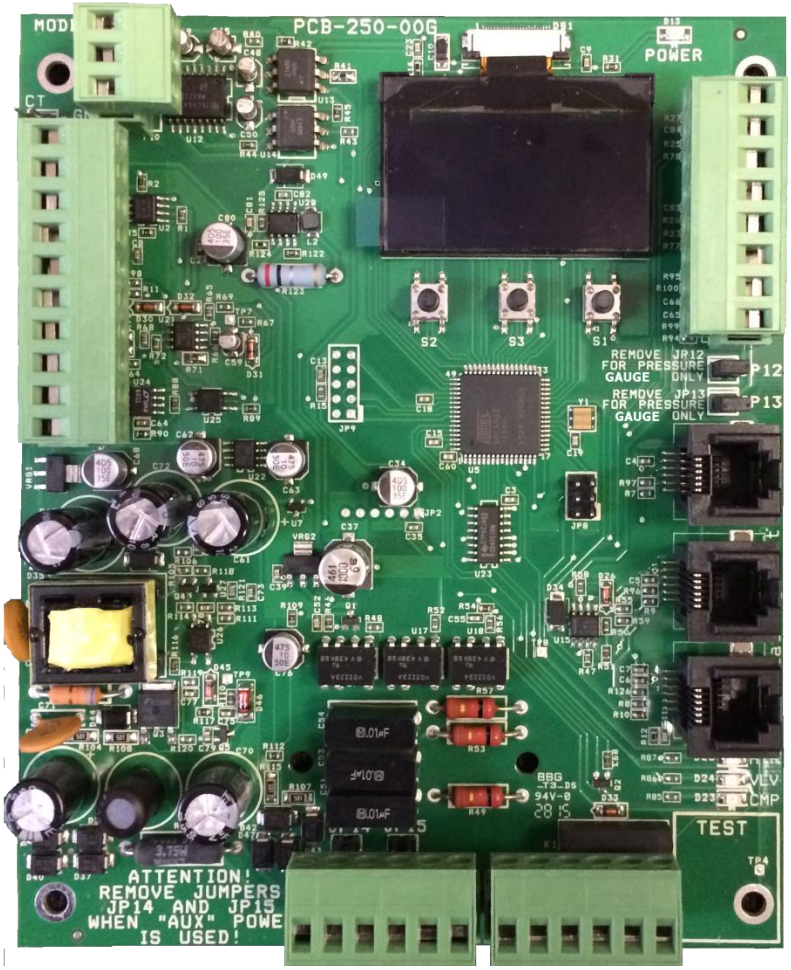
Hydromatic II

Manual and Specifications



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Introduction

The Hydromatic II system is a water temperature controller for use in loop circulation systems. It provides outputs for reverse cycle and electric heater operation at each control.

Features

- Modular system for controlling one to eight compressors.
- Directly drives AC contactors from 24 to 250 VAC.
- Integrated touch screen OLED display.
- Universal 115/230 VAC 50/60 Hz power supply
- Simple CANBUS (Computer area network) two wire connection between controls.
- Remote mounted tempered water and sea pump control board with pressure sense and flow inputs.
- Optional stage current sensing and over current shutdown.
- Optional high and low Freon pressure transducer inputs.
- VFD (Variable frequency drive) dry contact output.
- MODBUS input for VFD monitoring.
- Electric heat only transitioning based on sea water temperature.
- Auxiliary voltage input allows using contactors with operating voltages different from the supply voltage.
- Automatically equalizes compressor run times in multistage systems.
- Programmable temperature controlled staging for efficient operation.
- Automatic slave bypass and retry for a slave with a fault.
- Cycled or continuous sea pump operation.
- Compatible with AirNet 5 (internet / network access).
- Sea water temperature sensor.
- Individual tempered water flow switch inputs for each compressor.

Getting Started

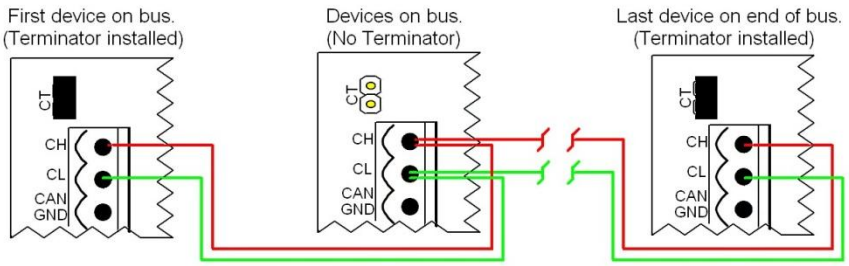
CAN Bus Basics

The CAN system (Computer Area Network) is a communications protocol system that facilitates communication between electronic controls. Controls are connected to each other to form a network. Typical controls in a network could include ice makers, chilled and heated water systems, air handlers, and direct expansion systems. The physical connection is called a bus and consists of a minimum of two wires connected to each device. Up to 127 controls including a computer connection may be connected on one bus. CAN bus exchange protocol follow the ISO-11898 standard for CAN specification 2.0 Part B. System integrators can find the message contents defined in the Microair CAN protocol specification available from http://www.Microair.net.

Wiring the CAN bus

The bus consists of a two or three wire connection to each device in the system. Wires are connected to each control in a sequentially wired, daisy chain style connection. Wire used for the CAN bus must be rated as indicated in the specifications section of this document.

To wire the system, first determine which devices will be at each end of the system. All other devices will be connected between these two devices. Wire the bus starting with a selected end device. Connect wires to CAN-L and CAN-H (and ground if used) on this device then connect the other end of these wires to the second control in the system. Connect wires in parallel to the wires connected to the second device to the third device in the system. Continue making connections until all controls are connected. Always connect GND to GND, CAN-L to CAN-L, and CAN-H to CAN-H. Never place more than two wires in any terminal connection.



The control at each end of the bus must have a terminator installed. The terminator is a two pin jumper located on the circuit board next to the CAN connector labeled CT. Place this jumper only on the first and last control in your system.

During installation, write down the serial numbers of each device connected and a description of the location they are in or are responsible for. This will help to simplify system setup later.

Connecting the control

Make connections to the Hydromatic board as shown in the wiring diagram contained in this manual. A freeze sensor, high refrigerant pressure switch, flow switch and low refrigerant pressure switch must be connected to each slave. If a low refrigerant pressure switch is not used in your application, a wire jumper must be installed between the low refrigerant pressure signal connection and low refrigerant pressure ground.

If electric heater is used, a high limit sensor must be used with each electric heater connected to a slave.

A return loop water temperature sensor must be connected to one slave in the system. This sensor may be connected to any slave in the system.

If you are using a 24 volt transformer or other AC source to supply power to the contactors, remove JP 14 and 15 and connect your source to the AUX terminals. ***Do not connect anything to the AUX terminals with JP14 and 15 installed.***

Connecting the pump controller

The separate pump control board is required for operation of the system. Sea water flow switch FL1 and loop water flow switch FL2 must be used or bypassed for proper operation. To bypass the switch, connect a wire from the GND terminal to the switch being bypassed. FL2 is used for the sea water pump flow detection. FL1 is used for the loop water pump flow detection. Connect the pump contactors as shown in the pump wiring diagram contained in this manual. Optional water pressure sensors and the optional sea water temperature sensor may be connected as shown in the diagram.

Navigating the menu

When the control is first powered, the display will show the firmware revision. The display will then show icons along the bottom of the display. Press the button below the icon to select the function.

Turn the system on or off.


Display the menu.


Select a menu item.


Advance to the next menu item.


Adjust parameter down.


Adjust parameter up.

System Overview

The Hydromatic system operates as a master – slave system. Each control in the system is considered a slave. The master function can be assigned to any slave in the system. The master function operates independently from the slave function within that control. A slave is designated as a master by making the group ID and unit ID the same value. Additional slaves can be added by setting their unit ID as the next numerically higher unit ID and assigning them to the same group ID as the master. A system pump control will also be configured during setup.

The master controls all operations once the system is configured. Individual slave compressors are started as needed and cycled regularly to equalize run time when possible.

Additional details on setting unit numbers may be found in Appendix 2: Organizing IDs in the CAN system.

Operational Overview

Cooling

The first stage of cooling is started when the loop return water temperature rises above the cooling set point by the amount programmed in the differential parameter. One slave is selected by the master to start its compressor. If the stage is programmed to have more than one compressor, each additional compressor will start one at a time, after the expiration of the staging delay. Additional increases in loop return water temperature by the amount programmed in the differential parameter will start subsequent stages until all available stages are operating.

The first stage of cooling is shut down when the loop water temperature reaches:

(Set point + (number of active stages * differential) – hysteresis)

Differential and hysteresis is the value set by their programmable parameter value for the above equation.

Each subsequent reduction in loop return water temperature by the amount set in the hysteresis parameter will shut down the next stage. If the loop water return temperature reaches the cooling set point, all compressors will shut down.

Heating

Heating operation is similar in function to cooling operation utilizing the heating set point along with differential and hysteresis to control loop return water temperature. If the sea water temperature drops below the temperature set in the EL Heat Transition parameter, any operating compressors will be turned off and only electric heaters will be used to heat loop water. The heaters will be used for the remainder of the cycle even if the sea water temperature increases above the electric only temperature set point. Electric heaters must be available and the optional sea water sensor installed for this function.

Initial Configuration

Step 1: All Hydromatic controls and the pump control must be correctly wired and powered up.

Step 2: All Hydromatic controls must be in the off mode. If the display shows a screen saver text scrolling across the display, press any button exit the screen saver. The screen on the right shows a master control in the off mode. If only the menu symbol is shown, the control has been configured as a slave and is in the off mode. If the display shows temperatures in the upper right and left of the screen, the control is on and must be turned off by pressing the I/O button. The display may also flash "No Master Signal". This indicates the control has previously been configured as a slave. The error message will go away once properly configured.

Step 3: Set the group ID and unit ID of the master. If you are unfamiliar with organizing your system, please read Appendix 2: Organizing IDs in the CAN system, before continuing. Choose one slave to operate the master function. Press the menu button. Advance to the "Staging Parameters" menu and press the select button. Set the Group ID using the up or down buttons. Press the select button and set the unit ID to the same number as the group ID. Press the advance button repeatedly until you see "Back to menu" on the screen, and then press the select button.

Step 4: Follow the instructions in step 3 to set the group ID and unit ID for each slave in the system. Set the group ID on each slave to the same group ID set in step 3. Set the unit ID on each slave one higher than the last one you set.

Note: The next steps can be done on any slave only after completing step 4.

Step 5: Set the number of slaves in the system. Advance to and select the staging parameters menu item then advance to the "Number of Slaves" parameter. Each Hydromatic control is counted as a slave so if you have four Hydromatic controls, you will enter a 4.

Step 6: Select the system pump control. Advance through the staging parameters menu you entered in step 5 to "Pump ID". Use the down arrow to scroll through the available pump controls on the system until you see the serial number of the pump control you are using with this Hydromatic system. Press the select button to select the pump. An equal sign will appear before the ID indicating the selection. ***Note:*** *Once the pump is selected, the red LED on the pump relay will stop flashing indicating it is receiving commands from the master.*

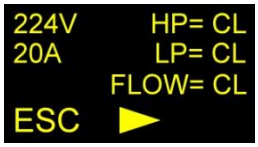
Step 7: Read and understand the following section on using the menu items and apply those parameters related to your specific installation conditions.

System Menu Items

Available menu options depend on the system operating mode. While the system is in heat or cool mode, the user can see a diagnostic view of the system, show the event history, or return to the operating screen. When the system is in the off mode, the user can also change parameters from any slave in the system. Parameter changes made to one slave in the system will change all the slaves in the system. See Appendix 1: System menu overview for a quick overview of the system menu structure.

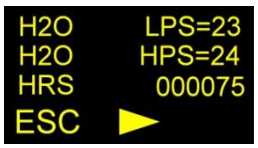
Diagnostic view

Screen 1



Three screens of information are available on all slaves. Screen 1 displays data specific to the slave you are viewing. AC line voltage and AC current if the optional sensor is installed is shown on the left side. The status of the high Freon pressure (HP), low Freon pressure (LP), and flow switches are shown on the right.

Screen 2



Screen 2 displays the pump relay pressure sensors, if installed, and the compressor running hours for the slave being viewed.

Screen 3 displays the slave overview screen. Details on this screen are given in the "Operation" section.

Show event history

When a fault occurs on a slave, it is saved in the event history log. Events are shown only for the slave being viewed. The last eight events may be viewed if available.

Copy parameters, Operating parameters, System setup, and Staging parameters should only be modified by qualified service personnel.

Copy parameters

If a stage controller fails to operate, a new controller can be installed and the system information copied from another slave in the system. Selecting this menu item displays the "Copy Slave" screen. Press the advance button to advance through the available slaves and press select to start the process. The menu will return to the unit ID entry when cloning if successful. Set the unit ID of the slave being replaced. Advance through the parameters and select "Back to Menu" then press "ESC".

Operating parameters

	Range	Default	Units
Purge air	0 to 3	0	Hours
Staging delay	15 to 200	60	Seconds
Cool Mode Set point	38 to 57	49	°F
	3.3 to 13.9	9.4	°C
Heat Mode Set point	100 to 140	108	°F
	37.8 to 60	42.2	°C
Hysteresis	1 to 3	2	°F
	.6 to 1.7	1.1	°C
Differential	1 to 3	2	°F
	.6 to 1.7	1.1	°C
Variable Speed Enable	5 to 90 and no	no	
EL. Heat Transition	30 to 60, OFF, EHO	50	°F
	-1.1 to 15.6, OFF, EHO	12.8	°C
Sea pump operation	Continuous or cycled	Continuous	
Low voltage shutdown	75 to 100 and Off	Off	VAC
	175 to 200 and Off	Off	VAC
VFD Fault Monitor	Yes or No	No	
Use Flow For Freeze	Yes or No	No	
Pump Flow SW Enable	Yes or No	YES	

Purge air

Set this parameter for one to three hours to force the loop water pump on while purging air from the system. The tempered water flow switch states will be ignored during this time.

Staging delay

Staging delay adjusts the time delay between the starting of compressors and/or heaters to prevent more than one turning on at the same time. It is the same for both heating and cooling modes. Delay may be set from fifteen to two hundred seconds.

Cool mode set point

This parameter sets the loop water temperature set point in cool mode. If the loop water attains this temperature, all compressors will be turned off. Adjustments can be made from 38 to 57 degrees Fahrenheit (1.7 °C to 13.9 °C).

Heat mode set point

This parameter sets the loop water temperature set point in heat mode. When the loop water attains this temperature, all compressors and/or electric heaters will be turned off. Adjustments can be made from 100 to 140 degrees (37.8 °C to 60 °C).

Hysteresis

The temperature change required to shut down a stage. This parameter may be set for 1, 2, or 3 degrees Fahrenheit (.6, 1.1, or 1.7 °C)

Differential
The temperature change required to start the next stage. This parameter may be set for 1, 2, or 3 degrees Fahrenheit (.6, 1.1, or 1.7 °C)

Variable speed enable
(Future option)

EL. heat transition (Electric Heat Transition)
If the sea water temperature drops below the programmed value, the electric heater or heaters if available will be used and all compressors turned off. This parameter may be set for 40°F to 60°F (4.4°C to 15.6°C). When programmed for EHO (Electric Heat Only), only electric heat will be used in heat mode. When programmed for OFF, only reverse cycle heating will be used. The system will show a freeze fault if the sea water drops below 40°F for 5 minutes if electric heaters are not available or E.L. heat transition is programmed for off in heat mode.

Sea water pump operation
The sea water pump may be set to run continuously or cycled. If the parameter is set to cycled, the master will wait 10 seconds after turning on the sea water pump to start any compressor operation.

Low voltage shutdown
If the line voltage at the slave drops below the set voltage for more than five minutes, a "Low AC Voltage" fault will be indicated on the display. Values can be set from 75 to 100 VAC and 175-200 VAC and can be set for "OFF".

VFD fault monitor
A VFD normally closed dry contact fault relay can be connected to the MOD bus DX and TX terminals. The VFD controller will open this relay when a fault occurs and the display will show VFD Fault. Set this parameter to "YES" to enable this feature.

Use flow for freeze
The flow switch input may be used as a dry contact input from an external freeze sensor. When the external freeze sensor opens its dry contact output, the control will stop the compressor and show "Flow Switch Open" on the display. Set this parameter to "YES" to enable this feature.

Pump Flow SW Enable
Pump flow switch enable causes the master control to react to an open flow switch on the pump relay board. This action prevents the pump from running dry for extended periods that can damage some pumps. If an open switch is detected, the pump and any operating compressors will be shut down. The *Pump Station Delay* parameter sets the reaction time.

System setup

	Range	Default	Units
Brightness	4 to 15	15	
Screen saver brightness	0 to 8	4	
Service high limit	141 to 159 and Off	Off	°F
	60.5 to 70.6	Off	°C
Current limit (Future Option)	1 to 50	50	Amps
Freon sensor type	Switch, both	Switch	
* Hi. Pressure maximum PSI	0 to 1016	624	PSI
* Hi. Pressure 0 PSI Voltage	0 to 2.48	0.50	Volts DC
* Low Pressure maximum PSI	0 to 1016	624	PSI
* Low Pressure 0 PSI Voltage	0 to 2.48	0.50	Volts DC
Water Sensor Type	Switch, Gauge, Both	Switch	
# LPS Pressure maximum PSI	0 to 1016	624	PSI
# LPS Pressure 0 PSI Voltage	0 to 2.48	0.50	Volts DC
# HPS Pressure maximum PSI	0 to 1016	624	PSI
# HPS Pressure 0 PSI Voltage	0 to 2.48	0.50	Volts DC
System units	°C or °F	°F	
Pump Station Delay	20 to 240	20	Seconds
Reset parameters	Yes or no	No	

*Freon sensor parameters with an asterisk * are shown only when the Freon sensor type "Gauge" or "Both" is selected.*

Water sensor parameters with number sign # are shown only when the water sensor type "Gauge" or "Both" is selected.

Brightness

OLED display brightness may be set from 4 to 15.

Screen saver brightness

Screen saver is activated after 3 minutes without a button press. The OLED brightness during screen saver may be set from 0 to 8.

Service high limit

The high limit sensor measures the water temperature leaving the electric heater. If the temperature measured by the sensor exceeds this set temperature in heat mode, the stage will stop heating and the display will indicate a "High Limit" fault. Temperature values may be set from 100 to 145 °F (37.8 to 62.8 °C).

Current limit (Future Option)

This parameter sets the maximum allowable stage or compressor current. The optional current sensor must be installed when using this parameter. Current values can be set from 5 to 50 amps in 5 amp steps. The default value is off.

Freon sensor type

Sets the type of sensor connected to the high and low Freon pressure input. If only a switch is installed, the parameter is set for switch and JP12 and JP 13 must have jumpers installed.

If the parameter is set for gauge or both, JP12 and JP 13 jumpers must be removed. The following options will also become available:

- Hi. Pressure maximum PSI
- Hi. Pressure 0 PSI voltage
- Low pressure maximum PSI
- Low pressure 0 PSI voltage

This system is compatible with standard pressure sensors operating in the 0 to 5 VDC range. These options allow independent setting of the pressure sensor connected. Set the maximum PSI parameter to the maximum pressure the sensor measures. Set the 0 PSI voltage to the 0 PSI reference voltage specified by the sensor manufacturer.

Water Sensor Type

Sets the type of sensor connected to the water pump LPS and HPS terminals.
The following options will become available if “Gauge” or “Both” are selected:

- LPS Pressure maximum PSI
- LPS Pressure 0 PSI voltage
- HPS pressure maximum PSI
- HPS pressure 0 PSI voltage

This system is compatible with standard pressure sensors operating in the 0 to 5 VDC range. These options allow independent setting of the pressure sensor connected. Set the 0 PSI voltage to the 0 PSI reference voltage specified by the sensor manufacturer. Set the maximum PSI parameter to the pressure the sensor measures at 4 volts above the 0 PSI reference voltage. This will typically be the maximum PSI reading for the sensor used.

System units

Sets the system units for metric (°C) or US standard (°F)

Pump Station Delay

Sets the minimum length of time needed to respond to an open flow switch on the pump relay board.

Reset parameters

Reset parameters to factory default values. (If Reset Parameters is used on any unit it should be repeated on all other units in system. The system should then be set up from the beginning. See the initial configuration section for details.)

Staging parameters

	Range	Default
Group ID	1 to 246	126
Unit ID	1 to 253	126
Number of slaves	1 to 8	1
Heater on slave (group ID)	Yes or no	Yes
Heater on slave (group ID + 1) *	Yes or no	Yes
Heater on slave (group ID + 2) *	Yes or no	Yes
Heater on slave (group ID + 3) *	Yes or no	Yes
Heater on slave (group ID + 4) *	Yes or no	Yes
Heater on slave (group ID + 5) *	Yes or no	Yes
Heater on slave (group ID + 6) *	Yes or no	Yes
Heater on slave (group ID + 7) *	Yes or no	Yes
Enable slave (group ID)	Yes or no	Yes
Enable slave (group ID + 1) *	Yes or no	Yes
Enable slave (group ID + 2) *	Yes or no	Yes
Enable slave (group ID + 3)*	Yes or no	Yes
Enable slave (group ID + 4) *	Yes or no	Yes
Enable slave (group ID + 5) *	Yes or no	Yes
Enable slave (group ID + 6) *	Yes or no	Yes
Enable slave (group ID + 7) *	Yes or no	Yes
Slaves on stage 1	1 to 8	1
Slaves on stage 2	1 to 8	1
Slaves on stage 3	1 to 8	1
Slaves on stage 4	1 to 8	1
Slaves on stage 5	1 to 8	1
Slaves on stage 6	1 to 8	1
Slaves on stage 7	1 to 8	1
Slaves on stage 8	1 to 8	1
Pump ID	See manual	See manual

Setting the correct number of slaves is critical to the proper operation of the system. Parameters with an asterisk (*) will be shown based on the number of slaves in the system. The number displayed, (group ID + number), is the unit ID of the slave that is being changed.

Group ID

See the “Organizing the system” section for details

Unit ID

See the “Organizing the system” section for details

Number of slaves

The number of slaves installed in the system. Each Hydromatic control is considered a slave including the one assigned to be a master. If you have 4 compressors on your system with one Hydromatic control on each, this parameter would be set for 4.

Heater on slave N

N is replaced by the unit ID of the control being changed. If the number of slaves is set for 4 and the group ID is 131, you will see menu items for heater on slaves 131 to 134. This parameter allows the user to program which stage an electric heater is installed on. Select “YES” for that slave if an electric heater is connected to the slave or “NO”, if the slave does not have an electric heater connected.

Enable slave N

N is replaced by the unit ID of the control being changed. If the number of slaves is set for 4 and the group ID is 131, you will see menu items for enable slave 131 to 134. Select “Yes” to enable the slave or “No” to disable the slave.

Slaves on stage X

The value for this parameter indicates how many compressors or heaters will be turned on for each temperature change set by differential or off for each temperature change set by hysteresis.

Pump ID

This parameter selects the serial number of the control board used for the system pump. Pressing the  button scrolls through the available choices. Any pump control board on the system may be selected as the system pump. Be sure to select the correct pump control board for the system being configured.

Operation

Screen Saver

If no buttons are pressed for more than 3 minutes and no faults exist, screen saver text will scroll across the display. Press any button to exit the screen saver.

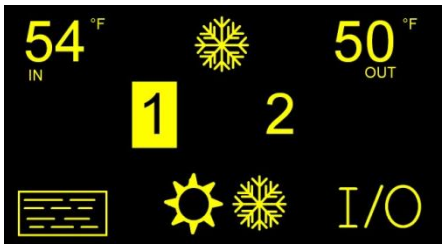
Operating Modes

Off mode screen

Three modes of operation are available in the Hydromatic II off, cool, and heat. On the master in the off mode, the display shows only the power symbol and the menu symbol. Slaves will show only the menu symbol when the system is off. Press the power button on the master to toggle the system from the off mode to the heating or cooling mode.

Master Overview

Master Overview



The master overview will be shown when the control you are viewing is a master. The loop water inlet and outlet temperatures for the system are shown at the top. In the example on the right, the system is set for cooling which is indicated by the snow flake icon displayed at the top of the screen. To switch the system to heating, press the center button below the sun and snowflake symbols. The "1" in the center of the screen shows slave 1 is operating as indicated by the block around the 1. Slave 2 is not currently operating.

The indicators below may appear in place of the slave number. These indicators will alternate with a description when a slave is inoperative.

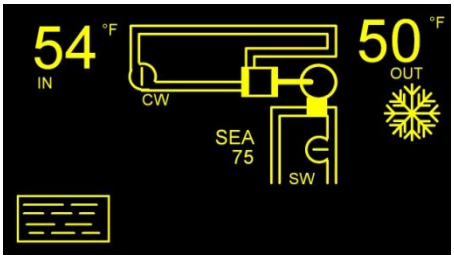
F is a fault on that slave.

B is a slave that has been bypassed.

L is a slave that has been locked out by the master. See faults for more information.

Slave Overview

Slave Overview



The slave overview will be shown when you are viewing is not configured as a master. This view is also available on the master in the diagnostic view. If the return sensor is installed, the tempered water return temperature for the slave is displayed on the top left. The tempered water outlet temperature for the slave is displayed on the top right. CW is the system tempered water loop, SW is the system sea water loop and the piston symbol in the center is for the slave's compressor. System sea water temperature is indicated under "SEA" in the center of the screen. Sea water temperature is only valid while the sea water pump is running.

Pump Control Board

The loop water pump and sea water pump operation is automatically controlled by the master. LED indicators on the board illuminate when a pump is on. The Flow 1 LED will light whenever the loop water switch is closed. The Flow 2 LED will light whenever the sea water flow switch is closed.

Fault Handling

When a slave detects a fault, the slave will turn off the compressor or heater if they are operating. If the fault has been corrected, the master will attempt to restart the slave after two minutes if required. Multiple recurring faults will cause the slave to be locked out by the master.

Fault Indication

The fault will be indicated at the master by an F symbol appearing in place of the slave number. The master will alternate between showing the slave number and the fault, and the normal status display. The slave will flash the fault that has occurred on its display.

Sensor Trouble

One of the connected sensors is reading out of range. Check the slave display on the slave with the fault for the sensor that is out of range.

Low AC Voltage

Low line voltage has been detected for more than 10 minutes.

High Freon Pressure

The high Freon pressure switch has been opened.

Low Freon Pressure

The low Freon pressure switch has been open for 5 minutes.

Flow Switch Open

The flow switch for this slave has been opened.

Over Current

The compressor running current has exceeded the programmed value.

High Limit

The high limit sensor temperature has exceeded the programmed value.

Freeze Fault

In cool mode, the freeze sensor measuring the compressor water output temperature is reading below 38 °F (3.3°C). In heat mode, the sea water temperature has dropped below the sea water limit and no electric heaters are installed.

No Master Signal

The master transmission on the CAN bus is not received by the slave.

Slave Not Responding

This fault is seen at the master if a programmed slave is not responding.

Slave Bypassed
This message is seen at the master as a B on the display in place of the slave number. This indication is not actually a fault but indicates an action was taken by the user to prevent the operation of a slave.

VFD Trouble
The Variable Frequency Drive (VFD) has reported a fault. See the documentation for the VFD to determine the cause and resolution.

Lockout
The master keeps fault count for each slave. If four faults occur on a slave without this count being reset, the master will prevent that slave from operating. This is called a lockout and is indicated on the master with an L on the master status screen in place of the slave number. A lockout is cleared by pressing the unlock button.  *The fault count for a slave is reset when it is unlocked, the power button is pressed, or if the master turns off the slave.*

Pump Not Responding
This fault is seen at the master if a programmed pump control is not responding.

Low Seawater Temperature
Seawater temperature is below 40°F (4.4°C) for over 5 minutes in reverse cycle heat.

Wiring Diagrams

Board and Firmware revisions

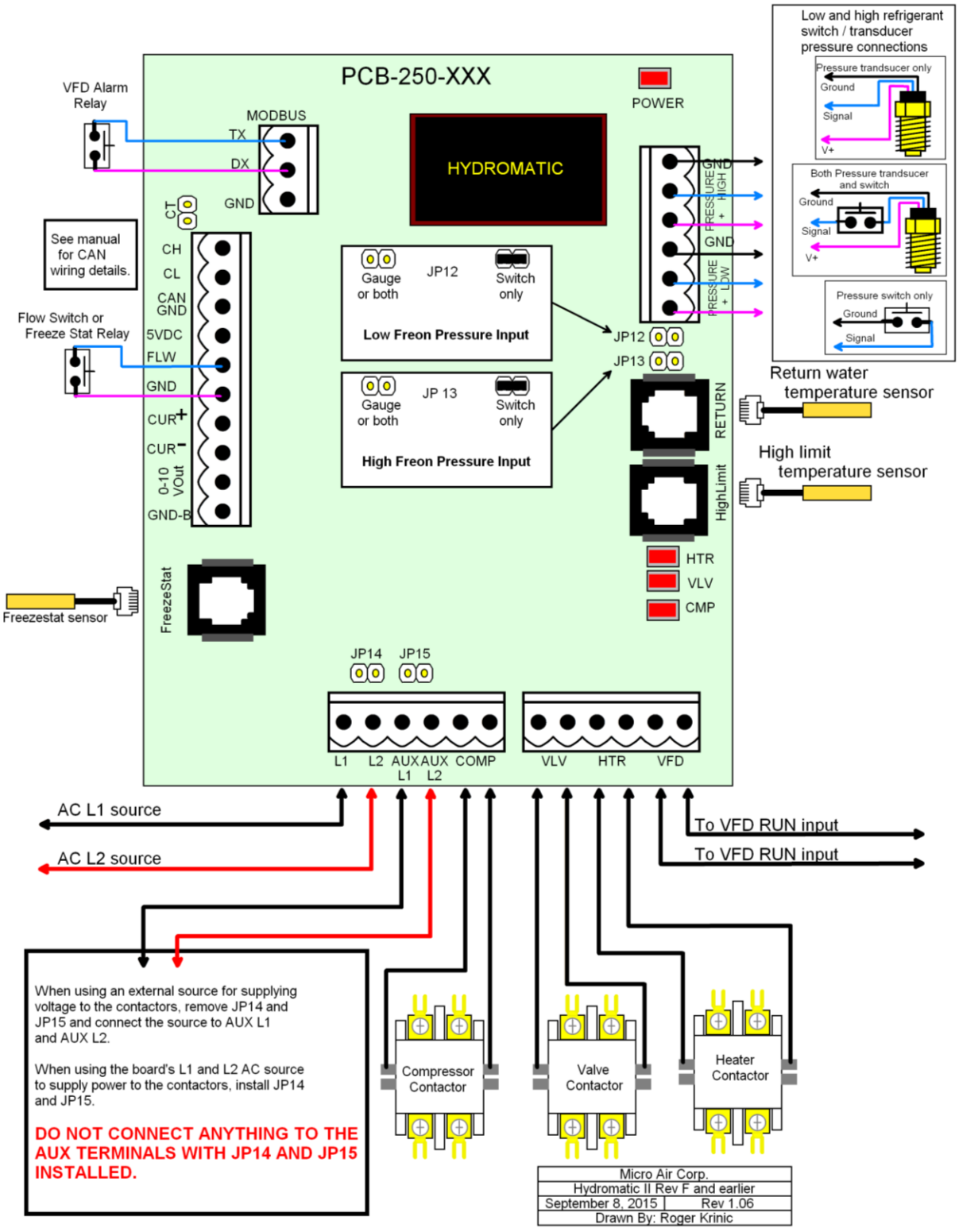
This manual makes reference to Hydromatic II control board printed circuit board (PCB) revisions. The PCB revision is found along the edge of the printed circuit board in white silk screened lettering and starts with PCB-250. PCB-250-00E indicates a revision E circuit board.

Firmware revision is shown on the display immediately after applying power.

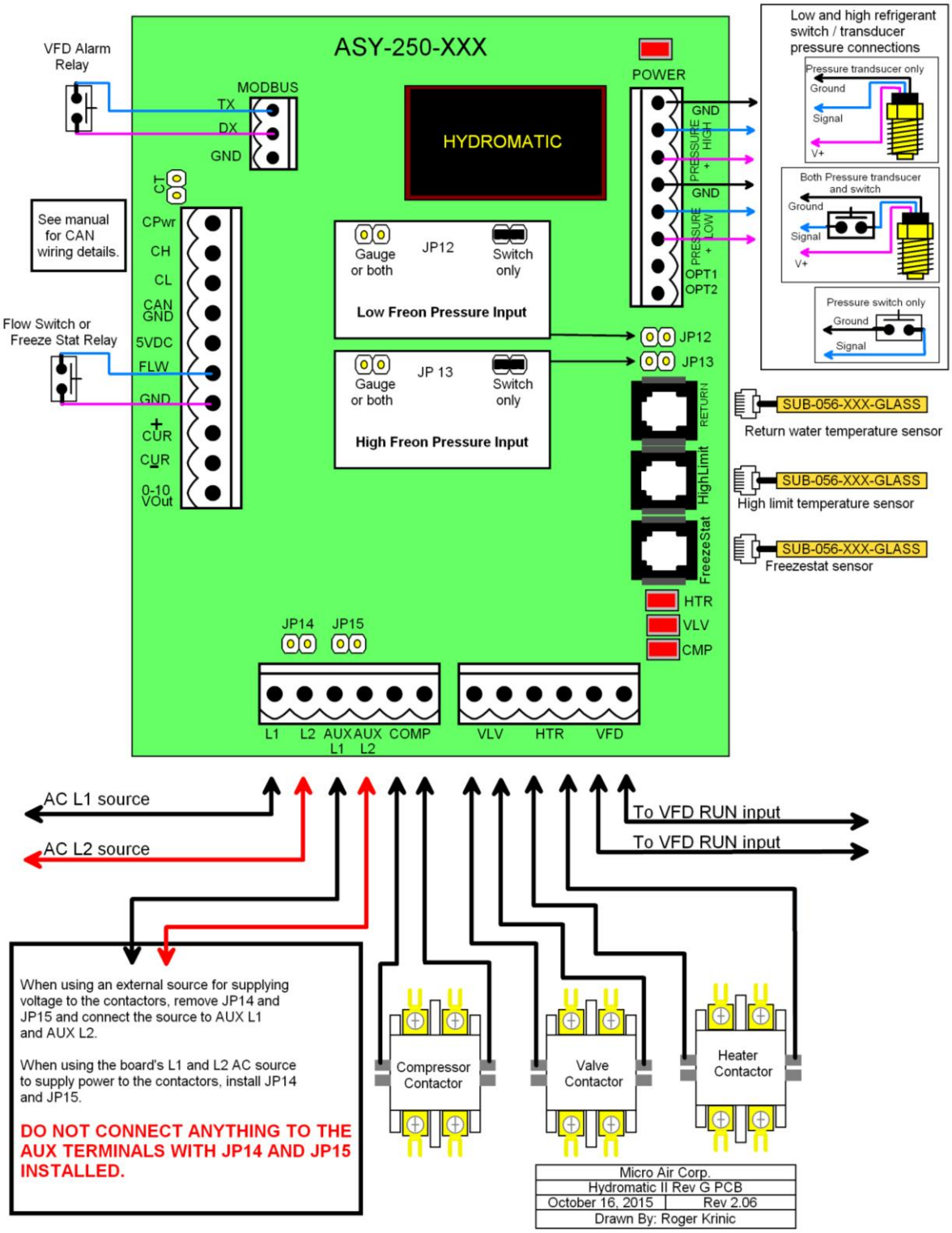
Wiring Diagram Identification

The included wiring diagrams are organized by board revision. To find the correct diagram for your system, first identify the control board revision used in your system. Use this identifier to find the correct wiring. Systems may not include all features shown in the wiring diagrams. Colors are provided for clarity and may not reflect the colors used in your system.

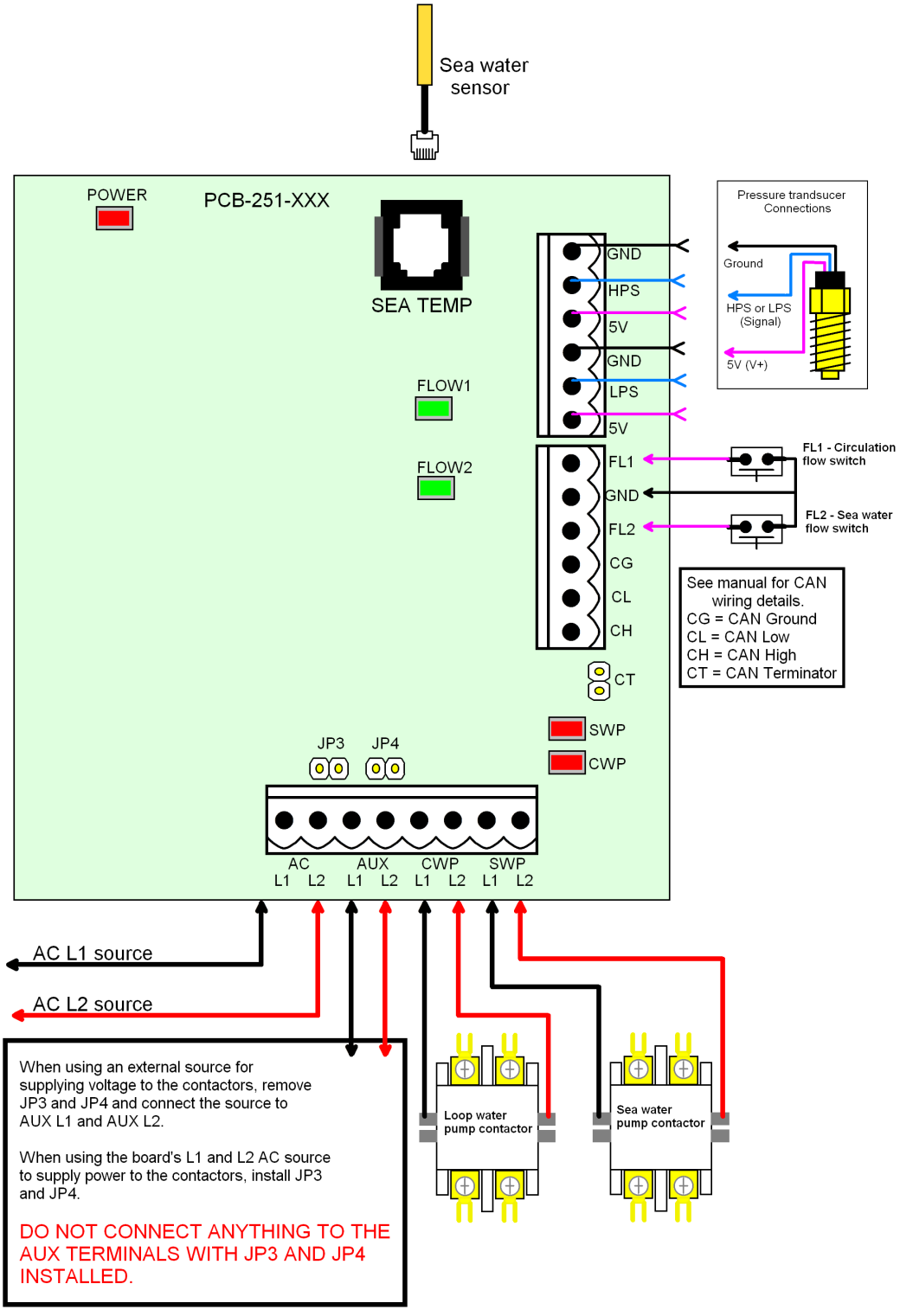
Hydromatic II Rev F and Earlier PCB



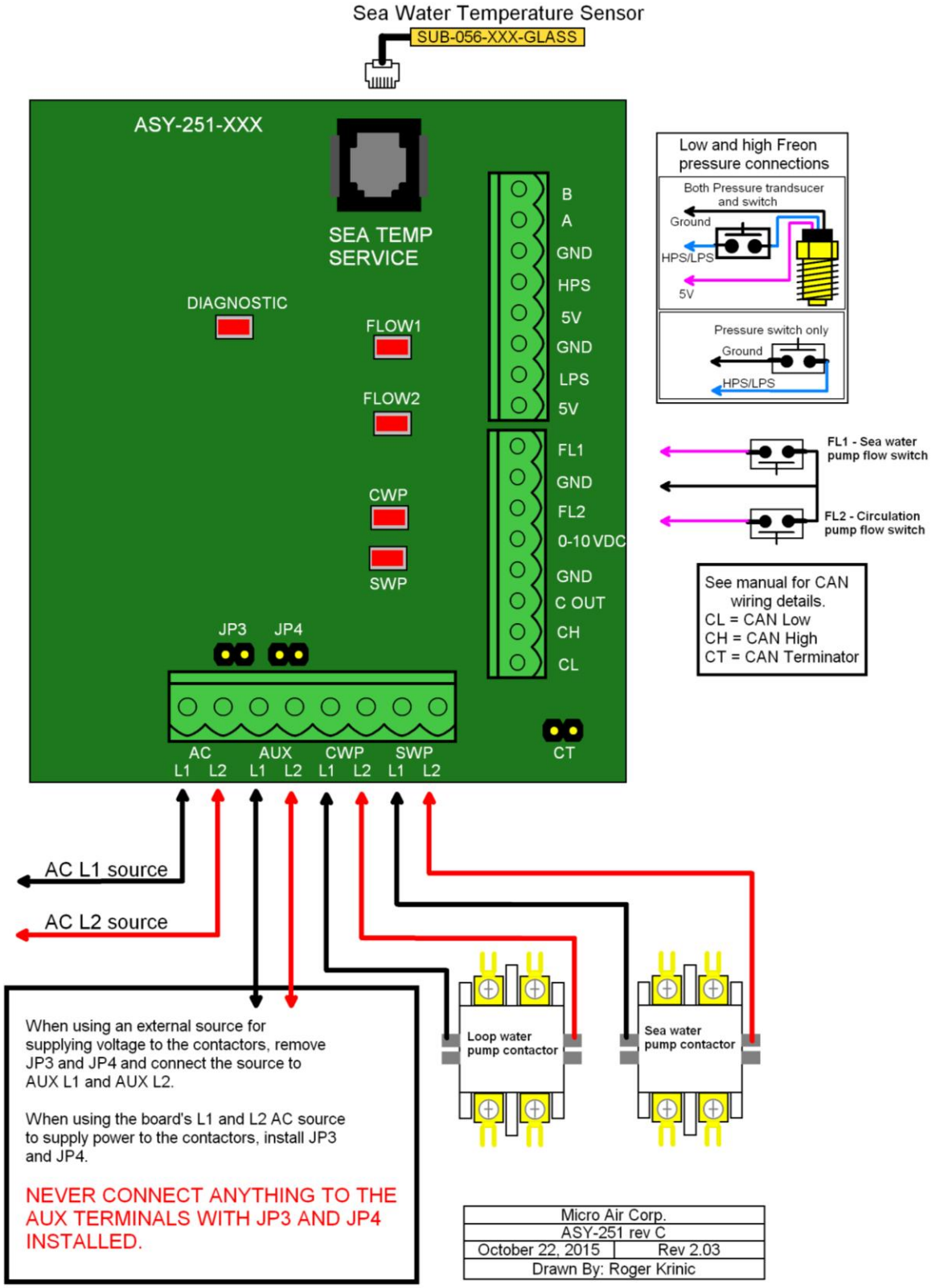
Hydromatic II Rev G PCB



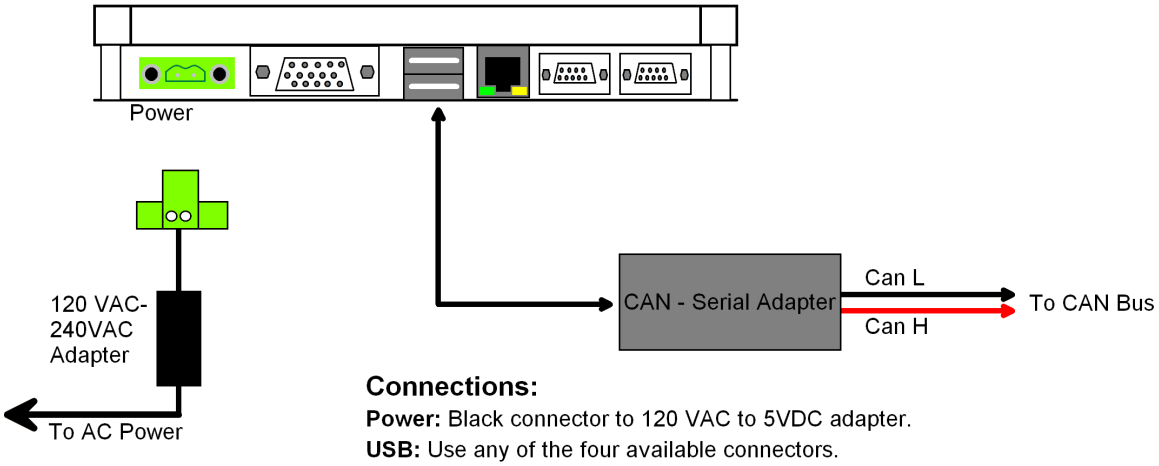
Pump Relay Wiring Diagram Rev B



Pump Relay Wiring Diagram Rev C



Touch Screen Display Wiring



Connections:

Power: Black connector to 120 VAC to 5VDC adapter.

USB: Use any of the four available connectors.

Note: Connect the USB cable to USB-CAN adapter before applying power.

Specifications

Set point range:	
Cooling	35°F to 57°F 1.7°C to 13.9°C
Heating	100°F to 140°F 37.8°C to 60°C
Temperature range displayed	5°F to 150°F
Sensor accuracy	+/-2°F at 77°F
Low voltage limit 115 VAC units	75VAC
Low voltage limit 230 VAC units	175VAC
Line high voltage limit	250VAC
Frequency	50 or 60 Hz
Heater output MAX	.5 Amps AC
Valve output MAX	.5 Amps AC
Pump output MAX	.5 Amps AC
Compressor output MAX	.5 Amps AC
Minimum operating temperature	0°F
Maximum operating temperature	180°F
Maximum RH conditions	95% Non-condensing
Maximum length for sensor cables	50 Feet (15 meters)
Maximum CAN system cable length	750 Feet (228 meters)
Flow and pressure switches	normally closed.
Current transformer	Future Option
VFD dry contact output	28 VAC Maximum 40 VDC Maximum 100 mA Maximum

CAN bus wire:

Compatibility: SAE J1939
Characteristic impedance: 120 ohms
Line capacitance: < 80pF per meter at 1 MHz
Wire gauge: 20 AWG minimum
Specific line delay (velocity factor) : > 70%
Mechanical: 2 conductors, twisted pair with shield and drain connection.

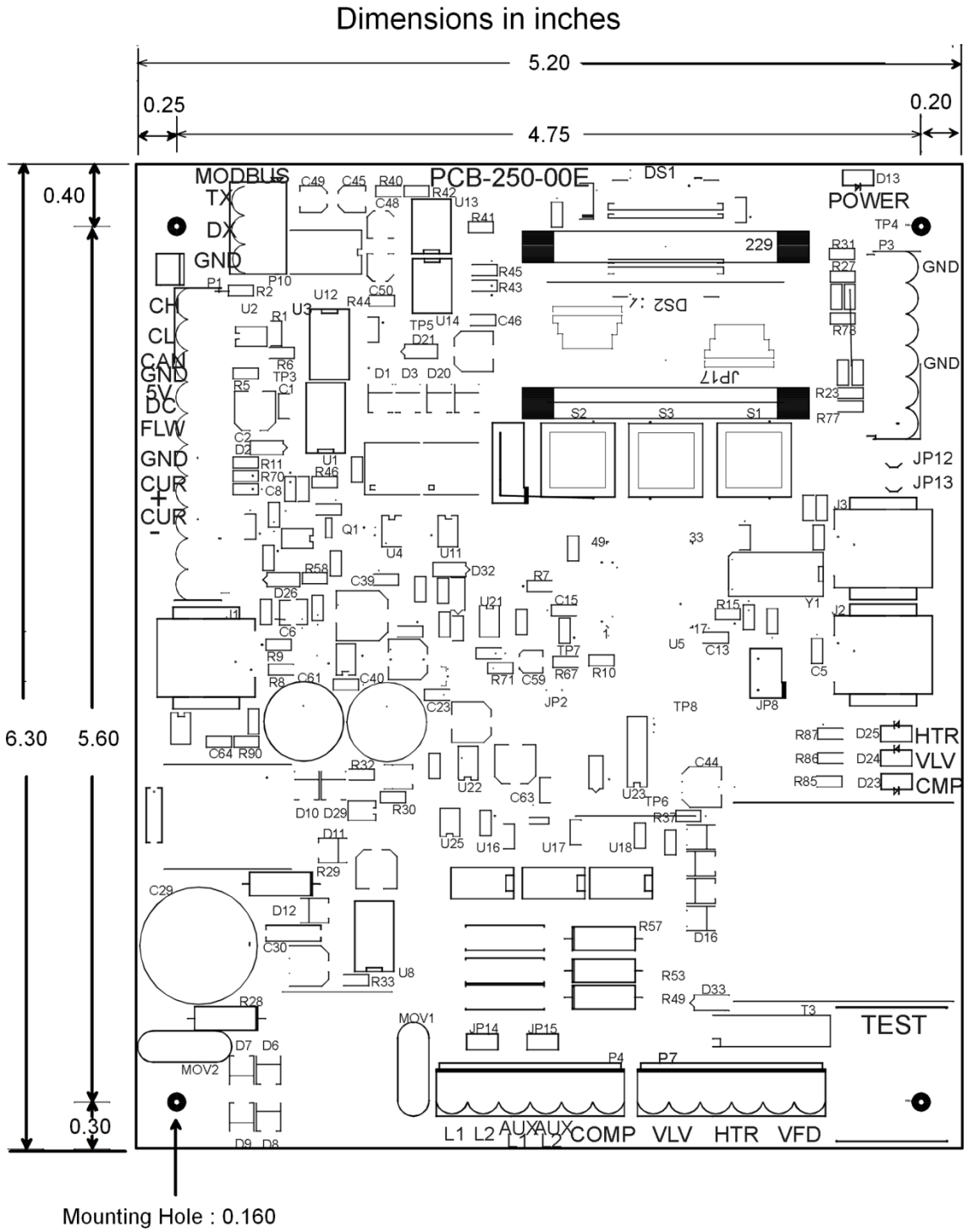
Examples of acceptable wire:
North Wire Data Cell J1939

Waytec CB20-11F 20

Prestolite Wire SAE1939-15 #149812

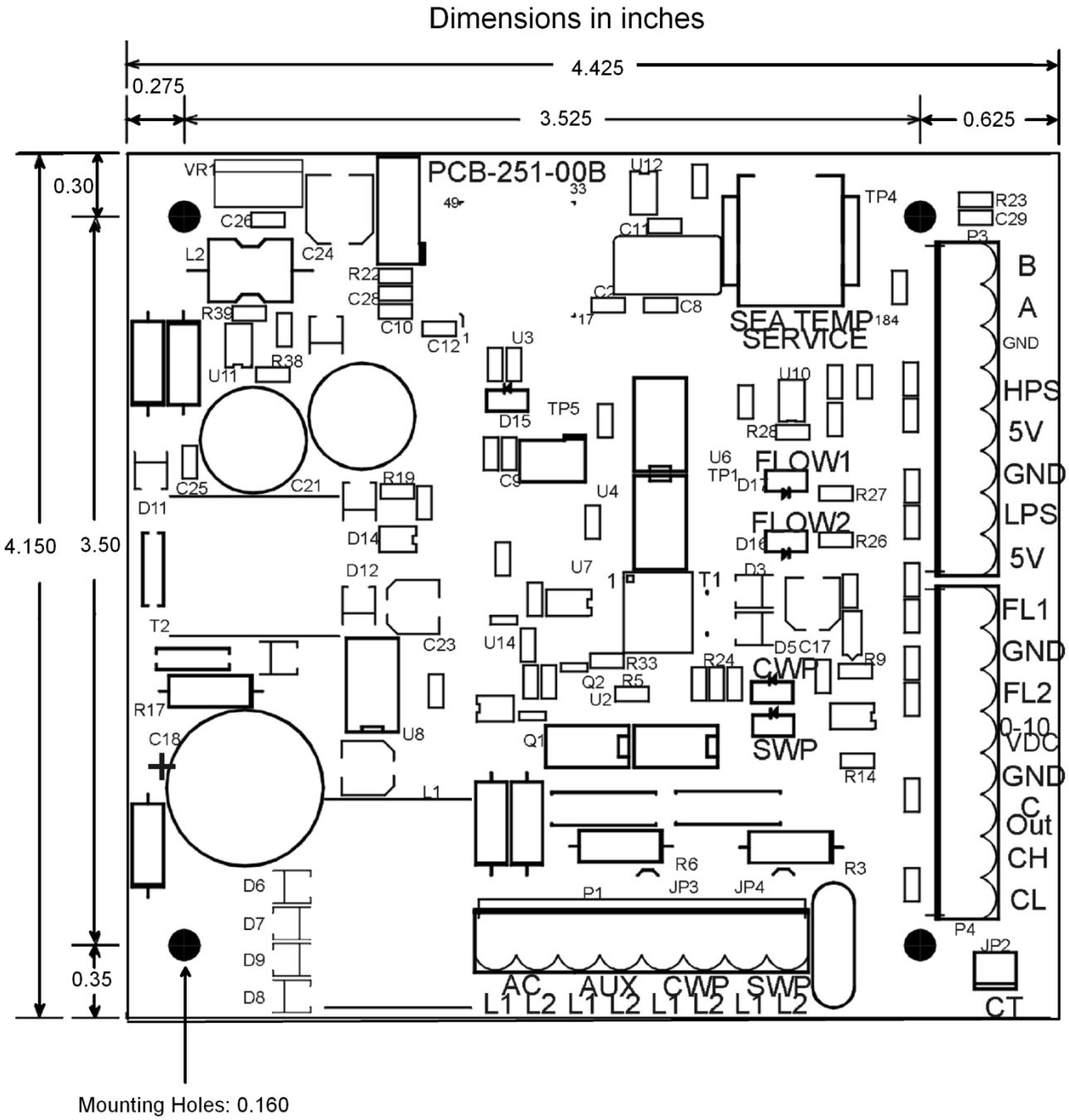
Hydromatic II Dimensions

(Not to scale)



Pump Control Dimensions

(Not to scale)



Glossary

(Simplified for Hydromatic II)

Bus:

A wired connection consisting of 2 or 3 wires connected to each control in a sequentially wired, daisy chain style connection.

CAN:

Computer Area Network is a communications system that facilitates communication between electronic controls.

Differential:

The temperature change required to start a stage. This can be set in the Operating Parameters menu.

Group ID:

A user defined ID number used to permit communications between similar controls.

Master:

A slave assigned to perform the master function.

Master Function:

The control of operations of all slaves and pumps properly configured with a common group ID.

Slave:

A slave is any Hydromatic control in a CAN system.

Slave Function:

A slave is responsible to turn on outputs when commanded by the master. The slave will also detect faults with devices connected to it, and relay sensor and switch status to the master.

Stages:

Compressors and heaters can be grouped so that more than one slave can be turned on or off at specific temperature intervals. These grouped units of heating or cooling capacity are called stages.

Terminator:

A usually black 2 pin jumper placed over a two pin header located near the CAN connection jack. These jumpers are installed only on the controls at the beginning and end of the CAN bus.

Unit ID:

A user defined ID number assigned uniquely to each control in a CAN system.

Appendix 1: System menu overview

- Diagnostic view
  - View 1 (See manual)
  - View 2 (See manual)
  - Slave View (Master only)
- Show event history
  - Events 1-8
- Copy unit in system (**Items in red available only when system is off**)
  - Copy slave
- Operating parameters
  - Purge air
  - Staging delay
  - Heat mode set point
  - Cool mode set point
  - Hysteresis
  - Differential
  - Electric only temperature
  - Sea pump operation
  - Low voltage shut down
  - Back to menu
- System set up
  - Brightness
  - Screen saver brightness
  - Service high limit
  - Current limit
  - Freon sensor type
    - High pressure maximum PSI (Both or gauge only)
    - High pressure 0 PSI voltage (Both or gauge only)
    - Low pressure maximum PSI (Both or gauge only)
    - Low pressure 0 PSI voltage (Both or gauge only)
  - Water sensor type
    - LPS pressure maximum PSI (Both or gauge only)
    - LPS pressure 0 PSI voltage (Both or gauge only)
    - HPS pressure maximum PSI (Both or gauge only)
    - HPS pressure 0 PSI voltage (Both or gauge only)
  - System units
  - Reset parameters
  - Back to menu
- Staging parameters
  - Group ID
  - Unit ID
  - Number of slaves
  - Heater on slave (1-8)
  - Enable slave (1-8)
  - Slaves on stage (1-8)
  - Pump ID
  - Back to menu

Appendix 2: Organizing IDs in the CAN system

Controls are addressed on the CAN bus by assigning group ID and unit ID numbers to each control in the system.

System example:

Control	Unit	Group	
Area 1, Air handler	1	1	
Area 2, Air handler 1	2	2	
Area 2, Air handler 2	3	3	
Area 3, DX system	4	4	
Ice maker	5	5	
Area 4 Air handler 1	13	13	
Area 4 Air handler 2	14	13	
Area 4 Air handler 3	15	13	
Hydromatic 1	131	131	Master (Slave 1)
Hydromatic 2	132	131	Slave 2
Hydromatic 3	133	131	Slave 3
Hydromatic 4	134	131	Slave 4
Pump relay	139	131	System pump for Hydromatic

- **Rule 1:** All controls must have unique unit IDs.
- **Rule 2:** All controls that independently service an area must have the same group ID as their unit ID. See units 1 to 5 above.
- **Rule 3:** Controls that service a common area must have the same group ID. See units 13, 14, and 15 above.
- **Rule 4:** Every control in a Hydromatic system must have the same group ID.
- **Rule 5:** No Hydromatic master must be assigned an ID within 9 ID's of another Hydromatic master.
- **Rule 6:** The Hydromatic master must have the same unit ID and group ID value.
- **Rule 7:** Each Hydromatic slave in the system must be sequentially numbered above its group id. See 131 to 134 above.

Note: Controls are identified to connected computers by serial number. Additionally some controls require entering the serial number during configuration. When installing controls, the serial numbers of each control and its location should be recorded along with the unit ID assigned to the control.

Appendix 3: Ordering a system

The Hydromatic II control system is a versatile platform that can be configured as desired for specific system requirements. The number of sensors required depends on the options in your system. Use the table below to determine the number of sensors required for your system.

Table 1	**Sensors required**
Number of compressors in system	
Number of electric heaters in system	
Return sensor	1
Additional return sensors (optional *)	
TOTAL SENSORS (Add Boxes):	

*Additional return sensors may be added to each control board. Only one sensor is used however if a sensor fails, the master will switch to another installed sensor if one is available. .

A touch screen display is available as an option. This panel permits remotely monitoring and programming the system without needing to access the control boards.

Each compressor in the system requires a controller. Use the chart below to determine the additional Microair supplied components needed in your system.

Table 2

Order Number	Description	Quantity determined by:	Quantity
SUB-056-X15-GLASS	Sensor	Total sensors from Table 1	
ASY-250-XXX	Control board	Number of compressors	
ASY-251-XXX	Pump relay board	Always order 1	1
ASY-387-XXX	Touch Screen Display	Optional display. Can be more than one in system.	

Custom Electrical Enclosures

Micro Air also builds and wires custom electrical boxes containing all the components and connections needed to control multiple compressors with the Hydromatic II system. Contact Microair with your system requirements for details on these custom boxes.

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