neuro 102

PPI
The Perfection Experts

Universal Single Loop Process Controller

User Manual

CONTENTS

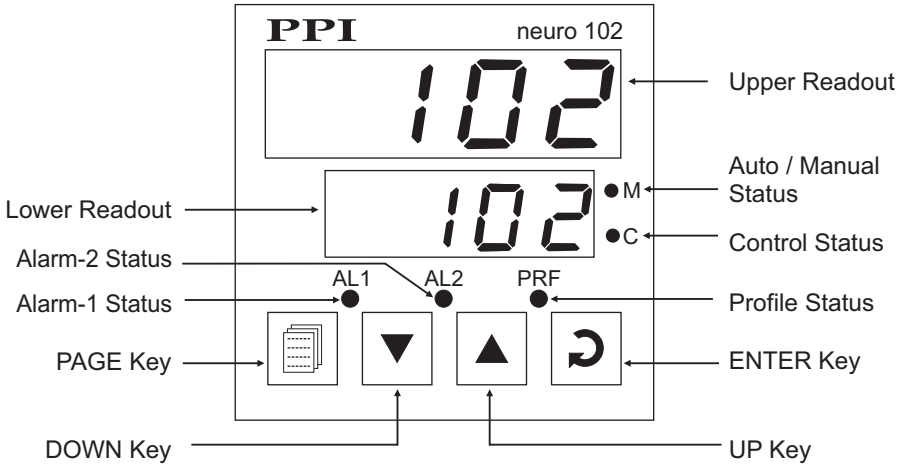
For Size 48X48

For Size 96X96

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 Set-up Mode, the Upper Readout displays parameter values/options.

The Lower Readout is a 4 digit, 7-segment bright green LED display and usually displays Setpoint Value or % Output Power. In Set-up Mode, the Lower Readout displays parameter names (prompts) .

INDICATORS

The front panel indicators are red LED's that show the status related to control, alarm and operation mode. Refer Table 1.1 below for details.

Table 1.1

LED	Status
M	• Glows if the manual (Hand) mode is active. • Remains OFF if Automatic (Auto). Standby or profile mode is active.
C	• Indicates Output-1 ON/OFF status if the Control Output Type is Relay / SSR drive. • Remains OFF if the Control Output Type is DC Linear.
AL1	Indicates Alarm-1 status if Output -2 (OP2) is configured as Alarm. • Flashes while the Alarm-1 is active. • Remains OFF while the Alarm - 1 is inactive or if OP2 is configured as cool control output

AL2	Indicates Alarm-1 status if Output -3 (OP3) is configured as Alarm. • Flashes while the Alarm-2 is active. • Remains OFF while the Alarm - 2 is inactive or if OP3 is configured as Recorder / Retransmission.
PRF	Indicates profile status if the Profile mode is Enabled. • Flashes while the controller is executing ramp/soak profile cycle. • Glows continuously if the profile cycle is in HOLD state. • Remains OFF, if not executing a profile Cycle.

KEYS

There are four tactile keys provided on the front panel for configuring the controller, setting-up the parameter values and selecting Operation Modes. Refer Table 1.2 for detailed key operations.

Table 1.2

Symbol	Key	Function
	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 on the PAGE.

Section 2
BASIC OPERATION

POWER-UP

Upon power-up, all displays and indicators are lit on for approximately 3 seconds. This is followed by the indication of the controller model name n.102 on the Upper Readout and the firmware version 1.01.0 on the Lower Readout, for approximately 1 second.

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 Setpoint Value. This is the MAIN Display Mode that shall be used most often.

% Output Power Indication

In PID control mode, the Lower Readout can be toggled using ENTER key to indicate either % output power or setpoint value SP. The output power is indicated with the left most digit showing 'P', 'H' or 'C' depending upon uni-directional (Heat or Cool) or bi-directional (Heat and Cool) control mode. Refer Figure 2.1 below.

Figure 2.1

Heat or Cool **P**ower — **H**eat Power — **C**ool Power

Uni-directional Control — **Bi-directional Control**

Adjusting SP (Control Setpoint)

If permitted at Supervisory Level, the SP value can be directly adjusted on the Lower Readout in the MAIN Display Mode. While the Lower Readout shows the control setpoint, step through the following sequence for adjusting the SP value :

1. Press and release UP or DOWN key once. The Lower Readout starts flashing.
2. Use UP/ DOWN keys to adjust the SP value.
3. Press and release ENTER key. The Lower Readout stops flashing and the new set value is registered and stored.

Tune Mode Indication

The Lower Readout flashes tUnE while the controller is Tuning. Do not disturb the process or alter any parameter values while Tuning is in progress. The "Tune" message automatically disappears upon completion of Tuning procedure.

Profile Mode Indications

While a Profile Cycle is in progress, the front panel indicator 'PRF' flashes or glows steadily. The steady glowing indicates that though the profile is active, it is currently in HOLD state. Also, the Lower Readout shows the Profile Setpoint instead of the control setpoint SP. The % Output Power (if PID Control) can be viewed by toggling the Lower Readout using ENTER key.

Note :

While Profile Cycle is in progress, the Control Setpoint SP can still be adjusted on Lower Readout. While the Lower Readout shows Profile Setpoint, use UP/DOWN keys to adjust the control setpoint SP as described earlier.

PV Error Indications

The PV Error type is flashed on the Upper Readout. For different errors and the causes, refer Table 2.1 below.

Table 2.1

Message	Error Type	Cause
Or	Over-range	PV above Max. Range
Ur	Under-range	PV below Min. Range
OPEn	Sensor Open	Thermocouple / RTD broken

CONTROL / ALARM STATUS UNDER PV ERROR CONDITIONS

a) The tuning, if in progress, is aborted.

b) The Profile Cycle, if in progress, enters in HOLD state.

c) Under *Over-range* or *Under-range* error condition, all the control outputs are switched off. However, under *Sensor Open* error, the PID control output power is maintained at the value set for the parameter “Sensor Break Output Power” on PAGE-12.

d) For Alarm activation, the under-range condition is treated as minimum PV, whereas the over-range and open conditions are treated as maximum PV. Thus, Process High, positive Deviation Band and Window Band alarms activate under *Over-range/Open error*. Similarly, Process Low, negative Deviation Band and Window Band alarms activate under *Under-range error*.

- **MANUAL MODE OPERATION**

This operation mode is available only if the control action is PID and if the manual mode operation is permitted at supervisory level. In this mode, the controller operates in Open loop mode wherein the % Output Power is manually adjusted by the operator. This mode is often used for process start-up to make sure that the process equilibrium is achieved before the control is transferred for subsequent automatic (closed loop) control. The controller ensures a *bumpless* Auto / Manual transfer.

The manual mode can be activated or de-activated using ENTER key. While in manual mode, the Upper Readout shows PV while the Lower Readout shows % Power that can be adjusted using UP/DOWN keys.

Follow the steps below to enter (Activate) into Manual Mode and to revert to (De-activate) Automatic Mode.

1. Hold ENTER key pressed for approximately 2 seconds until front panel indicator M (Manual Mode) turns on.

2. Release Enter key. The controller is now placed in Manual mode. The Upper Readout displays the PV and the Lower Readout displays the %Output Power (with the leftmost digit indicating either P (Unidirectional control) or H / C (Bidirectional control)).

3. Adjust the Output Power using the UP and DOWN keys. Note that in Unidirectional mode, the Output Power is adjustable between the set Power Low and Power High limits. However, in Bi-directional mode, the Output Power is adjustable from -100% to +100%.The power range from -100% to 0 is Cool Power (with the leftmost digit indicating C) and 0 to +100% is Heat Power (with the leftmost digit indicating H).

To de-activate the Manual mode; Hold the ENTER key pressed for approximately 2 seconds until the front panel indicator M turns off. The controller now enters into Auto control mode with the first power same as that was adjusted last while in Manual mode.

Notes:
1. *If the Manual mode is activated while a Profile Cycle is in progress; the profile segment (Ramp or Soak) continues to run uninterrupted. However, the % output power is in accordance with the user set value. The PV, thus may not follow the setpoint profile closely.*
2. *The Manual mode Activation / De-activation is suppressed while the Tuning is in progress. However, the Tuning procedure can be activated regardless of whether the controller is in Auto or Manual control mode.*
3. *The Standby Mode (explained later in this section) over-rides the Manual control mode (if active).*
4. *If the power fails while the Manual Control Mode is active; upon resumption of power the controller continues to remain in Manual control mode with the last user set power.*

- **STANDBY MODE**

  This mode, allows the operator to put the controller in '*indication-only*' mode wherein all the output control signals as well as Alarm Relays are forced OFF. This may be desired prior to the start of a new process batch.

  If enabled at supervisory level, the standby mode can be activated or de-activated by setting the parameter 'Standby' to Yes or No respectively. The standby parameter is available on operator page, explained later in the section.

Notes:
1. *The Standby and Tuning modes are mutually exclusive. Similarly, if Standby mode is activated while the controller is tuning, the controller aborts tuning operation and enters Standby mode.*
2. *If the Power Supply to the controller is switched-off or a Power-failure occurs while the controller is operating in Standby mode; upon resumption of power, the controller continues to operate in Standby mode.*

OPERATOR PAGE AND PARAMETERS

The controller provides a separate page that contains parameters that require frequent settings by the operator. The page is called *Operator Page* and the parameters are called *Operator Parameters*. The availability of operator parameters is controlled at supervisory level and the parameter setting is not affected by the master lock status.

Accessing Operator Page & Adjusting Parameters

Step through the following sequence to open the operator page and to adjust the operator parameter values.

1. Press and release PAGE key. The Lower Readout shows PAGE (PAGE) and Upper Readout shows 0 (0).
2. Press ENTER key. The Lower Readout shows prompt for the first available operator parameter and the Upper Readout shows value for the parameter.
3. Use UP / DOWN keys to adjust the value and then press ENTER key to store the set value and scroll to next parameter.

The controller automatically reverts to MAIN Display Mode upon scrolling through the last operator parameter. Alternatively, use PAGE key to return to MAIN Display Mode.

The operator parameters are described in Table 2.2. Note that the parameters presented on operator page depend upon the functions selected/enabled and supervisory level permissions.

The operator parameter list mainly includes :

a) Profile related commands like Start, Abort, Pause, Skip etc.

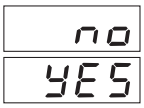
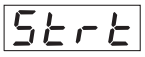
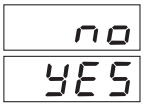
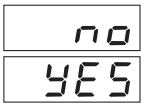
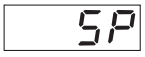
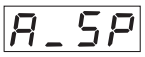
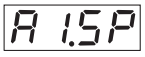
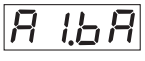
b) Standby mode entry / exit.

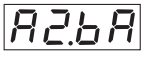
c) Control Setpoint (SP) value.

d) Alarm-1 Setpoint / Band values.

e) Alarm-2 Setpoint / Band values.

Table 2.2

Parameter Description	Settings (Default Value)
STAND BY MODE  This parameter is available and applicable only if Standby mode is enabled at supervisory level. Set the parameter value to 'Yes' or 'No' for entering and exiting the Standby mode, respectively.	 (Default : No)
PROFILE START COMMAND  These parameters are mutually exclusive. Use start command to commence a new Profile Cycle and Abort command to abort / terminate a running Profile cycle. Set the value to 'Yes' to issue the command.	 (Default : No)
PROFILE ABORT COMMAND  These parameters are mutually exclusive. Use start command to commence a new Profile Cycle and Abort command to abort / terminate a running Profile cycle. Set the value to 'Yes' to issue the command.	 (Default : No)
CONTROL SETPOINT  This is the Setpoint value that the controller respects for the control purpose while it is not running a profile or not in standby / tuning mode.	Setpoint Low Limit to Setpoint High Limit (Default : -200)
AUXILIARY SETPOINT  The alternate control setpoint that the controller respects for control purpose when selected through remote input terminals. This parameter is available only if the hardware *Remote Input* module is fitted and if the selected Utility Option is *Auxiliary Setpoint.*	Setpoint Low Limit to Setpoint High Limit (Default : -200)
ALARM-1 SETPOINT  The setpoint / Band value (depending upon the type of Alarm) for Alarm-1. This parameter is not available if the selected Alarm type is 'None'.	Throughout the range for the selected Input Type (Default : For Process Low :-200 For Process Low :1300)
ALARM-1 DEVIATION BAND  Same as Alarm-1 Setpoint	-999 to 999 (Default : 3)
ALARM-1 WINDOW BAND  Same as Alarm-1 Setpoint	3 to 999 (Default : 3)

Parameter Description	Settings (Default Value)
ALARM-2 SETPOINT  The setpoint / Band value (depending upon the type of Alarm) for Alarm-2. This parameter is not available if the selected Alarm type is 'None'.	Throughout the range for the selected Input Type (Default : For Process Low : -200 For Process Low : 1300)
ALARM-2 DEVIATION BAND  Same as Alarm-2 Setpoint	-999 to 999 (Default : 3)
ALARM-2 WINDOW BAND  Same as Alarm-2 Setpoint	3 to 999 (Default : 3)

Section 3
SET-UP MODE : ACCESS AND OPERATION

The various parameters are arranged in different groups, called PAGES, depending upon the functions they represent. Each group is assigned a unique numeric value, called PAGE NUMBER, for its access.

The parameters are always presented in a fixed format: The Lower Readout displays the parameter prompt (Identification Name) and the Upper Readout displays the set value. The parameters appear in the same sequence as listed in their respective sections.

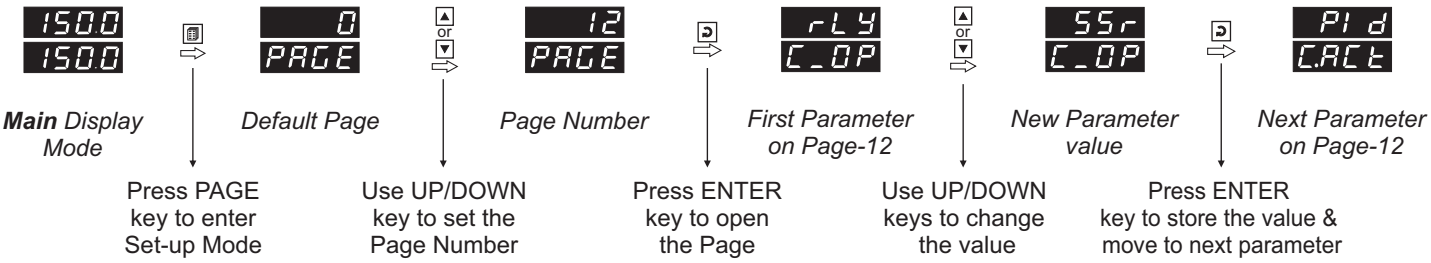
SET-UP MODE

The Set-up Mode allows the user to view and modify the parameter values. Follow the steps below for setting the parameter values:

1. Press and release PAGE key. The Lower Readout shows PAGE and the Upper Readout shows page number 0. Refer Figure 3.1.
2. Use UP / DOWN keys to set the desired PAGE NUMBER.
3. Press and release ENTER key. The Lower Readout shows the prompt for the first parameter listed in the set PAGE and the Upper Readout shows its current value. If the entered PAGE NUMBER is invalid (contains no parameter list or any associated function), the controller reverts to the MAIN Display Mode.
4. Press and release the ENTER key until the prompt for the required parameter appears on the Lower Readout. (The last parameter in the list rolls back to the first parameter).
5. Use UP / DOWN keys to adjust the parameter value. (The display flashes if UP key is pressed after reaching the maximum value or DOWN key is pressed after reaching the minimum value).
6. 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 3.1 illustrates the example of altering the value for the parameter 'Control Output'.

Figure 3.1



Notes

1. *Each page contains a fixed list of parameters that are presented in a pre-determined sequence. Note however that availability of a few parameters, called Conditional Parameters, depend upon the settings for some other parameters. For example, the parameter 'Control Hysteresis' for Output-1 is available only if, the set value for the parameter 'Control Action' is 'On-Off'.*
2. *To exit the set-up mode and return to the MAIN Display Mode, press and release PAGE key.*
3. *If no key is pressed for approximately 30 seconds, the set-up mode times out and reverts to the MAIN Display Mode.*

MASTER LOCKING

The controller facilitates locking all the PAGES (except Operator PAGE) by applying Master Lock Code. Under Locking, the parameters are available for *view only* and cannot be adjusted. The Master Lock, however does not lock the operator parameters. This feature allows protecting the rather less frequently used parameters against any inadvertent changes while making the frequently used operator parameters still available for any editing.

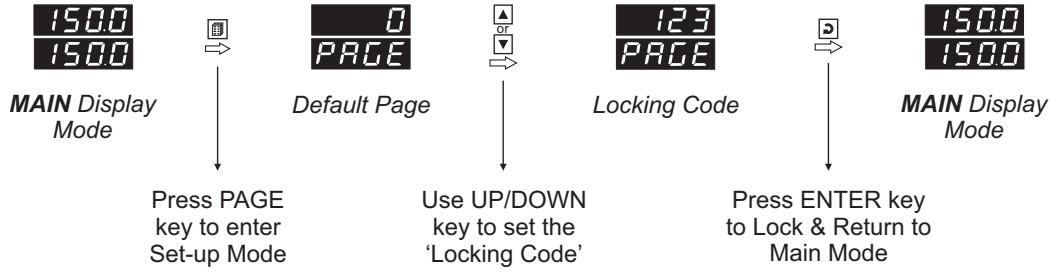
For enabling / disabling the Lock, step through the following sequence:

Locking

1. Press and release PAGE key while the controller is in the MAIN Display Mode. The Lower Readout shows PAGE and the Upper Readout shows 0.
2. Use UP / DOWN keys to set the Page Number to 123 on the Upper Readout.
3. Press and release ENTER key. The controller returns to the MAIN Display Mode with the Lock enabled.

The Figure 3.2 below illustrates the Locking procedure.

Figure 3.2



UnLocking

Repeat the Locking procedure twice for unlocking.

Section 4

CONTROL PARAMETERS

Visit www.ppiindia.net. Refer technical notes on CONTROL and TUNING for detailed understanding of the parameters / terminologies used for describing control parameters in this section.

The parameters presented on PAGE-10 depend upon the type of algorithm selected for the control purpose, viz., On-Off, Pulsed On-Off and PID. The parameter list further extends if the selected control mode is bi-directional (that is, heat-cool control). Refer Table 4.1 for the parameter descriptions and settings.

Table 4.1

Parameter Description	Settings (Default Value)
PROPORTIONAL BAND Pb *(Available for PID Control only)* Sets proportional gain (% power per unit error). Defined in same units and resolution as that for PV.	0 to 999 Units (Default : 50 units)
HYSTERESIS HYSt *(Available for On-Off or Pulsed On-Off Control only)* Sets differential (dead) band between On-Off switching for OP1.	1 to 999 (Default : 2)
INTEGRAL TIME It *(Available for PID Control only)* Sets integral time constant in seconds. Setting the value to 0, cuts-off the integral action.	0 to 1000 Seconds (Default : 100 sec.)
DERIVATIVE TIME dt *(Available for PID Control only)* Sets derivative time constant in seconds. Setting the value to 0, cuts-off the derivative action.	0 to 250 Seconds (Default : 25 sec.)
CYCLE TIME Ct *(Available for PID Control only)* Sets the total 'On + Off' time in seconds for time proportional power output through OP1 Relay / SSR.	0.5 to 120.0 Seconds (in steps of 0.5 secs.) (Default : 20.0 sec.)
RELATIVE COOL GAIN r-EL.C *(Available for PID Control with bi-directional, that is, Heat-Cool mode)* Sets the ratio of cooling power to the heating power.	0.1 to 10.0 (Default : 1.0)
COOL CYCLE TIME C.Ct *(Available for PID Control with bi-directional, that is, Heat-Cool mode)* Sets the On + Off cycle time in seconds for time proportional power output through OP2 Relay / SSR.	0.5 to 120.0 Seconds (in steps of 0.5 secs.) (Default : 20.0 sec.)
HEAT POWER LOW PL *(Available for PID Control only)* Sets the minimum % output power limit for OP1.	0 to Power High (Default : 0)

Parameter Description	Settings (Default Value)
HEAT POWER HIGH PH *(Available for PID Control only)* Sets the maximum % output power limit for OP1 .	Power Low to 100 (Default : 100)
COOL POWER LOW C.PL *(Available for PID Control with bi-directional, that is, Heat-Cool mode)* Sets the minimum % output power limit for OP2.	0 to Power High (Default : 0)
COOL POWER HIGH C.PH *(Available for PID Control with bi-directional, that is, Heat-Cool mode)* Sets the maximum % output power limit for OP2.	Power Low to 100 (Default : 100)

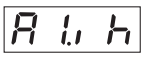
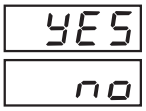
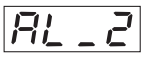
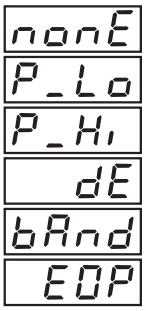
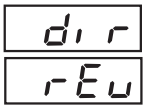
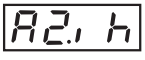
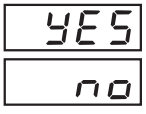
Section 5
ALARM PARAMETERS

Visit www.ppiindia.net. Refer technical notes on ALARM for detailed understanding of the parameters/terminologies used for describing the Alarm parameters in this section.

The parameters required for configuring Alarm-1 and Alarm-2 are grouped on PAGE-11. The configuration includes selecting the type of Alarm, setting the hysteresis value, enabling / disabling start-up alarm suppression, etc. Refer Table 5.1 for parameter description & settings.

Table 5.1

Parameter Description	Settings (Default Value)
ALARM-1 TYPE AL_1 Select the Alarm-1 activation type. Selecting 'None' will disable the alarm and suppress all the related parameters for Alarm-1.	nonE None P_Lo Process Low P_Hi Process High dE Deviation Band bAnd Window Band EOP End of Profile (Default : None)
ALARM-1 SETPOINT A1.SP *(Available for Process High or Process Low Alarm-1 Type)* Sets Alarm limit independent of control setpoint.	Min. to Max. Range specified for the selected Input Type (Default : For Process Low : -200 For Process Low : 1300)
ALARM-1 DEVIATION BAND A1.dE *(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.	-999 to 999 (Default : 3)
ALARM-1 WINDOW BAND A1.bA *(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.	3 to 999 (Default : 3)
ALARM-1 HYSTERESIS A1.HY Sets differential (dead) band between Alarm-1 switching ON and OFF states.	1 to 999 (Default : 2)
ALARM-1 LOGIC A1.L Set to Yes to suppress Alarm-1 activation upon power-up or process start-up.	dir Direct rEv Reverse (Default : Direct)

Parameter Description	Settings (Default Value)
ALARM-1 INHIBIT  Set to Yes to suppress Alarm-1 activation upon power-up or process start-up.	 Yes No (Default : Yes)
ALARM-2 TYPE  Select the Alarm-2 activation type. Selecting 'None' will disable the alarm and suppress all the related parameters for Alarm-2.	 None Process Low Process High Deviation Band Window Band End of Profile (Default : None)
ALARM-2 SETPOINT  *(Available for Process High or Process Low Alarm-2 Type)* Sets Alarm limit independent of control setpoint.	Min. to Max. Range specified for the selected Input Type (Default : For Process Low : -200 For Process Low : 1300)
ALARM-2 DEVIATION BAND  *(Available for Deviation Band Alarm-2 Type)* Sets positive or negative deviation (offset) limit from control setpoint for High or Low Alarm-2 activation, respectively.	-999 to 999 (Default : 3)
ALARM-2 WINDOW BAND  *(Available for Window Band Alarm-2 Type)* Sets symmetrical positive and negative deviation (offset) limits from control setpoint for both High and Low Alarm-2 activation.	3 to 999 (Default : 3)
ALARM-2 HYSTERESIS  Sets differential (dead) band between Alarm-2 switching ON and OFF states.	1 to 999 (Default : 2)
ALARM-2 LOGIC  Set to Yes to suppress Alarm-2 activation upon power-up or process start-up.	 Direct Reverse (Default : Direct)
ALARM-2 INHIBIT  Set to Yes to suppress Alarm-2 activation upon power-up or process start-up.	 Yes No (Default : Yes)

Section 6

CONFIGURATION PARAMETERS

The controller is provided with a variety of hardware options and software features to cater to a host of applications. The controller thus needs to be appropriately configured in terms of inputs / outputs and other features like control algorithm, digital filter etc.

The PAGE-12 presents configuration parameters that are listed below in Table 6.1 .

Table 6.1

Parameter Description	Settings (Default Value)
CONTROL OUTPUT (OP1) TYPE C_OP Select the output type in accordance with the hardware configuration for Output-1 (OP1).	rLY Relay SSr SSR 0-20 0 - 20mA 4-20 4 - 20mA 0-5 0 - 5V 0-10 0 - 10V (Default : Relay)
CONTROL LOGIC CtrL Select Reverse (*heat* logic) or Direct (*cool* logic).	rEv Reverse dir Direct (Default : Reverse)
INPUT TYPE inPt Select Input type in accordance with the type of Thermocouple or RTD, sensor or transducer output connected for process value measurement. Ensure proper hardware jumper settings, if required.	Refer Table 6.2 (Default : Type K)
UNITS SELECTION FOR PV Unit *(Available for Thermocouple / RTD Inputs)* Selects temperature measurement units in °C or °F.	°C °C °F °F (Default : °C)
RESOLUTION FOR PV rSLn *(Not Available for Thermocouple Inputs)* Sets the process value indication resolution (decimal point). All the resolution based parameters (control setpoint, hysteresis, alarm setpoints etc.) then follow this resolution setting.	Refer Table 6.2 (Default : 1)
PV RANGE LOW r.Lo *(Available for DC Linear Inputs)* Sets process value corresponding to minimum DC Linear signal input (e.g., 0V, 0mA, 4mA, etc.)	Refer Table 6.2 (Default : 0)
PV RANGE HIGH r.Hi *(Available for DC Linear Inputs)* Sets process value corresponding to maximum DC Linear signal input (e.g., 5V, 10V, 20mA, etc.)	Refer Table 6.2 (Default : 1000)

Parameter Description	Settings (Default Value)
SETPOINT LOW LIMIT SP.Lo Sets minimum permissible control setpoint value.	Min. Range to Setpoint High for the selected Input Type (Default : -200)
SETPOINT HIGH LIMIT SP.Hi Sets maximum permissible control setpoint value.	Setpoint Low to Max. Range for the selected Input Type (Default : 1300)
OFFSET FOR PV OFSt 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	-1999 to 9999 (Default : 0)
DIGITAL FILTER FOR PV FiLt 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.	0.5 to 25.0 Seconds (in steps of 0.5 Seconds) (Default : 1.0 sec.)
SENSOR BREAK (OPEN) STRATEGY S.brK This parameter allows the user to decide the level at which the PV is required to be maintained upon detecting the sensor break (open) condition while the controller is operating in Auto or Profile mode.	Sb.OP Sensor Break Output Power HOLd Hold (Default : Sensor Break Output Power)
SENSOR BREAK OUTPUT POWER Sb.OP *(Available for PID control only)* In case of Thermocouple / RTD broken or disconnected, the controller outputs this power value under open loop condition.	-100 to 100 (Default : 0.0)

Table 6.2

Option	What it means	Range (Min. to Max.)	Resolution
tC_J	Type J Thermocouple	0 to +960°C / +32 to +1760°F	Fixed 1°C / 1°F
tC_K	Type K Thermocouple	-200 to +1376°C / -328 to +2508°F	
tC_t	Type T Thermocouple	-200 to +385°C / -328 to +725°F	
tC_r	Type R Thermocouple	0 to +1770°C / +32 to +3218°F	
tC_S	Type S Thermocouple	0 to +1765°C / +32 to +3209°F	
tC_b	Type B Thermocouple	0 to +1825°C / +32 to +3092°F	
tC_n	Type N Thermocouple	0 to +1300°C / +32 to +2372°F	
rESu	Reserved for customer specific Thermocouple type not listed above. The type shall be specified in accordance with the ordered (optional on request) Thermocouple type.		
rtd	3-wire, RTD Pt100	-199 to +600°C / -328 to +1112°F **or** -199.9 to 600.0°C / -199.9 to 999.9°F	User settable 1°C / 1°F **or** 0.1°C / 0.1°F
0-20	0 to 20mA DC current	-1999 to +9999 units	User settable 1 / 0.1 / 0.01/ 0.001 units
4-20	4 to 20mA DC current		
0.050	0 to 50mV DC voltage		
0.200	0 to 200mV DC voltage		
1.25	0 to 1.25V DC voltage		
5.0	0 to 5.0V DC voltage		
10.0	0 to 10.0V DC voltage		
1-5	1 to 5.0V DC voltage		

Section 7
SUPERVISORY PARAMETERS

The supervisory level responsibilities include exercising control over operator, making process related decisions and controlling the availability of process data for remote use. The PAGE-13 parameters allow implementation supervisory level decisions. The Table 7.1 below list supervisory parameters.

Table 7.1

Parameter Description	Settings (Default Value)
SELF-TUNE COMMAND tUnE *(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 No YES Yes (Default : No)
OVERSHOOT INHIBIT oS.i h *(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.	dSbL Disable EnbL Enable (Default : Disable)
OVERSHOOT INHIBIT FACTOR Oi h.F *(Available for PID control with Overshoot Inhibit enabled)* 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.	1.0 to 2.0 (Default : 1.2)
SP ADJUSTMENT ON LOWER READOUT SP.Lr Supervisory permission for control setpoint editing on Lower Readout. Set to 'Enable' for permission.	EnbL Enable dSbL Disable (Default : Enable)
SP ADJUSTMENT ON OPERATOR PAGE SP.OP Supervisory permission for control setpoint editing on Operator Page. Set to 'Enable' for permission.	EnbL Enable dSbL Disable (Default : Enable)
MANUAL(HAND) MODE HAnd Supervisory permission for Manual mode operation. Set to 'Enable' for permission.	dSbL Disable EnbL Enable (Default : Disable)
ALARM SP ADJUSTMENT ON OPERATOR PAGE AL.SP Supervisory permission for Alarm setpoint adjustments on Operator Page. Set to 'Enable' for permission.	dSbL Disable EnbL Enable (Default : Disable)
STANDBY MODE StbY Supervisory control over availability of Standby (entry / exit) command on Operator Page. 'Enable' for availability.	dSbL Disable EnbL Enable (Default : Disable)

Parameter Description	Settings (Default Value)
PROFILE ABORT COMMAND ON OPERATOR PAGE (AbrT) Supervisory control over availability of Profile Abort command on Operator Page. 'Enable' for availability.	dSbL Disable EnbL Enable (Default : Disable)
AUXILIARY SETPOINT OR SERIAL COMM.OPTION SELECTION (OPtn) This parameter allows the user to configure the controller in either Auxiliary Setpoint or Serial Communication mode options. When the 'Auxiliary Setpoint' option is selected, the controller treats the Auxiliary Setpoint (ASP) same as control (main) Setpoint (SP) and attempts to maintain PV at the Auxiliary Setpoint upon detecting the potential free contact closure of external switch/Relay or a TTL-compatial voltage level below 0.5 Volts by the Hardware module. When the 'Serial Communication' option is selected, the Following parameters are available and applicable for Serial Communication Function if the respective hardware module is fitted.	nonE None SrL.C Serial Comm. AU.SP Auxiliary Setpoint (Default : None)
BAUD RATE (bAUd) Communication speed in 'Bits per Second'. Set the value to match with the host baud rate.	1.2 1200 2.4 2400 4.8 4800 9.6 9600 (Default : 9.6)
CONTROLLER ID NUMBER (Id) Unique numeric code assigned to the controller for identification by the host. Set the value as required by the host.	1 to 127 (Default : 1)
COMMUNICATION WRITE ENABLE (CoM.E) Setting to 'No' disallows the host to set or modify any parameter value. The value however can be read by the host.	no No YES Yes (Default : No)

Section 8

PROFILE PARAMETERS

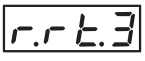
Visit www.ppiindia.net. Refer technical notes on PROFILE for detailed understanding of the parameters / terminologies used for describing the profile parameters in this section.

The profile parameters are grouped on PAGE-14 and pertain to the Ramp / Soak Profile Utility. The Controller comes with an in-buit 4 Ramp + Soak Profile.

The Table 8.1 below lists the parameters followed by the definition of each parameters.

Table 8.1

Parameter Description	Settings (Default Value)
PROFILE MODE SELECTION PrOF This parameter can be set as 'Enable' or 'Disable' to activate or deactivate the controller's operator in Profile mode. If enabled, the controller executes a 4 Ramp + 4 Soak Profile upon issuing 'Profile start Command'.	dSbL Disable EnbL Enable (Default : Disable)
RAMP HOLD BAND r.bnd This parameters sets the allowable deviation between the PV and the Ramping Setpoint while running a ramp segment. Should the PV fall outside this band, the Setpoint ramping holds until the PV enters the band again. This parameters can be Used to ensure that the PV follows the set Ramp Rate within allowable limits as far as possible. Set this value to 0 if Ramp hold back function is not required. This parameters is expressed in the same unit and resolution as that for PV.	0 to 250 (Default : 0)
SOAK HOLD BAND S.bnd This parameters sets the allowable deviation of PV from the Target Setpoint while executing a Soak segment. Should the PV fall outside this band, the controller suspends execution of the soak time until the PV enters the band again. This parameters can be Used to ensure that the PV is maintained at the Target Setpoint within allowable limits as for as possible. Set this value to 0 Soak Hold back function is nat required. This parameters is expressed in the same unit and resolution as that for PV.	0 to 250 (Default : 0)
RAMP RATE-1 r.rt.1 This parameter sets the rate at which the setpoint ramps to the first Target Setpoint from the PV at the start of a new Profile Cycle. The value is set in terms of "Units per Minute". For e.g., a Ramp Rate of 1.25, for Temperature input means the Setpoint shall ramp to the Target Setpoint at a rate of 1.25 ºC per minute. The setting resolution of this parameter is independent of the displayed PV resolution. If set to 0, the Ramp Setpoint immediately equals the Target Setpoint-1.	0.00 to 99.99 (Default : 0.00)

Parameter Description	Settings (Default Value)
TARGET SETPOINT-1  This parameter sets the target level for the first ramp segment. The Setpoint ramps to this level with Ramp Rate-1 upon initiation of the Profile Cycle by issuing 'Profile Start Command'. This parameter is expressed in the same unit and resolution as that for PV. By default, this parameter value is set to the Minimum Range altered, this parameter value automatically set to the Minimum Range value of the altered 'Input Type'.	Min. to Max. Range Specified for the selected Input Type (Default : -200)
SOAK TIME-1  This parameter sets the time duration for which the Setpoint is maintained at Target setpoint - 1. This segment is skipped if set to 0, that is, the Setpoint start ramping to Target Setpoint - 2 as soon as it reaches to target Setpoint - 1. This parameter is expressed in minutes and settable in 1 minute resolution.	0 to 9999 (Default : 0)
RAMP RATE-2  This parameter sets the rate at which the Setpoint ramps from Target Setpoint - 1 to Target Sepoint - 2. The setting resolution of this parameter is independent of the displayed PV resolution. If set to 0, the Ramp Setpoint immediately equals to the Target Setpoint - 2.	0.00 to 99.99 (Default : 0.00)
TARGET SETPOINT-2  This parameter sets the target level for the second ramp segment. The Setpoint ramps to this level with Ramp Rate-2 from target Setpoint - 1. This parameter is expressed in the same unit and resolution as that for PV. By default, this parameters value is set to the Minimum Range value specified for the selected 'Input'. If the 'Input Type' is altered, this parameter value automatically set to the Minimum Range of the altered 'Input Type'.	Min. to Max. Range Specified for the selected Input Type (Default : -200)
SOAK TIME-2  This parameter sets the time duration for which the Setpoint is maintained at Target setpoint - 2. This segment is skipped if set to 0, that is, the Setpoint start ramping to Target Setpoint - 3 as soon as it reaches to target Setpoint - 2. This parameter is expressed in minutes and settable in 1 minute resolution.	0 to 9999 (Default : 0)
RAMP RATE-3  This parameter sets the rate at which the Setpoint ramps from Target Setpoint - 2 to Target Sepoint - 3. The setting resolution of this parameter is independent of the displayed PV resolution. If set to 0, the Ramp Setpoint immediately equals to the Target Setpoint - 3.	0.00 to 99.99 (Default : 0.00)
TARGET SETPOINT-3  This parameter sets the target level for the third ramp segment. The Setpoint ramps to this level with Ramp Rate-3 from target Setpoint - 2.	Min. to Max. Range Specified for the selected Input Type (Default : -200)

Parameter Description	Settings (Default Value)
This parameter is expressed in the same unit and resolution as that for PV. By default, this parameters value is set to the Minimum Range value specified for the selected 'Input Type'. If the 'Input Type' is altered, this parameter value automatically set to the Minimum Range value of the altered 'Input Type'.	
SOAK TIME-3  This parameter sets the time duration for which the Setpoint is maintained at Target setpoint - 3. This segment is skipped if set to 0, that is, the Setpoint start ramping to Target Setpoint - 4 as soon as it reaches to target Setpoint - 3. This parameter is expressed in minutes and settable in 1 minute resolution.	0 to 9999 (Default : 0)
RAMP RATE-4  This parameter sets the rate at which the Setpoint ramps from Target Setpoint - 3 to Target Sepoint - 4. The setting resolution of this parameter is independent of the displayed PV resolution. If set to 0, the Ramp Setpoint immediately equals to the Target Setpoint - 4.	0.00 to 99.99 (Default : 0.00)
TARGET SETPOINT-4  This parameter sets the target level for the fourth ramp segment. The Setpoint ramps to this level with Ramp Rate-4 from target Setpoint - 3. This parameter is expressed in the same unit and resolution as that for PV. By default, this parameters value is set to the Minimum Range value specified for the selected 'Input Type'. If the 'Input Type' is altered, this parameter value automatically set to the Minimum Range value of the altered 'Input Type'.	Min. to Max. Range Specified for the selected Input Type (Default : -200)
SOAK TIME-4  This parameter sets the time duration for which the Setpoint is maintained at Target setpoint - 4. This segment is skipped if set to 0. The Profile Cycle is over at the end of this segment. If the parameter 'Output Off' is set to 'No', the controller start controlling the PV with respect to the SP (Control/Auxilary). If alarm type is selected as 'end of Profile', the OP3 Relay/SSR (if fitted) energizes for approximately 10 seconds at the end of this segment. This parameter is expressed in minutes and settable in 1 minute resolution.	0 to 9999 (Default : 0)
OUTPUT OFF  This parameter allows the user to set the strategy as regards what the controller shall do after completion of a running Profile Cycle. If this parameter is set to 'Yes', the controller keeps the Control Output (s) OFF until a next 'Profile Start Command' is issued or the Profile Cycle is aborted.; If however, this parameter is set to 'No', the controller behaves as a single loop controller and maintains the PV at the user set value for the SP (control/Auxiliary).	 No  Yes (Default : No)

Section 9
OP2 & OP3 FUNCTION PARAMETERS

The controller is supplied with two optional hardware plug-in modules, viz., OP2 and OP3. Each module is factory configured for either Relay / SSR (jumper selectable) or DC Linear Voltage or DC Linear Current. The two modules are interchangeable.

The OP2 module can be programmed to function as Alarm-1 Output, Event Output for End of Profile or Cool Control Output for Bi-directional Control. The remaining OP2 related parameters are then presented based on the function selected.

The OP3 module can be programmed to function as Alarm-2 Output, Event Output for End of Profile or PV/SP Re-transmission Output. The remaining OP3 related parameters are then presented based on the function selected.

The OP2 and OP3 function selection and the related parameters are listed below in Table 9.1.

Table 9.1

Parameter Description	Settings (Default Value)
OUTPUT-2 FUNCTION SELECTION OP2.F *(Applicable for OP2 hardware module, if fitted)* Select the function / feature to which the OP2 module is to be logically attached for activation.	ALrn Alarm C.Con Cool Control (Default : Alarm)
OUTPUT-2 TYPE OP2.t *(Available if OP2 function is Cool Control)* Select type for Output-2 (OP2) in accordance with the hardware module fitted and / or the jumper settings.	rLY Relay SSr SSR 0-20 0 - 20mA 4-20 4 - 20mA 0-5 0 - 5V 0-10 0 - 10V (Default : Relay)
OUTPUT-3 FUNCTION SELECTION 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.	ALrn Alarm rEC Recorder Output (Default : Alarm)
RECORDER TRANSMISSION TYPE trnS *(Available if OP3 function is recorder)* Select the parameter (process value or setpoint) which is to be transmitted for remote recording / control.	Pu Process Value SP Setpoint (Default : Process Value)
RECORDER OUTPUT TYPE rEC.o *(Available if OP3 function is recorder)* Select type for Output-3 (OP3) in accordance with the hardware module fitted.	0-20 0 to 20mA 4-20 4 to 20mA 0-5 0 to 5V 0-10 0 to 10V (Default : 4 to 20mA)

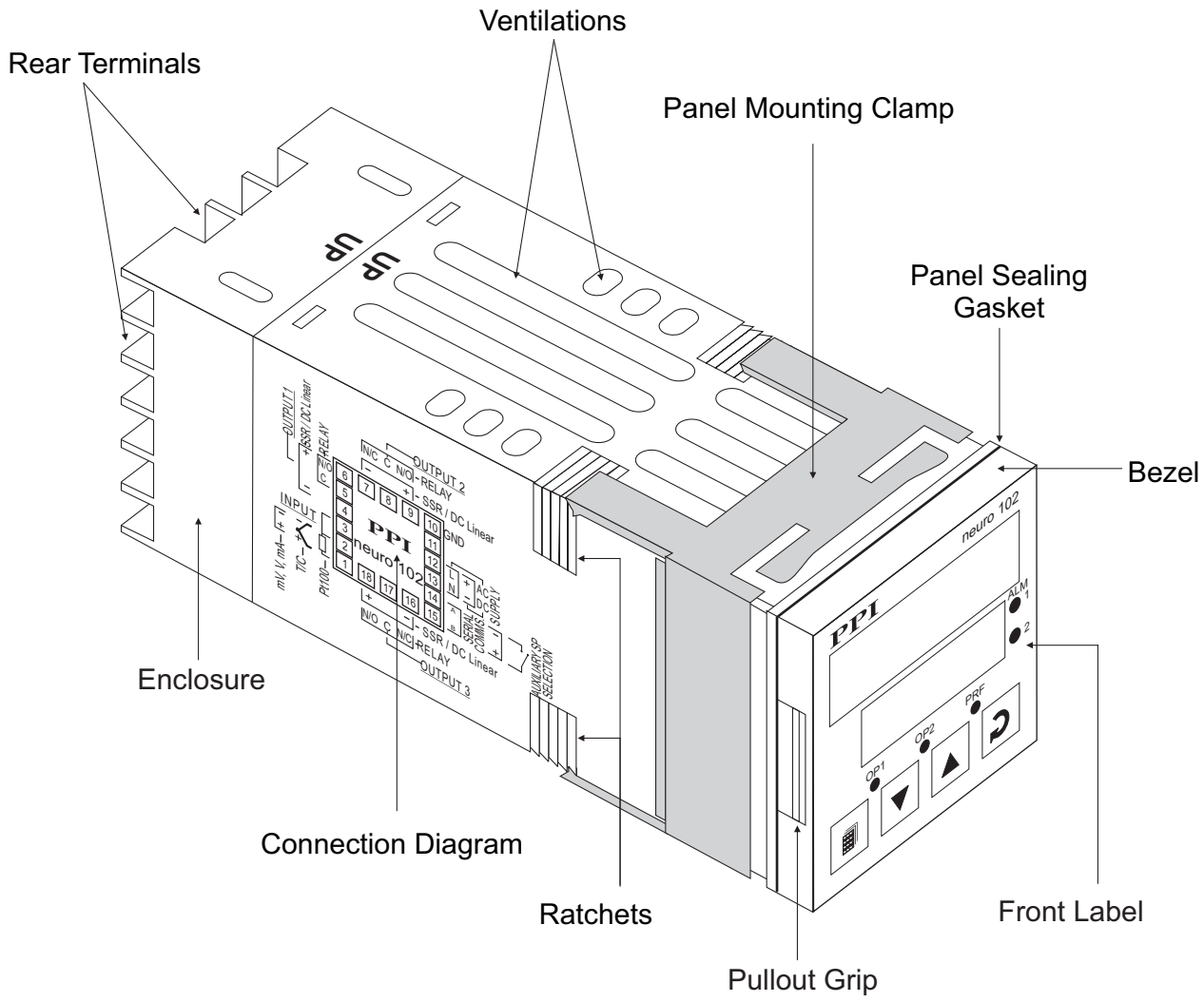
Parameter Description	Settings (Default Value)
RECORDER LOW rEC.L *(Available if OP3 function is recorder)* Set the minimum parameter value (SP or PV) that shall correspond to the minimum recorder output signal level (0mA or 4 mA or 0V).	Min. to Max. Range Specified for the Selected Input Type (Default : -200)
RECORDER HIGH rEC.H *(Available if OP3 function is recorder)* Set the maximum parameter value (SP or PV) that shall correspond to the maximum recorder output signal level (20mA or 10 V or 5V).	Min. to Max. Range Specified for the Selected Input Type (Default : 1300)

Section 10

HARDWARE ASSEMBLY AND CONFIGURATIONS

The Figure 10.1 below shows the controller outer-case viewed with front label upright.

Figure 10.1

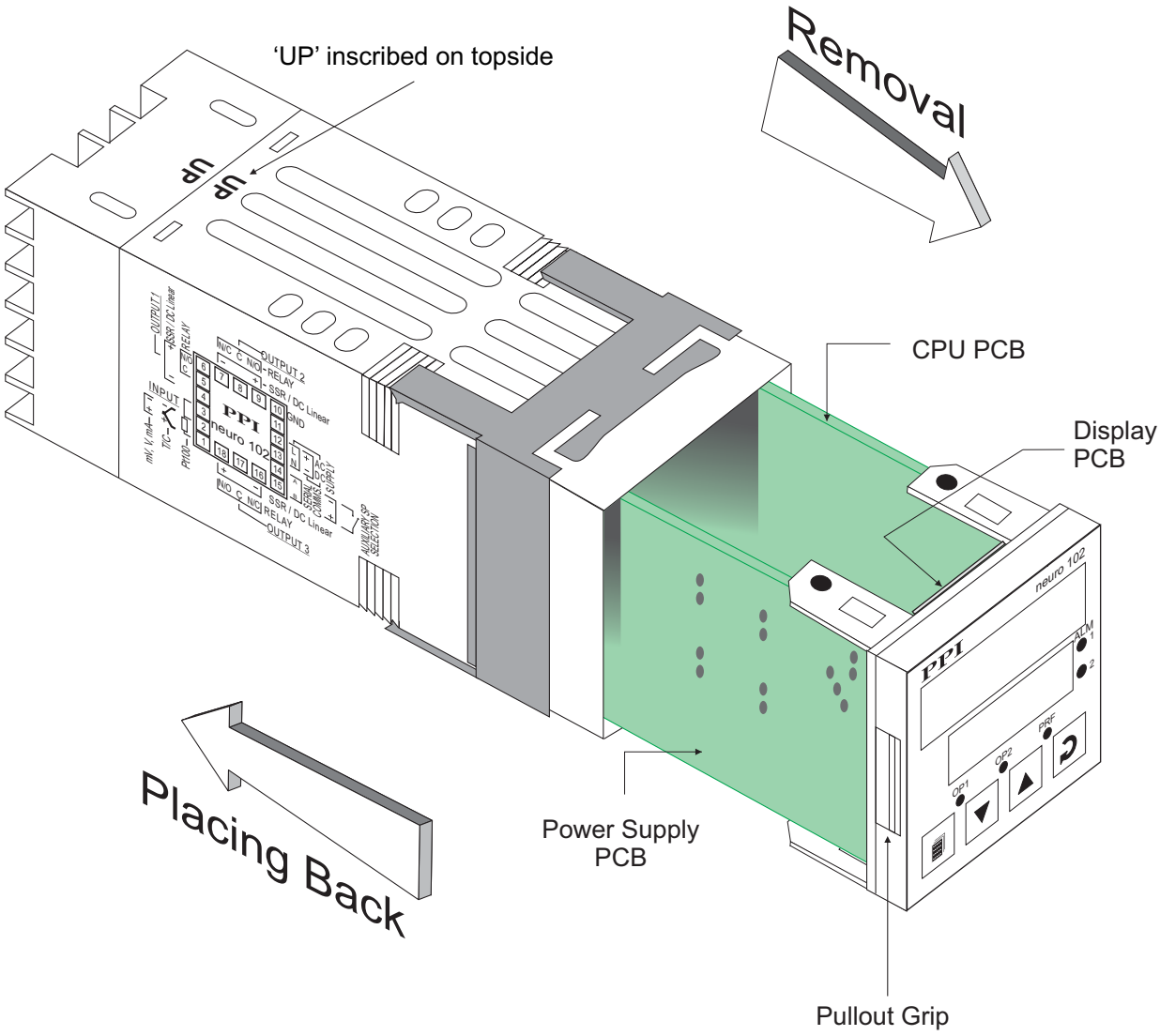


ELECTRONIC ASSEMBLY

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 controller 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 controller 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.

The Figure 10.3 below shows the basic electronics assembly of the controller (without any plug-in modules). The basic electronics assembly of the controller comprises of 3 Printed Circuit Boards. As shown in the figure, when viewed from the front, the CPU board is to the right, Power-supply board is to the left and the Display board is behind the bezel.

Figure 10.3

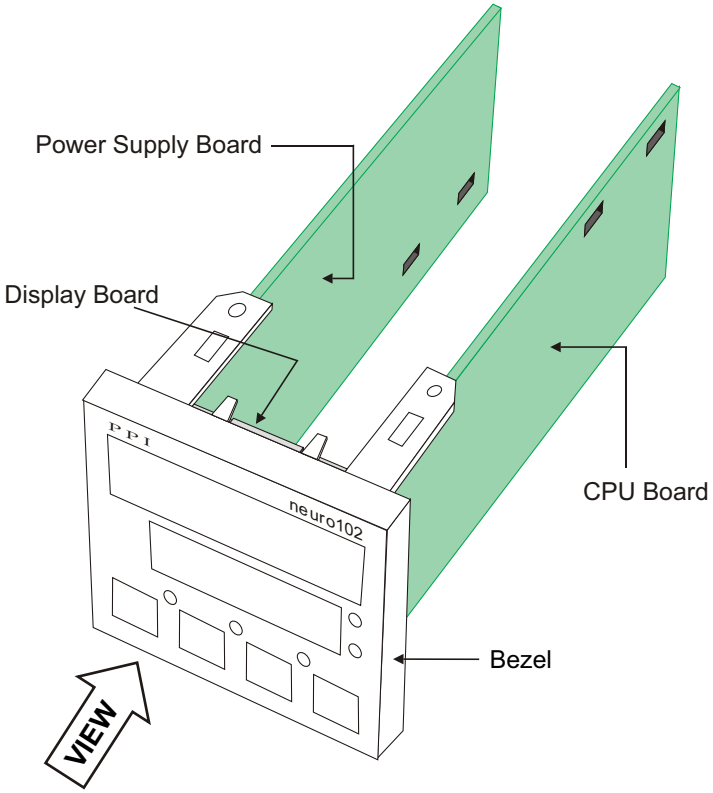
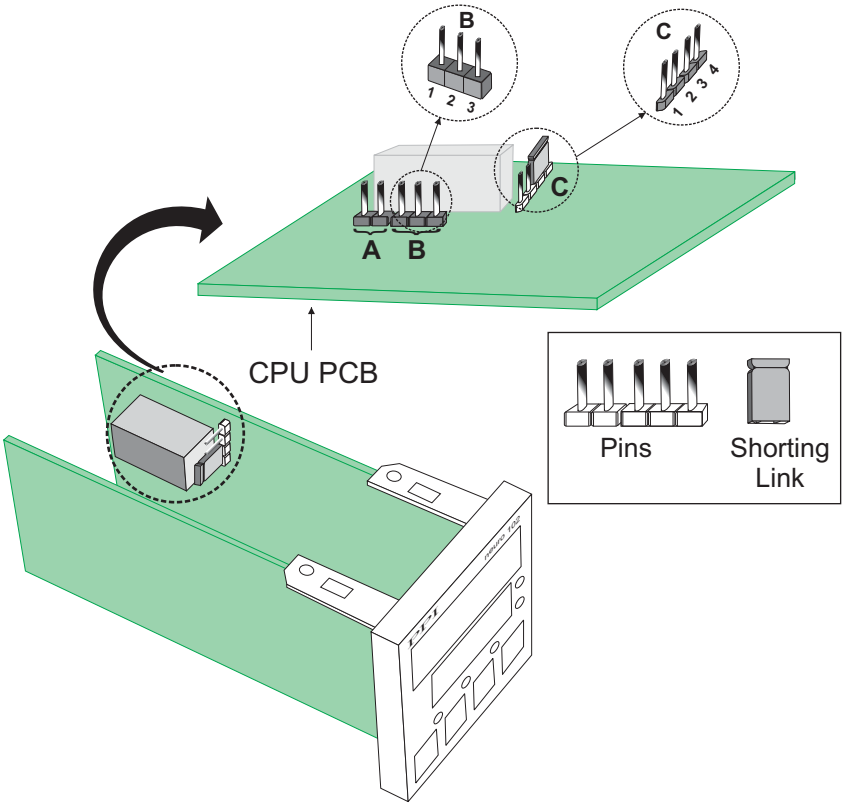


Figure 10.4



The Input type and the Output-1 type are user configurable and thus require, 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 10.4. The Jumper setting marked A is for Input configuration whereas those marked B & C are for Output-1 configuration.

INPUT : Jumper Settings

For DC Linear Current Inputs (0-20mA or 4-20mA), short the Pins using Shorting-Link as shown in Figure 10.5 (a). For all other Input types, keep the Shorting-Link parked leaving the Pins open, as shown in Figure 10.5 (b).

OUTPUT-1 : Jumper Settings

Besides the parameter settings, the Output-1 configuration requires jumper settings marked B & C for different output type selections as shown in the Table 10.1 below.

Figure 10.5 : Input Jumper Settings

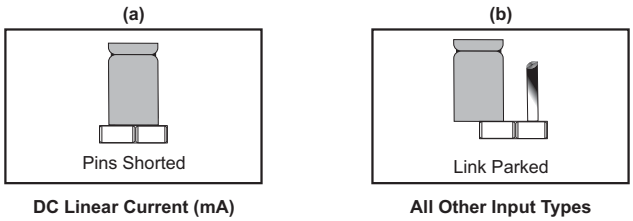
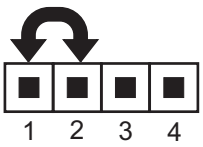
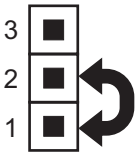
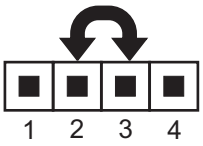
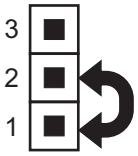
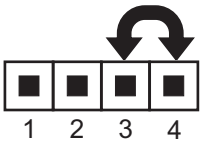
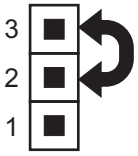


Table 10.1 : Output-1 Jumper Settings

Output Type	Jumper Setting - A	Jumper Setting - B
Relay		
SSR Drive		
DC Linear Current (or Voltage)		

MOUNTING PLUG-IN MODULES

The controller supports up to 3 plug-in modules, viz. *Output-2 Module* (Relay / SSR or DC Linear), *Output-3 Module* (Relay / SSR or DC Linear) and *Option Module* (RS485 Serial Port or Digital Input for Auxiliary Setpoint selection). These modules are either pre-fitted while the controller 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.

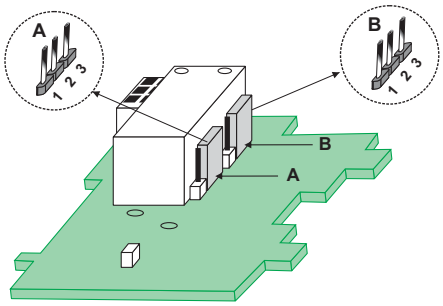
OUTPUT-2 & OUTPUT-3 : Modules and Jumper Settings

The *Output-2* and *Output-3* Modules come in three versions, viz., Relay / SSR, DC Linear Voltage and DC Linear Current. The two modules are identical and, thus, can be fitted interchangeably in Output-2 or Output-3 positions.

Relay / SSR Module

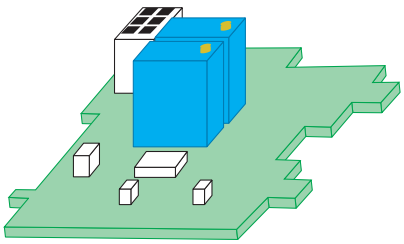
This module can be configured for either Relay or SSR output through proper jumper selection. Two jumper settings A and B, as shown in Figure 10.6 and Table 10.2, are required for Relay or SSR selection.

Figure 10.6



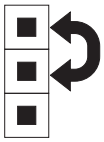
Relay/SSR Module

Figure 10.7



DC Voltage/Current Module

Table 10.2

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

DC Linear Voltage / Current Module

The DC Linear Module is factory configured for either Current or Voltage output. The current output can be configured for 0-20 mA or 4-20 mA and similarly the voltage output can be configured for 0-5 V or 0-10 V through parameter settings.

MOUNTING / UN-MOUNTING OF MODULES

The Figures 10.8 & 10.9 illustrates how to mount the plug-in Output-2 & Output-3 module, respectively. Notice the orientation of the controller 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 10.8

Mounting Output-2 Module

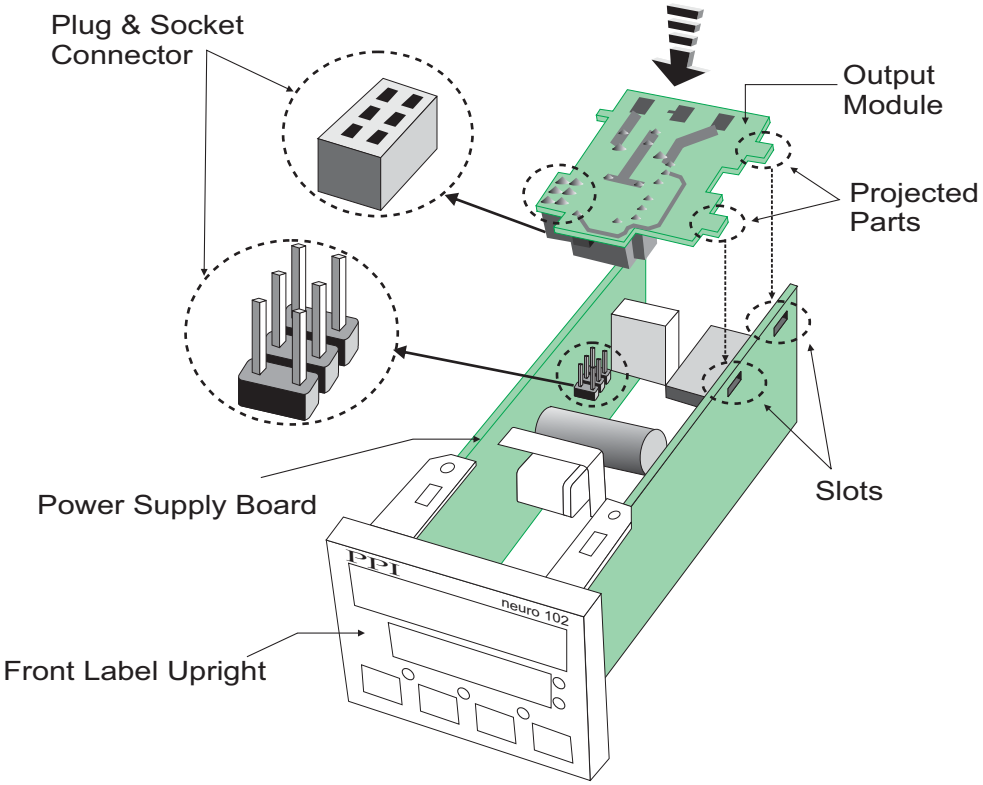
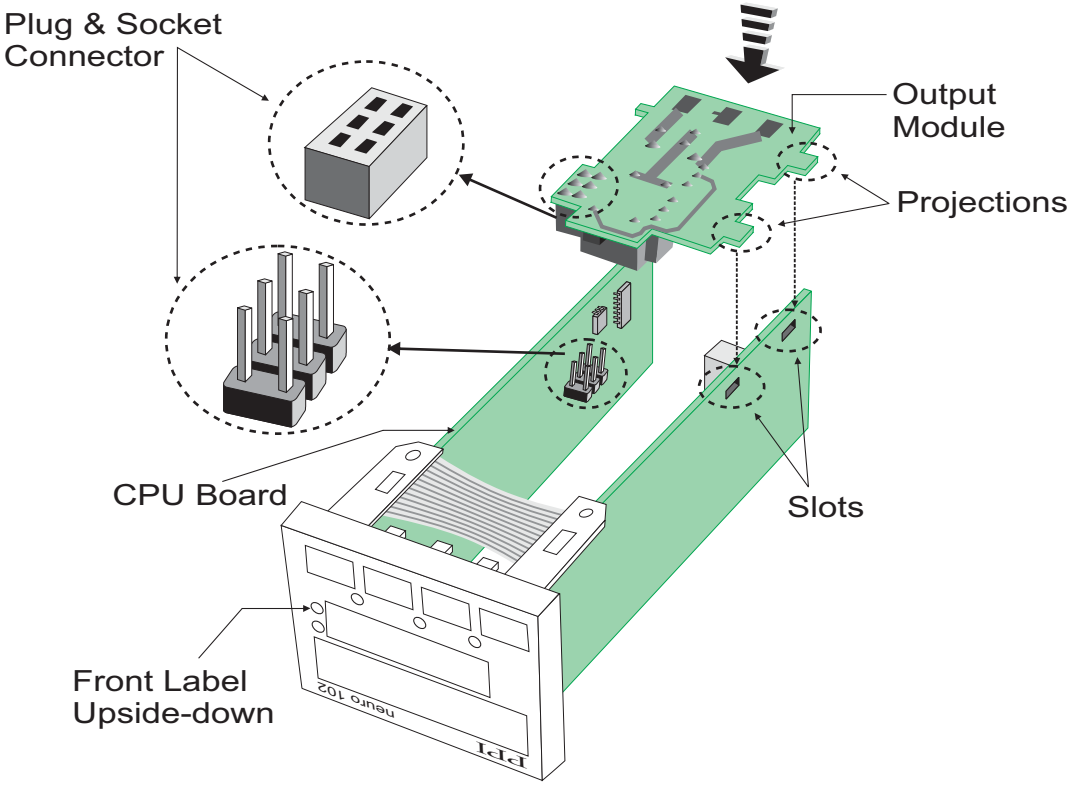


Figure 10.9

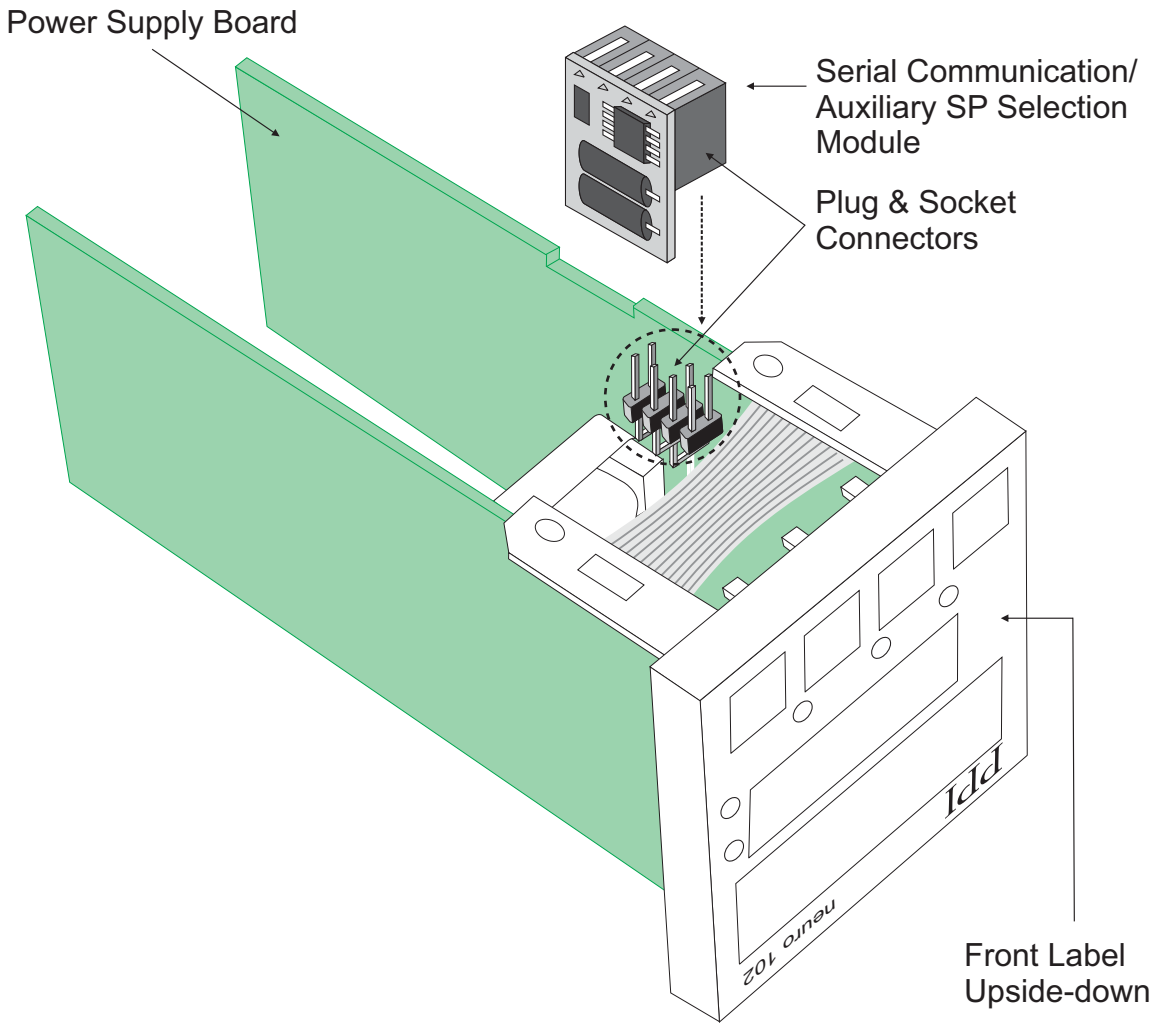
Mounting Output-3 Module



The plug for the Serial Communication or Auxiliary SP Selection module is located on the Power-supply PCB. The Figure 10.10 below illustrates how to plug-in the Serial Communication/Auxiliary SP module. To plug (or unplug) the module simply insert (or remove) the socket into (or from) the plug.

Figure 10.10

Mounting Serial Communication/Auxiliary SP Selection Module



Section 11
MECHANICAL INSTALLATION

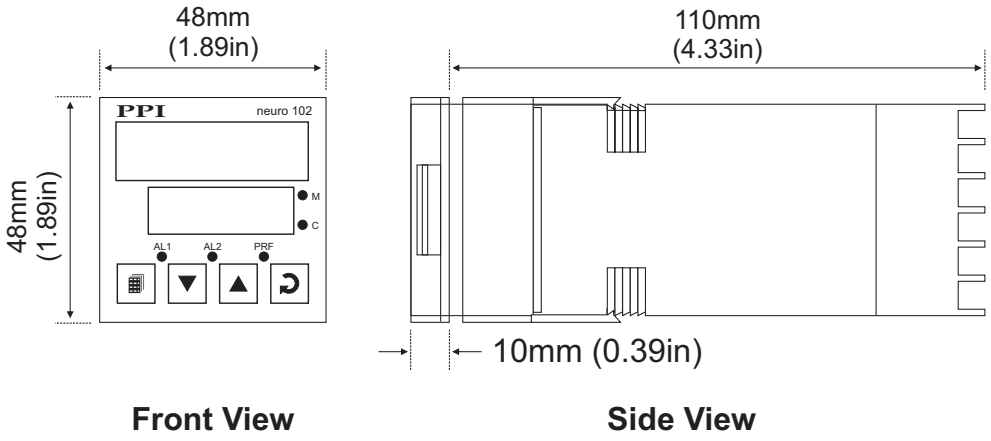
The following precautions should be strictly observed while installing the controller:

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 controller should not exceed the maximum specified for the proper operation of the controller.
3. The place of installation should be adequately protected against excessive electrostatic or electromagnetic interference.
4. The controller should not be subject to direct vibration or shock.
5. The controller 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 controller.

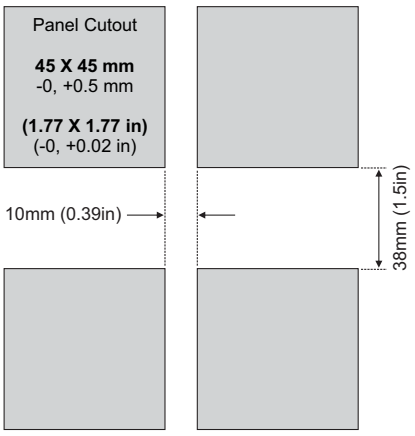
Figure 11.1



PANEL CUTOUT AND RECOMMENDED MINIMUM SPACING

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

Figure 11.2

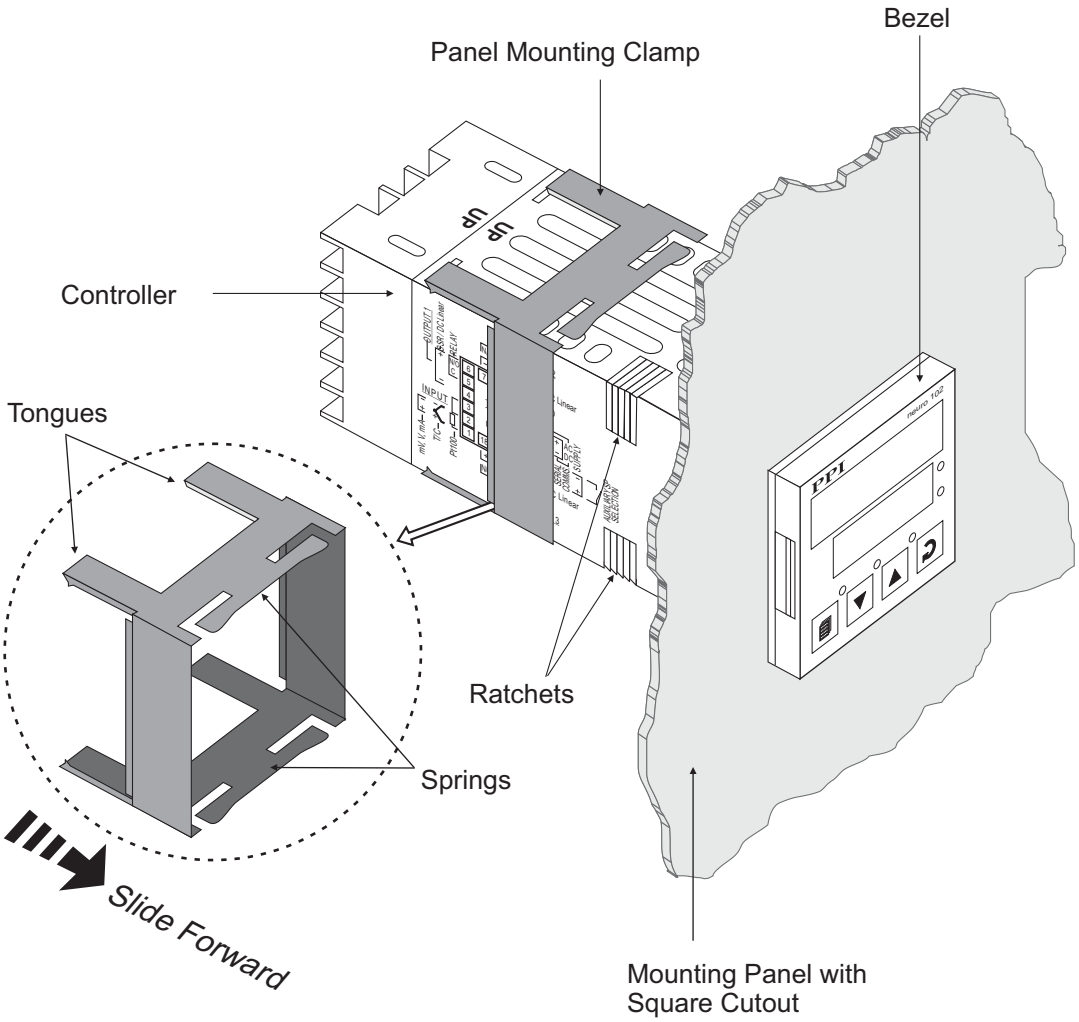


PANEL MOUNTING

Follow the steps below for mounting the controller on panel:

1. Prepare a square cutout to the size shown in Figure 11.2.
2. Remove the Panel Mounting Clamp from the controller Enclosure.
3. Insert the rear of the controller housing through the panel cutout from the front of the mounting panel.
4. Hold the controller 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 controller 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.

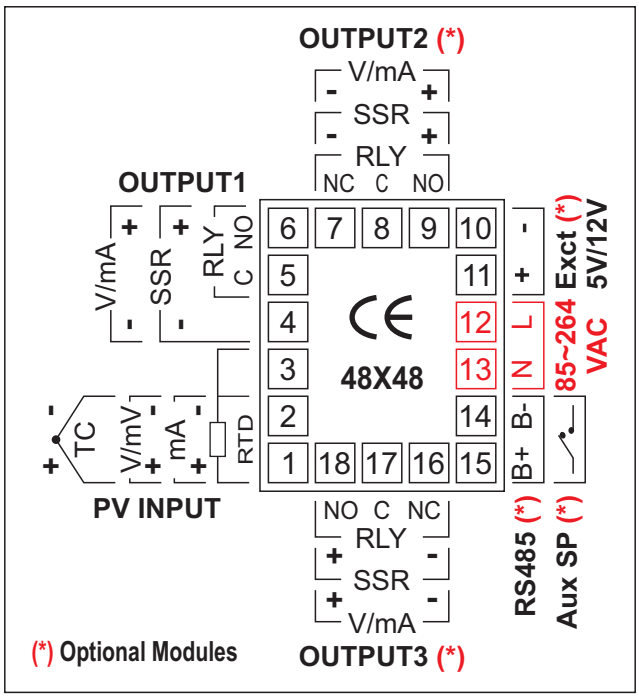
1. The user must rigidly observe the Local Electrical Regulations.
2. Do not make any connections to the unused terminals for making a tie-point for other wires (or for any other reasons) as they may have some internal connections. Failing to observe this may result in permanent damage to the controller.
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 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 left side of the controller enclosure. The diagram shows the terminals viewed from the REAR SIDE with the controller label upright. Refer the label provided on the Rear Side for terminal numbers. Note that the OUTPUT-2, OUTPUT-3 and the Serial Comm./Auxiliary SP connections are applicable only if the respective plug-in modules are fitted. Also the DC SUPPLY is applicable only if the controller is supplied with 20 to 50 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:

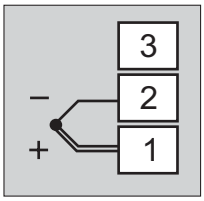
INPUT (Terminals : 1, 2, 3)

The controller accepts Thermocouples (J, K, T, R, S, B, N & Reserved), 3-wire RTD Pt100 and DC Linear Current / Voltage (mA/mV/V) as input.

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.

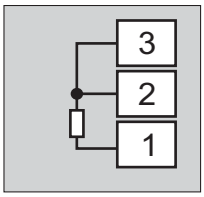
Figure 12.2 (a)



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.

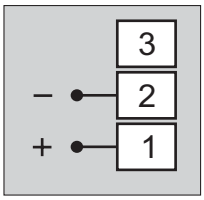
Figure 12.2 (b)



DC Linear Voltage (mA/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).The DC Current source is also connected in the similar way.

Figure 12.2 (c)



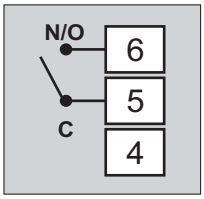
OUTPUT-1 (Relay Terminals : 5, 6; SSR / DC Linear Terminals : 4, 6)

The Output-1 can be configured (through jumper settings) as either Relay, SSR Drive or DC Linear Current (or Voltage).

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.

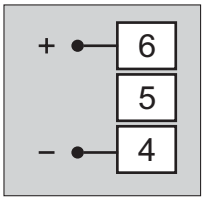
Figure 12.3 (a)



Drive for SSR

DC Voltage level is generated for switching the external SSR (Solid State Relay). Connect (+) and (-) terminals of SSR to controller terminals 6 and 4, 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.

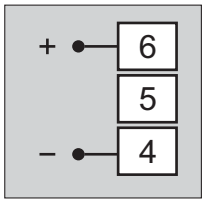
Figure 12.3 (b)



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 (-) if the Output-1 is configured for DC Linear.

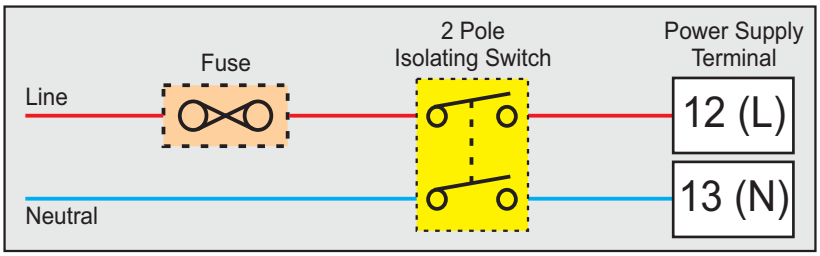
Figure 12.3 (c)



OUTPUT- 2 (Terminals : 7, 8, 9)
OUTPUT- 3 (Terminals : 16, 17, 18)
The Output-2 and Output-3 are available through plug-in modules. The modules are factory configured for either Relay / SSR or DC Linear Voltage or DC Linear Current. The connection descriptions are the same as those described for Output-1.

POWER SUPPLY (Terminals : 12, 13)

Figure 12.4



Caution

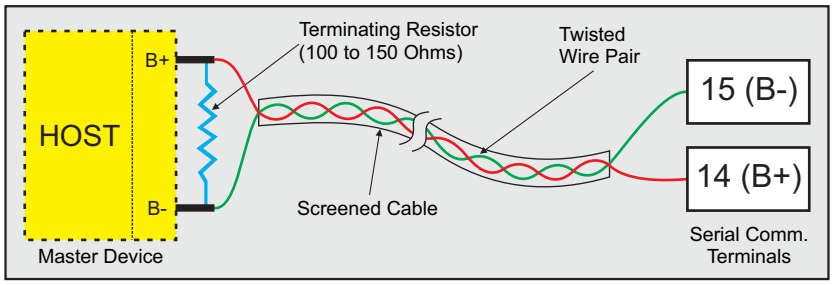
The indicator is designed for installation in an enclosure which provides adequate protection against electric shock. Local regulations regarding electrical installation should be rigidly observed. Consideration should be given to prevention of access to the Power Supply terminals by unauthorized personnel.

As standard, the 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 0.5mm^2 for power supply connections. Connect Line (Phase) supply line to terminal 12 and the Neutral (Return) supply line to terminal 13 as shown in Figure 15.4. The controller is not provided with fuse and power switch. If necessary, mount them separately. Use a time lag fuse rated 1A @ 240 VAC.

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

SERIAL COMMUNICATION PORT (Terminals : 14 , 15)

Figure 12.5

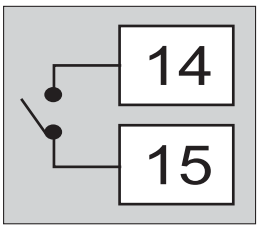


(The Option plug-in module is supplied as either RS485 Serial Port or Digital Input for Auxiliary SP Selection).

If the Optional plug-in communication board is fitted, connect terminal 15 and 14 of the controller to (+) and (-) terminals of the Master device.

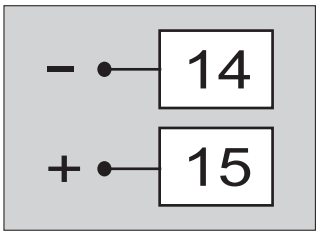
For reliable noise free communication, use a pair of twisted wires inside screened cable as shown in Figure 12.5. The wire should have less than 100 ohms / km nominal DC resistance (Typically 24 AWG or thicker). Connect the terminating resistor (Typically 100 to 150 ohm) at one end to improve noise immunity.

Figure 12.6 (a)



Potential-free Contact closure

Figure 12.6 (b)



TTL-Compatible Voltage Level

DIGITAL INPUT FOR AUXILIARY SP SELECTION (Terminals : 14, 15)

(The Option plug-in module is supplied as either RS485 Serial Port or Digital Input for Auxiliary SP Selection).

The plug-in Option module for selecting Auxiliary SP is factory configured for either potential-free contact closure or TTL-compatible voltage input.

The Setpoint selection is as under :

a) Potential-Free Contacts : OPEN :- Main SP selected
CLOSE :- Auxiliary SP selected

b) TTL-compatible Voltage : > 0.6 V :- Main SP selected
< 0.5 V :- Auxiliary SP selected

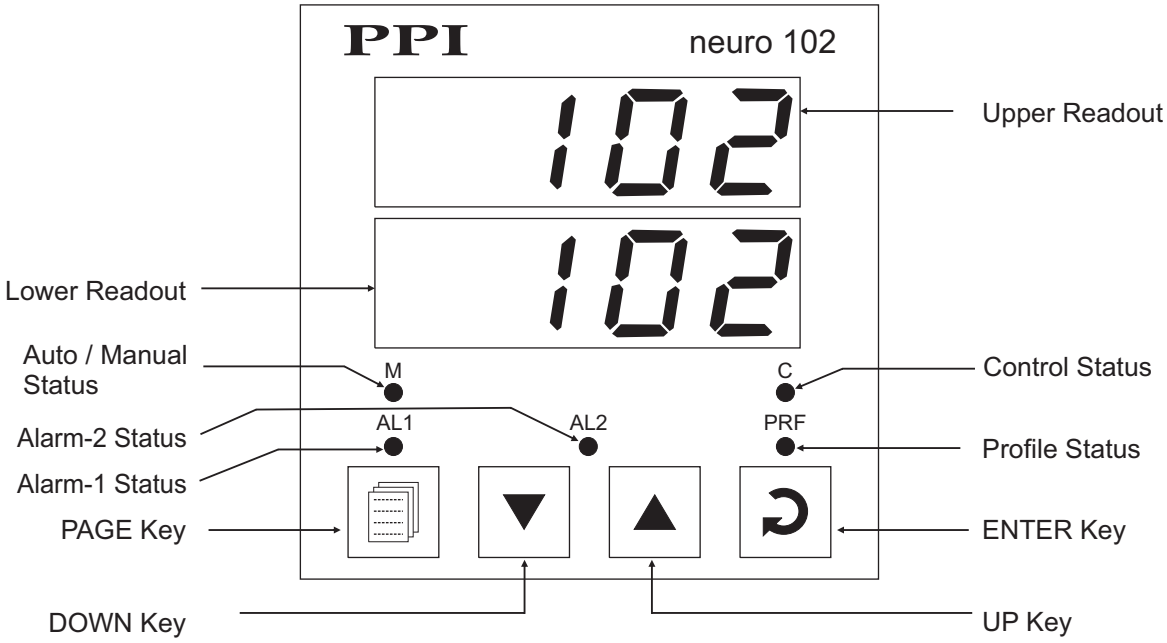
neuro 102 96X96

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 Set-up Mode, the Upper Readout displays parameter values/options.

The Lower Readout is a 4 digit, 7-segment bright green LED display and usually displays Setpoint Value or % Output Power. In Set-up Mode, the Lower Readout displays parameter names (prompts) .

INDICATORS

The front panel indicators are red LED's that show the status related to control, alarm and operation mode. Refer Table 1.1 below for details.

Table 1.1

LED	Status
M	• Glows if the manual (Hand) mode is active. • Remains OFF if Automatic (Auto). Standby or profile mode is active.
C	• Indicates Output-1 ON/OFF status if the Control Output Type is Relay / SSR drive. • Remains OFF if the Control Output Type is DC Linear.
AL1	Indicates Alarm-1 status if Output -2 (OP2) is configured as Alarm. • Flashes while the Alarm-1 is active. • Remains OFF while the Alarm - 1 is inactive or if OP2 is configured as cool control output

LED	Status
AL2	Indicates Alarm-1 status if Output -3 (OP3) is configured as Alarm. • Flashes while the Alarm-2 is active. • Remains OFF while the Alarm-2 is inactive or if OP3 is configured as Recorder / Retransmission.
PRF	Indicates profile status if the Profile mode is Enabled. • Flashes while the controller is executing ramp/soak profile cycle. • Glows continuously if the profile cycle is in HOLD state. • Remains OFF, if not executing a profile Cycle.

KEYS

There are four tactile keys provided on the front panel for configuring the controller, setting-up the parameter values and selecting Operation Modes. Refer Table 1.2 for detailed key operations.

Table 1.2

Symbol	Key	Function
	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 on the PAGE.

Section 2

HARDWARE ASSEMBLY AND CONFIGURATIONS

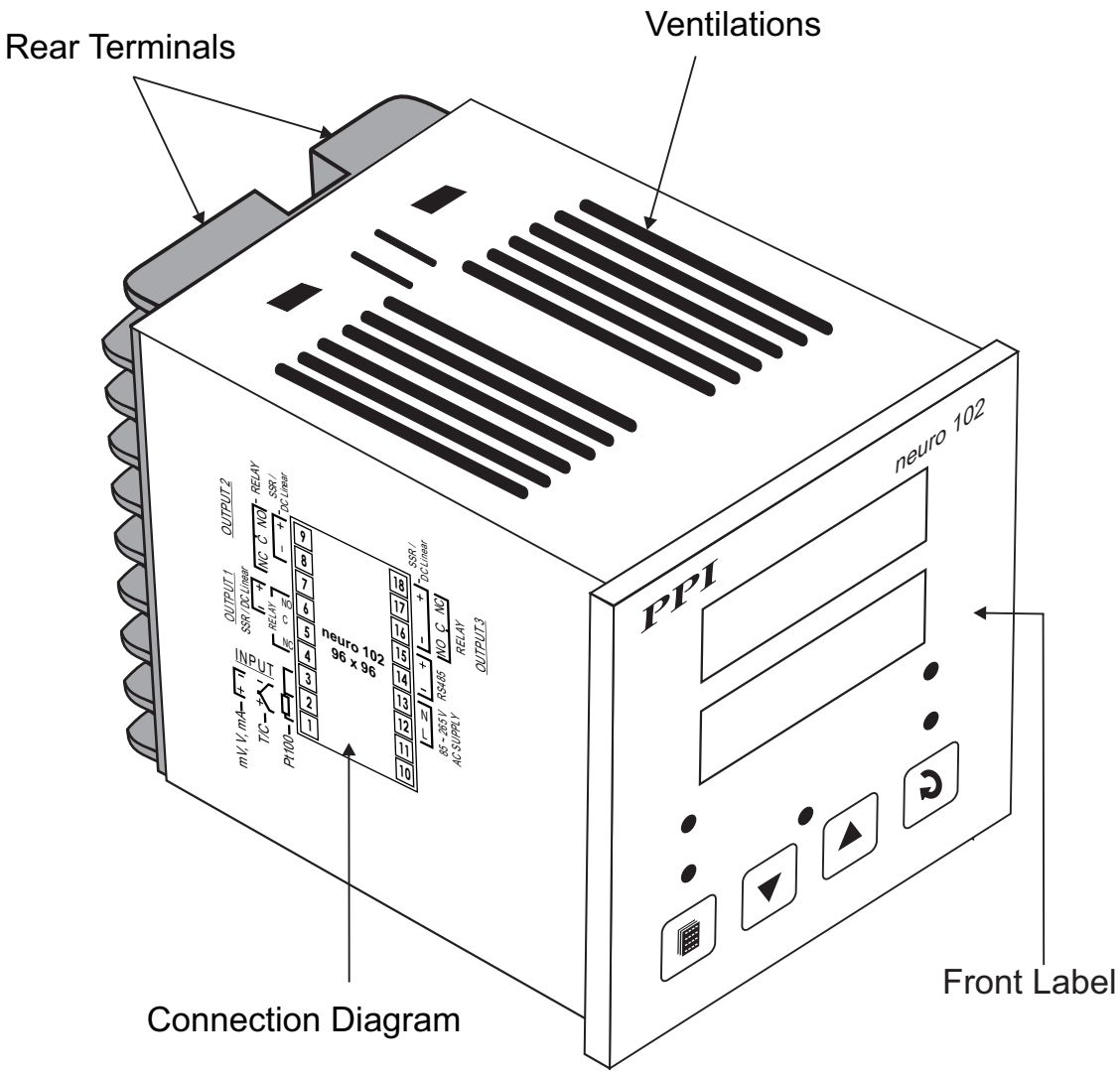
The Figure 2.1 below shows the controller outer-case viewed with front label upright.

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 left, Power-supply PCB is to the right 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 2.1.

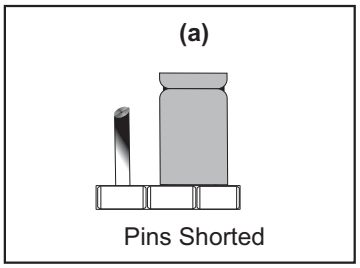
Figure 2.1



Input Jumper Setting

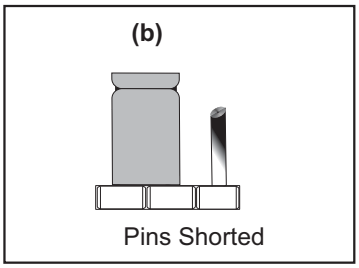
For DC Linear Current Inputs (0-20mA or 4-20mA), short the Pins using Shorting-Link as shown in Figure 2.2 (a). For all other Input types, keep the Shorting-Link parked leaving the Pins open, as shown in Figure 2.2 (b).

Figure 2.2 (a)



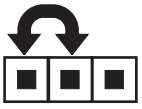
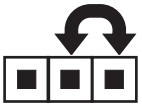
DC Linear Current (mA)

Figure 2.2 (b)



All other Input Types

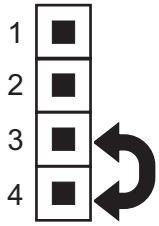
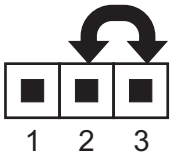
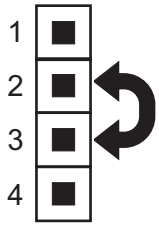
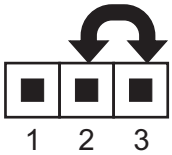
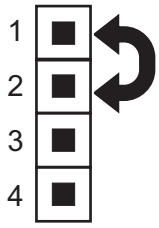
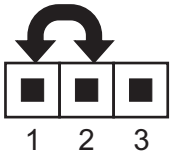
Table 2.1 **Input Jumper Settings**

Input Type	Jumper 'A' Setting
Thermocouple, RTD Pt100, mV & V	
DC Linear Current (mA)	

OUTPUT-1 : Jumper Settings

Besides the parameter settings, the Output-1 configuration requires jumper settings marked B & C for different output type selections as shown in the Table 2.2 below.

Table 2.2 **Output-1 Jumper Settings**

Output Type	Jumper Setting - B	Jumper Setting - C
Relay		
SSR Drive		
DC Linear Current (or Voltage)		

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 2.3, are required for Relay or SSR selection. Refer Table 2.3 for appropriate jumper setting positions.

Figure 2.3

Relay/SSR Module

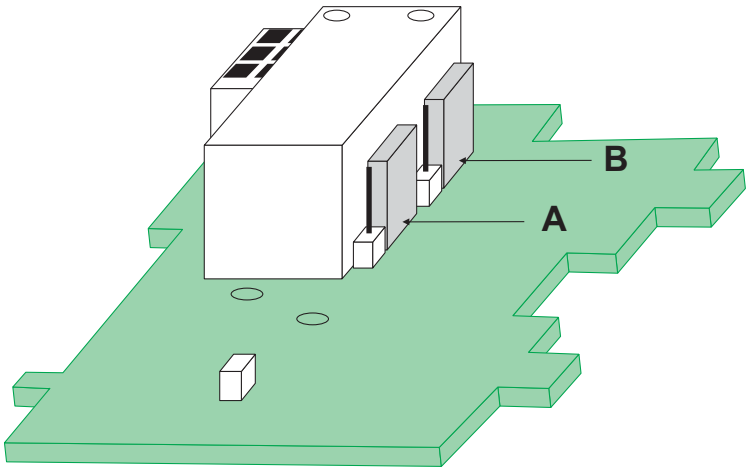


Table 2.3 **Output-2 Jumper Settings**

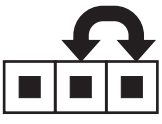
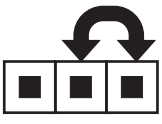
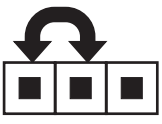
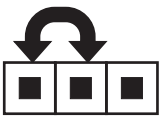
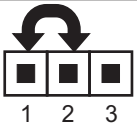
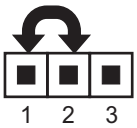
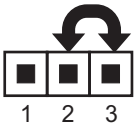
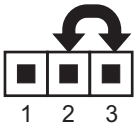
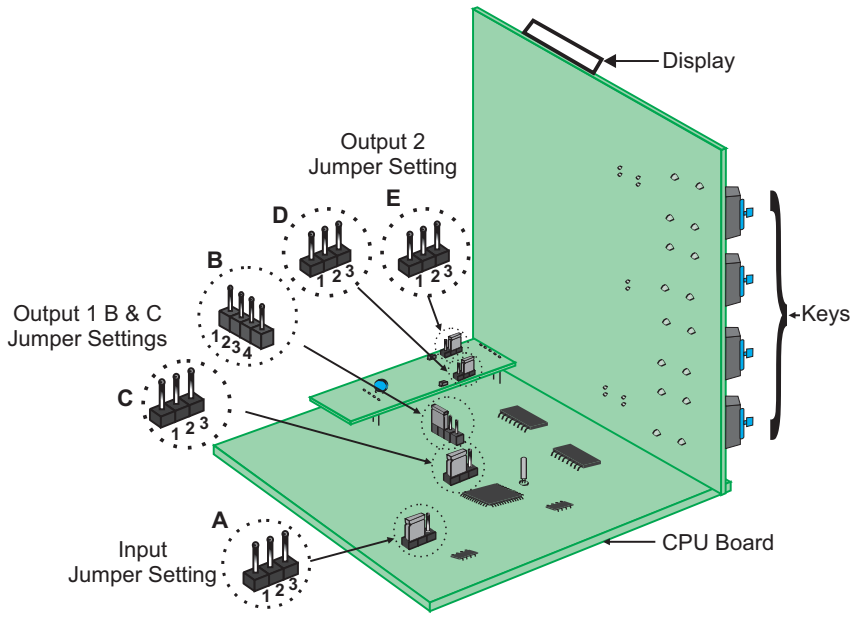
Output Type	Jumper Setting - D	Jumper Setting - E
Relay		
SSR		

Table 2.4 **Output-3 Jumper Settings**

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

Mounting Output Modules

Figure 2.4



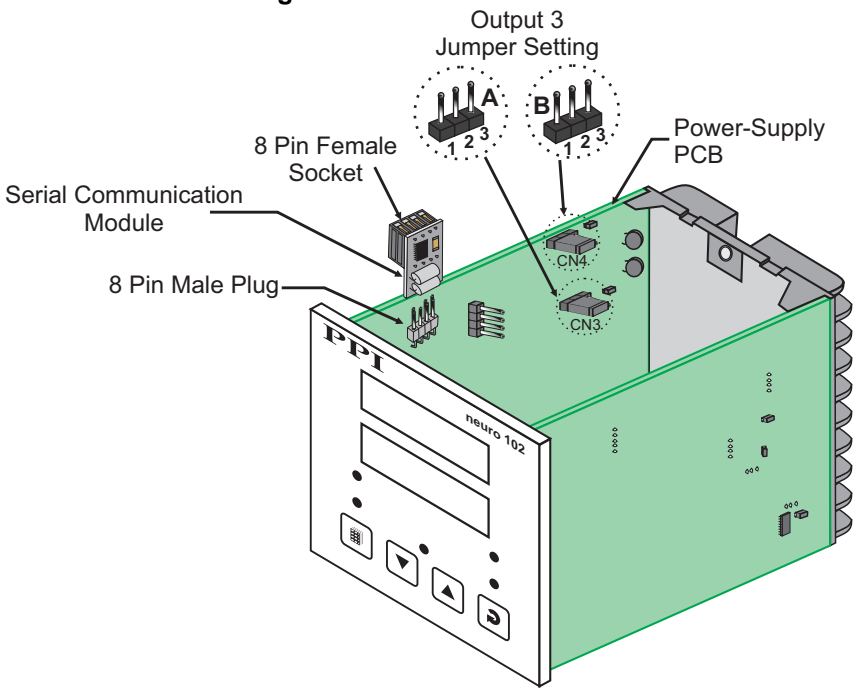
Mounting / Un-Mountion of Modules

The Figure 2.4 Illustrates how to mount output-2 & output-3 module, respectively. Notice the orientation of the controller & a few identifying components shown in figure to help locate the plugs for the modules.

The plug for the Serial Communication or Remote Alarm Acknowledgment module is located on the Power-supply PCB. The Figure 2.5 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 2.5

Mounting Serial Communication Module



Section 3
ELECTRICAL CONNECTIONS

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

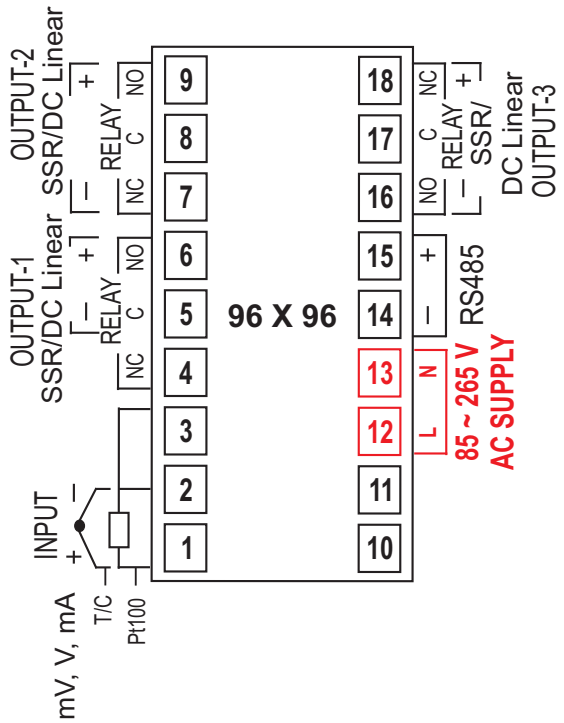
1. The user must rigidly observe the Local Electrical Regulations.
2. Do not make any connections to the unused terminals for making a tie-point for other wires (or for any other reasons) as they may have some internal connections. Failing to observe this may result in permanent damage to the controller.
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 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 left side of the controller enclosure. The diagram shows the terminals viewed from the REAR SIDE with the controller label upright. Refer the label provided on the Rear Side for terminal numbers. Note that the OUTPUT-2, OUTPUT-3 and the Serial Comm./Auxiliary SP connections are applicable only if the respective plug-in modules are fitted. Also the DC SUPPLY is applicable only if the controller is supplied with 20 to 50 VDC supply voltage option.

The rear panel electrical wiring connection diagram is shown in Figure 3.1 below.

Figure 3.1



DESCRIPTIONS

The back panel connections are described as under:

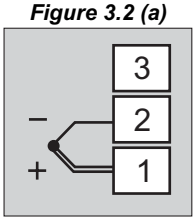
INPUT (Terminals : 1, 2, 3)

The controller accepts Thermocouples (J, K, T, R, S, B, N & Reserved), 3-wire RTD Pt100 and DC Linear Current / Voltage (mV/V/mA) as input.

Thermocouple

Connect Thermocouple Positive (+) to terminal 1 and Negative (-) to terminal 2 as shown in Figure 3.2 (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.

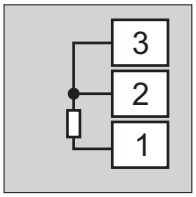
Figure 3.2 (a)



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 3.2 (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.

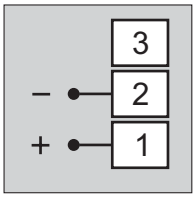
Figure 3.2 (b)



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 3.2 (c).

Figure 3.2 (c)

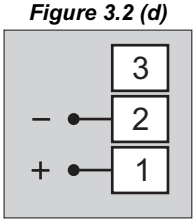


DC Linear Current (mA)

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 3.2 (d).

Make sure that the Jumper Pins for Input selection are shorted using the Shorting-Link (Refer *Section 9 Hardware Assembly and Configurations, Input-Jumper Settings).*

Figure 3.2 (d)

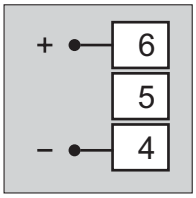


OUTPUT-1 (Terminals : 4, 6)

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 3.3

Figure 3.3



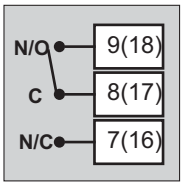
OUTPUT- 2 (Terminals : 7, 8, 9)
OUTPUT- 3 (Terminals : 16, 17, 18)

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 3.4(a) and 3.4(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.

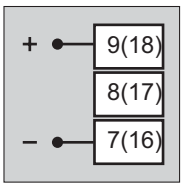
Figure 3.4 (a)



Drive for SSR

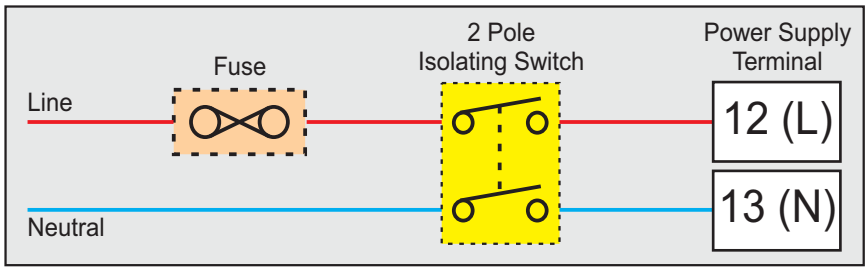
DC Voltage level is generated for switching the external SSR (Solid State Relay). Connect (+) and (-) terminals of SSR to indicator terminals 9(18) and 7(16), respectively. Use Zero-Crossover, 3 to 30 VDC operated SSR, rated approximately 1.5 times the actual load rating. Use appropriate Heat Sink for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

Figure 3.4 (b)



POWER SUPPLY (Terminals : 12, 13)

Figure 3.5



Caution

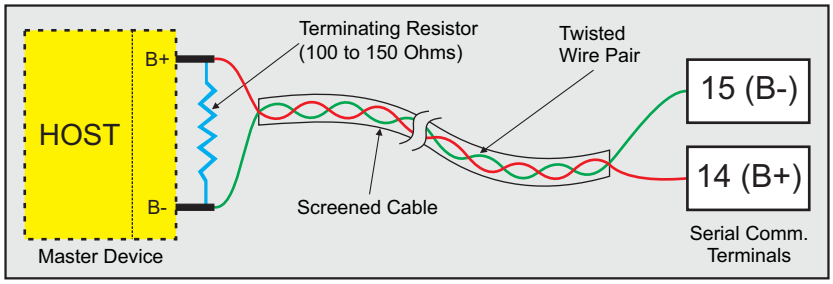
The indicator is designed for installation in an enclosure which provides adequate protection against electric shock. Local regulations regarding electrical installation should be rigidly observed. Consideration should be given to prevention of access to the Power Supply terminals by unauthorized personnel.

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 3.5. 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)

Figure 3.5

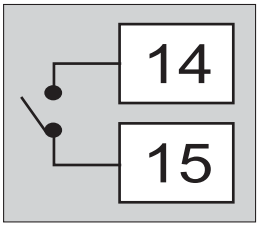


(The Option plug-in module is supplied as either RS485 Serial Port or Digital Input for Auxiliary SP Selection).

If the Optional plug-in communication board is fitted, connect terminal 15 and 14 of the controller to (+) and (-) terminals of the Master device.

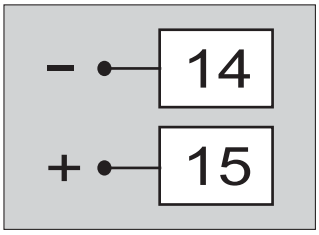
For reliable noise free communication, use a pair of twisted wires inside screened cable as shown in Figure 3.5. The wire should have less than 100 ohms / km nominal DC resistance (Typically 24 AWG or thicker). Connect the terminating resistor (Typically 100 to 150 ohm) at one end to improve noise immunity.

Figure 3.6 (a)



Potential-free Contact closure

Figure 3.6 (b)



TTL-Compatible Voltage Level

DIGITAL INPUT FOR AUXILIARY SP SELECTION (Terminals : 14, 15)

(The Option plug-in module is supplied as either RS485 Serial Port or Digital Input for Auxiliary SP Selection).

The plug-in Option module for selecting Auxiliary SP is factory configured for either potential-free contact closure or TTL-compatible voltage input.

The Setpoint selection is as under :

a) Potential-Free Contacts : OPEN :- Main SP selected
CLOSE :- Auxiliary SP selected

b) TTL-compatible Voltage : > 0.6 V :- Main SP selected
< 0.5 V :- Auxiliary SP selected

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