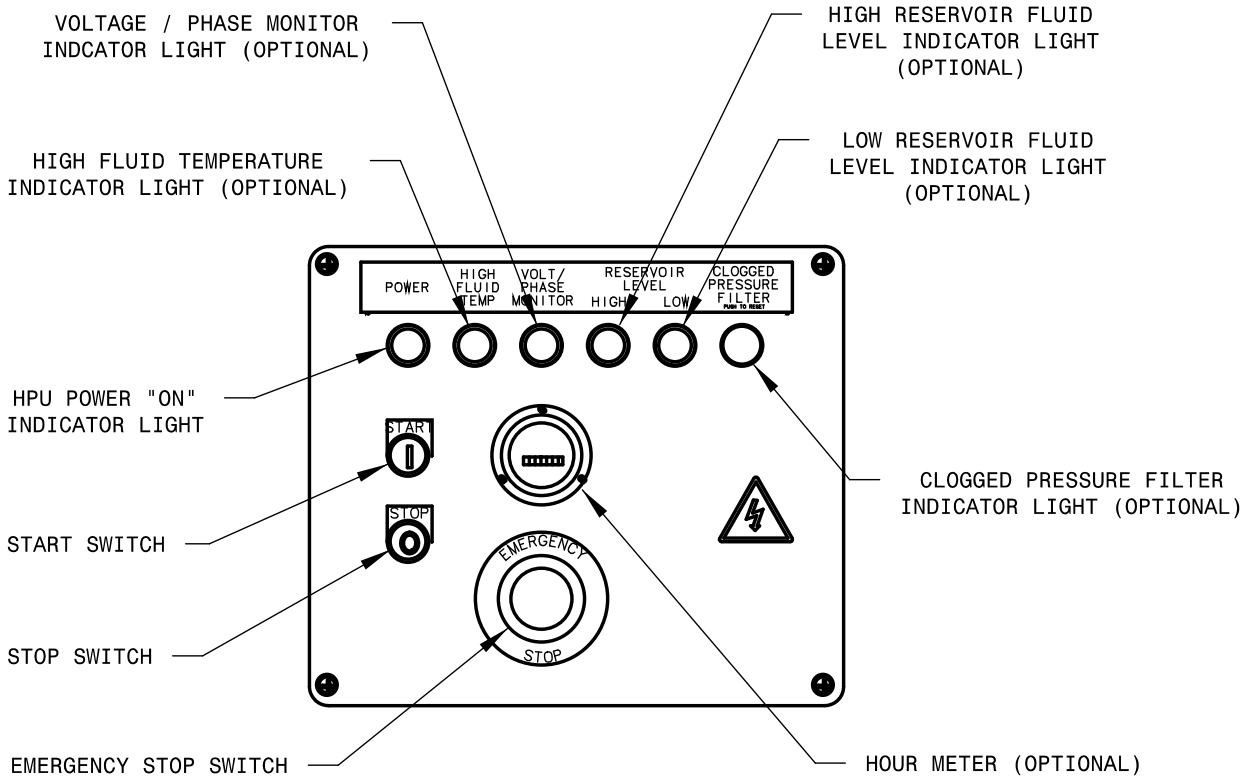
## 5.3 LOCATION & LAYOUT OF CONTROLS

### 5.3.1 Front Panel Controls



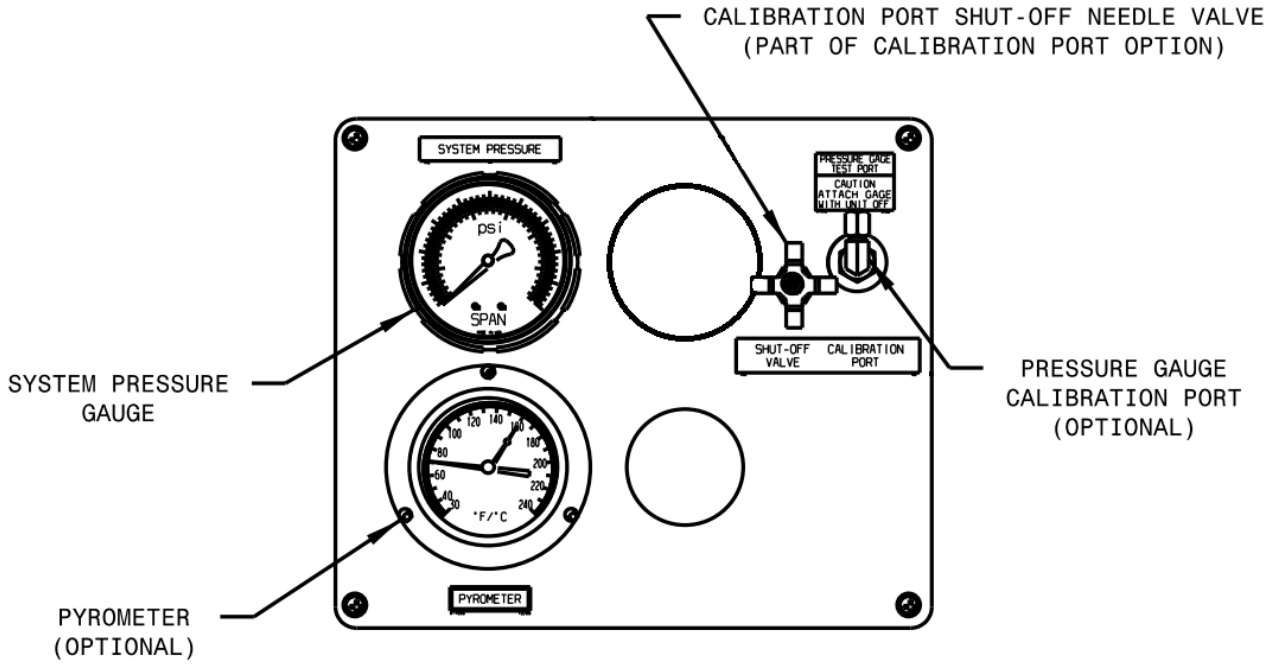

| | |
|---|---|
| Electrical Control Panel | See Section 5.3.2 |
| Hydraulic Control Panel | See Section 5.3.3 |
| Bypass Valve | For loading and unloading the motor driven hydraulic pump |
| Flowmeter | Displays the flow from the motor driven hydraulic pump |
| Pump Control Access | See Figure 5.3.5 - Hydraulic Pump Controls |
| Reservoir Selector | For selecting between using the aircraft reservoir or the HPU reservoir |
| Sight Gauge | Visual indicator displays the fluid level in the reservoir |
| Reservoir Fill Access | Locking cap for servicing the HPU reservoir |
| Desiccant Filter | Access to the reservoir air filter/desiccant filter |
| Hand Pump *(Option M)* | Access for hand pump and relief screw, handle stored inside |
| Floor Lock | Locking/unlocking, foot actuated and released floor lock |

5.3.2 Electrical Control Panel



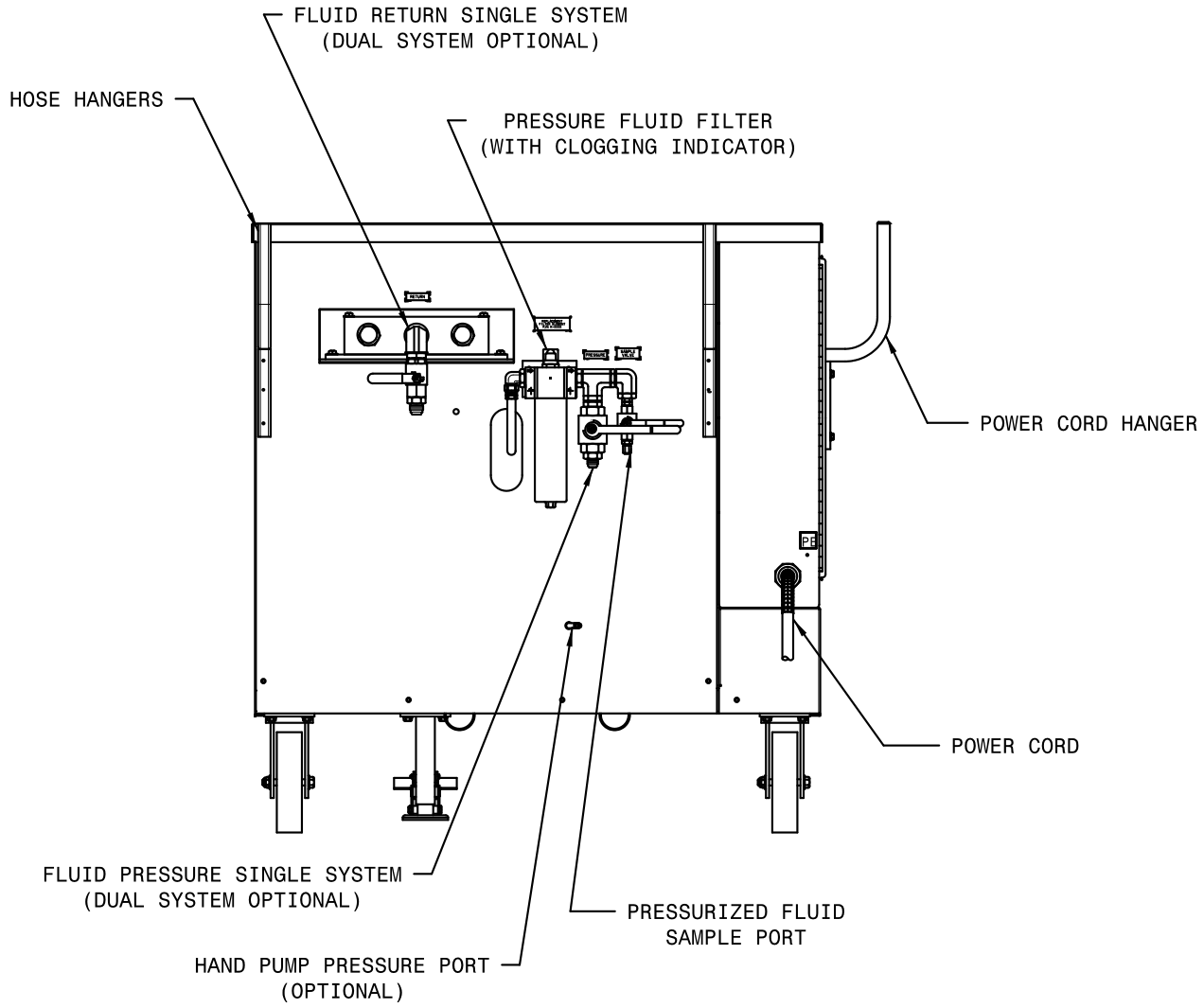

| | |
|---|---|
| Emergency Stop | Removes power to all electrical devices, must turn to reset |
| Stop Switch | Turns off the electric motors driving the hydraulic pump and cooling fan |
| Start Switch | Turns on the electric motors driving the hydraulic pump and cooling fan |
| HPU Power "On" Indicator Light | Light is illuminated when the electric motors driving the hydraulic pump and cooling fan are on |
| High Fluid Temperature Indicator Light *(Option S)* | Light is illuminated when the return fluid temperature reaches 170° F (77° C) or above. The HPU will shut down when light is illuminated. The HPU can be re-started when the fluid has cooled and the indicator light is off |
| High Reservoir Fluid Level Indicator Light *(Option L)* | Light is illuminated when the fluid level in the reservoir is above the normal operating range. The HPU will shut down until the fluid level is restored to a normal operating level |
| Low Reservoir Fluid Level Indicator Light *(Option L)* | Light is illuminated when the fluid level in the reservoir is below the normal operating range. The HPU will shut down until the fluid level is restored to a normal operating level |
| Voltage/Phase Monitor Indicator Light *(Options G – J)* | Light is illuminated if any of the following conditions occur<br>- Voltage imbalance between L1, L2, L3, greater than 5%<br>- Loss of voltage from L1, L2, L3<br>- Over voltage from L1, L2, L3, greater than 5%<br>- Change in phase orientation between L1, L2, L3. The HPU will shut down until the electrical problem is corrected |
| Clogged Pressure Filter Indicator Light *(Option R)* | Light is illuminated when the pressure filter element requires changing. The HPU will not shut down when illuminated. Pressing the illuminated button will reset the light |

5.3.3 Hydraulic Control Panel




| | |
|---|---|
| System Pressure Gauge | Displays the system pressure on an analog fluid dampened gauge |
| Pyrometer *(Option K)* | Displays the fluid temperature in the return system on an analog gauge. A warning indicator preset to 170° F (77° C) warns of high operating temperature |
| Pressure Gauge Calibration Port *(Option Q)* | Allows for calibration of the system pressure gauge up to the operating pressure of HPU. Calibration port shut off valve must be used in conjunction with the calibration port |
| Calibration Port Shut Off Valve *(Part of Calibration Port Option Q)* | Used to shut off pressure to the calibration port. This valve should only be opened when the external standard gage is attached. (See Operation & Service Manual for proper procedure) |

5.3.4 Rear Panel Controls

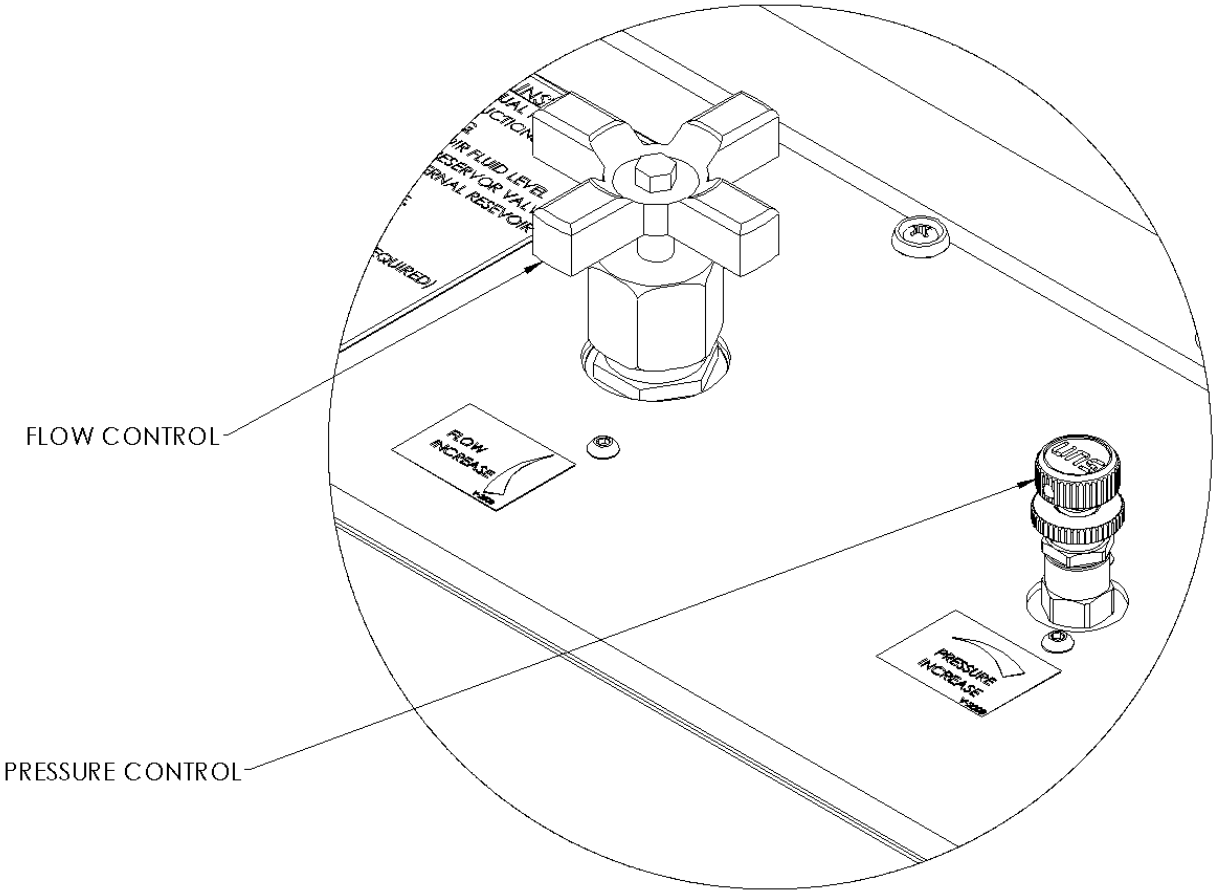



| | |
|---|---|
| * Fluid Pressure System | The source of pressurized fluid from the HPU that flows to the aircraft pressure system through the pressure hose |
| * Fluid Return System | Fluid returning to the HPU from the aircraft that flows through the return hoses |
| Pressure Fluid Filter | Filters the pressurized fluid before it flows to the aircraft pressure system |
| Pressurized Fluid Sample Port | A sample valve is provided to obtain a fluid sample for analysis. |
| Hand Pump Pressure Filter *(Option M)* | Filters the pressurized fluid before it flows to the aircraft system |
| Hose Racks | Location for storing the pressure, return and optional hand pump hoses when not in use |
| Power Cord Hanger | Location for storing the power cord when not in use |

* ***Split System (Optional) consists of two (2) each of these items.***

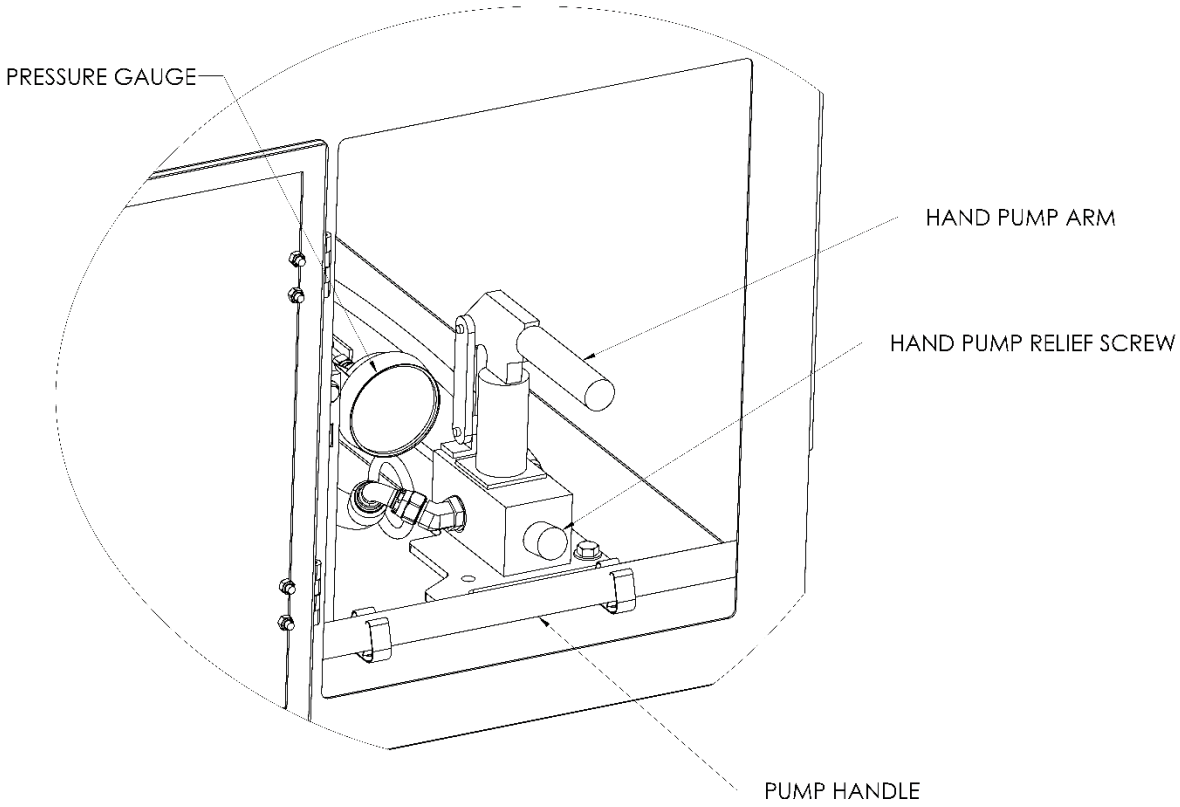
5.3.5 Hydraulic Pump Controls

The hydraulic pump flow control and pressure control are located on the front panel.



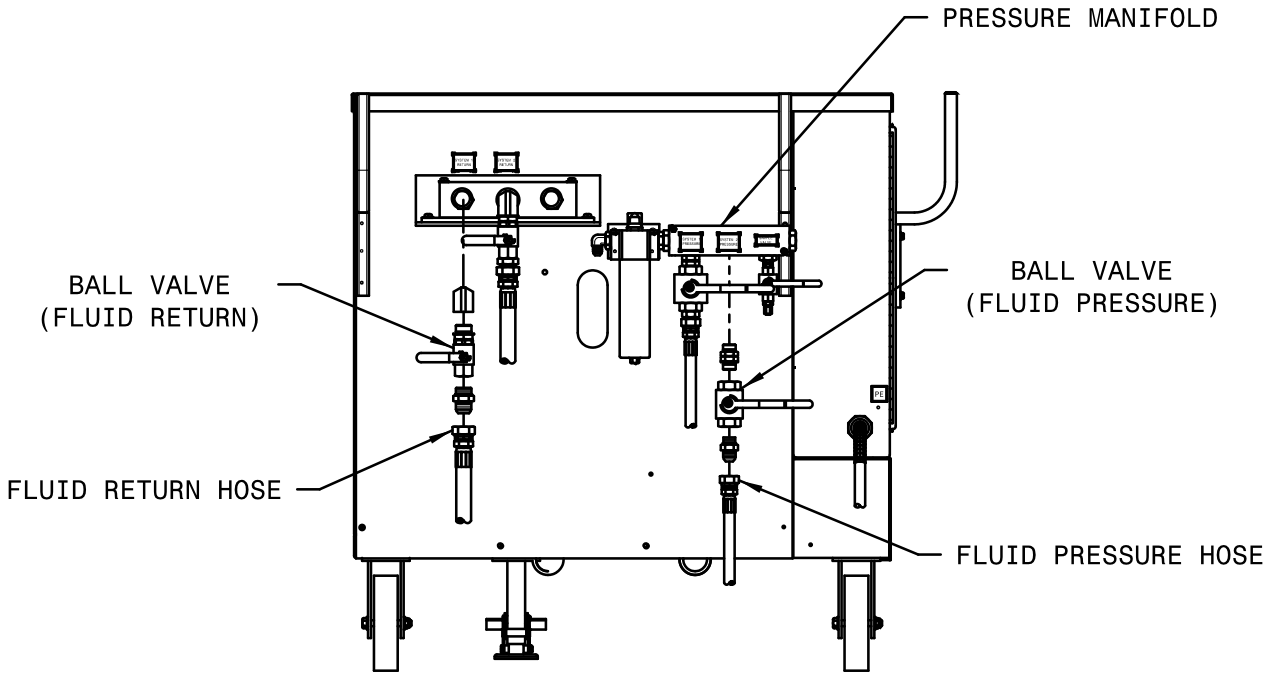

| | |
|---|---|
| Flow Control | This control is used to set the maximum flow required from the HPU |
| Pressure Control | The pressure control is used to set the system pressure of the HPU during operation |

5.3.6 Hand Pump Controls *(Option M)*
Reference 5.9 Hand Pump Operation




| | |
|---|---|
| Pump Handle | Located inside the front access door is the hand pump handle used for opening and closing the hand pump relief screw and stroking the hand pump arm |
| Hand Pump Relief Screw | Accessed through the front panel opening, this screw allows opening and closing of the hand pump hydraulic circuit using the hand pump handle |
| Hand Pump Arm | The handle is used to access the hand pump arm used for up and down motion to produce hydraulic flow and pressure |
| Hand Pump Pressure Gauge | Displays the hand pump system pressure on analog fluid dampened gauge |

5.3.7 Split System Controls *(Option C)*
Reference 5.7 Split System Operation



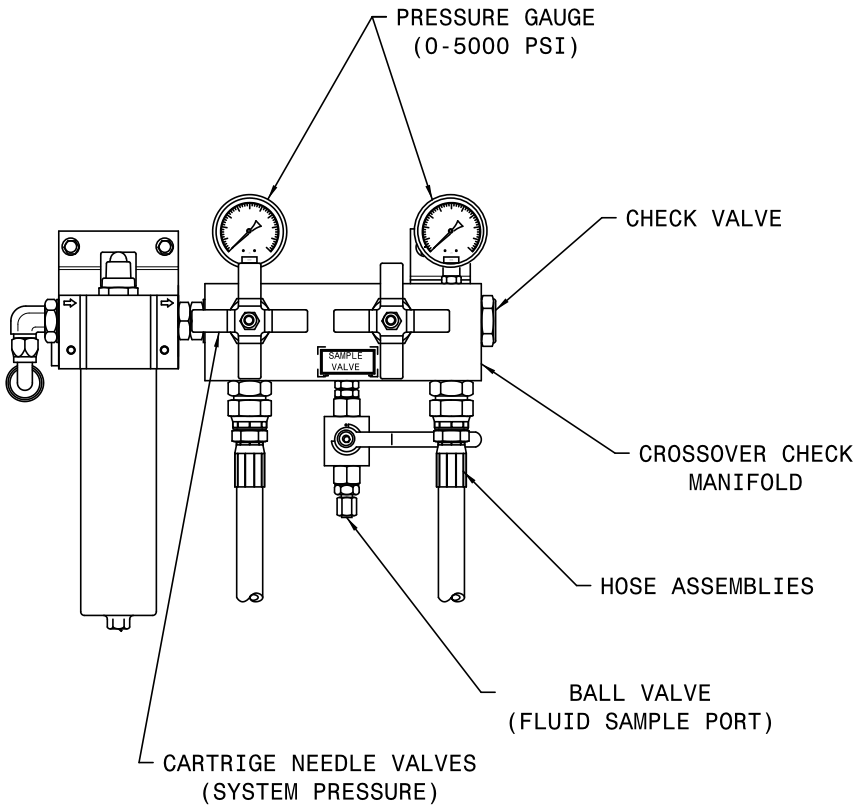

| | |
|---|---|
| Pressure Manifold | Houses the pressure valves |
| Fluid Pressure Ball Valve | Used to turn on and off the flow to separate aircraft systems. Always use in either fully open or fully closed position; never use in a partially open position |
| Fluid Pressure Hose | Connects HPU to aircraft pressure systems |
| Fluid Return Hose | Connects HPU to aircraft return systems |
| Fluid Return Ball Valve | Used to turn on and off the flow from separate aircraft systems. Always use in either fully open or fully closed position; never use in a partially open position |

**WARNING!**

**NEVER open or close split system valves without shutting off the Hydraulic Power Unit. Damage to the aircraft system or reservoir may result if either return line valve is closed while the machine is running.**

5.3.8 Split System Crossover Check Controls *(Option D)*

Reference 5.8 Split System Crossover Check Operation




| | |
|---|---|
| Pressure Gauge | Displays the pressure in each aircraft system |
| Hose Assembly | Connects HPU to aircraft pressure system |
| Ball Valve | Turns on and off the fluid for taking contamination samples |
| Crossover Check Manifold | Houses the valves and gauges |
| Cartridge Needle Valve | Used to turn on and off the flow to the separate aircraft pressure systems. Always use in either fully open or fully closed position; never use in a partially open position |
| Check Valve | Prevents cross flow from System 2 pressure line to System 1 pressure line |

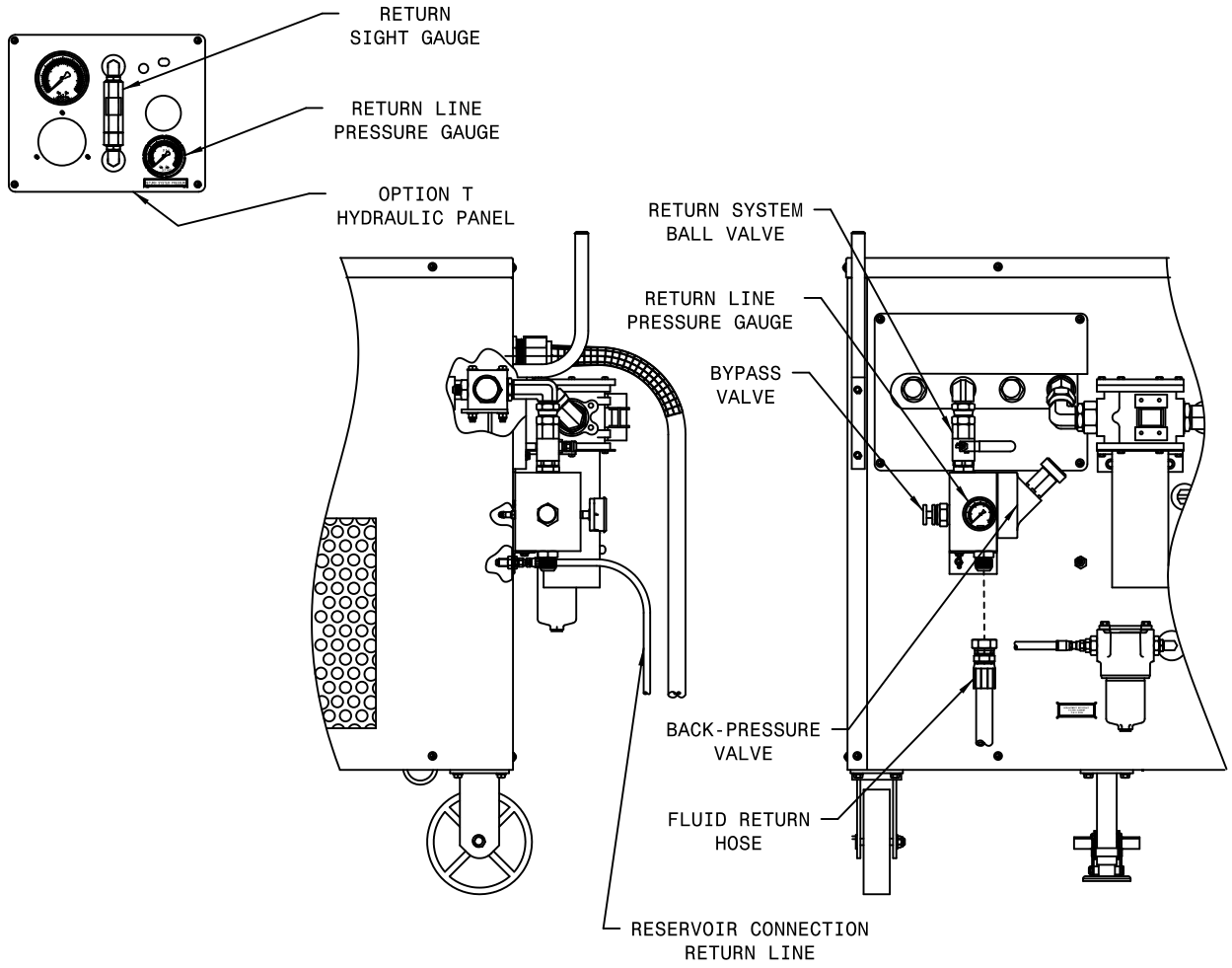
**WARNING!**

**NEVER open or close split system valves without shutting off the Hydraulic Power Unit. Damage to the aircraft system or reservoir may result if either return line valve is closed while the machine is running.**

5.3.9 Return Back-Pressure with Sight Gauge *(Option T)*

**This option is only available on 5231 models**

Reference 5.10 Return Back-Pressure with Sight Gauge Operation




| | |
|---|---|
| Return Sight Gauge | Allows viewing of fluid returned through the reservoir connection line (third hose) |
| Return Line Pressure Gauge (Panel Mounted) | Indicates the pressure in the main return hose (back-pressure). The panel gauge is positioned for ease of operation |
| Hydraulic Panel *(Option T)* | Added for the back-pressure Option *(Option T)*. It varies slightly from the standard panel |
| Return System Ball Valve | The return system ball valve has been added for normal operation when combined with a Split System Option *(Options C or D)*. The ball valve is **not** used when the back-pressure feature is being utilized and **must remain open while the machine is running** |
| Return Line Pressure Gauge (Manifold Mounted) | Indicates the pressure in the main return hose (back-pressure) The manifold mounted gauge is positioned for ease of valve adjustment |
| Back-Pressure Valve | Adjustable check valve, used for creating back-pressure in the main return line |
| Bypass Valve | Allows fluid to bypass the back-pressure valve |
| Fluid Return Hose | Connects HPU to aircraft return systems |
| Reservoir Connection Return Line | Connects HPU to aircraft reservoir overflow line |

**WARNING!**

**Never close the return system ball valve while the machine is operating. Damage to the aircraft system or reservoir may result.**

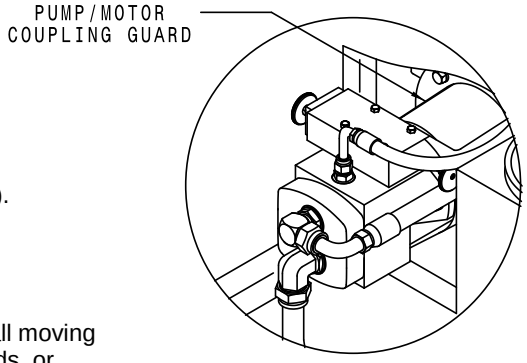
## 5.4 START UP PROCEDURES

### 5.4.1 Procedure for First Time or Different Electrical Supply ONLY

Phase Monitor (Options G – J Only): Check that the phase monitor light on the instrument panel is not illuminated. If the light is illuminated, change any two of the three input leads at the plug. Once the phase monitor light is not illuminated with power attached, check for proper motor rotation.

To check rotation (with or without Phase Monitor):

a. Close the fluid pressure ball valve(s) at the rear of the HPU. Reference 5.3.4 Rear Panel Controls for location of ball valve.
b. Open the bypass valve on the instrument panel fully counter-clockwise.
c. Set the flow control to maximum flow (fully counter-clockwise).
d. Place the reservoir selector valve in HPU Reservoir position.
e. Remove the pump/motor coupling guard
Reference Pump/Motor Coupling Access figure.




***Pump/Motor Coupling Access***

**Rotating Parts!** Keep hands, feet, hair, and clothing away from all moving parts to prevent injury. Never operate the HPU with covers, shrouds, or guards removed.

**Electrical Shock!** Never touch electrical wires or components while the HPU is attached to the power source. They can be sources of electrical shock. **Do not operate HPU with cabinet panels removed.**

f. Verify that the unit has been prepared for use by connecting electrical leads and servicing the reservoir (Reference section 3.0 Preparation Prior to First Us.)
g. Keeping hands clear of the pump/motor coupling area, momentarily press the start button and immediately press the stop button
h. Observe direction of rotation of the pump/motor coupling. When the Operator is facing the front panel, the pump/motor coupling should be rotating in a clockwise direction
i. If the pump/motor coupling is rotating in a counter-clockwise direction, change any two of the three leads at the plug. Observe direction of rotation to verify that pump/motor is rotating in a clockwise direction
j. Replace the pump/motor coupling guard

### 5.4.2 Initial Start Up of the HPU

a. Unit must be prepared per section 3.0 Preparation Prior to First Use and section 5.4.1 First Time or Different Electrical Supply ONLY before starting the HPU
b. Operator must be familiar with this manual and be properly trained prior to starting the HPU
c. Close the fluid pressure ball valve(s) at the rear of the HPU. Reference 5.3.4 for location of ball valve.
d. Open the bypass valve on the instrument panel fully counter-clockwise
e. Set the flow control to maximum flow (fully counter-clockwise)
f. Place the reservoir selector valve in HPU Reservoir position
g. Press the start switch; the flowmeter should show full flow immediately. If no flow displays on the flow meter, press the stop switch immediately and reference 9.2 No Flow in Trouble Shooting section
h. Adjust the flow down to approximately 6 gpm (22.71 lpm)
i. Close the bypass valve, adjust the pressure control until 3,000 psi (206.84 bar) is displayed on the pressure gauge. (If no pressure displays on the system pressure gauge after adjusting the pressure control, reference Trouble Shooting 8.4 No Pressure or Reduced Pressure)
j. Open the bypass valve; press the stop switch

**NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.**

## 5.5 PRELIMINARY ADJUSTMENTS FOR OPERATION

The following are basic to the operation of the HPU and should be thoroughly understood. The pressure and flow controls have lock nuts to prevent rotation of the control shaft during operation. These nuts should be moved away from the pump during adjustment of flow or pressure in order to eliminate binding of the control shafts.

### 5.5.1 Flow Control Adjustment

a. Open bypass valve
b. Select "Hydraulic Power Unit" position with reservoir selector valve
c. Start HPU
d. Adjust flow control on pump for maximum desired flow. Observing the flowmeter, read flow in gallons (liters) per minute directly from flowmeter. Be sure the control shaft lock nut is loose during adjustment. Tighten after adjustment to maintain setting

### 5.5.2 Pressure Control Adjustment

a. Open bypass valve
b. Select "Hydraulic Power Unit" position with reservoir selector valve
c. Start HPU
d. Close bypass valve
e. Adjust pressure control for desired pressure; observing the system pressure gauge, read in psi (bar). Be sure the control shaft lock nut is loose during adjustment. Tighten after adjustment to maintain setting

**NOTE: Once the flow and pressure controls have been adjusted, it is not necessary to change these settings after each operation unless desired.**

### 5.5.3 Reservoir Selector Valve Operation

Operation of the reservoir selector valve allows the operator to select either the aircraft reservoir (closed loop) or the HPU reservoir (open loop).

**CAUTION!**

**The reservoir selector valve should only be operated when the HPU is not running. The operation of the reservoir selector valve should be done prior to starting the HPU.**

a. Aircraft Reservoir Position (Closed Loop)
In this position, the HPU is dependent on the aircraft reservoir and system for an adequate supply of fluid. Cavitation, due to an inadequate fluid supply from the aircraft, may be indicated by erratic fluctuation of the system pressure gauge or flowmeter. At times, the aircraft fluid supply will be restricted due to small return oil lines in the aircraft. If this is a problem, decrease the flow control setting until the cavitation is eliminated.

b. HPU Reservoir Position (Open Loop)
In this position, the HPU reservoir supplies fluid to the pump and accepts return fluid from the aircraft. It is desirable to operate the HPU in this mode since it eliminates any possibility of cavitation.

Since the HPU reservoir is vented to atmosphere and the aircraft is at a higher level, it is normal for the aircraft reservoir to drain into the HPU reservoir. It is, therefore, necessary to be sure that sufficient room is available in the HPU reservoir to accommodate the additional fluid.

**CAUTION!**

**The aircraft system reservoir must be serviced after completion of operational testing.**

In the "HPU Reservoir" position, faster landing gear swings are usually possible since there is no restriction to flow at the pump inlet.

5.5.4 Bypass Valve Operation

The bypass valve is used for unloading the pump. The valve should be either in the fully open or fully closed position only. Do not operate the valve in a partially open position.

a. Start Up Operation
The bypass valve must be opened prior to starting the HPU in order to allow the motor to start under a no load condition and not pressurize the aircraft hydraulic system.

b. Shut Down Operation
Prior to shutdown, the bypass valve must be opened to bleed off any residual system pressure.

**CAUTION!**

**Excessive heat, which could damage machine components, will be generated if the bypass valve is partially open or is used for regulating flow or pressure.**

- **Use the flow and pressure controls for regulation.**
- **Use the bypass valve for unloading the system only.**

5.6 BLEEDING AIR FROM SYSTEM

Rapid fluctuations of the pressure gage and flow-meter are indications of cavitation or entrapped air in the hydraulic lines and/or components. Air may enter the system when:

- Operating the unit with insufficient oil in the reservoir
- Changing a component on the aircraft
- Changing hose connections and/or couplings

5.6.1 To Easily Purge the Unit of Air

a. Fill reservoir to recommended level
b. Open bypass valve
c. Place reservoir selector valve in “Hydraulic Power Unit” position
d. Start unit and adjust flow control to maximum position

**NOTE: If fluid is not flowing, shut off HPU and reference 8.2 No Flow in Trouble Shooting section**

e. Run unit for five (5) minutes and shut off
f. If additional bleeding is required, connect the pressure and return hoses together and open all pressure and return ball valves at the rear of the HPU. Start the HPU and slowly close the bypass valve (system pressure should remain under 200 psi (approximately 14 bar). Allow fluid to flow at full flow for five (5) minutes, then shut the HPU off

**WARNING!**

**Failure to open the return ball valves will cause hose or valve rupture. Property damage and personal injury can result.**

5.7 SPLIT SYSTEM OPERATION *(Option C)*

The split system option allows control of fluid flow to aircraft with two hydraulic systems. The systems consist of two sets of hoses and valves located in the pressure and return systems. The valves are mounted on the rear of the hydraulic power unit and are of the 90o ball type. The valves are open when the operating handle is in line with the valve.

Although both systems may be operated simultaneously, usually only one system is required at any one time. If both valve sets are open simultaneously, the pump output will be divided between the two systems. Also, cross flow between aircraft reservoirs may occur if a reservoir level or pressure differential exists. Select valve positions prior to starting machine.

5.7.1 To Operate the Split System

a. Before starting machine, open pressure and return valves of the same system

**WARNING!**

**Ensure pressure and return hoses of the *same system* are paired and used together.**

b. After completing tests on one system, shut the machine off before selecting the second system

**WARNING!**

**NEVER open or close split system valves without shutting off the Hydraulic Power Unit. Damage to the aircraft system or reservoir may result if either return line valve is closed while the machine is running.**

## 5.8 SPLIT SYSTEM CROSSOVER CHECK *(Option D)*

The Split System feature of this option allows control of fluid flow to the aircraft with two hydraulic systems. The systems consist of two sets of hoses and valves located at the rear of the unit on the pressure and return manifolds. The return system valves are of the 90° ball type and are open when the handle is in line with the valve. The pressure system valves are cartridge type needle valves.

Although both systems may be operated simultaneously, usually only one system is required at any one time. If both valve sets are open simultaneously, the pump output will be divided between the two systems.

The Split System Crossover Check option adds a check valve and pressure gauges to the split system feature. The check valve prevents cross flow from System 2 pressure line to System 1 pressure line, while the gauges allow bleed down pressure in each line to be read when the needle valves are closed.

**To Operate the Split System with Crossover Check**
Before starting the machine, open pressure and return valves of the same system

**WARNING!**

**Ensure pressure and return hoses of the *same* system are paired and used together.**

1. After completing tests on one system, shut the machine off before selecting the second system.

**WARNING!**

**NEVER open or close split system valves without shutting off the Hydraulic Power Unit.**

**Damage to the aircraft system or reservoir may result if either return line valve is closed while the machine is running.**

2. Follow the aircraft manufacturer's instructions for proper use of the crossover check capabilities.

## 5.9 HAND PUMP OPERATION *(Option M)*

The Hand Pump Option allows for filling the reservoir (low pressure) or static testing of components or system (high pressure). The hand pump circuit is separate from the main hydraulic system; a separate filter and hose are attached to the back panel of the HPU.

### 5.9.1 To Operate the Hand Pump

a. Remove the pump handle from inside the side access door. (Reference 5.3.6 – Hand Pump Controls)
b. Insert the end of the pump handle into the hand pump relief screw.
c. Turn the pump handle clockwise to close the relief screw.
d. Insert the pump handle onto the hand pump arm through the front panel slot.
e. Pump the handle using an up and down motion. Observe the hand pump system pressure mounted on the hand pump. The pump is an automatic two stage pump. 500 psi (34.47 bar) can be produced with high fluid flow and 5,000 psi (344.74 bar) can be produced with low fluid flow.
f. Turning the relief screw in a counter-clockwise direction releases hydraulic pressure in the hand pump system.

**Pressurized Fluid!** Before disconnecting the hand pump pressure hose, ALWAYS open the relief screw valve to relieve any residual pressure in the hydraulic system.

5.10 RETURN BACK-PRESSURE WITH SIGHT GAUGE *(Option T)*

**This option is only available on 5231 models**

The Return Back-Pressure manifold consists of a back-pressure valve, a return bypass valve, pressure gauges, and a return ball valve; all mounted in an aluminum manifold block at the rear of the HPU. The Instrument Panel contains an additional pressure gauge and a sight gauge for viewing fluid returned from the reservoir connection (third hose).

The back-pressure valve is an adjustable check valve with a range from 0 to 250 psi (0 to 17 bar). The valve can be used for holding back pressure on the aircraft reservoir while running the HPU in HPU Reservoir mode. The adjusted back-pressure is displayed on both pressure gauges.

Opening the return bypass valve will allow fluid to free-flow past the back-pressure valve for normal operation. The return bypass valve is intended for use either completely open or completely closed. Do not use the return bypass valve for metering or flow control.

The return ball valve is a zero leakage valve and can be used when standard Split System operation is desired. Reference 5.6 for Split System Operation.

**WARNING!**

**Never close the return system ball valve while the machine is operating. Damage to the aircraft system or reservoir may result.**

**CAUTION!**

**Do not use the back-pressure valve when the HPU reservoir is selected for Aircraft Reservoir position. Cavitation and pump damage will result.**

Follow aircraft manufacturer's instructions when utilizing the back-pressure valve and when filling or bleeding the aircraft reservoir.

5.11 SAMPLE VALVE

A sample valve is provided on the rear of the unit to obtain a fluid sample for analysis or inspection.

**Pressurized Fluid!** Before servicing the HPU or equipment, ALWAYS open the bypass valve to relieve any residual pressure in the hydraulic system.

5.12 EMERGENCY SHUT DOWN PROCEDURE

In the event an emergency shut down is necessary, press the emergency stop switch located on the electrical panel. (Reference 5.3.2 – Electrical Control Panel) Open the bypass valve to remove any system pressure.

5.13 DESCRIPTION OF ALARM SYSTEMS

Reference 5.3.2 – Electrical Control Panel

5.13.1 High Fluid Temperature Indicator *(Option S)*

The indicator light for high fluid temperature is an active light which will illuminate when the return fluid temperature is 170° F (77° C) or above. The HPU will shut down if the light is illuminated. The HPU can be re-started when the fluid has cooled sufficiently and the light has shut off.

If the high temperature light is illuminated reference section 8.0 Trouble Shooting.

5.13.2 Voltage/Phase Monitor Indicator *(Options G – J)*

The indicator light for the voltage/phase monitor is an active light which will illuminate if there is a problem with the incoming electrical power source. The HPU will shut down if the light is illuminated.

If the voltage/phase monitor light is illuminated, reference section 8.0 Trouble Shooting.

5.13.3 High and Low Reservoir Level Indicator *(Option L)*

The indicator lights for high and low reservoir level are active lights which will illuminate when the reservoir fluid level is either above the maximum level or below the minimum level. The HPU will shut down if either of the lights are illuminated.

If the light on either of the reservoir level indicator lights, restore the fluid level in the reservoir to a normal operating range.

5.13.4 Clogged Filter Indicator Light *(Option R)*

The indicator light for the clogged filter is a passive light which will illuminate if the pressure filter element becomes clogged or is in need of replacement. The HPU will not shut down if the light is illuminated.

If the clogged filter indicator light is illuminated, the pressure filter element requires changing. Reference section 9.13.11 Electric Filter Clogging Indicator (Option R) for maintenance procedure. Pressing the clogging filter indicator light will reset the light and the light will turn off.

**NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.**

5.14 INFREQUENT HPU USE

If the unit is not used frequently Tronair recommends operating the unit monthly. Operating regularly assures that the seals are kept lubricated, eliminates air pockets in the system, reduces moisture in the fluid and helps extend the hose life.

5.14.1 Infrequent HPU Use Start Up Procedure

1. Assure that the HPU reservoir is filled between the minimum and maximum level
2. Connect the unit to a proper electrical power source
3. If unit is equipped with a run around kit, connect the pressure and return hoses together
4. Place the reservoir selector valve in “HPU Reservoir” position
5. Open the return ball valves on the back of the unit
6. Pressure ball valves
   a. If unit **IS** equipped with a runaround kit **ensure the hoses are connected to each other**, open the pressure ball valves on the back of the unit
   b. If the hoses **are not connected to each other**, close the pressure ball valves on the back of the unit
7. Verify the return ball valves on the back of the unit are open
8. Fully open the bypass valve
9. Adjust the pressure control to the minimum setting (CCW)
10. Start the unit and verify the flow is above “0” on the flowmeter
    a. If flow is present: adjust the flow control to increase flow (CW)
    b. If no flow is immediately present: turn unit off, verify the motor rotation (see 5.4.1 Procedure for First Time or Different Electrical Supply ONLY), correct rotation if necessary
11. Set flow to ½ the maximum flow capacity of the unit. You may need to increase the pressure adjustment to achieve flow.
12. Bypass valve
13. If unit **IS** equipped with a runaround kit **ensure the hoses are connected to each other**, fully close the bypass valve
    a. If the hoses **are not connected to each other**, leave the bypass valve fully open
14. Operate the unit for 15-30 minutes in this condition. Fluid temperature should reach 100º-130º F (37.8º-54.4º C)
15. At the completion of the 15-30 minute circulation run, open the bypass valve and shut off the unit
16. Remove the electric power
17. Place the selector valve in the Aircraft Reservoir position
18. Close the pressure and return ball valves on the back of the unit

## 6.0 PACKAGING AND STORAGE

6.1 PACKAGING REQUIREMENTS

a. Drain hydraulic fluid until level is below the minimum fluid level indicator.
b. Block up the unit on a pallet so the wheels are not touching the pallet or shipping container.
c. Plug all hose ends.
d. Strap unit to pallet or shipping container using the tie down rings located on the frame bottom.

**NOTE: Use at least four (4) straps with a minimum 2,000 lb (907.2 kg) capacity each.**

6.2 HANDLING

The unit is designed to be moved by hand using the handles located on the front of the unit. The unit can be lifted by means of a fork truck from the center of the machine. Lifting must be from the motor side of the unit only.

**NOTE: Be sure the forks are long enough to reach the frame cross members for stability during lifting. Spread the forks to their maximum width for stability. Reference 7.0 – HPU on Forklift.**

6.3 PACKAGING PROTECTION

No special packaging material for cushioning or suspension is required.

6.4 LABELING OF PACKAGING

Packaging should be labeled as follows: **DO NOT DROP**
**THIS SIDE UP**
**DO NOT STACK**

6.5 STORAGE COMPATIBILITY

No special considerations for short term storage (less than three months).

6.6 STORAGE ENVIRONMENT

Cover HPU with a suitable, non-abrasive tarp if storing outside. For storage periods greater than three months, drain hydraulic fluid from all hoses and the reservoir. Cover unit to protect outside surface.

If storing outside, protect unit from freezing water, sand, dirt, and direct sunlight. A cover is highly recommended.

6.7 STORAGE SPACE AND HANDLING FACILITIES

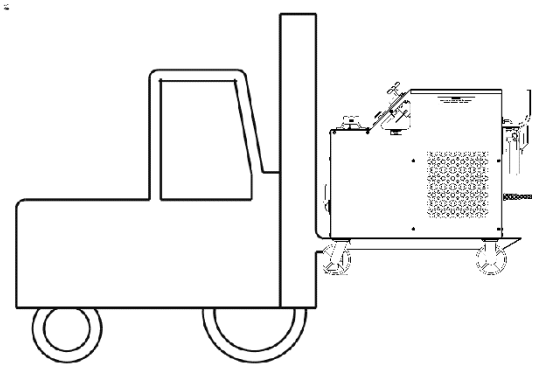
Weight (Dry) .....1,200 lbs (544 kg)
Width .....51 in (129.5 cm)
Height.....48.75 in (124 cm)
Depth.....55 in (140 cm)

## 7.0 TRANSPORTATION

1 Do not stack Hydraulic Power Units
2 The unit can be lifted by means of a fork truck from the motor side center of the HPU

**NOTE: Be sure the forks are long enough to reach frame cross members for stability during lifting. Spread the forks to their maximum width for stability. Reference figure HPU on Forklift.**

Weight (Dry) .....1,200 lbs (544 kg)



***HPU on Forklift***

## 8.0 TROUBLE SHOOTING

The following is a guide to solutions of common problems associated with the HPU. See related Appendix for Hydraulic and Electrical Schematics.

If the problem is not resolved using the trouble shooting information, call the manufacturer for Technical Assistance (See Section 1.3 Manufacturer).

**NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained Technician.**

### 8.1 HPU WILL NOT START

| Possible Cause | Solution |
|---|---|
| Supply power off | Check incoming power and restore power. Check across-the-line voltage on all three phase legs |
| Supply power fuses are blown/ circuit breakers tripped | Check and replace. Check across-the-line voltage on all three phase legs |
| Control Transformer fuses blown | Check and replace |
| Supply power phase or voltage incorrect *(Phase/Voltage Monitor Option G – J only)* | Voltage/Phase Monitor Indicator light will be illuminated Refer to Section 3.3 Connecting Electrical Leads |
| Reservoir fluid level is too high or too low *(Electric Reservoir Level Option L only)* | One reservoir level indicator light (Low or High) will be illuminated. Fill the reservoir above the Minimum Fluid Level arrow to extinguish the Low Level light. Drain fluid below the Maximum Fluid Level arrow to extinguish the High Level light |
| High return fluid temperature *(Electric Over-Temperature Option S only)* | High Fluid Temperature indicator light will be illuminated. Allow the hydraulic fluid to cool until the light goes out. Refer to Section 8.5 for over-heated causes |
| Motor has tripped thermal overload device | Allow the motor to cool. The thermal overload device (motor starter) will reset automatically after sufficient cooling. The tripped condition is usually caused by loading the motor beyond its rated capacity; however, any condition (such as unbalanced voltage) that causes an increase in amperage can result in a tripped condition |

**NOTE: Using the bypass valve to meter flow or pressure will increase the motor load and may cause the thermal overload device to trip. Refer to section 5.5.4 Bypass Valve Operation for proper use of the bypass valve.**

### 8.2 NO FLOW

| Possible Cause | Solution |
|---|---|
| Motor turning in wrong direction | See Section 3.3 Connecting Electrical Leads |
| Flow control set too low | Increase flow setting |
| Fluid level in reservoir too low | Service the HPU reservoir |
| Air in pump inlet lines | Disconnect the HPU from the aircraft. Fill the HPU reservoir to a level above the pump inlet port. Set the reservoir selector valve to the HPU Reservoir position. **Fully open the Bypass Valve.** Close the Pressure and Return ball valves at the rear of the unit. Adjust the pump flow to maximum and "bump" the start and stop switches to "jog" the motor. Flow should be indicated at the Flowmeter on first or second "jog" |

**NOTE: Under some conditions where a large amount of air has entered the system, the pump may not be able to draw an initial prime. If this occurs, loosen the inlet hose near the pump and allow air to escape. Re-tighten the hose when fluid appears.**

| Possible Cause | Solution |
|---|---|
| Motor is turning but pump is not | Check pump and motor couplings to ensure they are tight |
| Flow path does not exist | A flow path (such as a moving actuator or an open circuit) must exist for flow to be present. When system pressure exceeds the compensator control setting, or when the system no longer requires flow, the control de-strokes the pump while maintaining the preset pressure |

8.3 REDUCED FLOW

| Possible Cause | Solution |
|---|---|
| Flow control set too low | Increase flow setting. |
| Pressure adjustment is set too low | Slightly increase pressure setting. |
| Pressure compensator control is reducing pump output | When system pressure exceeds the compensator control setting, or when the system no longer requires flow, the control de-strokes the pump while maintaining the preset pressure. |
| Pump inlet is not receiving enough fluid (cavitation) | Follow the procedure for “Air in pump inlet lines” in Section 8.2. |
| Motor is “Single Phasing” | Motor is not getting power on all three phase legs. Check across-the-line voltage on all three phase legs. |
| Supply voltage is 50 Hz | Pumps used on 50 Hz units will flow at only 83% of the pump nameplate rating. An HPU designed to run on 50 Hz will supply flow as stated in the specifications for that unit. |

8.4 NO PRESSURE or REDUCED PRESSURE

| Possible Cause | Solution |
|---|---|
| Pressure adjustment is set too low | Increase pressure adjustment. |
| Motor is “Single Phasing” | Motor is not getting power on all three phase legs. Check across-the-line voltage on all three phase legs. |
| Pump inlet is not receiving enough fluid (cavitation) | Follow the procedure for “Air in pump inlet lines” in Section 8.2. |
| Flow path is open | Pressure is resistance to flow. The HPU will reach full pressure as flow paths (such as moving actuators and open valves) are closed. |

8.5 FLUID OVERHEATS

| Possible Cause | Solution |
|---|---|
| Fan is not functioning properly | Check the cooler fan output. Forced air should be easily detected at the right hand side of the HPU. Check the fuses for the fan motor (See Appendices – Electrical Schematic INS-2016). |
| Bypass valve or rear ball valve is being used in a partially closed position | The bypass valve and all ball valves must be used in a fully open or fully closed position. These valves are not intended for metering flow. All flow adjustments must be made using the pump flow control. |

8.6 HAND PUMP (*Option M)* IS NOT PUMPING FLUID

| Possible Cause | Solution |
|---|---|
| Release screw is open | Use the slotted end of the pump handle to close the release screw located at the base of the pump. |
| Ball valve is closed | Open the ball valve for the pump inlet line located at the bottom of the reservoir. |
| Pump piston is filled with air | If the pump is not primed after several strokes, remove the bleed screw from the top of the pump piston (See Section *9.13.9.a – Pump Diagram*). Slowly stroke the pump until fluid is present at the bleed screw. Replace the bleed screw. |

## 9.0 MAINTENANCE

If the unit is not used frequently Tronair recommends operating the unit monthly. Operating regularly assures that the seals are kept lubricated, eliminates air pockets in the system, reduces moisture in the fluid and helps extend the hose life. If the unit is not used frequently see 5.13 Infrequent Use Procedure.

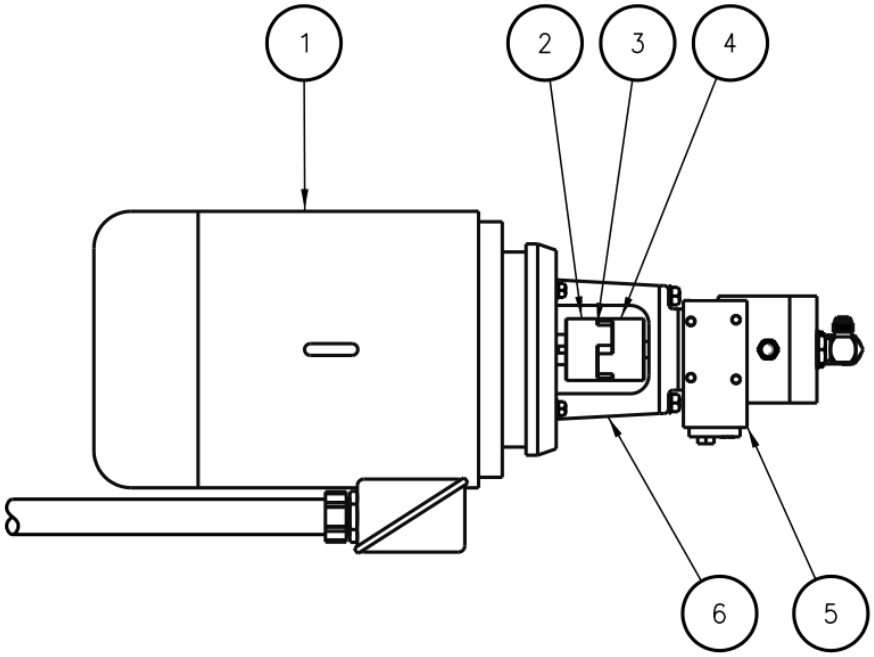
### 9.1 GENERAL

Periodically inspect the HPU for loose fasteners, hose fittings, damaged hoses, and worn electrical cables. Make repairs as needed for safe operation.

Reference Sections 9.2 – 9.14 for Parts Lists, Descriptions and Illustrations

### 9.2 ELECTRIC MOTOR

The Electric Motor is pre-greased by the manufacturer. Periodic greasing is necessary on a frequently used HPU.




## Parts List

**All Models - All Fluid Types**

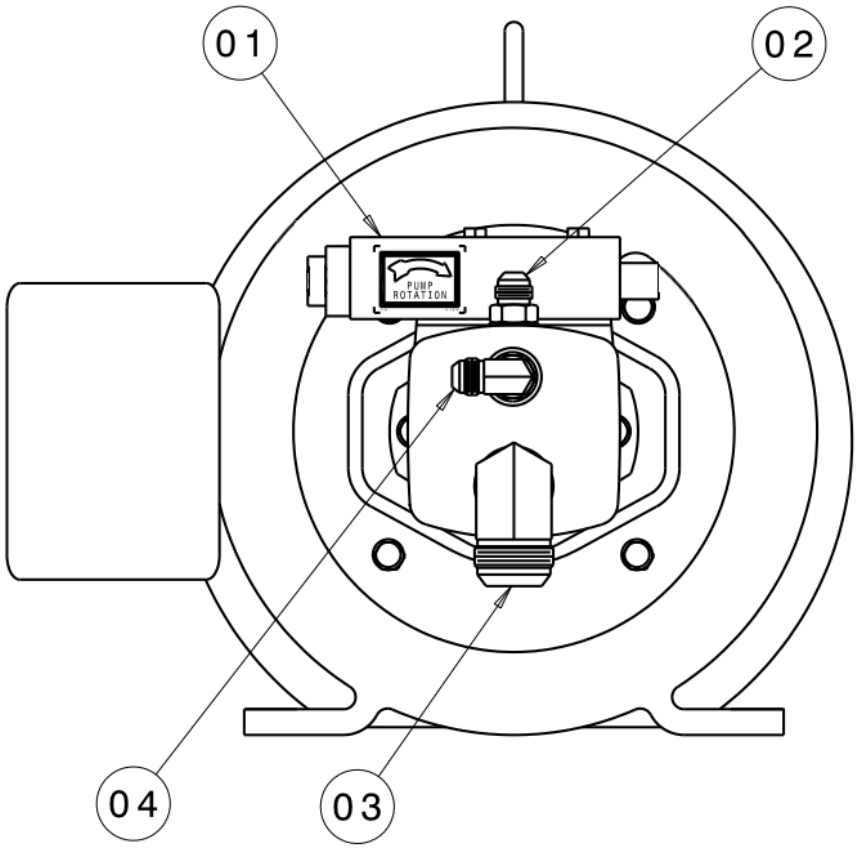
| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | Reference table below | ELECTRIC MOTOR | 1 |
| 2 | H-2424-15 | COUPLING (MOTOR HALF) | 1 |
| 3 | H-2427 | SPIDER (HYTREL) | 1 |
| 4 | H-2424-03 | COUPLING (PUMP HALF) | 1 |
| 5 | Reference 9.3 and 9.3.1 | MOTOR DRIVEN HYDRAULIC PUMP | 1 |
| 6 | HC-1755-03 | PUMP/MOTOR ADAPTER | 1 |

| 60 Hz Applications | |
|---|---|
| **Voltage** | **Part Number** |
| 208 | EC-1186-11 |
| 230 | EC-1186-11 |
| 380 | EC-1186-11 |
| 460 | EC-1186-11 |
| 575 | EC-1186-12 |

| 50 Hz Applications | |
|---|---|
| **Voltage** | **Part Number** |
| 200 | EC-1555-11 |
| 220 | EC-1555-11 |
| 380 | EC-1186-11 |
| 415 | EC-1186-11 |
| 440 | EC-1555-11 |

9.3 MOTOR DRIVEN HYDRAULIC PUMP

The hydraulic pump does not require regular maintenance. Under normal operating conditions, the pump will perform for thousands of hours of use without rebuilding.




## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-2904-00 | HC-2910-00 | HC-2904-00 | ASSEMBLY, HYDRAULIC PUMP (painted pump with knobs does not include fittings, labels or coupling half) | 1 |
| 2 | N-2007-19-S-B | N-2007-19-S-E | N-2007-19-S-V | CONNECTOR, MALE #8 SAE X #12 JIC | 1 |
| 3 | N-2001-36-S-B | N-2001-36-S-E | N-2001-36-S-V | ELBOW, 90° MALE #12 SAE X #20 JIC | 1 |
| 4 | N-2001-11-S-B | N-2001-11-S-E | N-2001-11-S-V | ELBOW, 90° MALE #8 SAE X #8 JIC | 1 |

9.3.1 Motor Driven Hydraulic Pump Replacement Kits List

For replacement parts and seals, contact Tronair with hydraulic pump part number and serial number.

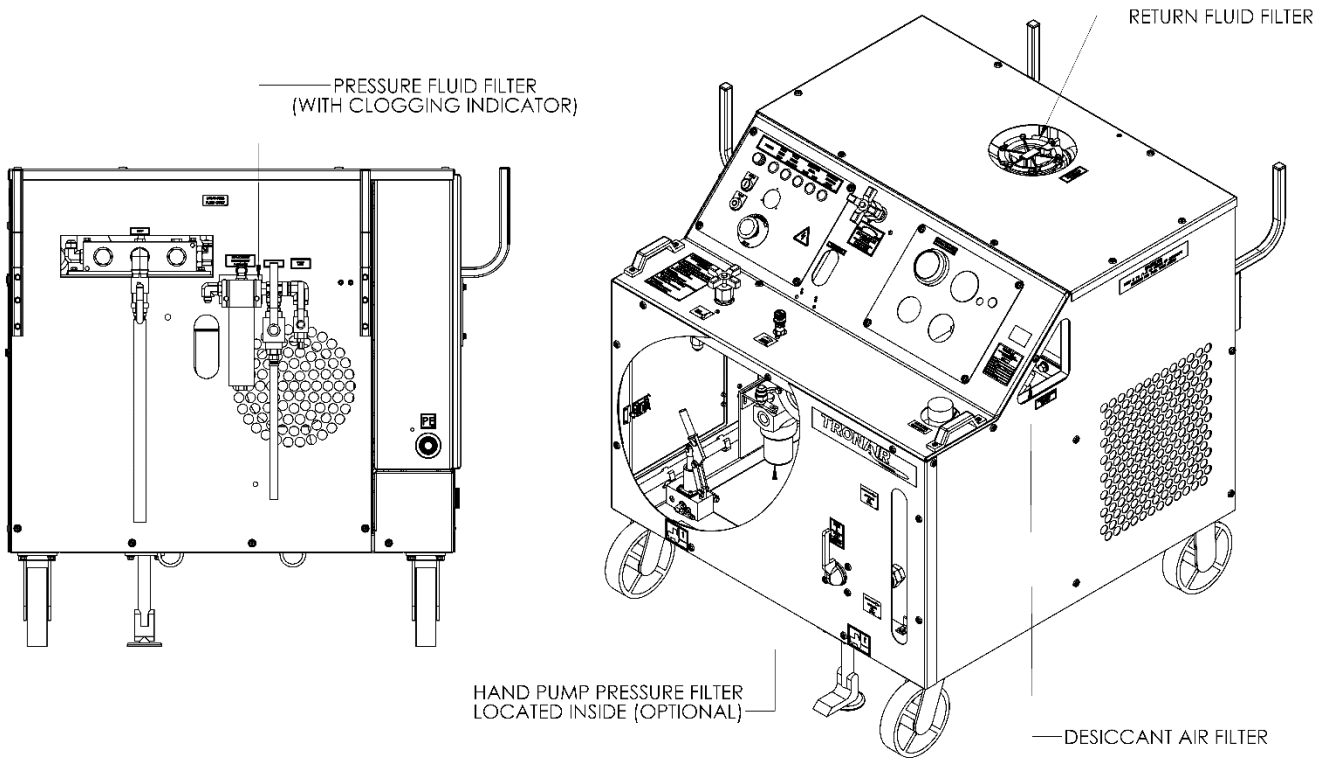
9.4 HYDRAULIC FLUID

Any time an unusual color, smell or visual indicator is noticed with the hydraulic fluid, a sample analysis should be performed to determine the condition of the fluid. (See Section 5.11 – Sample Valve Operation)

Refer to the manufacturer of the specific fluid for your unit to obtain additional information:

| **Model Number** | **Fluid Type** |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

9.5 FILTERS

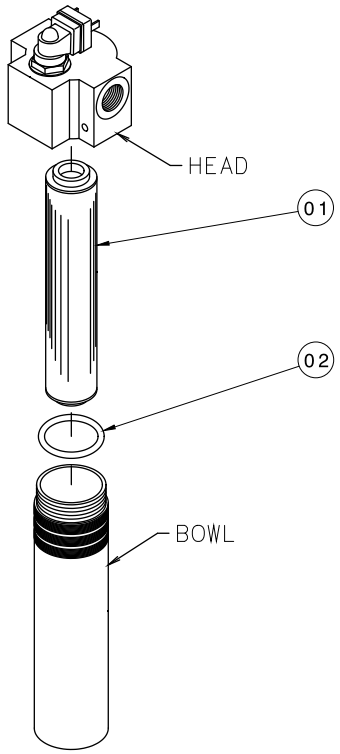


9.5.1 Pressure Filter

Replace the filter element any time the clogged filter indicator light *(Option R)* is triggered or when the pop-up indicator located on the filter head changes to red during operation.

Replace the filter element annually to ensure proper cleanliness of the hydraulic system. This is a minimum requirement.

Standard filter changes depend on how frequently the HPU is used and the cleanliness of the fluid, along with the environment to which the HPU is exposed. Periodic fluid analysis is recommended to properly determine the optimum frequency of filter element changes.



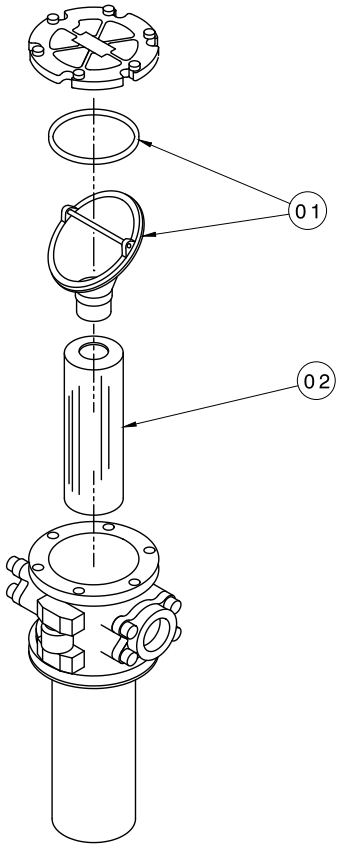

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 2 | HC-2000-138 | HC-2006-138 | HC-2007-138 | O-RING | 1 |
| 1, 2 | K-1416 | K-1417 | K-3928 | KIT, REPLACEMENT FILTER ELEMENT | 1 |

9.5.2 Return Filter

Replace the return filter element at the same time the pressure filter element is being replaced.



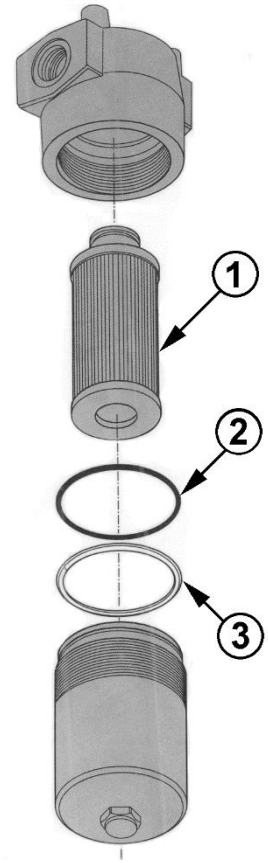

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 2 | HC-2000-350 | HC-2006-350 | HC-2007-350 | O-RING | 1 |
| 1, 2 | K-3493 | K-3494 | K-3805 | KIT, REPLACEMENT FILTER ELEMENT | 1 |

9.5.3 Hand Pump *(Option M)* Filter

Replacement of the hand pump filter element is dictated by frequency of use and the cleanliness of the fluid, along with the environment to which the HPU is exposed. Changing the hand pump filter element at the same time as the pressure filter element will ensure a regular maintenance schedule.



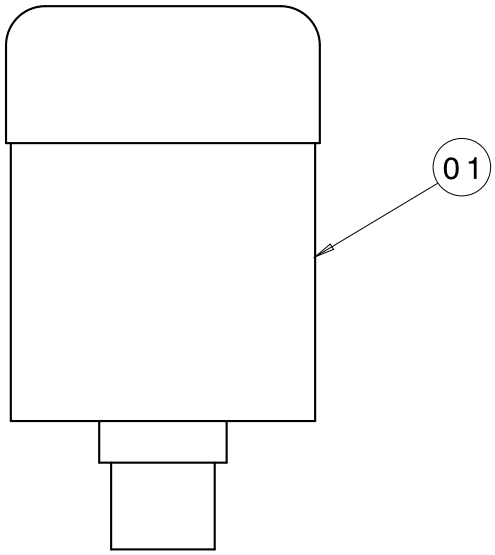

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 2, 3 | K-3796 | K-3797 | TBD | O-RING (BOWL) | 1 |
| 1, 2, 3 | K-3751 | K-3752 | K-3831 | KIT, REPLACEMENT FILTER ELEMENT | 1 |

9.5.4 Desiccant Air Filter

Replace the desiccant/air filter whenever the material inside the element is pink or reddish in color (see Element Label for details).




## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | HC-1763 | FILTER ELEMENT | 1 |

9.6 HYDRAULIC HOSES

Hoses used on the HPU must be periodically inspected for damage, blisters, leaks, or hose end problems. Any damaged or defective hose should be replaced as soon as possible.

Hoses used on Aviation Phosphate Ester, Type IV units have a shorter useful life than hoses used on Mineral Base units. Surface moisture is normal with Aviation Phosphate Ester, Type IV hoses as long as the fluid does not form into drops.

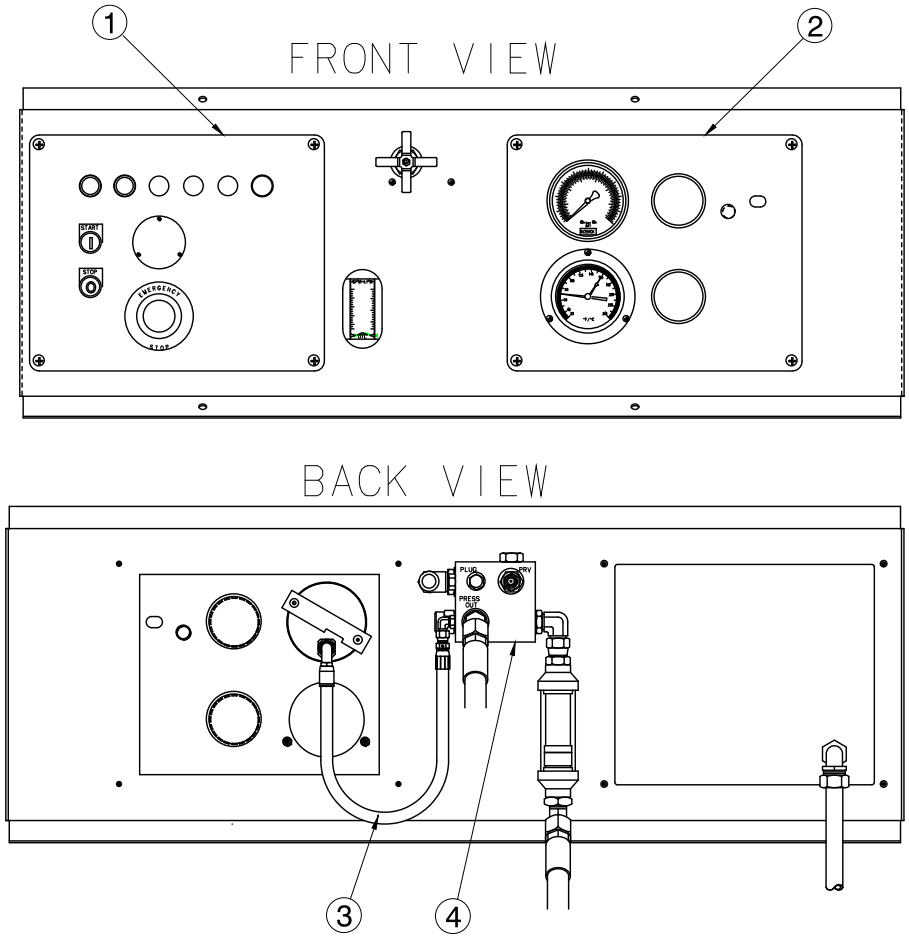
## Parts List

| Model Number | Fluid Type |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

| | 5211 & 5221 | 5231 | 5241 | | | |
|---|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **From** | **To** | **Qty** |
| 1 | TF-1039-11*12.8 | TF-1040-40*70.0 | TF-1039-18*12.8 | SELECTOR VALVE | PUMP INLET | 1 |
| 2 | TF-1037-01*35.0 | TF-1041-03*11.0 | TF-1038-23*35.0 | PUMP OUTLET | FLOWMETER | 1 |
| 3 | TF-1037-13*32.8 | TF-1040-39*13.3 | TF-1038-08*32.8 | CONTROL MANIFOLD | PRESSURE FILTER | 1 |
| 4 | TF-1038-16*23.0 | TF-1041-21*56.5 | TF-1038-16*23.0 | CONTROL MANIFOLD | PRESSURE GAUGE | 1 |
| 5 | TF-1039-16*38.3 | TF-1041-51*74.0 | TF-1039-16*38.3 | CASE DRAIN | COOLER (REAR) | 1 |
| 6 | TF-1039-15*16.3 | TF-1041-09*53.0 | TF-1038-20*16.3 | COOLER (FRONT) | RETURN MANIFOLD | 1 |
| 7 | TF-1038-01*31.3 | TF-1040-11*49.0 | TF-1038-01*31.3 | CONTROL MANIFOLD | RETURN MANIFOLD | 1 |
| 8 | TF-1039-11*35.3 | TF-1040-45*31.0 | TF-1039-18*35.3 | RETURN FILTER | SELECTOR VALVE (TOP) | 1 |
| 9 | TF-1038-08*17.5 | TF-1041-21*37.5 | TF-1039-17*17.5 | RETURN PRESSURE RELIEF VALVE | RESERVOIR | 1 |
| N/S | TF-1037-01*180 | TF-1041-09*180 | TF-1038-23*180 | EXTERNAL PRESSURE HOSE | | 1 |
| N/S | TF-1039-01*180 | TF-1041-15*180 | TF-1038-01*180 | EXTERNAL RETURN HOSE | | 1 |

9.7 INSTRUMENT PANEL

Refer to Section ***9.6 Hydraulic Hoses*** concerning hose inspection for general maintenance on Item 3 Hose Assembly.



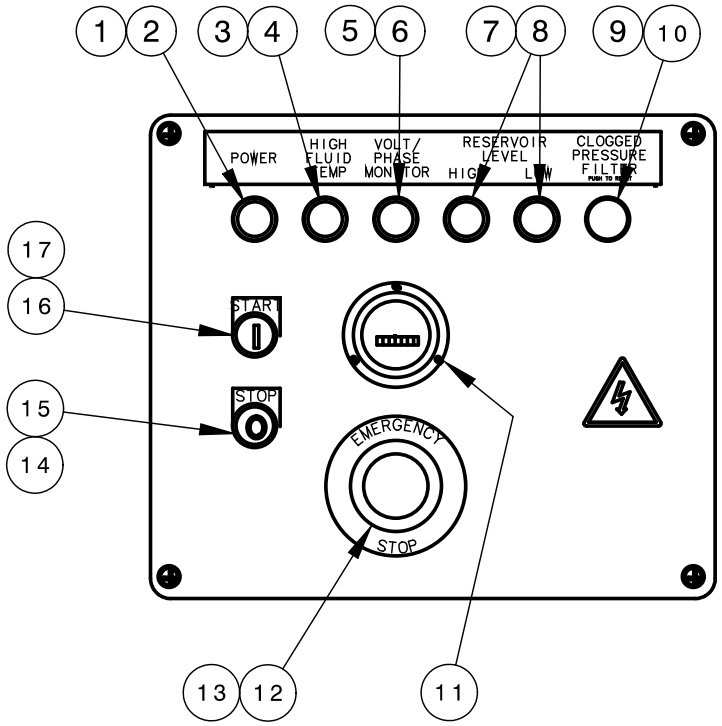

## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | See Section 9.7.1 | ELECTRIC PANEL | 1 |
| 2 | See Section 9.7.2 | HYDRAULIC PANEL | 1 |
| 3 | See Section 9.6 | ASSEMBLY, HOSE #4 | 1 |
| 4 | See Section 9.7.3 | CONTROL BLOCK/FLOWMETER | 1 |

9.7.1 Electric Panel

The Electric Panel does not require regular general maintenance.



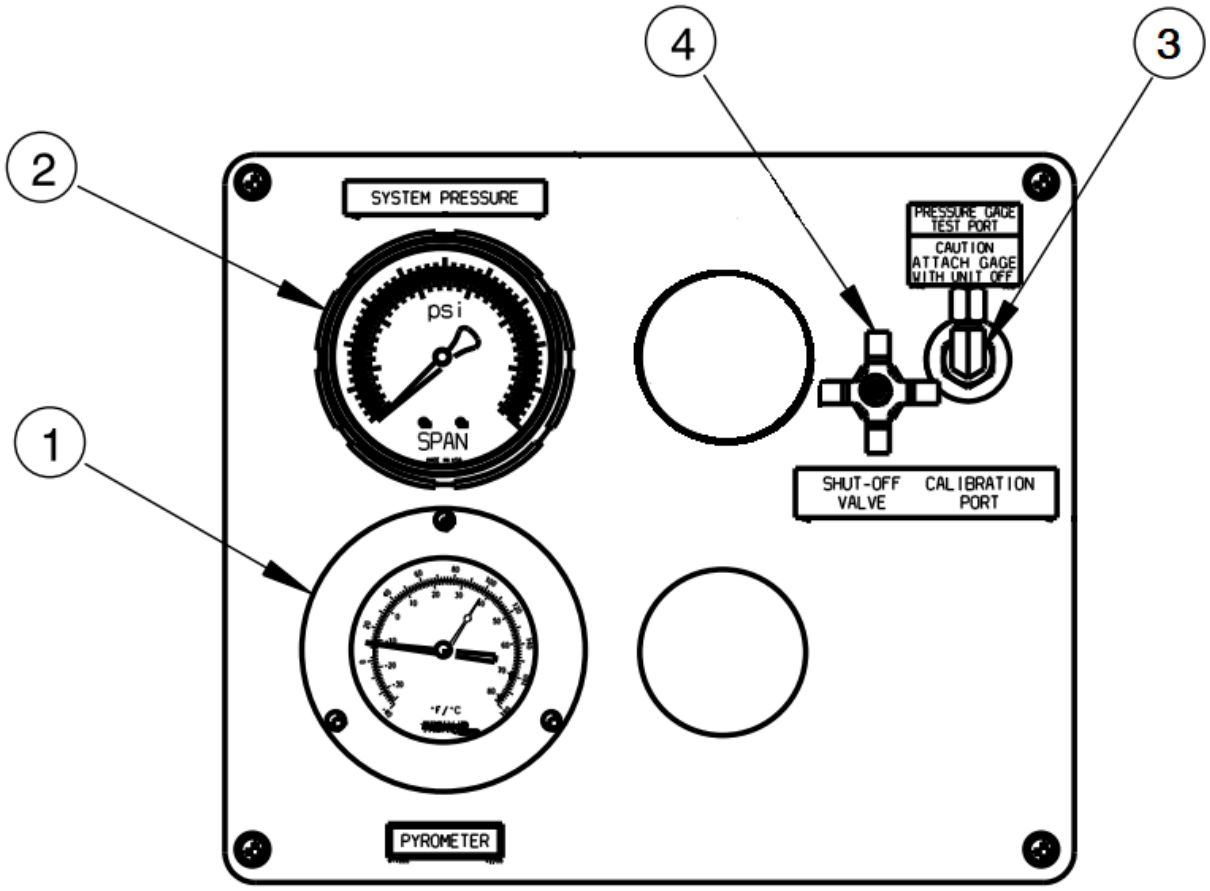

## Parts List

**All Models - All Fluid Types**

| Item | Component | Part Number | Description | Qty |
|---|---|---|---|---|
| 1 | STANDARD | EC-1945-01 | LIGHT, DIFFUSED PILOT | 1 |
| 2 | STANDARD | EC-1951-MN5G | POWER, MODULE W/LATCH | 1 |
| 3 | OPTION | EC-1945-03 | LIGHT, DIFFUSED PILOT | 1 |
| 4 | OPTION | EC-1951-MN5Y | POWER, MODULE W/LATCH | 1 |
| 5 | OPTION | EC-1945-03 | LIGHT, DIFFUSED PILOT | 1 |
| 6 | OPTION | EC-1951-MN5Y | POWER, MODULE W/LATCH | 1 |
| 7 | OPTION | EC-1945-04 | LIGHT, DIFFUSED PILOT | 2 |
| 8 | OPTION | EC-1951-MN5B | POWER, MODULE W/LATCH | 2 |
| 9 | OPTION | EC-1952 | PUSH BUTTON, ILLUMINATED/FLUSH | 1 |
| 10 | OPTION | EC-1944 | POWER, MODULE W/CONTACT/LATCH | 1 |
| 11 | OPTION | EC-1577 | HOUR METER (50 HZ OPERATION) | 1 |
| | | EC-1578 | HOUR METER (60 HZ OPERATION) | 1 |
| 12 | OPTION | EC-1948 | SWITCH, EMERGENCY STOP | 1 |
| 13 | STANDARD | EC-1946-MX02 | CONTACT BLOCK W/LATCH | 1 |
| 14 | STANDARD | EC-1953-ME205 | PUSH BUTTON, NON-ILLUMINATED | 1 |
| 15 | STANDARD | EC-1946-MX01 | CONTACT BLOCK W/LATCH | 1 |
| 16 | STANDARD | EC-1953-MF306 | PUSH BUTTON, NON-ILLUMINATED | 1 |
| 17 | STANDARD | EC-1946-MX10 | CONTACT BLOCK W/LATCH1 | 1 |

9.7.2 Hydraulic Panel

Annual calibration of instrumentation is recommended. See Section 12.0 – Calibration of Instrumentation for details of calibration.



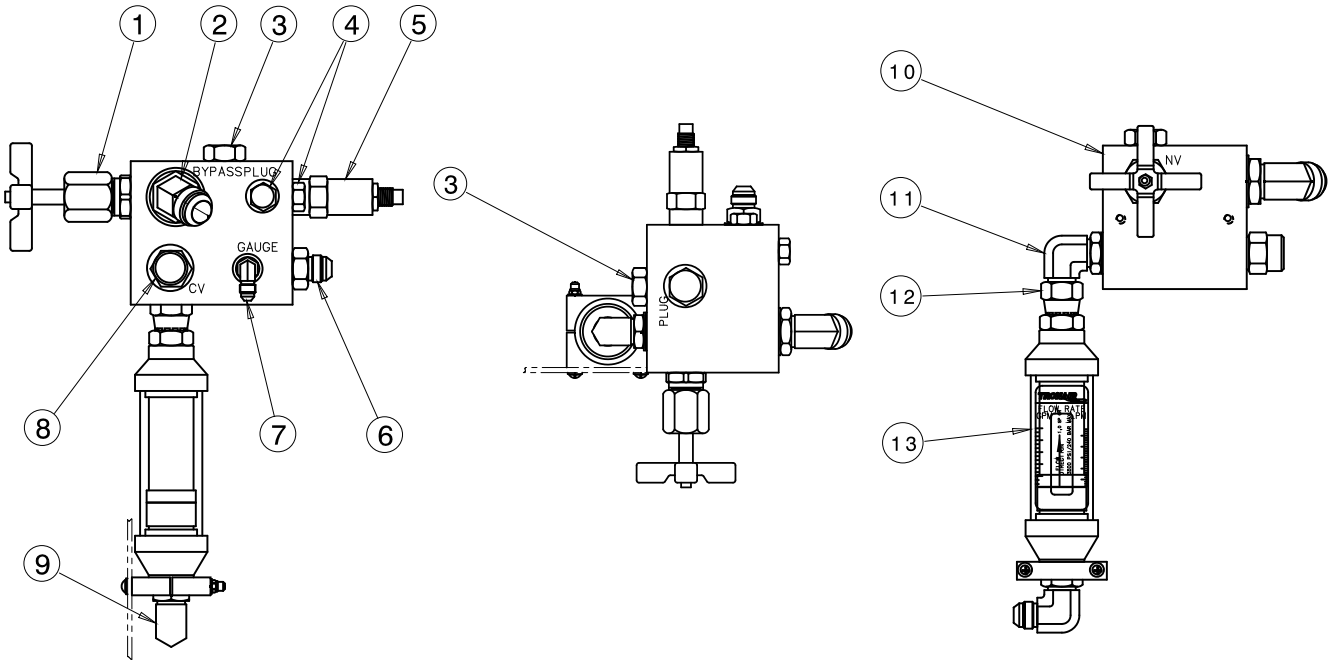

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-2268-01 | HC-2268-02 | HC-2268-03 | PYROMETER (OPTIONAL) | 1 |
| 2 | HC-2144 | HC-2144 | HC-2144 | SYSTEM PRESSURE GAUGE | 1 |
| 3 | See Section 9.13.10 | | | CALIBRATION PORT (OPTIONAL) | 1 |
| 4 | HC-1900-01 | HC-1900-02 | HC-1900-03 | SHUT OFF NEEDLE VALVE (CALIBRATION PORT OPTION ONLY) | 1 |

9.7.3 Control Block/Flowmeter

The Control Block components do not require regular general maintenance.



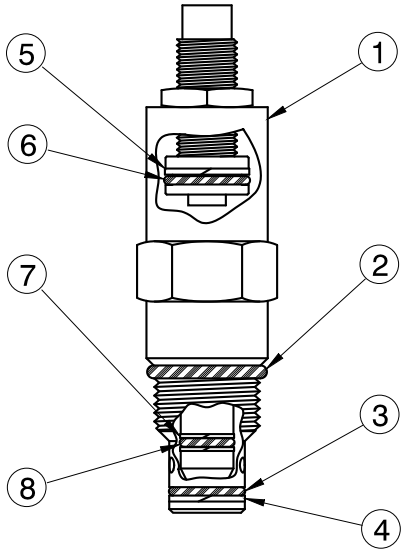

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-1254-04 | HC-1927-05 | HC-1254-04 | NEEDLE VALVE | 1 |
| 2 | N-2042-09-S-B | N-2042-09-S-E | N-2042-09-S-V | ELBOW, STRAIGHT THREAD (#12) | 1 |
| 3 | N-2066-10-S-B | N-2066-10-S-E | N-2066-10-S-V | O-RING HEX PLUG (#10) | 2 |
| 4 | N-2066-06-S-B | N-2066-06-S-E | N-2066-06-S-V | PLUG, O-RING HEX (#6) | 2 |
| 5 | HC-2127 | HC-2149 | HC-2207 | PRESSURE RELIEF VALVE | 1 |
| 6 | N-2007-13-S-B | N-2007-13-S-E | N-2007-13-S-V | ELBOW, 45 STRAIGHT THREAD (#12-10) | 2 |
| 7 | N-2001-03-S-B | N-2001-03-S-E | N-2001-03-S-V | ELBOW, STRAIGHT THREAD (#4) | 1 |
| 8 | HC-1673 | HC-1677 | HC-2208 | CHECK VALVE | 1 |
| 9 | N-2001-15-S-B | N-2001-15-S-E | N-2001-13-S-V | ELBOW, STRAIGHT THREAD (#10) | 1 |
| 10 | J-3399 | J-3399 | J-3399 | PRESSURE MANIFOLD | 1 |
| 11 | N-2001-15-S-B | N-2001-15-S-E | N-2001-15-S-V | ELBOW, STRAIGHT THREAD (#10) | 1 |
| 12 | N-2036-07-S-B | N-2036-07-S-E | N-2036-07-S-V | SWIVEL, 37° FEMALE (#10) | 1 |
| 13 | HC-2129 | HC-2132 | HC-2251 | FLOWMETER, 15 GPM/3,500 PSI | 1 |
| | HC-2129-A1 | HC-2132-A1 | HC-2251-A1 | FLOWMETER (CALIBRATED) | 1 |

9.7.3.a System Pressure Relief Valve

The System Pressure Relief Valve does not require regular general maintenance. It is possible however, for a contaminant to hold the relief valve in a partially open condition. If service is required, the new or repaired relief valve must be reset to 3,250 psig.



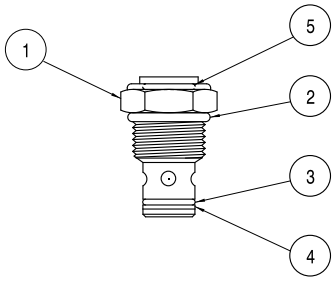

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-2127 | HC-2149 | HC-2207 | PRESSURE RELIEF VALVE (NOT SET) | 1 |
| 2 | HC-2010-910 | HC-2013-910 | HC-2014-910 | O-RING, SERIES 3 | 1 |
| 3 | HC-2000-014 | HC-2006-014 | HC-2007-014 | O-RING, SERIES 2 | 1 |
| 4 | HC-2020-014 | HC-2020-014 | HC-2020-014 | BACKUP RING (TEFLON) | 1 |
| 5 | HC-2020-015 | HC-2020-015 | HC-2020-015 | BACKUP RING (TEFLON) | 1 |
| 6 | HC-2000-015 | HC-2006-015 | HC-2007-015 | O-RING, SERIES 2 | 1 |
| 7 | HC-2020-011 | HC-2020-011 | HC-2020-011 | BACKUP RING (TEFLON) | 2 |
| 8 | HC-2000-011 | HC-2006-011 | HC-2007-011 | O-RING, SERIES 2 | 1 |

9.7.3.b Check Valve

The Check Valve does not require regular general maintenance.



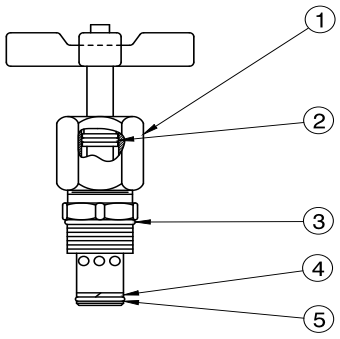

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-1673 | HC-1677 | HC-2208 | CHECK VALVE | 1 |
| 2 | HC-2010-910 | HC-2013-910 | HC-2014-910 | O-RING, SERIES 3 | 1 |
| 3 | HC-2000-014 | HC-2006-014 | HC-2007-014 | O-RING, SERIES 2 | 1 |
| 4 | HC-2020-014 | HC-2020-014 | HC-2020-014 | BACKUP RING | 1 |
| 5 | HC-2010-905 | HC-2013-905 | HC-2014-905 | O-RING, SERIES 3 | 1 |

9.7.3.c Bypass Valve

The Bypass Valve does not require regular general maintenance.

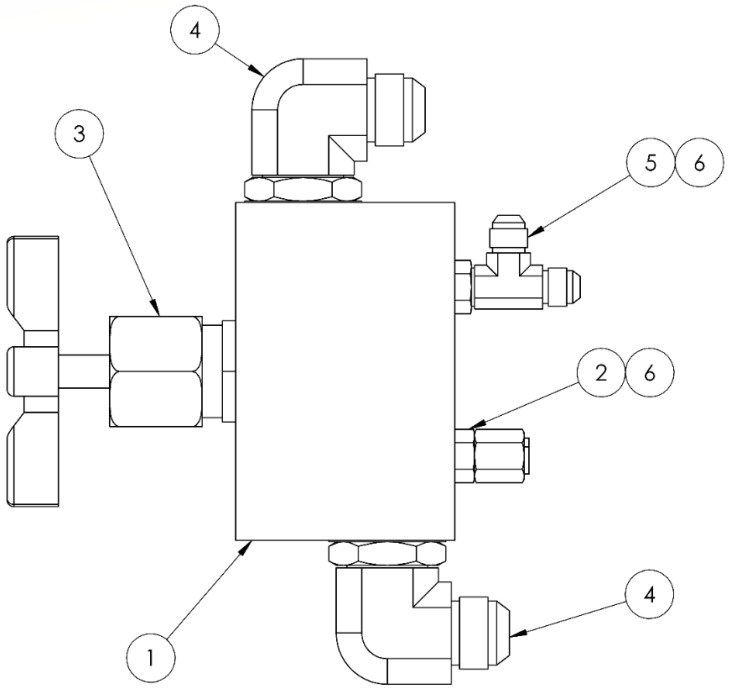



## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-1254-04 | HC-1927-05 | HC-1254-04 | NEEDLE VALVE | 1 |
| 2 | HC-2000-1111 | HC-2006-111 | HC-2007-1111 | O-RING | 1 |
| 3 | HC-2010-912 | HC-2013-912 | HC-2014-912 | O-RING | 1 |
| 4 | HC-2020-114 | HC-2020-114 | HC-2020-114 | BACKUP RING | 1 |
| 5 | HC-2000-114 | HC-2006-114 | HC-2007-114 | O-RING | 1 |

9.7.4 Flow Control

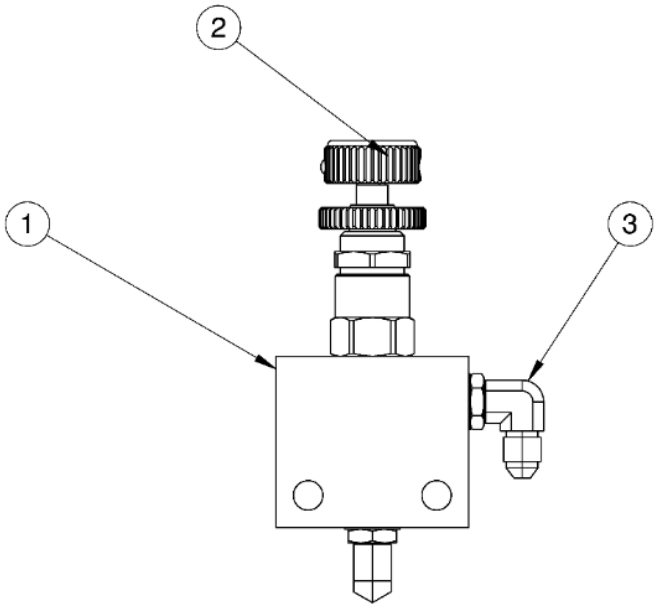



## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | J-8108 | J-8108 | J-8108 | MANIFOLD, FLOW CONTROL | 1 |
| 2 | N-2007-08-S-B | N-2007-08-S-E | N-2007-08-S-V | CONNECTOR, STR THREAD | 1 |
| 3 | HC-1254-04 | HC-1927-05 | HC-1254-04 | VALVE, NEEDLE | 1 |
| 4 | N-2001-14-S-B | N-2001-14-S-E | N-2001-14-S-V | ELBOW, STR THREAD | 2 |
| 5 | N-2015-08-S-B | N-2015-08-S-E | N-2015-08-S-V | TEE, RUN STR THREAD | 1 |
| 6 | N-2008-05-S | N-2008-05-S | N-2008-05-S | CAP, 3/8 | 2 |

9.7.5 Pressure Control



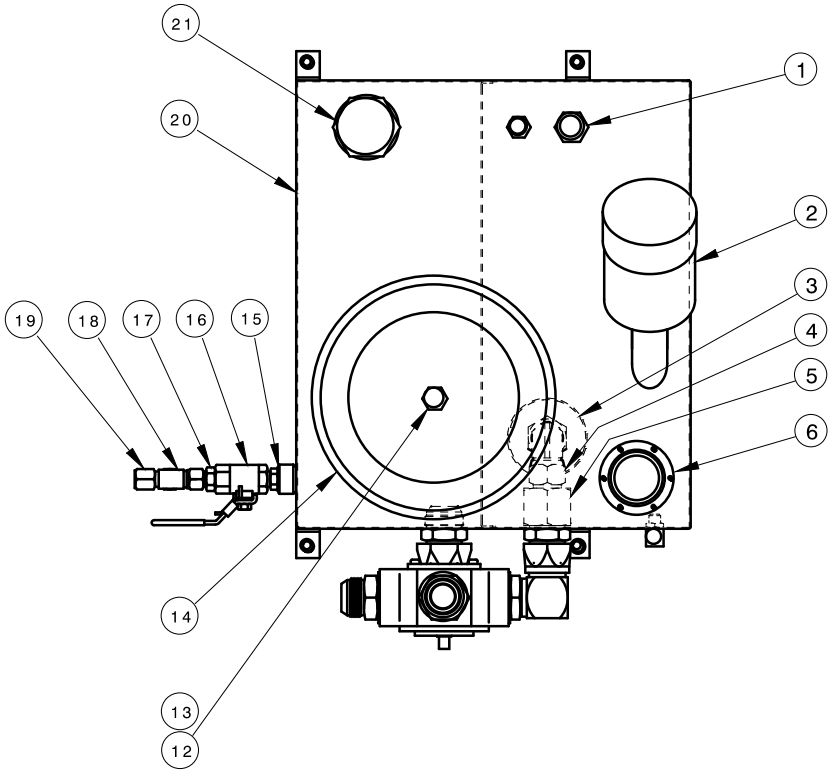

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | J-6603-1 | J-6603-1 | J-6603-1 | MANIFOLD, PRESSURE CONTROL | 1 |
| 2 | HC-2793 | HC-2827 | HC-2793 | VALVE, PRESSURE CONTROL | 1 |
| 3 | N-2001-03-S-V | N-2001-03-S-E | N-2001-03-S-V | ELBOW, STR THREAD | 2 |

9.8 RESERVOIR ASSEMBLY

Replace the desiccant air filter whenever the material inside the element is pink or reddish in color (See Element label for details). The Reservoir Assembly does not require regular general maintenance. If periodic inspections for silt are desired, be certain to thoroughly clean the dome cover and surrounding area before removing the dome cover. The Selector Valve (Item 9) is not field serviceable.

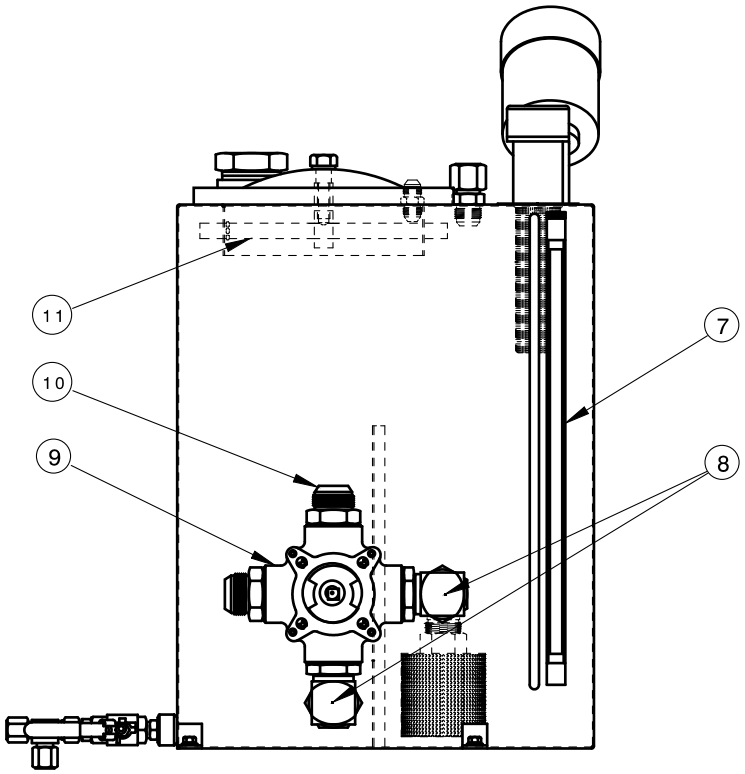



## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2008-08-S | N-2008-08-S | N-2008-08-S | CAP, #12 | 1 |
| 2 | HC-1763 | HC-1763 | HC-1763 | DESICCANT FILTER | 1 |
| 3 | HC-1397-02 | HC-1397-02 | HC-1397-02 | DIFFUSER, 1" NPT | 1 |
| 4 | N-2035-08-S | N-2035-08-S | N-2035-08-S | ELBOW, SWIVEL MALE, #16 JIC X 1" NPT | 1 |
| 5 | N-2055-25-S | N-2055-25-S | N-2055-25-S | TUBE REDUCER, #20 X #16 JIC | 1 |
| 6 | HC-2193-06 | HC-2193-06 | HC-2193-06 | FILLER, NON-VENTED | 1 |
| 12 | H-1735-02 | H-1735-02 | H-1735-02 | WASHER, NYLON | 1 |
| 13 | G-1100-110016 | G-1100-110016 | G-1100-110016 | BOLT, HEX HEAD, GRADE 5, ⅝-11 X 1 ¾" LG | 1 |
| 14 | H-1740 | H-1741 | H-1741 | COVER ASSEMBLY | 1 |
| 15 | N/A | N/A | N/A | N/A | N/A |
| 16 | HC-1761 | HC-1761 | HC-1761 | BALL VALVE, SAE #8 LOCKABLE | 1 |
| 17 | N-2007-11-S-B | N-2007-11-S-E | N-2007-11-S-V | CONNECTOR, STR THREAD #8 SAE X #8 JIC | 1 |
| 18 | N-2016-06-S-B | N-2016-06-S-E | N-2016-06-S-V | TEE, SWIVEL RUN, #8 JIC | |
| 19 | N-2008-06-S | N-2008-06-S | N-2008-06-S | CAP, #8 | 3 |
| 20 | Z-5525 | | | RESERVOIR, 30 GALLON (113.4 LT) | 1 |
| 21 | N-2206-09-S | | | PLUG, HEX HEAD, 2" NPT | 1 |

9.8 RESERVOIR ASSEMBLY *(continued)*




## Parts List

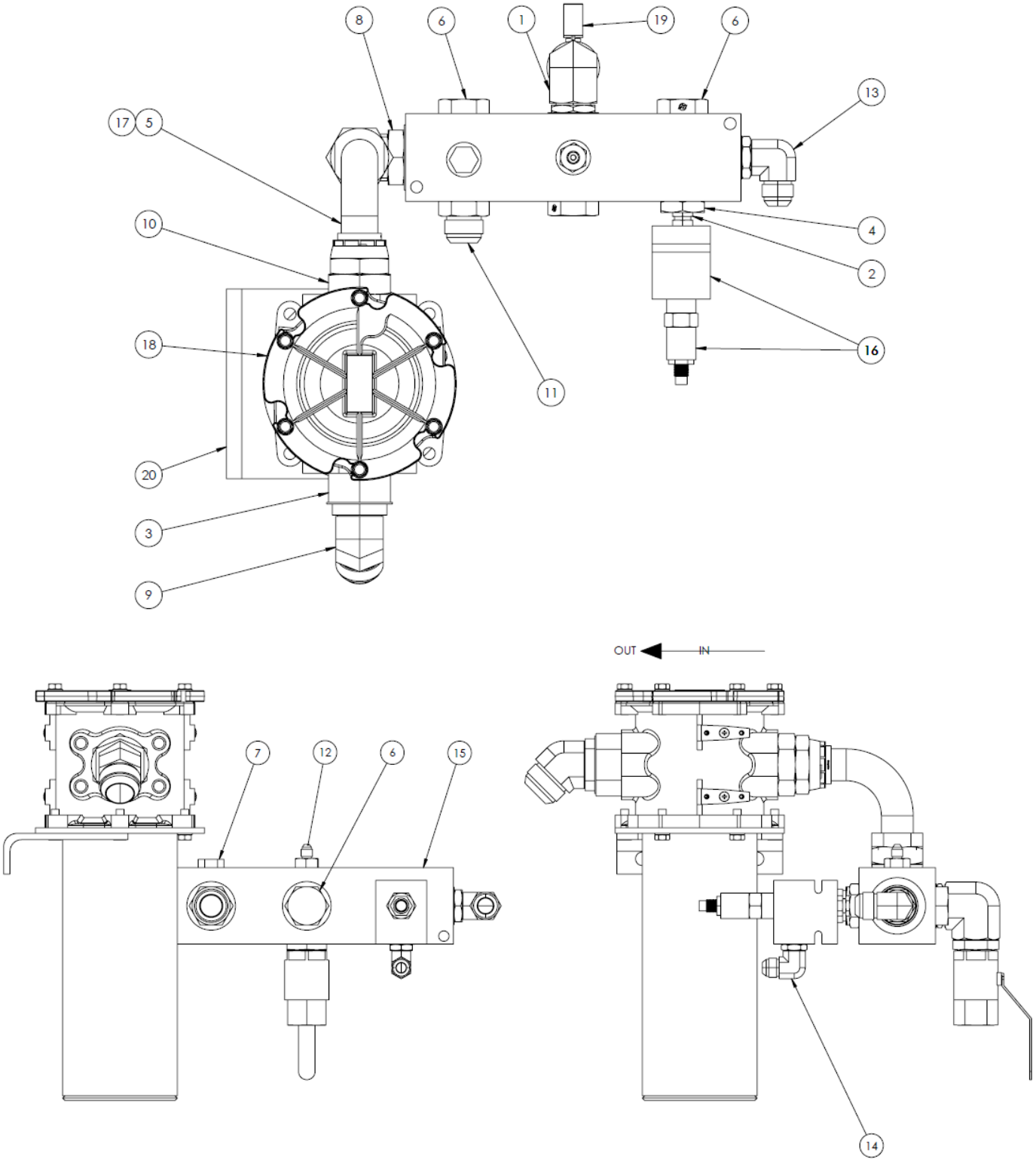
**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 7 | HC-1382-18 | HC-1383-18 | HC-2212 | SIGHT GAUGE | 1 |
| 8 | N-2049-20-S-B | N-2049-20-S-E | N-2049-20-S-V | ELBOW, 90° SWIVEL, #20 | 2 |
| 9 | HC-1764-01 | HC-1764-02 | HC-1764-03 | SELECTOR VALVE, #20 SAE | 1 |
| 10 | N-2007-28-S-B | N-2007-28-S-E | N-2007-28-S-V | CONNECTOR, STRAIGHT THREAD #20 SAE | 2 |
| 11 | Z-2394-01 | Z-2394-01 | Z-2394-01 | CLAMP ASSEMBLY | 1 |

9.9 RETURN MANIFOLD ASSEMBLY

The Return Manifold does not require regular general maintenance.

**NOTE: DO NOT attempt to adjust the Return System Pressure Relief Valve. See Section 9.9.1 – Return System Pressure Relief Valve for details.**



9.9 RETURN MANIFOLD ASSEMBLY *(continued)*

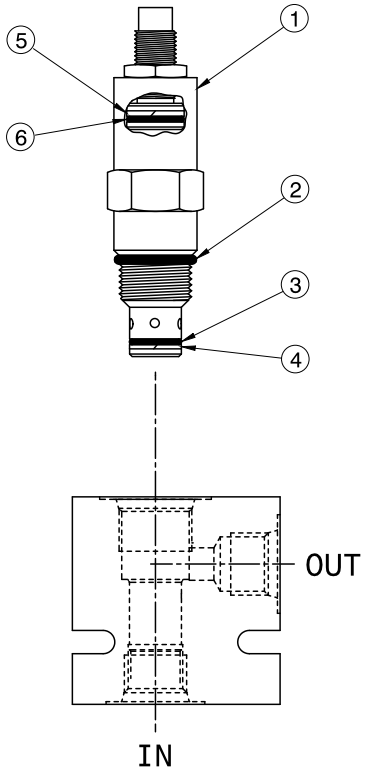
## Parts List

| Model Number | Fluid Type |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2661-06-S-B | N-2661-06-S-E | N-2661-06-S-V | ELBOW, 90º STR THREAD | 1 |
| 2 | N-2464-06-S-B | N-2464-06-S-E | N-2464-06-S-V | UNION, #8 STR THREAD | 1 |
| 3 | N-2463-25-S-B | N-2463-25-S-E | N-2463-25-S-V | FITTING, REDUCER/EXPANDER | 1 |
| 4 | N-2463-16-S-B | N-2463-16-S-E | N-2463-16-S-V | FITTING, REDUCER/EXPANDER | 1 |
| 5 | N-2063-04 | N-2063-04 | N-2063-04 | ELBOW, BENT SWIVEL NUT | 1 |
| 6 | N-2053-10-S-B | N-2053-10-S-E | N-2053-10-S-V | PLUG, HEX HEAD | 3 |
| 7 | N-2053-06-S-B | N-2053-06-S-E | N-2053-06-S-V | PLUG, HEX HEAD, W/O-RING | 1 |
| 8 | N-2049-20-S-B | N-2049-20-S-E | N-2049-20-S-V | ELBOW, 90° SWIVEL | 1 |
| 9 | N-2042-13-S-B | N-2042-13-S-E | N-2042-13-S-V | ELBOW, 45° STR THREAD | 1 |
| 10 | N-2007-30-S-B | N-2007-30-S-E | N-2007-30-S-V | CONNECTOR, STR THREAD | 1 |
| 11 | N-2007-24-S-B | N-2007-24-S-E | N-2007-24-S-V | CONNECTOR, STR THREAD | 1 |
| 12 | N-2007-06-S-B | N-2007-06-S-E | N-2007-06-S-V | CONNECTOR, STR THREAD | 1 |
| 13 | N-2001-37-S-B | N-2001-37-S-E | N-2001-37-S-V | ELBOW, STR THREAD | 1 |
| 14 | N-2001-11-S-B | N-2001-11-S-E | N-2001-11-S-V | ELBOW, STR THREAD | 1 |
| 15 | HC-2205 | HC-2205 | HC-2205 | MANIFOLD, RETURN | 1 |
| 16 | HC-2199 | HC-2200 | HC-2211 | VALVE, PRESSURE RELIEF | 1 |
| 17 | HC-1951-20 | HC-1951-20 | HC-1951-20 | SEAL, CONICAL (-20) | 2 |
| 18 | HC-1906-01 | HC-1906-02 | HC-1906-03 | FILTER, RETURN | 1 |
| 19 | HC-2206-05 | HC-1771-05 | HC-2206-05 | VALVE, BALL | 1 |
| 20 | H-1581 | H-1581 | H-1581 | BRACKET, FILTER MOUNTING | 1 |
| N/S | N-2464-10-S-B | N-2464-10-S-E | N-2464-10-S-V | UNION, #16 STRAIGHT THREAD | 1 |

9.9.1 Return System Pressure Relief Valve

The Return System Pressure Relief Valve can be purchased as a preset assembly. If the relief valve is serviced by the end user, the valve must be set to crack at 150+/-7 psig **before** being re-installed on the HPU.



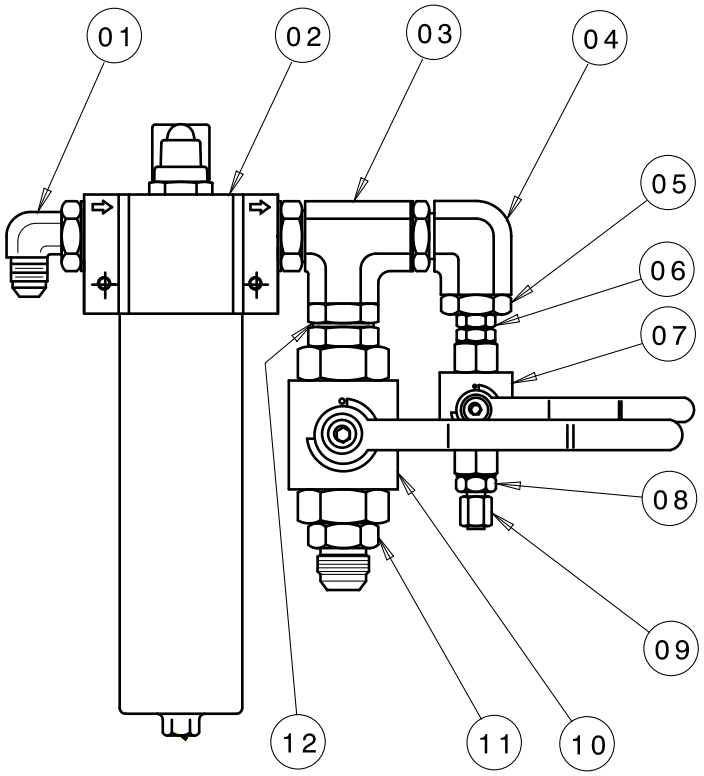

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-2199 | HC-2200 | HC-2211 | PRESSURE RELIEF VALVE (INCLUDES VALVE BLOCK) | 1 |
| 2 | HC-2010-910 | HC-2013-910 | HC-2014-910 | O-RING, SERIES 3 | 1 |
| 3 | HC-2000-014 | HC-2006-014 | HC-2007-014 | O-RING, SERIES 2 | 1 |
| 4 | HC-2020-014 | HC-2020-014 | HC-2020-014 | BACKUP RING (TEFLON) | 1 |
| 5 | HC-2020-015 | HC-2020-015 | HC-2020-015 | BACKUP RING (TEFLON) | 1 |
| 6 | HC-2000-015 | HC-2006-015 | HC-2007-015 | O-RING, SERIES 2 | 1 |

9.10 PRESSURE FILTER ASSEMBLY (Single System)

Refer to Section 9.5.1 for information on changing filter element.



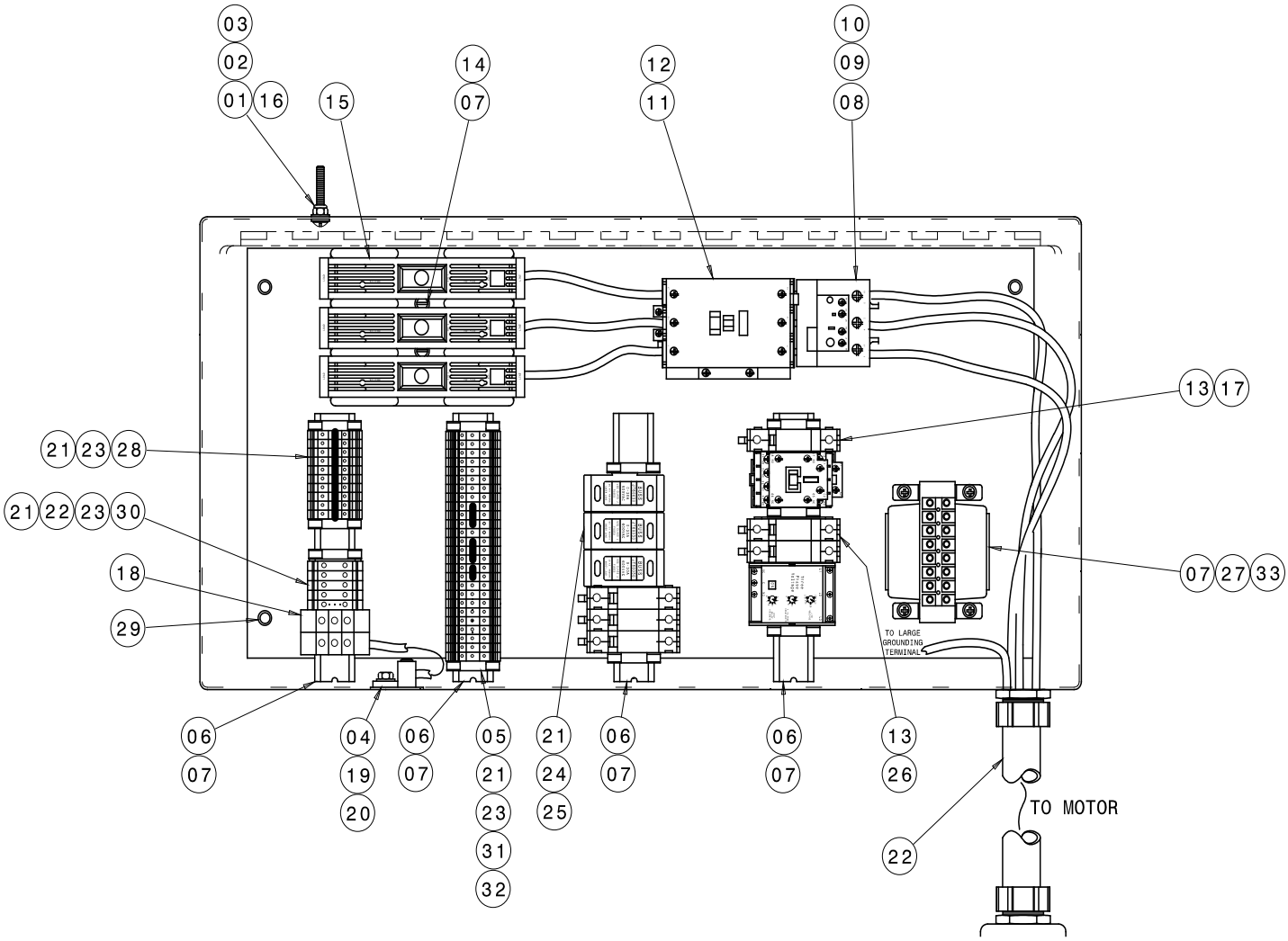

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2001-14-S-B | N-2001-14-S-E | N-2001-14-S-V | ELBOW, STR THREAD #8-12 | 1 |
| 2 | HC-2194-01 | HC-2194-02 | HC-2194-02 | FILTER, PRESSURE | 1 |
| 3 | N-2660-05-S-B | N-2660-05-S-E | N-2660-05-S-V | TEE, STR THREAD #12 | 1 |
| 4 | N-2661-05-S-B | N-2661-05-S-E | N-2661-05-S-V | ELBOW, STR THREAD #12 | 1 |
| 5 | N-2463-35-S-B | N-2463-35-S-E | N-2463-35-S-V | UNION, STR THREAD #12 MALE X #6 FEMALE | 1 |
| 6 | N-2464-05-S-B | N-2464-05-S-E | N-2464-05-S-V | UNION, MALE STR THREAD #6 | 1 |
| 7 | HC-2206-02 | HC-1771-02 | HC-2206-02 | VALVE, BALL SAE #6 | 1 |
| 8 | N-2007-05-S-B | N-2007-05-S-E | N-2007-05-S-V | CONNECTOR, STR THREAD #6 SAE X ¼ JIC | 1 |
| 9 | N-2008-03-S | N-2008-03-S | N-2008-03-S | CAP, #4 FEMALE | 1 |
| 10 | HC-2206-04 | HC-1771-04 | HC-2206-04 | VALVE, BALL SAE #12 | 1 |
| 11 | N-2007-14-S-B | N-2007-14-S-E | N-2007-14-S-V | CONNECTOR, STR THREAD #8-#12 | 1 |
| 12 | N-2464-08-S-B | N-2464-08-S-E | N-2464-08-S-V | UNION, MALE STR THREAD #12 | 1 |

9.11 ELECTRICAL COMPONENTS

Regularly inspect the external power cord for nicks, cuts, abrasion, and fluid damage. Replace power cord if damage is found. See Section 10.0 Provision of Spares for recommended spare fuses.




Set Item **08** to Automatic Reset position. Wire per Electrical Schematic INS-2016 Reference Wiring Diagram INS-2144

9.11 ELECTRICAL COMPONENTS *(continued)*

## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | G-1159-105516 | Screw, RD HD CRS REC, ¼ - 28 x 1 ¾ long | 1 |
| 2 | G-1250-1050N | Flatwasher, ¼ Narrow | 2 |
| 3 | G-1202-1055 | ESN, ¼ - 28 | 1 |
| 4 | G-1180-105006 | Screw, ¼ HH Type F | 1 |
| 5 | EC-1956-02 | Block, IEC Terminal (Red) | 26 |
| 6 | EC-1803 | Rail, Din | 4 |
| 7 | G-1150-103506 | Screw, #10-32 HH Mach x ¾ long | 14 |
| 9 | EC-1603 | Shield, Anti-Tamper | 1 |
| 10 | EC-1604 | Shield, Current Adjustment | 1 |
| 12 | EC-1607 | Lug Set, Terminal | 1 |
| 13 | EC-1541-01 | Fuse Holder, IEC Class CC | 3 |
| 16 | EC-1180-24 | Terminal, Ring Tongue ¼ Bolt Hole | 1 |
| 17 | EC-1542-04 | Fuse, LP-CC-Low Peak 1-6/10A | 1 |
| 18 | EC-1957 | Block, IEC Ground | 2 |
| 19 | EC-1532-02 | Lug, Ground | 1 |
| 20 | G-1251-1050R | Lockwasher, ¼ Regular | 5 |
| 21 | EC-1959 | Anchor, IEC End | 10 |
| 22 | EC-1958 | Block, IEC Ground | 5 |
| 24 | EC-1960-01 | Barrier, End | 2 |
| 24 | EC-1596-01 | Fuse Holder, Class J | 3 |
| 27 | EC-1804-02 | Transformer, Control (100 W) | 1 |
| 28 | EC-1956-03 | Block, IEC Terminal (Blue) | 10 |
| 29 | G-1202-1070 | ESN, ⅜ – 16 | 4 |
| 30 | EC-1961-04 | Jumper, Center | 1 |
| 31 | EC-1961-02 | Jumper, Center | 2 |
| 32 | EC-1961-01 | Jumper, Center | 1 |
| 33 | EC-1826 | Guard, Finger Touchproof | 1 |

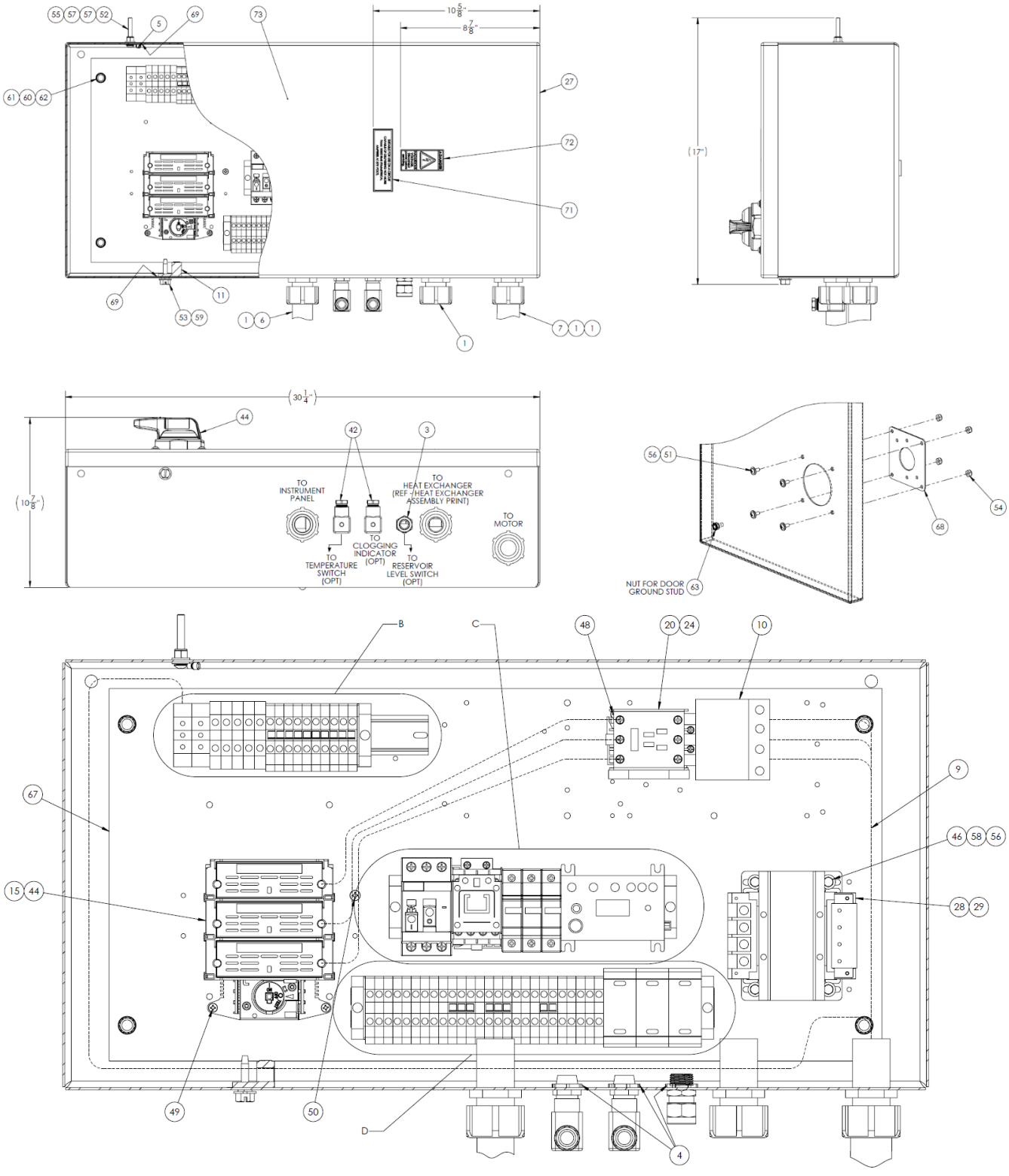
**THE FOLLOWING PARTS ARE APPLICATION SPECIFIC**
**Be sure to locate the correct voltage and hertz of the unit before selecting the part**

| Item | 60 Hz Applications | | | | | Description | Qty |
|---|---|---|---|---|---|---|---|
| | 208 | 230 | 380 | 460 | 575 | | |
| 8 | EC-1525 | EC-1589 | EC-1589 | EC-1589 | EC-1589 | Relay, Overload | 1 |
| 11 | EC-1842 | EC-1586 | EC-1586 | EC-1586 | EC-1586 | Contactor, IEC Motor | 1 |
| 14 | EC-1563 | EC-1563 | EC-1563 | EC-1674 | EC-1674 | Fuse Block, Class J | 1 |
| 15 | EC-1557-30 | EC-1557-30 | EC-1557-27 | EC-1557-25 | EC-1557-24 | Fuse, Class J | 3 |
| 25 | EC-1557-02 | EC-1557-02 | EC-1557-01 | EC-1557-01 | EC-1557-04 | Fuse, Class J | 3 |
| 26 | EC-1726-09 | EC-1726-08 | EC-1726-05 | EC-1726-04 | EC-1726-04 | Fuse, Class CC | 2 |

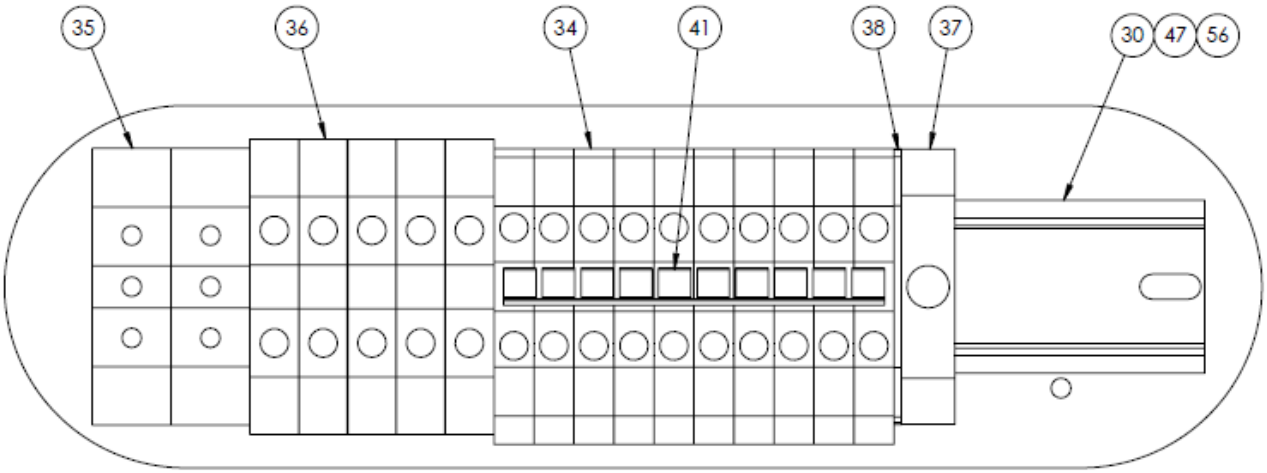
| Item | 50 Hz Applications | | | | | Description | Qty |
|---|---|---|---|---|---|---|---|
| | 200 | 220 | 380 | 415 | 440 | | |
| 8 | EC-1525 | EC-1589 | EC-1589 | EC-1589 | EC-1589 | Relay, Overload | 1 |
| 11 | EC-1842 | EC-1586 | EC-1586 | EC-1586 | EC-1586 | Contactor, IEC Motor | 1 |
| 14 | EC-1563 | EC-1563 | EC-1674 | EC-1674 | EC-1674 | Fuse Block, Class J | 1 |
| 15 | EC-1557-31 | EC-1557-31 | EC-1557-26 | EC-1557-26 | EC-1557-26 | Fuse, Class J | 3 |
| 25 | EC-1557-04 | EC-1557-04 | EC-1557-01 | EC-1557-01 | EC-1557-01 | Fuse, Class J | 3 |
| 26 | EC-1726-10 | EC-1726-09 | EC-1726-05 | EC-1726-05 | EC-1726-04 | Fuse, Class CC | 2 |

9.11.1 Electrical Components With 100 ft. Input Cord Option

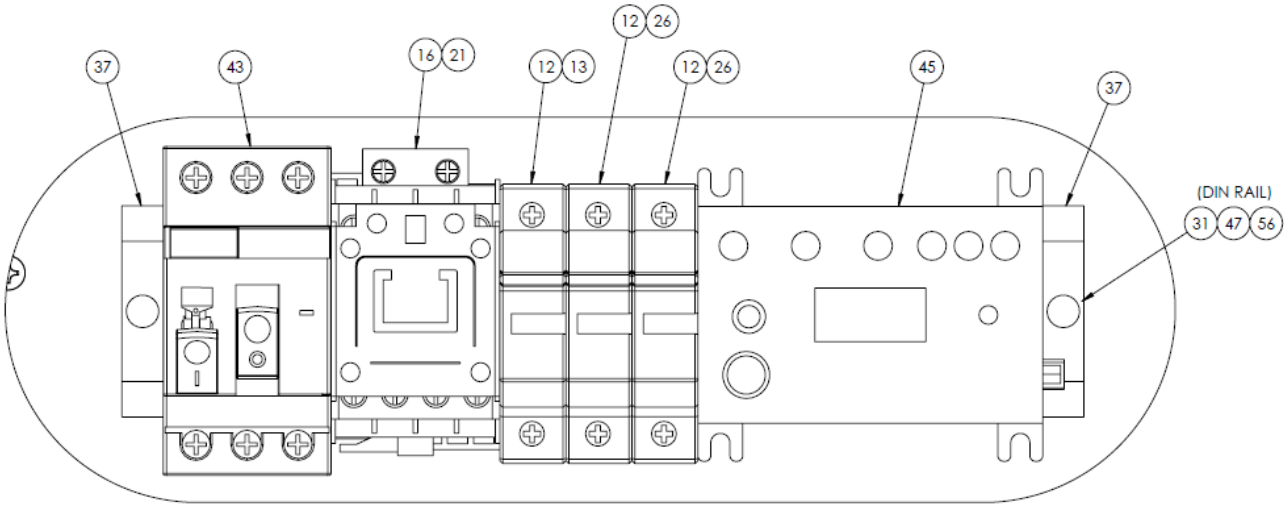
Regularly inspect the external power cord for nicks, cuts, abrasion, and fluid damage. Replace power cord if damage is found. See Section 10.0 Provision of Spares for recommended spare fuses.



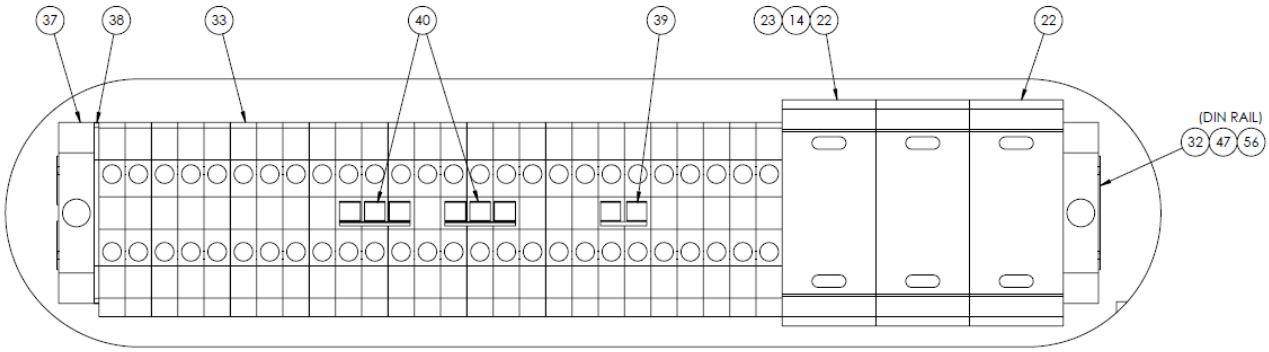
9.11.1 Electrical Components With 100 ft. Input Cord Option *(continued)*




DETAIL B




DETAIL C




DETAIL D

9.11.1 Electrical Components With 100 ft. Input Cord Option *(continued)*

## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | EC-1167-04 | CONNECT. NYLON INS CONDUIT | 4 |
| 2 | EC-1175-06-A | CONNECTOR, POWER CABLE 1/2IN | REF |
| 3 | EC-1175-08-A | CONNECTOR, POWER CABLE | REF |
| 4 | EC-1176-02 | LOCKNUT, CONDUIT | 3 |
| 5 | EC-1180-24 | TERMINAL, RING BLUE, 18-14AWG, 1/4 | 1 |
| 8 | EC-1263-08-12.0 | WIRE, POWER (2AWG, BLACK) | 3 |
| 9 | EC-1263-05-50.0 | WIRE, POWER (BLACK 6 AWG) | 3 |
| 11 | EC-1532-02 | LUG, GROUND | 1 |
| 12 | EC-1541-01 | FUSEHOLDER, MODULAR IEC CLASS CC | 3 |
| 13 | EC-1542-09 | FUSE, LP-CC LOW-PEAK | 1 |
| 16 | EC-1564 | RELAY, CONTROL | REF |
| 17 | EC-1572-01-108 | WIRE, ELECTRICAL | 2 |
| 18 | EC-1572-08-120 | WIRE, GROUND (2 AWG, GRN/YLW) | 1 |
| 19 | EC-1572-08-24.0 | WIRE, GROUND ( 2 AWG, GRN/YLW) | 1 |
| 22 | EC-1596-01 | FUSEHOLDER, CLASS J | 3 |
| 24 | EC-1607 | BLOCK, AUXILARY CONTACT | 1 |
| 27 | EC-1802 | ENCLOSURE, ELECTRICAL | 1 |
| 29 | EC-1826 | GUARD, FINGER TOUCH PROOF | 1 |
| 31 | EC-1895-010.00 | RAIL, DIN | 1 |
| 32 | EC-1895-013.00 | RAIL, DIN | 1 |
| 33 | EC-1956-02 | BLOCK, TERMINAL | 26 |
| 34 | EC-1956-03 | BLOCK, TERMINAL | 10 |
| 35 | EC-1957 | BLOCK, GROUNDING | 2 |
| 36 | EC-1958 | BLOCK, GROUNDING | 5 |
| 37 | EC-1959 | ANCHOR, END | 5 |
| 38 | EC-1960-01 | BARRIER, END | 2 |
| 39 | EC-1961-01 | JUMPER, CENTER | 1 |
| 40 | EC-1961-02 | JUMPER, CENTER | 2 |
| 41 | EC-1961-04 | JUMPER, CENTER | 1 |
| 42 | EC-2198 | CABLE, DIN CONNECTOR | REF |
| 43 | EC-2465 | STARTER, MOTOR | 1 |
| 44 | EC-2669 | KIT, DISCONNECTED FUSE (60A) | 1 |
| 45 | EC-3302-X | 3PH VOLTAGE FREQUENCY | REF |
| 46 | G-1150-103503 | SCREW, #10-32 X 3/8" LG HEX HD MACHINE | 4 |
| 47 | G-1150-103504 | SCREW, #10-32 X 1/2" LG HEX HD MACHINE | 6 |
| 49 | G-1159-102006 | SCREW, #8-32 X 3/4" LG. RD HD CRS REC | 4 |
| 50 | G-1159-103503 | SCR, #10-32 RD HD CRS REC | 1 |
| 51 | G-1159-103504 | SCR, #10-32 RD HD CRS REC | 4 |
| 52 | G-1159-105516 | SCR, 1/4-20 RD HD CRS REC | 1 |
| 53 | G-1180-105006 | SCR, 1/4 HEX HD TPG TYPE F | 1 |
| 54 | G-1202-1035 | STOPNUT, #10-32 ELASTIC | 4 |
| 55 | G-1202-1055 | STOPNUT, 1/4-28 ELASTIC | 1 |

9.11.1 Electrical Components With 100 ft. Input Cord Option *(continued)*

## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 56 | G-1250-1030N | FLATWASHER, #10 NARROW | 14 |
| 57 | G-1250-1050N | FLATWASHER, 1/4 NARROW | 2 |
| 58 | G-1251-1030R | LOCKWASHER, #10 REGULAR | 4 |
| 59 | G-1251-1050R | LOCKWASHER, 1/4 REGULAR | 1 |
| 60 | G-1514-M80R | SPLIT LOCK WASHER M8 | 4 |
| 61 | G-1515-M80 | FLATWASHER, M8 | 4 |
| 62 | G-1567-07 | NUT, HEX M8X1.25 | 4 |
| 63 | G-1904-060 | NUT W/ TOOTH WSHR, M6X1 | 1 |
| 64 | H-2432-06 | PLUG, PAINTED SHEETMETAL | 3 |
| 65 | INS-2016 | SCHEMATIC, HPU ELECTRICAL | 1 |
| 66 | INS-2144 | INSTRUCTION,WIRING | 1 |
| 67 | S-2012 | PANEL, INNER | 1 |
| 68 | S-3448-00 | ADAPTER, DISCONNECT | 1 |
| 69 | V-1665 | LABEL, GROUND | 2 |
| 70 | V-1978 | LABEL, ELECTRICAL | 1 |
| 71 | V-2293 | LABEL, CIRCUIT CAPABLE | 1 |
| 72 | V-2294 | LABEL, DANGER | 1 |
| 73 | V-2414 | LABEL, FUSE ID | 1 |

9.11.1 Electrical Components With 100 ft. Input Cord Option *(continued)*

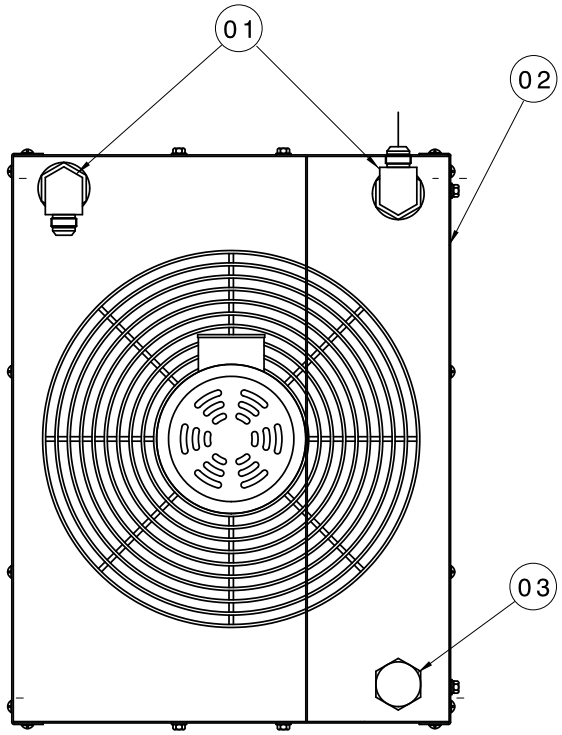
**THE FOLLOWING PARTS ARE APPLICATION SPECIFIC**
**Be sure to locate the correct voltage and hertz of the unit before selecting the part**

| ITEM | 60 HZ Applications | | | | | Description | Qty |
|---|---|---|---|---|---|---|---|
| | 208 | 230 | 380 | 460 | 575 | | |
| 6 | EC-1187-06-16.0 | EC-1187-06-16.0 | EC-1187-06-16.0 | EC-1187-06-16.0 | EC-1187-06-16.0 | CONDUIT, FLEXIBLE WIRING | |
| 7 | EC-1187-06*21.8 | EC-1187-06*21.8 | EC-1187-06*21.8 | EC-1187-06*21.8 | EC-1187-06*21.8 | CONDUIT, FLEXIBLE WIRING | |
| 10 | EC-1525 | EC-1589 | EC-1589 | EC-1589 | EC-1589 | OVERLOAD | 1 |
| 14 | EC-1557-02 | EC-1557-02 | EC-1557-01 | EC-1557-01 | EC-1557-01 | FUSE, CLASS J | 3 |
| 15 | EC-1557-31 | EC-1557-30 | EC-1557-26 | EC-1557-25 | EC-1557-24 | FUSE, CLASS J | 3 |
| 20 | EC-1587 | EC-1586 | EC-1586 | EC-1586 | EC-1586 | CONTACTOR | 1 |
| 23 | --- | --- | EC-1602-01 | EC-1602-01 | EC-1602-01 | REDUCER, FUSE | 3 |
| 26 | EC-1726-09 | EC-1726-08 | EC-1726-05 | EC-1726-04 | EC-1726-04 | FUSE, CLASS CC | 2 |
| 28 | EC-1804-02 | EC-1676-02 | EC-1804-02 | EC-1676-02 | EC-1804-02 | TRANSFORMER | 1 |
| 48 | G-1159-103506 \| 4 | G-1159-102005 \| 2 | G-1159-102005 \| 2 | G-1159-102005 \| 2 | G-1159-102005 \| 2 | SCREW, ROUND HEAD | 2/4 |

| ITEM | 50 HZ Applications | | | | | Description | Qty |
|---|---|---|---|---|---|---|---|
| | 200 | 220 | 380 | 415 | 440 | | |
| 6 | EC-1540-04*16.0 | EC-1540-04*16.0 | EC-1540-04*16.0 | EC-1540-04*16.0 | EC-1540-04*16.0 | CONDUIT, FLEXIBLE WIRING | |
| 7 | EC-1540-04*21.8 | EC-1540-04*21.8 | EC-1540-04*21.8 | EC-1540-04*21.8 | EC-1540-04*21.8 | CONDUIT, FLEXIBLE WIRING | |
| 10 | EC-1525 | EC-1525 | EC-1589 | EC-1589 | EC-1589 | OVERLOAD | 1 |
| 14 | EC-1557-04 | EC-1557-04 | EC-1557-01 | EC-1557-01 | EC-1557-01 | FUSE, CLASS J | 3 |
| 15 | EC-1557-31 | EC-1557-30 | EC-1557-26 | EC-1557-26 | EC-1557-26 | FUSE, CLASS J | 3 |
| 20 | EC-1587 | EC-1587 | EC-1586 | EC-1586 | EC-1586 | CONTACTOR | 1 |
| 23 | --- | --- | EC-1602-01 | EC-1602-01 | EC-1602-01 | REDUCER, FUSE | 3 |
| 26 | EC-1726-10 | EC-1726-09 | EC-1726-05 | EC-1726-05 | EC-1726-04 | FUSE, CLASS CC | 2 |
| 28 | EC-1804-02 | EC-1804-02 | EC-1804-02 | EC-1804-02 | EC-1804-02 | TRANSFORMER | 1 |
| 48 | G-1159-103506 \| 4 | G-1159-103506 \| 4 | G-1159-102005 \| 2 | G-1159-102005 \| 2 | G-1159-102005 \| 2 | SCREW, ROUND HEAD | 2/4 |

9.12 HEAT EXCHANGER ASSEMBLY

The Heat Exchanger Assembly does not require regular general maintenance.




| Voltage | Frequency | Part Number |
|---|---|---|
| 208v | 60 Hz | HC-2136-01 |
| 230v | 60 Hz | HC-2136-01 |
| 380v | 60 Hz | HC-2136-01 |
| 460v | 60 Hz | HC-2136-01 |
| 575v | 60 Hz | HC-2136-02 |
| 200v | 50 Hz | HC-2136-01 |
| 220v | 50 Hz | HC-2136-01 |
| 380v | 50 Hz | HC-2136-01 |
| 415v | 50 Hz | HC-2136-01 |
| 440v | 50 Hz | HC-2136-01 |

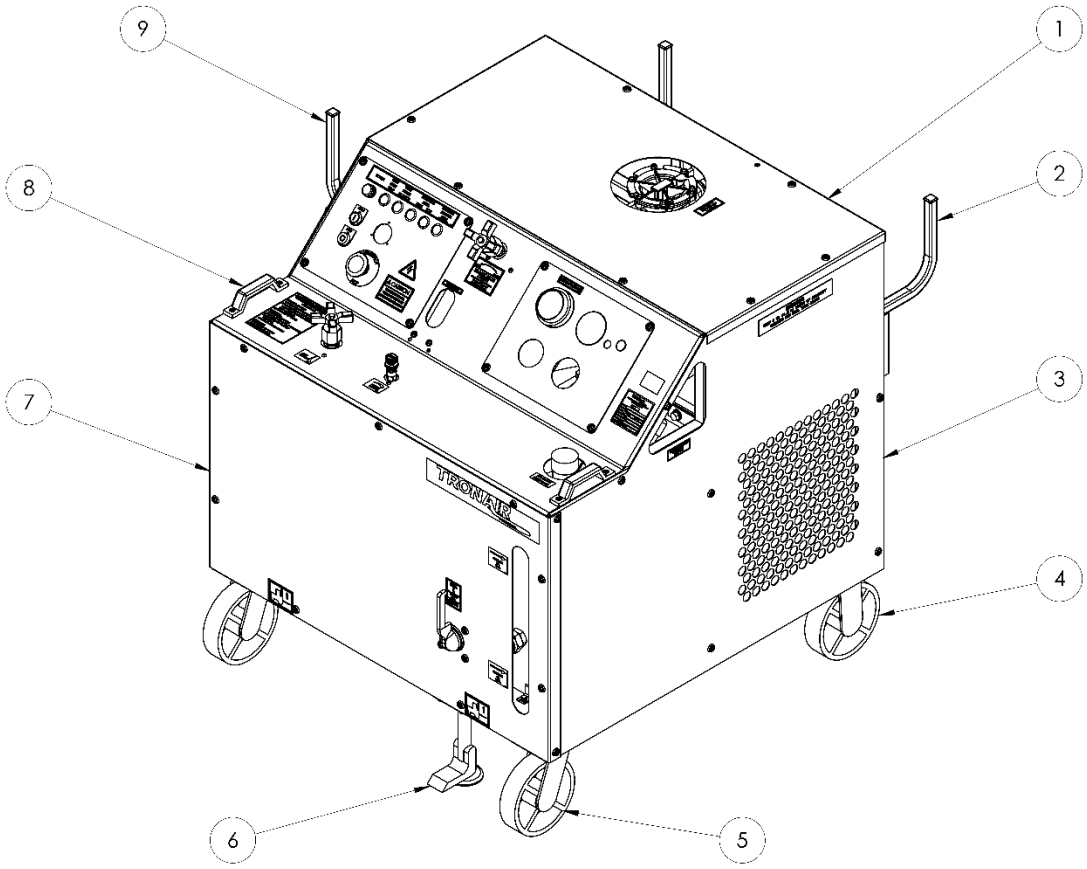
## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2001-37-S-E | N-2001-37-S-E | N-2001-37-S-V | ELBOW, STRAIGHT THREAD (12-20) | 2 |
| 2 | Reference Table above | | | CONNECTOR, STR THREAD | 1 |
| 3 | N-2066-20-S-B | N-2066-20-S-E | N-2066-20-S-V | PLUG, #20 SAE (HIDDEN) | 1 |

9.13 EXTERNAL COMPONENTS

Keep HPU clean. Do not allow labels to become damaged; thusly illegible. Regularly inspect casters and floor locks to ensure safe working condition.




## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | S-1889-01 | TOP PANEL | 1 |
| 2 | Z-5772-01 | HANGER | 3 |
| 3 | S-3953-00 | RIGHT SIDE PANEL | 1 |
| 4 | U-1093 | RIGID CASTER | 2 |
| 5 | U-1094 | SWIVEL CASTER | 2 |
| 6 | H-1142 | FLOOR LOCK | 1 |
| 7 | Z-11052-00 | FRONT PANEL | 1 |
| 8 | H-1780 | HANDLE | 2 |
| 9 | Z-5549-01 | CORD HANGER | 1 |
| N/S | Z-11301 | LEFT SIDE PANEL | 1 |
| N/S | Z-11900-00 | FRAME | 1 |

9.14 ADDITIONAL FEATURES

9.14.1 25 ft (7.6 m) Hoses *(Option A)*

Refer to Section 9.6 Hydraulic Hoses concerning hose inspection.

| **Model Number** | **Fluid Type** |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

| **5211 & 5221** | **5231** | **5241** | | |
|---|---|---|---|---|
| **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| TF-1037-01*300 | TF-1041-09*300 | TF-1038-23*300 | PRESSURE HOSE, 25 FT/7.6 M | 1 per Option |
| TF-1039-01*300 | TF-1041-15*300 | TF-1038-01*300 | RETURN HOSE, 25 FT/7.6 M | 1 per Option |

9.14.2 50 ft (15.2 m) Hoses *(Option B)*

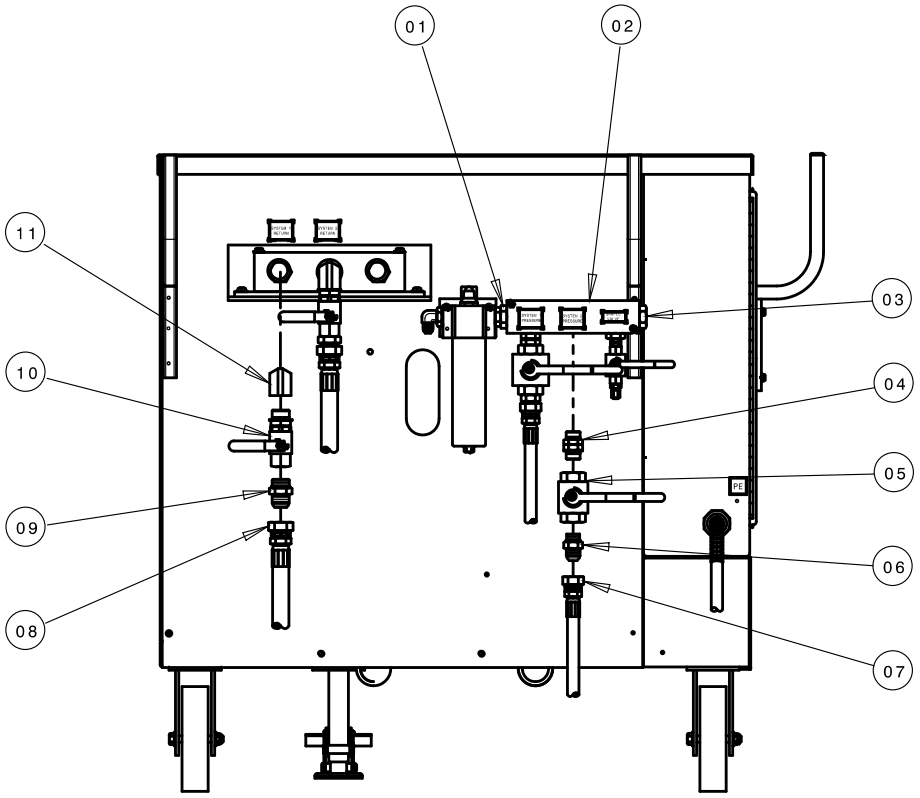
Refer to Section 9.6 Hydraulic Hoses concerning hose inspection.

| **Model Number** | **Fluid Type** |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

| **5211 & 5221** | **5231** | **5241** | | |
|---|---|---|---|---|
| **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| TF-1037-01*300 | TF-1041-09*300 | TF-1038-23*300 | PRESSURE HOSE, 25 FT/7.6 M | 2 per Option |
| TF-1039-01*300 | TF-1041-15*300 | TF-1038-01*300 | RETURN HOSE, 25 FT/7.6 M | 2 per Option |
| N-2011-06-S | N-2011-06-S | | UNION | 1 per Option |
| N-2011-08-S | N-2011-08-S | | UNION, # 12 | 1 per Option |

9.14.3 Split System *(Option C)*

Refer to Section 9.6 Hydraulic Hoses concerning hose inspection.



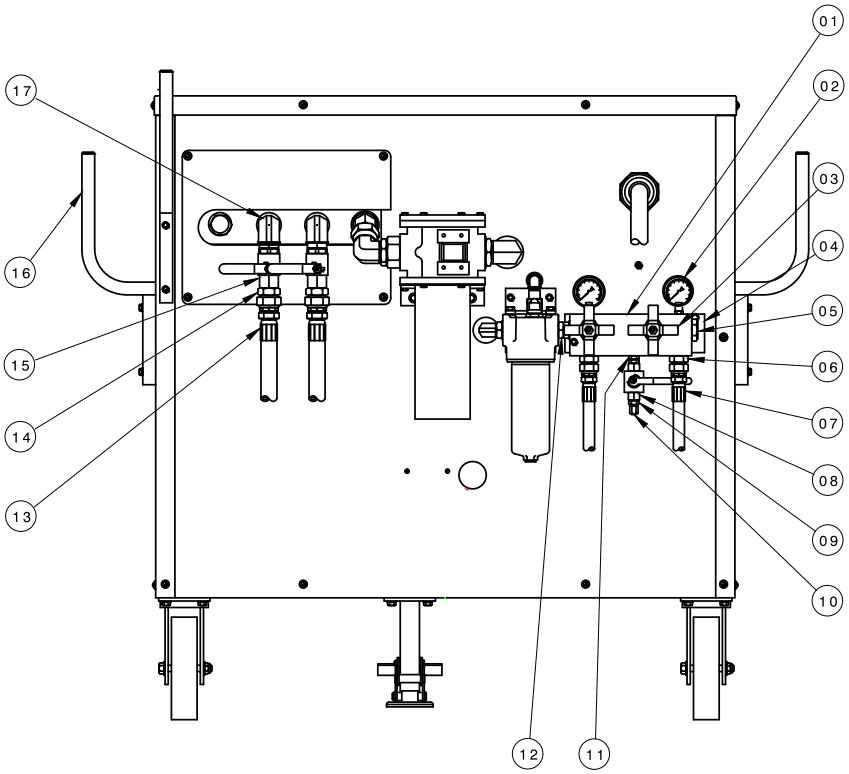

## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2464-14-S-B | N-2464-14-S-E | N-2464-14-S-V | UNION, MALE STR THREAD #12 X #16 | 1 |
| 2 | HC-1908 | HC-1908 | HC-1908 | PRESSURE MANIFOLD (PLATED) | 1 |
| 3 | N-2053-10-S-B | N-2053-10-S-E | N-2053-10-S-V | PLUG, MALE STR THREAD #16 | 1 |
| 4 | N-2464-08-S-B | N-2464-08-S-E | N-2464-08-S-V | UNION, MALE STR THREAD #12 | 1 |
| 5 | HC-1768-04 | HC-1771-04 | HC-2206-04 | BALL VALVE | 1 |
| 6 | N-2007-14-S-B | N-2007-18-S-E | N-2007-14-S-V | CONNECTOR, STR THREAD #12 X #12 JIC | 1 |
| 7 | TF-1037-01*180 | TF-1040-09*180 | TF-1038-23*180 | PRESSURE HOSE ASSEMBLY, #12 | 1 |
| 8 | TF-1039-01*180 | TF-1041-15*180 | TF-1038-01*180 | RETURN HOSE ASSEMBLY, #16 | 1 |
| 9 | N-2007-21-S-B | N-2007-21-S-E | N-2007-21-S-V | CONNECTOR, STR THREAD #16 X #16 JIC | 1 |
| 10 | HC-2206-05 | HC-1771-05 | HC-2206-05 | BALL VALVE, #16 SAE | 1 |
| 11 | N-2638-06-S-B | N-2638-06-S-E | N-2638-06-S-V | ELBOW, 90° #16 M-SAE X #16 F-SAE | 1 |
| N/S | N-2464-10-S-B | N-2464-10-S-E | N-2464-10-S-V | UNION, #16 STRAIGHT THREAD | 1 |

9.14.4 Crossover Check (Option D)

Refer to Section ***9.6 Hydraulic Hoses*** concerning hose inspection. Annual calibration of instrumentation is recommended. See Section ***12.0 – Calibration of Instrumentation*** for details of gauge calibration.




## Parts List

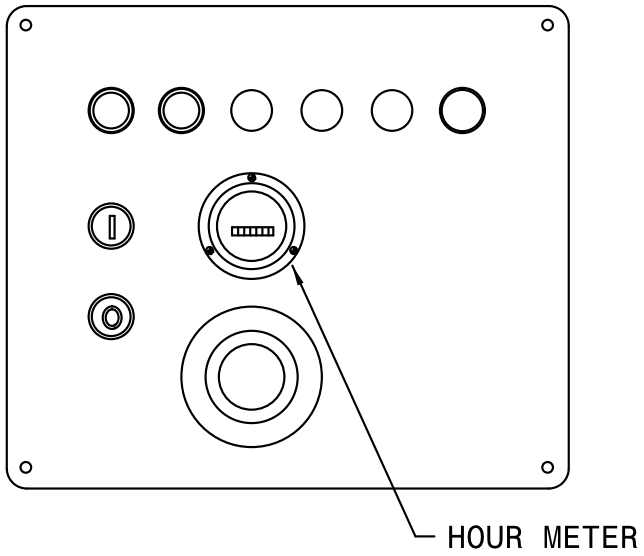
**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | J-3516 | J-3516 | J-3516 | CROSSOVER CHECK MANIFOLD | 1 |
| 2 | HC-1257 | HC-1257 | HC-1257 | PRESSURE GAUGE | 2 |
| 3 | HC-1254-05 | HC-1254-05 | HC-1254-05 | CARTRIDGE NEEDLE VALVE | 2 |
| 4 | HC-1437 | HC-1437 | HC-1436 | CHECK VALVE | 2 |
| 5 | N-2007-14-S-B | N-2007-14-S-E | N-2007-14-S-V | CONNECTOR, STRAIGHT THREAD | 2 |
| 6 | TF-1037-01*180 | TF-1041-09*180 | TF-1038-23*180 | PRESSURE HOSE ASSEMBLY | 2 |
| 7 | HC-1768-02 | HC-1771-02 | HC-2206-04 | BALL VALVE (#6) | 1 |
| 8 | N-2007-05-S-B | N-2007-05-S-E | N-2007-05-S-V | CONNECTOR, STRAIGHT THREAD | 1 |
| 9 | N-2008-03-S | N-2008-03-S | N-2008-03-S | CAP, #4 FEMALE | 1 |
| 10 | N-2464-05-S-B | N-2464-05-S-E | N-2464-05-S-V | UNION, STRAIGHT THREAD #6 SAE | 1 |
| 11 | N-2464-08-S-B | N-2464-08-S-E | N-2464-08-S-V | UNION, STRAIGHT THREAD #12 SAE | 1 |
| 12 | TF-1039-01*180 | TF-1041-15*180 | TF-1038-01*180 | RETURN HOSE ASSEMBLY | 2 |
| 13 | N-2007-21-S-B | N-2007-21-S-E | N-2007-21-S-V | CONNECTOR, STRAIGHT THREAD | 2 |
| 14 | HC-2206-05 | HC-1771-05 | HC-2206-05 | BALL VALVE (#16) | 2 |
| 15 | N-2638-06-S-B | N-2638-06-S-E | N-2638-06-S-V | ELBOW, 90° (#16 SAE) | 2 |
| N/S | N-2464-10-S-B | N-2464-10-S-E | N-2464-10-S-V | UNION, #16 STRAIGHT THREAD | 1 |

9.14.5 Hour Meter (Options E and F)

The Hour Meter does not require regular general maintenance.

**NOTE: Wire Hour Meter per Electrical Schematic INS-2016. Reference Wiring Diagram INS-2144**




## Parts List

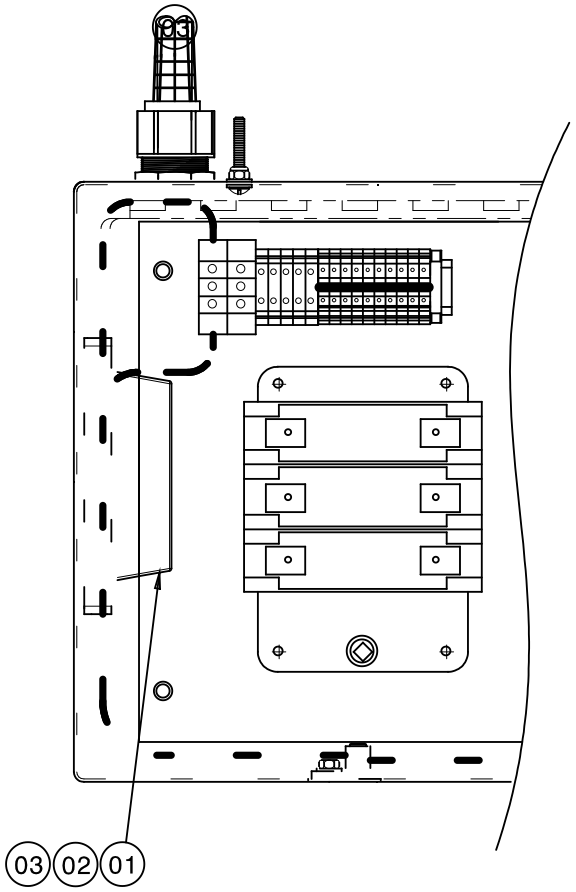
**All Models - All Fluid Types**

| Part Number | Application | Description | Qty |
|---|---|---|---|
| EC-1577 | 50 Hz Operation | Hour Meter | 1 |
| EC-1578 | 60 Hz Operation | Hour Meter | 1 |

9.14.6 Voltage/Phase Monitor (Options G – J)

The Voltage/Phase Monitor does not require regular general maintenance. The panel indicator light will illuminate if a tripped condition exists. If the Voltage/Phase Monitor is causing the HPU to shut off, verify the ♦Phase Monitor settings shown. Continued tripping may indicate a serious electrical problem. See Section ***10.0 – Provision of Spares*** for recommended spare fuses.

**NOTE: Wire per Electrical Schematic INS-2016 Reference Wiring Diagram INS-2144. Reference Section 9.7.1 Electrical Panel for Panel Light.**




## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | EC-1541-01 | Fuse Holder, IEC Class CC | 3 |
| 2 | EC-1675-12 | Fuse, KTK-R, 2 amp | 3 |
| 3 | See Table below | Phase Monitor | 1 |

**Phase Monitor**

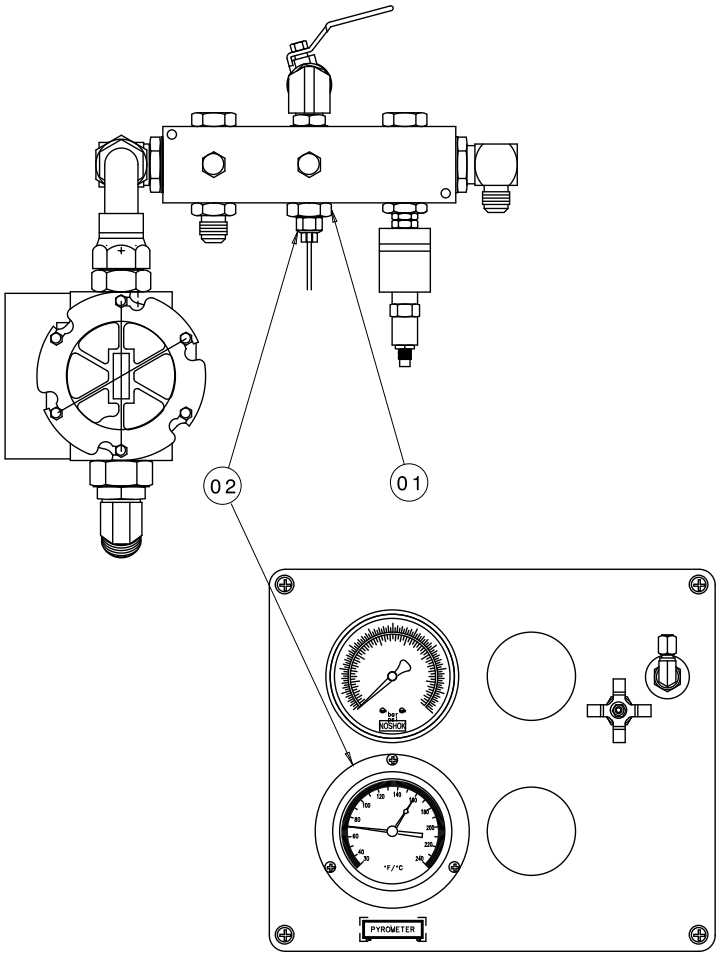
| Option | Voltage | Frequency | Part Number |
|---|---|---|---|
| G | 200 – 230 | 50/60 Hz | EC-1543-02 |
| H | 380 | 50/60 Hz | EC-1543-03 |
| I | 415 – 460 | 50/60 Hz | EC-1543-04 |
| J | 575 | 60 Hz | EC-1543-05 |

♦ Setting Instructions for Item 3:

1. Set ***Line Voltage*** to match the voltage rating of the Hydraulic Power Unit.
2. Set ***% Voltage Unbalanced*** to 5% for 60 Hz unit or 6% for 50 Hz unit.
3. Set ***Trip Delay*** to three (3) seconds.

9.14.7 Pyrometer *(Option K)*

Refer to Section 11.7 – Analog Temperature Gauge when calibration of the pyrometer is desired.




## Parts List

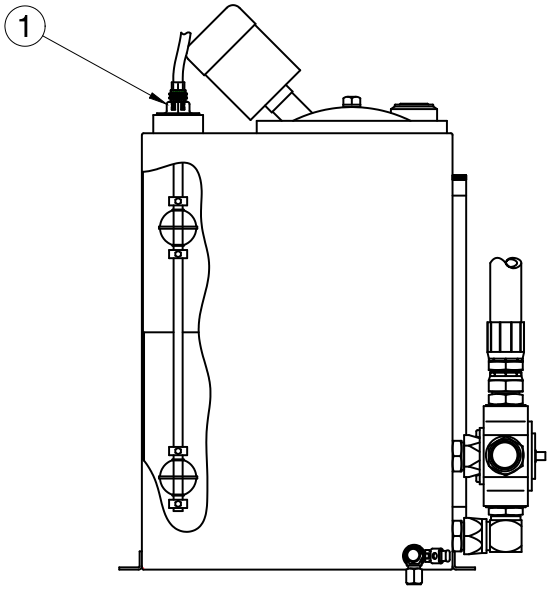
**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2463-16-S-B | N-2463-16-S-E | N-2463-16-S-V | REDUCER FITTING | 1 |
| 2 | HC-1769-01 | HC-2268-02 | HC-2268-03 | PYROMETER | 1 |

9.14.8 Electric Reservoir Level *(Option L)*

The Electric Reservoir Level switch does not require regular general maintenance. Panel indicator lights will indicate low or high fluid level.

**NOTE: Wire per Electrical Schematic INS-2016. Reference Wiring Diagram INS-2144. Reference 9.7.1 Electrical Panel for Panel Light.**



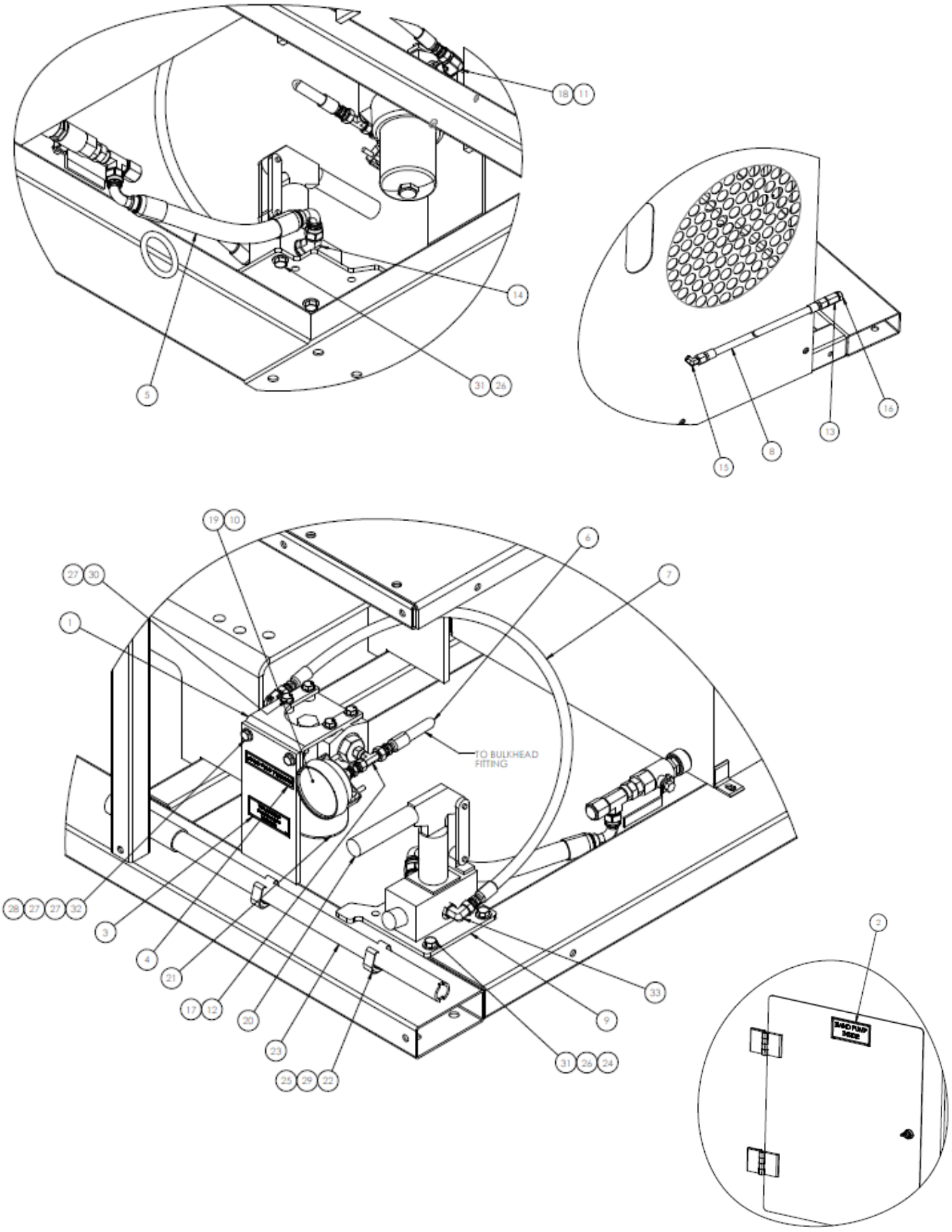

## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | EC-1798 | Multi-Level Switch (includes Plug-in Cable) | 1 |

9.14.9 Hand Pump *(Option M)*

Refer to Section 9.6 Hydraulic Hoses concerning hose inspection for general maintenance on Items 5, 10, 12, and 14 hose assemblies. Refer to Section 9.5.3 – Hand Pump (*Optional)* Filter



9.14.9 Hand Pump *(Option M) (continued)*

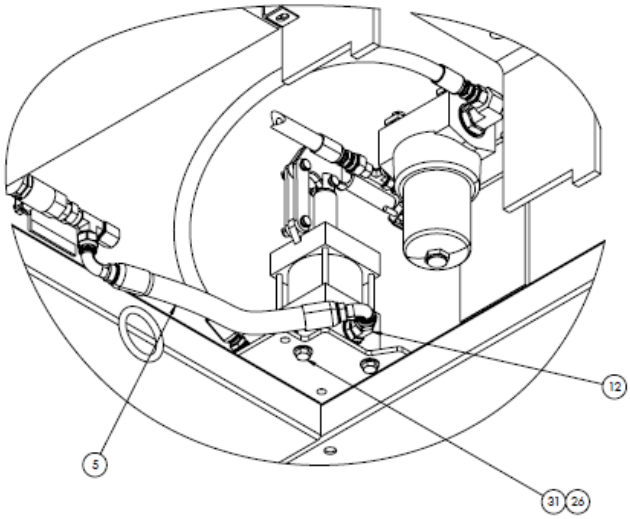
## Parts List

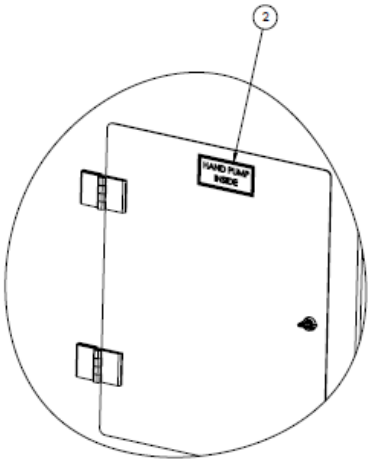
**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

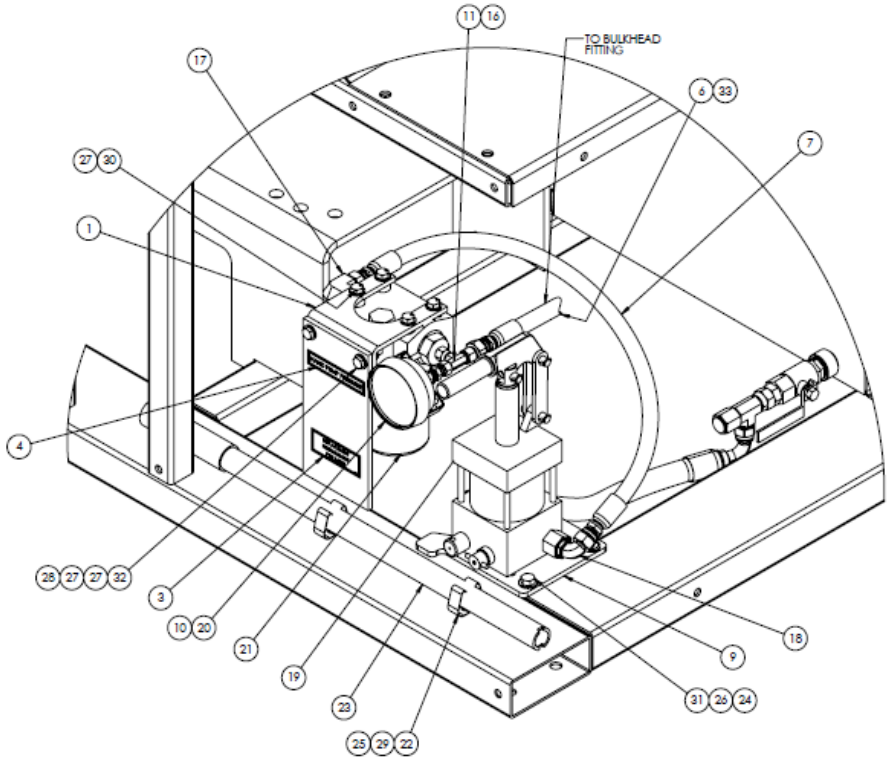
| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | Z-5093-00 | Z-5093-00 | Z-5093-00 | BRACKET, FILTER (P) | 1 |
| 2 | V-2929 | V-2929 | V-2929 | LABEL, HAND PUMP INSIDE | 1 |
| 3 | V-1988 | V-1989 | V-2050 | LABEL, FILTER REPLACEMENT | 1 |
| 4 | V-1887 | V-1887 | TF-1038-62-14.3 | LABEL, HAND PUMP PRESSURE | 1 |
| 5 | TF-1038-62-14.3 | TF-1041-26-14.3 | TF-1038-62-14.3 | HOSE ASSEMBLY, #8 | 1 |
| 6 | TF-1038-14-41.0 | TF-1041-05-41.0 | TF-1038-14-41.0 | HOSE ASSEMBLY, #4 | 1 |
| 7 | TF-1038-14-33.8 | TF-1041-05-33.8 | TF-1038-14-33.8 | HOSE ASSEMBLY, #4 | 1 |
| 8 | TF-1038-14-180 | TF-1041-05-180 | TF-1038-14-180 | HOSE ASSEMBLY, #4 | 1 |
| 9 | S-4085-00 | S-4085-00 | S-4085-00 | MOUNTING PALTE, HAND PUMP | 1 |
| 10 | N-2697-01-S | N-2697-01-S | N-2697-01-S | UNION, SWIVEL NUT | 1 |
| 11 | N-2463-10-S-B | N-2463-10-S-E | N-2463-10-S-V | FITTING, REDUCER/EXPANDER | 1 |
| 12 | N-2091-01-SS | N-2091-01-SS | N-2091-01-SS | SWIVEL, BRANCH TEE (-4) | 1 |
| 13 | N-2055-01-S | N-2055-01-S | N-2055-01-S | REDUCER, TUBE | 1 |
| 14 | N-2042-06-S-B | N-2042-06-S-E | N-2042-06-SV | ELBOW, 45º STR THD | 1 |
| 15 | N-2022-03-S | N-2022-03-S | N-2022-03-S | ELBOW, BLKHD, #4 JIC | 1 |
| 16 | N-2014-05-S | N-2014-05-S | N-2014-05-S | PLUG | 1 |
| 17 | N-2007-14-S-B | N-2007-14-S-E | N-2007-14-S-V | CONNECTOR, STR THD | 1 |
| 18 | N-2001-06-S-B | N-2001-06-S-E | N-2001-06-S-V | ELBOW, STR THD | 1 |
| 19 | HC-2146 | HC-2146 | HC-2146 | GAUGE, PRESSURE 10,000 PSI | 1 |
| 20 | HC-1778 | HC-1779 | HC-2249 | PUMP, 2 STAGE HYDRAULIC HAND | 1 |
| 21 | HC-1776 | HC-1777 | HC-2250 | FILTER, PRESSURE | 1 |
| 22 | H-1438-02 | H-1438-02 | H-1438-02 | HOLDER, SPRING CLIP | 2 |
| 23 | H-1009-01 | H-1009-01 | H-1009-01 | HANDLE, PUMP (P) | 1 |
| 24 | G-1439-1070-S | G-1439-1070-S | G-1439-1070-S | NUTSERT, 3/8-16 OPEN END | 2 |
| 25 | G-1439-1035-S | G-1439-1035-S | G-1439-1035-S | NUTSERT, #10-32 OPEN END | 2 |
| 26 | G-1250-1070N | G-1250-1070N | G-1250-1070N | FLATWASHER, 3/8 NARROW | 4 |
| 27 | G-1250-1060N | G-1250-1060N | G-1250-1060N | FLATWASHER, 5/16 NARROW | 8 |
| 28 | G-1202-1060 | G-1202-1060 | G-1202-1060 | STOPNUT, 5/16-18 ELASTIC | 2 |
| 29 | G-1157-13504 | G-1157-13504 | G-1157-13504 | SCREW, #10-32 X 1/2 LG PAN HD CRS REC | 2 |
| 30 | G-1114-080016 | G-1114-080016 | G-1114-080016 | BOLT, M8-1.25 X 16MM LG CLASS 8.8 | 4 |
| 31 | G-1100-107010 | G-1100-107010 | G-1100-107010 | BOLT, 3/8-16 X 1.0 HEX HD GR 5 | 4 |
| 32 | G-1100-106012 | G-1100-106012 | G-1100-106012 | BOLT, 5/19-18 X 1-1/4 LG HEX HD GR 5 | 2 |
| 33 | N-2001-05-S-B | N-2001-05-S-E | N-2001-05-S-V | ELBOW, STRAIGHT THREAD | 1 |

9.14.10 Hand Pump *(Option M-7)*

Refer to Section ***9.6 Hydraulic Hoses*** concerning hose inspection for general maintenance on hose assemblies.
Refer to Section ***9.5.3 – Hand Pump Filter***.



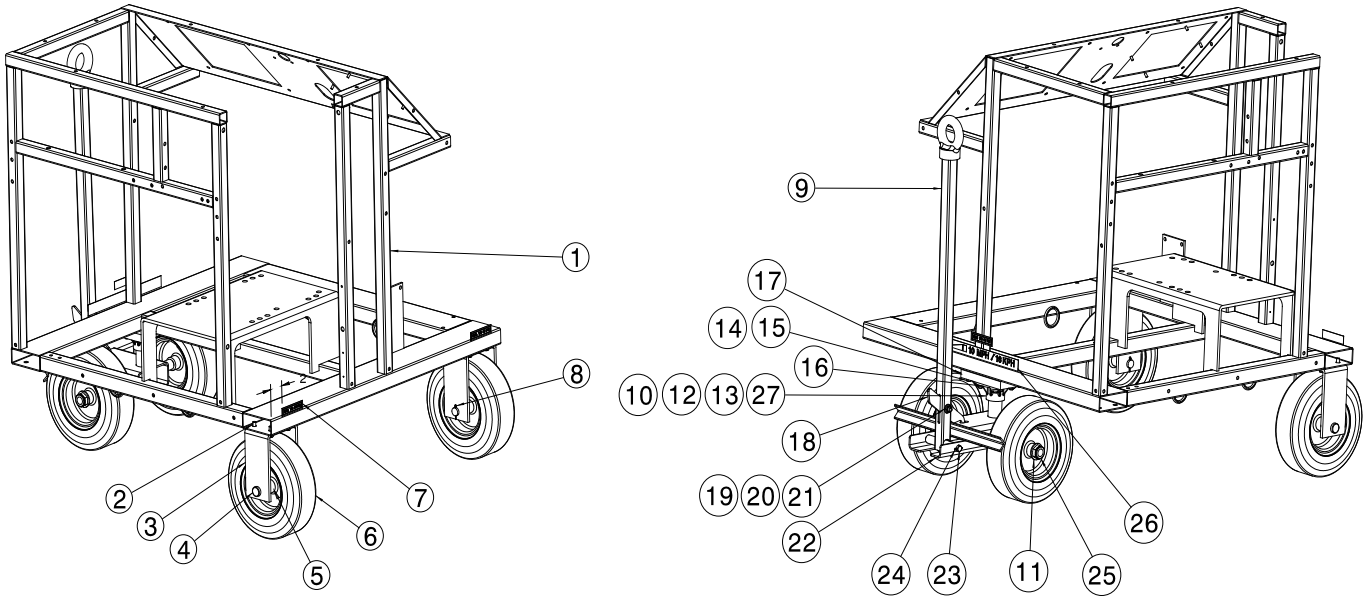
9.14.10 Hand Pump *(Option M-7) (continued)*

## Parts List

| Model Number | Fluid Type |
|---|---|
| 5211 | MIL-PRF-5606 |
| 5221 | MIL-PRF-83282 |
| 5231 | Aviation Phosphate Ester, Type IV and V |
| 5241 | MIL-PRF-87257 |

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | Z-5093-00 | Z-5093-00 | Z-5093-00 | BRACKET, FILTER (P) | 1 |
| 2 | V-2929 | V-2929 | V-2929 | LABEL, HAND PUMP INSIDE | 1 |
| 3 | V-1988 | V-1989 | V-2050 | LABEL, FILTER REPLACEMENT | 1 |
| 4 | V-1887 | V-1887 | TF-1038-62-14.3 | LABEL, HAND PUMP PRESSURE | 1 |
| 5 | TF-1038-62-14.3 | TF-1041-26-14.3 | TF-1038-62-14.3 | HOSE ASSEMBLY, #8 | 1 |
| 6 | TF-1038-18-41.0 | TF-1041-66-41.0 | TF-1038-18-41.0 | HOSE ASSEMBLY, #6 | 1 |
| 7 | TF-1038-18-26.0 | TF-1041-66-33.8 | TF-1038-18-26.0 | HOSE ASSEMBLY, #4 | 1 |
| 8 | TF-1038-04-300 | TF-1041-02-300 | TF-1038-04-300 | HOSE ASSEMBLY, #6 | 2 |
| 9 | S-4085-00 | S-4085-00 | S-4085-00 | MOUNTING PALTE, HAND PUMP | 1 |
| 10 | N-2697-01-S | N-2697-01-S | N-2697-01-S | UNION, SWIVEL NUT | 1 |
| 11 | N-2091-01-SS | N-2091-01-SS | N-2091-01-SS | SWIVEL, BRANCH TEE (-4) | 1 |
| 12 | N-2042-06-S-B | N-2042-06-S-E | N-2042-06-SV | ELBOW, 45º STR THD | 1 |
| 13 | N-2022-05-S | N-2022-05-S | N-2022-05-S | ELBOW, BLKHD, #4 JIC | 1 |
| 14 | N-2014-05-S | N-2014-05-S | N-2014-05-S | PLUG | 1 |
| 15 | N-2011-05-S | N-2011-05-S | N-2011-05-S | UNION, -06 JIC M X -06 JIC M | 1 |
| 16 | N-2007-47-S-B | N-2007-47-S-E | N-2007-47-S-V | CONNECTOR, STR THD | 1 |
| 17 | N-2001-39-S-B | N-2001-39-S-E | N-2001-39-S-V | ELBOW, STR THD | 1 |
| 18 | N-2001-08-S-B | N-2001-08-S-E | N-2001-08-S-V | ELBOW, STR THD | 1 |
| 19 | HC-2577 | HC-2970 | HC-2971 | PUMP, HYDRAULIC HAND | 1 |
| 20 | HC-2188 | HC-2188 | HC-2188 | GAUGE, PRESSURE 300 PSI | |
| 21 | HC-1776 | HC-1777 | HC-2250 | FILTER, PRESSURE | 1 |
| 22 | H-1438-02 | H-1438-02 | H-1438-02 | HOLDER, SPRING CLIP | 2 |
| 23 | H-1009-01 | H-1009-01 | H-1009-01 | HANDLE, PUMP (P) | 1 |
| 24 | G-1439-1070-S | G-1439-1070-S | G-1439-1070-S | NUTSERT, 3/8-16 OPEN END | 2 |
| 25 | G-1439-1035-S | G-1439-1035-S | G-1439-1035-S | NUTSERT, #10-32 OPEN END | 2 |
| 26 | G-1250-1070N | G-1250-1070N | G-1250-1070N | FLATWASHER, 3/8 NARROW | 4 |
| 27 | G-1250-1060N | G-1250-1060N | G-1250-1060N | FLATWASHER, 5/16 NARROW | 8 |
| 28 | G-1202-1060 | G-1202-1060 | G-1202-1060 | STOPNUT, 5/16-18 ELASTIC | 2 |
| 29 | G-1157-13504 | G-1157-13504 | G-1157-13504 | SCREW, #10-32 X 1/2 LG PAN HD CRS REC | 2 |
| 30 | G-1114-080016 | G-1114-080016 | G-1114-080016 | BOLT, M8-1.25 X 16MM LG CLASS 8.8 | 4 |
| 31 | G-1100-107010 | G-1100-107010 | G-1100-107010 | BOLT, 3/8-16 X 1.0 HEX HD GR 5 | 4 |
| 32 | G-1100-106012 | G-1100-106012 | G-1100-106012 | BOLT, 5/19-18 X 1-1/4 LG HEX HD GR 5 | 2 |
| 33 | N-2052-06 | N-2052-06 | N-2052-06 | ADAPTER, -04 F JIC X -06 M JIC | 1 |

9.14.11 Towing Trailer *(Option N)*
Air Pressure: 55 psi



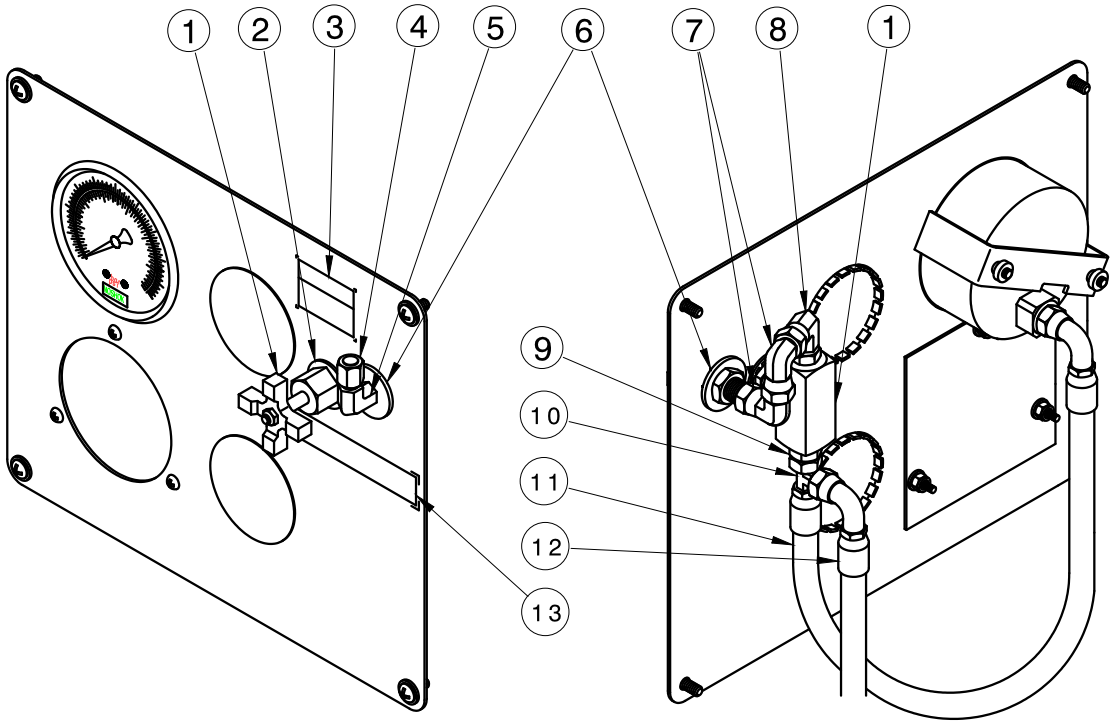

## Parts List

**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | Z-5775-01 | Weldment, Frame | *Ref* |
| 2 | G-1100-107010 | Bolt, HH, 3/8 – 16 x 1 long | 8 |
| 3 | J-3669-01 | Bracket, Fixed Wheel | 2 |
| 4 | G-1302-21 | Pin, Clevis 1 OD x 6 | 2 |
| 5 | TR-1894-01 | Spacer, Wheel | 4 |
| 6 | U-1113 | Assembly, Tire/Rim | 4 |
| 7 | V-1392 | Label, Tire Pressure | 3 |
| 8 | G-1301-03 | Pin, Cotter, 1/8 x 1 ½ long | 2 |
| 9 | Z-5584-03 | Weldment, Towbar | 1 |
| 10 | H-2789 | Hub, Idler | 1 |
| 11 | G-1250-1130N | Flatwasher, 1” Narrow | 3 |
| 12 | G-1230-01 | Nut, Axle, 1-14 UNS | 1 |
| 13 | G-1301-01 | Pin, Cotter, 3/16 x 1 ½ long | 1 |
| 14 | G-1100-107016 | Bolt, HH, 3/8 – 16 x 1 ¾ long | 4 |
| 15 | G-1250-1070N | Flatwasher, 3/8 Narrow | 4 |
| 16 | G-1151-109514 | Screw, ½ - 20 HEX SOC HD CAP | 4 |
| 17 | J-3670-01 | Plate, Steering Mount | 1 |
| 18 | J-3427 | Lever | 1 |
| 19 | G-1100-109522 | Bolt, HH, ½ - 20 x 2 ½ long | 1 |
| 20 | G-1250-1090N | Flatwasher, ½ Narrow | 2 |
| 21 | G-1203-1095 | Jamnut, Elastic, ½ - 20 | 1 |
| 22 | Z-6044-01 | Weldment, Steer Axle | 1 |
| 23 | R-2096 | Pin, Towbar | 1 |
| 24 | G-1301-02 | Pin, Cotter, 1/8 x 1 long | 2 |
| 25 | G-1203-1120 | Jamnut, Elastic, 1 - 14 | 2 |
| 26 | V-2074 | Label, Max Towing | 1 |
| 27 | G-1283 | Washer, Spindle | 1 |

9.14.12 Calibration Port *(Option Q)*

Refer to Section 9.6 Hydraulic Hoses concerning hose inspection.




## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

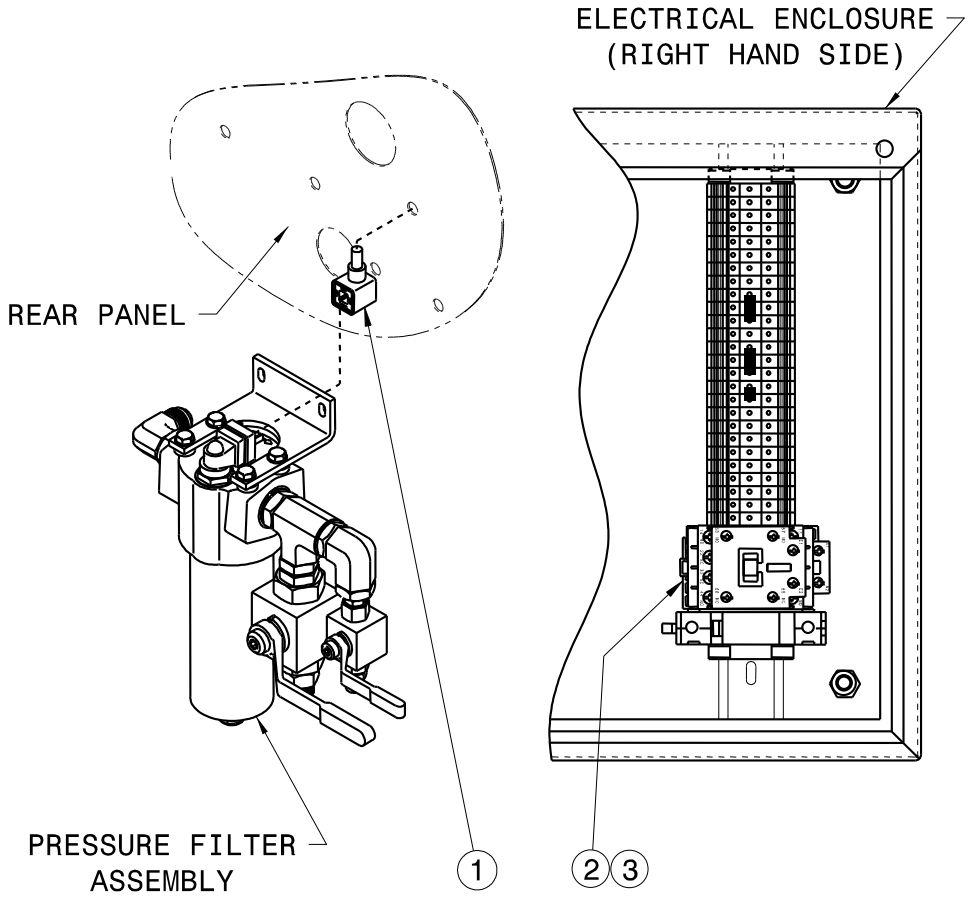
| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | HC-1900-01 | HC-1900-02 | HC-1900-03 | NEEDLE VALVE | 1 |
| 2 | HC-1122 | HC-1122 | HC-1122 | KIT, PANEL MOUNTING (MVK-4) | 1 |
| 3 | V-1470 | V-1470 | V-1470 | LABEL, CAUTION | 1 |
| 4 | N-2008-03-S | N-2008-03-S | N-2008-03-S | CAP, ¼, #4 JIC | 1 |
| 5 | N-2022-03-S | N-2022-03-S | N-2022-03-S | ELBOW, BULKHEAD UNION W/LOCKNUT #4 | 1 |
| 6 | G-1250-1080W | G-1250-1080W | G-1250-1080W | FLATWASHER, 7/16 WIDE | 2 |
| 7 | N-2002-03-S | N-2002-03-S | N-2002-03-S | ELBOW, SWIVEL NUT #4 | 2 |
| 8 | N-2049-07-S-B | N-2049-07-S-E | N-2049-07-S-V | ELBOW, 90° SWIVEL & O-RING #4 X #6 | 1 |
| 9 | N-2007-03-S-B | N-2007-03-S-E | N-2007-05-S-V | CONNECTOR, STRAIGHT THREAD #4 | 1 |
| 10 | N-2016-03-S | N-2016-03-S | N-2016-03-S | TEE, SWIVEL NUT RUN, #4 | 1 |
| 11 | TF-1038-16*23.0 | TF-1041-49*16.0 | TF-1038-16*23.0 | HOSE ASSEMBLY, #4 | 1 |
| 12 | TF-1038-16*23.0 | TF-1040-42*32.0 | TF-1038-16*23.0 | HOSE ASSEMBLY, #4 | REF |
| 13 | V-1888 | V-1888 | V-1888 | LABEL, SHUT-OFF CALIBRATION | 1 |

9.14.13 Electric Filter Clogging Indicator *(Option R)*

The Electric Filter Clogging Indicator does not require regular general maintenance. The panel light will illuminate when the clogging indicator senses a 50 psi differential pressure across the filter element. Installing a new filter element will eliminate the clogged condition. Pushing the illuminated button will reset the indicator light.

**NOTES: 1) Higher flow rates will result in higher differential pressures. (Example: The clogging indicator may sense a 50 psi differential pressure at a flow rate of 10 gpm but not show a clogged condition when the flow rate is reduced to 5 gpm.**

**2) Wire per Electrical Schematic INS-2016 Reference Wiring Diagram INS-2144. Reference 9.7.1 Electrical Panel for Panel Light.**




## Parts List

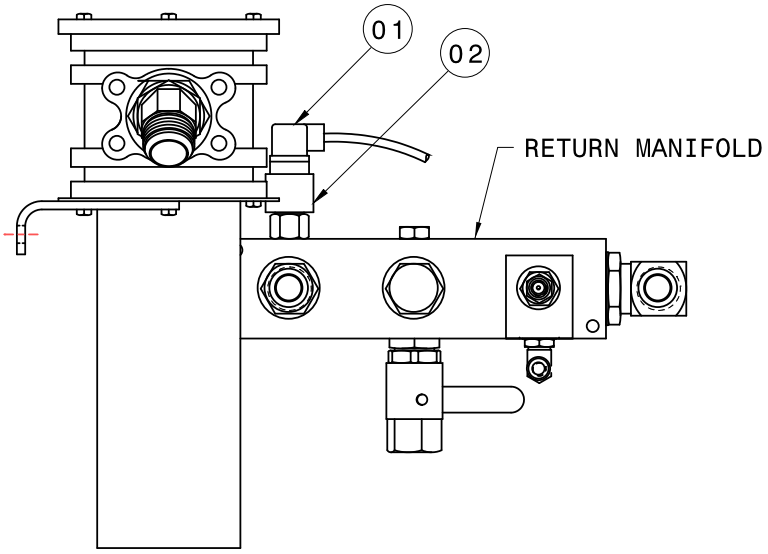
**All Models - All Fluid Types**

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | EC-2198 | DIN Connector Cable | 1 |
| 2 | EC-1564 | Relay, Control | 1 |
| 3 | EC-1591-04 | Latch, Mechanical | 1 |

9.14.14 Electric Over-Temperature *(Option S)*

The Electric Over-Temperature switch does not require regular general maintenance. However, automatic shut down due to high fluid temperature is an indication that maintenance or training may be needed elsewhere.

**NOTE: Wire per Electrical Schematic INS-2016. Reference Wiring Diagram INS-2144. Reference 9.7.1 Electrical Panel for Panel Light.**



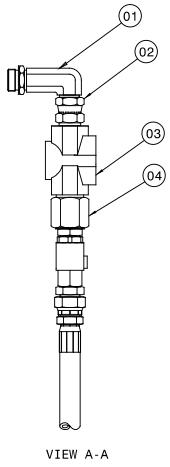

## Parts List

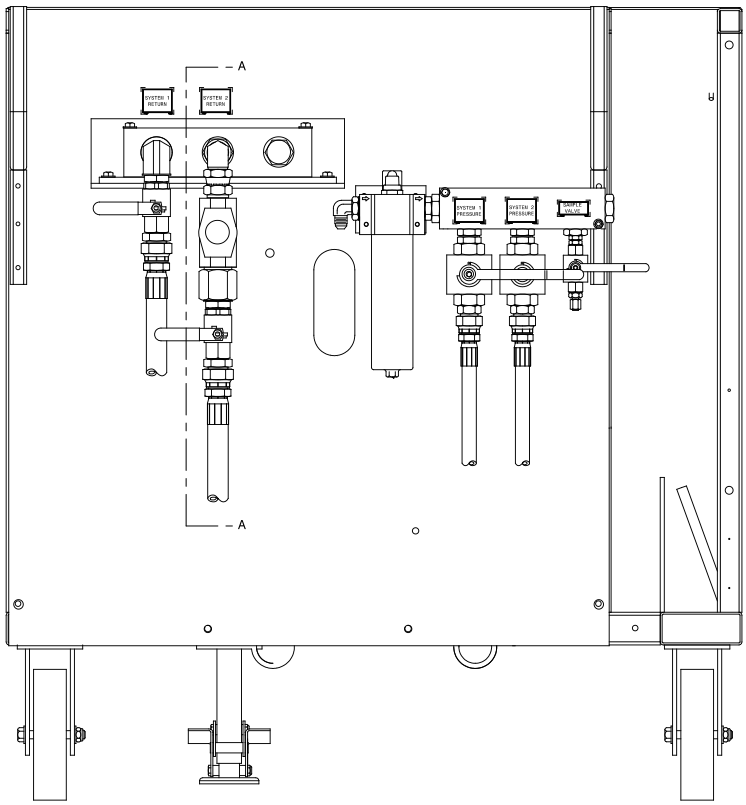
**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | EC-2198 | EC-2198 | EC-2198 | DIN CONNECTOR CABLE | 1 |
| 2 | EC-1782-01 | EC-1782-02 | EC-1782-03 | TEMPERATURE SWITCH | 1 |

9.14.15 Return Sight Gauge *(Option U)*

Refer to Section ***10.6 Hydraulic Hoses*** concerning hose inspection. Annual calibration of instrumentation is recommended.



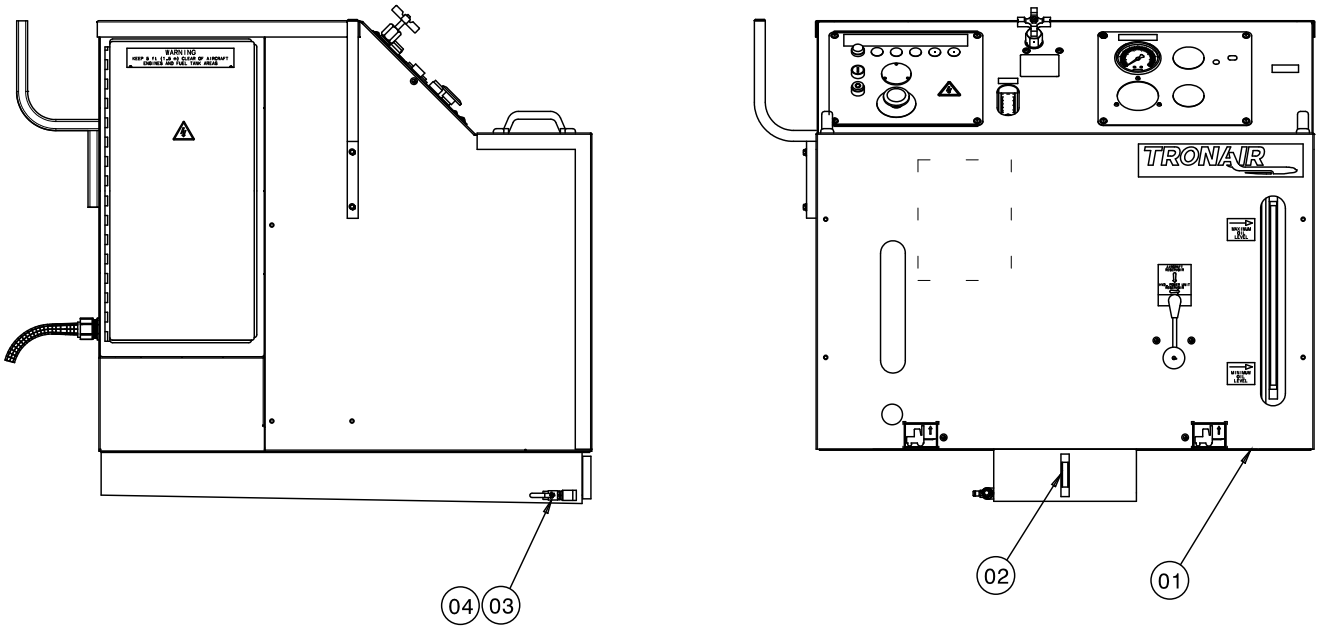




## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | N-2706-S-B | N-2706-S-E | N-2706-S-V | ELBOW, LONG STRAIGHT THREAD | 1 |
| 2 | N-2030-11-S | N-2030-11-S | N-2030-11-S | SWIVEL, FEMALE (-16 X 1 NPT) | 1 |
| 3 | HC-2261 | HC-2261 | HC-2261 | SIGHT GAUGE, FLOW 1” NPT | 1 |
| 4 | N-2226-08-S | N-2226-08-S | N-2226-08-S | CONNECTOR, MALE PIPE | 1 |

9.14.16 Drip Pan *(Option 4)*




## Parts List

**Model Number** **Fluid Type**
5211 ..... MIL-PRF-5606
5221 ..... MIL-PRF-83282
5231 ..... Aviation Phosphate Ester, Type IV and V
5241 ..... MIL-PRF-87257

| | 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|---|
| **Item** | **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| 1 | S-2508 | S-2508 | S-2508 | PAN, DRIP | 1 |
| 2 | HC-1382-03 | HC-1383-03 | HC-2340-03 | GAUGE, SIGHT | 1 |
| 3 | HC-1766-02 | HC-1770-02 | HC-2209-02 | VALVE, BALL | 1 |
| 4 | N-2661-02-S-B | N-2661-02-S-E | N-2661-02-S-V | ELBOW, STRAIGHT THREAD | 1 |
| 5 | G-1100-107010 | G-1100-107010 | G-1100-107010 | BOLT, ⅜– 16 HEX HEAD GRADE 5 | 8 |
| 6 | G-1250-1070W | G-1250-1070W | G-1250-1070W | WASHER, ⅜ REGULAR | 8 |

9.15 REPLACEMENT LABELS PARTS LISTS

9.15.1 Base Unit

| Part Number | Description | Qty |
|---|---|---|
| V-1001 | "MADE IN USA" | 1 |
| V-1033 | "TRONAIR" | 1 |
| V-1050 | ISO ELECTRICAL SHOCK SYMBOL | 2 |
| V-1365 | "SYSTEM PRESSURE" | 1 |
| V-1366 | "HPU BY-PASS VALVE" | 1 |
| V-1882 | CONTROL PANEL LIGHTS | 1 |
| V-1884 | "FLOWMETER" | 1 |
| V-1893 | "SAMPLE VALVE" | 1 |
| V-1894 | "PRESSURE" | 1 |
| V-1895 | "RETURN" | 1 |
| V-1896 | "MAXIMUM OIL LEVEL" | 1 |
| V-1897 | "MINIMUM OIL LEVEL" | 1 |
| V-1900 | "WARNING KEEP 5 FT CLEAR…" | 2 |
| V-1901 | HYDRAULIC SCHEMATIC | 1 |
| V-1902 | ELECTRICAL SCHEMATIC | 1 |
| V-1914 | RESERVOIR SELECTOR VALVE | 1 |
| V-1919 | "OPERATING INSTRUCTIONS…" | 1 |
| V-2246 | LABEL, PUMP CONTROLS | 1 |

9.15.2 Fluid Labels

| Model | Part Number | Description | Qty |
|---|---|---|---|
| 5211 | V-1975 | " MIL-PRF-5606 FLUID ONLY" | 2 |
| 5221 | V-1976 | " MIL-PRF-83282 FLUID ONLY" | 2 |
| 5231 | V-1977 | "PHOSPHATE ESTER FLUIDS ONLY" | 2 |

9.15.3 Filter Element Kit Labels

| Model | Part Number | Description | Qty |
|---|---|---|---|
| 5211, 5221 | V-1905 | "REPLACEMENT FILTER ELEMENT K-3493" | 1 |
| 5211, 5221 | V-2001 | "REPLACEMENT FILTER ELEMENT K-1416" | 1 |
| 5211, 5221 | V-1916 | "REPLACEMENT DESICCANT FILTER ELEMENT HC-1763" | 1 |
| 5231 | V-1906 | "REPLACEMENT FILTER ELEMENT K-3494" | 1 |
| 5231 | V-2002 | "REPLACEMENT FILTER ELEMENT K-1417" | 1 |
| 5231 | V-1916 | "REPLACEMENT DESICCANT FILTER ELEMENT HC-1763" | 1 |
| 5241 | V-2028 | "REPLACEMENT FILTER ELEMENT K-3805" | 1 |
| 5241 | V-2090 | "REPLACEMENT FILTER ELEMENT K-3928" | 1 |
| 5241 | V-1916 | "REPLACEMENT DESICCANT FILTER ELEMENT HC-1763" | 1 |

9.15.4 Split System *(Option C)* and Crossover Check *(Option D)* Labels

| Part Number | Description | Qty |
|---|---|---|
| V-2004 | "SYSTEM 1 PRESSURE" | 1 |
| V-2005 | "SYSTEM 2 PRESSURE" | 1 |
| V-2006 | "SYSTEM 1 RETURN" | 1 |
| V-2007 | "SYSTEM 2 RETURN" | 1 |

9.15.5 Pyrometer *(Option K)* Label

| Part Number | Description | Qty |
|---|---|---|
| V-1886 | "PYROMETER" | 1 |

9.15.6 Hand Pump *(Option M)* Labels

| Model | Part Number | Description | Qty |
|---|---|---|---|
| 5211, 5221 | V-1887 | "HAND PUMP PRESSURE" | 1 |
| 5211, 5221 | V-1915 | "HAND PUMP" | 1 |
| 5211, 5221 | V-1988 | "REPLACEMENT FILTER ELEMENT K-3751" | 1 |
| 5231 | V-1887 | "HAND PUMP PRESSURE" | 1 |
| 5231 | V-1915 | "HAND PUMP" | 1 |
| 5231 | V-1989 | "REPLACEMENT FILTER ELEMENT K-3752" | 1 |
| 5241 | V-1887 | "HAND PUMP PRESSURE" | 1 |
| 5241 | V-1915 | "HAND PUMP" | 1 |
| 5241 | V-2050 | "REPLACEMENT FILTER ELEMENT K-3831" | 1 |

9.15.7 Calibration Port *(Option Q)* Labels

| Part Number | Description | Qty |
|---|---|---|
| V-1470 | "CAUTION . . ." | 1 |
| V-1888 | "SHUT-OFF/CALIBRATION PORT" | 1 |

9.15.8 Back-Pressure Valve with Sight Glass *(Option T)* Label

| Part Number | Description | Qty |
|---|---|---|
| V-1987 | "RETURN SYSTEM PRESSURE" | 1 |

## 10.0 PROVISION OF SPARES

### 10.1 SOURCE OF SPARE PARTS

Spare parts may be obtained from the manufacturer:

***TRONAIR***, Inc.
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

For Spare Parts, Operations & Service Manuals or Service Needs:
Scan the QR code or visit Tronair.com/aftermarket

### 10.2 RECOMMENDED SPARE PARTS LISTS

It is recommended that the following spare parts be kept on hand and available for immediate use during maintenance.

#### 10.2.1 Spare Electrical Parts

| Part Number | Description | Qty |
|---|---|---|
| Refer to Section 9.10 Electrical Components | Fuse, Transformer Primary | 2 |
| EC-1542-04 | Fuse, Transformer Secondary | 1 |
| Refer to Section 9.10 Electrical Components | Fuse, Heat Exchanger | 3 |
| EC-1675-12 | Fuse, Phase Monitor *(Optional)* | 3 |

#### 10.2.2 Spare Parts

5J11 ..... MIL-PRF-5606
5J21 ..... MIL-PRF-83282
5J31 ..... Aviation Phosphate Ester, Type IV and V
5J41 ..... MIL-PRF-87257

| 5211 & 5221 | 5231 | 5241 | | |
|---|---|---|---|---|
| **Part Number** | **Part Number** | **Part Number** | **Description** | **Qty** |
| HC-1763 | HC-1763 | HC-1763 | DESICCANT FILTER ELEMENT | 1 |
| TBD | TBD | TBD | KIT, GASKETS AND O-RINGS FOR MAIN PUMP | 1 |
| K-1416 | K-1417 | K-3928 | KIT, PRESSURE FILTER ELEMENT | 1 |
| K-3493 | K-3494 | K-3805 | KIT, RETURN FILTER ELEMENT | 1 |
| TBD | TBD | TBD | KIT, SHAFT SEAL AND RETAINER FOR MAIN PUMP | 1 |
| K-3751 | K-3752 | K-3831 | KIT, HAND PUMP FILTER ELEMENT *(OPTIONAL)* | 1 |

## 11.0 CALIBRATION OF INSTRUMENTATION

All gauges on the Hydraulic Power Unit can be either returned to Tronair for calibration or certified by the end user if proper calibration equipment is available. Gauges returned to Tronair for calibration will be tested with standards traceable to N.I.S.T. (National Institute of Standards and Technology). Tronair recommends calibration of instrumentation at yearly intervals, but actual calibration dates may be based upon frequency of use and the end users quality system. For information on returning gauges for calibration, Reference 11.1 – Source of Calibration.

### 11.1 SOURCE OF CALIBRATION

***TRONAIR***, Inc.
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

## 12.0 IN SERVICE SUPPORT

Contact Tronair, Inc. for technical services and information. See Section 1.3 – Manufacturer.

## 13.0 GUARANTEES/LIMITATION OF LIABILITY

Tronair products are warranted to be free of manufacturing or material defects for a period of one year after shipment to the original customer. This is solely limited to the repair or replacement of defective components. This warranty does not cover the following items:

a) Parts required for normal maintenance
b) Parts covered by a component manufacturers warranty
c) Replacement parts have a 90-day warranty from date of shipment

If you have a problem that may require service, contact Tronair immediately. Do not attempt to repair or disassemble a product without first contacting Tronair, any action may affect warranty coverage. When you contact Tronair be prepared to provide the following information:

a) Product Model Number
b) Product Serial Number
c) Description of the problem

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Tronair for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on any shipping documents. Failure to obtain a RMA in advance of returning an item will result in a service fee. A decision on the extent of warranty coverage on returned products is reserved pending inspection at Tronair. Any shipments to Tronair must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Tronair on any warranty claims only. Any unauthorized modification of the Tronair products or use of the Tronair products in violation of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately void any warranty, express or implied.

The obligations of Tronair expressly stated herein are in lieu of all other warranties or conditions expressed or implied. **Any unauthorized modification of the Tronair products or use of the Tronair products in violations of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately *void any warranty, express or implied* and Tronair *disclaims any and all liability for injury (WITHOUT LIMITATION and including DEATH), loss or damage arising from or relating to such misuse*.**

## 14.0 APPENDICES

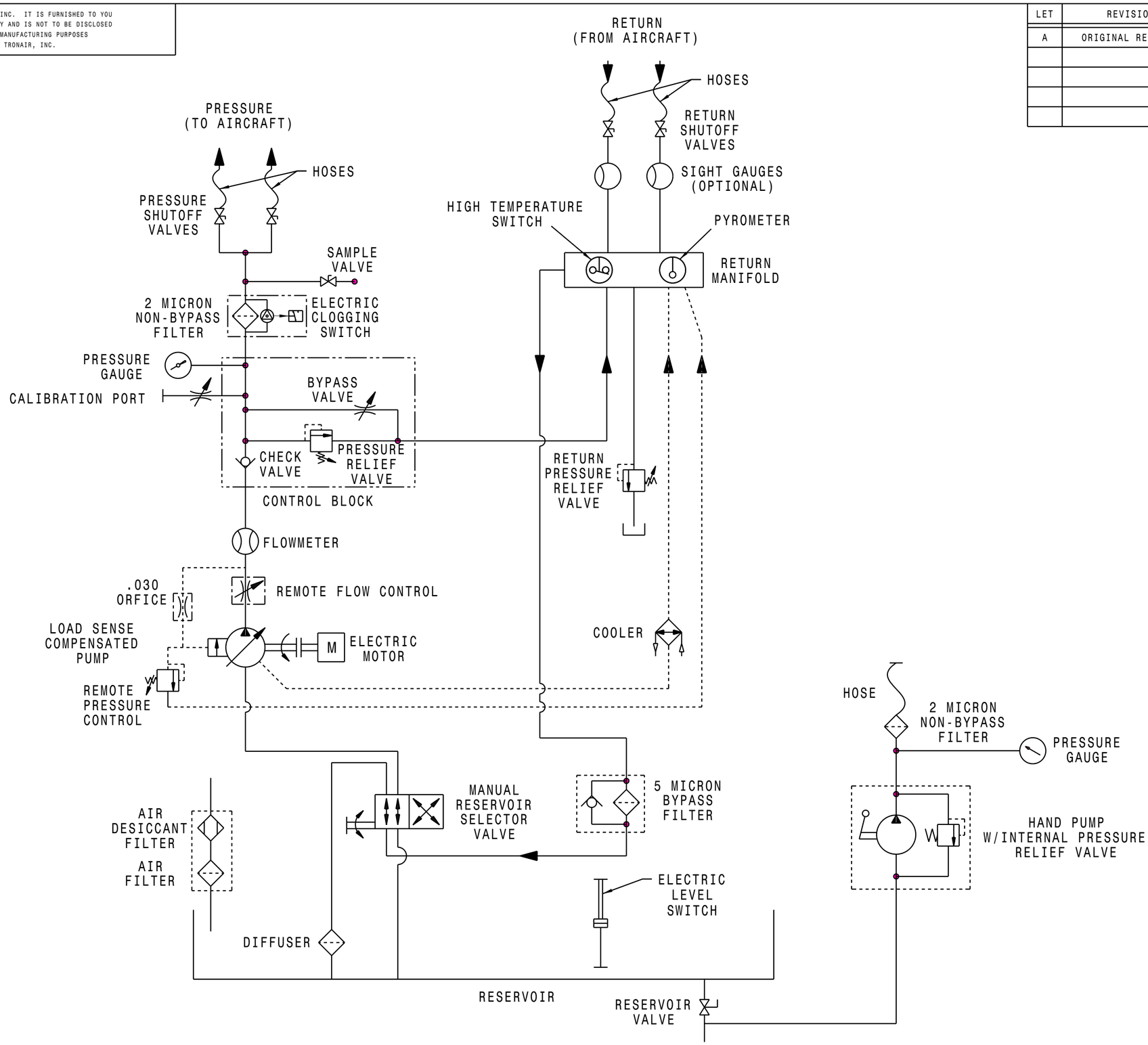
APPENDIX I Hydraulic Schematic (INS-2620)
APPENDIX II Electrical Schematic (INS-2016)
APPENDIX III Wiring Diagram (INS-2144)
APPENDIX IV Instrument Certification Notice
APPENDIX V Declaration of Conformity

TRONAIR®

# APPENDIX I

## Hydraulic Schematic
## (INS-2620)

| LET | REVISION | ECN | DWN | CHK | DATE |
|---|---|---|---|---|---|
| A | ORIGINAL RELEASE | 22155 | - | - | 09-10-20 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

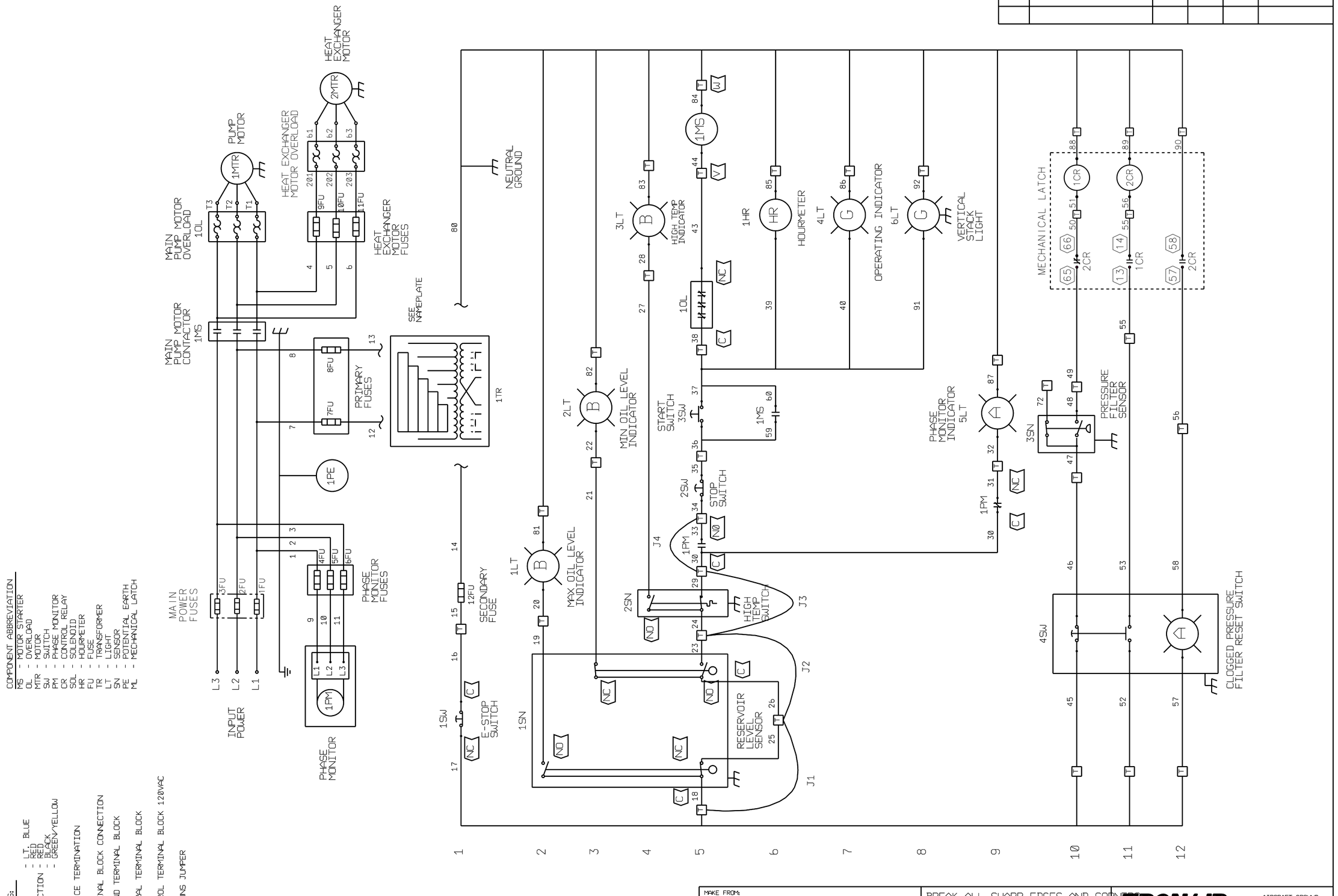



| | | | |
|---|---|---|---|
| MAKE FROM: N / A | | BREAK ALL SHARP EDGES AND CORNERS | TRONAIR AIRCRAFT GROUND SUPPORT EQUIPMENT |
| MATERIAL: N / A | TYPE: N / A | TOLERANCES UNLESS OTHERWISE SPECIFIED | DWN BY PEH · CKD BY ADO · 09-10-20 |
| FINISH: N / A | | DECIMAL .X ± .100; .XX ± .030; .XXX ± .010; FRACTION X/XX ± 1/16; ANGLES: ± 1/2 DEGREE | SCHEMATIC, HYDRAULIC |
| REFERENCE: N / A | SIZE C | < > INDICATES CRITICAL DIMENSIONS; ( ) INDICATES REFERENCE DIMENSIONS | 05 · INS-2620 · REV A |
| SCALE: FULL | DO NOT SCALE DRAWING | | |

# APPENDIX II

# Electrical Schematic
# (INS-2016)

| LET | REVISION | ECN | DWN | CHK | DATE |
|---|---|---|---|---|---|
| 01 | ORIGINAL RELEASE | 16922 | - | - | 06-08-09 |
| | | | | | |
| | | | | | |
| | | | | | |



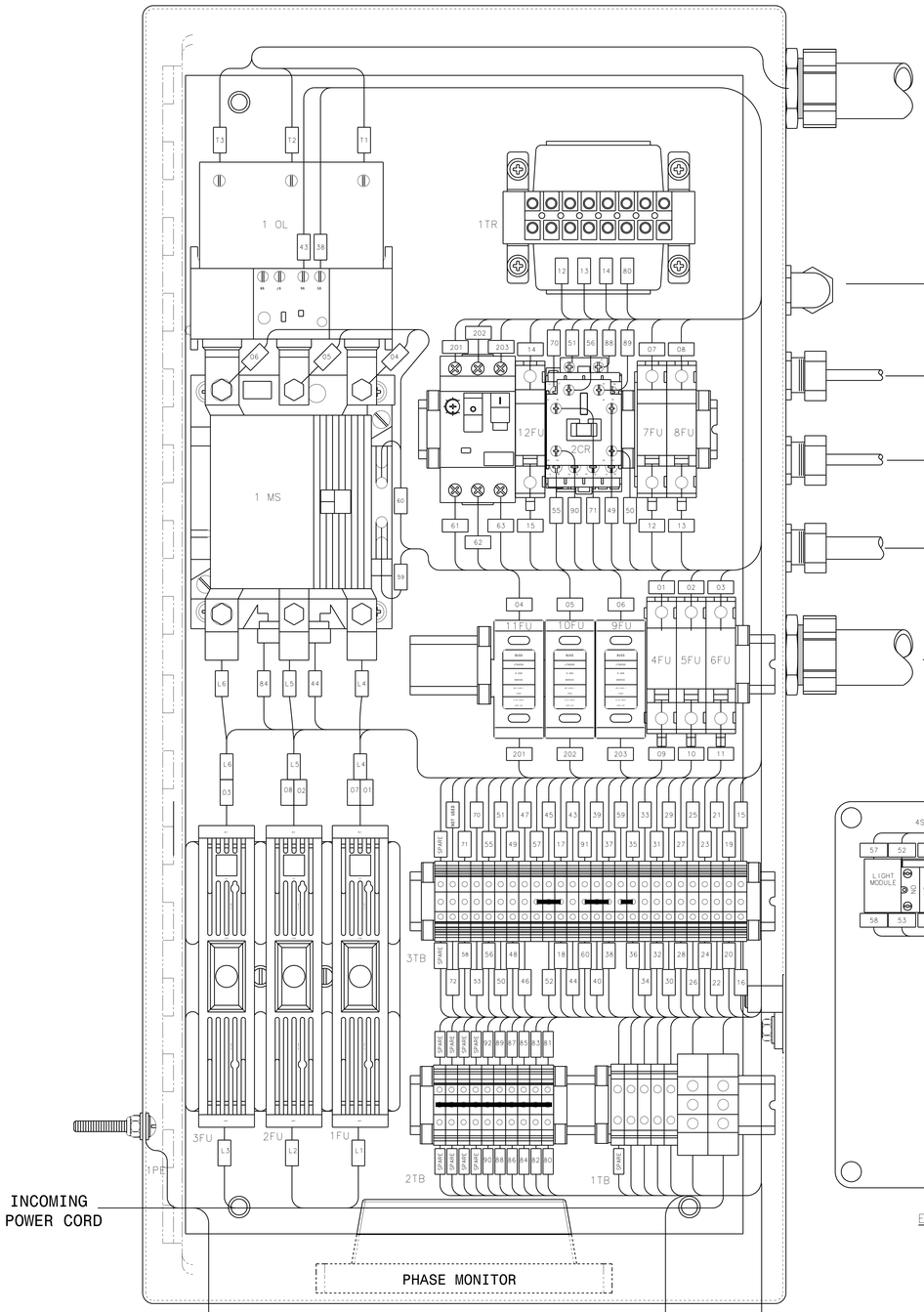

| | | | |
|---|---|---|---|
| MAKE FROM: N / A | | BREAK ALL SHARP EDGES AND CORNERS | TRONAIR AIRCRAFT GROUND SUPPORT EQUIPMENT |
| MATERIAL: N / A | TYPE: N / A | TOLERANCES UNLESS OTHERWISE SPECIFIED | DWN BY JMB / CKD BY PEH / 06-08-09 |
| FINISH: MILL | | DECIMAL .X ± .100; .XX ± .030; .XXX ± .010; FRACTION X/XX ± 1/16; ANGLES: ± 1/2 DEGREE | SCHEMATIC, HPU ELECTRICAL (K-4321) |
| REFERENCE: INS-1725 | SIZE C | < > INDICATES CRITICAL DIMENSIONS; ( ) INDICATES REFERENCE DIMENSIONS | 05 / INS-2016 / REV 01 |
| SCALE: N. S. R. | DO NOT SCALE DRAWING | | |

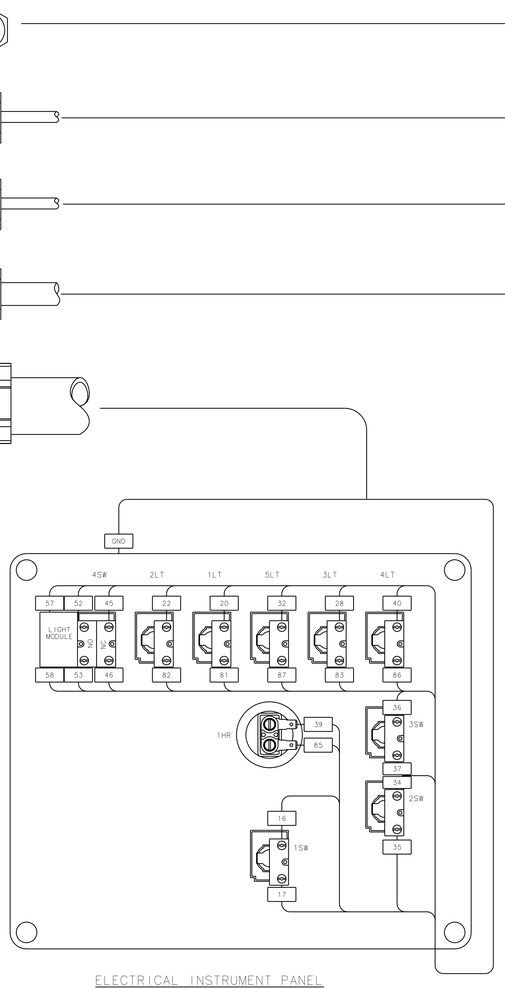
TRONAIR®

# APPENDIX III

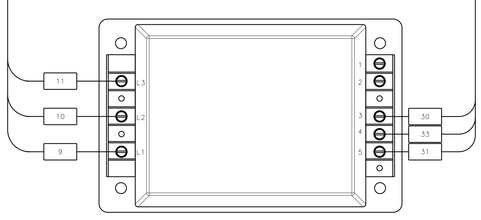
## Wiring Diagram
## (INS-2144)

| LET | REVISION | ECN | DWN | CHK | DATE |
|---|---|---|---|---|---|
| - | ORIGINAL RELEASE | 18634 | - | - | 05-03-12 |

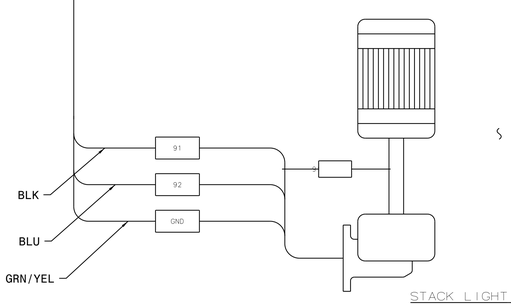


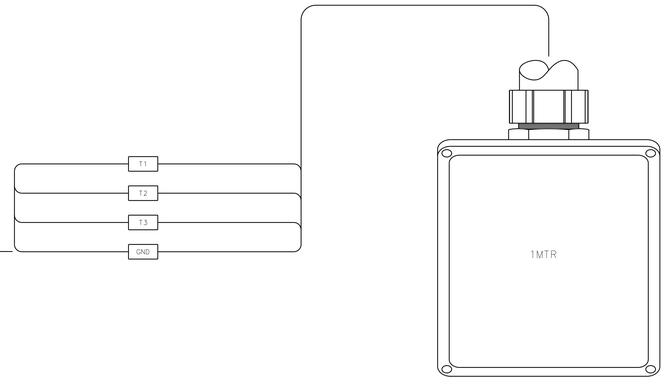

ELECTRICAL INSTRUMENT PANEL
(LOOKING FROM REAR OF PANEL)
SCALE: 9:16



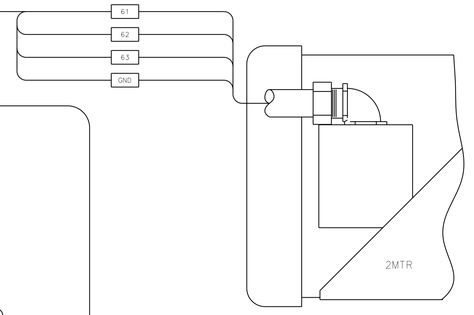

PHASE MONITOR
TOP VIEW



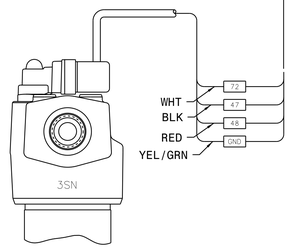

STACK LIGHT (OPTION)
ON ELEC BOX DOOR



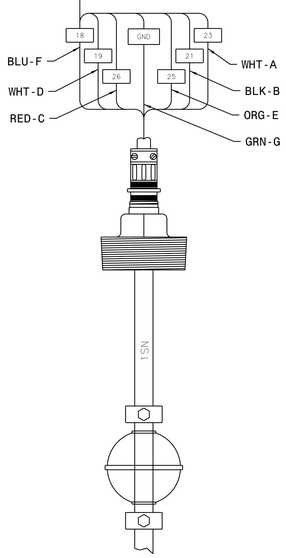

MOTOR CONNECTION BOX
SCALE: 1:2



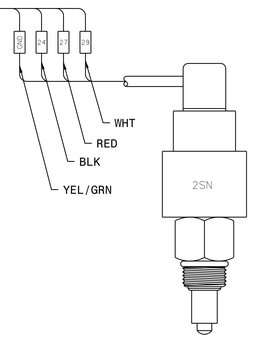

HEAT EXCHANGER MOTOR BOX
SCALE: 5:8




PRESSURE CLOGGING
(FROM PRESSURE FILTER)
SCALE: 1 : 2




MULTI-LEVEL SWITCH
(FROM RESERVOIR)
SCALE: 5:8




TEMPERATURE SWITCH
(FROM RETURN MANIFOLD)
SCALE: FULL

NOTES:

1. PLACE LABELS, V-1978, ON OR NEAR LOCATIONS SHOWN.
2. WIRE TRANSFORMER TO MATCH REQUIRED CUSTOMER VOLTAGE PER TRANSFORMER NAMEPLATE DIAGRAM.
3. IF NO RESERVOIR LEVEL SENSOR OPTION:
   ADD ORANGE JUMPER WIRE J1 FROM 18 TERMINAL POINT TO 25 TERMINAL POINT.
   ADD ORANGE JUMPER WIRE J2 FROM 26 TERMINAL POINT TO 23 TERMINAL POINT.
4. IF NO HIGH TEMP SWITCH OPTION:
   ADD ORANGE JUMPER WIRE J3 FROM 24 TERMINAL POINT TO 29 TERMINAL POINT.
5. IF NO PHASE MONITOR OPTION:
   ADD ORANGE JUMPER WIRE J4 FROM 30 TERMINAL POINT TO 33 TERMINAL POINT.

| | | | |
|---|---|---|---|
| MAKE FROM: N/A | | BREAK ALL SHARP EDGES AND CORNERS | TRONAIR AIRCRAFT GROUND SUPPORT EQUIPMENT |
| MATERIAL: N/A | TYPE: N/A | TOLERANCES UNLESS OTHERWISE SPECIFIED | DWN BY JMB CKD BY PEH 05-22-12 |
| FINISH: MILL | | DECIMAL .X ± .100 .XX ± .030 .XXX ± .010 FRACTION X/XX ± 1/16 ANGLES: ± 1/2 DEGREE | INSTRUCTION, WIRING DIAGRAM (CE)(CSA) |
| REFERENCE: N/A | SIZE E | < > INDICATES CRITICAL DIMENSIONS ( ) INDICATES REFERENCE DIMENSIONS | 05 INS-2144 REV A |
| SCALE: 3:4 DO NOT SCALE DRAWING | | | |

# APPENDIX IV

# Instrument Certification Notice

# Instrument Certification Notice

The gauge Certificates of Calibration supplied for the gauge(s) on this unit contain the calibration data for the actual instrument calibrated, along with the calibration date of the **STANDARD** used to perform the calibration check.

The due date for re-calibration of the instrument should be based upon the date the instrument was placed in service in your facility. Re-calibration should be done on a periodic basis as dictated by the end user's quality system or other overriding requirements.

Note that Tronair, Inc. does not supply certificates of calibration on flow meters or pyrometers unless requested at the time of placed order. These instruments are considered reference indicators only and are not critical to the test(s) being performed on the aircraft.

**Tronair, Inc.**
1 Air Cargo Pkwy East
Swanton, OH 43558

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Web: www.tronair.com
Email: sales@tronair.com


# APPENDIX V

# Declaration of Conformity

# EU Declaration of Conformity

| | |
|---|---|
| **Model Number(s)** | 52X1 Series (5211, 5221, 5231, 5241) |
| **Product Type/Name:** | Hydraulic Power Unit |
| **Serial Number(s):** | Enter serial number(s) |

**Declaration:** Tronair has assessed the equipment described above against the Essential Health and Safety Requirements of one or more Directives. Based on this assessment, the equipment described above is deemed to comply with the directive(s) listed below.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

| | | |
|---|---|---|
| **Directives:** | European Machinery Directive | 2006/42/EC |
| | Low voltage | 2014/35/EU |
| **Standards:** | EN ISO 12100:2010 | Safety of machinery – General principles for design - Risk assessment and risk reduction |
| | EN 1915-1:2013 | Aircraft ground support equipment – General requirements - Part 1: Basic safety requirements |
| | EN 60204-1:2018 | Safety of machinery – Electric equipment of machines. General requirements |
| | ISO 4021:1997 | Hydraulic fluid power – Particulate contamination analysis – Extraction of fluid samples from lines of an operating system |
| | ISO 4413:2010 | Hydraulic fluid power – General rules and safety requirements for systems and their components |
| | NFPA 70/NEC 1999 | National electric code |
| | NFPA/JIC T2.244.1-1990 | Hydraulic fluid power – System standards for stationary industrial machinery – Supplement to ISO 4413:1998 |
| | SAE ARP 1247D | Aircraft ground support equipment – General requirements |

**Markings:** CE

**The technical documentation for the machinery is available from:**

RAUH Hydraulic GmbH
Hallstadtler Straße 63
Email: tronair@rauh-hydraulik.de

**Location of Issue:** Tronair, 1 Air Cargo Parkway East, Swanton, OH 43558

**Identification of person empowered to sign on behalf of the Manufacturer**:

Patrick Finch
Quality Assurance Representative

Enter a date
Date

**Tronair, Inc.**
1 Air Cargo Pkwy East
Swanton, OH 43558

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