

Installation and Maintenance Manual

OM 1149-5

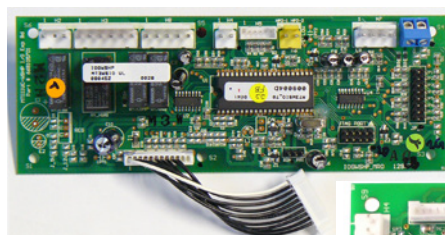
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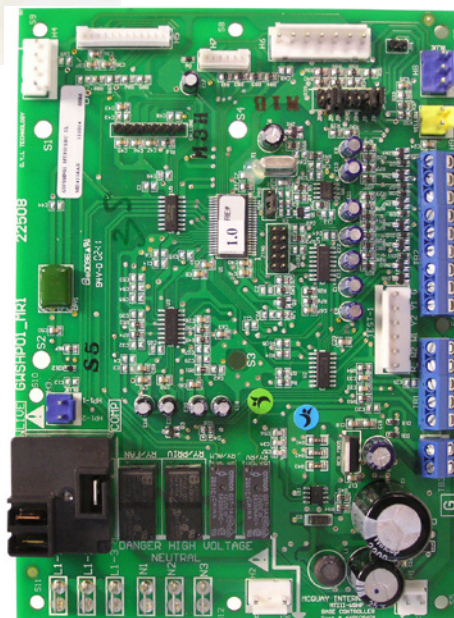
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MicroTech® III SmartSource® Unit Controller with I/O Expansion Module for Single and Two Stage Water Source Heat Pumps

For Models GC,GS, GT, VH



I/O Expansion Module



MicroTech III SmartSource Unit Controller

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Introduction

This installation and operation manual covers the MicroTech® III unit controller for Daikin SmartSource and Vertical Stacked Water Source Heat Pumps. For information on LONWORKS® or BACnet® communication modules and other ancillary components, see:

- IM 927 - MicroTech III Water Source Heat Pump LONWORKS Communication Module
- IM 928 - MicroTech III Water Source Heat Pump Unit Controller BACnet MS/TP Communication Module

Unit Controller and Control Modules Terminals and Connectors Descriptions

Table 1: MicroTech III unit controller terminals & descriptions

H1 – 1	24	24 VAC Power Input
H1 – 2	C	24 VAC common
H2 – 1	SL1	Fan Main Required Output – Switched L1
H2 – 2		Blank Terminal
H2 – 3	N	Fan Main Required Output – Neutral
H3 – 1	HP1-1	Comp High Pressure Switch (HP1) Input Terminal 1
H3 – 2	HP1-2	Comp High Pressure Switch (HP1) Input Terminal 2
H4 – 1	1	Discharge Air Temp Sensor – Common
H4 – 2		Discharge Air Temp Sensor – Signal
H4 – 3		Leaving Water Temp Sensor – Common
H4 – 4		Leaving Water Temp Sensor – Signal
H5 – 1	1	Connections to I/O Expansion Board
H5 – 2		
H5 – 3		
H5 – 4		
H5 – 5		
H5 – 6		
H5 – 7		
H5 – 8		
H5 – 9		
H5 – 10		
H5 – 11		
H5 – 12		
H6 – 1	1	Condensate Overflow Signal Input
H6 – 2		Compressor Suction Temp Sensor (LT1) – Common
H6 – 3		Compressor Suction Temp Sensor (LT1) – Signal
H6 – 4		Compressor Low Pressure Switch (LP1) – Source Voltage
H6 – 5		Compressor Low Pressure Switch (LP1) – Signal
H6 – 6		Reversing Valve – Common
H6 – 7		Reversing Valve – Output
H7 – 1	1	No Connection

H7 – 2		No Connection
H7 – 3		Red LED Output
H7 – 4		Green LED Output
H7 – 5		Yellow LED Output
H7 – 6		Red-Green-Yellow LED Common
H8 – 1	1	Isolation Valve/Pump Request Relay N/O
H8 – 2		Isolation Valve/Pump Request Relay N/C
H8 – 3		24 VAC Common
H9 – 1	1	Room Temp Sensor & Tenant Override – Signal
H9 – 2		Room Temp Sensor & Tenant Override – Common
TB1 – 1	1	Room Sensor – Status LED Output
TB1 – 2	2	Room Sensor – Fan Mode & Unit Mode Switches
TB1 – 3	3	Room Sensor – Setpoint Adjust Potentiometer
TB1 – 4	4	Room Sensor – Room Temp Sensor & Tenant Override
TB1 – 5	5	Room Sensor – DC Signal Common
TB2 – 1	R	24 VAC
TB2 – 2	A	Thermostat – Alarm Output
TB2 – 3	W2	Thermostat – Heat Stage #2 (W2) Input
TB2 – 4	W1	Thermostat – Heat Stage #1 (W1) Input
TB2 – 5	Y2	Thermostat – Cool Stage #2 (Y2) Input
TB2 – 6	Y1	Thermostat – Cool Stage #1 (Y1) Input
TB2 – 7	G	Thermostat – Fan Input
TB2 – 8	O	Thermostat – Heat Stage #3 (W3) Input
TB2 – 9	C	24 VAC Common
TB3 – 1	E	Emergency Shutdown Input
TB3 – 2	U	Unoccupied Input
L1 – 1	L1 - 1	Line Voltage Terminal 1
L1 – 2	L1 - 2	Line Voltage Terminal 2
L1 – 3	L1 - 3	Line Voltage Terminal 3
N1	N1	Neutral Terminal 1
N2	N2	Neutral Terminal 2
N3	N3	Neutral Terminal 3

I/O Expansion Module

Table 2: I/O expansion module connectors/terminals

H1 – 1	1	Connections to Main Board
H1 – 2		
H1 – 3		
H1 – 4		
H1 – 5		
H1 – 6		
H1 – 7		
H1 – 8		
H1 – 9		
H1 – 10		
H1 – 11		
H1 – 12		
H2 – 1	1	Auxiliary Heat Stage #2 Output – N/O
H2 – 2		No Connection
H2 – 3		24 VAC Common
H3 – 1	1	Ext. 24 VAC In
H3 – 2		Ext. 24 VAC Common In
H3 – 3		HGR / Waterside Economizer Output – N/O
H3 – 4		Ext. 24 VAC Common
H3 – 5		EC Fan Motor Variable Speed Signal Output
H3 – 6		EC Fan Motor Variable Speed Signal – Common
H4 – 1	1	Entering Water Temp Sensor – Signal
H4 – 2		Entering Water Temp Sensor – Common
H5 – 1	1	No Connection
H5 – 2		No Connection
H5 – 3		Red LED Output
H5 – 4		Green LED Output
H5 – 5		Yellow LED Output
H5 – 6		Red-Green-Yellow LED Common
H6 – 1	HP2-1	Comp High Capacity High Press Sw (HP2) Input Terminal 1
H6 – 2	HP2-2	Comp High Capacity High Press Sw (HP2) Input Terminal 2
H7 – 1		Fan Speed Table Row Select – Signal
H7 – 2		Fan Speed Table Row Select – Common
H7 – 3		Thermostat – Heat Stage #4 (W4) Input – Signal
H7 – 4		Auxiliary 24 VAC Out
H8 – 1	1	Compressor – High Capacity Output – N/O
H8 – 2		24 VAC Common
H8 – 3		No Connection
H8 – 4		Auxiliary Heat Stage #1 / Hydronic Heat Output N/O (24 VAC)
H8 – 5		24 VAC Common
TB1 – 1	1	Humidistat Signal Input
TB1 – 2	2	Thermostat - Heat Stage #4 (W4) Input – Signal

BACnet Communication Module

Table 3: BACnet communication module connectors/terminals

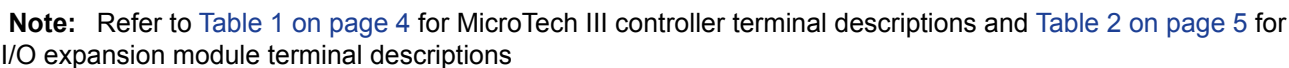
P4 – 1	P4	GND
P4 – 2		+ 5 VDC
P4 – 3		SPI SELECT (SPI Select To Communications Board)
P4 – 4		SPI CLK (Master Clock)
P4 – 5		SPI RCV (MOSI)
P4 – 6		SPI XMIT (MISO)
P4 – 7		SRDY OUT (SPI Ready To Baseboard)
P4 – 8		No Connection
P3 – 1	P3	Network Signal +
P3 – 2		Network Signal –
P3 – 3		REF
P3 – 4		Shield

LONWORKS Communication Module

Table 4: LON communication module connectors/terminals

CN_SPI – 1	CN_SPI	GND
CN_SPI – 2		+ 5 VDC
CN_SPI – 3		SPI_SELECT1_0 (SPI Select To Communications-Board)
CN_SPI – 4		SPI_CLK_0 (Master Clock)
CN_SPI – 5		SPI_RX_0 (MOSI)
CN_SPI – 6		SPI_TX_0 (MISO)
CN_SPI – 7		SREADY_0 (SPI Ready To Baseboard)
CN_SPI – 8		No Connection
TB1 – 1	TB1	Network Signal A
TB1 – 2		Network Signal B
TB1 – 3		REF

Figure 1: MicroTech III unit controller & I/O expansion module connectors descriptions



CAUTION

The MicroTech III unit controller incorporates static sensitive devices. A static charge from touching the device can damage the electronic components. To help prevent damage during service, use static discharge wrist straps. Static discharge wrist straps are grounded to the heat pump chassis through a 1M ohm resistor.

Replacing a MicroTech III Unit Controller:

1. Connect wrist strap to unit.
2. Remove faulty board and place on static protected surface.
3. Remove replacement unit controller from static protected bag.

Note: Do not touch circuit board; hold by edges.

4. Holding unit controller in grounded hand, install controller in unit.
5. Insert faulty board in empty static bag for return.

Figure 2: Location of configuration jumpers on the unit controller

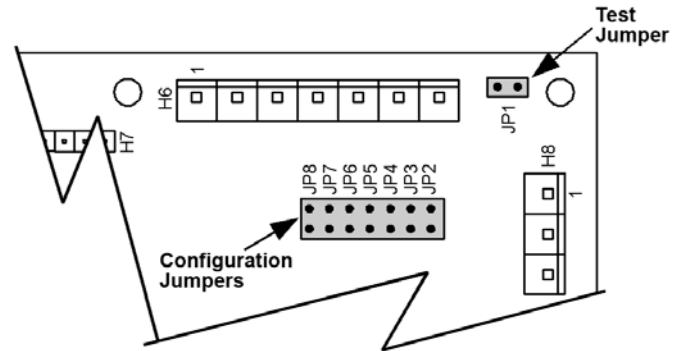


Table 5: Jumper settings and descriptions

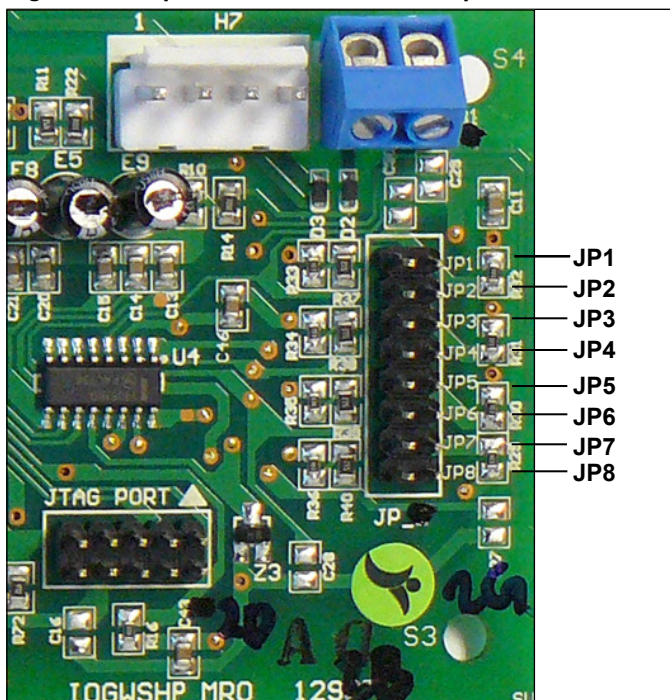
Jumper	Description	Options
JP1	Mode	Open for normal operation mode
		Shorted for service/test operation mode
JP2	Fan operation	Open for continuous fan operation, when not in unoccupied mode.
		Shorted for cycling fan operation
JP3 (See Warning)	Freeze Protection	Open for water freeze protection
		Shorted for systems with anti-freeze protection
JP4	Freeze Fault Protection	Open for none
		Shorted to enable freeze fault protection based on Leaving Water Temperature (LWT)
JP5	Set point adjustment range only applies to network controls with a room temperature sensor	Open for adjustment range of -5.0° to +5.0°F
		Shorted for 55° to 95°F adjustment range
JP6	Room control type	Open for thermostatic room control
		Shorted for room temperature sensor control, MicroTech III only.
JP7	Compressor heating source	Open to enable compressor heating
		Shorted to disable compressor heating
JP8	I/O expansion module	Open when I/O expansion module is not needed
		Shorted when I/O expansion module is required

WARNING

Proper antifreeze/water solution is required to minimize the potential of fluid freeze-up. Jumper JP3 is factory set for water freeze protection with the jumper open. Operation at fluid temperatures below 32°F with anti-freeze protection requires JP3 to be field configured for the jumper closed. If unit is employing a fresh water system (no anti-freeze protection), it is extremely important that JP3 jumper setting remains in the open position (factory default setting) in order to shut down the unit at the appropriate water temperature to protect your heat pump from freezing. Failure to do so can result in unit damage, property damage and will void unit warranty.

Table 6: I/O expansion module jumper settings

I/O Expansion Description	Jumper(s)	Setting	Model
Fan Row Select for Operating Modes: • Fan Only • Hydronic Heating • Waterside Economizer	JP1 & JP2	JP1 = Open JP2 = Open	Fan Row "A" Selected
		JP1 = Shorted JP2 = Open	Fan Row "B" Selected
		JP1 = Open JP2 = Shorted	Fan Row "C" Selected
		JP1 = Shorted JP2 = Shorted	Fan Row "D" Selected
Secondary Heating Options	JP3 & JP4	JP3 = Open JP4 = Open	None
		JP3 = Shorted JP4 = Open	Supplemental Electric Heat
		JP3 = Open JP4 = Shorted	Boilerless Electric Heat
		JP3 = Shorted JP4 = Shorted	Hydronic Heat
Dehumidification Options / Waterside Economizer	JP5 & JP6	JP5 = Open JP6 = Open	None
		JP5 = Shorted JP6 = Open	Hot Gas/Water Reheat (HGR)
		JP5 = Open JP6 = Shorted	Waterside Economizer
Not Used	JP7	JP7 = Open	–
Compressor Capacity Option	JP8	JP8 = Open JP8 = Shorted	Single-Stage Capacity Dual-Stage Capacity

Figure 3: Jumper locations on the I/O expansion module


General Use and Information

The MicroTech III SmartSource unit controller is a water source heat pump control platform used to control the heat pump in all modes of operation, including variable speed fans, two stage compressors, loop pumps, waterside economizers, hydronic heat, electric heat, two-way valves, reversing valves, and all components used to control conditioned space temperature and humidity. By adding communications cards, (LONWORKS or BACnet) network integration is possible. The controller can be used with thermostat or sensor control.

All MicroTech III unit controller inputs must be operated by dry contacts powered by the control board's power terminals or appropriate Daikin sensors. No solid state devices (Triacs) may be used to operate MicroTech III unit controller inputs. No external power sources may be used to operate MicroTech III. All units must be properly grounded per local code requirements. See the Installation and Maintenance bulletin specific to your Water Source Heat Pump.

Operating Modes

The I/O Expansion Module is an expansion of the main board and provides extra functionality to the MicroTech III control system.

- The MicroTech III unit controller in combination with the I/O Expansion Module will be the standard control system for SmartSource Water Source Heat Pumps.

Adding an I/O Expansion Module (with an interconnect cable) to the main controller allows:

- Compressor High Capacity On/Off Control
- Variable Speed Fan Control
- Water Side Economizer Control
- Active Hot Gas/Reheat (HGR), or Low Capacity Dehumidification Options
- Boilerless & Supplemental Auxiliary Heating Options
- The fourth thermostat Heating Stage (W4) Input
- Hydronic Heating Control

The I/O Expansion Module has an independent LED annunciator to identify operational fault conditions.

The MicroTech III SmartSource unit controller will manage occupied and unoccupied modes of operation.

- **Occupied Mode** – When in the occupied mode, the unit will be controlled to its occupied setpoint conditions. The occupancy mode can be established by a BACnet or LONWORKS communication signal, from a room sensor equipped with “Occupied/Unoccupied” mode functions, or a thermostat equipped with an “Occupied/Unoccupied” mode switch. The occupancy state will be displayed on sensors equipped with a status LED.
- **Unoccupied Mode** – When in the unoccupied mode, the unit will be controlled to its unoccupied setpoints. The occupancy state will be displayed on sensors equipped with a status LED.

A contact closure between terminals U and C on the MicroTech III SmartSource unit controller will place the unit into the unoccupied mode for night setback/setup operation. Thermostat equipped units will be controlled from Y2, W2, W3, W4 and DH inputs. The fan will cycle according to a call for cooling, dehumidification or heating.

- **Override Mode** – A momentary (4 to 9 seconds) press of the “Override” button on the thermostat or room sensor during the unoccupied mode will cause the unit to operate in the occupied mode for up to two hours, for after-hours heating, cooling or dehumidification. “OVERRIDE” will be displayed on sensors equipped with override button and status LED.
- **“Energy Save” Standby** – BACnet or LONWORKS units can receive a signal from the Building Automation System (BAS) to initiate the energy savings mode. This mode is typically initiated by the BAS with smart grid technologies to save energy. The savings is driven by reducing peak electrical demand for the building. Once initiated, the MicroTech III SmartSource unit controller will reset its effective setpoint to minimize compressor operation. “E-SAVE” will be displayed on sensors equipped with bypass mode annunciation capabilities.
- **Remote Shutdown** – When the unit is in the remote shutdown mode, unit operation is suspended. A contact closure between terminals E and C on the MicroTech III SmartSource unit controller will place the unit into remote shutdown mode.

Safety Inputs (HPS, LPS, SLTS, COS)

The control inputs are High Pressure Switch (HPS), Low Pressure Switch (LPS), Suction Line Temperature Sensor (SLTS), Condensate Overflow Sensor (COS). The control inputs are in normal states during occupied mode. The state of each control in occupied mode during normal operation is as follows:

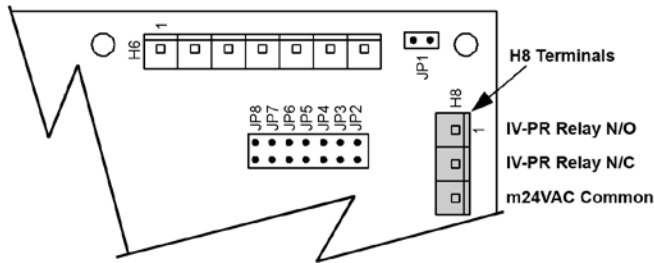
- **High Pressure Switch (HPS)** – Normally closed switch that opens on a high refrigerant pressure condition. Control will generate a high pressure fault and will disable the compressor output when the switch is open.
- **Low Pressure Switch (LPS)** – Normally closed switch that opens on a low refrigerant pressure condition. Control will generate a low pressure fault and will disable the compressor output when the switch is open.
- **Suction Line Temperature Sensor (SLTS)** – Monitors refrigerant suction line temperature. Control will generate a low temperature fault when the suction temperature drops below the cutout setpoint and will disable the compressor output.
- **Condensate Overflow Sensor (COS)** – Senses condensate level in condensate pan. Control will generate a condensate overflow fault when condensate level is too high and will disable the compressor in the cooling and dehumidification modes.

Control Outputs [A and IV/PR (H8)]

The control outputs are Alarm Fault (A) and Isolation Valve / Pump Request {IV/PR (H8)}. The operation of the control outputs during occupied mode is as follows:

- **The thermostat alarm output:** Will be energized when there are fault conditions presently active. Without any fault conditions active, the alarm output shall be de-energized.
- **Isolation Valve / Pump Request [IV/PR (H8)]:** is selectable to be energized when the compressor is off (normally closed), or when the compressor is on (normally open), by moving the wire lead to the appropriate terminal.

Figure 4: H8 terminals on MicroTech III board



- **Reversing Valve:** 24V signal that is energized upon a call for heat mode.
- **Compressor Relay:** Line or low voltage output used to control compressor. (On/Off)

Sequence Of Operation

Fan Only

On a call for fan the fan starts immediately thru the activation of the G terminal.

Note: If jumper JP2 on the main control board is open the fan will run continuous whenever there is a power supply to the unit. For cycling fan operation jumper JP2 needs to be shorted.

Cooling

On a call for 1st stage cooling from a thermostat or network setpoint, the H8 output on the MicroTech III board is activated to open the motorized valve to allow water flow thru the heat exchanger. The fan starts immediately (unless it is already on thru activation of the G terminal by the thermostat fan switch "ON" or a wall sensor command) at "FAN ONLY" setting. The compressor starts after 45 seconds to make sure the motorized valve has fully open for proof of water flow and the fan CFM output increases. The compressor minimum on timer of 180 seconds starts. The reversing valve will de-energize 5 seconds after the compressor starts. The fan CFM output is now determined by the Fan Setting switch, position 1, 2, 3 or 4 and the corresponding stage 1 CFM. If a two stage thermostat is used, a further demand for cooling will change (increase) the CFM output of the EC fan motor.

When the room setpoint conditions are satisfied, the compressor will shut off and the fan will either shut off (fan switch "AUTO") or continue to run (fan switch "ON" or jumper JP2 open). The compressor minimum off timer of 360 seconds will start.

Heating

On a call for 1st stage heating, from a thermostat or network setpoint, the H8 output on the MicroTech III board is activated to open the motorized valve to allow water flow thru the heat exchanger. The fan starts immediately (unless it is already on thru activation of the G terminal by the thermostat fan switch "ON" or a wall sensor command) at low CFM. The compressor starts after 45 seconds to make sure the motorized valve has fully open for proof of water flow and the fan CFM output increases. The compressor minimum on timer of 180 seconds starts. The reversing valve will energize 5 seconds after the compressor starts. The fan output is now determined by the Fan Setting switch, position 1, 2, 3 or 4 and the corresponding stage 1 CFM. If a two stage thermostat is used, a further demand for heating will change (increase) the CFM output of the EC fan motor. When the room setpoint conditions are satisfied, the compressor will shut off and the fan will either shut off (fan switch "AUTO") or continue to run (fan switch "ON" or jumper JP2 open). The compressor minimum off timer of 360 seconds starts.

Boilerless Electric Heat Mode

Units equipped with the boilerless electric heat option include an entering water temperature sensor. On a call for heating the fan starts immediately (unless it is already enabled through activation of the G terminal from the thermostat fan switch "ON" or a wall sensor command.) at "FAN ONLY" setting. The H8 output on the MicroTech III board is activated to open the motorized valve allowing water flow thru the heat exchanger. If the entering water temperature is below set point, (55°F standard units or 28°F for geothermal units), the MicroTech-III controller will disable the compressor, increase the fan speed to electric heat CFM and energize a 24VAC output to the electric heat control circuit. When the room setpoint conditions are satisfied, the electric heater will turn off and the fan will either cycle off (fan switch "AUTO") or continue to operate (fan switch "ON" or jumper JP2 open). If the entering water temperature is above setpoint, the unit will operate in compressor heating mode. The setpoints are adjustable by the BAS..

Supplemental Electric Heat Mode

On a call for supplemental electric heat (W3) or BMS setpoint, the compressor will continue to operate, the fan speed will increase to the electric heat setting and electric heating will energize. For units equipped with two stages of electric heat, W4 or BMS setpoint will turn on second stage of electric heat.

Emergency Electric Heat Mode

On a call for emergency heat, the fan will energize at its "electric heat" setting. When the room setpoint conditions are satisfied, electric heat will be de-energized. The fan will operate according to its "FAN ONLY" setting when enabled, for continuous fan operation. If fan cycling is enabled, the fan will turn off once room setpoint conditions are satisfied. A 24V control signal to TB1-2 (W4) from the thermostat or BMS will initiate a call for stage 2 electric heat.

Hydronic Heat Mode

This mode requires optional hydronic heat factory installed on vertical units. A hydronic coil, 3-way valve and entering water temperature sensor are included with this option. The purpose of this mode is to satisfy the heating demand by using the elevated loop water temperature between 90 and 120°F.

On a call for 1st stage heating with entering loop water above 90°F the H8 output on the MicroTech III board is activated to open the motorized valve diverting water flow to the hydronic coil. The fan starts after 30 seconds (unless it is already activated by the thermostat or room sensor). The fan output is determined by the I/O expansion module jumper setting. When the room setpoint conditions are satisfied, the 3-way valve will close and the fan will either shut off (fan switch "AUTO") or continue to run (fan switch "ON" or JP2 open). The minimum off timer of 360 seconds starts. When entering loop water temperature is below 90°F, standard heating operation resumes.

Smart Dehumidification (Hot Gas Reheat)

This mode requires optional hot gas reheat and a humidistat input to the MicroTech III board. This option also utilizes airflow management. If the space cooling temperature setpoint is satisfied, but the humidity is above the space humidity setpoint, the dehumidification mode is activated. The return air temperature must be 68°F or greater.

On a call for smart dehumidification, the fan will energize at its fan only setting, the pump will energize. After the 45 second flow timer and the compressor minimum off timer expire (360 seconds), the fan will operate at the dehumidification setting, the compressor will energize at full load operation and the hot gas reheat valve will

open sending hot gas to the reheat coil. The return air is cooled and reheated to near space temperature. When the space humidity setpoint is satisfied the compressor will turn off and the fan will operate according to its fan setting.

During smart dehumidification operation, a call for cooling will close the hot gas reheat valve and the unit will resume normal cooling operation until the space temperature is satisfied.

Simplified Dehumidification (Thermostat control only)

This mode helps control space humidity by reducing the CFM as the space temperature approaches the thermostat cooling setpoint without hot gas reheat. The return air temperature must be 68°F or greater for 1st stage operation. A multi-stage thermostat is used to provide compressor cooling with multiple airflows. Using a 3 cooling stage thermostat the following occurs: On a call for 1st stage cooling (Terminal TB1-1 on the I/O expansion module), the H8 output on the MicroTech III board enables the pump or motorized valve to direct water flow through the coaxial heat exchanger. The fan starts immediately (unless it is already on) at the dehumidification CFM. If the return air temperature is 68°F or greater, the compressor starts after the 45 second flow timer and the 360 second compressor minimum off timer has expired. The compressor minimum on timer of 180 seconds starts. On a call for cooling, stage 2 (Terminal Y1), the fan output will increase to the cooling stage 1 CFM. On a call for cooling, stage 3 (Terminal Y2), the fan output will increase to the cooling stage 2 CFM. The unit attempts to satisfy cooling at the lowest possible CFM for maximum dehumidification. When the room setpoint conditions are satisfied, the compressor will shut off and the fan will either shut off (fan switch "AUTO") or continue to run (fan switch "ON" or JP2 open).

Humidistat Controlled Dehumidification

This mode helps control space humidity by using space humidity sensing and by reducing the CFM by use of a humidistat in lieu of a thermostat. The humidistat control replaces stage 1 thermostat control as described above in simplified dehumidification operation. The TB1-1 terminal is controlled by the humidistat enabling dehumidification fan speed with compressor operation. The return air temperature must be 68°F or greater.

Waterside Economizer

This mode requires the optional factory-installed waterside economizer. A hydronic economizer coil, 3-way motorized valve and a entering water temperature (EWT) sensor are added to the unit.

For single stage SmartSource units with WSE option:

Hydronic cooling operation is adjustable between 50 and 70°F via BACnet or LON communication. (factory default of 55°F)

- On a call from Y1 or cooling stage 1 setpoint, and the EWT is below the hydronic cooling setpoint, but above 35°F, the unit will operate in hydronic cooling mode. (The 3-way valve is energized and the fan operates at the hydronic cooling CFM setting).
- On a call from Y2 of the thermostat or second stage cooling setpoint, and the EWT is below the hydronic cooling setpoint, but above 35°F, the unit will operate in hydronic cooling mode and full load mechanical cooling. (The fan will operate at the full load cooling CFM).

If at any time the EWT rises above the entering water temperature setpoint plus 5°F (while operating) or below 35°F, the 3-way valve will de-energize, disabling WSE operation.

If WSE is not available due to entering water temperatures out of range, the sequence becomes:

- On a call from Y1 or cooling stage 1 setpoint, the unit operates at full load mechanical cooling. (The fan will operate at the full load cooling CFM).
- On a call from Y2 or cooling stage 2 setpoint, status the same as above

For 2-stage SmartSource units with WSE option:

Hydronic cooling operation is adjustable between 50 and 70°F (factory default of 55°F)

- On a call from Y1 or cooling stage 2 setpoint, and the EWT is below the hydronic cooling setpoint, but above 35° F, the unit will operate in hydronic cooling mode. (The 3-way valve is energized and the fan operates at the hydronic cooling CFM setting).

- On a call from Y2 of the thermostat or BMS cooling stage 2 setpoint, and the EWT is below the hydronic cooling setpoint, but above 35°F, the unit will operate in hydronic cooling mode and part load mechanical cooling. (The fan will operate at the part load cooling CFM).
- On a call from Y3 of the thermostat or cooling stage 3 setpoint, and the EWT is below the hydronic cooling setpoint, but above 35°F, the unit will operate in hydronic cooling mode and full load mechanical cooling. (The fan will operate at the full load cooling CFM).

If at any time the EWT rises above the entering water temperature setpoint plus 5°F (while operating) or below 35°F, the 3-way valve will de-energize, disabling WSE operation.

If WSE is not available due to entering water temperatures out of range, the sequence becomes:

- On a call from Y1 or cooling stage 1 setpoint, the unit operates at part load mechanical cooling. (The fan will operate at the part load cooling CFM).
- On a call from Y2 or cooling stage 2 setpoint, status the same as above
- On a call from Y3 or cooling stage 3 setpoint, the unit goes to full load mechanical cooling. (The fan will operate at the full load cooling CFM).

The minimum off timer of 360 seconds starts. If the loop temperature increases above the changeover temperature, waterside economizer mode will be suspended and the unit will resume normal mechanical cooling mode with stage 1 of the thermostat or network setpoint now starting the compressor.

Note: *To prevent compressor cycling and all compressors from starting up together after loss of power, the required minimum on/off time default is 300 seconds plus the random restart of 0 to 60 seconds. This may cause the compressor time delay to be longer than indicated above.*

Unit Status

Unoccupied Operation – Stand Alone Thermostat Control

The board will be in unoccupied mode if the unoccupied terminal (U) is grounded.

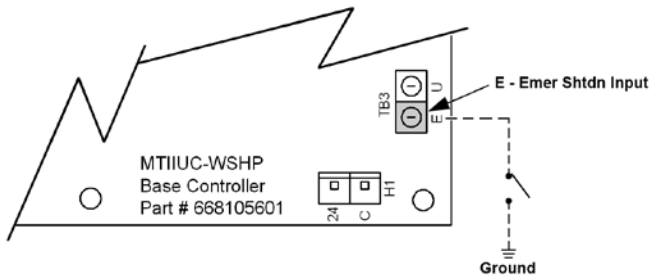
Board LED Status – Unoccupied		
Yellow	Green	Red
On	On	Off

Remote Shutdown

Board LED Status – Remote Shutdown		
Yellow	Green	Red
Off	Flash	Off

When the E terminal is grounded, the MicroTech III unit controller enters remote shutdown mode. Remote shutdown is provided so that when properly connected to a building automation system, remote switch, etc., the E terminal can be used to shut down the water source heat pump.

Figure 5: Terminal "E" - grounded for remote shutdown



When in remote shutdown (E terminal grounded), control inputs have no affect upon unit operation. No faults or modes have higher priority than remote shutdown. Remote shutdown and brownout condition have the same level of priority. See [Table 9 on page 16](#).

When the unit is in remote shutdown mode, the following occurs:

1. The compressor de-energizes (if enabled).
2. The fan de-energizes (if enabled).
3. Fault terminal (A) will remain de-energizes because emergency shutdown is a "mode".

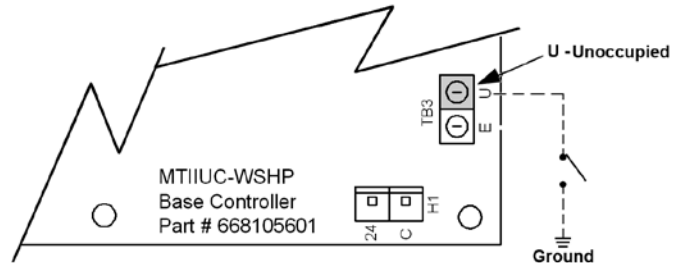
When the E terminal is no longer grounded the unit will automatically return to normal operation.

Note: The remote shutdown input (E) will suspend unit operation. Disconnect power when servicing the unit/controller.

Thermostat Inputs (G, Y1, Y2, W1, W2, W3, and W4)

The only thermostat inputs used during unoccupied operation are Y2 and W2, which when energized will activate Cooling Mode or Heating Mode respectively. Inputs G, Y1 and W1 have no effect during unoccupied mode.

Figure 6: Terminal "U" - Grounded for Unoccupied



Fault Modes

Brownout

Board LED Status – Brownout		
Yellow	Green	Red
Off	Flash	Off

Brownout condition is provided to protect the water source heat pump's motor electrical damage due to low voltage conditions.

The MicroTech III unit controller is designed to monitor the 24VAC power supply to the board. If the line voltage supplied to the water source heat pump drops, the 24VAC supply to the control board will also drop. When the line voltage supplied to the unit drops below approximately 80% of the unit nameplate rated value, the controller goes into brownout condition. The controller remains in brownout condition until line voltage returns to approximately 90% of the unit nameplate value.

When in brownout condition, thermostat and control inputs have no affect upon unit operation. Remote shutdown and brownout conditions have the same level of priority. See [Table 9 on page 16](#).

When the unit is in brownout condition the following occurs:

1. The compressor de-energizes.
2. The IV/PR(H8) output will change state.(On to Off / Off to On).
3. The fan de-energizes.
4. Fault terminal (A) energizes (fault).A to R will be used to indicate an alarm signal.When the line voltage supplied to the unit returns to acceptable levels (90% of nameplate) the controller returns to the current mode.

High / Low Pressure Faults (HP/LP)

Normally closed high and low refrigerant pressure switches help protect the water source heat pump from excessively high or low refrigerant pressures. The MicroTech III unit controller monitors these switches individually. If the compressor is running and the HP circuit is open, the controller enters a pressure fault mode. If the LP circuit is open after a time delay (default of 30 seconds, adjustable if a communication module is present) the controller enters a low pressure fault mode.

Board LED Status – High/Low Pressure Faults			
Pressure	Yellow	Green	Red
HP	Off	Off	Flash
LP	Off	Off	Solid

See Table 9 on page 16.

When the unit is in high or low pressure fault modes the following occurs:

1. The compressor de-energizes.
2. The IV/PR(H8) output will change state. (On to Off / Off to On).
3. The fan de-energizes.
4. The fault terminal (A) energizes (fault). A to R will be used to indicate an alarm signal.

High Pressure/Low Pressure Reset

After the HP circuit is closed, the unit does not return to normal operation until the alarm is manually reset. The unit is locked out in this manner until the unit can be serviced.

The alarm is reset by a short interruption of unit power, by holding down the tenant override button for more than 10 seconds, or via the Building Automation System (BAS).

Low Suction Temperature Fault Heating

1. When the suction line temperature falls below 28°F(standard range) or 6.5°F(Geothermal) the compressor output is disabled.

2. The control will attempt to recover from a low suction temperature condition by defrosting the water heat exchanger (coaxial coil). See "Defrost Sequence of Operation (Heating):"
3. When the suction line temperature increases by the Low Temp Protect Diff (the default is 8°F) degrees.
4. The compressor is available for heating when the compressor minimum off timer has expired.

Defrost Sequence of Operation (Heating):

1. Immediately turn off the compressor if operating in the cooling or dehumidification modes.
2. The reversing valve output is de-activated, placing the reversing valve in the cooling mode and moving warm refrigerant to the coax coil.
3. Fan speed is not changed, however "Heat Stage #1" speed is used if the fan is presently off.
4. If the compressor was on at the beginning of the defrost process, then start the 60 second fixed defrost timer.
5. Wait for the defrost timer to expire.
6. If the alarm condition has cleared:
 - Return to normal operation.
7. If the alarm condition remains active:
 - Compressor High Capacity is turned off
 - Compressor is immediately turned off, ignoring the Compressor Minimum ON timer
 - Compressor is disabled for heating and cooling
 - Electric heating can be used if it is available
 - Fan and pump remain available for operation
 - Alarm output energizes.
 - When the suction line temperature recovers to 36°F standard equipment (14.5°F on geothermal) the low temperature fault continues and the compressor will be locked out.

Low Suction Temperature Fault Cooling / Dehumidification

1. When the suction line temperature falls below 28°F, the compressor output is disabled. The fan will continue to run allowing the air coil to defrost. Once the suction line temperatures increases 8°F (default) the compressor will be enabled once the compressor minimum off time has expired.

Board LED Status – Low Suction Line Temperature Fault		
Yellow	Green	Red
Flash	Off	Off

Condensate Overflow

Board LED Status – Condensate Overflow		
Yellow	Green	Red
On	Off	Off

The MicroTech III unit controller's condensate sensor is designed to detect excessively high condensate water levels in the drain pan. When high condensate water levels are detected during cooling or dehumidification modes, the controller enters into condensate fault mode. The fan operates at fan only speed during the condensate overflow fault mode. The controller will continue to operate in heat mode.

Some faults and modes have higher priority than condensate overflow mode. See [Table 9 on page 16](#).

When the unit senses a condensate overflow fault while in cooling mode the following occurs:

1. The compressor de-energizes.
2. The fault terminal (A) energizes (fault). A to R will be used to indicate an alarm signal.

When condensate levels return to normal, the controller will automatically return to normal operation.

Remote Reset of Automatic Lockouts

The Remote Reset feature provides the means to remotely reset automatic lockouts. There are (3) ways to accomplish a unit reset once the fault condition has been remedied:

- Using the thermostat cycle from cool or heat to off and back to heat or cool two times within 30 seconds
- Press the Room Sensor or Thermostat Timed Override/Reset Button for more than 10 seconds
- Turn the unit power off and wait 10 seconds to turn back on.

When the cause of the fault condition has been remedied, and the unit is cycled from not requiring heating or cooling to needing heating or cooling twice within 30 seconds (accomplished by user manipulation of the Heat/Cool/ Auto/Off switch on the thermostat), an alarm reset equivalent to a tenant override button reset is generated. The intelligent reset counter and the 24 hour timer are cleared when this type of alarm reset is generated.

Note: *This feature only applies to thermostat controlled systems.*

For room sensor controlled units, pressing the "Override" or "Reset" button for more than 10 seconds will apply a ground signal to the tenant override terminal connection at TB1 pin 4) clearing the lockout alarm once the cause of the fault condition has been remedied.

A unit power cycle can also be used to clear an automatic lockout if the conditions causing the fault have been remedied.

Table 7: Fault recovery and reset

Fault Description	Auto Recovery	Tenant Override Button Reset	Network Reset
IO Expansion Communication Fail	Yes	No	No
Invalid Jumper Configuration	No	No	No
Low Voltage Brownout	Yes	No	Yes
All Sensor Failures	No	No	Yes
Compressor High Pressure	No	Yes	Yes
Compressor Low Pressure	No	Yes	Yes
Compressor Low Suction Temp or Freeze Fault Detect (Heat)	Yes ¹	Yes	Yes
Compressor Low Suction Temp or Freeze Fault Detect (Dehumidification)	Yes	Yes	Yes
Condensate Overflow (Cooling/Dehumidification)	Yes	No	Yes
Low Entering Water Temp. (Heating without Boilerless Electric Heat)	Yes	No	No
EEPROM Corrupted	No	No	No
Waterside Economizer Low Temp. Cutout (WSE & Cooling Request)	Yes	No	No

Note: ¹ *Indicates auto recover is subject to intelligent alarm reset. Alarm auto recovers on first two occurrences, locked out on third within 24 hour period. See "Intelligent Alarm Resetting" section on the previous page for further details.*

Fan Operation During Most Modes, Faults and Shutdowns

The MicroTech III unit controller allows fan operation during most modes, faults and shutdowns to facilitate maximum space comfort and control. However, the fan does not operate during brownout or emergency shutdown condition. During most modes, faults, or shutdowns the fan will operate normally:

Operation with the High Speed Jumper

- The MicroTech III unit controller includes a high-speed jumper terminal labeled JP1 to speed system check out and trouble-shooting. See [Figure 2 on page 7](#) for JP1 location.

Note: *This jumper is intended for factory unit testing and should only be used by trained service technicians as several timing functions are reduced to speed system check out.*

- Disconnect power to the unit when installing or removing the high-speed jumper.
- The high speed jumper should only be used for a short period of time for testing of the unit's operation by a trained service technician. The jumper must be removed for normal unit operation.
- If the jumper is left on after system check out, the unit may be damaged.

Table 8: Room sensor status LED

LED On Time (Sec)	LED Off Time (Sec)	Operating Mode
0.5	0.5	Alarm Condition or Network "Wink" Operation Active
0.0	Continually	Bypass Mode is Active
0.5	5.5	Unoccupied Mode
5.5	0.5	Standby Mode
Continually	0.0	Occupied Mode

Faults and Modes

Table 9: Priority level of faults and modes

Priority Level	Mode or Fault
1	I/O Expansion Communication Fail
2	Invalid Configuration
3	Low Voltage Brownout
4	Emergency Shutdown Mode
5	Compressor High Pressure
6	Compressor Low Pressure
7	Compressor Suction Temp Sensor Fail
8	Freeze Fault
9	Compressor Low Suction Temp
10	Room Temp Sensor Fail
11	Entering Water Temp Sensor Fail
12	Leaving Water Temp Sensor Fail
13	Condensate Overflow
14	Low Entering Water Temp
15	Serial EEPROM Corrupted
16	Waterside Economizer Low Temp Cutout
17	Service Test Mode

Table 10: MicroTech III unit controller status LED's

Description	Type	Yellow	Green	Red
IO Expansion Communication Fail	Fault	ON	Flash	Flash
Invalid Configuration	Fault	Flash	Flash	OFF
Low Voltage Brownout	Fault	OFF	Flash	OFF
Emergency Shutdown	Mode	OFF	Flash	OFF
Compressor High Pressure	Fault	OFF	OFF	Flash
Compressor Low Pressure	Fault	OFF	OFF	ON
Compressor Suction Temp Sensor Fail	Fault	Flash	Flash	ON
Freeze Fault Detect	Fault	Flash	OFF	Flash
Compressor Low Suction Temp	Fault	Flash	OFF	OFF
Room Temp or Return Air Sensor Fail (Room Sensor Control Only)	Fault	Flash	Flash	ON
Leaving Water Temp Sensor Fail (Freeze Fault Protect)	Fault	Flash	Flash	ON
Condensate Overflow (Cooling & Dehumidification Modes)	Fault	ON	OFF	OFF
Serial EEPROM Corrupted	Fault	ON	ON	ON
Waterside Economizer Low Temp Cutout (WSE Control & Call for Cooling)	Mode	Flash	ON	Flash
Service Test Mode Enabled	Mode	Flash	Flash	Flash
Unoccupied Mode	Mode	ON	ON	OFF
Occupied, Bypass, Standby, or Tenant Override Modes	Mode	OFF	ON	OFF

MicroTech III Unit Controller LED Faults

Troubleshooting I/O Expansion Communication Fail

Description	Type	Yellow	Green	Red
I/O Expansion Fail	Fault	ON	Flash	OFF

- Verify connection of 12 wire cable between H5 on the main board and H1 on the I/O expansion board is fully engaged in the connector.
- Verify run program jumper on the I/O expansion board is installed in the run position.
- Replace the run jumper with a spare jumper.
- Replace I/O expansion board.

Invalid Configuration

Description	Type	Yellow	Green	Red
Invalid Configuration	Fault	Flash	Flash	OFF

- Verify jumper selection on both the main board and I/O expansion board. Jumper selections must be verified using the jumper configuration setting outlined in this document, main board and I/O expansion board software must be compatible.

Table 11: Low Voltage Brownout / Emergency Shutdown

Description*	Type	Yellow	Green	Red
Low Voltage Brownout	Fault	OFF	Flash	OFF
Emergency Shutdown	Mode	OFF	Flash	OFF

* Same LED display for both conditions.

- Verify the E terminal is not connected to common. Remove wire, if connected, and LED should change to solid green only (Occ, Bypass, Standby modes).
- Confirm the low voltage supply is between 19-32VAC at the H1 terminal of the main board. If the low voltage supply is out of range, verify the unit supply voltage matches the nameplate voltage and the correct transformer primary wire has been selected.

Compressor High Pressure

Description	Type	Yellow	Green	Red
Compressor High Pressure	Fault	OFF	OFF	Flash

- Verify high pressure switch is connected to terminal H3 on the main board.
- Check for continuity of the high pressure switch.

If the high pressure fault resets when power is recycled:

- Check water flow (cooling operation)
- Check airflow (heating operation)
- Entering water and air temperatures should be within the operating limits.

Compressor Low Pressure

Description	Type	Yellow	Green	Red
Compressor Low Pressure	Fault	OFF	OFF	ON

- Loose wire connection on low pressure circuit.
- Failed low pressure switch.
- Unit is low on charge.

Compressor Suction Temp Sensor Fail / Room or Return Temp Sensor Fail (Room Sensor or HGRH Control Only) / Leaving Water Temp Sensor Fail or Room/Return Air Sensor On Units With HGRH

Description	Type	Yellow	Green	Red
Compressor Suction Temp Sensor Fail	Fault	Flash	Flash	ON
Room Temp Sensor Fail (Room Sensor or HGRH Control Only)	Fault	Flash	Flash	ON
Leaving Water Temp Sensor Fail (Freeze Fault Protection Only)	Fault	Flash	Flash	ON

- Check connection of low suction temperature sensor on terminal H6 pins 2 and 3.
- Check resistance of low suction temperature sensor, leaving water temperature sensor, and room sensor or return air sensor. All sensors are 10kohm thermistor @77°F.
- Return air sensor and room sensor shall not be connected simultaneously.

Compressor Low Suction Temp

Description	Type	Yellow	Green	Red
Compressor Low Suction Temp	Fault	Flash	OFF	OFF

- Check water flow (heating operation).
- Check airflow (cooling operation).
- Entering water and air temperatures should be within the operating limits.

MicroTech III Unit Controller LED Faults (Continued)

Freeze Fault Detect

Description	Type	Yellow	Green	Red
Freeze Fault Detect	Fault	Flash	OFF	Flash

- Low entering water temperature (below 35°F standard range or 13.5°F extended range)

Condensate Overflow (Freeze Fault Protection Only)

Description	Type	Yellow	Green	Red
Condensate Overflow	Fault	ON	OFF	OFF

- Poor condensate drain.
- Check the resistance to ground on condensate wire. This should be open if there is no water in the pan.

Serial EEPROM Corrupted

Description	Type	Yellow	Green	Red
Serial EEPROM Corrupted	Fault	ON	ON	ON

- Disconnect the BAS communication wiring and cycle power to the controller
 - If the alarm clears confirm that the BAS is not writing setpoints values that are out of range
 - If the alarm persists replace the controller

Waterside Economizer Low Temp Cutout (WSE Control & Call for Cooling)

Description	Type	Yellow	Green	Red
Waterside Economizer Low Temp Cutout (WSE Control & Call for Cooling)	Mode	Flash	ON	Flash

- Water temperature is below 35°F.

Service Test Mode Enabled

Description	Type	Yellow	Green	Red
Service Test Mode Enabled	Mode	Flash	Flash	Flash

- Jumper JP1 is shorted for test mode operation.

Unoccupied Mode

Description	Type	Yellow	Green	Red
Unoccupied Mode	Mode	ON	ON	OFF

- Terminal U on main control board is connected to common from external source or commanded by network.

Occupied, Bypass, Standby, Modes

Description	Type	Yellow	Green	Red
Occupied, Bypass, Standby, Override Modes	Mode	OFF	ON	OFF

- Unit is operating normal. It may currently have a control signal or ready to operate when a control signal is active.

Baseboard Communication Fail

Description	Type	Yellow	Green	Red
Baseboard Communication Fail	Fault	Flash	OFF	Flash

- Verify jumper JP8 on main board is shorted.
- Verify connection of cable between H5 on main board and H1 on I/O expansion board.

Entering Water Temp Sensor Fail (Boilerless Electric Heat, Hydronic Heat or Waterside Economizer Only)

Description	Type	Yellow	Green	Red
Entering Water Temp Sensor Fail (Boilerless Electric Heat or Waterside Economizer Only)	Fault	ON	OFF	Flash

- Verify jumper JP8 on main board is shorted.
- Verify connection of cable between H5 on main board and H1 on I/O expansion board.

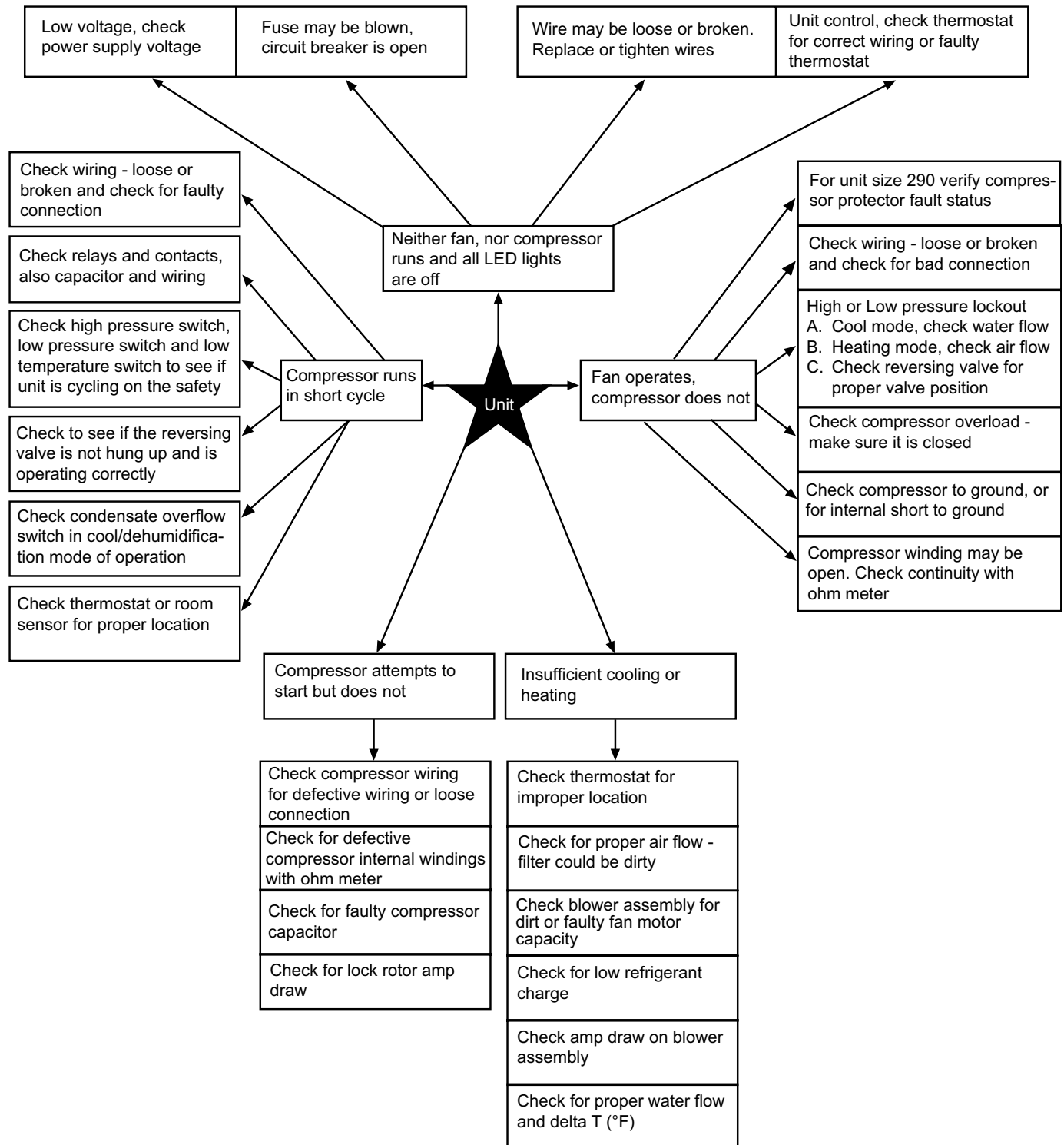
Low Entering Water Temperature (Heating) (No Display On Boilerless Electric Heat)

Description	Type	Yellow	Green	Red
Low Entering Water Temperature (No Display On Boilerless Electric Heat)	Fault	OFF	ON	Flash

- Verify entering water temperature is greater than set point.

Troubleshooting the Water Source Heat Pump Unit

Figure 7: Troubleshooting guide - unit operation



The MicroTech III unit controller's valve or pump request terminal [IV/PR (H8)] is an output signal to external devices to allow water flow as required by the heat pump. The IV/PR (H8) terminal follows compressor operation inversely if connected to the normally open terminal and simultaneously when connected to the normally closed terminal. The IV/PR (H8) terminal can be used as a signal to an external pump or valve to enable flow to the unit. The compressor start is delayed for 45 seconds after the IV/PR (H8) output is energized.

Table 12: IV/PR(H8) terminal and compressor operation

IV/PR(H8)	Compressor On	Compressor Off
Normally Open	24 VAC	0 VAC
Normally Closed	0 VAC	24 VAC

Operation

Thermostat Inputs

Waterside Economizer/ Dehumidification

- The Waterside Economizer/Dehumidification input (TB1-1) on the I/O expansion board, when energized from the thermostat, enables Waterside Economizer or Dehumidification operation depending on jumper configuration.

Electric Heat Controls

W4

- The W4 (TB1-2) terminal enables the second stage of electric heat.

Supplemental Electric Heat Control

The supplemental electric heating option provides additional stages of heating that can be used in conjunction with compressor heating, or exclusively if the compressor is not available for heating.

General Rules:

- Supplemental electric heater and the compressor may operate simultaneously.
- Minimum Compressor ON and OFF timers do not apply to electric heat control.

Operation:

Fan Main Output: will turn ON and the Fan PWM signal will be at "Auxiliary Heat" duty cycle when:

- Any auxiliary heat output is energized.
- For 30 fixed seconds after all auxiliary heat outputs have been de-activated.

Electric Heat Outputs: are allowed to energize when either condition exists:

- Inter-Stage ON timer must be expired.
- Compressor is not available for heating.

When Compressor is Available:

- Auxiliary Heat Stage #1 output energizes upon activation of Heating – Stage #3.
- Auxiliary Heat Stage #2 output energizes upon activation of Heating – Stage #4.

When Compressor is Unavailable:

- Auxiliary Heat Stage #1 output energizes upon activation of "Heating – Stage #1.
- Auxiliary Heat Stage #2 output energizes upon activation of Heating – Stage #4.

Boilerless Heat Control

- Turns on the heater when the entering water temperature is less than setpoint (default is 55°F), the temperature set point is adjustable through the network.
- For geothermal applications the heater turns on when the entering water temperature is less than setpoint (default 28°F).

Note: *In both cases the compressor is shut down.*

Compressor Heating Source Selection

Compressor heating source selection provides a method to disable the compressor operation when in the heating mode.

Baseboard JP7 configuration jumper operation:

- Open: Enables compressor operation in the heating mode.
- Shorted: Disables compressor operation in the heating mode.

When compressor operation is disabled in the heating mode and electric heat is available:

- Auxiliary Heat Stage #1: output energizes upon activation of the "Heating – Stage #1".
- Auxiliary Heat Stage #2: output energizes upon activation of the "Heating – Stage #4".

When compressor operation is disabled in the heating mode electric and hydronic heat is unavailable:

- The unit will not provide any form of heating.

Hydronic Heat

General:

The hydronic heating option provides control of a two position valve connected to a hot water coil when loop water temperature is warm enough for hydronic heating.

- Loop water temperature is sensed by a factory installed entering water temperature sensor located on the inlet water line.
- Hydronic heat circuit shall be independent and substitute the use of the compressor driven refrigeration circuit.

Operation:

The Auxiliary Heat Stage #1 (H8-4) output on the I/O expansion board is used to open the hydronic heating valve.

- Hydronic heating setpoint allowed range is 70°F to 158°F, with a 90°F default value.
- When Entering Water Temperature (EWT) rises above the hydronic heating on setpoint:
- Compressor will be locked out of heating
- (compressor minimum on timer applies).
- If hydronic heating is required: the pump request output is activated; the "wait for flow" timer is canceled because the EWT is adequate for hydronic heating; the hydronic heating output shall energize; and the fan will turn on 30 seconds after the hydronic heating output has been energized.
- The fan speed signal is based on the highest active heating stage (#1 or #2)

Fan Speed Selector Switch

A 4-position fan speed selector switch located in the control box allows CFM settings to be field adjustable with some fan options. Fan speed control optimizes unit fan speed based on thermostat/room sensor inputs. The fan speed switch allows for manually setting an optimal fan speed specific to the application requirements. Each position on the fan speed switch represents settings 1-4.

Figure 8: 4-position fan speed selector switch

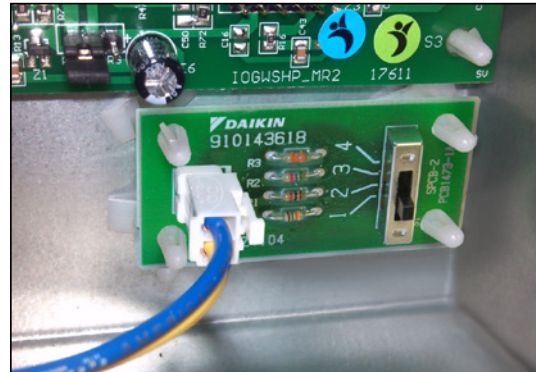
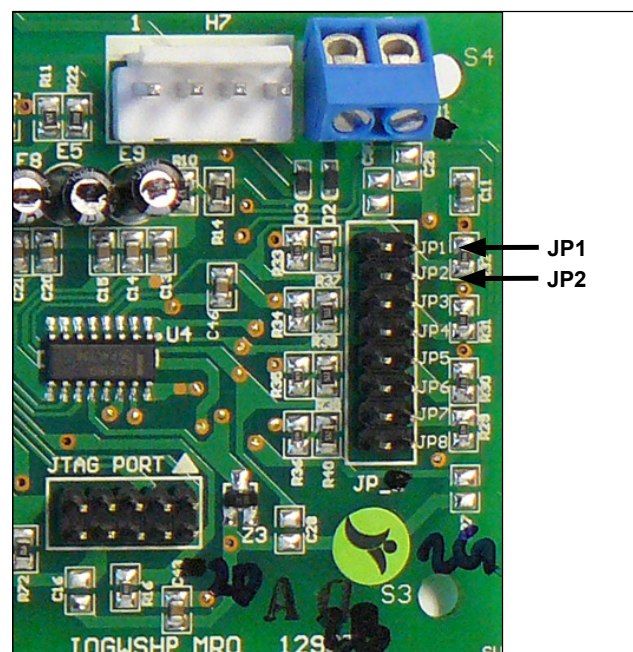


Table 13: I/O expansion module jumper configuration

I/O Expansion module configuration		
Setting	JP1	JP2
A	Open	Open
B	Shorted	Open
C	Open	Shorted
D	Shorted	Shorted

Note: Refer to Figure 9 for jumper configuration location.

Figure 9: JP1 & JP2 location on the I/O expansion module



Unit Options

Waterside Economizer

■ Application:

The Microtech III controls the waterside economizer. Upon a call for economizer operation via TB1-1, the output to the 3-way diverting valve and the fan motor are energized, allowing water flow through the economizer coil and fan operation.

■ Items Required:

- Multi-stage thermostat or sensor

■ Unit Control Settings:

- I/O Expansion Module Jumper Settings:
 - JP5 = Open
 - JP6 = Shorted

Figure 10: Model GT unit with WSE and thermostat wiring diagram

Model GT			
Unit		Thermostat	
R	_____	R	24VAC
C	_____	C	Common
G	_____	G	Fan
TB-1	_____	Y1	Cool Stage 1
Y1	_____	Y2	Cool Stage 2
Y2	_____	Y3	Cool Stage 3

Figure 11: Models GS and GC unit with WSE and thermostat wiring diagram

Model GS			
Unit		Thermostat	
R	_____	R	24VAC
C	_____	C	Common
G	_____	G	Fan
TB-1	_____	Y1	Cool Stage 1
Y1	_____	Y2	Cool Stage 2

SmartSource Dehumidification

■ Simplified Dehumidification

- Hot Gas Reheat Smart Dehumidification
- Humidistat Controlled Dehumidification
- Dehumidification Only

Simplified Dehumidification

■ Application:

By utilizing a basic thermostat and configuring the Microtech III unit controller for this mode of operation, the WSHP will provide maximum latent capacity by optimizing blower fan speeds resulting in decreased humidity levels in the conditioned space.

■ Items Required:

- Model GT = 3 stage thermostat
- Model GS, GC, VH = 2 stage thermostat
- Return air sensor

Note: This feature is not available if unit is controlled by a wall sensor

■ Unit Control Settings:

- I/O Expansion Module Jumper Settings:
 - JP5 = Shorted
 - JP6 = Open

■ Wiring:

Figure 12: Model GT unit and thermostat simplified dehumidification wiring diagram

Model GT			
Unit		Thermostat	
R	_____	R	24VAC
C	_____	C	Common
G	_____	G	Fan
TB-1	_____	Y1	Cool Stage 1
Y1	_____	Y2	Cool Stage 2
Y2	_____	Y3	Cool Stage 3

Figure 13: Model GS unit and thermostat simplified dehumidification wiring diagram

Model GS			
Unit		Thermostat	
R	_____	R	24VAC
C	_____	C	Common
G	_____	G	Fan
TB-1	_____	Y1	Cool Stage 1
Y1	_____	Y2	Cool Stage 2

■ Operation:

Unit will run at maximum compressor capacity with low CFM to maximize latent capacity.

Example: A 2-stage model GT, unit size 026, wired for Simplified Dehumidification:

- Upon a call for Y1, and the return air temperature is 68°F or greater. TB1-1 on the unit control board will be energized, allowing the compressor to operate at full load and the fan to operate at 600 CFM.
- Upon a call for Y2, Y1 on the unit control board will be energized, allowing the compressor to operate at part load and the fan to operate at 700 CFM. (Factory default fan speed setting #3)
- Upon a call for Y3, Y2 on the unit control board will be energized, allowing the compressor to operate at full load and the fan to operate at 800 CFM. (Factory default fan speed setting #3)

Hot Gas Reheat Smart Dehumidification

■ Application:

By utilizing the factory installed hot gas reheat and smart air flow management; dehumidification can be achieved in applications where precise humidity control is required.

■ Items Required:

- Unit with Hot Gas Reheat option
- Humidistat and a Thermostat OR Digitally Adjustable Wall Sensor
- Return air sensor

■ Unit Control Settings:

- I/O Expansion Module Jumper Settings:
 - JP5 = Shorted
 - JP6 = Open

■ Wiring:

- Thermostat (Part No. 910121746 or 910121748) Sensor (Part No. 667720401) Combination:
- Digitally adjustable room temperature sensor (Part No. 910121754)

Figure 14: Model GT thermostat and sensor combination hot gas reheat smart dehumidification wiring diagram

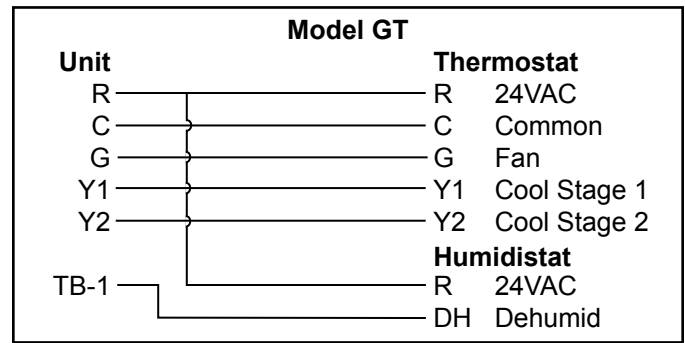
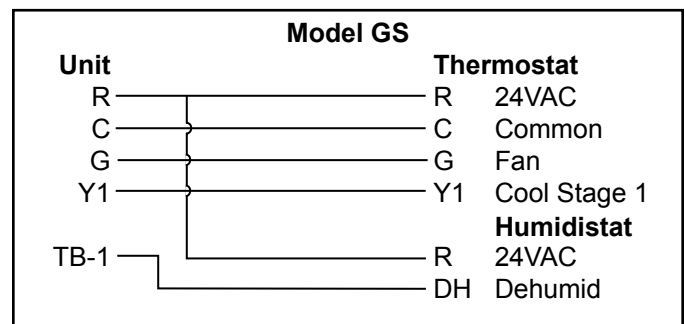


Figure 15: Model GS thermostat and sensor combination hot gas reheat smart dehumidification wiring diagram



■ Operation:

A call for heating or cooling has a higher priority than a call for dehumidification. Dehumidification is allowed only if the room temperature is satisfied and the return air temperature is 68°F or greater. If the controller detects the need for heating or cooling, or if the Humidistat is no longer calling for dehumidification, dehumidification mode will be suspended. Dehumidification mode will enable the 3-way hot gas bypass valve, sending hot superheated refrigerant to the hot gas reheat coil while running the compressor at full load and the fan at dehumidification speed.

Note: See Fan Performance section in catalog for unit size specific fan speeds.

Figure 16: SmartSource MicroTech III controller to digital room temperature sensor wiring

SmartSource Board	MicroTech III Board								I/O	
	Base Board								Expansion Module	
Terminal Block Label	TB2-1	TB1-1	TB1-2	TB1-3	TB1-4	TB1-5	TB3-1	TB3-2	TB1-1	
Description	24VAC	Unit Status Output	Fan & Unit Mode	Setpoint Adjust	Room Temp Sensor & Tenant Override	DC Signal Common	Emergency Shutdown Input	Unoccupied Input	Dehumidification Input	
Terminal Label	R	1	2	3	4	5	E	U	1	
Typical Wiring										
Terminal Label	R (24VAC)	1 (ST)	2 (FM)	3 (SP)	4 (UTS)	5 (GND)	6 (FC)	E	U	DH
Description	24VAC	Unit Status Output	Fan & Unit Mode	Setpoint Adjust	Room Temp Sensor & Tenant Override	DC Signal Common	Fan Speed Select - Fan Coil Version Only	Emergency Shutdown	Unoccupied	Dehumidification
Sensor	Digitally Adjustable Room Temperature Sensor (Part No. 910121754)									

Humidistat Controlled Dehumidification

■ Application:

Similar to the simplified dehumidification option, this option also maximizes latent capacity by using a humidistat and thermostat. This option allows the room thermostat to control sensible cooling, while the independent humidistat controls room humidity levels

■ Items Required:

- Humidistat combined with a...
- Model GT = 3 stage thermostat
- Model GS = 2 stage thermostat
- Return air sensor

OR

- I/O Expansion Module Jumper Setting:
 - JP5=Shorted
 - JP6=Open

Note: This feature is not available if unit is controlled by wall sensor

■ Unit Control Settings:

- I/O Expansion Module Jumper Settings:
 - JP5=Shorted
 - JP6=Open

■ Wiring:

- Thermostat/Sensor combination:
- Field supplied sensor

Figure 17: Model GT thermostat and humidistat combination - humidistat controlled dehumidification wiring diagram

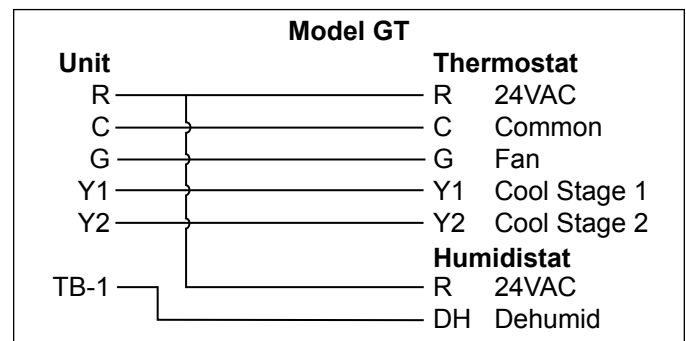


Figure 18: Model GS thermostat and humidistat combination - humidistat controlled dehumidification wiring diagram

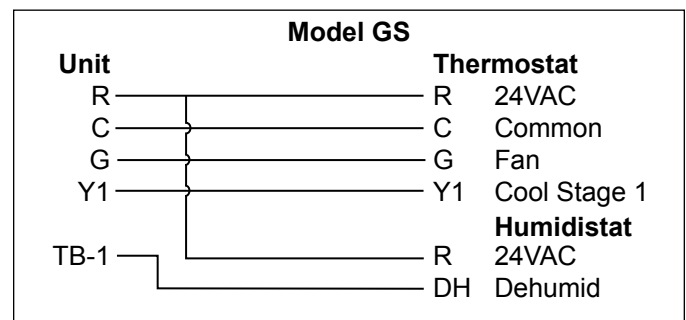


Figure 19: SmartSource MicroTech III controller & I/O expansion module to field supplied room temperature sensor wiring

SmartSource Board	MicroTech III Board								I/O Expansion Module	
	Base Board									
Terminal Block Label	TB2-1	TB1-1	TB1-2	TB1-3	TB1-4	TB1-5	TB3-1	TB3-2	TB1-1	TB1-2
Description	24VAC	Unit Status Output	Fan & Unit Mode	Setpoint Adjust	Room Temp Sensor & Tenant Override	DC Signal Common	Emergency Shutdown Input	Unoccupied Input	Dehumidification Input	Humidistat Source Voltage (24VAC)
Terminal Label	R	1	2	3	4	5	E	U	1	

Typical Wiring

Terminal Label					X	X			X	X
Description					Room Temp Sensor, 10K Ohm ATP Curve Z or equivalent	DC Signal Common			Dehumidification Output	Dehumidification Source Voltage
Sensor					Field Supplied Room Temperature Sensor					

■ Operation:

Unit will run at maximum compressor capacity with low CFM to maximize latent capacity.

Example: A 2-stage model GT, unit size 026, wired for Humidistat Controlled Dehumidification:

- Upon a call for dehumidification, TB1-1 on the unit control board will be energized by the humidistat, allowing the compressor to operate at full load and the fan to operate at 600 CFM.
- Upon a call for stage 1 cooling, Y1 on the unit control board will be energized from Y1 on the thermostat, allowing the compressor to operate at part load and the fan to operate at 700 CFM. (Factory default fan speed setting #3)
- Upon a call for stage 2 cooling, Y2 on the unit control board will be energized from Y2 on the thermostat, allowing the compressor to operate at full load and the fan to operate at 800 CFM. (Factory default fan speed setting #3)

Note: See *Fan Performance* section in catalog for unit size specific fan speeds.

Dehumidification Only

■ Application:

In applications where only dehumidification is needed, the humidistat can be wired to TB1-1 on the Microtech III unit controller, allowing the WSHP unit to operate in dehumidification mode only. The unit will only respond to a call for dehumidification whenever the return air temperature is 68°F or greater.

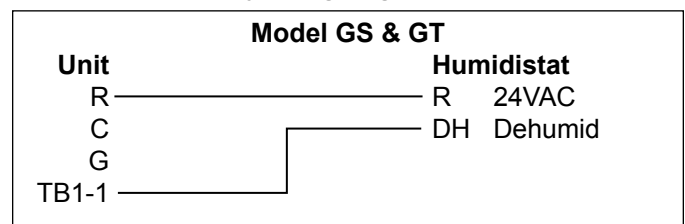
■ Items Required:

- Humidistat
- Return air sensor

■ Unit Control Settings:

- I/O Expansion Module Jumper Settings:
 - JP5=Shorted
 - JP6=Open

■ Wiring:

Figure 20: Model GS & GT unit and humidistat-dehumidification only wiring diagram


■ Operation:

Upon a call for dehumidification, the unit will run in cool stage 1 compressor capacity and cool stage 1 fan speed.

Example: A 2-stage model GT, unit size 026, wired for Dehumidification Only:

- Upon a call for dehumidification from the humidistat, TB1-1 on the unit control board will be energized, allowing the compressor to operate at full load and the fan to operate at 600 CFM.

Note: See *Fan Performance* section in catalog for unit size specific fan speeds.

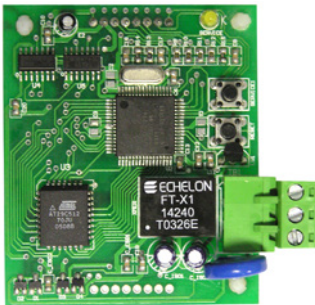
MicroTech III Unit Controller with LONWORKS® Communication Module

For installation and operation information on LONWORKS Communication Module and other ancillary control components, see:

- IM 927 - MicroTech III Water Source Heat Pump LONWORKS Communication Module.
- IM 933 - LonMaker Integration Plug-in Tool: For use with the MicroTech III Unit Controller.
- IM 955 - MicroTech III Wall Sensor for use with Microtech III Unit Controller

Each Daikin water source heat pump can be equipped with a LONWORKS communication module that is LONMARK 3.4 certified to meet the LONMARK Space Comfort Control (SCC) profile for heat pumps. The controller is microprocessor-based and is designed to communicate over a LONWORKS network. With the optional factory or field-installed communication module. The unit controller is programmed and tested with all the logic required to monitor and control the unit. An optional wall sensor may be used with the communication module to provide limited local control of the Water Source Heat Pump. The unit controller monitors water and air temperatures and passes information to the communication module. The module communicates with the BAS to provide network control of the Water Source Heat Pump.

Figure 21: LONWORKS Communication Module



The MicroTech III unit controller with communication module includes a unit-mounted return air, discharge air and leaving water temperature sensor. Wall mounted temperature sensors include setpoint adjustment and tenant override. The user has the capability of substituting the wall sensor with a duct-mounted return air sensor.



MicroTech III Unit Controller with LONWORKS Communication Module orchestrates the following unit operations:

- Enable heating and cooling to maintain setpoint based on a room sensor
- Enable fan and compressor operation
- Monitors all equipment protection controls
- Monitors room and discharge air temperatures
- Monitors leaving water temperature
- Relays status of all vital unit functions

The MicroTech III unit controller with an optional communication module includes:

- Return Air Temperature sensor (RAT)(field-installed)
- Discharge Air Temperature sensor (DAT)(field-installed)
- Leaving Water Temperature sensor (LWT)

Note: Refer to IM 956-X for details to install (RAT) & (DAT) sensors.

CAUTION

When an optional wall-mounted room temperature sensor is connected to the unit controller, the Return Air Temperature (RAT) sensor must not be installed. A wall-mounted room temperature sensor and the return air temperature sensor must not be connected simultaneously or the unit will not operate properly.

The communication module provides access to setpoints for operational control

Available wall sensors include:

- Room sensor with LED status and tenant override button
- Room sensor with LED status, tenant override button, and $\pm 5^{\circ}\text{F}$ setpoint adjustment
- Room sensor with LED status, tenant override button, 55° to 95°F setpoint adjustment

MicroTech III Controller with an Optional BACnet® Communication Module



For installation and operation information on MicroTech III unit controller and other ancillary components, see:

- IM 928 - MicroTech III Water Source Heat Pump BACnet Communication Module
- IM 955 - MicroTech III Wall Sensor For use with Microtech III Unit Controller

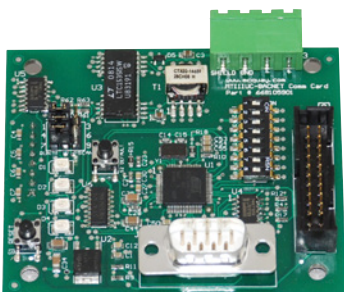
Daikin water source heat pumps are available with an optional BACnet MS/TP communication module that is designed to communicate over a BACnet MS/TP communications network to a building automation system (BAS). It can be factory or field-installed.

The unit controller is programmed and tested with all the logic required to monitor and control the unit. An optional wall sensor may be used with the communication module to provide limited local control of the water source heat pump. The unit controller monitors water and air temperatures and passes information to the communication module. The module communicates with the BAS, to provide network control of the water source heat pump.

The module makes operational data and commands available on a communications network using BACnet objects and properties:

- The network cable is a shielded twisted-pair cable
- Network communications run up to 76.8 Kbps
- DIP switches on the controller enable the MS/TP MAC address to be set in the range 0-127
- Four green status LEDs on the communication module indicate communication activity on the MS/TP communication network and with the unit controller

Figure 22: MicroTech III BACnet MS/TP Snap-in Communication Module



MicroTech III Unit Controller with BACnet MS/TP Communication Module orchestrates the following unit operations:

- Enable heating and cooling to maintain setpoint based on a room sensor
- Enable fan and compressor operation
- Monitors all equipment protection controls
- Monitors room and discharge air temperatures
- Monitors leaving water temperature
- Relays status of all vital unit functions

The MicroTech III unit controller with an optional communication module includes:

- Return Air Temperature sensor (RAT)(field-installed)
- Discharge Air Temperature sensor (DAT)(field-installed)
- Leaving Water Temperature sensor (LWT)

Note: Refer to IM 956-X for details to install (RAT) & (DAT) sensors.

CAUTION

When an optional wall-mounted room temperature sensor is connected to the unit controller, the Return Air Temperature (RAT) sensor must not be installed. A wall-mounted room temperature sensor and the return air temperature sensor must not be connected simultaneously or the unit will not operate properly.

The communication module provides access to setpoints for operational control

Available wall sensors include:

- Room sensor with LED status and tenant override button
- Room sensor with LED status, tenant override button, and $\pm 5^{\circ}\text{F}$ setpoint adjustment
- Room sensor with LED status, tenant override button, 55° to 95°F setpoint adjustment

Controller Comparison

Note: The Mark IV, MicroTech 2000, Alerton and MicroTech III boards are NOT interchangeable.

Table 14: Control Boards and Features

Features	Mark IV	MicroTech 2000	Alerton	MicroTech III
DC Power	•	–	–	–
AC Power	•	•	•	•
Terminal Connection 1/4" Push-on	•	–	–	–
IDC Connection	–	•	•	•
Fault Indicators	•	•	–	•
Thermostatic Controls	•	–	–	•
Room Sensor	–	•	•	•
LONMARK Capable	–	•	–	•
LONWORKS Capable	–	•	–	–
BACnet Capable ¹	–	–	•	•
Motorized Valve Capability	–	•	•	•
Short Cycle Protection & Random Start	•	•	•	•
Unoccupied Mode	•	•	•	•
Override Mode	•	•	•	•
Pump Restart	•	•	•	•
Loadshed	•	•	•	–
Brownout Protection	•	•	•	•
Unit Shutdown	•	•	•	•
Condensate Overflow Protection	•	•	•	•
Remote Reset ¹	•	–	–	•
Intelligent Reset ¹	–	–	–	•
Dual Circuit Capability	•	•	•	•
Adjustable Set Points Through Software	–	•	•	•
Adjustable Fan Speed	–	–	–	•
Electric Heat Availability	–	–	–	•
Service Tools Needed at Start up	–	•	•	•
Dipswitch Settings	–	–	•	–
Programmable Front-end Settings	–	•	–	•
Switching Line Voltage	•	–	–	•

Notes: • = Applies – = Does not apply

¹ Alerton BACnet requires Alerton service tools for commissioning

¹ Alerton dipswitch settings must be configured during commissioning

¹ See Remote Reset and Intelligent Reset information under section: Additional Operating Modes



Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. Refer to Form 933-430285Y. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

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