Operation and Maintenance Manual

IOM 1150-1

Group: **Controls**

Part Number: **IOM 1150-1**

Date: **October 2014**

Daikin Loop Water Manager

For Daikin water source heat pumps with MicroTech® III unit controls in a MicroTech Integrated System or in stand-alone operation in a water loop application

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Revision History

Number	Date	Type
IOM 1150	September 17, 2012	Initial release
IOM 1150-1	October 2014	Rewired some inputs and outputs to new locations on the terminal board, having all inputs and outputs grouped together, respectively. Updated descriptions of many objects. Brand renaming.

Reference Documents

Number	Company	Title	Source
ED19015	Daikin Applied	MicroTech III Loop Water Manager Protocol Information for BACnet	www.DaikinApplied.com
OM 1092-2	Daikin Applied	MicroTech Integrated System Manager operations manual	www.DaikinApplied.com
ANSI/ASHRAE 135-2008	American Society of Heating, Refrigerating and Air-Conditioning Engineers	BACnet® A Data Communication Protocol for Building Automation and Control Networks	www.ashrae.org

Limited Warranty

Consult your local Daikin Applied Representative for warranty details. Refer to Form 933-43285Y. To find your local Daikin Applied Representative, go to www.DaikinApplied.com.

NOTICE

Use this manual to install and configure the Daikin Loop Water Manager. Use the appropriate Daikin Engineering Data (ED) publication, known as the Protocol Information document, to integrate the unit into your network. The Protocol Information document contains addressing details, BACnet® protocol information, and a list of the data points available to the network. See the Reference Documents section of this manual for Protocol Information document numbers. MicroTech III control integration literature is available from your local Daikin sales representative and www.DaikinApplied.com.

Introduction

This document contains information related to the Daikin Loop Water Manager (LWM) for Daikin water source heat pumps with MicroTech III unit controllers.

Hazard Identification Messages

⚠DANGER

Dangers indicate a hazardous situation that will result in death or serious injury if not avoided.

⚠WARNING

Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

⚠CAUTION

Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

⚠WARNING

Electric shock hazard. Can cause personal injury or equipment damage.

This equipment must be properly grounded. Connections and service to the MicroTech III Loop Water Manager must be performed only by personnel knowledgeable in the operation of the equipment being controlled.

⚠CAUTION

Static sensitive components. Can cause equipment damage.

Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

NOTICE

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense. **Daikin Applied disclaims any liability resulting from any interference or for the correction thereof.**

Description

The Daikin Loop Water Manager (LWM) initiates and controls main and secondary flow pumps, as well as heat addition/rejection outputs, to supply heat or cooling to the water loop for multiple zones of water source heat pumps, which will in turn deliver climate control to their associated zones.

The Loop Water Manager can be ordered in a variety of hardware configurations to accommodate the site needs. See the Model Number Nomenclature section and Hardware section to determine the inputs and outputs (I/O) available on your particular model (**Error! Reference source not found.**).

One or two main pumps can be used in lead/lag mode or cycled based on operating hours. Each pump can have its own flow switch or share the same switch. Secondary pumps can be configured for a secondary boiler or tower loop. You may have up to two secondary loops and each one is equipped with a flow switch to verify pump operation. Alternatively, you may have redundant secondary pumps operating on a single secondary loop.

Depending on model of the Loop Water Manager you have, you can have up to 12 cooling or heating stages. Each stage has its own setpoint and deadband. There are also analog tower or boiler valve outputs to use with a variable heating element (boiler valve or SCR electric) or cooling element (tower fan VFD or heat exchanger valve).

The LWM comes factory equipped with an alarm LED and audible alarm. It also has been equipped with a manual override switch, emergency stop LED, and sump dump switch on the exterior of the panel.

The LWM can be capable of interfacing with a building automation system (BAS) or MicroTech Integrated System using BACnet MS/TP (refer to model number, specifically the last two digits as indicated in the Model Nomenclature on page 9.)

A user's building automation system or BAS will be able to connect directly to the LWM via twisted pair communication wire in BACnet/MSTP networks and via an Ethernet cable in BACnet/IP networks. The contractor or network administrator will be responsible for ensuring that the system's performance is not altered.

Model Number Nomenclature

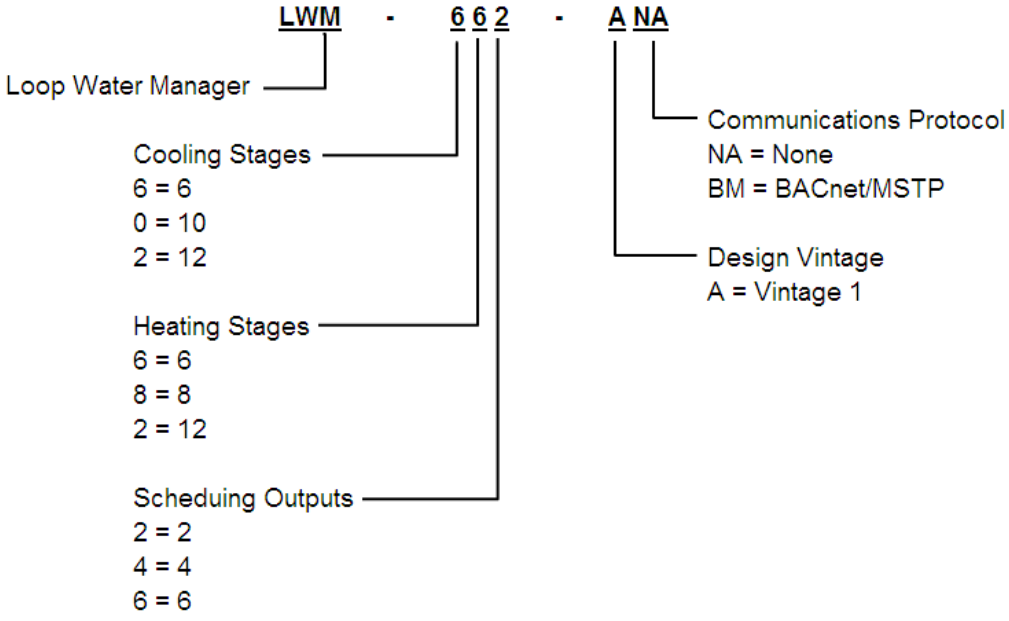


Figure 1. LWM Model Number Nomenclature

Hardware Installation Process

The Loop Water Manager is designed for indoor use only. The panel should be mounted on the interior surface of a convenient sturdy wall with adequate clearance for door to swing.

The Loop Water Manager should be protected from direct sunlight, excessive moisture, dust or lint. The ambient environmental temperature and humidity specifications for the panel are listed below:

Operating: 32° F to 115° F (0-95% RH, noncondensing)

Storage: -20° F to 140° F (0-95% RH, noncondensing)

Four mounting holes are provided for use in installation. These holes are located in the four corners of the LWM outside of the back panel. Mount the panel to the wall using screws or bolts (not provided). A knock out for field wiring is provided in the lower right corner of the panel. If it is necessary to drill additional holes, you must temporarily remove or protect the back panel of the LWM to protect all electrical devices from metal filings and debris.

The Loop Water Manager cabinet requires 115V/60/1 power source. Supply 115 volts to terminals 1H (115 volts) and 2N (common) as shown on the schematic. The control panel must be properly grounded. Run a separate copper ground wire (#14AWG minimum size) from either terminal 3G or grounding lug GLG1 to earth ground.

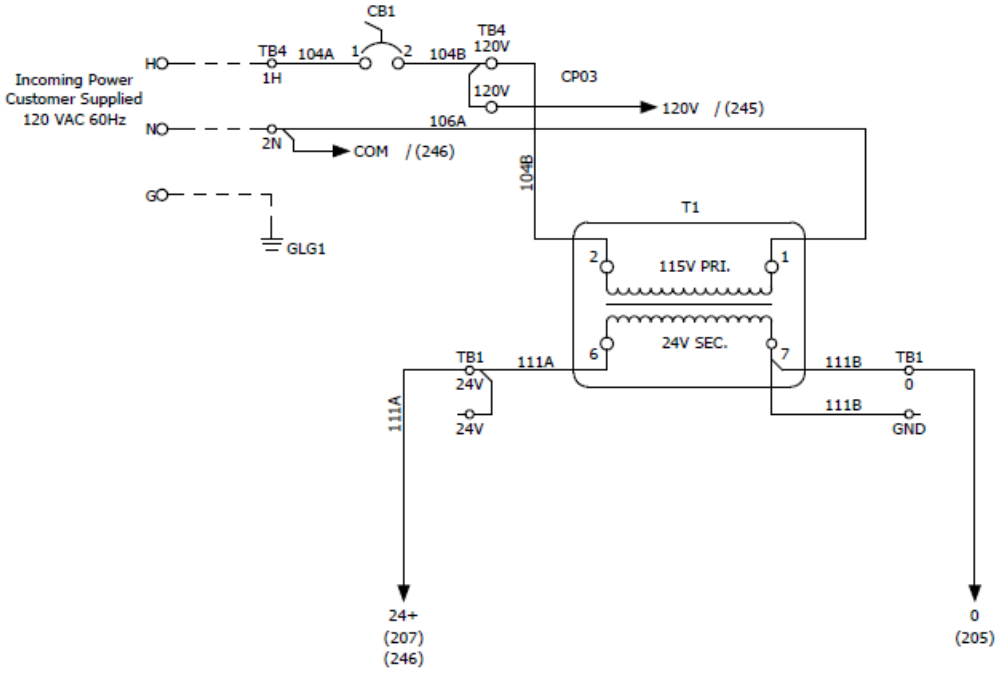


Figure 2. Field power schematic

The panel is internally protected from short circuits with a 10 amp circuit breaker in the bottom right hand corner near the power terminals. This circuit breaker can also be used as an on/off switch for the LWM. Flip this switch to the "up" position to power the LWM and move it to the "down" position to remove power. **Caution - Power will still be present on terminal block TB4 when the circuit breaker is in the off position!** You must turn off the circuit breaker in the building that feeds power to the LWM to remove all power within the cabinet.

The following sections will describe how to configure the unit to utilize field-installed sensors and relays for appropriate control of the water loop. The LWM should only be configured for the options that are physically installed in the field, or alarming will occur.

Loop Water Manager Wiring Diagrams

Wiring for Loop Water Manager models LWM662, LWM084, LWM226

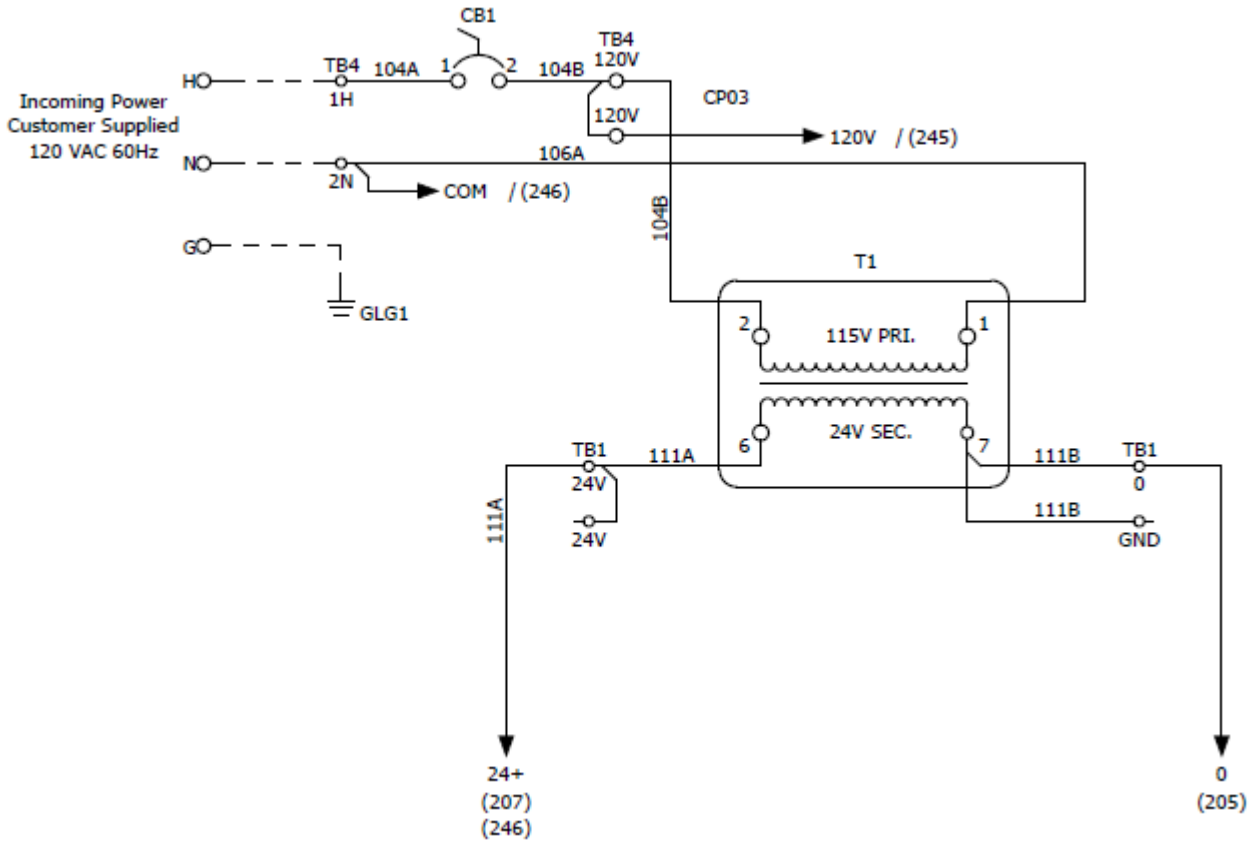


Figure 3. Wiring diagram for all LWM

Wiring for Loop Water Manager models LWM662, LWM084, LWM226 (continued)

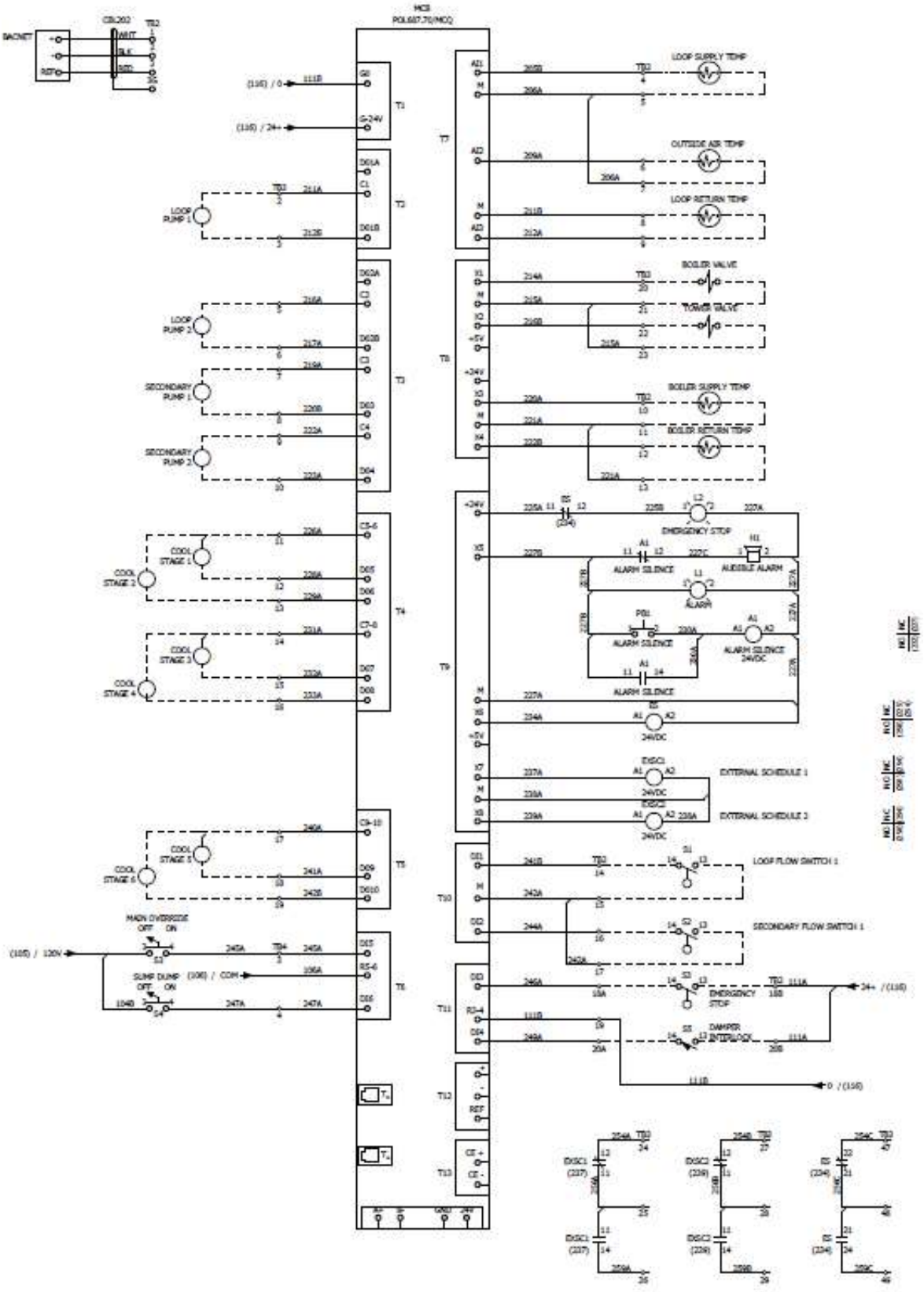


Figure 4. Main Board Wiring Schematic

Wiring for Loop Water Manager models LWM662, LWM084, LWM226 (continued)

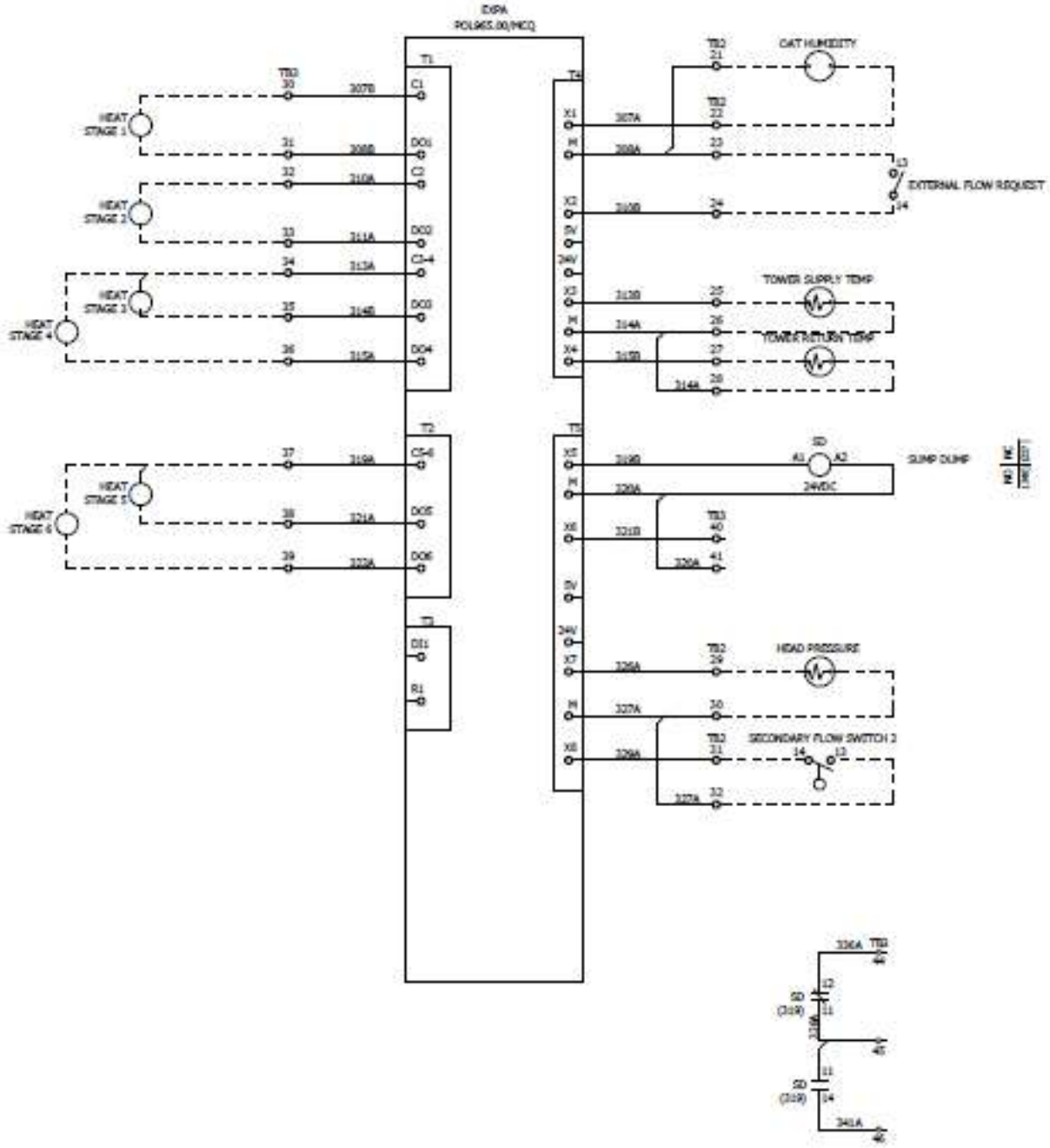


Figure 5. Expansion Board A Wiring Schematic

Wiring for Loop Water Manager models LWM084 and LWM226 only

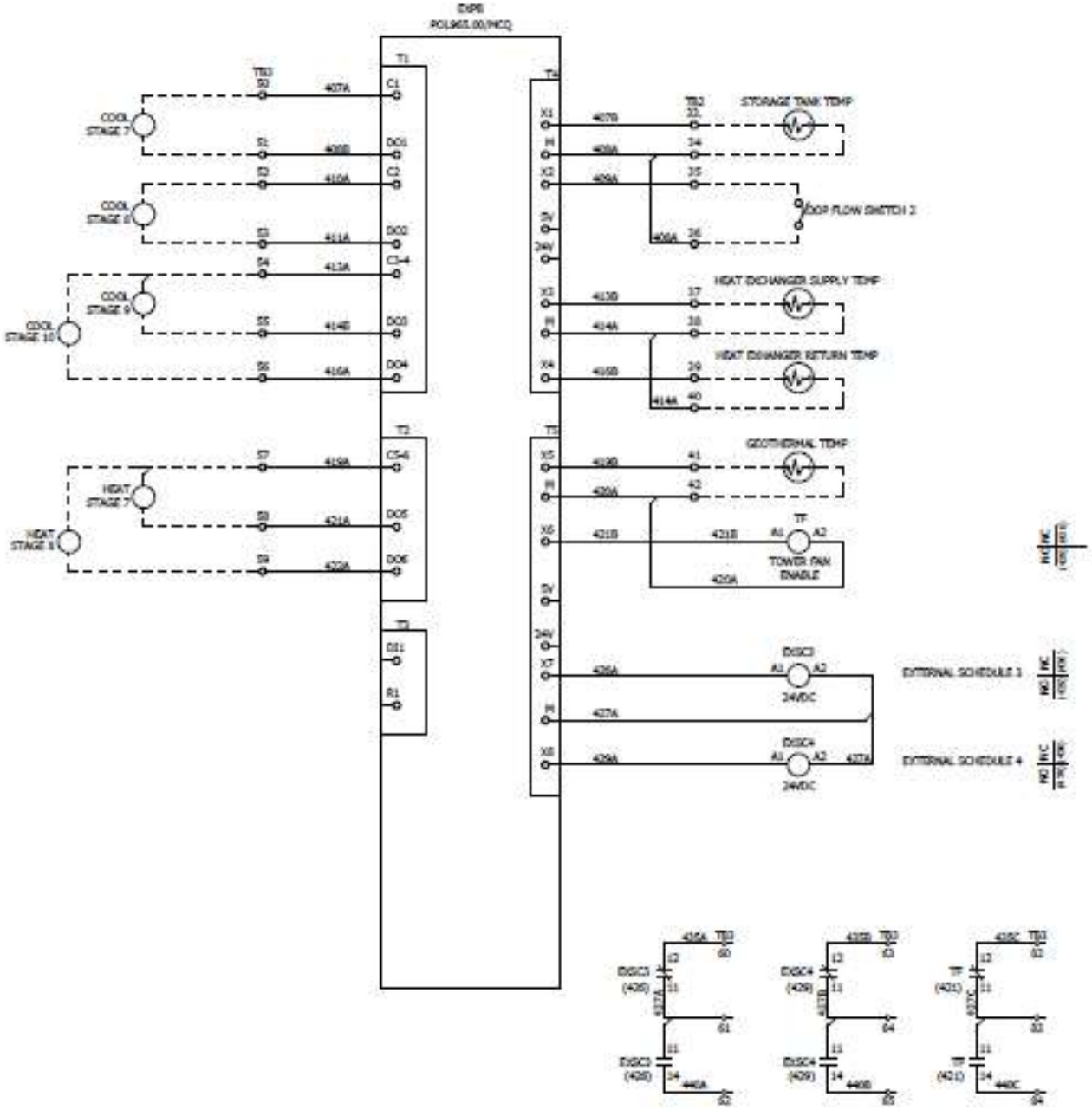


Figure 6. Expansion Board B Wiring Schematic

Wiring for Loop Water Manager model LWM226 only

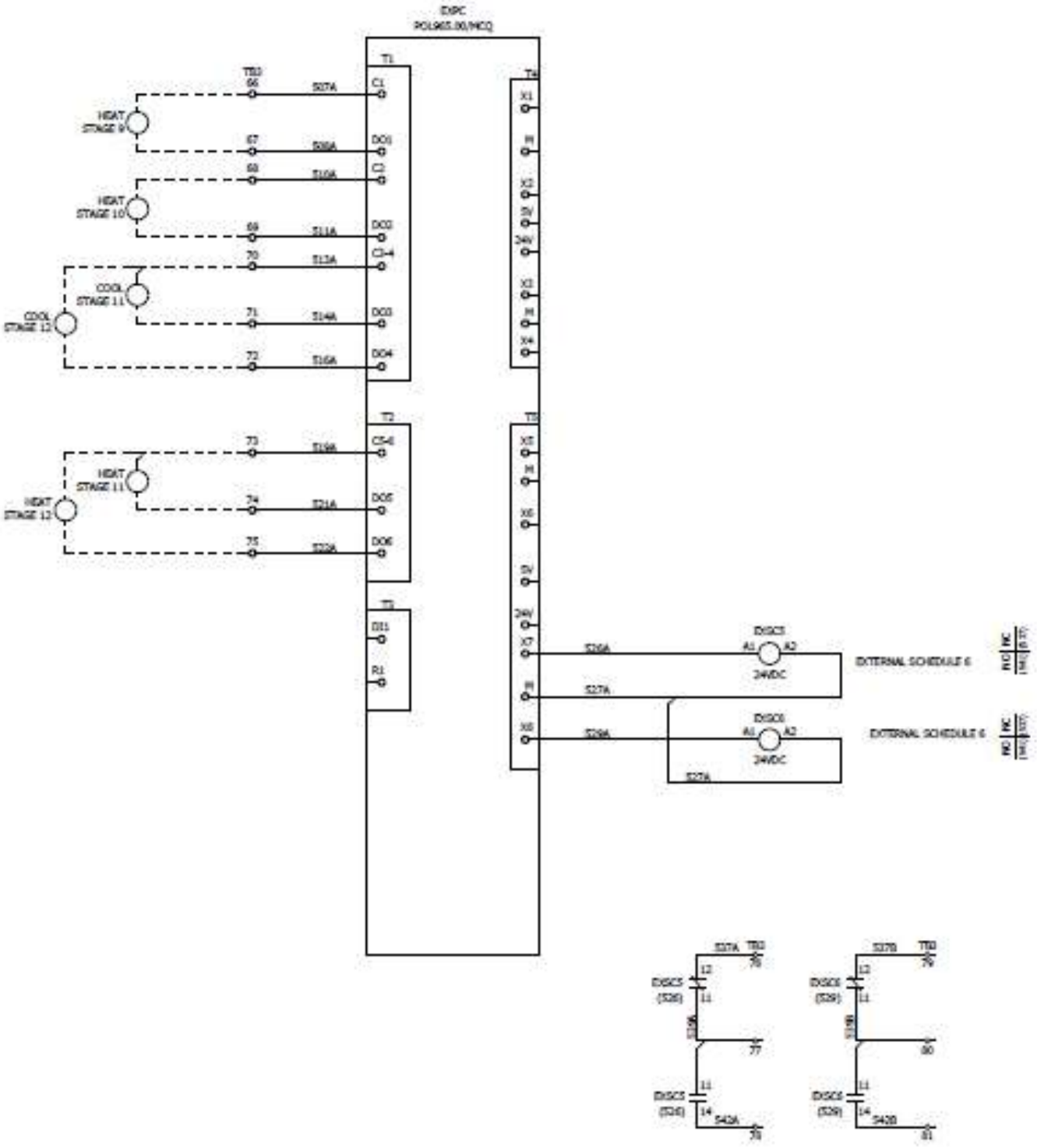


Figure 7. Expansion Board C Wiring Schematic

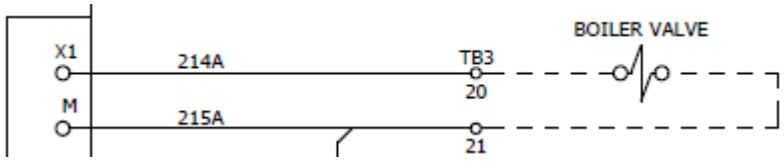
Field Wiring

This section describes the various options and features that may require field wiring to the Loop Water Manager (LWM). The available points depend on the model of your LWM and the configuration of your particular unit. Refer to your model number or unit schematics to determine which points have been supplied on your unit. Which inputs and outputs you use will depend on how you have configured the LWM. In general, terminal block TB2 contains field terminals for all inputs and TB3 contains terminals for field connected outputs. All inputs and outputs for the LWM are designed to be dry contacts, but can be made to be powered as indicated in the following sections.

Field Analog Output Signals

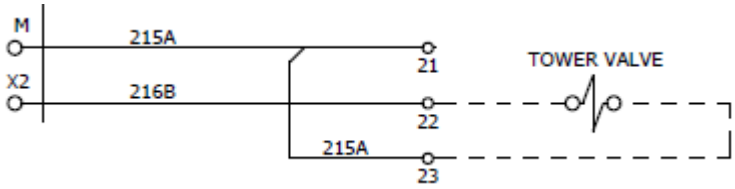
Boiler Valve

The boiler valve output is a configurable (4-20mA, 0-5VDC or 0-10VDC) output with a range that is configured within the unit configuration menu. The X1 terminal of the main control board (TB3, terminal 20) is the signal output, with M (TB3, terminal 21) being the common for this output.



Tower Fan

The Tower Fan/Valve output is a configurable (4-20mA, 0-5VDC or 0-10VDC) output with a range that is configured within the unit configuration menu. The X2 terminal of the main control board (TB3, terminal 22) is the signal output, with M (TB3, terminal 23) being the common for this output.



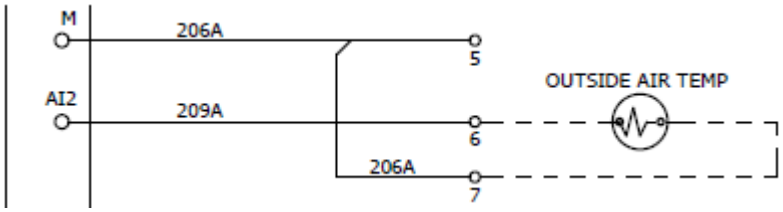
Field Analog Input Signals

Water Loop Supply Temp

The loop supply temperature sensor is connected to AI 1 on the main control board, and terminals 4 and 5 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.

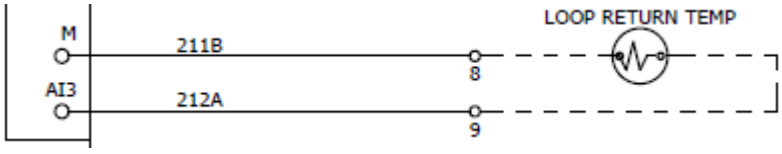
Outdoor Air Temperature

The outdoor air temperature sensor is connected to AI 2 on the main control board, and terminals 6 and 7 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



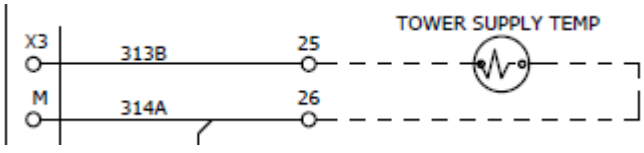
Water Loop Return Temperature

The loop return temperature sensor is connected to AI 3 on the main control board, and terminals 8 and 9 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



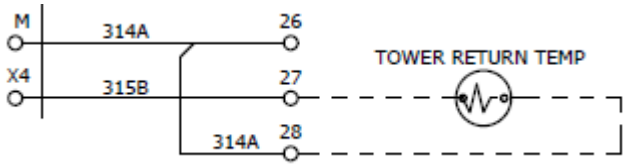
Tower Supply Temperature

The tower supply temperature sensor is connected to X3 on expansion module A, and terminals 25 and 26 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



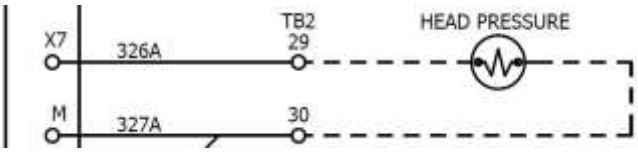
Tower Return Temperature

The tower return temperature sensor is connected to X4 on expansion module A, and terminals 27 and 28 of TB2 on the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



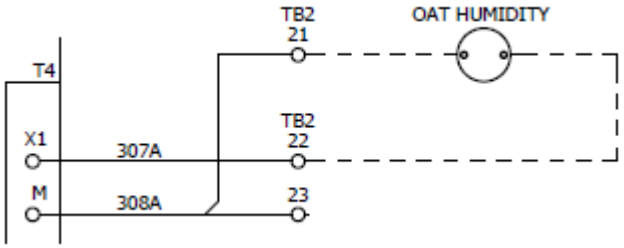
Head Pressure

The head pressure sensor is connected to X7 on expansion module A. This input is configurable (4-20mA, 0-5VDC or 0-10VDC). The X7 terminal of the expansion module (TB2, terminal 29) is the signal input, with M (TB2, terminal 30) being the common for this input.



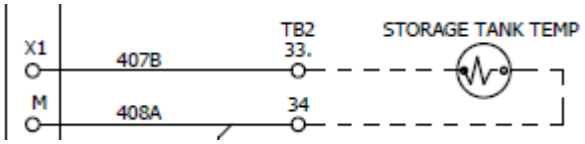
Outdoor Air Humidity

The outdoor air humidity sensor is connected to X1 on expansion module A. This input is configurable (4-20mA, 0-5VDC or 0-10VDC). The X1 terminal of the expansion module (TB2, terminal 22) is the signal input, with M (TB2, terminal 21) being the common for this input.



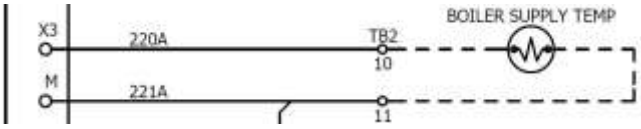
Storage Tank Temperature

The storage tank temperature sensor is connected to X1 on expansion module B (if so equipped), and terminals 33 and 34 of TB2 on the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



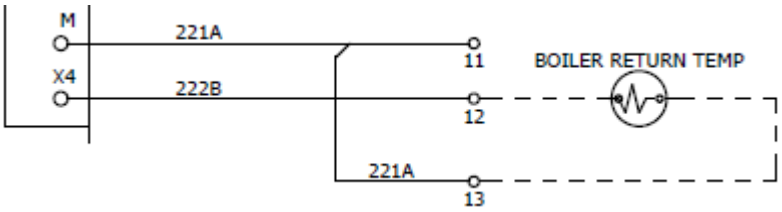
Boiler Supply Temperature

The boiler supply temperature sensor is connected to X3 on the main control board, and terminals 10 and 11 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



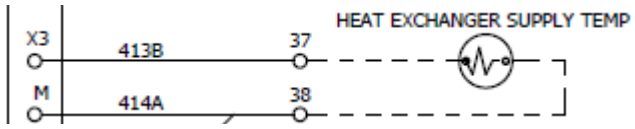
Boiler Return Temperature

The boiler return temperature sensor is connected to X4 on the main control board, and terminals 12 and 13 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



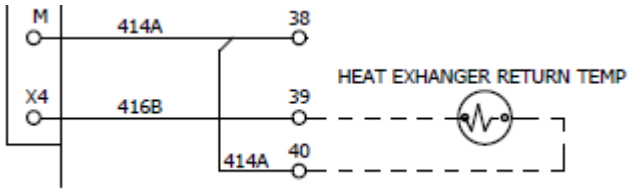
Heat Exchanger Supply Temperature

The heat exchanger supply temperature sensor is connected to X3 on the expansion module B (if so equipped) and terminals 37 and 38 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



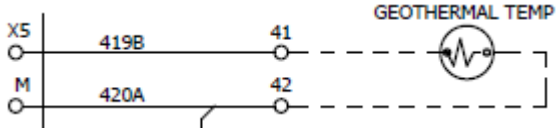
Heat Exchanger Return Temperature

The heat exchanger return temperature sensor is connected to X4 on the expansion module B (if so equipped) and terminals 39 and 40 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



Geothermal Temperature

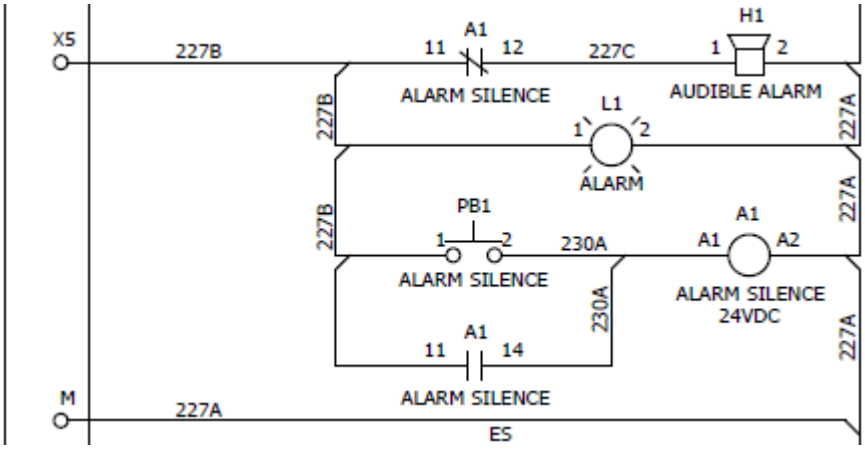
The geothermal temperature sensor is connected to X5 on the expansion module B (if so equipped) and terminals 41 and 42 on TB2 of the Loop Water Manager. This sensor must be a 10K NTC type thermistor to read properly on the Loop Water Manager.



Field Digital Outputs Signals

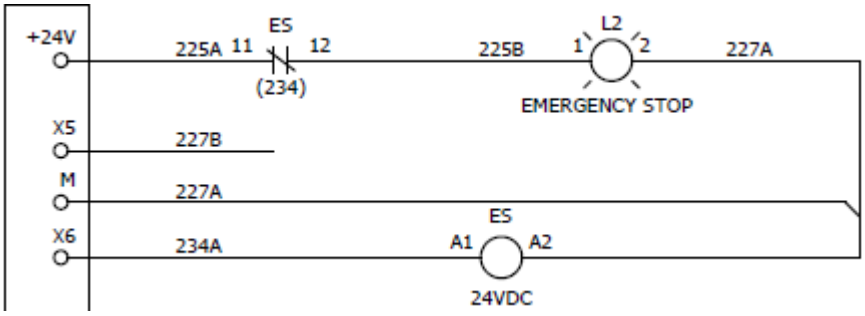
Alarm LED Output

The alarm output (MCB-X5) and the alarm LED will be will be ON if there is an active alarm in the LWM and OFF if there are no alarms. Along with the alarm LED, an audible alarm will be initiated. The audible alarm can be silenced using the alarm silence push button on the LWM panel door.



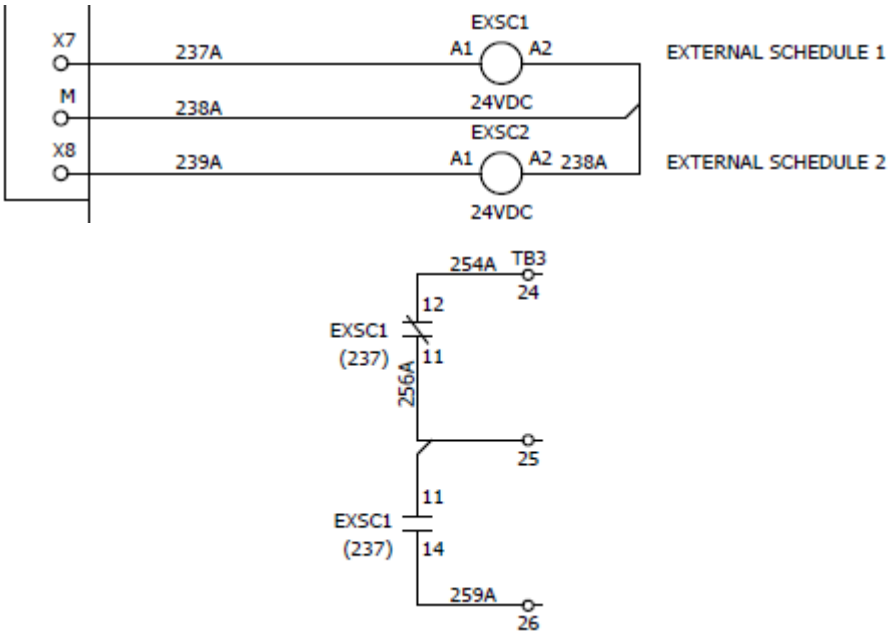
Emergency Stop LED

The emergency stop output (MCB-X6) will be will be OFF if there is an emergency stop alarm in the LWM and ON otherwise. The emergency stop LED will illuminate if the unit is currently in the emergency shutdown condition. Relay ES is energized by the X6 output on the main control board and the NC contracts of that relay feed the emergency stop LED. Under normal operating conditions, the relay is energized by the X6 output from the main control board and the NC contacts are open, de-energizing the emergency stop LED. When an emergency stop condition occurs, the X6 output de-energizes and the NC contacts of ES close and energize the emergency stop LED.



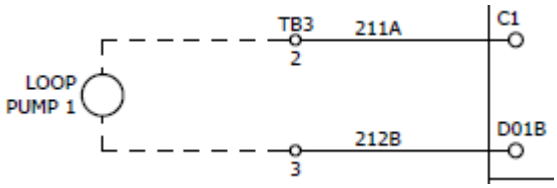
External Schedule 1-6

The number of external scheduling outputs will be based on the model of the loop water manager. See unit schematics for terminal information. The main control board (or the associated expansion board outputs) energizes an external schedule relay with 24VDC. The NO and NC contacts of this relay are tied to terminals in the LWM for field use.

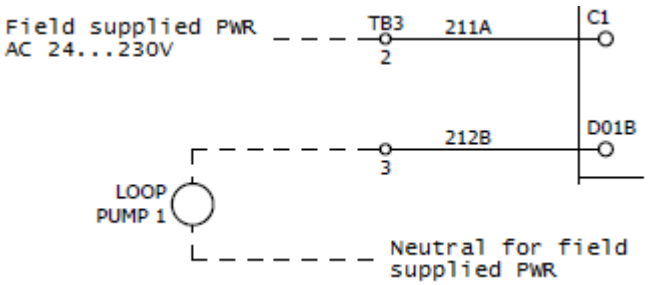


Loop Pump 1 & 2

The output for main loop pump 1 originates from DO1B and C1 on the main control board. The LWM closes the connection between C1 and DO1B in the main control board for a dry contract output for field connection to main loop pump 1.



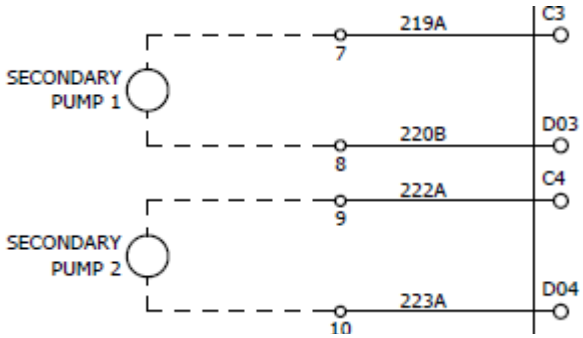
Alternatively, the output for main loop pump 1 can be made to be an energized output in the field. The field provided power source should be connected to the C1 terminal on the main control board (terminal 2, TB3). When the pump is to be energized, the LWM will close the C1 terminal to the output terminal (DO1B) and energize the field relay with the field provided power. The common terminal for the field relay should be connected to a neutral for the power source (as shown below).



Loop pump 2 is wired in the same fashion using the C2 and DO2B terminals on the main control board, see unit schematics for LWM terminal numbers.

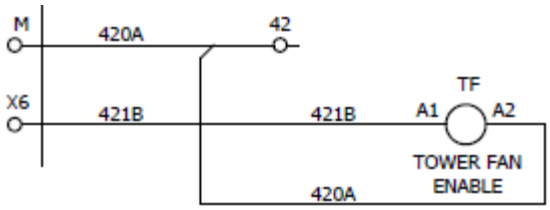
Secondary Pump 1 & 2

Similar to the main loop pump outputs, the secondary pump outputs are dry connections between the C terminal and the output terminal for the respective pump. When the pump is commanded on by the LWM, the C terminal is closed to the output terminal internally on the main control board, creating a dry contact for the field. To create a powered output, see explanation on "Loop Pump 1 & 2" above.

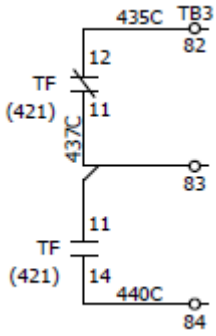


Tower Fan Enable

The Tower Fan Enable output (if applicable) can be used to provide an enable signal to the tower fan VFD. It will be energized when the tower fan analog signal has gone above 0%. The Tower Fan Enable relay is powered from the X6 output on expansion module B.



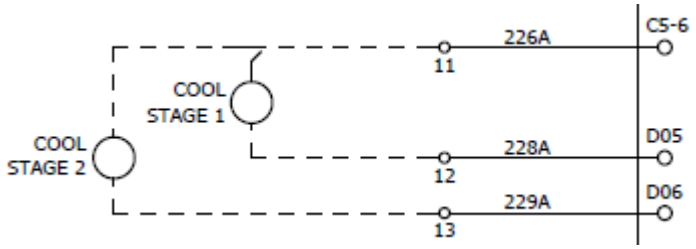
The NO and NC contacts of the Tower Fan Enable relay are tied to field terminals on the LWM.



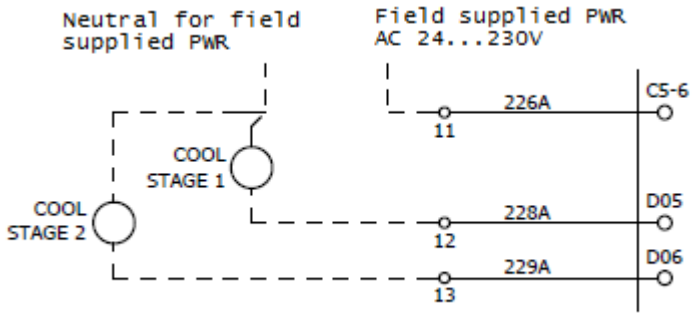
Cooling Stage 1-12

The number of Cooling (Heat Rejection) stages is configurable through the Avail Cl Stgs= item in the Unit Configuration menu on the keypad. The number of available cooling outputs depends on the model of the LWM being used. See the LWM schematics or expansion module I/O definitions page to determine the amount of cooling stages available. There is one digital output for each stage of cooling. The LWM will close the connection from the C terminal for the respective cooling stage to the output terminal for that stage.

For example, Cooling Stages 1 and 2 are energized via the DO5 and DO6 outputs on the main control board respectively. There will be a dry contact made between C5-6 and DO5 when Cooling Stage 1 is energized and another dry contact made between C5-6 and DO6 when Cooling Stage 2 is energized.

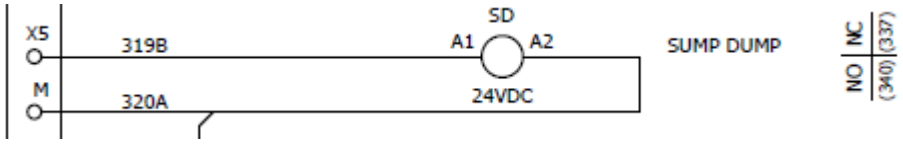


Alternatively, the output for the cooling stages can be made to be an energized output in the field. The field provided power source should be connected to the C terminal for the respective output. When the cooling stage is to be energized, the LWM will close the C terminal to the output terminal and energize the field relay with the field provided power. The common terminal for the field relay should be connected to a neutral for the power source (as shown below).

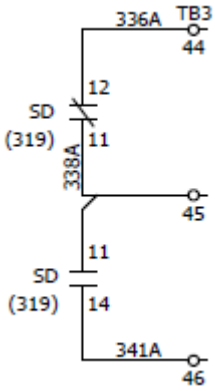


Sump Dump Output

The sump dump output energizes the SD relay with 24VDC from expansion module output X5 when a sump dump command has been identified.



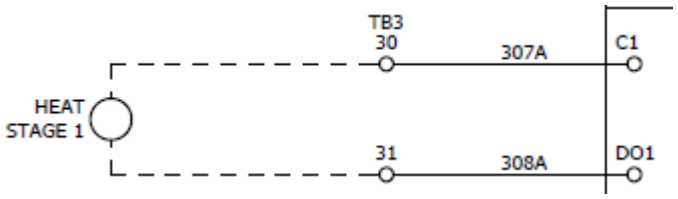
NO and NC contacts from the sump dump output are tied to field terminals to provide a dry contact for field connection. See below.



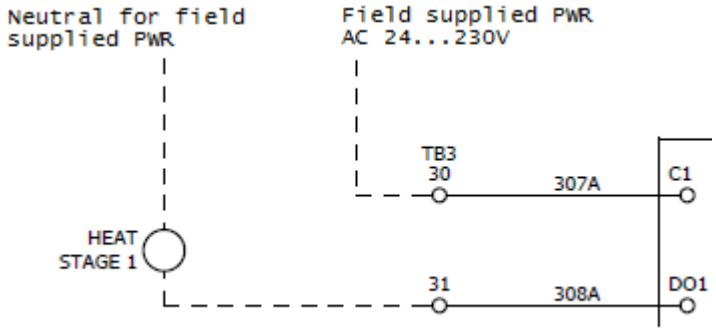
Heating Stage 1-12

The number of Heating (Heat Addition) stages is configurable through the Avail Ht Stgs= parameter on the Unit Configuration menu on the keypad. The number of available heating outputs depends on the model of the LWM being used. See the LWM schematics or expansion module I/O definitions page to determine the amount of heating stages available. There is one digital output for each stage of heating. The LWM will close the connection from the C terminal for the respective heating stage to the output terminal for that stage.

For example, heating stage 1 is energized via the DO1 output on expansion board A. There will be a dry contact made between C1 and DO1 when heating stage 1 is energized.



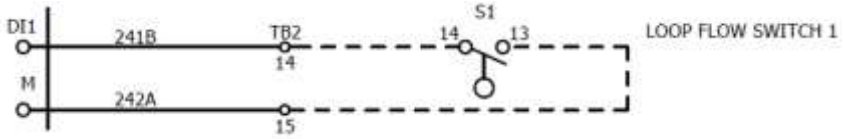
Alternatively, the output for the heating stages can be made to be an energized output in the field. The field provided power source should be connected to the C terminal for the respective output. When the heating stage is to be energized, the LWM will close the C terminal to the output terminal and energize the field relay with the field provided power. The common terminal for the field relay should be connected to a neutral for the power source (as shown below).



Field Digital Input Signals

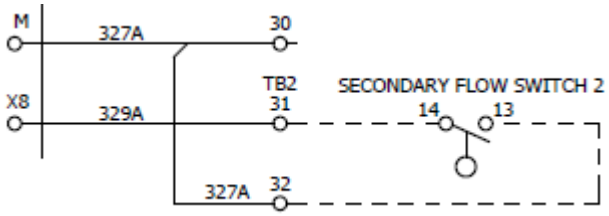
Loop Flow Switch 1 & 2

The number of main loop flow switches provided is dependent on the module number of the LWM selected and number of flow switches configured on the unit. See unit schematics or I/O definitions section to determine how many main loop flow switches are provided with your model. The loop flow switch inputs are to be dry contacts from the field.



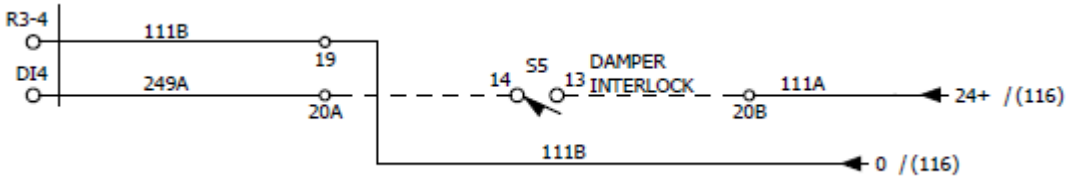
Secondary Flow Switch 1 & 2

Similar to the main loop flow switches, the number of secondary loop flow switches provided is dependent on the module number of the LWM selected and number of flow switches configured on the unit. See unit schematics or I/O definitions section to determine how secondary loop flow switches are provided with your model. The secondary loop flow switch inputs are to be dry contacts from the field.



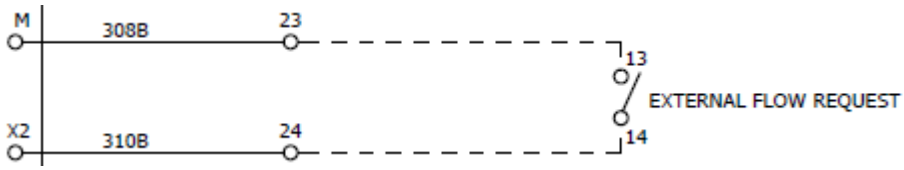
Damper Interlock

The damper interlock input is energized with 24VAC when the field provided interlock switch makes the connection between terminals 20A and 20B on TB2 of the LWM. When configured to use the damper interlock, the LWM is allowed to progress from Cool Stage 1 to Cool Stage 2 when this input is made.



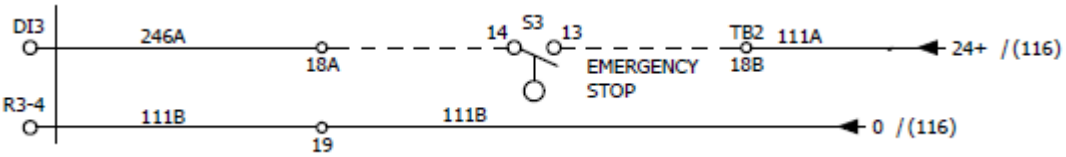
External Flow Request

The external flow request input is a dry contact from the field. A field-provided switch should make the connection between terminals 23 and 24 on TB2 of the LWM for a flow request signal.



Emergency Stop Input

The emergency stop input is powered by 24VAC when a field-provided switch makes the connection between terminals 18A and 18B on TB2 of the LWM. When this input is powered, the LWM shuts down on emergency stop alarm.



Hardware

The status of all Inputs/Outputs (I/O) are available via the keypad/display.

Main Controller

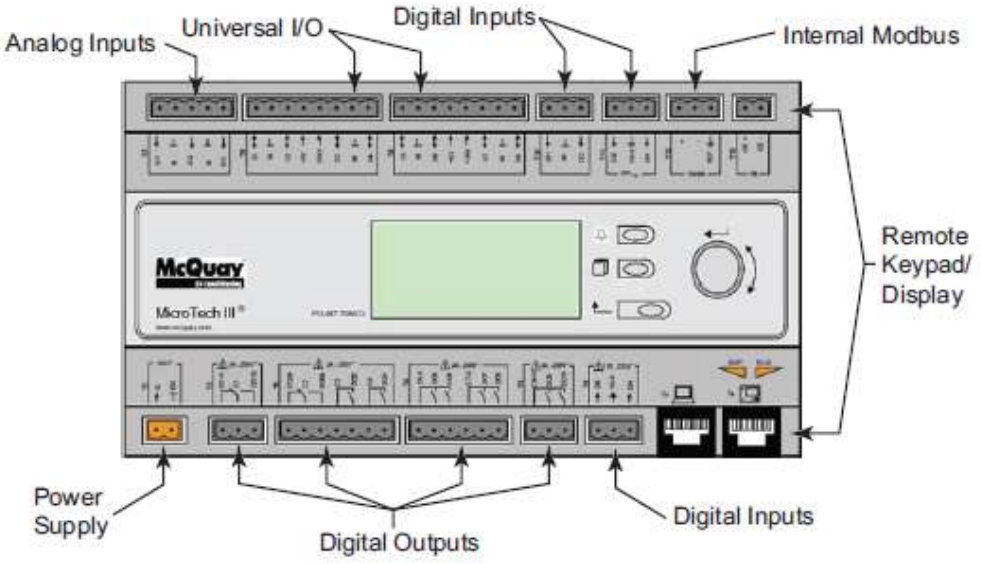


Figure 8. Main Control Board

Inputs/Outputs

Table 1. Main Controller Inputs/Outputs (I/O)

Main Controller (All models)						
Analog Inputs – 10K NTC						
#	Point					Comments
AI 1	Water Loop Supply Temp					10K Thermistor
AI 2	Outside Air Temperature					10K Thermistor
AI 3	Water Loop Return Temperature					10K Thermistor
Universal Input/Output						
#	DI	AI	DO	AO	Point	Comments
X 1				X	Boiler Valve Analog Signal	Configurable Analog Output
X 2				X	Tower Fan/Valve Analog Signal	Configurable Analog Output
X 3		X			Boiler Supply Temp	10K Thermistor
X 4		X			Boiler Return Temp	10K Thermistor
X 5			X		Alarm LED	24 VDC
X 6			X		Emergency Stop LED	24 VDC
X 7			X		External Schedule 1	24 VDC
X 8			X		External Schedule 2	24 VDC
Digital Inputs – Dry Contacts						
#	Point					Comments
DI 1	Loop Flow Switch 1					Flow switch for loop pump 1
DI 2	Secondary Flow Switch 1					Flow switch for the tower or boiler

Digital Inputs – 24V		
#	Point	Comments
DI 3	Emergency Stop input	Shuts down LWM
DI 4	Damper Interlock	Switch, when enabled, must be active before proceeding to cooling stage 2
Digital Inputs – 115V		
#	Point	Comments
DI 5	Manual Override	Panel switch for manually initiating occupied mode.
DI 6	Sump Temperature Switch	Panel switch for manually initiating a sump dump.
Digital Outputs – Relay (SPST, Normally Open, 230 VAC 3 Amp)		
#	Point	Comments
DO 1	Loop Pump 1	Activates loop pump 1
DO 2	Loop Pump 2	Activates loop pump 2
DO 3	Secondary Pump 1	Activates tower or boiler pump
DO 4	Secondary Pump 2	Activates tower or boiler pump
DO 5	Cooling Stage 1	Activates cooling stage 1
DO 6	Cooling Stage 2	Activates cooling stage 2
DO 7	Cooling Stage 3	Activates cooling stage 3
DO 8	Cooling Stage 4	Activates cooling stage 4
Digital Outputs – Solid State Relays, 24-230 VAC, .5A		
#	Point	Comments
DO 9	Cooling Stage 5	Activates cooling stage 5
DO 10	Cooling Stage 6	Activates cooling stage 6

Expansion Modules

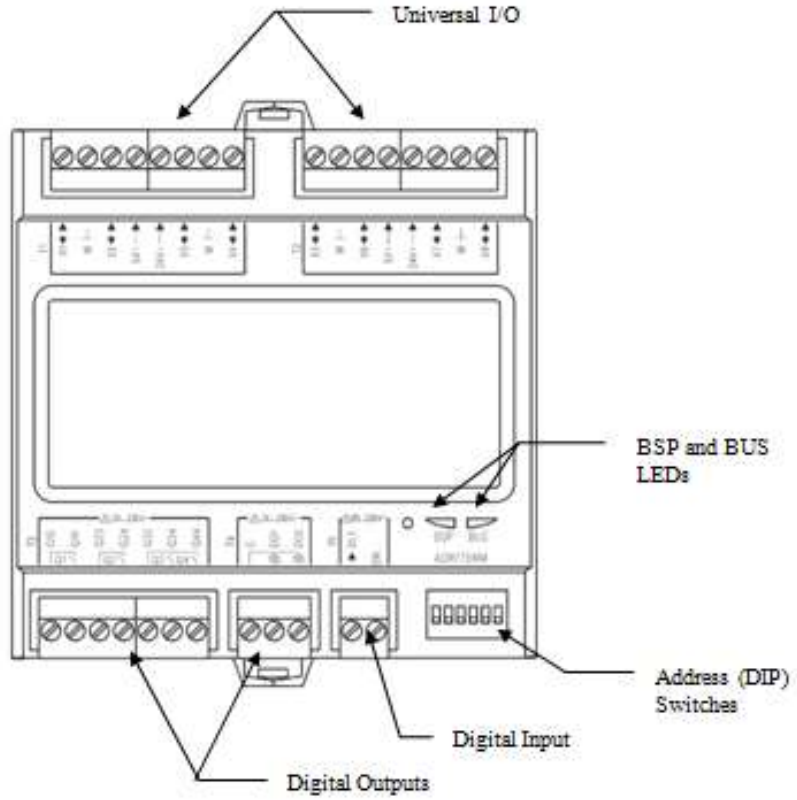


Figure 9. Expansion Modules

DIP Switch Configuration

The expansion module is equipped with DIP switches for communication with the controller. Switches 1 through 5 are configurable to set the slave address, while Switch 6 acts as peripheral bus termination. The last expansion module that is installed must have Switch 6 set to 'On'.

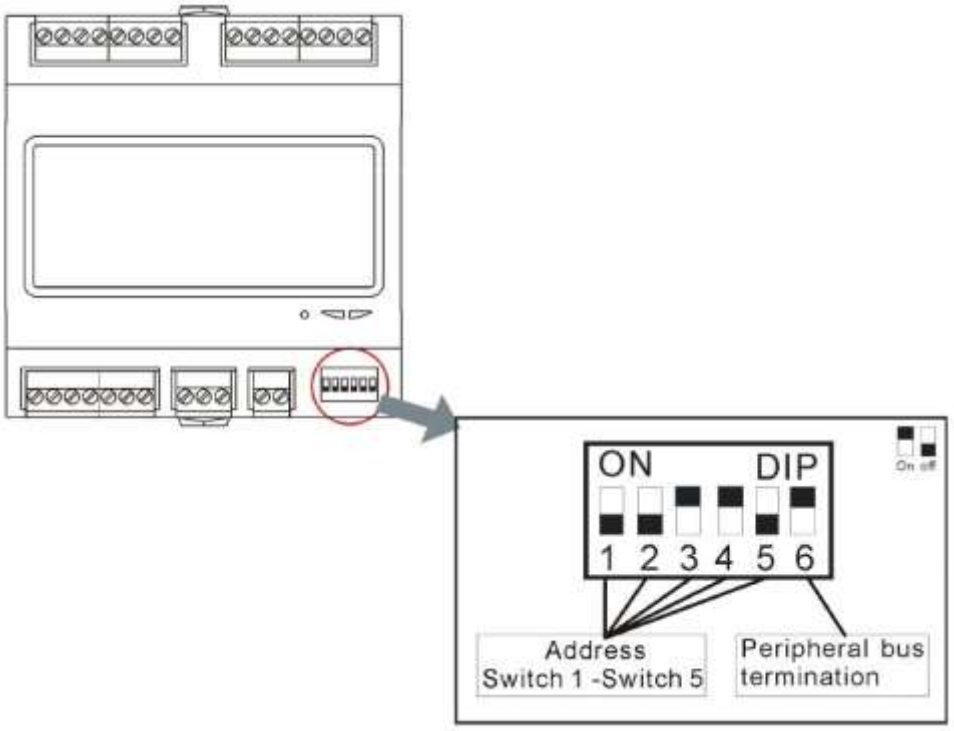


Figure 10. Expansion Module DIP Switches

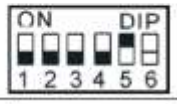
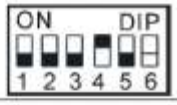
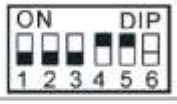
The bit order for the switches is from 5 to 1. The lowest bit is 5, while the highest bit is 1. The following table shows the logic of slave addresses:

Switch Number	Value
1	2^4=16
2	2^3=8
3	2^2=4
4	2^1=2
5	2^0=1

Expansion Module Address Example

Let's assume you have two expansion modules (Module A and Module B), and Module A is attached to the main unit controller and Module B is attached to Module A. Module A is always set to address 1 and Module B is always set to address 2. In addition, since Module B is the last module installed, switch 6 needs to be set. Therefore the DIP switches will be set as follows:

- Module A – Switch 5 is On, all others are Off
- Module B – Switch 4 and 6 are On, all others are Off

	DIP switch configuration of extension module					
Slave address (controller)	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Schematics
1	Off	Off	Off	Off	On	
2	Off	Off	Off	On	Off	
3	Off	Off	Off	On	On	
4	Off	Off	On	Off	Off	

Light Emitting Diodes (LEDs)

The expansion modules have a BSP LED and a BUS LED to indicate communication activity and status of the expansion module. These indicators are visible when the expansion module is connected to the Unit Controller and the unit is powered on (see **Error! Reference source not found.**).

BSP LED

The BSP LED indicates the state of the BSP. The table below describes the status of the BSP LED.

BSP LED Color	Meaning
Alternate Red/Green Flashing	BSP upgrade in progress
Green	BSP is running
Red flashing with 2Hz	BSP Error or slave address error[1]
Red	Hardware Error[1]

[1] In the event that this should occur, cycle power to the unit controller to attempt to clear the problem. Contact the Daikin Applied Controls Customer Support Group at 866-462-7829 for additional assistance if necessary.

BUS LEDs

The BUS LED indicates the communication status between the Expansion Module and the unit controller. The table below describes the status of the BUS LED.

BUS LED Color	Meaning
Green	Communication is running & I/O is working
Red	Communication error
Orange / Yellow	Communication is running but parameter from the application is wrong or missing, or the calibration from the factory is not correct.

Expansion Module A

Inputs/Outputs

Table 2. Expansion Module A - I/O

Expansion Module A (All models)						
Universal Inputs/Outputs						
#	DI	AI	DO	AO	Point	Comments
X 1		X			Outside Air Humidity	Configurable Analog Input 4-20mA, 0-5VDC, or 0-10VDC
X 2	X				External Flow Request	Dry Contact
X 3		X			Tower Supply Temperature	10K NTC Thermistor
X 4		X			Tower Return Temperature	10K NTC Thermistor
X 5			X		Sump Dump Output	24 VDC
X 7		X			Head Pressure	Configurable Analog Input 4-20mA, 0-5VDC, or 0-10VDC
X 8	X				Secondary Flow Switch 2	Dry contact

Digital Outputs – Relay (SPST, Normally Open, 230 VAC 3 Amp)		
#	Point	Comments
DO 1	Heat Stage 1	Activates Heat Stage 1
DO 2	Heat Stage 2	Activates Heat Stage 2
DO 3	Heat Stage 3	Activates Heat Stage 3
DO 4	Heat Stage 4	Activates Heat Stage 4

Digital Outputs – Triac (24 VAC, .5 Amp)		
#	Point	Comments
DO 5	Heat Stage 5	Activates Heat Stage 5
DO 6	Heat Stage 6	Activates Heat Stage 6

Note – Expansion Module A dipswitches are always set to address #1. Dipswitch #6 must be in the On position when it is the last module.

Expansion Module B

Inputs/Outputs

Table 3. Expansion Module B - I/O

Expansion Module B (Models LWM084 and LWM226 only)						
Universal Inputs/Outputs						
#	DI	AI	DO	AO	Point	Comments
X 1		X			Storage Tank Temperature	10K NTC Thermistor
X 2	X				Loop Flow Switch 2	Dry contact
X 3		X			Heat Xchr Supply Temperature	10K NTC Thermistor
X 4		X			Heat Xchr Return Temperature	10K NTC Thermistor
X 5		X			Geothermal Temp	10K NTC Thermistor
X 6			X		Tower Fan Enable	24 VDC
X 7			X		External Schedule 3	24 VDC
X 8			X		External Schedule 4	24 VDC

Digital Outputs – Relay (SPST, Normally Open, 230 VAC 3 Amp)		
#	Point	Comments
DO 1	Cooling Stage 7	Activates cooling stage 7
DO 2	Cooling Stage 8	Activates cooling stage 8
DO 3	Cooling Stage 9	Activates cooling stage 9
DO 4	Cooling Stage 10	Activates cooling stage 10

Digital Outputs – Triac (24 VAC, .5 Amp)		
#	Point	Comments
DO 5	Heat Stage 7	Activates heating stage 7
DO 6	Heat Stage 8	Activates heating stage 8

Note – Expansion Module B dipswitches are always set to address #2. Dipswitch #6 must be in the On position when it is the last module.

Expansion Module C

Inputs/Outputs

Table 4. Expansion Module C - I/O

Expansion Module C (Model LWM226 only)						
Universal Inputs/Outputs						
#	DI	AI	DO	AO	Point	Comments
X 7			X		External Schedule 5	24 VDC
X 8			X		External Schedule 6	24 VDC
Digital Outputs – Relay (SPST, Normally Open, 230 VAC 3 Amp)						
#			Point			Comments
DO 1			Heat Stage 9			Activates heating stage 9
DO 2			Heat Stage 10			Activates heating stage 10
DO 3			Cooling Stage 11			Activates cooling stage 11
DO 4			Cooling Stage 12			Activates cooling stage 12
Digital Outputs – Triac (24 VAC, .5 Amp)						
#			Point			Comments
DO 5			Heat Stage 11			Activates heating stage 11
DO 6			Heat Stage 12			Activates heating stage 12

Note – Expansion Module C dipswitches are always set to address #3. Dipswitch #6 must be in the On position when it is the last module.

Field Temperature Sensors

The Loop Water Manager requires passive negative temperature coefficient (NTC) 10K ohm sensors. These sensors vary their input resistance to the LWM as the temperature changes. Table 5 details the resistance versus temperature values. For typical sensor wiring examples, refer to the Field wiring section.

Table 5. Nominal input resistance versus temperature

Temp (°F)	R nominal (kΩ)	Temp (°F)	R nominal (kΩ)	Temp (°F)	R nominal (kΩ)	Temp (°F)	R nominal (kΩ)	Temp (°F)	R nominal (kΩ)
-40	336.050	-6	103.486	28	36.601	62	14.546	96	6.382
-39	323.889	-5	100.184	29	35.565	63	14.179	97	6.238
-38	312.212	-4	96.999	30	34.562	64	13.822	98	6.097
-37	300.999	-3	93.927	31	33.591	65	13.475	99	5.960
-36	290.229	-2	90.962	32	32.650	66	13.139	100	5.826
-35	279.884	-1	88.101	33	31.739	67	12.811	101	5.696
-34	269.945	0	85.340	34	30.856	68	12.493	102	5.569
-33	260.396	1	82.676	35	30.000	69	12.184	103	5.446
-32	251.218	2	80.103	36	29.171	70	11.884	104	5.325
-31	242.397	3	77.620	37	28.368	71	11.591	105	5.208
-30	233.918	4	75.222	38	27.590	72	11.307	106	5.093
-29	225.766	5	72.906	39	26.835	73	11.031	107	4.981
-28	217.928	6	70.670	40	26.104	74	10.762	108	4.872
-27	210.390	7	68.510	41	25.394	75	10.501	109	4.766
-26	203.139	8	66.424	42	24.707	76	10.247	110	4.663
-25	196.165	9	64.408	43	24.040	77	10.000	111	4.562
-24	189.455	10	62.460	44	23.394	78	9.760	112	4.463
-23	182.998	11	60.578	45	22.767	79	9.526	113	4.367
-22	176.785	12	58.759	46	22.159	80	9.298	114	4.273
-21	170.804	13	57.001	47	21.569	81	9.077	115	4.182
-20	165.048	14	55.301	48	20.997	82	8.862	116	4.093
-19	159.506	15	53.658	49	20.442	83	8.652	117	4.006
-18	154.169	16	52.069	50	19.903	84	8.448	118	3.921
-17	149.030	17	50.533	51	19.380	85	8.249	119	3.838
-16	144.081	18	49.047	52	18.873	86	8.056	120	3.757
-15	139.313	19	47.610	53	18.380	87	7.868	121	3.678
-14	134.720	20	46.220	54	17.902	88	7.685	122	3.601
-13	130.295	21	44.875	55	17.438	89	7.506	123	3.526
-12	126.031	22	43.574	56	16.988	90	7.333	124	3.453
-11	121.921	23	42.315	57	16.551	91	7.164	125	3.381
-10	117.960	24	41.097	58	16.126	92	6.999	126	3.311
-9	114.141	25	39.917	59	15.714	93	6.839	127	3.243
-8	110.460	26	38.776	60	15.313	94	6.682	128	3.176
-7	106.910	27	37.671	61	14.924	95	6.530	129	3.111

Using the Keypad/Display

The keypad/display (human machine interface or HMI) on the inside of the LWM panel consists of a 5-line by 22 character display, three keys and a "push and roll" navigation wheel.

There is an Alarm Button, Menu (Home) Button, and a Back Button. The wheel is used to navigate between lines on a screen (page) and to increase and decrease changeable values when editing. Pushing the wheel acts as an Enter Button.

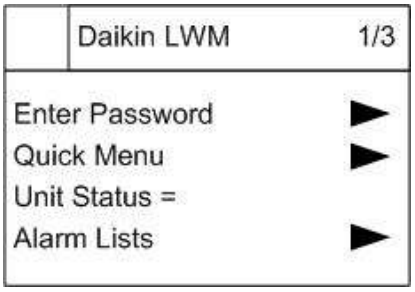
The first line on each page includes the page title and the line number to which the cursor is currently "pointing". The line numbers are X/Y to indicate line number X of a total of Y lines for that page. The left most position of the title line includes an "up" arrow to indicate there are pages "above" the currently displayed items, a "down" arrow to indicate there are pages "below" the currently displayed items or an "up/down" arrow to indicate there are pages "above and below" the currently displayed page.

Each line on a page can contain status only information or include changeable data fields. When a line contains status only information and the cursor is on that line all but the value field of that line is highlighted meaning the text is white with a black box around it. When the line contains a changeable value and the cursor is at that line, the entire line is highlighted. Each line on a page may also be defined as a "jump" line, meaning pushing the navigation wheel will cause a "jump" to a new page. An arrow is displayed to the far right of the line to indicate it is a "jump" line and the entire line is highlighted when the cursor is on that line.

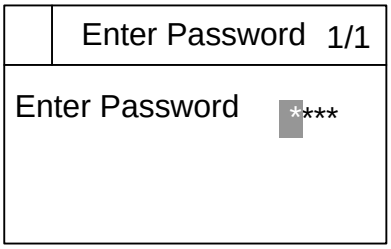
Passwords

The three password levels available are Level 2, Level 4, and Level 6, with Level 2 having the highest level of access. Entering the Level 6 password (or no password) allows access to the Quick Menu, Alarm Lists, and About this LWM menus. Entering the Level 2 or 4 passwords allows similar access to Level 6 with the addition of the I/O Setup menus. The Level 2 password is 6363, the Level 4 is 2526 and the Level 6 password is 5321.

Continuing without entering one of these three levels allows access only to the I/O Status menus.



The password field initially has a value **** where each * represents an adjustable field. These values can be changed by entering the Edit Mode described below.



Entering an invalid password has the same effect as continuing without entering a password.

Once a valid password has been entered, the controller allows further changes and access without requiring the user to enter a password until either the password timer expires or a different password is entered. The default value for this password timer is 10 minutes.

The password setup is shown above.

Navigation Mode

In the Navigation Mode, when a line on a page contains no editable fields, all but the value field of that line is highlighted meaning the text is white with a black box around it. When the line contains an editable value field, the entire line is inverted when the cursor is pointing to that line.

When the navigation wheel is turned clockwise, the cursor moves to the next line (down) on the page. When the wheel is turned counter-clockwise the cursor moves to the previous line (up) on the page. The faster the wheel is turned the faster the cursor moves.

When the Back Button is pressed the display reverts back to the previously displayed page. If the Back button is repeatedly pressed the display continues to revert one page back along the current navigation path until the "main menu" is reached.

When the Menu (Home) Button is pressed the display reverts to the "main page".

When the Alarm Button is depressed, the Alarm Lists menu is displayed. Since alarms are not implemented in this version, there will never be alarms listed here.

Edit Mode

The Editing Mode is entered by pressing the navigation wheel while the cursor is pointing to a line containing an editable field. Once in the edit mode pressing the wheel again causes the editable field to be highlighted. Turning the wheel clockwise while the editable field is highlighted causes the value to be increased. Turning the wheel counter-clockwise while the editable field is highlighted causes the value to be decreased. The faster the wheel is turned the faster the value is increased or decreased. Pressing the wheel again causes the new value to be saved and the keypad/display to leave the edit mode and return to the navigation mode.

Unit Support

From the Main Screen\Commission Unit menu, the user can change the type of units that are displayed on the keypad/display. The options include English (default) or SI. Power must be cycled to the unit controller before changes to Unit Support take effect.

Access to the Commission Unit menu requires a level 2 or level 4 password.

Software Startup Process

Prior to the LWM power-up, all auxiliary control devices such as pumps, cooling tower, boilers, and valves should be checked, tested, and started in accordance with the manufacturer's instructions. Also, ensure that all components are connected, particularly the Loop Supply Temperature sensor. If some sensors are enabled and not connected, alarms will be generated. After power-up, the unit will start up in Off mode (Control Mode=Off), with no outputs energized. The user should then take the following steps:

1. Log in to the keypad/display.
2. Go to the Unit Configuration/Component Setup menu and ensure that all available settings are properly configured for the system. If any changes are made, the Apply Changes line must be set to 'Yes'. This will cycle power to the controller.
3. Navigate to the critical settings menus - Unit Configuration/Safety Setpoints, Unit Configuration/Clock Setup – to ensure critical system functions run unhindered. These changes do not require a system restart to apply.
4. Navigate to the Unit Control submenus to configure system operations to the user's preference.
5. Navigate to the schedules and setup schedules as needed.
6. When the unit is properly configured, set Control Mode, on the main menu, appropriately.

Unit Configuration

The following configuration options are all found within the Main Menu/Unit Configuration menu of the keypad/display. Access to this menu requires a Level 2 password access or higher. Following any changes to the members of this menu, the Apply Changes option must be activated, or the system will not recognize them.

Radiant Loop App

This setting should be set to 'Yes', if the LWM is used as a radiant loop application. When set to true, no cooling can be configured. Default = No.

Main Loop Pumps

This setting defines to the controller the number of pumps installed to generate flow in the main water loop. Default = 2.

Secondary Loop Pumps

This setting defines to the controller the number of secondary pumps installed. Default = 2.

Main Loop Flow Switches

This setting informs the controller of how many flow switches to expect in the main water loop. The number of main loop flow switches available will depend on the model of LWM you have, see I/O portion of the main controller section for point availability by model number. It is assumed that a setting of 1 means that the one flow switch is installed in such a way that it will detect flow regardless of which pump is creating it, should there be 2 pumps installed. Likewise, it is assumed that a setting of 2 means that two flow switches are installed to generate unique presence-of-flow signals from the two installed pumps. A setting of 2 combined with a setting of 1 in the main loop pumps line is considered invalid, and will be reset to 1 automatically. Default = 1.

Secondary Loop Flow Switches

This setting informs the controller of how many secondary loop flow switches are installed. It operates under the same assumptions as the main flow loop switch settings, as pertains to the secondary water loop. Default = 1.

Secondary Loop Pump 1 & 2 Function

This setting determines under what circumstances the secondary loop pump is allowed to function. There can be a total of two secondary pumps and each one can be configured independently as a boiler loop pump or a tower loop pump. If the unit is configured for two secondary pumps and they are of the same type (boiler or tower), then an additional lead/lag feature can be used in which you select which pump should attempt to run first or start the one with the least number of run hours (auto lead/lag). Both pumps will never run at the same time. If the pumps are of different types, lead/lag does not apply. Default = None.

Available Heat Stages

This setting specifies how many heat addition stages are available to the controller for use during normal occupied operation. Higher values of this setting may require additional I/O expansion modules for proper functionality. The number of heating stages available will depend on the model of LWM you have, see I/O portion of the main controller section for point availability by model number. Default = None.

Available Cool Stages

This setting specifies how many heat rejection stages are available to the controller for use during normal occupied operation. Higher values of this setting may require additional I/O expansion modules for proper functionality. The number of cooling stages available will depend on the model of LWM you have, see I/O portion of the main controller section for point availability by model number. Default = None.

PreHeat/PreCool Enable

These settings enable PreHeat or PreCool operation, and are not mutually exclusive. The function of these operational settings is described in the previous section "System Features". Enabling of these features activates the Unit Control/PreHeat & PreCool menu option. Default = Off.

Boiler Valve Active

This setting allows the user to configure the presence of a boiler valve for heat addition control. Default = None.

Boiler Output Type

This setting allows the user to configure the type of output used to for the Boiler Output. Default = 0-10VDC.

Tower Fan Active

This setting allows the user to configure the presence of a tower fan or control valve for heat rejection control. Default = None.

Tower Output Type

This setting allows the user to configure the type of output used to for the Tower Output. Default = 0-10VDC.

Loop Return Sensor

This setting allows the user to configure the whether or not there is a loop return sensor present. Default = Disable.

Head Pressure Sensor

The three settings involving the head pressure sensor allow the user to configure the different properties of the sensor. The sensor may be configured as a 5VDC, 10VDC, or 4-20mA sensor, with the ability to set the sensory range. Default = Disabled, None, 500.0psi

Head Pressure Sensor Type

This setting allows the user to configure the type of head pressure sensor. Default = None.

Pressure Sensor Range

Default = 500.0psi.

Outside Air Humidity Sensor Enable

This setting allows the user to enable an outside air humidity sensor. Default = None.

Outside Air Humidity Sensor

This setting allows the user to configure the type of sensor used for the outside air humidity sensor. The sensor may be configured in 5VDC, 10VDC or 4-20mA setups. Default = None.

Sensor Enables

The list of sensor enables (Loop Return Temp, Boiler Supply Temp, Tower Return Temp, etc.) is a series of optional, display-only temperature sensors. They are expected to be temperature probe sensors utilizing the same temperature/resistance table used by the main Loop Supply Temperature sensor. When enabled, they will be displayed on the Unit Status screen. Default = Disabled.

Damper Interlock

This setting enables a digital input designated for interlock circuitry during heat rejection staging. When active, the controller will wait for this input to be active before progressing to Cool Stage 2. When disabled, the controller will not pause between Cool Stages 1 and 2 for any length of time more than the stage timer requires.

External Schedules

This setting allows the user to specify a number of digital outputs to use for external occupancy indication. The number of scheduling outputs available will depend on the model of LWM you have, see I/O portion of the main controller section for point availability by model number. Default = 1.

Staged Heating Outdoor Air Reset

This setting enables the outdoor air reset of the staged heating (heat addition) setpoints. This feature is described in the **Error! Reference source not found.** section. Also enabled is the menu containing settings for this feature, held at View/Set Unit\Stg OA Reset. Default = None.

Boiler Valve Outdoor Air Reset

This setting enables the outdoor air reset of the boiler valve setpoint. This featureis described in the **Error! Reference source not found.** section. Also enabled is the menu containing settings for this feature, held at View/Set Unit\Stg OA Reset. Default = None.

Keypad/Display Menu Structure

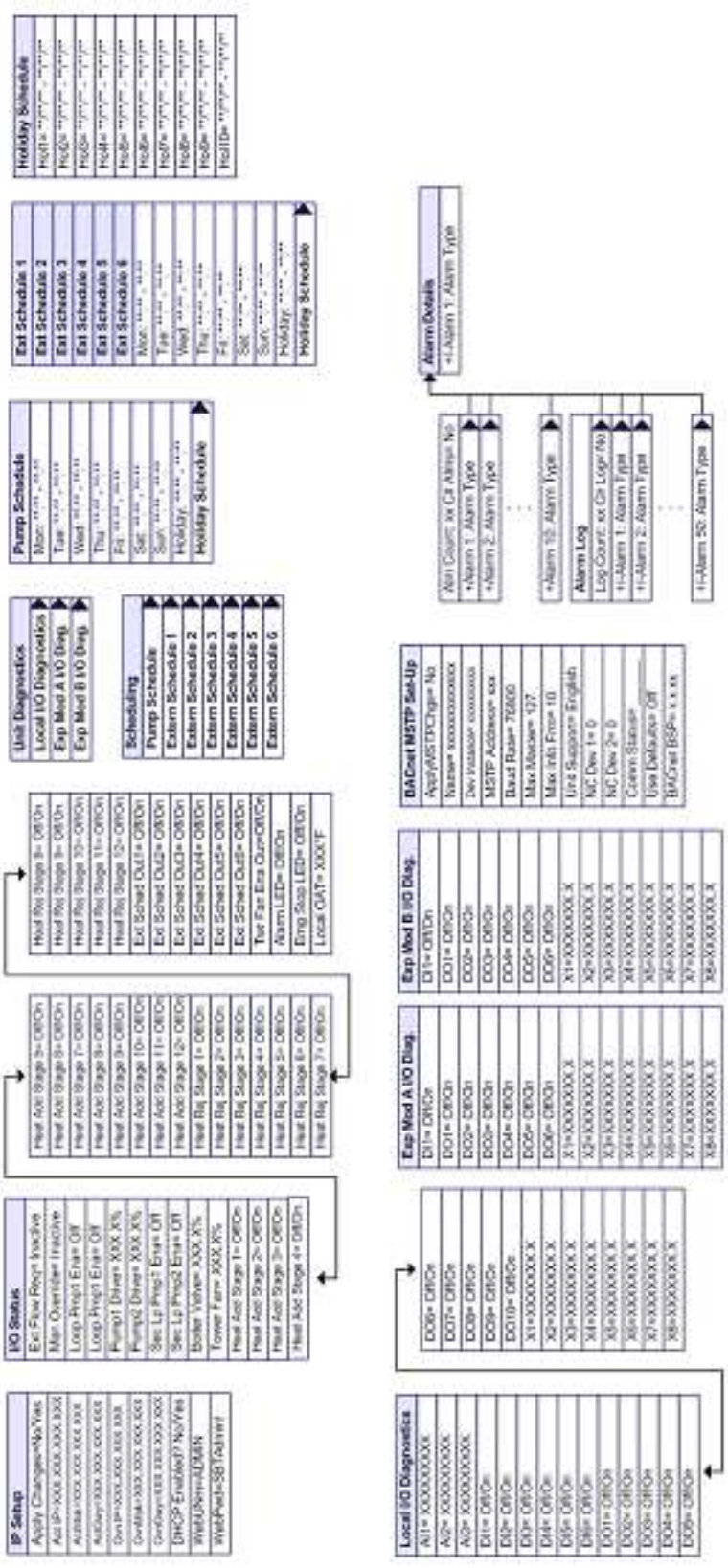


Figure 11 through

Figure 13. Keypad/Display Menu Structure (Page 3)13 are descriptions of the Loop Water Manager menu structure. These menus and items can all be displayed with the keypad/display. Menu items displayed will change based on the selected unit configuration.

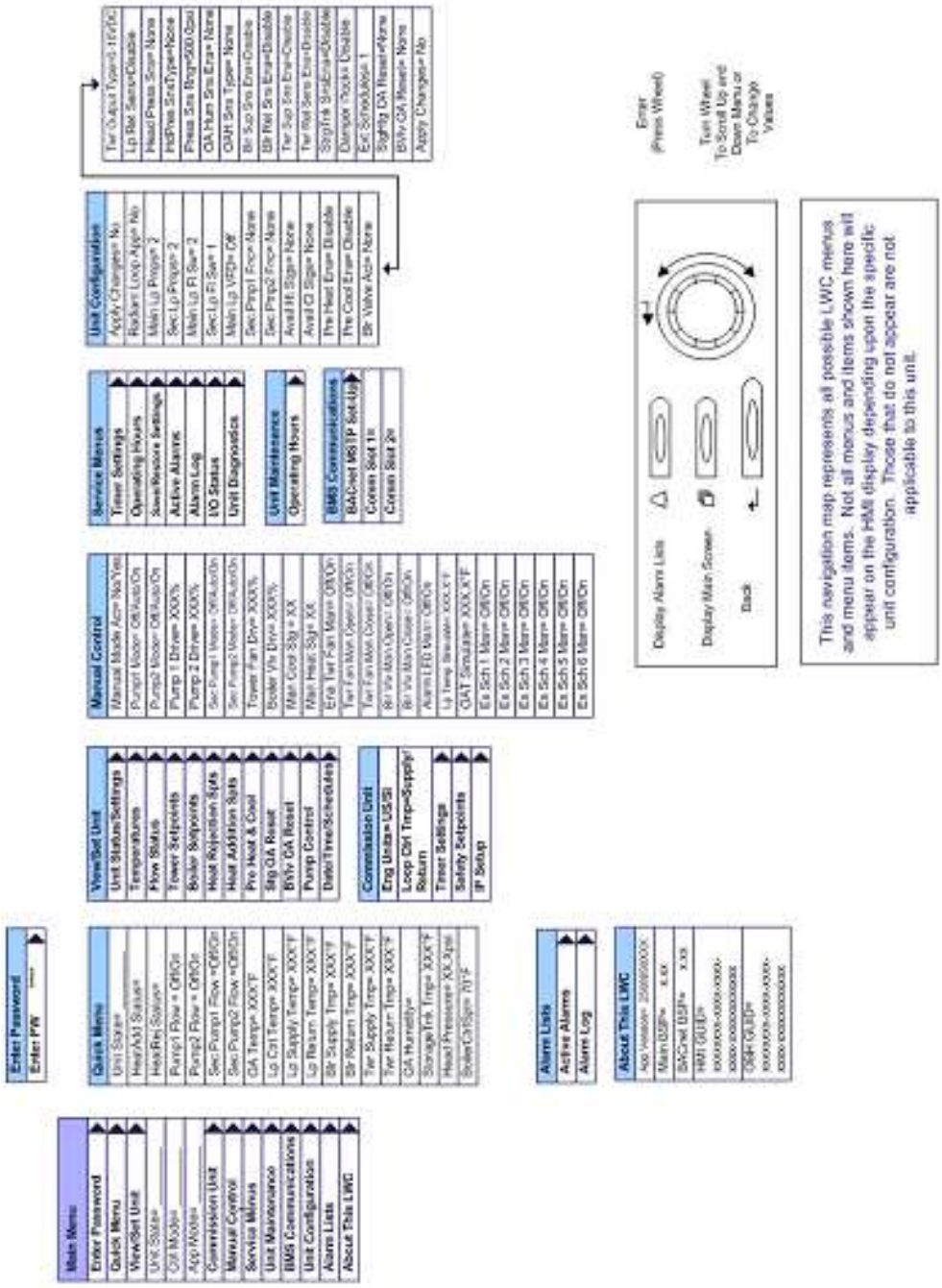


Figure 11. Keypad/Display Menu Structure (Main Menu)

Figure 12. Keypad/Display Menu Structure (Page2)

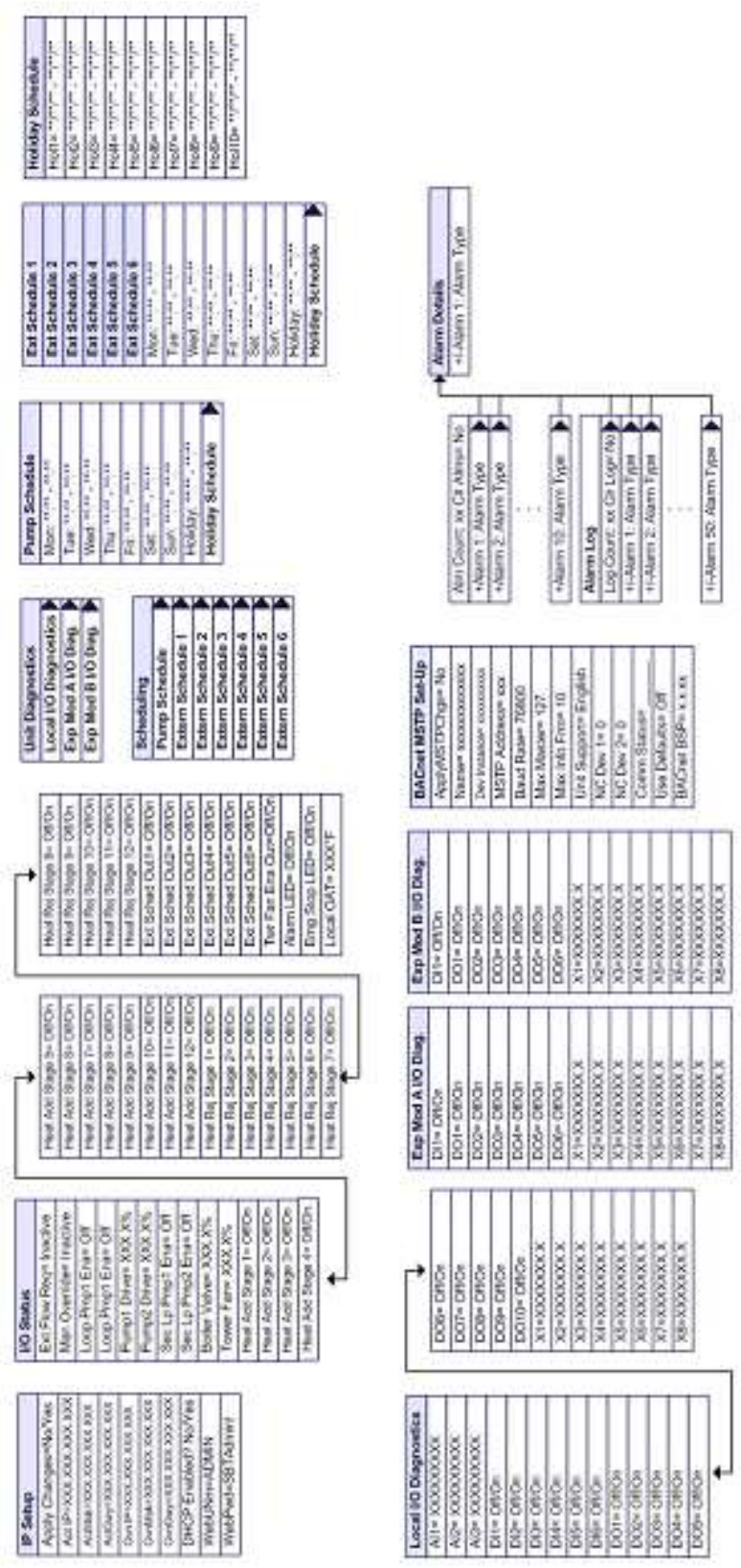


Figure 13. Keypad/Display Menu Structure (Page 3)

Main Menu

The main menu is the first menu that appears when you look at the keypad display. All other menus originate from this location. The menus that appear are dependent on the log in level of the user.

Table 6: Analog Input Status Menu

Menu Display Name	Item Display Name	Default	Range
Main Menu	Enter Password	-	-
	Quick Menu	-	-
	View/Set Unit	-	-
	Unit State=	-	Unocc, UnoccLim, Recirc, Preheat, PreCool,ExtFlowReq, Occ, Alarm, Manual, Off
	Ctrl Mode=	Off	Off, Recirc, HeatAddOnly, HeatRejOnly, HeatAddRej, Auto/Net
	App Mode=	HeatAddRej	Off, Recirc, HeatAddOnly, HeatRejOnly, HeatAddRej
	Occ Mode=	Auto	Occ, Unocc, Auto
	Commission Unit	-	-
	Manual Control	-	-
	Service Menu	-	-
	Unit Maintenance	-	-
	BMS Communications	-	-
	Unit Configuration	-	-
	Alarm Lists	-	-
	About This LWM	-	-

Enter Password is the menu that allows you to enter the password to enable more user menus at higher access levels.

Quick Menu is a menu that gives access to general operating data. It is available to all users.

View/Set Unit menu is used to view operational data and set various setpoints.

Unit State displays the current unit status of the LWM. For a detailed description of each unit state refer to page 45.

Ctrl Mode is a variable used to enable/disable various features. If it is set to anything other than Auto/Net, the Application Mode from the network is ignored.

- **Off** puts the LWM into the Off state.
- **Recirc** disables heat addition and rejection as well as pre heat and pre cool. Enables pumps only.
- **HeatAddOnly** enables heat addition. Heat rejection and pre cool are not available.
- **HeatRejOnly** enables heat rejection. Heat addition and pre heat are not available.
- **HeatAddRej** enables heat addition and rejection.
- **Auto/Net** allows the application mode (App Mode) to determine the enabled modes. App Mode is changeable only through the network.

App Mode is a network point used to enable/disable various features. This only applies if the control mode (Ctrl Mode) is set to Auto/Net. See Ctrl Mode above for definitions of the applicable modes.

Occ Mode is a variable used to determine allowable occupancy modes.

- **Auto** allows the LWM to toggle in and out of occupancy via a network command or flow request input.
- **Occ** runs the LWM conditioning the loop regardless of the network input or external flow request input.
- **Unocc** ensures that the LWM does not run regardless of the network or flow request inputs.

Commission Unit is a menu used to set commission level parameters on the LWM during startup.

Manual Control is a menu used to set the LWM in manual control and manually manipulate the various outputs.

Service Menu is a menu used to set timers, view operating hours, save/restore parameters, view alarms, I/O status and general diagnostics.

Unit Maintenance is a menu used to view operating hours.

BMS Communications is a menu used to configure the network communication module.

Unit Configuration is a menu used to configure the LWM. Apply Changes must be set to 'Yes' after making any changes to this menu. This will cycle power to the LWM unit controller.

Alarm Lists is a menu used to view active alarms, the alarm log and to clear the active alarms or alarm log.

About This LWM is a menu used to view information about the LWM including software and BSP versions.

Quick Menu

Items in the Quick Menu contain basic unit operating status and control set point parameters. The items shown in the Quick Menu are Read Only if a valid password has not been entered. The following are brief descriptions of the Quick Menu items. No password is required to view the Quick Menu.

Table 7: Quick Menu

Menu Display Name	Item Display Name	Default	Range
Quick Menu	Unit State=	-	Unocc, UnoccLim, Recirc, Preheat, PreCool,ExtFlowReq, Occ, Alarm, Manual, Off
	Occ Mode=	Auto	Occ, Unocc, Auto
	HeatAdd Status=	-	None, OffLoc, OffNet, Enabled, Alarm
	HeatRej Status=	-	None, OffLoc, OffNet, Enabled, Alarm
	Pump1 Flow=	-	Off/On
	Pump2 Flow=	-	Off/On
	Sec Pump1 Flow=	-	Off/On
	Sec Pump2 Flow=	-	Off/On
	OA Temp=	-	-
	Lp Ctrl Temp	-	-
	Lp Supply Temp=	-	-
	LpReturn Temp=	-	-
	Blr Supply Tmp=	-	-
	Blr Return Tmp=	-	-
	Twr Supply Temp=	-	-
	Twr Return Tmp=	-	-
	OA Humidity=	-	-
	StorageTnk Tmp=	-	-
	Head Pressure=	-	-
	BoilerCtrlSpt=	-	-

Unit State is the current unit state of the LWM. For a detailed description of each unit state refer to page 45.

Occ Mode is a variable used to determine allowable occupancy modes.

- **Auto** allows the LWM to toggle in and out of occupancy via a network command or flow request input.
- **Occ** runs the LWM conditioning the loop regardless of the network input or external flow request input.
- **Unocc** ensures that the LWM does not run regardless of the network or flow request inputs.

HeatAdd Status defines the current status of heat addition.

- None – LWM is configured for 0 stages of heat addition and no boiler valve
- OffLoc – The control mode is locking out heat addition.
- OffNet – The network is locking out heat addition through the Application Mode.
- Enabled – Heat addition is enabled and available if required. It does not mean it is currently running.
- Alarm – All secondary pumps are off on alarm (ie, Secondary Loop Pump Fail Problem is active).

HeatRej Status, defines the current status of heat rejection.

- None – LWM is configured for 0 stages of heat rejection and no tower valve
- OffLoc – The control mode is locking out heat rejection.
- OffNet – The network is locking out heat rejection through the Application Mode.
- Enabled – Heat rejection is enabled and available if required. It does not mean it is currently running.
- Alarm – All secondary pumps are off on alarm (i.e., Secondary Loop Pump Fail Problem is active).

Pump1 Flow is the current status of the Pump 1 Flow digital input.

Pump2 Flow is the current status of the Pump 2 Flow digital input.

Sec Pump1 Flow is the current status of the Secondary Pump 1 Flow digital input.

Sec Pump2 Flow is the current status of the Secondary Pump 2 Flow digital input.

OA Temp is the outdoor air temperature.

Lp Ctrl Temp is the loop control temperature. It is either supply or return depending on the configuration.

Lp Supply Temp is the current loop supply temperature.

Lp Return Temp is the current loop return temperature.

Blr Supply Temp is the current boiler supply temperature.

Blr Return Temp is the current boiler return temperature.

Twr Supply Temp is the current tower supply temperature.

Twr Return Temp is the current tower return temperature.

OA Humidity is the current outdoor air humidity.

StorageTnk Tmp is the current storage tank temperature.

Head Pressure is the current Head Pressure.

BoilerCtrlSpt is the current setpoint being used for boiler control.

Table 8: View/Set Unit Menu

Menu Display Name	Item Display Name	Default	Range
View/Set Unit	Unit Status/Settings	-	-
	Temperatures	-	-
	Flow Status	-	-
	Tower Setpoints	-	-
	Boiler Setpoints	-	-
	Heat Rejection Spts	-	-
	Heat Addition Spts	-	-
	Pre Heat & Cool	-	-
	Stg OA Reset	-	-
	BVlv OA Reset	-	-
	Pump Control	-	-
	Date/Time/Schedules	-	-

Unit Status/Settings Menu

The "Unit Status/Settings" menu provides a summary of basic unit status and control items. This menu summarizes the current operating state of the unit, giving the operating state the unit is in, along with the current capacity level of that operating state.

Table 9. Unit Status/Settings Menu

Menu Display Name	Item Display Name	Default	Range
Unit Status/Settings	Unit State=	-	Unocc, UnoccLim, Recirc, Preheat, PreCool,ExtFlowReq, Occ, Alarm, Manual, Off
	Occ Mode=	Auto	Occ, Unocc, Auto
	HeatAdd Status=	-	None, OffLoc, OffNet, Enabled
	HeatRej Status=	-	None, OffLoc, OffNet, Enabled
	Pump1 Flow=	-	Off/On
	Pump2 Flow=	-	Off/On
	Sec Pump1 Flow=	-	Off/On
	Sec Pump2 Flow=	-	Off/On
	Local OAT=	-	-
	Lp Ctrl Temp=	-	-
	Lp Supply Temp=	-	-
	LpReturn Temp=	-	-
	Blr Supply Tmp=	-	-
	Blr Return Tmp=	-	-
	Twr Supply Temp=	-	-
	Twr Return Tmp=	-	-
	OA Humidity=	-	-
	StorageTnk Tmp=	-	-
	Head Pressure=	-	-
	BoilerCtrlSpt=	-	-
	HeatXchr SupTmp=	-	-
	HeatXchr RetTmp=		
	Geothermal Tmp=		

Unit State is the current unit state of the LWM.

- **Unocc (Unoccupied)** is the resting/standby state for the controller. All systems are within acceptable parameters and there are no requests for flow, either scheduled or manual. No outputs, digital or analog, are active. The system is monitoring outdoor air temperature and the loop water temperature for a breach of acceptable boundaries, but is otherwise at rest.
- **UnoccLim (Unoccupied Limit Protect)** is not a scheduled or requested response, but the system has detected that the loop water temperature has broken the acceptable threshold or the outdoor air temperature presents a risk of the loop water freezing, and therefore must activate in order to prevent damage to the system. The system will turn on and behave as if it were in Occupied mode. If the setpoints are aligned as intended, the system will advance through its stages until all available heat addition stages are active, although this may not necessarily be the case. The system will remain active and heating until such time as the outdoor air temperature increases above the setpoint, the loop water temperature increases above the setpoint + differential, or a scheduled or manual event occurs.
- **Recirc (Recirculate)** is used to activate the lead main and secondary pumps, beginning head pressure control, if available. Temperature control is *inactive*. The system should not attempt temperature control until the system's loop water is flowing and not stagnant. All outputs not related to external scheduling or flow control shall be *inactive*. This state shall be maintained for a user specified amount of time before proceeding to any temperature controlling state.

- **PreHeat** allows the system to prepare itself for a scheduled period of occupancy in the case that heat addition is required. It may have a smaller sub-set of the available heat addition stages available to it. It is a scheduled event that depends on the current loop water temperature and the outdoor air temperature.
- **PreCool** allows the system to prepare itself for a scheduled period of occupancy in the case that heat rejection is required. It may have a smaller sub-set of the available heat rejection stages available to it. It is a scheduled event that depends on the current loop water temperature and the outdoor air temperature.
- **ExtFlowReq** (External Flow Request) is triggered by the external flow switch. In this situation, the controller will function as though it were in the occupied state, complete with full flow and temperature control. This state is released when the activating input is released.
- **Occ (Occupied)** is the standard control state for the system, when scheduled it overrides all other non-essential control modes. This state activates the full range of functionality of the controller. All available stages may be activated, as well as full availability and control of any cooling tower or boiler. Pressure-based closed-loop flow control is available. Closed-loop temperature control based on the Loop Supply Temperature is available and active.
- **Alarm** is when the system has detected a fatal error that creates issues with its overall functionality. Operation must cease to avoid further damage to equipment. All outputs deactivate. No normal controller operation is possible until the controller is reset with the pertinent error(s) remedied. Controller may be put into manual mode for troubleshooting purposes.
- **Manual** is when a user enters the Main Menu\Manual Control menu and activates Manual Mode. This mode overrides all control and faults. It disregards all sensors and digital inputs. The user at the keyboard - and only that user - has direct control over all outputs as well as the ability to simulate Loop Water Temperature and Outdoor Air Temperature readings to force control activation.
- **Off** is when the LWM is unable to run. The LWM will be in the off state if either the Control Mode is set to Off (default) from the keypad or if the Control Mode is set to Auto/Net and the Application Mode is set to Off from the network.

Occ Mode is a variable used to determine allowable occupancy modes.

- **Auto** allows the LWM to toggle in and out of occupancy via a network command or flow request input.
- **Occ** runs the LWM conditioning the loop regardless of the network input or external flow request input.
- **Unocc** ensures that the LWM does not run regardless of the network or flow request inputs.

HeatAdd Status, defines the current status of heat addition.

- None – LWM is configured for 0 stages of heat addition
- OffLoc – The control mode is locking out heat addition.
- OffNet – The network is locking out heat addition through the Application Mode.
- Enabled – Heat addition is enabled and available if required. It does not mean it is currently running.

HeatRej Status, defines the current status of heat rejection.

- None – LWM is configured for 0 stages of heat rejection
- OffLoc – The control mode is locking out heat rejection.
- OffNet – The network is locking out heat rejection through the Application Mode.
- Enabled – Heat rejection is enabled and available if required. It does not mean it is currently running.

Pump1 Flow is the current status of the Pump 1 Flow digital input.

Pump2 Flow is the current status of the Pump 2 Flow digital input.

Sec Pump1 Flow is the current status of the Secondary Pump 1 Flow digital input.

Sec Pump2 Flow is the current status of the Secondary Pump 2 Flow digital input.

Local OAT is the value being returned from the thermistor connected to the OAT input terminal.

Lp Ctrl Temp is the loop control temperature. It is either supply or return depending on the configuration.

Lp Supply Temp is the current loop supply temperature.

Lp Return Temp is the current loop return temperature.

Blr Supply Temp is the current boiler supply temperature.

Blr Return Temp is the current boiler return temperature.

Twr Supply Temp is the current tower supply temperature.

Twr Return Temp is the current tower return temperature.

OA Humidity is the current outdoor air humidity.

StorageTnk Tmp is the current storage tank temperature.

Head Pressure is the current Head Pressure.

BoilerCtrlSpt is the current setpoint being used for boiler control.

HeatXchr SupTmp is the current heat exchanger supply temperature. It is for display only. There is no control associated with this temperature.

HeatXchr RetTmp is the current heat exchanger return temperature. It is for display only. There is no control associated with this temperature.

Geothermal Tmp is the current geothermal temperature. It is for display only. There is no control associated with this temperature.

Temperatures Menu

The Temperatures menu contains the status of various temperatures in the LWM.

Table 10. Temperatures Menu

Menu Display Name	Item Display Name	Default	Range
Temperatures	OA Temp=	-	-
	Lp Ctrl Temp=	-	-
	Lp Supply Temp=	-	-
	Lp Return Temp=	-	-
	Blr Supply Tmp=	-	-
	Blr Return Temp=	-	-
	Twr Supply Tmp=	-	-
	Twr Return Temp=	-	-
	StorageTnk Tmp=	-	-
	HeatXchr SupTmp=	-	-
	HeatXchr RetTmp=		
	Geothermal Tmp=		

OA Temp is the current outdoor air temperature. When the network is not writing to the OAT network variable, this value will indicate the current status of the OAT input terminal. When the network is writing to the OAT network variable, this value will indicate the network value.

Lp Ctrl Temp is the current loop control temperature (space or return).

Lp Supply Temp is the current loop supply temperature.

Lp Return Temp is the current loop return temperature.

Blr Supply Temp is the current boiler supply temperature.

Blr Return Temp is the current boiler return temperature.

Twr Supply Temp is the current tower supply temperature.

Twr Return Temp is the current tower return temperature.

StorageTnk Tmp is the current storage tank temperature.

HeatXchr SupTmp is the current heat exchanger supply temperature. It is for display only. There is no control associated with this temperature.

HeatXchr RetTmp is the current heat exchanger return temperature. It is for display only. There is no control associated with this temperature.

Geothermal Tmp is the current geothermal temperature. It is for display only. There is no control associated with this temperature.

Main Loop Flow Control

The Loop Water Manager is able to maintain control of and verify the water flow within the main water loop of the system. It provides up to two digital outputs to start a field provided and wired main loop pump. An input from a field mounted flow switch is monitored to determine if the pump achieves flow. If the main pump is activated, but does not achieve enough flow to make the flow switch, a pump alarm is initiated and the pump output is deactivated. If the Loop Water Manager is configured for a second main pump, it will attempt to start the second pump to achieve flow in the loop. In this dual main pump configuration, the user may select which pump shall be the lead pump or select "auto", in which the controller will automatically select the pump with the least amount of run hours. If the second pump fails to achieve flow, it will also be shut down and the Loop Water Manager will stay off in alarm, until the error(s) have been remedied and the alarms manually cleared at the LWM. Additionally, the LWM can be configured to control up to two secondary pumps for a tower or boiler loop.

Flow Status Menu

The Flow Status Menu contains the flow status for primary and secondary pumps.

Table 11. Flow Status Menu

Menu Display Name	Item Display Name	Default	Range
Flow Status	Pump1 Flow=	-	Off, On
	Pump2 Flow=	-	Off, On
	Sec Pump1 Flow=	-	Off, On
	Sec Pump2 Flow=	-	Off, On

Pump1 Flow tells if the pump1 switch is indicating flow (On) or not (Off).

Pump2 Flow tells if the pump2 switch is indicating flow (On) or not (Off).

Sec Pump1 Flow tells if the secondary pump1 switch is indicating flow (On) or not (Off).

Sec Pump2 Flow tells if the secondary pump2 switch is indicating flow (On) or not (Off).

Optional Tower or Boiler Valve Control

The LWM is capable of analog valve position control for heating or cooling of the main loop. The control loop is temperature-based, with the loop control temperature (supply or return) as the measured variable.

The LWM's analog position control is an analog signal. Any valve or fan that may be connected to that output must either be compatible with that specified signal range or create peripheral circuitry to compensate.

Tower and boiler valve control setpoints are independent of the staged heat addition/rejection setpoints, but are only enabled when one stage is active.

Tower Setpoint Menu

The Loop Water Manager can control an optional cooling tower fan speed or valve. The output is controlled via an analog signal. The tower fan/valve has its own setpoint, deadband, and control zone configuration points. These configuration points dictate the behavior and temperature control based around the tower. The cooling tower waits for the activation of Cool Stage 1 before allowing its fan to activate. The tower and cool staging process are otherwise independent outside of the fact that both control the same medium based on the same measured value.

Tower Sump Dump Control

The Loop Water Manager is equipped to control a tower sump. The tower sump can be dumped via a two position switch on the outside of the panel or trigger automatically on an outdoor air temperature setpoint. The sump may also be configured to dump or fill based on a schedule set on the LWM.

There are two options available to control how to dump the sump. The parameters to setup this control are located on the Tower Setpoints menu on the HMI.

Options one and two include the use of Sump Dump Select. Using this variable, you can dump the sump based on a hardware switch (MCB-DI6) and based on Outdoor Air Temperature (OAT). The switch can be configured to be normally open or normally closed using the "SumpDmp Sw" item on the HMI. If normally open is selected, the sump will dump when the switch is closed. If normally closed is selected, the sump will dump when the switch is open. If this feature is enabled by setting Sump Dump Select to Enable, the sump will dump when either the switch tells it to, or the OAT drops below the sump dump setpoint minus the sump dump deadband. It will refill when both the switch indicates fill and OAT rises above the sump dump setpoint plus the sump dump deadband. Selecting Disable for Sump Dump Select, disables the ability to dump the sump based on switch and OAT.

The second option to dump the sump is to setup a dump month and day along with a corresponding sump fill month and day. If the current date in the controller is between the dump and fill dates, the sump will be dumped. Otherwise, it will be filled. This option can be used at the same time as Sump Dump Select is used. If either option call for the sump to dump, the sump will dump.

The output used to dump or fill the sump (EMA-X5) is also fully configurable using the SumpDmp Out item on the HMI. If this parameter is set to Norm Off, then the output will be On to dump the sump. If this parameter is set to Norm On, the output will be Off to dump the sump.

The Tower Setpoint Menu contains setpoints used to for tower control.

Table 12. Tower Setpoints Menu

Menu Display Name	Item Display Name	Default	Range
Tower Setpoints	Tower Ctrl Zone=	7°F	1-20°F
	Tower Spt=	80°F	0-200°F – Can't overlap heat addition or boiler setpoints, if they are present.
	Tower DB=	1°F	0-10°F
	SumpDmp Ena=	Enable	Disable, Enable
	SumpDmp Out=	Norm Off	Norm Off, Norm On
	SumpDmp Spt=	35°F	28°F – 38°F
	SumpDmp DB=	2°F	0°F – 10°F
	SumpDmp Sw=	NormOpen	NormOpen, NormClosed
	SumpDmp Month=	Disabled	Disabled, Jan-Dec
	SumpDmp Day=	1	1-31
	SumpFill Month=	Disabled	Disabled, Jan-Dec
	SumpFill Day=	1	1-31

Tower Ctrl Zone is used to compute the gain used in the PID to control the tower valve. This setpoint can be used to fine tune the tower valve output signal for slower or quicker reaction of the tower control (heat rejection) analog output.

Tower Spt is the setpoint used by the tower control heat rejection analog output only. Staged heat rejection output setpoints should be set in the "Heat Rejection Setpoints" menu. This value will be used to control the tower analog output when there is no reset schedule being used.

Tower DB is the tower deadband.

SumpDmp Ena is used to enable the method used to dump the sump.

- Disable – Disables the sump dump feature.
- Enable – Enables the sump dump feature using the outside air temperature (OAT) and a digital input.

SumpDmp Out is used to configure the sump dump output.

- Norm Off – The sump dump output is normally off. It will turn on to dump the sump.
- Norm On – The sump dump output is normally on. It will turn off to dump the sump.

SumpDmp Spt is the sump dump setpoint and is used when SumpDmp Ena is set to Enable. If the OAT is less than the sump dump setpoint minus the deadband, the controller will energize the sump dump output. The output will be de-energized when the OAT rises above the sump dump setpoint by more than the deadband. However, the sump dump output can also energize based on a digital input. If either the digital input or the OAT requires it, the sump dump output energizes

SumpDmp DB is the deadband for the sump dump setpoint and is used to ensure the sump dump output does not cycle excessively when the OAT is very close to the sump dump setpoint.

SumpDmp Sw is used to configure the sump dump switch.

- NormOpen – The sump dump switch is normally open. Closing the switch will dump the sump.
- NormClosed – The sump dump switch is normally closed. Opening the switch will dump the sump.

SumpDmp Month is used to configure the month in which the sump should be dumped.

- Disable – Disables the sump dump by date feature
- Jan-Dec – Selects the month in which the sump should begin to dump and will continue until the Fill date.

SumpDmp Day is used to configure the day of the month in which the sump should start to be dumped.

SumpFill Month is used to configure the month in which the sump should fill.

- Disable – Disables the sump fill by date feature
- Jan-Dec – Selects the month in which the sump should begin to fill again.

SumpFill Day is used to configure the day of the month in which the sump should fill.

Boiler Setpoints Menu

The Loop Water Manager has the ability to control an optional boiler valve. That valve is controlled via an analog signal dictating its exact position. The boiler also has its own setpoint, deadband, and control zone configuration points. These configuration points dictate the behavior and temperature control based around the boiler. The boiler waits for activation of Heat Stage 1 before allowing its valve to open. The boiler and heat staging process are otherwise independent outside of the fact that both control the same medium based on the same measured value.

The Boiler Setpoints Menu contains setpoints used for boiler control.

Table 13. Boiler Setpoints Menu

Menu Display Name	Item Display Name	Default	Range
Boiler Setpoints	Active Setpoint=	-	-
	Boiler Ctrl Zone=	7°F	1-30°F
	Boiler Spt=	70°F	0-200°F – Should not overlap heat rejection or tower setpoints, if they are present.
	Boiler DB=	1°F	0-10°F

Active Setpoint is the current setpoint used in the PID to control the boiler valve and is independent of the staged heat addition setpoints. If no reset schedule is used, this setpoint is equal to Boiler Spt.

Boiler Ctrl Zone is used to compute the gain used in the PID to control the boiler valve. This setpoint can be used to fine tune the boiler valve output signal for slower or quicker reaction of the boiler valve (heat addition) analog output.

Boiler Spt the boiler setpoint is used by the heat addition analog output only. Staged heat addition output setpoints should be set in the "Heat Addition Setpoints" menu. This value will be used to control the boiler valve when there is no reset schedule being used.

Boiler DB is the boiler deadband.

Heat and Cool Stage Sequencing

Heat addition (heat) and heat rejection (cool) stages are the basis for tempering the water loop to allow the water source heat pumps to deliver climate control to their assigned zones. The LWM manages the activation and deactivation of these outputs in response to the changes in loop water control temperature to maintain proper loop temperature. The return or supply loop water temperature can be selected as the control loop water temperature. (Default=Supply)

Each stage has a user-configurable setpoint and differential. For example, in the case of a heat addition stage with a setpoint of 65°F and a differential of 3°F, when the control loop water temperature falls below 65°F, this stage will activate and remain on until the control water temperature rises above 68°F.

Each available stage has its own unique output. Staging is forced by setpoint control to maintain a sequence. Stages activate and deactivate in the same sequence. Actual physical representation of a heat addition or heat rejection stage shall be independent of the controls. Optional damper interlock logic is included to ensure fan discharge dampers have completely opened before proceeding to heat rejection Stage 2.

Heat Rejection Spts Menu

The Loop Water Manager has the ability to control and sequence up to 12 heat rejection (cool) stages (depending on model). Each stage has its own setpoint and differential to control its activation and deactivation which are available on the keypad and through BACnet. Each available stage has setpoint limits enforced so as to keep the stages in sequence. As a setpoint is changed, it moves the available range of the adjacent setpoints accordingly. In addition, the heat rejection setpoints cannot be set less than the heat addition setpoints.

The Heat Rejection Spts is a menu containing the setpoints and differentials for each stage of heat rejection. Each heat rejection setpoint must be set higher than the previous, so that the setpoints do not overlap.

Table 14. Heat Rejection Spts Menu

Menu Display Name	Item Display Name	Default	Range
Heat Rejection Spts	Stage 1 Spt=	81°F	0-200°F – Can't overlap heat addition or boiler setpoints, if they are present.
	Stage 1 Diff=	3°F	0-9°F
	Stage 2 Spt=	82.9°F	Stage 1 Spt – 110°F
	Stage 2 Diff=	3°F	0-9°F
	Stage 3 Spt=	84.9°F	Stage 2 Spt – 110°F
	Stage 3 Diff=	3°F	0-9°F
	Stage 4 Spt=	87.1°F	Stage 3 Spt – 110°F
	Stage 4 Diff=	3°F	0-9°F
	Stage 5 Spt=	89.1°F	Stage 4 Spt – 110°F
	Stage 5 Diff=	3°F	0-9°F
	Stage 6 Spt=	91°F	Stage 5 Spt – 110°F
	Stage 6 Diff=	3°F	0-9°F
	Stage 7 Spt=	91.9°F	Stage 6 Spt – 110°F
	Stage 7 Diff=	3°F	0-9°F
	Stage 8 Spt=	93°F	Stage 7 Spt – 110°F
	Stage 8 Diff=	3°F	0-9°F
	Stage 9 Spt=	93.9°F	Stage 8 Spt – 110°F
	Stage 9 Diff=	3°F	0-9°F
	Stage 10 Spt=	95°F	Stage 9 Spt – 110°F
	Stage 10 Diff=	3°F	0-9°F
	Stage 11 Spt=	96.1°F	Stage 10 Spt – 110°F
	Stage 11 Diff=	3°F	0-9°F
	Stage 12 Spt=	97°F	Stage 11 Spt – 110°F
	Stage 12 Diff=	3°F	0-9°F

Stage x Spt is the setpoint used to turn on stage x of heat rejection when the control temperature is greater than this setpoint and the stage time has expired.

Stage x Diff is the differential used to turn off stage x of heat rejection when the control temperature is less than the corresponding stage x setpoint minus differential and the stage time has expired.

Heat Addition Spts Menu

The Loop Water Manager has the ability to control and sequence up to 12 heat addition stages (depending on model). Each stage has its own setpoint and differential to control its activation and deactivation. Each available stage has setpoint limits enforced so as to keep the stages in sequence. As a setpoint is changed, it will move the available range of the adjacent setpoints accordingly. In addition, the heating addition setpoints cannot be set greater than the heat rejection (cooling) setpoints.

The Heat Addition Spts is a menu containing the setpoints and differentials for each stage of heat addition. Each heat addition setpoint must be set lower than the previous, so that the setpoints do not overlap.

Table 15. Heat Addition Spts Menu

Menu Display Name	Item Display Name	Default	Range
Heat Addition Spts	Stage 1 Spt=	64.9°F	Stage 2 Spt - 200°F – Can't overlap heat rejection or tower setpoints, if present.
	Stage 1 Diff=	3°F	0-9°F
	Stage 2 Spt=	63°F	Stage 3 Spt – Stage 1 Spt
	Stage 2 Diff=	3°F	0-9°F
	Stage 3 Spt=	61°F	Stage 4 Spt – Stage 2 Spt
	Stage 3 Diff=	3°F	0-9°F
	Stage 4 Spt=	59°F	Stage 5 Spt – Stage 3 Spt
	Stage 4 Diff=	3°F	0-9°F
	Stage 5 Spt=	57.9°F	Stage 6 Spt – Stage 4 Spt
	Stage 5 Diff=	3°F	0-9°F
	Stage 6 Spt=	57°F	Stage 7 Spt – Stage 5 Spt
	Stage 6 Diff=	3°F	0-9°F
	Stage 7 Spt=	55.9°F	Stage 8 Spt – Stage 6 Spt
	Stage 7 Diff=	3°F	0-9°F
	Stage 8 Spt=	55°F	Stage 9 Spt – Stage 7 Spt
	Stage 8 Diff=	3°F	0-9°F
	Stage 9 Spt=	54°F	Stage 10 Spt – Stage 8 Spt
	Stage 9 Diff=	3°F	0-9°F
	Stage 10 Spt=	53.1°F	Stage 11 Spt – Stage 9 Spt
	Stage 10 Diff=	3°F	0-9°F
	Stage 11 Spt=	52°F	Stage 12 Spt – Stage 10 Spt
	Stage 11 Diff=	3°F	0-9°F
	Stage 12 Spt=	51.1°F	40°F – Stage 11 Spt
	Stage 12 Diff=	3°F	0-9°F

Stage x Spt is the setpoint used to turn on stage x of heat addition when the control temperature is less than this setpoint and the stage time has expired.

Stage x Diff is the differential used to turn off stage x of heat addition when the control temperature is greater than the corresponding stage x setpoint plus differential and the stage time has expired.

Pre-heating and Pre-cooling

When enabled (Unit Configuration menu), this feature allows the system to prepare itself before the expected daily occupancy load occurs, allowing the system to deliver temperature control to its environment more rapidly upon entering its scheduled occupied state.

Pre-heating and cooling is a scheduled activity that includes other qualifying conditions, such as outside air temperature. The user specifies a quantity of the available heat and cool stages (Pre Heat & Cool Menu) to use during the pre-heat or pre-cool process and the system will execute control through the available stages. Also, during active pre-heating or cooling, any available boiler valves or tower fans or valves will be stroked completely open or turned to 100% capacity.

This feature is a subset of the normal operation and requires no additional functional components or parameters beyond what is already in place during normal occupied operation.

PreHeat Activation

To activate this state, the following conditions must be met: The system must be in either the Unocc or UnoccLim states. The loop water temperature must be below the PreHeat setpoint less the differential. The outside air temperature must be below the PreHeat Outdoor Air setpoint. A scheduled PreHeat cycle must be active.

State operation proceeds in a manner analogous to normal occupancy, up to the point where the highest user-specified stage is activated. A boiler valve, if available, will be stroked fully open in this state. Temperature control will continue until the loop water temperature rises above the PreHeat setpoint. At that time, the system will enter Recirculate state until a scheduled occupancy period begins.

PreCool Activation

To activate this state, the following conditions must be met: The system must be in either the Unocc or UnoccLim states. The loop water temperature must be above the PreCool setpoint plus the differential. The outside air temperature must be less than the outdoor air setpoint plus the differential. A scheduled PreCool cycle must be active.

State operation proceeds in a manner analogous to normal occupancy, up to the point where the highest user-specified stage is activated. A tower fan or valve, if available, will be stroked to full power/full open for the duration of this state. Temperature control will continue until one of these occur: the loop water temperature falls below the PreCool setpoint, the outside air rises above the PreCool setpoint, or the outside air rises above the PreCool outside air setpoint when there are no available cooling stages.

Pre Heat & Cool Menu

The Pre Heat & Cool is the menu containing items used to configure preheat and precool. Activation of preheat or precool stages maintains the control temperature in a desired range prior to occupancy times.

Table 16. Pre Heat & Cool Menu

Menu Display Name	Item Display Name	Default	Range
Pre Heat & Cool	Pre Heat Stages=	None	None, 1-12
	Pre Heat Spt=	70°F	60-80°F
	Pre Heat OA Spt=	40°F	30-50°F
	Pre Heat Diff=	3.0°F	0-10°F
	Pre Cool Stages=	None	None, 1-12
	Pre Cool Spt=	75°F	65-85°F
	Pre Cool OA Spt=	70°F	55-85°F
	Pre Cool Diff=	3.0°F	0-10°F
	Monday Active=	**:**	**:**, 00:00-23:59
	Tuesday Active=	**:**	**:**, 00:00-23:59
	Wednesday Active=	**:**	**:**, 00:00-23:59
	Thursday Active=	**:**	**:**, 00:00-23:59
	Friday Active=	**:**	**:**, 00:00-23:59
	Saturday Active=	**:**	**:**, 00:00-23:59
	Sunday Active=	**:**	**:**, 00:00-23:59
	Holiday Active=	**:**	**:**, 00:00-23:59

Pre Heat Stages configures the LWM for the number of preheat stages. Setting this parameter to None, disables the preheat feature.

Pre Heat Spt configures the preheat setpoint. The control temp must be less than the setpoint minus the Pre Heat Diff to enter preheat. When the control temp goes above the Pre Heat Spt, preheat is complete.

Pre Heat OA Spt configures the preheat outdoor air setpoint. The outside air temp must be less than this setpoint to enter preheat.

Pre Heat Diff configures the preheat differential.

Pre Cool Stages configures the LWM for the number of precool stages. Setting this parameter to None, disables the precool feature.

Pre Cool Spt configures the precool setpoint. The control temp must be greater than the setpoint plus the Pre Cool Diff to enter precool. When the control temp goes below the Pre Cool Spt, precool is complete.

Pre Cool OA Spt configures the precool outdoor air setpoint. The outside air temp must be more than this setpoint plus the Pre Cool Diff in order to enter precool.

Pre Cool Diff configures the precool differential.

Monday…Holiday Active sets the time in which pre heat and/or pre cool become active.

Outside Air Setpoint Reset

Reset of Staged Heating Setpoints

This feature is designed to maintain water temperature and space comfort during times of increased radiant heat loss.

The controlling variable in this feature is the outdoor air temperature. Based on the user's settings, the heat stage setpoints will adjust upward in response to the outside air temperature. For example, if the user sets a maximum adjustment of 4°F over a range of 10°F-60°F, all heat stage setpoints will be adjusted 2°F upward when the outside air temperature is 35°F, as displayed in Figure 10. If the outside air temperature is 20°F, heat stage setpoints will be adjusted 3.2°F upward.

This feature integrates seamlessly into the existing staging and sequencing structure. It is otherwise invisible to the rest of the program and, when disabled, leaves no trace of its existence.

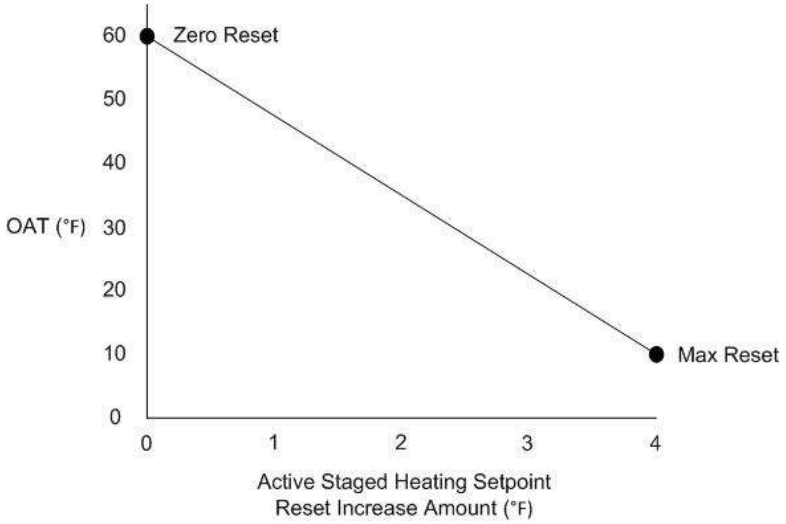


Figure 14. Example of Outside Air Setpoint Reset with a maximum adjustment of 4°F over a range of 10°F - 60°F.

Stg OA Reset Menu

The Stg OA Reset is the menu containing items used to configure outdoor air reset to reset the staged heat addition setpoints.

Table 17. Stg OA Reset Menu

Menu Display Name	Item Display Name	Default	Range
Stg OA Reset	Max Reset Amt=	8.0°F	0-9°F
	Max Reset Spt=	-0.0°F	-20-10°F
	Zero Reset Spt=	60°F	55-65°F

Max Reset Amt is an adjustable item which sets the maximum amount the staged heat addition setpoints can be reset when outdoor air reset is enabled.

Max Reset Spt is the outside air temperature where maximum reset occurs. This only applies to outside air resetting of the staged heat addition setpoints.

Zero Reset Spt is the outside air temperature when zero reset occurs. This only applies to outside air resetting of the staged heat addition setpoints.

Reset of Boiler Valve Setpoint

This feature is normally used in radiant loop applications (Radiant Loop App = Yes). The controlling variable in this feature is the outdoor air temperature. Based on the user's settings, the boiler valve setpoint adjusts upward as the outdoor air temperature decreases.

To enable this feature:

1. Navigate to the Main Menu\Unit Configuration screen on the HMI.
2. Change BVlv OA Reset on the Unit Configuration menu to Yes.
3. Change Apply Changes to Yes. This will cycle power to the unit controller.

Error! Reference source not found. graphically shows the boiler valve reset operation. The boiler valve setpoint is defaulted to 70°F. When the outdoor air reset is enabled the unit adjusts the boiler valve setpoint from 90°F to 180° as the outdoor air temperature decreases between 50°F and -10°F. This example would give the following inputs:

Bvlv OAR Min = 180°F

Bvlv OAR Min@ = -10°F

Bvlv OAR Max = 90°F

Bvlv OAR Max@ = 50°F

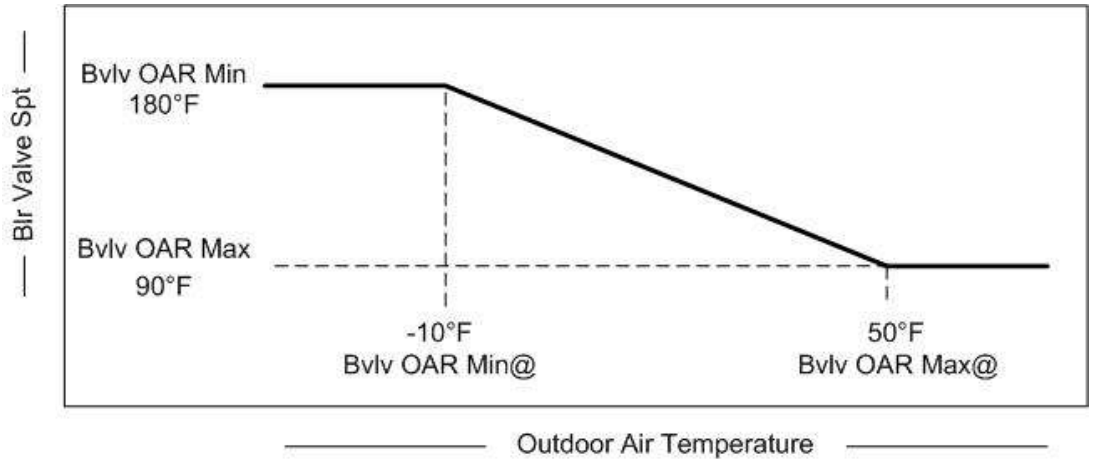


Figure 15. Boiler Valve OA Reset

BVlv OA Reset Menu

The BVlv OA Reset is the menu containing items used to configure outside air reset to reset the boiler valve setpoint.

Table 18. BVlv OA Reset Menu

Menu Display Name	Item Display Name	Default	Range
BVlv OA Reset	OA Reset Man=	Off	Off, On
	OA R Man Value=	70°F	-83.2-147.2°F
	Bvlv OAR Min=	180.0°F	32-194°F
	Bvlv OAR Max=	90.0°F	32-194°F
	Bvlv OAR Min@=	-10.0°F	-40-80°F
	Bvlv OAR Max@=	50.0°F	-40-80°F

OA Reset Man is an adjustable item that enables manual reset of the boiler valve. If yes, the boiler valve will modulate to the OA R Man Value.

OA R Man Value is an adjustable item that is used as the boiler valve setpoint when OA Reset Man is set to Yes.

Bvlv OAR Min is an adjustable item which sets the minimum boiler valve setpoint for use with an outdoor air reset schedule.

Bvlv OAR Max is an adjustable item which sets the maximum boiler valve setpoint for use with an outdoor air reset schedule.

Bvlv OAR Min@ is an adjustable item which sets the value of the outdoor air sensor at which the boiler valve setpoint is reset to the boiler valve outside air reset minimum setpoint (Bvlv OAR Min) value.

Bvlv OAR Max@ is an adjustable item which sets the value of the outdoor air sensor at which the boiler valve setpoint is reset to the boiler valve outside air reset maximum setpoint (Bvlv OAR Max) value.

Pump Control Menu

The Loop Water Manager is able to maintain control of and verify the water flow within the main water loop of the system. It provides up to two digital outputs to start a field provided and wired main loop pump. An input from a field mounted flow switch is monitored to determine if the pump achieves flow. If the main pump is activated, but does not achieve enough flow to make the flow switch, a pump alarm is initiated and the pump output is deactivated. If the Loop Water Manager is configured for a second main pump, it will attempt to start the second pump to achieve flow in the loop. In this dual main pump configuration, the user may select which pump shall be the lead pump or select "auto", in which the controller will automatically select the pump with the least amount of run hours. If the second pump fails to achieve flow, it will also be shut down and the Loop Water Manager will stay off in alarm, until the error(s) have been remedied and the alarms manually cleared at the LWM. Additionally, the LWM can be configured to control up to two secondary pumps for a tower or boiler loop.

The Pump Control is the menu containing pump hours, the configuration point to select the lead pump and head pressure control setpoints.

Table 19. Pump Control Menu

Menu Display Name	Item Display Name	Default	Range
Pump Control	Pump1 Hours=	-	0-88000
	Pump2 Hours=	-	0-88000
	Ld Pmp Select=	Auto	None, Pump1, Pump2, Auto
	Sec Pump1 Hrs-	-	0-88000
	Sec Pump2 Hrs=	-	0-88000
	Ld Sec Pmp Select=	Auto	None, Pump1, Pump2, Auto

Pump1 Hours is the number of run hours for primary pump 1.

Pump2 Hours is the number of run hours for primary pump 2.

Ld Pmp Select configures which pump should start first.

- **None** is used when there are no pumps.
- **Pump1** always start pump 1 first.
- **Pump2** always start pump 2 first.
- **Auto** start whichever pump has the least run hours. This is only available if there is more than 1 pump.

Sec Pump1 Hours is the number of run hours for secondary pump 1.

Sec Pump2 Hours is the number of run hours for secondary pump 2.

Ld Sec Pmp Select configures which secondary pump should start first.

- **None** is used when there are no pumps.
- **Pump1** always start pump 1 first.
- **Pump2** always start pump 2 first.
- **Auto** start whichever pump has the least run hours. This is only available if there is more than 1 pump.

Date/Time/Schedules Menu

The Date/Time/Schedules is a menu containing controller date/time, link to the schedules menu and the configuration points for daylight savings time. The Loop Water Manager maintains and executes one internal schedule and up to six external schedules (available scheduling outputs will depend on LWM model). Internally, the schedule maintains occupancy times as well as the ability to schedule a pre-heating or pre-cooling process. In addition, the BACnet network can command occupancy using the Current State variable. If either the Current State or the internal time schedule is occupied, the LWM will be occupied. Externally, water source heat pumps can be divided into zones on different schedules and connected to the controller for independent control.

Table 20. Date/Time/Schedules Menu

Menu Display Name	Item Display Name	Default	Range
Date/Time/Schedules	Time=	-	hh:mm:ss
	Date=	-	MM/DD/YYY
	Scheduling	-	-
	Daylight Savings		
	DLS Strt Mon=	Mar	Jan…Dec
	DLS Strt Week=	2ndWeek	1stWeek, 2ndWeek, 3rdWeek, 4thWeek, 5thWeek
	DLS End Mon=	Nov	Jan…Dec
	DLS End Week=	1stWeek	1stWeek, 2ndWeek, 3rdWeek, 4thWeek, 5thWeek
	DLS Active=	Yes	No, Yes

Time is the current local time in the LWM.

Date is the current local date in the LWM.

Scheduling is a menu containing pump schedule and external schedules.

DLS Strt Mon is the month in which daylight savings starts.

DLS Strt Week is the week of the month in which daylight savings starts.

DLS End Mon is the month in which daylight savings ends.

DLS End Week is the week of the month in which daylight savings ends.

DLS Active configures the controller to enable daylight savings (Yes) or not (No)

Scheduling Menu

The Scheduling is a menu containing links to the pump schedule and external schedules.

Table 21. Scheduling Menu

Menu Display Name	Item Display Name	Default	Range
Scheduling	Pump Schedule	-	-
	Extern Schedule 1 … Extern Schedule 6	-	-

Pump Schedule Menu

The Pump Schedule is a menu used to configure the daily and holiday schedules for the pumps.

Table 22. Pump Schedule Menu

Menu Display Name	Item Display Name	Default	Range
Pump Schedule Extern Schedule 1…6	Mon:	**:** - **:**	00:00-23:59
	Tue:	**:** - **:**	00:00-23:59
	Wed:	**:** - **:**	00:00-23:59
	Thu:	**:** - **:**	00:00-23:59
	Fri:	**:** - **:**	00:00-23:59
	Sat:	**:** - **:**	00:00-23:59
	Sun:	**:** - **:**	00:00-23:59
	Holiday:	**:** - **:**	00:00-23:59
	Holiday Schedule	-	-

Extern Schedule 1...6 Menu

The Extern Schedule 1…6 are menus used to configure the daily and holiday schedules for the external schedules.

Table 23. Extern Schedule 1…6 Menu

Menu Display Name	Item Display Name	Default	Range
Pump Schedule Extern Schedule 1…6	Mon:	**:** - **:**	00:00-23:59
	Tue:	**:** - **:**	00:00-23:59
	Wed:	**:** - **:**	00:00-23:59
	Thu:	**:** - **:**	00:00-23:59
	Fri:	**:** - **:**	00:00-23:59
	Sat:	**:** - **:**	00:00-23:59
	Sun:	**:** - **:**	00:00-23:59
	Holiday:	**:** - **:**	00:00-23:59
	Holiday Schedule	-	-

HolidaySchedules Menu

The Holiday Schedules is a menu used to configure the 10 possible holiday schedules.

Table 24. Holiday Schedule Menu

Menu Display Name	Item Display Name	Default	Range
Holiday Schedule	Hol1= … Hol10=	**/**/** - **/**/**	-

Commission Unit

Table 25. Commission Unit Menu

Menu Display Name	Item Display Name	Default	Range
Commission Unit	Eng Units=	US	US, SI
	Loop Ctrl Tmp=	Supply	Supply, Return
	Timer Settings	-	-
	Safety Setpoints	-	-
	IP Setup	-	-

Eng Units is used to set the units that are displayed by the keypad.

Loop Ctrl Tmp is used to set which temperature is used for control (Return or Supply).

Timer Settings Menu

The Timer Settings is the menu containing settings for various timers.

Table 26. Timer Settings Menu

Menu Display Name	Item Display Name	Default	Range
Timer Settings	Stage Time=	20s	0-600 seconds
	Recirc Time=	180s	0-1800 seconds

Stage Time is the amount of time between heat addition/rejection stages.

Recirc Time is amount of time the unit status will remain in the Recirculate state when starting.

Safety Setpoints Menu

The Safety Setpoints is the menu containing critical alarm setpoints.

Table 27. Safety Setpoints Menu

Menu Display Name	Item Display Name	Default	Range
Safety Setpoints	SupHiTmpShutdn=	230.0°F	-4.0-230.0°F
	SupLoTmpShutdn=	35.0°F	-4.0-230.0°F
	RetHiTmpShutdn=	194.0°F	-4.0-230°F
	RetLoTmpShutdn=	25°F	-4.0-230°F
	HiTmp Emg Strt=	100°F	85°F - 115°F
	LoTmp EmgStrt=	45°F	32°F - 60°F
	Anti-Fz OA Spt=	35°F	20°F - 50°F
	Loop SD Diff=	5°F	0°F - 15°F
	Pump Fail Delay=	10s	0-600 seconds
	HiPressFault=	725.2psi	0-7251.8psi
	LoPressFault=	0.0psi	0-7251.8psi

SupHiTmpShutdn is the temperature at which the LWM will shut down if the supply temperature rises above it.

SupLoTmpShutdn is the temperature at which the LWM will shut down if the supply temperature goes below it.

RetHiTmpShutdn is the temperature at which the LWM will shut down if the return temperature rises above it.

RetLoTmpShutdn is the temperature at which the LWM will shut down if the return temperature goes below it.

HiTmp Emg Strt is the temperature at which the LWM will start (if unoccupied) if the outdoor air temperature rises above it.

LoTmp Emg Strt is the temperature at which the LWM will start (if unoccupied) if the outdoor air temperature goes below it.

Anti-Fz OA Spt is the temperature at which the LWM will start (if unoccupied) if the outdoor air temperature goes below it. The unit will run in UnocLim state

Loop SD Diff is the differential used to determine when emergency start is complete. For example, if the control temp is greater than the HiTmp Emg Strt setpoint and the unit starts up, it needs to go below the HiTmp Emg Strt setpoint by more than this differential to transition off again.

Pump Fail Delay is the amount of time the LWM will wait for the flow switch to make before turning off the pump on a pump fail.

HiPressFault is the pressure at which a high pressure fault is generated.

LoPressFault is the pressure at which a low pressure fault is generated.

The IP Setup Menu

Table 28. IP Setup Menu

Menu Display Name	Item Display Name	Default	Range
IP Setup	Apply Changes=	No	No, Yes
	Act IP=	-	-
	ActMsk=	-	-
	ActGwy=		-
	Gvn IP=	-	-
	GvnMsk=	-	-
	GvnGwy=		-
	DHCP Enabled?	No	No, Yes
	WebUNm=	ADMIN	-
	WebPwd=	SBTAdmin!	-

Apply Changes must be set to Yes after making any changes. Setting this to yes will cycle power to the controller to allow the network setup changes to take place.

Act IP is the actual IP address of the BACnet communication module.

Act Msk is the actual Subnet Mask of the BACnet communication module.

ActGwy is the actual Gateway address.

GvnIP is the given IP address of the BACnet communication module.

GvnMsk is the given Subnet Mask of the BACnet communication module.

GvnGwy is the given Gateway address.

DHCP Enabled? is the Dynamic Host Configuration Protocol, a network protocol that enables a server to automatically assign an IP address.

Manual Control

The manual control of operation is a function that is used for operating the unit during a service call only. The unit must not be operated in this mode for any extended period of time.

Table 29. Manual Control Menu

Menu Display Name	Item Display Name	Default	Range
Manual Control	Manual Mode Act=	No	No/Yes
	Pump1 Mode=	Auto	Off, Auto, On
	Pump2 Mode=	Auto	Off, Auto, On
	Pump 1 Drive=	0%	0-100%
	Pump 2 Drive=	0%	0-100%
	Sec Pump1 Mode=	Auto	Off, Auto, On
	Sec Pump2 Mode=	Auto	Off, Auto, On
	Tower Fan Drv=	0%	0-100%
	Boiler Vlv Drv	0%	0-100%
	Man Cool Stg=	0	0-12
	Man Heat Stg=	0	0-12
	Ena Twr Fan Man=	Off	Off, On
	Twr Fan Man Open=	Off	Off, On
	Twr Fan Man Close=	Off	Off, On
	Blr Vlv Man Open=	Off	Off, On
	Blr Vlv Man Close	Off	Off, On
	Alarm LED Man=	Off	Off, On
	EStop LED Man=	Off	Off, On
	Lp Temp Simulate=	70.7°F	-25.6-122°F
	OAT Simulate=	70.7°F	-25.6-122°F
	Ex Sch 1 Man= … Ex Sch 6 Man=	Off	Off, On

Service Menus

Table 30. Service Menu

Menu Display Name	Item Display Name	Default	Range
Timer Settings	Stage Time=	20s	0-600 seconds
	Recirc Time=	180s	0-1800 seconds
Operating Hours	Pump1 Hours=	-	-
	Pump2 Hours=	-	-
	Sec Pump1 Hrs=	-	-
	Sec Pump2 Hrs=	-	-
Save/Restore Settings	Save Params=	No	No, Yes
	Rstr Params=	No	No, Yes
	SaveToCard=	No	No, Yes
	LoadFromCard=	No	No, Yes
Active Alarms	Alm Count:xx ClrAlms=	No	No, Yes
	Alarm 1 … Alarms 10	-	-
Alarm Log	Log Count:xx Clr Log=	No	No, Yes
	Alarm 1 … Alarm 50	-	-
I/O Status	Ext Flow Req=	-	Inactive, Active
	Man Override=	-	Inactive, Active
	Loop Pump1 Ena=	-	Off, On
	Loop Pump2 Ena=	-	Off, On
	Pump1 Drive=	-	0-100%
	Pump2 Drive=	-	0-100%
	Sec Lp Pmp1 Ena=	-	Off, On
	Sec Lp Pmp1 Ena=	-	Off, On
	Boiler Valve=	-	0-100%
	Tower Fan=	-	0-100%
	Heat Add Stage 1= …. Heat Add Stage 12=	-	Off, On
	Heat Rej Stage 1= …. Heat Rej Stage 12=	-	Off, On
	Ext Sched Out1= … Ext Sched Out6=	-	Off, On
	Twr Fan Ena Out=	-	Off, On
	Alarm LED=	-	Off, On
	Emg Stop LED=	-	Off, On
	Local OAT=	-	-

Unit Diagnostics	Local I/O Diagnostics	-	-
	Exp Mod A I/O Diag.	-	-
	Exp Mod B I/O Diag.	-	-
Local I/O Diagnostics	AI1=	-	-
	AI2=	-	-
	AI3=	-	-
	DI1= … DI6=	-	Off, On
	DO1= … DO10=	-	Off, On
	X1= … X8=	-	-
Exp Mod A I/O Diag. Exp Mod B I/O Diag.	DI1=	-	Off, On
	DO1= … DO6=	-	Off, On
	X1= … X8=	-	-

Timer Settings is a menu containing configurable timers used in the LWM.

Stage Time is the amount of time between heat addition and heat rejection stages.

Recirc Time is the amount of time the LWM will remain in the recirculate state at startup.

Operating Hours is a menu containing the primary and secondary pump run hours.

Pump1 Hours is the number of runtime hours for pump 1.

Pump2 Hours is the number of runtime hours for pump 2.

Sec Pump1 Hrs is the number of runtime hours for secondary pump 1.

Sec Pump2 Hrs is the number of runtime hours for secondary pump 2.

Unit Maintenance

This menu gives the user access to the Operating Hours menu that contains the operating hours for the primary and secondary pumps.

Table 31. Unit Maintenance Menu

Menu Display Name	Item Display Name	Default	Range
Unit Maintenance	Operating Hours	-	-
Operating Hours	Pump1 Hours=	-	-
	Pump2 Hours=	-	-
	Sec Pump1 Hrs=	-	-
	Sec Pump2 Hrs=	-	-

Operating Hours is the menu used to view run hours for the primary and secondary pumps.

Pump1 Hours is the number of runtime hours for pump 1.

Pump2 Hours is the number of runtime hours for pump 2.

Sec Pump1 Hrs is the number of runtime hours for secondary pump 1.

Sec Pump2 Hrs is the number of runtime hours for secondary pump 2.

BMS Communications

Table 32. BMS Communications

Menu Display Name	Item Display Name	Default	Range
BMS Communications	BACnet MSTP Set-Up	-	-
	Comm Slot 1=	-	None, IP, LON, MSTP, Modbus, DNET
	Comm Slot 2=	-	None, IP, LON, MSTP, Modbus, DNET
	Comm Slot 3=	-	None, IP, LON, MSTP, Modbus, DNET
BACnet MSTP Set-Up	ApplyMSTPChgs=	No	No, Yes
	Name=	-	
	Dev Instance=	-	0 – 4194303
	MSTP Address=	-	
	Baud Rate=	38400	9600, 19200, 38400, 76800
	Max Master=	127	1-127
	Max Info Frm=	1	1-32
	Unit Support=	English	SI, English
	Term Resistor=	No	No, Yes
	NC Dev 1=	0	0 – 42949672
	NC Dev 2=	0	0 – 42949672
	Comm Status=	-	
	Use Defaults=	Off	Off, On
	RstOutOfSrvc=	Done	Done, False, True
	BACnet BSP=	8.14	-

BACnet MSTP Set-up is the menu used to setup the parameters for the MS/TP communication module.

Comm Slot 1 defines the type of module located in the slot 1 position (closest to the main controller).

Comm Slot 2 defines the type of module located in the slot 2 position (second from the main controller).

Comm Slot 3 defines the type of module located in the slot 3 position (third from the main controller).

ApplyMSTPChgs causes the controller to reset, when set to yes, to allow the network setup changes to take effect.

Name is the Device Object Name. It must be unique throughout the entire BACnet network.

Dev Instance is the device instance of the BACnet Communication Module. It must be unique throughout the BACnet network.

MSTP Address is the MS/TP address of the BACnet Communication Module.

Baud Rate is the data transfer speed.

Max Master specifies the highest possible address for master nodes and shall be less than or equal to 127.

Max Info Frm specifies the maximum number of information frames the BACnet Communication Module may send before it must pass the token.

Unit Support controls the type of units that are passed through BACnet (English or Metric).

Term Resistor is a software termination resistor, if MicroTech III controller is end of line an internal end of line resistor can be programmed.

NC Dev 1 is the device instance of the BACnet workstation or device that will receive the alarm notification. Use this in place of the Recipient List in the Notification Class.

NC Dev 2 is the device instance of the BACnet workstation or device that will receive the alarm notification. Use this in place of the Recipient List in the Notification Class

Comm Status indicates the status of the BACnet Communication Module.

Use Defaults is used to determine the default BACnet setup values. If set to Off, the defaults will be gotten from the unit controller. This can be useful when replacing a communication card.

RstOutOfSrvc will set the value of the Out of Service Property for setpoints.

BACnet BSP is the current version of firmware in the BACnet communication module

Unit Configuration

After the LWM main control board software is loaded into the MCB, it must be "configured" for the specific control application. This consists of setting the value of configuration variables within the MCB. These variables define things such as the number of pumps, number of heating stages, and boiler valve output type, etc. If all of these items are not set appropriately for the specific unit, the unit will not function properly. Once changes have been made to the Unit Configuration Menu, the Apply Changes flag must be changed from 'No' to 'Yes' in order for the controller to recognize the changes. Setting the Apply Changes flag to 'Yes' will automatically reset the controller.

Table 33. Unit Configuration Menu

Menu Display Name	Item Display Name	Default	Range
Unit Configuration	Apply Changes=	No	No, Yes
	Radiant Loop App=	No	No, Yes
	Main Lp Pmps=	2	None, 1, 2
	Main Lp Fl Sw=	2	None, 1, 2
	Sec Pmp Sw 1=	None	None, SecPmp1, Both
	Sec Pmp Sw 2=	None	None, SecPmp2, Both
	Sec Pmp1 Fnc=	None	None, Tower, Boiler
	Sec Pmp2 Fnc=	None	None, Tower, Boiler
	Avail Ht Stgs=	None	None, 1-12
	Avail Cl Stgs=	None	None, 1-12
	Pre Heat Ena=	Disable	Disable, Enabled
	Pre Cool Ena=	Disable	Disable, Enabled
	Blr Valve Act=	None	None, Analog
	Blr Output Type=	0-10VDC	0-10VDC, 0-10Rev, 2-10VDC, 2-10Rev, 4-20mA, 4-20Rev
	Twr Fan Act=	None	None, Analog
	Twr Output Type=	0-10VDC	0-10VDC, 0-10Rev, 2-10VDC, 2-10Rev, 4-20mA, 4-20Rev
	Lp Ret Sens=	Disable	Disable, Enabled
	Head Press Sns=	Disable	Disable, Enabled
	HdPres SnsType=	None	None, Current, 5VDC, 10VDC
	Press Sns Rng=	500.0psi	24.5 to 750.6psi
	OA Hum Sns Ena=	Disable	Disable, Enabled
	OAH Sns Type=	None	None, Current, 5VDC, 10VDC
	Blr Sensors=	None	None, Sup&Ret, Supply, Return
	Tower Sensors=	None	None, Sup&Ret, Supply, Return
	HeatXchr Sns=	None	None, Sup&Ret, Supply, Return
	Geothermal Sns=	Disable	Disable, Enable
	StrgTnk SnsEna=	Disable	Disable, Enabled
	Damper I'lock=	Disable	Disable, Enabled
	Ext Schedules=	1	1-6
	StgHtg OA Reset=	None	None, Ntwrk, OAT
	BVlv OA Reset=	None	None, Ntwrk, OAT
	Sump Control=	Yes	No, Yes
	Apply Changes=	No	No, Yes

Apply Changes must be set to 'Yes' after making any changes in this menu. It will cycle power to the unit controller.

Radiant Loop App defines whether or not this unit is used as a radiant loop application.

Main Lp Pmps defines the number of main loop pumps.

Main Lp Fl Sw defines the number of main loop flow switches.

Sec Pmp Sw 1 enables the secondary loop flow switch 1.

Sec Pmp Sw 2 enables the secondary loop flow switch 2.

Sec Pmp 1 Fnc defines if pump 1 is a tower or boiler pump. If there is no secondary pump 1, this should be set to 'None'.

Sec Pmp 2 Fnc defines if pump 2 is a tower or boiler pump. If there is no secondary pump 2, this should be set to 'None'.

Avail Ht Stgs defines the number of heating stages (heat addition). If none, set to 'None'.

Avail Cl Stgs defines the number of cooling stages (heat rejection). If none, set to 'None'.

Pre Heat Ena enables or disables the pre heat functionality.

Pre Cool Ena enables or disables the pre cool functionality.

Blr Valve Act defines the type of boiler valve actuator. If none, set to 'None'.

Twr Fan Act defines the type of tower fan actuator. If none, set to 'None'.

Lp Ret Sens defines whether (enabled) or not (disabled) there is a loop return sensor present.

Head Press Sns defines whether (enabled) or not (disabled) there is a loop return sensor present.

HdPres SnsType defines the type of head pressure sensor.

Press Sns Rng defines the maximum output of the head pressure sensor.

OA Hum Sns Ena defines whether (enabled) or not (disabled) there is an outdoor air humidity sensor present.

OAH Sns Type defines the type of outdoor air humidity sensor.

Blr Sensors defines whether or not there are any boiler sensors (supply or return) present.

Tower Sensors defines whether or not there are any tower sensors (supply or return) present.

HeatXchr Sns defines whether or not there are any heat exchanger sensors (supply or return) present.

Geothermal Sns defines whether (enable) or not (disable) there is a geothermal temperature sensor present.

StrgTnk Sns Ena defines whether (enabled) or not (disabled) there is a storage tank sensor present.

Damper I'lock defines whether to enable or disable damper interlock.

Ext Schedules defines the number of external schedules. There will be one output for each schedule.

StgHtg OA Reset defines the method used to reset the staged heating setpoints based on outdoor air temperature setpoint.

- **None** disables this feature.
- **Ntwrk** the outdoor air temperature is written from the BACnet network.
- **OAT** reset is based on the outdoor air temperature. See the Stg OA Reset menu for parameters.

BVlv OA Reset defines the method used to reset the boiler valve setpoint based on outdoor air temperature setpoint.

- **None** disables this feature.
- **Ntwrk** the outdoor air temperature is written from the BACnet network.
- **OAT** reset is based on the outdoor air temperature. See the BVlv OA Reset menu for parameters.

Sump Control defines whether (Yes) or not (No) there is a sump to control.

Alarms

Alarms provide the user with information about abnormal conditions that affect unit operation. The cause of the alarm should be investigated and eliminated before the unit or any disabled equipment in it is placed back into service.

All active alarms as well as the date and time that they were detected are displayed on the Active Alarm menu. These alarms are displayed in order of priority. Higher priority alarms are displayed first. The last fifty alarm 'events' detected as well as the date and times that they were detected are displayed on the Alarm Log menu. An alarm 'event' is either an alarm becoming active or being cleared. A '+' symbol precedes the active alarm event and a '-' symbol precedes the cleared alarm event. These alarms are displayed in the order that they were detected. The alarm that was detected most recently is displayed first. Multiple occurrences of the same alarm may appear.

Alarm Clearing

Active alarms can be cleared through the keypad/display or a BAS network. Alarms are automatically cleared when power is cycled. Alarms are cleared only if the conditions required to initiate the alarm do not exist. All alarms and groups of alarms can be cleared via the network or keypad by setting the ClrAlms variable to 'On'.

Table 34. Alarm Lists Menu

Menu Display Name	Item Display Name	Default	Range
Alarm Lists	Active Alarms	-	-
	Alarm Log	-	-
Active Alarms	Alm Count:xx ClrAlms=	No	No, Yes
	Alarm 1 … Alarms 10	-	-
Alarm Log	Clr Log: Log Count:xx	No	No, Yes
	Alarm 1 … Alarm 50	-	-

Active Alarm is a menu that lists all current alarms. Alarms can also be cleared in this menu.

Alm Count is the number of current alarms.

ClrAlms is used to clear all active alarms. Alarms will only clear if the condition that caused the alarm has cleared.

Alarm 1…Alarm10 are the current active alarm.

Active Log is a menu that lists all the last 50 alarm. Each alarm is entered twice into the log. Once when it becomes active (+) and once when it is cleared (-). The log can also be cleared in this menu.

Clr Log is used to clear the alarm history log.

Log Count is the number of alarms in the alarm log.

Alarm 1…Alarm 50 are all alarms in the alarm log.

Fault Alarms (Highest Priority)

Faults are conditions that are serious enough to shut down the unit. The alarm must be manually cleared to allow unit operation.

Table 35. Fault Alarms in Order of Priority

Alarm Message	Indication	Clear
High Supply Temperature Fault	The loop supply temperature is high.	Manual
Low Supply Temperature Fault	The loop supply temperature is low.	Manual
High Return Temperature Fault	The loop return temperature is the control temperature and is high.	Manual
Low Return Temperature Fault	The loop return temperature is the control temperature and is low.	Manual
High Head Pressure	The head pressure sensor has detected a dangerous high pressure condition.	Manual
Low Head Pressure	The head pressure sensor has detected a dangerous low pressure condition.	Manual
Head Pressure Sensor Fault	Head Pressure sensor is in error. Type of error – disconnect, short, etc – is not specified.	Manual
Outside Air Sensor Fault	Outside Air Temp sensor is in error. Type of error – disconnect, short, etc. – is not specified.	Manual
Loop Return Sensor Fault	Loop Return Temp sensor is in error. Type of error – disconnect, short, etc. – is not specified.	Manual
Loop Supply Sensor Fault	Loop Supply Temp sensor is in error. Type of error – disconnect, short, etc. – is not specified.	Manual
Main Loop Pump Fail SD	All available main loop pumps were activated and failed to establish flow. Auto-clears once all appropriate pump fail problems have cleared.	Automatic
Emergency Stop	Emergency Stop Input in the Alarm (Open) condition.	Automatic

Problem Alarms (Medium Priority)

Problems are conditions that result in some limitation of unit operation, but the unit is allowed to continue to operate. Some of these alarms must be cleared manually, but others clear automatically.

Table 36. Problem Alarms in Order of Priority

Alarm Message	Indication	Clear
Main Loop Pump 2 Fail	Main Loop Pump 2 was activated, but no flow was detected before FlowEstDelay timer expired.	Manual
Main Loop Pump 1 Fail	Main Loop Pump 1 was activated, but no flow was detected before FlowEstDelay timer expired.	Manual
Boiler Pumps Fail	All available secondary loop pumps that are configured as boiler pumps, were activated and failed to establish flow.	Automatic
Tower Pumps Fail	All available secondary loop pumps that are configured as tower pumps, were activated and failed to establish flow.	Automatic
High Return Temperature Prob	The loop return temperature is not the control temperature and is high.	Manual
Low Return Temperature Prob	The loop return temperature is not the control temperature and is low.	Manual
Return Temp Sensor Problem	The loop return temperature is not the control temperature and there is a problem with the sensor.	Manual

Warning Alarms (Lowest Priority)

Warnings inform the user of conditions that should be addressed, but do not limit operation in any way. The alarm condition needs to be fixed and the alarm must be manually cleared to cause this alarm to no longer be active.

Table 37. Warning Alarms in Order of Priority

Alarm Message	Indication	Clear
UnoccLimProtect	Loop Supply Temp exceeds bounds set by Water High Lim and Water Low Lim setpoints. Also triggered if Outdoor Air Temp has fallen below Anti-Freeze setpoint. Unit has entered UnoccLim state.	Automatic
SecPump2Manual	Secondary Loop Pump 2 has been manually activated or deactivated, overriding any controller directives, and disregarding all alarms.	Automatic

SecPump1Manual	Secondary Loop Pump 1 has been manually activated or deactivated, overriding any controller directives, and disregarding all alarms.	Automatic
Pump2Manual	Main Loop Pump 2 has been manually activated or deactivated, overriding any controller directives, and disregarding all alarms.	Automatic
Pump1Manual	Main Loop Pump 1 has been manually activated or deactivated, overriding any controller directives, and disregarding all alarms.	Automatic
Secondary Loop Switch 2 Stuck Fail	Secondary Loop Flow Switch 2 is indicating flow, but Sec Pump 2 is not active.	Automatic
Secondary Loop Switch 1 Stuck Fail	Secondary Loop Flow Switch 1 is indicating flow, but no appropriate pump is active.	Automatic
Main Loop Switch 2 Stuck Fail	Main Loop Flow Switch 2 is indicating flow, but Main Pump 2 is not active.	Automatic
Main Loop Switch 1 Stuck Fail	Main Loop Flow Switch 1 is indicating flow, but no appropriate pump is active.	Automatic
Secondary Loop Pump 2 Fail	Secondary Loop Pump 2 was activated, but no flow was detected before FlowEstDelay timer expired.	Manual
Secondary Loop Pump1 Fail	Secondary Loop Pump 1 was activated, but no flow was detected before FlowEstDelay timer expired.	Manual
Tower Return Air Temp Fail	Tower return air temperature sensor is enabled and failed.	Automatic
Tower Supply Air Temp Fail	Tower supply air temperature sensor is enabled and failed.	Automatic
Storage Tank Temp Fail	Storage tank temperature sensor is enabled and failed.	Automatic
Geothermal Temp Fail	Geothermal temperature sensor is enabled and failed.	Automatic
Boiler Supply Temp Fail	Boiler supply temperature sensor is enabled and failed.	Automatic
Boiler Return Temp Fail	Boiler return temperature sensor is enabled and failed.	Automatic
Heat Exchanger Return Temp Fail	Heat exchanger return temperature sensor is enabled and failed.	Automatic
Heat Exchanger Supply Temp Fail	Heat exchanger supply temperature sensor is enabled and failed.	Automatic
OA Humidity Sensor Fail	OA Humidity sensor is enabled and failed.	Automatic

Emergency Control Activation

If, during a period of unoccupancy, ambient conditions bring the system into a state that may cause damage to the system if allowed to continue, the LWM activates and works against that trend, bringing the system back into a more stable and safe condition before returning to its unoccupied state.

This state is triggered by a user-settable parameter. Outdoor air and current loop water temperatures are taken into consideration as to when to activate this state. Once active, the LWM will initiate temperature control until the system returns to normal parameters.

This feature is a subset of the normal operation and requires no additional functional components or parameters beyond what is already in place during normal occupied operation.

Emergency System Shutdown

It may occur that, during normal operation, a component malfunctions or the system enters a state from which there is no self-repair. In these cases, the LWM ceases operation and generates an alarm.

System shutdown is a last-resort failure. Only the most extreme of situations should cause the system to cease operation. These conditions are: failure of both main loop pumps to operate, operation failure of the loop control temperature sensor, excessively high or low loop temperature, and excessively high or low loop water pressure, should the pressure sensor be present.

About this LWM

Table 38. About this LWM Menu

Menu Display Name	Item Display Name
About this LWM	App Version=
	Main BSP=
	BACnet BSP=
	HMI GUID=
	OBH GUID=

App Version is the version of application code loaded into the controller

Main BSP is the current version of firmware in the main controller

BACnet BSP is the current version of firmware in the BACnet communication module

HMI GUID is the HMI software identifier number unique to each application code version

OBH GUID is the OBH software identifier number unique to each application code version

Unit State Transitions

Table 39. Unit State Transitions

Current State	Conditions for transitioning to End State	End State
Any State	Control Mode is set to Off (default) via the keypad or the Control Mode is set to Auto/Net and the Application Mode is set to Off via the network.	Off
Unocc	Any condition detailed below leading from Recirc to any other state.	Recirc
Recirc	The recirc timer expires and the loop control temp is either less than the water low limit setpoint or greater than the water high limit setpoint.	UnoccLim
Recirc	The recirc timer expires and this is a scheduled PreCool period as defined by the time settings in the Pre Heat & Cool menu. In addition, the loop control temp must be greater than the PreCool setpoint plus PreCool differential and the outside air temp must be less than the PreCool outside air setpoint plus PreCool differential.	PreHeat
Recirc	The recirc timer expires and this is a scheduled PreCool period as defined by the time settings in the Pre Heat & Cool menu. In addition, the loop control temp must be greater than the PreCool setpoint plus PreCool differential and the outside air temp must be less than the PreCool outside air setpoint plus PreCool differential.	PreCool
Recirc	Recirc timer expires and either the Network Flow Request input or the Manual Override input is active.	ExtFlowReq
Recirc	The recirc timer expires and this is a scheduled occupancy period. The scheduled occupancy will be occupied if either the local schedule indicates occupied or the network is commanding the unit occupied through the Current State network variable.	Occ
UnoccLim	Loop Control Temp returns within bounds of High and Low Lim setpoints.	Unocc
UnoccLim	The controller enters a scheduled occupied period. The scheduled occupancy will be occupied if either the local schedule indicates occupied or the network is commanding the unit occupied through the Current State network variable.	Occ
UnoccLim	The LWM enters a scheduled PreCool period as defined by the time settings in the Pre Heat & Cool menu. In addition, the loop control temp must be greater than the PreCool setpoint plus PreCool differential and the outside air temp must be less than the PreCool outside air setpoint plus PreCool differential.	PreHeat
UnoccLim	The LWM enters a scheduled PreCool period as defined by the time settings in the Pre Heat & Cool menu. In addition, the loop control temp must be greater than the PreCool setpoint plus PreCool differential and the outside air temp must be less than the PreCool outside air setpoint plus PreCool differential.	PreCool
UnoccLim	Either the Network Flow Request Input or Manual Override Input becomes active.	ExtFlowReq
PreHeat	The controller enters a scheduled occupied period. The scheduled occupancy will be occupied if either the local schedule indicates occupied or the network is commanding the unit occupied through the Current State network variable.	Occ

PreHeat	Either the Network Flow Request Input or Manual Override Input becomes active.	ExtFlowReq
PreCool	The controller enters a scheduled occupied period. The scheduled occupancy will be occupied if either the local schedule indicates occupied or the network is commanding the unit occupied through the Current State network variable.	Occ
PreCool	Either the Network Flow Request Input or Manual Override Input becomes active.	ExtFlowReq
ExtFlowReq	External stimulus (Network Flow Request or Manual Override) that caused transition released.	Unocc
ExtFlowReq	The controller enters a scheduled occupied period. The scheduled occupancy will be occupied if either the local schedule indicates occupied or the network is commanding the unit occupied through the Current State network variable.	Occ
Any State (except Manual)	• Loop Supply Temp < Loop Temp Low Shutdown OR • Loop Supply Temp > Loop Temp High Shutdown OR • Loop Control Temp < Loop Temp Low Shutdown OR • Loop Control Temp > Loop Temp High Shutdown OR • Head Pressure > High Pressure Shutdown OR • Head Pressure < Low Pressure Shutdown OR • Loop Supply Temp sensor disconnected OR • Head Pressure Sensor (if present) disconnected OR • Both Main Loop Pumps fail OR • Both Sec Loop Pumps fail OR • Emergency Stop digital input is made.	Alarm
Any State	User activates Manual Mode.	Manual
Manual	User deactivates Manual Mode.	Unocc

BACnet Communication Module

Component Data

Figure 16 shows the location of the major components of the BACnet Communication Module.

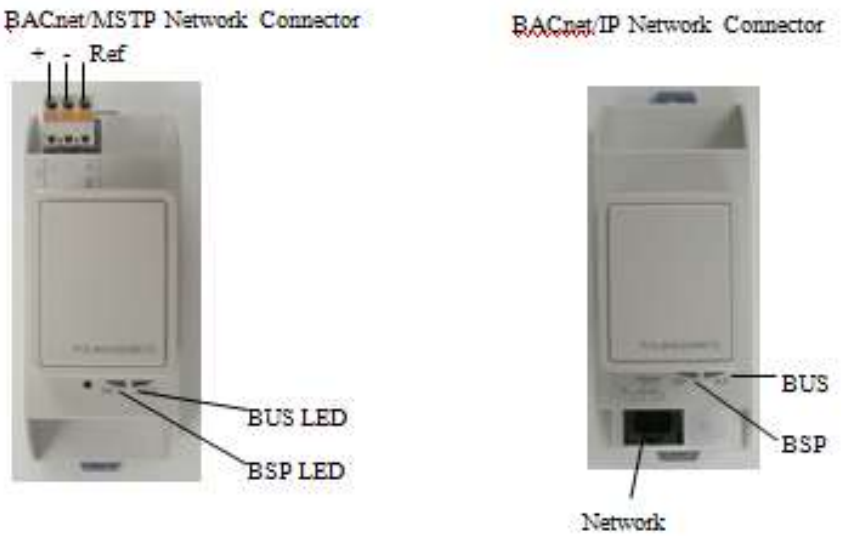


Figure 16. BACnet Communication Module Components.

Light Emitting Diodes (LEDs)

The BACnet Communication Module has a BSP LED and a BUS LED to indicate communication activity and status of the BACnet Communication Module. These indicators are visible when the communication module is connected to the Unit Controller and the unit is powered on (see Figure 16).

BSP LED

The BSP LED indicates the communication state between the BACnet Communication Module and the Unit Controller. The table below describes the status of the BSP LED.

BSP LED Color	Meaning
Flashing between Red & Green	Board Support Package (BSP) upgrade in progress
Green	Communication is established between the communication module and the unit controller.
Yellow	The communication module is capable of communicating to the unit controller. However, communication is not established.
Red flashing with 2Hz	Red flashing with 2Hz = Software error.[1]
Red	Hardware error. [1]

[1] In the event that this should occur, cycle power to the unit controller to attempt to clear the problem. Contact the Daikin Applied Controls Customer Support Group at 866-462-7829 for additional assistance if necessary.

BUS LEDs

The BUS LED indicates the communication status between the BACnet Communication Module and the BACnet MS/TP network. The table below describes the status of the BUS LED.

BUS LED Color	Meaning
Green	The unit controller is capable of communicating to the network.
Red	The unit controller is not capable of communicating to the network.
Orange / Yellow	Communication module is initializing.

BACnet Network Connector

An RS485 connector connects the BACnet Communication Module to the MS/TP Network and has three pins: + , -, and ref. See Figure 16.

An RJ45 connector connects the BACnet Communication Module to the IP Network.

Board-To-Board Connector

The Board-to-Board Connector connects the Unit Controller to the BACnet Communication Module (see Figure 17 and Figure 18).

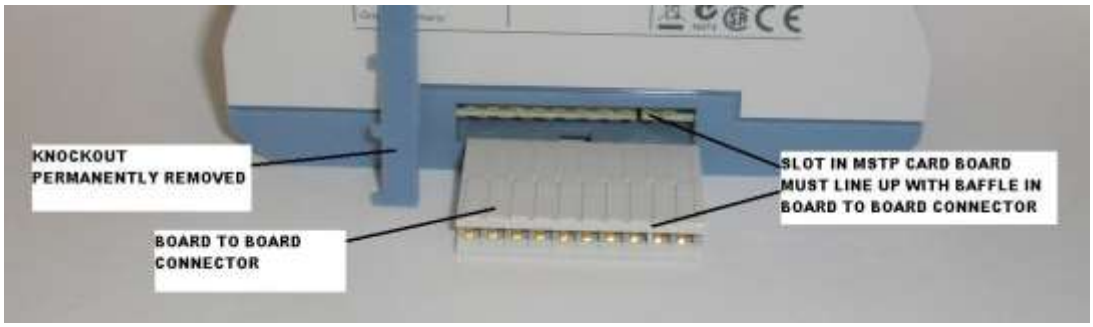


Figure 17. BACnet Communication Module and Knockout

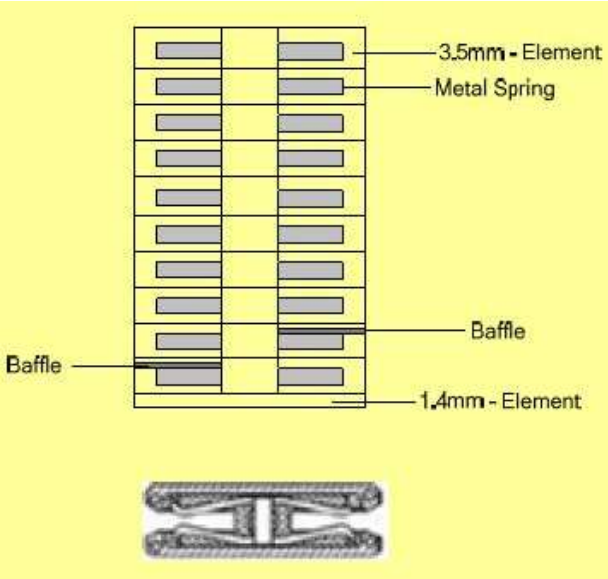


Figure 18. Diagram of Board-to-Board Connector

Figure 19. BACnet Communication Module with Board-to-Board Connector Inserted

Installation

The following section describes how to field install a new BACnet Communication Module or replace an existing BACnet Communication Module on the MicroTech III LWM so that it can be incorporated into the BACnet network. The Communication Module can be factory or field installed. See Parts List for details.

⚠ CAUTION

Electrostatic discharge hazard.

Can cause equipment damage.

This equipment contains sensitive electronic components that may be damaged by electrostatic discharge from your hands. Before you handle a communications module, you need to touch a grounded object, such as the metal enclosure, in order to discharge the electrostatic potential in your body.

Contents of the BACnet Communication Module Kit

The following is the list of items included in the field-installed kit:

- The BACnet Communication Module
- Board-to-board connector (separate)
- Network connector (attached)

Installing a new BACnet Communication Module

Follow these steps to install a BACnet Communication Module on the Unit Controller to incorporate it into an existing BACnet network.

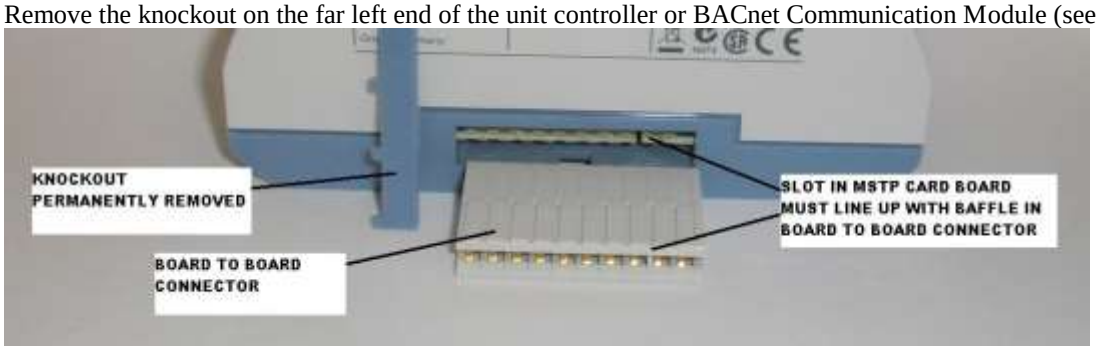
⚠ DANGER

Electric shock hazard. Can cause death or equipment damage.

Power must be removed from the unit controller.

This equipment must be properly grounded. Only personnel knowledgeable in the operation of the equipment being controlled must perform connections and service to the Unit Controller.

1. Remove power from the Unit Controller.
2. Remove the knockout on the far left end of the unit controller or BACnet Communication Module (see



3. Figure 17. BACnet Communication Module and Knockout
4. 7.)

Note: To prevent damage to the unit controller, insert a small screwdriver or other tool to the tab on the bottom of the unit controller and pull the screwdriver away from the controller.

5. Remove the knockout on the far right side of the BACnet Communication Module.

6. Insert the board-to-board connector into the BACnet Communication Module (Figures 17 and 18). Note that it only fits one way and that the baffles must line up with corresponding slots in BACnet Communication Module and the unit controller (see Figures 18 and 19).
7. Insert the other end of the board-to-board connector to the far left side of the unit controller or other communication module, if attached (see Figure 8 on page 29).

Connect the BACnet Communication Module to the network by inserting a network cable into the communication network connector (see

Figure 19. BACnet Communication Module with Board-to-Board Connector Inserted

8.).
9. Power up the unit controller.
10. The unit controller automatically resets itself approximately 20 seconds after it is powered up. This reset is necessary so that the BACnet Communication Module is synchronized with the unit controller.

Note: There is a limit of three devices that can be attached to the left side of the unit controller.

Replacing an Existing BACnet Communication Module

Follow these steps to remove an existing BACnet Communication Module from the unit controller and replace it with a new BACnet Communication Module.

⚠ DANGER

Electric shock hazard. Can cause personal injury or equipment damage.

Power must be removed from the unit controller.

This equipment must be properly grounded. Only personnel knowledgeable in the operation of the equipment being controlled must perform connections and service to the Unit Controller.

1. Remove power from the Unit Controller.
2. Locate the BACnet Communication Module to the left of the Unit Controller.
3. Pull the network cable connector from the BACnet Communication Module.
4. Grasp the BACnet Communication Module and carefully pull it from the Unit Controller.
5. Install the new BACnet Communication Module.
6. Insert the network cable connector into the BACnet Communication Module (see Figure 16 for location of network connector).
7. Power up the Unit Controller.
11. The unit controller automatically resets itself approximately 20 seconds after it is powered up. This reset is necessary so that the BACnet Communication Module is synchronized with the unit controller.

Integration

Once the BACnet Communication Module has been properly installed on the unit controller, it is then possible to integrate the unit controller into a building automation system (BAS) via the BACnet IP or MS/TP network. The configuration process is described in the following section.

Connecting to the MicroTech Integrated System

Addressing

If the MicroTech III LWM is ordered with the MicroTech Integrated System, the BACnet MS/TP setup will be complete and your controller can be wired directly to your system. If ordered separately, the BACnet IP or MS/TP addressing will need to be setup prior to wiring it into the BACnet network. Check with your system integrator for correct addressing. See OM 1092 for information regarding startup, operation and configuration of the MicroTech Integrated System.

Configuring the BACnet Communication Module

The BACnet Communication Module can be configured using the keypad/display on the Unit Controller. When ordered with a MicroTech Integrated System, the network addressing should be pre-configured and should not require any field alterations. The unit is ready to communicate the parameter values in the unit controller after you change the default parameters for your particular network. Refer to Daikin Protocol Document ED 19015 for descriptions of the available BACnet objects.

BACnet IP Addressing

There are three parameters that must be configured properly to establish communication between the Unit Controller and the BACnet IP network: BACnet IP Address, IP Subnet Mask, and IP Router Address. See your system integrator for additional information regarding BACnet IP addressing. The BACnet Communication Module is DHCP (Dynamic Host Configuration Protocol) enabled.

To Configure the Module using the Keypad/Display:

1. Navigate to the Enter Password screen if you have not already entered a password. If you have entered a password, skip to step 3.

2. Enter Password: 6363.

3. Continue to navigate to BMS Communications\IP Setup.

Note: The IP Setup menu only appears if a BACnet Communication Module is installed correctly (see Installation section of this document for details.) If the BACnet Communication Module is installed correctly and this menu still does not appear, cycle power to the unit controller and repeat the procedure from Step 3 above.

4. Modify the parameters as necessary (see Table 40 for a complete list.)

5. To modify the Given IP Address, Given IP Mask, or Given IP Gateway, follow steps a-c below:

    a. Fully change all four octets of the desired field.

    Note: After entering all four octets of the desired field, the cursor should blink in the open space to the right of the last character of the octet.

    b. Select Enter by pressing down on the circular knob on the unit controller keypad. *Do not press the Back button until Enter has been selected.*

    c. From this screen, use the Back button to navigate to BMS Communications\IP Setup and change "ApplyIPChgs" from 'No' to 'Yes'.

6. Check that the network cable is connected and navigate to the IP Setup menu to verify the Actual IP Address. The Actual IP Address displays 0.0.0.0 if the network cable is not attached. This procedure may take a minute while the BACnet Communication Module powers up.

Configurable Parameters

Table 40 defines the network parameters of the BACnet Communication Module that must be set using the keypad/display in order to establish communication between the Unit Controller and the BAS. Change parameters as required for your network.
Note: To save alteration of these parameters, select "ApplyIPChgs" under BMS Communications/IP Setup (see Step 4 from previous section).

Table 40. Network Configuration Menu

Parameter	Value (Range)/Definition	Initial Value/Note
Apply IP Chg	No-Yes/Apply IP Changes. Setting this to yes will cycle power to the controller to allow the network setup changes to take place.	No
Name	Up to a 17-character Device Object Name. Change this value as needed to match installation parameters.	POL908_FF2BEE/This name must be unique throughout the entire BACnet network. The last 6 characters of the default are the last 6 digits of the MAC Address, which is printed on a label located on the left end of the module. "Apply IP Change" must be activated for changes to the Device Object Name to take effect.
Dev Instance	0-4194303/Device Instance of the BACnet Communication Module	1579312/ This must be unique throughout the entire BACnet network.
UDP Port	(User Datagram Protocol) Identifies the application process in the destination unit	47808
DHCP	Off-On/Dynamic Host Configuration Protocol (DHCP) is a network protocol that enables a server to automatically assign an IP Address	On/Set to Off if a static IP Address is needed.
Act IP	Actual IP Address of the BACnet Communication Module	
ActMsk	Actual Subnet Mask of the BACnet Communication Module	
ActGwy	Actual Gateway Address	
Gvn IP	Given IP Address of the BACnet Communication Module	127.0.0.1
GvnMsk	Given Subnet Mask of the BACnet Communication Module	255.255.255.0
GvnGwy	Given Gateway Address	127.0.0.1
Unit Support	Off-On/Controls the type of units that are passed through BACnet (English or Metric).	On/To set the unit for Metric, set Unit Support to Off. If Unit Support is On, they type of units will be set to the same units as the keypad.
NC Dev 1	0-4194303/Alarm Recipient Device 1	0 (no device)/This is the device instance of the BACnet workstation or device that will receive the alarm notification. Use this in place of the Recipient List in the Notification Class.
NC Dev2	0-4194303/Alarm Recipient Device 2	0 (no device)/This is the device instance of the BACnet workstation or device that will receive the alarm notification. Use this in place of the Recipient List in the Notification Class.
AHU Loc/Net	Local-Network	Network
Comm Status	Ok, Hardware, Init, Memory, ID, COVReg, Other/Indicates the status of the BACnet module.	
RstOutOfSrvc	Done, False, True/Reset Out of Service will set the value of the Out of Service Property for setpoints.	Done
BACnetBSP	Basic Support Package Version	9.26

Note: If unit controller application software requires uploading in the field, the network configuration parameters revert to their default values. Please contact the Applied Air Handling Customer Support Group at 763-553-5330 for assistance with upgrading unit controller application software.

Test Procedures

If you can control the Unit Controller from the keypad/display, but you are not able to communicate via the network, follow these steps:

- Check the network wiring
- Check communications
- Use the standard TCP/IP suite of protocols to check your connectivity with other devices. For example, type "ping <IP address of the MicroTech III BACnet Communication Module>." If you get a response from that IP address, you are connected to the BACnet Communication Module. If you do not get a response, verify the BACnet Communication Module and the PC network settings.

Contact the Controls Customer Support Group at 866-462-7829 for additional assistance if necessary.

BACnet MS/TP Addressing

The BACnet MS/TP Media Access Control (MAC) address is a one-octet address that must be set during the BACnet Communication Module configuration. The MAC address must be unique to the MS/TP network and have a valid range of 0-127.

Additionally, there are certain parameters that must be set properly to verify communication between the LWM and the MS/TP network. Table 41 provides details about these addressing parameters. See your system integrator for additional information regarding proper BACnet MS/TP addressing.

To Configure the Module using the Keypad/Display:

1. Navigate to the Enter Password screen if you have not already entered a password. If you have entered a password, skip to step 3.
2. Enter Password: 6363.
3. Continue to navigate to BMS Communication\BACnet MSTP Set-Up.

Note: The BACnet MSTP Set-Up menu only appears if a BACnet Communication Module installed correctly (see Installation section of this document for details.) If the BACnet Communication Module is installed correctly and this menu still does not appear, cycle power to the unit controller and repeat the procedure from Step 3 above.

4. Modify the parameters as necessary
5. Continue to navigate to BMS Communication\BACnet MSTP Set-Up and change "ApplyMSTPChgs" from 'No' to 'Yes' (see Figure 20).
6. On the MSTP Set-Up menu, verify the settings of all parameters. This procedure may take a minute while the BACnet Communication Module powers up.

Changing the MS/TP Data Transmission Rate

The options for baud rate (in bps) include: 9600, 19200, 38400, and 76800. The factory default baud rate is 38400 bps. If connecting to a MicroTech Integrated System, the Baud Rate needs to match the Baud Rate on the Settings\Network Setup page. The default for the MicroTech Integrated System is 38400.

⚠ WARNING

Electric shock hazard. Can cause personal injury or equipment damage.

This equipment has exposed electrical connections inside BACnet Communication Module. Only personnel that are knowledgeable in the operation of this equipment must perform connections and service to the BACnet Communication Module.

Changing the MS/TP Data Transmission Rate:

1. Navigate to the Enter Password screen if you have not already entered a password. If you have entered a password, skip to step 3.
2. Enter Password: 6363.
3. Navigate to the BMS Communication\BACnet MSTP Set-Up and change the baud rate to desired value (see Figure 21).
4. Continue to navigate to BMS Communication\BACnet MSTP Set-Up and change "ApplyMSTPChgs" from 'No' to 'Yes' (see Figure 20).

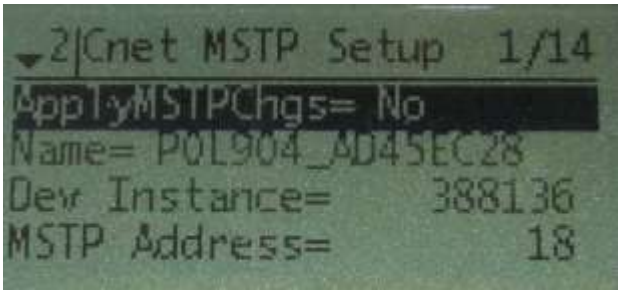


Figure 20. Unit Controller MSTP Setup Screen – Change "ApplyMSTPChgs"

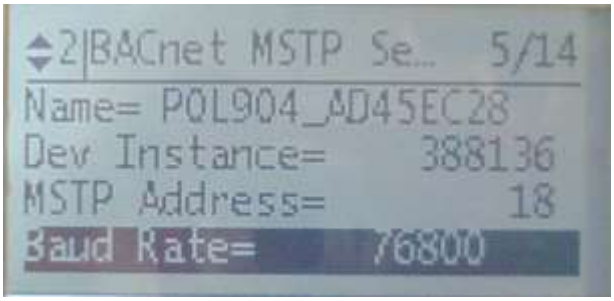


Figure 21. Unit Controller MSTP Setup Screen – Change Baud Rate

BACnet/MSTP Configurable Parameters

Table 41 defines the network parameters of the BACnet Communication Module that must be set using the keypad/display in order to establish communication between the Unit Controller Unit and the BAS. Change parameters as required for your network.

Note: To save alteration of these parameters, select "ApplyMSTPChgs" under BMS Communication\BACnet MSTP Set-Up (see Step 4 from previous section). For additional information on using the keypad/display, refer to the **Error! Reference source not found.** section on page 36.

Table 41. Network Configuration Menu

Parameter	Value (Range)/Definition	Initial Value/Note
ApplyMSTPChg	No-Yes/Apply MSTP Changes. Setting this to yes will cycle power to the controller to allow the network setup changes to take place.	No
Device Instance	0-4194303/Device Instance of the BACnet Communication Module.	Variable/If ordered with the VAV System, the Device Instance will be set at the factory. This must be unique throughout the entire BACnet network.
MS/TP Address[1]	0-127/ This is the MS/TP address of the BACnet Communication Module.	Variable/ If ordered with the VAV System, the Device Instance will be set at the factory. Each device on the BACnet network must have a unique MS/TP address.
Name	Up to a 17-character Device Object Name. Change this value as needed to match installation parameters.	POL904_FF2BEE/This name must be unique throughout the entire BACnet network. The last 6 characters of the default are the last 6 digits of the MAC Address, which is printed on a label located on the left end of the module. "Apply MSTP Change" must be activated for changes to the Device Object Name to take effect.
Baud Rate[1]	9600-19200-38400-76800/ Data transfer speed.	38400/If connecting to the VAV System, the Baud Rate needs to match the Baud Rate on the Settings\Network Setup page. The default for the VAV System is 38400.
Max Master	0-127/ This variable specifies the highest possible address for master. nodes and shall be less than or equal to 127.	127
Max Info Frames	0-255/ This variable specifies the maximum number of information frames the BACnet Communication Module may send before it must pass the token.	10
Unit Support	Off-On/Controls the type of units that are passed through BACnet (English or Metric).	English//To set the unit for Metric, set Unit Support to SI. "Apply MSTP Change" must be activated for changes to the Device Object Name to take effect.
Term Resistor[1]	No-Yes	No

NC Dev 1	0-4194303/Alarm Recipient Device 1	0 (no device)/This is the device instance of the BACnet workstation or device that will receive the alarm notification. Use this in place of the Recipient List in the Notification Class.
NC Dev2	0-4194303/Alarm Recipient Device 2	0 (no device)/This is the device instance of the BACnet workstation or device that will receive the alarm notification. Use this in place of the Recipient List in the Notification Class.
Comm Status	Ok, Hardware, Init, Memory, ID, COVReg, Other/Indicates the status of the BACnet module.	
Use Defaults	No-Yes	No/If No, default values are retained if module is replaced.
BACnetBSP	Basic Support Package Version	8.14

[1] Parameter only available via the keypad/display.

Note: If unit controller application software requires uploading in the field, the network configuration parameters revert to their default values. Please contact the Daikin Applied Controls Customer Support group at 866-462-7829 for assistance with upgrading unit controller application software.

Controller Application Software Upgrade Procedures

Use this procedure to upgrade the MicroTech III controller application software in the Loop Water Manager. To load the files into the controller, you will need an SD memory card no larger than 4GB with a FAT file system format.

Upgrading Firmware or Application Software

Note: Upgrading firmware or application software will result in all points being set back to their default values. Be sure to record the configuration of the unit before proceeding so it can be restored once the upgrade is complete.

1. If the application code files & firmware files are compressed in a ZIP archive file, extract the files and place them in the root directory of the SD memory card.
2. Insert the SD memory card into the controller's memory card slot. The label on the card should be facing to the rear, toward the controller.

Figure 22. SD Memory Card Slot

3. Power off the controller.
4. Make sure that all communication modules that need to be updated are connected.
5. Insert a small tool, such as the end of a 3/64" (1 mm) Hex Key or other similar tool with a narrow end, in the service hole on the controller and hold the service button depressed.
6. While holding the service button depressed, power on the controller.
7. Continue depressing the service button until the BSP LED begins to flash between red and green.

Figure 23. Service Button and BSP LED

8. Release the service button.
9. When all BSP LED's on all modules have stopped flashing between red and green, power cycle the controller. **Note:** If you have a communication module connected to the controller, wait for the controller to automatically reset (approximately 30 seconds) before proceeding to the next step.
10. Configure your Loop Water Manager for your application.

Troubleshooting Guide

Error! Reference source not found. summarizes several potential problems and corresponding solutions. Contact the Daikin Applied Controls Customer Support group at 866-462-7829 for additional assistance.

Table 42. Common Problems and Solutions

Error/Condition	Problem	Solution
Keypad is missing data and/or menus.	After changing the configuration, you must always cycle power to the unit controller.	Cycle power to the unit controller. This can be done by setting the Apply Changes parameter on the Unit Configuration menu to 'Yes'.
Erroneous alarms for inputs not connected or being used.	LWM is alarming on sensors and inputs not being used in your application	Verify the settings in the Unit Configuration menu are appropriate. If so, select Apply Changes and then select 'Yes'. It can be possible for configuration changes to be made, but not applied. If no configuration setting applies for the sensor in question, it is likely a requirement for operation.
Outputs not energizing field relays	Field relay coils are not being energized by output terminals from the LWM, even though the output is on.	Output terminals on the LWM are inherently dry contacts from the factory. When wired in a way that the output terminals on the LWM are powered, the power source must be provided by the field. See field wiring section. Ensure the power source for these outputs has enough VA to handle the load from all field installed relay coils.
Red light on MCB	There is a red light on the MCB and no display	Call Daikin Applied technical response; this is typically an indication of a physical problem with the controller.
Red light on EXPA-C	There is a red light on the expansion module	Verify the address is set properly (see I/O section) on the expansion module and cycle power. Call Daikin Applied technical response if error still occurs.

Service Information

Test Procedures

If you can control the unit from its keypad, but you are not able to communicate with unit via the network, follows these steps:

- Check the network wiring
- Check the network parameters and verify that they are correct and that there are no duplicate devices on the network
- Check communications

If the BACnet Communication Module still does not respond, contact the Daikin Applied Controls Customer Support Group at 866-462-7829.

Parts List

Component Designation	Description	Part Number
MCB	MicroTech III Controller with inbuilt HMI	193407301
BACNET	BACnet/MSTP Communication Card	090016710
BACNET	MicroTech III Communication Module, BACnet IP kit (kit includes communication module, board-to-board connector, and Installation Manual)	090016709
EXPA, EXPB, EXPC	MicroTech III Expansion Modules A, B, and C	193407501
T1	Transformer, Class II, 75VA, 120/24VAC	300041236
	Terminal Block 2X2 Spring Grey, 2 Row Jumper Ports	349930641
	Terminal Block 2X2 Spring Green (grounded terminals)	349930647
	Terminal Block Jumper, 2 Pole	349930942
CB1	Circuit Breaker, 1-Pole, 10A, 120/240VAC	193431801
EXSC1-6, ES, SD, TF	Relay, 24VDC, 8A, DPDT	193592701
	Relay Socket, DPDT	193592801
S3, S4	Selector Switch, 2 Position	193593001
PB1	Push Button	193592901
H1	Audible Alarm	193520501
L1	Pilot Light, Yellow, 24V LED	193520701
L2	Pilot Light, Red, 24V LED	193520601

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. 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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