SPXFLOW

INSTRUCTION MANUAL

HES Series

Refrigerated Type Compressed Air Dryers

Models: HES90, HES120, HES140, HES190, HES240, HES280, HES360, HES450, HES540, HES675

FORM NO.: 5006820 REVISION: 02/2017

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.

Hankison

CONTENTS

GENERAL SAFETY INFORMATION

1. **PRESSURIZED DEVICES:**

This equipment is a pressure containing device.

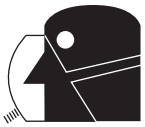
- Do not exceed maximum operating pressure as shown on equipment serial number tag.
- Make sure equipment is depressurized before working on or disassembling it for service.

2. **ELECTRICAL:**

This equipment requires electricity to operate.

- Install equipment in compliance with all applicable electrical codes.
- Standard equipment is supplied with electrical enclosures not intended for installation in hazardous environments.
- Disconnect power supply to equipment when performing any electrical service work.

3. **BREATHING AIR:**



- Air treated by this equipment may not be suitable for breathing without further purification.

  Refer to applicable standards and specifications for the requirements for breathing quality air.

RECEIVING, MOVING, AND UNPACKING

A. **RECEIVING**

This shipment has been thoroughly checked, packed and inspected before leaving our plant. It was received in good condition by the carrier and was so acknowledged.

Check for Visible Loss or Damage. If this shipment shows evidence of loss or damage at time of delivery to you, insist that a notation of this loss or damage be made on the delivery receipt by the carrier's agent.

B. **UNPACKING**

Check for concealed loss or damage. When a shipment has been delivered to you in apparent good order, but concealed damage is found upon unpacking, notify the carrier immediately and insist on his agent inspecting the shipment. Concealed damage claims are not our responsibility as our terms are F.O.B. point of shipment.

C. **MOVING**

In moving or transporting dryer, do not tip dryer onto its side.

D. **STORAGE/SHUT DOWN**

⚠ CAUTION Dryer should not be stored outside (either packed or unpacked) or exposed to the weather. Damage to electrical and control components may result.

IMPORTANT: WATER-COOLED UNITS - If unit is shut down in below-freezing temperatures, the water-cooled condenser may freeze and cause permanent damage. Condenser must be drained when the unit is shut down.

IMPORTANT: Do not store dryer in temperatures above 130°F (54.4°C) or below 20°F (-7°C).

1.0 INSTALLATION

1.1 Location

A. For typical placement in a compressed air system, see drawing.

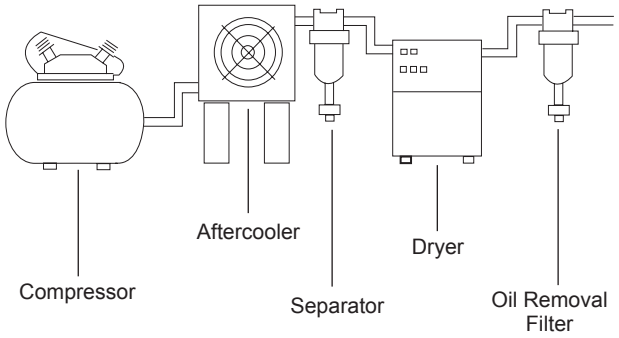
B. Air compressor intake – Locate air compressor so that contaminants potentially harmful to the dryer (e.g. ammonia) are not drawn into the air system.

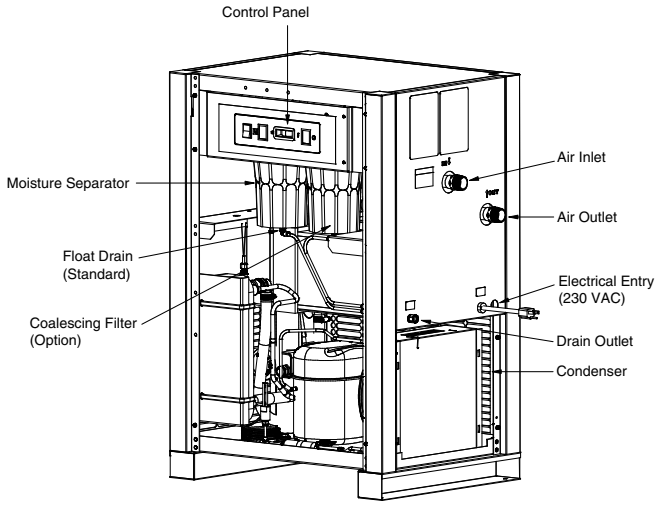
C. Clearances Free air flow
Front 36 inches (914 mm)
Back 6 inches (152 mm)
Sides 36 inches (914 mm)
Service - To facilitate maintenance leave 36 inches (914 mm) of clearance in front of dryer.

D. Standard units are designed to operate in ambients:
Air-cooled: 40 to 110°F (4 to 43°C).
Water-cooled: 40 to 130°F (4 to 54°C).

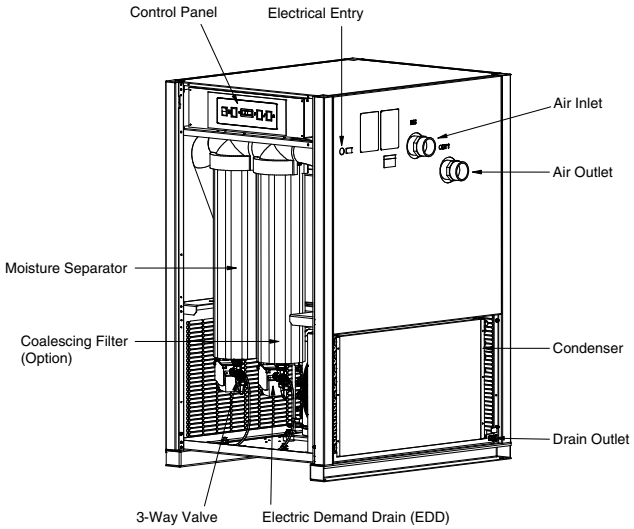
E. The installation of a flexible connection prior to the dryer is recommended to prevent possible damage from vibration.

NOTE: Outdoor installation – Standard units are designed for indoor installation. Contact manufacturer if installing outdoors.





Models 90, 120, & 140



Models 190, 240, 280, 360, 450, 540, & 675

1.2 Mounting

Mount the dryer on a level solid surface. Holes are provided in the dryer base to permanently mount the dryer to the floor.

1.3 Piping Connections

A. Air Inlet - Connect compressed air line from air source to air inlet. (Reference markings on dryer for air inlet/outlet connection locations.)

⚠WARNING Refer to Serial Number Tag for maximum working pressure. Do not exceed dryer's Maximum Working Pressure.

NOTE: Install dryer in air system at highest pressure possible (e.g. before pressure reducing valves).

NOTE: Install dryer at coolest compressed air temperature possible. Maximum inlet compressed air temperature: 130°F (54°C). If inlet air exceeds this temperature, precool the air with an aftercooler.

B. Air Outlet – Connect air outlet to downstream air lines.

C. Bypass piping – If servicing the dryer without interrupting the air supply is desired, piping should include inlet and outlet valves and an air bypass valve.

D. Water cooled models – cooling water inlet and outlet
   1. Connect cooling water supply to cooling water inlet.
   2. Connect cooling water return line to cooling water outlet connection.

NOTE: Strainer and water regulating valve are supplied on water cooled models.

1.4 Electrical Connections

IMPORTANT: Use copper supply wires only.

A. Dryer is designed to operate on the voltage, phase, and frequency listed on the serial number tag.

B. If dryer is supplied with a cord and plug, install in a receptacle of proper voltage.

C. Electrical entry on larger dryers is through a hole in the cabinet. It is located on the right side panel when facing the front of the unit. Connect power source to terminal strip in electrical enclosure as shown on the wiring diagram included with the dryer.

NOTE: The dryer should NOT be wired to cycle on/off with the air compressor.

NOTE: ON MODELS 450, 540, and 675, CHECK FOR CORRECT PHASING OF UNIT. After starting the dryer, if an unusual noise is heard, or if the discharge line does not get hot, the refrigeration compressor may be running in the reverse direction. Immediately stop the dryer, reverse two of the power leads, restart the dryer, and verify the unusual noise is corrected and the refrigerant discharge line is hot. FAILURE TO DO SO MAY DAMAGE THE COMPRESSOR AND VOID THE WARRANTY.

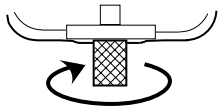
1.5 Moisture Separator

A. **Models 90-140**
Separator (and Oil Removal Filter where applicable) has an internal drain which automatically discharges condensate.

Models 190-675
Separator (and Oil Removal Filter where applicable) has an electronic demand drain (EDD) which automatically discharges condensate.

NOTE: It may be desirable to pipe the condensate from the Automatic Drain outlet to a suitable drain.

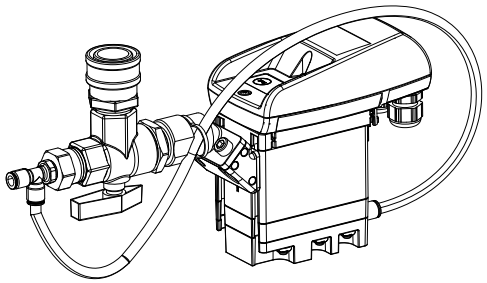
B. **Models 90-140**
Separator has a knurled fitting with flexible drain tubing attached. Be sure knurled fitting is tightened by turning counter-clockwise before operating dryer.



TO CLOSE
TURN COUNTERCLOCKWISE

C. **Models 190-675**
For manual draining, convenient dryer depressurization, and EDD service, a three-way valve assembly has been installed at the bottom of the moisture separator (and cold coalescing filter where applicable). Review the following for proper drain function:

- Automatic Draining - Valve handle should be positioned parallel to the valve body (as shown), with the arrow on the handle pointing toward the EDD. In this position, condensate will flow from the bowl to the EDD.
- Drain Isolation (Shutdown) - Valve handle shall be turned perpendicular to the valve body (rotate 90°). In this position, condensate flow is shutoff.



- Manual Draining - Drain valve handle shall be rotated slightly past the drain isolation position to allow throttling through the valve for manual discharge and depressurization.
- NOTE: The quick disconnect fitting allows removal of the entire drain assembly. **However, the unit must be depressurized prior to disassembly or serious injury may occur.**

NOTE: Discharge is at system pressure. Drain line should be anchored.

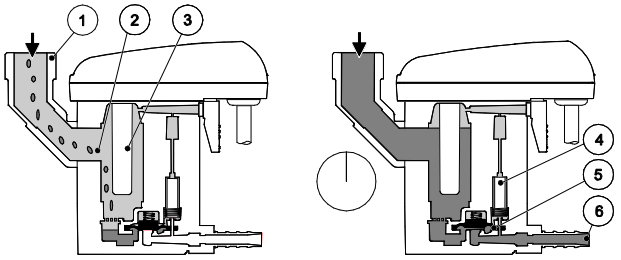
NOTE: Condensate may contain oil. Comply with applicable laws concerning proper disposal.

1.6 EDD Operation

A. Verify that isolation valves are open. If the drain fails to discharge after the valve is energized, the electronic control circuit will repeatedly energize the valve in an attempt to clear the discharge port. If, after 60 seconds, the drain still fails to discharge, the control circuit then switches to the alarm mode. In this mode the valve is de-energized and the red alarm light is activated on the drain. The valve is then automatically energized every 80 seconds for 60 seconds. Check the drain operation. Push drain (push-to-test) button on the drain or the Electronic Controller (if equipped) to energize drain. A flow of condensate and/or air should be present at the drain outlet. The alarm mode automatically clears after the drain returns to normal operation.

B. The condensate flows through the feed line **(1)** into the condensate drain and accumulates in the housing **(2)**. A capacitive sensor **(3)** continuously registers the liquid level. As soon as the container is filled, a fixed waiting period begins during which more condensate accumulates. After the waiting time has expired the pilot valve (4) is then activated and the diaphragm **(5)** opens the outlet line **(6)** for discharging the condensate.

When the condensate drain has been emptied, the outlet line is closed again quickly and tightly without wasting compressed air.



2.0 DRYER OPERATION

Basic Theory of Operation: This energy savings dryer operates using a glycol/air heat exchanger to absorb heat from the air stream. A refrigeration compressor is used to cool the glycol mixture and when the dryer load is reduced, the excess cooling from the compressor is used to lower the temperature of the glycol. When the glycol reaches a minimum temperature, the compressor is turned off to save energy. The dryer continues to operate by using the glycol mixture to cool the air stream until the glycol reaches a maximum temperature set point at which time the compressor again turns on to cool the glycol mixture.

2.1 Minimum/Maximum Operating Conditions

A. Maximum inlet air pressure: refer to dryer serial number tag

B. Minimum inlet air pressure: 30 psig (2.1 kgf/cm^2)

C. Maximum inlet air temperature: 130°F (54°C)

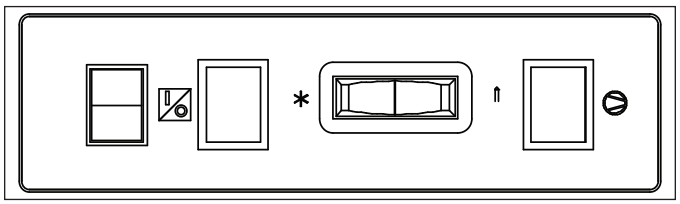
D. Maximum ambient temperature:
Air-cooled models: 110°F (43°C)
Water-cooled models: 130°F (54°C)

E. Minimum ambient temperature: 40°F (4°C)

2.2 Start-up

A. **Models 90-140: Standard Controller**
Energize compressor by positioning the on/off switch in the on (I) position. Power on light will illuminate. Compressor on light will illuminate. Compressor will run until glycol mixture is cooled. The refrigeration unit will then turn off, and the compressor on light will be extinguished.

SLOWLY pressurize the dryer with compressed air. Fully open the inlet and outlet valves. Dryer will operate automatically and the compressor will cycle in response to the air load.



On/Off Switch | Dryer On Light | Dewpoint Indicator | Compressor On Light

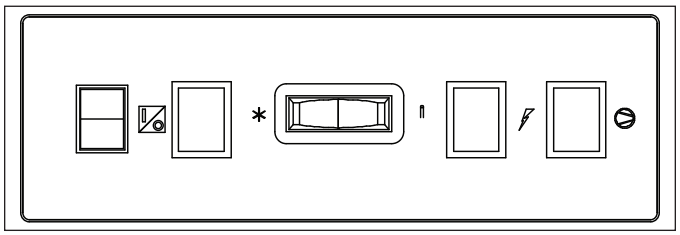
B. **Models 190-675: Standard Controller**
Energize dryer by applying power to the unit. The green dryer energized light will illuminate.

NOTICE: Energize dryer for 24 hours prior to starting refrigeration compressor! Failure to follow these notices may result in a non-warrantable compressor failure.

Energize compressor by positioning the on/off switch in the on (I) position. Power on light will illuminate. Compressor on light will illuminate. Compressor will run until glycol mixture is cooled. The refrigeration unit will then turn off, and the compressor on light will be extinguished.

NOTE: ON MODELS 450, 540, and 675, CHECK FOR CORRECT PHASING OF UNIT. After starting the dryer, if an unusual noise is heard, or if the discharge line does not get hot, the refrigeration compressor may be running in the reverse direction. Immediately stop the dryer, reverse two of the power leads, restart the dryer, and verify the unusual noise is corrected and the refrigerant discharge line is hot. FAILURE TO DO SO MAY DAMAGE THE COMPRESSOR AND VOID THE WARRANTY.

SLOWLY pressurize the dryer with compressed air. Fully open the inlet and outlet valves. Dryer will operate automatically and the compressor will cycle in response to the air load.



On/Off Switch | Power-On Light | Dewpoint Indicator | Dryer Energized Light | Compressor On Light

C. **Models 190-675: Advanced Controller**
Energize dryer. Green power on light will illuminate.

NOTICE: Energize dryer for 24 hours prior to starting refrigeration compressor! Failure to follow these notices may result in a non-warrantable compressor failure.

NOTICE: Do not use disconnect switch to remove power from dryer for extended periods except for dryer repair.

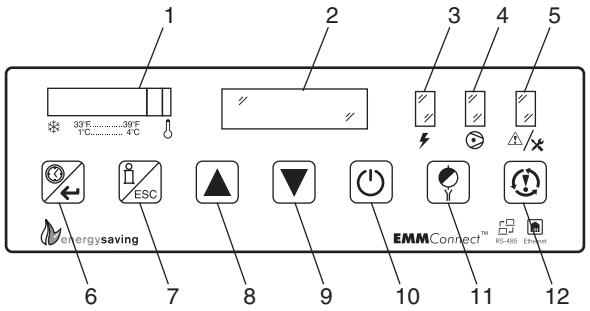
D. **Advanced Controller Setup**

Press and hold Program Mode button until Main Menu appears. Use the Up and Down arrow buttons to scroll through the menu choices. Press Enter button in order to display the selected menu item. Press ESC to exit the Main Menu and return to Display mode.

1. Language selection
   a. Use the 'Up' and 'Down' arrow buttons to scroll through available languages (English, Spanish, French, German, Portuguese, Italian, Polish, Danish, Dutch, Norwegian, Finnish, Swedish, and Czech).
   b. Press 'Enter' button to apply the current language selection.
   c. Push 'ESC' button to return to the Main Menu.
2. Setting Date & Time
   a. Press 'Enter' to edit value.
   b. Use the 'Up' and 'Down' arrow buttons to set year (00 to 99 representing 2000 to 2099). Press 'Enter' button to accept new value.
   c. Use the 'Up' and 'Down' arrow buttons to set month (1-12). Press 'Enter' button to accept new value.
   d. Use the 'Up' and 'Down' arrow buttons to set day (01 to maximum for month and year selected). Press 'Enter' button to accept new value.
   e. Use the 'Up' and 'Down' arrow buttons to set hours (00 to 23). Press 'Enter' button to accept new value.
   f. Use the 'Up' and 'Down' arrow buttons to set minutes (00 to 59). Press 'Enter' button to accept new value.
   g. Press 'Enter' button to accept new value. Push 'ESC' at any time to return to the Main Menu.
3. Setting Schedule
   a. Use the 'Up' and 'Down' arrow buttons to select desired "Day of week + on/off". Press 'Enter' to adjust time.
   b. Use the 'Up' and 'Down' arrow buttons to set hour (00 to 23). Press 'Enter' to accept new value.

      NOTE: If the hour setting is '--:--', press 'Enter' again to move the cursor under the "Day of week + on/off". Repeat steps a through b (or c) as needed.
   c. Use the Up and Down arrow buttons to set minutes (00, 10, 20, 30, 40, 50; not shown if hour setting is '--'. Press 'Enter' to accept new value and return to "Day of week + on/off". Repeat steps a through c as needed.
   d. Push 'ESC' at any time to return to the Main Menu.

CONTROL PANEL



1. Glycol Temperature Indicator
2. Operator Interface Display
3. Power-on Light
4. Compressor-on Light
5. Alarm / Service Light
6. Schedule On/Off and Enter Button
   a. In Display Mode: Press to toggle between SCHEDULED MODE and MANUAL MODE.
   b. In Program Mode:
      i. Press to move to a lower level menu.
      ii. Press to accept a value that has been edited.
7. Program Mode (i) and Esc
   a. In Display Mode: Press and hold to enter Program Mode.
   b. In Program Mode: Press to move to a higher level menu.
8. Up Arrow
   a. In Display Mode: Press to cycle to next Display screen.
   b. In Program Mode:
      i. Press to view the next item in a list or to increment a variable to a higher value.
      ii. When the top of the list (or highest value) is displayed, pressing the up button will cause the display to wrap to the bottom of the list (or lowest value).
9. Down Arrow
   a. In Display Mode: Press to cycle to previous Display screen
   b. In Program Mode:
      i. Press to view the previous item in a list or to decrement a variable to a lower value.
      ii. When the bottom of the list (or lowest value) is displayed, pressing the down button will cause the display to wrap to the top of the list (or highest value).
10. 1/0: Press at any time to turn the dryer on/off.
11. Drain test: Press at any time to momentarily open the drains.
12. Reset: Press at any time to clear the alarm/service message (if shown) and the alarm LED.

4. Alarm History
    a. Use the 'Up' and 'Down' arrow buttons to scroll through the last 20 dryer alarms sorted in chronological order.
    b. Press 'ESC' to return to the Main Menu.

    NOTE: Hold the 'Enter' and 'Up' buttons to clear the alarm history.
5. Energy Cost
    a. Use the 'Up' and 'Down' arrow buttons to select the desired currency. Press 'Enter' to accept the new value and move to the next field.
    b. Use the 'Up' and 'Down' arrow buttons to select the energy cost. Press 'Enter' to accept the new value and move to the previous field.
    c. Press 'ESC' to return to the Main Menu.
6. Service Interval
    a. Use the 'Up' and 'Down' arrow buttons to program the desired service interval. Press 'Enter' to accept the new service interval value.
    b. Press 'ESC' to return to the Main Menu.
7. Auto-Restart
    a. Use the 'Up' and 'Down' arrow buttons to enable/disable auto-restart. Press 'Enter' to accept the new selection.
    b. Press 'ESC' to return to the Main Menu.

E. Dryer Startup

NOTICE: Energize Dryer for 24 hours prior to starting refrigeration compressor! Failure to follow these notices may result in a non-warrantable compressor failure.

1. Start dryer 15 minutes prior to compressed air flow.
2. On water-cooled models: begin cooling water flow prior to compressor startup.
3. Check for proper electrical voltage.
4. Slowly pressurize unit air side by opening inlet isolation valve. Check for leaks.
5. After 15 minutes, open outlet isolation valve slowly.
6. Close air bypass valve.
7. Dryer may be operated in Manual or Scheduled Modes.

NOTE: ON MODELS 450, 540, and 675, CHECK FOR CORRECT PHASING OF UNIT. After starting the dryer, if an unusual noise is heard, or if the discharge line does not get hot, the refrigeration compressor may be running in the reverse direction. Immediately stop the dryer, reverse two of the power leads, restart the dryer, and verify the unusual noise is corrected and the refrigerant discharge line is hot. FAILURE TO DO SO MAY DAMAGE THE COMPRESSOR AND VOID THE WARRANTY.

F. Dryer Operation

1. Manual Mode - Pushing the On/Off button will cause the dryer to turn on or turn off. Dryer status is indicated on the text display. The compressor will begin cycling based on the glycol temperature. The compressor LED will reflect the state of the compressor.
2. Scheduled Mode - Pressing the Schedule Mode button will cause the dryer to toggle between Scheduled and Manual Modes. The compressor will cycle based on the glycol temperature when the dryer is on.
3. Remote Mode - By closing the remote mode contact the dryer will enter a remote control mode. The state of the dryer will be based on the remote control contact. If the contact is closed the dryer will run, if the contact is open the dryer will remain off.

NOTE: The dryer may be returned to Manual Mode at any time by pressing the 'Schedule' button or 'On/Off' button or by pressing On/Off button. Manual Mode will appear on text display. To re-enable scheduled operation, press the 'Schedule On/Off and Enter' button again.

Auto-Restart

Disabled (Factory Default) - Following a power interruption the dryer will begin operation in manual mode with the dryer off.

Enabled - Following a power interruption the dryer will return to the previous operating mode and will turn the dryer on or off based on the mode.

Manual Mode - Dryer will return to state it was in prior to power failure.

Scheduled Mode - Dryer will be on or off based on the programmed schedule.

Remote Mode - Dryer will be on or off based on remote control contact.

G. Dryer Display

1. Operating Mode - Displays the current date/time and operating mode.
2. Hours to Service - Displays the hours remaining before dryer service is required.
3. Total Hours - Displays the total hours the dryer has been operating.
4. Dryer Load - Displays the average dryer load over the last cycle.
5. Energy Savings - Displays the estimated annual energy savings based on the average dryer load over the last 30 days.
6. Glycol Temperature - Displays the glycol temperature reading.

H. Dryer Alarms

SERVICE DRYER - Indicates that the service interval for the dryer has expired. Perform required dryer maintenance and reset using the alarm reset button.

HIGH DISCHARGE PRESSURE - Indicates that the refrigeration compressor control circuit has opened because of high head pressure. The high pressure switch must be reset manually. After fixing the fault and resetting the pressure switch the alarm can be cleared using the alarm reset button.

COMPRESSOR – Indicates that the compressor contactor has not engaged. Check the compressor contactor. Once the fault has been corrected the alarm can be manually cleared using the alarm reset button.

TEMPERATURE SENSOR FAILURE – Indicates a problem with the PT100 RTD. Check to make sure the RTD is properly connected to the control board and the resistance across the RTD is correct. Once the fault has been corrected, the alarm can be manually cleared using the alarm reset button.

HIGH TEMPERATURE - HIGH GLYCOL TEMPERATURE – Indicates that the dryer is overloaded or there is a problem with the refrigeration system leading to poor dryer performance. Once the fault has been corrected the alarm can be manually cleared using the alarm reset button.

HEATER – Indicates a problem with the crank case heater. The crank case heater should energize any time the dryer is off. Check to make sure the crank case heater is energized. Once the fault has been corrected the alarm can be manually cleared using the alarm reset button.

DRAIN – Indicates a problem with the electronic demand drain. Refer to the electronic demand drain manual for further information on how to correct the drain fault. Once the fault has been corrected the alarm can be manually cleared using the alarm reset button.

2.3 Using the RS-485 Port Connector (J8)

This connector provides RS-485 compatible signals from the internal master microprocessor. Using jumpers on the headers supplied near the connector (J12), 120 ohm termination resistors can be connected and the system can be connected for either two-wire or four-wire operation (half or full duplex). To connect the termination resistors, install jumpers on J12 in the direction shown by the white bars printed above the connector.

If the jumpers are removed no termination of the RS-485 bus is in effect. Usually, these jumpers must be in position for proper operation of the bus.

J10 contains the two-wire/four-wire jumper. If the jumper is set in W2 place, the circuit is set up for two-wire operation. If the jumper is set in W4 place, the circuit is set up for four-wire operation. Selection of jumper settings must be determined by the customer's system. The jumpers are supplied as standard and are installed as shown at the factory. Be sure to set the jumpers properly for your system.

RS-485 Pinout

Following is the pinout for J8, the RS-485 communications connector.

1 A
2 B
3 Z
4 Y

When connected in two-wire mode, the bus wires may be connected to pins 1 & 2. Also note that when in two-wire mode, one termination resistor jumper should be removed to prevent the termination from being too low in value. It may be stored on the top set of pins on J12. Those pins are not connected. Please make sure that your connections are properly made. This connector is a 4-pin terminal block. Mating connectors are not supplied. The electrical signals supplied by this connector are TIA/EIA-485A compliant. A good cable should be used to transmit signals such as Belden 3109A or equivalent.

Communication Parameters:

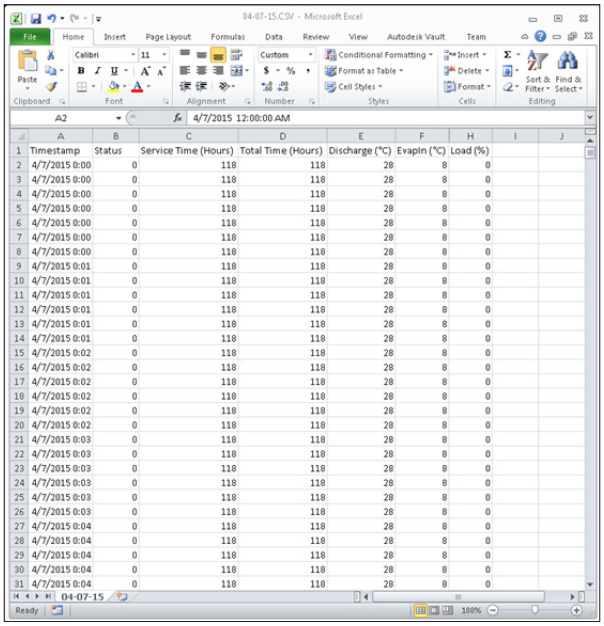
RS-485 Parameters	
Baud Rate	19200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None
Modbus Drop I/O	Factory Default = 1 (user adjustable 1 - 247)

2.4 Using the USB Host Feature (J7)

The EMM connect is equipped with a USB Host port located at J7 on the control board which allows for the connection of a USB flash drive. The USB flash drive can be used for data logging, event history, and installing software updates.

1. USB Data Logging

When a USB flash drive is installed in the controller it will begin to automatically record key dryer operating parameters: timestamp, dryer status, service timer, total compressor run timer, discharge temperature, evaporator inlet temperature, evaporator outlet temperature, and dryer % load.



Timestamp	Status	Service Time (Hours)	Total Time (Hours)	Discharge (°C)	Evapin (°C)	Load (%)
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:00	0	118	118	28	8	0
4/7/2015 0:01	0	118	118	28	8	0
4/7/2015 0:01	0	118	118	28	8	0
4/7/2015 0:01	0	118	118	28	8	0
4/7/2015 0:01	0	118	118	28	8	0
4/7/2015 0:01	0	118	118	28	8	0
4/7/2015 0:01	0	118	118	28	8	0
4/7/2015 0:02	0	118	118	28	8	0
4/7/2015 0:02	0	118	118	28	8	0
4/7/2015 0:02	0	118	118	28	8	0
4/7/2015 0:02	0	118	118	28	8	0
4/7/2015 0:02	0	118	118	28	8	0
4/7/2015 0:02	0	118	118	28	8	0
4/7/2015 0:03	0	118	118	28	8	0
4/7/2015 0:03	0	118	118	28	8	0
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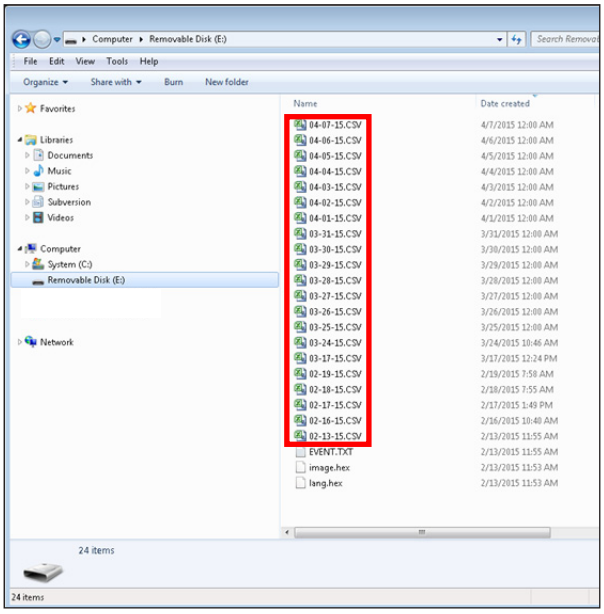
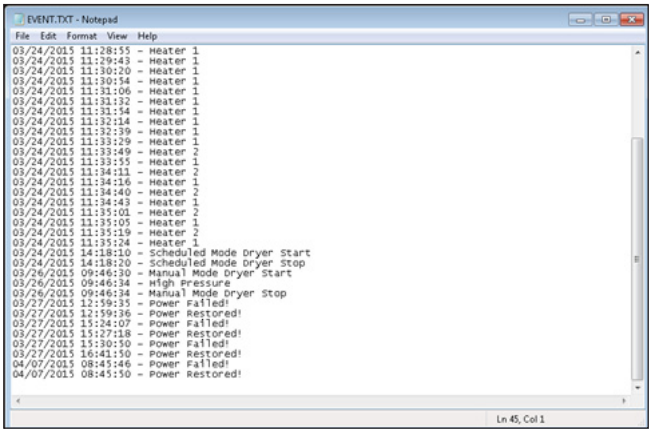
4/7/2015 0:03	0	118	118	28	8	0
4/7/2015 0:04	0	118	118	28	8	0
4/7/2015 0:04	0	118	118	28	8	0
4/7/2015 0:04	0	118	118	28	8	0
4/7/2015 0:04	0	118	118	28	8	0

These values will be written every 10 seconds to a comma separated value file stored in the root folder of the USB flash drive. Each day a new comma separated value file will be created for storing the samples for that day. Comma separated value files older than 60 days will be automatically deleted.

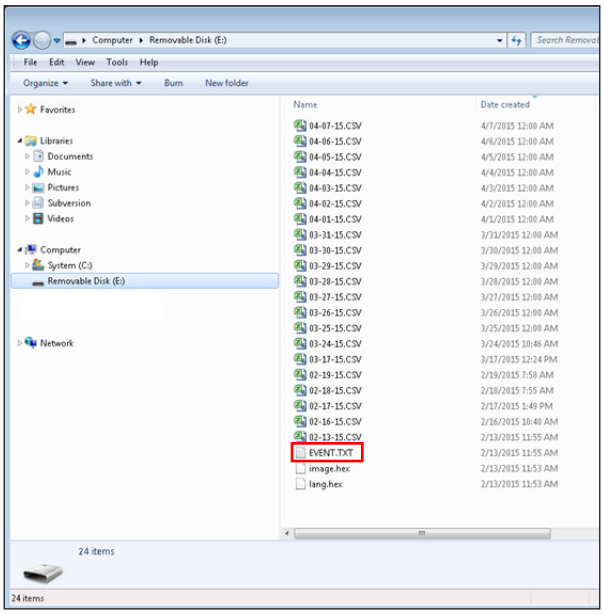


2. USB Event History

When a USB flash drive is installed in the controller it will begin to automatically log all dryer events: power loss, power recovery, alarms, state (standby/running), and mode (manual/scheduled/remote).

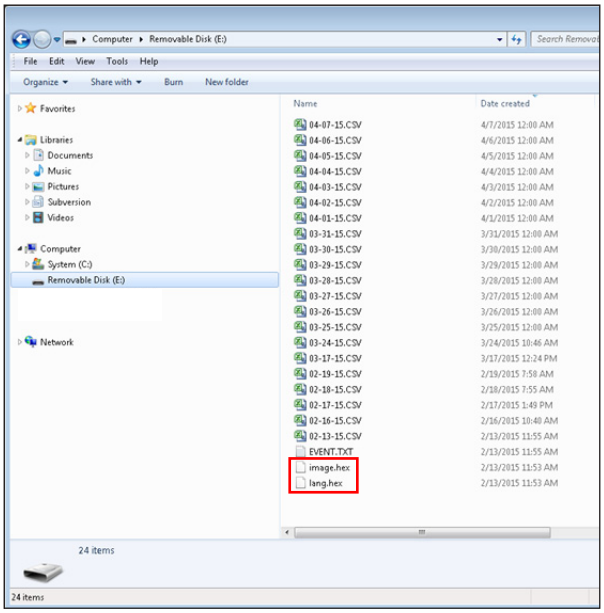


Events are timestamped and recorded in the EVENT.TXT file stored in the root folder of the USB flash drive.



3. USB Bootloader

Firmware updates for the EMM connect can be performed via the USB flash drive. In order to perform a firmware update; place the image.hex and lang.hex files provided by SPX in the root folder of a USB thumb drive.



With the dryer controller powered off install the USB flash drive in the USB host port on the EMM connect. Then while holding the enter button on the front panel apply power to the controller. Once the power LED begins blinking rapidly you can release the enter button. The controller will reboot when the update is complete. On startup the current firmware version will be shown on the text display.

2.5 Using the Ethernet Feature (J3)

The EMM connect is equipped with an Ethernet port located at J3 on the control board which allows the customer to connect the dryer to a local area network. The customer can then monitor the dryer status and performance via Web Interface or ModbusTCP.

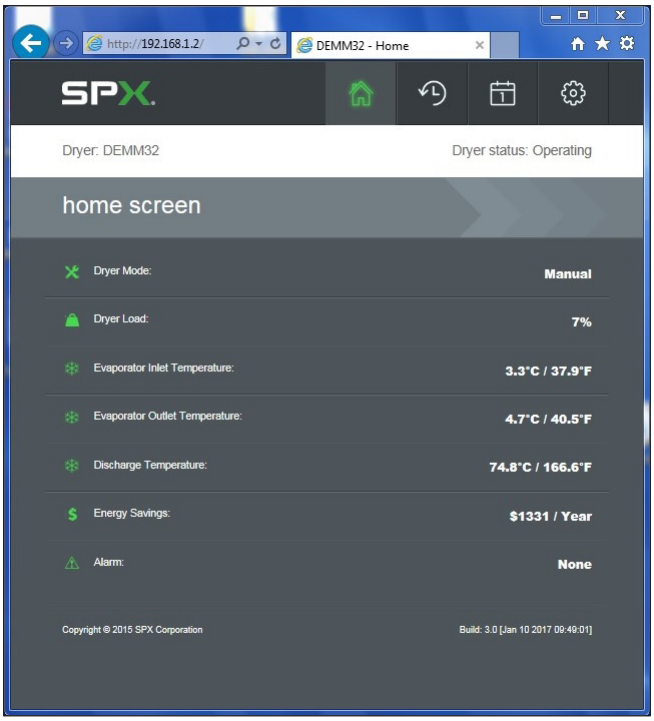
1. Web Interface

After assigning an IP address to the dryer the IP address can be entered into the address bar of any web browser to connect to the web interface.

The first page displayed is the home screen. Displayed on this page are the dryers operating status, operating mode, current dryer load, evaporator inlet temperature, evaporator outlet temperature, discharge temperature, energy savings, and any active alarms. The navigation bar at the top of this page can be used to view event history, dryer scheduler, and dryer settings.

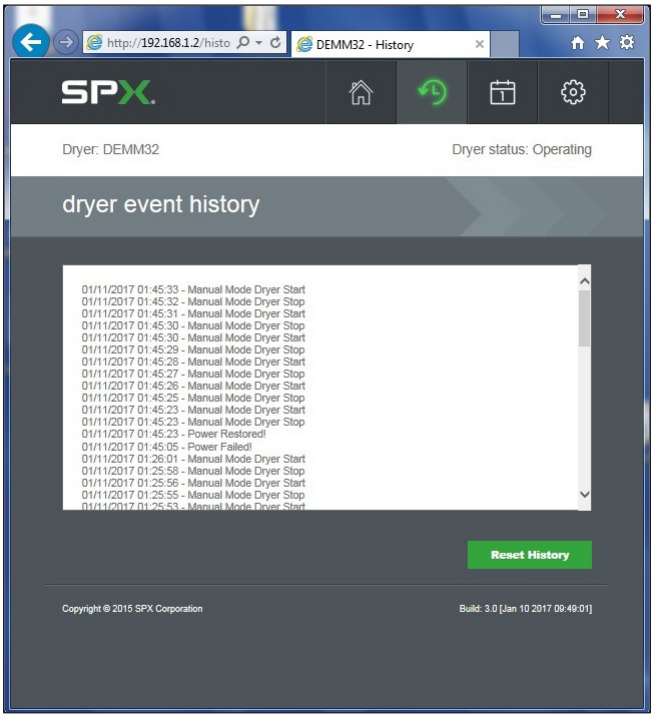
Energy savings is shown as the estimated annual energy savings based on the actual energy cost (entered on the settings page) and the average dryer load over the last 30 days.

Figure 1: Home Screen



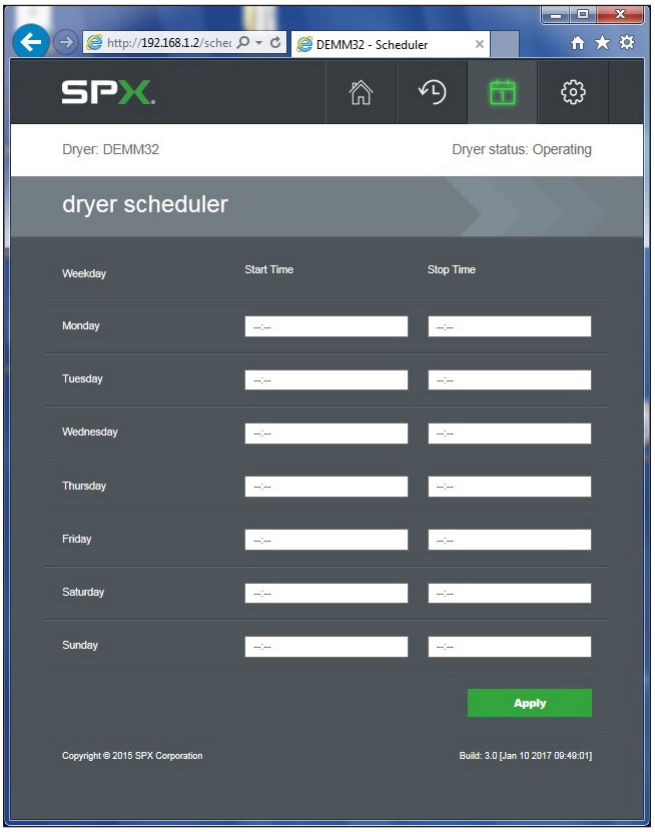
The event history page shows the last 64 timestamped events that have occurred on the dryer. These events include power failure/recovery, dryer mode changes, dryer status changes, and alarms.

Figure 2: Event History



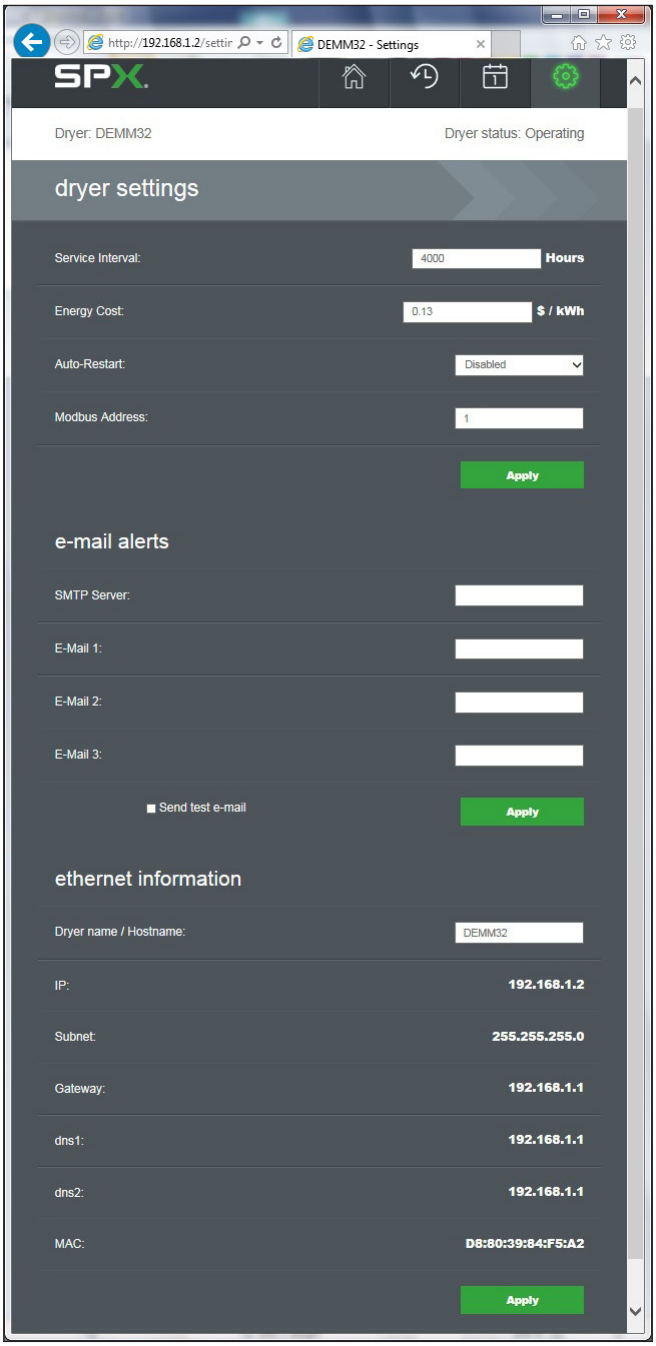
The dryer scheduler page allows the customer to view/edit the daily start/stop times that will be used when operating the dryer in scheduled mode.

Figure 3: Schedule



The dryer settings screen allows the customer to view/edit various dryer set points and setup E-mail alerts that will send an e-mail to up to 3 different e-mail addresses whenever an alarm or warning occurs on the dryer.

Figure 4: Settings



2. Modbus TCP

The Modbus TCP connection allows you to continuously monitor the dryer from a DCS system which implements a Modbus TCP master. The dryer controller implements a ModbusTCP server on port 502. The following Modbus register table provides a list of data that is available.

Modbus Registers

Holding Register		Name	Units	Description
Reference	Address			
40001	0x0000	DRYER_STATUS	Status ID	Status ID for the dryer
40002	0x0001	ALARM_STATUS	Flag Bits	Alarm flag bits
40003	0x0002	WARNING_STATUS	Flag Bits	Warning flag bits
40004	0x0003	RESERVED	N/A	Reserved
40005	0x0004	SERVICE_TIMER	Hours	Timer to service
40006	0x0005	TOTAL_TIMER	Hours	Total operating hours
40007	0x0006	EVAPORATOR_INLET_TEMP	1/10 Degree Celsius	Evaporator inlet temperature
40008	0x0007	DISCHARGE_TEMP	1/10 Degree Celsius	Discharge temperature
40009	0x0008	DRYER_LOAD	%	Dryer load
40010	0x0009	SAVINGS	Dollars / Euros	Energy savings
40011	0x000A	EVAPORATOR_OUTLET_TEMP	1/10 Degree Celsius	Evaporator outlet temperature
40012	0x000B			
40013	0x000C			
40014	0x000D			
40015	0x000E			
40016	0x000F			
40017	0x0010	DRYER_MODEL	Model_ID	Dryer model
40018	0x0011	DRYER_MODE	Mode_ID	Dryer mode
40019	0x0012	SERVICE_INTERVAL	Hours	Service interval
40020	0x0013	AUTO_RESTART	Boolean	Auto-restart (0=Disabled, 1=Enabled)
40021	0x0014	UI_LANGUAGE	Language_ID	User interface language
40022	0x0015	RESERVED	N/A	Reserved
40023	0x0016	RESERVED	N/A	Reserved
40024	0x0017	ENERGY_COST	Integer	Energy cost (Cost / kWh)
40025	0x0018	AUDIBLE_ALARM	Boolean	Audible Alarm (0=Disabled, 1=Enabled)
40026	0x0019	MODBUS_ADDRESS	Integer	Modebus Address
40027	0x001A	FULL_POWER	Watts	Full load power
40028	0x001B			
40029	0x001C			
40030	0x001D			
40031	0x001E			
40032	0x001F			
40033	0x0020	ALARM_MSG_1	Integer	Alarm message #1 phrase id
40034	0x0021	ALARM_MSG_2	Integer	Alarm message #2 phrase id
40035	0x0022			
40036	0x0023			
40037	0x0024			
40038	0x0025			
40039	0x0026			
40040	0x0027			
40041	0x0028	INPUT_STATUS	Flag Bits	Digital Input Status
40042	0x0029	OUTPUT_STATUS	Flag Bits	Digital Output Status
40043	0x002A	ANALOG[0]	1/10 Degree Celsius	Analog Input [0]
40044	0x002B	ANALOG[1]	1/10 Degree Celsius	Analog Input [1]
40045	0x002C	ANALOG[2]	1/10 Degree Celsius	Analog Input [2]
40046	0x002D	PV	1/10 Degree Celsius	Process value
40047	0x002E	P	Integer	P Term
40048	0x002F	I	Integer	I Term
40049	0x0030	D	Integer	D Term
40050	0x0031	FIXED_LOAD	Seconds	Fixed cycle load period
40051	0x0032	FIXED_UNLOAD	Seconds	Fixed cycle unload period
40052	0x0033	FIXED_TIME	Seconds	Fixed mode timeout period
40053	0x0034	DELTA_PID_CALC	1/10 Degree Celsius	PID calculation set point
40054	0x0035	DELTA_PID_CTRL	1/10 Degree Celsius	PID control set point

Modbus Register Details

Dryer Status	
Register	40001

Decimal	Hex	Description
0	0x0000	Standby
1	0x0001	Fixed
2	0x0002	PID
3	0x0003	Reserved
4	0x0004	Reserved
5	0x0005	Reserved
6	0x0006	Reserved
7	0x0007	Reserved

Dryer Alarm Flags	
Register	40002

Bit	Mask	Description
0	0x0001	High Discharge Temperature
1	0x0002	High Refrigerant Pressure
2	0x0004	Low Refrigerant Pressure
3	0x0008	Compressor #1
4	0x0010	Compressor #2
5	0x0020	Oil Protection #1
6	0x0040	Oil Protection #2
7	0x0080	Phase Reversal
8	0x0100	Phase Loss
9	0x0200	Evaporator Temperature Sensor Failure
10	0x0400	Glycol Temperature Sensor Failure
11	0x0800	Evaporator Outlet Temperature Sensor Failure
12	0x1000	Discharge Temperature Sensor failure
13	0x2000	High Super Heat
14	0x4000	Reserved
15	0x8000	Reserved

Dryer Warning Flags	
Register	40003

Bit	Mask	Description
0	0x0001	High Evaporator Temperature
1	0x0002	High Glycol Temperature
2	0x0004	Heater #1
3	0x0008	Heater #2
4	0x0010	Drain #1
5	0x0020	Drain #2
6	0x0040	Filter #1
7	0x0080	Filter #2
8	0x0100	Reserved
9	0x0200	Reserved
10	0x0400	Reserved
11	0x0800	Reserved
12	0x1000	Reserved
13	0x2000	Reserved
14	0x4000	Reserved
15	0x8000	Reserved

Modbus Register Details

Dryer Model		
Register	40017	
Decimal	Hex	Description
0	0x0000	Non-Cycling MRD
1	0x0001	Non-Cycling LRD
2	0x0002	ES-MRD 90
3	0x0003	ES-MRD 120
4	0x0004	ES-MRD 140
5	0x0005	ES-MRD 190
6	0x0006	ES-MRD 245
7	0x0007	ES-MRD 280
8	0x0008	ES-MRD 360
9	0x0009	ES-MRD 450
10	0x000A	ES-MRD 540
11	0x000B	ES-MRD 675
12	0x000C	DEMM 800
13	0x000D	DEMM 1000
14	0x000E	DEMM 1250
15	0x000F	DEMM 1500
16	0x0010	DEMM 1750
17	0x0011	DEMM 2000
18	0x0012	DEMM 2500
19	0x0013	DEMM 3000
20	0x0014	Reserved
21	0x0015	Reserved
22	0x0016	Reserved
23	0x0017	Reserved
24	0x0018	Reserved
25	0x0019	Reserved
26	0x001A	Reserved
27	0x001B	Reserved
28	0x001C	Reserved
29	0x001D	Reserved
30	0x001E	Reserved
31	0x001F	Reserved

Dryer Mode		
Register(s)	40018	
Decimal	Hex	Description
0	0x0000	Manual Mode
1	0x0001	Scheduled Mode
2	0x0002	Remote Mode
3	0x0003	Reserved
4	0x0004	Reserved
5	0x0005	Reserved
6	0x0006	Reserved
7	0x0007	Reserved

Modbus Register Details

UI Language		
Register(s)	40021	
Decimal	Mask	Description
0	0x0000	English
1	0x0001	Spanish
2	0x0002	French
3	0x0003	German
4	0x0004	Portuguese
5	0x0005	Italian
6	0x0006	Polish
7	0x0007	Danish
8	0x0008	Dutch
9	0x0009	Norwegian
10	0x000A	Finnish
11	0x000B	Swedish
12	0x000C	Czech
13	0x000D	Reserved
14	0x000E	Reserved
15	0x000F	Reserved

3.0 MAINTENANCE

3.1 Daily

A. Check separator to make sure the automatic drain is discharging.

3.2 Weekly

A. Blow down the separator weekly by pushing the test button on the control panel.

3.3 Monthly

A. Clean off the accumulated dust and dirt on the condenser coil monthly.

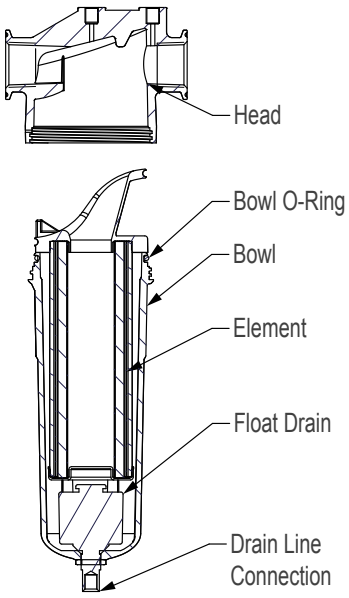
3.4 Annually

A. Replace the filter element in the moisture separator annually. Also replace the cold coalescing filter element annually where applicable.

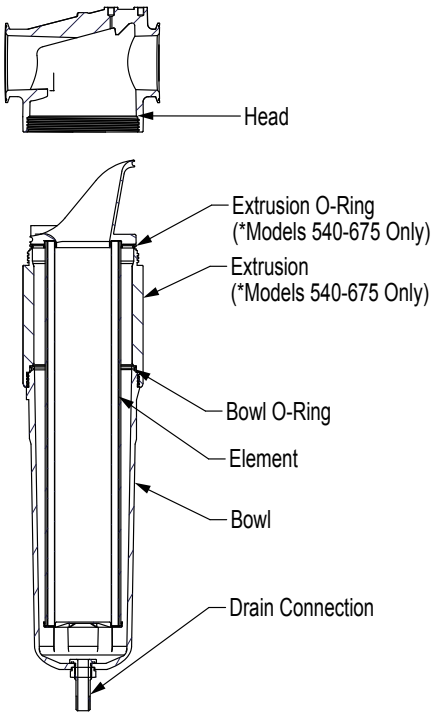
B. Replace the drain service unit annually.

C. Maintenance kits are available to facilitate annual maintenance.

Models 90-140



Models 190-675



3.5 Glycol Level

To add glycol to the glycol tank, a mixture of four (4) parts water to one (1) part propylene glycol should be added to bring the glycol level up to the minimum fluid height required as identified in the following table. DO NOT USE ETHYLENE GLYCOL.

Glycol Volumes and Tank Levels

Model	Fluid Amount (gal)	Minimum Fluid Height (in)*
90	2.4	4-1/4
120	3.7	5-1/2
140	3.7	5-1/2
190	5.0	6
240	7.5	9-1/2
280	8.0	10-3/4
360	8.0	10-3/4
450	9.0	8-1/4
540	11.0	10
675	13.0	11-1/2

* measured from the bottom of the tank with a dipstick

NOTE: Fluid is 20% propylene glycol and 80% water
(Factory supplied glycol contains 5% rust inhibitor)

4.0 TROUBLESHOOTING GUIDE: STANDARD CONTROLLER: MODELS 90-675

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
A) Water downstream of dryer	1. Residual free moisture remaining in downstream pipelines. 2. Air bypass system is open. 3. Inlet and Outlet connections are reversed. 4. Air lines downstream of dryer are exposed to temperatures below the dew point. 5. Excessive free moisture (bulk liquid) at dryer inlet. 6. Condensate not being drained Drain mechanism is clogged or inoperative. Drain line is restricted or frozen. Electric drains-timer not set to allow for sufficient condensate removal. 7. Dryer overloaded resulting in elevated dew point. 8. Refrigeration system not functioning.	Blow out system with dry air. Check valve positions. Check for correct connection. Insulate or heat trace air lines exposed to low ambients or dry air to lower dew point. Install separator ahead of dryer. Replace drain mechanism if inoperative. Open drain line. Electric drains-reset time so that all liquid is discharged. Check inlet air temperature and pressure, flow rate (compressor capacity) and ambient air or water temperature. See D below.
B) High pressure drop across dryer	1. Excessive air flow. 2. Freezing of moisture in evaporator. because of refrigeration system fault. 3. Separator filter element clogged.	Check flow rate. See D below. Replace filter element.
C) Dew point indicator in red area	1. Dryer overloaded resulting in high air outlet temperature. 2. Refrigeration system not functioning properly. 3. Glycol pump not operating.	See A 7. See D below. Replace pump cartridge. Check for power to pump.
D) Refrigeration system not functioning properly		
1. Dryer on light off	a. Power failure. b. Line disconnect switch open. c. Blown fuses, open breaker. d. Faulty wiring, loose terminals. e. Dryer on/off switch is off.	Check for power to unit. Close disconnect switch. Check for continuity. Have electrician check electrical connections. Depress switch to "on" position.
2. Insufficient cooling for the refrigeration unit.	a. Air-Cooled Clogged Condenser. Faulty fan motor. Faulty fan pressure switch. b. Water-Cooled Clogged water strainer. Insufficient water pressure. Water regulating valve mis-adjusted or defective.	Clean condenser face. Check / replace motor. Check / replace switch. Clean water strainer. Check water pressure during period of high water flow demand. Check / adjust / replace.

NOTE: If problem persists, contact a qualified refrigeration repairman or manufacturer's service department

TROUBLESHOOTING GUIDE: ADVANCED CONTROLLER: MODELS 190-675

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
A) Water downstream of dryer	1. Residual free moisture remaining in downstream pipelines. 2. Air bypass system is open. 3. Inlet and Outlet connections are reversed. 4. Air lines downstream of dryer are exposed to temperatures below the dew point. 5. Excessive free moisture (bulk liquid) at dryer inlet. 6. Condensate not being drained. 7. Dryer overloaded resulting in elevated dew point. 8. Refrigeration system not functioning. 9. Glycol pump not operating.	1. Blow out system with dry air. 2. Check valve positions. 3. Check for correct connection. 4. Insulate or heat trace air lines exposed to low ambients or dry air to lower dew point. 5. Install separator ahead of dryer. 6. See C below. 7. See C below. 8. See C below. 9. Replace pump cartridge. Check for power to pump.
B) High pressure drop across dryer	1. Excessive air flow. 2. Freezing of moisture in evaporator because of refrigeration system fault. 3. Filter loaded with solid particulates.	1. Check flow rate. 2. See C below. 3. Replace filter element.
C) Checkpoint faults		
1. Power on light off.	a. Power failure; open circuit.	a. Check for power to dryer.
2. Compressor on light off.	a. Compressor commanded off by manual switch or programmed schedule. b. Open circuit. c. Control circuit open on high or low pressure cutout.	a. Check current command status. b. Check power to compressor. c. Check display for fault.
3. Alarm/Service alert light on -check Display for active conditions.		
SERVICE DRYER	a. Service interval specified has elapsed.	a. Perform scheduled service.
HIGH PRESSURE NOTE: If high refrigerant pressure occurs, switch must be manually reset	a. Lack of condenser cooling. Air-cooled - Ambient temperature too high, clogged condenser fins, obstructed flow across condenser, faulty fan motor or fan control switch. Water-cooled - Cooling temperature too high, flow too low, clogged strainer, faulty water regulating valve.	Check air temperature 6" in front of condenser; Clean condenser and check for free air flow; Check fan and switch operation. Check cooling medium temperature and flow, clean strainer, check valve operation.
HIGH TEMPERATURE (also observed as high reading on temperature indicator)	a. Dryer overloaded. b. Refrigeration system off or not cooling sufficiently.	a. Check compressed air flow, temperature, and pressure. b. Check power to unit, power to compressor, Low or High pressure faults Have qualified technician evaluate system.
DRAIN	a. Drain line restricted or frozen. b. Drain mechanism faulty.	a. Open drain line. b. Turn 3-way valve to horizontal position and open petcock for manual draining. Rebuild drain mechanism.
COMPRESSOR	a. Faulty compressor contactor. b. Faulty N.O. auxiliary contact on compressor contactor.	a. Check wiring and operation of contactor. b. Check wiring and operation of auxiliary contact.
HEATER	a. Faulty compressor contactor. b. Faulty N.C. auxiliary contact on compressor contactor.	a. Check wiring and operation of contactor. b. Check wiring and operation of auxiliary contact.
TEMP SENSOR	a. Temperature sensor or wiring to sensor is open (none of LED's in the temperature display will be illuminated). b. Temperature sensor or wiring to sensor is shorted (all of the LEDs in the temperature display will be illuminated).	a. Replace sensor or repair wiring. b. Replace sensor or repair wiring.

NOTE: After fault correction, press reset button to clear display

5.0 REFERENCE

SIZING

Determining dryer capacity at actual operating conditions

To determine the maximum inlet flow capacity of a dryer at various operating conditions, multiply the rated capacity from Table 1 by the multipliers shown in Table 2.

Example: How many scfm can an air-cooled model 360 handle when compressed air to be dried is at 200 psig and 110°F; ambient air temperature is 80°F?

Answer: 360 x 0.95 x 1.12 = 383 scfm.

TABLE 1

Rated capacity (scfm) and pressure drop @ 100 psig inlet pressure, 100°F inlet temperature, and 100°F ambient temperature

MODEL		90	120	140	190	240
Rated capacity of air-cooled models (scfm)	60 Hz	90	120	140	190	240
	50 Hz	75	100	117	158	200

MODEL		280	360	450	540	675
Rated capacity of air-cooled models (scfm)	60 Hz	280	360	450	540	675
	50 Hz	233	300	375	450	562

TABLE 2

Air capacity correction factors (Multipliers)

INLET COMPRESSED AIR CONDITIONS

INLET PRESSURES		INLET TEMPERATURES					
		80°F	90°F	100°F	110°F	120°F	130°F
psig	bar	27°C	32°C	38°C	43°C	49°C	54°C
30	2.0	1.24	0.92	0.71	0.56	0.44	0.35
50	3.4	1.40	1.07	0.83	0.66	0.54	0.44
80	5.5	1.55	1.19	0.95	0.77	0.63	0.52
100	6.9	1.61	1.25	1.00	0.82	0.68	0.56
125	8.6	1.67	1.30	1.05	0.86	0.72	0.61
150	10.4	1.71	1.34	1.08	0.90	0.75	0.64
175	12.1	1.75	1.37	1.11	0.92	0.78	0.66
200	13.8	1.77	1.39	1.14	0.95	0.80	0.68
250	17.2	1.81	1.43	1.17	0.98	0.83	0.72

COOLING MEDIUM*

AMBIENT TEMPERATURE		MULTIPLIER
°F	°C	
80	27	1.12
90	32	1.06
100	38	1.00
110	43	0.94

**Air-cooled models; water-cooled models use 1.15 multiplier if cooling water is below 35°C, 95°F.*

ENGINEERING DATA TABLE: MODELS 90-240

Model		90	120	140	190	240
Air System Data						
Rated Air Flow at 100°F & 100 psig Inlet, 100°F Ambient (scfm)	60 Hz, a-c	90	120	140	190	240
	60 Hz, w-c	n/a	n/a	n/a	219	276
Rated Air Flow at 95°F & 100 psig Inlet, 77°F Ambient (scfm)	50 Hz, a-c	95	127	148	201	254
	50 Hz, w-c	n/a	n/a	n/a	203	257
Minimum / Maximum Inlet Compressed Air Pressure		30 / 232 psig (2.1 / 16.0 barg)				
Minimum / Maximum Inlet Compressed Air Temperature		40 / 120°F (4 / 49°C)				
Minimum / Maximum Ambient Temperature	a-c	40 / 110°F (4 / 43°C)				
	w-c	40 / 130°F (4 / 54°C)				
Outlet Air Temperature (nominal at rated conditions)		85°F (29°C)				
Refrigeration System Data						
Compressor Type		Hermetic, Reciprocating				
Refrigeration Compressor Horsepower		0.5	0.75	0.75	1	1.5
Refrigeration Capacity @ Rated Flow (BTU/h) *	60 Hz, a-c	4,820	6,030	6,030	8,900	15,200
	50 Hz, a-c	4,760	7,070	7,070	9,130	16,070
Refrigerant Type		R-134A				
Refrigerant Charge		See Serial Tag on Dryer				
Compressor Pressure Switch Setting (cut out / cut in)	High, a-c	N/A			281 - 190 psig (19.4 - 13.1 barg)	
	High, w-c	N/A			200 - 160 psig (13.8 - 11.0 barg)	
Air-Cooled Condenser						
Air Flow Across Condenser (cfm)	60 Hz	300	450	450	710	1,070
	50 Hz	250	370	370	590	890
Condenser Fan Pressure Switch Setting (cut in / cut out)	Fan 1	110 / 70 psig (7.6 / 4.8 barg)			113 / 78 psig (7.8 / 5.4 barg)	
	Fan 2	N/A				
Water-Cooled Condenser						
Water Regulating Valve Setting		135 psig (9.3 barg)				
Minimum Water Pressure Differential		40 psig (2.8 barg)				
Cooling Water Flow with 85°F (gallons per minute) *	60 Hz	N/A			1.3	1.5
	50 Hz	N/A			1.2	1.4
Electrical Data						
Nominal Voltage		**115/1/60**			**208-230/3/60**	
Voltage Range		104 - 127			187 - 253	
Input Power @ Rated Flow (watts) *		875	1,070	1,100	1,363	1,942
Compressor Rated Load Amps		9.5	13.0	13.0	7.5	10.4
Compressor Locked Rotor Amps		44.0	70.0	70.0	51.0	66.0
Minimum Circuit Ampacity		12.8	18.0	18.0	10.5	15.9
Maximum Overcurrent Protector (amps)		20	25	25	15	20
Compressor Winding Resistance (ohms)		4.3 S / 0.6 R	1.06 S / 0.42 R	1.06 S / 0.42 R	1.8	1.3
Nominal Voltage		**208-230/1/60**			**460/3/60**	
Voltage Range		187 - 253			414 - 506	
Input Power @ Rated Flow (watts) *		875	1,070	1,100	1,363	1,942
Compressor Rated Load Amps		4.4	6.5	6.5	3.6	4.7
Compressor Locked Rotor Amps		20.8	35.0	35.0	25.0	33.0
Minimum Circuit Ampacity		6.0	9.1	9.1	5.2	7.5
Maximum Overcurrent Protector (amps)		15	15	15	15	15
Compressor Winding Resistance (ohms)		7.55 S / 2.52 R	3.95 S / 1.47 R	3.95 S / 1.47 R	7.4	5.0
Nominal Voltage		**240/1/50**			**575/3/60 ****	
Voltage Range		216 - 264			518 - 633	
Input Power @ Rated Flow (watts) *		612	749	770	1,363	1,942
Compressor Rated Load Amps		4.5	5.0	5.0	3.6	4.7
Compressor Locked Rotor Amps		21.0	30.0	30.0	25.0	33.0
Minimum Circuit Ampacity		6.2	7.3	7.3	4.2	6.0
Maximum Overcurrent Protector (amps)		15	15	15	15	15
Compressor Winding Resistance (ohms)		12.7 S / 2.7 R	4.38 S / 1.92 R	4.38 S / 1.92 R	7.4	5.0
Nominal Voltage		N/A			**380-420/3/50**	
Voltage Range		N/A			342 - 462	
Input Power @ Rated Flow (watts) *		N/A				
Compressor Rated Load Amps		N/A			3.6	4.7
Compressor Locked Rotor Amps		N/A			25.0	33.0
Minimum Circuit Ampacity		N/A			5.2	7.5
Maximum Overcurrent Protector (amps)		N/A			15	15
Compressor Winding Resistance (ohms)		N/A			7.4	5.0

NOTES:

* For 60 Hz: 35°F Evaporator & 100°F Ambient; for 50Hz: 35°F Evaporator & 77°F Ambient.

** 575/3/60 units use equipment transformers on incoming power. Compressor and fan voltage is 460/3/60.

ENGINEERING DATA TABLE: MODELS 280-675

Model		280	360	450	540	675
Air System Data						
Rated Air Flow at 100°F & 100 psig Inlet, 100°F Ambient (scfm)	60 Hz, a-c	280	360	450	540	675
	60 Hz, w-c	322	414	518	621	776
Rated Air Flow at 95°F & 100 psig Inlet, 77°F Ambient (scfm)	50 Hz, a-c	297	382	477	572	716
	50 Hz, w-c	300	385	482	578	722
Minimum / Maximum Inlet Compressed Air Pressure		30 / 232 psig (2.1 / 16.0 barg)				
Minimum / Maximum Inlet Compressed Air Temperature		40 / 120°F (4 / 49°C)				
Minimum / Maximum Ambient Temperature	a-c	40 / 110°F (4 / 43°C)				
	w-c	40 / 130°F (4 / 54°C)				
Outlet Air Temperature (nominal at rated conditions)		85°F (29°C)				
Refrigeration System Data						
Compressor Type		Hermetic, Reciprocating			Hermetic, Scroll	
Refrigeration Compressor Horsepower		1.5	1.5	2	2.5	3.5
Refrigeration Capacity @ Rated Flow (BTU/h) *	60 Hz	15,200	15,200	19,200	22,000	30,500
	50 Hz	16,070	16,070	20,060	21,120	29,650
Refrigerant Type		R-134A				
Refrigerant Charge		See Serial Tag on Dryer				
Compressor Pressure Switch Setting (cut out / cut in)	High, a-c	281 / 190 psig (19.4 / 13.1 barg)				
	High, w-c	200 / 160 psig (13.8 / 11.0 barg)				
Air-Cooled Condensers						
Air Flow Across Condenser (cfm)	60 Hz	1,070	1,070	2,470	1,680	2,170
	50 Hz	890	890	2,060	1,400	1,810
Condenser Fan Pressure Switch Setting (cut in / cut out)	Fan 1	113 / 78 psig (7.8 / 5.4 barg)				
	Fan 2	N/A		183 / 124 psig (12.6 / 8.6 barg)		
Water-Cooled Condensers						
Water Regulating Valve Setting		135 psig (9.3 barg)				
Minimum Water Pressure Differential		40 psig (2.8 barg)				
Cooling Water Flow with 85°F (gallons per minute) *	60 Hz	1.7	2.1	2.5	3.0	3.6
	50 Hz	1.6	2.0	2.3	2.8	3.3
Electrical Data						
Nominal Voltage		**208-230/3/60**				
Voltage Range		187 - 253				
Input Power @ Rated Flow (watts) *		1,950	2,065	2,496	3,081	4,350
Compressor Rated Load Amps		10.4	10.4	11.4	13.9	22.1
Compressor Locked Rotor Amps		66.0	66.0	75.0	88.0	115.0
Minimum Circuit Ampacity		15.9	15.9	20.0	19.7	30.4
Maximum Overcurrent Protector (amps)		20	20	25	30	45
Compressor Winding Resistance (ohms)		1.3	1.3	1.1	1.0	0.7
Nominal Voltage		**460/3/60**				
Voltage Range		414 - 506				
Input Power @ Rated Flow (watts) *		1,950	2,065	2,496	3,081	4,350
Compressor Rated Load Amps		4.7	4.7	5.1	7.1	9.6
Compressor Locked Rotor Amps		33.0	33.0	40.0	44.0	63.0
Minimum Circuit Ampacity		7.5	7.5	9.6	10.4	15.2
Maximum Overcurrent Protector (amps)		15	15	15	15	20
Compressor Winding Resistance (ohms)		5.0	5.0	4.1	4.0	2.7
Nominal Voltage		**575/3/60 ****				
Voltage Range		518 - 633				
Input Power @ Rated Flow (watts) *		1,950	2,065	2,496	3,081	4,350
Compressor Rated Load Amps		4.7	4.7	5.1	7.1	9.6
Compressor Locked Rotor Amps		33.0	33.0	40.0	44.0	63.0
Minimum Circuit Ampacity		6.0	6.0	7.7	8.3	12.2
Maximum Overcurrent Protector (amps)		15	15	15	15	20
Compressor Winding Resistance (ohms)		5.0	5.0	4.1	4.0	2.7
Nominal Voltage		**380-420/3/50**				
Voltage Range		342 - 462				
Input Power @ Rated Flow (watts) *						
Compressor Rated Load Amps		4.7	4.7	5.1	7.1	9.6
Compressor Locked Rotor Amps		33.0	33.0	40.0	44.0	63.0
Minimum Circuit Ampacity		7.5	7.5	8.1	10.4	15.2
Maximum Overcurrent Protector (amps)		15	15	15	15	20
Compressor Winding Resistance (ohms)		5.0	5.0	4.1	4.0	2.7

NOTES:

* For 60 Hz: 35°F Evaporator & 100°F Ambient; for 50Hz: 35°F Evaporator & 77°F Ambient.

** 575/3/60 units use equipment transformers on incoming power. Compressor and fan voltage is 460/3/60.

DRYER SET POINT TABLE

DIP Switch Settings

DIP Switch	Description	On	Off
1	Evaporator Outlet Temperature Sensor	Disabled	Enabled
2	Status Menu Scrolling	Disabled	Enabled
3	Reserved	N/A	N/A
4	Reserved	N/A	N/A

Dryer Configuration

Description	Units	Lower	Upper	Increment	Default
Service Interval	Hours	0	9999	1	4000
Energy Cost	Decimal	0.00	0.99	0.01	0.13
Total Hours	Hours	0	999999	1	0
High Glycol Temperature	Celsius	—	—	—	15.6°C (60.1°F)
Compressor On Temperature	Celsius	0.0°C (32.0°F)	15.0°C (59.0°F)	0.1°C (0.2°F)	6.0°C (42.8°F)
Compressor Off Temperature	Celsius	0.0°C (32.0°F)	15.0°C (59.0°F)	0.1°C (0.2°F)	3.0°C (37.4°F)
Modbus Device Address	Integer	1	247	1	1
Full Load Power	Watts	0	29999	10	0

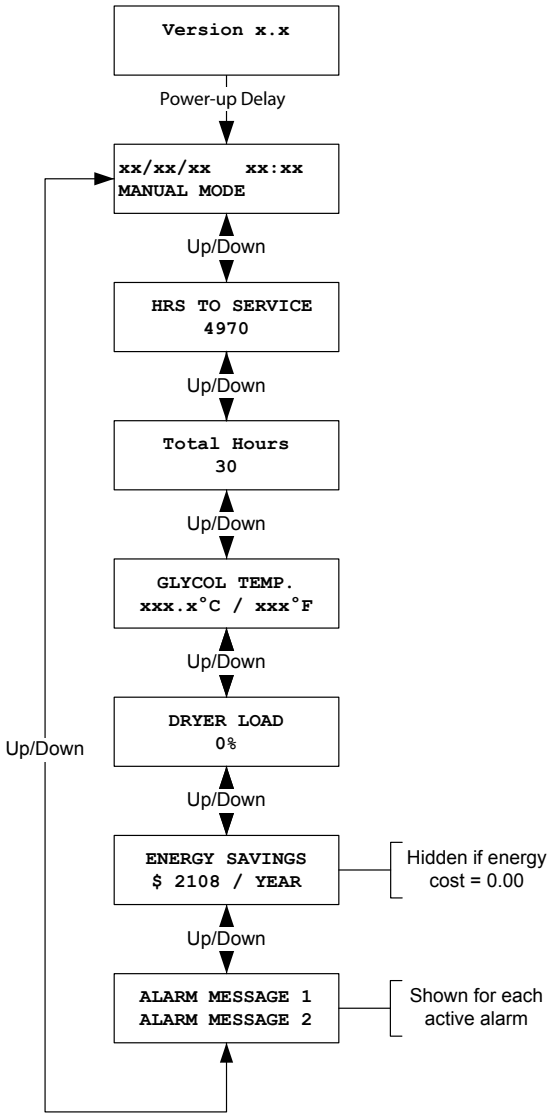
DRYER ALARM TABLE

Alarm Conditions

Alarm Text	Alarm Trigger	Delay	Monitored	Exit Condition	Alarm Action
HIGH PRESSURE	High pressure switch open	1 Second	Always	Alarm reset button pressed	Halt compressors De-energize alarm relay #1
COMPRESSOR	Motor protection switch open	1 Second	Primary Compressor On	Alarm reset button pressed	Halt compressors De-energize alarm relay #1
HEATER	Heater switch open	1 Second	Standby	Alarm reset button pressed	De-energize alarm relay #2
DRAIN 1	Drain #1 switch open	1 Second	Dryer On	Alarm reset button pressed	De-energize alarm relay #2
DRAIN 2	Drain #2 switch open	1 Second	Dryer On	Alarm reset button pressed	De-energize alarm relay #2
SERVICE DRYER	Dryer service interval > 0 AND Dryer service timer > Dryer service interval	None	Always	Alarm reset button pressed	De-energize alarm relay #2
GLYCOL HIGH TEMPERATURE	Glycol temperature > high glycol temperature set point	1 Second	Dryer On > 10 minutes	Alarm reset button pressed	De-energize alarm relay #2
GLYCOL TEMP SENSOR	Glycol temperature sensor out of range	5 Seconds	Always	Alarm reset button pressed	Halt compressors De-energize alarm relay #1

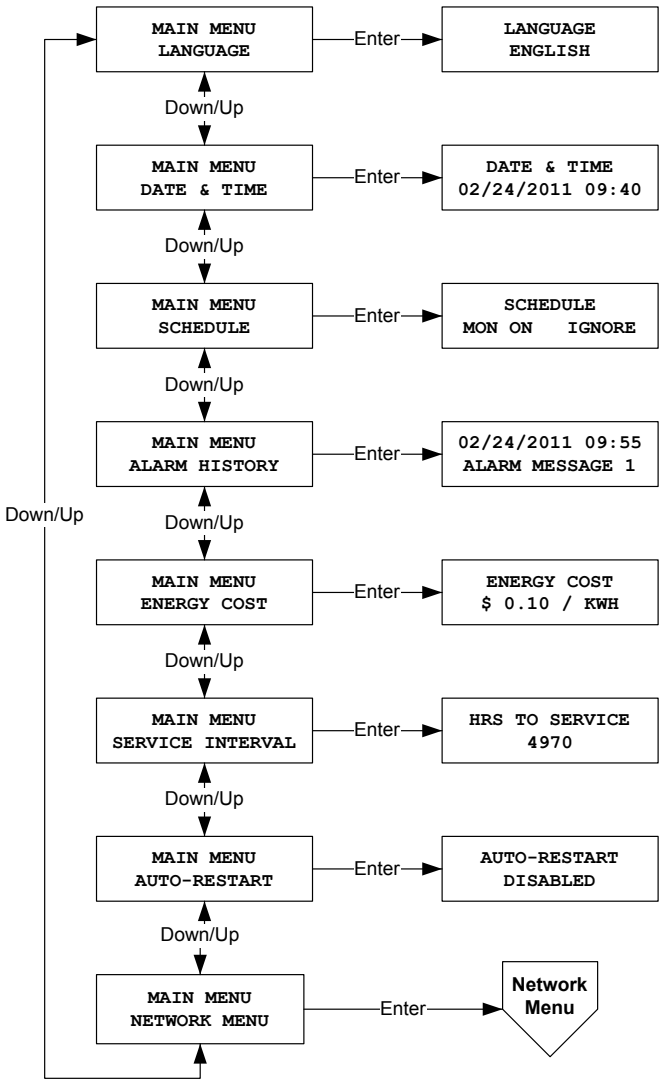
CONTROLLER SCREEN SHOTS

Status Menu Screens



CONTROLLER SCREEN SHOTS

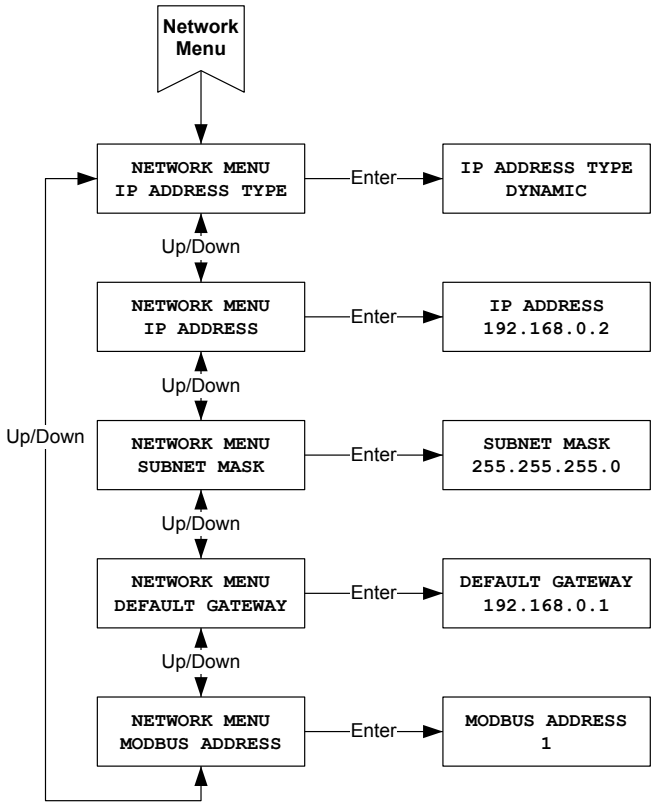
Setup Menu Screens



NOTE: Press & hold ESC button for 3 seconds to enter setup menu.

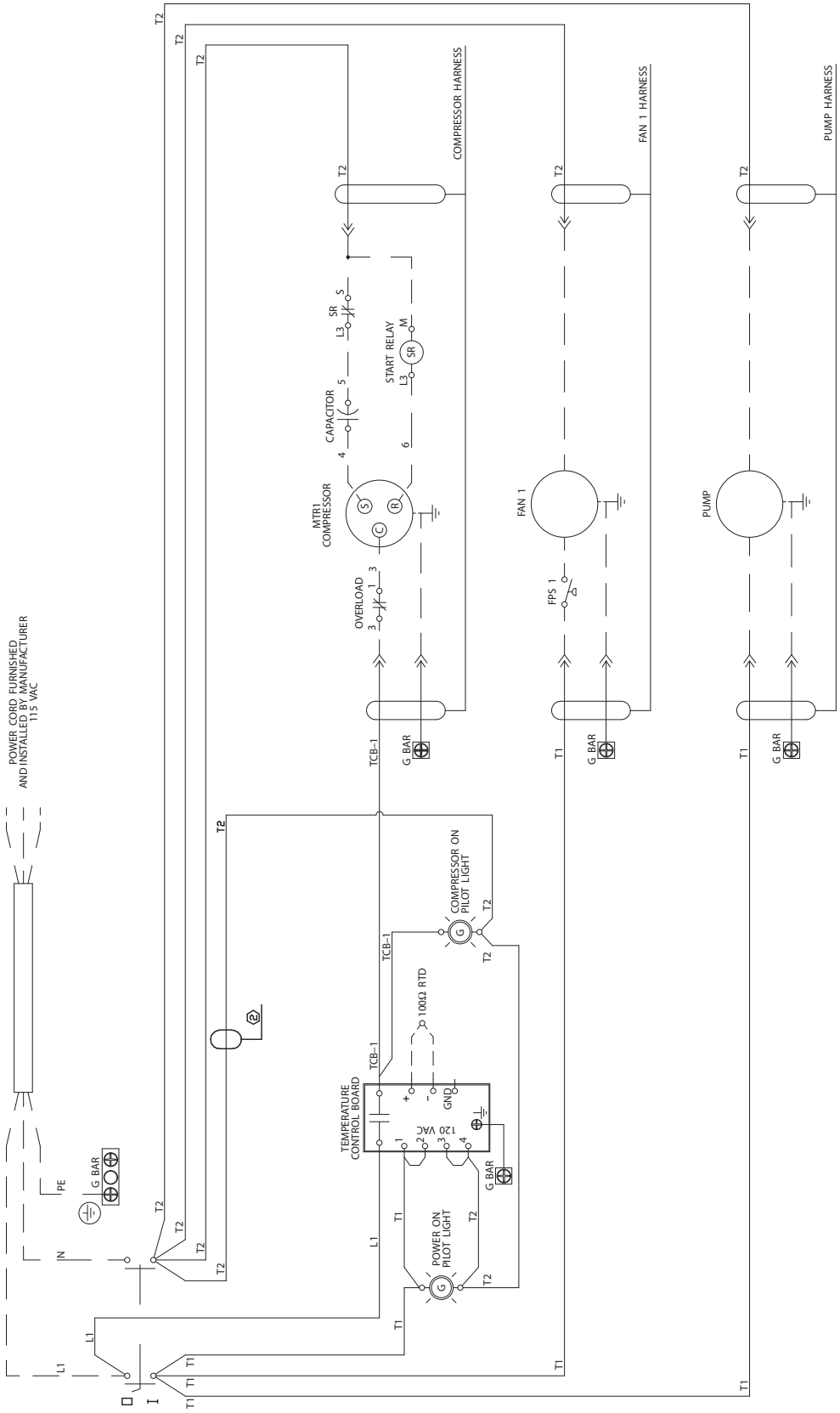
CONTROLLER SCREEN SHOTS

Network Menu Screens



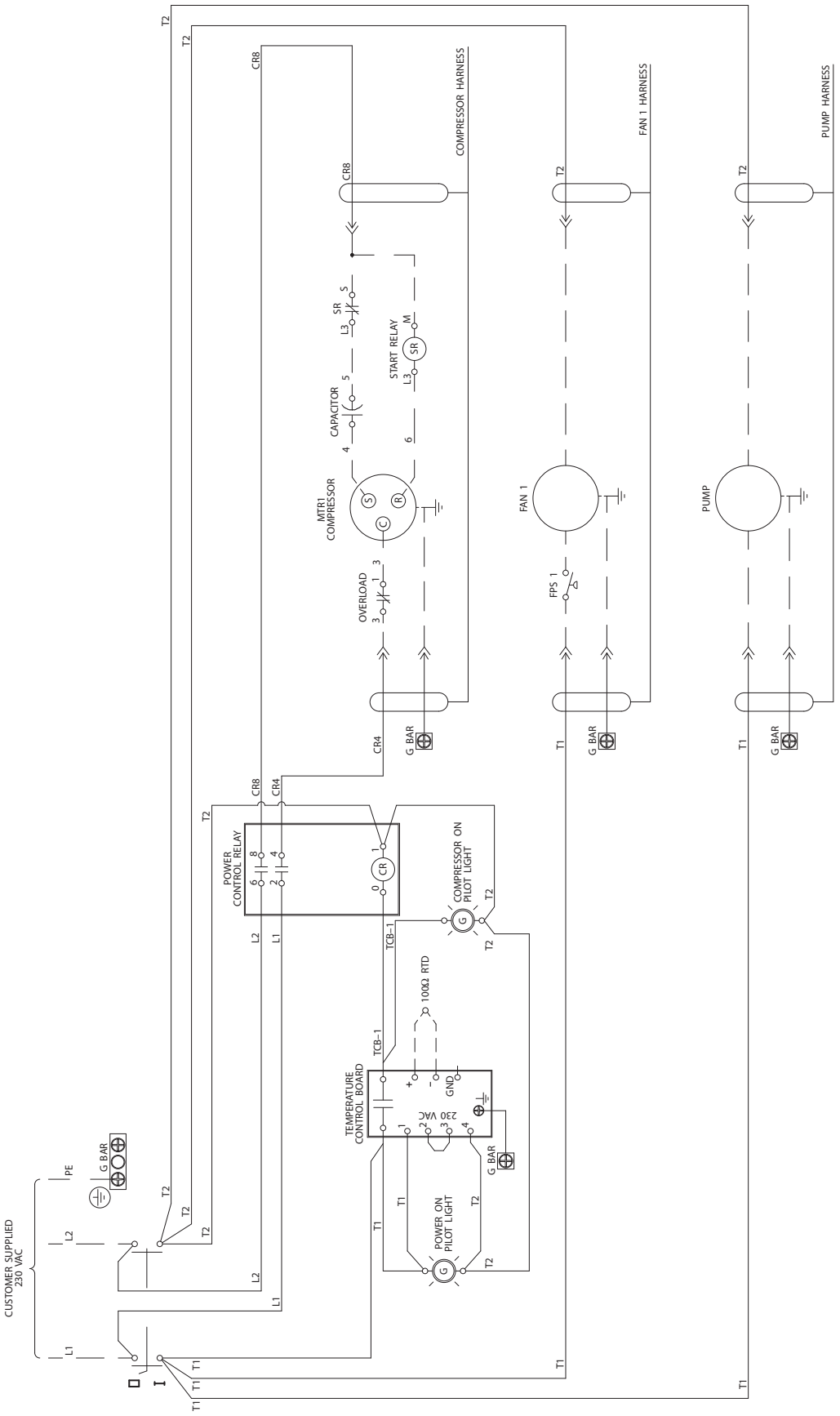
6.0 WIRING DIAGRAM

Standard Controller
Models 90/120/140 (115/1/60)



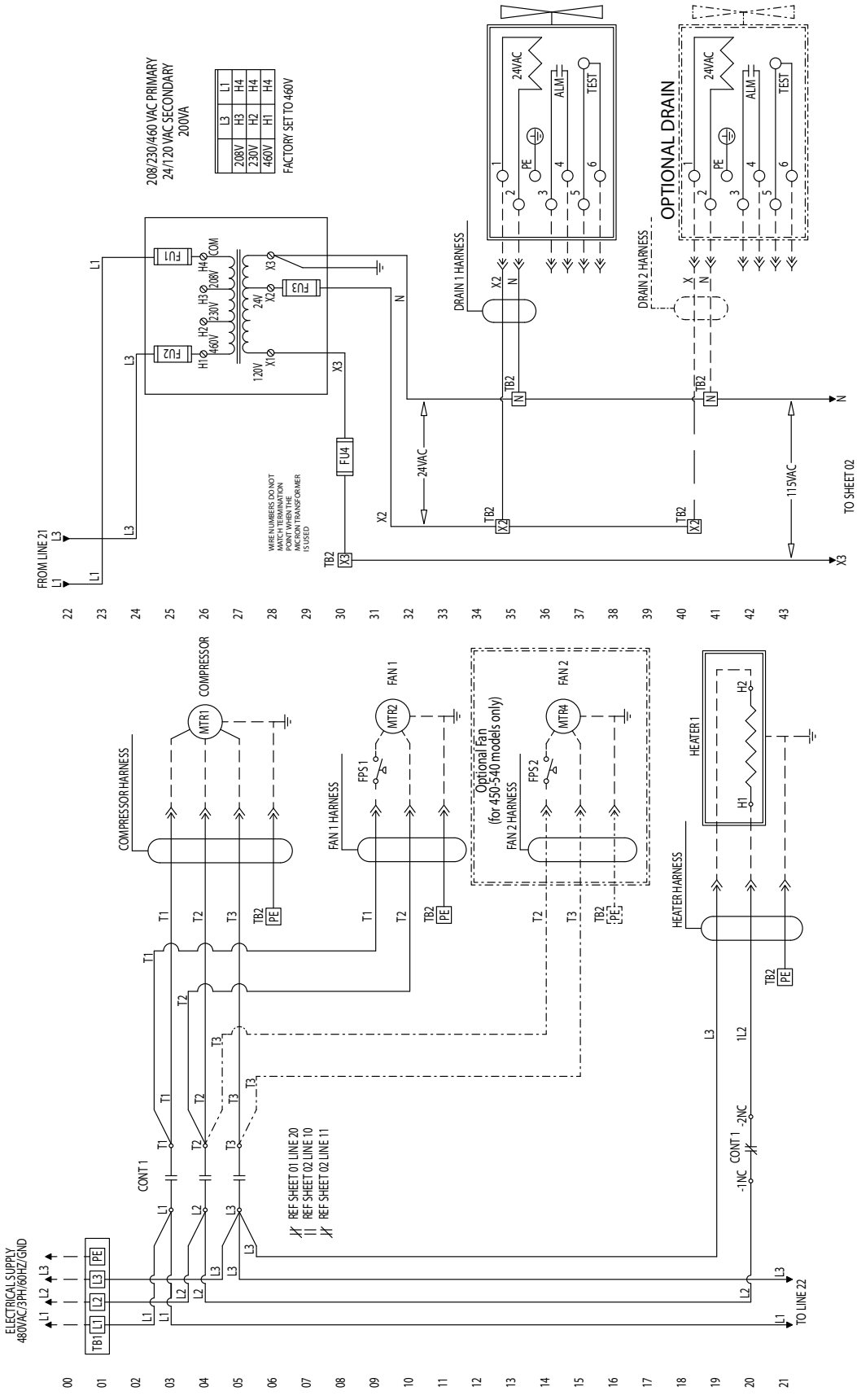
WIRING DIAGRAM

Standard Controller
Models 90/120/140 (230/1/60)



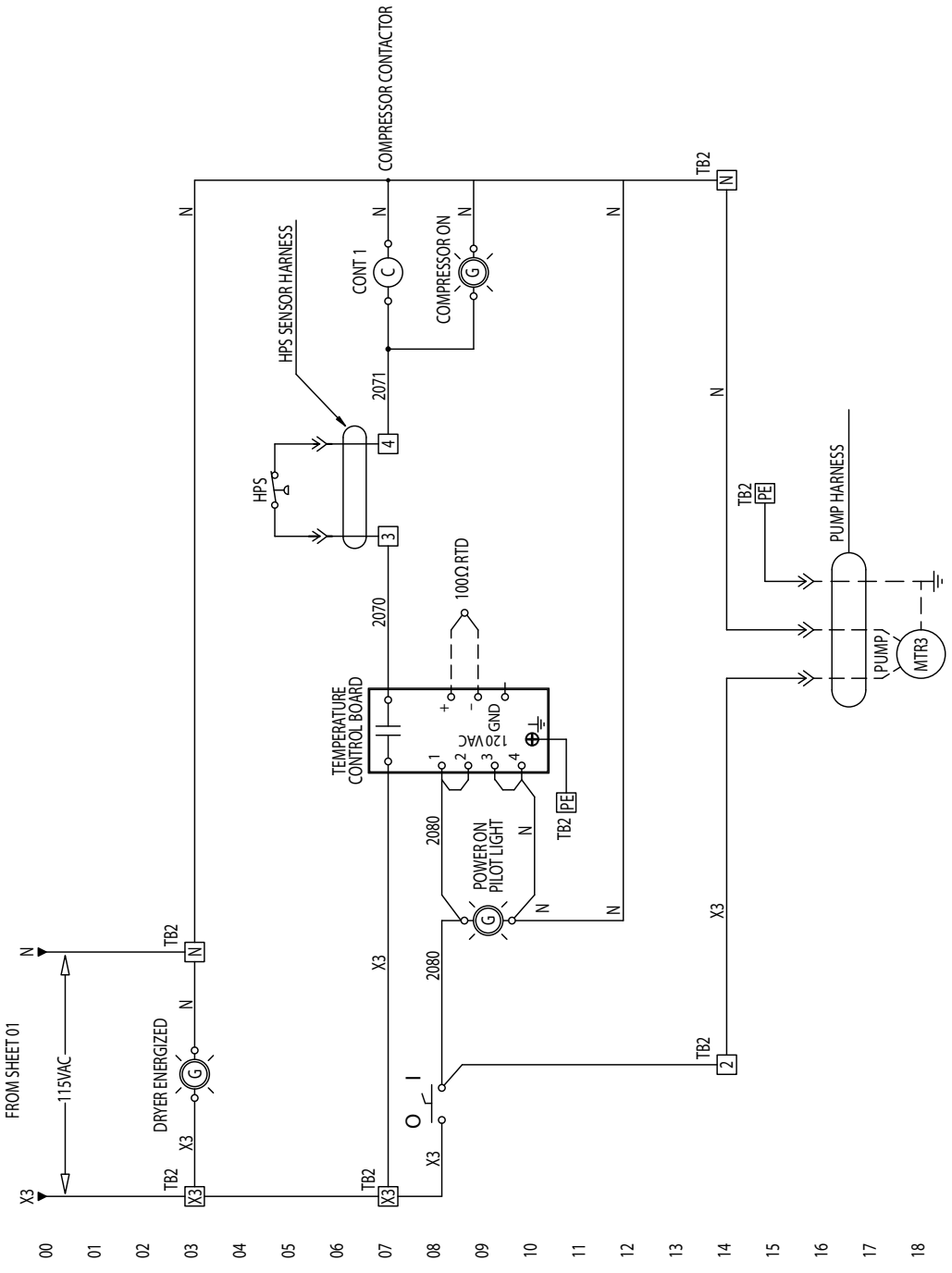
WIRING DIAGRAM

Standard Controller
Models 190/240/280/360/450/540
Sheet 1 of 2



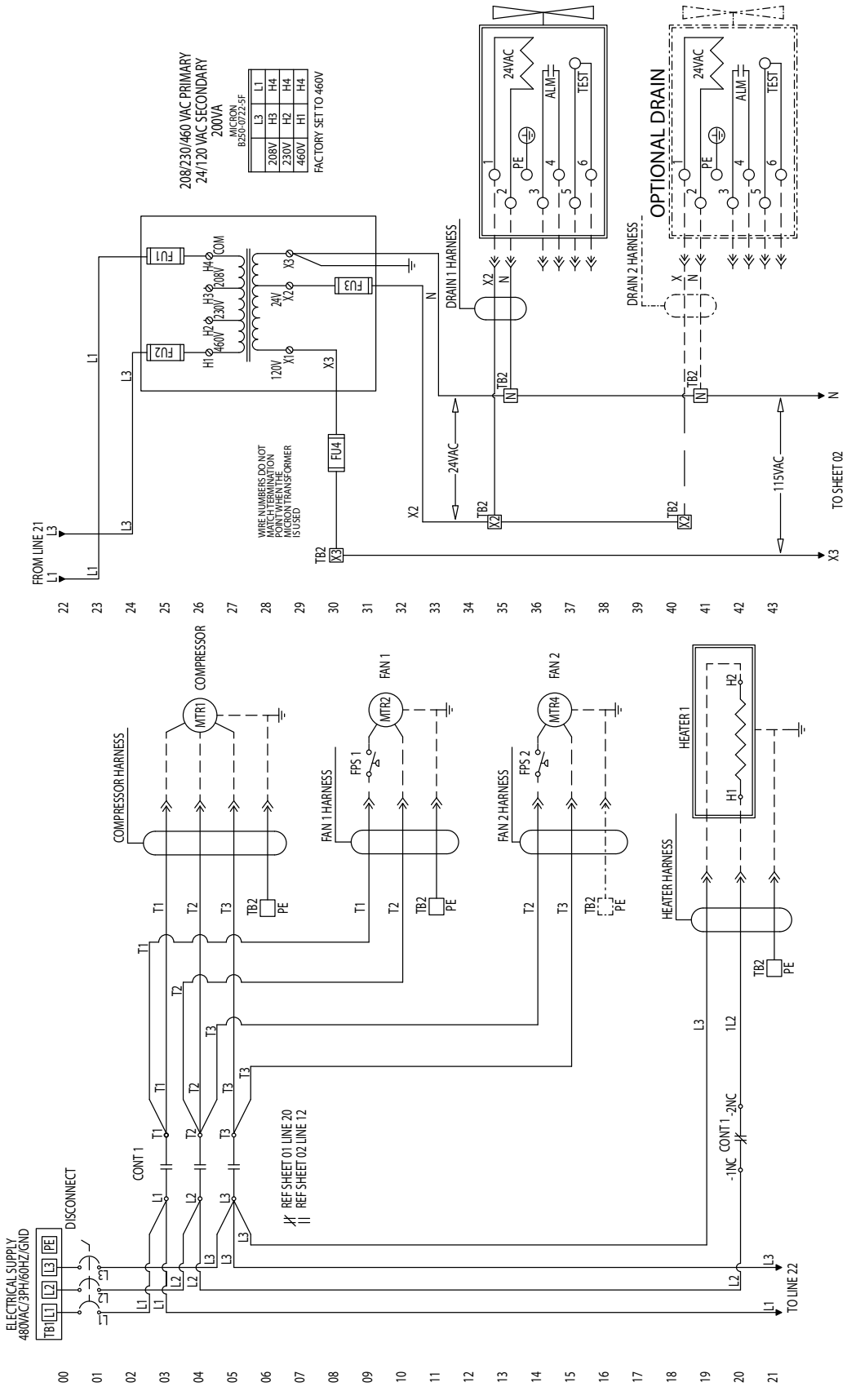
WIRING DIAGRAM

Standard Controller
Models 190/240/280/360/450/540
Sheet 2 of 2



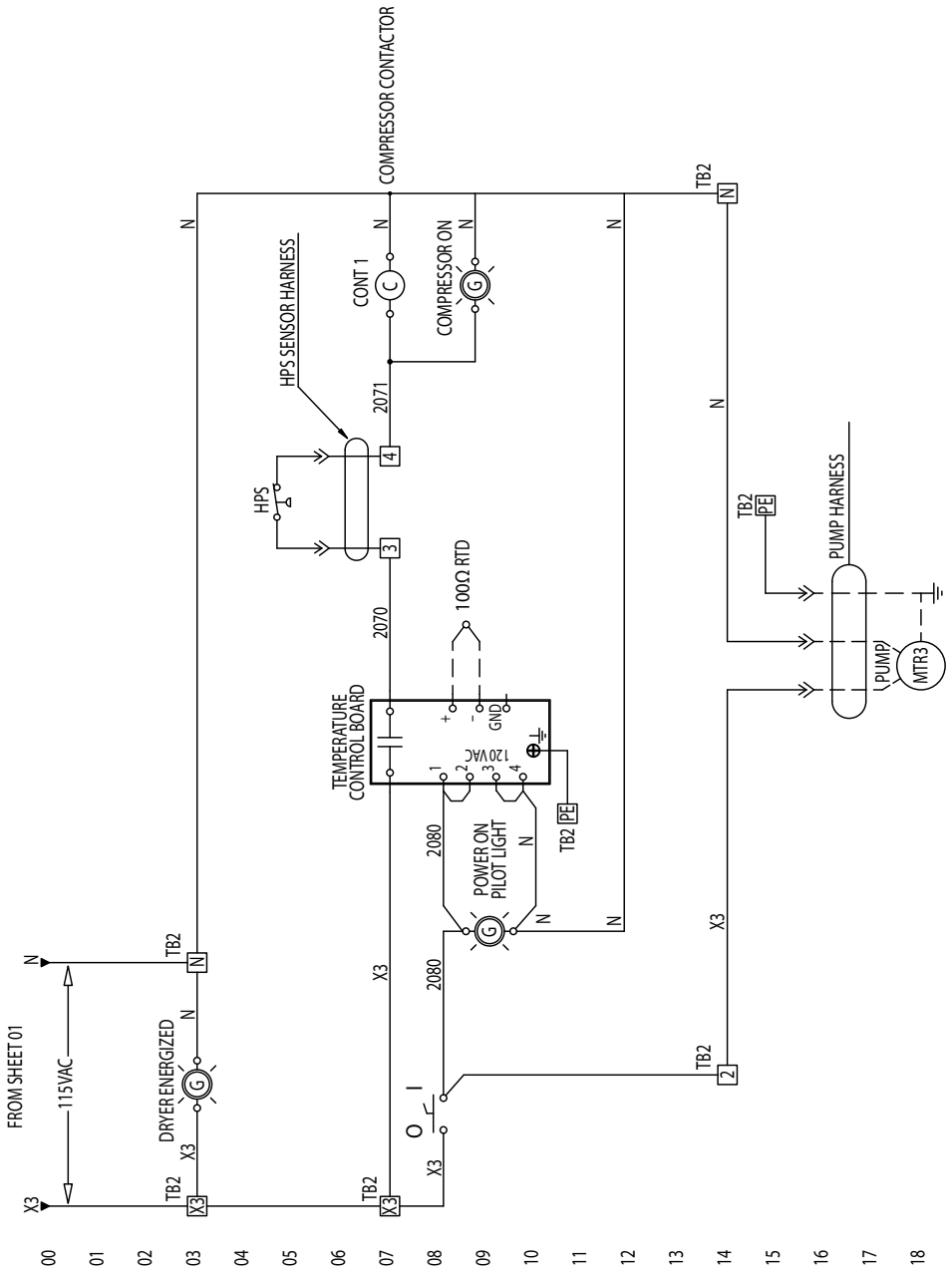
WIRING DIAGRAM

Standard Controller
Model 675
Sheet 1 of 2



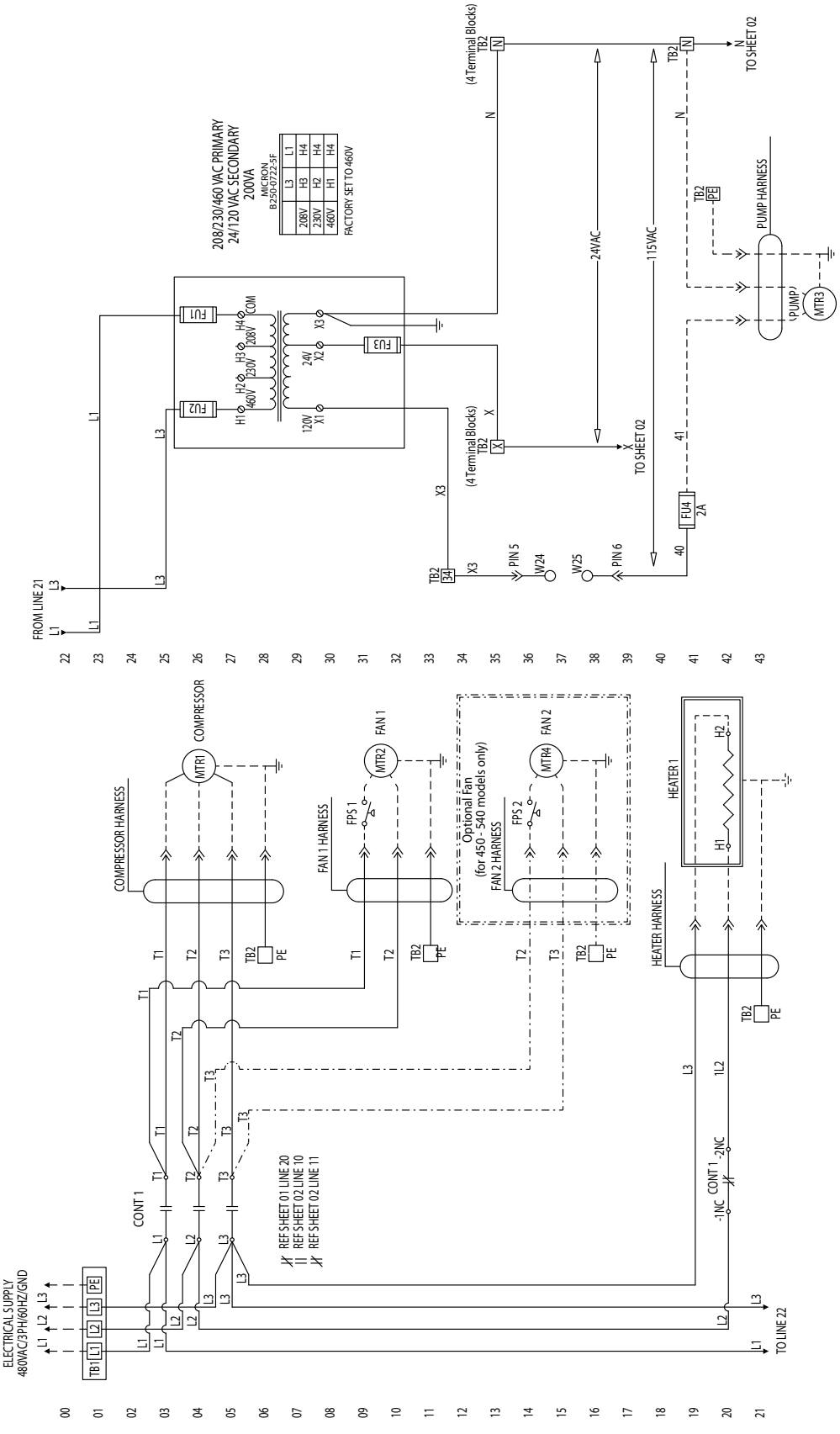
WIRING DIAGRAM

Standard Controller
Model 675
Sheet 2 of 2



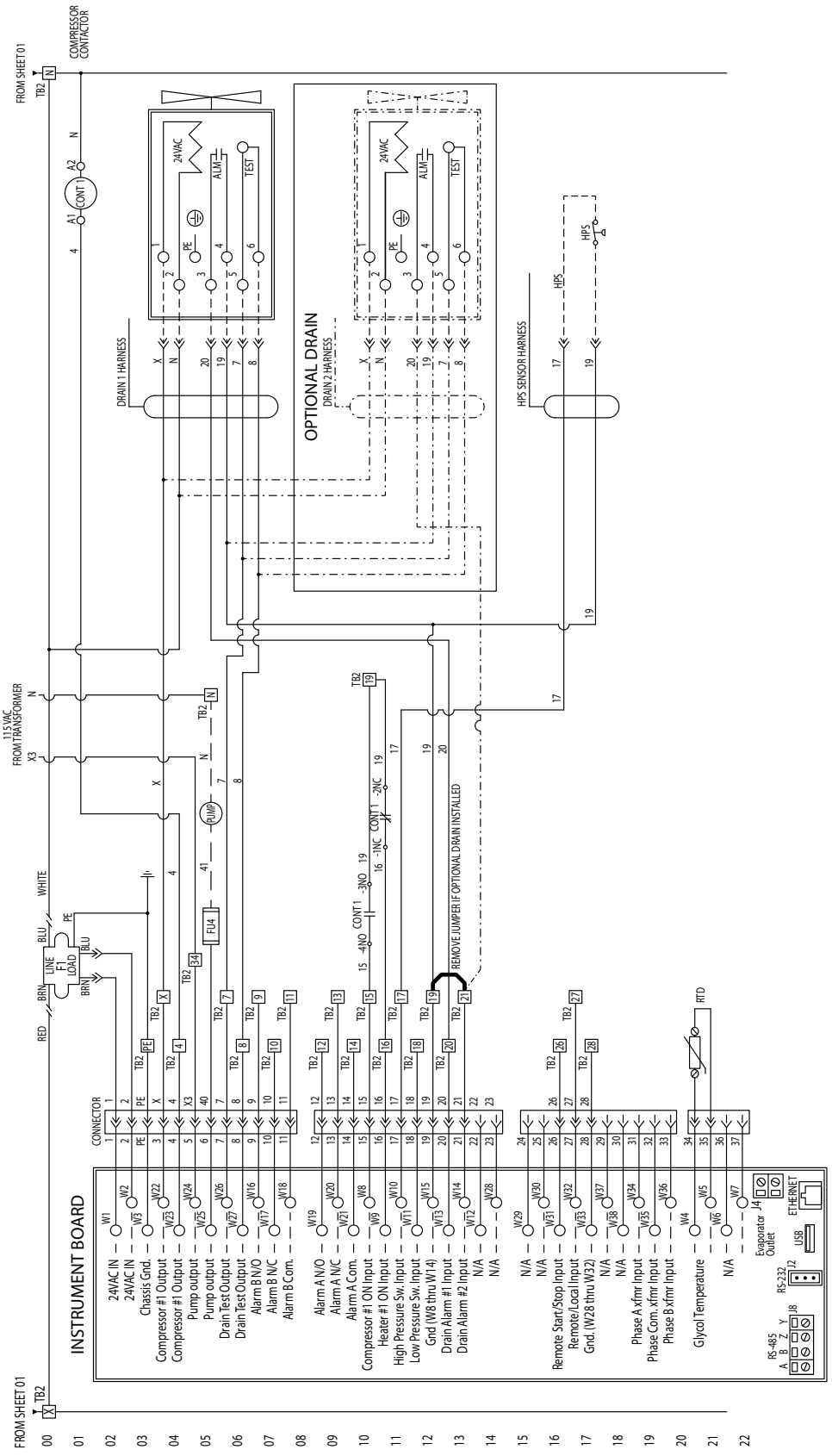
WIRING DIAGRAM

Advanced Controller
Models 190/240/280/360/450/540
Sheet 1 of 2



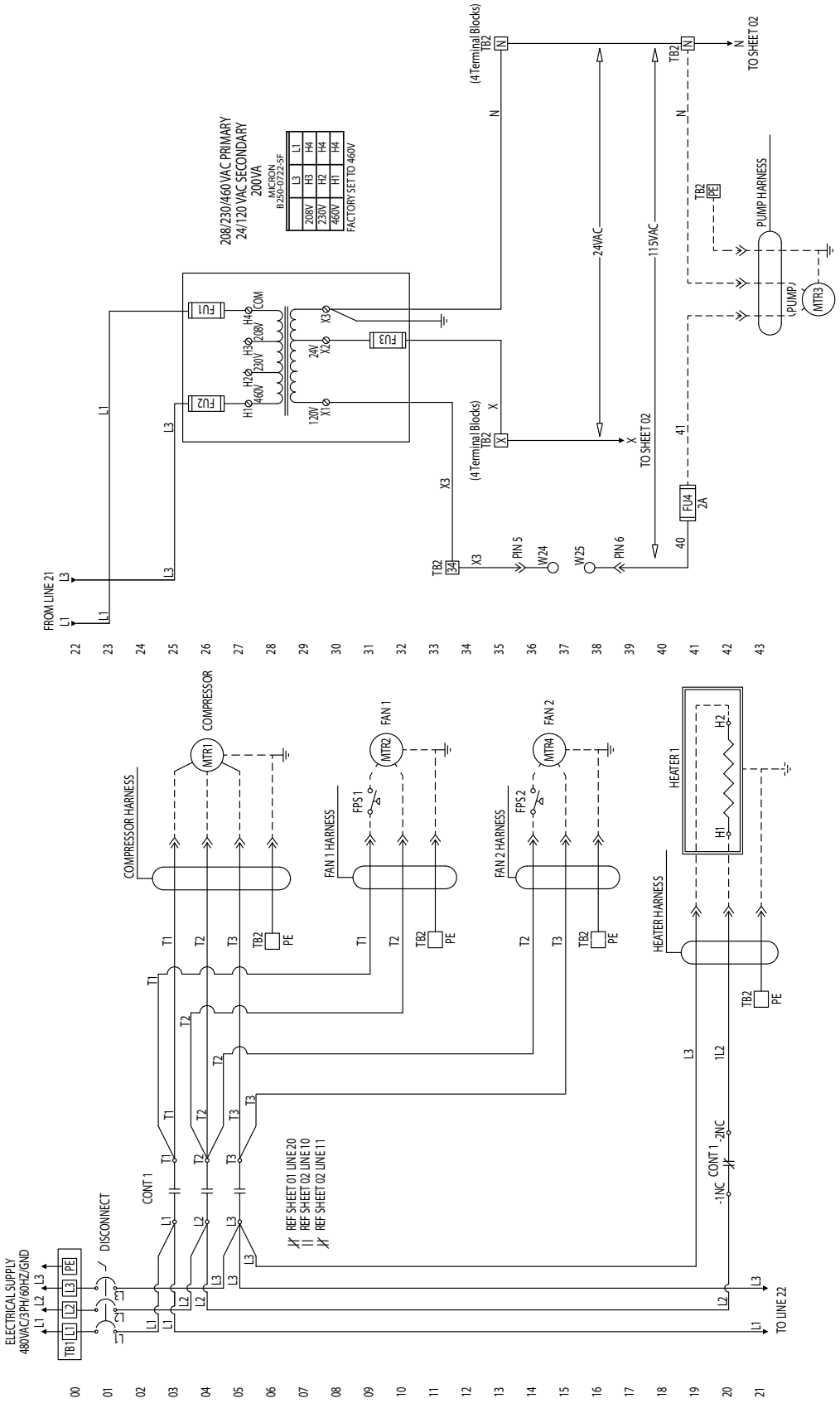
WIRING DIAGRAM

Advanced Controller
Models 190/240/280/360/450/540
Sheet 2 of 2



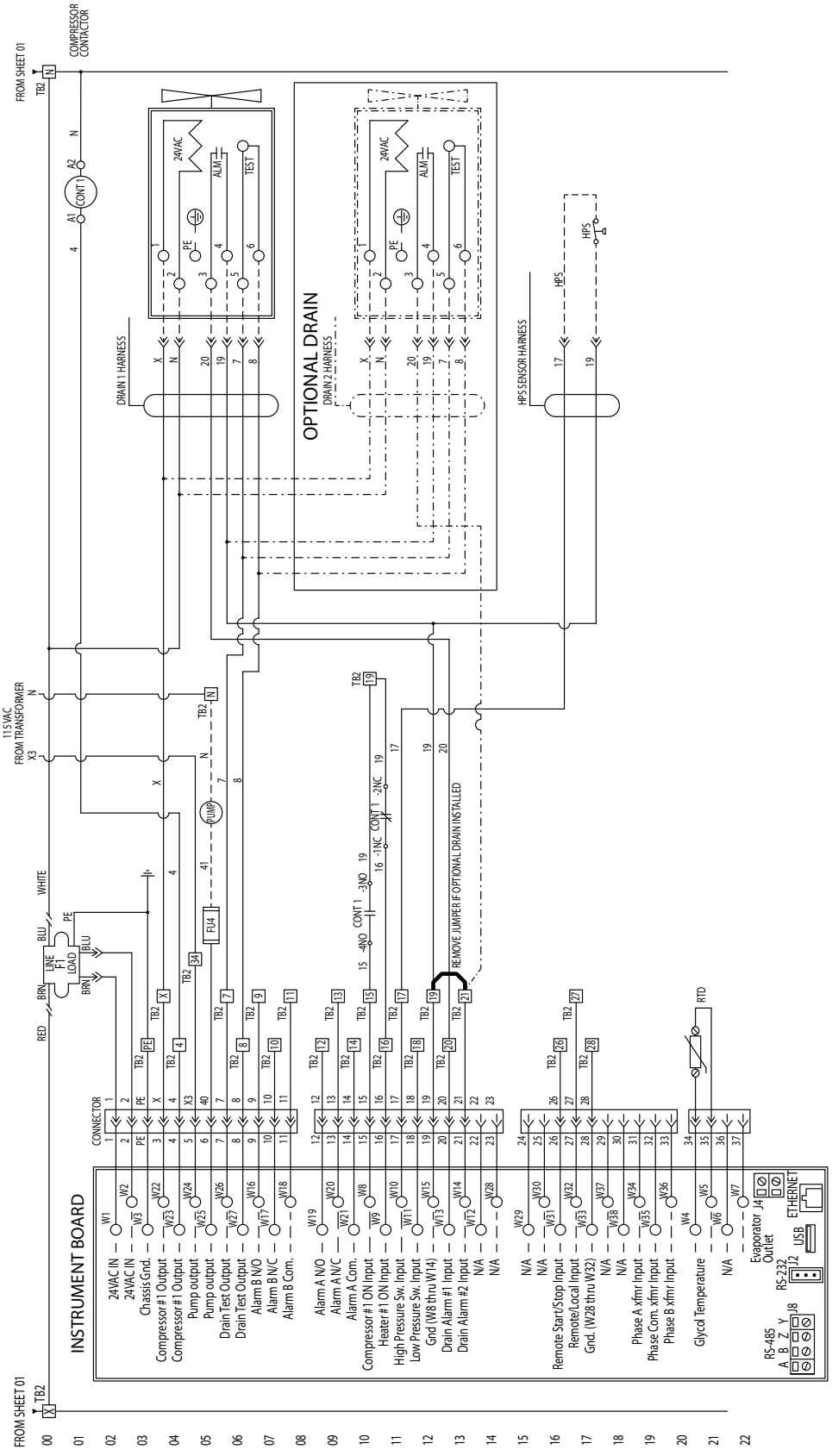
WIRING DIAGRAM

Advanced Controller
Model 675
Sheet 1 of 2



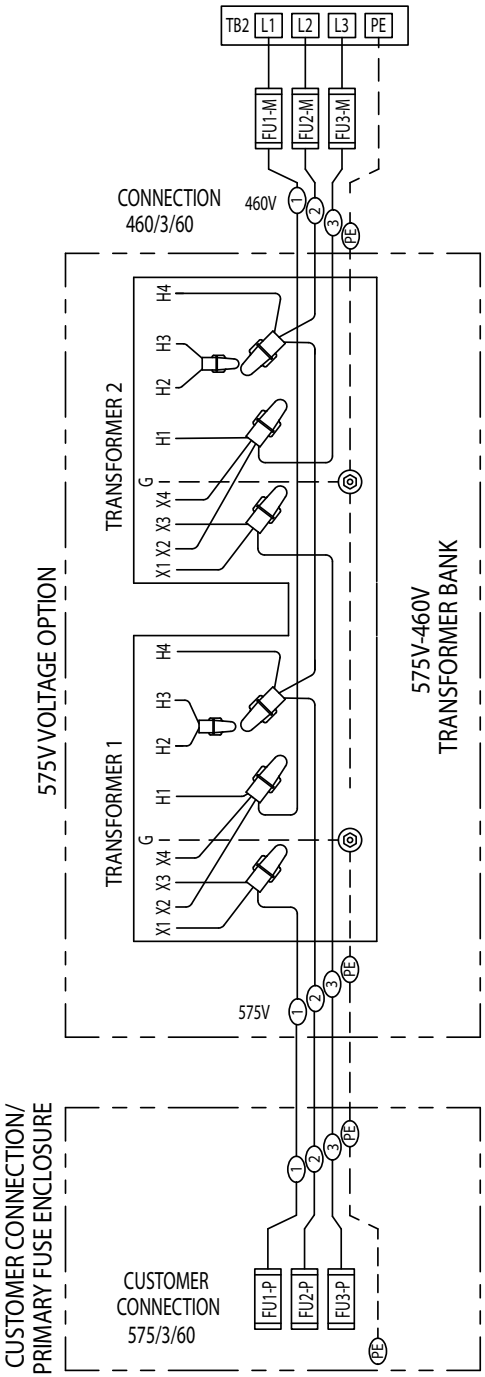
WIRING DIAGRAM

Advanced Controller
Model 675
Sheet 2 of 2



WIRING DIAGRAM

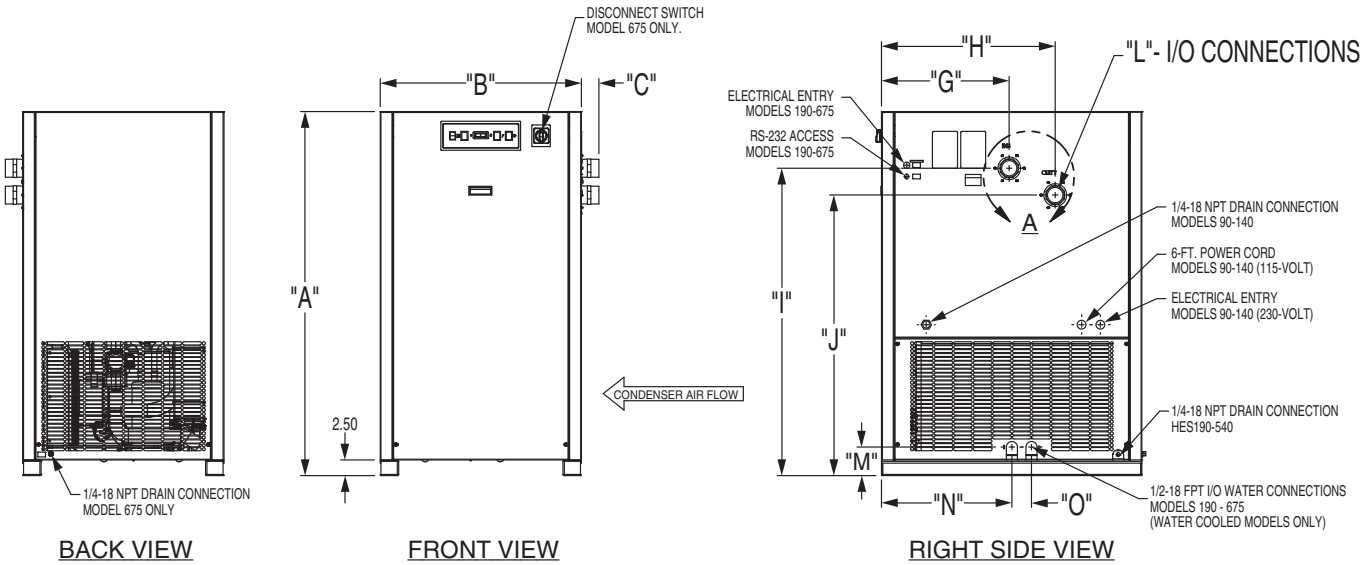
575 - 460/3/60 Transformer Pack
Models 190/240/280/360/450/540/675



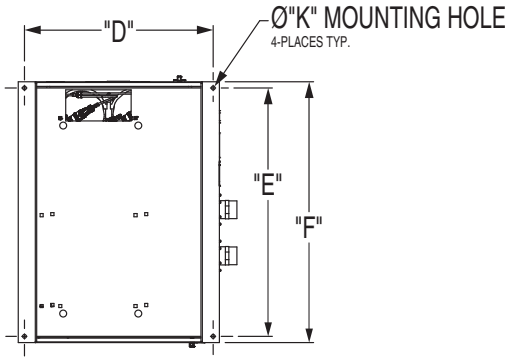
7.0 DIMENSIONS / WEIGHTS

Dimensions, inches (mm)										
Model	90	120	140	190	240	280	360	450	540	675
A	37.56 (954)	37.56 (954)	37.56 (954)	38.60 (980)	38.60 (980)	45.38 (1153)	45.38 (1153)	58.06 (1475)	58.06 (1475)	58.06 (1475)
B	25.62 (651)	25.62 (651)	25.62 (651)	32.15 (817)	32.15 (817)	32.15 (817)	32.15 (817)	32.15 (817)	32.15 (817)	32.15 (817)
C	1.63 (41)	1.63 (41)	1.63 (41)	1.88 (48)	1.88 (48)	1.88 (48)	2.63 (67)	2.77 (70)	2.77 (70)	2.77 (70)
D	23.62 (600)	23.62 (600)	23.62 (600)	30.15 (766)	30.15 (766)	30.15 (766)	30.15 (766)	30.15 (766)	30.15 (766)	30.15 (766)
E	17.62 (448)	17.62 (448)	17.62 (448)	30.15 (766)	30.15 (766)	30.15 (766)	30.15 (766)	39.62 (1006)	39.62 (1006)	39.62 (1006)
F	19.62 (498)	19.62 (498)	19.62 (498)	32.15 (817)	32.15 (817)	32.15 (817)	32.15 (817)	41.62 (1057)	41.62 (1057)	41.62 (1057)
G	9.58 (243)	9.58 (243)	9.58 (243)	7.64 (194)	7.64 (194)	13.51 (343)	16.25 (413)	20.44 (519)	20.44 (519)	20.44 (519)
H	14.96 (380)	14.96 (380)	14.96 (380)	15.80 (401)	15.80 (401)	21.82 (554)	25.68 (652)	27.79 (706)	27.79 (706)	27.79 (706)
I	28.54 (725)	28.54 (725)	28.54 (725)	30.19 (767)	30.19 (767)	29.98 (761)	36.89 (937)	49.06 (1246)	49.06 (1246)	49.06 (1246)
J	25.02 (636)	25.02 (636)	25.02 (636)	26.04 (661)	26.04 (661)	25.74 (654)	32.82 (833)	44.78 (1137)	44.78 (1137)	44.78 (1137)
K	0.31 (7.9)	0.31 (7.9)	0.31 (7.9)	0.31 (7.9)	0.31 (7.9)	0.31 (7.9)	0.31 (7.9)	0.63 (16)	0.63 (16)	0.63 (16)
L	1 MPT	1 MPT	1 MPT	1.5 MPT	1.5 MPT	1.5 MPT	2 MPT	2.5 MPT	2.5 MPT	2.5 MPT
M	N/A	N/A	N/A	4.56 (116)	4.56 (116)	4.56 (116)	4.56 (116)	4.81 (122)	4.81 (122)	4.81 (122)
N	N/A	N/A	N/A	9.84 (250)	9.84 (250)	9.84 (250)	9.84 (250)	20.82 (529)	20.82 (529)	20.82 (529)
O	N/A	N/A	N/A	3.13 (80)	3.13 (80)	3.13 (80)	3.13 (80)	3.13 (80)	3.13 (80)	3.13 (80)
Weight lbs (kg)	241 (109)	258 (117)	263 (119)	408 (185)	478 (217)	497 (225)	540 (244)	708 (321)	793 (360)	844 (382)

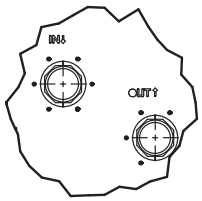
NOTE: Dimensions and Weights are for reference only. Request certified drawings for construction purposes.



BACK VIEW FRONT VIEW RIGHT SIDE VIEW

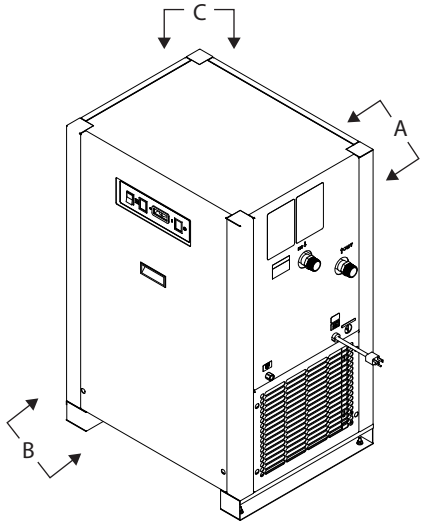


BOTTOM VIEW

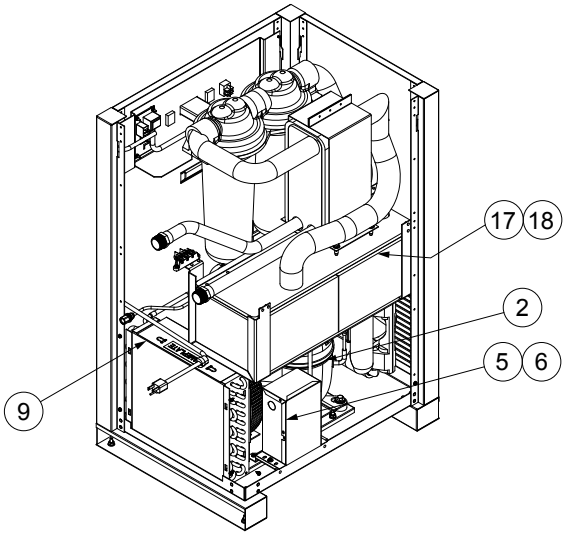


DETAIL A

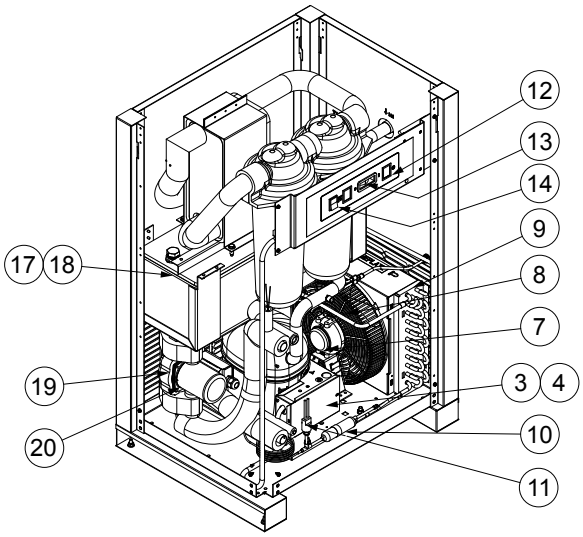
8.0 REPLACEMENT PARTS: MODELS 90 THROUGH 140



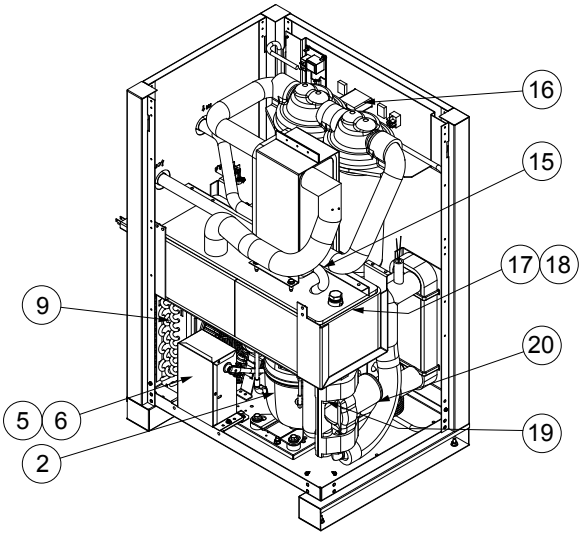
VIEW ORIENTATION REFERENCE



RIGHT REAR, VIEW-A
(covers and center support shelf removed for clarity)



RIGHT FRONT, VIEW-B
(covers and center support shelf removed for clarity)



LEFT REAR, VIEW-C
(covers and center support shelf removed for clarity)

REPLACEMENT PARTS: MODELS 90 THROUGH 140

MAINTENANCE KITS

MODEL	Kit Components	90	120	140
Standard Kit	Separator Element, O-Ring, Drain Valve Repair Kit, Lube Packet, Service Reminder Decal	HESMK30S	HESMK31S	HESMK32S
Cold Coalescing Kit	Separator Element, Cold Coalescing Element, O-Ring, Drain Valve Repair Kit, Lube Packet, Service Reminder Decal	HESMK50S	HESMK51S	HESMK52S

REPLACEMENT PARTS

ID #	PARTS DESCRIPTION	90			120			140		
		115/1/60 100/1/60	208-230/1/60	220-240/1/50	115/1/60 100/1/60	208-230/1/60	220-240/1/50	115/1/60 100/1/60	208-230/1/60	220-240/1/50
1	Condensing Unit Assembly[1]	5006623	5006624	5006625	7427774	7427775	7427776	7427774	7427775	7427776
2	Compressor (Only)	5002243	5002250	5002256	7427777	7427778	7427779	7427777	7427778	7427779
3	Overload	5002244	5002251	5002257	3233219	3233220	3252935	3233219	3233220	3252935
4	Start Relay	5002245	5002252	5002258	7427780	7427781	7427782	7427780	7427781	7427782
5	Start Capacitor	5002246	5002253	5002253	7427783	7427784	7427784	7427783	7427784	7427784
6	Run Capacitor	N/A	N/A	N/A	7427785	7427786	7427787	7427785	7427786	7427787
7	Fan Motor	5002247	5002254	5002259	3233151	3210368	3210368	3233151	3210368	3210368
8	Fan Blade	5002248	5002255	5002255	3219405	3219405	3219405	3219405	3219405	3219405
9	Condenser	5002249	5002249	5002249	3232828	3232828	3232828	3232828	3232828	3232828
10	Filter / Dryer (Liquid Line)	3223808	3223808	3223808	3223809	3223809	3223809	3223809	3223809	3223809
11	Fan Pressure Switch	3230761	3230761	3230761	3230761	3230761	3230761	3230761	3230761	3230761
12	Panel Light (Green)	3227421	3215356	3215356	3227421	3215356	3215356	3227421	3215356	3215356
13	Dew Point Indicator	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212
14	On-Off Switch	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777
15	Temperature Sensor	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289
16	Temperature Control Board	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525
17	Glycol Tank	5006673	5006673	5006673	5006673	5006673	5006673	5006673	5006673	5006673
18	Glycol - 100%	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107
19	Glycol Pump	5006677	5006939	5006940	5006677	5006939	5006940	5006677	5006939	5006940
20	Glycol Pump Cartridge	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295

[1] Condensing Unit Assembly consists of: Compressor, Condenser, Fan Assembly, Hot Gas Bypass Valve, Filter/Dryer, Base Pan, Accumulator (in some cases) and interconnecting piping.

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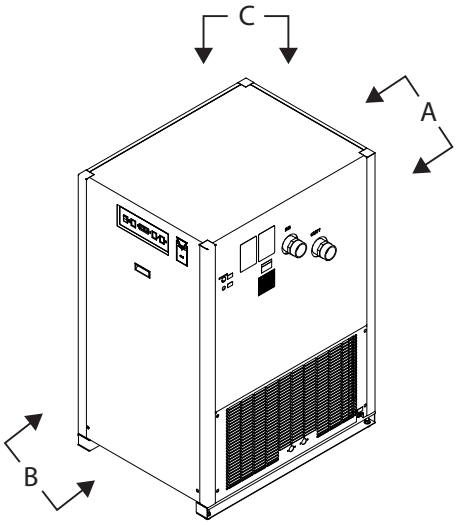
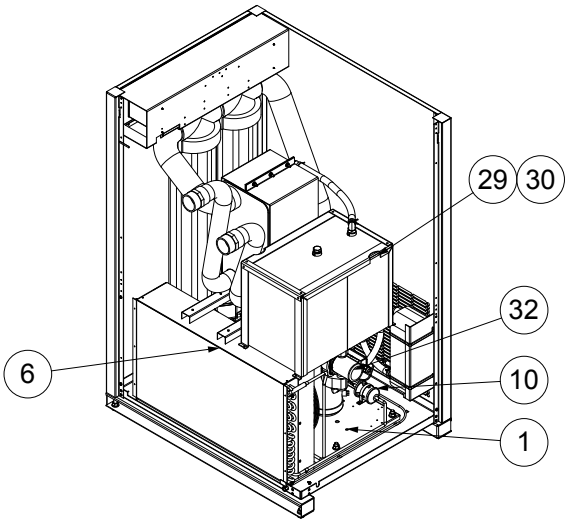
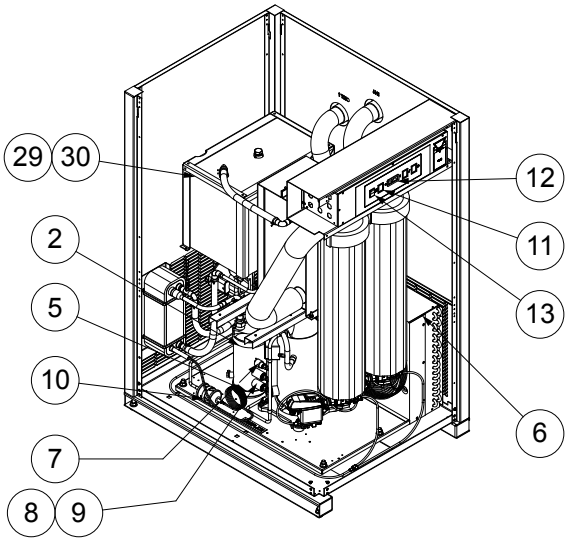
REPLACEMENT PARTS: MODELS 190 THROUGH 675 (AIR-COOLED UNITS)



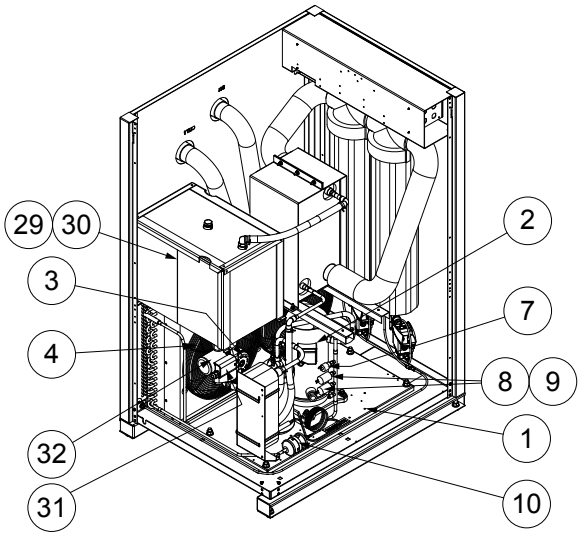
VIEW ORIENTATION REFERENCE



RIGHT REAR, VIEW-A
(covers and center support shelf removed for clarity)



RIGHT FRONT, VIEW-B
(covers and center support shelf removed for clarity)



LEFT REAR, VIEW-C
(covers and center support shelf removed for clarity)

REPLACEMENT PARTS: MODELS 190 THROUGH 675 (AIR-COOLED UNITS)

MAINTENANCE KITS

MODEL	Kit Components	190	240	280	360	450	540	675
Standard Kit	Separator Element, O-Ring, Drain Service Kit, Lube Packet	HESMK33D2	HESMK33D2	HESMK34D2	HESMK35D2	HESMK36D2	HESMK37D2	HESMK37D2
Cold Coalescing Kit	Separator Element, Cold Coalescing Element, O-Ring, Drain Service Kit, Lube Packet	HESMK53D2	HESMK53D2	HESMK54D2	HESMK55D2	HESMK56D2	HESMK57D2	HESMK57D2
Service Kit - Demand Drain		7428278	7428278	7428278	7428278	7428278	7428278	7428278

REPLACEMENT PARTS

		208-230/3/60					380-420/3/50, 460/3/60, and 575/3/60				
ID #	PARTS DESCRIPTION	190	240, 280, 360	450	540	675	190	240, 280, 360	450	540	675
1	Condensing Unit Assembly [1]	5006630	5006632	5006634	5006636	5006638	5006629	5006631	5006633	5006635	5006637
2	Compressor (Only)	3221303	3232809	3221304	5002921	7428008	3210937	3211540	3210939	5002930	7428007
3	Fan Motor	3238932	3233153	3233153	5002922	3233153	3233152	3228005	3228005	5002931	3228005
4	Fan Blade	3232640	3232642	3219406	5002923	3219406	3232640	3232642	3219406	5002923	3219406
5	Crankcase Heater	3232974	3232974	3232974	3223261	3223261	3232975	3232975	3232975	3223260	3223260
6	Condenser	3232829	3232830	3232831	5002924	3232832	3232829	3232830	3232831	5002924	3232832
7	High Refrigerant Pressure Switch	3230764	3230764	3230764	3230764	3230764	3230764	3230764	3230764	3230764	3230764
8	Fan Cutout Switch 1	3230762	3230762	3230762	3230762	3230762	3230762	3230762	3230762	3230762	3230762
9	Fan Cutout Switch 2	N/A	N/A	3230763	3230763	3230763	N/A	N/A	3230763	3230763	3230763
10	Filter / Dryer (Liquid Line)	5002925	5002925	5002925	5002925	5002925	5002925	5002925	5002925	5002925	5002925
11	Panel Light (Green) - Std Panel	3227421	3227421	3227421	3227421	3227421	3227421	3227421	3227421	3227421	3227421
12	Dew Point Indicator - Std Panel	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212
13	On-Off Switch (Std Panel)	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777
14	Temperature Sensor - Std Panel [2]	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289
15	Temperature Control Board - Std Panel [2]	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525
16	Contactor [2]	5002260	5002260	5002260	5002260	5002260	5002260	5002260	5002260	5002260	5002260
17	Contactor - Advanced Control [2]	5002926	5002926	5002926	5002926	5002928	5002926	5002926	5002926	5002926	5002928
18	Auxiliary Contactor [2]	5002927	5002927	5002927	5002927	5002927	5002927	5002927	5002927	5002927	5002927
19	Transformer 230/460 Prim; 115/24 Sec [2]	5007344	5007344	5007344	5007344	5007344	5007344	5007344	5007344	5007344	5007344
20	Fuse Primary [2]	5007345	5007345	5007345	5007345	5007345	5007345	5007345	5007345	5007345	5007345
21	Fuse Secondary - 115VAC [2]	5007346	5007346	5007346	5007346	5007346	5007346	5007346	5007346	5007346	5007346
22	Fuse Secondary - 24 VAC [2]	4010495	4010495	4010495	4010495	4010495	4010495	4010495	4010495	4010495	4010495
23	Power Transformer (575V) [2]	N/A	N/A	N/A	N/A	N/A	3230895	3230895	3230895	3230895	3230895
24	575V Transformer Primary Fuse [2]	N/A	N/A	N/A	N/A	N/A	3049090	3049090	3049090	3049090	3049090
25	575V Transformer Secondary Fuse [2]	N/A	N/A	N/A	N/A	N/A	5007288	5007288	5007288	5007288	5007288
26	Board, Printed Circuit - Advanced Control [2,3]	7426184	7426184	7426184	7426184	7426184	7426184	7426184	7426184	7426184	7426184
27	PC Board Fuse - Advanced Control [2]	5002943	5002943	5002943	5002943	5002943	5002943	5002943	5002943	5002943	5002943
28	Temperature Sensor - Advanced Control [2]	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289
29	Glycol Tank	5006742	5006742	5006748	5006748	5006748	5006742	5006742	5006748	5006748	5006748
30	Glycol - 100%	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107
31	Glycol Pump	5006677	5006677	5006677	5006677	5006677	5006677	5006677	5006677	5006677	5006677
32	Glycol Pump Cartridge	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295

[1] Condensing Unit Assembly consists of: Compressor, Condenser, Fan Assembly, Hot Gas Bypass Valve, Filter/Dryer, Base Pan, Accumulator (in some cases) and interconnecting piping.

[2] Items 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, and 28 are located in the electrical enclosure located behind the control panel. Refer to the appropriate Electrical Schematic to identify part.

[3] NOTE: Consult factory with the dryer serial number when ordering Item 26- Advanced Control Printed Circuit Board.

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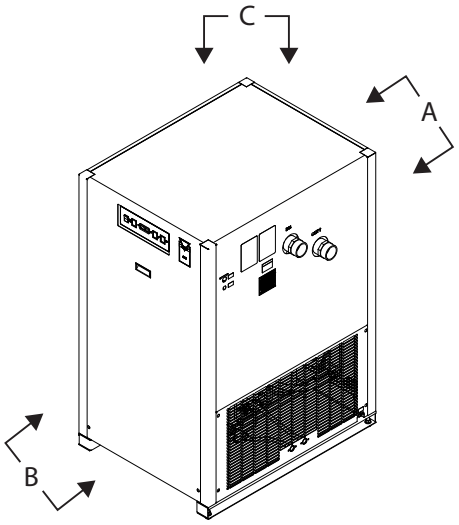
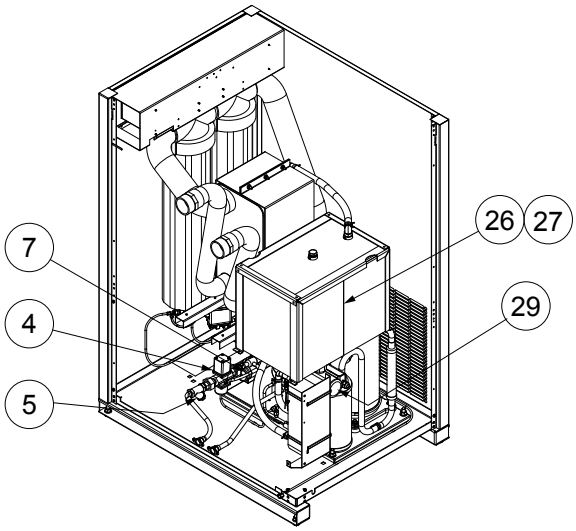
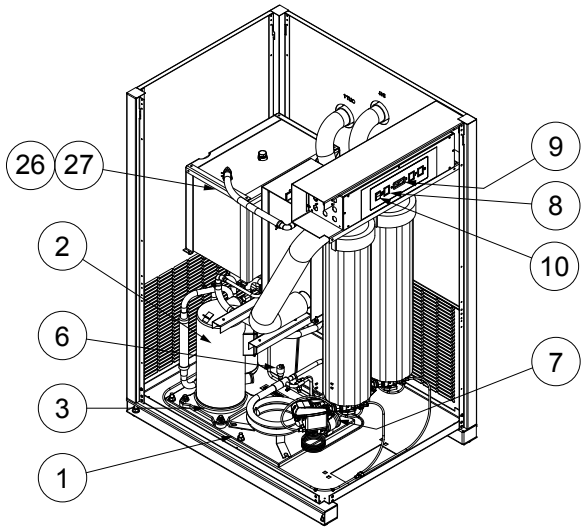
REPLACEMENT PARTS: MODELS 190 THROUGH 675 (WATER-COOLED UNITS)



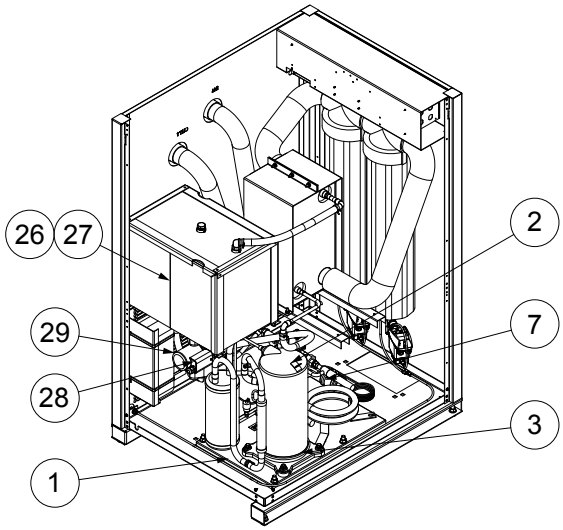
VIEW ORIENTATION REFERENCE



RIGHT REAR, VIEW-A
(covers and center support shelf removed for clarity)



RIGHT FRONT, VIEW-B
(covers and center support shelf removed for clarity)



LEFT REAR, VIEW-C
(covers and center support shelf removed for clarity)

REPLACEMENT PARTS: MODELS 190 THROUGH 675 (WATER-COOLED UNITS)

MAINTENANCE KITS

MODEL	Kit Components	190	240	280	360	450	540	675
Standard Kit	Separator Element, O-Ring, Drain Service Kit, Lube Packet	HESMK33D2	HESMK33D2	HESMK34D2	HESMK35D2	HESMK36D2	HESMK37D2	HESMK37D2
Cold Coalescing Kit	Separator Element, Cold Coalescing Element, O-Ring, Drain Service Kit, Lube Packet	HESMK53D2	HESMK53D2	HESMK54D2	HESMK55D2	HESMK56D2	HESMK57D2	HESMK57D2
Service Kit - Demand Drain		7428278	7428278	7428278	7428278	7428278	7428278	7428278

REPLACEMENT PARTS

		208-230/3/60					380-420/3/50, 460/3/60, and 575/3/60				
ID #	PARTS DESCRIPTION	190	240, 280, 360	450	540	675	190	240, 280, 360	450	540	675
1	Condensing Unit Assembly [1]	3221372	3221305	3234937	3244638	3221289	4006364	3221306	3221286	3244639	3221288
2	Compressor (Only)	3221303	3232809	3221304	5002921	7428008	3210937	3211540	3210939	5002930	7428007
3	Crankcase Heater	3232974	3232974	3232974	3223261	3223261	3232975	3232975	3232975	3223260	3223260
4	Cooling Water Regulatory Valve	3232502	3232502	3232502	3232503	3232503	3232502	3232502	3232502	3232503	3232503
5	Cooling Water Strainer Screen	3230672	3230672	3230672	3230672	3230672	3230672	3230672	3230672	3230672	3230672
6	High Refrigerant Pressure Switch	3230764	3230764	3230764	3230764	3230764	3230764	3230764	3230764	3230764	3230764
7	Filter / Dryer (Liquid Line)	5002925	5002925	5002925	5002925	5002925	5002925	5002925	5002925	5002925	5002925
8	Panel Light (Green) - Std Panel	3227421	3227421	3227421	3227421	3227421	3227421	3227421	3227421	3227421	3227421
9	Dew Point Indicator - Std Panel	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212	3259212
10	On-Off Switch (Std Panel)	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777	3230777
11	Temperature Sensor - Std Panel [2]	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289
12	Temperature Control Board - Std Panel [2]	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525	3258525
13	Contactor**	5002260	5002260	5002260	5002260	5002260	5002260	5002260	5002260	5002260	5002260
14	Contactor - Advanced Control [2]	5002926	5002926	5002926	5002926	5002928	5002926	5002926	5002926	5002926	5002928
15	Auxiliary Contactor [2]	5002927	5002927	5002927	5002927	5002927	5002927	5002927	5002927	5002927	5002927
16	Transformer 230/460 Prim; 115/24 Sec [2]	5007344	5007344	5007344	5007344	5007344	5007344	5007344	5007344	5007344	5007344
17	Fuse Primary [2]	5007345	5007345	5007345	5007345	5007345	5007345	5007345	5007345	5007345	5007345
18	Fuse Secondary - 115VAC [2]	5007346	5007346	5007346	5007346	5007346	5007346	5007346	5007346	5007346	5007346
19	Fuse Secondary - 24 VAC [2]	4010495	4010495	4010495	4010495	4010495	4010495	4010495	4010495	4010495	4010495
20	Power Transformer (575V) [2]	N/A	N/A	N/A	N/A	N/A	3230895	3230895	3230895	3230895	3230895
21	575V Transformer Primary Fuse [2]	N/A	N/A	N/A	N/A	N/A	3049090	3049090	3049090	3049090	3049090
22	575V Transformer Secondary Fuse [2]	N/A	N/A	N/A	N/A	N/A	5007288	5007288	5007288	5007288	5007288
23	Board, Printed Circuit - Advanced Control [2,3]	7426184	7426184	7426184	7426184	7426184	7426184	7426184	7426184	7426184	7426184
24	PC Board Fuse - Advanced Control [2]	5002943	5002943	5002943	5002943	5002943	5002943	5002943	5002943	5002943	5002943
25	Temperature Sensor - Advanced Control [2]	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289	5007289
26	Glycol Tank	5006742	5006742	5006748	5006748	5006748	5006742	5006742	5006748	5006748	5006748
27	Glycol - 100%	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107	5008107
28	Glycol Pump	5006677	5006677	5006677	5006677	5006677	5006677	5006677	5006677	5006677	5006677
29	Glycol Pump Cartridge	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295	5007295

[1] Condensing Unit Assembly consists of: Compressor, Condenser, Fan Assembly, Hot Gas Bypass Valve, Filter/Dryer, Base Pan, Accumulator (in some cases) and interconnecting piping.

[2] Items 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25 are located in the electrical enclosure located behind the control panel. Refer to the appropriate Electrical Schematic to identify part.

[3] NOTE: Consult factory with the dryer serial number when ordering Item 23 - Advanced Control Printed Circuit Board.

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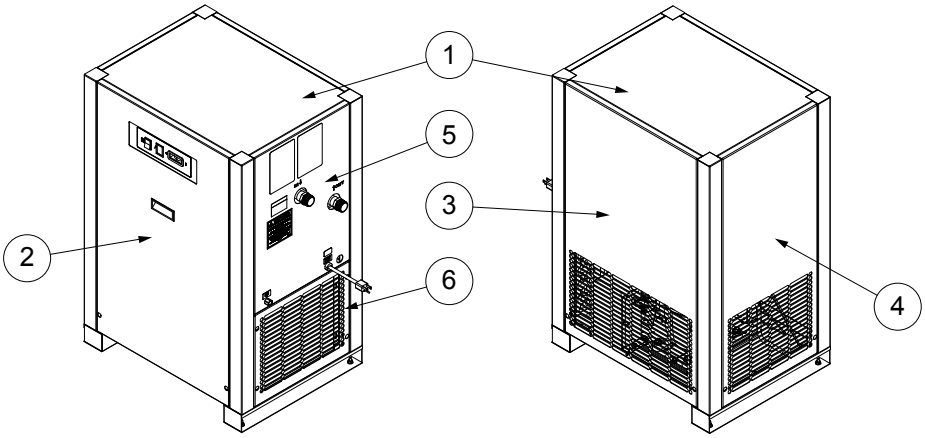
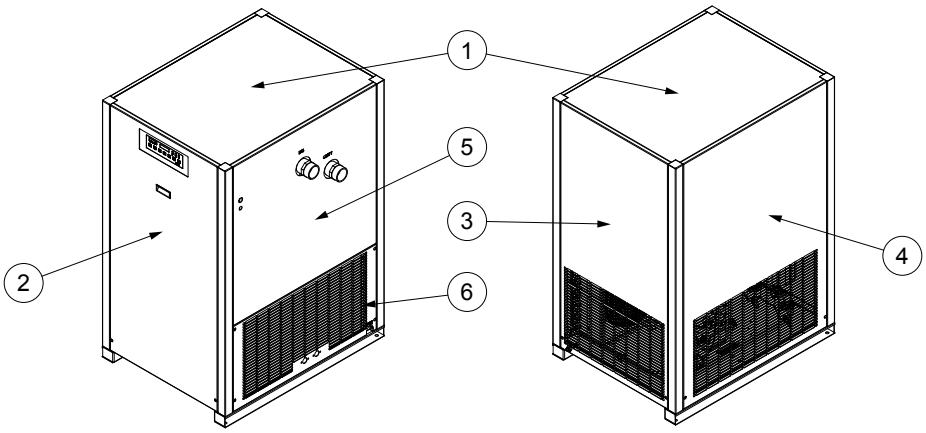
REPLACEMENT PARTS: CABINET PANELS (ALL MODELS)

REPLACEMENT CABINET PARTS - Models 90 through 140



ID #	PARTS DESCRIPTION	90	120	140
1	Cabinet Panel - Top	5002067	5002067	5002067
2	Cabinet Panel - Front	5002068	5002068	5002068
3	Cabinet Panel - Rear	5002072	5002072	5002072
4	Cabinet Panel - Left	5002069	5002069	5002069
5	Cabinet Panel - Right Upper	5002070	5002070	5002070
6	Cabinet Panel - Right Lower	5002071	5002071	5002071

REPLACEMENT CABINET PARTS - Models 190 through 675



ID #	PARTS DESCRIPTION	190	240	280	360	450	540	675
1	Cabinet Panel - Top	5002082	5002082	5002082	5002082	5002106	5002106	5002106
2	Cabinet Panel - Front	5002083	5002083	5002095	5002095	5002107	5002107	5003092
3	Cabinet Panel - Rear	5002084	5002084	5002096	5002096	5002111	5002111	5002111
4	Cabinet Panel - Left	5002084	5002084	5002096	5002096	5002108	5002108	5002108
5	Cabinet Panel - Right upper	5002085	5002085	5002097	5002102	5002109	5002109	5002109
6	Cabinet Panel - Right lower	5002086	5002086	5002098	5002098	5002110	5002110	5002110

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Houghton Chemical Corporation

Safety Data Sheet

SAFE-T-THERM® HD

Section 1 - Identification	
Manufacturer Address	Houghton Chemical Corporation 52 Cambridge Street, Allston, MA 02134 1-617-254-1010 or 1-800-777-2466
Emergency Telephone	**CHEMTREC: 1-800-424-9300**
Chemical Name & Synonyms	Antifreeze/Inhibited Propylene Glycol
Chemical Family	Propylene Glycol Mixture
Recommended Use	Heat Transfer Fluid
Restrictions on Use	Dilution to 50% is generally recommended: dilute to meet local condition.

Section 2 – Hazard(s) Identification	
Hazard Classification	Not Applicable
Signal Word	Not Applicable
Hazard Statement	While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this SDS contains valuable information critical to the safe handling and proper use of this product.
Pictogram Description	Not Applicable
Precautionary Statement	Keep container tightly closed. Keep away from heat, sparks or open flames. No smoking, drinking or eating around product. Wear protective gloves, eye and face equipment. Store in a cool, dry and well-ventilated location. Avoid release to the environment.
Any other Hazard not otherwise classified	Not Applicable

Section 3 – Composition and Information on Ingredients			
Chemical Name	Common name and synonyms	CAS #	% by weight
Propylene Glycol	1,2 - Propanediol	57-55-6	95%
Water	N/A	7732-18-5	2.5%
Inhibitors & Dye	N/A	Proprietary	2.5%

Section 4 – First aid Measures	
Symptoms of Exposure	
Acute	Irritation of affected area
Delayed	Irritation
Inhalation	Vapors and mists expected to be slightly irritating to upper respiratory tract.
Skin	Irritation may result
Eye Contact	Irritation may cause transitory stinging and tearing.
Ingestion	Very low toxicity if ingested. Ingestion of larger amounts may cause gastrointestinal upset and possible temporary central nervous system depression.
First Aid Instructions	
Inhalation	Remove to fresh air. If symptoms persist, seek medical attention.
Skin	Wash skin with soap and water. Remove any contaminated clothing. Seek medical attention if irritations develops or persists.
Eye Contact	Flush with water for at least 20 minutes. Seek medical attention if irritations develops or persists.
Ingestion	DO NOT induce vomiting, seek medical attention.
Other	Not Applicable

Section 5 – Fire Fighting Measures	
Suitable Extinguishing Material	**Water, water fog, water spray, alcohol foam, dry chemical or carbon dioxide**
Unsuitable Extinguishing Material	No Data Available
Hazards from Combustion	Smoke may contain the original material in addition to but not limited to: oxides of phosphorus, potassium, carbon, nitrogen, sulfer and hydrogen chloride.
Special Protective Equipment for Firefighters	Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas and keep upwind of fire.

Section 6 – Accidental Release Measures	
Use of personal precautions	Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment.
Protective equipment to prevent the contamination of skin, eyes, and clothing.	Usage of safety glasses or googles is recommended. Chemical resistant gloves, chemical resistant apron, boots, and full suit will be necessary depending on the extent of clean up task. If ventilation does not control airborne concentration then respiratory protection equipment that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements should be used.
Methods and materials used for containment	Collect liquid in an appropriate container or absorb with inert material and place in chemical waste container.
Cleanup procedures	Do not flush to sewer. Comply with all federal, state, and local regulations.
Section 7 – Handling and Storage	
Precautions for safe handling	Protect container from physical damage. Wear appropriate personal protection equipment. Do not expose containers to open flame, excessive heat, or direct sunlight. Use local exhaust over processing area. Do not eat, drink or smoke around products.
Recommendations on the conditions for safe storage, Storage/handling incompatibilities.	Store in a cool, dry and ventilated area away from sources of heat, moisture and incompatible materials. Observe all warnings and precautions listed for the product. Keep container closed to prevent contamination.
Section 8 – Exposure Controls/Personal Protection	
OSHA Permissible Exposure Limits (PELs)	Not Applicable
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values	Not Applicable
Other Exposure Limits	AIHA WEEL is 10 mg/m3 for total vapor and aerosol.
Engineering Control	Use mechanical (general) ventilation to control airborne levels below exposure guidelines.
Individual Protection Measures	Wear protective safety glasses or goggles, gloves, apron, vapor respirator.
Section 9 – Physical and Chemical and Chemical Properties	
Appearance (physical state, color, etc.)	Liquid, Clear, Orange
Upper/lower flammability or explosive limits	Not Explosive; LOWER: 2.6% (v) UPPER: 12.5% (v)
Odor	Slight to no odor
Vapor pressure	133 Pa / 0.1 mmHg
Odor threshold	Not Applicable
Vapor density (air = 1)	2.1
pH	9.0 - 10.7
Relative density	1.057 - 1.067
Freezing point (as 50%)	-23°F / -31°C
Solubility(ies)	Miscible in water
Initial boiling point and boiling range	311°F / 155°C
Flash point	225°F / 107°C
Evaporation rate (Butyl Acetate = 1)	<1
Flammability (solid, gas)	Not Flammable
Partition coefficient: n-octanol/water	No Data Available
Auto-ignition temperature	> 700°F / > 370°C
Decomposition temperature; and	Not Applicable
Viscosity	~75 cps at 60°F
Section 10 – Stability and Reactivity	
Reactivity	Product is stable under typical use temperatures.
Chemical Stability	Product is stable under typical use temperatures.
Hazardous Reactions	Avoid contact with oxidizing materials and strong acids.
Conditions to Avoid	Heat, flames, ignition sources and incompatibles.
Incompatible Materials	Avoid contact with oxidizing agents and strong acids.
Decomposition Products	Carbon dioxide and carbon monoxide may form when heated to decomposition.

	Aldehydes, alcohols or other organic acids may also be formed.

Section 11 – Toxicological Information

Likely Routes of Exposure	Eyes / Skin / Ingestion / Inhalation

	Effects from Short Term Exposure	Effects from Long Term Exposure
Delayed Effects	Irritation of affected area	Irritation of affected area
Immediate Effects	Irritation of affected area	Irritation of affected area
Chronic Effects	Not Applicable	Lactic acidosis, stupor and seizures have been reported following chronic ingestion.
The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (median lethal dose)) - the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.		Skin: The LD50 for skin absorption in rabbits is >10,000 mg/kg Ingestion: The oral LD 50 for rats is 20,000 mg/kg
Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.		Irritation of affected areas. Lactic acidosis, stupor and seizures.

Listed in the National Toxicology Program (NTP) Report on Carcinogens	No	Found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs	No	Found to be a potential carcinogen by OSHA	No

Section 12 – Ecological Information

Ecotoxicity	Low Ecotoxicity
Persistence and Degradability	Biodegradable
Bioaccumulation	Does not bioaccumulate significantly
Mobility in Soil	Dissolves in water. If product enters soil, it will be highly mobile and may contaminate ground water
Other Adverse Effects	No Data Available

Section 13 – Disposal Considerations

Do not dump into sewers, on ground or into any bodies of water. Contact local sewer, municipal, state and/or federal agencies to determine appropriate disposal options

Section 14 – Transport Information

Is product DOT regulated in Non-Bulk packaging?	No

DOT BULK

UN number	Not Regulated
UN proper shipping name	Not Regulated
Transport hazard class(es)	Not Regulated
Packing group number	Not Regulated
Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code))	Not Regulated
Guidance on transport in bulk (according to Annex II of MARPOL 73/783 and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code))	Not Regulated
Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises	Not Regulated

Section 15 – Regulatory Information (Not indicated anywhere else on this SDS)

Safety Regulations	OSHA Hazard Communication Standard: This product is not a "Hazardous Chemical" as defined by the OSHA Hazard CommunicationStandard, 29 CFR 1910.1200.	
Health Regulations	Not Available	
Environmental Regulations	Not Available	
SARA 311/312	Based upon available information, this material is classified as the following health and/or physical hazards according to Section 311 & 312	Superfund Amendments and Reauthorization Act of 1986 Title III (SARA) Sections 311 and 312: Immediate (Acute) Health Hazard - No; Delayed (Chronic) Health Hazard - No;

		Fire Hazard - No; Reactive Hazard - No; Sudden Release of Pressure Hazard - No. Section 313: To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.
HMIS	Blue/Health	0
	Red/Flammability	1
	Orange/Physical Hazard	0
	White/Personal Protection	X
NFPA 0(no hazard) to 4(severe risk)	Health (Blue)	0
	Flammability (Red)	1
	Special (White)	0
	Instability/Reactivity (Yellow)	N/A
US Toxic Substance Control Act	All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30	
CEPA – Domestic Substances List (DSL)	All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.	

Section 16 – Other Information

This SDS is applicable for all dilutions and containers for this brand of product. The information herein is provided in good faith and believed to be accurate as of the effective revision date shown. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/ user's responsibility to ensure that activities comply with all federal, state, provincial or local law.

Product Dilutions Differentials

Properties[1]	**60%**	**50%**	**40%**	**35%**	**30%**	**25%**
SAFE-T-THERM® HD	60%	50%	40%	35%	30%	25%
Performance Additives and Water	40%	50%	60%	65%	70%	75%
Specific Gravity ($15/15^0$C $60/60^0$F)	1.055 - 1.062	1.050 - 1.060	1.040 - 1.050	1.035 - 1.045	1.032 - 1.042	1.030 - 1.040
Reserve Alkalinity (min)	10	8	6	6	5	4
Freeze Point Max	-49°F / -45°C	-23°F / -31°C	-4°F / -20°C	4°F / -16°C	10°F / -12°C	15°F / -10°C

Revision Date: November 14, 2014

WARRANTY

The manufacturer warrants the product manufactured by it, when properly installed, operated, applied, and maintained in accordance with procedures and recommendations outlined in manufacturer's instruction manuals, to be free from defects in material or workmanship for a period as specified below, provided such defect is discovered and brought to the manufacturer's attention within the aforesaid warranty period.

The manufacturer will repair or replace any product or part determined to be defective by the manufacturer within the warranty period, provided such defect occurred in normal service and not as a result of misuse, abuse, neglect or accident. Normal maintenance items requiring routine replacement are not warranted. The warranty covers parts and labor for the warranty period unless otherwise specified. Repair or replacement shall be made at the factory or the installation site, at the sole option of the manufacturer. Any service performed on the product by anyone other than the manufacturer must first be authorized by the manufacturer.

Unauthorized service voids the warranty and any resulting charge or subsequent claim will not be paid. Products repaired or replaced under warranty shall be warranted for the unexpired portion of the warranty applying to the original product.

The foregoing is the exclusive remedy of any buyer of the manufacturer's product. The maximum damages liability of the manufacturer is the original purchase price of the product or part.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR STATUTORY, AND IS EXPRESSLY IN LIEU OF THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OR DAMAGE BY REASON OF STRICT LIABILITY IN TORT OR ITS NEGLIGENCE IN WHATEVER MANNER INCLUDING DESIGN, MANUFACTURE OR INSPECTION OF THE EQUIPMENT OR ITS FAILURE TO DISCOVER, REPORT, REPAIR, OR MODIFY LATENT DEFECTS INHERENT THEREIN.

THE MANUFACTURER, HIS REPRESENTATIVE OR DISTRIBUTOR SHALL NOT BE LIABLE FOR LOSS OF USE OF THE PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE BUYER, WHETHER ARISING FROM BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

The manufacturer does not warrant any product, part, material, component, or accessory manufactured by others and sold or supplied in connection with the sale of manufacturer's products.

Warranty Period

Parts and labor for two (2) years from the date of shipment from the factory; heat exchangers are covered (parts only) for an additional three (3) years (total of five [5]). On units that manufacturer requests be returned to the factory, a one time removal/reinstallation labor allowance as noted in the Service Warranty Policies and Procedures Handbook will apply. Freight to the factory from the installation site and to the installation site from the factory will be paid by the manufacturer; means of transportation to be specified by manufacturer.

AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.

SERVICE DEPARTMENT: (724) 746-1100

HES Series

Refrigerated Type Compressed Air Dryers

Models: HES90, HES120, HES140, HES190, HES240, HES280, HES360, HES450, HES540, HES675

SPXFLOW

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Improvements and research are continuous at SPX FLOW, Inc.
Specifications may change without notice.

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