Zenex-ultra

PPI
The Perfection Experts

Ultra Precision (0.01 °C) Self-Tune PID Temperature Controller with Programmable Timer

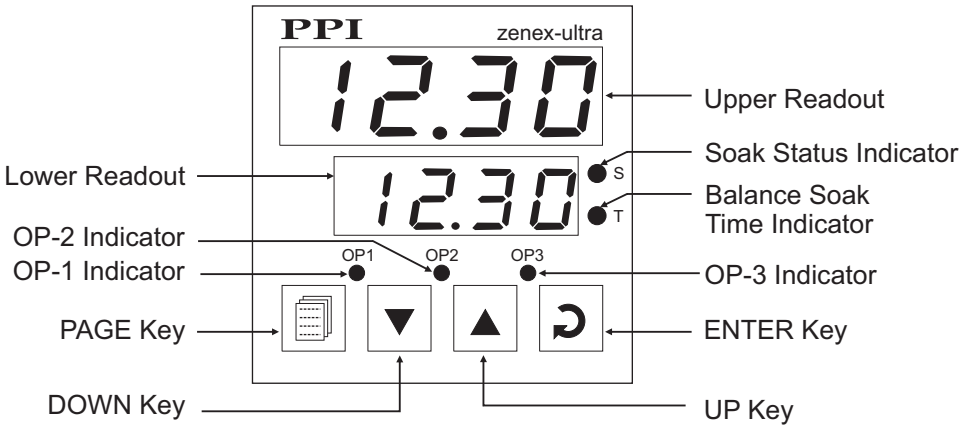
User Manual

CONTENTS

Section 1
FRONT PANEL LAYOUT

The controller front panel comprises of digital readouts, LED indicators and membrane keys as shown in Figure 1.1 below.

Figure 1.1



READOUTS

The upper readout is a 4 digit, 7-segment bright red LED display and usually displays the PV (Process Value) in 0.01°C Resolution. In parameter set-up mode, the upper readout displays parameter values.

The lower readout is a 4 digit, 7-segment bright green LED display and usually displays the SP (Process Setpoint) value in 0.01°C Resolution. In parameter set-up mode, the lower readout displays prompts for the parameters.

INDICATORS

The Table 1.1 lists each front panel LED and the associated status.

Table 1.1

Indicator	Status
S	• Flashes while the Soak Timer is counting down. • Glows steadily while the Soak Timer is outside the Timer Start Band or Hold Band (that is, HOLD state).
T	Glows while the Lower Readout shows the Balance Soak Time in Main display mode.
OP1	• Indicates Output-1 ON/OFF status if the Control Output is Relay or SSR drive. • Remains OFF if the Control Output is DC Linear.
OP2	• Indicates Output-2 status if OP2 function is Auxiliary / Blower Control. • Flashes Alarm-1 status if OP2 function is Alarm.
OP3	• Indicates Output-3 status if OP3 function is Auxiliary Control. • Flashes Alarm-2 status if OP3 function is Alarm.

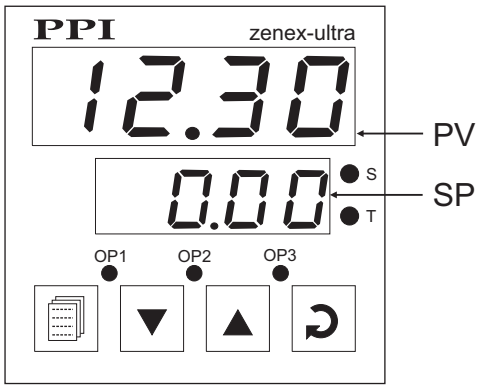
Section 2
BASIC OPERATIONS

MAIN DISPLAY MODE

After the power-up display sequence, the upper readout starts showing the measured PV (Process Value) and the lower readout displays the SP (Setpoint) in 0.01°C Resolution.

This is called the MAIN display mode and this is the one that shall be used most often. The MAIN display mode is depicted in Figure 2.1.

Figure 2.1



PV ERROR INDICATIONS

In case the PV falls below the Minimum Range or rises above the Maximum Range specified for the RTD Pt100 input type or in case the RTD Pt100 sensor is open / broken; the upper readout flashes the error messages listed in Table 2.1 below. The Figure 2.2 illustrates an open sensor condition.

Figure 2.2

Table 2.1

Message	PV Error Type
Or	Over-range (PV above Max. Range)
Ur	Under-range (PV below Min. Range)
OPEn	Open (Sensor open / broken)

Section 3
PAGES & PARAMETERS

ORGANIZATION

The controller requires various user settings that determine how the controller will function or operate. These settings are called parameters. The various parameters have been grouped as shown in Table 3.1. Each group is assigned a unique PAGE NUMBER for its access and the parameters within each group are presented depending on the function(s) selected.

The parameters are always presented in a fixed format: The lower readout displays the parameter prompt (Identification Tag) and the upper readout displays the set value. The parameters appear in the same sequence as listed in their respective sections.

Table 3.1

Group	Page Number	Main Parameters
Installation Parameters	10	Output Type
Configuration Parameters	11	Calibration Offset Control Mode Overshoot Inhibit Control Logic Hysteresis Digital Filter
Supervisory Parameters	12	Serial Communication Setpoint Locking Tune At Setpoint Change Optimize Command
Output-2 Function	13	Function Selection Process Alarm Settings Blower Settings Soak Timer Settings
Output-3 Function	14	Function Selection Process Alarm Settings Heater Break Alarm Serial Communication
PID Control Parameters	15	Proportional Band Integral Time Derivative Time

ADJUSTING PARAMETER VALUES

Once a PAGE is accessed, step through the following sequence to adjust the values of the desired parameters:

1. Press and release the ENTER key until the prompt for the required parameter appears in the lower readout. The last parameter in the list rolls back to the first parameter.
2. Use UP / DOWN keys to adjust the parameter value.

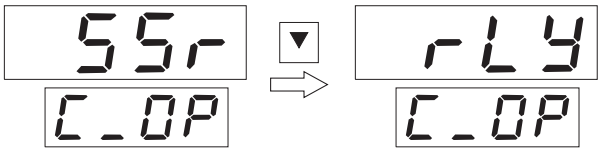
   Note that some parameters (examples; Alarm Setpoint, Blower Setpoint, etc.) have numeric values while others

(examples; Control Mode, Alarm Logic, etc.) have a series of options. If adjusting a numeric value; depressing the UP/DOWN key once, increases/decreases the parameters value by one digit. For parameters having a series of options, depressing the UP/DOWN key once takes you to the next/previous option. In each case, keeping the UP/DOWN key pressed speeds up the rate. If the value reaches the maximum / minimum settable value/option, the upper readout flashes and the UP (if maximum value is reached) or DOWN (if minimum value is reached) key has no effect.

3. Press and release the ENTER key. The new value gets stored in the controller's non-volatile memory and the next parameter in the list is displayed.

The Figure 3.2 illustrates the example of altering the value for the parameter 'Control Output Type'. As in this example no other parameter is available in the list, pressing ENTER key will not displayed any other parameter in the list.

Figure 3.2



To exit the set-up mode and return to the MAIN display, press and release PAGE key.

VIEW-ONLY PARAMETERS

While the controller is operating in the PID control mode, the user can view (but not adjust) the instantaneous values of the % output power. The view facility is available in PAGE-0 and can be availed as described below.

1. Press and release PAGE key. The lower readout shows PAGE and the upper readout shows 0.
2. Press and release ENTER key. The controller enters into view mode.
3. Keep pressing ENTER key to select between the parameters available for viewing.

The prompt for identifying the parameter is indicated in the lower readout and the actual value is indicated in the upper readout.

Prompt	Parameter
OUt.P	% Output Power

To exit view mode and return to the MAIN display mode; press and release PAGE key.

Section 4
INSTALLATION PARAMETERS : PAGE-10

The installation parameters are contained in PAGE-10 and are required to be set only at the time of a new installation.

The installation parameters are listed below in Table 4.1, followed by the definitions for each parameter.

Table 4.1

Parameter Description	Settings (Default Value)
OUTPUT TYPE C_OP The controller is supplied with built-in Relay and DC voltage pulses (for driving external SSR) as control output signals. The required output type can be selected by appropriate jumper settings as described in *section 9: Hardware Assembly And Configurations*. The jumper-selected output type must also be set as a value for this parameter for correct operation. The controller automatically sets the cycle time for the time-proportioning PID output in accordance with the selected output type. The Table 4.3 below lists the options available for setting this parameter value.	Refer Table 4.2 (Default : SSR)

Table 4.2

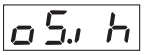
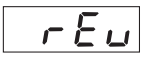
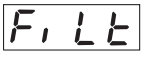
Option	What it means	Cycle Time
rLy	Electromechanical Relay contacts (Common & Normally Open)	20 Seconds
SSr	DC voltage pulses for driving external Solid State Relay (SSR)	1 Second

Note:
In the zenex-ultra, the Temperature Range is restricted to -19.99 to +102.9°C. This Temperature Range is fixed and not available as settable parameter. The 0.01°C Resolution is available upto 99.99°C. After this, the resolution automatically changes to 0.1°C.

Section 5
CONFIGURATION PARAMETERS : PAGE-11

The Configuration parameters are contained in PAGE-11 and are factory set to the appropriate default values. However, for specific installations the user may need to alter the values. Altering the configuration parameter values affect either the measured PV and/or the control algorithm implemented by the controller. The parameters are listed in Table 5.1 below, followed by their definitions.

Table 5.1

Parameter Description	Settings (Default Value)
CALIBRATION OFFSET  This value is algebraically added to the measured PV to derive the final PV that is displayed and compared for alarm / control. Final PV = Measured PV + Offset	-19.99 to +25.00 (Default : 0.00)
CONTROL MODE  Select appropriate Control Algorithm suited for process requirement.	 PID  On-Off (Default : PID)
OVERSHOOT INHIBIT  *(Available for PID control only)* Enabling this feature controls the PV rise or fall upon process start-up in order to reach the control setpoint with as minimum overshoot as possible.	 Enable  Disable (Default : Enable)
CONTROL LOGIC  *(Available for On-Off or Pulsed On-Off Control only)* Select Reverse (*heat* logic) or Direct (*cool* logic).	 Reverse  Direct (Default : Reverse)
HYSTERESIS  *(Available for On-Off or Pulsed On-Off Control only)* Sets differential (dead) band between On-Off switching for OP1.	0.10 to 25.00 (Default : 0.20)
DIGITAL FILTER FOR PV  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.	1.0 to 25.0 Seconds in steps of 0.5 Seconds (Default :1.5)

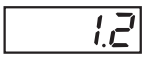
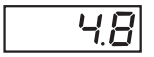
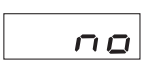
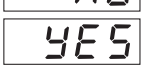
Note:

The Calibration Offset and Hysterisis parameter values are settable same as that for the PV resolution. Hence, they are also available in 0.01°C resolution. Their settings and default values are modified as per the 0.01°C resolution as shown in the above Table 5.1.

Section 6
SUPERVISORY PARAMETERS : PAGE-12

The parameters are listed in Table 6.1 below followed by their definitions.

Table 6.1

Parameter Description	Settings (Default Value)
SETPOINT LOCKING  Set to Yes to Lock the SP editing on the Lower Readout.	 No  Yes (Default : No)
SELF-TUNE ON SETPOINT CHANGE  The controller's "X-THERM" algorithm is powered with the ability to self-detect the need for Tuning / Optimization of the controller if there is a substantial change in the SP by the user. The algorithm takes into account the magnitude of SP change and the Temperature Range. If this parameter is set to 'Enable', the controller, if required, automatically optimizes the control parameter values while approaching the new SP. The user can set this parameter to 'Disable' if this feature is not desired.	 Enable  Disable (Default : Disable)
OPTIMIZE COMMAND  *(Available for PID control only)* Set to 'Yes' to initiate a new tuning cycle or set to 'No' to abort a tuning operation in progress.	 No  Yes (Default : No)
CONTROLLER ID NUMBER  This parameter, settable from 1 to 8, assigns a unique slave identity number to the controller that the Master Device uses to address the controller for data read/write operation.	1 to 8 (Default : 1)
BAUD RATE  This parameter defines the communication speed expressed in "Bits per Second". This parameter is settable as 1200, 2400, 4800 or 9600 and must be set in accordance with the communication speed set for the Master Device.	 1200  2400  4800  9600 (Default : 4800)
COMMUNICATION WRITE ENABLE  *Yes* The Read/Write parameters can be accessed for both reading and writing. *No* The Read/Write parameters can only be accessed for reading. That is, the parameter values cannot be altered through serial communication.	 No  Yes (Default : No)

Section 7
OP-2 FUNCTION PARAMETERS : PAGE-13

The Output-2 Function Parameters are available in PAGE-13. The parameters are specified in Table 7.1 below.

Table 7.1

Parameter Description	Settings Default Value
OUTPUT-2 FUNCTION SELECTION OP2.F *None* OP2 module not installed or function not used. *Alarm* OP2 relay activates as Alarm status. *Blower* OP2 relay activates as Blower / Compressor control status. *Soak* OP2 Relay activates as end-of-soak Alarm.	nonE None ALrn Alarm bLOr Blower SoAK Soak (Default : None)

OP2 Function : Alarm

Parameter Description	Settings Default Value
TYPE tYPE *Process Low* The alarm activates for PV less than or equal to Alarm Setpoint. *Process High* The alarm activates for PV greater than or equal to Alarm Setpoint. *Deviation Band* The alarm activates if the PV deviation from SP is greater than the set positive or negative 'Deviation Band' value. *Window Band* The alarm activates if the PV deviation from SP is greater than the set 'Window Band' value in either direction.	P_Lo Process Low P_Hi Process High dEu Deviation Band bAnd Window Band (Default : Process Low)
SETPOINT AL.SP Available for 'Process High' or 'Process Low' Alarms. Sets the Upper (Process High) or Lower (Process Low) Alarm Limit.	Min. to Max. Range for the selected Input type (Default : 0)
DEVIATION BAND bAnd Available for 'Deviation Band' Alarm. Sets a deviation band above (Positive value) or below (Negative value) the SP for alarm activation.	-1999 to 9999 **or** -199.9 to 999.9 (Default : 0)
WINDOW BAND bAnd Available for 'Window Band' Alarm. Sets a symmetrical band above and below the SP for alarm activation.	3 to 999 **or** 0.3 to 99.9 (Default : 3)

Parameter Description	Settings Default Value
LOGIC AL.LG *Direct* The Alarm output (Relay/SSR) remains ON under alarm condition; OFF otherwise. Useful for Audio / Visual Alarm. *Reverse* The Alarm output (Relay / SSR) remains OFF under alarm condition; ON otherwise. Useful for Tripping the system under control.	dir Direct rEu Reverse (Default : Direct)
INHIBIT AL.ih *No* Alarm is not suppressed for start-up condition. *Yes* The Alarm activation is inhibited (suppressed) until the PV is found within alarm limits from the time the controller is switched ON.	YES Yes no No (Default : Yes)

OP2 Function : Blower / Compressor Control

Parameter Description	Settings Default Value
OFFSET VALUE bL.SP Sets a positive (+) offset to the SP to define the 'Blower / Compressor Setpoint'. Blower / Compressor Setpoint = Control Setpoint (SP) + Offset Value	0 to 250 **or** 0.0 to 25.0 (Default : 0)
HYSTERESIS bL.HY Differential (dead) band between the blower ON and OFF states.	1 to 250 **or** 0.1 to 25.0 (Default : 2 **or** 0.2)
TIME DELAY t.dLY This parameter is mainly used for Compressor Load. The set time delay is elapsed each time before the compressor is switched ON. Set the value to 0 if no Time Delay is required.	00.00 to 10.00 Min. Sec (in steps of 5 Seconds) (Default : 00.00)

OP2 Function : Soak

Parameter Description	Settings Default Value
SOAK TIME SoAt (Available only if OP2 Function is selected as Soak Timer.) The preset time value in Minutes for the Soak Timer.	1 to 9999 min. (Default : 30 min.)
END-OF-SOAK OUTPUT STATUS EoS This parameter sets the output status for Control & Alarm at the End-of-Soak Timer. The options are : *None* None of the outputs is affected. *Heater Off* The control output (Heater) is Switched-off. *Alarm On* The Alarm output is activated. *Both* The control output (Heater) is Switched-off & the Alarm output is activated.	none None H.OFF Heater Off AL.On Alarm On both Both (Default : None)

Section 8
OP-3 FUNCTION PARAMETERS : PAGE-14

The Output-3 Function Parameters are available in PAGE-14. The parameters are specified in Table 8.1 below.

Table 8

Parameter Description	Settings (Default Value)
OUTPUT-3 FUNCTION OP3.F *(Applicable for OP3 hardware module, if fitted)* Select the function / feature to which the OP3 module is to be logically attached for activation.	nonE None ALrn Alarm H.brK Heater-break (Default : None)
ALARM TYPE tYPE *(Available if OP3 function is Alarm)* Select the Alarm-1 activation type. Selecting 'None' will disable the alarm and suppress all the related parameters for Alarm-1.	P_Lo Process Low P_hi Process High dEu Deviation Band bAnd Window Band Default : Process Low
ALARM SETPOINT AL.SP *(Available for Process High or Process Low Alarm-1 Type)* Sets Alarm limit independent of control setpoint.	0.00 to 99.99 (Default : 0.00)
DEVIATION BAND bAnd *(Available for Deviation Band Alarm-1 Type)* Sets positive or negative deviation (offset) limit from control setpoint for High or Low Alarm-1 activation, respectively.	-19.99 to +25.00 (Default : 0.00)
WINDOW BAND bAnd *(Available for Window Band Alarm-1 Type)* Sets symmetrical positive and negative deviation (offset) limits from control setpoint for both High and Low Alarm-1 activation.	0.30 to 25.00 (Default : 0.30)
ALARM LOGIC AL.LG *(Available if OP3 function is Alarm)* Select 'Direct' if Alarm-1 is to activate an Audio / Visual alarm. Select 'Reverse' if Alarm-1 is to Trip the system.	dir Direct rEu Reverse (Default : Direct)

Parameter Description	Settings (Default Value)
ALARM INHIBIT AL.1 h *(Available if OP3 function is Alarm)* Set to Yes to suppress Alarm-1 activation upon power-up or process start-up.	EnbL Enable dSbL Disable (Default : Disable)
HEATER-BREAK OUTPUT H.brP Not implemented. Ignore this parameter.	ALrn Alarm trIP Trip (Default : Alarm)

Section 9
PID CONTROL PARAMETERS : PAGE-15

As described in *Section 5: Configuration Parameters*, the control mode can be set as ON-OFF or PID. If set as PID, the controller allows adjustment of various control related parameters that are grouped in PAGE-15. Note that these parameters are not presented to the user if the set control mode is ON-OFF.

The PID control parameters are listed in Table 9.1 below, followed by their definitions.

Table 9.1

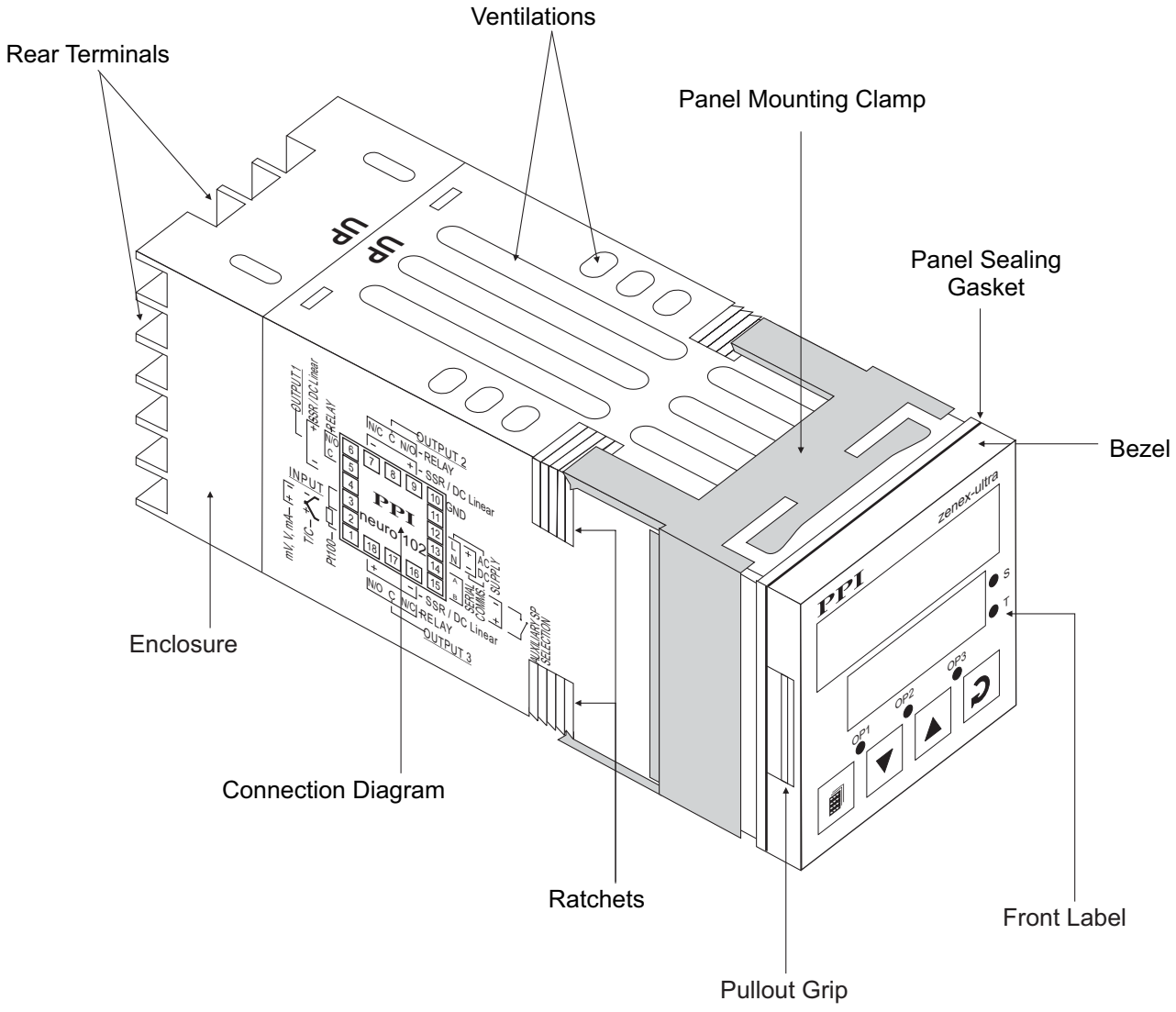
Parameter Description	Settings (Default Value)
CYCLE TIME  This parameter, expressed in seconds, is applicable only to the time proportion output associated with Relay or SSR as the control output. For the time proportion output, the controller implements the output power by adjusting the ON time of Relay/SSR as a % of the Cycle Time. The Relay/SSR remains OFF for the rest of the Cycle Time. For example, if the Cycle Time is set to 20.0 seconds and if the output power demand is 10%, the ON and OFF time duration for relay/SSR are computed (and implemented) as follows: ON time = 10% X 20 = (10/100) X 20 = 2 Seconds OFF time = Cycle Time - ON duration = 20 - 2 = 18 Seconds The Cycle Time, thus, equals 'ON time + OFF time'. The controller output is 100% (fully on) during ON time and 0% (fully off) during OFF time.	0.5 to 120.0 Seconds (in steps of 0.5 secs.) (Default : 20 sec for relay, 1 sec for SSR)
PROPORTIONAL BAND  This parameter value defines the band within which the control output signal varies proportionally between the maximum (100%) to the minimum (0%) level depending upon the error (difference between the control setpoint and PV). The Proportional Band is expressed in same resolution and unit as that for PV and accordingly modified to set within 0.01 to 99.99 °C. Though this parameter value is automatically set by the self-tune / optimize utility, the user can alter the value manually.	0.01 to 99.99°C (Default : 10.00°C)
INTEGRAL TIME  This parameter value, expressed in seconds, is a measure of the time response of the process and defines the time the controller takes to remove the steady state offset errors within the proportional band. Though this parameter value is automatically set by the self-tune / optimize utility, the user can alter the value manually. Setting this parameter value to 0 cuts-off the integral action.	0 to 1000 Seconds (Default : 100 Sec)

Parameter Description	Settings (Default Value)
DERIVATIVE TIME dt This parameter value, expressed in seconds, defines how strong the control output level will change in response to the rate of change of measured PV. This, in effect, produces larger proportional and Integral actions should the PV change at a faster rate. Though this parameter value is automatically set by the self-tune / optimize utility, the user can alter the value manually. Setting this parameter value to 0 cuts-off the derivative action.	0 to 250 Seconds (Default : 25 Sec)

Section 10

HARDWARE ASSEMBLY AND CONFIGURATIONS

Figure 10.1



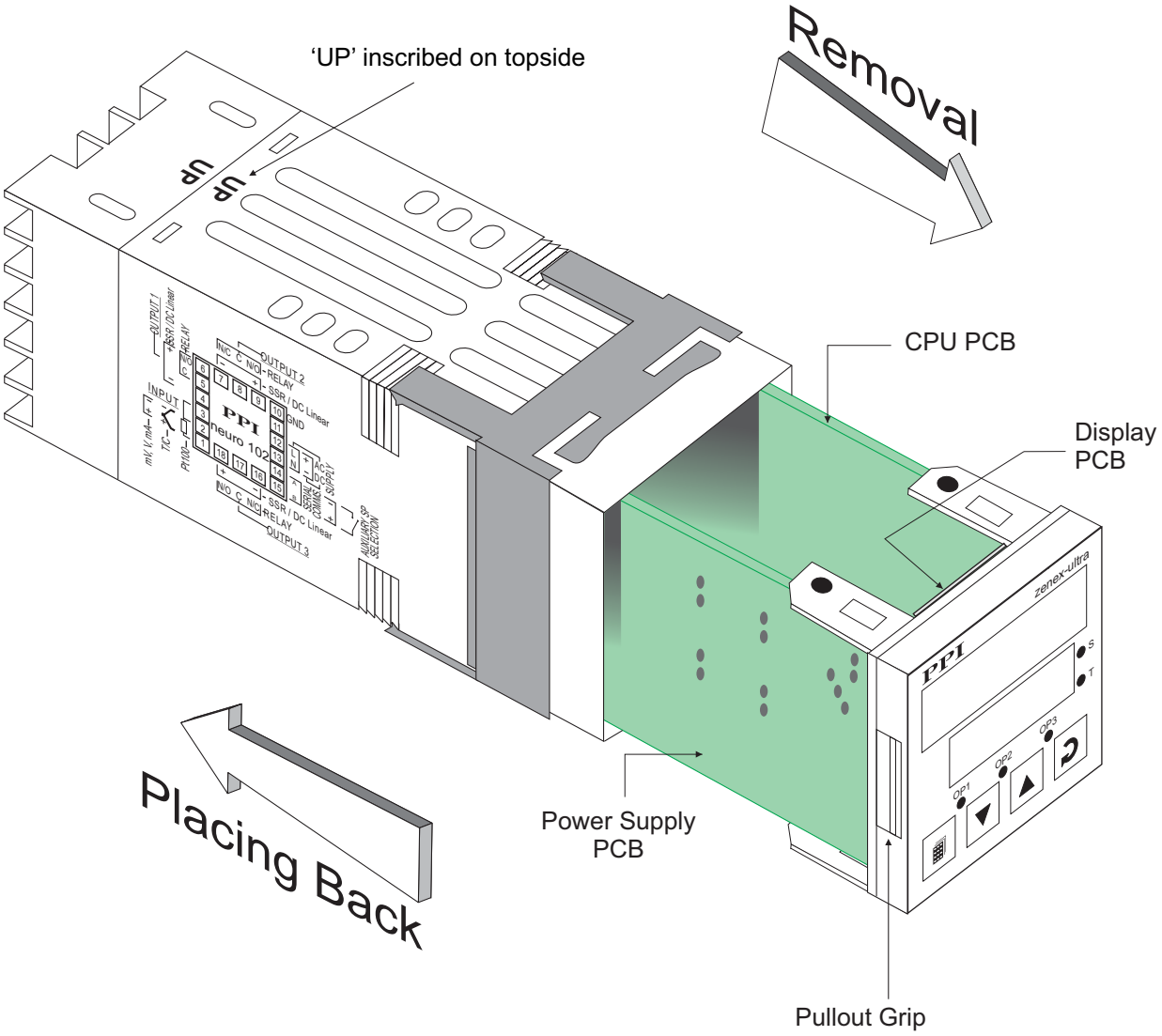
The Figure 10.1 above shows the indicator outer-case viewed with front label upright.

ELECTRONIC ASSEMBLY

The basic electronics assembly (without any plug-in modules), comprises of 3 Printed Circuit Boards (PCB). When viewed from the front; the CPU PCB is to the right, Power-supply PCB is to the left and the Display PCB is behind the bezel.

The electronic assembly can be removed from the plastic enclosure and placed back as described and illustrated in Figure 10.2.

Figure 10.2



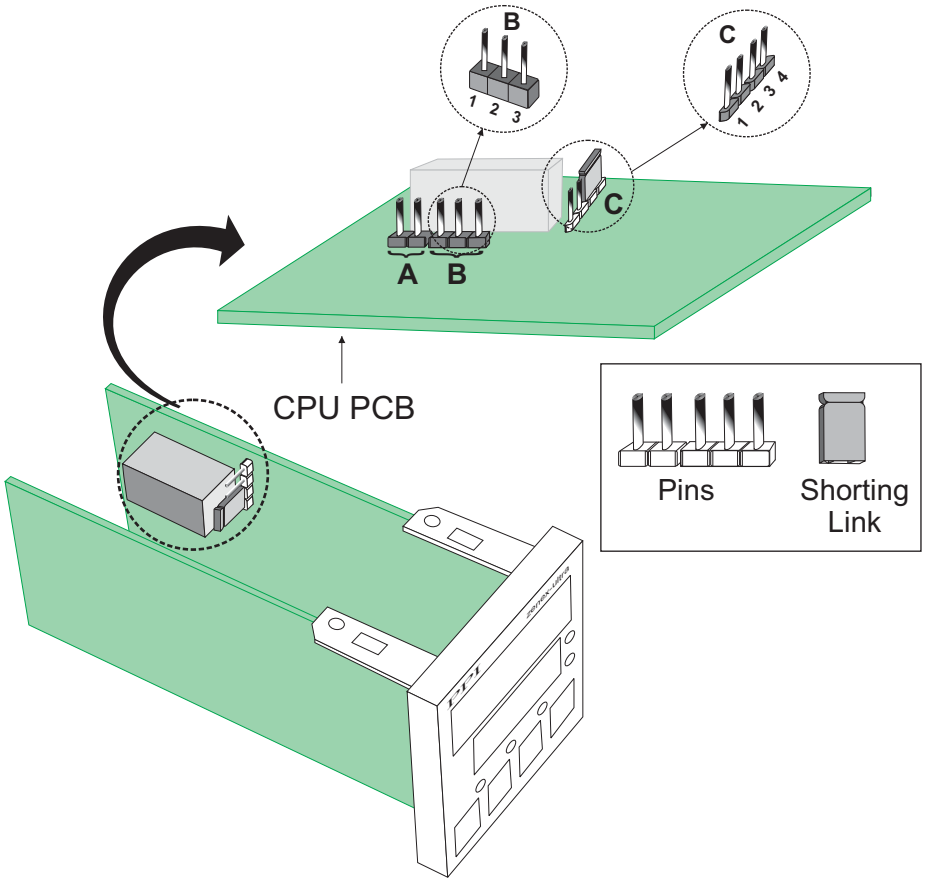
Removing Assembly from Enclosure

With the indicator upright, hold the Bezel with the fingers on the pullout grips provided on the left and right sides of the bezel. Pull the bezel outward. The assembly comes out with the bezel.

Placing Assembly Back into Enclosure

With the indicator upright (the UP inscribed on the Enclosure is on the topside), insert the bezel gently with the boards on either side sliding into the guides provided inside of the Enclosure. Ensure that the bezel fits in tight on the Enclosure-front to secure the panel-sealing gasket.

Figure 10.3



INPUT : Jumper Settings

The Input type is user configurable and thus requires, besides parameter selections, proper jumper-settings prior to electrical connections. The jumper settings are provided in the form of Pins & Shorting-Link arrangements on the CPU PCB towards the rear end as shown in Figure 10.3.

The Jumper setting marked A is for Input configuration. (Jumper settings marked B & C are unused.) For DC Linear Current Inputs (0-20mA or 4-20mA), short the Pins using Shorting-Link. For all other Input types, keep the Shorting-Link parked leaving the Pins open.

MOUNTING PLUG-IN MODULES

The indicator supports up to 3 plug-in modules, viz. *Output-2 Module* (Relay/SSR), *Output-3 Module* (Relay/SSR) and *Option Module* (RS485 Serial Port or Remote Alarm Acknowledgment). These modules are either pre-fitted while the indicator is shipped from the factory or can be fitted by the user later.

All 3 plug-in modules are provided with female socket that directly fits into the corresponding male plug provided on either Power-supply PCB or CPU PCB. The *Output-2* and *Option* Modules fit into plugs provided on Power-supply PCB whereas the *Output-3* Module fits into plug provided on the CPU PCB

OUTPUT-2 & OUTPUT-3 : Modules and Jumper Settings

The *Output-2* and *Output-3* Modules are identical and, thus, can be fitted interchangeably in Output-2 or Output-3 positions. These modules can be configured for either Relay or SSR output through proper jumper selection. Two jumper settings A and B, as shown in Figure 10.4, are required for Relay or SSR selection. Refer Table 10.1 for appropriate jumper setting positions.

Figure 10.4

Relay/SSR Module

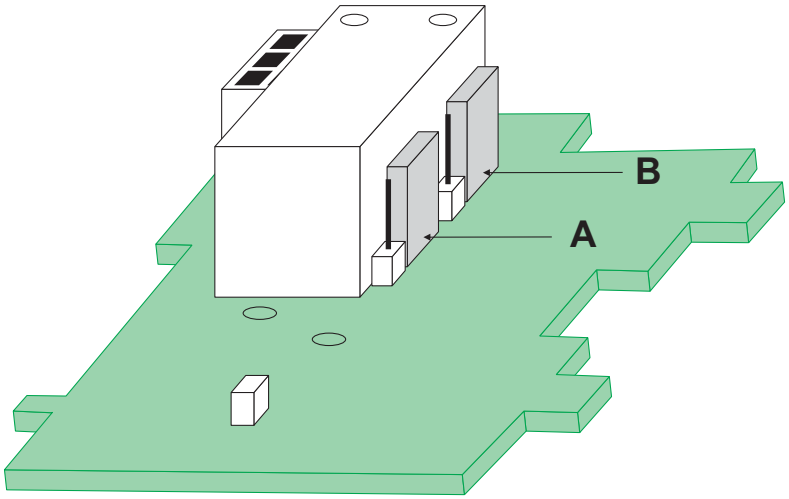
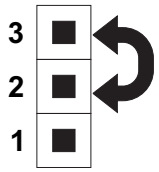
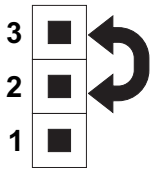
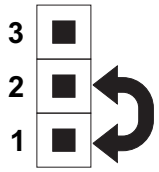
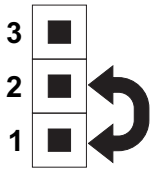


Table 10.1

Output Type	Jumper Setting - A	Jumper Setting - B
Relay		
SSR		

MOUNTING / UN-MOUNTING OF MODULES

The Figures 10.5 & 10.6 illustrates how to mount the plug-in Output-2 & Output-3 module, respectively. Notice the orientation of the indicator and a few identifying components shown in figures to help locate the plugs for the modules. Ensure that the socket snap-fits into the plug and the 2 projected parts on the module fit into the 2 slots provided on the Power-Supply / CPU PCB for proper electrical contacts and secured fitting.

For plugging out the module(s), follow the steps below:

1. Gently pull apart the Power-supply board and the CPU board until the projections of the module board come out of the slots.
2. Pull the module outward to unlock the socket from the plug.

Figure 10.5

Mounting Output-2 Module

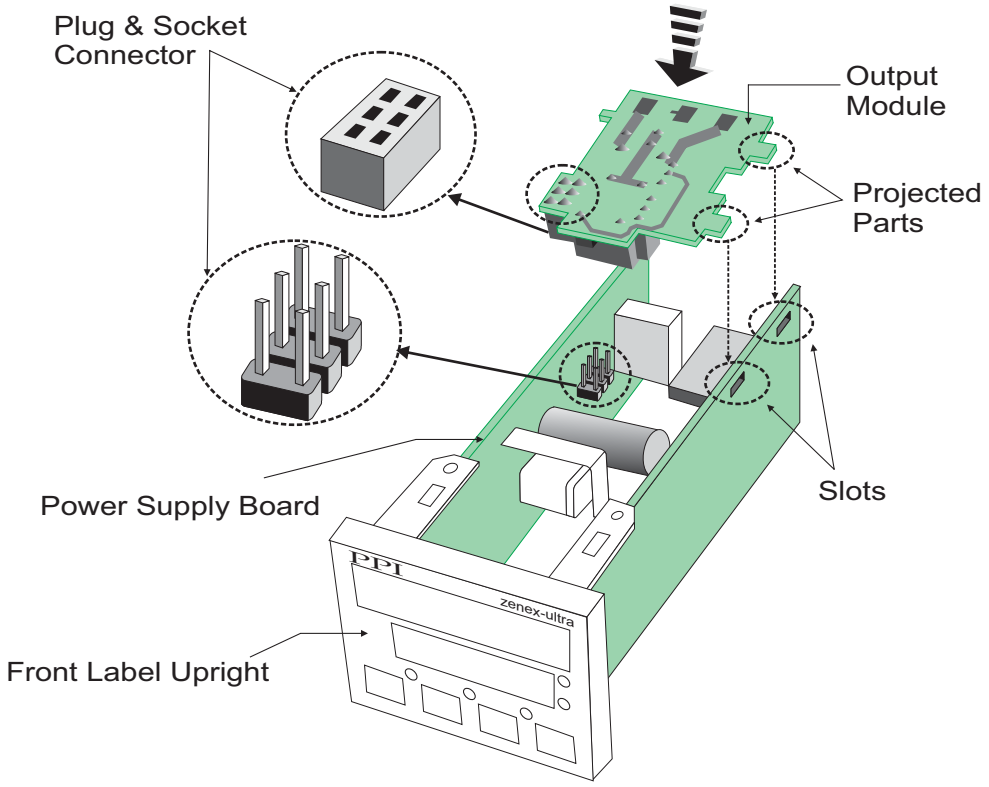
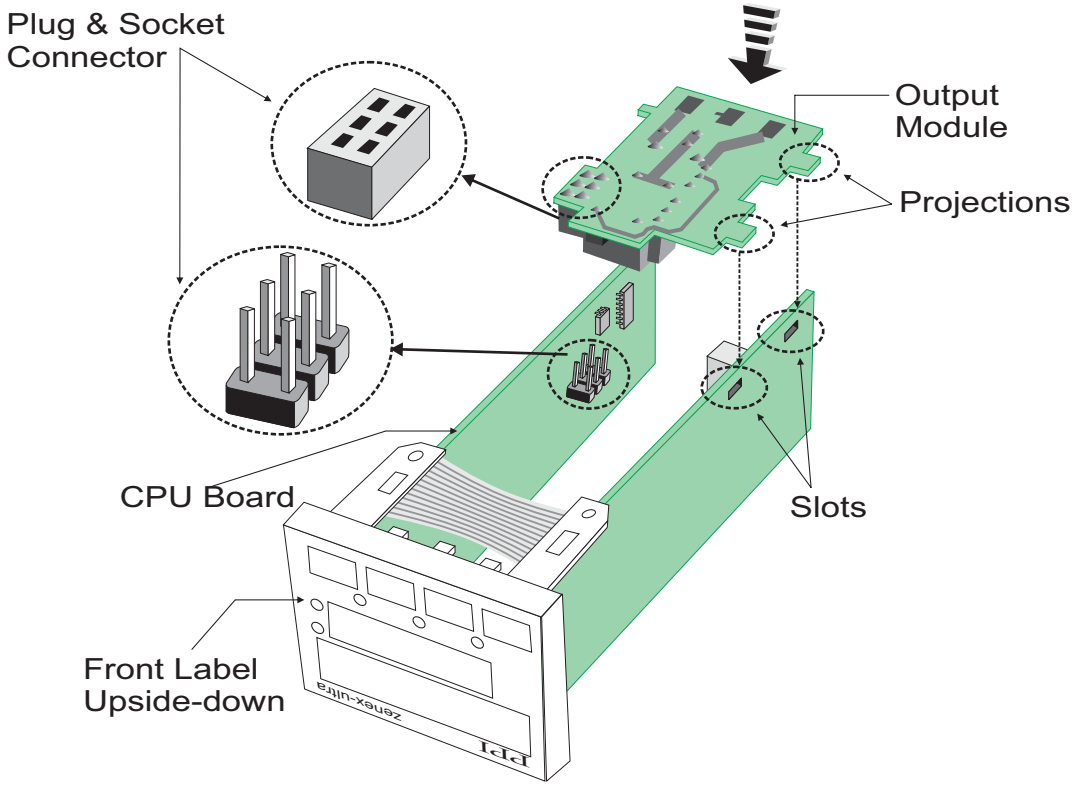


Figure 10.6

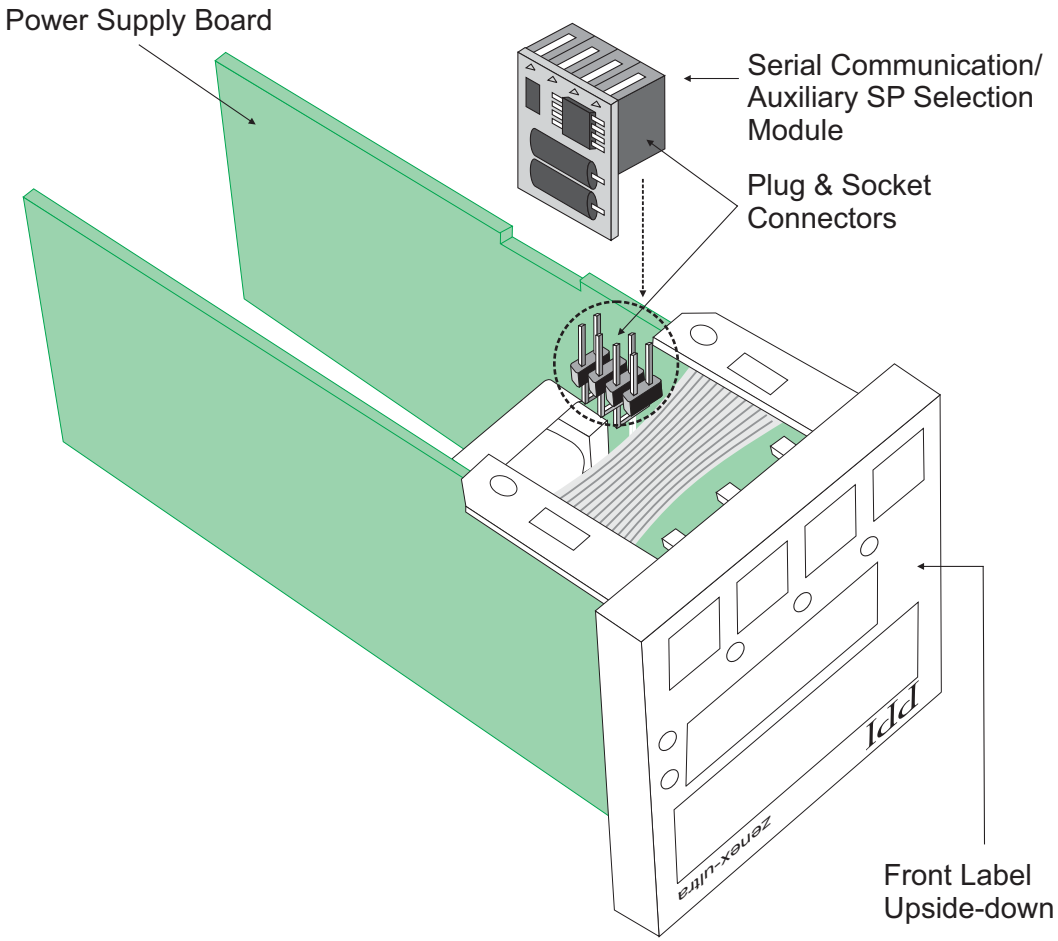
Mounting Output-3 Module



The plug for the Serial Communication or Remote Alarm Acknowledgment module is located on the Power-supply PCB. The Figure 10.7 below illustrates how to plug-in the Serial Communication/Remote Alarm Acknowledgment module. To plug (or unplug) the module simply insert (or remove) the socket into (or from) the plug.

Figure 10.7

Mounting Serial Communication/
Remote Alarm Acknowledgment Module



Section 11
MECHANICAL INSTALLATION

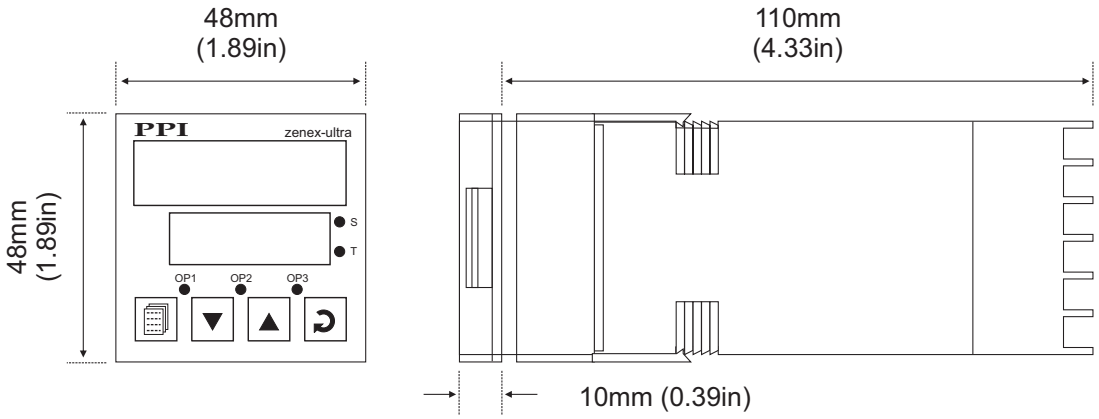
The following precautions should be strictly observed while installing the indicator:

1. The place of installation should be free of corrosive/combustible gases and electrically conductive pollution.
2. Ensure that the place of installation is not subject to rapid ambient changes that can cause condensation. Also the Ambient Temperature and Relative Humidity surrounding the indicator should not exceed the maximum specified for the proper operation of the Indicator.
3. The place of installation should be adequately protected against excessive electrostatic or electromagnetic interference.
4. The Indicator should not be subject to direct vibration or shock.
5. The Indicator should not be exposed to dust, salt air, direct sunlight or radiant heat.

OUTER DIMENSIONS

The Figure 11.1 shows the outer dimensions of the indicator.

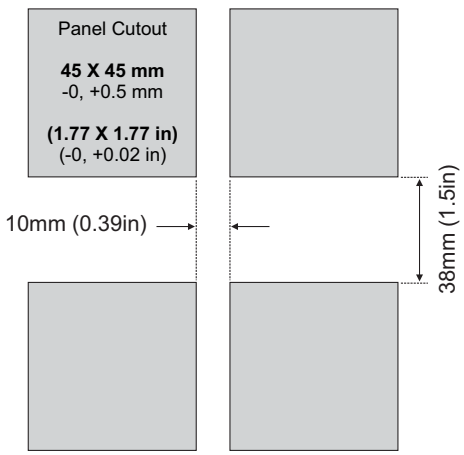
Figure 11.1



PANEL CUTOUT AND RECOMMENDED MINIMUM SPACING

The Figure 11.2 shows the panel cutout requirements for a single Indicator and also the minimum spacing recommended if several Indicators are required to be mounted on a single panel.

Figure 11.2

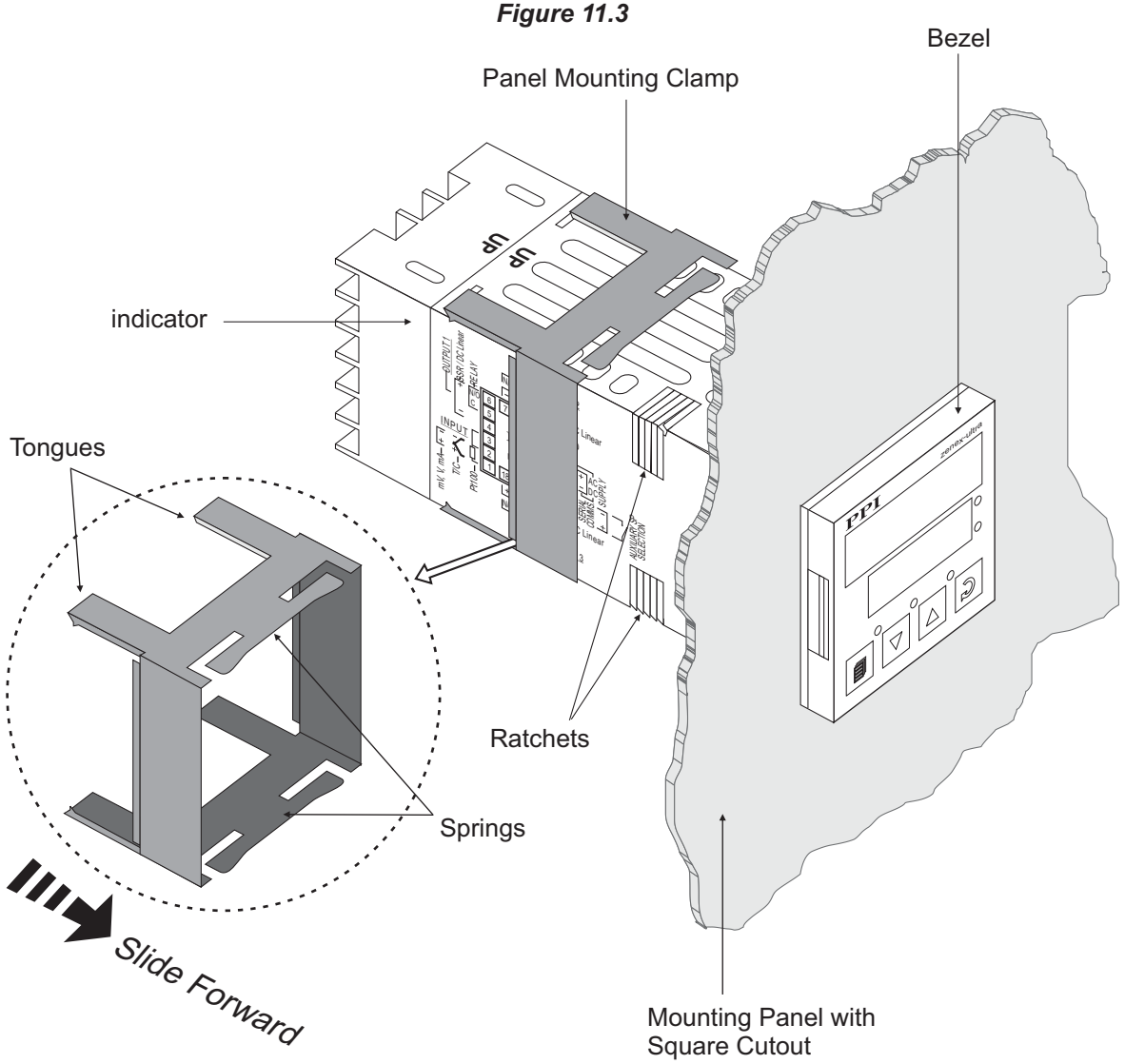


PANEL MOUNTING

Follow the steps below for mounting the Indicator on panel:

1. Prepare a square cutout to the size shown in Figure 11.2.
2. Remove the Panel Mounting Clamp from the Indicator Enclosure.
3. Insert the rear of the Indicator housing through the panel cutout from the front of the mounting panel.
4. Hold the Indicator gently against the mounting panel such that it positions squarely against the panel wall, see Figure 11.3. Apply pressure only on the bezel and not on the front label.
5. Slide the mounting clamp forward until it is firmly in contact with the rear face of the mounting panel and the tongues of the clamp engage in the ratchets on the Indicator enclosure, as shown in Figure 11.3. Ensure that the springs of the clamp push firmly against the rear face of the mounting panel for secured mounting.

Figure 11.3



Section 12

ELECTRICAL CONNECTIONS

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

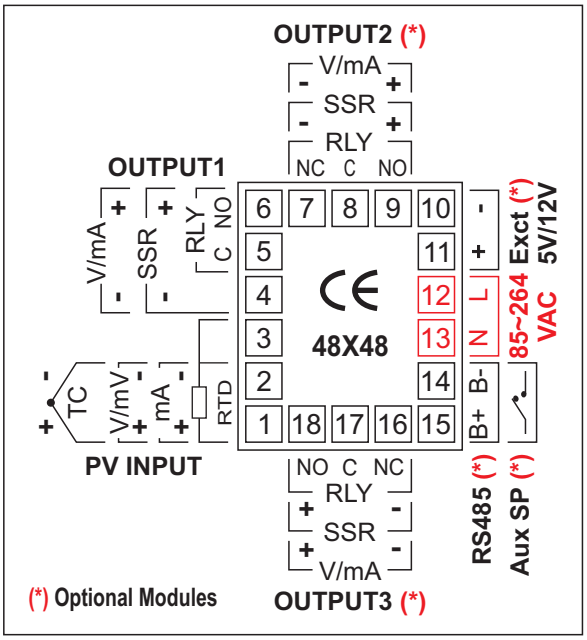
1. The user must rigidly observe the Local Electrical Regulations.
2. Do not make any connections to the unused terminals for making a tie-point for other wires (or for any other reasons) as they may have some internal connections. Failing to observe this may result in permanent damage to the indicator.
3. Run power supply cables separated from the low-level signal cables (like Thermocouple, RTD, DC Linear Current/Voltage, 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 indicator 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 Indicator supply is switched-off while making/removing any connections or removing the Indicator from its enclosure.

CONNECTION DIAGRAM

The Electrical Connection Diagram is shown on the left side of the Indicator enclosure. The diagram shows the terminals viewed from the REAR SIDE with the Indicator label upright. Refer the label provided on the Rear Side for terminal numbers. Note that the OUTPUT-2, OUTPUT-3 and the Serial Comm./Remote Alarm Acknowledgment connections are applicable only if the respective plug-in modules are fitted. Also the DC SUPPLY is applicable only if the Indicator is supplied with 18 to 34 VDC supply voltage option.

The rear panel electrical wiring connection diagram is shown in Figure12.1 below.

Figure 12.1

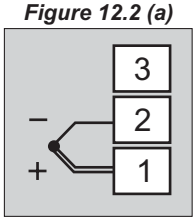


DESCRIPTIONS

The back panel connections are described as under:

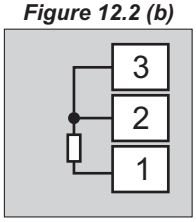
INPUT (Terminals : 1, 2, 3)
The Indicator accepts Thermocouples (J, K, T, R, S, B, N), 3-wire RTD Pt100 and DC Linear Current/Voltage (mA/mV/V) as input.

Figure 12.2 (a)



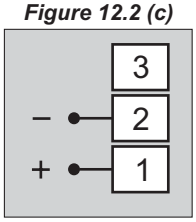
Thermocouple
Connect Thermocouple Positive (+) to terminal 1 and Negative (-) to terminal 2 as shown in Figure 12.2 (a). Use the correct type of Thermocouple extension lead wires or compensating cable for the entire distance ensuring the correct polarity throughout. Avoid joints in the cable.

Figure 12.2 (b)



RTD Pt100, 3-wire
Connect single leaded end of RTD bulb to terminal 1 and the double leaded ends to terminal 2 and 3 (interchangeable) as shown in Figure 12.2 (b). 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.

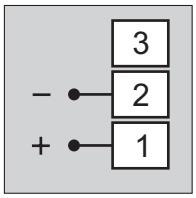
Figure 12.2 (c)



DC Linear Voltage (mV / V)

Use a shielded twisted pair with the shield grounded at the signal source for connecting mV / V source. Connect common (-) to terminal 2 and the signal (+) to terminal 1, as shown in Figure 12.2 (c).

Figure 12.2 (d)

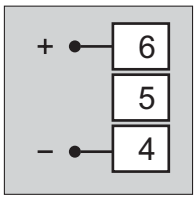


DC Linear Current (mA)

Use a shielded twisted pair with the shield grounded at the signal source for connecting mA source. Connect common (-) to terminal 2 and the signal (+) to terminal 1, as shown in Figure 12.2 (d).

Make sure that the Jumper Pins for Input selection are shorted using the Shorting-Link (Refer S*ection 10 Hardware Assembly and Configurations, Input-Jumper Settings).*

Figure 12.3



OUTPUT-1 (Terminals : 4, 6)
DC Linear Current / Voltage Output
The DC Linear (0/4-20 mA) Current or (0-5/10V) Voltage output is also available at Terminal 6 (+) and Terminal 4 (-) for Retransmission (Recorder) output. Refer Figure 12.3.

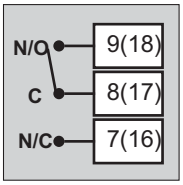
OUTPUT- 2 (Terminals : 7, 8, 9)
OUTPUT- 3 (Terminals : 16, 17, 18)

The Output-2 and Output-3 are available through plug-in modules that can be configured as Relay or SSR through appropriate Jumper Settings. The connection descriptions are shown in figures 12.4(a) and 12.4(b).

Relay

Potential-free Relay changeover contacts N/O (Normally Open) and C (Common) rated 2A/240 VAC (resistive load) are provided as Relay output. Use external auxiliary device like contactor with appropriate contact rating for driving the actual load.

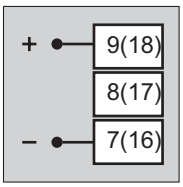
Figure 12.4 (a)



Drive for SSR

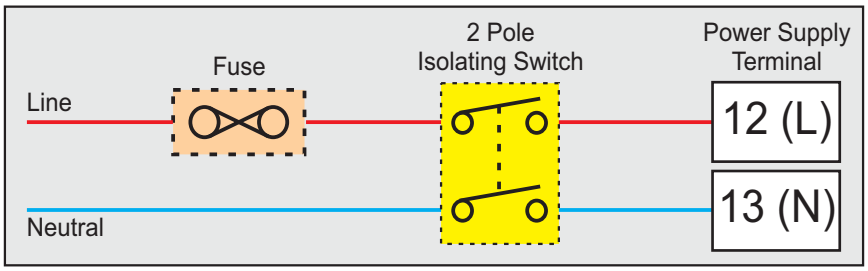
DC Voltage level is generated for switching the external SSR (Solid State Relay). Connect (+) and (-) terminals of SSR to indicator terminals 9(18) and 7(16), respectively. Use Zero-Crossover, 3 to 30 VDC operated SSR, rated approximately 1.5 times the actual load rating. Use appropriate Heat Sink for load rating exceeding 10A.

Figure 12.4 (b)



POWER SUPPLY (Terminals : 12, 13)

Figure 12.5



The indicator is designed for installation in an enclosure which provides adequate protection against electric shock. Local regulations regarding electrical installation should be rigidly observed. Consideration should be given to prevention of access to the Power Supply terminals by unauthorized personnel.

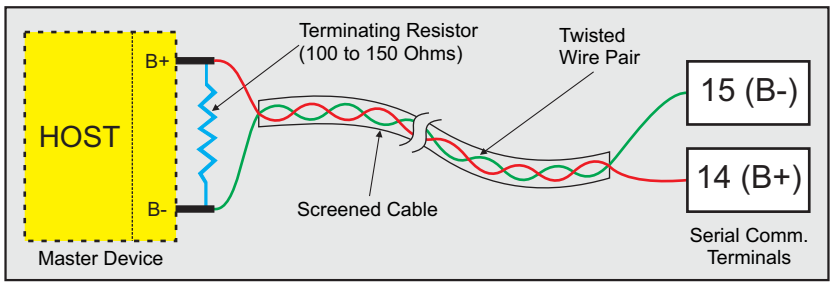
As standard, the indicator is supplied with power connections suited for 85 to 264 VAC. Use well-insulated copper conductor wire of the size not smaller than 0.5mm^2 for connections. Connect Line (Phase) to terminal 12 and the Neutral (Return) to terminal 13 as shown in Figure 12.5. The indicator is not provided with fuse and power switch. If necessary, mount them separately. Use a time lag fuse rated 1A @ 240 VAC.

For DC Supply, connect Signal (+) & Common (-) to indicator terminals 12 & 13, respectively.

SERIAL COMMUNICATION PORT (Terminals : 14 , 15)

(Applicable if the Option plug-in module for RS485 Serial Port is fitted)

Figure 12.6

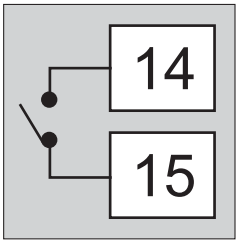


If the Optional plug-in communication board is fitted, connect terminal 15 and 14 of the indicator to (+) and (-) terminals of the Master device. For reliable noise free communication, use a pair of twisted wires inside screened cable as shown in Figure 12.6. The wire should have less than 100 ohms/km nominal DC resistance (Typically 24 AWG or thicker). Connect the terminating resistor (Typically 100 to 150 ohm) at one end to improve noise immunity.

REMOTE ALARM ACKNOWLEDGMENT INPUTS (Terminals : 14,15)

(Applicable if the Option plug-in module for Remote Alarm Acknowledge is fitted).

Figure 12.7



Use potential-free push button switch with normally Open contacts for the purpose of Alarm Acknowledgment. Connect the switch across the terminals14 &15 as shown in figure 12.7.

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