

Multi-Purpose Temperature Controller with Graphic Display



Zenex Plus 96

128 X 64 Monochrome Graphic Display
Universal Temperature Input (RTD & Thermocouple)
Self-Tune PID / On-Off Control with Built-in Timer
Compressor Control with Setable Time Delay
¼ DIN (96x96) Compact Enclosure

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User Manual



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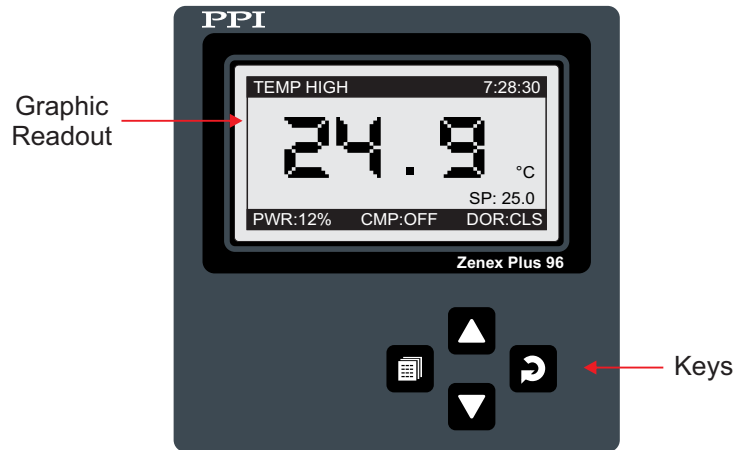
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Section 1

FRONT PANEL LAYOUT

The Controller front panel comprises of Graphic Readout and tactile keys as shown in Figure 1.1 below.

Figure 1.1



GRAPHIC READOUT

The Graphic Readout is a 128 X 64 Pixel Monochrome LCD Display. In Normal operation mode the display shows measured Temperature Value, Set Temperature Value, % Output Power, Balance Soak Time, Alarm Status, Compressor Status, and Door Status.





In Set-up Mode, the display shows parameter names and values that can be edited using front keys.

KEYS

There are four tactile keys provided on the front panel for configuring the controller and setting-up the parameter values.

The Table 1.1 below lists each key (identified by the front panel symbol) and the associated function.

Table 1.1

Symbol	Key	Function (in Set-up Mode)
	PAGE	Press to enter or exit set-up mode.
	DOWN	Press to decrease the parameter value. Pressing once decreases the value by one count; keeping pressed speeds up the change.
	UP	Press to increase the parameter value. Pressing once increases the value by one count; keeping pressed speeds up the change.
	ENTER	Press to store the set parameter value and to scroll to the next parameter in setup mode. Can also be used as Alarm Acknowledgment in normal operation mode.



Section 2 BASIC OPERATIONS

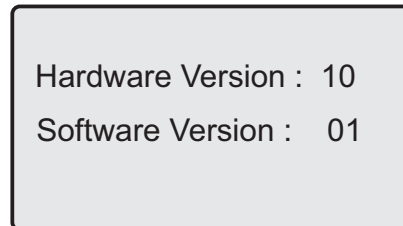
POWER-UP DISPLAY

Upon powering up, the display shows the Model Name (Zenex Plus 96) followed by the Hardware Version and Software Version for approximately 2 seconds each as shown in figure 2.1(a) & 2.1(b).

Figure 2.1 (a)



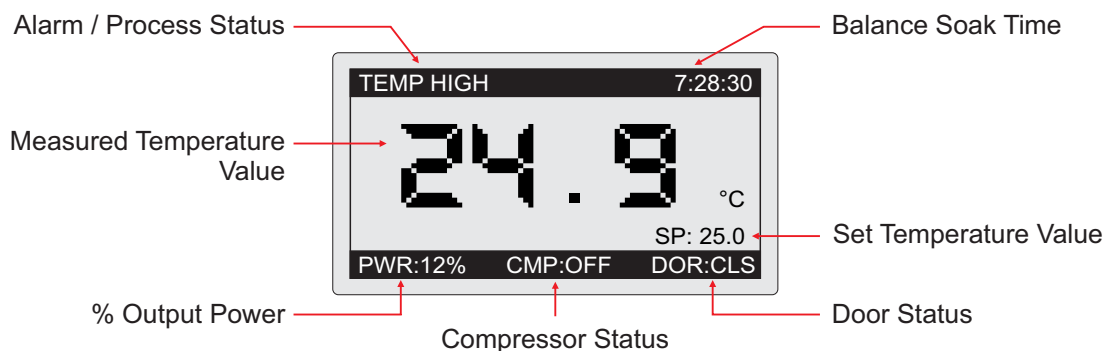
Figure 2.1(b)



RUN MODE

After the Power-up display sequence the controller enters into RUN Mode. This is the normal operation mode wherein the controller starts PV measurements, Alarm monitoring and Control Loop execution. The information displayed is depicted in the figure 2.2 below.

Figure 2.2



PV Error Indication

In case of measured temperature value errors, the messages listed in Table 2.1 are displayed in place of temperature values.

Table 2.1

Message	Error Type	Cause
OPEN	Sensor Open	Sensor (RTD / Thermocouple) Broken / Open.
OVER	Over-range	Measured Temperature value is above Maximum Specified Range.
UNDR	Under-range	Measured Temperature value is below Minimum Specified Range.

Alarm / Process Status Indication

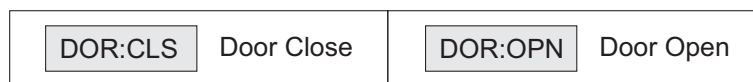
The Alarm / Process Status may show one or more of the several messages listed in the below table depending upon the active alarms or process events. In case of multiple active alarms or process events, the messages are toggled with an approximate time interval of 2 seconds.

Message String	Alarm / Process Status
No Alarm	No active Alarm or Process Event.
Temp High	The measured temperature is in Process High Alarm State.
Temp Low	The measured temperature is in Process Low Alarm State.
Tuning	The Controller is Self Tuning.
Door Open	The Equipment / Chamber door is open for a time longer than the set 'DOORALRM DLY' time.
Timer Hold	The Countdown Timer is paused since the PV is outside Hold Band.

Compressor Status Indication

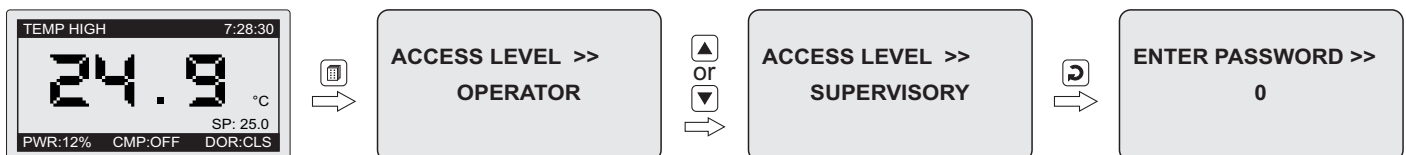


Door Status Indication



SETUP MODE

This Mode can be entered by pressing the Page Key from Run Mode. This mode allows controller parameter settings. The parameters are organized under three Access Levels; Operator, Supervisory, and Factory. Each level is protected using a numeric password. The below diagram shows an example of how to enter the Supervisory Access level. The parameters under each Access level are described in subsequent sections.

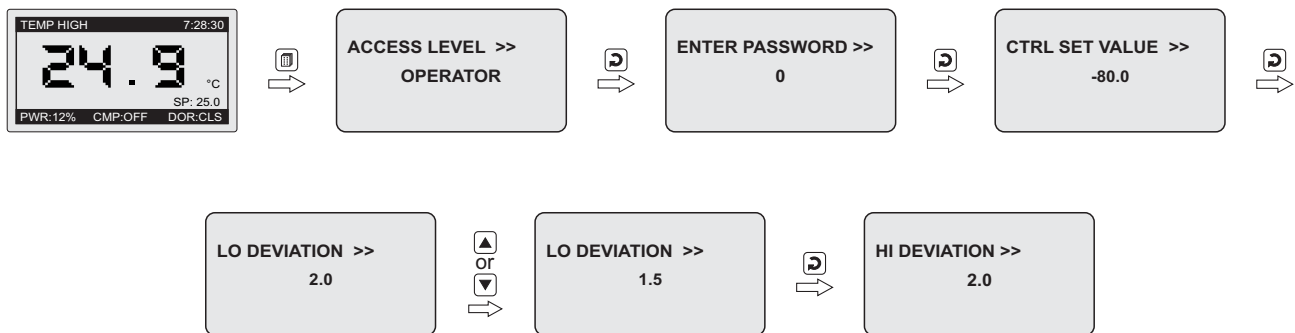


Section 3 OPERATOR ACCESS LEVEL

The Operator Parameters are accessible under default password 0. The list includes parameters for adjusting Control & Alarm setpoints, acknowledge various alarms, and issuing manual defrost commands.

The Figure 3.1 shows how to access Operator Parameters. The Example illustrates changing the low deviation alarm setpoint from 2.0 to 1.5.

Figure 3.1



The Table 3.1 below described the Operator Parameters in detail.

Table 3.1

Parameter Description	Settings (Default Value)
TIMER START >> TIMER ABORT >> <i>(Available only if Timer is Enabled)</i> These two commands are mutually exclusive. Set to 'Yes' to start timer, if not already started or to stop a running timer.	Yes No (Default : No)
TIME INTERVAL HH:MM >> <i>(Available only if Timer is Enabled)</i> The set time value for the timer in Hours : Minutes.	0.01 to 249.59 (HH:MM) (Default : 0.10)
CTRL SET VALUE >> This parameter sets the value at which the controller attempts to maintain the measured temperature value.	Setpoint LO limit to Setpoint HI limit (Default : 25.0)

Parameter Description	Settings (Default Value)
<p>LO DEVIATION >> Sets <i>Negative</i> deviation (offset) limit from control setpoint for <i>Low Alarm</i> activation.</p> <p>E.g.; If the Control Setpoint is 25.0 °C and the Low Deviation is 0.5 then the Low Alarm Limit is : $25.0 - 0.5 = 24.5$ °C.</p>	<p>0.2 to 99.9 (Default : 2.0)</p>
<p>HI DEVIATION >> Sets <i>Positive</i> deviation (offset) limit from control setpoint for <i>High Alarm</i> activation.</p> <p>E.g.; If the Control Setpoint is 25.0 °C and the Low Deviation is 1.0 then the Low Alarm Limit is : $25.0 + 1.0 = 26.0$ °C.</p>	<p>0.2 to 99.9 (Default : 2.0)</p>
<p>CHANGE PASSWORD >> The Controller is shipped from the factory with a default password (0) for accessing the parameters reserved for Operator. However, if required the password can be changed by setting the new value for this parameter.</p> <p>Set to 'Yes' for changing the Password.</p>	<p>No Yes (Default : No)</p>
<p>NEW PASSWORD >> This parameter is presented if 'Change Password' is set to 'Yes'. Set the new password value.</p>	<p>0 to 3000 (Default : 0)</p>



Section 4

SUPERVISORY ACCESS LEVEL

The Supervisory Parameters are accessible under default password 123. The parameters are arranged in various groups for convenient access. Refer Table 4.1 below for a quick summary of parameters under different groups. The parameters are described in subsequent sections.

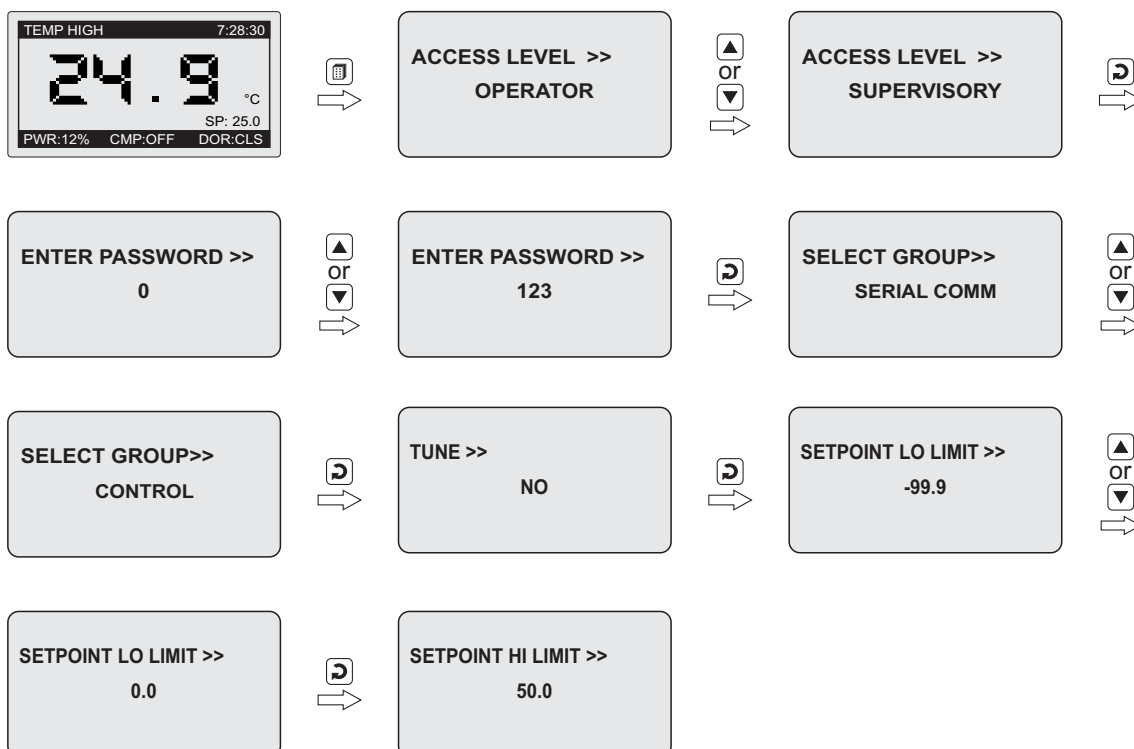
Tabel 4.1

Group	Parameters
Serial Communication	Device ID, Baud Rate, Parity, Serial Write Permission
Sensor Input	Zero Offset
Control (The parameter availability varies with the control strategy)	Tune, Setpoint Low Limit, Setpoint High Limit, Compressor Set-point, Compressor Hysteresis, Heat Control Action, Heat Hysteresis, CZ Proportional Band, CZ Integral Time, CZ Derivative Time, HZ Proportional Band, HZ Integral Time, HZ Derivative Time, Cycle Time, Power Low, Power High, Overshoot Inhibit, Cutoff Factor
Password	Change Password

Accessing Group & Parameters

The Figure 4.1 below illustrates how to access the group and its parameters under Supervisory Level. The example shows accessing the group CONTROL and changing the value for the parameter 'SETPOINT LO LIMIT' from -99.9 to 0.0.

Figure 4.1



Note

The Last Parameter in the selected Group rolls back to the 'SELECT GROUP' screen to avoid re-entering the password in case parameters under multiple groups need to be set.

Parameter Descriptions

The various Supervisory Parameters are described below with their respective group headings.

SUPERVISORY > SERIAL COMM

Parameter Description	Settings (Default Value)
DEVICE ID >> Unique numeric code assigned to the indicator for identification by the host. Set the value as required by the host.	1 to 127 (Default : 1)
BAUD RATE >> Communication speed in 'Bits per Second'. Set the value to match with the host baud rate.	9600 19200 38400 (Default : 9600)
PARITY >> One of the communication error trapping features. Select the data packet parity as implemented by the host protocol.	None Even Odd (Default : Even)
SERIAL WRITE >> Setting to 'No' disallows the host to set / modify any parameter value. The host, however, can read the values.	No Yes (Default : Yes)

SUPERVISORY > SENSOR INPUT

Parameter Description	Settings (Default Value)
ZERO OFFSET >> 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	-50.0 to 50.0 (Default : 0.0)

SUPERVISORY > CONTROL

Parameter Description	Settings (Default Value)
TUNE >> <i>(Available for 'Heat Only' & 'Heat+Cool' Control Strategy)</i> Select 'Yes' to activate and 'No' to abort the Tuning operation.	Yes No (Default : No)
SETPOINT LO LIMIT >> This parameter sets the minimum limit on the Control Setpoint value.	Sensor Min Range to Setpoint HI Limit (Default : Sensor Min Range)
SETPOINT HI LIMIT >> This parameter sets the maximum limit on the Control Setpoint value.	Setpoint LO Limit to Sensor Max Range (Default : Sensor Max Range)
COMPRESSOR SP >> <i>(Available for 'Heat + Cool' Control with 'PV-based' Compressor Strategy)</i> This Setpoint Value is compared with the process value to switch the compressor On/Off with the set compressor hysteresis.	0.0 to 100.0 (Default : 45.0)
COMPRESSOR HYST >> <i>(Available for 'Cool Only' & 'Heat + Cool' Control with 'PV-based' Compressor Strategy)</i> Differential (dead) band between the compressor ON and OFF states.	0.1 to 99.9 (Default : 2.0)
HEAT CTRL ACTION >> <i>(Available for 'Heat Only' & 'Heat + Cool' Control Strategy)</i> <i>On-Off</i> The control algorithm attempts to maintain the PV at SP by either switching the output (say, Heater) fully OFF or fully ON. The On and Off switching is differentiated by the user settable 'Hysteresis Band'. <i>PID</i> The control algorithm uses a 2nd order equation to compute the '% Output Power' required to maintain the PV at SP. The constants P, I, D are automatically set by the controller.	ON-OFF PID (Default : PID)
HEAT HYST >> <i>(Available for 'ON-OFF' Heat Control Action)</i> Sets a differential (dead) band between the ON and OFF states. Keep it large enough to avoid frequent switching of the load without losing the desired control accuracy.	0.1 to 99.9 (Default : 0.2)

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Heat Only Control	Heat + Cool Control Zone : Single	Heat + Cool Control Zone : Dual
PROPORTIONAL BAND >> 0.1 to 999.9 (Default : 50.0)	PROPORTIONAL BAND >> 0.1 to 999.9 (Default : 50.0)	CZ PROP BAND >> <i>Proportional Band for Cool Pre-dominant zone</i> 0.1 to 999.9 (Default : 50.0)
INTEGRAL TIME >> 0 to 3600 sec (Default : 100 sec)	INTEGRAL TIME >> 0 to 3600 sec (Default : 100 sec)	CZ INTEGRAL TIME >> <i>Integral Time for Cool Pre-dominant zone</i> 0 to 3600 sec (Default : 100 sec)
DERIVATIVE TIME >> 0 to 600 sec (Default : 16 sec)	DERIVATIVE TIME >> 0 to 600 sec (Default : 16 sec)	CZ DERIVATIVE TIME >> <i>Derivative Time for Cool Pre-dominant zone</i> 0 to 600 sec (Default : 16 sec)
—	—	HZ PROP BAND >> <i>Proportional Band for Heat Pre-dominant zone</i> 0.1 to 999.9 (Default : 50.0)
—	—	HZ INTEGRAL TIME >> <i>Integral Time for Heat Pre-dominant zone</i> 0 to 3600 sec (Default : 100 sec)
—	—	HZ DERIVATIVE TIME >> <i>Derivative Time for Heat Pre-dominant zone</i> 0 to 600 sec (Default : 16 sec)
CYCLE TIME >> 0.5 to 100.0 sec (Default : 10.0 sec)	CYCLE TIME >> 0.5 to 100.0 sec (Default : 10.0 sec)	CYCLE TIME >> 0.5 to 100.0 sec (Default : 10.0 sec)
POWER LOW >> 0 to 100% (Default : 0%)	POWER LOW >> 0 to 100% (Default : 0%)	POWER LOW >> 0 to 100% (Default : 0%)
POWER HIGH >> 0 to 100% (Default : 100%)	POWER HIGH >> 0 to 100% (Default : 100%)	POWER HIGH >> 0 to 100% (Default : 100%)

Heat Only Control	Heat + Cool Control Zone : Single	Heat + Cool Control Zone : Dual
OVERSHOOT INHIBIT >> Enable Disable (Default : Disable)	OVERSHOOT INHIBIT >> Enable Disable (Default : Disable)	OVERSHOOT INHIBIT >> Enable Disable (Default : Disable)
CUTOFF FACTOR >> 1.0 to 2.0 sec (Default : 1.2 sec)	CUTOFF FACTOR >> 1.0 to 2.0 sec (Default : 1.2 sec)	CUTOFF FACTOR >> 1.0 to 2.0 sec (Default : 1.2 sec)

PROPORTIONAL BAND

Sets proportional gain (% power per unit error). Defined in same units and resolution as that for PV.

INTEGRAL TIME

Sets integral time constant in Seconds. Setting the value to 0, cuts-off the integral action.

DERIVATIVE TIME

Sets derivative time constant in seconds. Setting the value to 0, cuts-off the derivative action.

CYCLE TIME

Sets the total 'On + Off' time in seconds for time proportional power output through Relay / SSR for OP1.

POWER LOW

Sets the minimum % output power limit for OP1.

POWER HIGH

Sets the maximum % output power limit for OP1.

OVERSHOOT INHIBIT

Set this parameter to 'Enable' if the process exhibits unacceptable overshoot upon start-up or a step change in SP. If enabled, the controller controls the rate of change of PV to minimize overshoot while approaching the target SP.

CUTOFF FACTOR

This parameter adjusts the effectiveness of the Overshoot Inhibit feature. Increase the value if the overshoot is curbed but the PV takes longer to reach the SP. Decreases the value if the overshoot persists.

SUPERVISORY > PASSWORD

Parameter Description	Settings (Default Value)
<p>CHANGE PASSWORD >></p> <p>The Controller is shipped from the factory with a default password (123) for accessing the parameters reserved for Operator. However, if required the password can be changed by setting the new value for this parameter.</p> <p>Set to 'Yes' for changing the Password.</p>	<p>No Yes (Default : No)</p>
<p>NEW PASSWORD >></p> <p>This parameter is presented if 'Change Password' is set to 'Yes'. Set the new password value.</p>	<p>0 to 3000 (Default : 123)</p>



Section 5

FACTORY ACCESS LEVEL

The Factory Parameters are accessible under default password 321. The parameters are arranged in various groups for convenient access. Refer Table 5.1 below for a quick summary of parameters under different groups. The parameters are described in subsequent sections.

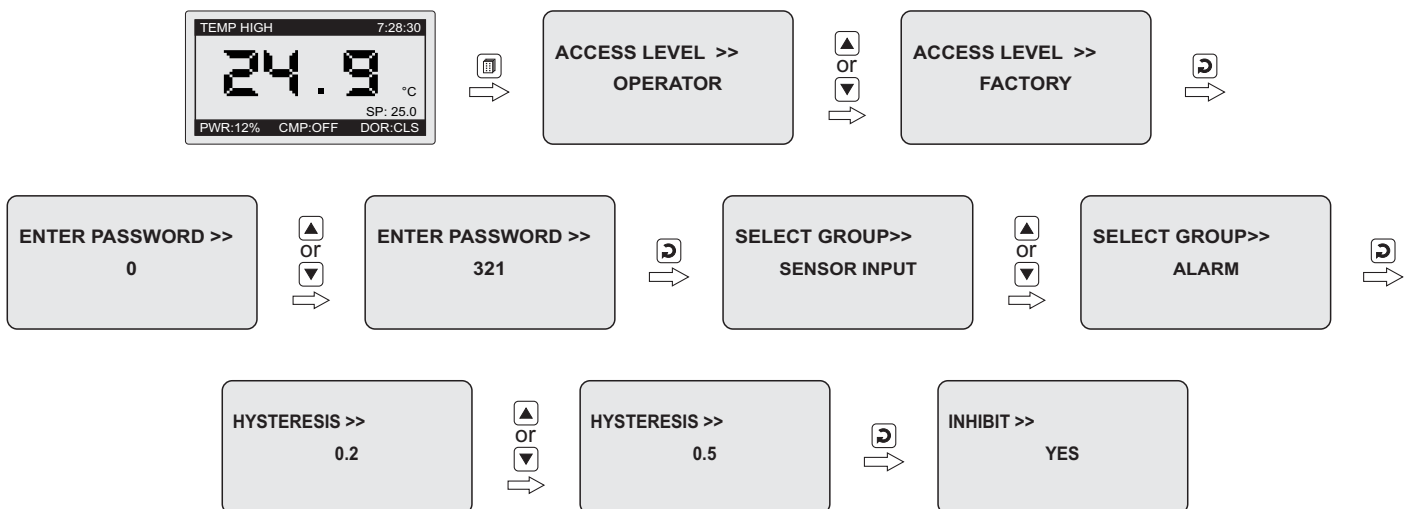
Table 5.1

Group	Parameters
Sensor Input	Input Type, Filter Constant
Alarm	Hysteresis, Inhibit
Heat Cool Select	Control Strategy, Compressor Strategy, Boundary Set Value, Control Zones, Time Delay (Sec)
Timer	Enable, Start Band, Holdback Strategy, Hold Band, Heat Off, Cool Off, Power-Fail Recovery
Door Open	Enable/Disable, Switch Logic, Door Alarm Delay
Factory Default	Set to Default Yes/No
Password	Change Password

Accessing Group & Parameters

The Figure 5.1 below illustrates how to access the group and its parameters under Factory Level. The example shows accessing the group ALARM and changing the value for the parameter 'HYSTERESIS' from 0.2 to 0.5.

Figure 5.1



Note

The Last Parameter in the selected Group rolls back to the 'SELECT GROUP' screen to avoid re-entering the password in case parameters under multiple groups need to be set.

FACTORY > SENSOR INPUT

Parameter Description	Settings (Default Value)
INPUT TYPE >> Select Input type in accordance with the type of Temperature sensor (Thermocouple / RTD) connected for measurement.	Refer Table 5.2 (Default : RTD Pt100)
PV FILTER TIME >> Sets the time constant, in Seconds, for the low-pass digital filter applied to the measured PV. The filter helps smoothing / averaging the signal input and removing the undesired noise. The higher the filter value the lower the indication response to the PV changes and vice-a-versa.	0.5 to 60.0 (In steps of 0.5 sec) (Default : 0.5)

Table 5.2

Option	Range (Min. to Max.)	Resolution & Unit
Type J	0 to +960°C	1 °C
Type K	-200 to +1376°C	
Type T	-200 to +387°C	
Type R	0 to +1771°C	
Type S	0 to +1768°C	
Type B	0 to +1826°C	
Type N	0 to +1314°C	
Type E	-200 to +1000°C	
RTD Pt100	-99.9 to +850.0°C	0.1 °C

FACTORY > ALARM

Parameter Description	Settings (Default Value)
HYSTERESIS >> This parameter sets a differential (dead) band between the ON and OFF Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.	0.1 to 99.9 (Default : 0.2)
INHIBIT >> Yes 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. No The Alarm is not suppressed during the start-up Alarm conditions.	YES NO (Default : YES)

FACTORY > HEAT COOL SELECT

The PPI “Multi-Purpose Temperature Controller” provides control outputs for driving, both, heating & cooling sources. The user can enable any one or both outputs depending upon the test equipment type and application. If both outputs are enabled (by setting the parameter ‘Control Strategy’ to ‘Heat + Cool’) and if the cooling source is compressor then the controller offers various strategies for switching the compressor as described below.

Compressor Switching Strategies

1. Compressor Off

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

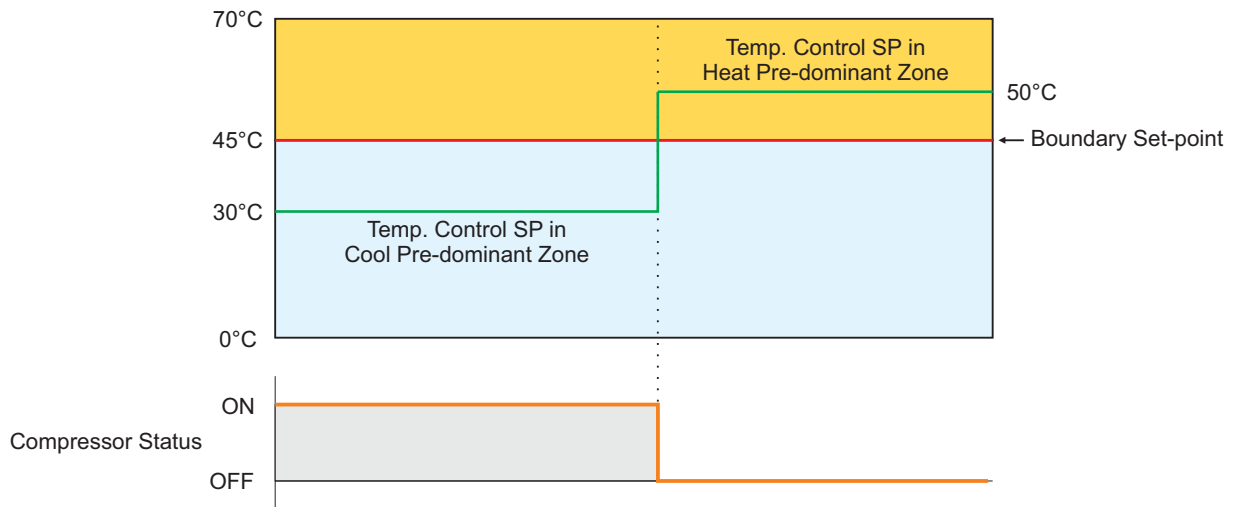
2. Compressor On

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 5.2.

Figure 5.2



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.

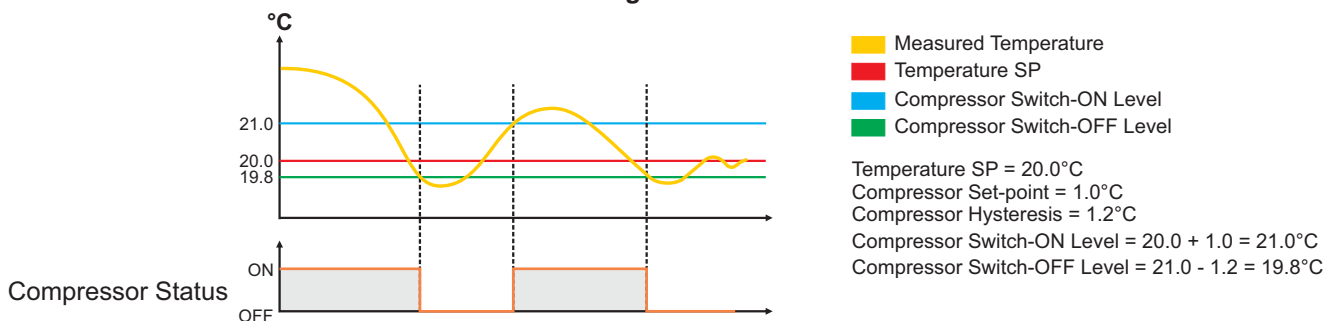
If the parameter *Control Zones* is set to “Dual”; separate tuning can be performed in the Cool and Heat Pre-dominant zones for accurate control in each zone. The controller maintains separate sets of Proportional Band, Integral Time & Derivative Time constants for each zone that are automatically selected 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 air temperature. The controller switches the compressor ON or OFF based on the comparison between the Measured & Set Temperature values. Refer Figure 5.3 below.

Figure 5.3



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;

$$\text{Compressor Switch - ON Level} = (\text{Temperature SP}) + (\text{Compressor Set-point})$$

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;

$$\text{Compressor Switch - OFF Level} = (\text{Compressor Switch-ON Level}) - (\text{Compressor Hysteresis})$$

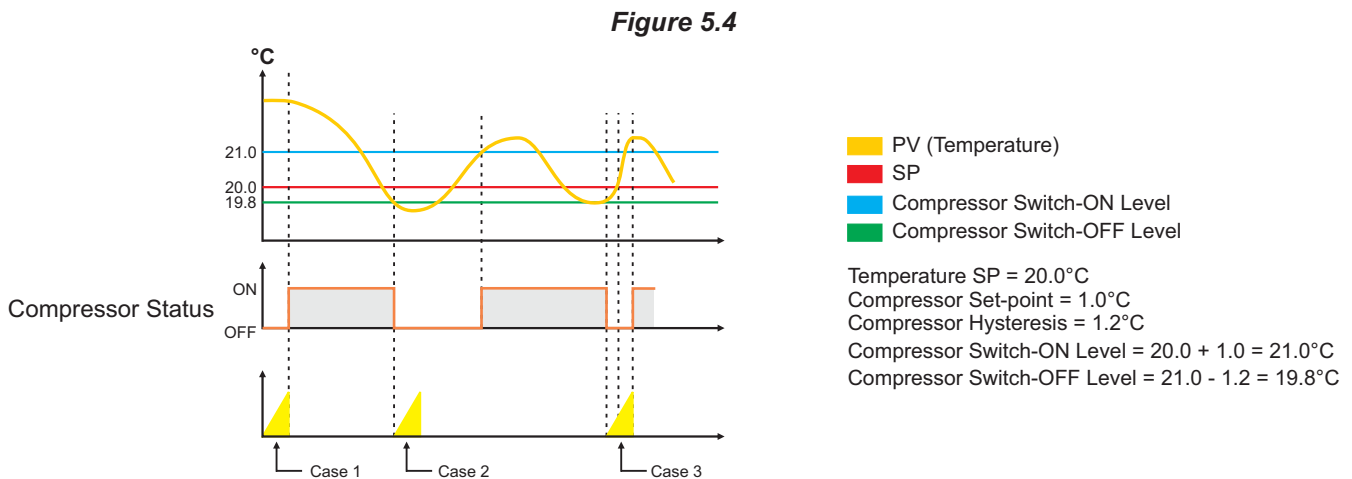
The hysteresis inserts a dead band between the Compressor Switch-ON Level and Compressor Switch-OFF Level to avoid frequent switching of the compressor.

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 5.4 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.

Table 5.2 lists various parameters required for setting-up appropriate compressor switching strategy and associated parameters.

For parameter description the user is requested to read the preceding section.

Table 5.2

Parameter Description		Settings (Default Value)
CONTROL STRATEGY >> <i>Heat Only</i> Used in applications like Heating Oven, Vacuum Oven, Muffle Furnace, etc.; that require raising the temperature above ambient. The HTR (Heater) control output switches 'heating source' for maintaining the temperature at desired setpoint. The CMP (Compressor) control output is inactive (kept off). <i>Cool Only</i> Used in applications like Deep Freezer, Cold Cabinet, Lab Refrigerator, etc.; that require lowering the temperature below ambient. The CMP (Compressor) control output switches 'cooling source' for maintaining the temperature at desired setpoint. The HTR (Heater) control output is inactive (kept off). <i>Heat + Cool</i> Used in applications like Environment Chamber, BOD Incubator, etc.; that require either lowering the temperature below or raising the temperature above ambient. Both, the CMP (Compressor) and HTR (Heater) control outputs switch 'cooling source' & 'heating source', respectively, for maintaining the temperature at desired setpoint.		Heat Only Cool Only Heat + Cool (Default : Heat + Cool)
Control Strategy : Cool Only		
TIME DELAY (SEC) >>		0 to 1000 Sec (Default : 200 Sec)
Control Strategy : Heat + Cool		
COMPRESSOR STRATEGY >>		CONT. OFF CONT. ON SP BASED PV BASED (Default : SP BASED)
CONT. ON	SP BASED	PV BASED
TIME DELAY (SEC) >> 0 to 1000 Sec (Default : 200 Sec)	BOUNDARY SET VALUE >> 0.0 to 100.0 (Default : 45.0)	TIME DELAY (SEC) >> 0 to 1000 Sec (Default : 200 Sec)
	CONTROL ZONES >> SINGLE DUAL (Default : SINGLE)	
	TIME DELAY (SEC) >> 0 to 1000 Sec (Default : 200 Sec)	

FACTORY > TIMER

Parameter Description	Settings (Default Value)
<p>ENABLE >></p> <p><i>Yes</i> Timer function and Start / Abort commands are enabled.</p> <p><i>No</i> Timer function and Start / Abort commands are disabled.</p>	<p>No Yes (Default : No)</p>
<p>START BAND >></p> <p>After issuance of start command, the timer starts counting down once the PV enters the process band around SP defined by this parameter value.</p>	<p>0 to 999.9 (Default : 0.5)</p>
<p>HOLDBACK STRATEGY >></p> <p><i>None</i> PV based timer-pause is not required.</p> <p><i>Up</i> Timer is paused if PV is outside hold band <i>above</i> SP.</p> <p><i>Down</i> Timer is paused if PV is outside hold band <i>below</i> SP.</p> <p><i>Both</i> Timer is paused if PV is outside hold band either <i>above</i> or <i>below</i> SP.</p>	<p>None Up Down Both (Default : None)</p>
<p>HOLD BAND >></p> <p>Sets the temperature limit(s) with respect to the SP for the timer to pause. The timer holds back counting should the PV cross the limit(s).</p>	<p>0.1 to 999.9 (Default : 0.5)</p>
<p>HEAT OFF >></p> <p>The heater is turned off after the set time period is elapsed.</p>	<p>No Yes (Default : No)</p>
<p>COOL OFF >></p> <p>The compressor is turned off after the set time period is elapsed.</p>	<p>No Yes (Default : No)</p>
<p>POWER-FAIL RECOVERY>></p> <p><i>Abort</i> The timer operation is suspended until a new start command is issued.</p> <p><i>Re-Start</i> The timer re-runs the complete time.</p> <p><i>Continue</i> The timer resumes operation for the balance time.</p>	<p>Abort Restart Continuous (Default : Restart)</p>

FACTORY > DOOR MONITORING

Parameter Description	Settings (Default Value)
ENABLE >> Set to 'Yes' if the door status monitoring switch is installed.	YES NO (Default : NO)
SWITCH LOGIC >> <i>Close : Door Open</i> The Door position is considered <i>Open</i> if the switch is CLOSE. <i>Open : Door Open</i> The Door position is considered <i>Open</i> if the switch is OPEN.	CLOSE : DOOR OPEN OPEN : DOOR OPEN (Default : CLOSE : DOOR OPEN)
DOOR ALRM DLY (SEC) >> This parameter sets a time delay. If the door is kept open for a period longer than the set time delay, the <i>Door Open</i> alarm is activated.	0 to 1000 Sec (Default : 60 Sec)

FACTORY > FACTORY DEFAULT

Parameter Description	Settings (Default Value)
SET TO DEFAULT >> Selecting 'Yes' sets all the parameters to their Default Values.	NO YES (Default : NO)

FACTORY > PASSWORD

Parameter Description	Settings (Default Value)
CHANGE PASSWORD >> The Controller is shipped from the factory with a default password (321) for accessing the parameters reserved for Operator. However, if required the password can be changed by setting the new value for this parameter. Set to 'Yes' for changing the Password.	No Yes (Default : No)
NEW PASSWORD >> This parameter is presented if 'Change Password' is set to 'Yes'. Set the new password value.	0 to 3000 (Default : 321)



Section 6 MECHANICAL INSTALLATION

Installation Precautions

Ensure the following precautions are taken while installing the device:

1. *Environment*

Install in a location free from corrosive/combustible gases and electrically conductive pollutants.

2. *Temperature & Humidity*

Avoid rapid temperature changes that may cause condensation. Ensure ambient conditions do not exceed the specified temperature and humidity limits.

3. *Electromagnetic Interference (EMI)*

Protect the installation site from excessive electrostatic or electromagnetic interference.

4. *Vibration & Shock*

Do not mount the device in areas with high vibration or mechanical shock.

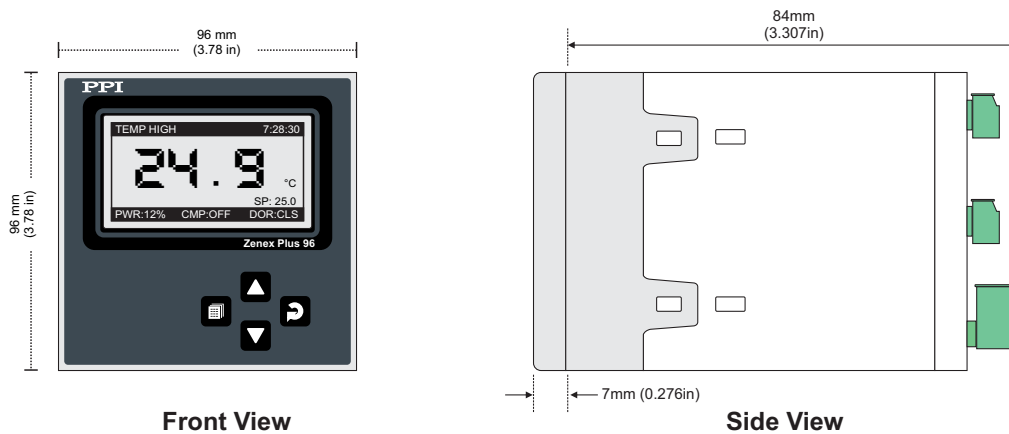
5. *External Elements*

Keep the device away from dust, salt air, direct sunlight, and radiant heat sources.

Outer Dimensions

Refer to Figure 6.1 for the outer dimensions of the device.

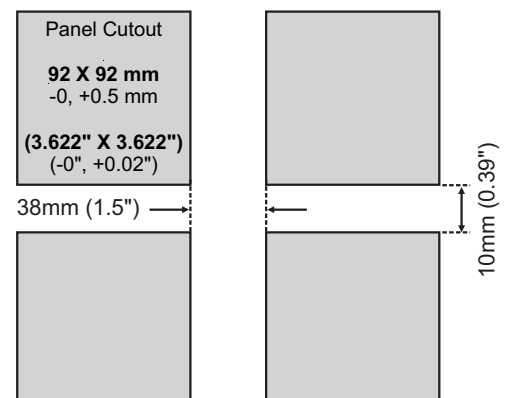
Figure 6.1



Panel Cutout & Spacing Requirements

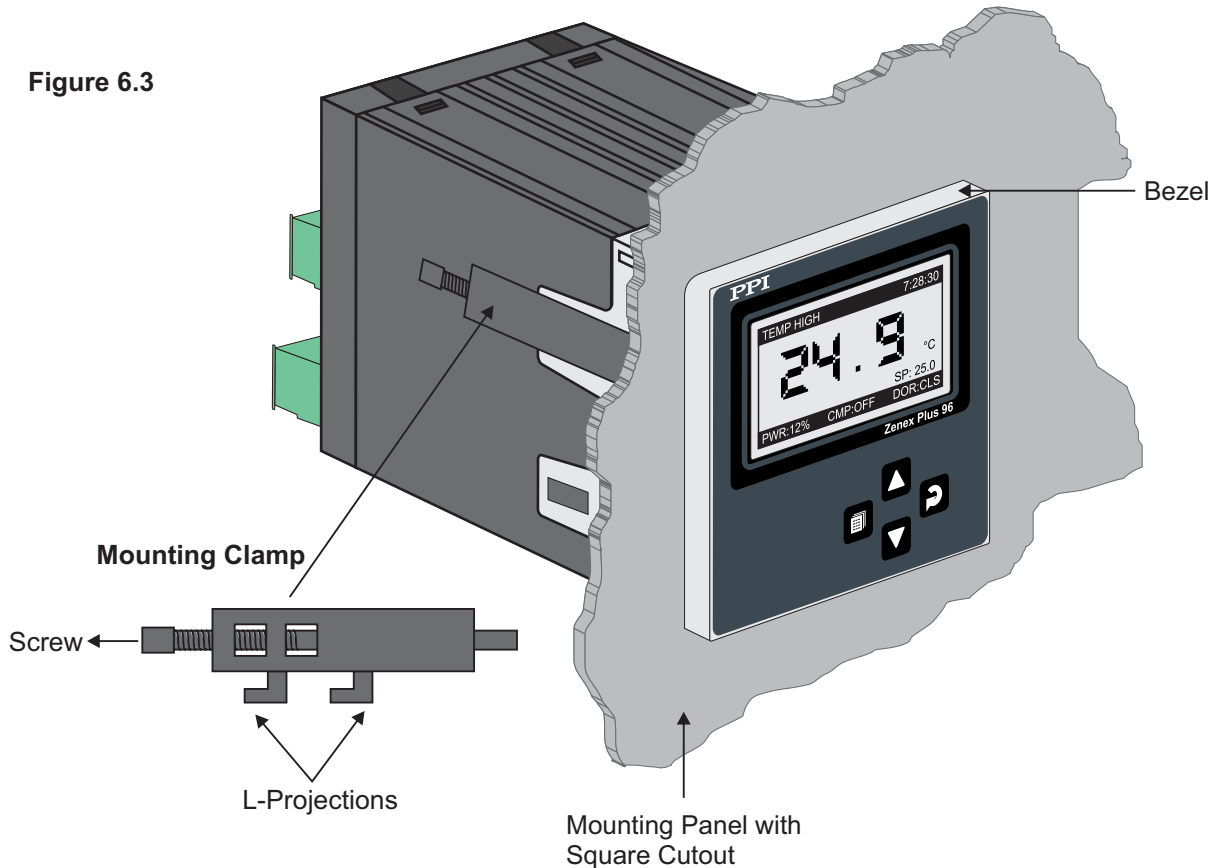
- **Cutout Size**
[92 × 92, mm, -0, +0.5 mm]
[3.622" × 3.622", -0, +0.02"]
- **Minimum Spacing**
Maintain the recommended clearance if installing multiple devices on the same panel.
- **Reference**
See Figure 6.2 for panel cutout dimensions and spacing guidelines.

Figure 6.2



Panel Mounting Instructions

Figure 6.3



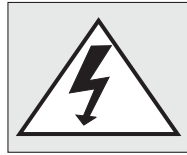
Follow these steps to securely mount the device on a panel:

1. Prepare the Cutout
Create a square cutout on the panel according to the dimensions in Figure 6.2.
2. Remove Mounting Clamps
Detach the Mounting Clamps from the device enclosure.
3. Insert the device:
 - From the front of the panel, insert the rear side of the device housing through the cutout.
 - Ensure the device sits squarely against the panel wall.
 - Caution: Apply pressure only on the bezel, not on the front label.
4. Secure with Mounting Clamps:
 - Attach each clamp so that its L-projections fit into the holes on the left and right sides of the enclosure.
 - Tighten the screws until the clamps firmly secure the device against the panel wall.
5. Reference
 - See Figure 6.3 for panel mounting.



Section 7

ELECTRICAL CONNECTIONS



WARNING
MISHANDLING / NEGLIGENCE
CAN RESULT IN PERSONAL DEATH
OR SERIOUS INJURY.

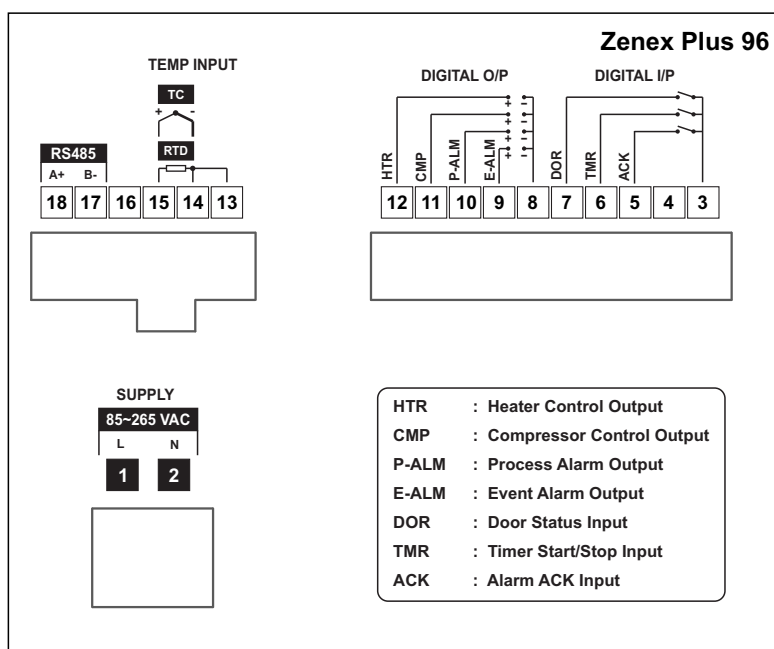
ELECTRICAL CONNECTIONS

1. The user must rigidly observe the Local Electrical Regulations.
2. Do not make any connections to the unused terminals for making a tie-point for other wires (or for any other reasons) as they may have some internal connections. Failing to observe this may result in permanent damage to the controller.
3. Run power supply cables separated from the low-level signal cables (like **RTD**, **Thermocouple**, etc.). If the cables are run through conduits, use separate conduits for power supply cable and low-level signal cables.
4. Use appropriate fuses and switches, wherever necessary, for driving the high voltage loads to protect the controller from any possible damage due to high voltage surges of extended duration or short-circuits on loads.
5. Take care not to over-tighten the terminal screws while making connections.
6. Make sure that the controller supply is switched-off while making/removing any connections or removing the controller from its enclosure.

CONNECTION DIAGRAM

The Electrical Connection Diagram is shown on the back side of the controller enclosure. The diagram shows the terminals viewed from the **REAR SIDE** with the controller label upright.

Figure 7.1



Multi-Purpose Temperature Controller with Graphic Display

DESCRIPTIONS

The back panel connections are described as under:

TEMP INPUT

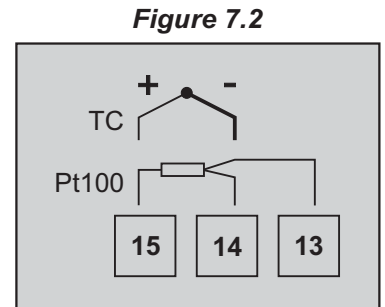
Connect Thermocouple or 3-wire RTD Pt100 sensor as shown below.

RTD Pt100, 3-wire

Connect single lead end of RTD bulb to terminal T2 and the double lead ends to terminals T3 and T4 (interchangeable) as shown in Figure 7.2. Use low resistance copper conductor leads of the same gauge and length. Avoid joints in the cable.

Thermocouple

Connect Thermocouple Positive (+) to terminal T2 and Negative (-) to terminal T3 as shown in Figure 7.2. Use correct type of extension lead wires or compensating cable. Avoid joints in the cable.



Heater Control Output (terminals : 12, 8)

Compressor Control Output (terminals : 11, 8)

Process Alarm Output (terminals : 10, 8)

Event Alarm Output (terminals : 9, 8)

All the above control & alarm outputs are Voltage pulses (12VDC @ 20mA, Short-circuit protected) for driving external SSR or Relay. The '+' and '-' terminals are for voltage 'Source' and 'Return' paths, respectively.

Door Status Input (Terminals 7, 3)

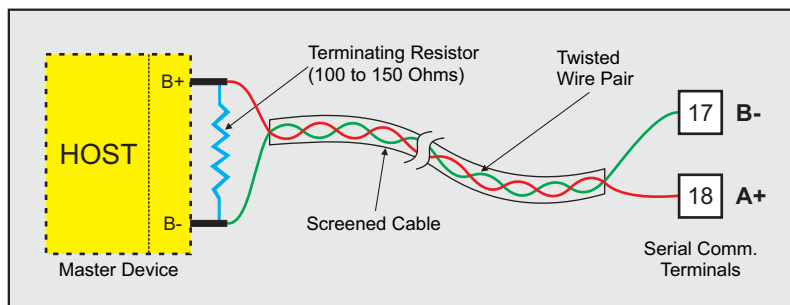
Timer Start/Stop Input (Terminals 6, 3)

Alarm ACK Input (Terminals 5, 3)

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

PC COMMUNICATION PORT (Terminals 22, 21)

Figure 7.3



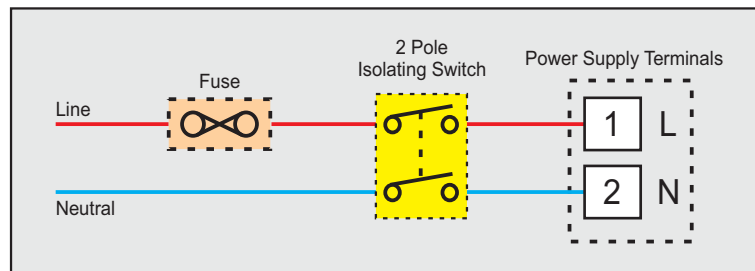
The controller Communication Port is RS485 and requires a similar port at the host (master) end. If, however, the host port is different (say, USB), use appropriate protocol converter (say, USB to RS485) for interface.

For reliable noise free communication, use a pair of twisted wires inside screened cable as shown in Figure 7.3. 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)





As standard, the module is supplied with power connections suited for 85 to 265 VAC line supply. 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 7.4. The module is not provided with fuse and power switch. If necessary, mount them separately. Use a time lag fuse rated 1A @ 240 VAC.

Figure 7.4



Multi-Purpose Temperature Controller with Graphic Display

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