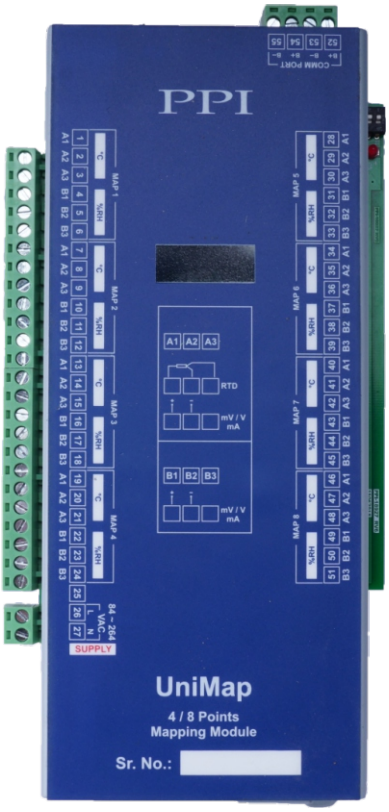
HumiTherm Ultra

PPI
The Perfection Experts

Temperature + Humidity (%RH) Control & Recording System with 8 / 16 Mapping Inputs



User Manual

CONTENTS

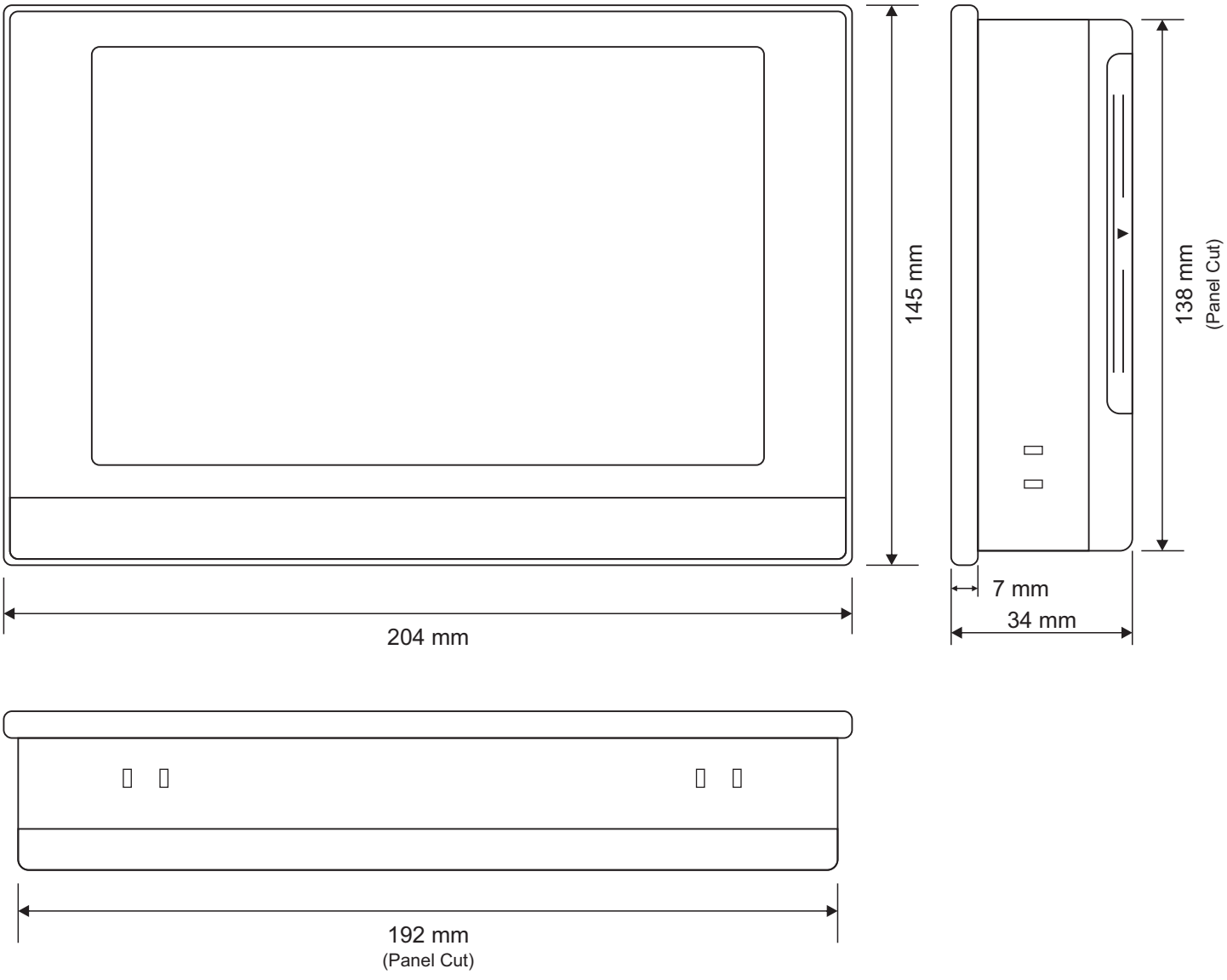
Section 1

MOUNTING & ELECTRICAL CONNECTIONS : HMI (TOUCH PANEL)

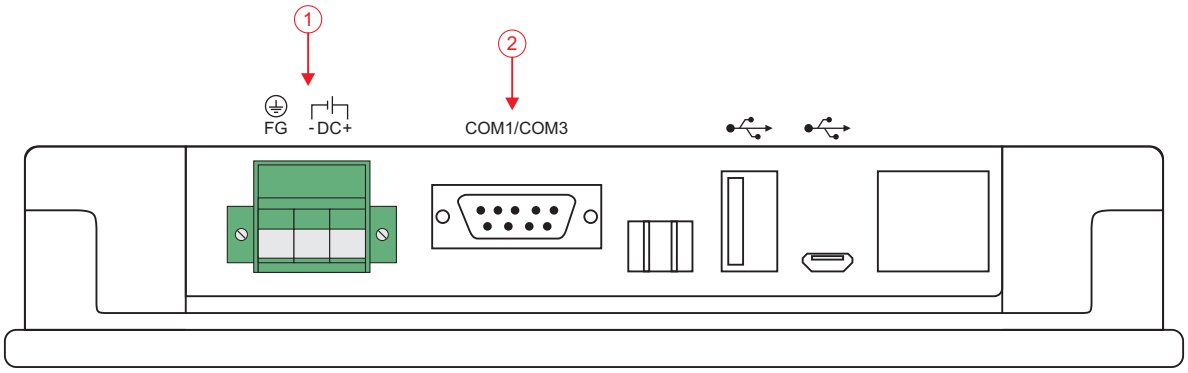
HMI NEW Version

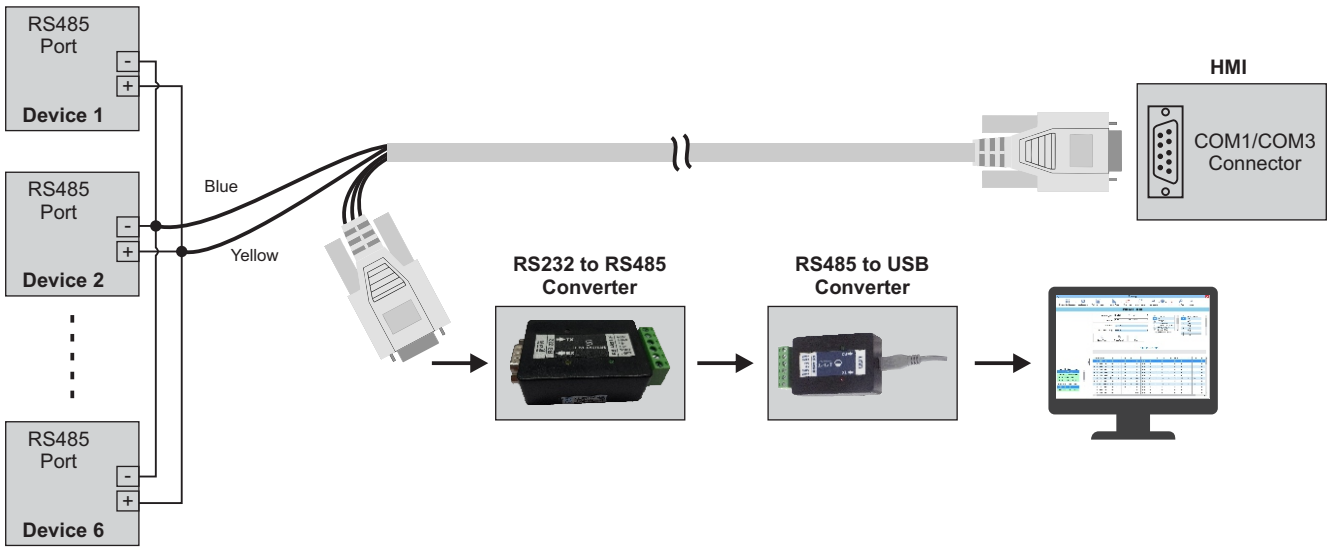
HMI (Touch Panel)

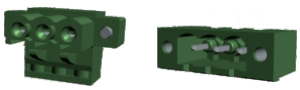
Dimensions	
Overall	204(W) X 145(H) X 34(D), mm
Panel Cutout	192(W) X 138(H), mm



HMI (Touch Panel)





1		**3-Pin Male / Female Connector (5.08 mm pitch)** Supply Voltage : 20 to 28 VDC (24 V Nominal)
2	 9 Pin	**9 Pin D Type Connector** RS485 Serial Communication with Control Unit & PC

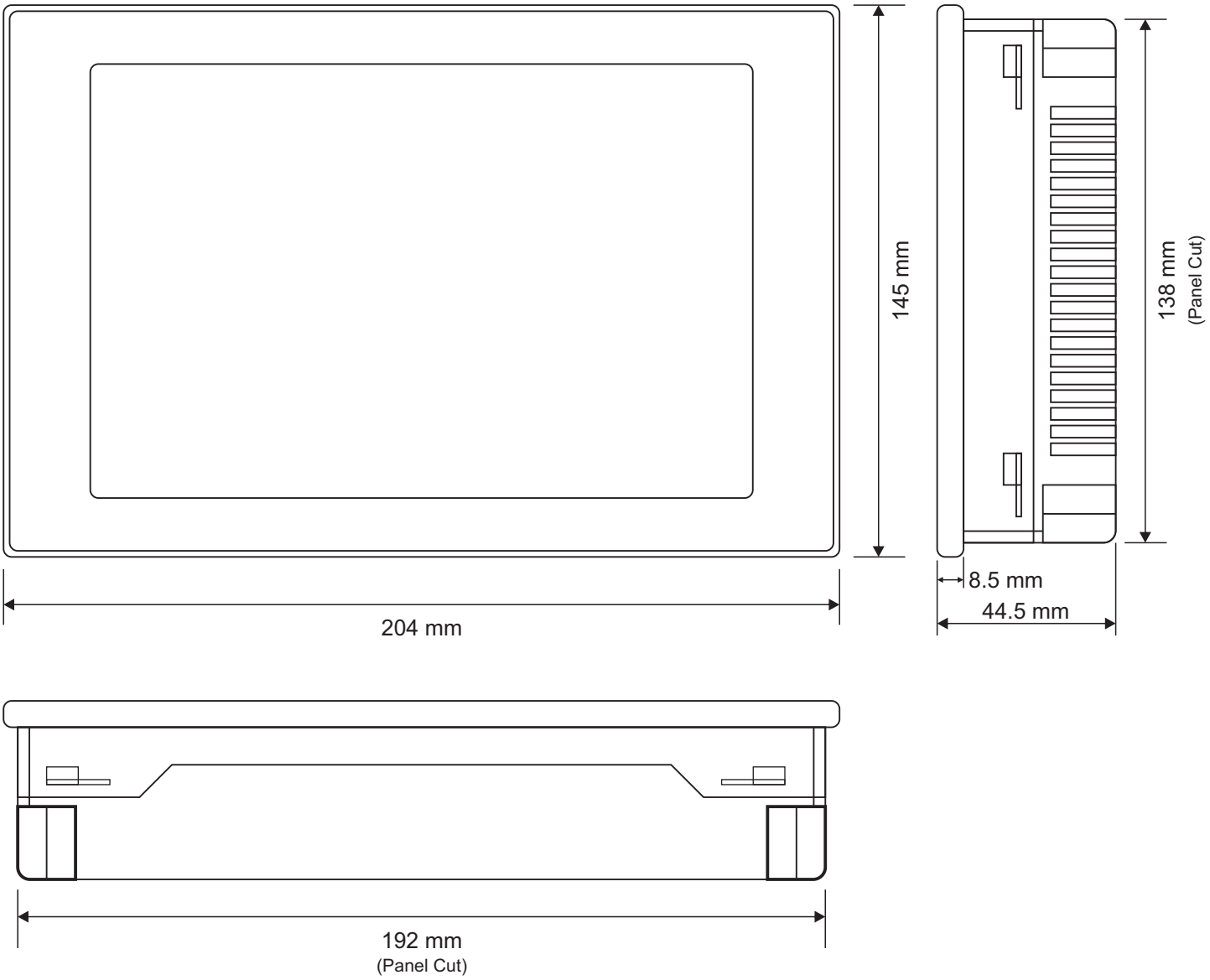
HMI OLD Version

7” Mounting

Table 1.1

Dimensions	
Overall	204(W) X 145(H) X 44.5(D), mm
Panel Cutout	192(W) X 138(H), mm

Figure 1.1



7” Electrical Connections

Figure 1.2

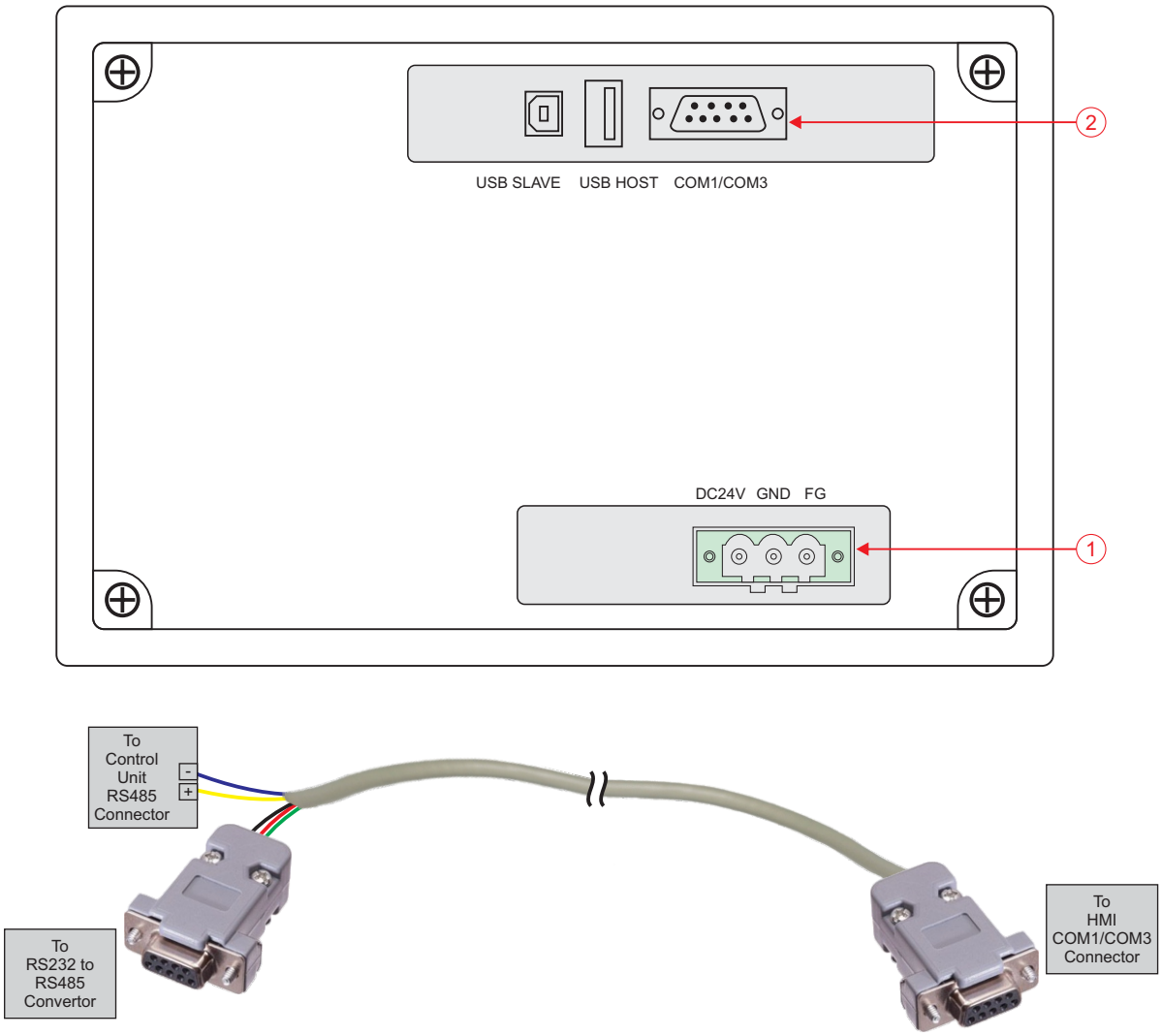
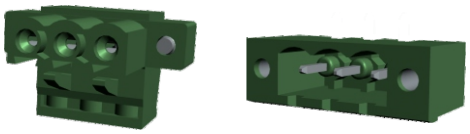


Table 1.2

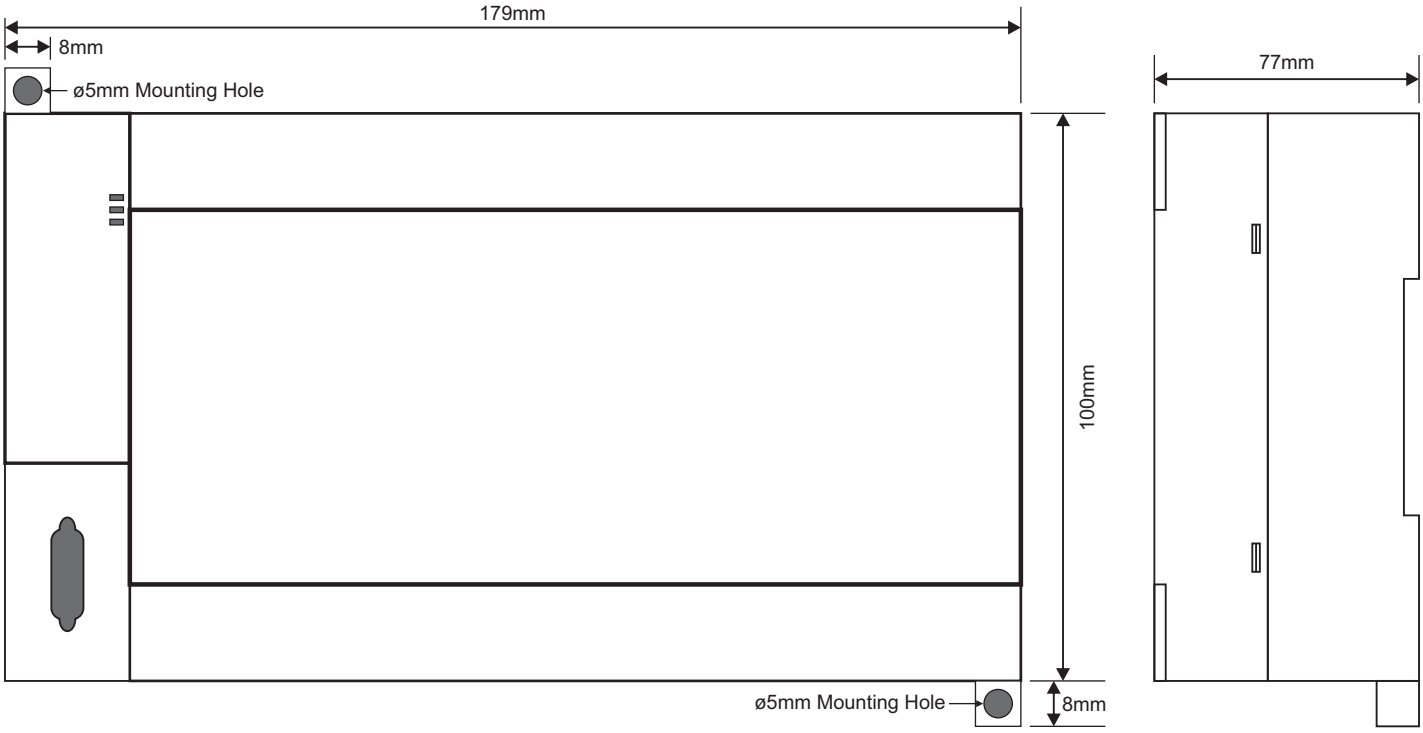
1		**3-Pin Male / Female Connector (5.08 mm pitch)** Supply Voltage : 20 to 28 VDC (24 V Nominal)
2	 **9 Pin**	**9 Pin D Type Connector** RS485 Serial Communication with Control Unit & PC

Section 2

MOUNTING & ELECTRICAL CONNECTIONS : microPLC

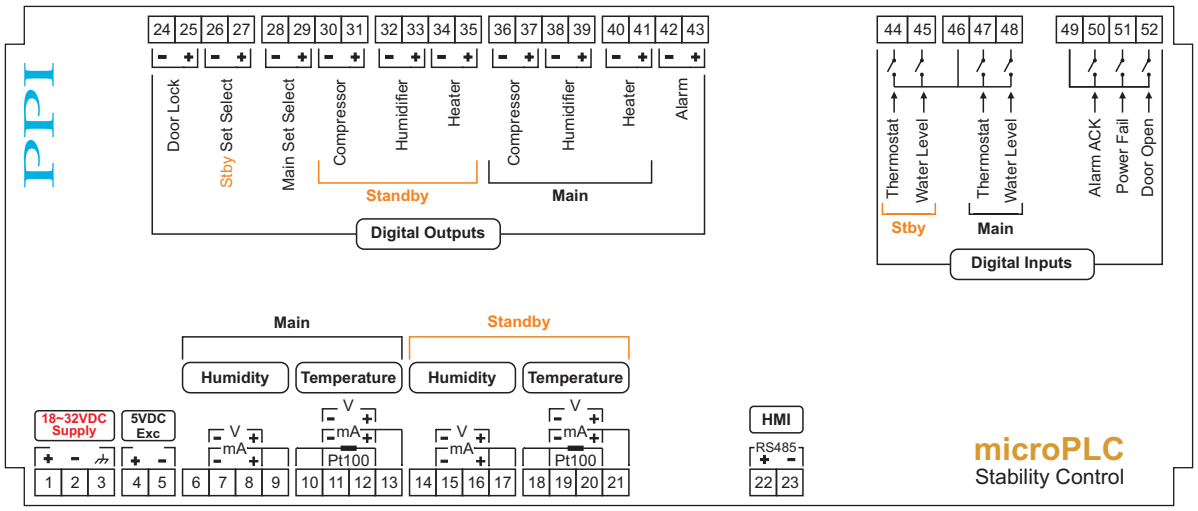
Mounting (Base / Wall Mounting)

Figure 2.1



microPLC Electrical Connections

Figure 2.2

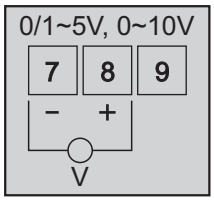


DESCRIPTIONS

The connections are described as under:

Main Humidity (%RH) Transmitter Input (Terminals : 7,8, 9)

Figure 2.3 (a)

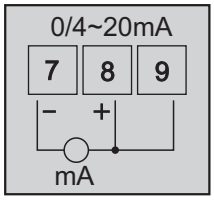


The Controller accepts DC Current (mA) / DC Voltage (V) as Humidity input. The connections are described below.

Humidity Transmitter with DC Voltage (V) Output

The Figures 2.3(a) depicts wiring connections for voltage output transmitter. The Excitation Voltage can be obtained from an external source or from the controller (5 VDC).

Figure 2.3 (b)



Humidity Transmitter with DC Current (mA) Output

The Figures 2.3(b) depict wiring connections for current output transmitter. Note that terminals 8 & 9 should be shorted. The Excitation Voltage can be obtained from an external source or from the controller (5 VDC).

Main Temperature (°C) Sensor / Transmitter Input (Terminals : 10, 11, 12, 13)

The Controller accepts RTD Pt100 (3-wire / 2-wire) or DC Current (mA) / DC Voltage (V) as Temperature input. The connections are described.

Figure 2.4 (a)

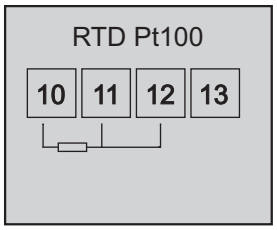


Figure 2.4 (b)

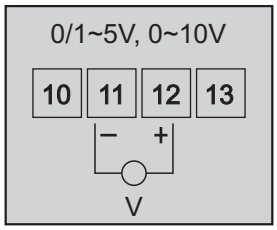
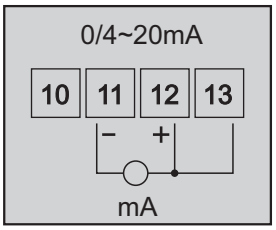


Figure 2.4 (c)



RTD Pt100, 3-wire

Connect single leaded end of RTD bulb to terminal 10 and the double leaded ends to terminals 11 & 12 as shown in Figure 2.4(a). Use copper conductor leads of very low resistance ensuring that all 3 leads are of the same gauge and length. Avoid joints in the cable.

Temperature Transmitter with DC Voltage (V) Output

The Figures 2.4(b) depicts wiring connections for voltage output transmitter. The Excitation Voltage can be obtained from an external source or from the controller (5 VDC).

Temperature Transmitter with DC Current (mA) Output

The Figures 2.4(c) depict wiring connections for current output transmitter. Note that terminals 12 & 13 should be shorted. The Excitation Voltage can be obtained from an external source or from the controller (5 VDC).

5 VDC Excitation Voltage (Terminals : 4, 5)

The Controller is supplied with inbuilt 5VDC Excitation Voltage as standard. The Excitation Voltage can be used to power external Temperature and/or RH Transmitters.

The '+' and '-' terminals are for voltage 'Source' and 'Return' paths, respectively.

[Optional] Standby Humidity (%RH) Transmitter Input (Terminals : 14, 15, 16, 17)
[Optional] Standby Temperature (°C) Sensor / Transmitter Input (Terminals : 18, 19, 20, 21)
The Control Unit optionally supports Inputs for Standby (redundant) Humidity & Temperature sensor / transmitter. The Connection detail are the same as for main sensor / transmitter described above.

[Optional] Door Output (terminals : 24, 25)
[Optional] Standby Set Select Output (terminals : 26, 27)
[Optional] Main Set Select Output (terminals : 28, 29)
[Optional] Standby Compressor Output (terminals : 30, 31)
[Optional] Standby Humidifier Output (terminals : 32, 33)
[Optional] Standby Heater Output (terminals : 34, 35)
Main Compressor Output (terminals : 36, 37)
Main Humidifier Output (terminals : 38, 39)
Main Heater Output (terminals : 40, 41)
Alarm Output (terminals : 42, 43)

All the above control & alarm outputs are Voltage pulses (12VDC @ 40mA) for driving external SSR or Relay. The '+' and '-' terminals are for voltage 'Source' and 'Return' paths, respectively.

The Optional Outputs are fitted only if Controller is ordered with Standby Control Outputs.

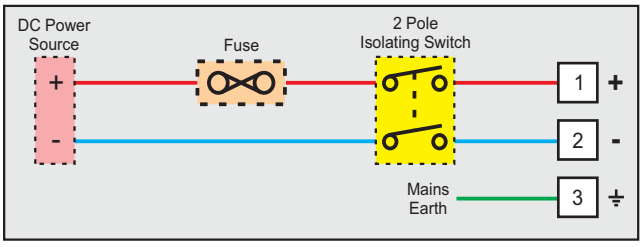
[Optional] Standby Thermostat Digital Input (Terminals 44, 46)
[Optional] Standby Water Level Digital Input (Terminals 45, 46)
Main Thermostat Digital Input (Terminals 47, 46)
Main Water Level Digital Input (Terminals 48, 46)
Alarm Acknowledge Digital Input (Terminals 50, 49)
Power Fail Digital Input (Terminals 51, 49)
Door Open Digital Input (Terminals 52, 49)
(Terminals 46 & 49 are Common)

Potential-free contact closure input terminals are provided as digital inputs. An 'Open' or 'Close' switch position is detected as input.

HMI COMMUNICATION PORT (Terminals 22, 23)
For reliable noise free communication, use a pair of twisted wires inside screened cable. The wire should have less than 100 ohms / km nominal DC resistance (Typically 24 AWG or thicker). Connect the terminating resistor (Typically 100 to 150 ohm) at one end to improve noise immunity.

POWER SUPPLY (Terminals 1, 2, 3)
As standard, the Module is supplied with power connections suited for 18 to 32 VDC power source. The accuracy / performance of the Module is not affected by the variations in the supply within specified limits of 18 to 32 VDC. Use well-insulated copper conductor wire of the size not smaller than 0.5mm² for power supply connections ensuring proper polarity as shown in Figure 2.5. The Module is not provided with fuse and power switch. If necessary, mount them separately. Use a slow blow fuse rated for 0.5A current.

Figure 2.5



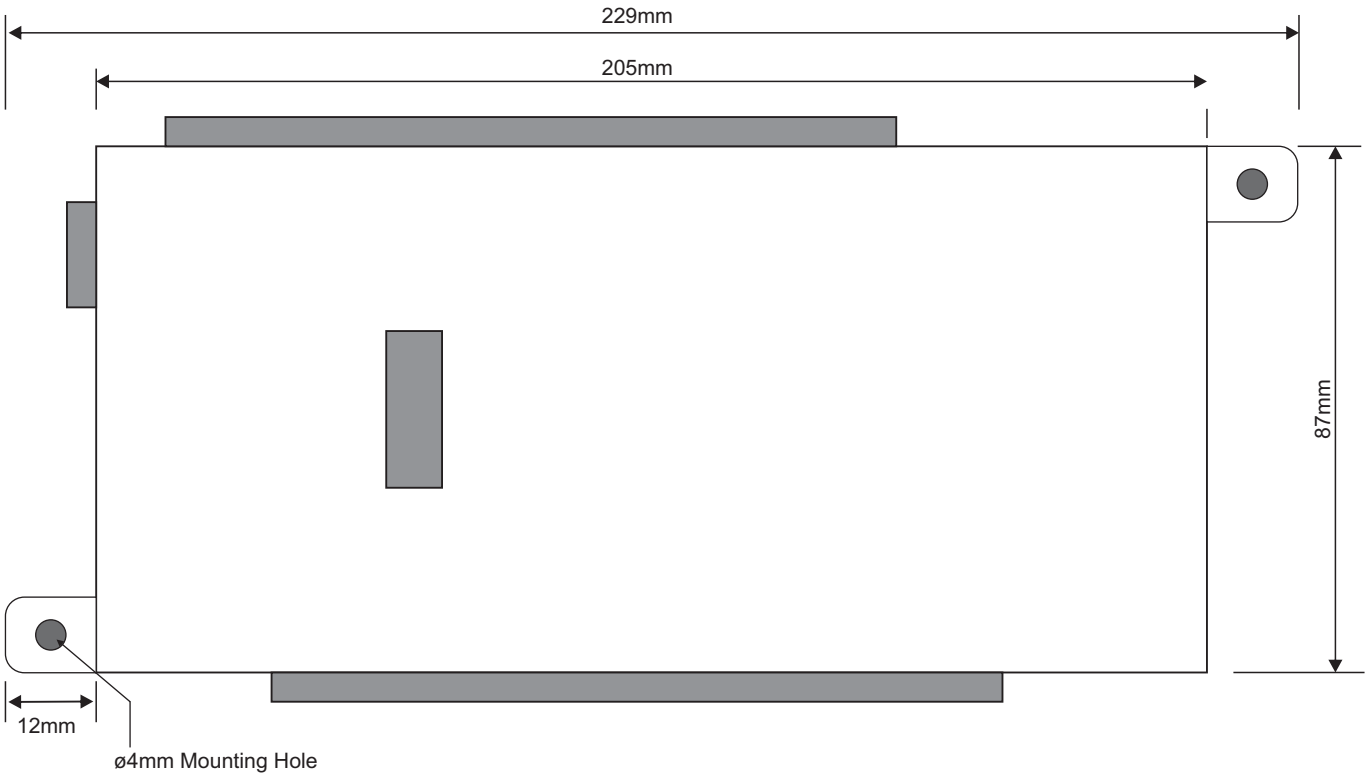
For safety and enhanced electrical noise immunity, it is highly recommended to connect Main Power Supply 'Earth' to terminal 3.

Section 3

MOUNTING, ELECTRICAL CONNECTIONS & JUMPER SETTINGS : MAPPING

Mounting (Base / Wall Mounting)

Figure 3.1



Mapping Electrical Connections

Figure 3.2(a) : New Version

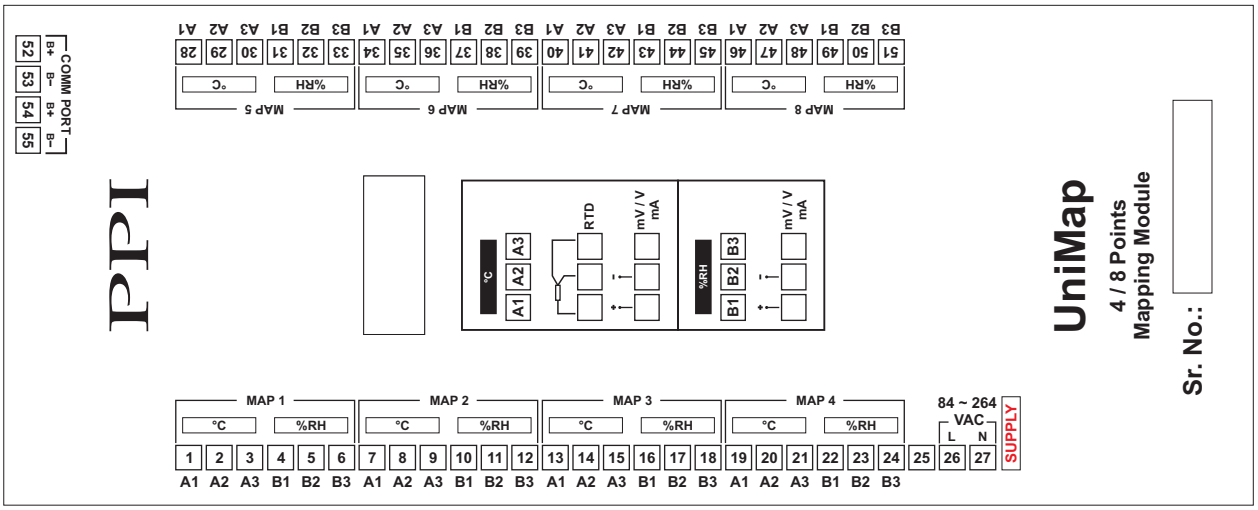
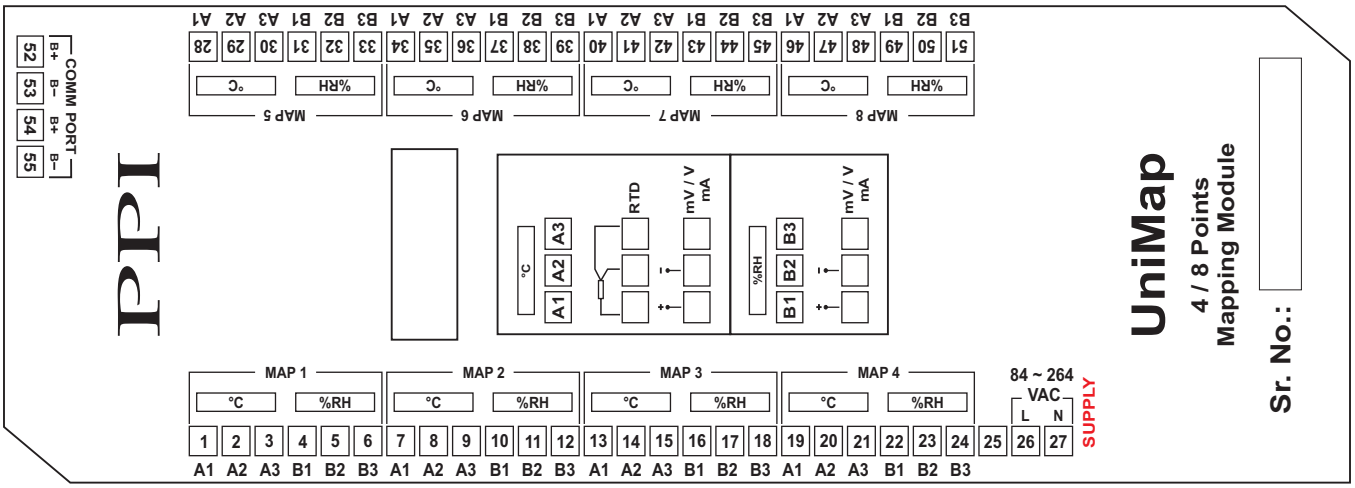


Figure 3.2(b) : Old Version



Map Inputs

Each of the °C and %RH inputs are identical from wiring connection viewpoint. The descriptions below apply to all the inputs with no deviations.

Make sure that proper jumper settings are made for each input for the selected input type as described later in this section.

Figure 3.3(a)

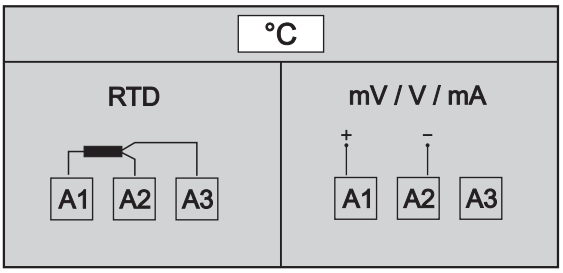
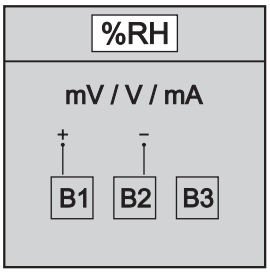


Figure 3.3(b)



RTD Pt100, 3-wire

Connect single leaded end of **RTD** bulb to A1 and the double leaded ends to terminals A2 and A3 (interchangeable) as shown in **Figure 3.3(a).** Use copper conductor leads of very low resistance ensuring that all 3 leads are of the same gauge and length. Avoid joints in the cable.

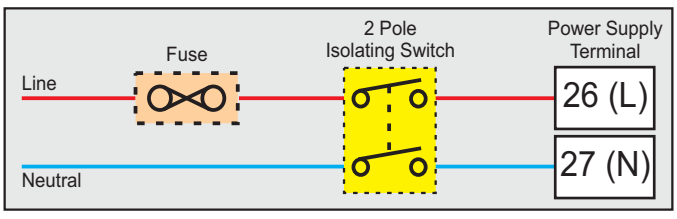
DC Linear Voltage (mV / V) & Current (mA)

Use a shielded twisted pair with the shield grounded at the signal source for connecting mA / mV / V source. Connect common (-) to A2 / B2 and the signal (+) to A1 / B1, as shown in **Figure 3.3(a) & (b).**

POWER SUPPLY

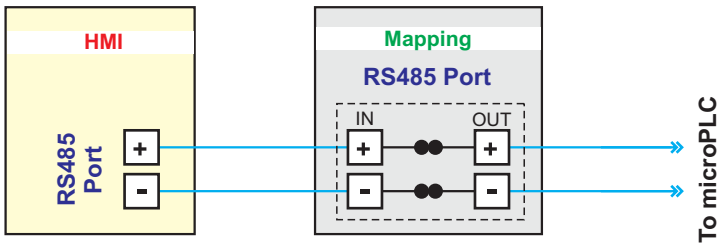
As standard, the controller is supplied with power connections suited for 85 to 264 VAC line supply. Use well-insulated copper conductor wire of the size not smaller than 0.5mm² for power supply connections. Connect Line (Phase) supply line to terminal 26 and the Neutral (Return) supply line to terminal 27 as shown in Figure 3.4. The controller is not provided with fuse and power switch. If necessary, mount them separately. Use a time lag fuse rated 1A @ 240 VAC.

Figure 3.4



SERIAL COMMUNICATION PORT

Figure 3.5



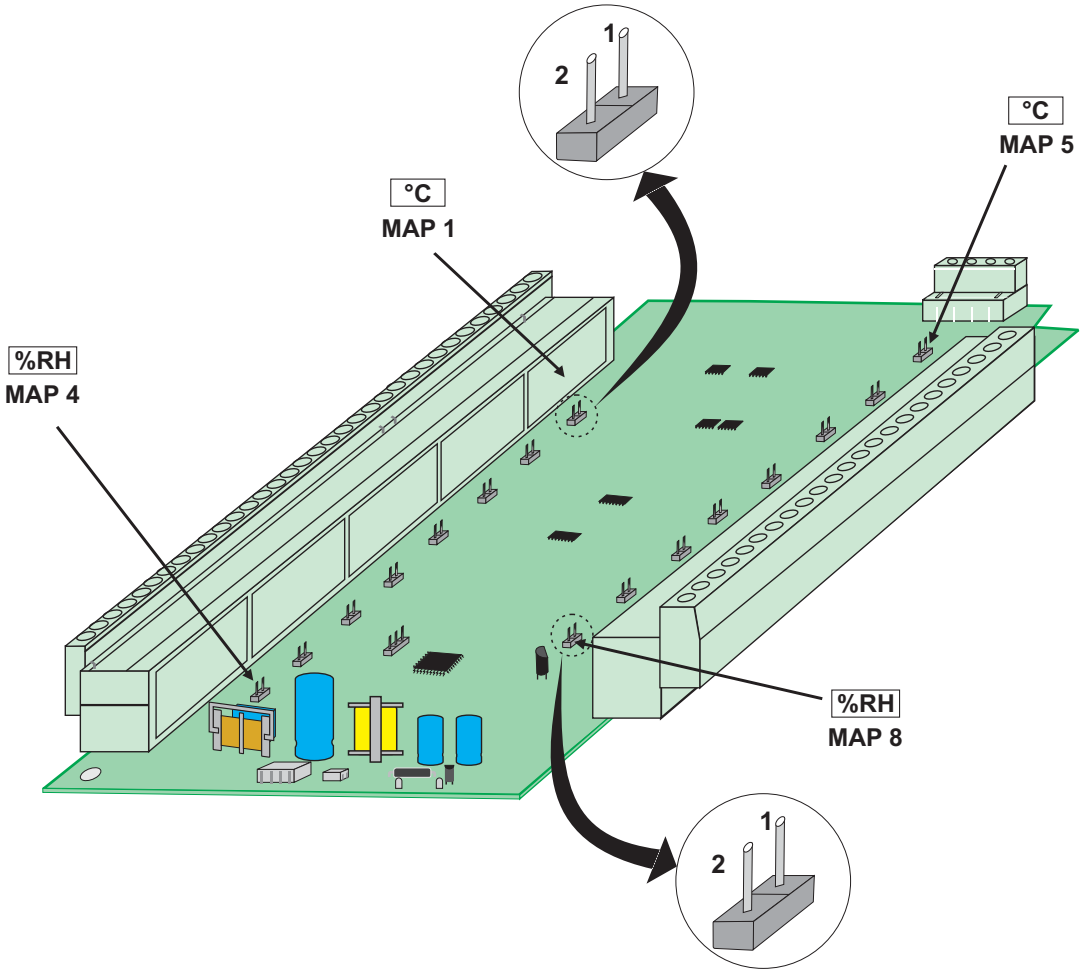
The wiring connections for interfacing the HMI with mapping unit is shown in the figure 3.5.

INPUT TYPE : JUMPER SETTINGS

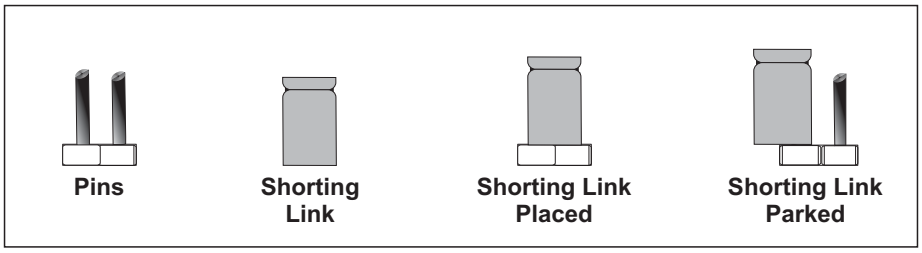
The Mapping Unit (UniMap) is supplied with 8 (4T + 4RH) or 16 (8T + 8RH) Map Inputs. Each Input can be user configured for a variety of input types which requires appropriate parameters settings and jumper settings on UniMap.

The UniMap hardware has been re-desiged for improved functionality & features. The **New** & **Old** Hardware designs have different Jumper Setting arrangements. Refer Figures 3.6 & 3.7 for **New** & **Old** versions respectively.

Figure 3.6 : New Hardware Version



The jumper setting arrangement comprises of **Pins & Shorting-Link** as shown in the figure below. The figure also depicts how to mount the Shorting-Link for a particular jumper setting.

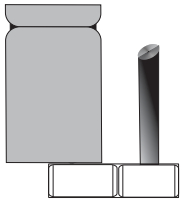


The figures below show the jumper settings for different input types.

RTD Sensor
Pt100 (3-wire)

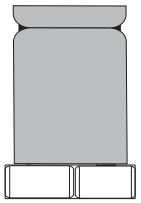
Thermocouples
J, K, T, R, S, B, N Types

DC Voltage
0-50mV, 0-200mV
0-1.25V, 0-5V, 1-5V, 0-10V



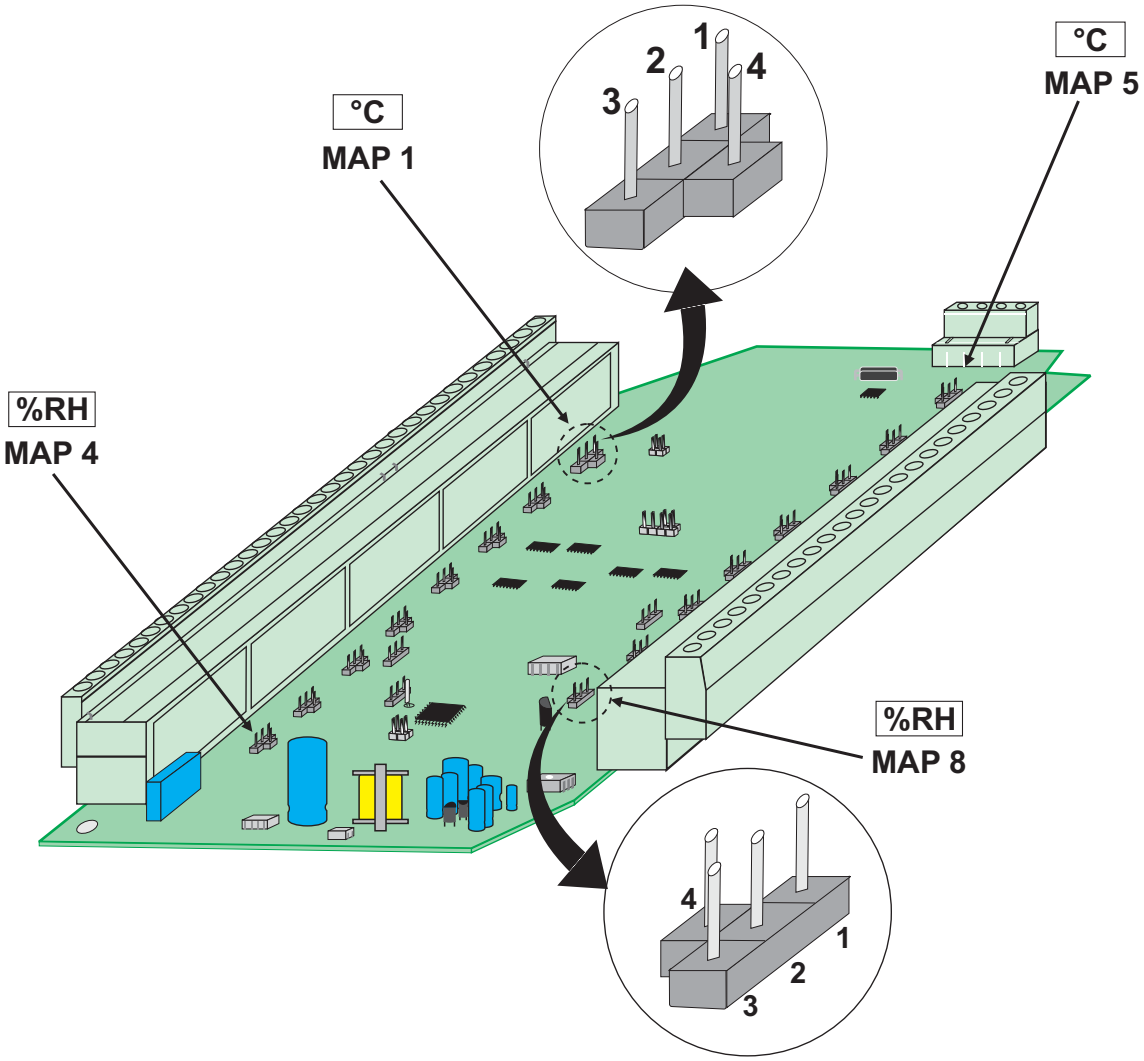
Park Shorting Link

DC Current
0-20mA, 4-20mA

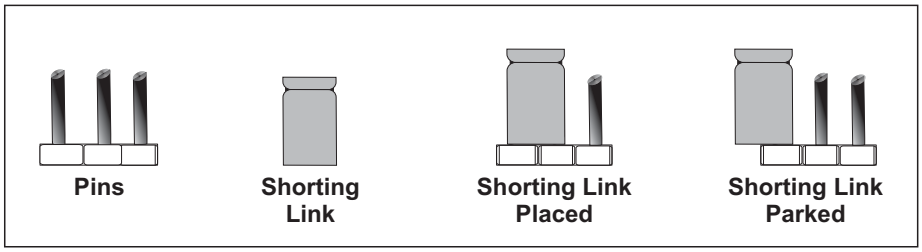


Place Shorting Link on Pins 1 & 2

Figure 3.7 : Old Hardware Version



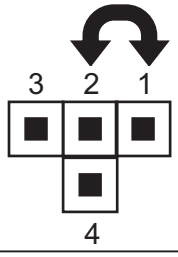
The jumper setting arrangement comprises of **Pins & Shorting-Link** as shown in the figure below. The figure also depicts how to mount the Shorting-Link for a particular jumper setting.



The figures below show the jumper settings for different input types.

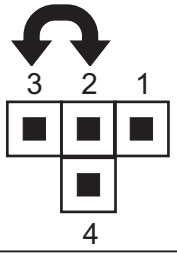
RTD Pt100 (3-wire)

Place Shorting Link on Pins 1 & 2



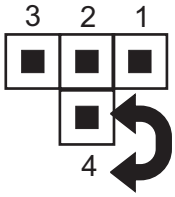
0-20mA, 4-20mA

Place Shorting Link on Pins 2 & 3



0-50mV, 0-200mV, 0-1.25V, 0-5V, 1-5V, 0-10V

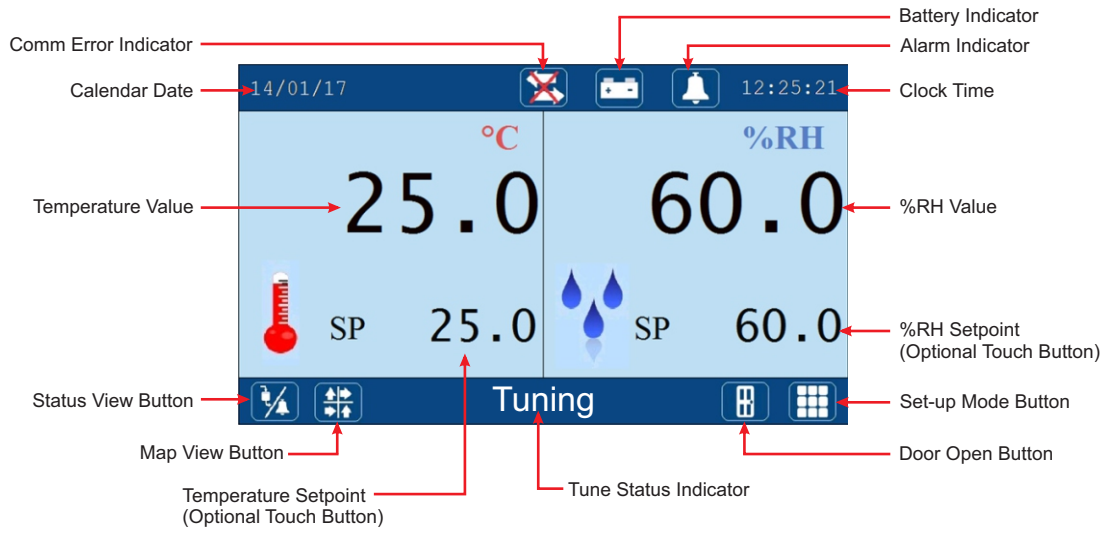
Park Shorting Link



Section 4

BASIC OPERATION & PARAMETER ORGANIZATION

Upon Power up to the HMI, after a few initialization screens, the Main (Home) screen is displayed. This is the screen that shall be used most often and is described below in details.



ALARM INDICATOR

This icon appears if one or more process alarms are active. The Alarm Relay gets activated whenever any alarm becomes active. The user can acknowledge the alarm (de-activate the relay) by touching this icon.

BATTERY INDICATOR

This icon appears if the Mains power has failed and the controller is currently powered through an auxiliary power source like Battery or Inverter.

COMM ERROR INDICATOR

This icon appears if the HMI communication link with the Control Unit, Mapping Unit or GSM Module is broken. Upon touching this icon a message window pops up showing which communication link(s) is broken.

CALENDER DATE & CLOCK TIME

These two fields show the current date (DD/MM/YY) & time (HH:MM:SS, 24 Hours format), respectively.

TEMPERATURE VALUE & %RH VALUE

These two fields show the Temperature & %RH Process Values in 0.1 °C / %RH resolution. In case of errors the field shows OPEN (Sensor Open), OVER (Process Value above Max Range), UNDR (Process Value below Min Range). The Process Values are shown in Black color under normal condition. The Error Messages are shown in Red color.

TEMPERATURE SETPOINT & %RH SETPOINT

These two fields show the Temperature & %RH Set Values (SP) in 0.1 °C / %RH resolution. If enabled, these values can be edited by touching the respective field. Upon touching a Numeric Keypad pops up for setting.

TUNE STATUS INDICATOR

This text appears if the controller is self tuning the temperature and / or %RH control loop.

STATUS VIEW BUTTON

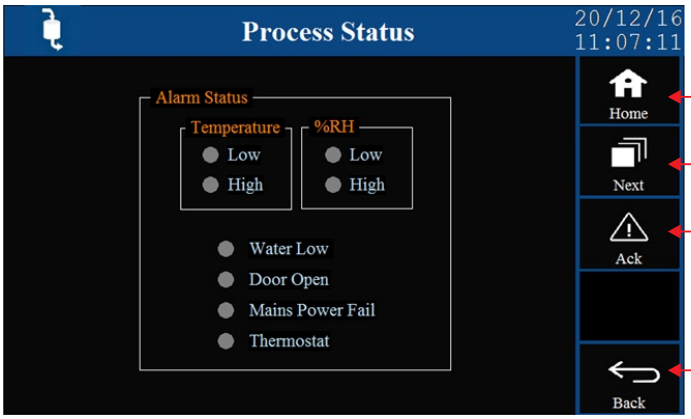
This a touch button that enables navigation through various process status screens. The Screens are shown below.

Process Status Screen

This screen shows various process Alarm status and the information regarding working / failure of various Main and Standby Sensors (Temperature & %RH) & Control Gadgets (Air Heater, Boiler Heater & Compressor). The contents on this screen are dependent on whether Standby Sensors and / or Standby Control Gadgets are installed or not. Accordingly the following four variants of this screen exist:

1. Alarm Only
2. Alarm + Standby Sensor
3. Alarm + Standby Control
4. Alarm + Standby Sensor + Standby Control

Alarm Only



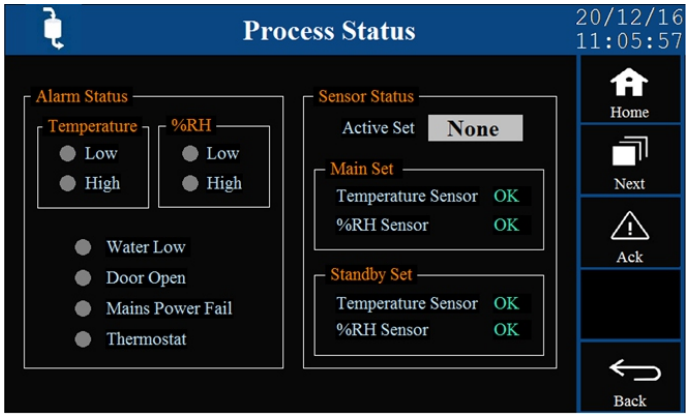
Touch Button to go to Home (Main) Screen

Touch Button to go to Next Screen

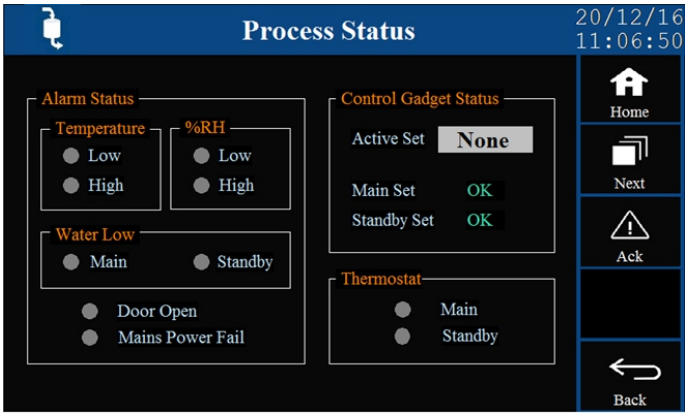
Touch Button to Acknowledge Alarm

Touch Button to go to Previous Screen

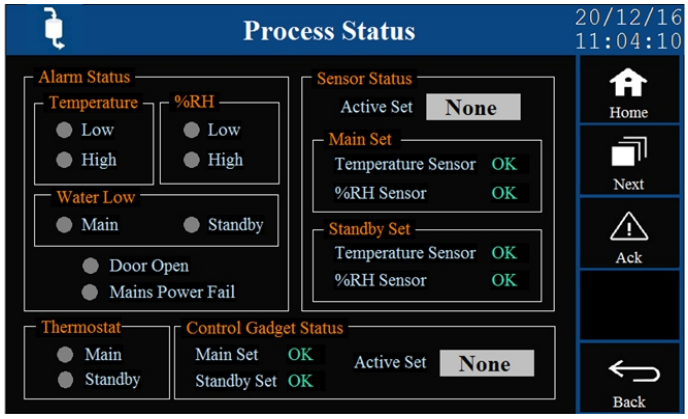
Alarm + Standby Sensor



Alarm + Standby Control



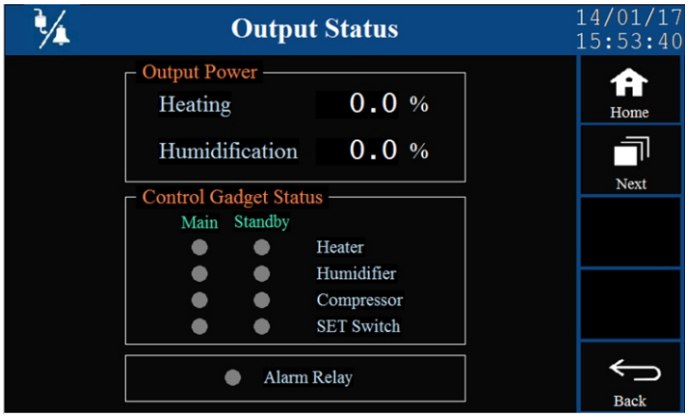
Alarm + Standby Sensor + Standby Control

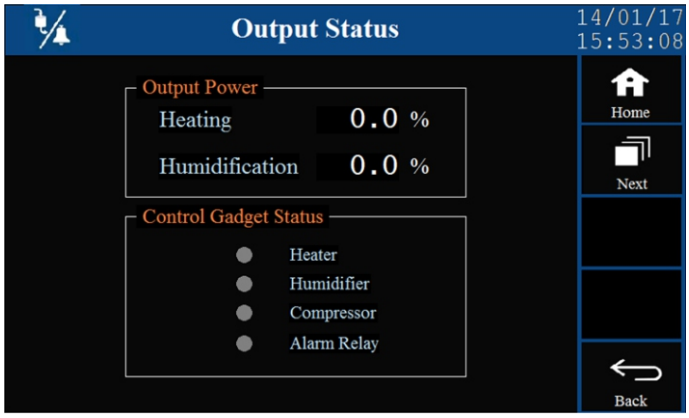


Output Status

This screen shows :

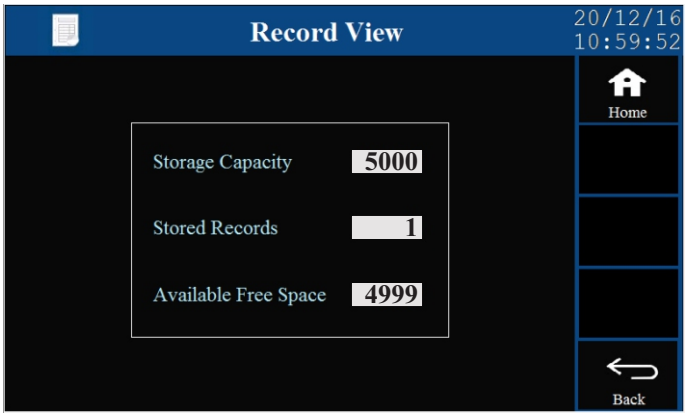
- Heating & Humidification % output power
- On-Off Status for Main & Standby (if installed) Air Heater, Boiler Heater (Humidifier) & Compressor
- Alarm Relay Status





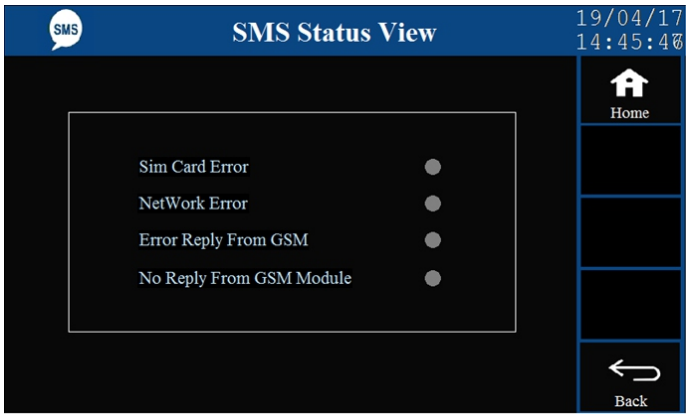
Record Status

This screen shows the total record storage capacity, numbers of current stored records and available free space.



SMS Status

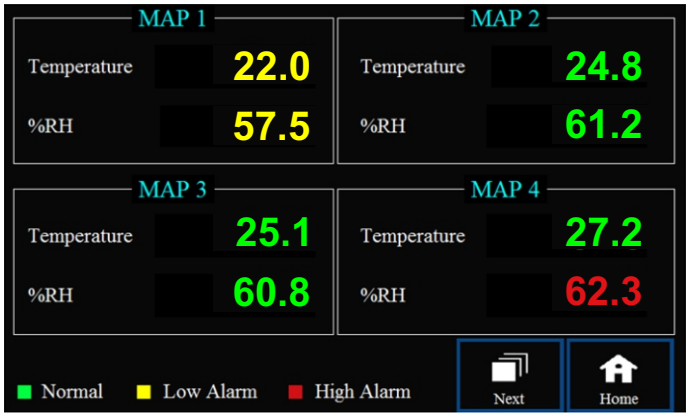
This screen shows the status related to GSM Module (if installed).



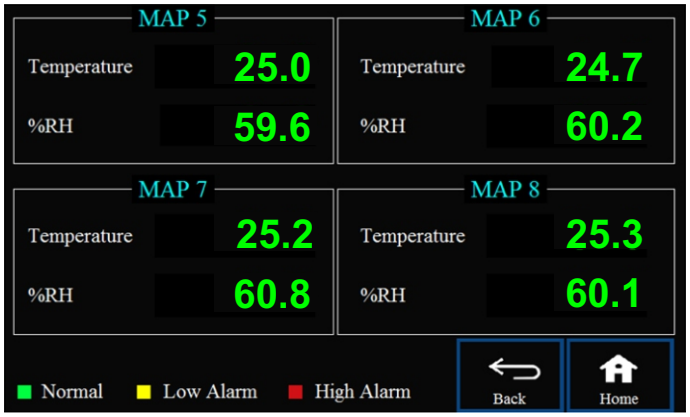
MAP VIEW BUTTON

This is a touch button that opens up screen(s) to view process values for mapping inputs. The installed mapping inputs could be 8 (4 Map Points : 4T + 4RH) or 16 (8 Map Points : 8T + 8RH) and accordingly 1 or 2 screens are displayed. Note that this touch button is not available if no mapping inputs are installed. The Screens are shown below.

Appears for both 8 & 16 Map Inputs

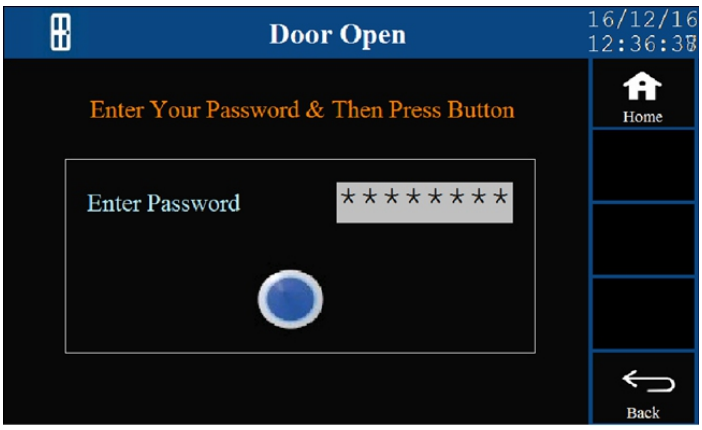


Appears for 16 Map Inputs only



DOOR OPEN BUTTON

If the Humidity cabinet is equipped with Door Lock, this touch button opens a screen that allows password entry for unlocking the cabinet door by authorised person. Also the authorised person's identity is logged for audit purpose.



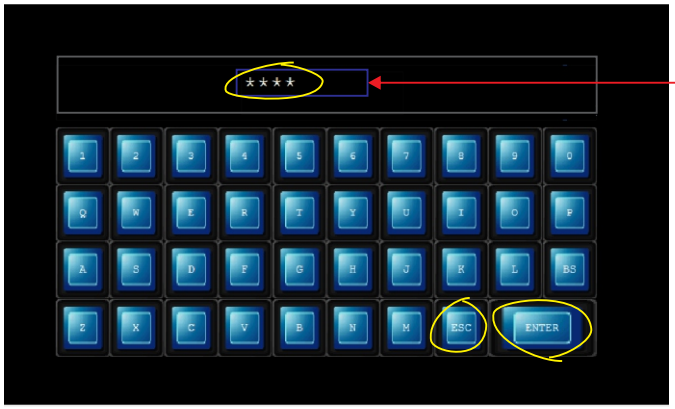
SET-UP MODE BUTTON

This touch button opens a screen that allows access to Operator, Supervisory or Factory Level parameter settings through appropriate **4 character** password entry.

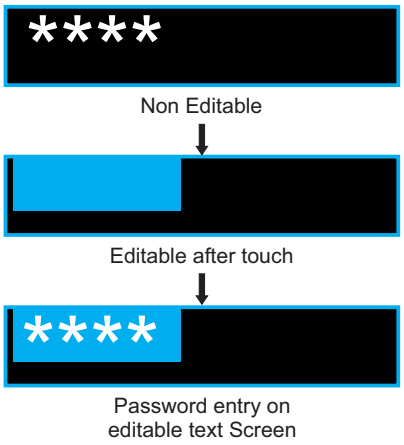
The Factory default passwords are as below :

Access Level	Default Password
Operator	0000
Supervisory	0001
Factory	0002

Upon touching one of the levels, a keyboard for password entry pops-up as shown below.

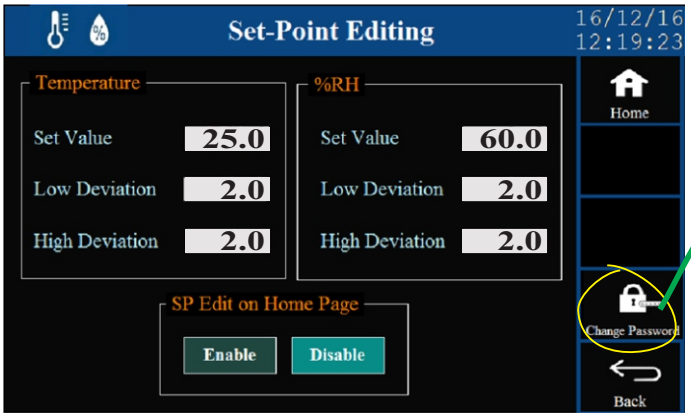


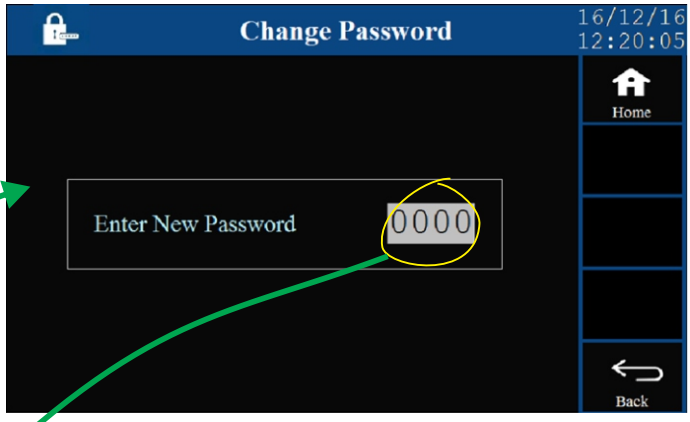
The user must touch the text screen to make it editable. Upon touch the text screen shows a blue band as shown below.



While the screen is editable, type 4 character password & then press ENTER Key. If the password is correct, the parameter setting screen opens up. Use ESC key (in case password is not known) to pop down the key pad.

Once an access level is entered, the user can change the password for that level as shown below as an example for operator level.





Each access level may have sub levels for convenient parameter grouping. The Table 4.1 lists various parameters with levels and sub levels.

Table 4.1

Level	Sub-Level		Parameters
Operator			**Temperature** Set Value Low Deviation Alarm High Deviation Alarm **%RH** Set Value Low Deviation Alarm High Deviation Alarm **SP Edit on Home Screen**
Supervisory	Recording		Recording Interval 'Delete Record' Command
	Clock & Calendar		Calendar Date (DD/MM/YY) Clock Time (HH:MM:SS)
	SMS Alert		GSM Machine ID Reset GSM Module
	Door Lock Access		Lock Position (On / Off) Password Entry
	Standby Switching		'Switch Main / Standby Outputs' 'Switch to Standby Sensors'
	Maintenance		Repair Acknowledge 'Control Gadget' Repair Acknowledge 'Input Sensor'
Factory	Temperature	Input Settings	Input Type, Signal Range Low, Signal Range High, Display Range Low, Display Range High, Zero Offset
		Alarm Settings	Inhibit (Yes / No), Low Alarm Deviation, High Alarm Deviation, Hysteresis
		Control Settings	Heat Zone PID Constants, Cool Zone PID Constants, Output Cycle Time (Sec.), Control SP Setpoint Low Limit, Setpoint High Limit Self Tune
	%RH	Input Settings	Input Type, Signal Range Low, Signal Range High, Display Range Low, Display Range High, Zero Offset
		Alarm Settings	Inhibit (Yes / No), Low Alarm Deviation, High Alarm Deviation, Hysteresis
		Control Settings	Heat Zone PID Constants, Cool Zone PID Constants, Output Cycle Time (Sec.), Control SP Setpoint Low Limit, Setpoint High Limit Self Tune

Level	Sub-Level			Parameters
Factory	Compressor			Mode (ON, OFF, PV Based, SP Based), Boundary SP or Compressor SP, Time Delay, Hysteresis Zone Select (Single, Dual)
	Water Level			**Float** Detection Enable (Yes / No), Low Level Logic (Open / Close) **Thermostat** Detection Enable (Yes / No), Low Level Logic (Open / Close) **Common Boiler** (Yes / No)
	Door Open			Detection Enable (Yes / No), Door Open Logic (Open / Close), Alarm Delay (Sec.)
	Power Fail			Detection Enable (Yes / No), Power Fail Logic (Open / Close)
	Standby	Sensor Inputs		Sensor Fail Detection Limits
		Control Gadgets		Fail Detect Time (Min) Cyclic Time (Hrs.) Inhibit Time (Hrs.)
	Mapping	Configuration		Select Mapping Inputs (4T + 4RH, 8T + 8RH)
		Temperature	Alarm Settings	**Low Alarm** (Common for all Inputs) Set Value, Hysteresis, Inhibit **High Alarm** (Common for all Inputs) Set Value, Hysteresis, Inhibit
			Input Settings	Input Type, Range Low, Range High, Zero Offset
		%RH	Alarm Settings	**Low Alarm** (Common for all Inputs) Set Value, Hysteresis, Inhibit **High Alarm** (Common for all Inputs) Set Value, Hysteresis, Inhibit
			Input Settings	Input Type, Range Low, Range High, Zero Offset

PARAMETER SETTINGS

There are 3 types of parameters; Numeric, String Option and Commands. The setting methods for different types are described below.

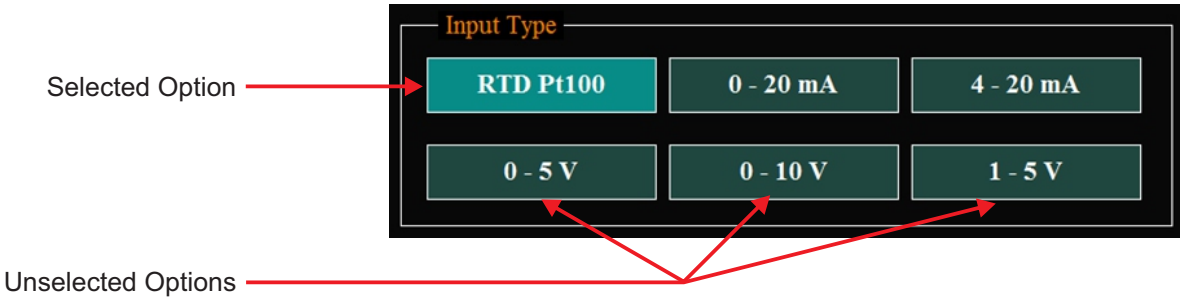
Numeric Parameters

This type of parameter has 2 fields; *Name Field* & *Value Field* as shown in the figure. The value for this type of parameter is set using a Numeric keypad that pops up upon touching the *Value Field* for the parameter. The value can be edited using numeric keys & other functional keys as shown in the figure. Use ENT key for storing the new value or use ESC key to revert without changes. Touching ENT or ESC key, the keypad automatically collapses.

> Note that if the modified value falls outside the Minimum or Maximum limits specified for the parameter value then the parameter retains the old value.

String Option Parameters

This type of parameter has 2 or more fixed options to choose from. All the options are shown in rectangular boxes with appropriate texts as shown in the figure. Only one of the several options can be selected. The selected option box is shown in bright ( ) color, while all other unselected options are shown in dark ( ) color. For selecting the desired option. just touch the box and wait for a while until the color changes from unselected to selected.

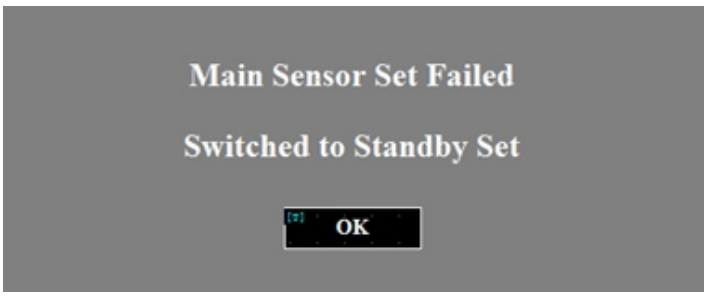


Command Parameters

This type of parameter is used to perform specific actions like Start / Abort tuning, Delete Records, etc. A touch *Push Button* image is provided for issuance of command as shown in the figure. Usually an acknowledgment window with OK button pops up to indicate the action performed. The window collapses upon touching the OK button.

ALARM MESSAGE WINDOWS

For the Alarms related to gadget or sensor failure, door open detection, low water level detection, etc.; message windows are popped up on the Main (Home) Screen showing the cause of alarm and action taken by the controller. The figure below shows, for example, the message screen that pops up when the controller detects Main Sensor Set Failure & changes over to the Standby Set.



Section 5
OPERATOR LEVEL PARAMETERS

Operator

Temperature Set Value

Range : Temperature Setpoint Low Limit to Temperature Setpoint High Limit

Default : 25.0 °C

This is the Setpoint Value for temperature control loop. This value can also be set on home screen if enabled through the parameter *SP Edit on Home Screen*.

Temperature Low Deviation Alarm

Range : 0.2 to 99.9 °C

Default : 2.0 °C

This Parameter sets a Negative Deviation (offset) limit with respect to the '*Temperature Set Value*'. The Alarm is activated if the measured temperature value falls below this limit.

Temperature High Deviation Alarm

Range : 0.2 to 99.9 °C

Default : 2.0 °C

This Parameter sets a Positive Deviation (offset) limit with respect to the '*Temperature Set Value*'. The Alarm is activated if the measured temperature value exceeds this limit.

%RH Set Value

Range : %RH Setpoint Low Limit to %RH Setpoint High Limit

Default : 60.0 %

This is the Setpoint Value for %RH control loop. This value can also be set on home screen if enabled through the parameter *SP Edit on Home Page*.

%RH Low Deviation Alarm

Range : 0.2 to 99.9 %

Default : 2.0 %

This Parameter sets a Negative Deviation (offset) limit with respect to the '*%RH Set Value*'. The Alarm is activated if the measured %RH value falls below this limit.

%RH High Deviation Alarm

Range : 0.2 to 99.9 %

Default : 2.0 %

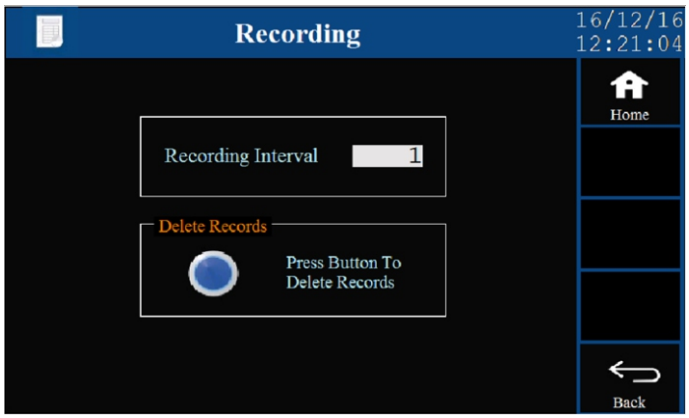
This Parameter sets a Positive Deviation (offset) limit with respect to the '*%RH Set Value*'. The Alarm is activated if the measured %RH value exceeds this limit.

SP Edit on Home Screen

This parameter allows to Enable or Disable the set value editing for both temperature & %RH on Home (Main) Screen. If Enabled, the temperature & %RH set values can be edited by touching the receptive indicated values on the Home Screen.

Section 6

SUPERVISORY LEVEL PARAMETERS



Recording Interval

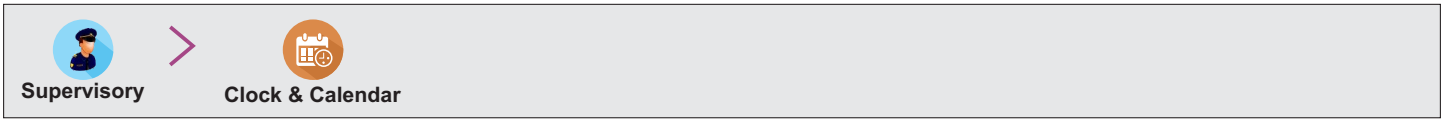
Range : 1 to 250 Minutes

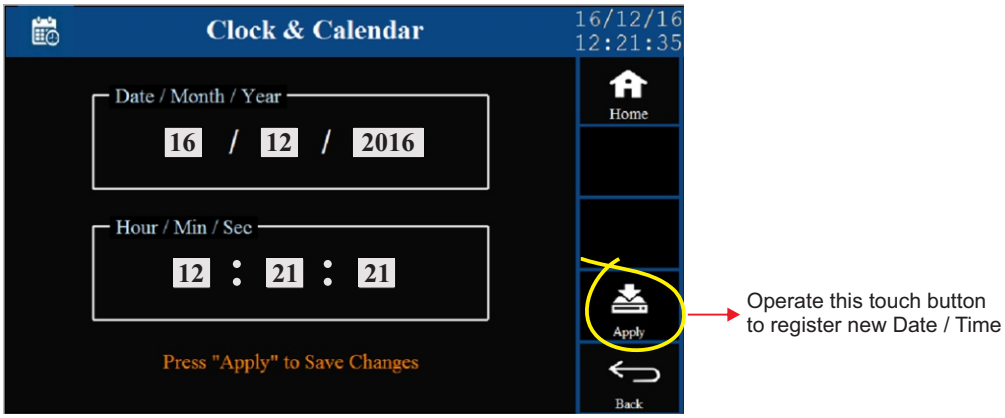
Default : 5 Minutes

The Controller generates and stores periodic records at the interval set by this parameter.

'Delete Record' Command

This command is issued using the touch push button. All the stored records are deleted from the memory.





Calendar Date

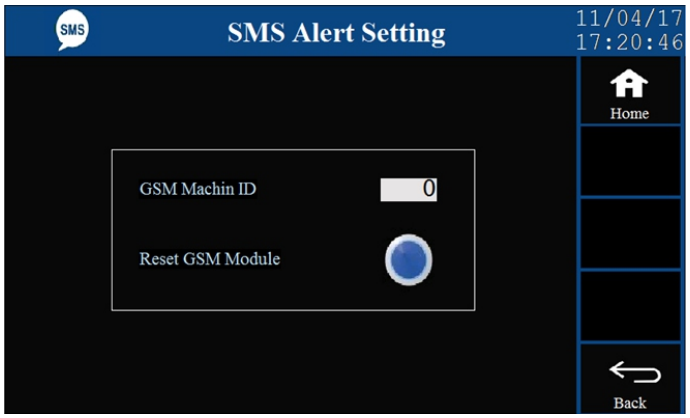
Clock Time

The Calendar Date is set using 3 separate fields; Date (DD), Month (MM) & Year (YY).

The Clock Time is set in 24 Hours format using 3 separate fields; Hours (HH), Minutes (MM) & Seconds (SS).

It is a must to operate the 'Apply' touch button in order to register the modified values.

Supervisory > SMS Alert (Available only if the controller is supplied with GSM Module Version)



GSM Machine ID

Range : 1 to 128

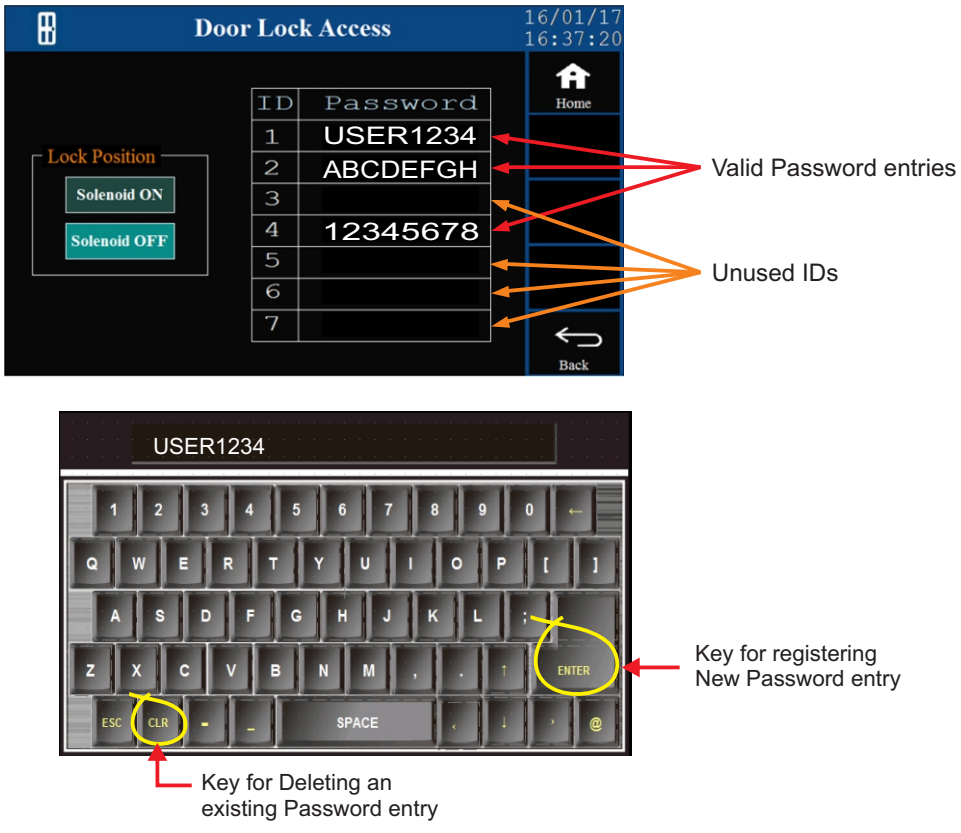
Default : 1

This parameter can be used to assigned a unique ID to the machine (chamber) to identify the source of SMS alert.

'Reset GSM Module'

Use this touch button if for any reason the GSM module fails to send SMS alerts.

Supervisory > Door Lock Access



Lock Position

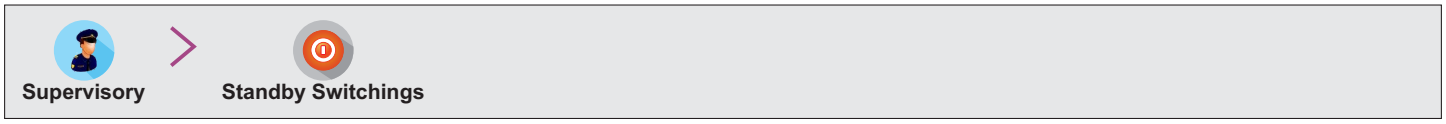
Options : Solenoid ON, Solenoid OFF

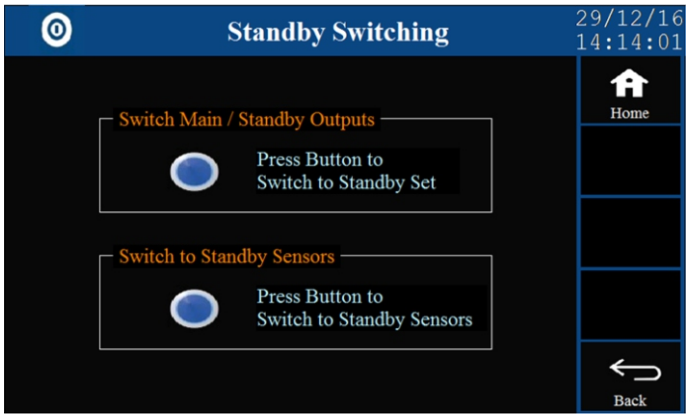
Default : Solenoid OFF

Set this parameter to 'Solenoid ON', if the chamber door is locked when the solenoid is turned ON (energized). Set this parameter to 'Solenoid OFF', if the chamber door is locked when the solenoid is turned OFF (de-energized).

Password Entry

The Supervisor can Authorize up to 7 Persons by assigning them their respective **8 Character Alpha-Numeric Password**. A table with 2 columns (ID & PASSWORD) is provided for password entries. The ID numbers are fixed from 1 to 7 and correspond to the **Name Entries** made in the PC Software (HumiLog). The Password against each ID can be entered / edited / deleted by touching the table cell provided for the ID. Upon touching the cell, an alpha numeric keypad pops up. Use alpha numeric keys to assign a new password (or edit the existing password) and then press ENTER key. To delete an exiting password use CLR key and then press ENTER key. The passwords can be entered / deleted in any order of ID. The password fields for unused Ids must be cleared (empty).



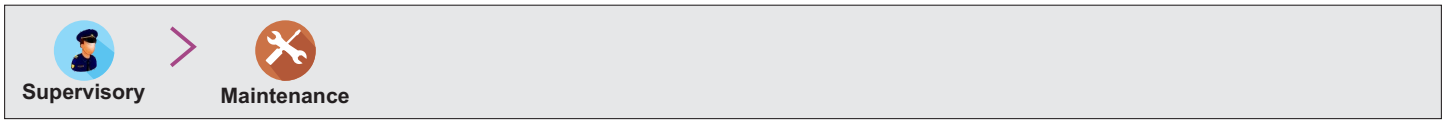


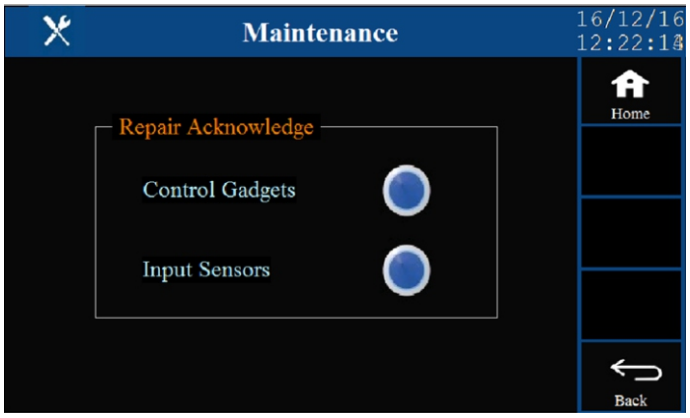
Switch Main / Standby Outputs

If the controller is installed with standby control gadget set, the user can manually switch between the Main and the Standby set by using the touch push button. The switching is permitted / performed only if both sets are working.

Switch to Standby Sensors

If the controller is installed with Standby Sensor set, the user can manual switch to the Standby set if he detects failure of either temperature or RH sensor from Main set. The switching is permitted / performed only if the Standby Sensor set is working.

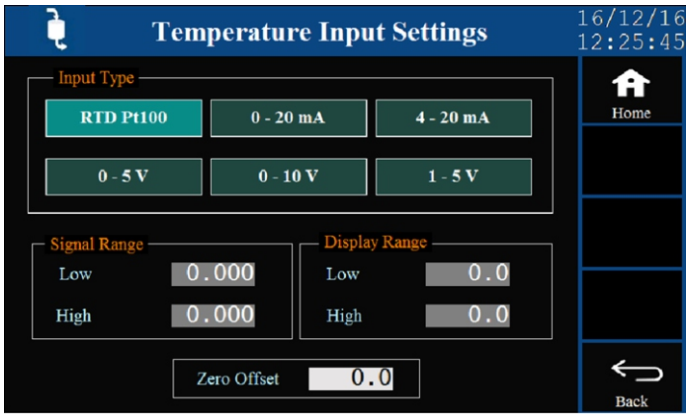




Repair Acknowledge

In case the control system is installed with standby set of sensors and / or control gadgets, the controller automatically switches to the Standby set should any of the sensors / control gadgets of the Main set fail. After fixing the fault / failure, the user must acknowledge the same to the controller for resuming the operation with the main set. The following touch buttons are provided for the purpose depending on the standby installation.

Section 7
FACTORY LEVEL PARAMETERS



Input Type

Options : RTD Pt100, 0 to 20 mA, 4 to 20 mA, 0 to 5 V, 0 to 10 V, 1 to 5 V

Default : RTD Pt100

Select Input type in accordance with the type of Temperature sensor / transmitter connected for measurement.

Signal Range Low

(Available for DC Linear Volts & mA Inputs only)

Input Type	Settings	Default
0 to 20 mA	0.00 to Signal High	0.00
4 to 20 mA	4.00 to Signal High	4.00
0 to 5 V	0.000 to Signal High	0.000
0 to 10 V	0.00 to Signal High	0.00
1 to 5 V	1.000 to Signal High	1.000

This parameter is the transmitter output signal value that corresponds to the Range Low process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Signal Range High

(Available for DC Linear Volts & mA Inputs only)

Input Type	Settings	Default
0 to 20 mA	Signal Low to 20.00	20.00
4 to 20 mA	Signal Low to 20.00	20.00
0 to 5 V	Signal Low to 5.000	5.000
0 to 10 V	Signal Low to 10.00	10.00
1 to 5 V	Signal Low to 5.000	5.000

This parameter is the transmitter output signal value that corresponds to the Range High process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Display Range Low

(Available for DC Linear Volts & mA Inputs only)

Range : -199.9 to Range High

Default : 0.0

This parameter is the Process Value that corresponds to the Signal Low value from the transmitter. Refer *Appendix-A : DC Linear Signal Interface* for details.

Display Range High

(Available for DC Linear Volts & mA Inputs only)

Range : Range Low to 999.9

Default : 100.0

This parameter is the Process Value that corresponds to the Signal High value from the transmitter. Refer *Appendix-A : DC Linear Signal Interface* for details.

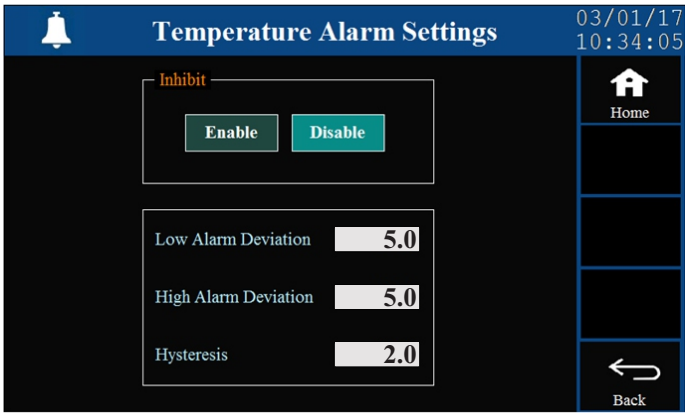
Zero offset

Range : -50.0 to 50.0 °C

Default : 0.0 °C

This value is algebraically added to the measured Temperature Value to derive the final Value that is displayed and compared for alarm / control. Use this value to nullify any known constant error.

Final Value = Measured Value + Offset



Inhibit

Options : Enable, Disable

Default : Enable

If this parameter is set to 'Enable', the Alarm activation is suppressed until the Temperature value is within Alarm limits from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions.

If this parameter is set to 'Disable', the Alarm is not suppressed during the start-up Alarm conditions.

Low Alarm Deviation

Range : 0.2 to 99.9 °C

Default : 2.0 °C

This parameter sets the maximum permissible process value deviation **below** the temperature setpoint. If the temperature exceeds this deviation, the alarm is activated.

High Alarm Deviation

Range : 0.2 to 99.9 °C

Default : 2.0 °C

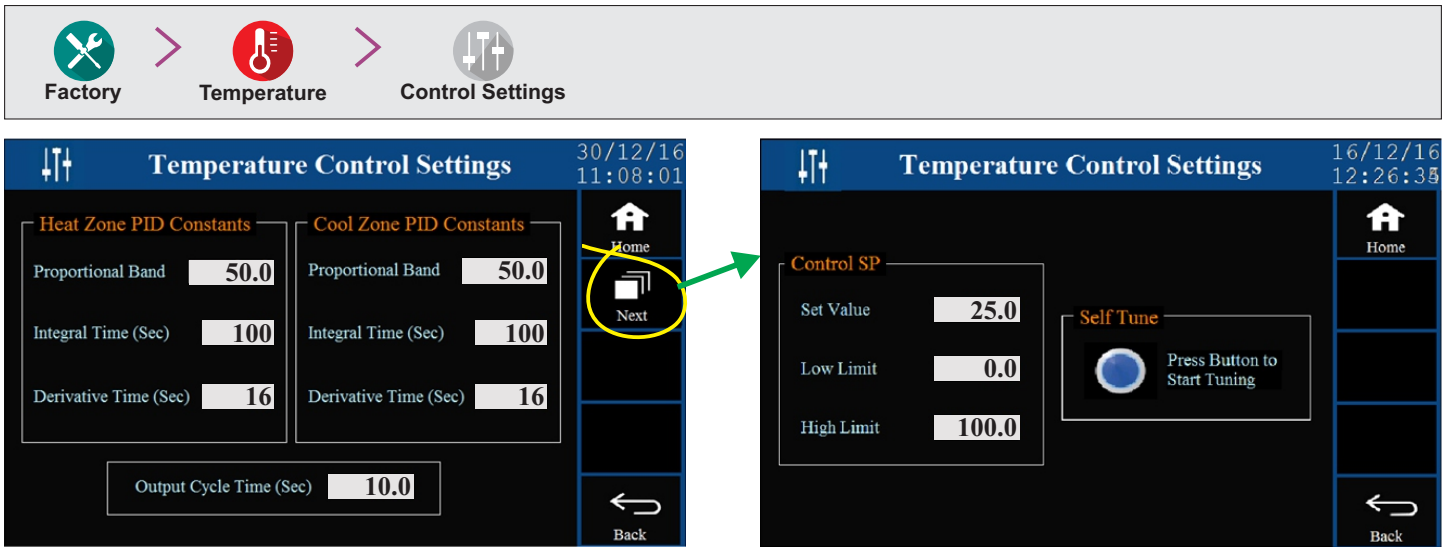
This parameter sets the maximum permissible process value deviation **above** the temperature setpoint. If the temperature exceeds this deviation, the alarm is activated.

Hysteresis

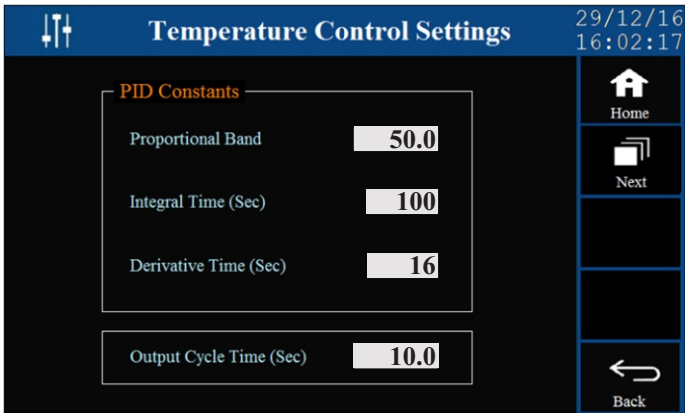
Range : 0.1 to 99.9

Default : 0.2

This parameter sets a differential (dead) band between the ON and OFF Temperature Deviation Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.



The control settings for temperature comprises of two screens shown above. Also the first screen parameters change depending on the selection for the parameter 'Zone Select' (Single or Dual) provided on the screen "Compressor Settings". The Cool Zone and Heat Zone are described in details in **Appendix-B : Compressor Switching Strategies**. The screen for parameters for Dual Zone is shown above and that for Single Zone is shown below.



*The **Dual Zone** PID Constants are described below.*

Heat Zone Proportional Band
Range : 0.1 to 999.9 °C
Default : 50.0 °C
Sets proportional gain for Heat Pre-dominant zone.

Heat Zone Integral Time
Range : 0 to 3600 Sec.
Default : 100 Sec.
Sets integral time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off integral action.

Heat Zone Derivative Time
Range : 0 to 600 Sec.
Default : 16 Sec.
Sets derivative time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off derivative action.

Cool Zone Proportional Band
Range : 0.1 to 999.9 °C
Default : 50.0 °C
Sets proportional gain for Cool Pre-dominant zone.

Cool Zone Integral Time
Range : 0 to 3600 Sec.
Default : 100 Sec.
Sets integral time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off integral action.

Cool Zone Derivative Time
Range : 0 to 600 Sec.
Default : 16 Sec.
Sets derivative time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off derivative action.

*The **Single Zone** PID Constants are described below.*

Proportional Band
Range : 0.1 to 999.9 °C
Default : 50.0 °C
Sets proportional gain.

Integral Time
Range : 0 to 3600 Sec.
Default : 100 Sec.
Sets integral time constant in Seconds. Setting the value to 0, cuts-off integral action.

Derivative Time
Range : 0 to 600 Sec.
Default : 16 Sec.
Sets derivative time constant in Seconds. Setting the value to 0, cuts-off derivative action.

*The parameters below are applicable to both **Single Zone** & **Dual Zone**.*

Output Cycle Time (Sec.)
Range : 0.5 to 100.0 Sec.
Default : 10.0 Sec.
Sets the total 'On + Off' time in seconds for time proportional power output for Air Heater through Relay / SSR.

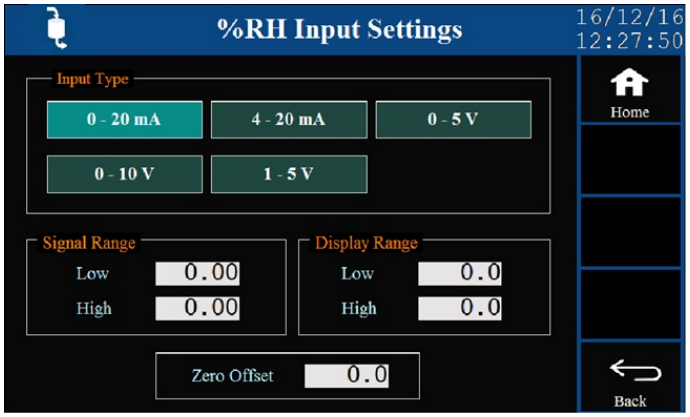
Set Value (Temperature Control Loop)
Range : Temperature Setpoint Low Limit to Temperature Setpoint High Limit
Default : 25.0
Sets Value for Temperature Control.

Low Limit (for Temperature Control Set Value)
Range : -199.9 to Temperature Setpoint High Limit
Default : 10.0
Minimum permissible setpoint value for Temperature control.

High Limit (for Temperature Control Set Value)
Range : For RTD : Temperature Setpoint Low Limit to 600.0
For mA/V : Temperature Setpoint Low Limit to 999.9
Default : 60.0
Maximum permissible setpoint value for Temperature control.

Self Tune
This parameter is a command to Start or Abort Self Tuning for automatic computation of PID constants. The command starts or aborts self tuning for both temperature & %RH simultaneously. For Dual Zone setting, the controller needs to be tuned separately for Heat prominent & Cool Prominent zones.

Pressing the touch push button initiates tuning if the controller is already not tuning. However, if the controller is tuning, pressing the touch button causes the controller to abort tuning.



Input Type

Options : 0 to 20 mA, 4 to 20 mA, 0 to 5 V, 0 to 10 V, 1 to 5 V

Default : 0 to 5 V

Select Input type in accordance with the type of %RH sensor / transmitter connected for measurement.

Signal Range Low

Input Type	Settings	Default
0 to 20 mA	0.00 to Signal High	0.00
4 to 20 mA	4.00 to Signal High	4.00
0 to 5 V	0.000 to Signal High	0.000
0 to 10 V	0.00 to Signal High	0.00
1 to 5 V	1.000 to Signal High	1.000

This parameter is the transmitter output signal value that corresponds to the Range Low process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Signal Range High

Input Type	Settings	Default
0 to 20 mA	Signal Low to 20.00	20.00
4 to 20 mA	Signal Low to 20.00	20.00
0 to 5 V	Signal Low to 5.000	5.000
0 to 10 V	Signal Low to 10.00	10.00
1 to 5 V	Signal Low to 5.000	5.000

This parameter is the transmitter output signal value that corresponds to the Range High process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Display Range Low

Range : -199.9 to Range High

Default : 0.0

This parameter is the Process Value that corresponds to the Signal Low value from the transmitter. Refer *Appendix-A : DC Linear Signal Interface* for details.

Display Range High

Range : Range Low to 999.9

Default : 100.0

This parameter is the Process Value that corresponds to the Signal High value from the transmitter. Refer *Appendix-A : DC Linear Signal Interface* for details.

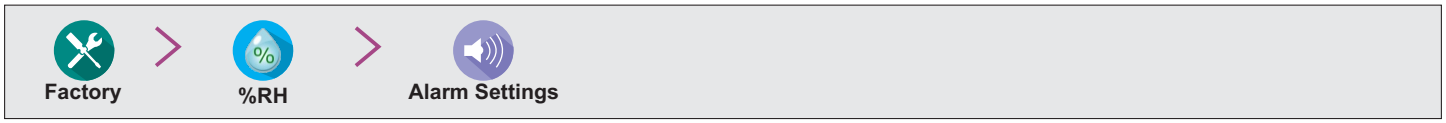
Zero offset

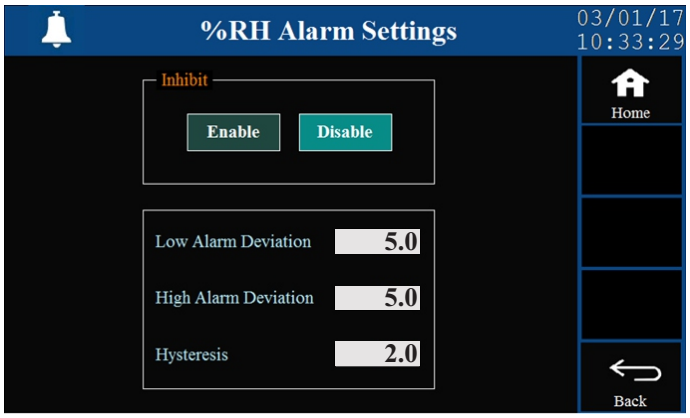
Range : -50.0 to 50.0 %

Default : 0.0 %

This value is algebraically added to the measured %RH Value to derive the final Value that is displayed and compared for alarm / control. Use this value to nullify any known constant error.

Final Value = Measured Value + Offset





Inhibit

Options : Enable, Disable

Default : Enable

If this parameter is set to 'Enable', the Alarm activation is suppressed until the %RH value is within Alarm limits from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions.

If this parameter is set to 'Disable', the Alarm is not suppressed during the start-up Alarm conditions.

Low Alarm Deviation

Range : 0.2 to 99.9 %

Default : 2.0 %

This parameter sets the maximum permissible process value deviation **below** the %RH setpoint. If the %RH exceeds this deviation, the alarm is activated.

High Alarm Deviation

Range : 0.2 to 99.9 %

Default : 2.0 %

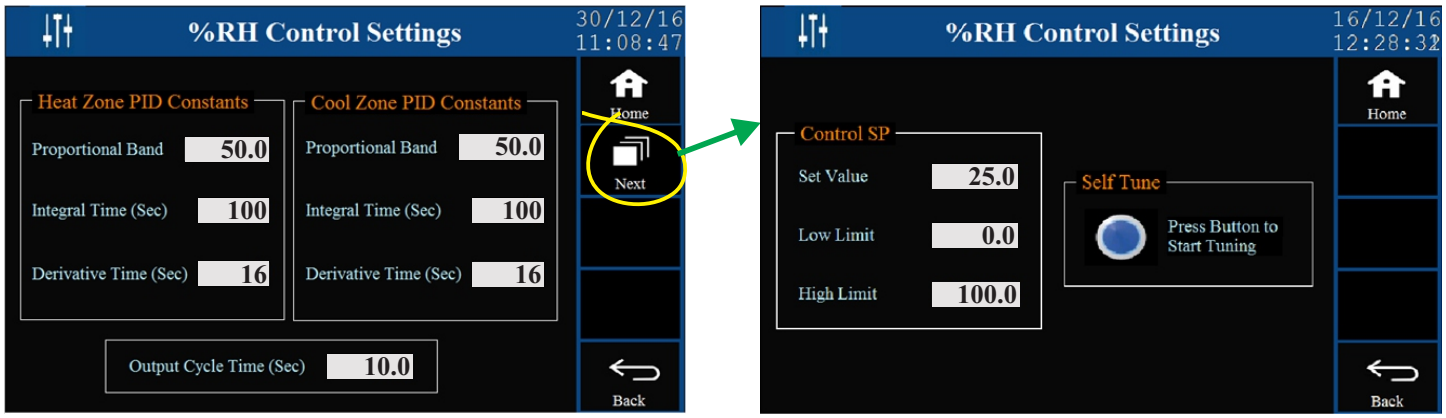
This parameter sets the maximum permissible process value deviation **above** the %RH setpoint. If the %RH exceeds this deviation, the alarm is activated.

Hysteresis

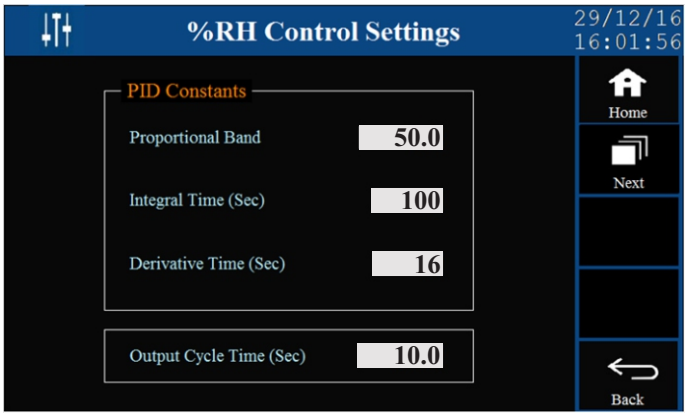
Range : 0.1 to 99.9

Default : 0.2

This parameter sets a differential (dead) band between the ON and OFF %RH Deviation Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.



The control settings for %RH comprises of two screens shown above. Also the first screen parameters change depending on the selection for the parameter 'Zone Select' (Single or Dual) provided on the screen "Compressor Settings". The Cool Zone and Heat Zone are described in details in **Appendix-B : Compressor Switching Strategies**. The screen for parameters for Dual Zone is shown above and that for Single Zone is shown below.



*The **Dual Zone** PID Constants are described below.*

Heat Zone Proportional Band
Range : 0.1 to 999.9 %RH
Default : 50.0 %RH
Sets proportional gain for Heat Pre-dominant zone.

Heat Zone Integral Time
Range : 0 to 3600 Sec.
Default : 100 Sec.
Sets integral time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off integral action.

Heat Zone Derivative Time
Range : 0 to 600 Sec.
Default : 16 Sec.
Sets derivative time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off derivative action.

Cool Zone Proportional Band
Range : 0.1 to 999.9 %RH
Default : 50.0 %RH
Sets proportional gain for Cool Pre-dominant zone.

Cool Zone Integral Time
Range : 0 to 3600 Sec.
Default : 100 Sec.
Sets integral time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off integral action.

Cool Zone Derivative Time
Range : 0 to 600 Sec.
Default : 16 Sec.
Sets derivative time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off derivative action.

*The **Single Zone** PID Constants are described below.*

Proportional Band
Range : 0.1 to 999.9 %RH
Default : 50.0 %RH
Sets proportional gain.

Integral Time
Range : 0 to 3600 Sec.
Default : 100 Sec.
Sets integral time constant in Seconds. Setting the value to 0, cuts-off integral action.

Derivative Time
Range : 0 to 600 Sec.
Default : 16 Sec.
Sets derivative time constant in Seconds. Setting the value to 0, cuts-off derivative action.

*The parameters below are applicable to both **Single Zone** & **Dual Zone**.*

Output Cycle Time (Sec.)
Range : 0.5 to 100.0 Sec.
Default : 10.0 Sec.
Sets the total 'On + Off' time in seconds for time proportional power output for Air Heater through Relay / SSR.

Set Value (%RH Control Loop)
Range : %RH Setpoint Low Limit to %RH Setpoint High Limit
Default : 25.0
Sets Value for %RH Control.

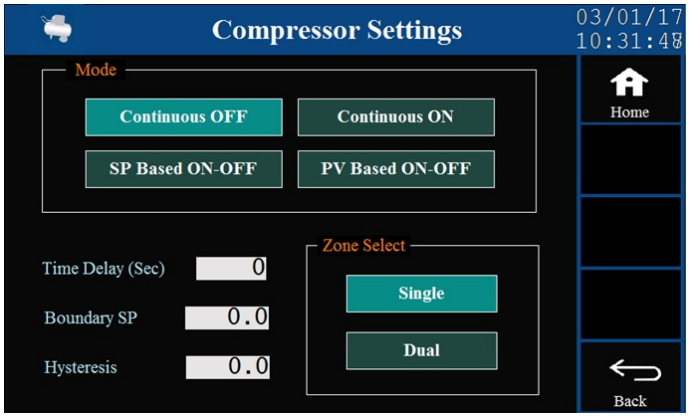
Low Limit (for %RH Control Set Value)
Range : 0.0 to %RH Setpoint High Limit
Default : 0.0
Minimum permissible setpoint value for %RH control.

High Limit (for %RH Control Set Value)
Range : %RH Setpoint Low Limit to 100.0
Default : 100.0
Maximum permissible setpoint value for %RH control.

Self Tune
This parameter is a command to Start or Abort Self Tuning for automatic computation of PID constants. The command starts or aborts self tuning for both %RH & temperature simultaneously. For Dual Zone setting, the controller needs to be tuned separately for Heat prominent & Cool Prominent zones.

Pressing the touch push button initiates tuning if the controller is already not tuning. However, if the controller is tuning, pressing the touch button causes the controller to abort tuning.

Factory > Compressor



*For detailed description and functioning of the parameters related to compressor operation, refer **Appendix-B : Compressor Switching Strategies**.*

Mode
Options : Continuous OFF, Continuous ON, SP Based ON-OFF, PV Based ON-OFF
Default : Continuous OFF

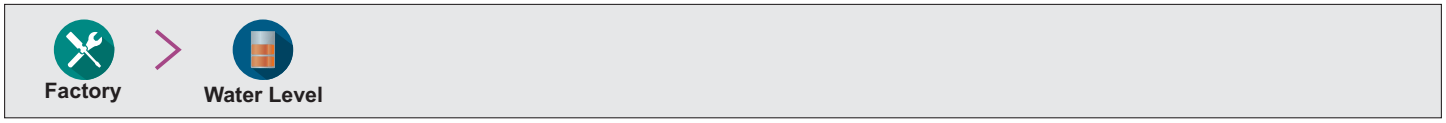
Compressor SP
Range : 0.0 to 100.0
Default : 45.0

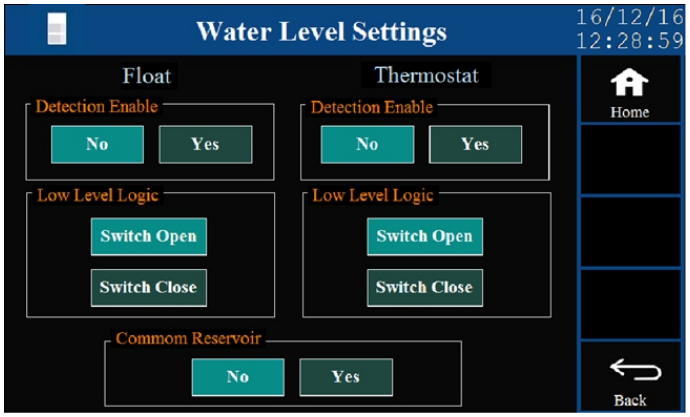
Boundary SP
Range : 0.0 to 100.0
Default : 45.0

Time Delay
Range : 0 to 1000 Sec.
Default : 200 Sec.

Hysteresis
Range : 0.1 to 99.9 °C
Default : 2.0 °C

Zone Select
Options : Single, Dual
Default : Single





Float Detection Enable

Options : No, Yes

Default : No

Set to 'Yes' if Float Switch is mounted for detecting Low water level.

Float Low Level Logic

Options : Switch Open, Switch Close

Default : Switch Close

If set to 'Switch Close', the water level is considered Low if the switch is CLOSE. If set to 'Switch Open', the water level is considered Low if the switch is OPEN.

Thermostat Detection Enable

Options : No, Yes

Default : No

Set to 'Yes' if Thermostat is mounted for detecting Low water level.

Thermostat Low Level Logic

Options : Switch Open, Switch Close

Default : Switch Close

If set to 'Switch Close', the water level is considered Low if the thermostat contacts are CLOSE. If set to 'Switch Open', the water level is considered Low if the thermostat contacts are OPEN.

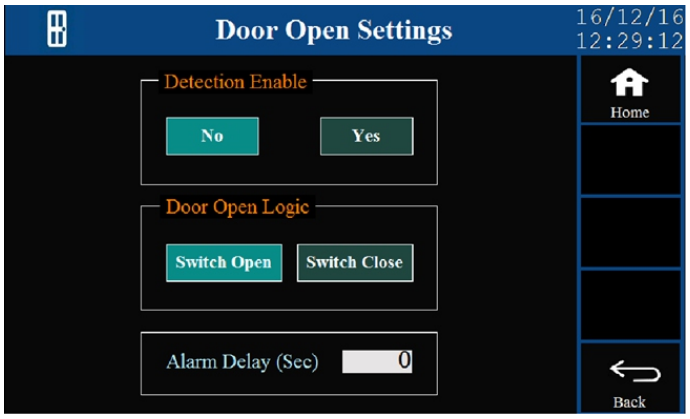
Common Boiler

Options : No, Yes

Default : No

This parameter is shown on the screen only if Standby Control Gadget option is enabled / installed. Set this parameter to 'Yes' if both, Main and Standby, heaters are mounted in a single steam generating boiler. In this case, only a single pair of Float Switch & Thermostat is used and connected to Main Digital Inputs.

Factory > Door Open



Detection Enable

Options : No, Yes

Default : No

Set to 'Yes' if Door Open detection switch is mounted.

Door Open Logic

Options : Switch Open, Switch Close

Default : Switch Close

If this parameter is set to 'Switch Close', the door is detected as *Open* if the switch is CLOSE. If this parameter is set to 'Switch Open', the door is detected as *Open* if the switch is OPEN.

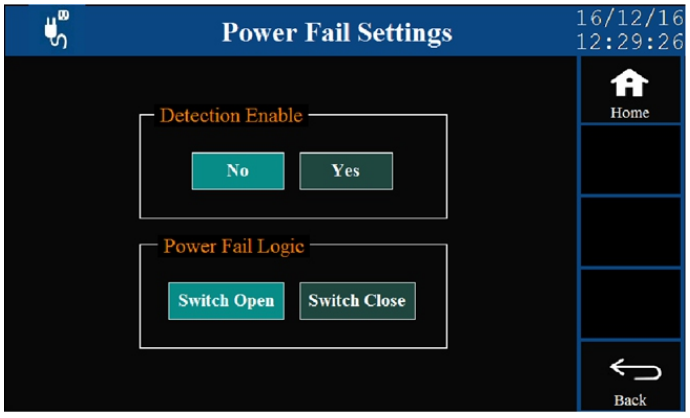
Alarm Delay (Sec.)

Range : 0 to 1000 Sec.

Default : 60 Sec.

This parameter sets a timer. From the time the door is opened, the timer begins counting down. If the door is not closed before the timer reaches 0, the *Door Open* alarm is activated.

Factory > Power Fail



Detection Enable

Options : No, Yes

Default : No

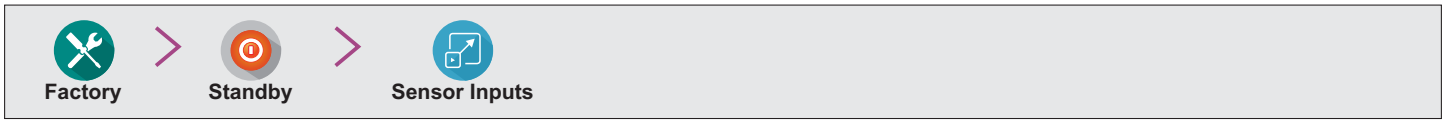
Set to 'Yes' if provision is made for running the controller on an auxiliary power sources like battery or inverter and a Switch is mounted for detecting main power source failure.

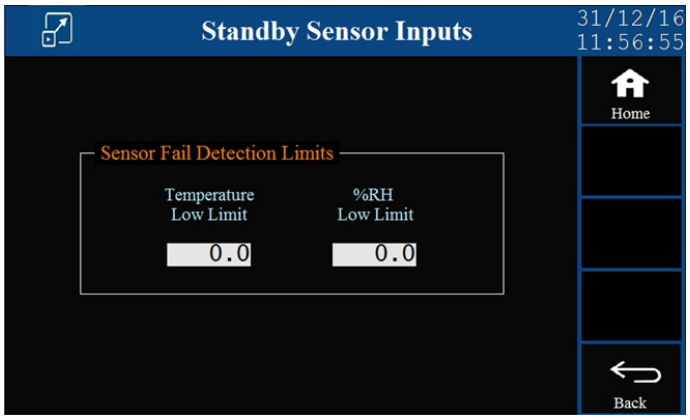
Power Fail Logic

Options : Switch Open, Switch Close

Default : Switch Close

If set to 'Switch Close', the CLOSE switch position indicates that the Mains Power has failed and the Controller is operating on auxiliary power source. If set to 'Switch Open', the OPEN switch position indicates that the Mains Power has failed and the Controller is operating on auxiliary power source.





These parameters are particularly useful when sensors with DC Volts / Current Outputs are used for measuring temperature and / or %RH.

Temperature Low Limit for Sensor Fail Detection

Range : 0 to 25.0 °C

Default : 0 °C

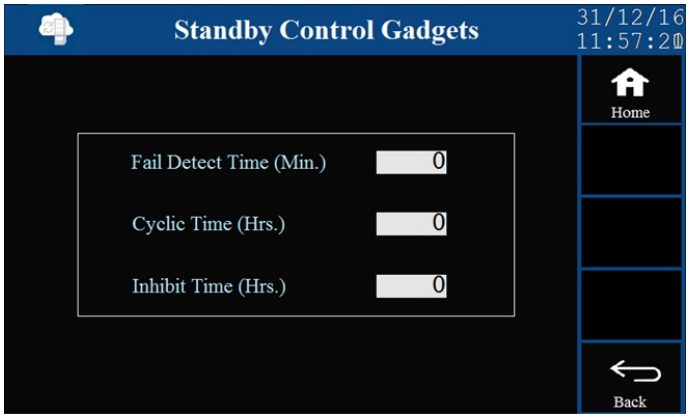
This parameter should be set to a value below which the temperature is not likely to fail under normal conditions. In case of sensor open / fail, the output signal will generally fall to minimum level corresponding to Low Process Value. This condition is detected as sensor fail & the controller switches to alternate set of sensors.

%RH Low Limit for Sensor Fail Detection

Range : 0 to 60.0 %

Default : 0 %

Description is same as for "Temperature Low Limit for Sensor Fail Detection".



Fail Detect Time (Min)

Range : 0 to 250 Min.

Default : 10 Min

This parameter sets a timer. If either temperature or %RH process value exceeds “High Alarm Deviation” limit, the timer starts counting down. If the process value does not return below the “High Alarm Deviation” limit before the timer reaches 0, the working control gadget set is detected as failed. The controller then switches to the alternate control gadget set.

Cyclic Time (Hrs.)

Range : 0 to 500 Hrs.

Default : 48 Hrs.

If both, Main & Standby, control gadget sets are in working condition, the controller keeps switching between these two sets periodically with a time interval set by this parameter value.

Inhibit Time (Hrs.)

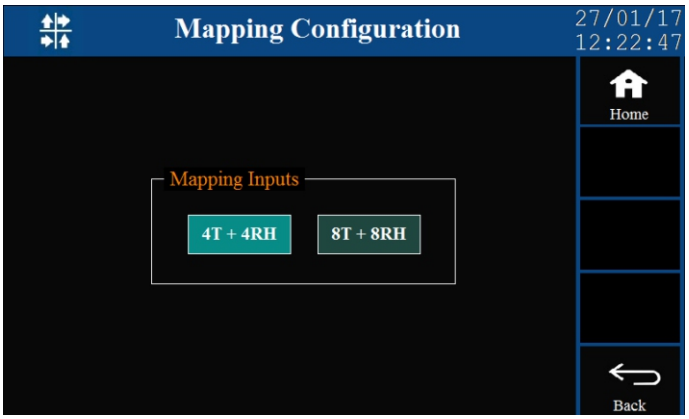
Range : 0 to 250 Hrs.

Default : 1 Hrs.

This parameter sets a time interval for which the controller stops monitoring the control gadget fail detection condition (described under parameter “Fail Detect Time”). This time interval is usually applied under following conditions.

1. System is powered (Start Up)
2. Change-over from Auxiliary Power source (Battery / Inverter) to Mains Power
3. After recovery from Door Open Alarm
4. Change-over from Main to Standby Control gadget Set or vice-a-versa

This feature suppresses false detection of control gadget failure.

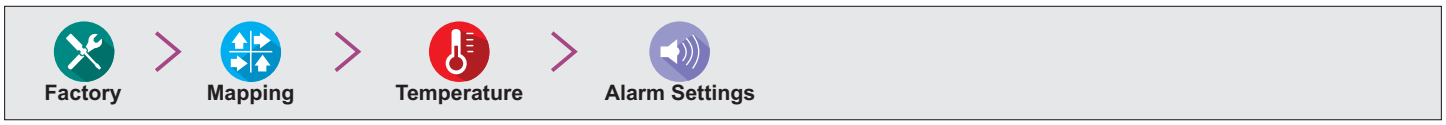


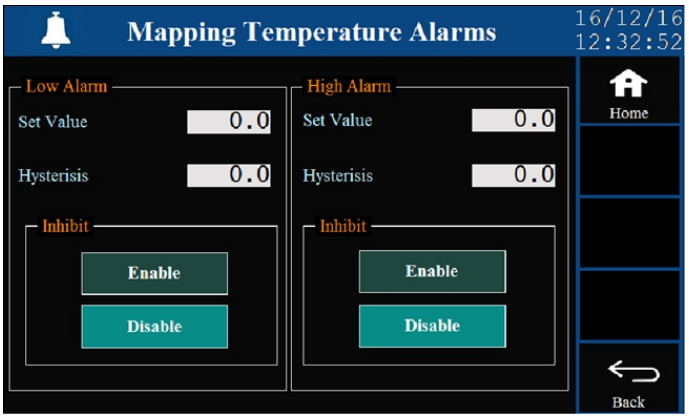
Select Mapping Inputs

Options : 4T + 4RH, 8T + 8RH

Default : 4T + 4RH

Select this parameter depending upon whether 8 input (4 Temperature + 4 %RH) or 16 input (8 Temperature + 8 %RH) unit is installed for mapping.





Low Alarm Set Value

Range : -199.9 to 600.0 °C

Default : 0 °C

This parameter sets a **common** Temperature value limit **below** which an alarm is generated.

Low Alarm Hysteresis

Range : 0.1 to 50.0 °C

Default : 2.0 °C

This parameter sets a differential (dead) band between the ON and OFF Low Temperature Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.

Low Alarm Inhibit

Options : Enable, Disable

Default : Disable

If this parameter is set to 'Enable', the Alarm activation is suppressed until the Temperature value is above the Low Alarm Set Value from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions.

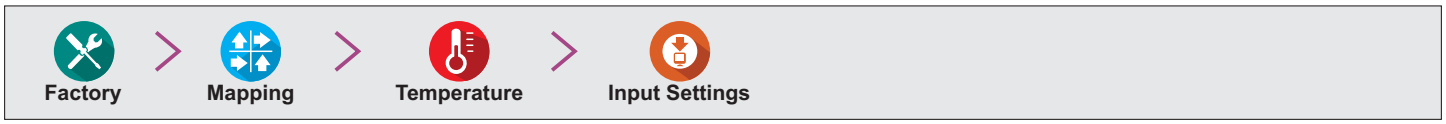
If this parameter is set to 'Disable', the Alarm is not suppressed during the start-up Alarm conditions.

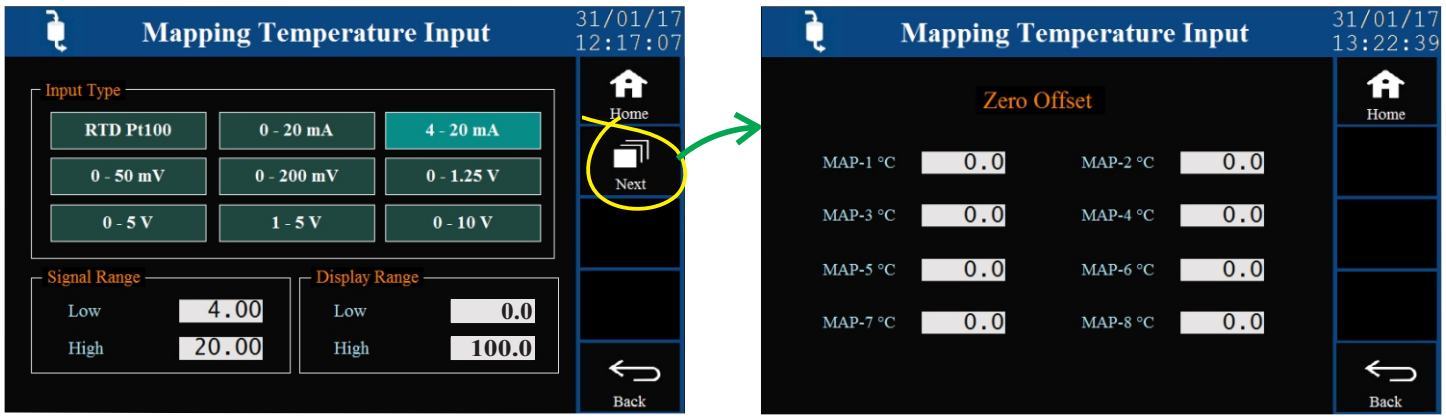
High Alarm Set Value
Range : -199.9 to 600.0 °C
Default : 0 °C
This parameter sets a **common** Temperature value limit **above** which an alarm is generated.

High Alarm Hysteresis
Range : 0.1 to 50.0 °C
Default : 2.0 °C
This parameter sets a differential (dead) band between the ON and OFF High Temperature Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.

High Alarm Inhibit
Options : Enable, Disable
Default : Disable
If this parameter is set to 'Enable', the Alarm activation is suppressed until the Temperature value is below the High Alarm Set Value from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions.

If this parameter is set to 'Disable', the Alarm is not suppressed during the start-up Alarm conditions.





All the parameter settings, except Zero Offset, on this screen are Common for all Temperature Inputs.

Input Type
Options : RTD Pt100, 0 to 20 mA, 4 to 20 mA, 0 to 50 mV, 0 to 200 mV, 0 to 1.25 V, 0 to 5 V, 1 to 5 V, 0 to 10 V
Default : RTD Pt100
Select Input type in accordance with the type of Temperature sensor / transmitter connected for measurement.

Signal Range Low
(Available for DC Linear Volts & mA Inputs only)

Input Type	Settings	Default
0 to 20 mA	0.00 to Signal High	0.00
4 to 20 mA	4.00 to Signal High	4.00
0 to 50 mV	0.00 to Signal High	0.00
0 to 200 mV	0.0 to Signal High	0.0
0 to 1.25 V	0.000 to Signal High	0.000
0 to 5 V	0.000 to Signal High	0.000
1 to 5 V	1.000 to Signal High	1.000
0 to 10 V	0.00 to Signal High	0.00

This parameter is the transmitter output signal value that corresponds to the Range Low process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Signal Range High

(Available for DC Linear Volts & mA Inputs only)

Input Type	Settings	Default
0 to 20 mA	Signal Low to 20.00	20.00
4 to 20 mA	Signal Low to 20.00	20.00
0 to 50 mV	Signal Low to 50.00	50.00
0 to 200 mV	Signal Low to 200.0	200.0
0 to 1.25 V	Signal Low to 1.250	1.250
0 to 5 V	Signal Low to 5.000	5.000
1 to 5 V	Signal Low to 5.000	5.000
0 to 10 V	Signal Low to 10.00	10.00

This parameter is the transmitter output signal value that corresponds to the Range High process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Display Range Low

(Available for DC Linear Volts & mA Inputs only)

Range : -199.9 to Range High

Default : 0.0

This parameter is the Process Value that corresponds to the Signal Low value from the transmitter (0 mA or 0 mV or 0/1 V).

Display Range High

(Available for DC Linear Volts & mA Inputs only)

Range : Range Low to 999.9

Default : 100.0

This parameter is the Process Value that corresponds to the Signal High value from the transmitter (20 mA or 50/200 mV or 5/10V).

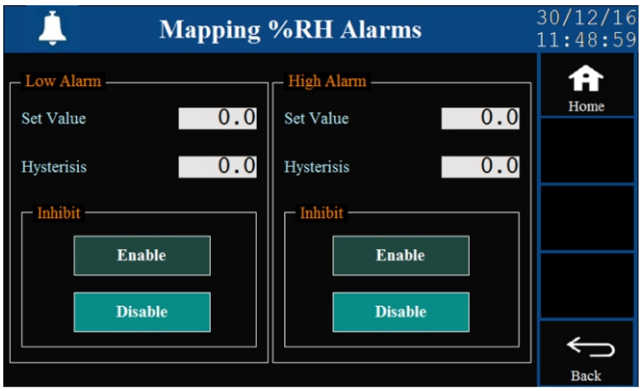
Zero Offset

Range : -50.0 to 50.0 °C

Default : 0.0 °C

This parameter value is individually set for each Temperature Input (4 or 8). This value is algebraically added to the measured Temperature Value to derive the final Value that is displayed and compared for alarm / control. Use this value to nullify any known constant error.

Final Value = Measured Value + Offset



Low Alarm Set Value

Range : 0 to 100.0 %RH

Default : 0 %RH

This parameter sets a **common** %RH value limit **below** which an alarm is generated.

Low Alarm Hysteresis

Range : 0.1 to 50.0 %RH

Default : 2.0 %RH

This parameter sets a differential (dead) band between the ON and OFF Low %RH Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.

Low Alarm Inhibit

Options : Enable, Disable

Default : Disable

If this parameter is set to 'Enable', the Alarm activation is suppressed until the %RH value is above the Low Alarm Set Value from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions. If this parameter is set to 'Disable', the Alarm is not suppressed during the start-up Alarm conditions.

High Alarm Set Value

Range : 0 to 100.0 %RH

Default : 0 %RH

This parameter sets a **common** %RH value limit **above** which an alarm is generated.

High Alarm Hysteresis

Range : 0.1 to 50.0 %RH

Default : 2.0 %RH

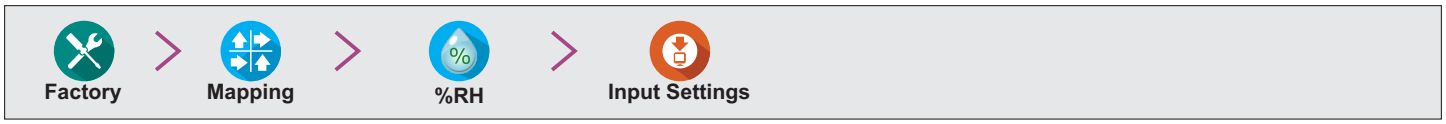
This parameter sets a differential (dead) band between the ON and OFF High %RH Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.

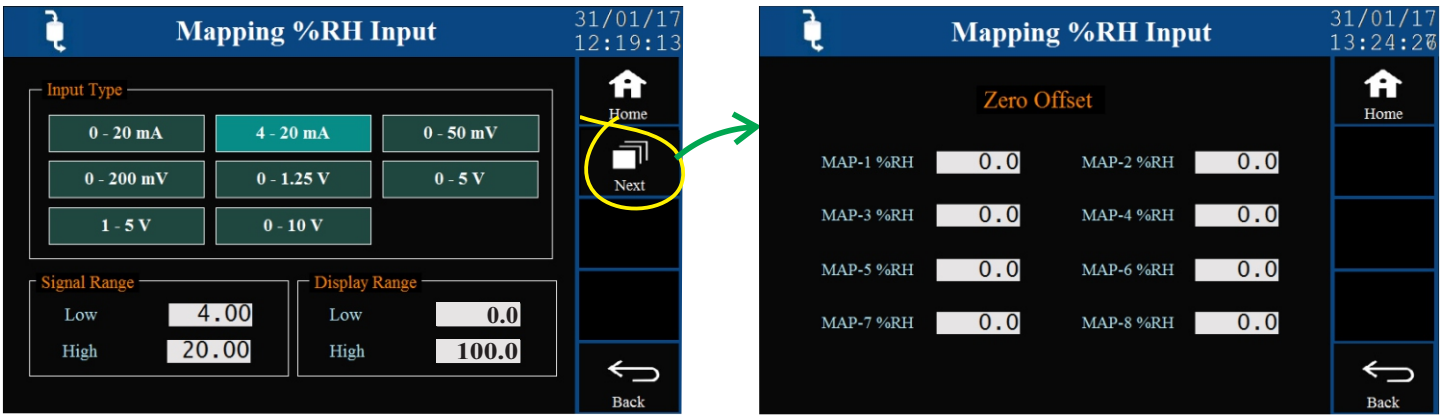
High Alarm Inhibit

Options : Enable, Disable

Default : Disable

If this parameter is set to 'Enable', the Alarm activation is suppressed until the %RH value is below the High Alarm Set Value from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions. If this parameter is set to 'Disable', the Alarm is not suppressed during the start-up Alarm conditions.





All the parameter settings, except Zero Offset, on this screen are Common for all %RH Inputs.

Input Type

Options : 0 to 20 mA, 4 to 20 mA, 0 to 50 mV, 0 to 200 mV, 0 to 1.25 V, 0 to 5 V, 1 to 5 V, 0 to 10 V

Default : 0 to 5 V

Select Input type in accordance with the type of sensors / transmitters connected for measurement on all %RH Inputs.

Signal Range Low

(Available for DC Linear Volts & mA Inputs only)

Input Type	Settings	Default
0 to 20 mA	0.00 to Signal High	0.00
4 to 20 mA	4.00 to Signal High	4.00
0 to 50 mV	0.00 to Signal High	0.00
0 to 200 mV	0.0 to Signal High	0.0
0 to 1.25 V	0.000 to Signal High	0.000
0 to 5 V	0.000 to Signal High	0.000
1 to 5 V	1.000 to Signal High	1.000
0 to 10 V	0.00 to Signal High	0.00

This parameter is the transmitter output signal value that corresponds to the Range Low process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Signal Range High

(Available for DC Linear Volts & mA Inputs only)

Input Type	Settings	Default
0 to 20 mA	Signal Low to 20.00	20.00
4 to 20 mA	Signal Low to 20.00	20.00
0 to 50 mV	Signal Low to 50.00	50.00
0 to 200 mV	Signal Low to 200.0	200.0
0 to 1.25 V	Signal Low to 1.250	1.250
0 to 5 V	Signal Low to 5.000	5.000
1 to 5 V	Signal Low to 5.000	5.000
0 to 10 V	Signal Low to 10.00	10.00

This parameter is the transmitter output signal value that corresponds to the Range High process value. Refer *Appendix-A : DC Linear Signal Interface* for details.

Display Range Low

Range : 0.0 % to Range High

Default : 0.0 %

This parameter is the Process Value that corresponds to the Signal Low value from the transmitter (0 mA or 0 mV or 0/1 V).

Display Range High

Range : Range Low to 100.0 %

Default : 100.0 %

This parameter is the Process Value that corresponds to the Signal High value from the transmitter (20 mA or 50/200 mV or 5/10V).

Zero Offset

Range : -50.0 to 50.0 %

Default : 0.0 %

This parameter value is individually set for each %RH Input (4 or 8). This value is algebraically added to the measured %RH Value to derive the final Value that is displayed and compared for alarm / control. Use this value to nullify any known constant error.

Final Value = Measured Value + Offset

APPENDIX - A

DC LINEAR SIGNAL INTERFACE

This appendix describes the parameters required to interface process transmitters that produce Linear DC Voltage (mV/V) or Current (mA) signals in proportion to the measured process values. A few examples of such transmitters are;

1. Pressure Transmitter producing **4 to 20 mA** for **0 to 5 psi**
2. Relative Humidity Transmitter producing **1 to 4.5 V** for **5 to 95 %RH**
3. Temperature Transmitter producing **0 to 20 mA** for **-50 to 250 °C**

The instrument (indicator/controller/recorder) that accepts the linear signal from the transmitter computes the measured process value by solving the mathematical equation for Straight-Line in the form:

$$Y = mX + C$$

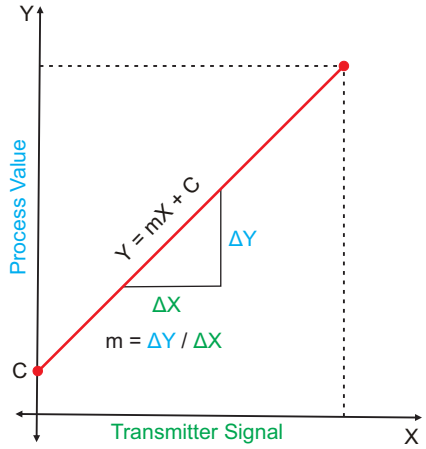
Where;

X : Signal Value from Transmitter

Y : Process Value Corresponding to Signal Value X

C : Process Value Corresponding to X = 0 (Y-intercept)

m : Change in Process Value per unit Change in Signal Value (Slope)



As is evident from the aforementioned transmitter examples, different transmitters produce signals varying both in *Type* (mV/V/mA) and *Range*. Most PPI instruments, thus, provide programmable Signal Type and Range to facilitate interface with a variety of transmitters. A few industry standard signal types and ranges offered by the PPI instruments are: 0-50mV, 0-200mV, 0-5 V, 1-5 V, 0-10V, 0-20 mA, 4-20 mA, etc.

Also, the output signal range (e.g. 1 to 4.5 V) from different transmitters corresponds to different process value range (e.g. 5 to 95 %RH); the instruments thus also provide facility for programming the measured process value range with programmable Resolution.

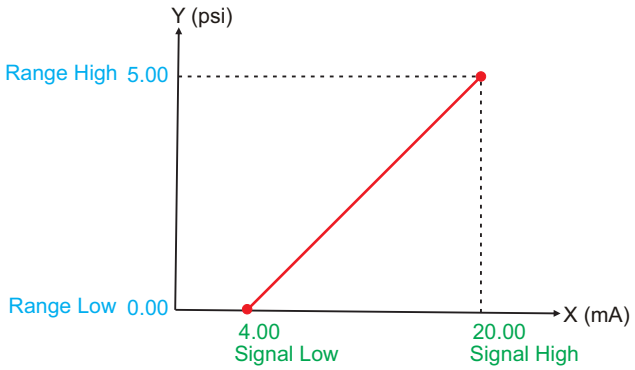
The linear transmitters usually specify two signal values (Signal Low and Signal High) and the corresponding Process Values (Range Low and Range High). In the example Pressure Transmitter above; the Signal Low, Signal High, Range Low & Range High values specified are: 4 mA, 20 mA, 0 psi & 5 psi, respectively.

In summary, the following 6 parameters are required for interfacing Linear Transmitters:

1. Input Type : Standard DC Signal Type in which the transmitter signal range fits (e.g. 4-20 mA)
2. Signal Low : Signal value corresponding to Range Low process value (e.g. 4 mA)
3. Signal High : Signal value corresponding to Range High process value (e.g. 20 mA)
4. PV Resolution : Resolution (least count) with which to compute process value (e.g. 0.01)
5. Range Low : Process value corresponding to Signal Low value (e.g. 0.00 psi)
6. Range High : Process value corresponding to Signal High value (e.g. 5.00 psi)

The following examples illustrate appropriate parameter value selections.

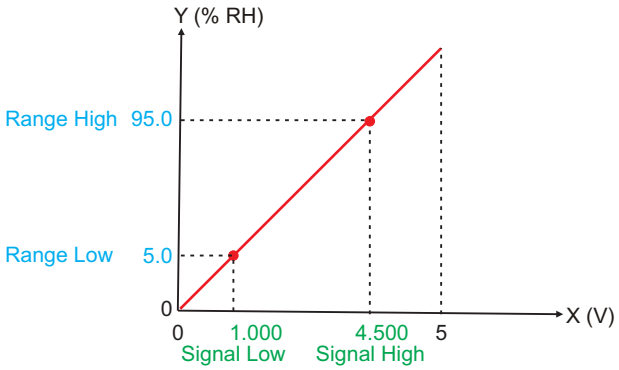
Example 1: Pressure Transmitter producing **4 to 20 mA** for **0 to 5 psi**



Presume the pressure is to be measured with 0.01 Resolution, that is 0.00 to 5.00 psi.

Input Type	:	4-20 mA
Signal Low	:	4.00 mA
Signal High	:	20.00 mA
PV Resolution	:	0.01
Range Low	:	0.00
Range High	:	5.00

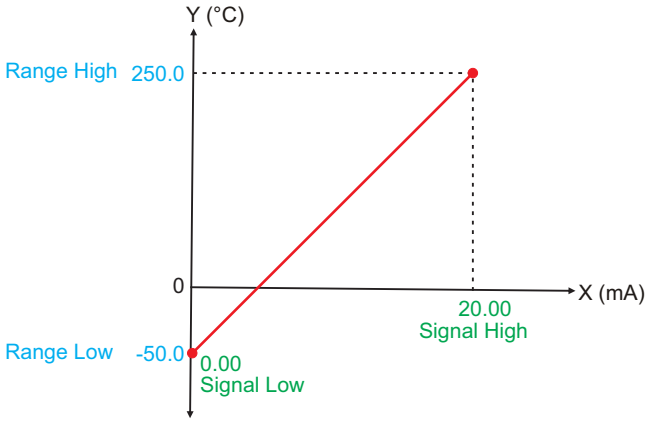
Example 2: Relative Humidity Transmitter producing **1 to 4.5 V** for **5 to 95 %RH**



Presume the humidity is to be measured with 0.1 Resolution, that is 0.0 to 100.0 %.

Input Type	:	0-5 V
Signal Low	:	1.000 V
Signal High	:	4.500 V
PV Resolution	:	0.1
Range Low	:	5.0
Range High	:	95.0

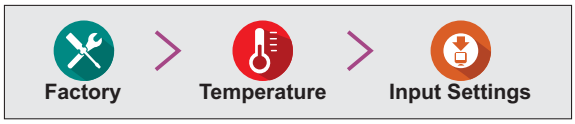
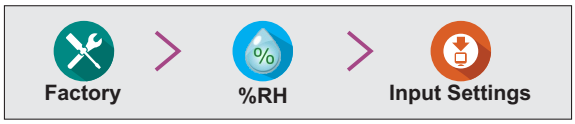
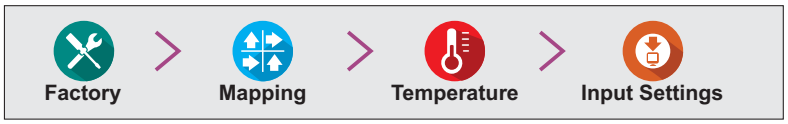
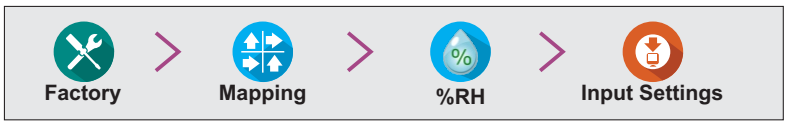
Example 3: Temperature Transmitter producing **0 to 20 mA** for **-50 to 250 °C**



Presume the Temperature is to be measured with 0.1 Resolution, that is -50.0 to 250.0°C.

Input Type	:	0-20 mA
Signal Low	:	0.00 mA
Signal High	:	20.00 mA
PV Resolution	:	0.1
Range Low	:	-50.0
Range High	:	250.0

The following table list various parameters related to DC linear signal input interface & their respective locations.

Parameter Name	Navigation (Where to Locate)
Main & Standby Temperature Control Sensors Temperature Input Type Temperature Signal Low Temperature Signal High Temperature Range Low Temperature Range High	
Main & Standby %RH Control Sensors %RH Input Type %RH Signal Low %RH Signal High %RH Range Low %RH Range High	
Temperature Mapping Sensors Temperature Input Type Temperature Signal Low Temperature Signal High Temperature Range Low Temperature Range High	
%RH Mapping Sensors %RH Input Type %RH Signal Low %RH Signal High %RH Range Low %RH Range High	

APPENDIX - B

COMPRESSOR SETTING PARAMETERS

Compressor Switching Strategies

The PPI “Temperature + Humidity” composite controllers offer different programmable strategies for compressor switching to meet different design approaches by the manufacturers of Humidity Chambers. The various strategies and the implementations are described here.

1. **Compressor Off**

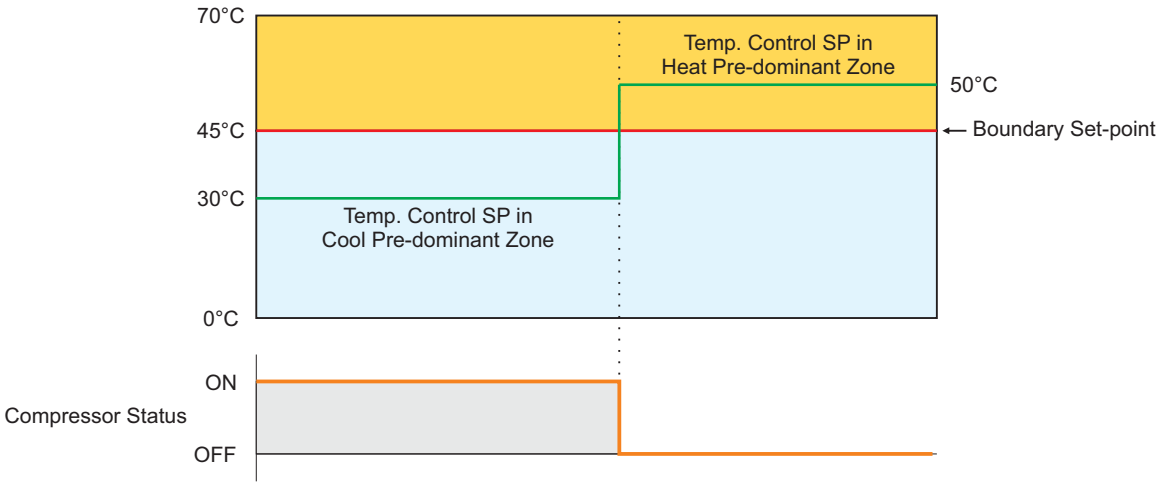
   The compressor is kept Off. This strategy is usually selected for temperature values significantly above the ambient temperature.

2. **Compressor On**

   The compressor is kept On regardless of the measured or set temperature value. This strategy is usually selected for temperature values significantly below the ambient temperature.

3. **SP Based Strategy**

   In this strategy, the chamber temperature range is split in two zones by setting the parameter 'Boundary Set-point' (BSP). Refer Figure below.



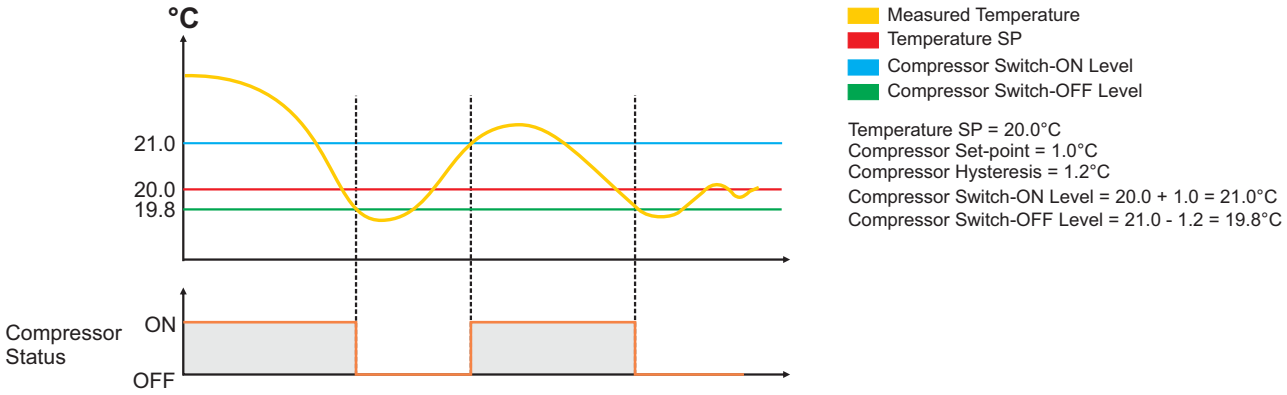
The zone at and above the boundary SP ( ) is referred as Heat Pre-dominant zone and that below the boundary SP ( ) is referred as Cool Pre-dominant zone. The controller automatically switches between the two zones depending upon the Temperature SP. If the Temperature SP is below boundary SP, Cool Pre-dominant zone is active and the compressor is kept ON. If the Temperature SP is at or above boundary SP, Heat Pre-dominant zone is active and the compressor is kept OFF. This strategy eliminates the need for the user to manually switch the compressor ON or OFF.

If the parameter *Control Zones* is set to “Dual”; separate tuning can be performed in the Cool and Heat Pre-dominant zones for accurate control in each zone. The controller maintains separate sets of Proportional Band, Integral Time & Derivative Time constants for each zone that are automatically selected and used by the controller depending upon the active zone.

However, if the parameter *Control Zones* is set to “Single”; the controller uses a single set of Proportional Band, Integral Time & Derivative Time constants for both zones.

4. PV Based Strategy

In this strategy, the compressor is switched to cool down the chamber air temperature. The controller switches the compressor ON or OFF based on the comparison between the chamber temperature value and the Temperature SP. Refer Figure below.



The compressor is turned ON if the chamber air temperature value is above the Temperature SP by an amount set by the parameter 'Compressor Set-point'. That is;

Compressor Switch - ON Level = (Temperature SP) + (Compressor Set-point)

Once the air temperature falls below Compressor Switch-ON Level by an amount set by the parameter 'Compressor Hysteresis', the compressor is turned OFF. That is;

Compressor Switch - OFF Level = (Compressor Switch-ON Level) – (Compressor Hysteresis)

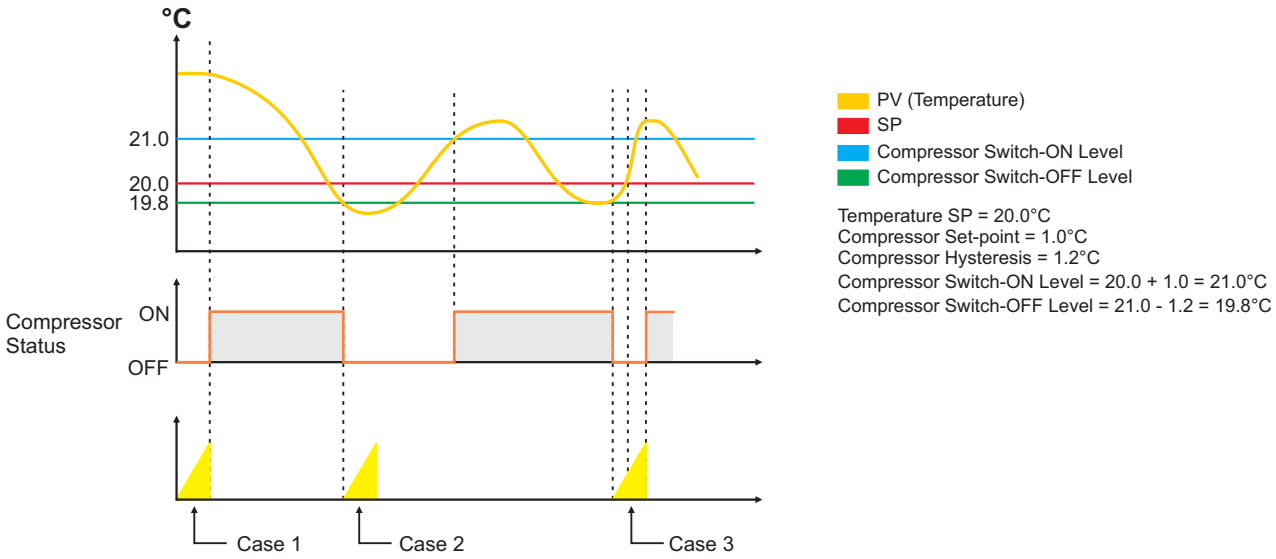
The hysteresis inserts a dead band between the Compressor Switch-ON Level and Compressor Switch-OFF Level to avoid frequent switching of the compressor.

Compressor Time Delay

Once the compressor is switched off, a time delay is desired before it is turned ON again. The time delay prevents the possible damage due to short cycling. When the compressor switches off, it spins backward as pressure equalizes. If compressor is energized while it is still spinning backward, it continues to run backward until it trips on internal overloads. This may cause damage to the compressor.

The time delay cycle is executed every time the compressor is turned off. The compressor turning off may be a result of power failure or the on-off control algorithm executed by the controller. The controller in “Auto Mode” monitors the Process Value (PV) against the Set-Point (SP) and attempts to switch the compressor *ON* or *OFF* depending upon whether the PV is *above* or *below* the SP.

The time delay starts counting down from the instance the compressor is switched off. The compressor is inhibited from switching-on until the delay elapses regardless of the difference between the PV and SP. Once the time delay is elapsed, the control algorithm switches the compressor ON as and when the PV is above SP.



The figure above illustrates 3 cases. Case (1) illustrates power-up delay. In case (2); the time elapses before PV rises above the SP. The compressor is thus switched ON as soon as the PV rises above the SP. In case (3); the PV rises above the SP while the time delay is still in progress. The compressor is switched ON as soon as the delay time elapses.

The following table list various parameters related to Compressor Switching Mode / Operation & their respective locations.

Parameter Name	Navigation (Where to Locate)
Mode Boundary SP Time Delay Hysteresis Zone Select	Factory > Compressor

APPENDIX - C

STANDBY SENSORS

If the Controller is supplied with *Standby Sensors* option, two additional analog inputs are provided for interfacing an additional set of temperature & %RH sensors as standby. That is, there are two sets of Sensors; **Main** & **Standby**.

Sensor / Transmitter Fail Detection
In case of RTD Pt100 sensor the controller can directly detect Sensor failure through Sensor Open, Over-range or Under-range condition.

For DC linear inputs (mA or Volts), the controller can not detect the transmitter open or short condition. Therefore, the controller provides two programmable Setpoint Limits, one each for Temperature & %RH. If the measured process value falls below the respective setpoint limit, the condition is treated as transmitter failure or mal-functioning.

Note the Setpoint Limit for temperature is applicable even if input sensor used for temperature is RTD Pt100.

Main Set Failure
The controller, by default, uses the Main set for measurement, control & alarm purpose. Should any one or both Main Sensors / Transmitters fail, the controller automatically switches to the Standby set and stores in its non-volatile memory the *Main Set Failure* condition. The controller continues to work with Standby Set until the *Main Set Failure* condition is cleared from its memory through Repair Acknowledge button (explained later).

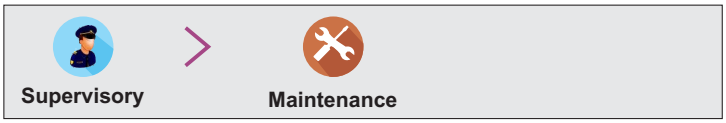
Standby Set Failure
The controller uses the Standby Set only if Main Set Failure condition is stored in its memory. The Main Set Failure condition is set upon Main Sensor failure detection by controller or manual change over by user from Main Set to Standby Set (explained later). Should any one or both Standby Sensors / Transmitters fail, the controller switches off all the control outputs and stores in its non-volatile memory the *Standby Set Failure* condition. That is, now both Main & Standby Failure conditions are stored in memory. As long as this condition prevails, the controller behaves like an indicator by keeping all its outputs off. Replace / repair sensors / transmitters and then use Repair Acknowledge button to bring controller to its normal operation mode.

Manual Switch-over to Standby Set
If the controller is working with the Main Set sensors, the user can switch to Standby Set by using touch push button provided for this purpose. This feature facilitates the user to use Standby Set should he observe misbehavior in measurement readings (like continuous fluctuations or intermittent spikes) through Main Set sensors. The manual change-over is treated same as Main Set Failure condition and is thus stored in memory.

Repair Acknowledge
Once the Main Set and / or Standby Set Failure condition is stored in memory, the only way to clear the same is through Repair Acknowledge touch button. This feature avoids continuous toggling between Main & Standby Sets should both fail.

Note that Repair Acknowledge button clears both Main & Standby Set Failure conditions from memory.

The following table list various parameters related to Standby Sensors & their respective locations.

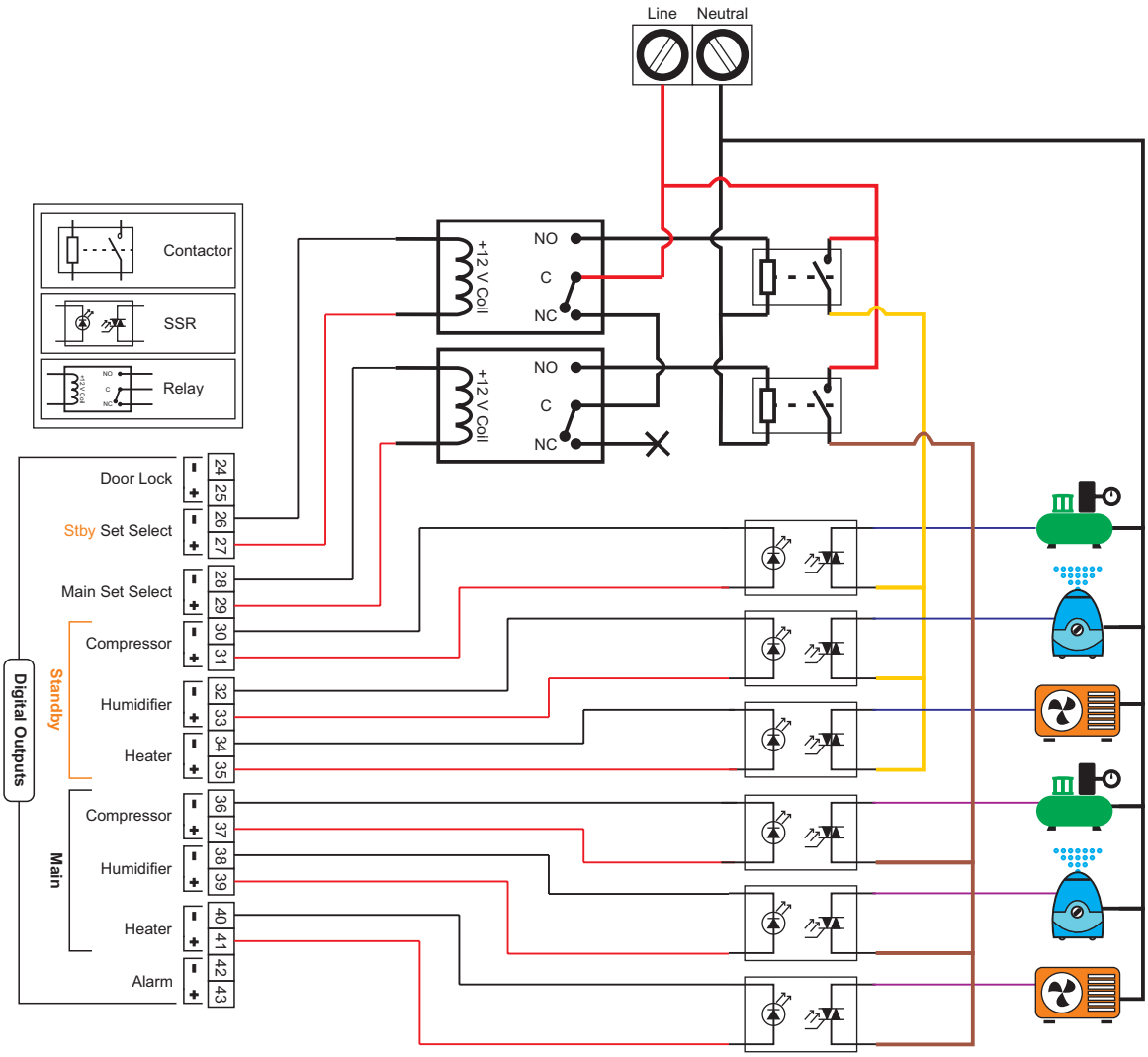
Parameter Name	Navigation (Where to Locate)
Sensor Fail Detection Limit Temperature Low %RH Low	
Switch to Standby Sensor	
Input Sensor Repair Acknowledge	

APPENDIX - D

STANDBY CONTROL GADGETS

If the Controller is supplied with Standby Control Gadgets option, 5 additional digital outputs are provided for interfacing an additional set of Control Gadgets as standby. That is, there are two sets of Control Gadgets; Main & Standby.

The additional 5 outputs (besides 3 standard outputs, viz., Main Compressor, Main Heater & Main Humidifier) are; Standby Compressor, Standby Heater, Standby Humidifier, Main Set Select & Standby Set Select. The Main Set Select & the Standby Set Select outputs are used to drive two external gadgets (usually electromechanical relays) that switch power to SSRs that drive Main & Standby gadgets respectively. Refer generic electrical connection diagram below.



Control Gadget Fail Detection

The term control gadget failure applies to the complete set (Main or Standby) rather than an individual gadget. The failure may arise due to reasons like heater-break, compressor tripping / failure, SSR output short circuiting, etc. The failure of any gadget is treated as a set failure and the entire set is switched to the working set.

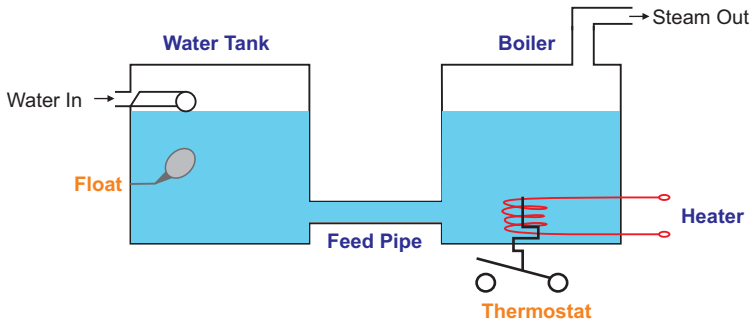
The controller uses Measured Temperature & Low Water Level detection for detecting the control gadget failure.

Temperature Based Detection

For temperature based detection, the controller uses High Deviation Alarm & a Programmable Fail Detect Time (Minutes). If the measured temperature value crosses the High Deviation Limit & remains there for the set programmed Fail Detect time then the condition is treated as control gadget failure.

Water Level Based Detection

For water level based detection, the system must implement a float switch and a thermostat. Refer Figure below.



The float switch detects water level in the water tank whereas the thermostat detects water level in the boiler. If the thermostat detects a low water level in the boiler while the float switch indicates that there is sufficient water in the water tank, the condition is treated as control gadget failure. This situation arises when there is water choking in the feed pipe and thus the steam generating system needs maintenance.

Time Based Cyclic Switching
When both, Main & Standby, sets are in working condition, the controller periodically switches between the Main & Standby sets. The periodic time is user settable in Hours.

Note that both, the working set and the elapsed time are stored in the memory upon power fail. Upon power resumption, the controller switches the set that was in operation at the time of power failure and executes the balance time.

Main Set Failure
Upon detecting the Main set failure, the controller automatically switches to the Standby set provided the Standby set is in working condition. The controller stores in its non-volatile memory the Main Set Failure condition. The controller continues to work with Standby Set until the Main Set Failure condition is cleared from its memory through Repair Acknowledge button (explained later).

If the Main Set failure is detected while the Standby set is already failed, the controller switches off all outputs and acts as an indicator.

Standby Set Failure
Upon detecting the Standby set failure, the controller automatically switches to the Main set provided the Main set is in working condition. The controller stores in its non-volatile memory the Standby Set Failure condition. The controller continues to work with Main Set until the Standby Set Failure condition is cleared from its memory through Repair Acknowledge button (explained later).

If the Standby Set failure is detected while the Main set is already failed, the controller switches off all outputs and acts as an indicator.

Main & Standby Sets Failure
As long as this condition prevails, the controller behaves like an indicator by keeping all its outputs off. Replace / repair the faulty control gadget(s) and then use Repair Acknowledge button to bring controller to its normal operation mode.

Manual Switch-over
If both, Main & Standby, sets are the user can switch from Main to Standby Set or vice-a-versa by using touch push button provided for this purpose.

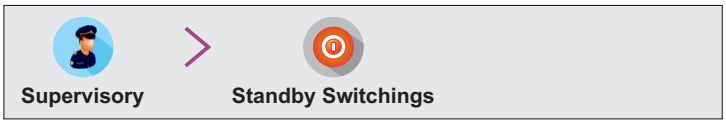
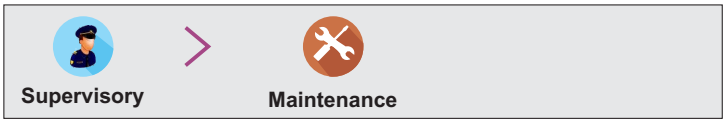
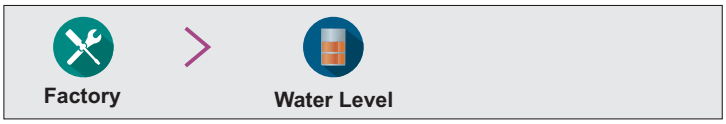
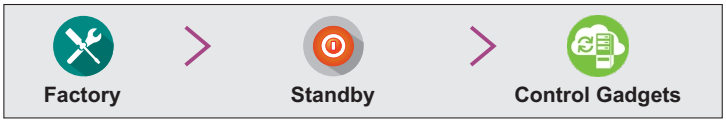
Repair Acknowledge
Once the Main Set and / or Standby Set Failure condition is stored in memory, the only way to clear the same is through Repair Acknowledge touch button. This feature avoids continuous toggling between Main & Standby Sets should both fail.

Note that Repair Acknowledge button clears both Main & Standby Set Failure conditions from memory.

Inhibit Timer
The controller provides a programmable timer (in hours) for setting a time interval during which the controller ignores the *Control Gadget Fail Detection*. This timer is activated upon the following conditions.

1. After recovery from Door Open Alarm
2. Switching over from Auxiliary Power Source (Battery / Inverter) to Mains Power Source
3. System Power-up
4. After automatic / manual changeover from Main control set to Standby control set or vice-a-versa
5. After Repair Acknowledgment
6. After completion of Auto Tuning

The following table list various parameters related to Standby Sensors & their respective locations.

Parameter Name	Navigation (Where to Locate)
Switch Main / Standby Output	
Control Gadgets Repair Acknowledge	
Water Level Settings **Float** Detection Enable / Disable Low Level Logic (Open / Close) **Thermostat** Detection Enable / Disable Low Level Logic (Open / Close) **Common Boiler** (Yes / No)	
Standby Control Gadgets Fail Detect Time (Min) Cyclic Time (Hrs.) Inhibit Time (Hrs.)	

APPENDIX - E

DOOR LOCK

If the Controller is supplied with Door Lock option, an additional digital output is provided for operating an electro-mechanical (Solenoid driven) locking system through an external relay / contactor. For automatic operation of the lock by the controller, the cabinet door must also be installed with Door Open detect switch that should be connected to the controller digital input labeled 'Door Open'.

Door "Lock" Operation

Upon power up if the cabinet door is detected *closed,* the controller locks the door. However if the door is detected *open* upon power up, the controller waits until the door is detected *closed* before applying the lock.

Similarly, when the cabinet door is closed after opening (through appropriate password entry by authorized person) the controller immediately applies the lock.

Door "Unlock" Operation

The HMI provides independent password entry for up to 7 authorized persons. Each person is identified by a unique ID (1 to 7) and a corresponding 8 character alpha-numeric password as shown below.

ID	Password
1	ABCDEFGH
2	12345678
3	WXYZ9876
4	
5	
6	
7	

If less than 7 persons need to be authorized then the password field for the unused ID must be left blank. The figure above shows only three persons authorized to open door.

The unique ID on the HMI side is mapped with a corresponding entry describing person's name / position on the PC software (ProLog).

For unlocking the cabinet door the authorized person must enter his password on the HMI screen. Upon correct password entry the door lock is opened and an Event Record is generated by the HMI containing the authorized person's ID. The Event Record thus generated is used by the PC software to describe the door open action along with the name / position of the responsible person in Audit Trail Report.

APPENDIX - F

DIGITAL INPUTS & OUTPUTS

DIGITAL INPUTS

The microPLC Control Unit incorporates interfaces for potential-free digital inputs for various functions described below.

Power Fail

This Digital Input is used if provision is made for running the controller on an auxiliary power sources like battery or inverter and a Switch is mounted for detecting main power source failure. This input detects whether the controller is being powered from Main or Auxiliary power source.

Door Open

This Digital Input is used to warn if the chamber door is left open for more than a user programmed time period by activating the Alarm. Also a record is generated each time the door is opened or closed.

Water Level

This Digital Input can be used to detect Low Water Level in the Steam generating boiler by mounting a Float / Water Level Switch. Upon detecting Low Water Level, the boiler supply is cut-off and Alarm is activated for safety.

Thermostat

This Digital Input can be connected to a thermostat to detect Low Water Level to change over from Main Control Gadget Set to Standby Control Gadget Set and vice-a-versa. The Thermostat used is set to 110 °C and is immersed in boiler water. So long as the water level is normal, the thermostat remains immersed and the temperature is below 100 °C. Under Low Water Level condition, the thermostat gets exposed to air and the temperature eventually rises above 110 °C and the thermostat trips.

Alarm Acknowledge

This Digital Input can be used to mute the Alarm Output Relay.

DIGITAL OUTPUTS

The microPLC Control Unit provides several digital outputs for Alarm & Process Control. The outputs are voltage levels rated 12 VDC @ 40 mA each.

Heater

This Digital Output switches in accordance with the output power computed by PID loop controlling the Temperature. The output drives the heating element through external Relay / SSR.

Humidifier

This Digital Output switches in accordance with the output power computed by PID loop controlling the %RH. The output drives the boiler heater through external Relay / SSR.

Compressor

This Digital Output switches in accordance with the On-Off Strategy & Time-Delay set for the compressor operation for cooling / de-humidification. The output drives the power to compressor through external Relay / SSR.

Main Set Select

Standby Set Select

These Digital Output are fitted and functional only if controller is supplied with Standby Output feature. The digital outputs control external electrical switches (like contactors) that, in turn, control the power to the relay / SSR sets that drive control gadgets (Heater, Humidifier & Compressor).

Door Lock

This Digital Output can be used to switch an electro-mechanical (magnetic) lock for cabinet door opening. The door usually remains locked and is opened only upon correct password entry by the authorized person.

Alarm

This Digital output can be used to activate an audio / visual device under process alarm condition.

PPI
The Perfection Experts

Process Precision Instruments

101, Diamond Industrial Estate, Navghar, Vasai Road (E),
Dist. Palghar - 401 210.Maharashtra, India
Sales : 8208199048 / 8208141446
Support : 07498799226 / 08767395333
sales@ppiindia.net, support@ppiindia.net

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