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Preliminary – Subject to change

Configuration Guide – LP-FX03

Introduction

*The **FX03** is a Configurable Terminal Unit Controller in the Facility Explorer range of products. The controller is designed specifically to provide direct digital control of terminal unit applications with heating and/or cooling coils, an electric heater and a three-speed or variable speed fan. These applications include close control units, fan coil units, unit ventilators and chilling or heating ceiling beam installations.*

The device can be configured by the installer, without the need of a PC and software tool, using a set of on-board dip-switches.

The controller is designed for field installation in a panel or enclosure or for mounting by original equipment manufacturers (OEMs) on DIN-rail or directly on a surface.

The space comfort set point, occupancy mode and fan speed may be adjusted from a wide range of room sensor modules with options for a digital display.

Communication options are available to enable the controller to be integrated into an N2 Open or BACnet® network of a building automation system.

The BACnet® interface of the controller complies with the ANSI/ASHRAE Standard 135-2004 for sharing data with other devices on the network.

Figure 2: FX03 Configurable Terminal Unit Controller

Figure 1: FX03 Room Sensor Modules

Configuration Options for FX03

The FX03 controller is designed for terminal units control and regulates a heating valve and a cooling valve, a fan with up to three speeds and an optional electric heater. The controller can be configured to regulate a single valve in a 2 pipe application with heating/cooling change-over or two valves in a 4 pipes application. The control action can be overridden by a window contact or a condensation detector.

For the room occupant the Room Sensor Module offers temperature setpoint, occupancy mode and fan speed override.

A series of auxiliary NTC50KΩ sensors, when connected, will enable the related function:

T1 – Remote Temperature Sensor;

T2 – Auto Changeover Sensor / Contact (2 Pipe Only);

T3 – Soft-Start Coil Sensor;

T4 – Discharge Limit Sensor;

The summary of the features of the controller is shown in Table 1.

Table 1: Main Features

Features	Benefits
Field Selectable application type, communication protocol and room module, via dip-switches on controller	Ease of configuration and commissioning - no special tool required Dedicated function input/output (I/O) terminals, allow for an easier installation avoiding wiring connection errors.
24 / 230 VAC power Relay outputs at 230 VAC 3A for direct fan control or optional Variable Speed Fan control via 0 - 10 VDC Triac outputs 24 / 230VAC for proportional thermal actuators control Relay outputs 24 / 230 VAC for on/off actuators control or optional control for electrical heater through 2 kW relay Proportional 0 - 10 VDC outputs for modulating actuators 24 VAC power supply for valve actuators provided by the controller	Low installed cost for a wide range of terminal unit applications.
Modular range of Room Sensor Modules	Suitable for a wide range of installations with wall-mount, flush-mount and hand-held remote control options.
Network Communications Options - N2 Open and BACnet® MS/TP	Provides cost effective means to connect the controller to a supervisory system, including the Metasys® M3i Workstation and the NAE Network Automation Engine that integrates the controller into a facility-wide building management network.
BACnet® MS/TP with Peer to Peer Communication	Provides cost effective solution for small networks and environmental control of rooms featuring more controllers to be driven by a single Room Sensors Module
Commission using FX CommPro N2 or BACnet®	Set operating parameters for a wide range of applications using the commissioning features of the FX CommPro N2 or BACnet® software package

Controller Configuration

The application software is pre-loaded at the factory and the controllers are delivered with factory-set configuration parameters such that no on-site programming is necessary to set the terminal unit control or integrated room control system into operation.

The basic controller configuration, defining the installation details as for example the number and pipes and fan speeds, valve actuators and room sensor types etc., as shown on **Table 2: Room** Sensor Modules Dip-Switches, without the need of a PC and software tool, using a set of on-board dip-switches.

The controller information, including the dip-switches settings, may be accessed using an N2 / BACnet® network commissioning tool. FX CommPro N2 / BACnet® are the recommended tools.

All the parameters in the controller such as the operating mode, set points and control loop tuning constants can be modified from the network commissioning tools.

Once configured, commissioned, and connected to a network, the controller may be monitored from a supervisory system, including the Metasys® M3i Workstation and the NAE Network Automation Engine that integrates the controller into a facility-wide building management network.

As the controller is BACnet® MS/TP compliant, it may be connected to any BACnet® MS/TP network and configured to communicate with other devices on the network using FX CommPro BACnet® configuration tool.

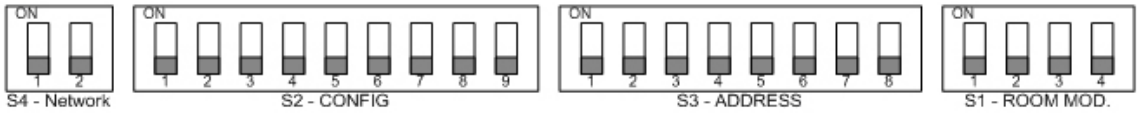
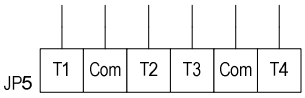


Figure 3: Configuration Dip-Switches

Auxiliary Temperature Sensors



A series of auxiliary NTC50KΩ sensors, when connected, will enable the related function:

T1 – Remote Temperature Sensor;

T2 – Auto Changeover Sensor / Contact (2 Pipe Only);

T3 – Soft-Start Coil Sensor;

T4 – Discharge Limit Sensor;

T1 – Remote Temperature Sensor

The T1 Remote Temperature Sensor can be used as an alternative source of control temperature rather than the Space Temperature retrieved by the room sensor module.

(E.g. Shall be used to control Discharge or Return Air Temperature)

When T1 is connected to the FX03 in conjunction with LP-RSM room sensor module serie, T1 value automatically overrides the space temperature sensed by the LP-RSM.

On LP-RSM003-000C and LP-RSM003-001C units it is possible to configure the location of the ambient temperature sensor to be shown on their integrated displays through an onboard Jumper. Available options are:

- Space Temperature from the FX03 controller (T1)
- Space Temperature from the RSM Built-in sensor

In case the LP-RSM is not connected, T1 value automatically overrides the effective space temperature.

When T1 is connected to the FX03 in conjunction with TM or RS room sensor module series, T1 value is given for monitoring purposes only.

When using TM configuration, an NTC10KΩ temperature remote sensor (TE or TS series) shall be connected to **S** terminal instead of connecting the TM room sensor wires.

Information Point	Range	Default	Description
T1_RoomTemperature	0˚C...+40˚C	-	Temperature by T1 sensor (T1,COM terminals) or LP-RSM room module sensor series

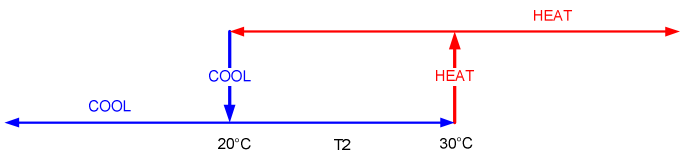
T2 – Auto Changeover Sensor / Contact

T2 allows to automatically change the controller effective HVAC Mode (HEAT / COOL) in 2 pipes application, depending on the supply water temperature sensor or thermostat signal.

The Auto Changeover function can be enabled thru a dedicated parameter in 2 pipe applications.

Information Point	Range	Default	Description
T2Enable	1-ON , 0-OFF	0	"1" - T2 Enable "0" - T2 Disable

- COOL mode when T2<20˚C or when the T2,COM contact is OPEN
- HEAT mode when T2>30˚C or when the T2,COM contact is CLOSED
- Dead-Band when 20˚C ≤T2≤30˚C



T3 – Soft-Start Coil Sensor

The T3 Soft-Start Coil Sensor, when connected, interlocks the Fan operations with the effective coil temperature depending on the effective HVAC Mode, as following described.

HEAT

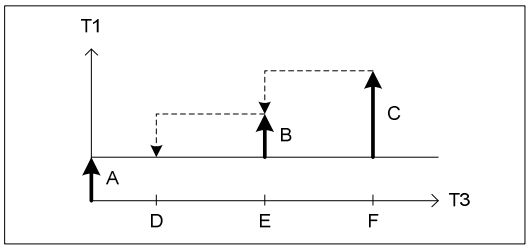
- Fan, starts operating when T3 > 38℃
- Fan, stops operating when T3 < 34℃

COOL

- Fan, starts operating when T3 < 18℃
- Fan, stops operating when T3 > 20℃

Stratification

T3 sensor shall be optionally used to enable stratification function over T1.



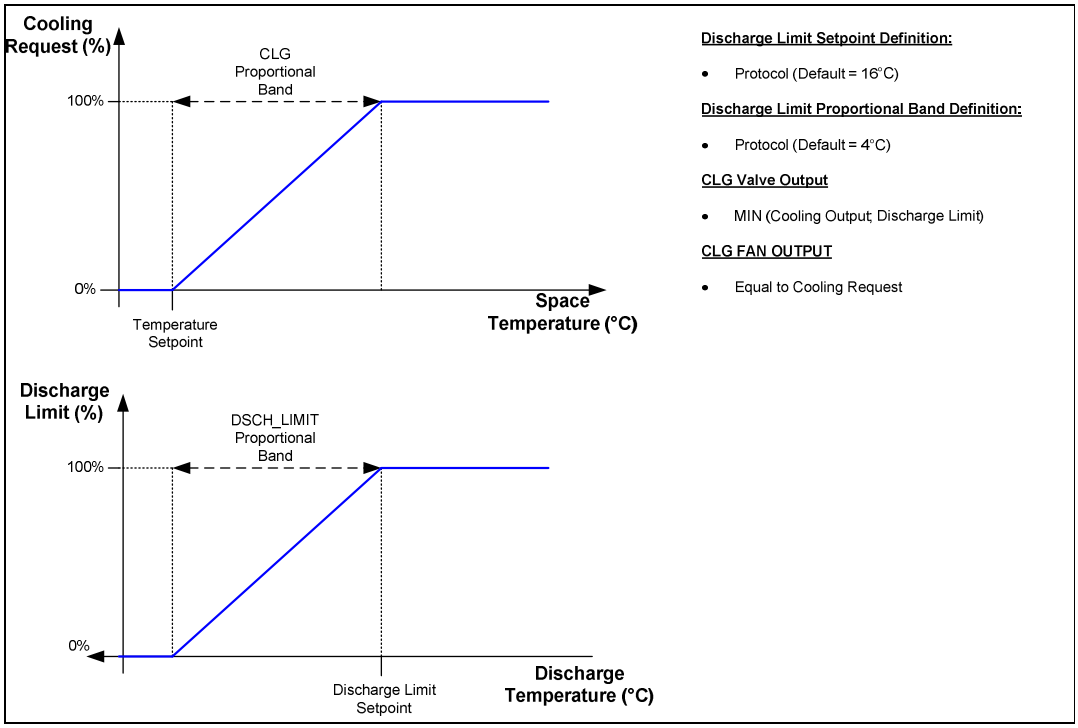
A - ShiftT1InHeat
B - T1_ShiftBy_T3_STEP1
C - T1_ShiftBy_T3_STEP2
D - T1_CompansationBy_T3_STEP0
E - T1_CompansationBy_T3_STEP1
F - T1_CompansationBy_T3_STEP2

Information Point	Range	Default	Description
HeatingT1Offset	0˚C …6˚C	0˚C	Constant offset for the T1 temperature in heat mode (sensed through T1,COM terminals or S,COM terminals).
T1_CompensationBy_T3_STEP0	25˚C …50˚C	30˚C	When T3 temperature is less than STEP0 temperature, the SHIFT of T1 according to T3 is canceled.
T1_CompensationBy_T3_STEP1	25˚C …50˚C	32˚C	When T3 temperature reaches STEP1 temperature, SHIFT1 of T1 occurs.
T1_ShiftBy_T3_STEP1	0˚C …10˚C	0˚C	The shift of T1 when T3 reaches the STEP1 temperature (SHIFT1).
T1_CompensationBy_T3_STEP2	25˚C …50˚C	36˚C	When T3 temperature reaches STEP2 temperature, SHIFT2 of T1 occurs.
T1_ShiftBy_T3_CompensationValue	0˚C …100˚C	0˚C	The total shift of T1 based on T3 temperature. The value can be either 0, T1-SHIFT1 or T1-SHIFT2. (Read only).

When T3 is connected to FX03 Terminals the Electrical Heater selection as first heating stage is prevented.

T4 – Discharge Limit Sensor (COOL only)

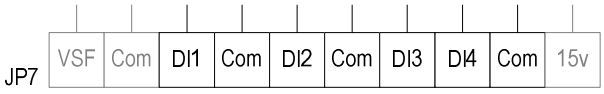
The T4 Discharge Limit Sensor, when connected, allows to control the Discharge Air Temperature to do not fall under a pre-defined limit during cooling operations for an optimal occupant comfort.



The discharge limit strategy affects the cooling valve output only, forcing the valve position to the minimum value between Cooling and Dicharge Limit requests.

Information Point	Range	Default	Description
T4_DischargeSensorTemperature	-40˚C…+89˚C	-	Temperature by T4 sensor (T4,COM terminals).
DischargeLimitSetpoint	10...30 °C	16 °C	Discharge limit set-point (for limiting the blown air temperature [cooling only])
DSCHLimitProportionalBand	0...10 °C	4 °C	Discharge limit proportional band (based on T4 reading)
BlownAirLimitRequest	0...100 %	100%	The actual discharge position (based on T4 reading, DischargeLimitSetpoint, DSCHlimitProportionalBand). (Read only).

DIGITAL INPUTS



DI1 – Off / Window Open

When Active forces the FX03 status to OFF.

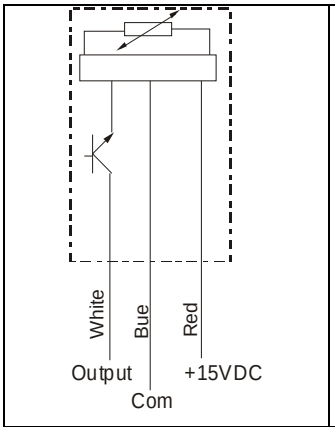
DI2 – Condensation (Dew-Point) Sensor

When Active forces the Cooling Valve Output to OFF (0%).

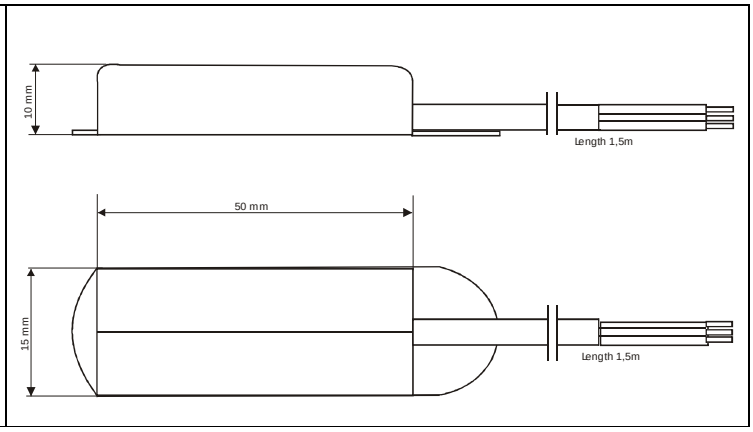
HX-9100-8001

The HX-9100-8001 sensing element is combined with an open collector output to produce an ON/OFF output used by a digital input of a controller. The output is switched from open to close position when 90-95% RH is sensed.

This is particularly useful on **chilled ceiling / beams applications** where a specific function to prevent condensation during cooling operations it is often required.



Wirings



Dimensions

DI3 – Unoccupancy Sensor

When active (No Occupancy) longer than a pre-defined interval of time the room is forced to Unoccupied whatever the Supervision value. The controller Occupancy status will be reset as soon as an occupant will be detected in the controlled space.

DI4 – General Purpose, Network Integration

The value of DI4 is available as a general purpose contact to be used in network integration functions at supervision level.

OCC – Temporary Occupancy

The temporary occupancy contact it is provided as interface with TM Temporary Occupancy Button. In case the controller effective occupancy status is set to Unoccupied, whenever the temporary occupancy contact is activated, a temporary Occupied status is forced for a pre-defined period of time (Bypass Time).

Every time the button is pressed the Bypass timer is refreshed.

Information Point	Range	Default	Description
DI1_WindowContact	1-ON , 0-OFF		"DI1,COM" terminals (Read only)
DI2_CoolValveOff	1-ON , 0-OFF		"DI2,COM" terminals – Condensing pump (Read only) For ceiling applications – condensing pump – Cool valve stops – fan keep running.
DI3_OccupancySensor	1-ON , 0-OFF		"DI3,COM" terminals (Read only)

DI4_OptionForApplication	1-ON , 0-OFF		Option for application.
OccupancyButton	1-ON , 0-OFF		The status of the room module occupancy button. (Read only)
UnoccupancySensorDelayTime	0…7200 sec.	3600 sec.	Delay before DI3 is considered active
BypassTime	0….1440 min.	120 min.	Time of “Temporary occupied” mode.(see Effective_Occupancy_Mode object). ”0” – disable “Temporary Occupied” mode

S1 – ROOM MOD

Figure 4: S1 – Room Module Configuration

"S1 – Room Mod" Dip-Switches Block is fully dedicated to the configuration of the Room Sensor Module model the FX03 controller is expected to work with.

The FX03 controller provides proven compatibility with the following series of Room Sensor Modules:

- TM-2100 Series, Parallel Wired Room Command Module;
- RS-1180 Series, Parallel Wired Room Command Module with LCD Display;
- LP-RSM Series, Communicating Infra-red (IR) Room Command Module with LCD Display;

Table 2: Room Sensor Modules Dip-Switches

	Function	Position	Default
S1.1	TM-21xx, RS-1180 Series	On	On
	LP-RSM003 Series	Off	
S1.2	Other Room Sensor Modules	On	On
	RS-1180 Series	Off	
S1.3	Other Room Sensor Modules	On	On
	RS-1180 Series	Off	
S1.4	Absolute Set-point Scale (12-28 °C)	On	On
	Dail Set-point Scale (+/- 3 °C)	Off	

Information Point	Range	Default	Description
SetPointDial	+5˚C…+35˚C	22˚C	Base set-point temperature for room modules with +/- scale. SetPointEffective = SetPointDial +/- scale value from JC Room Module +/-3
SetPointCompensation	-6˚C…+6˚C	0˚C	Additional offset to the set-point through protocol, used for applications such as summer/winter
UnOccupancySetPointCool	+5˚C…+35˚C	28˚C	Set-point temperature for cool in unoccupied mode.
UnOccupancySetPointHeat	+5˚C…+35˚C	16˚C	Set-point temperature for heat in unoccupied mode.
SetPointAbsolute	+5˚C…+35˚C	22˚C	Set-point temperature (without taking the limits and compensation into consideration).
SetPointLowLimit	+5˚C…+35˚C	5˚C	Low limit for the set-point temperature.
SetPointHighLimit	+5˚C…+35˚C	35˚C	High limit for the set-point temperature.
SetPointEffective	+5˚C…+35˚C		The real set-point temperature (taking the limits and compensation into consideration). (Read only).
ReturnAirTemperatureOffset	-6˚C…+6˚C	0˚C	Offset – Calibration for measured temperature when needed. Can be used for the temperature sensed by T1 or by LP-RSM panels only.
ReturnAirSensorEffective	-40˚C…+89˚C	-	Real temperature for controller, it can be from: T1, TM/RS modules or LP-RSM (after temperature compensations and offset) (Read only).

LP-RSM – Room Sensor Modules Series (LP-RSM003-00xC)

The fully featured and stylish Infra-Red communicating **LP-RSM** series are well suited to light commercial, residential or apartment applications.

They feature an internal temperature sensor, onboard IR receiver and buttons allowing the occupant to adjust the temperature setpoint value or request a warmer or cooler setpoint, to override the speed of a three -speed fan or to manage the terminal unit operating modes in case a supervisor network is not available.

Figure 5: Communicating (IR) RSM Configuration

Please note: LP-RSM Room Sensor Module Series Setpoint is Absolute (12÷28℃) only.

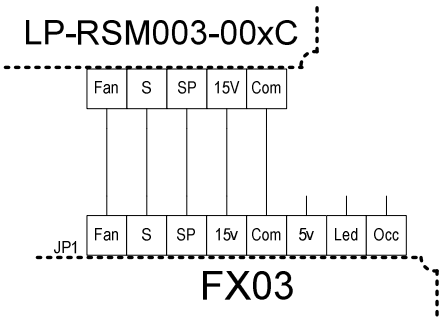
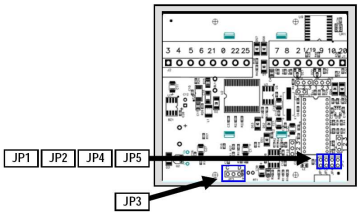
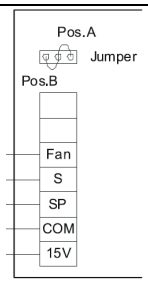


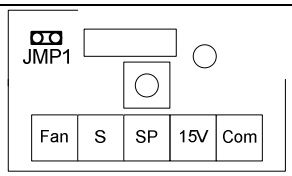
Figure 6: Communicating (IR) RSM Wirings

IMPORTANT: (T1) Remote Space Temperature shall be used in conjunction with the RSMs and, when connected, it will take the priority over the space temperature sensed by the connected Room Sensor Module.

A jumper, located on the the RSM boards, allows to switch the control sensor wether integrated or remote (T1). RSM units featuring integrated display will show the selected sensor value.

Jumper Settings

 ***LP-RSM003-000C***	Jumper JP2 located at the bottom of the board as shown in the drawing, is used to define the location of the ambient temperature sensor as follows: • Open - Temperature readings from FX03 (T1) • Short - Temperature readings from RSM Built-in Sensor (Default)
 ***LP-RSM003-001C***	The jumper next to the connectors on the LP-RSM003-001C is used to define the location of the ambient temperature sensor as follows: • Pos. A Temperature readings from FX03 (T1) • Pos. B Temperature readings from RSM Built-in Sensor (Default)

 ***LP-RSM003-003C***	Jumper JMP1 on the IR Receiver is used to define the location of the ambient temperature sensor as follows: • Open - Temperature readings from FX03 (T1) • Short - Temperature readings from RSM Built-in Sensor (Default)

TM-21xx Room Sensor Modules Series

The **TM-2100** series of Room Command Modules are designed for use with the FCC series of DDC terminal unit controllers. It's also suitable for use with Facility Explorer series of field controllers.

The set point dial enables the room occupant to adjust the working set point of the controller within the range of 12 to 28 ℃ or +/- according to the model number.

The occupancy button enables the occupant to request a "temporary occupied" (bypass) mode during "unoccupied" (night/weekend) operation. The "occupied" (comfort) mode is shown by an LED indicator.

The Room Command module with a three-speed fan override switch is also available.

(T1) Remote Space Temperature shall be used in conjunction with the TMs and, when connected, it will take the priority over the space temperature sensed by the connected Room Sensor Module.

Figure 7: TM-21xx Room Sensor Modules Configuration

Please note: S1.4 has to be set accordingly to the related RSM model, Absolute (12÷28℃) or Dial (±3℃) Setpoint. Please refer to Ordering Codes des criptions for Absolute or Dial setpoint models.

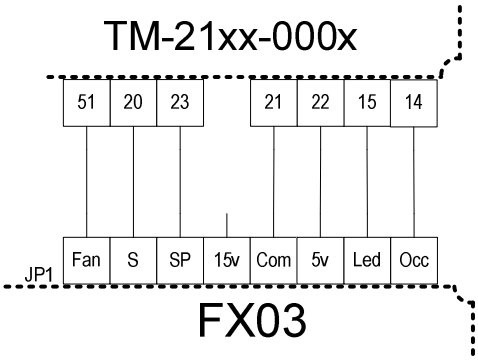


Figure 8: TM-21xx Room Sensor Modules Wirings

(T1) Remote Space Temperature shall be used in conjunction with the RSMs and, when connected, it will take the priority over the space temperature sensed by the connected Room Sensor Module.

RS-1180 Room Sensor Modules Series w/ LCD Display

The **RS-1180** Room Command Modules are designed for use with Facility Explorer Series or System 91 controllers from Johnson Controls and provides a 0…10V signal directly proportional to the sensed temperature.

The LCD display and the dial on the front of the module allow the room occupant to view and adjust the space temperature. Modules with LCD display will automatically request the temporary occupied (bypass) mode when the dial is moved during unoccupied or standby periods. On models without LCD display this function is activated by means of the temporary occupied button on the left side of the module.

Figure 9: RS-1180 Room Sensor Modules Configuration

Please note: S1.4 has to be set accordingly to the related RSM model, Absolute (12÷28°C) or Dial (±3°C) Setpoint. Please refer to Ordering Codes des criptions for Absolute or Dial setpoint models.

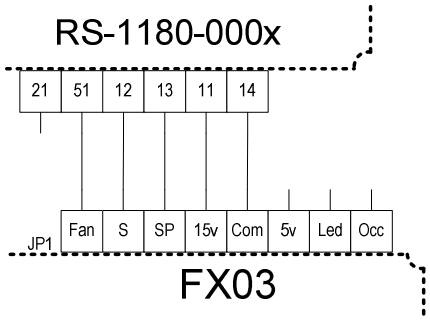


Figure 10: Parallel Wired RSM w/ LCD Display Wirings

(T1) Remote Space Temperature shall be used in conjunction with the RSMs and, when connected, it will take the priority over the space temperature sensed by the connected Room Sensor Module.

S2 – CONFIG

Figure 11: S2 – Control Configuration

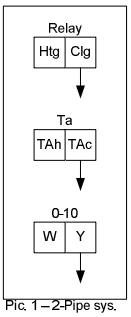
"S2 – Config" Dip-Switches Block is fully dedicated to the configuration of the application the FX03 controller is expected to work with.

The FX03 controller provides the following listed level of configuration:

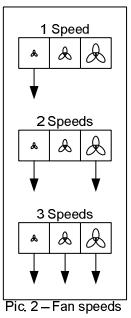
- Electrical Heater management, either as first or second heating stage;
- RS485 Communication Protocol Selection, either N2 Open or BACnet MS/TP;
- Chilled / Hot Water cirquits availability, either 2 or 4 Pipes installation;
- Valves Control Algorithm, either On/Off or Proportional;
- Fan Speed Management, from Single up to Three Speeds;
- Heating Relay Management, either as standard heating logic or as general purpose managed from the communication;
- BACnet Device Object Instance Number Management, either equal to MAC Address or set through software;
- BACnet Automatic Binding, when enabled allows to share the control points of the selected controller with up to five pre-defined "slave" controllers. Slaves have to be FX03 and matching the binding pre-defined MAC Addresses.

Table 3: Configuration Dip-Switches

DIP Switch S2 - CONFIG		S2.1	S2.2	S2.3	S2.4	S2.5	S2.6	S2.7	S2.8	S2.9	S2.10
S2.1	HTG Electrical Heater output – 1st Stage	on									
	HTG Electrical Heater output – 2nd Stage	off									
S2.2	BACnet Protocol		on								
	N2 Open Protocol		off								
S2.3	4-Pipe			on							
	2-Pipe (1 valve output – "Cool" terminal) – Pic. 1			off							
S2.4	Output Valves - On/Off				on						
	Output Valves - Proportional				off						
S2.5 , S2.6	1 Fan speed (Low speed output) – Pic. 2					on	on				
	2 Fan speeds (Low & High speed outputs) – Pic. 2					on	off				
	3 Fan speeds					off	off				
	3 Fan speeds					off	on				
S2.7	Instant number through software							on			
	Instant number = MAC address							off			
S2.8	Automatic Binding ON								on		
	Automatic Binding OFF								off		
S2.9	Htg relay - general purpose - work through protocol									on	
	Htg relay – standard logic (Heat)									off	



Pic. 1 – 2-Pipe sys.



Pic. 2 – Fan speeds

HTG Electrical Heater

1st Stage (T3 Disconnected)

The HTG relay works in parallel with the selected Heating Output. HTG relay shall be configured to be be controlled either in On/Off or PWM modes.

In case T3 is connected to the controller terminals the Electrical Heater function will be disabled.

2nd Stage

The HTG relay works in addition to the selected Heating Output as 2nd stage booster. HTG relay shall be configured to be be controlled either in On/Off or PWM modes.

The Electrical Heater behaviour can be configured by the following listed information points.

Information Point	Range	Default	Description
ElHeaterPWM	1-ON , 0-OFF	0	"0" = Electrical Heater On/Off "1" = Electrical Heater PWM.
ElHeater_Cycle	120…600 sec.	120	The cycle of the Electrical Heater Output (Htg) when working in PWM. Note: The Electrical Heater output works as PWM or On/Off according to Binary Value " ElHeaterPWM "
ElHeater_MinOnLimit	0…25%	5%	Minimum ON limit of the Heat Output (Htg) PWM.
ElHeater_MinOffLimit	0…25%	5%	Minimum OFF limit of the Heat Output (Htg) PWM.
ElHeater_Value	0…100%	0%	Control Output (HTG)
ElHeater_ProportionalBand	0˚C …5˚C	2˚C	Heat Output ("Htg" terminal) PWM proportional band.
ElHeater_Offset	0˚C …20˚C	1˚C	The offset temperature before starting electrical heat stage 2 (On/Off or PWM) "Htg" terminal.

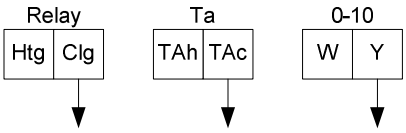
Outputs control logic

The figures below show how the outputs behave depending on different DIP switch combinations.

Information Point	Range	Default	Description
CoolCycleTA	30…600 sec.	300 sec.	Cool Thermal valve cycle time.
CoolDeadZone	0˚C ...5˚C	1˚C	Dead zone for cool valve and fan digital in cool.
CoolProportionalBand	2˚C ...10˚C	2˚C	Cool valve ("Y" & "TAc" terminals) proportional band.
CoolProportionalLowLimit	0…100%	0%	Cool valve ("Y" & "TAc" terminals) proportional low limit.
CoolProportionalHighLimit	0…100%	100%	Cool valve ("Y" & "TAc" terminals) proportional high limit.
CoolIndication	0…100%	0%	The open percentage of the cool valve for both proportional and on/off valves. (On/Off valve: 0 – Close 100 – Open)
HeatCycleTA	30…600 sec.	300 sec.	Heat Thermal Valve ("TAc" for 2-pipe or "TAh" for 4-pipe) cycle time.
HeatDeadZone	0˚C ...5˚C	1˚C	Dead zone for heat valve and fan digital in heat.
HeatProportionalBand	2˚C ...10˚C	2˚C	Heat valve ("TAc and "Y" terminals for 2-pipe, and "TAh" and "W" terminals for 4- pipe) proportional band.
HeatProportionalLowLimit	0…100%	0%	Heat valve ("TAc and "Y" terminals for 2-pipe, and "TAh" and "W" terminals for 4-pipe) proportional low limit.
HeatProportionalHighLimit	0…100%	100%	Heat valve ("TAc and "Y" terminals for 2-pipe, and "TAh" and "W" terminals for 4-pipe) proportional high limit.
HeatIndication	0…100%	0%	The open percentage of the cool valve for both proportional and on/off valves. (On/Off valve: 0 – Close 100 – Open)

2 Pipe Applications

The FX03 controller, when configured for 2 pipe applications (S2.3 = OFF), uses the cooling outputs only for valve control as following shown on Pic.1.



Pic. 1 – 2-Pipe

IMPORTANT: Using following configurations, CLG and HTG outputs may work in parallel during heating operations.

Single On/Off Valve for Chilled / Hot Water

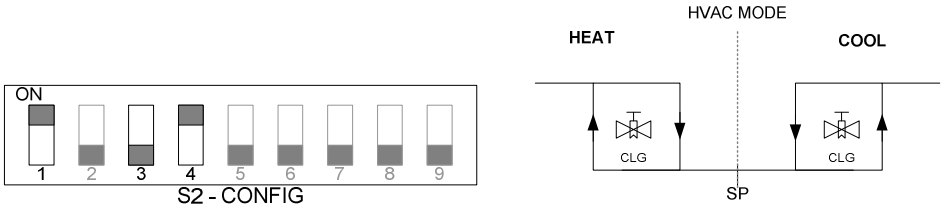


Figure 12: Single On/Off Valve (CLG) Control

On/Off Valve for Chilled Water and Electrical Heater (1st Stage)

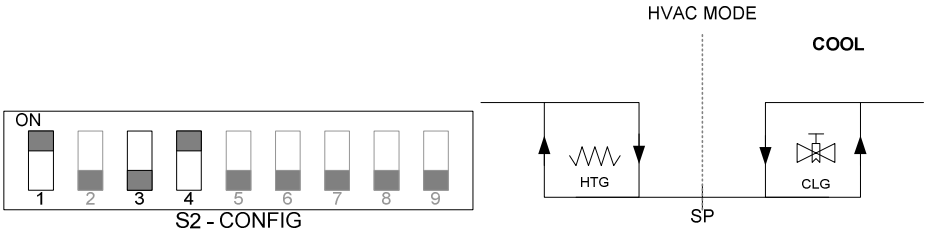


Figure 13: On/Off Valve for Chilled Water (CLG) and Electrical Heater (HTG) Control

On/Off Valve for Chilled / Hot Water plus Electrical Heater (2nd Stage)

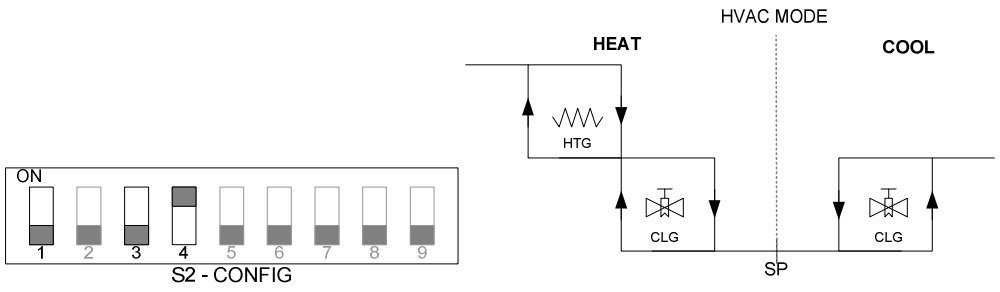


Figure 14: On/Off Valve for Chilled/Hot Water (CLG) plus Electrical Heater (HTG) Control

Single Proportional Valve for Chilled/Hot Water

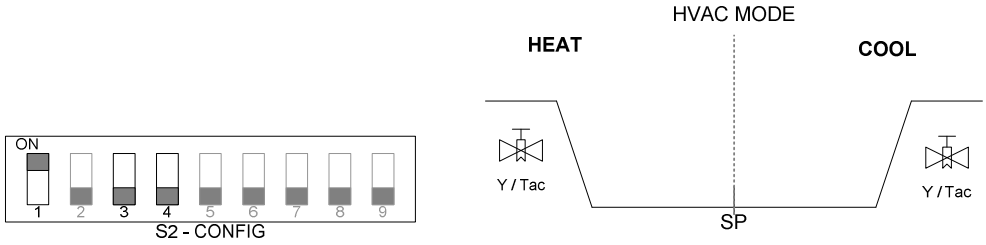


Figure 15: Single Proportional Valve for Chilled/Hot Water (Y, TAc) Control

Proportional Valve for Chilled Water and Electrical Heater (1st Stage)

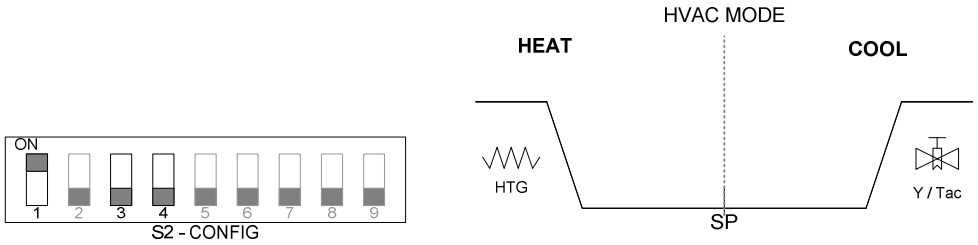


Figure 16: Proportional Valve for Chilled Water (Y, TAc) and Electrical Heater (HTG) Control

Proportional Valve for Chilled/Hot Water plus Electrical Heater (2nd Stage)

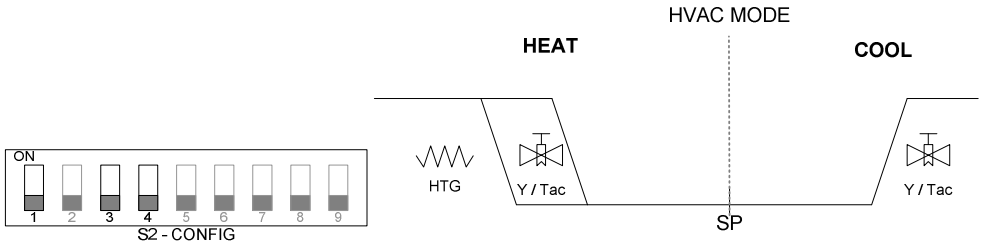


Figure 17: Proportional Valve for Chilled/Hot Water (Y, TAc) plus Electrical Heater (HTG) configuration

4 Pipes

IMPORTANT: Using this configuration, W / TAh and HTG outputs may work in parallel during heating operations.

Dual On/Off Valves Chilled and Hot Water

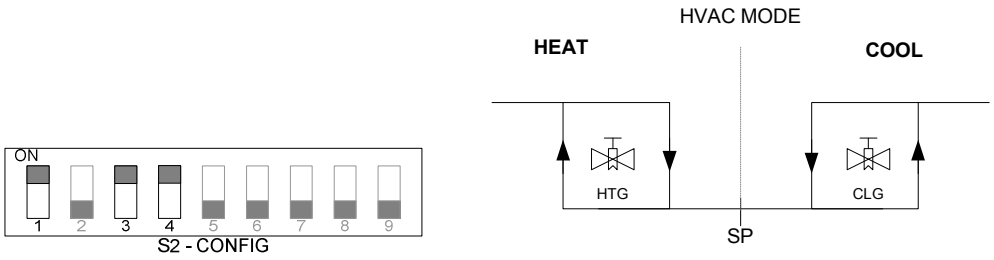


Figure 18: On/Off Valves for Chilled (CLG) and Hot Water (HTG) Control

On/Off Valve Chilled Water and Electrical Heater (1st Stage)

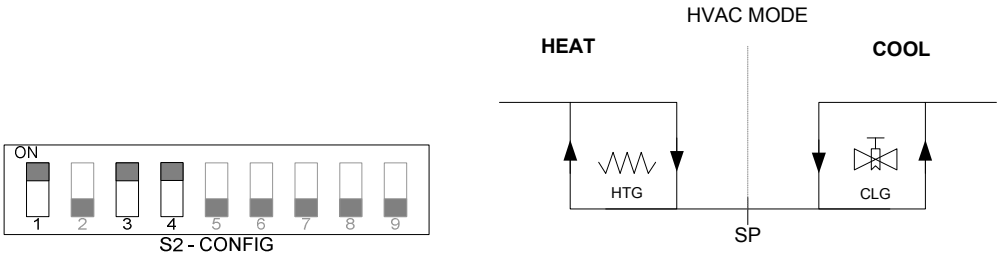


Figure 19: On/Off Valves for Chilled Water (CLG) and Electrical Heater (HTG) Control

Dual On/Off Valves plus Electrical Heater (2nd Stage)

Configuration not available.

Dual Proportional Valves Chilled (TAc, Y) and Hot Water (TAh, W)

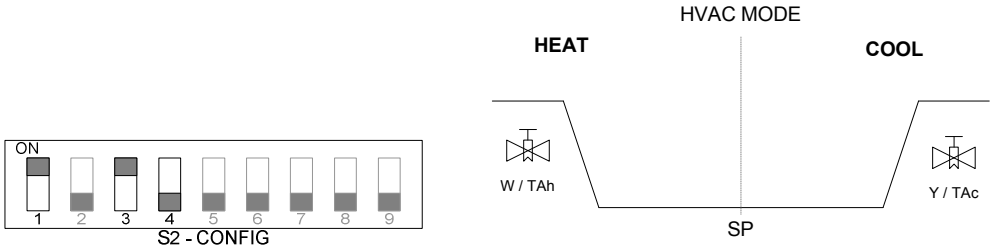


Figure 20: Dual Valves Chilled (TAc, Y) and Hot (TAh, W) Water Control

Proportional Valve Chilled Water and Electrical Heater (1st Stage)

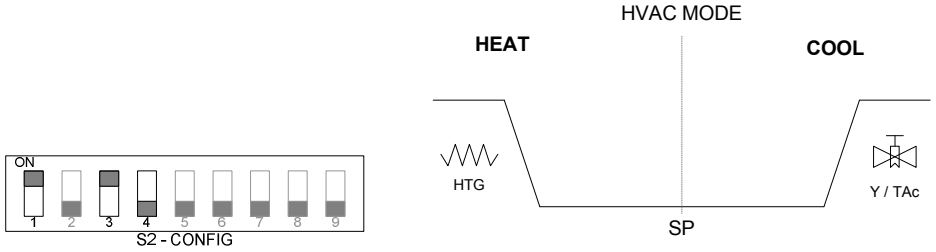


Figure 21: Proportional Valve Chilled Water (TAc, Y) and Electrical Heater (HTG) Control

Dual Valves Chilled and Hot Water plus Electrical Heater (2nd Stage)

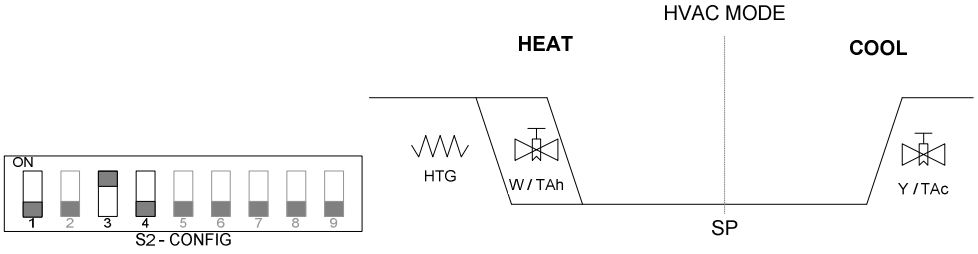


Figure 22: Dual Valves Chilled (TAc, Y) Hot Water (TAh, W) plus Electrical Heater (HTG) control

Fan Control Options

The controller may be configured to control a single-speed, two-speed or three-speed fan. A variable fan speed proportional output, 0-10VDC, is also available as option.

Options are also available to keep the fan running continuously at low speed or to allow the fan to cycle on and off as the space temperature reaches the given setpoint.

Information Point	Range	Default	Description
Supervisory_FanSpeed	1,2,3,4	4	1 – Low(digital) or 30%(VSFI) 2 – Medium(digital) or 60%(VSF) 3 – High(digital) or 90%(VSF) 4- Auto
EffectiveFanIndication	0…100%	-	Actual fan position (one object for both digital and VSF) VSF – open percentage. Digital: 30% - Low 60% - Medium 90% - High 0 – Off
DifferentialForFan	10…100%	35%	The differential (hysteresis) between digital fan speeds (see illustration) is defined as a percentage of the cool or heat valves proportional band. The same value is used for all speeds. For best performance, it is not recommended to change the default value of 35%.
FanDeadZoneInCool	0˚C ...5˚C	1˚C	Dead zone for fan proportional (VSF) in cool mode. It is recommended that this value will be the same as the dead zone for cool valve.
FanProportionalBandInCool	2˚C …10˚C	2˚C	Fan proportional ("VSF" terminal) band in cool mode. Exception: When value "0" is selected, the fan will never work.
FanLowLimitInCool	0…100%	0%	Fan proportional ("VSF" terminal) low limit in cool mode.
FanHighLimitInCool	0…100%	100%	Fan proportional ("VSF" terminal) high limit in cool mode.
FanDeadZoneInHeat	0˚C ...5˚C	1˚C	Dead zone for fan proportional (VSF) in heat mode. It is recommended that this value will be the same as the dead zone for heat valve.
FanProportionalBandInHeat	2˚C …10˚C	2˚C	Fan proportional ("VSF" terminal) band in heat mode.
FanLowLimitInHeat	0…100%	0%	Fan proportional ("VSF" terminal) low limit in heat mode.
FanHighLimitInHeat	0…100%	100%	Fan proportional ("VSF" terminal) high limit in heat mode.
HeatingFan_ForceONPeriod	0…100 min.	10 min.	The time until the fan is forced to start (in heat mode, when the fan is not active).
HeatingFan_ForceONDuration	0…100 min.	1 min.	For how long the fan is forced to work (in the above conditions).
CoolFanOnDelay	0…300 sec.	0 sec.	Delay before starting the fan in cool.
CoolFanOffDelay	0…300 sec.	120 sec.	Delay before stopping the fan in cool.
HeatFanOnDelay	0…300 sec.	0 sec.	Delay before starting the fan in heat. **Warning:** this object must be set to "0" when using electrical heat.
HeatFanOffDelay	0…300 sec.	120 sec.	Delay before stopping the fan in heat.
AutoFanInCool	1-ON , 0-OFF	0	Turn off fan if no demand for cool when in cool mode (Default: Not turn off fan)
AutoFanInHeat	1-ON , 0-OFF	1	Turn off fan if no demand for heat when in heat mode (Default: Turn off fan)

Single-Speed Fan

Figure 23: Single Speed Fan – Configuration and Control Output

Dual-Speed Fan

Figure 24: Dual-Speed Fan – Configuration and Control Outputs

Three-Speed Fan

Figure 25: Three-Speed Fan – Configuration and Control Outputs

Variable Speed Fan (VSF)

Jumpers		Position
JMP1	Fan VSF (Proportional 0-10V)	VSF
	Fan On/Off (Relay)	On/Off

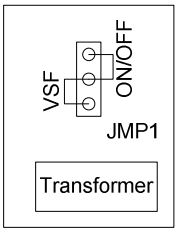


Figure 26: Variable Speed Fan - Configuration and Control Output

Communication Options

An advanced configuration level for complex operations (such as Peer-to-Peer communication) and the fine tuning of parameters can be achieved via commissioning feature of the FX CommPro N2 or BACnet® software package.

Communication options are available to enable the controller to be integrated into an N2 Open or BACnet® network of a building automation system.

The BACnet® MS/TP interface of the controller complies with the ANSI/ASHRAE Standard 135-2004 for sharing data with other devices on the network.

N2 Open

Figure 27: N2 Open Communication – Configuration

- Phisical Layer RS 485
- Baud Rate 9600 Baud

BACnet® MS/TP

Figure 28: BACnet MS/TP Communication – Configuration

- Phisical Layer RS 485
- Baud Rate Automatic (Max. 38400 Baud)

BACnet® Device Object Identifier (Instance Number)

The Device object type defines a standardized object whose properties represent the externally visible characteristics of a BACnet Device. There shall be exactly one Device object in each BACnet Device.

A Device object is referenced by its Object_Identifier property, also known as Instance Number, which is not only unique to the BACnet Device that maintains this object but is also unique throughout the BACnet internetwork.

This means that in case a multi-trunk BACnet/IP network is in place, the device MAC Address information won't be sufficient to fit the univocity requirement for devices identification within the whole network.

To accomplish this requirement the FX03 offers two valid options:

- Instance Number equals MAC Address;

Figure 29: Instance Number equals MAC address – Configuration

- Instance Number to be set via commissioning tool (Future Use);

Figure 30: Instance Number via commissioning tool – Configuration

Whatever the controller configuration, it is possible to monitor the control loops activities through the following information points.

Information Point	ShortName	Default	Description
Effective_HVAC_Mode	AppModeEff	0 – AUTO	The Effective HVAC Mode: 0 – Auto 1 – Off 2 – Heat 3 – Cool 4 – Fan Only
Effective_Occupancy_Mode	OccModeEff	0 – OCC	The Effective Occupancy Mode: 0 - Occupied 1 - Unoccupied 2 - ByPass
SetpointEffective	SP_Eff	22℃	The Effective Set-point Temperature (Read-only)
ReturnAirTemperatureEffective	SpaceT_Eff	–	The Effective Controller Process Variable (Read-only)
EffectiveFanIndication	FanSpd_Eff	–	The Effective Controller Fan Speed 30% - Low Speed 60% - Medium Speed 90% - High Speed (Read-only)
CoolProportionalIndication	ClgRequest	–	The Cooling valve request for both proportional and On/Off valves. (On/Off: 0 – Close 100 – Open)
HeatProportionalIndication	HtgRequest	–	The Heating valve request for both proportional and On/Off valves. (On/Off: 0 – Close 100 – Open)
ElHeater_Value	EHRequest	–	The Electrical Heater request.

N2 / BACnet® Commissioning

An advanced configuration level for complex operations (such as Peer-to-Peer communication) and the fine tuning of parameters can be achieved via commissioning feature of the FX CommPro N2 or BACnet® software package.

BACnet® Device Object

Vendor_Name: JCI
Vendor_Identifier: 5
Model_Name: "FX03"

Room Sensor Modules

A unique and specific series of room sensor modules (RSM) is available for use with the FX03 controllers. The RSM series features both infra-red communicating modules and non-communicating (parallel wired connections) room sensor modules.

The operating controls of the room command modules are shown in Figures 3 and 4 below.

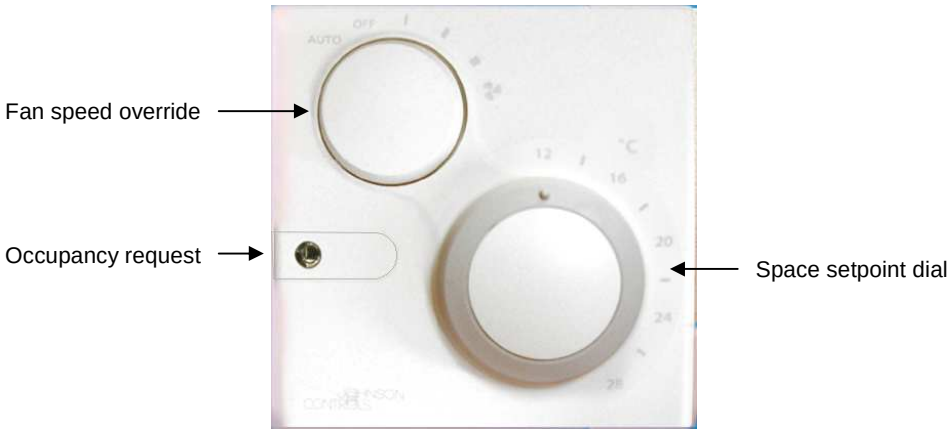


Figure 31: Parallel Wired Room Sensor Module for FX03

Note: Any movement of the fan speed override button or space setpoint dial also sends an occupancy request when the connected controller is not already in OCCUPIED mode.

Figure 32: Parallel Wired Room Sensor Module with Display for FX03

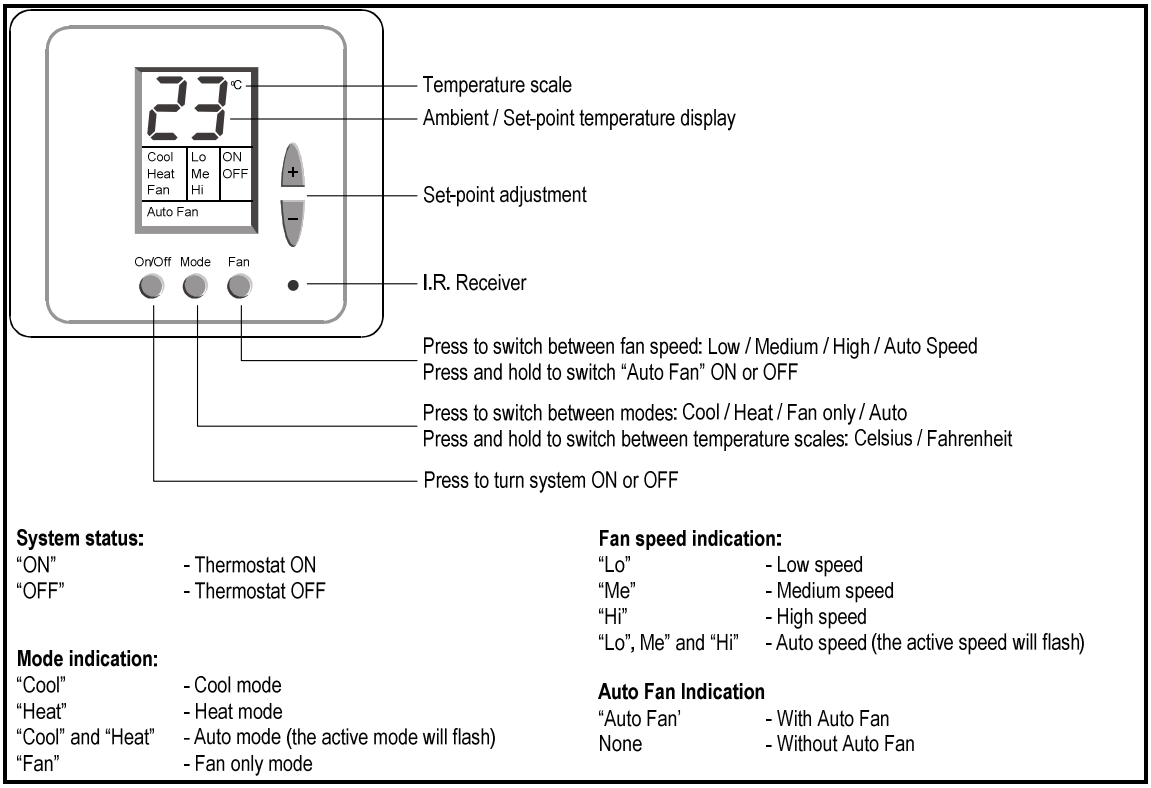


Figure 33: LP-RSM003-000C

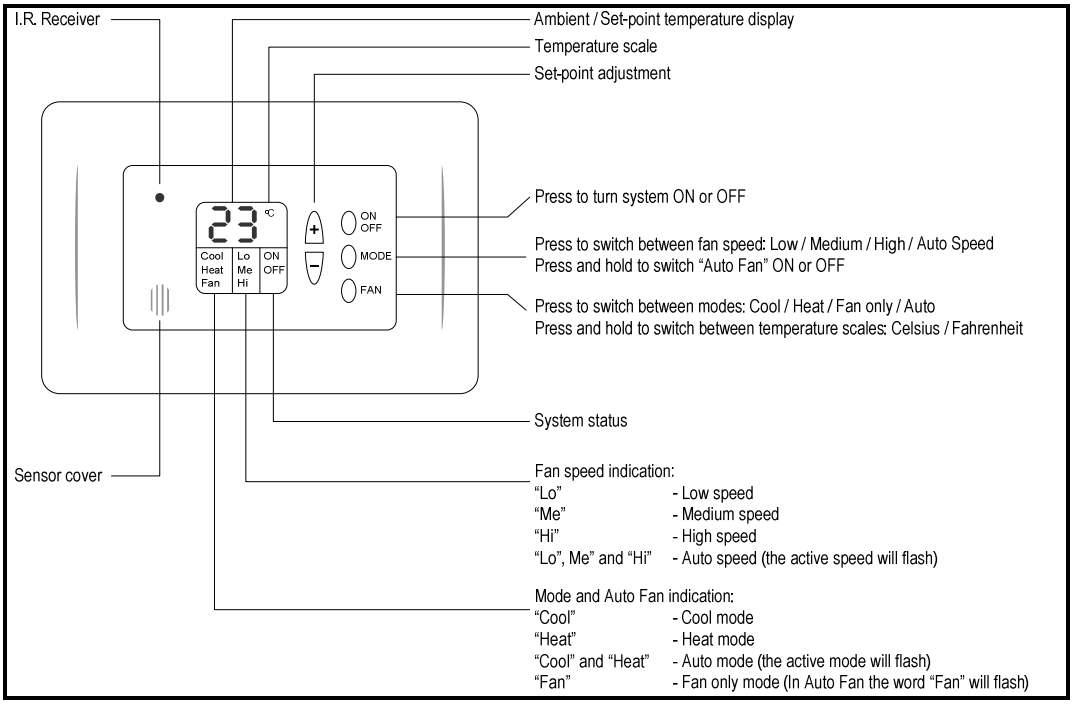


Figure 34: LP-RSM003-001C

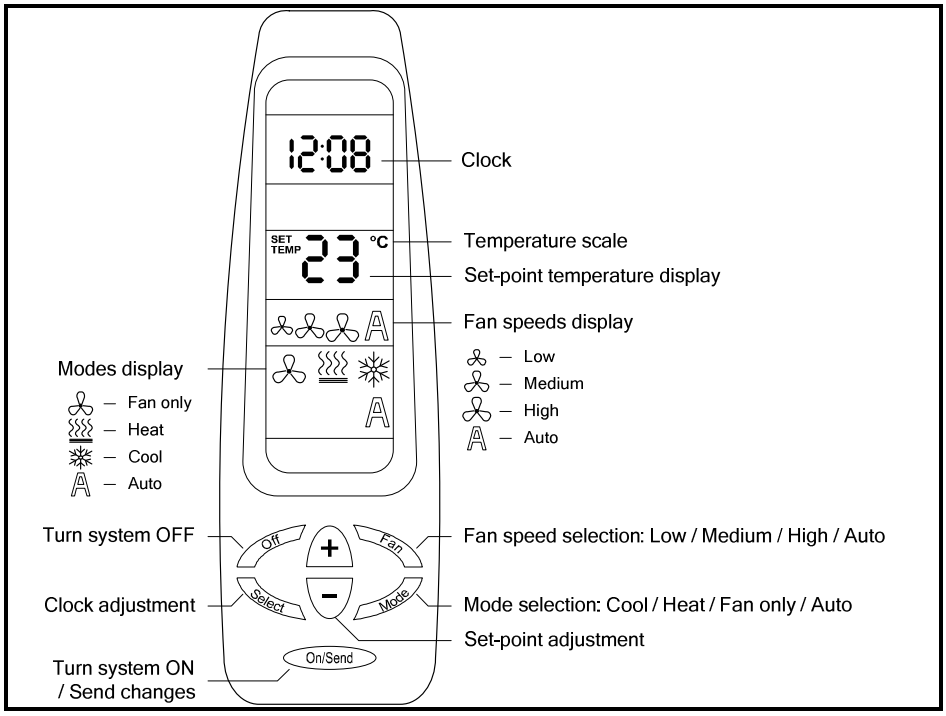


Figure 35: LP-RSM003-004C

TW - INSERIRE TABELLA

Technical Specifications da Product Bulletin.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products, and reserves the right to change or supplement the contents of this publication.

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