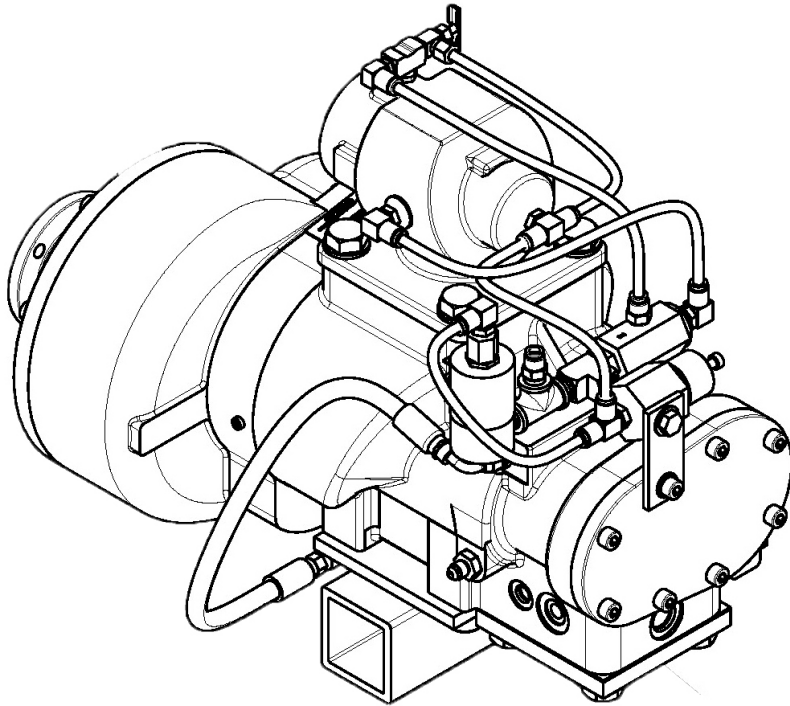




Eclipse GEN 2.0™ CAFSystem, Model 150-ECL CAFS PTO Kit Installation Instructions

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IL4306



Read through the installation instructions carefully before beginning installation of the Eclipse GEN 2.0™.

NOTE: Instructions subject to change without notice

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F-1031, Section 3063 (Issued: 10/9/17)

Introduction

This instruction covers the installation of the Waterous Eclipse GEN 2.0™ Model 150-ECL CAFS PTO system.

The primary use of the compressor kits is to provide compressed air for Compressed Air Foam System (CAFS) in fire-fighting vehicles. Water to cool the compressor is supplied by the vehicle's pump, from its tank or an exterior source. If the kit is not installed in a fire-fighting vehicle, the compressor requires alternate cooling, such as an air-oil cooler.

New installation tasks include:

- Installing compressor
- Installing compressor sump, separator filter and oil cooler.
- Installing foam pump:
See separate instruction:
Model Aquis 2.5: F-1031, Section 3061
Models Advantus 3E or 6E: F-1031, Section 3062
- Installing CAFS generators and controls, see separate instruction, F-1031, Section 3069

Power Take-Off Suggestions

There are many PTO suppliers and many types of transmissions available, and the choice of PTO will in part depend on what can be installed in the vehicle. "Hot Shift" PTOs are commonly used.

Make sure that there will be room to install the air compressor on a bracket close to the PTO, with their drive angles matched.

CAUTION

The driveline angles **MUST** be matched to prevent serious damage to the compressor, PTO, or transmission.

Specific gear ratios vary among the different transmissions and PTO suppliers. The ratios suggested below are a guide for selecting the PTO. With these ratios, the rated CFM is usually achieved with the engine speed near 1400 RPM.

CAUTION

A higher speed on the PTO means the CAFS system will reach the desired CFM at lower engine speeds. Exceeding the compressor's rated RPM can damage the compressor, and void the warranty. In such applications, an over speed cutout should be installed on the PTO to protect the compressor.

To calculate the possible compressor RPM, use this equation:

$$\text{Engine RPM} \times \text{gear ratio on PTO} \times 3.267 = \text{compressor rotor RPM}$$

The compressor produces 150 CFM at approximately 5200 rotor RPM. The maximum rotor speed is 9000 RPM.

CFM required	PTO speed	HP average
150	143% HI	45 – 50

Safety Information

WARNING

Compressed air can be dangerous. Read and understand the operating instructions for the Waterous compressed air foam unit and individual components prior to operating.

WARNING

Discharge outlets that are capped, hose lines that are valved and charged and the air compressor sump may contain compressed air. Relieve all pressure before attempting to remove any caps, fittings and nozzles or to perform maintenance to prevent serious personal injury.

WARNING

Operating the compressed air foam unit with water and compressed air pumped through a discharge without foam concentrate will create a potentially dangerous condition known as “slug flow,” where unmixed pockets of water and air are passed through the nozzle, causing erratic nozzle reaction.

CAUTION

Nozzle reaction force is significantly increased at the time the nozzle valve is opened in compressed air foam operations. Open CAFS nozzles slowly.

CAUTION

Do not use the compressed air foam unit as an air source for SCBA or any breathing air supply

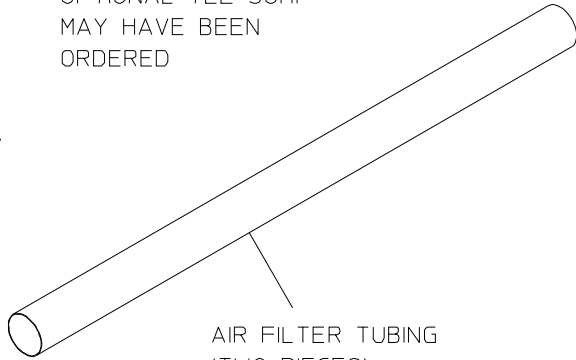
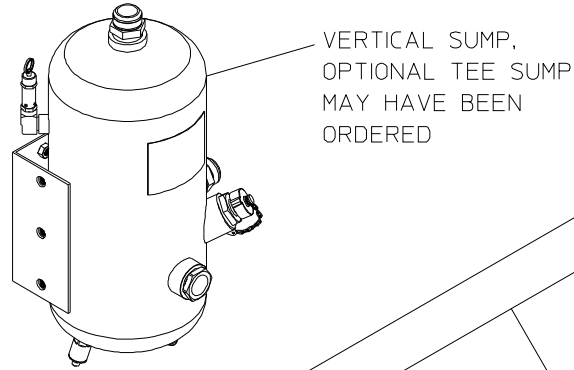
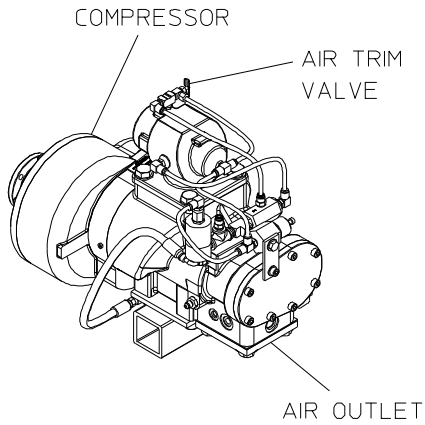
CAUTION

For compressed air foam operations, use only fire hose that is rated at 200 PSI or higher working pressure.

NOTICE

The unit operator should have a thorough understanding of “Boyle’s Law” (The law of compressed gases) prior to operating the compressed air foam unit.

Components – Standard Compressor Components

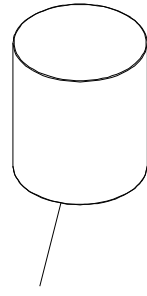
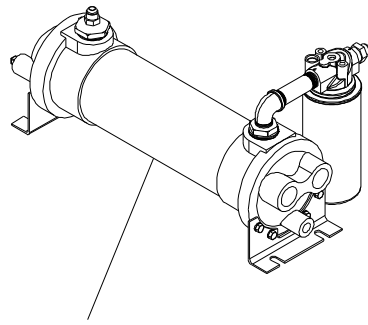
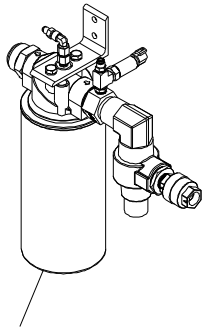


AIR FILTER
INSTALL KIT
L1185
INCLUDES:
- ELBOWS
- CLAMPS

COMPRESSOR
AIR OUTLET
FLANGE KIT
L1190
INCLUDES:
- FLANGE
- GASKET
- SCREWS
- NPT X JIC ADAPTER

OIL COOLER
IN-LINE STRAINER KIT
L1192
INCLUDES:
- WYE STRAINER
- BALL VALVE
- PIPE NIPPLE

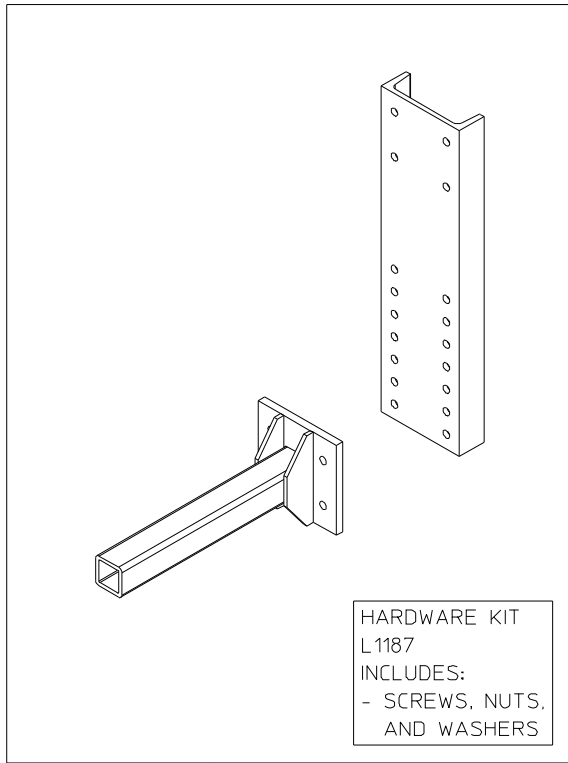
COMPRESSOR INSTALL KIT
L1184
INCLUDES:
- AIR CIRCUIT TUBING
- TEMPERATURE SENDER AND BUSHING
- 1/2 IN. IN-LINE CHECK VALVE
- CAFS WARNING PANEL PLATE



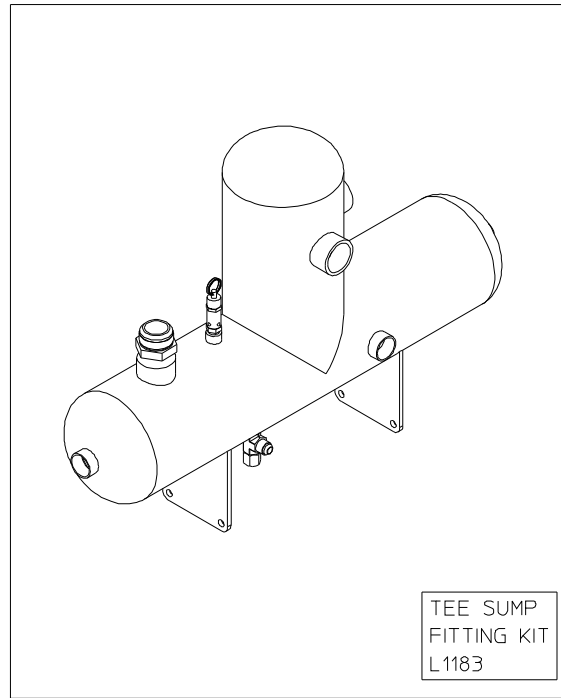
IL4306

STANDARD COMPONENTS

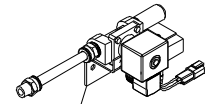
Components – Optional Compressor Components



MOUNTING BRACKETS



TEE SUMP

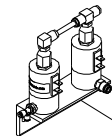


SUMP VENT,
83293 (L1186)

HOSE AND FITTING
INSTALL KIT
83368 (L1188)

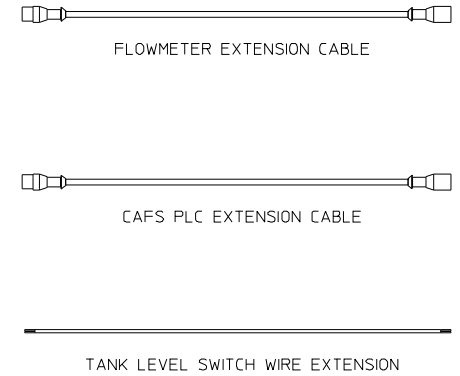
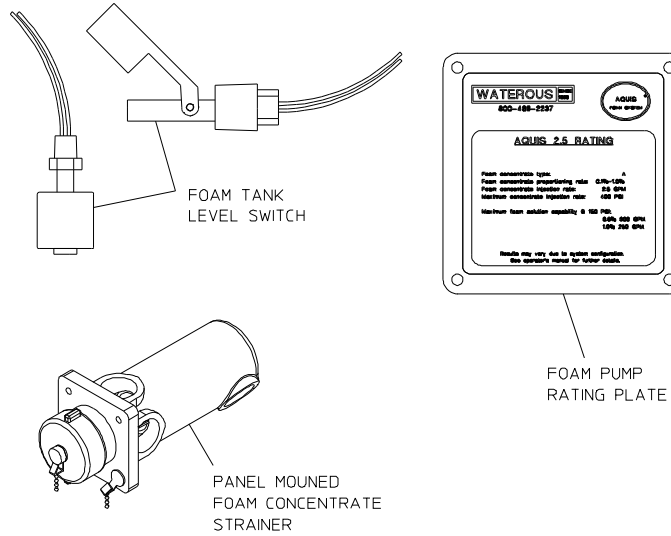
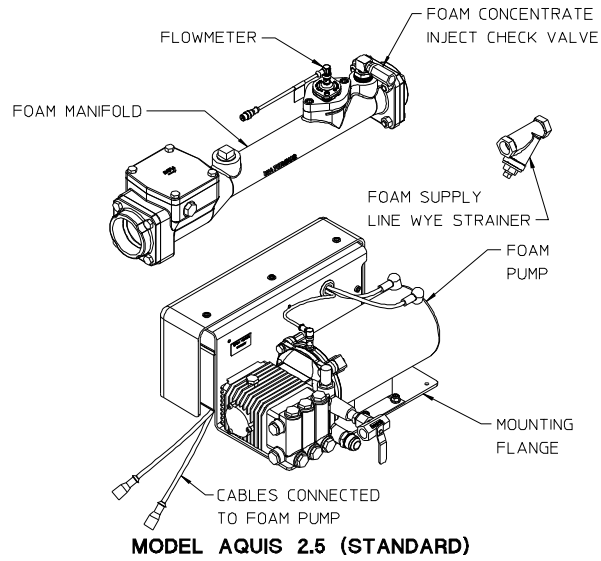
COMPRESSOR OIL INJECT
CHECK VALVE KIT
83368 (L1188-5)

AUXILIARY AIR
DISCHARGE KIT
83360 (L1193)



AUTO-SYNC FOR CAFS
HIGH RISE OPTION
9395

Components – Foam Pump



FOAM SUPPLY LINE HOSE KIT L1194 (83430)

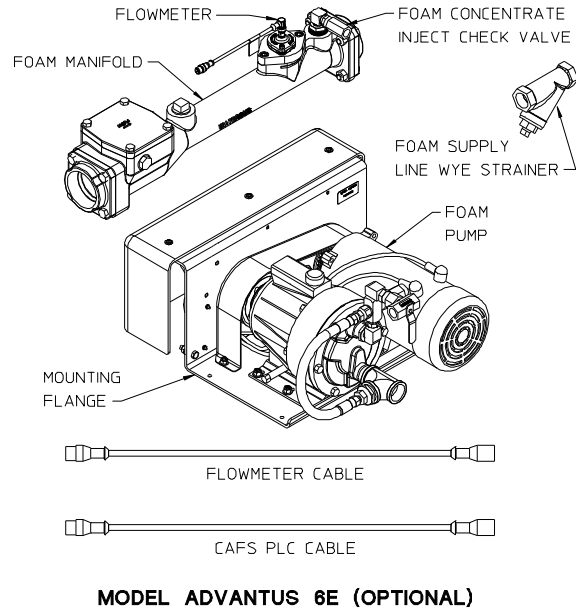
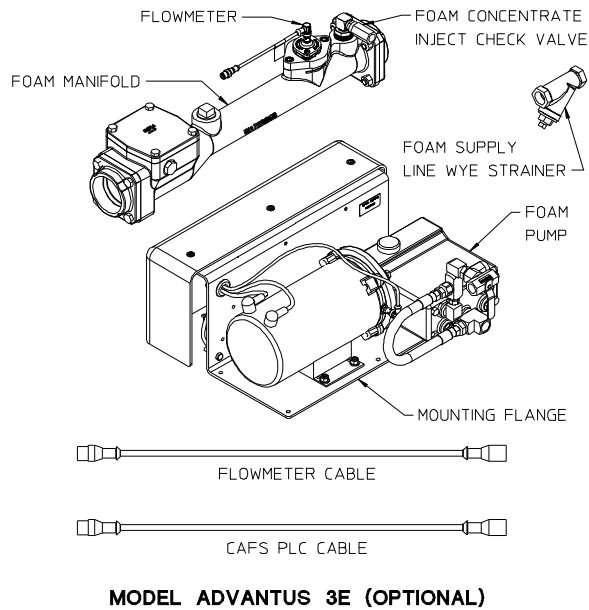
OVERBOARD FOAM PICK-UP KIT 83492

DUAL TANK SELECTOR KIT 83440

FOAM FILL SYSTEM 83438

FOAM INJECT/BY-PASS HOSE KIT L1195 (83430)

OPTIONAL COMPONENTS

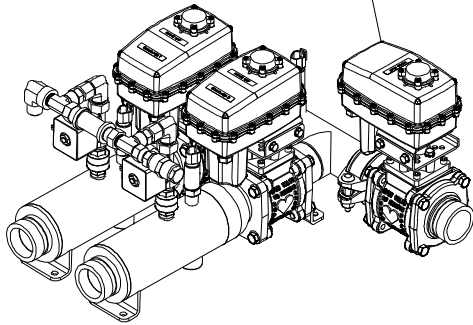


IL 4321

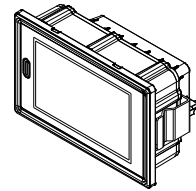
Components – Eclipse GEN 2.0™ Generators and Controls

IL4469

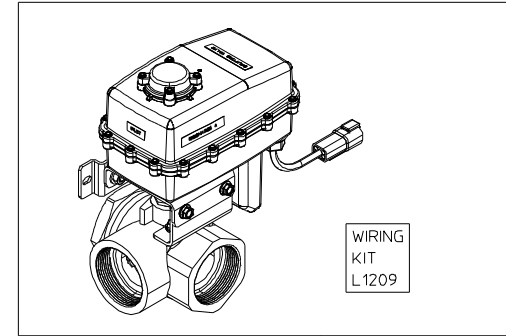
WATER INLET
VALVE AND CLAMP
SHIPPED LOOSE



DOUBLE CAFS FOAMULATORS



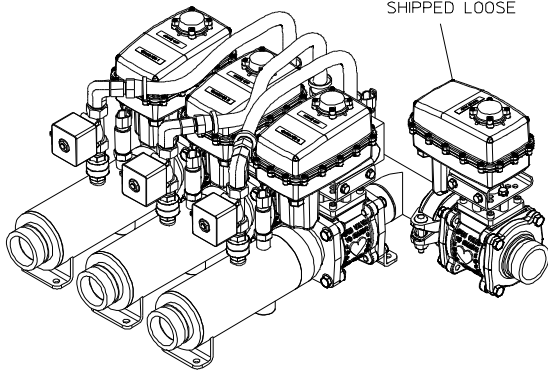
HMI CONTROL
PANEL



WIRING
KIT
L1209

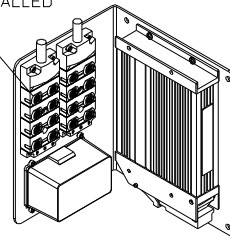
DISCHARGE SPLITTING VALVE,
9439

WATER INLET
VALVE AND CLAMP
SHIPPED LOOSE

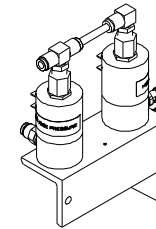


TRIPLE CAFS FOAMULATORS

ALL CABLES CONNECTED
HERE WILL BE INSTALLED
AT THE FACTORY



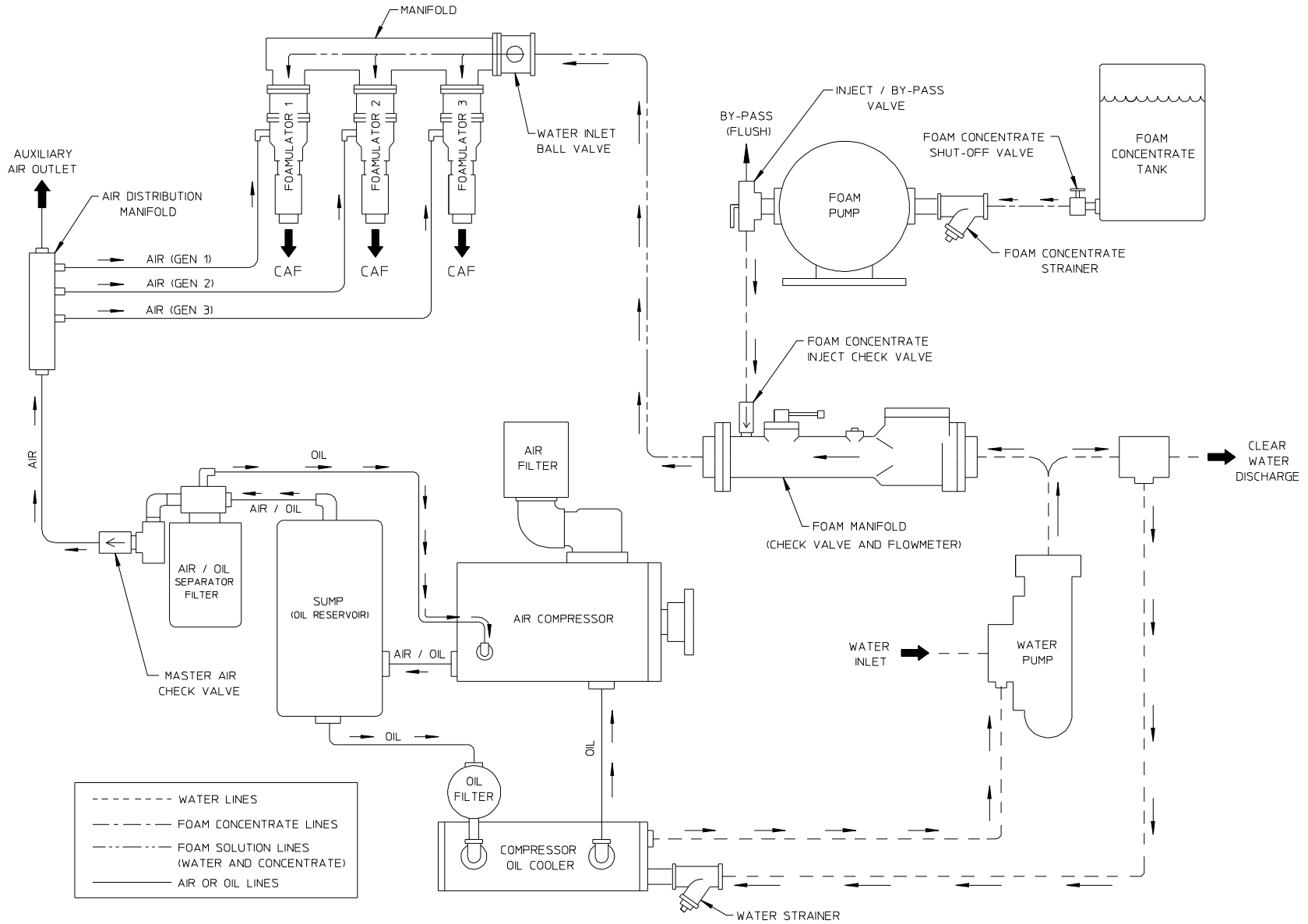
PLC



AUTO-SYNC FOR
ECLIPSE GEN 2.0 HIGH
RISE OPTION, 9395
FURNISHED WITH
COMPRESSOR

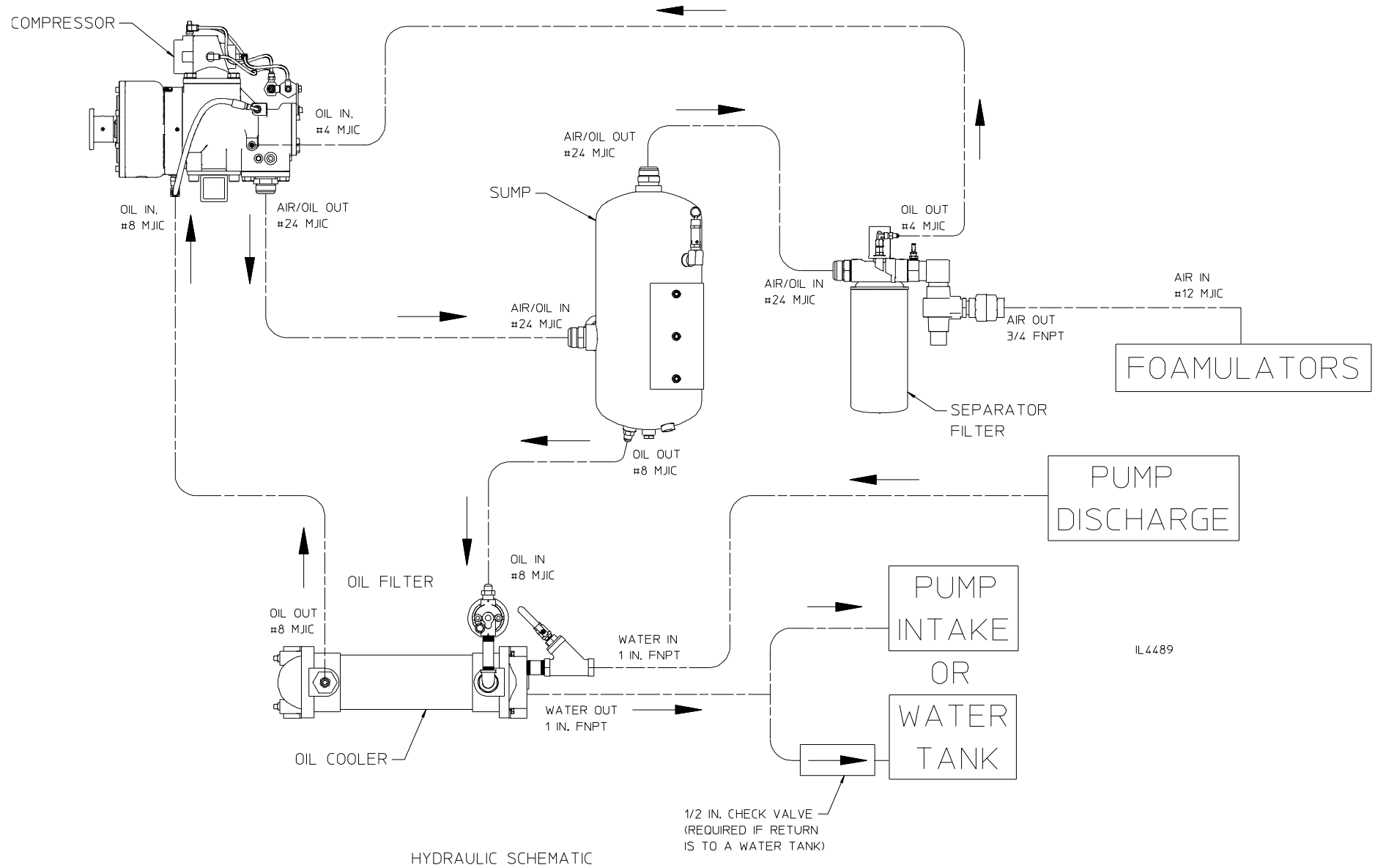
OPTIONAL COMPONENTS

Schematic - System



IL4470

Schematic – Hydraulic



HYDRAULIC SCHEMATIC

Installation – General Guidelines

Refer to the System Schematic in this instruction for system components and interconnectivity. Within the guidelines given here, components can be installed wherever there is room for them to be securely mounted.

Components must be bolted to brackets welded to the apparatus frame, or bolted directly to the frame.

CAUTION

Do not damage the vehicle chassis during installation. Check with the vehicle manufacturer to ensure the planned welds and bolts are in acceptable areas.

Make sure electronic devices that may be damaged are disconnected from the chassis before welding.

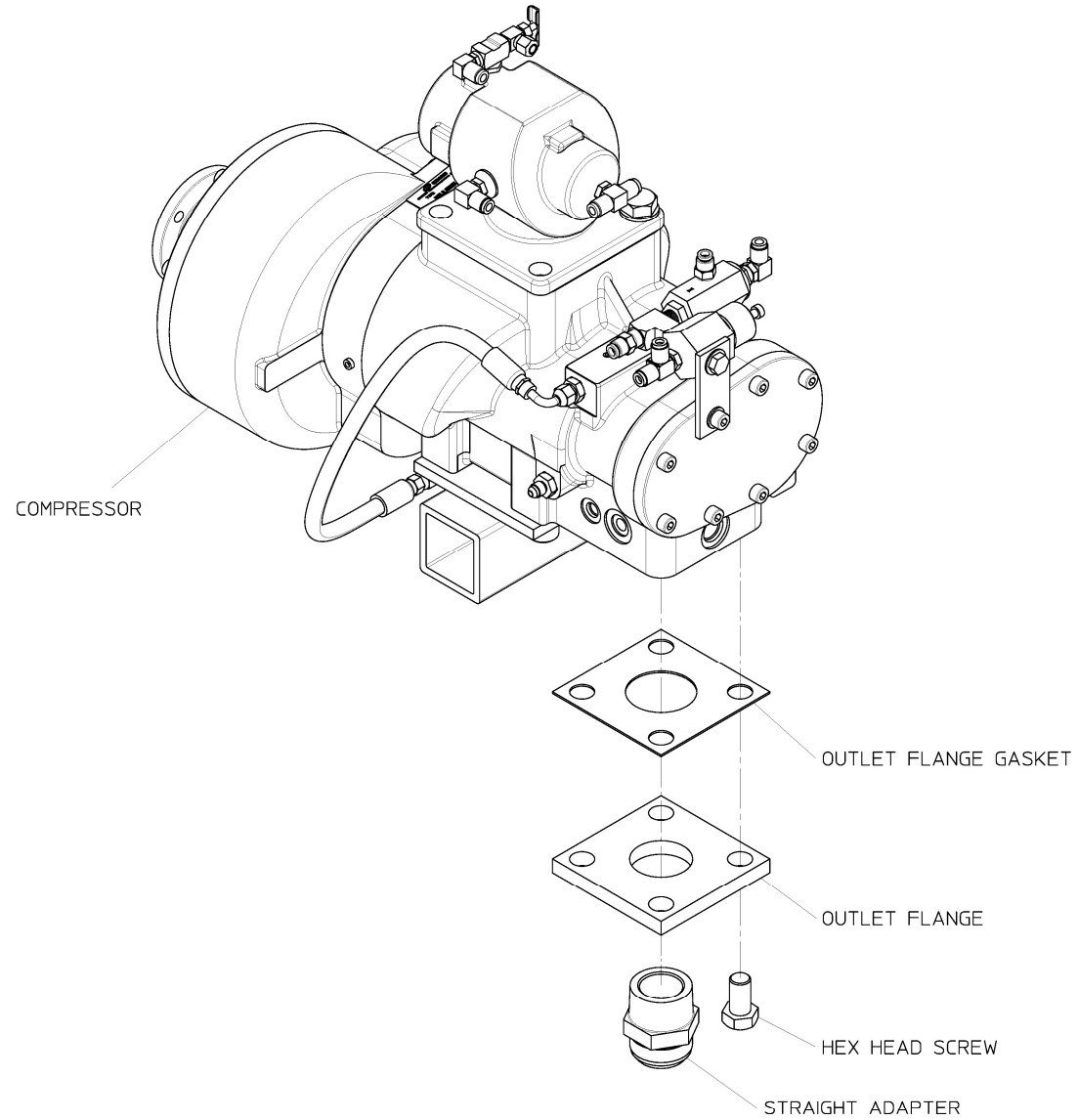
Allow for access and clearance for routine maintenance such as checking and adding oil, replacing filters, cleaning screens and opening drain valves.

To prevent damage to hydraulic and air lines, or accidentally disconnecting them, run them along the support beams of the pump compartment whenever possible. Bundling and securing with cable ties or other fasteners is a good practice.

Wires, hoses or tubing that passes through metal such as a compartment panel, must have a protective bushing or shield around the edges of the hose to protect against abrasion.

Installation – Air Outlet Flange

Install air outlet flange and fitting furnished with Compressor Outlet Flange Kit L1190 on the bottom of the compressor.



IL4225

Installation – Compressor

The compressor is furnished with a mounting bracket designed to accept 2 in. square steel tubing.

Waterous offers an optional universal mounting bracket which is designed to interface with the compressor bracket.

Installation using optional Waterous bracket:

The vertical bracket is bolted or welded to the vehicle frame and the horizontal arm bolted to the vertical bracket. Hardware is included in kit L1187.

Use of the vertical bracket is optional, the horizontal arm may be bolted directly to the vehicle frame.

The compressor is then slid onto the horizontal arm and positioned in the appropriate location along the length of the arm.

Once in the proper location, securely weld the compressor bracket to the horizontal arm. Weld completely around the interface of the two tubes.

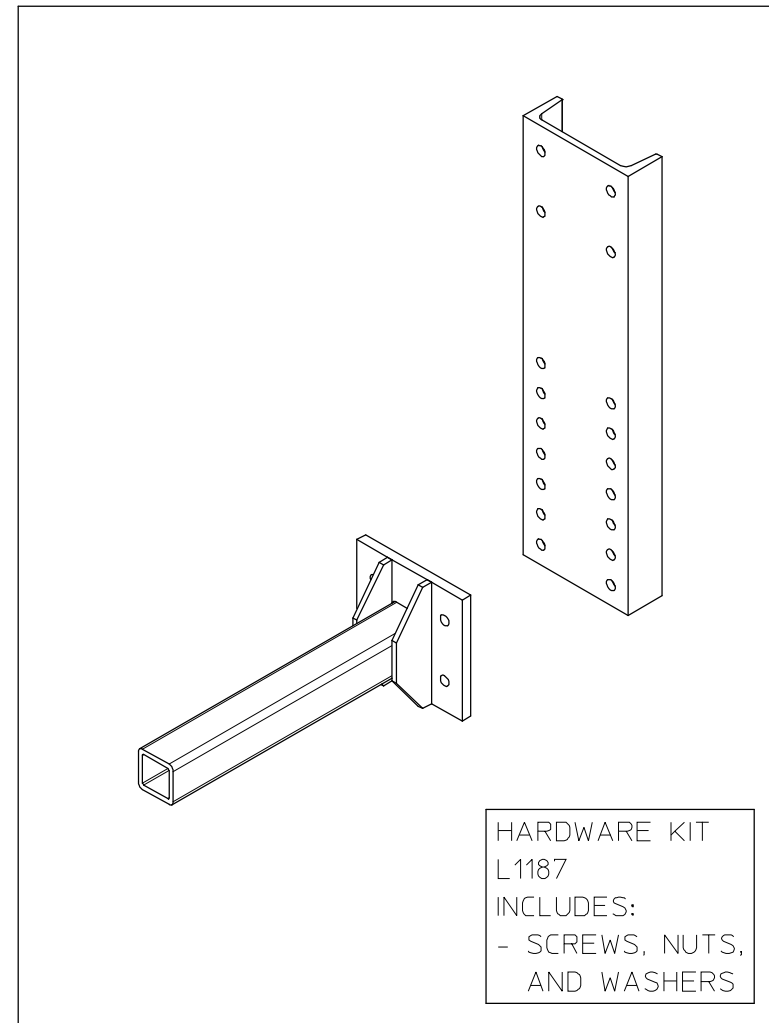
See drawing DPL83571 for bracket dimensions.

Installation using OEM fabricated bracket:

Remove the bracket furnished with the compressor and fabricate brackets to attach to that location.

CAUTION

Make sure electronic devices that may be damaged are disconnected from the chassis before welding.



IL4306

MOUNTING BRACKETS

Installation – Sump (Oil Reservoir)

Purpose:

The compressor used in this system is rotary screw type which requires oil for operation. The sump acts as the oil reservoir.

Location:

The sump works best when it is installed so the sight glass opening is below the air discharge outlet on the air compressor, however having the sight glass at the same level is acceptable.

In some cases, finding room for the sump can be difficult. It is acceptable to mount the sump to 12 in. /30 cm. higher than the air compressor. For these installations a check valve should be installed in the line returning oil to the compressor to prevent flooding the compressor with oil. The check valve is an option that can be ordered from Waterous.

For either installation, it is imperative that the sight glass is easily viewed so that the oil level can be monitored and replenished as required.

CAUTION

Waterous will not be responsible for damage to systems where the sump and sight glass are installed such that the oil level cannot be checked or does not display the correct oil level due to improper installation.

Additional Components Required:

You will need to install a temperature sender which is furnished with **Compressor Component Kit L1184** in the bottom of the sump using the reducing bushing furnished.

For the optional Tee sump, you will need to install all oil/air fittings which are included in **Kit L1183**.

Mounting:

Use the bracket welded to the sump to attach to the apparatus frame. See drawing DPL83571 for dimensions of sump and bracket.

Hose Connections:

1. Connect the compressor air outlet to the #24 JIC fitting on the side of the sump using 1-3/8" hydraulic hose.
2. Connect the separator filter to the #24 JIC fitting on the top of the sump using 1-3/8" hydraulic hose.
3. Connect the oil cooler filter to the #8 JIC fitting on the bottom of the sump using 1/2" hydraulic hose.
4. See the Hose Specification section of this instruction for hose specifications.

Note that all hoses and fittings are available as an optional kit from Waterous, see drawing DPL83571.

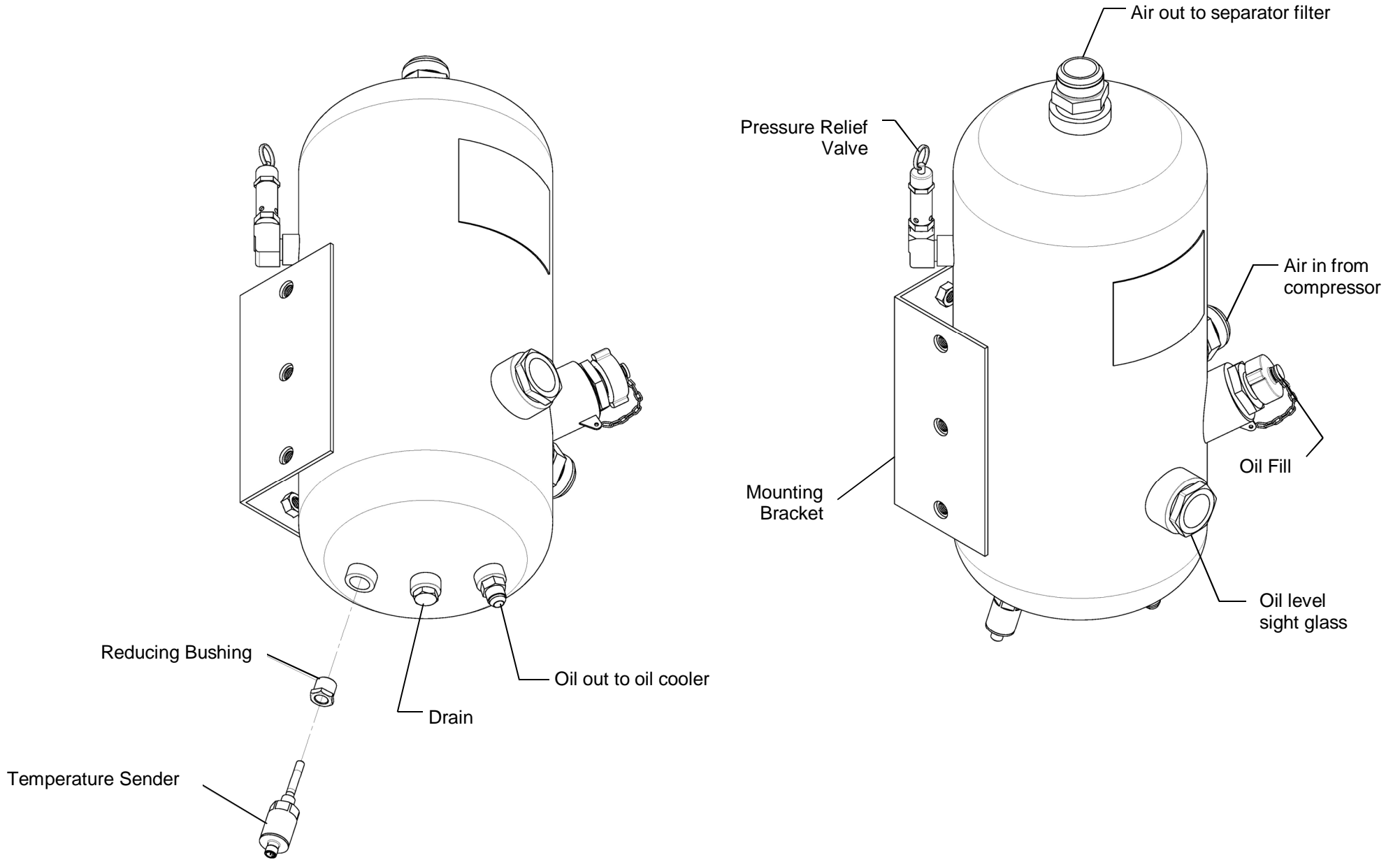
Electrical Conditions:

The temperature sender will be connected to the CAFS Generator wiring, see **Generators and Controls Instruction F-1031-3069**.

Drain:

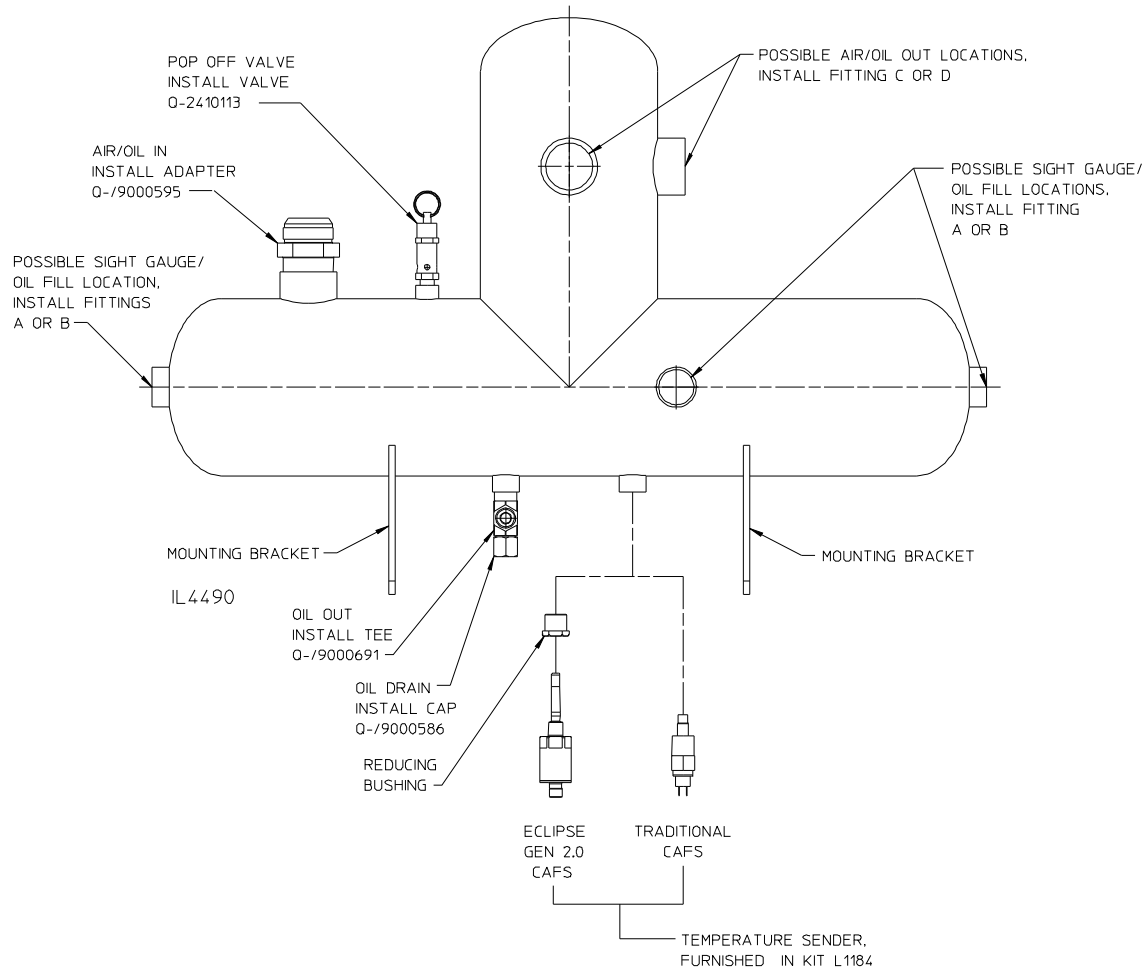
A plug is located in the bottom of the sump for draining oil.

Installation – Sump, Vertical Sump Diagram



IL4281

Installation – Sump, Tee Sump Diagram



<p style="text-align: center;">FITTING A SIGHT GAUGE/OIL FILL FITTINGS</p>	
<p>Q-1090002 CAP WITH CHAIN 1 in. NPSH</p> <p>Q-2270001 NIPPLE 1 NPT X 1 NPSH</p> <p>Q-2370002 SIGHT GLASS, 1 in.</p> <p>Q-/9000534 PLUG - HEX HD 1 in. NPT</p> <p style="text-align: center;">FITTING B PLUG, 1 IN NPT</p>	<p>Q-/9001046 SPRING CLOSE OVAL LOOP, 1-3/8</p> <p>W 6016-24B NIPPLE - CLOSE PIPE 1 in. NPT</p> <p>Q-2450000 BRANCH WYE 1 in. FNPT</p> <p>Q-/9000595 ADAPTER - STRIGHT 24 MJIC X 1-1/2 MNPT</p> <p style="text-align: center;">FITTING C OUTPUT FITTING</p>
<p>Q-/9000537 PLUG - HEX HD 1-1/2 in. NPT</p> <p style="text-align: center;">FITTING D PLUG, 1-1/2 IN NPT</p>	<p>NOTE: 1. APPLY LOCTITE 545 (RED) OR EQUIVALENT TO ALL AIR OR HYDRAULIC FITTING THREADS, UNLESS NOTED OTHERWISE.</p>

Installation – Optional Sump Vent

Purpose:

The sump vent releases compressor pressure to the atmosphere for 10 seconds at compressor start-up to reduce the likelihood of stalling the engine. All components are furnished in kit L1186.

Location:

The sump vent can be located anywhere in the chassis keeping in mind that it must be wired to the circuit that engages the compressor and an air line must be connected to the separator filter.

Mounting:

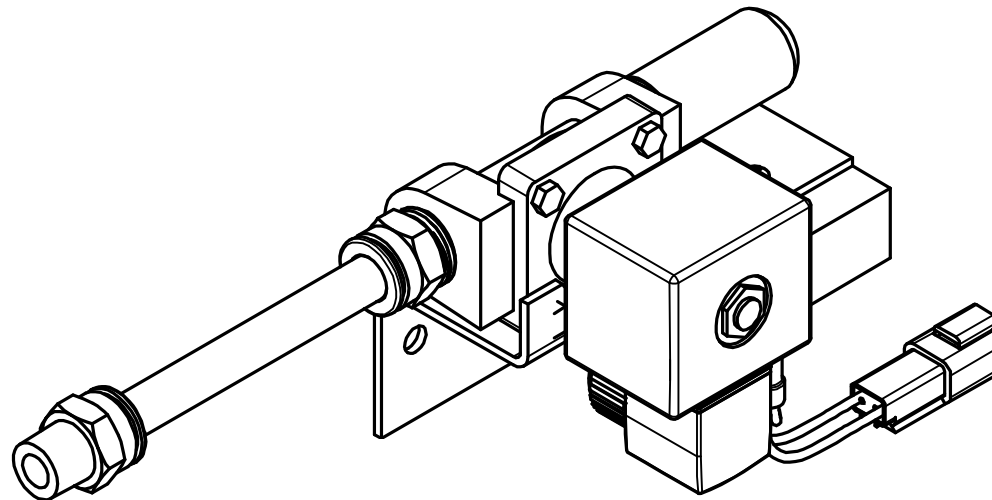
Use the bracket to attach to the apparatus frame. See drawing DPL83571 for dimensions of sump and bracket.

Electrical Connections:

The Deutsch connector on the sump vent must be wired to the CAFS engage circuit.

Hose Connections:

A 1/2 in. air line must be installed between the sump vent and the separator filter. All tubing and fittings are furnished.



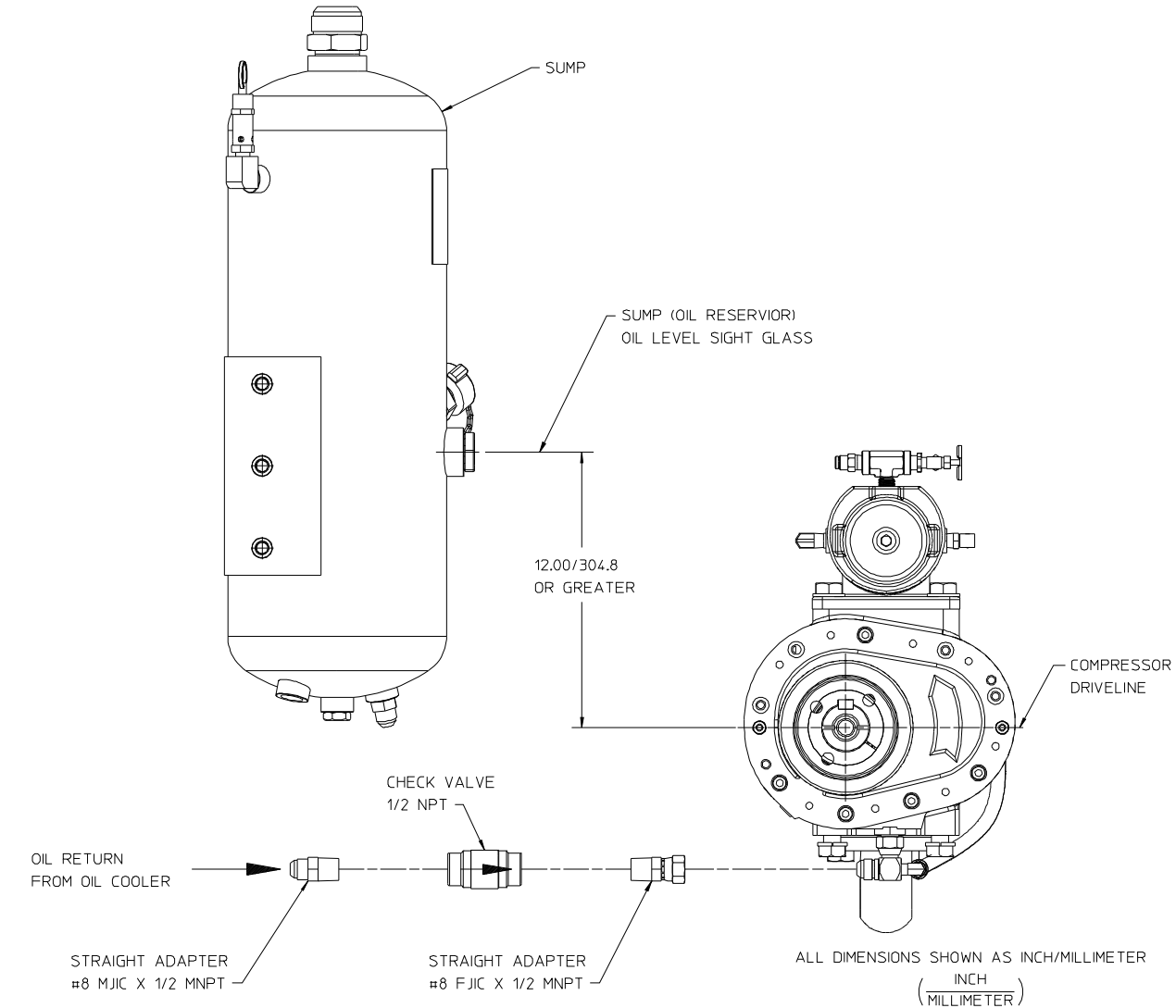
IL4306

Installation – Optional Oil Inject Check Valve

Purpose:

If the sump is mounted with its oil level 12.00 in./304 mm or more above the compressor driveline, a check valve will be required in the oil line from the oil cooler to the compressor. This is necessary to prevent flooding the compressor with oil.

The check valve is an option that can be ordered from Waterous. See drawing DPL83571.



IL4438

OPTIONAL OIL INJECT CHECK VALVE
REQUIRED WHEN SUMP (OIL RESERVIOR OIL LEVEL IS,
12 IN./304.8 mm OR MORE ABOVE COMPRESSOR DRIVELINE

Installation – Oil Cooler

Purpose:

The oil flowing to the compressor from the sump is passed through an oil filter to remove contaminants and then through the cooler which uses water from the pump to cool the oil.

Location:

The cooler should be located so that the strainer screen and oil filter can be accessed for maintenance and the cooler drained after each use.

Open space should be left under the oil filter to allow for removal of the filter. If cooler ordered has a panel mounted water strainer, the strainer screen is accessed at the operator's panel.

Mounting:

The cooler has a right angle mounting bracket on each end oriented for mounting on a horizontal surface. If mounting on a vertical surface, these brackets may be re-oriented on the cooler. Ensure that the drain port is located down (under the inlet ports).

The cooler must be installed horizontally with the drain port at the lowest point. The cooler should have a slight slope towards the drain end.

If necessary to ease the installation, the oil and water inlets and outlets can be reversed.

If relocating the oil filter, note that the filter has a one-way flow. Ensure the flow arrow on the top of the filter is correct.

Hose Connections:

In-Line Strainer:

Install the in-line wye strainer furnished in kit L1192 in the water inlet tap on the cooler. Note that screen in the strainer must be accessed for regular inspection and cleaning.

CAUTION

Waterous will not be responsible for damage due to plugged strainers. Without adequate water flow through the cooler, the compressor will overheat and possibly fail. Removing the screen does not improve water flow as it will allow debris to enter the cooler which can clog the small internal cooler tubes and restrict water flow.

Hose Connections:

Water Lines:

Supply Lines:

The cooler water is supplied by diverting water via fitting (OEM supplied) from the **DISCHARGE** side of the fire pump 1/2 in. I.D. hose should be used to supply the proper flow for the cooling system.

CAUTION

Do not install a shut off valve in the oil cooler water supply line. This could cause the system to overheat and fail and void the manufacturer's warranty.

Return Line, Option 1:

The cooler discharge water may be routed to the booster tank and a check valve installed in the line to prevent backflow from the tank through the cooler. During drafting and hydrant supplied operations, the booster tank may overflow because of the cooler return water. This check valve is included in compressor install kit L1184. 1/2 in. I.D. hose should be used to supply the proper flow for the cooling system.

Return Line, Option 2:

Route the return line to the inlet side of the pump, In this case, it is not necessary to install an in-line check valve, but it will be necessary for the pump operator to open the tank fill valve during operation to prevent overheating the pump. 1/2 in. I.D. hose should be used to supply the proper flow for the cooling system.

Drain Lines:

The oil cooler has a 3/8 in. NPT tap located on the end of the cooler where water lines are connected. This line can be tied into the pump drain valve or a separate valve used. It is recommended that 1/2 in. I.D. hose be used for the drain line. Waterous does not furnish the hose or separate valve.

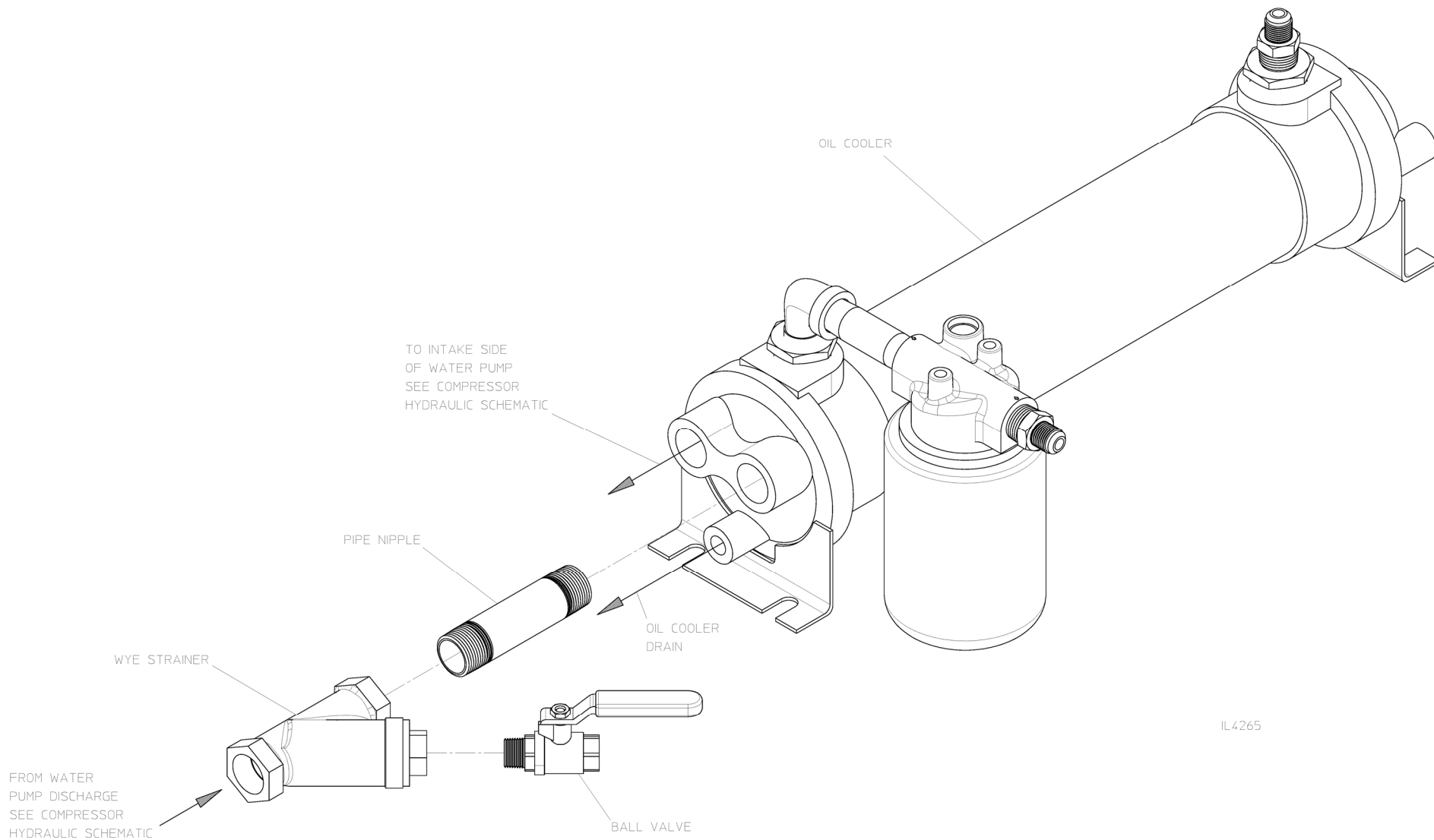
The outlet of the drain hose must be lower than the drain tap on the cooler and should be a continuous downward run (no goosenecks) to allow proper drainage.

Oil Line:

Connect the oil cooler filter to the #8 JIC fitting on the bottom of the sump using 1/2 in. hydraulic hose.

See the **Hose Specification** section of this instruction for hose specifications. Note that all hoses and fittings except for the drain line are included in the optional hose and fitting kit available from Waterous. See drawing DPL83571

Installation – Oil Cooler (con't)



Installation – Separator Filter

Purpose:

The filter removes oil from the air being discharged by the compressor and returns it to the compressor via an oil return (scavenger) hose. It is also the point from which compressed air is obtained for the CAF discharges.

Location:

The separator filter can be installed anywhere there is room in the apparatus. Install vertically with the housing up and filter element down. Leave room under the filter to facilitate its removal for maintenance.

Mounting:

Use the angle bracket on the filter to attach to the apparatus frame. See drawing **DPL83571** for dimensions and required maintenance space.

Hose Connections:

Note the flow directions arrows on the top of the filter.

Hydraulic Lines:

1. Connect the intake side to the #24 JIC fitting on the top of the sump using 1-3/8" hydraulic hose.
2. Connect the discharge side 3/4" NPT tap to the #8 JIC fitting on the Foam Generators using 1/2" air line.
3. Connect the #4 JIC elbow on the top of the filter to the #4 JIC oil return fitting on the air compressor using 1/4" hydraulic hose.

See the hose specification section of this instruction for hose specifications.

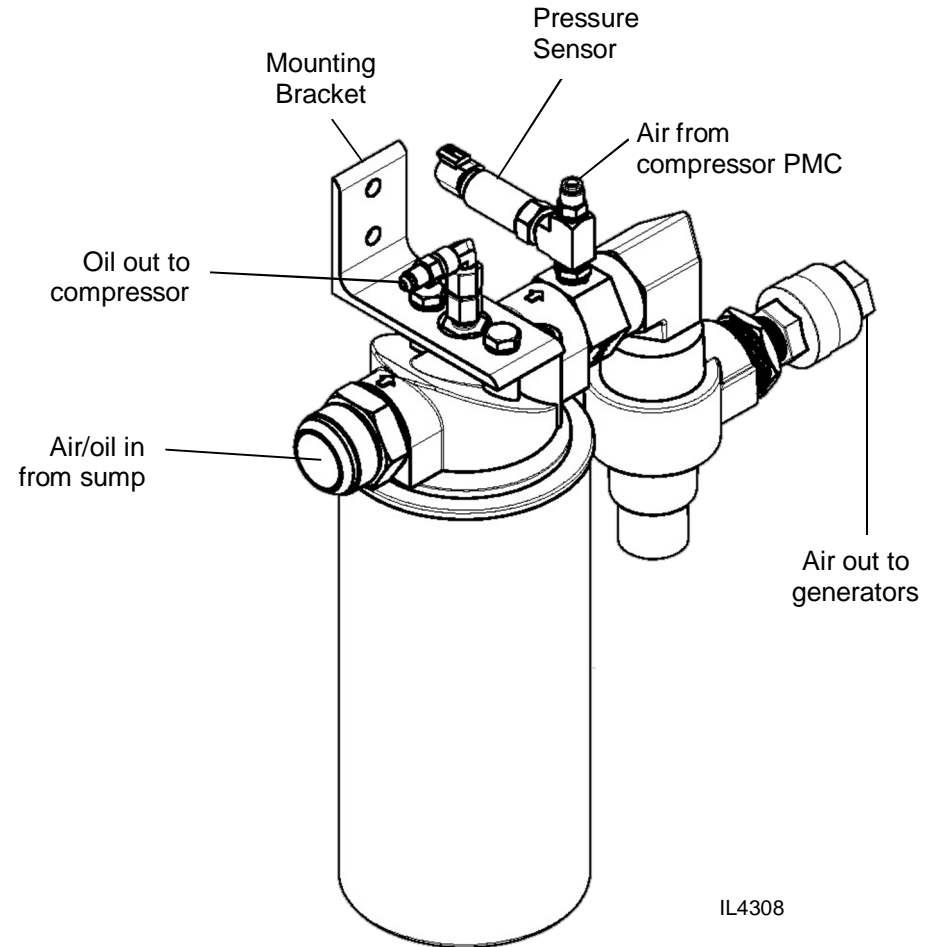
Note that all hoses and fittings are available as an optional kit from Waterous, see drawing DPL83571.

Air Line Connection:

The push-on fitting on the top of the filter is to be connected to the air compressor pressure modulating control (PMC). See Air Line section of this instruction.

Electrical Connection:

The pressure switch will be connected to the Foam Generator wiring, see **Generator and Controls Instruction F-1031-3069**.



Installation – Air Filter

Purpose:

The air filter prevents any contaminants such as dust and sand from entering the compressor.

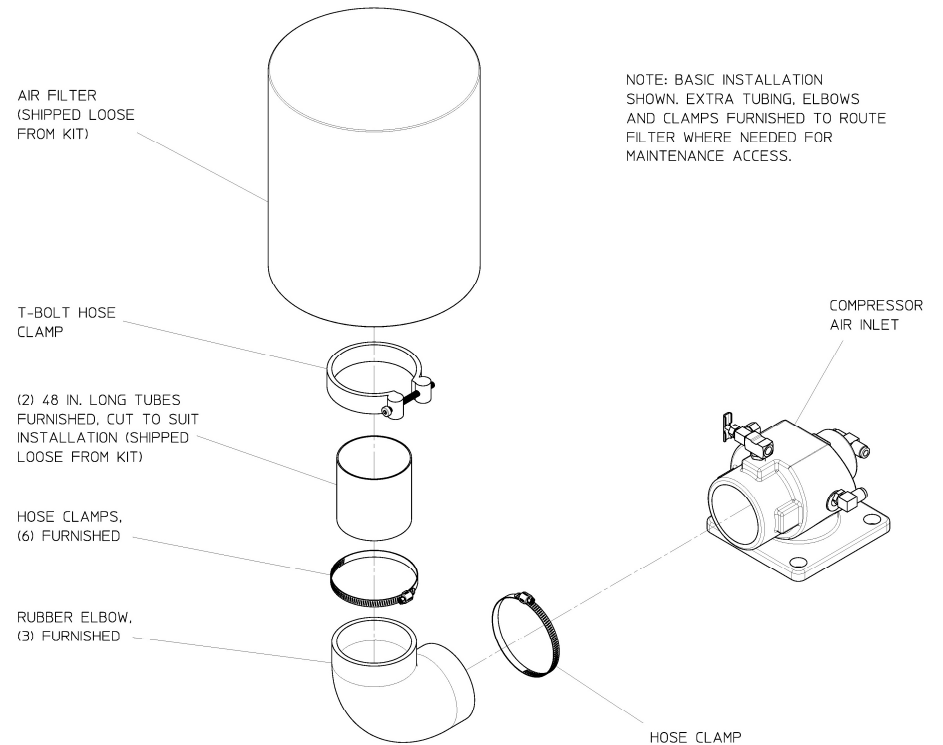
Location:

The air filter is to be installed on the air compressor inlet. The air intake area should be unobstructed. Note that the filter is a maintenance item, so it should be accessible in the apparatus with adequate space for removal.

Mounting:

Use the two 4 foot pieces of tubing furnished along with rubber elbows and clamps furnished with install kit L1185. See drawing DPL83571 for dimensions.

Plumb it as though it were an engine air inlet, do not use flexible exhaust tubing or any material that water and dirt can easily penetrate. The tubing run should be as short and straight as possible.



IL4227

Installation – High Rise Option, Auto-Sync Solenoids

Location:

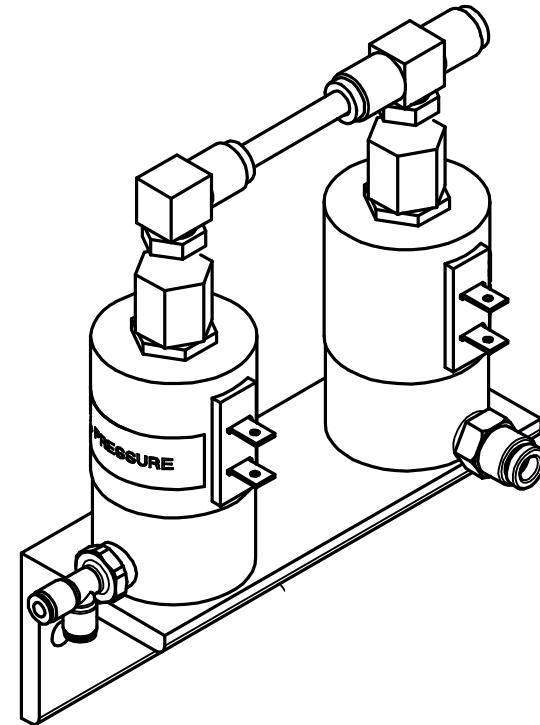
Use the right angle bracket to attach to the apparatus frame. See drawing DPL83571 for dimensions.

Air Line Connections:

Use black, red and yellow air line tubing furnished with **Compressor Component Kit L1184**. See **Air Lines – With High Rise Option** for connections.

Electrical Connections:

Each solenoid will be connected to the CAFS Generator wiring. See **Generators and Controls Instruction F-1031-3069**.

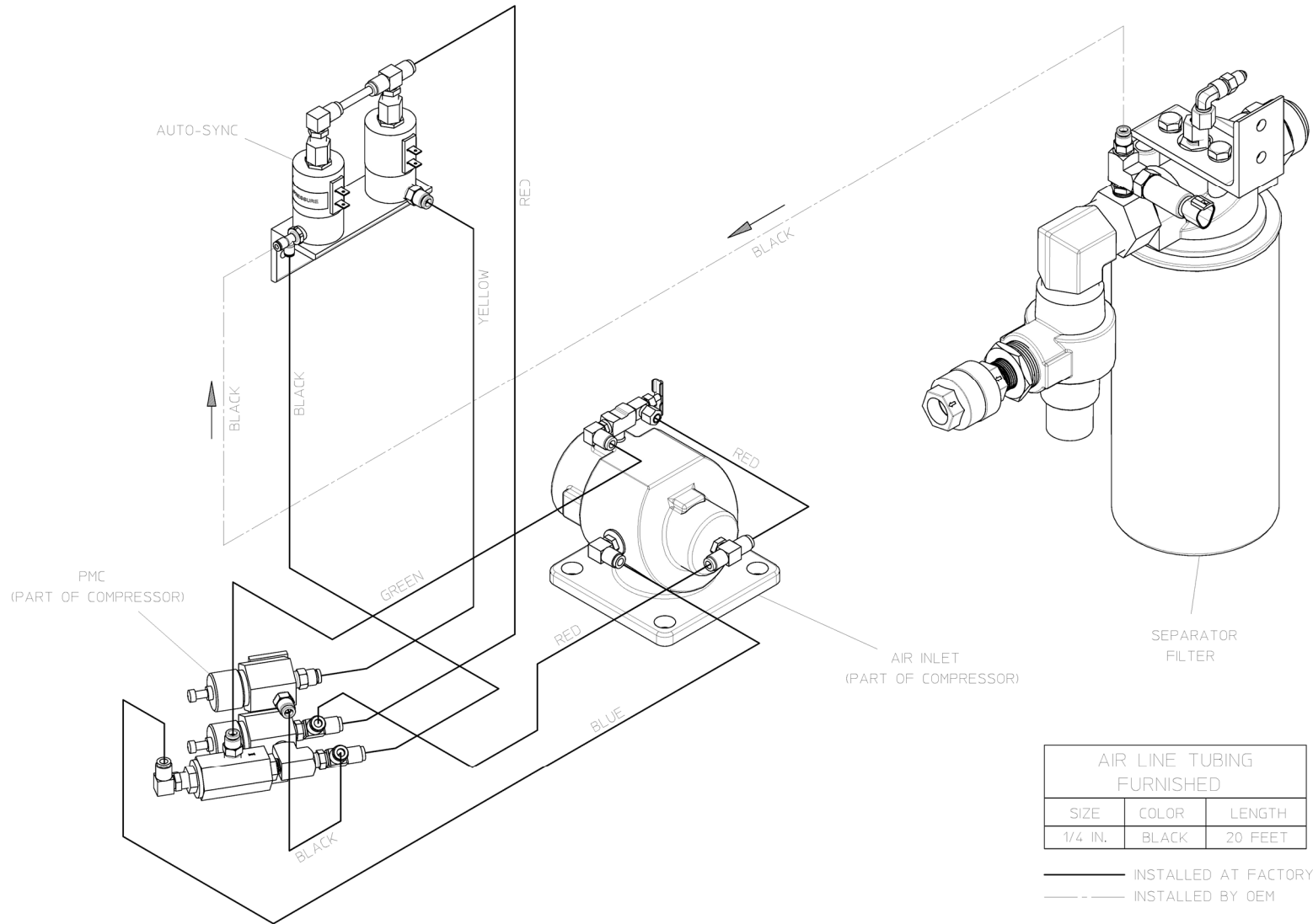


IL4306

Installation – Air Lines, Without High Rise Option

Air Line Connections:

1. Use black 1/4" air line tubing furnished with **Compressor Component Kit L1184**.
2. Connect the separator filter to PMC mounted on the compressor.
3. Discard the red and yellow tubing in the kit as it is not used.

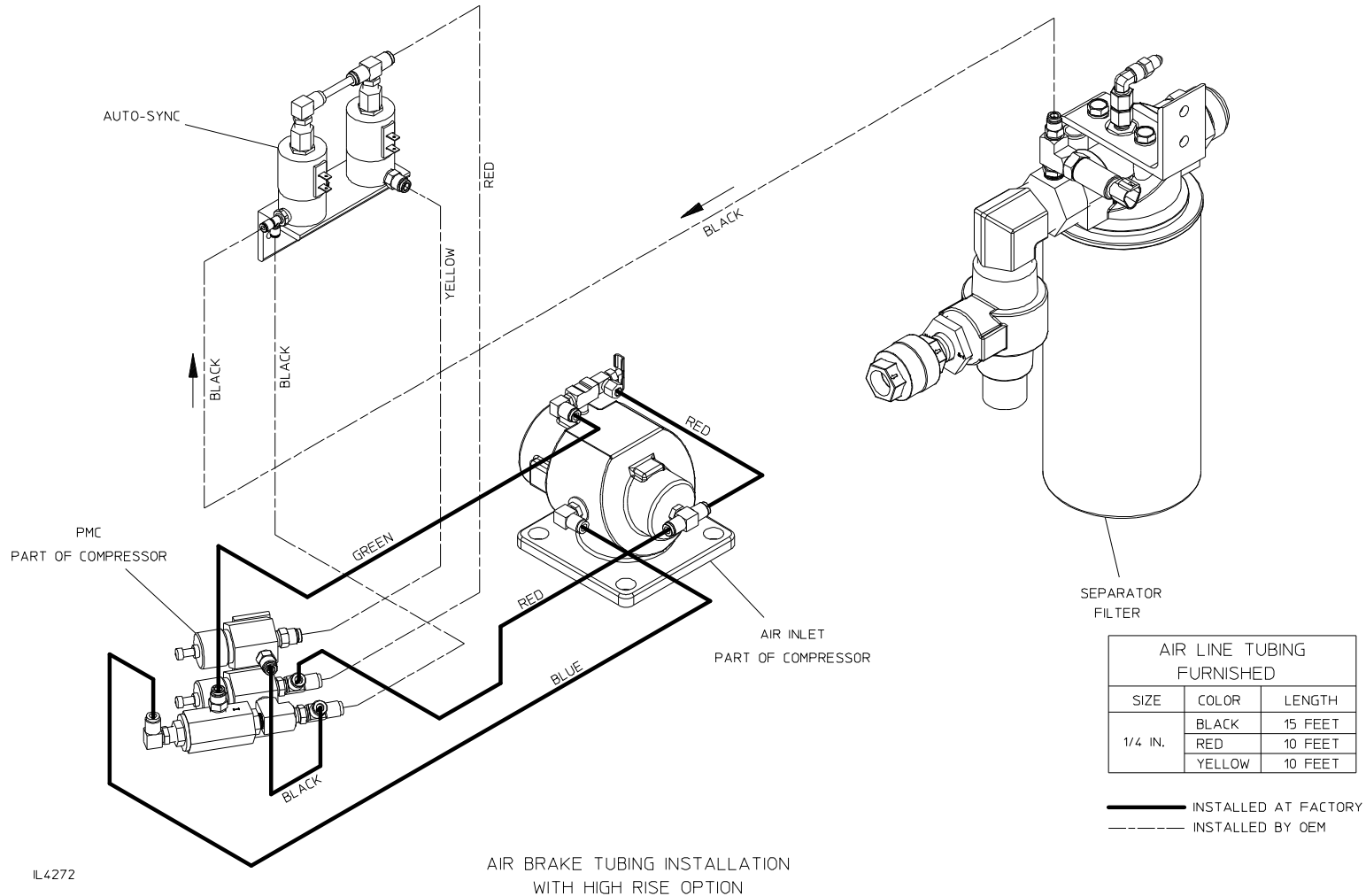


IL4270

Installation – Air Lines, With High Rise Option

Air Line Connections:

1. Use black, yellow and red 1/4 in. air line tubing furnished with **Compressor Component Kit L1184**.
 - a. Use the black tubing to connect the Separator Filter to the Auto-Sync Solenoid labeled “Normal Pressure.”
 - b. Use the yellow tubing to connect the Compressor PMC to the Auto-Sync Solenoid labeled “High Rise Pressure.”
 - c. Use the red tubing to connect the Compressor PMC to the Auto-Sync Solenoid labeled “High Rise Pressure.”



IL4272

Installation – Panel Plates

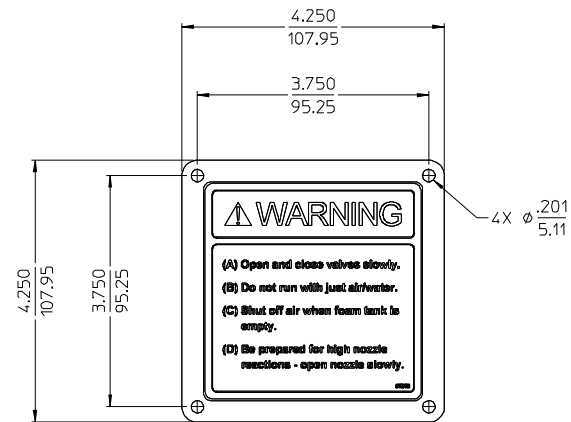
Location:

Two panel plates require installation on the operator's panel:

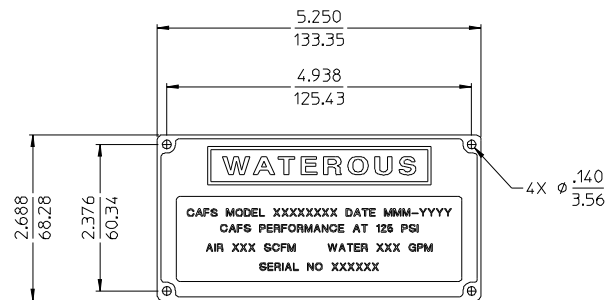
- CAFS Warning Plate furnished with **Compressor Component Kit L1184**.
- Serial Plate shipped loose with the compressor.

Mounting:

Use four screws to install each panel plate (not furnished by Waterous).



CAFS WARNING



SERIAL PLATE

PL83522.6

Installation – Hose Specifications

Hydraulic Oil (and air):

For compressor hydraulic system, use a hose that complies with SAE J517, 100R1 or 100R5 as a minimum.

Air:

For air compressor control circuit and gauging, ¼” OD air brake tubing is typically used. Tubing such as Eaton Synflex Eclipse or equivalent is suggested. The tubing shall comply with SAE J844 Type A.

For compressed air distribution, “push-on” type hose is typically used. An H101 or H201 general purpose hose with a working pressure rating of 300 psi or better is acceptable. The hose shall also have a minimum burst pressure of 4 times rated working pressure (4 x 300 = 1200 psi).

Water:

For cooling water hose or any hose connected to the discharge of the pump, use a hose that complies with SAE J517, 100R3 as a minimum.

General practice factors to avoid with hose (and tubing):

- Bending the hose to less than the minimum specified bend radius.
- Pulling, twisting, crushing or kinking.
- Routing hose over sharp edges, abrasive or hot surfaces.
- Pressure spikes in excess of rated working pressure.

NOTE: All hoses and fittings are available as an optional kit from Waterous. See drawing DPL83571.

Initial Power-up

Assembly Checks:

- Remove all tools, shop towels, hose trimmings and other debris from the apparatus compartment.
- Double check all hydraulic, air and water lines against schematics, checking to make sure each connection is tight and that the hose or tubing is fully inserted into fittings.
- Check that all unused inlets have the shipping plugs removed and replaced with appropriate plugs or caps.
- Make sure all drain valves are closed.
- Make sure the fire pump is operating properly and that water flows through the compressor oil cooler.
- Make sure the foam pump is operating properly.

Lubrication:

Fill the sump with hydraulic oil until the level 1/2 way up the sight glass. Use ISO AW68, low foaming/anti-foaming hydraulic oil.

Note that the level will need to re-checked and additional oil added to compensate for oil that fills the hydraulic lines and compressor after the initial compressor run.

Air Circuit Adjustment:

The air trim valve located on the compressor air inlet is factory set at three full turns open from its closed position. If necessary to reset, loosen lock nut, turn to fully close and then open three full turns. Tighten locknut after adjustment. See page 4 for location of air trim valve.

Power-up:

CAUTION

Compressed air can be dangerous. Make sure the pressure is allowed to bleed down to atmospheric pressure before opening any connections or valves.

Check ALL fluids in the entire vehicle before initial power-up.

1. Remove the compressor air filter piping and pour 8 to 16 ounces of hydraulic oil into the air inlet.
2. Replace the air filter piping.
3. Start the vehicle and engaged the CAFSystem.
4. Check for leaks by listening for hissing noises at the fittings.
5. Shut the system off and allow for air pressure to bleed off.

Re-check the sump oil level and add additional oil added to compensate for oil that fills the hydraulic lines and compressor after the initial compressor run.