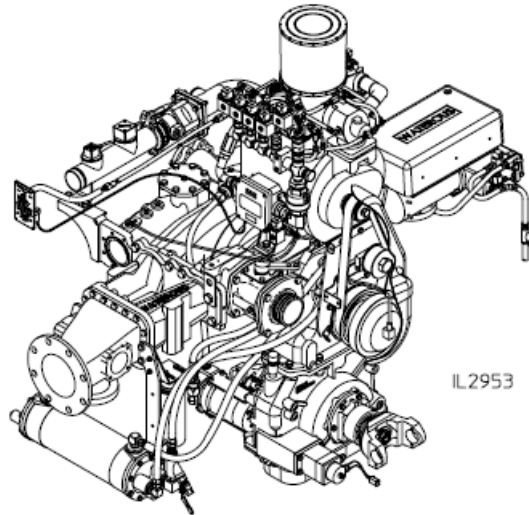


Eclipse™ Compressed Air System with Advantus®

Installation Instructions

Form No.	Section	Issue Date	Rev. Date
F-1031	3025	10/05/07	4/3/17

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IL2953



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Safety Information



Read through and communicate safety information to the end user of this Waterous Fire Pump.

WARNING

Death or serious personal injury might occur if proper operating procedures are not followed. The pump operator, as well as individuals connecting supply or discharge hoses to the apparatus must be familiar with these pump operating instructions as well as other operating instructions and manuals for the apparatus, water hydraulics and component limitation.

WARNING

Pressure Hazard. May result in personal injury.

Prior to connection or removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves. Bleeder valves should also be used while filling a hose connected to an intake with water.

WARNING

Scalding Water Hazard. May result in serious burns.

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs for a few minutes completely closed, it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

WARNING

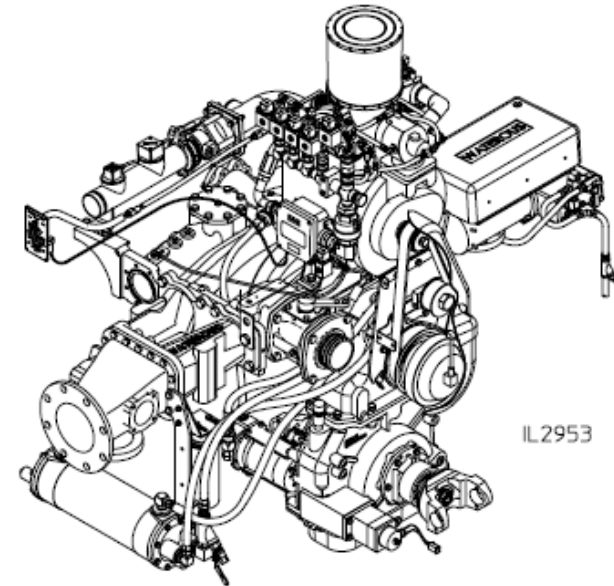
Compressed Air Pressure Hazard. May result in personal injury.

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

Introduction

This instruction covers the installation of a Waterous Eclipse™ Compressed Air Foam System with electric Auto-Sync. The Eclipse™ system (see Figure 1) is factory mounted on a Waterous CS, CSU or CMU midship pump.

Figure 1. Eclipse™



The following installation instructions are available:

- CM, CS Pump Installation, F-1031, Section 3011
- Priming System, F-1031, Section 3023
- Manifold Drain Valves, F-1031, Section 3008
- Overheat Protection Manager (OPM), F-1031, Section 3015

Before proceeding with the installation of the Eclipse™, read all the instructions carefully. Check the appropriate dimensional drawings in the Engineering Manual as needed.

CAUTION

Operating Speed Limit. May cause damage to the pump and/or air compressor.

The Eclipse compressor has a maximum operating speed of 8950 RPM. Do not allow the compressor to run beyond 8950 RPM.

Compressor speed can be calculated by **(Engine Speed) x (Pump Transmission Ratio) x 2.5**.

System Components

Listed below are the Eclipse^M Compressed Air Foam System's standard items furnished, optional items from Waterous and items not furnished by Waterous. Also see Page 4 for location of components.









Standard Items Furnished	
Ref. No.	Description
1	Rotary Screw Compressor
2	Sump Tank
3	Compressor Oil Cooler (Heat Exchanger)
4	Oil Temperature Sensor
5	Oil Filter
6	Oil Cooler Water Strainer and Flush Valve
7	Oil Drain (Oil Cooler / Heat Exchanger)
8	Water Drain (Oil Cooler / Heat Exchanger)
9	Air / Oil Separator
10	Siphon Tube / Return
11	Air Inlet Valve
12	Electric Auto Sync Control Panel
13	Polychain®
14	Pneumatic Clutch
15	Air Distribution Manifold (shown with optional Solenoid Valves)
16	Advantus ^M Foam Pump (Proportioner)
17	Foam Pump Inject/Bypass Valve
18	Electric Relay Panel
19	Air Flow Meter
20	Oil Fill and Level Sight Glass
21	Air Filter
22	Belt Adjustment Hardware
23	Foam Manifold
24	Trim Valves
25	Advantus ^M Foam Pump OIT (Control Panel)
26	Advantus ^M Operation Instruction Panel Plate
27	Oil Temperature Gauge
28	CAFS Warning Plate

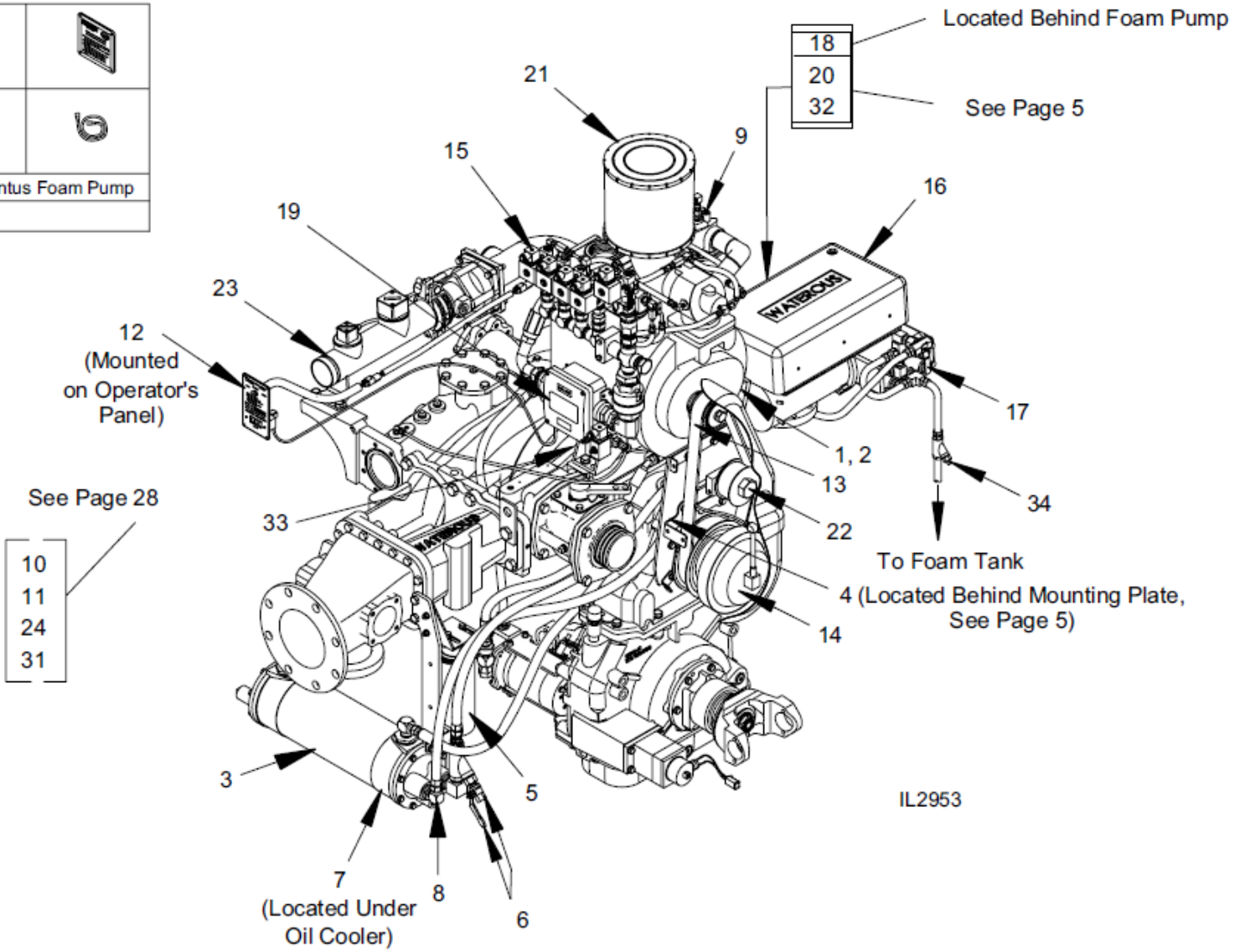
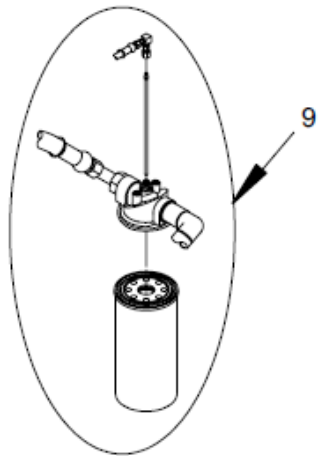
Standard Items Furnished (Continued)	
29	CAFS Hose Specification Plate
31	Minimum Pressure Valve
32	Compressor Safety Pop-off Valve
33	Air Clutch Solenoid
34	In-Line Foam Concentrate Strainer
35	OIT Cable

Optional Items from Waterous	
Description	
Air Distribution Solenoids	
Foam Tank Level Switch	
Dual OIT (Control Panel) Kit	
Dual Foam Tank Selector Kit	
Advantus Rating Panel Plate	
Advantus System Schematic Panel Plate	
OIT (Control Panel) Extension Cable	
Static Mixer	

Items not Furnished by Waterous	
Description	
Master Air Pressure Gauge	
Discharge Ball Valves and Check Valves	
Switch to Engage Air Clutch	
Compressor Overheat Light and Alarm	
Foam Concentrate Tank and Plumbing	
Air Line from Vehicle Air to Air Clutch Solenoid	
Air Lines from Air Distribution Solenoids to Discharge Valves	
Wiring from Vehicle to Compressor and Foam Pump	
Wiring to "Throttle Ready" Light	
Drain Lines from Manifold, Discharge Check Valves and Oil Cooler	

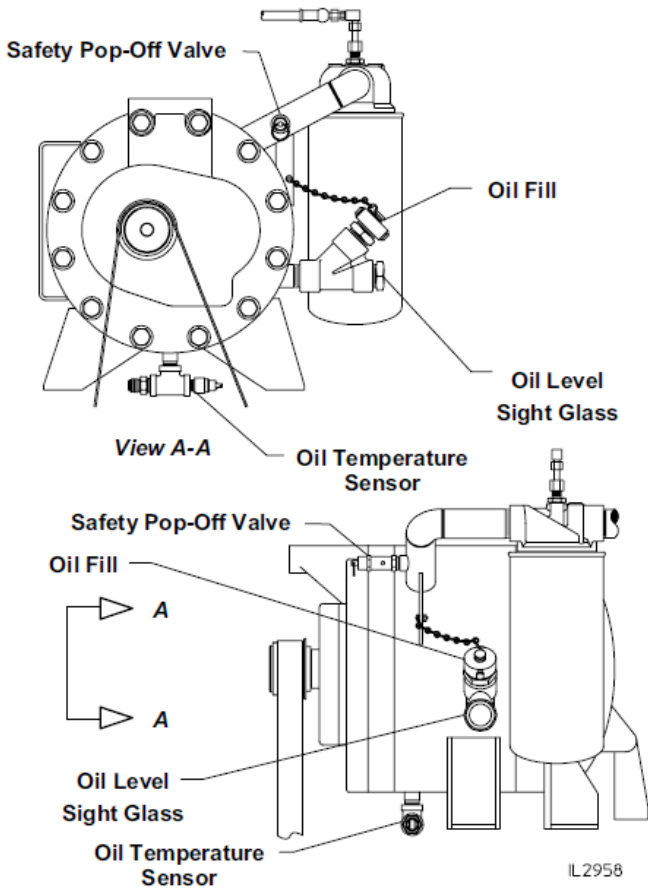
System Components

			
			
With Compressor		With Advantus Foam Pump	
Items Shipped Loose			



Air Compressor Oil Fill

After the Eclipse™ is mounted in the vehicle, the unit's compressor needs to be filled with oil. Fill the air compressor with ISO 68 hydraulic oil through the oil fill tube located on the compressor. The compressor holds approximately 2.5 gallons (9.5 liters).



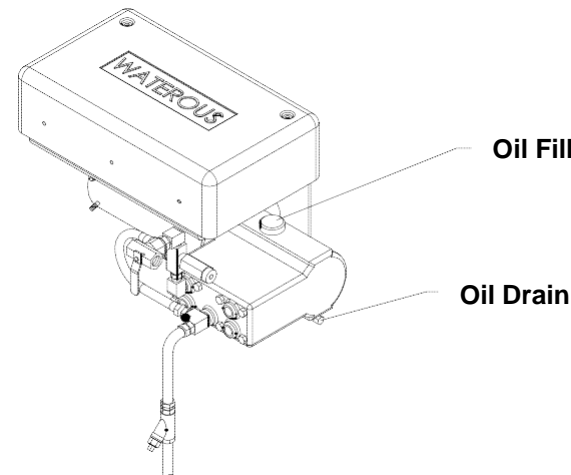
Advantus® Foam Pump Oil Fill

Check the oil level of the foam pump and add if necessary:

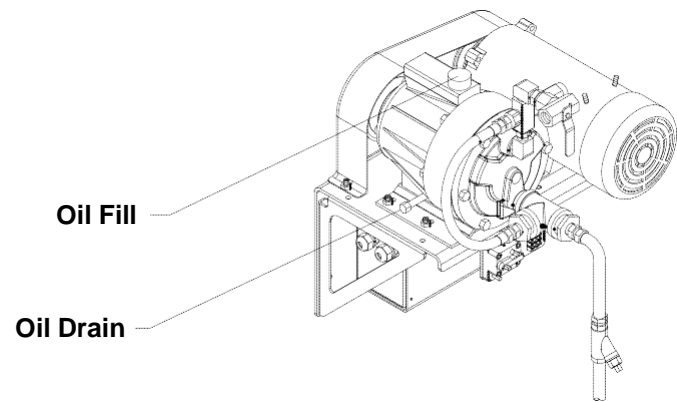
Advantus® Foam Pump Oil

Foam Pump Model	Level from Top of Oil Fill Port	Use Oil
Advantus 3	3/4 inch (19 mm)	Synthetic 10W-30 (Mobil 1 recommended)
Advantus 6	1 inch (25 mm)	

Advantus® 3 Systems

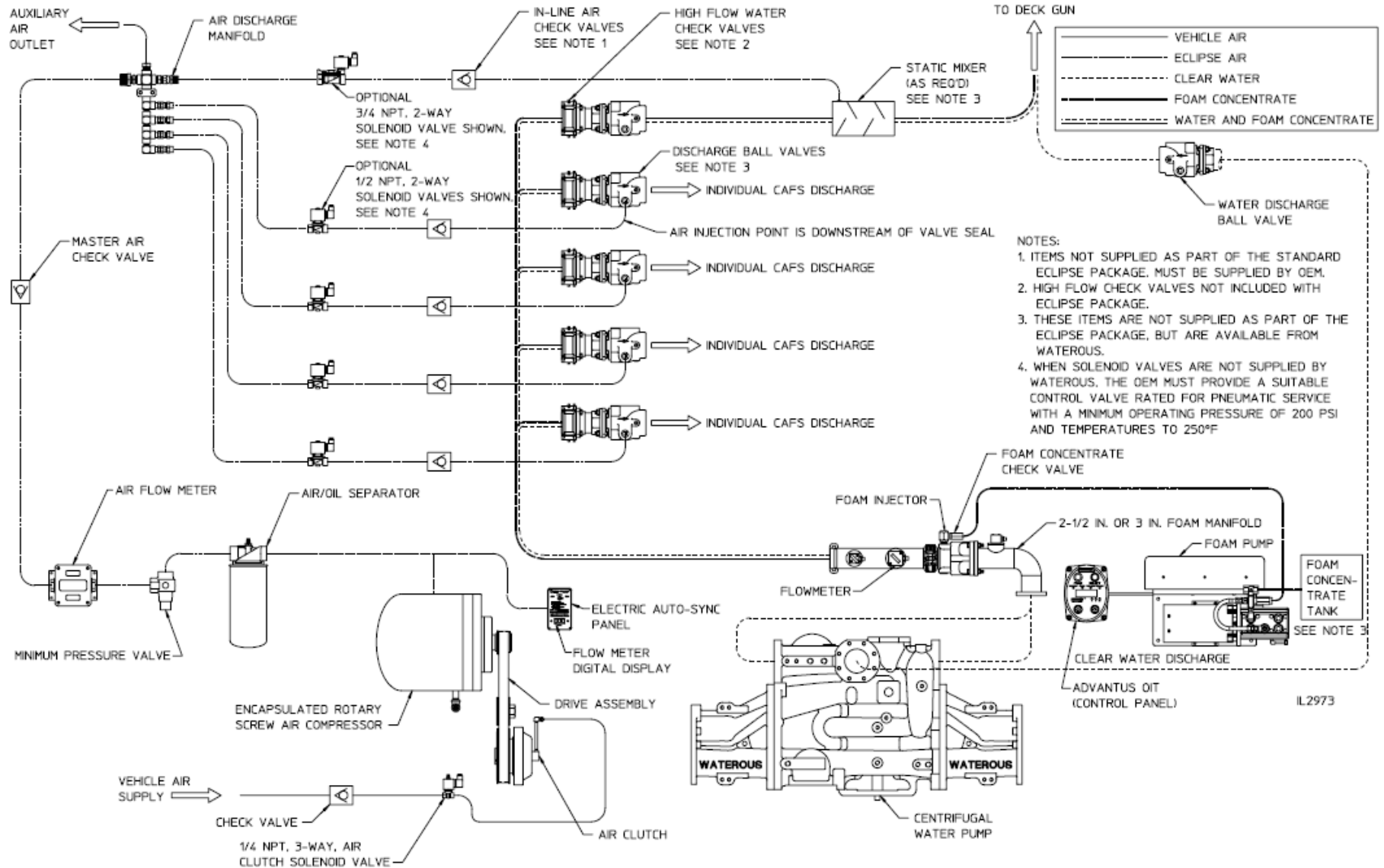


Advantus® 6 Systems

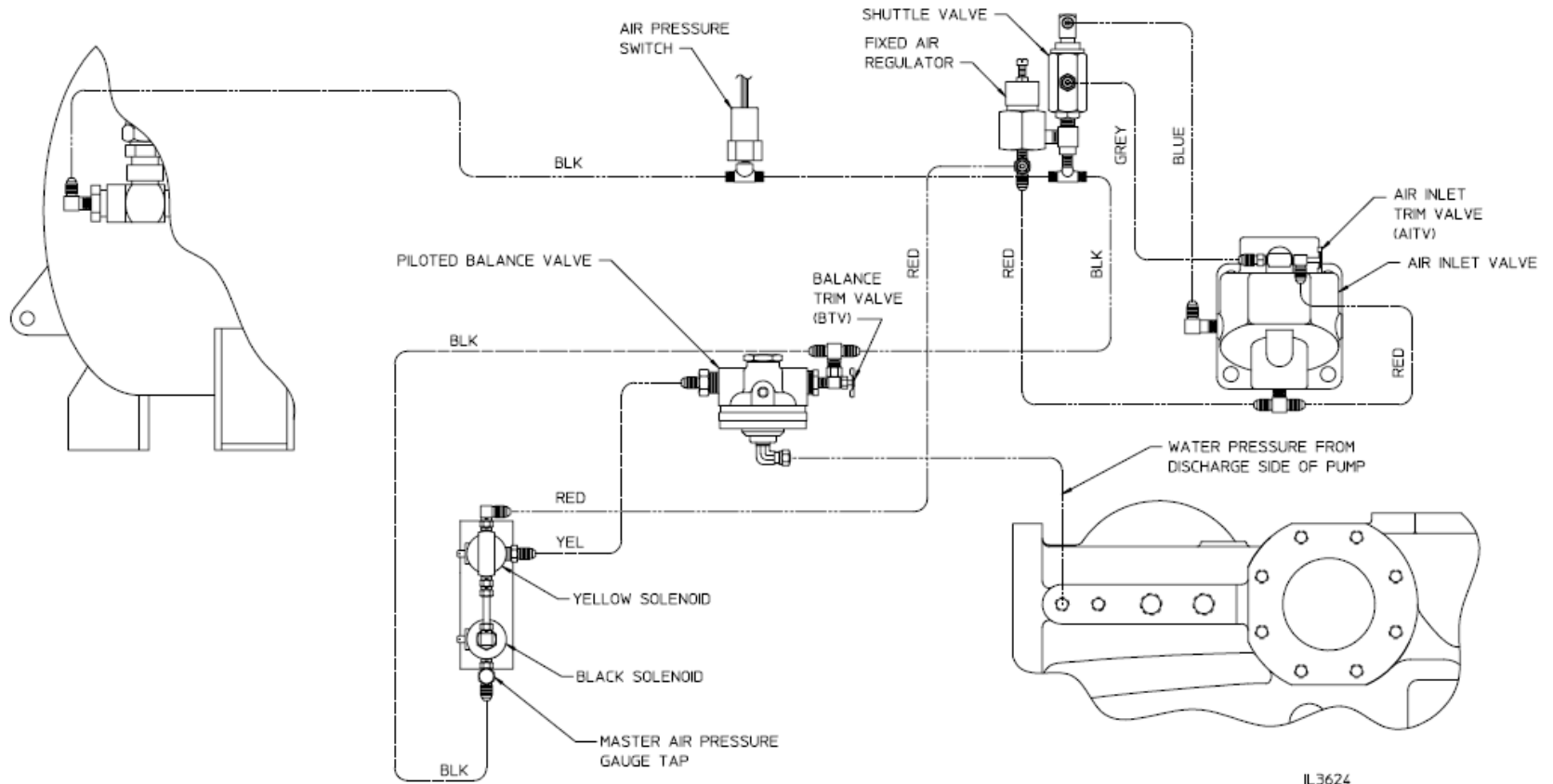


CAFS Schematic

The system schematic below shows an overview of the Eclipse™ CAFS, water, foam and air connections.



Control Air Circuit



IL3624

COMPRESSOR MODE	BLACK SOLENOID NORMALLY OPEN	YELLOW SOLENOID NORMALLY OPEN
UNLOAD	NOT ENERGIZED: OPEN	NOT ENERGIZED: OPEN
FIXED	ENERGIZED: CLOSED	ENERGIZED: CLOSED
AUTO	ENERGIZED: CLOSED	NOT ENERGIZED: OPEN

AIR CONTROL CIRCUIT SCHEMATIC FOR ECLIPSE CAFS

NOTE: For an explanation of control air circuit function during compressor operation, see F-1031, Section 2412, *Operation and Maintenance Instructions*.

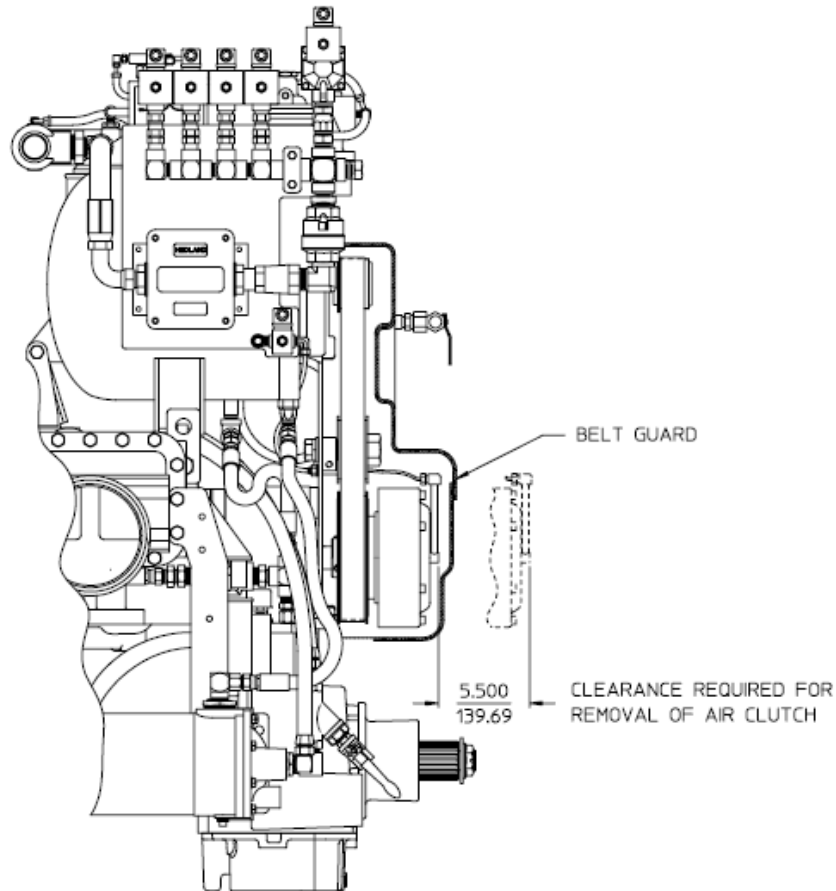
Installation

Fire Pump Mounting

For fire pump mounting instructions, see F-1031, Section 3011, *CM/CS Installation Instructions*.

Clearances Required for Maintenance

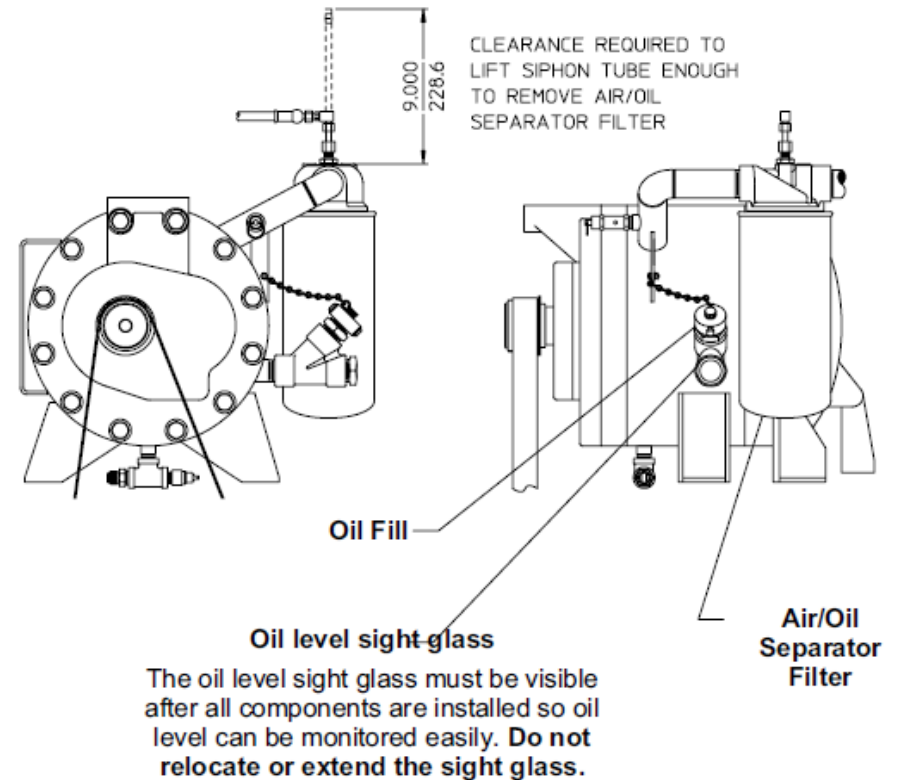
Compressor Air Clutch



IL2491

Air / Oil Separator Filter, Oil Fill and Sight Glass

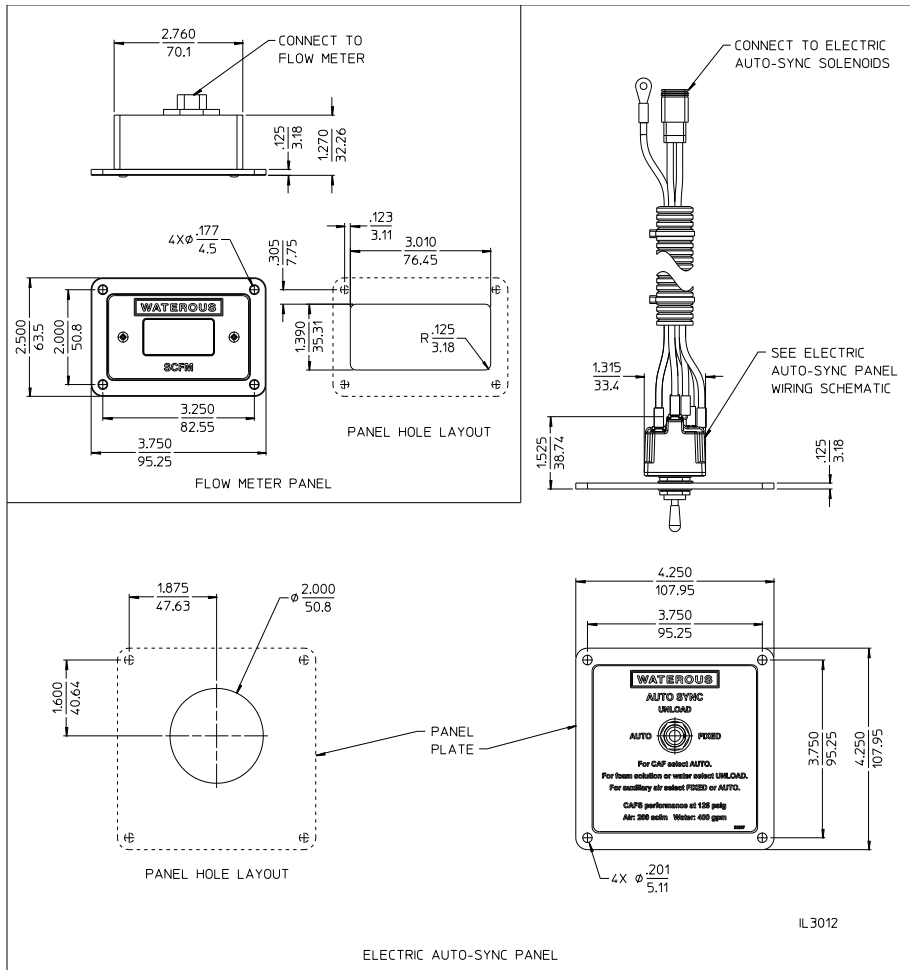
Allow enough clearance for routine maintenance, including checking oil level sight glass, adding oil and changing air/oil separator filter.



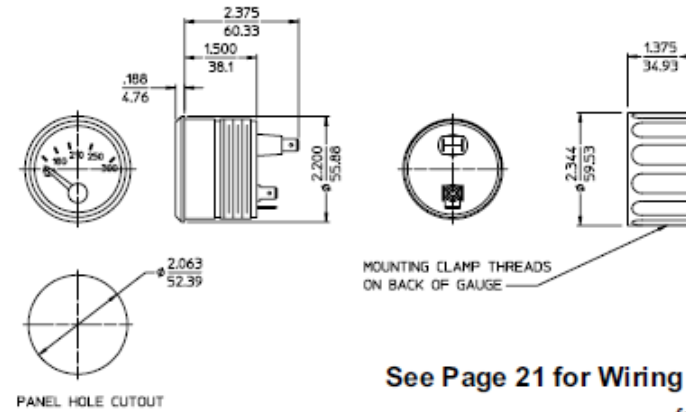
IL2491

Compressor Panel Components

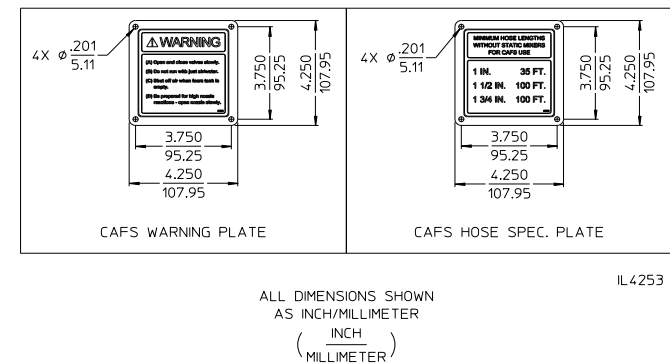
Electric Auto-Sync Panel



Oil Temperature Gauge



Panel Plates



Master Air Pressure Gauge

Not Furnished by Waterous, see Page 11 for specifications.

Advantus® Foam Pump Panel Components

OIT (Control Panel)

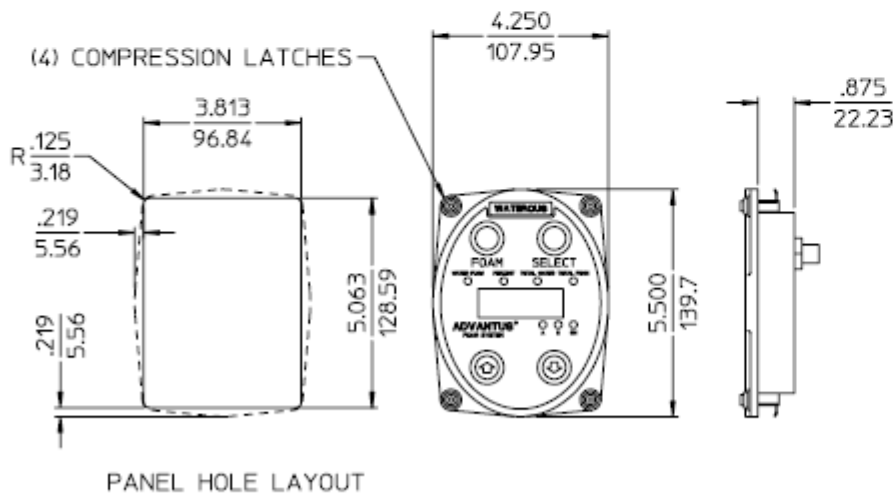
Determine a location for the Operator Interface Terminal (OIT) on the operator panel of the equipment.

- Consider the routing path of the cable from the OIT to the pump / motor driver assembly (see Page 24).
- If necessary, order longer or short cable assemblies to suit the location demands

NOTE: Make sure there is enough clearance behind the OIT assembly for the cable.

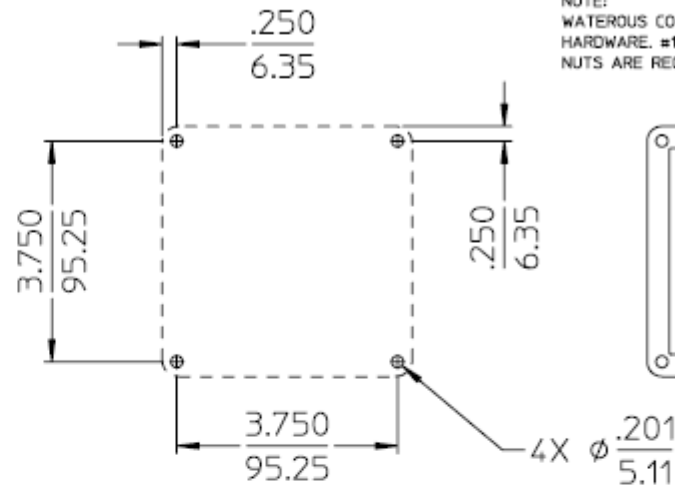
Optional Dual OIT (Control Panel) - Follow instructions furnished with kit.

OIT (Control Panel) - See Page 24 for Cable Connections



DPL82983

Instruction Panel



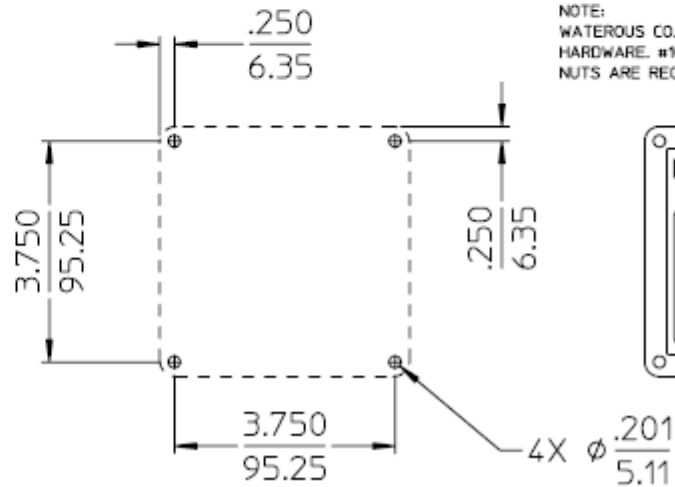
PANEL HOLE LAYOUT

DPL82983

NOTE:
WATEROUS CO. DOES NOT SUPPLY MOUNTING HARDWARE. #10 PAN HEAD SCREWS AND NUTS ARE RECOMMENDED FOR MOUNTING.



Optional Schematic and Rating Panels - Advantus 3 Shown



PANEL HOLE LAYOUT

DPL82983

NOTE:
WATEROUS CO. DOES NOT SUPPLY MOUNTING HARDWARE. #10 PAN HEAD SCREWS AND NUTS ARE RECOMMENDED FOR MOUNTING.

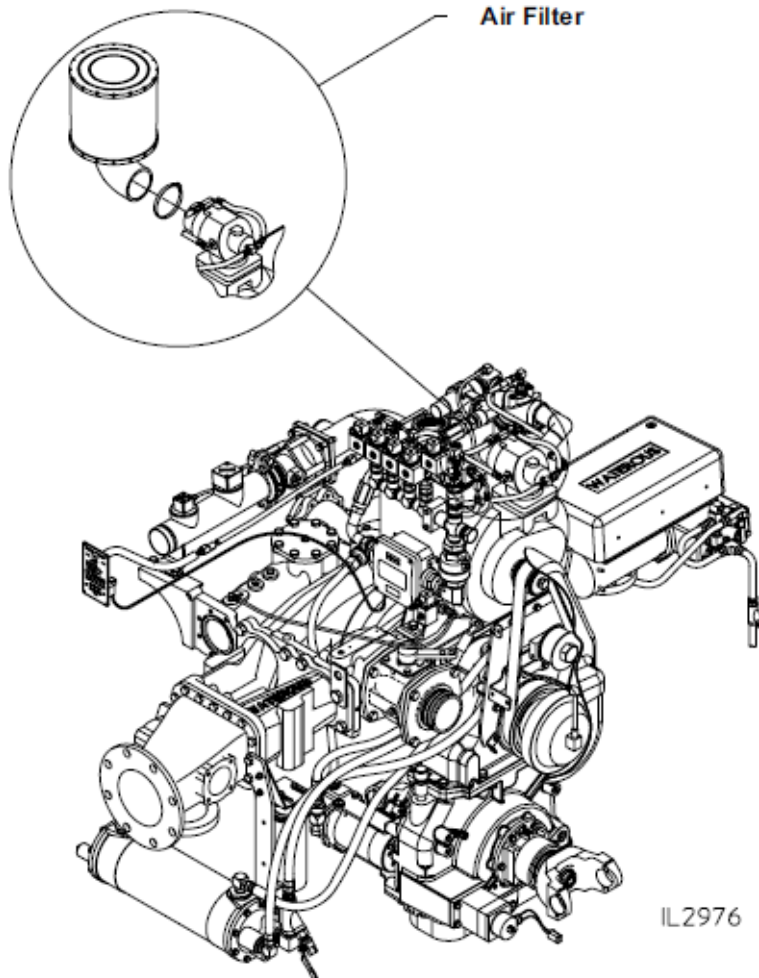


Air Connections

Air Filter

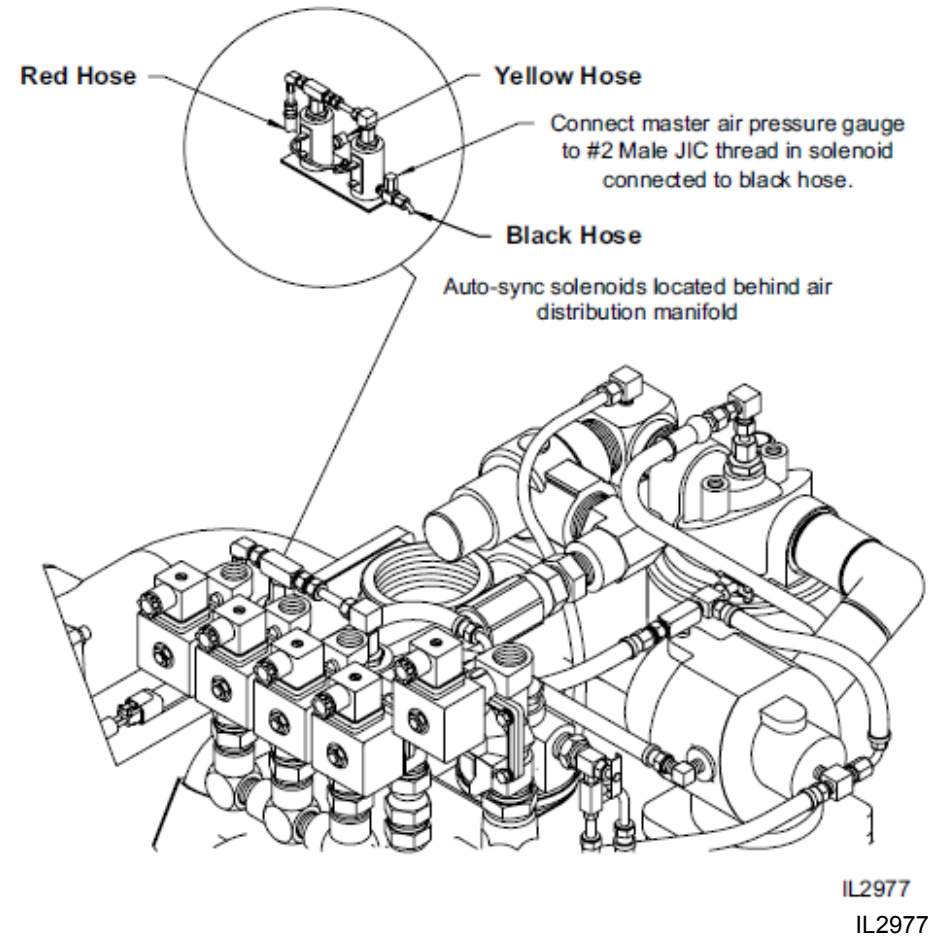
1. Secure air filter to air intake

NOTE: Filter should be checked monthly.



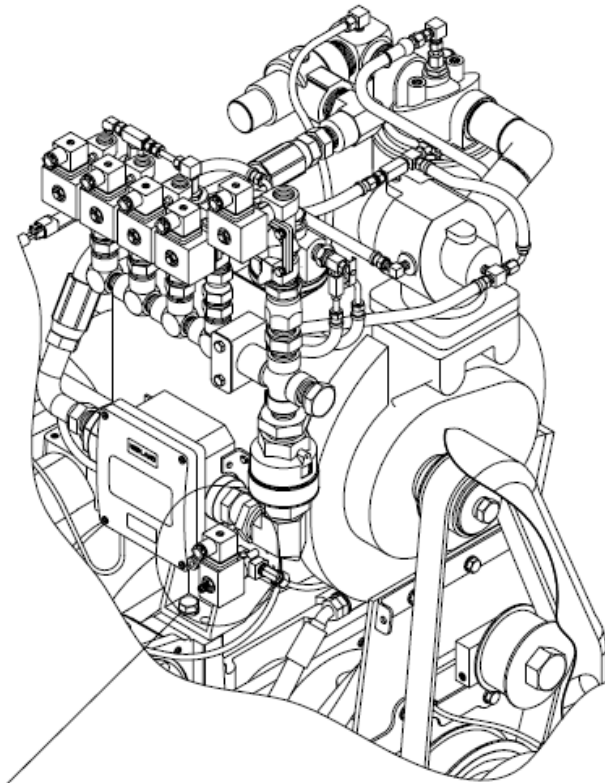
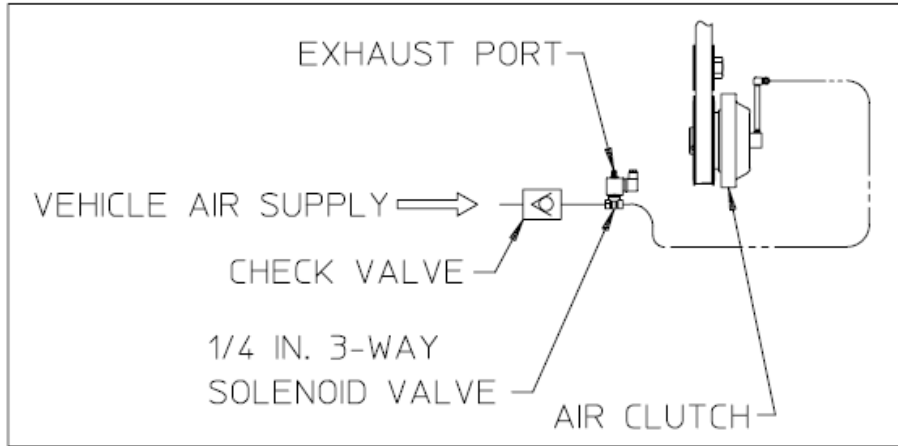
Master Air Pressure Gauge - *Not Furnished by Waterous*

1. The master air pressure gauge is to be mounted on the operator's panel and be plumbed to the master air pressure tap on the black auto-sync solenoid.
2. The gauge is not furnished by Waterous and must have a 0-200 psi pressure range.
3. Air line not furnished by Waterous.



Air Clutch Connection

All components shown except for air supply line furnished by Waterous.



Connect air line from vehicle air system to 1/4 in. NPT tap in 1/4 in. 3-way solenoid valve. Air line not furnished by Waterous.

DO NOT plug exhaust port in threaded stud.

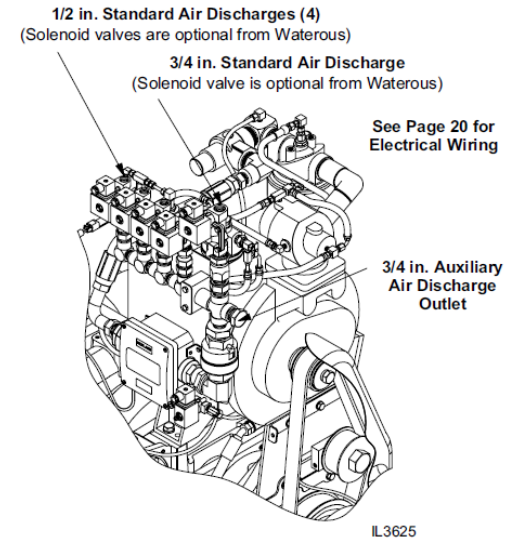
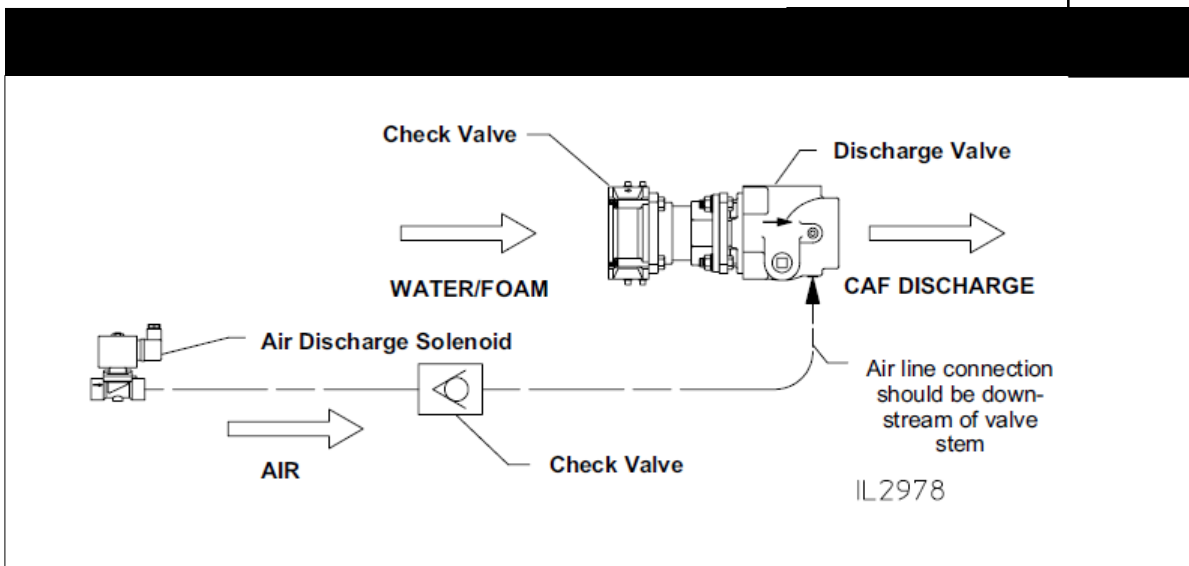
1/4 in., 3-way Solenoid Valve
See Page 19 for wiring and Page 17 for switch required to activate solenoid.

Air Distribution Ports

1. The Eclipse™ comes with an integrated air discharge manifold with optional solenoid discharge valves (four 1/2" valves and one 3/4" valve) or OEM supplied valves. The installer must plumb air discharge lines, with air check valves, from the manifold to the individual air injector points. Each air check valve is best installed at the point of air injection. The air injection is always located downstream of the water discharge valve.
2. If optional solenoid valves are not ordered from Waterous, valves suitable for pneumatic service at a minimum operating pressure of 200 psi and temperatures to 250°F must be provided by the OEM.
3. The discharge lines are sized individually for each discharge application. Refer to the table below for Air Distribution hose size guidelines.

Air Distribution Hose Size Guidelines	
Discharge Application	Hose ID (in.)
Booster Line < or = to 1 inch	3/8
> 1" and < 2-1/2"	1/2
2-1/2"	3/4
> 2-1/2"	3/4 to 1 inch (for a large aerial use 1")

Air Connection to CAF Discharge



Air Distribution Ports

Foam Concentrate Connection

Foam Tank - Not Furnished by Waterous

When specifying an integral foam tank, make sure provisions are made for installation of the optional low tank level sensor as well as foam suction connections and tank drainage according to NFPA.

Most water tank manufacturers will build the foam tank into the booster tank.

1. Place the foam tank so that refilling can be done safely.
2. Foam concentrates should gravity feed to the foam pump inlet from the foam tank. However, the systems are capable of drafting up to 1 meter vertically.

CAUTION

Shut-Off Valves. May cause damage to the foam pump.

Never install shut-off valves between the pump and discharge pressure regulator or in the regulator bypass line.

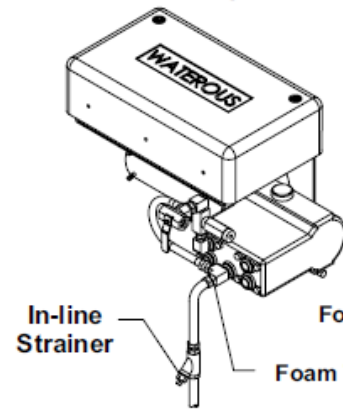
Foam Tank Connection to Advantus® Foam Pump

Flexible hose is required to make the hose connections from the foam pump to the foam tank. Note hose from the foam tank to the foam pump is not furnished by Waterous. The in-line foam concentrate strainer must be installed in the line and be accessible for maintenance.

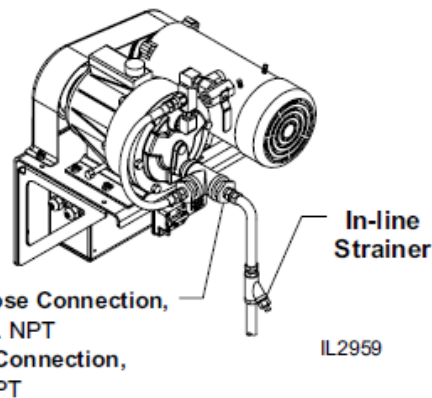
To ensure adequate concentrate supply, size hose as follows:

- Advantus 3 - minimum of 3/4 inch ID tubing
- Advantus 6 - minimum of 1 inch ID tubing

Advantust 3 Systems



Advantust 6 Systems

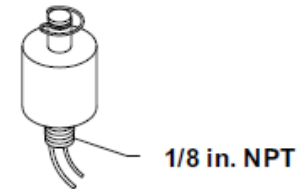


Optional Foam Tank Level Switch

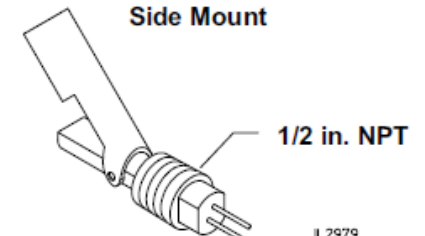
Waterous offers two types of tank level switches as shown below.

1. Install in tank according to NFPA (see Page 26 for wiring details).

Bottom Mount



Side Mount



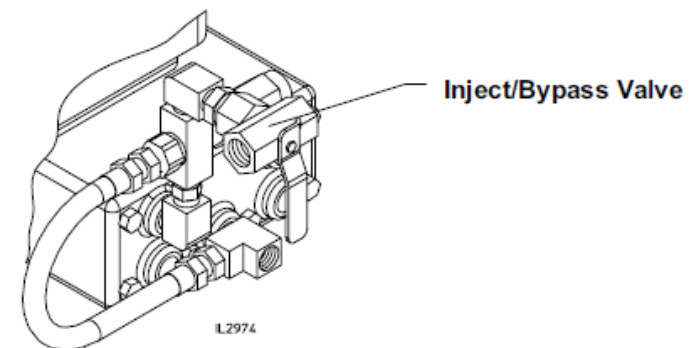
Inject / Bypass Valve

The Inject / Bypass valve is mounted on the discharge side of the foam pump. This valve shall be accessible by the pump operator during normal operations. The valve is a 3-way directional valve that selects where the output of the foam pump will go.

Check to make sure the valve is installed properly. Look at the ports as you move the handle. The flow should go from the center port to each of the other ports.

The hose and fittings from the inject port to the foam injector fitting should have a minimum rating of 3/8 of the maximum fire pump discharge pressure.

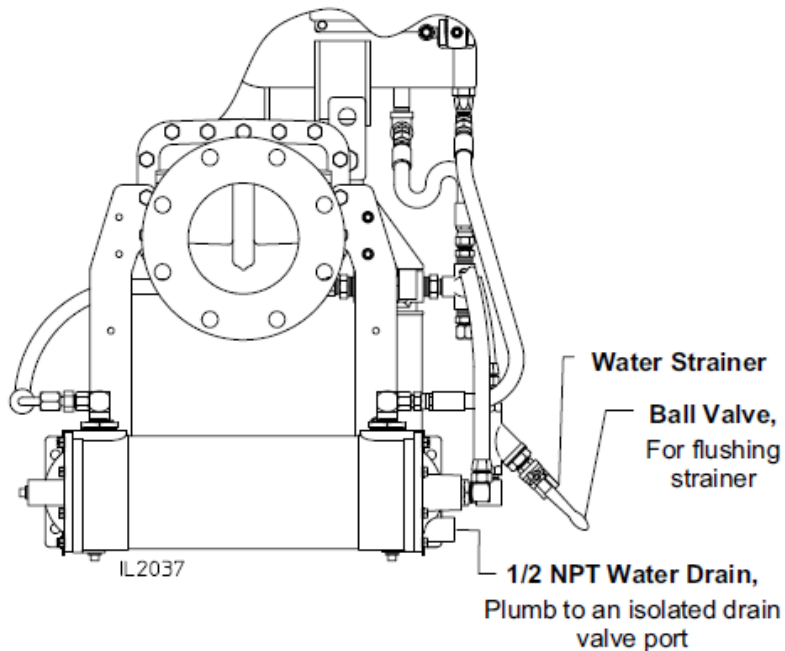
The hose from the bypass port may have a lower pressure rating since it is plumbed to the atmosphere and will not receive high pressures. This hose is used for pumping the concentrate into a container to empty the tank or to assist in priming of the foam pump. The hose from the bypass port must be long enough to reach a container outside the truck. This hose must be coiled for storage when not in use.



Water / Foam Solution Distribution

1. Waterous furnishes a mix manifold mounted on the pump with 2-1/2 in. Victaulic or 3 in. Victaulic discharge.
2. Distribution manifolds, piping and valves are not furnished by Waterous.
3. All Discharges should be equipped with water check valves.
4. See Page 14 for location of air injection.
5. Optional static mixers feature a six element mixing array inside a stainless steel pipe. Measuring 14 inches in overall length and 2-1/2" inches in diameter, the static mixers can be fitted with Victaulic, NPT or both connections on the inlet or outlet.
The optional static mixers are mounted downstream of the valve.
6. See drawing below for draining of check valves.

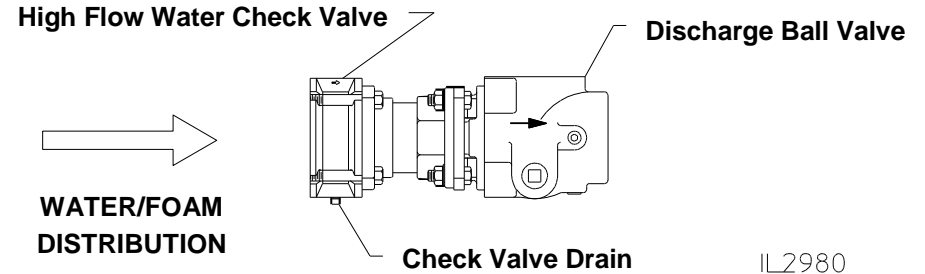
Oil Cooler (Heat Exchanger)



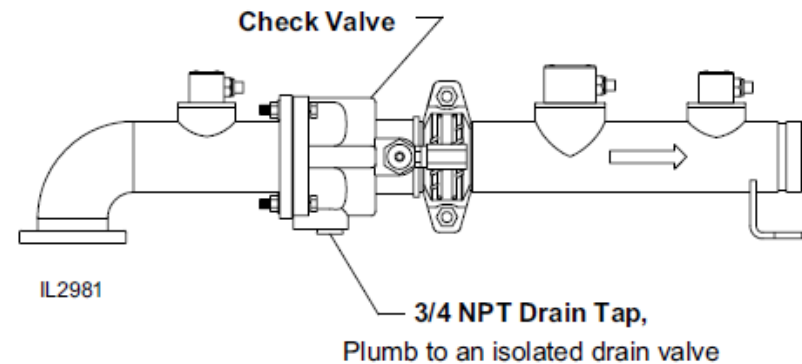
Note: A 1/2 in. minimum drain line is recommended. Discard pipe plug furnished with oil cooler.

Water Distribution Check Valves

All CAFS discharges should be equipped with water check valves. Water and foam can be trapped between the check valve and the discharge valve. In order for all water/foam to properly drain, water drains need to be plumbed to each check valve. These drains should be isolated drains.



Foam Manifold

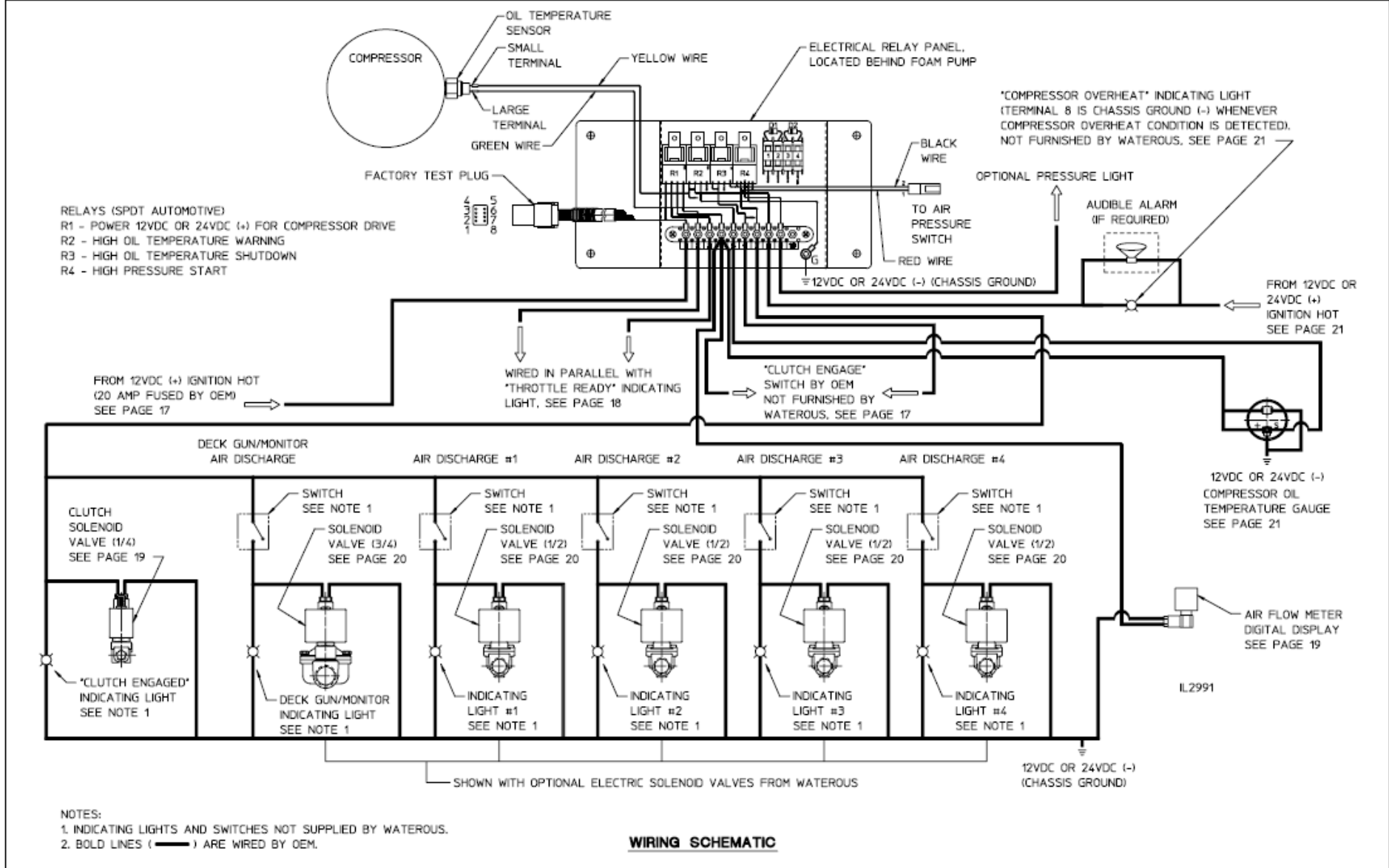


Water Drains

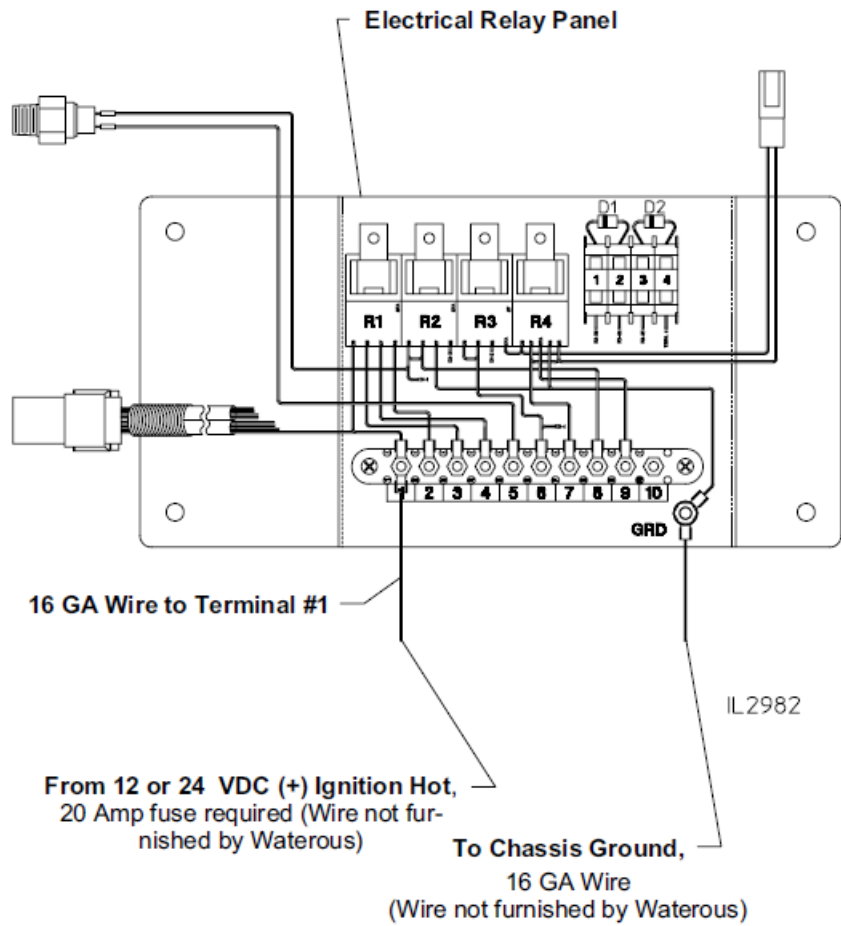
(Also refer to F-1031, Section 3008, *Drain Valve Installation Instructions*.)

Electrical Wiring

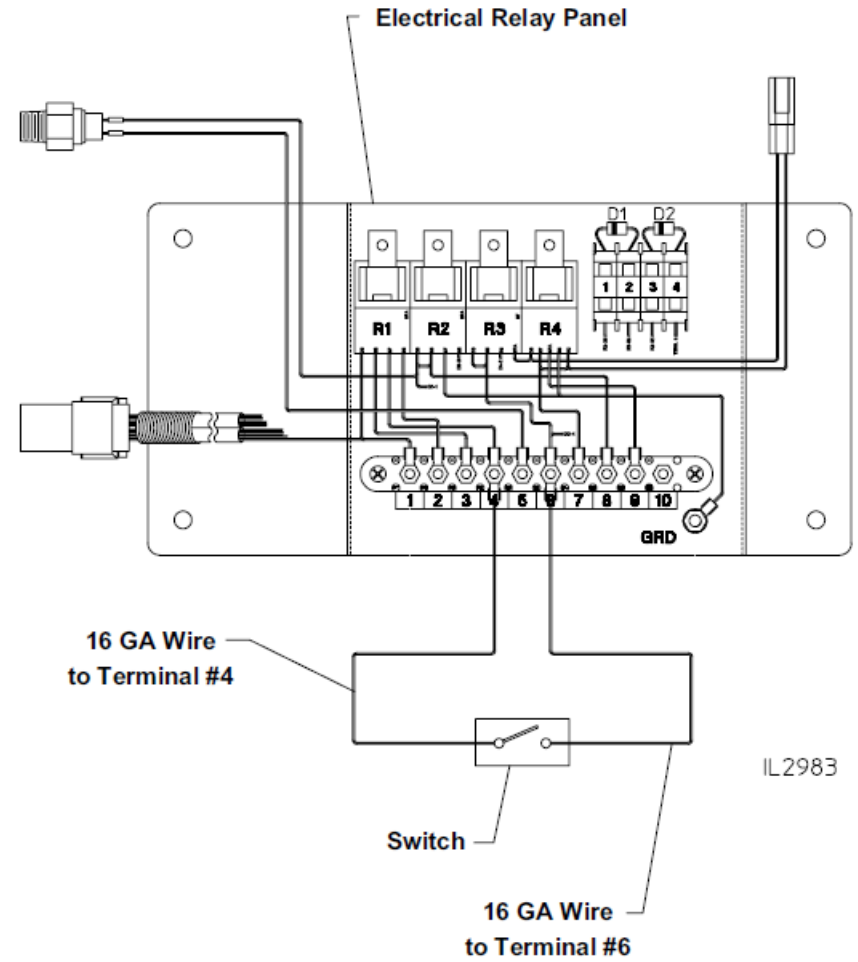
Compressor Wiring Schematic



Power to Relay Panel

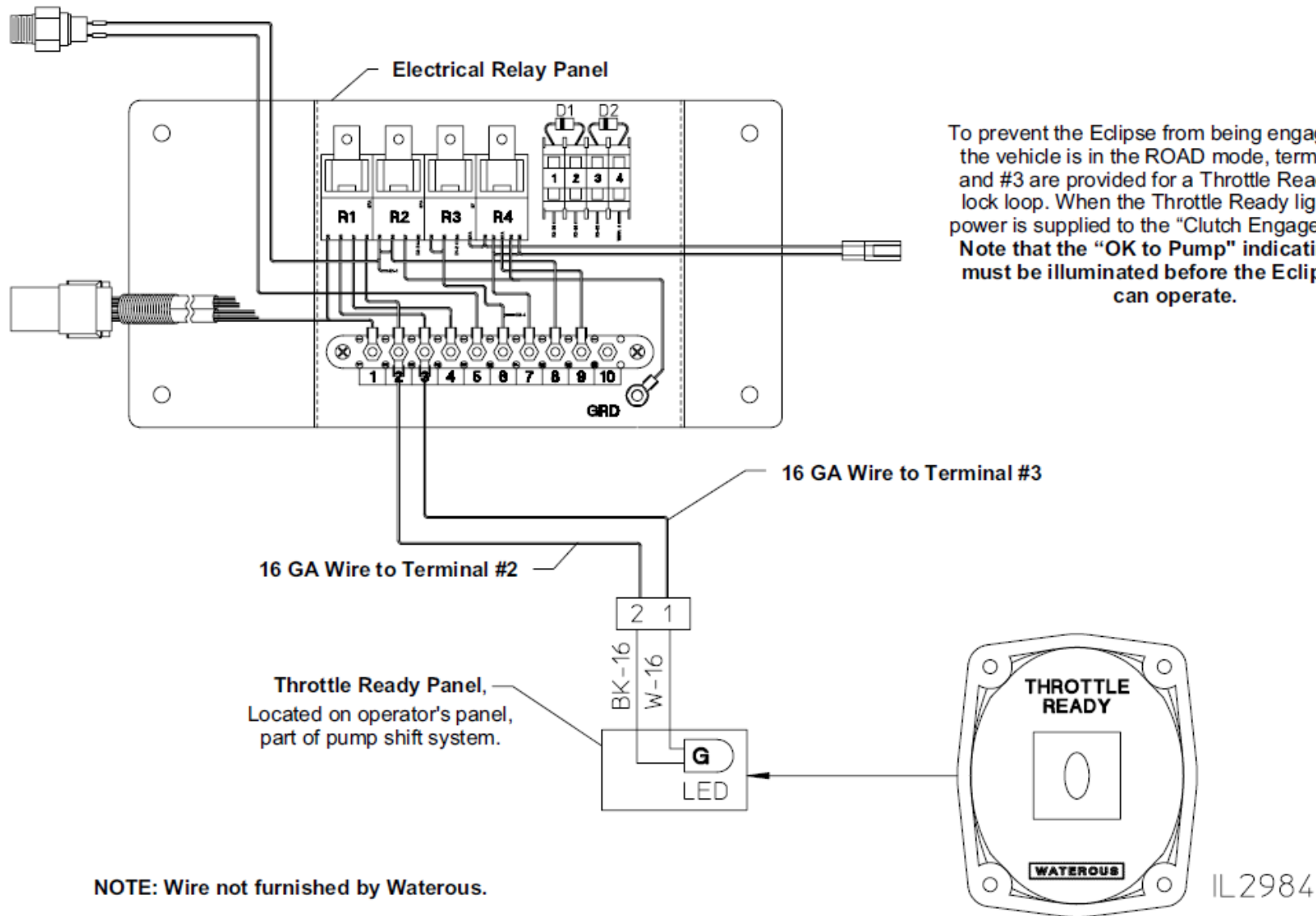


Air Clutch Engage Switch



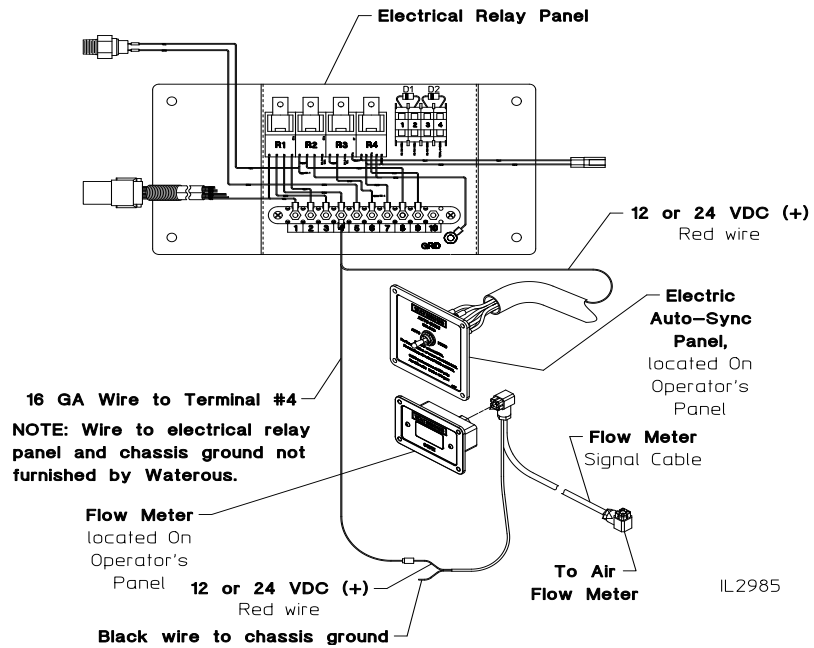
NOTE: Wire and switch not furnished by Waterous.

“Throttle Ready” Interlock Loop



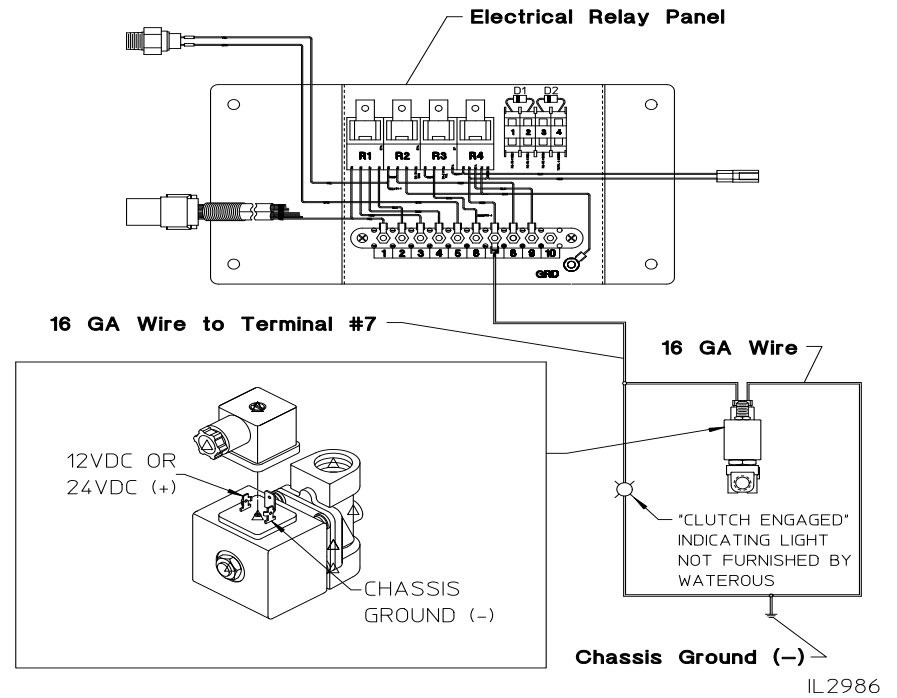
To prevent the Eclipse from being engaged while the vehicle is in the ROAD mode, terminals #2 and #3 are provided for a Throttle Ready interlock loop. When the Throttle Ready light is on, power is supplied to the "Clutch Engage Switch." **Note that the "OK to Pump" indicating light must be illuminated before the Eclipse unit can operate.**

Air Flow Meter



1. Connect the red wire (12 or 24 VDC +) of the flowmeter signal cable to Terminal #4 on the Eclipse Relay Panel.
2. The black wire of the flow meter signal cable is connected to chassis ground.
3. The flow meter signal cable is routed and plugged into the air flow meter located on the compressor.

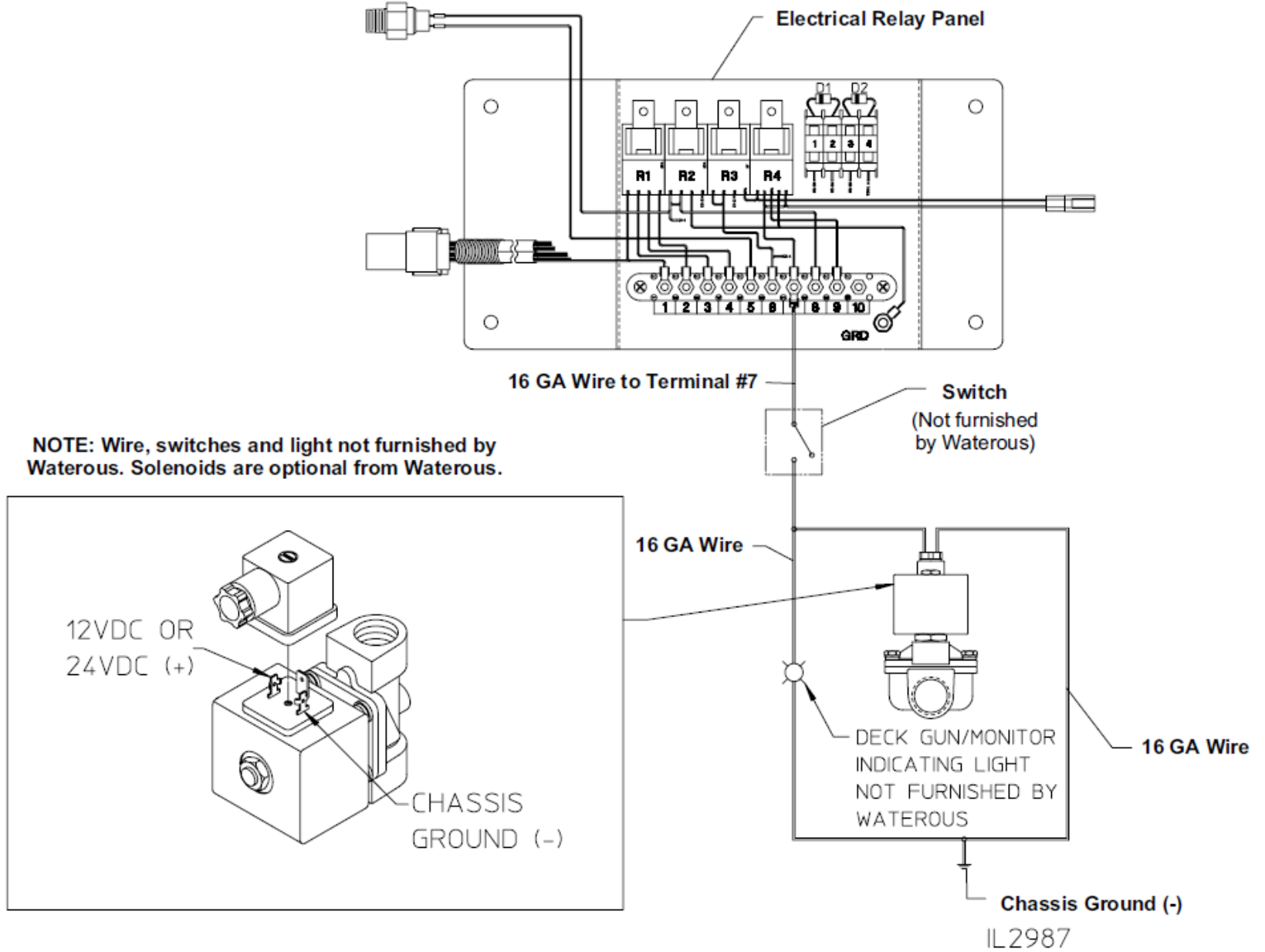
Air Clutch Solenoid – See Page 12 for Location



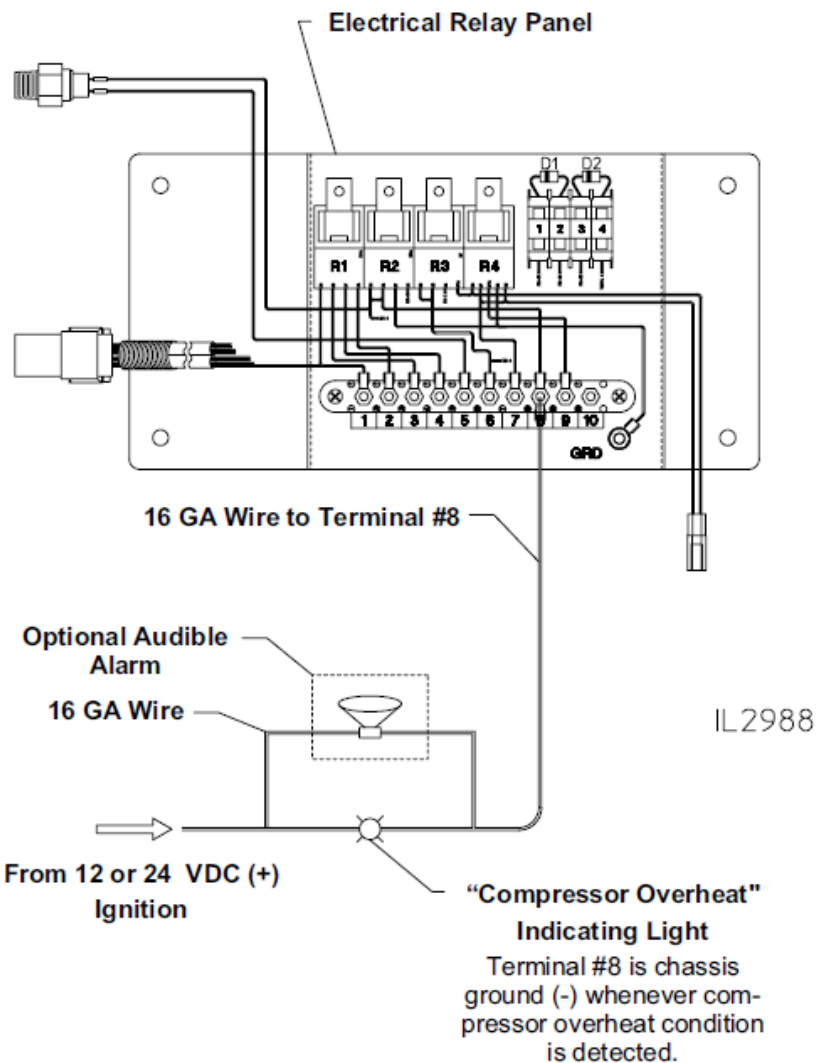
1. Wire the switch to +12 or 24 VDC from Terminal #7.
2. Wire the indicating light in parallel with the solenoid

NOTE: Wire and light not furnished by Waterous..

Air Discharge Solenoids - See Page 13 for Location

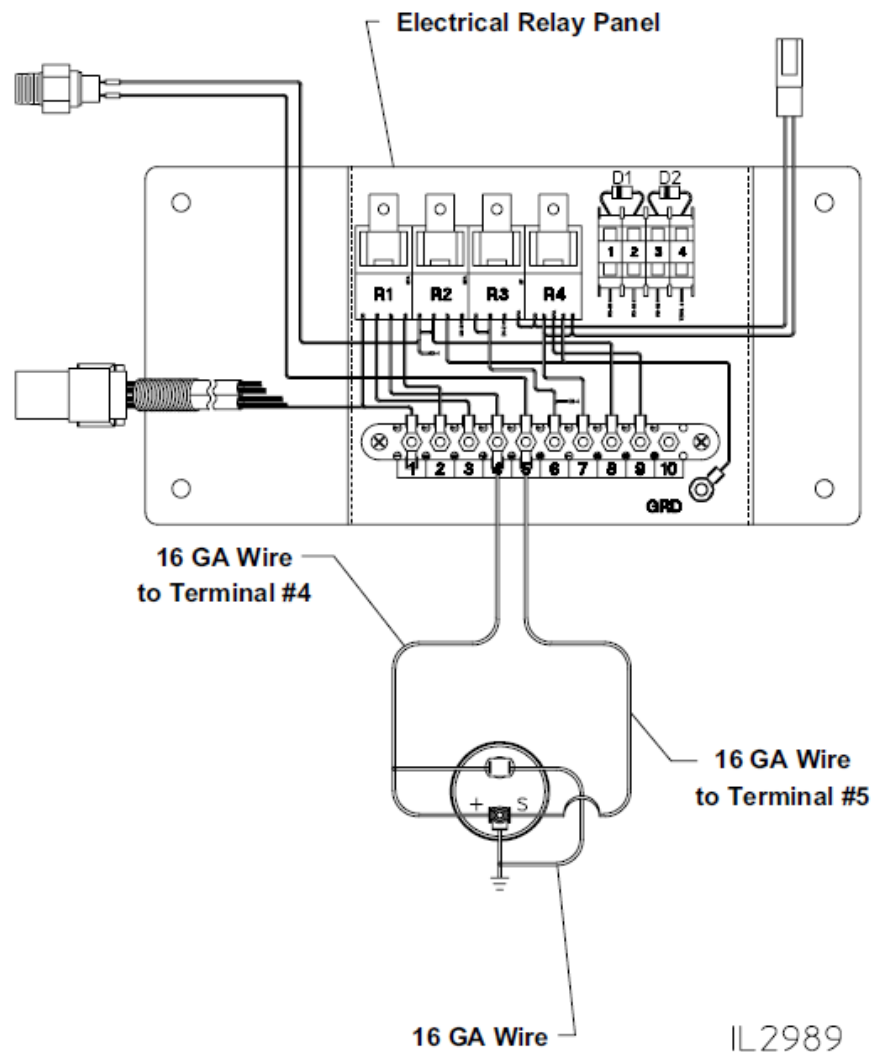


Compressor Overheat Light and Optional Audible Alarm



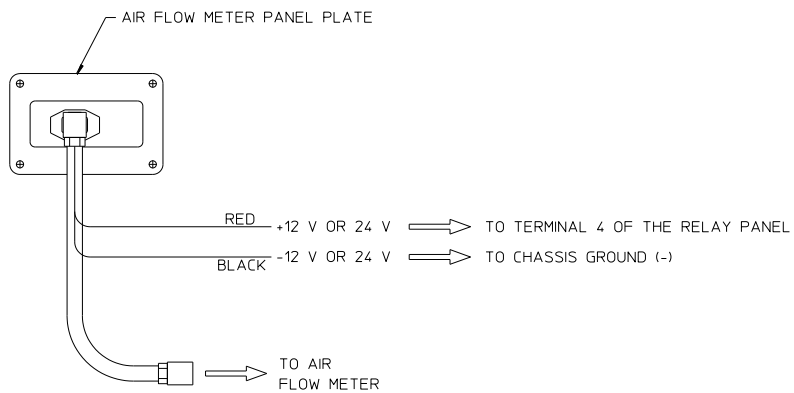
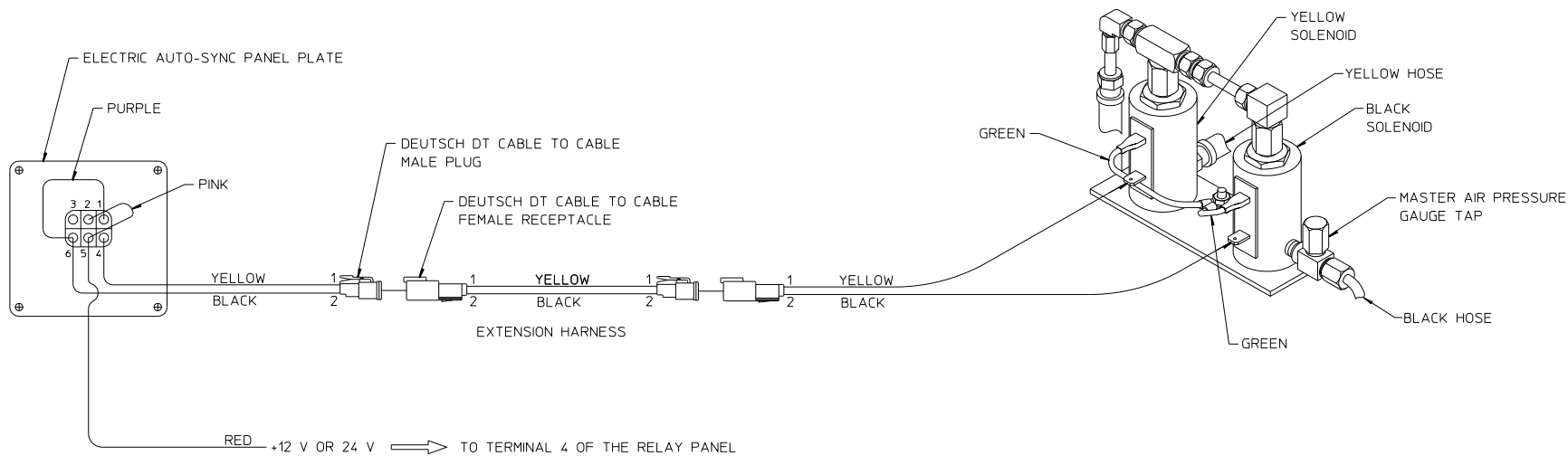
NOTE: Wires, light and alarm not furnished by Waterous.

Compressor Oil Temperature Gauge



NOTE: Wire and switch not furnished by Waterous. Gauge furnished, to be mounted on operator's panel.

Auto-Sync and Air Flow Digital Display



IL2557

Advantus® Foam Pump

Electrical Components

CAUTION

Follow the systems electrical diagrams on the following pages for proper hookup of each of the electrical components. Complete molded cable sets are provided with each Advantus system to make all the necessary connections.

1. The cables and receptacles are keyed so they only go in the correct receptacle and they can only go in one way.
2. DO NOT force mismatched cable connections. They system can only perform when the electrical connections are sound, so make sure one is right.
3. DO NOT hook up the main power cables until all of the connections are made to each of the electrical components. The last connection should be the power cable to the foam pump/motor base assembly.
4. Disconnect the leads of the battery.
5. DO NOT cut molded cables.
6. Make sure you provide at least 60 Amps of electrical power for 12 VDC systems or 30 Amps for 24 VDC systems from the battery to the main power terminal. Use 8 AWG (minimum) wire directly to the battery or battery switch.
7. The system is designed for 12 or 24 volt negative ground direct current systems only.
8. Use care when installing molded cables. Count pins before connecting. Bent pins caused by improper hookup can prevent proper operation even when cables are reattached properly.
9. If the seal washer is missing or damaged, water can enter the connector and cause corrosion of the pins and terminals that will cause system failure.
10. The cables shipped with each Advantus unit are tested at the factory with that unit. Improper handling and forcing connections can damage these cables which could result in other system damage.
11. Always disconnect the ground straps and control cables from the Operator Interface Terminal (OIT) or other Advantus equipment **before** electric arc welding at any point on the apparatus. Failures to do so may result in a power surge through the unit that could cause irreparable damage to the system components.

Power to Foam Pump

The large circuit breaker (see Page 24) is used to connect the 12 or 24 VDC input power.

Make sure you provide adequate electrical power from the battery. Use 8 AWG (minimum) wire directly to the battery or battery switch. Long wire runs may require 6 or 4 AWG wire for proper operation.

Recommended Wire Sizes

Wire Size	Wire Length (approx.)
8 AWG	10-20 feet
6 AWG	20 feet to 30 feet
4 AWG	30 feet or more

Power Requirements

Advantus System	Power Required	
	12 VDC	24 VDC
#3	60 Amps	30 Amps
#6	80 Amps	50 Amps

Power Supply

Electrical devices can be easily damaged by a weak or erratic power supply. The better the power supply, the better the Advantus systems will perform. At maximum output, the Advantus 3 system can draw 60 Amps at 12 VDC (30 Amps at 24 VDC). The Advantus 6 system can draw 80 Amps at 12 VDC (50 Amps at 24 VDC).

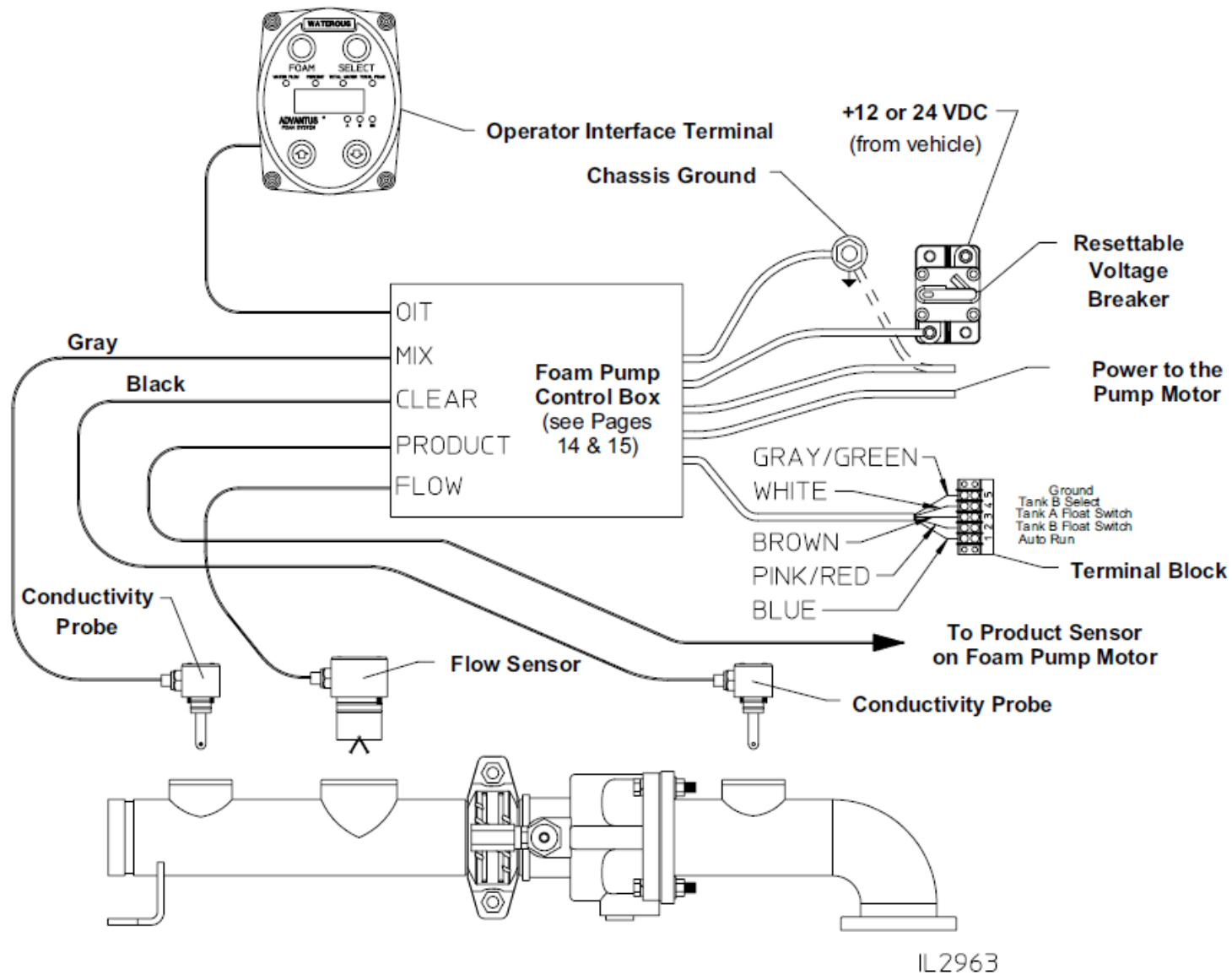
Connect the ground lead from the chassis frame or the negative battery terminal. Use the same size wire as the power lead.

DO NOT connect the main power leads to small leads that are supplying some other device such as a light bar or siren.

CAUTION

Be careful not to damage or short circuit the wires leading to the circuit breaker. Only the Advantus system is protected by the circuit breaker.

Advantus Foam Pump Schematic



Foam Pump Cables

1. Connect the control cable (8 pin) from the control box terminal to the back of the OIT control panel. Labels on the control box identify the terminal as "OIT". See Page 24, *Advantus Foam Pump Schematic*.
2. All other cables for the flow sensors are installed at the factory.
3. Making round coils of extra OIT and flow sensor cables in the pump compartment can act as an antenna. While the flow sensor and OIT cables cannot be shortened, various lengths of cable are available to minimize the "extra" cable in the truck. When routing cables, take care to avoid routing them next to antenna cables, radio power lines and radio components. When there is extra cable, double the cable back on itself and secure in a flat bundle with plastic wire ties instead of making a round coil.

CAUTION

Never attempt to cut or lengthen the molded cables. Cables can be daisy-chained to obtain longer lengths.

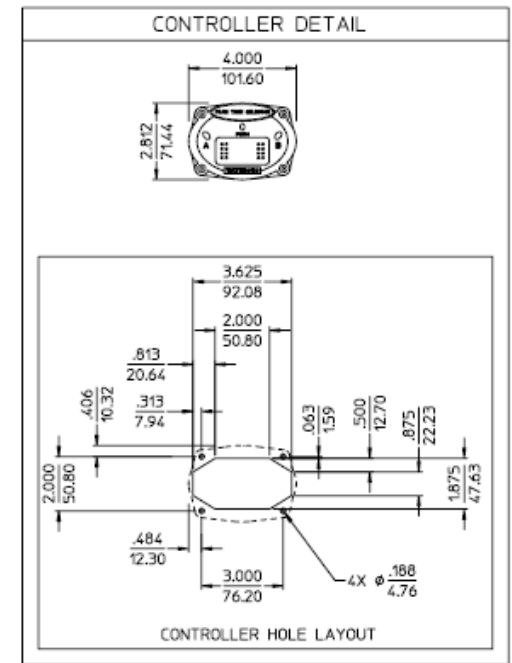
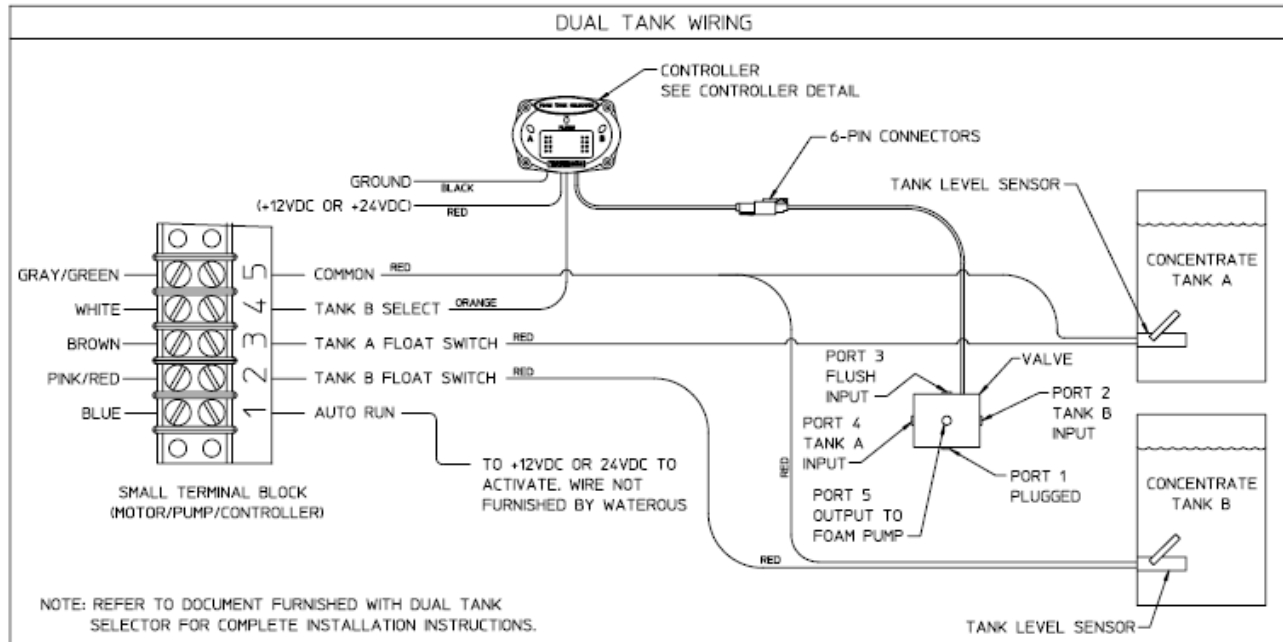
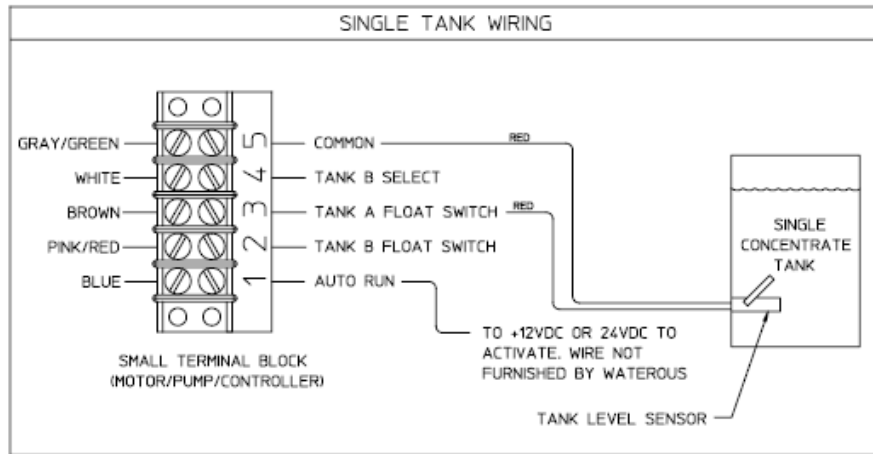
CAUTION

Always disconnect the ground straps and control cables from the Operator Interface Terminal (OIT) or other Advantus equipment **before** electric arc welding at any point on the apparatus. Failure to do so could result in a power surge through the unit that could cause irreparable damage to the electronic components.

Foam Manifold Grounding

The manifolds must be grounded. If metal piping is used, sufficient grounding may be present. However, Victaulic joints, plastic pipe, rubber hoses and rubber mounted pumps interfere with proper grounding and an additional ground wire may be required.

Foam Tank Switch - Dual or Single



IL2990

Clutch Flow Control Valve

The clutch flow control valve should be left completely open unless the engine is stalling due to low engine horse power.

If the the engine stalls upon compressor engagement, contact the Waterous Service Department for valve adjustment instructions.

Control Air Circuit

NOTE: For an explanation of control air circuit functions, see Operation and Maintenance Instructions, F-1031, Section 2412.

The Eclipse^M Control Air circuit is preset and adjusted at the factory prior to shipment. In most cases, the factory settings will provide satisfactory performance for typical CAFS and auxiliary air applications. The FIXED air operation is factory set at 145-150 P.S.I.G. The AUTO air operation is set (or trimmed) to match the fire pump discharge pressure (+/- 5%).

If the air control circuit requires changing or the circuit has lost its factory setting, the following procedure can be used.

Refer to Figure 2 component locations.

1. Preset the Air Inlet Trim Valve (AITV) by closing the valve, then opening the valve three turns.
2. Preset the Balance Trim Valve (BTV) to full open.
3. Start the fire pump, remaining at idle speed, and establish water flow either through a discharge or tank recirculation.
4. Set the Electric Auto-Sync Control Panel to UNLOAD mode and close all discharges.
5. Start the air compressor by placing the compressor engage switch to "ON".
6. Read the main air pressure gauge (should read 40-50 P.S.I.G.). In the UNLOAD mode, this minimum pressure is always present to provide compressor oil circulation.

Final Adjustments for the FIXED and AUTO Modes

FIXED Air Mode

1. Locate the Fixed Pressure Regulator. Note that the regulator has an adjustment screw with a lock nut.
2. Loosen the regulator's lock nut.
3. Place the control in the "FIXED" position on the Electric Auto-Sync Panel. The compressor will build pressure to some value and hold (regulate).
4. Adjust the screw on the Fixed Pressure Regulator, while monitoring the air pressure gauge, until the desired pressure is reached. Turning the screw

in will INCREASE the pressure. Turning the screw out will DECREASE the pressure.

5. Tighten down the locknut once the desired regulated pressure is achieved.
6. Verify the fixed regulator is performing by varying the compressor speed and monitoring the air pressure gauge. The pressure should remain steady at the fixed pressure setting.

With the final adjustments to the FIXED air mode complete, proceed with setting the AUTO air mode.

AUTO Air Mode

1. Place the Electric Auto-Sync control in the "AUTO" position with the fire pump operating at 100 P.S.I.G. main discharge and minimal flow.
2. Monitor main water discharge pressure gauge and the air pressure gauge. The pressure readings should be the same. If not, go to Step 3.

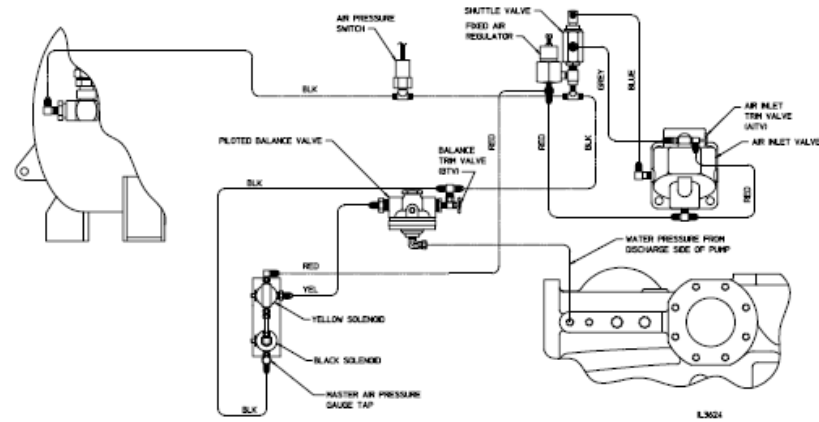
Air Inlet Trim Valve (AITV)

3. Close the trim valve in half turn increments if the air pressure is too high. Monitor both water and air pressure gauges until the pressures match. Once the pressures match, no further adjustments are needed and go to Step 5. If the air pressure is too low, open the trim valve a half turn then check water and air pressure gauges. If the air pressure is still too low, open the trim valve a half turn. If the air pressures match, no further adjustments are needed and go to Step 5. However, if you air pressure is still too low, go to Step 4.

Note that the Air Inlet Trim Valve is now four turns open from fully closed. It is not desirable to have the trim valve open more than four turns. To extend the trim valve's range, use the Piloted Balance Trim Valve (BTV).

4. Close the BTV one turn from the fully open position. Check the water and air pressure gauges. If the air is still too low, again close the BTV one turn and check the gauges. Keep repeating the process until the air pressure matches or is slightly higher than the water pressure. The final adjustment can be done using the AITV and Step 3.
5. Verify the piloted balance valve is performing by varying the fire pump discharge pressure and monitoring the water and air pressure gauges. The air pressure should follow and match the water pressure. If not, repeat the final adjustment procedure.

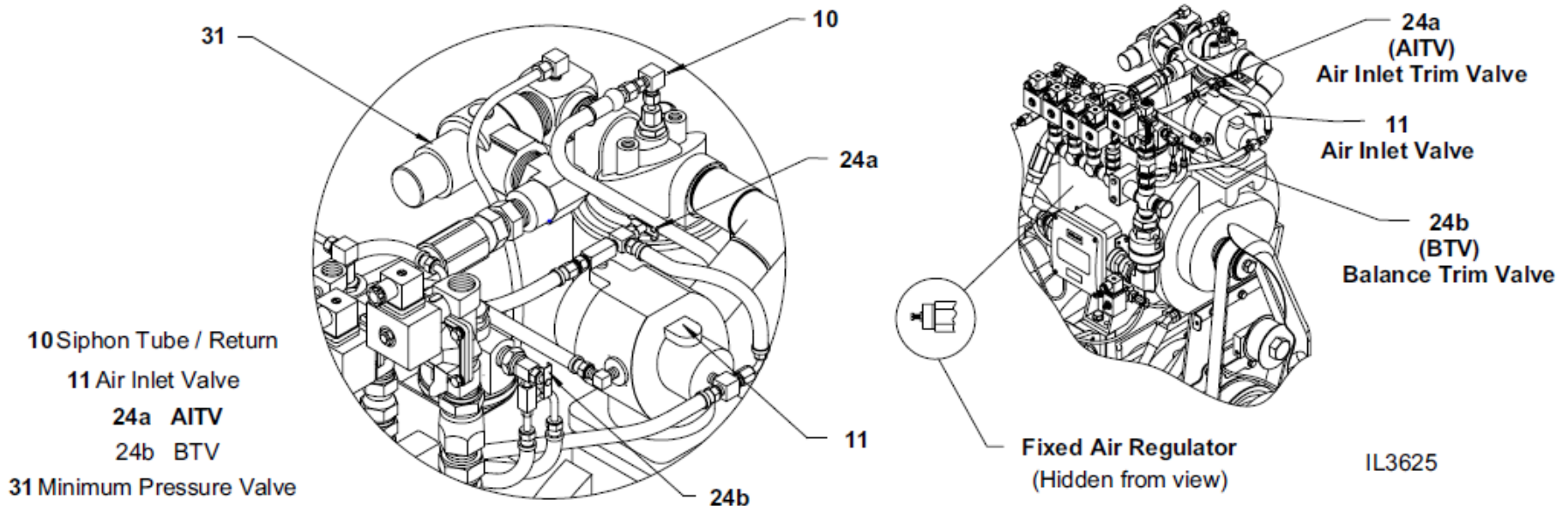
Control Air Circuit Schematic



COMPRESSOR MODE	BLACK SOLENOID NORMALLY OPEN	YELLOW SOLENOID NORMALLY OPEN
UNLOAD	NOT ENERGIZED: OPEN	NOT ENERGIZED: OPEN
FIXED	ENERGIZED: CLOSED	ENERGIZED: CLOSED
AUTO	ENERGIZED: CLOSED	NOT ENERGIZED: OPEN

AIR CONTROL CIRCUIT SCHEMATIC FOR ECLIPSE OAFS

Control Air Circuit Component Location



Advantus® Foam Pump

The Advantus system is able to be field calibrated using the control function buttons on the operating interface terminal (OIT), see figure below. Only units of measure, water flow and the foam percentage default can be field set.

A. Entering Calibration Mode

1. Entering calibration is accomplished by using the control unit functions buttons.
2. To enter this function, press and hold the **SELECT** button for minimum of five seconds.
3. Continue to hold the **SELECT** button.
4. While the **SELECT** button is depressed, push the **UP** and **DOWN** arrow buttons at the same time. The display will show **CAL** for two seconds and then display **F1**.
5. Use the **UP** button to advance to the next parameter (F2, F3, F4).
6. Use the **DOWN** button to back up to a previous parameter (F2, F1).
7. To edit a parameter, press the **SELECT** button at the associated Fn prompt.

B. F1 - Default Mix Percentage

1. At the **F1** prompt, press the **SELECT** button.
2. Use the **UP** and **DOWN** arrow buttons to select the default **FOAM %**. The only foam % selections will be .1%, .2%, .3%, .4%, .5%, .6%, .7%, .8%, .9%, 1.0%, 3.0% and 6.0%.
3. When finished, press the **SELECT** button to save the displayed value.

C. F2 - Units of Measurement

The units of measurement must be selected prior to any calibration functions. Units of measurement are U.S. Gallons, Imperial Gallons and Liters.

1. Push the **SELECT** button at the **F2** prompt. The display will show the current setting.
2. Use the **UP** and **DOWN** arrow buttons to select one of the following measurement units:
 - **GAL** will select U.S. Gallons
 - **IPL** will select Imperial Gallons
 - **LTR** will select Metric Liters
3. Pushing the **SELECT** button will save the displayed selection. This will allow for calibration of the water flow in the units of measurement selected.

D. F3 - Flow Rate Calibration

1. Press the **SELECT** button at the **F3** prompt. The current measured flow rate will be displayed. Establish a flow using an accurate flow measuring device.
2. Once this is established, press the **UP** or **DOWN** button to advance to the calibration step. If the displayed flow rate is correct, press the **SELECT** button to return back to the **F3** prompt. If there is insufficient flow, the display will show **LoFL** for two seconds, then return back to the **F3** prompt.
3. The display will now display **50** (starting value) or the last calibration value entered.
4. Use the **UP** and **DOWN** arrow buttons to change the displayed value to match the actual flow rate according to the flow measuring device. If the button is only pressed momentarily, the display increments or decrements by one. If the button is held, the display will increment or decrement by five.
5. Once the correct flow is achieved, pushing the **SELECT** will save the setting and return to the **F3** prompt.

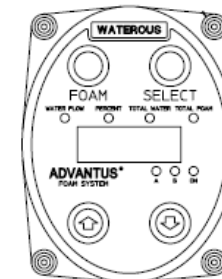
E. F4

System can be locked out after calibration and setup to avoid accidental changing.

F. Saving Calibration

To save all the calibration settings to flash memory, press the **FOAM** button while at the **Fn** prompt. The data will be stored and the unit will return to normal operation.

Operator Interface Terminal



Troubleshooting Guide

It is important to know what to do if your compressed air foam system is not operating properly. This troubleshooting guide should help you diagnose, isolate and fix the problem encountered.

Problem	Cause	Fix
Lack of air supply from air compressor Is the air compressor engaging?	No - Lack of air supply to air clutch (Eclipse)	Repair air leak or re-establish air supply to air clutch. Check operation of the electric 3-way solenoid valve.
	No - No PTO engagement	Confirm "THROTTLE READY" light is illuminated. If not, repair as needed.
	Yes - Confirm Electric Auto-Sync settings	Pressures should be as follows: Air PSI of 20-50 when in UNLOAD Air PSI of 45-150 when in FIXED Air PSI to match pump discharge PSI in AUTO (+/- 5%)
Air compressor operating properly, no air supply to discharges	Malfunctioning air discharge solenoid(s)	Verify power and operation of discharge solenoid(s). Repair or replace as needed. Verify proper wiring to solenoid (polarity sensitive) - See Page 20 for wiring schematic.
	Malfunctioning air check valve(s)	Verify direction of check valve (arrow to discharge) and correct as needed.
	Air inlet trim valve out of adjustment	Reference "Control Air Circuit Calibration Instructions" in F-1031, Section 2412.
	Debris in air inlet trim valve (AITV)	Clean debris from air inlet trim valve (AITV).
	Minimum Pressure Valve stuck	Disassemble and clean or replace as required.
FIXED develops PSI but AUTO fails to develop PSI	Lacking water supply to balance trim valve	Reference "Control Air Circuit Calibration Instructions" in F-1031, Section 2412.
Air discharge PSI does not match water PSI (+/- 5%)	Air discharge pressure higher than water discharge pressure	Circuit has an air leak or is uncoupled. Trace the red hose circuit to locate leaks and repair as needed.
	Air PSI gauge is not tapped into correct location	Verify that the air PSI gauge is tapped into the Master Air Pressure tap on the black solenoid of the Electric Auto Sync.
	Water PSI gauge is not tapped into correct location	Verify that the water PSI gauge is tapped into location shown on the dimensional assembly.
	Air inlet trim valve out of adjustment	Reference "Control Air Circuit Calibration Instructions" on Page 27.
	Air or water gauge not calibrated	Recalibrate and/or replace as required.
Safety pop-off valve opening (see Page 5 for location)	Balance trim valve completely closed	Reference "Control Air Circuit Calibration Instructions" on Page 27.

Problem	Cause	Fix
System overheating	Oil level in the air compressor is low	Check for oil leaks and repair as needed. Use ISO 68 viscosity hydraulic oil, filling to the middle of the sight glass.
	Plugged water strainer at oil cooler	Remove strainer and clean screen.
	Inadequate water supply	Verify that water is being circulated within the pump (TANK TO PUMP valve completely open with the TANK FILL valve 1/4 open).
	Overheated water supply	Supply the pump with fresh cool water and open a discharge valve or TANK FILL valve, allowing the heated water to be dumped to atmosphere.
	Compressor overspeeding in UNLOAD mode	Do not run compressor in excess of 8950 RPM. Compressor speed can be calculated as follows: drive line (engine) speed x 2.5 x gear ratio in the pump transmission.
Temperature gauge inoperative	Wires unconnected	Check wire connections at the gauge, sending unit and power supply.
	Wires improperly connected	Check wiring for proper sequence (green to large terminal; yellow to small terminal) - See Page 21.
Excessive oil consumption	Reservoir overfilled with oil	Check oil level while on a level surface. Reduce level to middle of the sight glass.
	Flowing in excess of 200 CFM	Reduce RPM and flow CAFS and recheck oil level.
	Oil/Air separator element torn or damaged	Result of flowing air in excess of 200 CFM. Replace air filter, flow CAFS, shut down the pump for 15 minutes and check oil level.
	Oil siphon line and check valve	Check oil siphon line for obstruction and inspect check valve for operation.
Excessive compressor bleed down time (time may vary)	Inlet air trim valve closed too far	Reference "Control Air Circuit Calibration Instructions" on Page 27.
	Debris in inlet air trim valve	Clean valve and reference "Control Air Circuit Calibration Instructions" on Page 27.
Engine stalls upon compressor engagement	Electric Auto-Sync in FIXED or AUTO mode	Place the Electric Auto-Sync in the "UNLOAD" position.
	Engaging compressor when under load	Operating under this condition causes the compressor oil to accumulate in the compressor creating a condition similar to a hydraulic pump. To correct, allow air to bleed off, restart the compressor and immediately begin flowing air through a discharge.
	Air compressor locked up	Due to a lack of compressor oil/lubrication. Repair or replace the compressor.
	Clutch Air Flow Control Valve	Contact the Waterous Service Department for valve adjustment.
Air flow digital display stuck at "0" CFM or inoperative	Digital display cable defective or disconnected	Check cable connections at the meter and digital display.
	Air flow meter not powered.	Check for damaged connectors in the meter or cable. Check pin connections for tightness and proper fit.

Problem	Cause	Fix
Poor foam solution (wet or dry)	Using wetting agent in place of foam	Flush system and install Class "A" foam.
	Lack of foam	Check if the Foam Pump is on. Check if there is foam in the reservoir. Make sure the foam supply valve is on and the Y strainer clean.
	Incorrect size air lines to discharges	Refer to "Air Distribution Hose Size Guidelines" on Page 13.
Foam in water system	Foam dumped into the water tank	Flush water tank and pump until foam is cleared.
	Foam cell is leaking into water tank	Condition applies to tanks utilizing a common wall(s) between the foam tank and the water tank. If a leak is confirmed, repair the foam tank and flush the water tank and pump until foam is cleared.
	Foam proportioning manifold check valve malfunction	If the above conditions have been corrected, the final cause for foam in the water tank may be the result of a malfunctioning foam manifold check valve. To troubleshoot, cap off one foam discharge that is plumbed to the foam manifold, open that discharge valve and increase the pump discharge to 30-40 PSI. Disengage the pump and monitor the corresponding discharge PSI gauge, looking for a drop in discharge pressure. If the PSI drops, it indicates the foam manifold check valve is leaking and requires repair.
	Foam manifold drain plumbed into master drain.	Supply a separate drain for foam manifold.
Water in compressors oil/air	Leaking oil cooler	Isolate the oil cooler and check for leaks. Replace if necessary. (Typical cause is freezing.)
	Discharge air check valve(s) malfunctioning	Confirm direction (arrow towards discharge valve). Replace if necessary.
Clutch not engaging / heating up / smoking	Engaging compressor with the Electric Auto-Sync in the FIXED or AUTO mode	Disengage compressor and place Electric Auto-Sync position to "UNLOAD", allow compressor to bleed off, then engage the compressor.
	High RPM engagement	Reduce engine RPM and engage in the "UNLOAD" position with the Master Air Pressure Gauge reading "0".
	Not allowing for compressor to bleed down prior to re-engaging	Allow ample time for compressor to bleed down. Re-engage the compressor in the "UNLOAD" position.
	Contaminated clutch disc or plate	Inspect the clutch disc and plate for contaminants (oil, dirt, foam, etc.). Clean or replace as necessary.
	Low air pressure or supply leak to clutch	Check pressure at supply side. Check supply line for leaks.
	Compressor locked up	Check entire system and repair as needed.
	Ensure the Clutch Air Flow Control Valve has not been closed off or restricted.	Open valve completely. If engine is stalling or bogging down when compressor is engaged contact the Waterous Service Department for valve adjustment.
Safety pop-off valve opening at low pressure (see Page 5 for location of pop-off valve)	Sump fire damaged pop-off valve	Check the system and oil level. Replace the pop-off valve. Once repaired, operate the compressor watching for air or oil being discharged from the pop-off valve. One indication of a pop-off valve failure is oil present throughout the pump compartment. Check for signs of sump fire.
Compressor locked up	Debris in compressor	Check entire system and repair as needed.