

**masibus®**

## User's Manual

### ON-OFF CONTROLLER

**LC5296**

**LC5296-H**

**5006-RN**

**LC5248E**

### INDICATOR

**408 - M**



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# 1. INTRODUCTION

## Foreword

Thank you for purchasing ON-OFF Controller- LC5296-H / LC5296 / 5006-RN / LC5248E and Indicator 408-M.

This manual describes the basic functions and operation methods. Please read through this user's manual carefully before using the product.

## Notice

The contents of this manual are subject to change without notice as a result of continuous improvements to the instrument's performance and functions.

Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform MASIBUS Sales office or sales representative. Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.

## Trademarks

Our product names or brand names mentioned in this manual are the trademarks or registered trademarks of Masibus Automation and Instrumentation (P) Ltd. (herein after referred to as MASIBUS).

Adobe, Acrobat, and Postscript are either registered trademarks or trademarks of Adobe Systems Incorporated. All other product names mentioned in this user's manual are trademarks or registered trademarks of their respective companies.

## Checking the Contents of the Package

Unpack the box and check the contents before using the product. If the product is different from which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact your sales representative.

## Product Ordering Code

The Single Loop Controller unit has a nameplate affixed to the one side of the enclosure. Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered.

Ordering Code										
Model	Input		Auxiliary Power Supply		Options				Display (Only in LC5296H)	
					Output-1		Output-2*			
LC5296	1	J	U1	80-265VAC / 100-300VDC	N	None	N	None	5	0.56"
5006RN	2	K	U2	18-36VDC	1	4-20mA	1	4-20mA	8	0.8"
LC5296H	3	T			2	0-20mA	2	0-20mA		
LC5248E	4	R			3	1-5V	3	1-5V		
	5	S			4	0-5V	4	0-5V		
	6	Pt-100			5	0-10V	5	0-10V		
	C	4-20mA					6	RS485		
	D	0-20mA								
	E	1-5V								
	F	0-5V								
	G	0-10V								

Output-2= 2<sup>nd</sup> Retransmission o/p is not possible in LC5296H & LC5248E model; Only optional RS485 is possible in same.

Ordering Code				
Model	Input		Auxiliary Power Supply	
408-M	1	J	U1	85-265 VAC / 100-300 VDC
	2	K	U2	18-36 VDC
	3	T		
	4	R		
	5	S		
	6	Pt-100		
	C	4-20mA		
	D	0-20mA		
	E	1-5 V		
	F	0-5 V		
	G	0-10 V		

### List of Accessories

The product is provided with the following accessories according to the model and suffix codes (see the table below). Check that none of them are missing or damaged.



No	Item name	Part number	Qty	Remarks
1	Mounting Clamps	-	2	

### Safety Precautions

The product and the instruction manual describe important information to prevent possible harm to users and damage to the property and to use the product safely.

Understand the following description (signs and symbols), read the text and Observe Descriptions.

### DESCRIPTION OF SIGN

	<b>WARNING</b>	<i>This indicates a danger that may result in death or serious injury if not avoided.</i>
	<b>CAUTION</b>	<i>This indicates a danger that may result in minor or moderate injury or only a physical damage if not avoided.</i>

## 2. SPECIFICATIONS

### 2.1 Inputs

<b>Analog Input</b>	
Input Type	Thermocouple, RTD (Pt100), Current, Voltage
Display Range	Refer Table-2.1
Accuracy	± (0.25% of Full Span + 1 degree) for T/C and RTD input. ± (0.1% of Full Span + 1 count) for Linear input.
ADC Resolution	16 bits
Display Resolution	0.1°C / 1 Count
Sampling Rate	5 Samples/Sec
CJC Error	±3.0 °C Max
Sensor open Detection	All inputs except 0-5V, 0-10V
Sensor Burnout current	0.25uA
RTD excitation current	0.166mA (Approx)
Allowable wiring resistance for RTD	Maximum 15 ohms/wire (Conductor resistance between three wires should be equal)
NMRR	> 40 dB
CMRR	> 120 dB
Temp-co	< 150ppm/°C
Input Impedance	> 1MΩ (Voltage Input) 250Ω (Current Input)
Max Voltage	20VDC

Input type	Range
<b>PT100 (0.1 °C)</b>	-199.9 to 850.0 °C
<b>PT100 (1 °C)</b>	-200 to 850 °C
<b>J</b>	-199.9 to 1200 °C
<b>K</b>	-199.9 to 1372 °C
<b>T</b>	-199.9 to 400 °C
<b>R</b>	0 to 1768 °C
<b>S</b>	0 to 1768 °C
<b>*4-20mA /1-5VDC, *0-20mA /0-5VDC</b>	-1999 to 9999 (Field Scalable)
<b>0-10VDC</b>	-1999 to 9999 (Field Scalable)

**Table-2.1**

**\*Use external 250ohms, 0.1% for current Input**

## 2.2 Display & Keys

Model	Display	Specification
LC5296	PV Display	4-Digit, 7-Segment, Red, Character height of 0.56"
	SV / Parameter Display	4-Digit, 7-Segment, Green, Character height of 0.40"
	Status Indication	Individual RED Led for Relay & Communication Status
LC5296-H	PV / Parameter Display <sup>2</sup>	4-Digit, 7-Segment, Red, Character height of 0.56" or 4-Digit, 7-Segment, Red, Character height of 0.8"
	Status Indication	Individual RED Led for Relay & Communication Status
5006-RN	PV Display	4-Digit, 7-Segment, Red, Character height of 0.56"
	Status Indication	Individual RED Led for Relay & Communication Status
408-M	PV Display	4-Digit, 7-Segment, Red, Character height of 0.8"
LC5248E	PV Display	4-Digit, 7-Segment, Red, Character height of 0.40"
	SV / Parameter Display <sup>1</sup>	4-Digit, 7-Segment, Green, Character height of 0.28"
	Status Indication	Individual RED Leds for Relay Status, Rx,Tx

### NOTE:

- LC5296-H is available with Two Different variant.
  - LC5296-H with 0.8" PV Display.
  - LC5296-H with 0.56" PV Display.

## 2.3 Output Types

Relay Output	
Relays	2 (Not available in 408-M)
Type	Single Change over LC5296/LC5296-H/5006-RN : Three Terminals (C, NO, NC)
Rating	2A @ 230VAC / 30VDC

Retransmission Output (For LC5296, LC5296-H, 5006-RN Only)	
Number of output	1 / 2 (Specified in Order Code)
Output According to	Process Value
Output Signal	4-20mA / 0-20mA /1-5VDC / 0-10V DC
Load resistance	<ul style="list-style-type: none"> <li>• For Current o/p &lt; 500Ω.</li> <li>• For Voltage o/p &gt; 3KΩ.</li> </ul>
Output accuracy	±0.25% of span

Loop Power Supply (For LC5296, LC5296-H, 5006-RN, 408-M, LC5248E Only)	
Supply Voltage	24VDC (±1V) @26mA with Inbuilt Short Circuit Protection

## 2.4 Communication Details

Communication (For LC5296, LC5296-H, 5006-RN, LC5248E Only)	
Interface	RS485 (2 Wire)

Protocol	Modbus-RTU
Baud rate	9600, 19200, 38400 bps

**2.5 Power Supply**

Standard	85-265VAC/ 100-300VDC
Optional	18-36VDC
Power consumption	<10 VA (LC5296/LC5296-H/5006-RN,408-M)
Data backup	Non-volatile memory (can be written up to 100000 times)

**Isolation (Withstanding voltage)**

- Between primary terminals\* and secondary terminals\*\*:  
At least 1500 V AC for 1 minute
- Between primary terminals\* and grounding terminal:  
At least 1500 V AC for 1 minute
- Between grounding terminal and secondary terminals\*\*:  
At least 1500 V AC for 1 minute
- Between secondary terminals\*\*:  
At least 500 V AC for 1 minute

\* Primary terminals indicate power terminals and relay output terminals.

\*\* Secondary terminals indicate analog I/O signal and Communication O/P.

**Insulation resistance:** 20MΩ or more at 500 V DC between power terminals and grounding terminal.

**2.6 Environmental Conditions**

TEMPCO	For Input to PV Display < 100ppm. FOR Display to Retransmission and Control output < 100ppm
Humidity	20% to 95% RH (Non-Condensing)
Instrument Warm-up Time	Approx. 15 minutes
Ambient temperature	0 to 55°C
Storage Temperature	0 to 80°C

**2.7 Advance Feature**

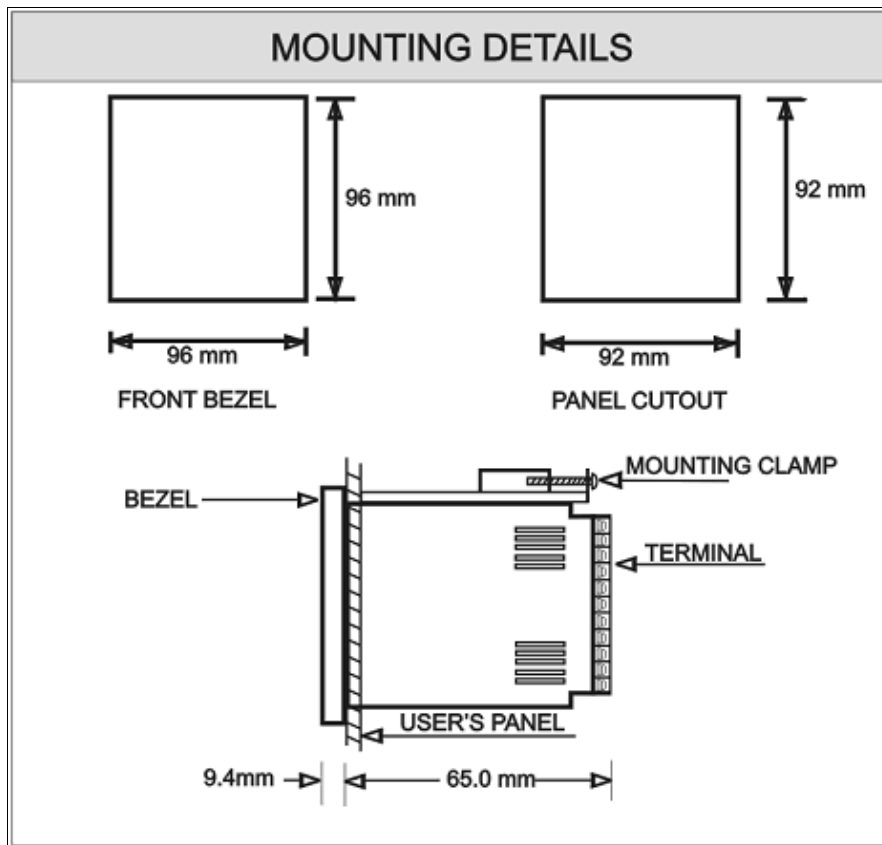
- Input scalability for linear input



### 3. PHYSICAL SPECIFICATIONS & MOUNTING DETAILS

#### 3.1 LC5296 / 5006-RN

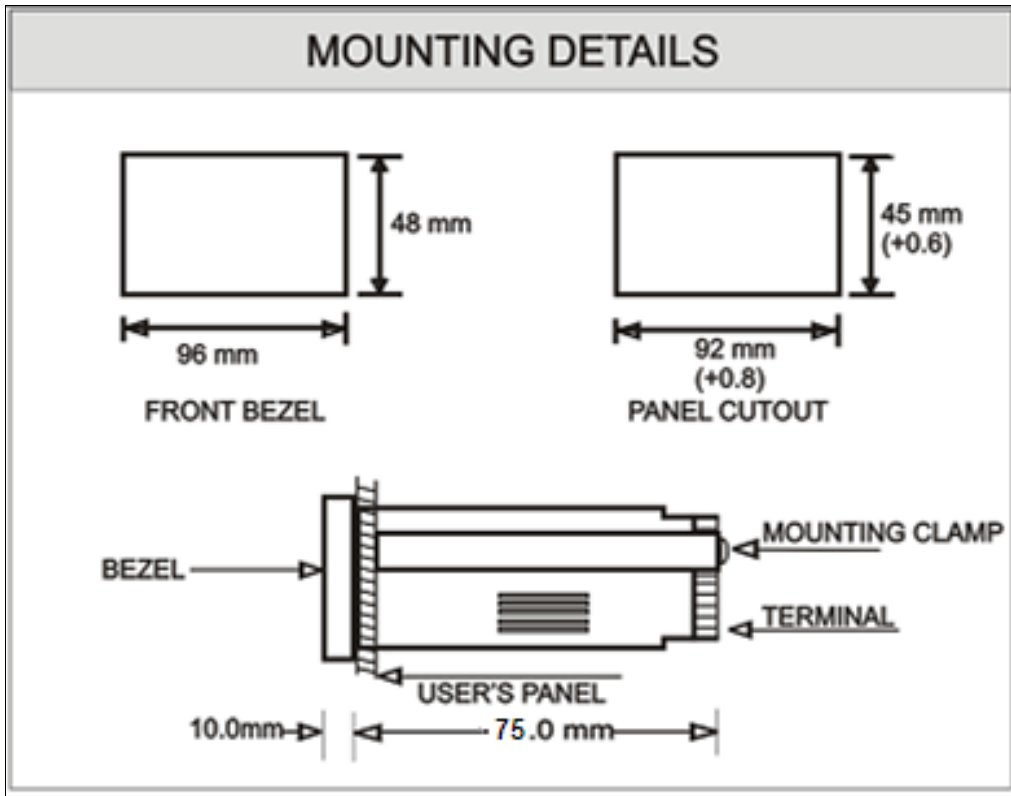
Front Bezel	96 x 96 mm
Panel Cutout	92mm(+0.8) x 92mm(+0.8)
Depth Behind The Panel	65 mm with Terminal
Weight	300g Approx.
Enclosure Material	ABS
Enclosure Protection	IP20
Terminal Cable Size	2.5 mm <sup>2</sup>



**Fig 3.1: Mounting Details for LC5296 / 5006-RN**

#### 3.2 LC5296-H / 408-M

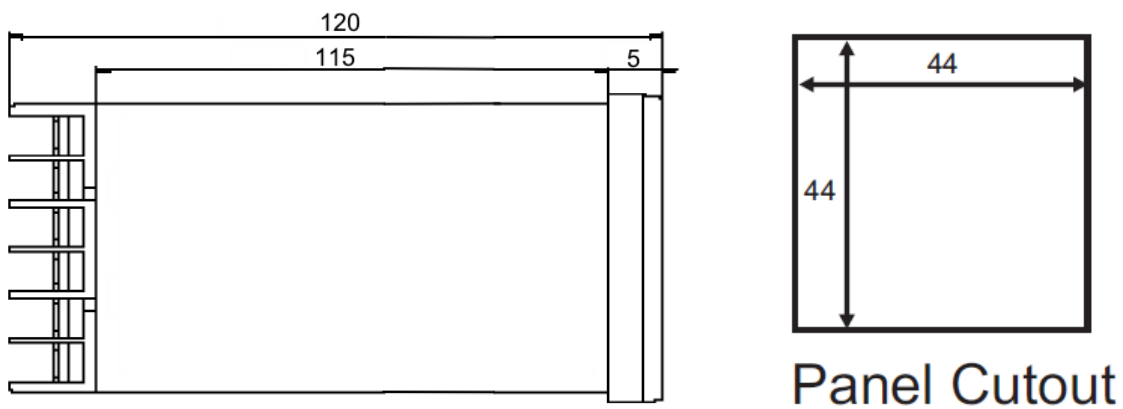
Front Bezel	48 x 96 mm
Panel Cutout	45mm(+0.6) x 92mm(+0.8)
Depth Behind The Panel	75 mm with Terminal
Weight	250g Approx.
Enclosure Material	ABS
Enclosure Protection	IP20
Terminal Cable Size	2.5 mm <sup>2</sup>



**Fig 3.3: Mounting Details for LC5296-H(0.56'')**

**3.3 LC5248E**

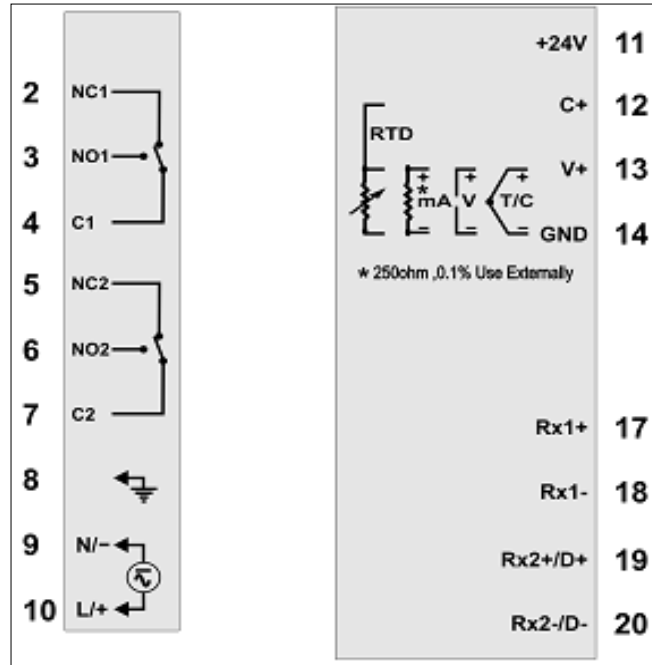
Front Bezel	48 x 48 mm
Panel Cutout	44 x 44 mm
Depth Behind The Panel	115mm
Weight	200g Approx.
Encloser Material	ABS
Encloser Protection	IP20
Terminal Cable Size	2.5 mm <sup>2</sup>



**Fig 3.2: Mounting Details for LC5248E**

## 4. TERMINAL CONNECTIONS

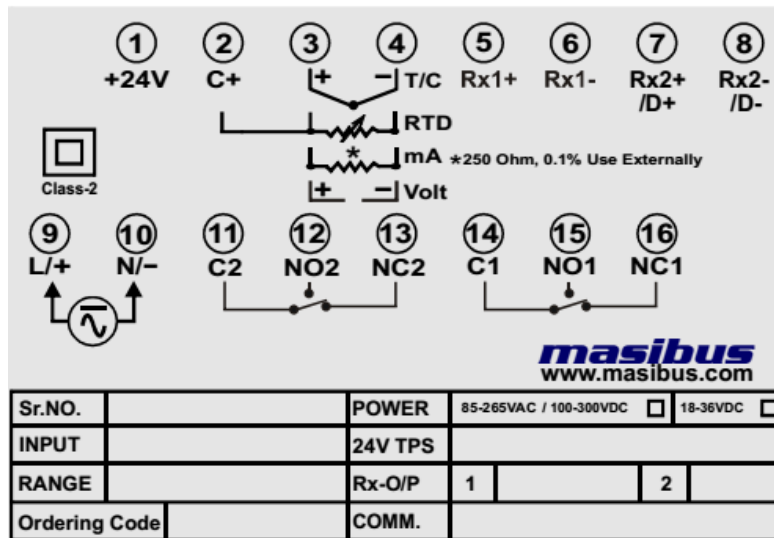
### 4.1 LC5296 & 5006-RN



**Fig 4.1: Terminal Connection Detail of LC5296 / 5006-RN**

Terminal No.	Description
2 (NC1) 3 (NO1) 4 (C1)	<ul style="list-style-type: none"> <li>For Relay-1 potential free Contacts (Use 230V -2A load)</li> <li>On-Off Control o/p.</li> </ul>
5 (NC2) 6 (NO2) 7 (C2)	<ul style="list-style-type: none"> <li>For Relay-2 potential free Contacts (Use 230V -2A load)</li> <li>On-Off Control o/p.</li> </ul>
8 (Earth)	Earth Connection
9 (N/-) 10 (L/+)	Power Supply Input
11 (LPS+)	24VDC Loop power supply Terminal 14 is ground Reference.
12	For RTD Input Only (Three wire Compensation).
13 (TC+ / V+) 14 (TC- / V- / LPS-)	For Thermocouple, RTD & Linear Input
17 (Rx1+) 18 (Rx1-)	<ul style="list-style-type: none"> <li>For Retransmission-1 output</li> </ul>
19 (Rx2+ / D+) 20 (Rx2- / D-)	<ul style="list-style-type: none"> <li>For Retransmission-2 output</li> <li>Modbus-RTU Communication Output</li> </ul>

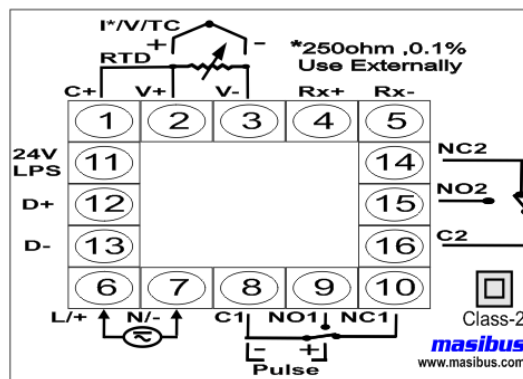
**4.2 LC5296-H / 408-M**



**Fig 4.4: Terminal Connection Detail of LC5296-H(0.56'')**

Terminal No.	Description
1 (LPS+)	24VDC Loop power supply Terminal 4 is ground Reference.
2	For RTD Input Only (Three wire Compensation).
3 (TC+ / V+)	For Thermocouple, RTD & Linear Input
4 (TC- / V- / LPS-)	
9 (L/+)	Power Supply Input
10 (N/-)	

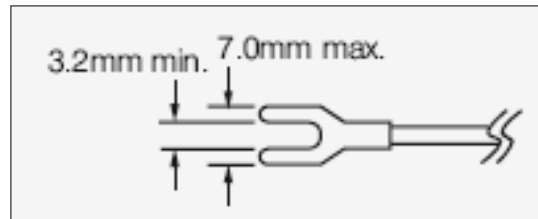
**4.3 LC5248E**



**Fig 4.5: Terminal Connection Detail of LC5248E**

Terminal No.	Description
1	For RTD Input Only (Three wire Compensation).
2 (TC+ / V+)	For Thermocouple, RTD & Linear Input
3 (TC- / V- / LPS-)	
4 (Rx1+)	<ul style="list-style-type: none"> <li>For Retransmission-1 output</li> </ul>
5 (Rx1-)	
6 (N/-)	Power Supply Input
7 (L/+)	
8 (C1)	<ul style="list-style-type: none"> <li>For Relay-1 potential free Contacts (Use 230V -2A load)</li> <li>On-Off Control o/p.</li> </ul>
9 (NO1)	

<b>10 (NC1)</b>	
<b>11 (LPS+)</b>	24VDC Loop power supply Terminal 14 is ground Reference.
<b>12 (D+)</b> <b>13 (D-)</b>	<ul style="list-style-type: none"> <li>• Modbus-RTU Communication Output</li> </ul>
<b>14 (NC2)</b> <b>15 (NO2)</b> <b>16 (C2)</b>	<ul style="list-style-type: none"> <li>• For Relay-2 potential free Contacts (Use 230V -2A load)</li> <li>• On-Off Control o/p.</li> </ul>



**Fig 4.6: Lead Termination Detail**

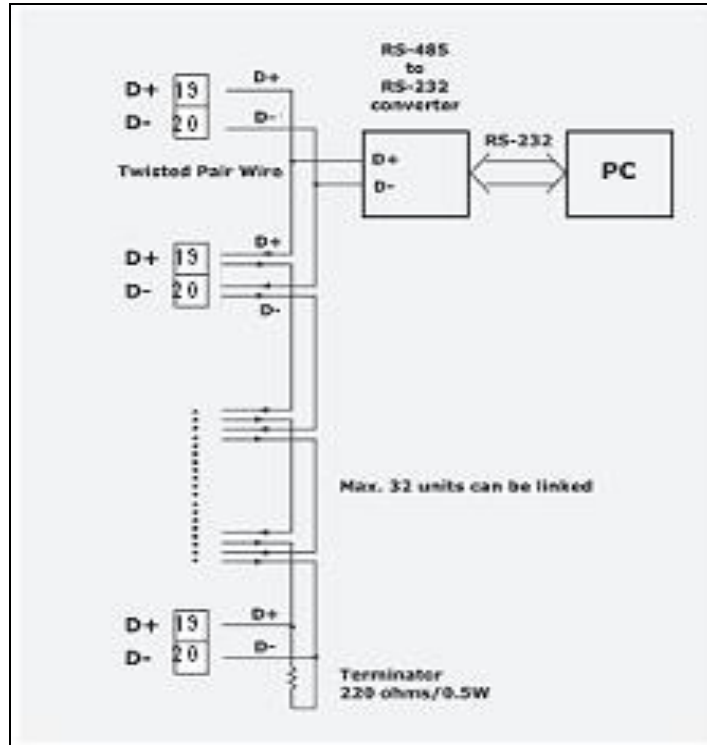
#### 4.5 How to connect wires?

Before carrying out wiring, turn off the power to the controller and check that the cables to be connected are not alive because there is a possibility of electric shock.

#### **NOTE:**

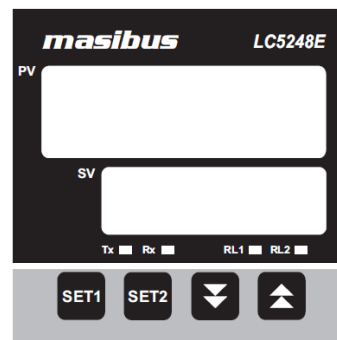
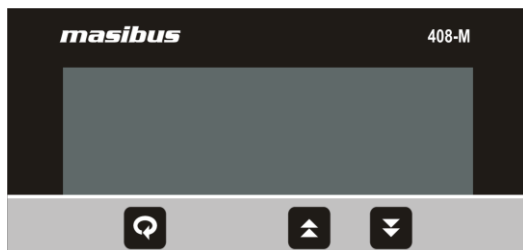
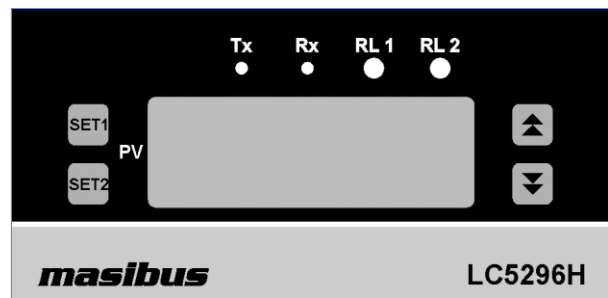
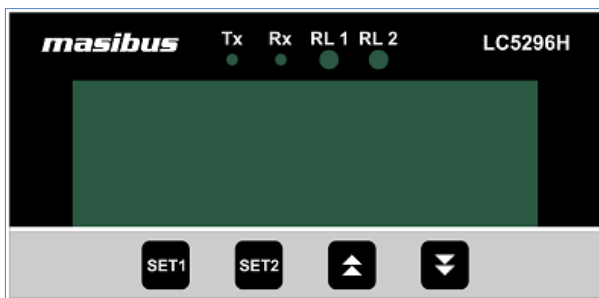
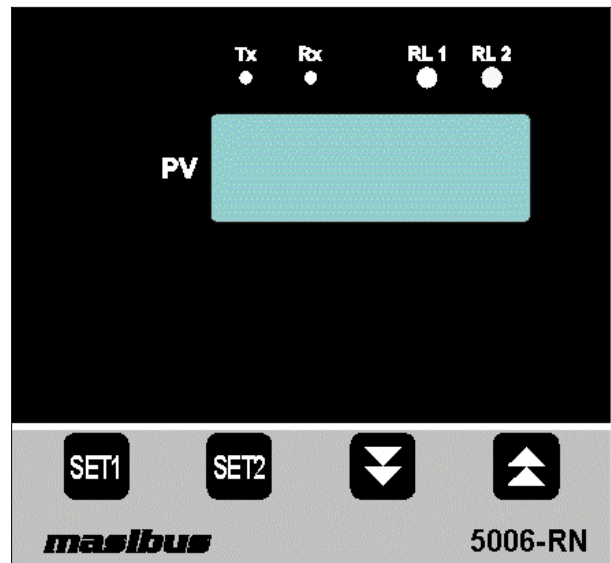
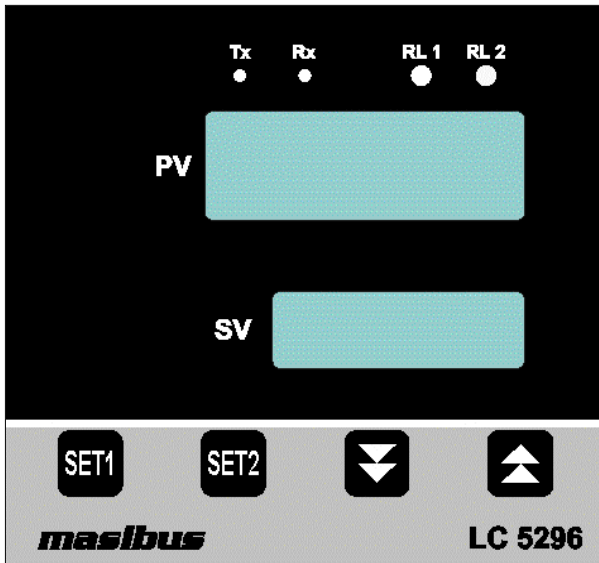
- ✓ All wiring must confirm to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for Voltage, Current and temperature rating of the system.
- ✓ Provide power from a single-phase instrument power supply. If there is a lot of noise in the power line, insert an insulating transformer into the primary side of the line and use a line filter on the secondary side. Do not place the primary and secondary power cables close to each other.
- ✓ For thermocouple input, use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.
- ✓ Use repeater after each set of 32 instruments connected in RS-485 Communication.
- ✓ Unused terminals should not be used as jumper points as they may be internally connected, which may cause damage to the unit.
- ✓ Unused control terminals should not be used as jumper points as they may be internally connected, which may cause damage to the unit.
- ✓ Use >250V-1Amp Cable for Power Supply.
- ✓ Supply voltage must be below maximum voltage rating specified on the label
- ✓ If cable has two parallel wires inside then isolation between them must be 2.5 KV.









**Fig 4.7: RS485 Connection Details**

## 5. FRONT PANEL DETAILS






**5.1 Front Panel Description for LC5296, LC5296-H, 5006-RN & LC5248E**

- **NOTE:** Two different variant for LC5296-H are available with different PV Display size.
  - LC5296-H with 0.56” Display & LC5296-H with 0.8” Display

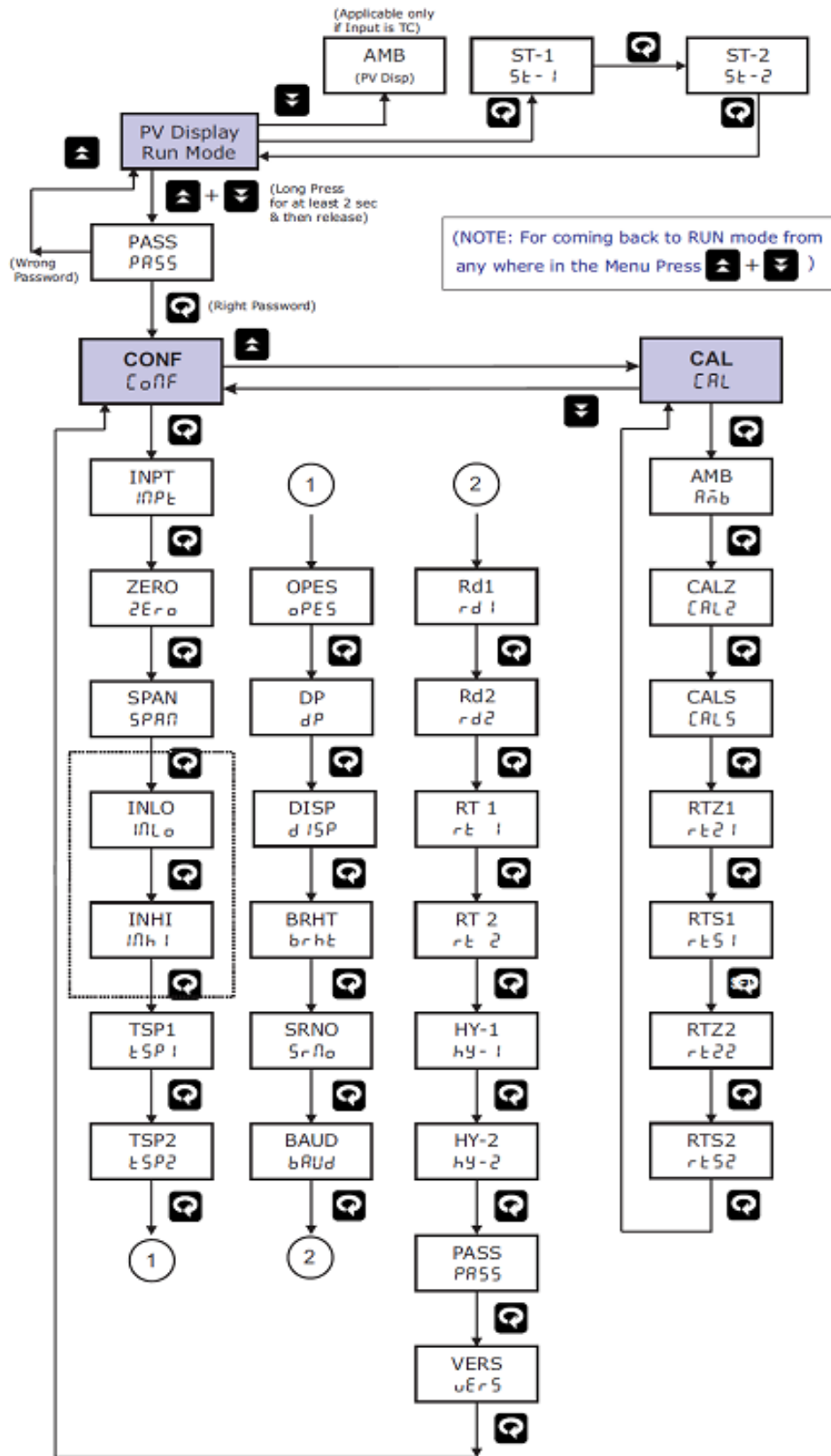
Name of Part	Symbol	Function	LC5296	5006RN LC5296-H
Increment Key		<ul style="list-style-type: none"> <li>• Increment the Value of any Parameter.</li> </ul>	✓	✓
Decrement Key		<ul style="list-style-type: none"> <li>• Decrement the Value of any Parameter.</li> <li>• Shows Ambient value for T/C Input in RUN mode.</li> </ul>	✓	✓
SET-1 Key (Menu / Enter Key)		<ul style="list-style-type: none"> <li>• Shows Set Point-1(ST-1), if pressed in RUN mode.</li> <li>• In Sub Menu it can be used to get to the next Parameter.</li> <li>• It is also used to save the parameters to nonvolatile memory, when user setting a proper data by Increment and decrement key for parameter configuration.</li> </ul>	✓	✓
SET-2 Key		<ul style="list-style-type: none"> <li>• Shows Set Point-1(ST-2), if pressed in RUN mode.</li> <li>• Also used to store modified SetPoint-2 Value.</li> </ul>	✓	✓
PV (Present Value) Display	PV	<ul style="list-style-type: none"> <li>• 4 digital 0.56 inch RED Display</li> <li>• 4 digital 0.8 inch RED Display (LC5296_0.8”, 408-M Model)</li> <li>• Display process value.</li> <li>• Display parameter name when user set parameter.</li> <li>• Display Parameter Value when in Edit mode. (For Single Display Model Only)</li> <li>• Display error message when an error occurs.</li> </ul>	✓	✓
SV (Set Value) Display	SV	<ul style="list-style-type: none"> <li>• 4 digital 0.4 inch GREEN</li> <li>• Display set value.</li> <li>• Display parameter value of parameter in process value field when user set parameter.</li> </ul>	✓	✗
Relay-1 Indication	RL1	<ul style="list-style-type: none"> <li>• ON when Relay-1 is energized &amp; OFF otherwise.</li> </ul>	✓	✓
Relay-2 Indication	RL2	<ul style="list-style-type: none"> <li>• ON when Relay-2 is energized &amp; OFF otherwise.</li> </ul>	✓	✓
TX Indication	Tx	<ul style="list-style-type: none"> <li>• ON when device is transmitting some Data (RS-485).</li> </ul>	✓	✓
RX Indication	Rx	<ul style="list-style-type: none"> <li>• ON when device is receiving some Data (RS-485).</li> </ul>	✓	✓



**5.2 Front Panel Description for 408-M**

Name of Part	Symbol	Function
Increment Key		<ul style="list-style-type: none"> <li>• Increment the Value of any Parameter in edit mode.</li> <li>• Shuffle to next parameter in the Sub Menu.</li> </ul>
Decrement Key		<ul style="list-style-type: none"> <li>• Decrement the Value of any Parameter in edit mode.</li> <li>• Shuffle to previous parameter in the Sub Menu.</li> <li>• Shows Ambient value for T/C Input in RUN mode.</li> </ul>
SET Key (Menu / Enter Key)		<ul style="list-style-type: none"> <li>• Shows different SET Points, if pressed in RUN mode.</li> <li>• It is used to enter in the sub menu.</li> <li>• It's used to enter in the edit mode.</li> <li>• It is also used to save the parameters to nonvolatile memory, when user setting a proper data by Increment and decrement key for parameter configuration.</li> </ul>
PV (Present Value) Display	PV	<ul style="list-style-type: none"> <li>• 4 digital 0.40 inch RED Display</li> <li>• Display process value.</li> <li>• Display parameter name when user set parameter.</li> <li>• Display Parameter Value when in Edit mode. (For Single Display Model Only)</li> <li>• Display error message when an error occurs.</li> </ul>

## 6. MENU LAYOUT FOR LC5296, LC5296-H, 5006-RN, LC5248E



### 6.1 Run Time Indication/Function

Following parameters can view or change during run time.

- For Thermocouple input type, Press Decrement key to show ambient temperature.

### 6.2 Set Point Setting

Parameter (PV display)		Setting name and description	Default value	Shows only if
Symbol	Name			
ST-1 (5t-1)	Set Point 1	Range Depending on PV sensor type selected	100	-
ST-2 (5t-2)	Set Point 2	Range Depending on PV sensor type selected	200	-

### 6.3 Configuration Mode

Parameter (PV display)		Setting Name & Description	Default Value	Show if Only		
Symbol	Name					
INPT (inPt)	INPUT Type	Set PV Input Type tC J / tC t / tC P / tC r / tC S / rtd1 / rtd .1 / 0-5v / 1-5v / 0-10	TC K			
		<b>Value</b>			<b>Input Type</b>	<b>Range</b>
		0			TC J	-199.9 to 1200 °C
		1			TC T	-199.9 to 400 °C
		2			TC K	-199.9 to 1372 °C
		3			TC R	0 to 1768 °C
		4			TC S	0 to 1768 °C
		5			RTD	-200 to 850 °C
		6			RTD.1	-199.9 to 850.0°C
		7			0-5 V/ 0-20 mA*	-1999 to 9999
8	1-5 V / 4-20 mA*					
9	0-10 V					
		<b>*Use external 250ohms,0.1% for current input</b>				
ZERO (ZEro)	Zero	Automatically change to the Input Lower Range with changing of Input Type (Refer Above Table)  Can be set to any value within the Input Range & less the SPAN Value.	-200 (If TC K)			

<b>SPAN</b> ( <i>SPAn</i> )	Span	Automatically change to the Input Higher Range with changing of Input Type (Refer Above Table)  Can be set to any value within the Input Range & greater the ZERO Value.	1372 (If TC K)	
<b>INLO</b> ( <i>inLo</i> )		Automatically change to the Input Lower Range with changing of Input Type (Refer Above Table)  Can be set to any value within the Input Range & less the SPAN Value.	0 (if 0-10V)	Only in Linear input
<b>INHI</b> ( <i>inhi</i> )		Automatically change to the Input Higher Range with changing of Input Type (Refer Above Table)  Can be set to any value within the Input Range & greater the ZERO Value.	10 (if 0-10V)	Only in Linear input
<b>TSP1</b> ( <i>tSP1</i> )	Type of Set Point-1	Set Type of Set Point <i>L-on / H-on</i>  0 : L-ON (Lower ON) 1 : H-ON (Higher ON) Refer ON-OFF Control on Page:30	0 (L-ON)	
<b>TSP2</b> ( <i>tSP2</i> )	Type of Set Point-2	Set Type of Set Point <i>L-on H-on</i>  0 : L-ON (Lower ON) 1 : H-ON (Higher ON) Refer ON-OFF Control on Page:30	0 (L-ON)	
<b>OPES</b> ( <i>oPE5</i> )	OPEN Sensor Status	Set Control O/P & Retransmission state when Input OPEN condition.  <i>down / UP</i>  0 : DOWN 1 : UP Refer Page:35	0 (DOWN)	
<b>DP</b> ( <i>dP</i> )	Decimal Point	Set position of Decimal Point on Display. <i>0 / 0.0 / 0.00 / 0.000</i>  0 : 0 0.0 : 1 0.00 : 2 0.000 : 3	0	
<b>DISP</b> ( <i>dSP</i> )	Display Set Point	Set which Set Point to shown in SV display in RUN mode while device is in Auto Mode  <i>St-1 / St-2</i> 0 : ST-1 (Set Point 1) 1 : ST-2 (Set Point 2)	0	Available for LC5296 only
<b>BRHT</b> ( <i>brHt</i> )	Brightness	Adjust Brightness of the 7-segment Display.	50	

		10 to 100		
<b>SRNO</b> (5rno)	Serial No.	Unit ID for Modbus-RS485 Communication 1 to 247	1	If Device Supports RS-485 Communication
<b>BAUD</b> (bAud)	Baud Rate	Set Modbus RS485 Communication Baud Rate  9600 / 19.2K / 38.4K  0 : 9600 (9600 bps) 1 : 19.2K (19200 bps) 2 : 38.4K (38400 bps)	0 (9600)	If Device Supports RS-485 Communication
<b>RD 1</b> (rd 1)	Relay Delay (For Relay-1)	Relay Delay is amount of time (in sec), that Relay 1 will wait before getting ON after the ON condition occurs.  0 to 99 sec	1 sec	
<b>RD 2</b> (rd 2)	Relay Delay (For Relay-2)	Relay Delay is amount of time (in sec), that Relay 2 will wait before getting ON after the ON condition occurs.  0 to 99 sec	1 sec	
<b>RT-1</b> (rt-1)	Retransmission 1 Type	Retransmission-1 Output Type This output is according to PV input. Zero & Span acts as Min & Max value of retransmission o/p scale respectively.  0-5V / 1-5V / 0-10 / 4-20 / 0-20  0 : 0-5V 1 : 1-5V 2 : 0-10V 3 : 4-20mA 4 : 0-20mA  Voltage or Current is Jumper Selectable from the Hardware.	0 (0-5V)	

<p><b>RT-2</b> (rt-2)</p>	<p>Retransmission 2 Type</p>	<p>Retransmission-2 Output Type This output is according to PV input. Zero &amp; Span acts as Min &amp; Max value of retransmission o/p scale respectively.</p> <p>0-5v / 1-5v / 0-10 / 4-20 / 0-20</p> <p>0 : 0-5V 1 : 1-5V 2 : 0-10V 3 : 4-20mA 4 : 0-20mA</p> <p>Voltage or Current is Jumper Selectable from the Hardware.</p>	<p>0 (0-5V)</p>	<p>if Device supports Dual Retransmission Output</p>												
<p><b>HY-1</b> (HY-1)</p>	<p>Hysteresis – 1 (For Relay-1)</p>	<p>Hysteresis Value (in °C) for Relay-1 during ON-OFF type Control.</p> <table border="1" data-bbox="512 891 1056 1151"> <tr> <td>1 to 100</td> <td>TC &amp; RTD Input</td> </tr> <tr> <td>0.1 to 10.0</td> <td>RTD.1 Input</td> </tr> <tr> <td>1 to 100</td> <td>Linear Input with DP=0</td> </tr> <tr> <td>0.1 to 10.0</td> <td>Linear Input with DP=1</td> </tr> <tr> <td>0.01 to 1.00</td> <td>Linear Input with DP=2</td> </tr> <tr> <td>0.001 to 0.100</td> <td>Linear Input with DP=3</td> </tr> </table>	1 to 100	TC & RTD Input	0.1 to 10.0	RTD.1 Input	1 to 100	Linear Input with DP=0	0.1 to 10.0	Linear Input with DP=1	0.01 to 1.00	Linear Input with DP=2	0.001 to 0.100	Linear Input with DP=3	<p>5</p>	
1 to 100	TC & RTD Input															
0.1 to 10.0	RTD.1 Input															
1 to 100	Linear Input with DP=0															
0.1 to 10.0	Linear Input with DP=1															
0.01 to 1.00	Linear Input with DP=2															
0.001 to 0.100	Linear Input with DP=3															
<p><b>HY-2</b> (HY-2)</p>	<p>Hysteresis – 2 (For Relay-2)</p>	<p>Hysteresis Value (in °C) for Relay-2 during ON-OFF type Control.</p> <table border="1" data-bbox="512 1285 1056 1545"> <tr> <td>1 to 100</td> <td>TC &amp; RTD Input</td> </tr> <tr> <td>0.1 to 10.0</td> <td>RTD.1 Input</td> </tr> <tr> <td>1 to 100</td> <td>Linear Input with DP=0</td> </tr> <tr> <td>0.1 to 10.0</td> <td>Linear Input with DP=1</td> </tr> <tr> <td>0.01 to 1.00</td> <td>Linear Input with DP=2</td> </tr> <tr> <td>0.001 to 0.100</td> <td>Linear Input with DP=3</td> </tr> </table>	1 to 100	TC & RTD Input	0.1 to 10.0	RTD.1 Input	1 to 100	Linear Input with DP=0	0.1 to 10.0	Linear Input with DP=1	0.01 to 1.00	Linear Input with DP=2	0.001 to 0.100	Linear Input with DP=3	<p>5</p>	
1 to 100	TC & RTD Input															
0.1 to 10.0	RTD.1 Input															
1 to 100	Linear Input with DP=0															
0.1 to 10.0	Linear Input with DP=1															
0.01 to 1.00	Linear Input with DP=2															
0.001 to 0.100	Linear Input with DP=3															
<p><b>PASS</b> (PASS)</p>	<p>Password</p>	<p>Set Device Password 0 to 99</p>	<p>1</p>													
<p><b>VERS</b> (VER5)</p>	<p>Version</p>	<p>Shows the Version of the Current Firmware</p>	<p>-</p>													

**6.4 Calibration Mode**

Parameter (PV display)		Setting Name & Description	Default Value	Show if Only
Symbol	Name			
<b>AMB</b> ( $\overline{A\bar{n}b}$ )	Ambient	Ambient Adjustment	-	Input is TC
<b>CALZ</b> ( $\overline{CALZ}$ )	Calibration Zero	Calibration Zero for PV Input (PV/SV Display : Current PV)	-	
<b>CALS</b> ( $\overline{CAL5}$ )	Calibration Span	Calibration Span for PV Input ( PV/SV Display : Current PV)	-	
<b>RTZ1</b> ( $\overline{r\bar{t}z1}$ )	Retransmission-1 ZERO	Calibration Zero for Retransmission Output-1  PV/SV Display : <u>For LC5296, LC5296-H(0.56") &amp; 5006RN</u> For Current & Voltage: 0  <u>For LC5296-H(0.8")</u> If voltage:-0.000 & If Current:-4.000	-	
<b>RTS1</b> ( $\overline{r\bar{t}s1}$ )	Retransmission-1 SPAN	Calibration Span for Retransmission Output-1  PV/SV Display : <u>For LC5296, LC5296-H(0.56") &amp; 5006RN</u> For Current & Voltage: 0  <u>For LC5296-H(0.8")</u> If voltage:-8.000 & If Current:-20.00	-	
<b>RTZ2</b> ( $\overline{r\bar{t}z2}$ )	Retransmission-2 ZERO	Calibration Zero for Retransmission Output-2  PV/SV Display : <u>For LC5296, LC5296-H(0.56") &amp; 5006RN</u> For Current & Voltage: 0  <u>For LC5296-H(0.8")</u> If voltage:-0.000 & If Current:-4.000	-	if Device supports Dual Retransmission Output
<b>RTS2</b> ( $\overline{r\bar{t}s2}$ )	Retransmission-2 SPAN	Calibration Span for Retransmission Output-2  PV/SV Display : <u>For LC5296, LC5296-H(0.56") &amp; 5006RN</u> For Current & Voltage: 0  <u>For LC5296-H(0.8")</u> If voltage:-8.000 & If Current:-20.00	-	if Device supports Dual Retransmission Output

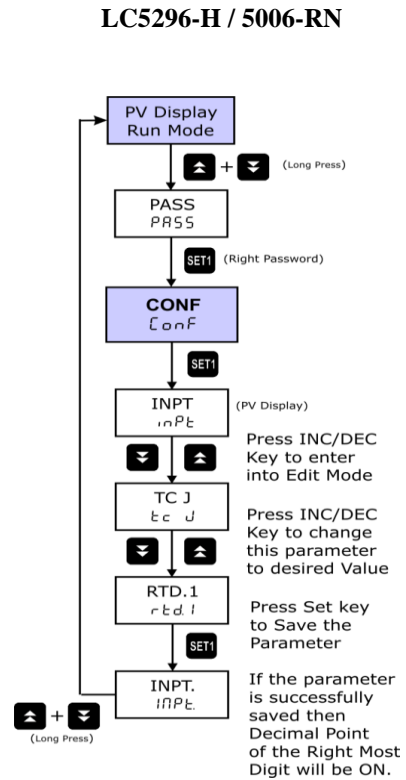
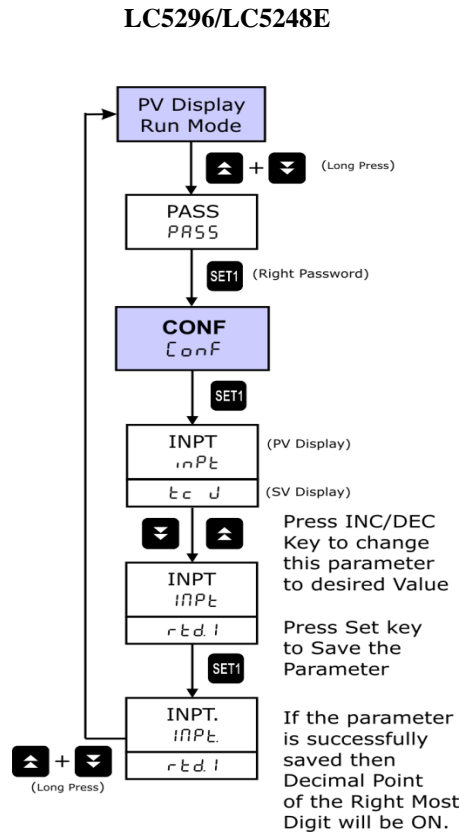
**NOTE:-**

- For Dual Display Device available option for parameter will be displayed on SV Display in Edit Mode. For Single Display Device available option for parameter will be displayed on PV Display in Edit Mode.
- The retransmission output type is jumper selectable. Thus if current type or voltage type output, will be decided by the position of the jumper.

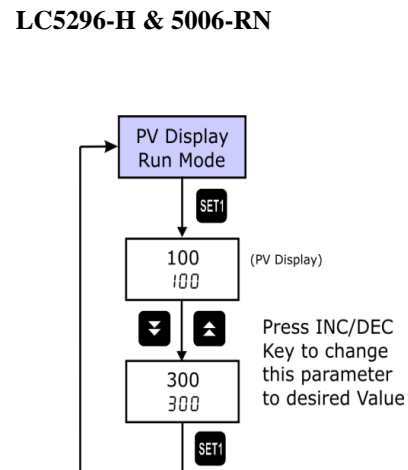
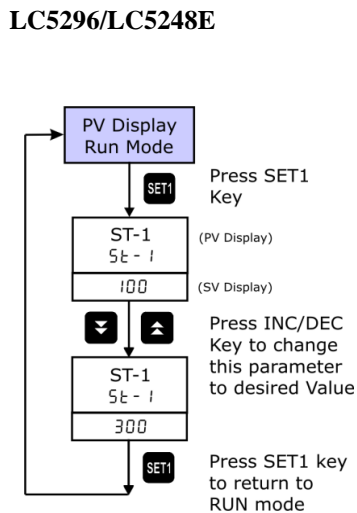
➤ No need to feed input while calibrating Rx. o/p. just make the value in calibration mode equal to the displayed value.

**Examples:**

1. How to change Input Type?



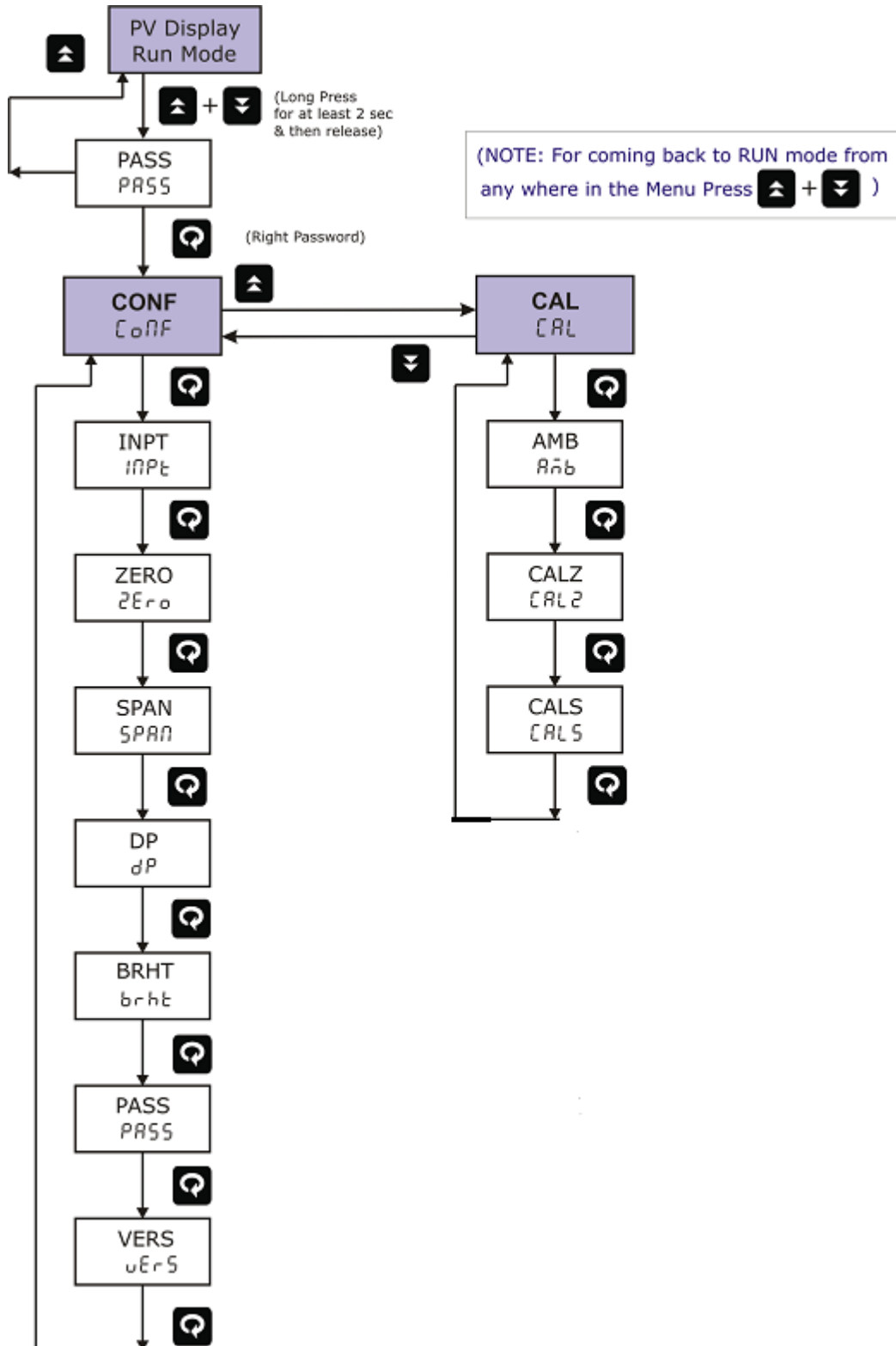
2. How to change Set Point-1?





## 7. MENU LAYOUT FOR 408-M

### 7.2 Menu Layout for 408-M



**7.3 Run Time Indication/Function**

Following parameters can view or change during run time.

- For Thermocouple input type, Press Decrement key to show ambient temperature.

**7.5 Configuration Mode**

Parameter (PV display)		Setting Name & Description	Default Value	Show if Only																							
Symbol	Name																										
<b>INPT</b> (INPT)	INPUT Type	Set PV Input Type  TCJ1 / TCJ.1 / TCK1 / TCK.1 / rtd1 / rtd.1 / 0-5v / 1-5v	5 (RTD.1)																								
		<table border="1"> <thead> <tr> <th>Value</th> <th>Input Type</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>TCJ1</td> <td>-200 to 1200 °C</td> </tr> <tr> <td>1</td> <td>TCJ.1</td> <td>-199.0 to 999.9 °C</td> </tr> <tr> <td>2</td> <td>TCK1</td> <td>-200 to 1372 °C</td> </tr> <tr> <td>3</td> <td>TCK.1</td> <td>-199.0 to 999.9 °C</td> </tr> <tr> <td>4</td> <td>RTD1</td> <td>-200 to 850 °C</td> </tr> <tr> <td>5</td> <td>RTD.1</td> <td>-199.9 to 850.0 °C</td> </tr> <tr> <td>6</td> <td>0-5V</td> <td>-1999 to 1999</td> </tr> <tr> <td>7</td> <td>1-5V</td> <td>-1999 to 1999</td> </tr> </tbody> </table> <p><b>*Use external 250ohms,0.1% for current input</b></p>			Value	Input Type	Range	0	TCJ1	-200 to 1200 °C	1	TCJ.1	-199.0 to 999.9 °C	2	TCK1	-200 to 1372 °C	3	TCK.1	-199.0 to 999.9 °C	4	RTD1	-200 to 850 °C	5	RTD.1	-199.9 to 850.0 °C	6	0-5V
Value	Input Type	Range																									
0	TCJ1	-200 to 1200 °C																									
1	TCJ.1	-199.0 to 999.9 °C																									
2	TCK1	-200 to 1372 °C																									
3	TCK.1	-199.0 to 999.9 °C																									
4	RTD1	-200 to 850 °C																									
5	RTD.1	-199.9 to 850.0 °C																									
6	0-5V	-1999 to 1999																									
7	1-5V	-1999 to 1999																									
<b>ZERO</b> (ZERO)	Zero	Automatically change to the Input Lower Range with changing of Input Type (Refer Above Table)  Can be set to any value within the Input Range & less the SPAN Value.	-199.9 (If RTD.1)																								
<b>SPAN</b> (SPAN)	Span	Automatically change to the Input Higher Range with changing of Input Type (Refer Above Table)  Can be set to any value within the Input Range & greater the ZERO Value.	850.0 (If RTD.1)																								
<b>DP</b> (dP)	Decimal Point	Set position of Decimal Point on Display.  0 / 0.0 / 0.00 / 0.000  0 : 0 1 : 0.0 2 : 0.00 3 : 0.000	0	Input Type is Linear																							
<b>BRHT</b> (brht)	Brightness	Adjust Brightness of the 7-segment Display.  10 to 100	50																								
<b>PASS</b> (PASS)	Password	Set Device Password  0 to 9999	1																								

<b>VERS</b> (vEr5)	Version	Shows the Version of the Current Firmware	-	
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### 7.6 Calibration Mode

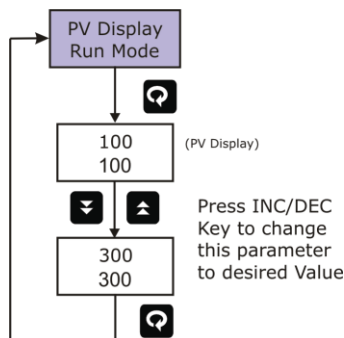
Parameter (PV display)		Setting Name & Description	Default Value	Show if Only
Symbol	Name			
<b>AMB</b> (Añb)	Ambient	Ambient Adjustment	-	Input is TC
<b>ZERO</b> (ZEr0)	Calibration Zero	Calibration Zero for PV Input (PV/SV Display : PV)	-	
<b>Span</b> (SPAn)	Calibration Span	Calibration Span for PV Input (PV/SV Display : PV)	-	

**NOTE:-**

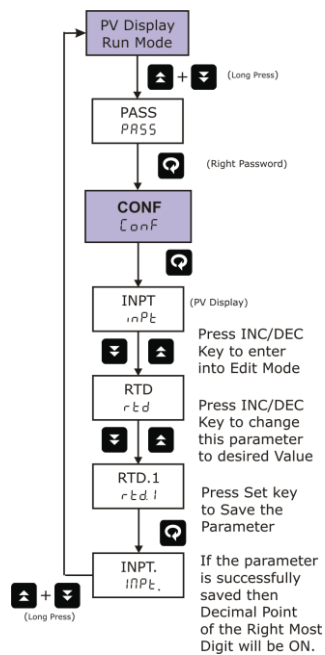
➤ For Dual Display Device available option for parameter will be displayed on SV Display in Edit Mode. For Single Display Device available option for parameter will be displayed on PV Display in Edit Mode.

**Examples:**

**1. How to change Set Point**



**2. How to change Input Type**

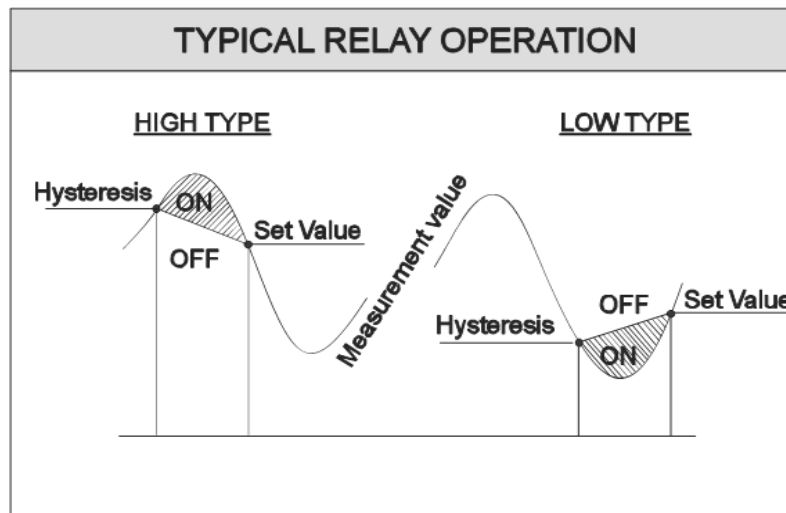


## 8. CONTROL FUNCTION

### 8.1 ON/OFF Control

ON/OFF Controller is the simplest form of temperature control device. The output from the device is either on or off, with no middle state. An on-off controller will switch the output only when the temperature crosses the set point. For heating control, the output is on when the temperature is below the set point, and off above set point.

Since the temperature crosses the set point to change the output stage, the process temperature will be cycling continually, going from below set point to above, and back below. In cases where this cycling occurs rapidly, and to prevent contactors and valves from getting damaged, an on-off differential, or “hysteresis,” is added to the controller operations. On-Off hysteresis prevents the output from “chattering” or making fast, continual switches if the cycling above and below the set point occurs very rapidly.



**Figure 8.1: Typical Relay operation**

#### High type (H-ON):

For High type of set value, once process value reaches up to set point + Hysteresis value, relay will be ON after few seconds (as per relay delay) and it will be ON until process value goes down to Set point.

#### Low type (L-ON):

For Low type of set value, once process value reaches down to set point – Hysteresis value relay will be ON after nearly few seconds (as per relay delay) and it will be ON until process value goes up toward Set point.

## **9. CALIBRATION PROCEDURE**

### **9.1 Procedure for CAL-zero and CAL-span**

The instrument is factory calibrated for the specified range, but due to long term drift of components, re-calibration may be necessary in some cases. For calibrating the instrument a reliable source is required. This source should be at least ten times accurate compared to the range of the instrument.

The unit can be calibrated without opening it and without trim pots.

For Entering into the Calibration Mode, Please refer Menu Layout.

After applying appropriate Input from the calibrator source, press 'INCREMENT' OR 'DECREMENT KEY' to bring the actual process value on display.

#### **Example:-**

At zero calibration reading expected on the display is 100 and it shows 107, adjust the process value to 100 by using 'DECREMENT KEY'. Now press 'SET' to store the calibration parameter in non-volatile memory. Similarly one can calibrate Ambient, SPAN and retransmission parameters.

### **9.2 Procedure for RET-zero and RET-span**

#### **(Applicable only for LC5296, LC5296-H, 5006-RN, LC5248E)**

For calibrating the retransmission output, both retransmission zero and retransmission span has to be calibrated. At a time there can be either one or two retransmission output available. If only one retransmission is used, then calibrate **RTZ1** (retransmission 1 zero) and **RTS1** (retransmission 1 span) and if there are two retransmission outputs available, then calibrate **RTZ2** (retransmission 2 zero) and **RTS2** (retransmission 2 span) for second retransmission. No need to feed input while calibrating retransmission o/p. it is like calibrating using digital trim pot. Only look at the output, display value has no significance with output generated.

#### **Example:-**

#### **For LC5296, LC5296-H(0.56"), 5006-RN, LC5248E**

At retransmission zero calibration, expected output is 4.00mA and it gives 4.153mA. Then adjust the output value to 4.000 by using 'DECREMENT KEY'. Now press 'SET1' to store the calibration parameter in non-volatile memory. Similarly one can calibrate retransmission span.

## 10. COMMUNICATION PROTOCOL–MODBUS RTU

**(Applicable only for LC5296, LC5296-H, 5006-RN, LC5248E)**

### 10.1 Introduction

The unit can be connected in RS-485 communication data link either in multi drop or repeat mode. Each unit must have unique Serial Number. Entire range of addresses (1 to 247) may be used. Before starting any communication, choose a baud rate compatible to the host computer. The serial protocol used is MODBUS RTU.

### Function Code for Modbus

CODE	NAME	Function
01	Read coil status	Use to read Relay and Digital output status
03	Read Holding registers	Use to read PV, Control, RSP output etc
04	Read input registers	Use to read programmable registers
06	Preset Single register	Use to write programmable register

The error checking field contains a 16-bit value implemented as two eight-bit bytes. The error check value is the result of a Cyclical Redundancy Check (CRC) calculation performed on the message contents.

### 10.2 Parameter Address Details

Sr. No.	Parameters	Absolute Address	Type	Access Type	LC5296	5006-RN LC5296-H
1	PROCESS VALUE	30001	Int	Read Only	✓	✓

**NOTE:** Process Value (PV) Error Conditions Value

OPEN : 32767  
 UNDER : 32765  
 OVER : 32766

Sr. No.	Parameters	Absolute Address	Type	Access Type	LC5296	5006-RN LC5296-H
1	Input Type	40001	Int	R + W	✓	✓
2	Zero	40002	Int	R + W	✓	✓
3	Span	40003	Int	R + W	✓	✓
4	SET Type-1	40004	Int	R + W	✓	✓
5	SET Type-2	40005	Int	R + W	✓	✓
6	Open Sensor Status	40006	Int	R + W	✓	✓
7	Decimal Point	40007	Int	R + W	✓	✓
8	Display set point	40008	Int	R + W	✓	✗
9	Brightness	40009	Int	R + W	✓	✓
10	Serial Number	40010	Int	R + W	✓	✓
11	Baud Rate	40011	Int	R + W	✓	✓
12	Relay Delay -1	40012	Int	R + W	✓	✓
13	Relay Delay -2	40013	Int	R + W	✓	✓
14	Retransmission o/p Type -1	40014	Int	R + W	✓	✓
15	Retransmission o/p Type -2	40015	NA	NA	✗	✗

16	Hysteresis 1	40016	Int	R + W	✓	✓
17	Hysteresis 2	40017	Int	R + W	✓	✓
18	Pass word	40018	Int	R + W	✓	✓
19	Set Value 1	40019	Int	R + W	✓	✓
20	Set Value 2	40020	Int	R + W	✓	✓
21	INLO	40021	Int	R + W	✓	✓
22	INHI	40022	Int	R + W	✓	✓

**10.3 Exceptional Response**

CODE	MEANING
01	Function code Invalid. It must be 01, 05, 03 or 06. The function code received in the query is not allowable action for the slave.
02	Illegal address value. The data address received in the query is not an allowable address for the slave.
03	Illegal data value. A value contained in the query data field is not an allowable value for the slave.
06	When Master device write some parameters to Slave device, If slave device busy then it will send 06 code to indicate slave device is busy.

**TABLE – 8**

**Note: 1. Refer Menu Mode Description Table the value & Range of each Parameter.**

**EX: Input Type (Applicable Range : 0 to 9):**

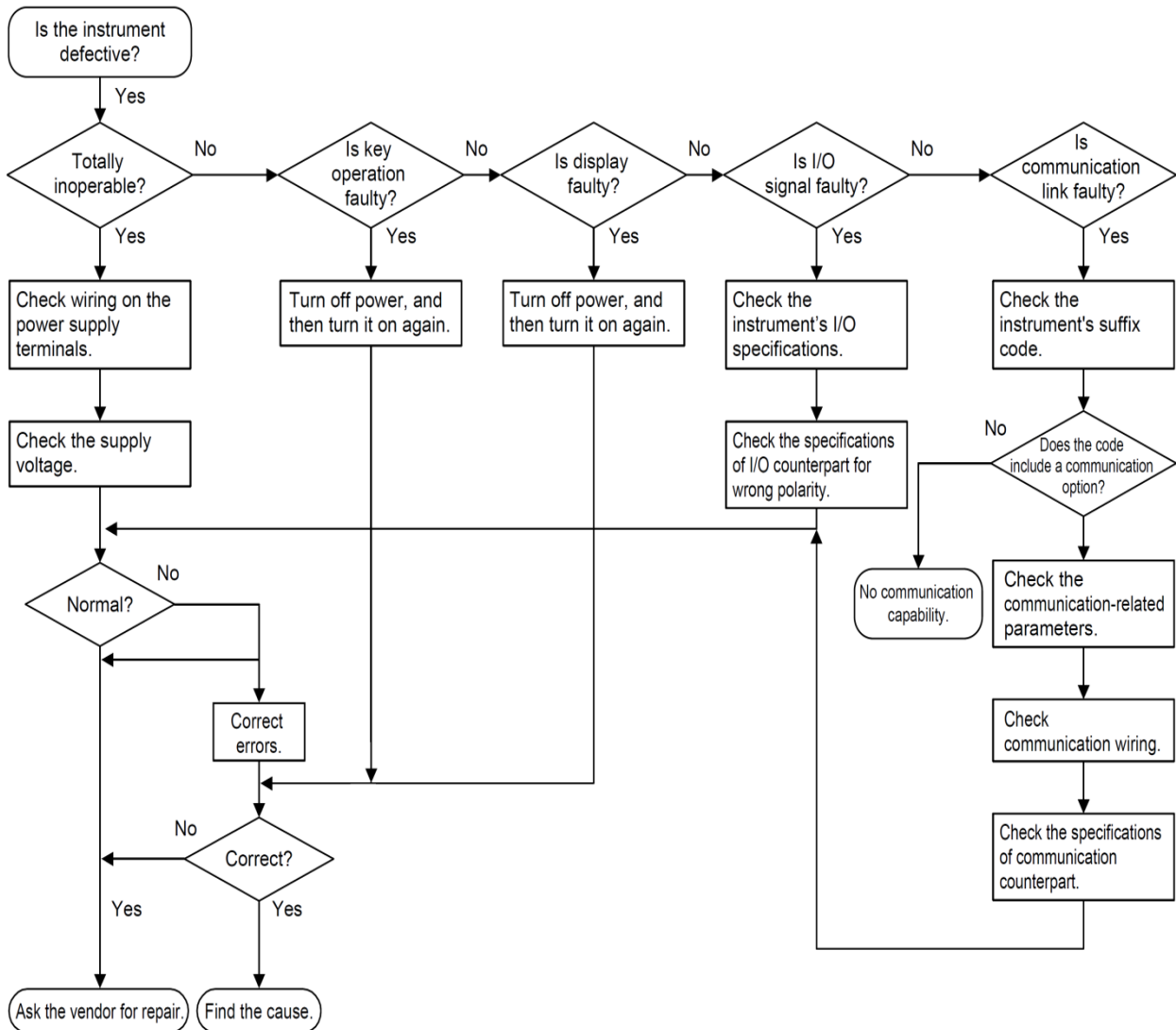
Input Type	Value
J-tc	0
T-tc	1
K-tc	2
R-tc	3
S-tc	4
Rtd	5
Rtd.1	6
0 – 5V	7
1 – 5V	8
0 – 10V	9

## 11. APPENDIX

### 11.1 Troubleshooting

If the operating display does not appear after turning on the controller's power, follow the measures in the procedure below.

If a problem appears complicated, contact our sales representative.



### **IMPORTANT**

Take note of the parameter settings when asking the vendor for repair.



**11.2 On-Off Logic**

Relay type	PV	Relay	LED
Hi-On	PV > SP	On	On
	PV < SP	Off	Off
Open sensor	Up scale	On	On
	Down scale	Off	Off
Low-On	PV > SP	Off	Off
	PV < SP	On	On
Open sensor	Up scale	Off	Off
	Down scale	On	On

**11.3 Retransmission Output Table for Open /Over /Under Condition**

**(Applicable only for LC5296, LC5296-H, 5006-RN)**

RETRASMISSION	VARIABLE	SCALE	ACTION	OPEN	OVER	UNDER
<b>4-20mA</b>	PV	UP	DIR	20.8	20.8	3.2
	PV	DOWN	REV	20.8	3.2	20.8
	PV	UP	REV	3.2	3.2	20.8
	PV	DOWN	DIR	3.2	20.8	3.2
<b>1-5V</b>	PV	UP	DIR	5.2V	5.2V	0.8V
	PV	DOWN	REV	5.2V	0.8V	5.2V
	PV	UP	REV	0.8V	0.8V	5.2V
	PV	DOWN	DIR	0.8V	5.2V	0.8V

**NOTE:** -1. OPEN/UNDER/OVER condition is applicable to all input types except 0-5v / 0-20mA.

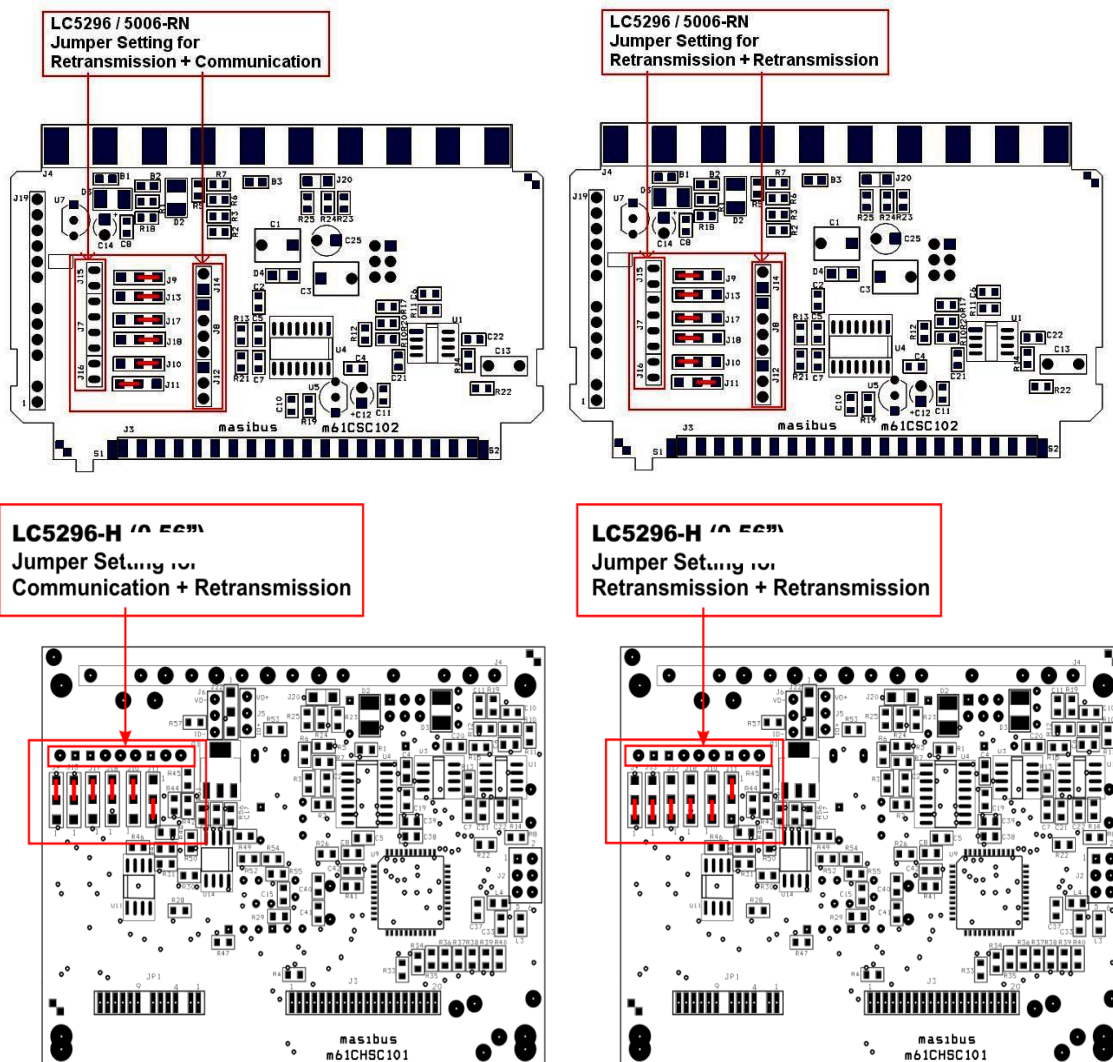
### 11.4 Jumper Settings for Add-on Card Selection & Retransmission

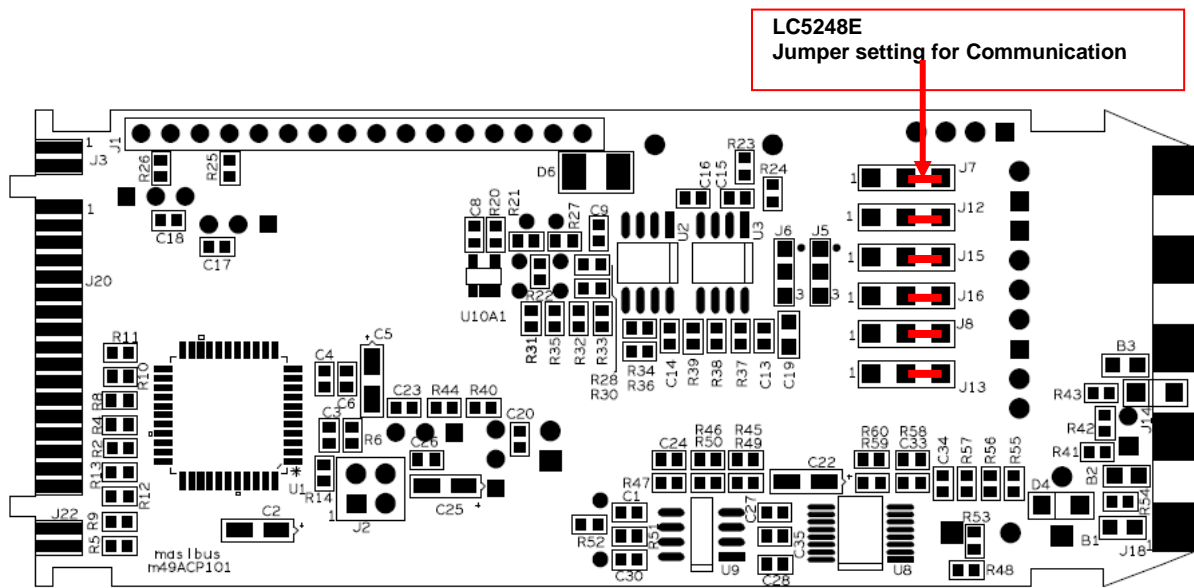
#### Output Type



**(Applicable only for LC5296 / LC5296-H / 5006-RN, LC5248E)**

- These units come with different Variants differing by various Output option available.
- There are Two (One for LC5296-H (0.56")) Addon Card Slots available on PCB of Signal Card. Among them One Slot is fixed for Retransmission (Analog) Output. And the other Slot can be used for either Retransmission or RS-485 Communication Card by appropriate Jumper setting shown in below figure.
- 0E (SMD 0805) Resistor is used for shorting the Jumper.

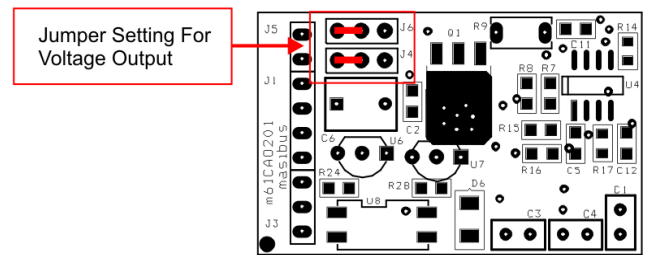
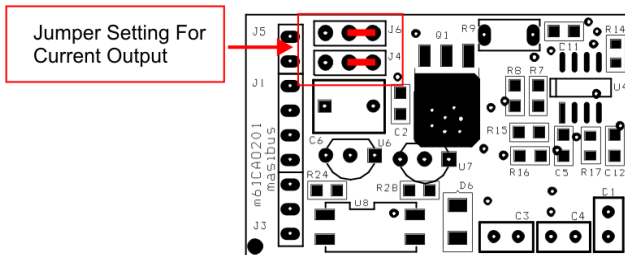




There are mainly Two types of Retransmission Output is available:

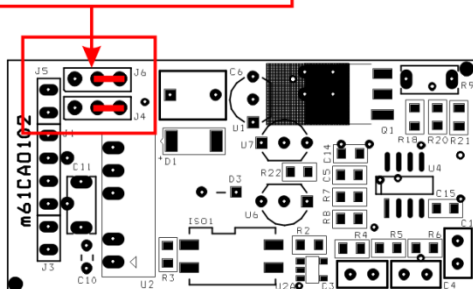
- Voltage (0-10VDC, 0-5VDC, 1-5VDC)
- Current (4-20mADC, 0-20mADC)
- This can be Settable by changing the Position of Shorting Link Jumpers on Retransmission Add-on Card shown in below figure.

**Jumper Setting for Retransmission card: m61Cao201**

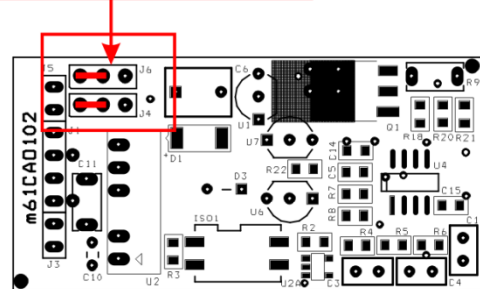


**Jumper Setting for Retransmission card: m61Cao102**

**Jumper Settings for Current Output**

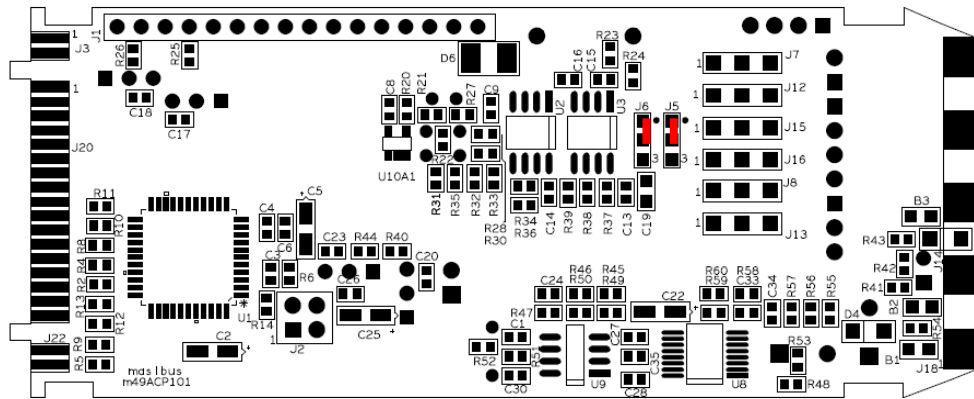


**Jumper Settings for Voltage Output**

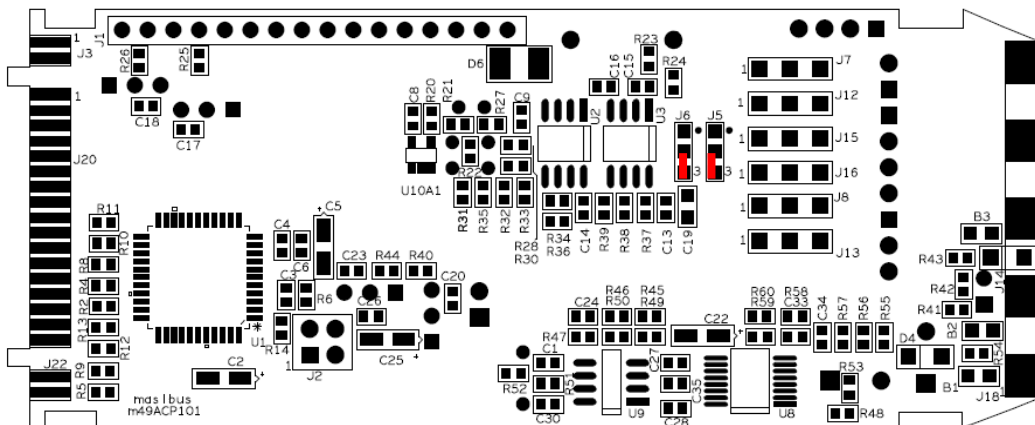


**Jumper Setting for Retransmission card: m49Acp101**

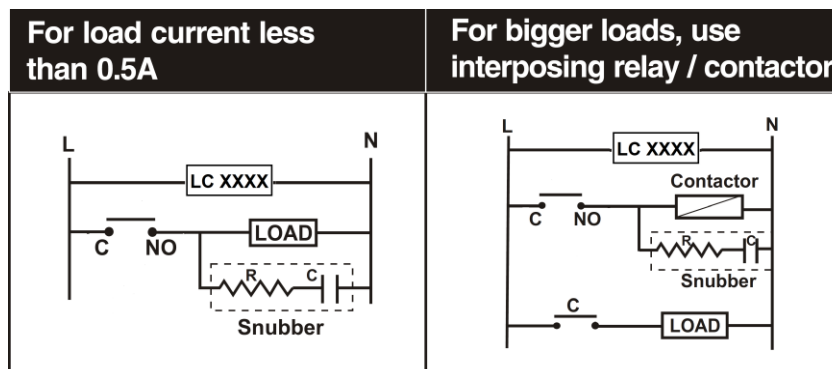
**Current Output**



**Voltage Output**



**11.5 Load connection**



**Electrical precautions during use**

Electrical noise generated by switching of inductive loads can create momentary disruption, erratic display, latch up, data loss or permanent damage to the instrument. Use of snubber circuits across loads as shown above, is recommended.