



Control Operation and Troubleshooting Instructions

CONTENTS

	Page
SAFETY CONSIDERATIONS	1
GENERAL	1,2
INSTALLATION	2-9
Wiring Requirements	2
Wiring Connections	2
Jumper Settings	2
Complete C Control	8
• WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING	
• AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING	
• ALARM RELAY SETTING	
Deluxe D Control	8
• WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING	
• AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING	
• ALARM RELAY SETTING	
• LOW PRESSURE SETTING	
CONFIGURATION	9,10
Complete C Control DIP Switches	9
• PERFORMANCE MONITOR (PM)	
• STAGE 2	
• DDC OUTPUT AT EH2	
• FACTORY SETTING	
Deluxe D Control DIP Switches	9
• DIP SWITCH BANK 1 (S1)	
• DIP SWITCH BANK 2 (S2)	
Deluxe D Control Accessory Relay Configurations	10
• CYCLE WITH FAN	
• CYCLE WITH COMPRESSOR	
• DIGITAL NIGHT SET BACK (NSB)	
• WATER VALVE (Slow Opening)	
• OUTSIDE AIR DAMPER (OAD)	
• HUMIDITY CONTROL	
CONTROL OPERATION	11-16
Complete C Control Indicators	11
Complete C and Deluxe D Controls	11
• TEST MODE	
• RETRY MODE	
• POWER UP MODE	
• STANDBY MODE	
• COOLING MODE	
• HEATING STAGE 1 MODE	
• HEATING STAGE 2 MODE	
• LOCKOUT MODE	
• LOCKOUT WITH EMERGENCY HEAT	
• EMERGENCY HEAT MODE	
• HIGH-PRESSURE SWITCH (HP)	
• LOW-PRESSURE SWITCH (LP)	
• WATER COIL FREEZE PROTECTION (FP1)	
• AIR COIL FREEZE PROTECTION (FP2)	
• CONDENSATE OVERFLOW (CO)	
• OVER/UNDER VOLTAGE SHUTDOWN	
• PERFORMANCE MONITOR (PM)	
• ANTI-SHORT CYCLE PROTECTION	
• RANDOM START	
• SWAPPED FP1/FP2 THERMISTORS	
• SENSORS	

Deluxe D Control	13
• LED INDICATORS	
• EXTENDED COMPRESSOR OPERATION MONITOR	
• STANDBY/FAN ONLY MODE	
• HEATING STAGE 1 MODE	
• HEATING STAGE 2 MODE	
• HEATING STAGE 3 MODE	
• EMERGENCY HEAT MODE	
• COOLING STAGE 1	
• COOLING STAGE 2	
• NIGHT LOW LIMIT (NLL) STAGED HEATING	
Thermostat Inputs	14
• COMPLETE C CONTROL	
• DELUXE D CONTROL	
• COMMUNICATION PORTS	
• MECHANICAL NIGHT SET BACK	
TROUBLESHOOTING	16-20
Field Inputs	16
Sensor Inputs	16
Sensor Outputs	17
Test Mode	17

IMPORTANT: Read the entire instruction manual before starting installation.

SAFETY CONSIDERATIONS

Read and follow manufacturer instructions carefully. Follow all local electrical codes during installation. All wiring must conform to local and national electrical codes. Improper wiring or installation may damage sensor.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies a hazard which could result in personal injury or death. CAUTION is used to identify unsafe practices which would result in minor personal injury or property damage.

GENERAL

Aquazone Complete C and Deluxe D electronic heat pump controls are durable, microprocessor-based controllers used to improve the safety and operation of Aquazone water source heat pumps. The microprocessor board is specifically designed to protect against building electrical system noise contamination and radio frequency interference.

The Complete C control base model is a low cost, easy to use control that provides all the necessary features for water source heat pump safety and operation. The Complete C control features a light-emitting diode (LED) to indicate high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow and control status. The Complete C control is compatible with most heat pump thermostats, but is not compatible with Heat/Cool thermostats.

The Deluxe D control is an advanced microprocessor-based control designed for maximum application flexibility. It includes all of the Complete C control features plus 3 LED status indicators and several additional features for extensive system capability. The Deluxe D control is compatible with heat pump thermostats as well as heat/cool thermostats.

INSTALLATION

The Aquazone™ Complete C and Deluxe D controls can be field configured for customized applications.

⚠ WARNING

Before performing service or maintenance operations on the system, turn off main power switches to the unit. Electric shock can cause personal injury.

Wiring Requirements

1. All wiring must be in compliance with all applicable local and national codes.
2. Wiring should be minimum of 24 AWG (American Wire Gage) wire with epoxy embedded beryllium copper clip.

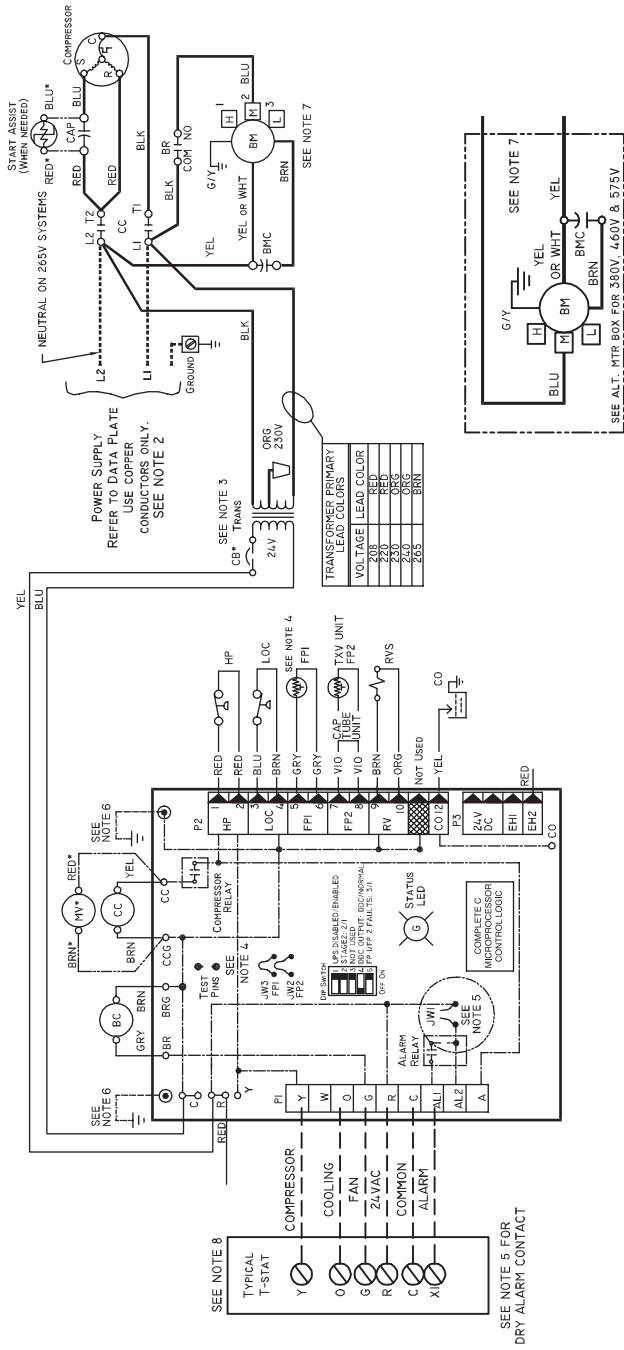
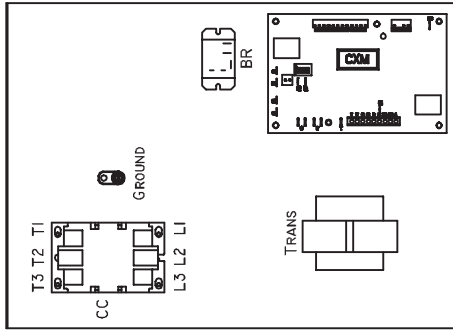
Wiring Connections — See Fig. 1-5 for typical wiring of Aquazone Complete C and Deluxe D controls.

Jumper Settings — Jumpers can be clipped on the control board to customize system operation. See Fig. 1-5.

⚠ WARNING

Jumpers should only be clipped when power to the control board has been turned off.

COMPONENT LOCATION

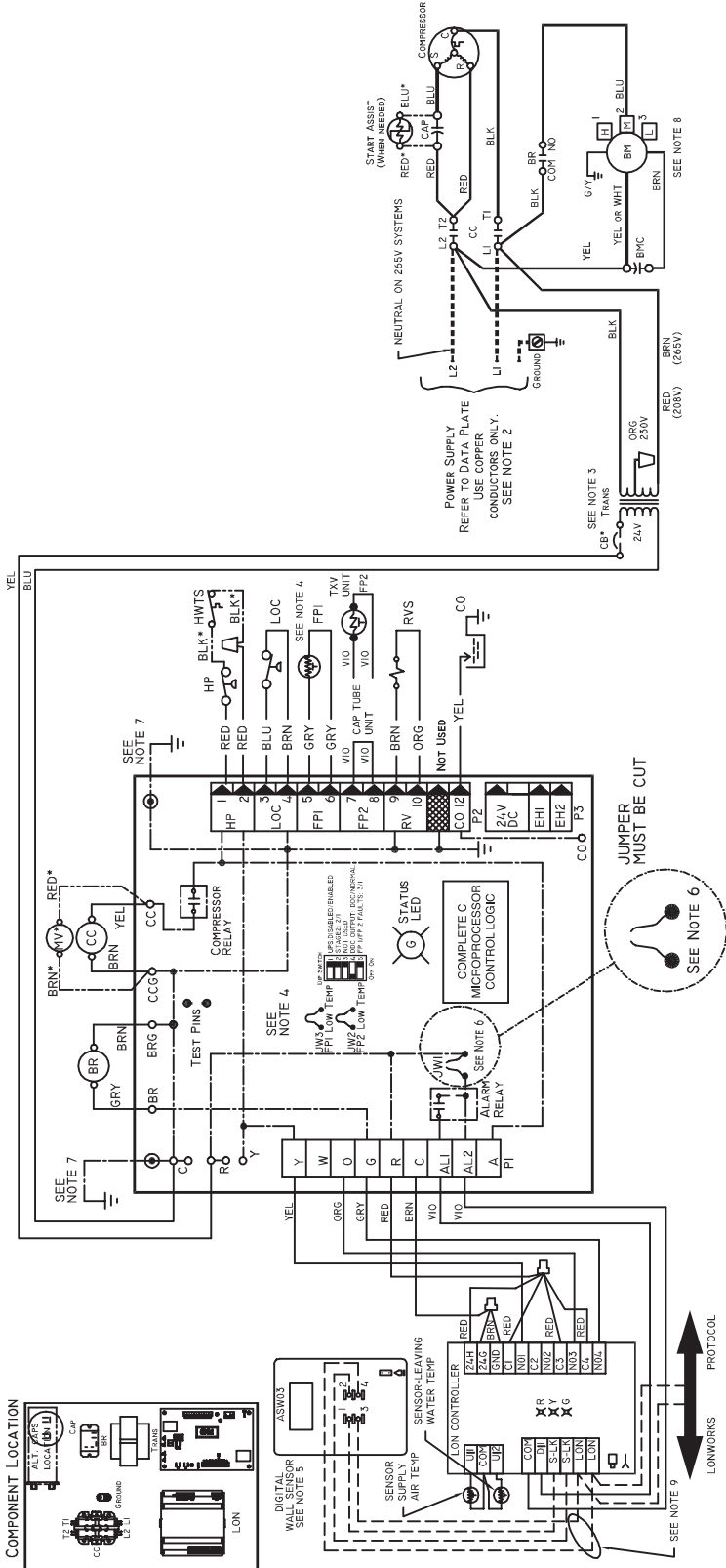


- NOTES:**
- Compressor and blower motor thermally protected internally.
 - All wiring to the unit must comply with NEC and local codes.
 - 208/230 v transformer will be connected for 208 v operation. For 230 v operation, disconnect RED lead a L1, and attach ORANGE lead to L1. Insulate open end of RED lead. 220/240 v transformer will be connected for 220 v operation. For 240 operation, disconnect RED lead at L1, and attach ORANGE lead to L1. Insulate open end of RED lead. Transformer is energy limiting or may have circuit breaker.
 - FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
 - Factory cut JW1. Dry contact will be available between AL1 and AL2. 24 v alarm signal shown.
 - Transformer secondary ground via standoffs and screws to control box. (Ground available from top two standoffs as shown.)
 - Blower motor is factory wired for medium speed. For high or low speed remove BLU wire from fan motor speed tap 'M' and connect to 'H' for high or 'L' for low.
 - Typical heat pump thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be 'Class 1' and voltage rating equal to or greater than unit supply voltage.

- LEGEND**
- PI — Field Wiring Terminal Block
 - P2 — Field Wiring Terminal Block
 - RVS — Reversing Valve Solenoid
 - TRANS — Transformer
 - TXV — Thermostatic Expansion Valve
 - — — — — Factory Low Voltage Wiring
 - — — — — Factory Line Voltage Wiring
 - - - - - Field Low Voltage Wiring
 - - - - - Field Line Voltage Wiring
 - · - · - Printed Circuit Trace
 - · - · - Optional Wiring
 - — Relay/Contactor Coil
 - — Thermistor
 - — Condensate Pan
 - — Circuit Breaker
 - ⊕ — Ground
 - — Optional
 - — Solenoid Coil
 - — Relay Contacts - N.C.
 - — Relay Contacts - N.O.
 - — Capacitor
 - — Temperature Switch
 - — Low-Pressure Switch
 - — High-Pressure Switch
 - — Wire Nut
 - — Splice Cap
 - — LED

- AL — Alarm Relay Contacts
- BC — Blower Contactor
- BM — Blower Motor
- BMC — Blower Motor Capacitor
- BR — Blower Relay
- CAP — Compressor Capacitor
- CB — Circuit Breaker
- CC — Compressor Contactor
- CCG — Compressor Contactor Ground
- CO — Condensate Overflow Sensor
- DDC — Direct Digital Control
- EH — Emergency Heat
- FP1 — Water Coil Freeze Protection Sensor
- FP2 — Air Coil Freeze Protection Sensor
- GRY — Grey
- HP — High-Pressure Switch
- JW — Jumper Wire
- LED — Light-Emitting Diode
- LOC — Loss of Charge Pressure Switch
- MV — Motorized Valve
- NEC — National Electrical Code
- ORG — Orange

Fig. 1 — Typical Aquazone™ Complete C Control Wiring with Heat Pump Control

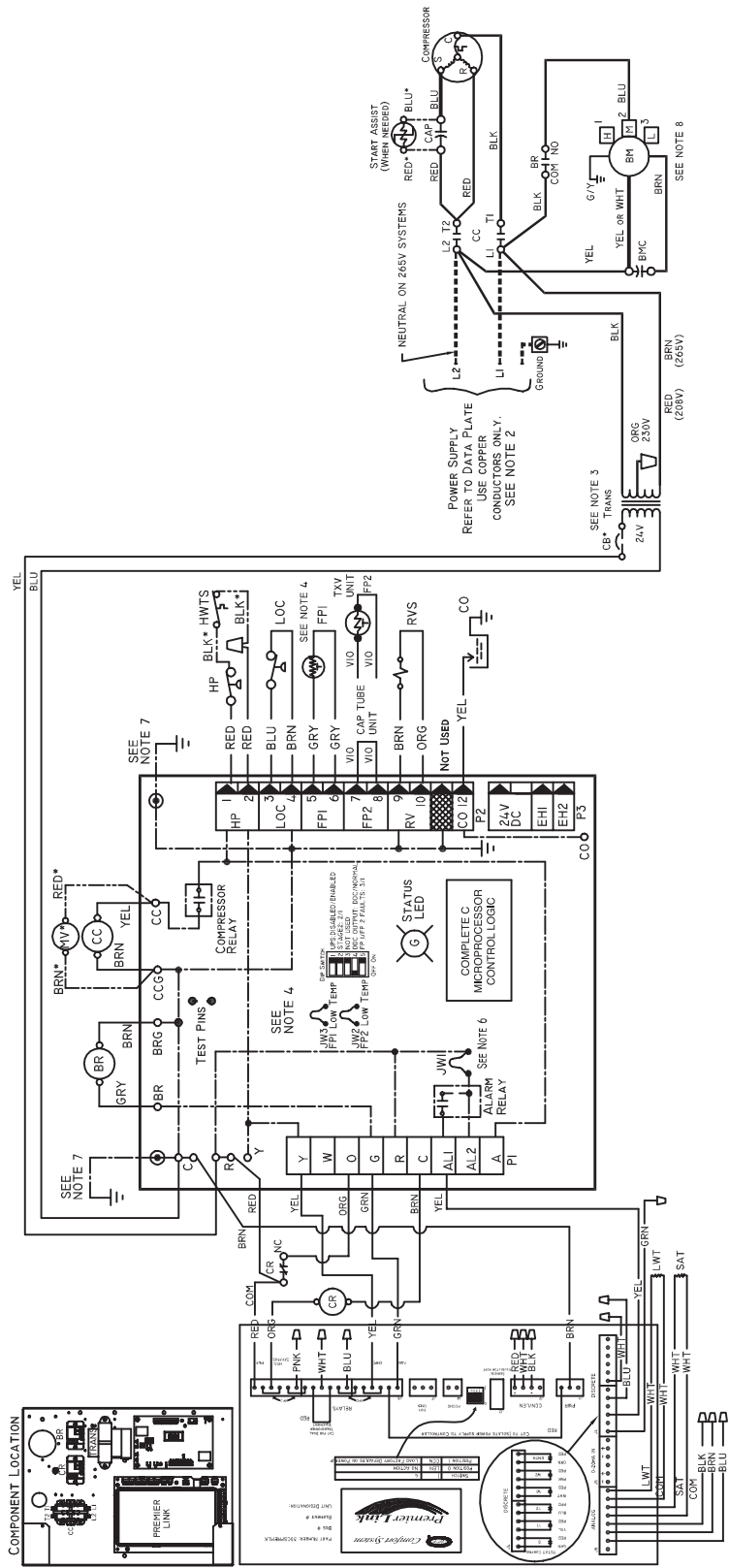


- NOTES:**
- Compressor and blower motor thermally protected internally.
 - All wiring to the unit must comply with NEC and local codes.
 - Transformer is wired to 265 v (BRN) lead for 265/60/1 units, 230 v (ORG) lead for 220-240/50/1, or 208 v (RED) lead for 208/60/1. For 230/60/1 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
 - FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
 - Refer to LonWorks® Installation, Application, and Operation manual for control wiring to the unit. Low voltage wiring must be "Class 1" and voltage rated equal or greater than unit supply voltage.
 - Factory cut JW1 jumper. Dry contact will be available between AL1 and AL2.
 - Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
 - Fan motors factory wired for medium speed. For high or low speed remove BLU wire from fan motor speed tap 'M' and connect to 'H' for high or 'L' for low.
 - Optional LON wires. Only connect if LON connection is desired at the wall sensor.

- LEGEND**
- Thermistor
 - Condensate Pan
 - Circuit Breaker
 - Relay Contacts - N.C.
 - Solenoid Coil
 - Relay Contacts - N.O.
 - Temperature Switch
 - High-Pressure Switch
 - Low-Pressure Switch
 - Ground
 - Wire Nut
 - Splice Cap

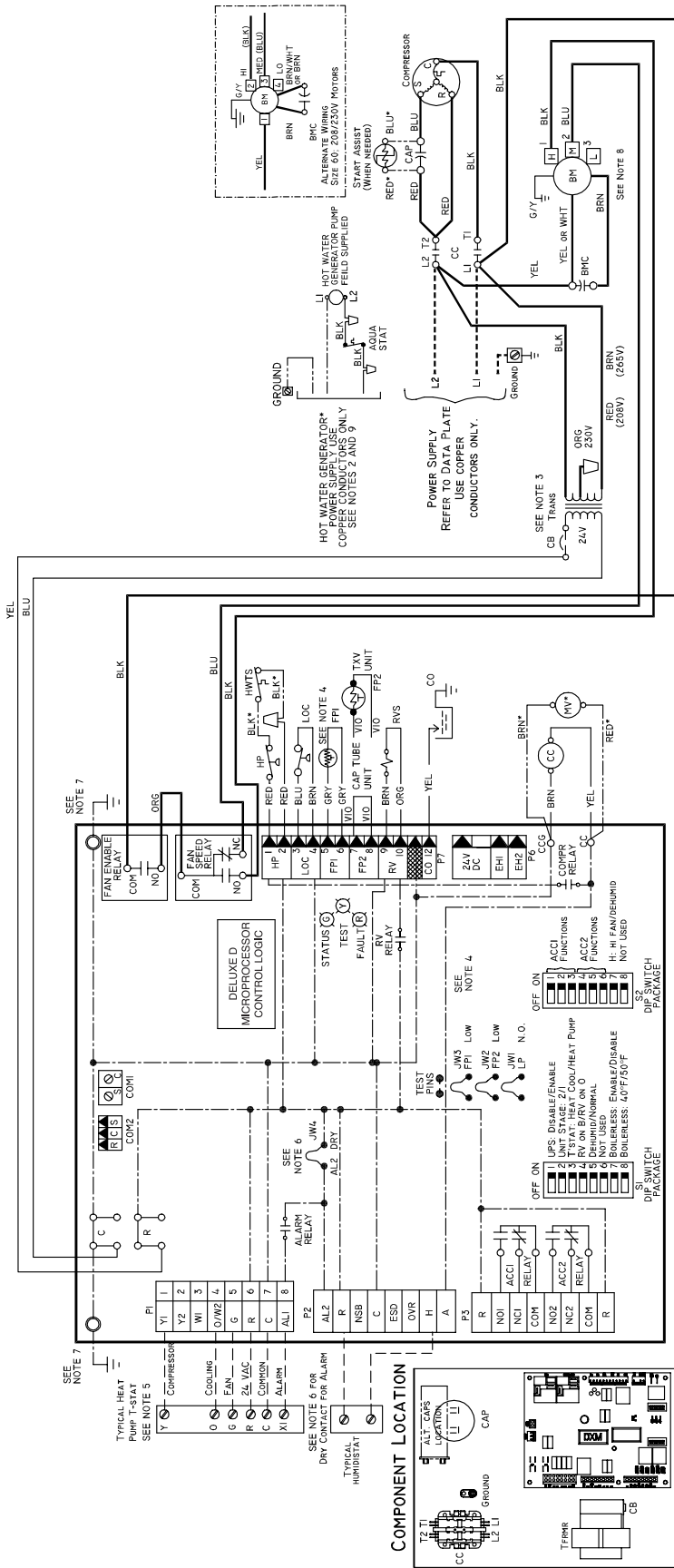
- Loss of Charge Pressure Switch
- Local Operating Network Motorized Valve
- National Electrical Code Orange
- Field Wiring Terminal Block
- Reversing Valve Solenoid Transformer
- Thermostatic Expansion Valve
- Optional Wiring
- Field Line Voltage Wiring
- Field Low Voltage Wiring
- Printed Circuit Trace
- Optional Wiring
- Relay/Contactor Coil

Fig. 2 — Typical Aquazone™ Complete C Control Wiring with LON Control



- COMPONENT LOCATION**
- LEGEND**
- AL Alarm Relay Contacts
 - BC Blower Contactor
 - BM Blower Motor
 - BMC Blower Motor Capacitor
 - BR Blower Relay
 - CAP Compressor Capacitor
 - CB Circuit Breaker
 - CCG Compressor Contactor
 - CO Compressor Contactor Ground
 - COM Communication
 - CR Cooling Relay
 - DDC Direct Digital Control
 - EH Emergency Heat
 - FP1 Water Coil Freeze Protection Sensor
 - FP2 Air Coil Freeze Protection Sensor
 - GRY Grey
 - HP High-Pressure Switch
 - HP (Leaving) Water Temp Switch
 - JW1 Clippable Field Selection Jumper
 - LED Light-Emitting Diode
 - LOC Loss of Charge Pressure Switch
 - LWT Leaving Water Temp
 - MV Motorized Valve
 - NEC National Electrical Code
 - ORG Orange
 - PI Field Wiring Terminal Block
 - RVS Reversing Valve Solenoid
 - SAT Supply Air Temperature
 - TRANS Transformer
 - TXV Thermostatic Expansion Valve
 - * Optional wiring
 - Field Line Voltage Wiring
 - Field Low Voltage Wiring
 - Printed Circuit Trace
 - Optional Wiring
 - Relay/Contactor Coil
 - Thermistor
 - Condensate Pan
 - Circuit Breaker
 - Relay Contacts - N.C.
 - Solenoid Coil
 - Relay Contacts - N.O.
 - Temperature Switch
 - High P Pressure Switch
 - Low Pressure Switch
 - Ground
 - Wire Nut
 - Splice Cap
- NOTES:**
1. Compressor and blower motor thermally protected internally.
 2. All wiring to the unit must comply with NEC and local codes.
 3. Transformer is wired to 265 v (BRN) lead for 265/60/1 units, 230 v (ORG) lead for 220-240/50/1, or 208 v (RED) lead for 208/60/1. For 203/60/1 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
 4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
 5. Refer to PremierLink start-up and configuration instructions for control wiring to the unit. Low voltage wiring must be "Class 1" and voltage rated equal or greater than unit supply voltage.
 6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
 7. Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
 8. Fan motors factory wired for medium speed. For high or low speed remove BLU wire from fan motor speed tap 'M' and connect to 'H' for high or 'L' for low.

Fig. 3 — Typical Aquateze™ Complete C Control Wiring with PremierLink™ Control



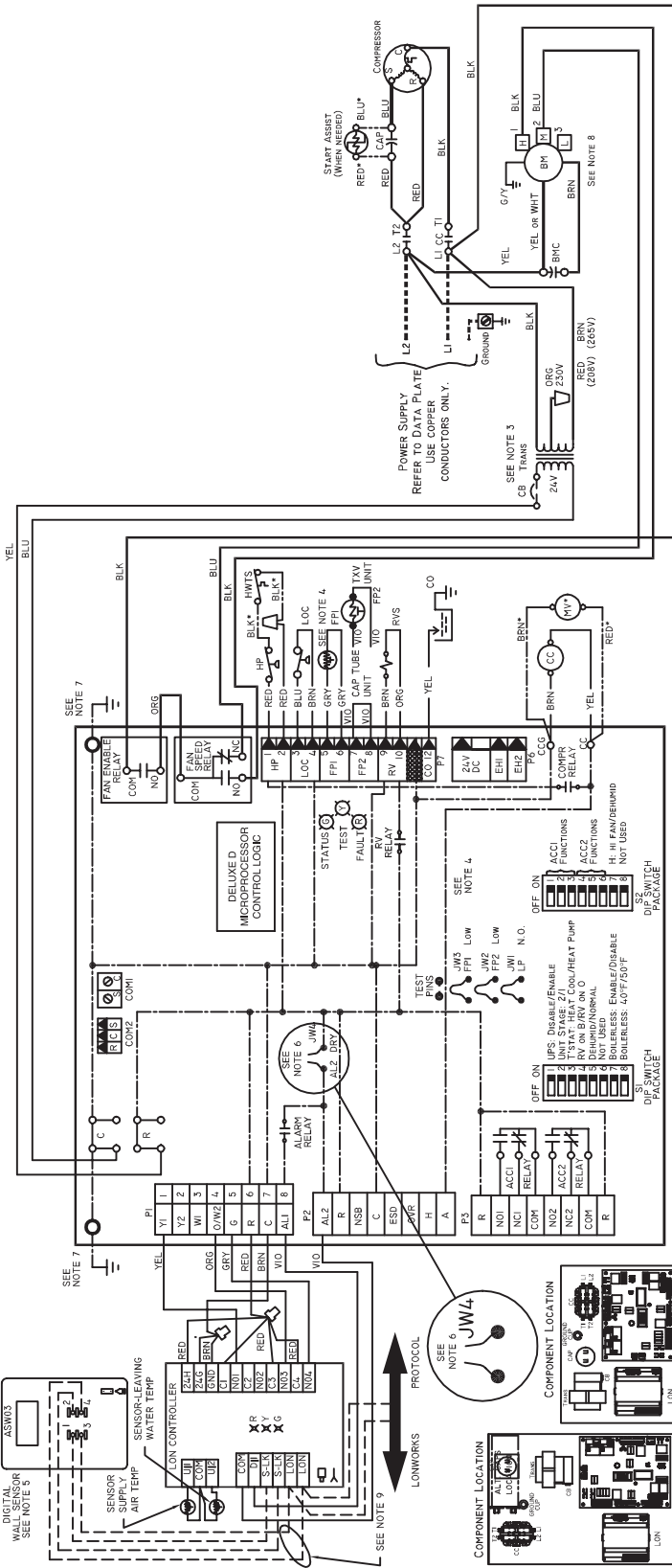
NOTES:

1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 265 v (BRN) lead for 265/60/1 units, or 208 v (RED) lead for 208/60/1. For 203/60/1 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermostat provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Check installation wiring information for specific thermostat hookup. Refer to Thermostat installation instructions for wiring to the unit. Thermostat wiring must be "Class 1" and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, at the motor attach BLACK wire to the higher of the two desired speed taps, and the BLUE wire to the lower of the two desired speed taps.
9. Aquastat is supplied with unit and must be wired in series with the hot leg to the pump. Aquastat is rated for voltages up to 277 v.

Fig. 4 — Typical Aquazone™ Deluxe D Control Wiring

LEGEND

- | | | |
|-----|-------------------------------------|-------------------------|
| AL | Alarm Relay Contacts | Thermistor |
| BC | Blower Contactor | Condensate Pan |
| BMC | Blower Motor Capacitor | Circuit Breaker |
| BR | Blower Relay | LED |
| CAP | Compressor Capacitor | Solenoid Coil |
| CB | Circuit Breaker | Relay Contacts - N.O. |
| CC | Compressor Contactor | Temperature Switch |
| CGG | Compressor Contactor Ground | Switch - Loss of Charge |
| CCH | Crankcase Heater | Ground |
| CO | Condensate Overflow Sensor | Wire Nut |
| DDC | Direct Digital Control | |
| EH | Emergency Heat | |
| FP1 | Water Coil Freeze Protection Sensor | |
| FP2 | Air Coil Freeze Protection Sensor | |
| GRY | Grey | |
| HP | High-Pressure Switch | |
| JW1 | Clippable Field Selection Jumper | |



- NOTES:**
1. Compressor and blower motor thermally protected internally.
 2. All wiring to the unit must comply with NEC and local codes.
 3. Transformer is wired to 265 v (BRN) lead for 265/60/1 units, 208 v (RED) lead for 208/60/1. For 230/60/1 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
 4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
 5. Refer to LonWorks® Installation, Application and Operation Manual for control wiring to the unit. Low voltage wiring must be "Class 1" and voltage rated equal or greater than unit supply voltage. Factory cut JW4 jumper dry contact will be available between AL1 and AL2.
 6. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
 7. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, at the motor attach BLACK wire to the higher of the two desired speed taps, and the BLUE wire to the lower of the two desired speed taps.
 8. Optional LON wires. Only connect if LON connection is desired at the wall sensor.

- LEGEND**
- LOC Loss of Charge Pressure Switch
 - MV Motorized Valve
 - NEC National Electrical Code
 - ORG Orange
 - PI Field Wiring Terminal Block
 - RVS Reversing Valve Solenoid
 - TRANS Transformer
 - TXV Thermostatic Expansion Valve
 - * Optional wiring
 - Field Line Voltage Wiring
 - Field Low Voltage Wiring
 - Printed Circuit Trace
 - Optional Wiring
 - Relay/Contactor Coil
 - Thermistor

- AL Alarm Relay Contacts
- BC Blower Contactor
- BM Blower Motor
- BMC Blower Motor Capacitor
- BR Blower Relay
- CAP Compressor Capacitor
- CB Circuit Breaker
- CC Compressor Contactor
- CCG Compressor Contactor Ground
- CO Condensate Overflow Sensor
- DDC Direct Digital Control
- EH Emergency Heat
- Water and Antifreeze Protection
- Grey
- FP1 & 2 High-Pressure Switch
- HP High (Leaving) Water Temperature Switch
- HWTS Clippable Field Selection Jumper
- JW1 Light-Emitting Diode
- LED

Fig. 5 — Typical Aquazone™ Deluxe D Control Wiring with LON Control

Complete C Control (Fig. 6)

⚠ CAUTION

Turn off unit power and lock out. Electrical shock and personal injury could result.

WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING — Select jumper 3 (JW3-FP1 Low Temp) to choose FP1 limit of either 30 F or 10 F. To select 30 F as the limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING — Select jumper 2 (JW2-FP2 Low Temp) to choose FP2 limit of either 30 F or 10 F. To select 30 F as the limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

ALARM RELAY SETTING — Select jumper 1 (JW1-AL2 Dry) to either connect alarm relay terminal (AL2) to 24 vac (R) or to remain as a dry contact (no connection). To connect AL2 to R, DO NOT clip the jumper. To set as dry contact, clip the jumper.

Deluxe D Control (Fig. 7)

⚠ CAUTION

Turn off unit power and lock out. Electrical shock and personal injury could result.

WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING — Select jumper 3 (JW3-FP1 Low Temp) to choose FP1 limit of either 30 F or 10 F. To select 30 F as the limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING — Select jumper 2 (JW2-FP2 Low Temp) to choose FP2 limit of either 30 F or 10 F. To select 30 F as the limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

ALARM RELAY SETTING — Select jumper 4 (JW4-AL2 Dry) to either connect alarm relay terminal (AL2) to 24 vac (R) or to remain as a dry contact (no connection). To connect AL2 to R, DO NOT clip the jumper. To set as dry contact, clip the jumper.

LOW PRESSURE SETTING — The Deluxe D control can be configured for Low Pressure Setting (LP). Select jumper 1 (JW1-LP Norm Open) for choosing between low pressure input normally opened or closed. To configure for normally closed operation, DO NOT clip the jumper. To configure for normally open operation, clip the jumper.

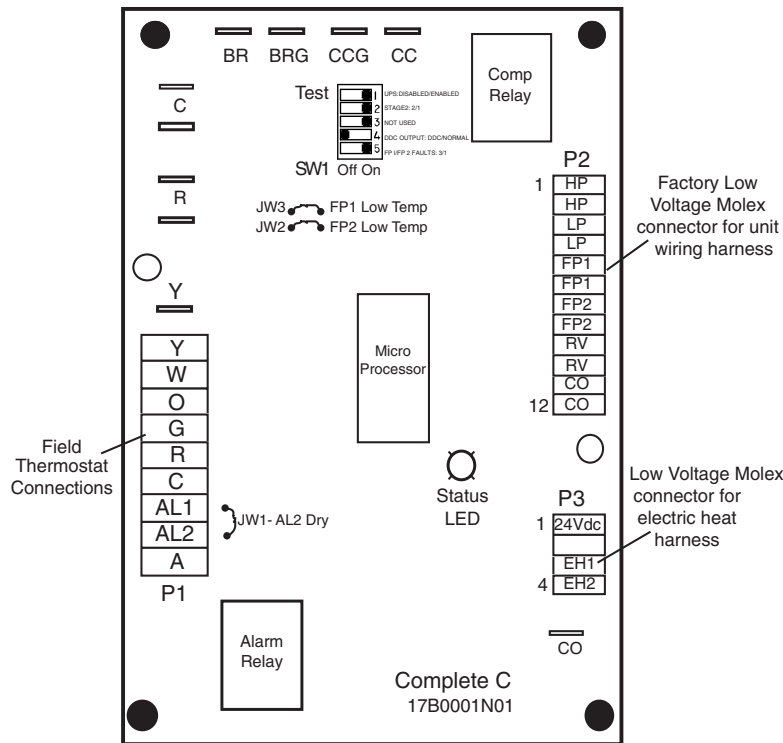


Fig. 6 — Complete C Board

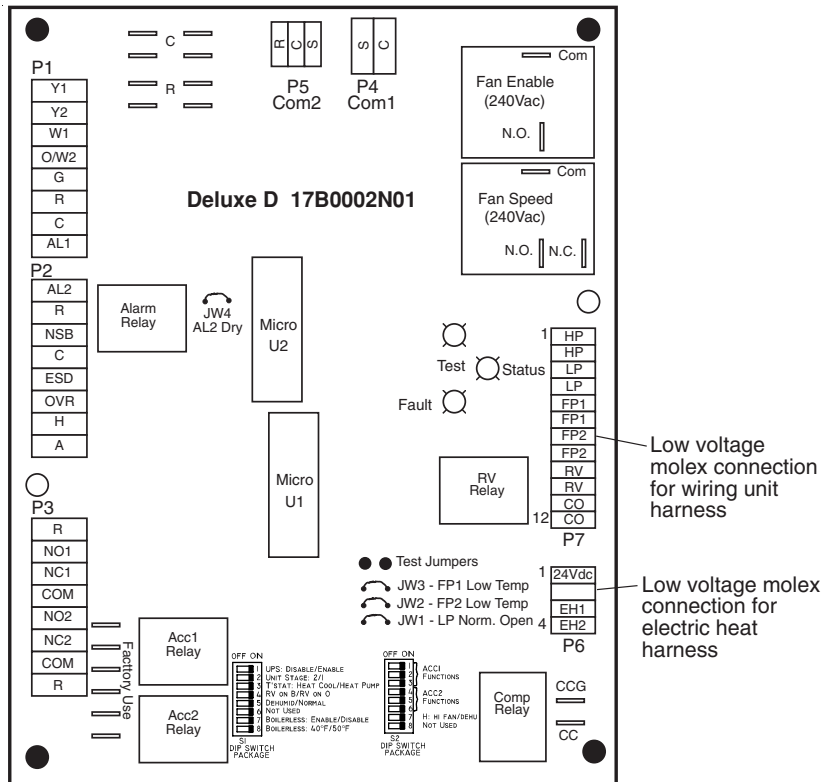


Fig. 7 — Deluxe D Board

CONFIGURATION

⚠ CAUTION

Turn off unit power and lock out. Electrical shock and personal injury could result.

Complete C Control DIP Switches — The Complete C control has one DIP (dual in-line package) switch bank with five switches labeled SW1. See Fig. 1.

PERFORMANCE MONITOR (PM) — The PM is a unique feature that monitors water temperature and will display a warning when heat pump is beyond typical operating range. Refer to Control Operation section for detailed information. DIP switch 1 will enable or disable this feature. To enable the PM, set the switch to ON. To disable the PM, set the switch to OFF.

STAGE 2 — Switch 2 will enable or disable compressor delay. Set switch to OFF for stage 2 in which the compressor will have a 3-second delay before energizing.

NOTE: The alarm relay will not cycle during Test mode if switch is set to OFF, stage 2.

Switch 3 is not used.

DDC OUTPUT AT EH2 — Switch 4 provides a selection for DDC (Direct Digital Control) operation. If set to DDC output at EH2, the EH2 terminal will continuously output the last fault code of the controller. If the control is set to EH2 Normal, then EH2 will operate as standard electric heat output. Set the switch to ON to set the EH2 to normal. Set the switch to OFF to set the DDC output at EH2.

NOTE: Some Complete C controls may only have a two-position DIP switch. Clip the jumper in position 4 of SW1 to select the DDC output at EH2 option.

FACTORY SETTING — Switch 5 is set to ON. Do not change the switch to OFF unless instructed to do so by the factory.

Deluxe D Control DIP Switches — The Deluxe D control has 2 DIP (dual in-line package) switch banks. Each bank has 8 switches and is labeled either S1 or S2 on the circuit board. See Fig. 4.

DIP SWITCH BANK 1 (S1) — This set of switches offers the following options for Deluxe D control configuration:

Performance Monitor (PM) — The PM is a unique feature that monitors water temperature and will display a warning when heat pump is beyond typical operating range. Refer to Control Operation section for detailed information. DIP switch 1 will enable or disable this feature. To enable the PM, set the switch to ON. To disable the PM, set the switch to OFF.

Compressor Relay Staging Operation — Switch 2 will enable or disable compressor relay staging operation. The compressor relay can be set to turn on with stage 1 or stage 2 call from the thermostat. This setting is used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications. In master/slave applications, each compressor and fan will stage according to its switch 2 setting. If switch is set to stage 2, the compressor will have a 3-second delay before energizing during stage 2 demand.

NOTE: If DIP switch is set for stage 2, the alarm relay will not cycle during Test mode.

Heating/Cooling Thermostat Type — Switch 3 provides selection of thermostat type. Heat pump or heat/cool thermostats can be selected. Select OFF for heat/cool thermostats. When in heat/cool mode, Y1 is used for cooling stage 1, Y2 is used for cooling stage 2, W1 is used for heating stage 1 and O/W2 is used for heating stage 2. Select ON for heat pump thermostats. In heat pump mode, Y1 used is for compressor stage 1, Y2 is used for compressor stage 2, W1 is used for heating stage 3 or emergency heat, and O/W2 is used for reversing valve (heating or cooling) depending upon switch 4 setting.

O/B Thermostat Type — Switch 4 provides selection for heat pump O/B thermostats. O is cooling output. B is heating output. Select ON for thermostats with O output. Select OFF for thermostats with B output.

Dehumidification Fan Mode — Switch 5 provides selection of normal or dehumidification fan mode. Select OFF for dehumidification mode. The fan speed relay will remain OFF during cooling stage 2. Select ON for normal mode. The fan speed relay will turn on during cooling stage 2 in normal mode.

Switch 6 — Switch 6 provides selection for DDC operation. If set to DDC output at EH2, the EH2 terminal will continuously output the last fault code of the controller. If the control is set to EH2 normal, then the EH2 will operate as standard electric heat output. Set the switch to ON to set the EH2 to normal. Set the switch to OFF to set the DDC output at EH2.

Boilerless Operation — Switch 7 provides selection of boilerless operation and works in conjunction with switch 8. In boilerless operation mode, only the compressor is used for heating when FP1 is above the boilerless changeover temperature set by switch 8 below. Select ON for normal operation or select OFF for boilerless operation.

Boilerless Changeover Temperature — Switch 8 on S1 provides selection of boilerless changeover temperature set point. Select OFF for set point of 50 F or select ON for set point of 40 F.

If switch 8 is set for 50 F, then the compressor will be used for heating as long as the FP1 is above 50 F. The compressor will not be used for heating when the FP1 is below 50 F and the compressor will operate in emergency heat mode, staging on EH1 and EH2 to provide heat. If a thermal switch is being used instead of the FP1 thermistor, only the compressor will be used for heating mode when the FP1 terminals are closed. If the FP1 terminals are open, the compressor is not used and the control goes into emergency heat mode.

DIP SWITCH BANK 2 (S2) — This set of DIP switches is used to configure accessory relay options. See Fig. 4.

Switches 1 to 3 — These DIP switches provide selection of Accessory 1 relay options. See Table 1 for DIP switch combinations.

Switches 4 to 6 — These DIP switches provide selection of Accessory 2 relay options. See Table 2 for DIP switch combinations.

Auto Dehumidification Mode or High Fan Mode — Switch 7 provides selection of auto dehumidification fan mode or high fan mode. In auto dehumidification fan mode the fan speed relay will remain off during cooling stage 2 if terminal H is active. In high fan mode, the fan enable and fan speed relays will turn on when terminal H is active. Set the switch to ON for auto dehumidification fan mode or to OFF for high fan mode.

Factory Setting — Switch 8 is set to ON. Do not change the switch to OFF unless instructed to do so by the factory.

Table 1 — DIP Switch Block S2 — Accessory 1 Relay Options

ACCESSORY 1 RELAY OPTIONS	DIP SWITCH POSITION		
	1	2	3
Cycle with Fan	On	On	On
Digital NSB	Off	On	On
Water Valve — Slow Opening	On	Off	On
OAD	On	On	Off
Reheat — (Fall in Humidity)	Off	Off	Off
Reheat — (Rise in Humidity)	Off	On	Off

LEGEND

NSB — Night Setback
OAD — Outside Air Damper

NOTE: All other DIP switch combinations are invalid.

Table 2 — DIP Switch Block S2 — Accessory 2 Relay Options

ACCESSORY 2 RELAY OPTIONS	DIP SWITCH POSITION		
	4	5	6
Cycle with Compressor	On	On	On
Digital NSB	Off	On	On
Water Valve — Slow Opening	On	Off	On
OAD	On	On	Off

LEGEND

NSB — Night Setback
OAD — Outside Air Damper

NOTE: All other switch combinations are invalid.

Deluxe D Control Accessory Relay Configurations — The following accessory relay settings are applicable for Deluxe D control:

CYCLE WITH FAN — In this configuration, the accessory relay 1 will be ON any time the Fan Enable relay is on.

CYCLE WITH COMPRESSOR — In this configuration, the accessory relay 2 will be ON any time the Compressor relay is on.

DIGITAL NIGHT SET BACK (NSB) — In this configuration, the relay will be ON if the NSB input is connected to ground C.

NOTE: If there are no relays configured for digital NSB, then the NSB and OVR inputs are automatically configured for mechanical operation. See the Mechanical Night Set Back section on page 16.

WATER VALVE (Slow Opening) — If relay is configured for Water Valve (slow opening), the relay will start 60 seconds prior to starting compressor relay.

OUTSIDE AIR DAMPER (OAD) — If relay is configured for OAD, the relay will normally be ON any time the Fan Enable relay is energized. The relay will not start for 30 minutes following a return to normal mode from NSB, when NSB is no longer connected to ground C. After 30 minutes, the relay will start if the Fan Enable is set to ON.

HUMIDITY CONTROL — A separate humidistat will allow the unit to dehumidify once the heating call is satisfied. Some integrated thermostats may be reconfigured to allow dehumidification in heating. See Fig. 4 for typical humidistat wiring. See below for Deluxe D DIP switch settings and reheat logic.

SENSOR	SWITCH BANK 2			LOGIC	REHEAT (ON)		REHEAT (OFF)	
	2.1	2.2	2.3		Terminal H	Terminal H		
Humidistat	OFF	OFF	OFF	Reverse	0 vac	24 vac		
Dehumidistat	OFF	ON	OFF	Standard	24 vac	0 vac		

Reheat

Humidistat — The humidistat energizes a contact when the humidity of the space rises or falls. See Table 3. A reheat coil (water coil located after the evaporator coil) will be modulated by a motorized valve enabled by the ACC1 relay to bring the supply air to neutral conditions.

Table 3 — Deluxe D Reheat Operating Modes

MODE	INPUT*				OUTPUT			
	O	G	Y1	H	O	G	Y1	Reheat Mode
No Demand	ON/OFF	OFF	OFF	OFF	ON/OFF	OFF	OFF	OFF
Fan Only	ON/OFF	ON	OFF	OFF	ON/OFF	ON	OFF	OFF
Cooling	ON	ON	ON	OFF	ON	ON	ON	OFF
Cooling and Humidistat†	ON	ON	ON	ON	ON	ON	ON	OFF
Humidistat Only	ON/OFF	OFF	OFF	ON	ON	ON	ON	ON
Heating	OFF	ON	ON	OFF	OFF	ON	ON	OFF
Heating and Humidistat	OFF	ON	ON	ON	OFF	ON	ON	OFF

*Reheat mode may be controlled with a humidistat configured for a rise or fall in humidity.

†Cooling input takes priority over dehumidify input.

**Deluxe D is programmed to ignore the H demand when the unit is in Heating mode.

CONTROL OPERATION

Complete C Control Indicators — The status LED on the Complete C control displays the current status of the Complete C control. If in Test mode, the LED will flash the code of the last fault and the alarm relay will cycle the same number as the fault code. See Table 4.

There are 2 categories of fault types: primary and secondary. Primary fault types include High Pressure (HP), Low Pressure (LP), Water Coil Freeze Protection (FP1), Air Coil Freeze Protection (FP2), and Condensate Overflow (CO). If fault type is primary, it is always stored in memory. Primary faults override secondary faults. Secondary fault types are: Over/Under Voltage Shutdown and Performance Monitor (PM). Secondary faults are retained in memory only if there are not any primary faults. Secondary faults will not override primary faults. See Table 5.

Table 4 — Complete C Control Current LED Status and Alarm Relay Operations

DESCRIPTION OF OPERATION	LED STATUS	ALARM RELAY
Normal Mode	On	Open
Normal Mode with PM Warning		Cycle (closed 5 sec., Open 25 sec.)
Complete C Control is non-functional	Off	Open
Fault Retry	Slow Flash	Open
Lockout	Fast Flash	Closed
Over/Under Voltage Shutdown	Slow Flash	Open (Closed after 15 minutes)
Test Mode — No Fault in Memory	Flashing Code 1	Cycling Code 1
Test Mode — HP Fault in Memory	Flashing Code 2	Cycling Code 2
Test Mode — LP Fault in Memory	Flashing Code 3	Cycling Code 3
Test Mode — FP1 Fault in Memory	Flashing Code 4	Cycling Code 4
Test Mode — FP2 Fault in Memory	Flashing Code 5	Cycling Code 5
Test Mode — CO Fault in Memory	Flashing Code 6	Cycling Code 6
Test Mode — Over/Under Shutdown in Memory	Flashing Code 7	Cycling Code 7
Test Mode — PM in Memory	Flashing Code 8	Cycling Code 8
Test Mode — FP1/FP2 Swapped Fault in Memory	Flashing Code 9	Cycling Code 9

LEGEND

CO	— Condensate Overflow
FP	— Freeze Protection
HP	— High Pressure
LED	— Light-Emitting Diode
LP	— Low Pressure
PM	— Performance Monitor

NOTES:

1. Slow flash is 1 flash every 2 seconds.
2. Fast flash is 2 flashes every 1 second.
3. EXAMPLE: "Flashing Code 2" is represented by 2 fast flashes followed by a 10-second pause. This sequence will repeat continually until the fault is cleared.

Table 5 — Complete C Control LED Code and Fault Descriptions

LED CODE	FAULT	DESCRIPTION
1	No fault in memory	There has been no fault since the last power-down to power-up sequence
2	High-Pressure Switch	HP Open Instantly
3	Low-Pressure Switch or LOC	LP open for 30 continuous seconds before or during a call (bypassed for first 120 seconds of operation)
4	Freeze Protection Coax — FP1	FP1 below Temp limit for 30 continuous seconds (bypassed for first 120 seconds of operation)
5	Freeze Protection Air Coil — FP2	FP2 below Temp limit for 30 continuous seconds (bypassed for first 120 seconds of operation)
6	Condensate overflow	Sense overflow (grounded) for 30 continuous seconds
7 (Autoreset)	Over/Under Voltage Shutdown	"R" power supply is <8 vac or >365 vac
8	PM Warning	Performance Monitor Warning has occurred.
9	FP1 and FP2 Thermostats are in Reverse Positions	FP1 temperature is higher than FP2 in Heating/Test mode, or FP2 temperature is higher than FP1 in Cooling test mode.

LEGEND

CO	— Condensate Overflow
FP	— Freeze Protection
HP	— High Pressure
LED	— Light-Emitting Diode
LOC	— Loss of Charge Switch
PM	— Performance Monitor

Complete C and Deluxe D Controls — The following operations are common to both Complete C and Deluxe D controls.

TEST MODE — Test mode provides the ability to check the control operation in a timely manner. The control enters a 20-minute Test mode by momentarily shorting the test terminals. All time delays are sped up 15 times.

To enter Test mode, cycle the power 3 times within 60 seconds or momentarily short the test terminals. The LED will flash a code representing the last fault when entering the Test mode. The alarm relay will also power on and off during Test mode. See Table 3. To exit Test mode, short the terminals for 3 seconds or cycle the power 3 times within 60 seconds.

NOTE: The flashing code and alarm relay cycling code will both have the same numerical label. For example, flashing code 1 will have an alarm relay cycling code 1. Code 1 indicates the control has not faulted since the last power off to power on sequence.

RETRY MODE — In retry mode, the status LED will start to flash slowly (one flash every two seconds) to signal that the control is trying to recover from an input fault. The control will stage off the outputs and try to again satisfy the thermostat used to terminal Y. Once the thermostat input calls are satisfied, the control will continue normal operation.

NOTE: If 3 consecutive faults occur without satisfying the thermostat input call to terminal Y, the control will go into lockout mode. The last fault causing the lockout is stored in memory and can be viewed by entering Test mode.

If one try is selected for FP1 and FP2 then there will be no retries for FP1 and FP2 faults.

POWER UP MODE — The unit will not operate until all the inputs, terminals and safety controls are checked for normal operation.

NOTE: The compressor will have a 5 minute anti-short cycle upon power up.

STANDBY MODE — The Y and W terminals are not active in Standby mode, however the O and G terminals may be active, depending on the application. The compressor will be off.

COOLING MODE — The Y and O terminals are active in cooling mode. After power up, the first call to the compressor will initiate a 5 to 80 second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

NOTE: On all subsequent compressor calls the random start delay is omitted.

HEATING STAGE 1 MODE — Terminal Y is active in heating stage 1. After power up, the first call to the compressor will initiate a 5 to 80 second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

NOTE: On all subsequent compressor calls the random start delay is omitted.

HEATING STAGE 2 MODE — To enter stage 2 mode, terminal W is active (Y is already active). Also, the G terminal must be active or the W terminal is disregarded. The compressor relay will remain on and EH1 is immediately turned on. EH2 will turn on after 10 minutes of continual stage 2 demand.

NOTE: EH2 will not turn on (or if on, will turn off) if FP1 temperature is greater than 45 F and FP2 is greater than 110 F.

LOCKOUT MODE — The status LED will flash fast in lockout mode and the compressor relay will be turned off immediately. Lockout mode can be “soft” reset via the Y input or can be “hard” reset via the disconnect. The last fault causing the lockout is stored in memory and can be viewed by entering test mode.

LOCKOUT WITH EMERGENCY HEAT — While in Lockout mode, if W becomes active, then Emergency Heat mode will occur.

EMERGENCY HEAT MODE — In Emergency Heat mode, terminal W is active while terminal Y is not. Terminal G must be active or the W terminal is disregarded. EH1 is immediately turned on. EH2 will turn on after 5 minutes of continual emergency heat demand.

NOTE: The FP1 and FP2 temperatures do not effect emergency heat operation.

HIGH-PRESSURE SWITCH (HP) — In the event of high refrigerant pressures, the high-pressure switch will open. The compressor relay is deenergized immediately because the high-pressure switch is in series with the compressor contactor coil. The high-pressure fault is recognized immediately. The high pressure lockout code 2 on the LED will appear as 2 fast flashes alternating with a 10-second pause.

LOW-PRESSURE SWITCH (LP) — If the low-pressure switch is open for 30 seconds prior to compressor power up, or is open and remains open for 30 continuous seconds during the “on” cycle, it is considered to be a low pressure (loss of charge) fault. The low-pressure switch input is bypassed for the first 120 seconds of compressor run cycle. The low pressure lockout code 3 on the LED will appear as 3 fast flashes alternating with a 10-second pause.

WATER COIL FREEZE PROTECTION (FP1) — The FP1 thermistor must be below the selected freeze protection limit setting and the measured temperature is rising at a rate of less than 2° F per 30 continuous seconds during a compressor run cycle to be recognized as a FP1 fault. The FP1 input is bypassed for the first 120 seconds of compressor run cycle. The FP1 lockout code 4 on the LED will appear as 4 fast flashes alternating with a 10-second pause.

AIR COIL FREEZE PROTECTION (FP2) — The FP2 thermistor must be below the selected freeze protection limit setting and the measured temperature is rising at a rate of less

than 2° F per 30 continuous seconds during a compressor run cycle to be recognized as a FP2 fault. The FP2 input is bypassed for the first 120 seconds of compressor run cycle. The FP2 lockout code 5 on the LED will appear as 5 fast flashes alternating with a 10-second pause.

CONDENSATE OVERFLOW (CO) — Condensate overflow sensor must sense overflow levels for 30 continuous seconds during a compressor run cycle to be recognized as a CO fault. The CO lockout code 6 on the LED will appear as 6 fast flashes alternating with a 10-second pause.

OVER/UNDER VOLTAGE SHUTDOWN — An over/under voltage shutdown condition exists when the control voltage is NOT in the range of 18 vac to 31.5 vac. The control will automatically be reset and normal operation will resume if the voltage comes back within at least 0.5 volts of the minimum and maximum voltage range (18.5 to 31 vac) for at least 0.5 seconds. This case is not considered a fault or lockout. If the control is in over/under voltage shutdown for 15 minutes, the alarm relay will close. The over/under voltage shutdown code 7 on the LED will appear as 7 fast flashes alternating with a 10-second pause.

PERFORMANCE MONITOR (PM) — The Performance Monitor displays a warning when the heat pump is operating inefficiently. The control will immediately generate a PM warning if any of the following conditions exist:

- FP2 is greater than 125 F for more than 30 continuous seconds in Heating mode with compressor energized.
- FP1 is greater than 125 F for more than 30 continuous seconds in Cooling mode with compressor energized.
- FP2 is less than 40 F for more than 30 continuous seconds in Cooling mode with compressor energized.

The status LED light will remain on as if control is in normal mode. Outputs of the control, excluding the LED and alarm relay, will not be affected by PM warning. A PM warning cannot happen during a compressor off cycle. During the PM warning, the alarm relay will cycle on and off. The cycle rate will continuously alternate on for 5 seconds and off for 25 seconds. PM warning code 8 on the LED will appear as 8 fast flashes alternating with a 10-second pause.

ANTI-SHORT CYCLE PROTECTION — The control features a 5-minute time delay from the last start before energizing the compressor again.

NOTE: The 5-minute anti-short cycle occurs at every power up.

RANDOM START — The random start control features five 80-second random start upon power up. The random start delay will be present in Deluxe D control after a control power up and after returning from Night Setback or Emergency Shutdown modes.

SWAPPED FP1/FP2 THERMISTORS — During Test mode, the control monitors to see if the FP1 and FP2 thermistors are wired to the appropriate place. If the control is in Test mode, the control will lock out, with code 9, after 30 seconds if:

- The compressor is on and in cooling mode and the FP1 sensor is colder than the FP2 sensor.
- The compressor is on and in heating mode and the FP2 sensor is colder than the FP1 sensor.

SENSORS

Thermistor — The thermistor is negative temperature coefficient (NTC) type and the sensor has a 1% calibration tolerance. See Fig. 8 and Table 6.

Condensate Sensor — The condensate sensor input will fault upon sensing impedance less than 100,000 ohms for 30 continuous seconds. The recommended design uses a single wire terminated with a male 1/4 in. quick connect located in the drain pan at the desired trip level. Upon a high condensate level the water will short between the air coil and the quick connect producing a resistance less than 100,000 ohms. Since condensate is free of impurities, it has no conductivity. Only

the impurities from the drain pan and coil dust or dirt create the conductance. A second ground wire with appropriate terminal to the drain pan can be used with the control to replace the air coil ground path. The condensate sensor can also be any open contact that closes upon a fault connection.

Table 6 — Thermistor Calibration Points

TEMP (F)	MINIMUM RESISTANCE (ohm)	MAXIMUM RESISTANCE (ohm)	NOMINAL RESISTANCE (ohm)
78.5	9,523	9,715	9,619
77.5	9,650	9,843	9,746
76.5	10,035	10,236	10,135
75.5	10,282	10,489	10,385
33.5	30,975	31,598	31,285
32.5	31,871	32,512	32,190
31.5	32,653	33,310	32,980
30.5	33,728	34,406	34,065
1.5	80,624	82,244	81,430
0.5	83,327	85,002	84,160
0.0	84,564	86,264	85,410

Deluxe D Control — The Deluxe D control includes all of the control operations above in addition to the following advanced operations:

LED INDICATORS — There are 3 LED indicators on the Deluxe D control. See Table 7 for indicators.

Status LED — Status LED indicates the current status or mode of the Deluxe D control. The status LED light is green.

Test LED — Test LED will be activated any time the Deluxe D control is in Test mode. The test LED light is yellow.

Fault LED — Fault LED light is red. The fault LED will always flash a code representing the last fault in memory. If there is no fault in memory, the fault LED will flash code 1 on the and appear as 1 fast flash alternating with a 10-second pause. See Table 7.

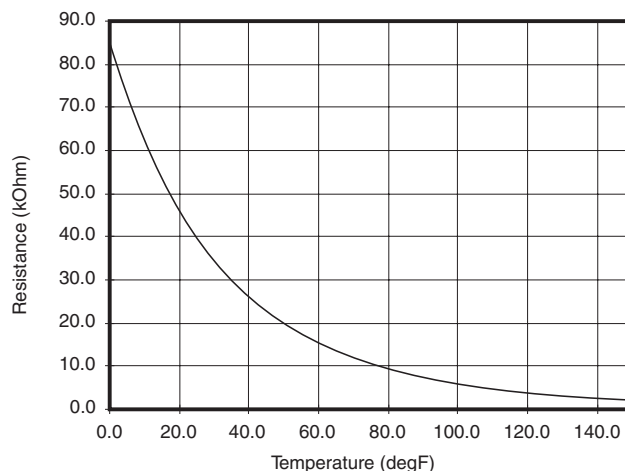


Fig. 8 — Thermistor Nominal Resistance

EXTENDED COMPRESSOR OPERATION MONITOR — If the compressor has been on for 4 continuous hours the control will automatically turn off the compressor relay and wait the short cycle time protection time. All appropriate safeties including the low-pressure switch will be monitored. If all operations are normal, and the compressor demand is still present, the control will turn the compressor back on.

STANDBY/FAN ONLY MODE — The compressor will be off. The fan enable, fan speed, and reversing valve (RV) relays will be on if inputs are present. If there is a fan 1 demand, the fan enable will immediately turn on. If there is a fan 2 demand, the fan enable and fan speed relays will immediately turn on.

NOTE: DIP switch 5 on S1 (dehumidification fan mode select) does not have an effect upon fan 1 and fan 2 outputs.

Table 7 — Aquazone™ Deluxe D Control Current LED Status and Alarm Relay Operations

DESCRIPTION	STATUS LED (Green)	TEST LED (Yellow)	FAULT LED (Red)	ALARM RELAY
Normal Mode	On	Off	Flash Last Fault Code in Memory	Open
Normal Mode with PM	On	Off	Flashing Code 8	Cycle (closed 5 sec, open 25 sec, ...)
Deluxe D Control is Non-Functional	Off	Off	Off	Open
Test Mode	—	On	Flash Last Fault Code in Memory	Cycling Appropriate Code
Night Setback	Flashing Code 2	—	Flash Last Fault Code in Memory	—
ESD	Flashing Code 3	—	Flash Last Fault Code in Memory	—
Invalid Thermostat Inputs	Flashing Code 4	—	Flash Last Fault Code in Memory	—
No Fault in Memory	On	Off	Flashing Code 1	Open
HP Fault	Slow Flash	Off	Flashing Code 2	Open
LP Fault	Slow Flash	Off	Flashing Code 3	Open
FP1 Fault	Slow Flash	Off	Flashing Code 4	Open
FP2 Fault	Slow Flash	Off	Flashing Code 5	Open
CO Fault	Slow Flash	Off	Flashing Code 6	Open
Over/Under Voltage	Slow Flash	Off	Flashing Code 7	Open (closed after 15 minutes)
HP Lockout	Fast Flash	Off	Flashing Code 2	Closed
LP Lockout	Fast Flash	Off	Flashing Code 3	Closed
FP1 Lockout	Fast Flash	Off	Flashing Code 4	Closed
FP2 Lockout	Fast Flash	Off	Flashing Code 5	Closed
CO Lockout	Fast Flash	Off	Flashing Code 6	Closed
Swapped FP1/FP2	Fast Flash	Off	Flashing Code 9	Closed

LEGEND

- CO** — Condensate Overflow
- ESD** — Emergency Shutdown
- FP** — Freeze Protection
- HP** — High Pressure
- LP** — Low Pressure
- PM** — Performance Monitor

NOTES:

1. If there is no fault in memory, the Fault LED will flash code 1.
2. Codes will be displayed with a 10-second Fault LED pause.
3. Slow flash is 1 flash every 2 seconds.
4. Fast flash is 2 flashes every 1 second.
5. EXAMPLE: "Flashing Code 2" is represented by 2 fast flashes followed by a 10-second pause. This sequence will repeat continually until the fault is cleared.

HEATING STAGE 1 MODE — In Heating Stage 1 mode, the fan enable and compressor relays are turned on immediately. Once the demand is removed, the relays are turned off and the control reverts to Standby mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will operate per their associated DIP switch 2 setting on S1.

HEATING STAGE 2 MODE — In Heating Stage 2 mode, the Fan Enable and Compressor relays remain on. The fan speed relay is turned on immediately and is turned off immediately once the demand is removed. The control reverts to Heating Stage 1 mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will operate per their associated DIP switch 2 setting on S1. If configured as Stage 2 (DIP switch S1 position 2 is set to OFF) then the compressor and fan will not turn until there is a call for Stage 2.

HEATING STAGE 3 MODE — In Heating Stage 3 mode, the fan enable, fan speed and compressor relays will remain on. The EH1 output is turned on immediately. With continuing Heat Stage 3 demand, EH2 will turn on after 10 minutes. The EH1 and EH2 output signals are turned off immediately when the Heating Stage 3 demand is removed. The control reverts to Heating Stage 2 mode.

The EH2 output signal will be off if FP1 is greater than 45 F AND FP2 (when shorted) is greater than 110 F during Heating Stage 3 mode. This condition will have a 30-second recognition time. Also, during Heating Stage 3 mode, EH1, EH2, fan enable, and fan speed will be ON if G input is not active.

EMERGENCY HEAT MODE — In Emergency Heat mode, the fan enable and fan speed relays are turned on. The EH1 output is turned on immediately. With continuing Emergency Heat demand, EH2 will turn on after 5 minutes. Fan enable and fan speed relays are turned off after a 60-second delay. The control reverts to Standby mode.

The EH1, EH2, fan enable, and fan speed signals will be ON if the G input is not active during Emergency Heat mode.

COOLING STAGE 1 — In Cooling Stage 1 mode, the fan enable, compressor and RV relays are turned on immediately. If configured as stage 2 (DIP switch S1 position 2 set to OFF) then the compressor and fan will not turn on until there is a stage 2 demand. The fan enable and compressor relays are turned off immediately when the Cooling Stage 1 demand is removed. The control reverts to Standby mode. The RV relay remains on until there is a heating demand. If there is a master/slave or dual compressor application, all compressor relays and related functions will track with their associated DIP switch 2 on S1.

COOLING STAGE 2 — In Cooling Stage 2 mode, the fan enable, compressor and RV relays remain on. The fan speed relay is turned off immediately once the Cooling Stage 2 demand is removed. The control reverts to Cooling Stage 1 mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will track with their associated DIP switch 2 on S1.

NIGHT LOW LIMIT (NLL) STAGED HEATING — In NLL staged Heating mode, the override (OVR) input becomes active and is recognized as a call for heating and the control will immediately go into a Heating Stage 1 mode. With an additional 30 minutes of NLL demand, the control will go into Heating Stage 2 mode. With another additional 30 minutes of NLL demand, the control will go into Heating Stage 3 mode.

Thermostat Inputs

COMPLETE C CONTROL

Y and W Terminals — Terminals Y and W have 1-second recognition time when being activated or removed.

O and G Terminals — Terminals O and G are direct pass through signals monitored by the microprocessor.

R and C Terminals — Terminals R and C originate from the transformer.

AL1 and AL2 Terminals — Terminals AL1 and AL2 originate from alarm relay.

Terminal A — Terminal A is paralleled with compressor output for use with well water solenoid valves.

Y 1/4 in. Quick Connect — The Y 1/4 in. quick connect is for factory use. It is used for panel mount relays such as loop pump relay.

DELUXE D CONTROL (see Tables 8-10)

Y1 — Terminal Y1 is input for compressor stage 1 if DIP switch 3 on S1 is set to ON. If DIP switch is set to OFF, then Y1 is input for Cooling Stage 1.

Y2 — Terminal Y2 is input for compressor stage 2 if DIP switch 3 on S1 is set to ON. If DIP switch is set to OFF, then Y2 is input for Cooling Stage 1.

W1 — If terminals Y1 and Y2 are active and DIP switch 3 on S1 is set to ON, then W1 is input for Heating Stage 3. If Y1 and Y2 are NOT active and DIP switch is set to ON, then W1 is input for Emergency Heat mode. If DIP switch is set to OFF, then W1 is input for Heating Stage 1 mode.

O/W2 — If DIP switches 3 and 4 on S1 are set to ON, terminal O/W2 will be input for Reversing Valve (RV) relay. If DIP switch 3 is OFF and DIP switch 4 is ON, O/W2 will be the input for Heating Stage 2 mode.

If DIP switch 3 is ON and DIP switch 4 is OFF, O/W2 will be the input for Heat mode. In this mode, the thermostat outputs a B call when in Heating mode and does not have an O output. The D control will employ RV control. This ensures RV will only switch positions if the thermostat has a call for heating/cooling mode change.

R and C Terminals — Terminals R and C originate from the transformer.

AL1 and AL2 Terminals — Terminals AL1 and AL2 originate from alarm relay.

G — Input for fan enable relay.

NSB and Override — When digital NSB is selected via the accessory relay DIP switch and the NSB input is connected to ground C, the appropriate accessory relay directly tracks the NSB input.

When digital NSB is NOT selected via the accessory relay DIP switch and the NSB input is NOT connected to ground C, then all thermostat inputs are ignored. During this time period, if OVR is momentarily connected to 24 vac, then the thermostat outputs are once again monitored for 2 hours. After the 2-hour override period, the Deluxe D control will assume NSB is again connected to ground C and the control will revert back to ignoring the thermostat inputs. There will be a random start timer when coming back from NSB mode.

A maximum of 75 Deluxe D controllers can be daisy-chained to the NSB terminals. The maximum total wire resistance is 500 ohms.

Table 8 — Deluxe D Control System Inputs

UNIT OPERATING MODE*	SYSTEM INPUTS			NIGHT SETBACK TYPE (NSB)	UNIT OPERATION IMPACTS
	Emergency Shut Down (ESD)	Night Setback (NSB)	Override (OVR)		
ANY	X	ANY	ANY	NONE	UNIT SHUT DOWN
ALL (EXCEPT INVALID)	OFF	OFF	OFF	NONE	NORMAL OPERATION
		OFF	M	NONE	
		X	OFF	DIGITAL	
		X	M	DIGITAL	
		X	OFF	MECHANICAL	STANDBY / OFF
		X	M	MECHANICAL	NORMAL FOR 2 HRS THEN RETURN TO STANDBY
C1, C2	OFF	OFF	X	NONE	INVALID
		X	X	MECHANICAL	
		X	X	DIGITAL	
EH	OFF	OFF	X	NONE	EH — NO CHANGE
		X	X	MECHANICAL	
		X	X	DIGITAL	
INVALID — UNIT WILL NOT OPERATE	OFF	ANY	ANY	NONE	UNIT WILL NOT OPERATE
OFF, F, H1,H2 OR H3	OFF	OFF	X	NONE	NLL STAGED HEATING
		X	X	MECHANICAL	
		X	X	DIGITAL	

LEGEND

- | | |
|-----------------------------|------------------------------|
| C1 — Cooling Stage 1 | H3 — Heat Stage 3 |
| C2 — Cooling Stage 2 | M — Momentary Input |
| EH — Emergency Heat | NLL — Night Low Limit |
| F — Fan | RVR — Reversing Valve |
| H1 — Heat Stage 1 | X — Continuous Input |
| H2 — Heat Stage 2 | |

*See Table 8 for additional operating mode information.

Table 9 — Deluxe D Control — Input Combinations — DIP Switch Block 1 (S1)

UNIT OPERATION		THERMOSTAT CONNECTIONS ENERGIZED					SWITCH 1 SETTING	
Mode	Operation	G	Y1	Y2	W1	O/W2	DIP 3	DIP 4
(OFF)	STANDBY / OFF	—	—	—	—	—	ANY	ANY
(FAN)	FAN OPERATION ONLY	X	—	—	—	—	ANY	ANY
(C1)	COOLING 1- FAN ENABLE / RVR – NO FAN OR COMPRESSOR	—	X	—	—	X	ON	ON
		—	X	—	—	—	ON	OFF
		—	X	—	—	—	OFF	ANY
(C2)	COOLING 2- FAN / COMPRESSOR 1 / RVR	—	—	X	—	X	ON	ON
		—	—	X	—	—	ON	OFF
		—	—	X	—	—	OFF	ANY
(H1)	HEATING 1- FAN ENABLE – NO FAN OR COMPRESSOR	—	X	—	—	—	ON	ON
		—	X	—	—	X	ON	OFF
		—	—	—	X	—	OFF	ANY
(H2)	HEATING 2- FAN / COMPRESSOR 1	—	—	X	—	—	ON	ON
		—	—	X	—	X	ON	OFF
		—	—	—	—	X	OFF	ANY
(H3)	HEATING 3- FAN / COMPRESSOR*/ELECTRIC HEAT	—	X	—	X	—	ON	ON
		—	X	—	X	X	ON	OFF
(EH)	HEATING – FAN / EMERGENCY ELECTRIC HEAT	—	—	—	X	—	ON	ON
		—	—	—	X	—	ON	OFF
—	Unit will not operate	—	—	—	X	X	ON	ON
		—	X	—	X	—	OFF	ANY
		—	X	—	—	X	OFF	ANY
		—	—	X	X	—	OFF	ANY
		—	—	X	—	X	OFF	ANY
		—	X	X	X	—	ON	OFF

LEGEND

- | | |
|-----------------------------|--------------------------|
| C1 — Cooling Stage 1 | H1 — Heat Stage 1 |
| C2 — Cooling Stage 2 | H2 — Heat Stage 2 |
| EH — Emergency Heat | H3 — Heat Stage 3 |

NOTE: Input combinations are on S1 with DIP Switch 2 set for “off” position for all combinations.

*Compressor no. 1 if energized.

Table 10 — Deluxe D Control — Input Combinations — DIP Switch Block 2 (S2)

UNIT OPERATING MODE*	SIGNAL ON H	SWITCH 2 DIP 7	UNIT OPERATION IMPACT
STANDBY / OFF	ENERGIZED	ON	STANDBY / OFF WITH AUTO. DEHUMIDIFICATION
		OFF	FAN HIGH
FAN 1 SIGNAL	ENERGIZED	ON	FAN LOW WITH AUTO. DEHUMIDIFICATION
		OFF	FAN HIGH
COOLING 1 SIGNAL	ENERGIZED	ON	COOLING WITH FAN LOW†
		OFF	COOLING WITH FAN HIGH†
COOLING 2 SIGNAL	ENERGIZED	ON	COOLING WITH FAN LOW†
		OFF	COOLING WITH FAN HIGH†
HEATING 1 SIGNAL	ENERGIZED	ON	HEATING WITH FAN LOW†
		OFF	HEATING WITH FAN HIGH†
HEATING 2 SIGNAL	ENERGIZED	ANY	HEATING WITH FAN HIGH
HEATING 3 SIGNAL	ENERGIZED	ANY	HEATING WITH FAN HIGH
EMERGENCY HEAT	ENERGIZED	ANY	EMERGENCY HEAT WITH FAN HIGH
INVALID	ANY	ANY	INVALID

LEGEND

H — Automatic Dehumidification

*See Table 8 for additional operation information.

†These results will vary depending on the configuration of DIP Switch 2 on S1.

NOTE: Input combinations are on S2 with DIP switch 7 and input “H” for automatic dehumidification.

ESD (Input for Emergency Shutdown mode) — When ESD is connected to ground C, all thermostat inputs are ignored and all outputs are turned off. There will be a random start timer when coming back from ESD mode.

A maximum of 75 Deluxe D controllers can be daisy-chained to the ESD terminals. The maximum total wire resistance is 500 ohms.

OVR (Input for Night Set Back Override or Night Low Limit Staged Heating input) — If digital NSB is NOT selected via accessory relay DIP switch inputs but is connected to ground C and OVR is momentarily connected to 24 vac for at least 1 second, then the OVR input is recognized as a NSB signal. The Deluxe D control reverts from NSB and begins to monitor thermostat inputs for heating and cooling calls for a 2-hour override period. If NSB is connected to ground C and if OVR is continuously connected to 24 vac, then the OVR input is recognized as a call for NLL Staged Heating. The control will then enter NLL Staged Heating.

H — The H input function is determined by the setting of DIP switch 7 on S2. If switch 7 on S2 is set to ON, then the H input is set to Automatic Dehumidification mode and is used as an automatic counterpart to DIP switch 5 on S1. If H is connected to 24 vac, the fan speed relay will not turn on during Cooling Stage 2. If H is NOT connected to 24 vac, then the fan speed relay will turn on during Cooling Stage 2.

If DIP switch 7 on S2 is set to OFF, then the H input is defined as High Speed Fan input. If the Deluxe D control is in normal operating mode and the H input is connected to 24 vac, then the fan enable and fan speed relays will be on at all times.

COMMUNICATION PORTS — There are 2 communication ports on the Deluxe D control (COM1 and COM2) which provide communications to external Deluxe D control boards.

COM1 — COM1 is used to communicate thermostat and external calls to other Deluxe D control master/slave controls. Up to 3 heat pumps can be controlled by one thermostat. The master Deluxe D control is defined as the primary Deluxe D control that is directly connected to the wall-mounted thermostat, timeclock, fire alarm and humidistat. The master Deluxe D control communicates typical thermostat signals to the secondary (or slave) Deluxe D control. The slave Deluxe D control does not have any direct connection to exterior devices.

NOTE: Each heat pump has the ability to be a dual compressor unit allowing up to 6 Deluxe D controls to be controlled by one thermostat. Only one Deluxe D control in each heat pump will be daisy chained on COM1.

COM2 — COM2 has the ability to communicate thermostat and external calls to a second Deluxe D control being used for dual compressor function. A heat pump with 2 compressors will have one Deluxe D control for each compressor. The master Deluxe D control will handle all input and output commands with external sources, monitor and control all operations of the secondary Deluxe D control. The secondary Deluxe D control does not have any direct connection to exterior devices.

Since the master and slave Deluxe D controls share sensor and water valve/pump restart operations they also share signals. Both Deluxe D controls will fault or go into lockout mode if either the master or slave Deluxe D control senses a CO fault. In either mode, the Deluxe D control will continue to provide water valve/pump restart operation for the other functioning Deluxe D control.

MECHANICAL NIGHT SET BACK — When NSB input is connected to ground C, all thermostat inputs are ignored. A thermostat set back heating call will then be connected to the OVR input. If OVR input becomes active, then the Deluxe D control will enter night low limit (NLL) staged heating mode. The NLL staged heating mode will then provide heating during the NSB period.

TROUBLESHOOTING

Refer to Fig. 9 and Tables 11-13 for additional troubleshooting guidelines.

Field Inputs — All inputs are 24 vac from the thermostat and can be verified using a voltmeter. See Tables 11 and 12 for input/output connections and descriptions.

Sensor Inputs — All sensor inputs are paired wires connecting each component with the board. Check pressure and condensate switches at the board connector. Measure thermistor resistance with the connector removed so only the impedance of the thermistor is measured.

Sensor Outputs — Compressor relay is 24 vac and can be verified using a voltmeter. The fan signal is passed through the board to the external fan relay. The alarm relay can be 24 vac or dry contact for use with DDC (Direct Digital Controls) by clipping the J1 jumper. Electric heat outputs are 24 vdc ground sinking and require a voltmeter set to DC to verify operation.

Test Mode — Test mode can be entered for 20 minutes by shorting the test pins. For diagnostic ease at the thermostat, the alarm relay will also cycle during Test mode. The alarm relay will cycle on and off similarly to the status LED to indicate a code representing the last fault at the thermostat.

NOTE: Test mode can also be entered and exited by cycling the G input 3 times within a 60-second time period.

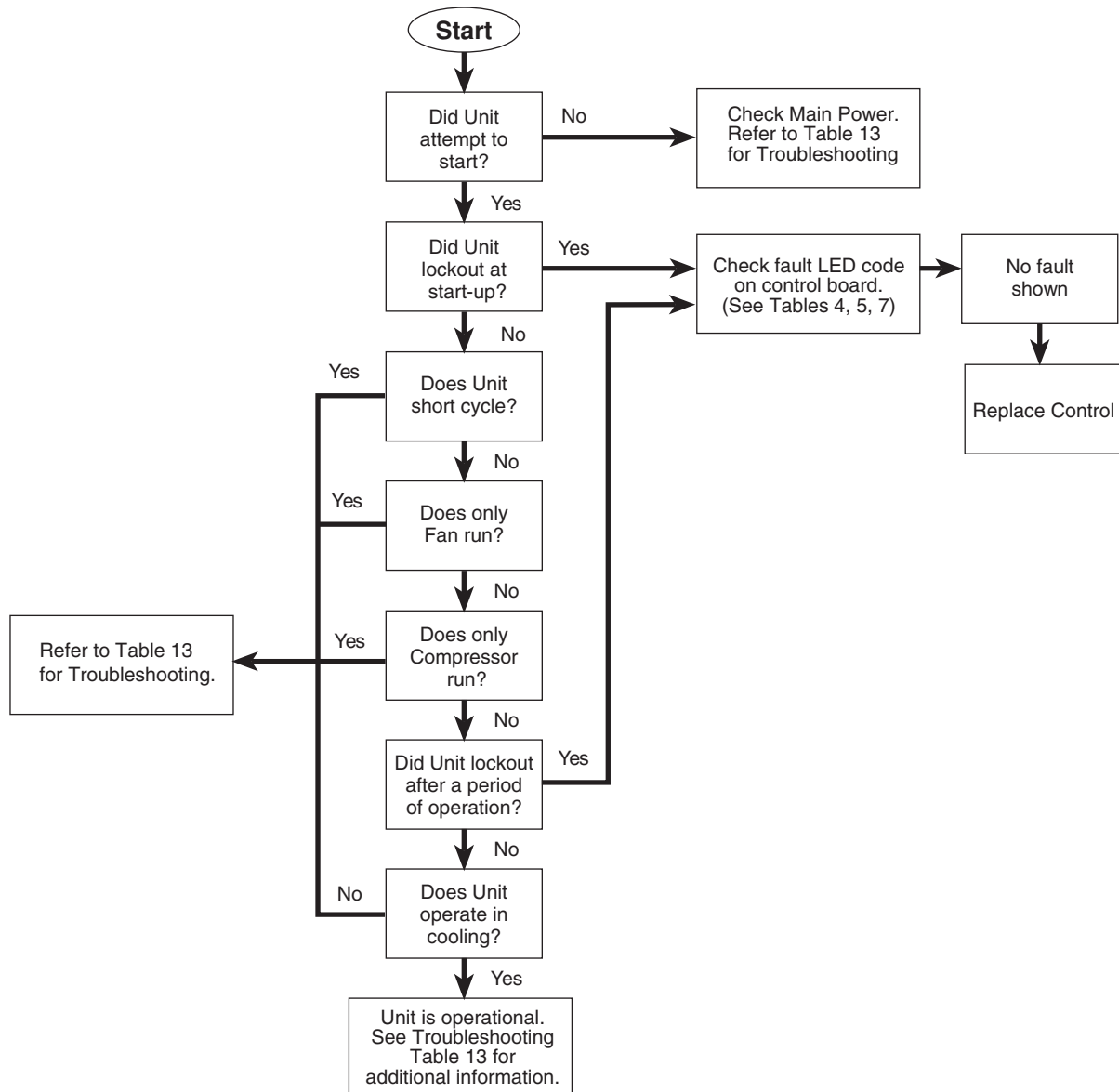


Fig. 9 — Aquazone™ Electric Heat Pump Control Troubleshooting Flow Chart

Table 11 — Complete C Control Input/Output Reference

CONNECTION	INPUT OR OUTPUT	DESCRIPTION
R	—	24 vac
C	—	24 vac (grounded common)
Y	I	Connect to thermostat — Y output call for compressor
W	I	Connect to thermostat — W output call for Heating 2 or Emergency Heat
O	I	Connect to terminal — O output call for reversing valve with cooling
G	I	Connect to thermostat — G output call for fan
AL1	O	Connect to thermostat fault light — 28 va at 24 vac or dry alarm
AL2	O	Alarm relay 28 va at 24 vac or dry
A	O	Output for water solenoid valve — paralleled with compressor contactor coil 20 va at 24 vac
BR	O	Connection for blower relay-direct connect from G
BRG	O	Blower relay common connection
CC	O	Connection for compressor contactor
CCG	O	Compressor contactor common connection
HP	I	High-pressure switch input terminals
LP	I	Low-pressure switch input terminals
FP1	I	Water coil freeze protection thermistor input
FP2	I	Air coil freeze protection thermistor input
RV	O	Reversing valve output terminals — direct connection from “O”
CO	I	Condensate overflow input terminals
24VDC	O	24 vdc supply to electric heat module
EH1	O	Output terminal for stage 1 electric heat
EH2	O	Output terminal for stage 2 electric heat

LEGEND

- I — Input
- O — Output

Table 12 — Deluxe D Control Input/Output Reference

CONNECTION	INPUT OR OUTPUT	DESCRIPTION
R	—	24 vac
C	—	24 vac (grounded common)
Y1	I	Connect to thermostat — Y1 output call for compressor stage 1
Y2	I	Connect to thermostat — Y2 output call for compressor stage 2
W1	I	Connect to thermostat — W1 output call for Heating 3 or Emergency Heat
O/W2	I	Connect to thermostat — O output call for reversing valve with cooling
G	I	Connect to thermostat — G output call for fan
AL1	O	Connect to thermostat fault light — 28 va at 24 vac or dry alarm
AL2	O	Alarm relay 28 va at 24 vac or dry
A	O	Output for water solenoid valve — paralleled with compressor contactor coil
NO1	O	Normally open accessory relay 1, 28 va at 24 vac
NC1	O	Normally closed accessory relay 1, 28 va at 24 vac
NO2	O	Normally open accessory relay 2, 28 va at 24 vac
NC2	O	Normally closed accessory relay 2, 28 va at 24 vac
Fan Enable	O	Fan enable relay
Fan Speed	O	Fan speed relay
CC	O	Connection for compressor contactor
CCG	O	Compressor contactor common connection
HP	I	High-pressure switch input terminals
LP	I	Low-pressure switch input terminals
FP1	I	Water coil freeze protection thermistor input
FP2	I	Air coil freeze protection thermistor input
RV	O	Reversing valve output terminals — direct connection from “O”
CO	I	Condensate overflow input terminals
24VDC	O	24 vdc supply to electric heat module
EH1	O	Output terminal for stage 1 electric heat
EH2	O	Output terminal for stage 2 electric heat
NSB	I	Night setback input
OVR	I	Night setback override input
ESD	I	Emergency shutdown input
H	I	Dehumidification or high speed fan input DIP switch bank 2, switch 7

LEGEND

- I — Input
- O — Output

Table 13 — Troubleshooting

FAULT	HEATING	COOLING	POSSIBLE CAUSE	SOLUTION
Main Power Problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24 vac between R and C on controller.
				Check primary/secondary voltage on transformer.
HP Fault — Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting. Check water flow adjust to proper flow rate.
		X	Water temperature out of range in cooling	Bring water temperature within design parameters.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. Dirty air coil — construction dust etc. External static pressure too high. Check blower tables in Installation Instructions book.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition in Installation Instructions.
	X	X	Bad HP switch	Check switch continuity and operation. Replace.
	X	X	Insufficient charge	Check for refrigerant leaks.
LP/LOC Fault — Code 3 Low Pressure/Loss of Charge	X		Compressor pump down at start-up	Check charge and start-up water flow.
	X			
FP1 Fault — Code 4 Water Freeze Protection	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting. Plugged strainer or filter. Clean or replace. Check water flow adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper freeze protect setting (30 F vs 10 F)	Clip JW2 jumper for antifreeze (10 F) use.
	X		Water temperature out of range	Bring water temperature within design parameters.
	X	X	Bad thermistor	Check temperature and impedance correlation.
		X		
FP2 Fault — Code 5 Air Coil Freeze Protection		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. External static pressure too high. Check blower tables in Installation Instructions book.
		X	Air temperature out of range	Too much cold vent air. Bring entering air temperature within design parameters.
		X	Improper freeze protect setting (30 F vs 10 F)	Normal airside applications will require 30 F only.
	X	X	Bad thermistor	Check temperature and impedance correlation.
		X		
Condensate Fault — Code 6	X	X	Blocked drain	Check for blockage and clean drain.
	X	X	Improper trap	Check trap dimensions and location ahead of vent.
		X	Poor drainage	Check for piping slope away from unit. Check slope of unit toward outlet. Poor venting. Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
Over/Under Voltage — Code 7 (Auto Resetting)	X	X	Under voltage	Check power supply and 24 vac voltage before and during operation. Check power supply wire size. Check compressor starting. Check 24 vac and unit transformer tap for correct power supply voltage.
	X	X	Over voltage	Check power supply voltage and 24 vac before and during operation. Check 24 vac and unit transformer tap for correct power supply voltage.
Performance Monitor — Code 8	X		Heating mode FP2>125 F	Check for poor airflow or overcharged unit.
		X	Cooling mode FP1>125 F OR FP2< 40 F	Check for poor water flow or airflow.
Swapped Thermistor — Code 9	X	X	FP1 and FP2 swapped	Reverse position of thermistors
ESD — ERV Fault (Deluxe D Control Only) Green Status LED — Code 3	X	X	ERV (Energy Recovery Ventilator) unit has fault (rooftop units only)	Troubleshoot ERV unit fault
No Fault Code Shown	X	X	No compressor operation	See scroll compressor rotation section in Installation Instructions book.
	X	X	Compressor overload	Check and replace if necessary.
	X	X	Control board	Reset power and check operation.
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in 'Test Mode'	Reset power or wait 20 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace if necessary.
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in Test mode.

LEGEND

RV — Reversing Valve

Table 13 — Troubleshooting (cont)

FAULT	HEATING	COOLING	POSSIBLE CAUSE	SOLUTION	
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.	
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for line voltage across BR contacts. Check fan power enable relay operation (if present).	
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.	
	X	X	Thermostat wiring	Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in Test mode.	
Unit Does Not Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24 vac on RV coil and at control. If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.	
		X	Thermostat setup	Check for 'O' RV setup not 'B'.	
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil.	
Insufficient Capacity/ Not Cooling or Heating Properly	X	X	Dirty filter	Replace or clean.	
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. External static pressure too high. Check blower tables in Installation Instructions book.	
		X		Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. External static pressure too high. Check blower tables in Installation Instructions book.
	X	X			Leaky ductwork
	X	X	Low refrigerant charge	Check superheat and subcooling in Installation Instructions.	
	X	X	Restricted metering device	Check superheat and subcooling in Installation Instructions. Replace.	
	X	X	Defective reversing valve	Perform RV touch test.	
	X	X	Thermostat improperly located	Check location and for air drafts behind thermostat.	
	X	X	Unit undersized	Recheck loads and sizing check sensible cooling load and heat pump capacity.	
	X	X	Scaling in water heat exchanger	Check for scale and clean if necessary.	
	X	X	Inlet water too hot or cold	Check load, loop sizing, loop backfill, ground moisture.	
	High Head Pressure	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. External static pressure too high. Check blower tables in Installation Instructions book.
			X		Reduced or no water flow in cooling
		X	Inlet water too hot		
X			Air temperature out of range in heating	Bring return-air temperature within design parameters.	
		X	Scaling in water heat exchanger	Check for scale and clean if necessary.	
X		X	Unit overcharged	Check superheat and subcooling. Reweigh in charge.	
X		X	Non-condensables in system	Vacuum system and reweigh in charge.	
X		X	Restricted metering device	Check superheat and subcooling per Installation Instructions. Replace.	
Low Suction Pressure	X		Reduced water flow in heating	Check pump operation or water valve operation/setting. Plugged strainer or filter. Clean or replace. Check water flow adjust to proper flow rate.	
	X			Water temperature out of range	Bring water temperature within design parameters.
		X		Reduced airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. External static pressure too high. Check blower tables in Installation Instructions book.
		X	Air temperature out of range		Too much cold vent air. Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.	
Low Discharge Air Temperature in Heating	X		Too high airflow	Check blower tables in Installation Instructions book.	
	X		Poor performance	See 'Insufficient Capacity'.	
High Humidity		X	Too high airflow	Check blower tables in Installation Instructions book.	
		X	Unit oversized	Recheck loads and sizing check sensible cooling load and heat pump capacity.	

LEGEND

RV — Reversing Valve