

Temperature Indicator : 409-4IN

REF NO: m47/om/201

Issue NO: 02

## User,s Manual

# 409-4IN Temperature Indicator



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## 1. Introduction

### 1.1 Product Overview/Description

409-4IN is a powerful micro-controller based large display process indicator, designed to accept multiple input types and two programmable set points with individual relays. Model-409-4IN accepts 21 different types of inputs (all industry standard input) which are field configurable, facilitates plant operator to use in any application. 409-4IN is easy to operate and configuration is user friendly.

### 1.2 Model and Suffix code

Check the model and suffix codes to confirm that the product received is one which was ordered.

MODEL	INPUT		COMMUNICATION		RELAY		RETRANSMISSION O/P		MOUNTING PROTECTION	
409-4IN	1	E	N	NONE	N	None	N	None	P0	19" Rack (IP20)
	2	J	Y	RS485	Y	2 Relays	C	4-20mA	W0	Wall (IP20)
	3	K					D	0-20mA	W1	Wall (IP65)
	4	T					E	1-5V		
	5	B					F	0-5V		
	6	R					G	0-10V		
	7	S								
	9	PT-100								
	C	4-20 mA								
	D	0-20mA								
	E	1-5V								
	F	0-5V								
	G	0-10V								
	H	0-2 V								
	I	0.4 – 2V								
	R	±75mV								
	U	0-75mV								
	V	0-400Ω								
	W	0-6000Ω								
	M	Serial RS 485								
	S	Special								

Table 1.

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### 1.3 Accessory

The product is provided with the following accessory. (See the table2below).

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

Table 2.

## 2. Safety/Warning Precaution

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 SIGNS

 <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>

## 3. Front Panel Description

### 3.1 Keyboard and Operation

There are four keys for operation of the instruments. For understanding the operation first of all understand the functionality of keys as shown in Fig.1.

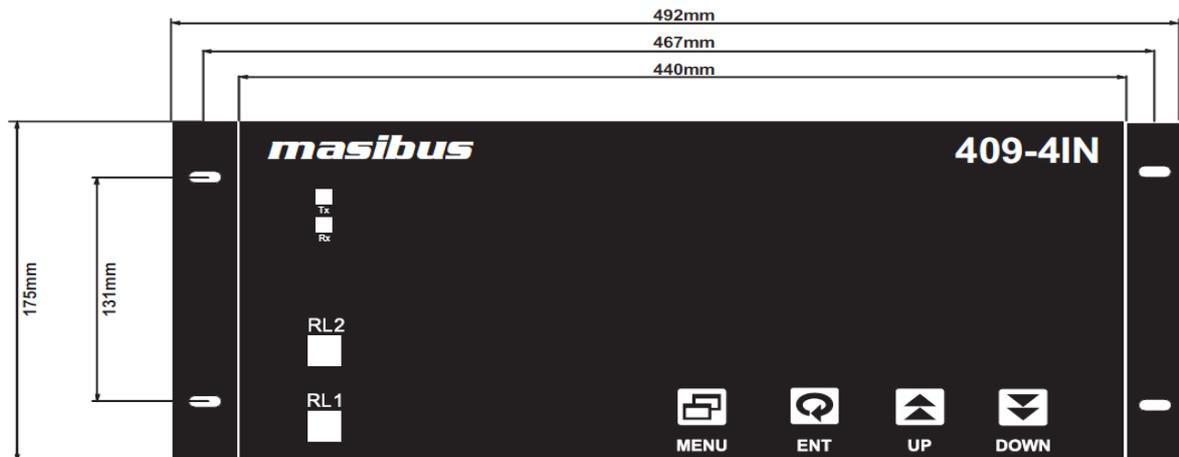


Fig 1. Front Panel for Wall Mount

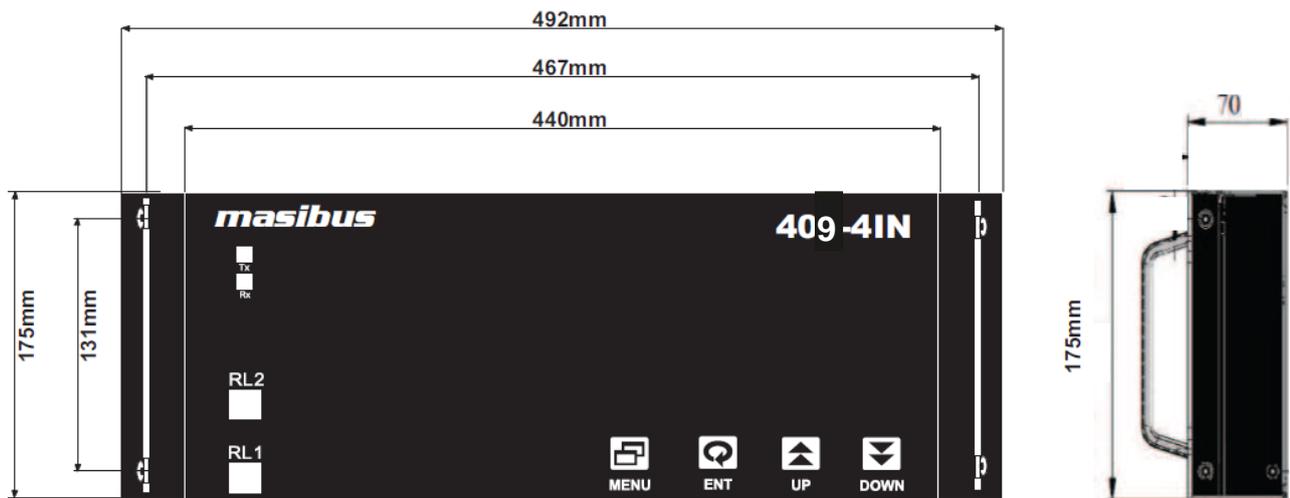


Fig 2. Front Panel for Panel Mount



**MENU key:** It is used to come out from the main or sub menu.



**ENTER key:** It is used to select the desired parameter in various operating Mode. After setting the data to proper value, by increment or decrement key, it is used to enter the value of the selected parameter in memory.



**UP key:** It is used to increment the parameter for selection. Value of Parameter can be incremented by pressing this key. If the key is pressed continuously for more than 10 counts change, the rate of increment will be made faster. This facility is to allow faster data change for higher values.



**DOWN key:** It is used to decrement the parameter for selection. Value of parameter can be decremented by pressing this key. If the key is pressed continuously for more than 10 counts change, the rate of decrement will be made faster. This facility is to allow faster data change for higher values. User presses during RUN mode for Thermocouple input it shows ambient value.

**Communication Status lamps:** Lamps will blink when communication is on.

**Alarm status lamps:** When alarm occurs respective alarm lamp will on.

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### 4. Terminal Arrangement Diagram

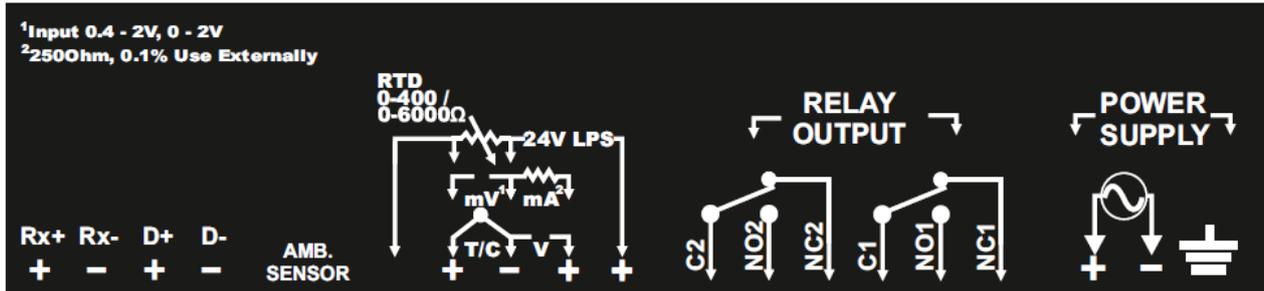


Fig 3. Terminal Arrangement for Panel Mount

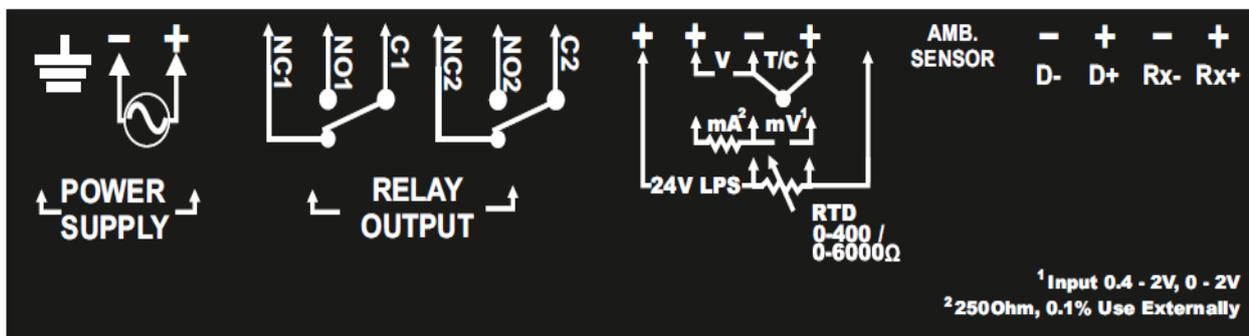


Fig 4. Terminal Arrangement For Wall mount

#### 4.1 Terminal Description

Terminal	Description	SYMBOL
L/+	Mains Supply 90-270VAC	
N/-		
E		
NC1 Normally close-1	Relay 1	
NO1 Normally open-1		
C1 Common-1		

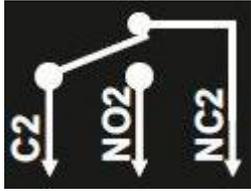
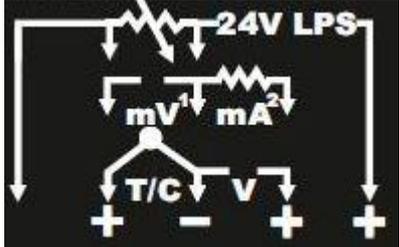
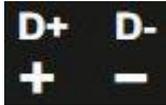
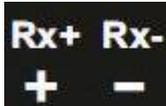
NC2 Normally close-2	Relay 2	
NO2 Normally open-2		
C2 Common-2		
24V LPS+	Transmitted power supply	
V+/mA+	Voltage and Current +ve	
24V LPS-/V-/mA- T/C-/mV- RTD-	24V LPS/Voltage/Current Thermocouple/mV RTD -ve	
T/C+/mV+ RTD+	Thermocouple/ mV RTD +ve	
RTD common	RTD Common	
AMB. SENSOR	Ambient Sensor	
D+	Rs-485 Communication (Serial Input)	
D-		
Rx+	Retransmission Output	
Rx-		

Table 3.

## 5. Configuration Guidelines

### 5.1 Menu Parameter List

Parameter	Name	Setting and Display range
<i>PASS</i>	Pass word	0001 – 9999
<i>OP</i>	Message indicates password entered correctly	
<i>FR IL</i>	Message indicates password entered is wrong.	
<i>INPUT</i>	Input type selection	
<i>tc - E</i>	Thermocouple 'E' type	

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<b>tc-J</b>	Thermocouple 'J' type	
<b>tc-K</b>	Thermocouple 'K' type	
<b>tc-T</b>	Thermocouple 'T' type	
<b>tc-B</b>	Thermocouple 'B' type	
<b>tc-R</b>	Thermocouple 'R' type	
<b>tc-S</b>	Thermocouple 'S' type	
<b>Pt 100</b>	RTD pt100 type	
<b>0-4V</b>	0-400Ω potentiometer	
<b>0-6V</b>	0-6000Ω potentiometer	
<b>1-10V</b>	± 10 volt DC	
<b>0-10V</b>	0-10 volt DC	
<b>0-5V</b>	0-5 volt DC	
<b>1-5V</b>	1-5 volt DC	
<b>0-2V</b>	0-2 volt DC	
<b>.4-2V</b>	0.4-2 volt DC	
<b>-10-20</b>	-10-20 mV DC	
<b>1-75</b>	± 75 mV DC	
<b>0-75</b>	0-75 mV DC	
<b>SErL</b>	Serial input	
<b>4-20</b>	4-20 mA DC	
<b>0-20</b>	0-20 mA DC	
<b>dP</b>	Decimal point	
<b>0</b>	No decimal point.	
<b>.0</b>	Decimal point at unit position	
<b>.00</b>	Decimal point at 10th position	
<b>.000</b>	Decimal point at 100th position	
<b>ZEro</b>	Zero enter	
<b>SPAN</b>	Span enter	
<b>INLO</b>	Input low value(Input Scalability)	
<b>INH I</b>	Input high value(Input Scalability)	
<b>CAL Ib</b>	Calibration	

<b>CALS</b>	Span calibration	
<b>CALZ</b>	Zero calibration	
<b>CALA</b>	Ambient calibration	
<b>ALARn</b>	Alarm Logic	
<b>ATYPE</b>	Alarm type	
<b>hh</b>	High-High logic	
<b>hL</b>	High-Low logic	
<b>LL</b>	Low-Low logic	
<b>SELCt</b>	Selection for Alarm 1 & 2.	
<b>AL 1</b>	Alarm 1	
<b>AL 2</b>	Alarm 2	
<b>ALARn</b>	Alarm selection	
<b>tr IP</b>	Trip selection	
<b>LAtch</b>	Latch status	
<b>YES</b>	Latch Yes	
<b>No</b>	Latch No	
<b>hYSt</b>	Hysteresis	0-255
<b>SEnSr</b>	Sensor logic selection	
<b>UP</b>	Up scale logic	
<b>doŪn</b>	Down scale logic	
<b>SEtP 1</b>	Set point 1 for Alarm 1	
<b>SEtP 2</b>	Set point 2 for Alarm 2	
<b>rLdLY</b>	Relay delay	0-9999
<b>ctRLY</b>	Control relay logic	
<b>oN</b>	On control relay	
<b>OFF</b>	OFF control relay	
<b>Coŵn</b>	485-Communication	
<b>Sr -No</b>	Serial number for Modbus.	1-247
<b>bAUD</b>	Baud rate selection	
<b>4800</b>	4800	
<b>9600</b>	9600	

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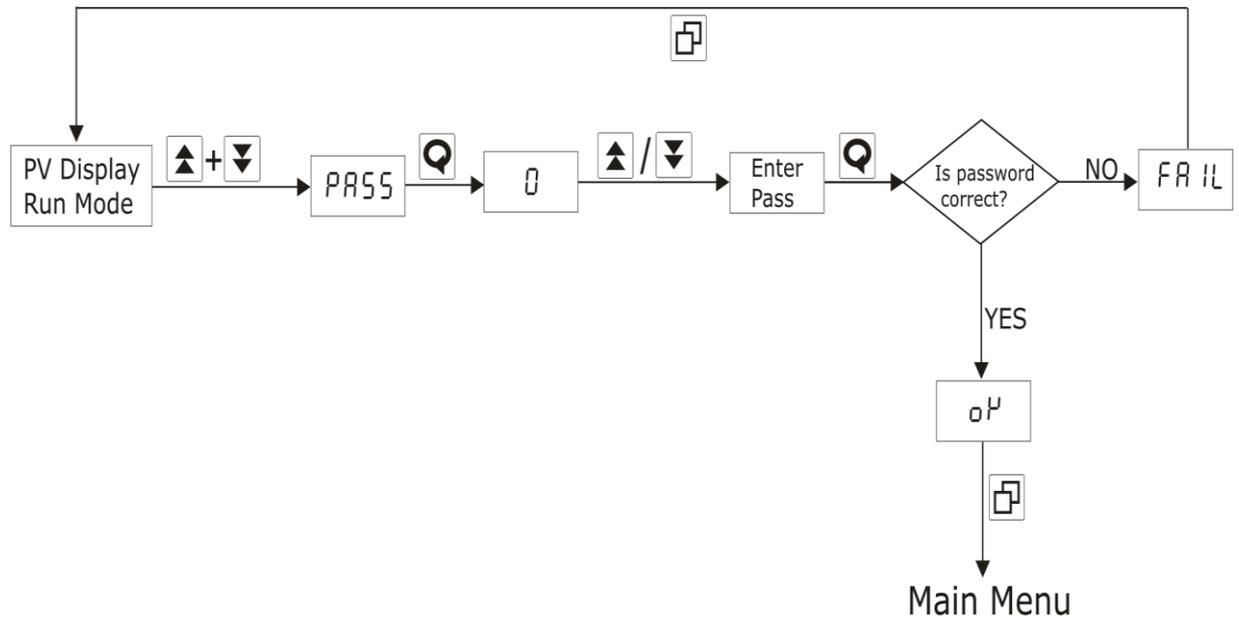
REF NO: m47/om/201

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<b>19200</b>	19200	
<b>38400</b>	38400	
<b>ገጽ ሃዋ</b>	Communication type	
<b>A</b>	Default communication(As per table 13)	
<b>b</b>	Communication as per 405-4IN (As per table 14)	
<b>ገጽ ገጽ</b>	Retransmission	
<b>ገጽ ህ</b>	Retransmission voltage	
<b>0-10ህ</b>	Output 0-10V	
<b>0-5ህ</b>	Output 0-5V	
<b>1-5ህ</b>	Output 1-5V	
<b>ገጽ ገጽ</b>	Retransmission current	
<b>0-20</b>	Output 0-20mA	
<b>4-20</b>	Output 4-20mA	
<b>ገጽ ገጽ</b>	Retransmission calibration	
<b>ገጽ 5</b>	Retransmission span	
<b>ገጽ 2</b>	Retransmission zero	
<b>F ስገጽ</b>	Digital Filter	0-60
<b>ገጽ ህገጽ</b>	Time out	1-32
<b>59ገጽ</b>	Square Root	
<b>ሃጽ5</b>	Square Root Yes	
<b>ገጽ</b>	Square Root No	
<b>ገጽ ስገጽ</b>	Brightness	1-100
<b>ገጽ ገጽ</b>	Change of password	0001 – 9999
<b>ገጽ</b>	Message indicates password change correctly	
<b>ገጽ ገጽ</b>	Sensor Diode is OPEN	

Table 4.

### 5.2 Menu Layout

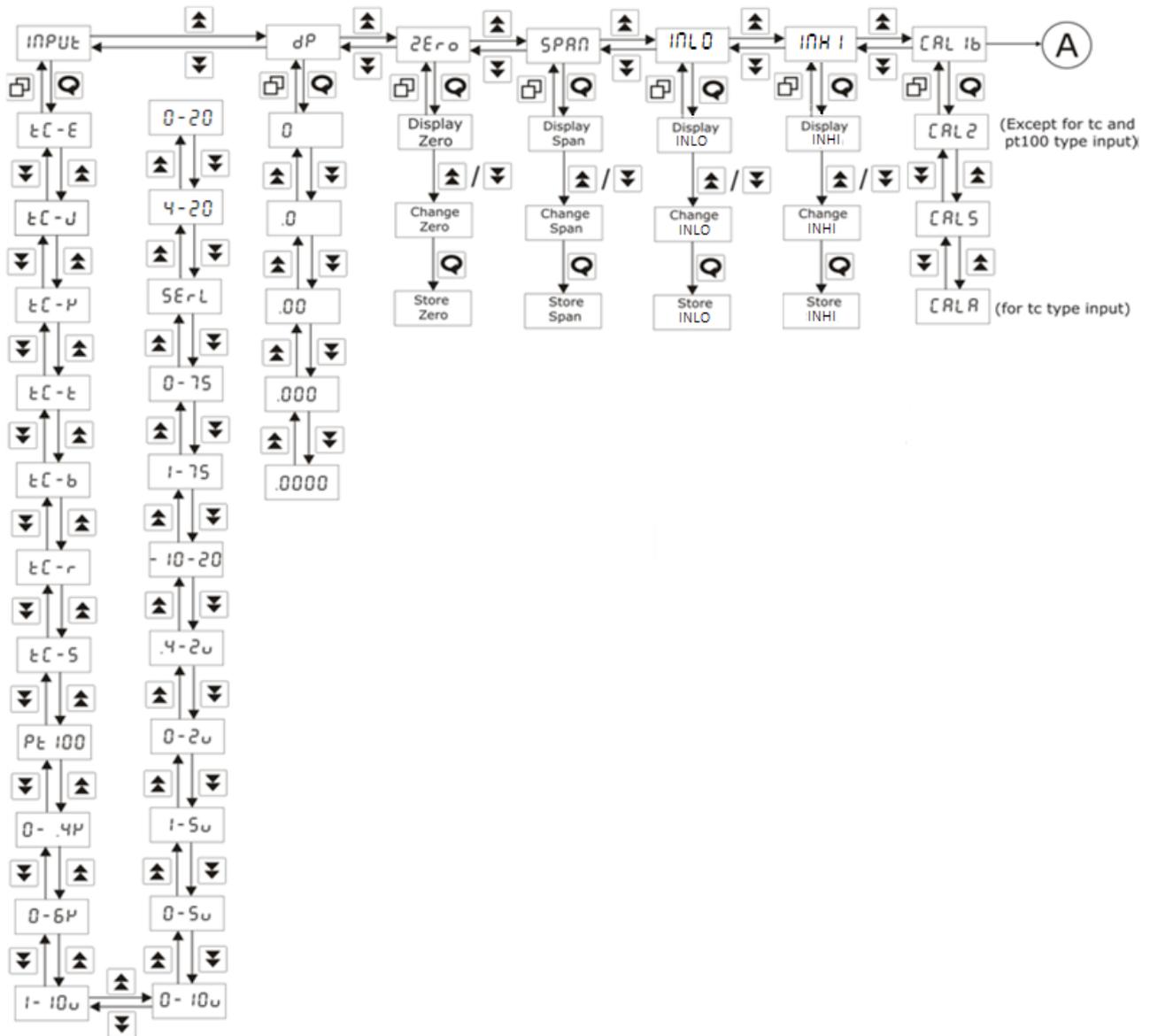


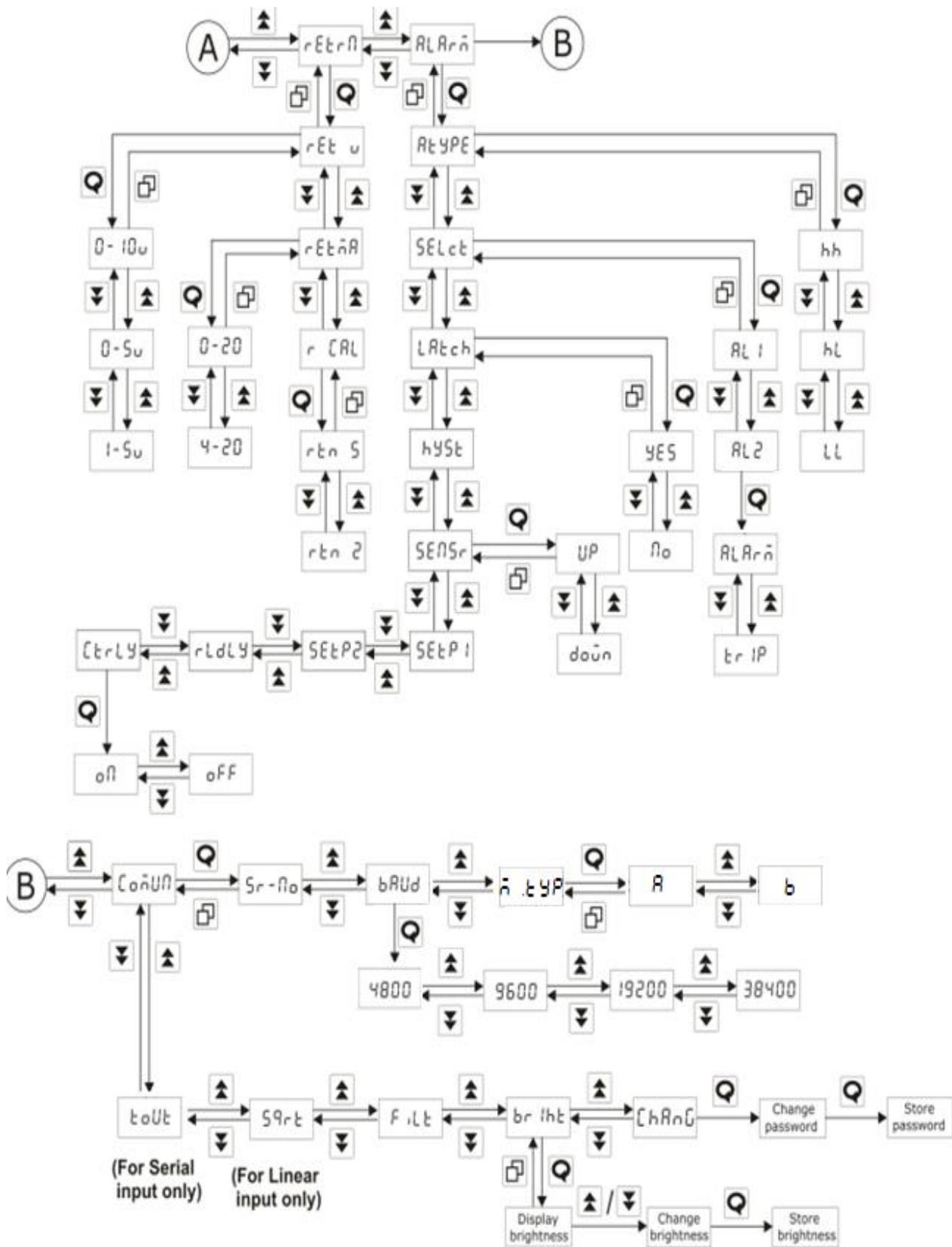
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### 5.3 Main Menu





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## 6. Alarm Operation

### 6.1 Alarm type

HH-high, very high. AL1-high, AL2-very high

HL-high, low AL1-low, AL2-high.

LL-low, low AL1-very low, AL2-low.

This setting is common for all groups.

### 6.2 Status of ALARM/TRIP

It will toggle between ALARM and TRIP depending up on selection in menu. ALARM mode is further subdivided into Alarm with Latch and Alarm without Latch.

TRIP is useful when the relay is used for tripping the plant or device and it is not to be started once again. Open condition is treated as normal condition in TRIP type.

### 6.3 Latching of ALARM

This is used for latching of discrete LEDs and relay status when alarm limit is crossed. This option will keep discrete LEDs/Relay latched even after channel has come to normal status until ENTER (ACK) key is pressed. This option can be changed to YES or NO for enabling or disabling respectively. When configurations of Alarms are of TRIP type, these parameters will be skipped from display. Different conditions for the ALARM/TRIP have been mentioned in the following table7, 8, 9 &10.

### 6.4 HH Logic

HH-high, very high. AL1-high, AL2-very high

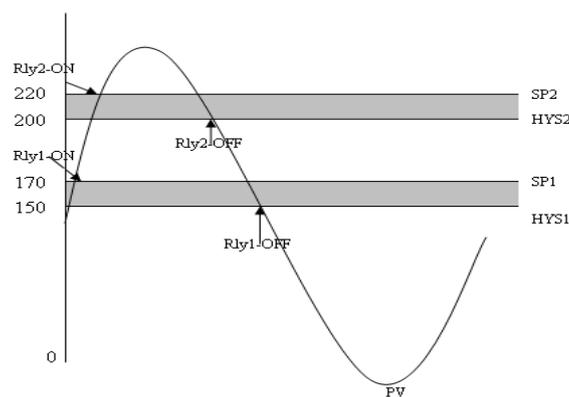


Fig 5.

AL1-High, AL2-Very High

SP2>SP1

If PV>SP1 but, less then SP2 => Relay 1- ON, Relay 2-OFF.

If PV<SP1-Hyst1 => Relay 1-OFF, Relay 2-OFF.

PV>SP2 => Relay1 and Relay2 both are ON.

If PV<SP2-Hyst2 but, >SP1 => Relay 1-ON, Relay 2-OFF.

Depending up on condition set i.e. Latch Yes/No, Acknowledge Yes/No or Trip refer table 7, 8, 9, &10.

### 6.5 HL Logic

HL-high, low AL1-low, AL2- high.

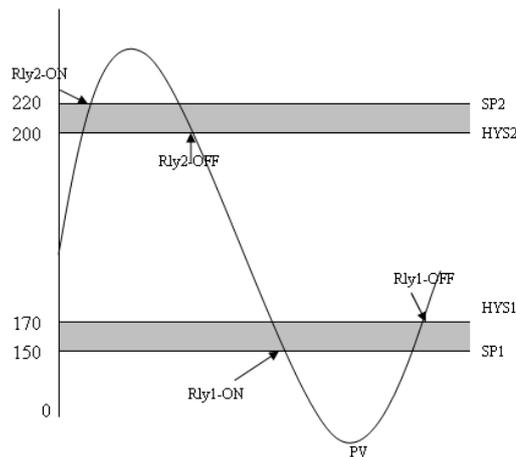


Fig 6.

AL1-low, AL2- High

SP2>SP1

If PV>SP2 then Relay 2-ON.

If PV<SP2-Hyst2 => Relay 2-OFF.

PV<SP1 => Relay1 ON.

If PV>SP1+Hyst1 then. Relay 1-OFF.

Depending up on condition set i.e. Latch Yes/No, Acknowledge Yes/No or Trip refer table7, 8, 9&10.

### 6.6 LL Logic

LL-low, low AL1-very low, AL2-low.

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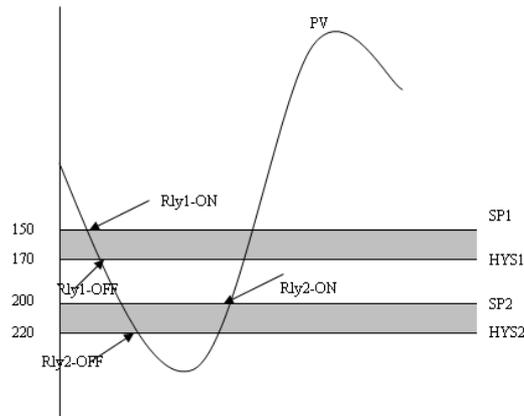


Fig 7.

AL1-Low, AL2-Very Low

SP2>SP1

If  $PV < SP1$  then  $\Rightarrow$  Relay 1-ON, Relay 2-ON.

Relay 1-ON till  $PV > SP1 + HYS1$  after that Relay 1-OFF.

Relay 2-ON till  $PV > SP2 + HYS2$  after that Relay 2- OFF.

Depending upon condition set i.e. Latch Yes/No, Acknowledge Yes/No or Trip refer table 7, 8, 9 & 10.

### 6.7 Open sensor UP scale/DOWN scale

This is used to define the state of the alarms in OPEN sensor condition. It can be configured as UP Scale or DOWN Scale by keys. This condition works if and only if OPEN sensor condition occurs. Suppose ,UP scale has been selected and “HH” logic is there then during OPEN sensor condition Relay 1 & 2 will be ON and Lamp will be FLASH as shown in table 7, 8, 9 & 10 .if DOWN logic is selected then relays and Lamp will be OFF.

### 6.8 HH Logic

HH-high, very high. AL1-high, AL2-very high.

In this logic if “UP Scale” condition has been selected than in OPEN sensor condition ALARM 1 and ALARM 2 will be in the ABNORMAL condition and will work according to the following tables 7, 8, 9 & 10.If “DOWN Scale” Condition has been selected for this logic than in OPEN sensor condition ALARM 1 and ALARM 2 will be in the NORMAL State of operation.

### 6.9 HL Logic

HL-high, low AL1-low, AL2-high.

In this logic if “UP Scale” condition has been selected than in OPEN sensor condition ALARM 2 will be in the ABNORMAL condition and ALARM 1 will be in the NORMAL condition will work according to the following tables 7, 8, 9 & 10.If “DOWN Scale” Condition has been selected for this logic than in OPEN sensor condition ALARM 1 will be in the ABNORMAL condition and ALARM 2 will be in the NORMAL condition and will work according to the following tables.

**6.10 LL Logic**

LL-low, low AL1-very low, AL2-low.

In this logic if “UP Scale” condition has been selected than in OPEN sensor condition ALARM 1 and ALARM 2 will be in the NORMAL condition and will work according to the following tables 7, 8, 9 & 10.If “DOWN Scale” Condition has been selected for this logic than in OPEN sensor condition ALARM 1 and ALARM 2 will be in the ABNORMAL State of operation.

**6.11 Messages during OPEN SENSOR condition**

Input type	Message
TC-E	OPEN
TC-J	OPEN
TC-K	OPEN
TC-T	OPEN
TC-B	OPEN
TC-R	OPEN
TC-S	OPEN
PT 100	OPEN
0-400Ω	OPEN
0-6000Ω	OPEN
±10V	RANDOM VALUE
0-10V	-1999
0 to 5V DC	UNDR
1 to 5V DC	OPEN
0 to 2V DC	OPEN
0.4 to 2V DC	OPEN

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-10 to 20mV DC	OPEN
±75mV	OPEN
0-75mV	OPEN
Serial	-----
4-20mA	OPEN
0-20mA	UNDR

Table 5.

**Note:** If set zero/span for input type is less than maximum value of zero and span for then process value will display readings above 5% of display range, then after it will show OVER/UNDER message until value crosses maximum value of Sensor range. Process value greater than maximum value of zero/span then display will show OPEN message. Retransmission o/p will follow 5% of display range and then it will give fixed o/p depending up on OPEN sensor selection. In case of linear inputs scaling is applied then during OPEN sensor condition it may not show OPEN message instead it will show either OVER/UNDER.

If diode is OPEN in that case message on display will be “dOPEN” .Switch OFF the instrument connects the diode properly and switch ON to have proper display. During diode OPEN condition modbus gives fixed value.

**6.12 Retransmission output during OPEN sensor/Diode Open condition**

I/P	0-20 mA O/P		4-20 mA O/P	
	UP Scale O/P	DW Scale O/P	UP Scale O/P	DW Scale O/P
*TC	21.00	0.0	20.8	3.2
Pt-100	21.00	0.0	20.8	3.2
0~5V	21.00	0.0	3.2	3.2
1~5V	21.00	0.0	20.8	3.2
±75mV	21.00	0.0	20.8	3.2
0~75mV	21.00	0.0	20.8	3.2
0~10V	Random	Random	Random	Random
*±10V	Random	Random	Random	Random
0~2V	21.00	0.0	20.8	3.2
0.4~2V	21.00	0.0	20.8	3.2
-10~20mV	21.00	0.0	20.8	3.2
0~6000Ω	21.00	0.0	20.8	3.2
0~400Ω	21.00	0.0	20.8	3.2
Serial	21.00	0.0	20.8	3.2
4-20mA	21.00	0.0	20.8	3.2
0-20mA	21.00	0.0	3.2	3.2

Table 6A.

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I/P	0-10 V O/P		0-5 V O/P		1-5 V O/P	
	UP Scale O/P	DW Scale O/P	UP Scale O/P	DW Scale O/P	UP Scale O/P	DW Scale O/P
*TC	10.50	0.0	5.25	0.0	5.20	0.80
Pt-100	10.50	0.0	5.25	0.0	5.20	0.80
0~5V	10.50	0.0	5.25	0.0	5.20	0.80
1~5V	10.50	0.0	5.25	0.0	5.20	0.80
±75mV	10.50	0.0	5.25	0.0	5.20	0.80
0~75mV	10.50	0.0	5.25	0.0	5.20	0.80
0~10V	Random	Random	Random	Random	Random	Random
*±10V	Random	Random	Random	Random	Random	Random
0~2V	10.50	0.0	5.25	0.0	5.20	0.80
0.4~2V	10.50	0.0	5.25	0.0	5.20	0.80
-10~20mV	10.50	0.0	5.25	0.0	5.20	0.80
0~6000Ω	10.50	0.0	5.25	0.0	5.20	0.80
0~400Ω	10.50	0.0	5.25	0.0	5.20	0.80
Serial	10.50	0.0	5.25	0.0	5.20	0.80
4-20mA	10.50	0.0	5.25	0.0	5.20	0.80
0-20mA	10.50	0.0	5.25	0.0	5.20	0.80

Table 6B.

\*TC – E,J,K,T,B,R,S.

\*±10V – OPEN is not displayed in this input type.

Above mention value in the table6A, 6B will come only after calibration for specific o/p type i.e. Voltage/Current.

### 6.13 Relay Delay

Relay delay is the parameter used to set the delay (second) in the operation of relays (both 1&2).Minimum value of delay is 0(second) and maximum value 9999 (second) can be configured using keyboard.

**6.14 Control Relay**

Control relay “OFF” then relay will function according to the condition mention in the following tables. Control relay “ON” then functioning of relay will be just opposite to the condition mention in the table. Lamp functioning will be as mention in the table i.e. no change in the LED status.

Alarm AL1 (Momentary Alarm): when in abnormal condition ACK not pressed.

Condition			Normal	Abnormal	UP	DOWN	ACK**	Normal*	ACK***
High	Alarm Latch( Yes)	LAMP	OFF	FLASH	FLASH	OFF		FLASH	OFF
		RELAY	OFF	ON	ON	OFF		OFF	OFF
	Alarm Latch( No)	LAMP	OFF	FLASH	FLASH	OFF		OFF	OFF
		RELAY	OFF	ON	ON	OFF		OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF		FLASH	OFF
		RELAY	OFF	ON	OFF	OFF		ON	OFF
Low	Alarm Latch( Yes)	LAMP	OFF	FLASH	OFF	FLASH		FLASH	OFF
		RELAY	OFF	ON	OFF	ON		OFF	OFF
	Alarm Ltch(N o)	LAMP	OFF	FLASH	OFF	FLASH		OFF	OFF
		RELAY	OFF	ON	OFF	ON		OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF		FLASH	OFF
		RELAY	OFF	ON	OFF	OFF		ON	OFF
VLow	Alarm Latch( Yes)	LAMP	OFF	FLASH	OFF	FLASH		FLASH	OFF
		RELAY	OFF	ON	OFF	ON		OFF	OFF
	Alarm Latch( No)	LAMP	OFF	FLASH	OFF	FLASH		OFF	OFF
		RELAY	OFF	ON	OFF	ON		OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF		FLASH	OFF
		RELAY	OFF	ON	OFF	OFF		ON	OFF

Table 7.

Temperature Indicator : 409-4IN

REF NO: m47/om/201

Issue NO: 02

Alarm AL2 (Momentary Alarm): when in abnormal condition ACK not pressed.

Condition			Normal	Abnormal	UP	DOWN	ACK**		Normal*	ACK***
VHigh	Alarm Latch(Yes)	LAMP	OFF	FLASH	FLASH	OFF			FLASH	OFF
		RELAY	OFF	ON	ON	OFF			OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	FLASH	OFF			OFF	OFF
		RELAY	OFF	ON	ON	OFF			OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF			FLASH	OFF
		RELAY	OFF	ON	OFF	OFF			ON	OFF
High	Alarm Latch(Yes)	LAMP	OFF	FLASH	FLASH	OFF			FLASH	OFF
		RELAY	OFF	ON	ON	OFF			OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	FLASH	OFF			OFF	OFF
		RELAY	OFF	ON	ON	OFF			OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF			FLASH	OFF
		RELAY	OFF	ON	OFF	OFF			ON	OFF
LOW	Alarm Latch(Yes)	LAMP	OFF	FLASH	OFF	FLASH			FLASH	OFF
		RELAY	OFF	ON	OFF	ON			OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	OFF	FLASH			OFF	OFF
		RELAY	OFF	ON	OFF	ON			OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF			FLASH	OFF
		RELAY	OFF	ON	OFF	OFF			ON	OFF

Table 8.

Alarm AL1 (Maintained Alarm): when in abnormal condition ACK is pressed.

Condition			Normal	Abnormal	UP	DOWN	ACK**	Normal*	ACK***
High	Alarm Latch(Yes)	LAMP	OFF	FLASH	FLASH	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	ON	OFF	ON	OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	FLASH	OFF	STEADY	OFF	OFF
		RELAY	OFF	ON	ON	OFF	OFF	OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	OFF	ON	ON	OFF
Low	Alarm Latch(Yes)	LAMP	OFF	FLASH	OFF	FLASH	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	ON	ON	OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	OFF	FLASH	STEADY	OFF	OFF
		RELAY	OFF	ON	OFF	ON	OFF	OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	OFF	ON	ON	OFF
VLOW	Alarm Latch(Yes)	LAMP	OFF	FLASH	OFF	FLASH	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	ON	ON	OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	OFF	FLASH	STEADY	OFF	OFF
		RELAY	OFF	ON	OFF	ON	OFF	OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	OFF	ON	ON	OFF

Table 9.

Temperature Indicator : 409-4IN

REF NO: m47/om/201

Issue NO: 02

Alarm AL2 (Maintained Alarm): when in abnormal condition ACK is pressed.

Condition			Normal	Abnormal	UP	DOWN	ACK**	Normal*	ACK***
VHigh	Alarm Latch(Yes)	LAMP	OFF	FLASH	FLASH	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	ON	OFF	ON	OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	FLASH	OFF	STEADY	OFF	OFF
		RELAY	OFF	ON	ON	OFF	OFF	OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	OFF	ON	ON	OFF
High	Alarm Latch(Yes)	LAMP	OFF	FLASH	FLASH	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	ON	OFF	ON	OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	FLASH	OFF	STEADY	OFF	OFF
		RELAY	OFF	ON	ON	OFF	OFF	OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	OFF	ON	ON	OFF
LOW	Alarm Latch(Yes)	LAMP	OFF	FLASH	OFF	FLASH	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	ON	ON	OFF	OFF
	Alarm Latch(No)	LAMP	OFF	FLASH	OFF	FLASH	STEADY	OFF	OFF
		RELAY	OFF	ON	OFF	ON	OFF	OFF	OFF
	Trip	LAMP	OFF	FLASH	OFF	OFF	STEADY	STEADY	OFF
		RELAY	OFF	ON	OFF	OFF	ON	ON	OFF

Table 10.

**Notes:** \*means normal condition after abnormal has occurred.

\*\*means ACK pressed in abnormal condition.

\*\*\*means ACK pressed in normal condition after abnormal has occurred.

## 7. Calibration Procedure

### 7.1 Calibration for Input

The calibration in the instrument is using front panel keys only. Instrument can be calibrated even during installed condition.

Calibration is carried out using following steps.

- 1) First of all enter in to calibration mode using front panel keys. Display indicates "CAL 1b" in 4-segment display.
- 2) Press 'ENTER' key to enter in to calibration for "zero", "span" or "ambient" (for Thermocouple type input zero calibration is not require).
- 3) Display indicates "CAL 2" for zero calibration;"CAL 5" for span calibration and "CAL R" for ambient calibration. User can enter in to zero/span/ambient calibration using UP, DOWN keys.
- 4) If input type selected is Thermocouple then there is no zero calibration hence, display will be either "CAL 5" or "CAL R".
- 5) Input type other then thermocouple display will be either "CAL 2" or "CAL 5" because for other inputs (except thermocouple) ambient calibration is not required.
- 6) To perform zero calibration, press ENTER key when display shows "CAL 2". Feed input corresponding to zero and adjust the value of display using UP, DOWN keys .Once value is adjusted using UP, DOWN keys press ENTER to store that value in memory .Display will start flashing when user presses ENTER key. Same procedure is required to perform calibration for span or ambient type.
- 7) Sometimes user may require iteration for zero and span calibration for better linearity/accuracy.
- 8) Depending upon input type selected value in the display is calibrated within limited range.

Input type	Calibration for input
E,J,K,T,B,R,S	Either of any input
Pt-100	Specific input
0-5V,1-5V,4-20mA,0-20mA	Either of any input
±10V,0-10V	Either of any input
0-2V,0.4-2V	Either of any input
±75mV,75mV	Either of any input
-10 – 20mV	Specific input
0-400Ω	Specific input
0-6000Ω	Specific input

Table 11.

Temperature Indicator : 409-4IN

REF NO: m47/om/201

Issue NO: 02

## 7.2 Calibration for Retransmission

The calibration in the instrument is using front panel keys only. Instrument can be calibrated even during installed condition.

Calibration is carried out using following steps.

- 1) Enter in to calibration mode using front panel keys. Display indicates "RETRN" in 4-segment display.
- 2) Select type of output i.e. voltage or current output RET V or RETS I then and then it will allow you to enter for calibration of zero and span.
- 3) After selecting type of output Press UP, DOWN key to get a prompt "RCAL" and press ENTER key to enter in to calibration.
- 4) Display indicates "rEt2" for zero calibration;"rEt5" for span calibration User can enter in to zero/span calibration using UP, DOWN keys (applicable for both voltage/current output).
- 5) To perform zero calibration presses ENTER key when display shows "rEt2". When user presses ENTER key display will be previously stored counts for voltage output/current output. Retransmission output will be nearly equal to 0 V/0mA depending up on type of selection. If output differs from 0V/0mA vary counts to get desire output.
- 6) Irrespective of value of count try to obtain 0V/0mA at the output and press ENTER key to store calibrated value in memory.

Repeat the above same steps for span calibration here, desired voltage output is 10V and current output is 20mA.

**Note:** calibration for voltage output is required to do in 0-10V range and for current output its 0-20mA range, which incorporates other ranges also. In case of current output specially to calibrate for zero side vary count in display such that output is greater than zero mA and then bring it down by varying counts it to zero mA.

## 8. Communication Parameter

### 8.1 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
05	Force single coil	Use to ON /OFF single coil.
16	Preset Multiple register	Use to write programmable register

**Table 12.**

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.

**8.1.1 Parameter Address Details For  $\bar{n}tYP : R$**

Sr.No	Parameter	Absolute address	Type	Minimum value	Maximum Value	Access Type
1.	*Relay status1	1	Bit	0	1	R/W
2.	*Relay status2	2	Bit	0	1	R
3.	*Alarm status1	10001	Bit	0	1	R
4.	*Alarm status2	10002	Bit	0	1	R
5.	*Alarm 1 Blinking	10004	Bit	0	1	R
6.	*Alarm 2 Blinking	10005	Bit	0	1	R
7.	Process value	30001	Integer			R
8.	Ambient	30002	Integer			R
9.	Zero display	40001	Integer			R/W
10.	Span display	40002	Integer			R/W
11.	Set point 1	40003	Integer			R/W
12.	Set point 2	40004	Integer			R/W
13.	Relay delay	40005	Integer	0	9999	R/W
14.	Brightness	40006	Unsigned Integer	1	100	R/W
15.	*Input type selected	40007	Unsigned char	0	18	R/W
16.	*Decimal point	40008	Unsigned char	0	4	R/W
17.	Hysteresis	40009	Unsigned char	0	255	R/W
18.	Serial number	40010	Unsigned Char	1	247	R/W

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19.	*Baud rate	40011	Unsigned char	0	3	R/W
20.	*Alarm logic type	40012	Unsigned char	0	2	R/W
21.	*Alarm 1	40013	Unsigned char	0	1	R/W
22.	*Alarm 2	40014	Unsigned char	0	1	R/W
23.	*Alarm Latch	40015	Unsigned char	0	1	R/W
24.	* Alarm sensor	40016	Unsigned char	0	1	R/W
25.	*Relay control	40017	Unsigned char	0	1	R/W
26.	Password	40018	Unsigned integer	1	9999	R/W
27.	Serial Input PV	40031	Integer	-1999	9999	R/W
28.	Time out	40032	Unsigned char	1	32	R/W
29.	*Sqrt	40033	Unsigned char	0	1	R/W
30.	Filter	40034	Unsigned integer	0	60	R/W

Table 13.

- \*Relay status1, \*Relay status2 it gives status of LED. Relay status1 can be used to acknowledge
- Alarm 1 Blinking, Alarm 2 Blinking : 1= Blinking On, 0 = Blinking Off
- Acknowledge using function code-5
- Address 3-16 for future use only
- \*Alarm status1, \*Alarm status2 gives status of abnormal condition only. Address 1006- 1016 for future use only
- \*Input type: 0 = Etc, 1 = Jtc, 2 = Ktc, 3 = Ttc,4 =Btc,5 =Rtc, 6 = Stc, 7= pt-100,8 = 0- 400Ω, 9 =0-6000Ω, 10 = ±10V, 11 = 0-10V, 12 = 0-5V, 13 = 1-5V,14 = 0-2V,15 = 0.4-2V, 16 = -10-20mV, 17 = ±75mV, 18 = 0-75mV,22=Serial, 23=4-20mA,24=0-20mA
- \*Baud rate: 0 = 4800, 1 = 9600, 2 = 19200, 3 = 38400
- \*Alarm Latch: 0 = YES, 1 = NO
- Alarm sensor: 0 =UP, 1=DOWN
- \*Relay control: 0 = ON, 1=OFF
- \*Alarm logic type: 0 = HH, 1 = HL, 2 = LL.
- \*Alarm 1: 0 = Alarm, 1 = Trip
- \*Alarm 2: 0 = Alarm, 1 = Trip.
- Values when OPEN: – 32766, UNDER: – 32768, OVER: – 32767, doPEN: -32765.
- \*Decimal point: 0=0, 1= .0, 2=.00, 3=.000, 4=.0000
- \*Sqrt: 0 = YES, 1 = NO
- \*Filt: 0 = No Filter, 1-60 = Filter used.

**8.1.2 Parameter Address Details For  $\bar{n}tY\bar{P} : b$  (405-4IN)**

Sr. No.	Analog Parameters	Absolute Address	Type of Access	Type	Value Applicable
1*	Process Value	40001	R/*W	Int	As Perspc. Table Of I/P Type Range
2	Set Value-1	40002	R/W	Int	Conf. Zero To Conf. Span
3	Setvalue-2	40003	R/W	Int	
4	Set Value-1 Hysteresis	40004	R/W	Int	0 – 255 Count
5	Set Value-2 Hysteresis	40005	R/W	Int	
6	Engineering Zero	40006	R/W	Int	Max Value As Perspc. Table Of I/P Type Range
7	Engineering Span	40007	R/W	Int	
8	Decimal Position	40008	R/W	Int	0 To 3

Table 14

\* Absolute Address 40001 is Read/Write only if Serl prompt is made 'YES'(Only serial input). If Serl prompt is made 'NO' then absolute address 40001 is Read only.

**8.2 Exceptional Response**

CODE	MEANING
01	Function code Invalid. It must be 01, 03, 04,05 or 16.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 salve.
03	Illegal data value. A value contained in the query data field is not an allowable value for the salve.
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 15.

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**9. Technical Specifications**

**9.1 Display:**

PV: Red LED 4-digit, character size 4.00”.

LED for status indication (Alarm and Tx/Rx).

Operation keys: Escape, Enter, Increment, Decrement.

**9.2 Input:**

Input	Type	Range	Accuracy
TC	E	-200 to 1000 °C	±0.1 % Of Full Span ± 1 Digit
	J	-200 to 1200 °C	
	K	-200 to 1350 °C	
	T	-200 to 400 °C	
	B	450 to 1800 °C	
	R	0 to 1750 °C	
	S	0 to 1750 °C	
RTD	Pt 100	-200 to 850 °C	
DC Current	4-20 mA	-1999 to 9999,	
	0-20 mA		
DC Voltage	0-5 V	-1999 to 9999,	
	1-5 V	-1999 to 9999,	
	0-2 V	-1999 to 9999,	
	0.4 – 2V	-1999 to 9999	
	± 10V	-1999 to 9999	
	0-10 V		
	-10-20mV		
	± 75 mV		
	0-75 mV		

Resistance Input	0-400Ω		
	0-6000Ω		
Serial	PV Write Facility	-1999 to 9999	

\* For DC Current input, 250Ω shunt resistor (sold separately) must be externally installed.

For DC current and voltage input, scaling is possible and decimal point can be changed.

**Burn out current** : 0.5 uA

**Reference Junction compensation error:** ±2 °C

**Noise Rejection Ratio** Common mode: >100 dB (50Hz)  
Normal mode : >40 dB (50Hz)

**RTD** : Allowable lead wire resistance 15 Ω or less.

**Input Impedance:**

1M Ω (Approx.) for TC, RTD, 0-2V,0.4-2V,0-75mV, ±75mV,0-400 Ω .

220 kΩ for 0-10V, ±10V

440 kΩ for 0-5V,1-5V, 0-6000 Ω .

**TEMPCO** :< 100 ppm for input to display  
<150 ppm for retransmission output.

**9.3 Input Sampling period:**

4 Sample/Sec

**9.4 Alarm:**

**Alarm AL1 - Momentary Alarm**

Condition – high/low/vlow

Lamp – on/flash/latch

Relay – on/off

**Alarm AL2 - Momentary Alarm**

Condition – vhigh/high/low

Lamp – on/flash/latch

Relay – on/off

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### **9.5 Transmission output**

**DC Current:** 0 to 20 mA DC, 4 to 20 mA DC

**DC Voltage:** 0 to 10V DC, 0 to 5V DC, 1 to 5V DC. (one at a time factory settable).

**Accuracy:**  $\pm 0.25\%$  of full Span

**Load Resistance for current O/P:** 600  $\Omega$  or less

**Load Resistance for Voltage O/P:** 2 K $\Omega$  or more

### **9.6 Supply voltage:**

85 to 265VAC, 50Hz.

24 V ( $\pm 10\%$ ) DC (Optional)

### **9.7 Power Consumption:**

Max. 10 VA

### **9.8 Insulation resistance:**

Between Power supply terminal and ground terminal, 500V DC 50M $\Omega$ .

### **9.9 Environment:**

**Ambient:** 0 to 55  $^{\circ}$ C.

**Humidity:** 20 to 95% RH (Non-condensing).

### **9.10 Case:**

**Material:** MS Powder Coated

**Color:** **IP 20** : Black

**IP 65** : Light Gray

**Protection:** **IP 20** : Panel / Wall / 19" Rack Mount

**IP 65** : Wall Mount

### **9.11 Mounting method:**

Panel / Wall / 19" Rack Mounting

### **9.12 Dimension:**

**IP 20** : 440mm (W) x 175mm (H) x 70mm (D)

**IP 65** : 500mm (W) x 300mm (H) x 120mm (D)

**9.13 Panel Cutout:**

444mm(+0.8) x 175mm(+0.8)

**9.14 Weight:**

**IP 20** : 3 kg (Approx.)

**IP 65** : 8.3 kg (Approx.)

**9.15 Communication**

<b>Communication Interface</b>	Based on EIA RS-485.
<b>Communication method</b>	Half-duplex communication start stop synchronous.
<b>Communication Speed</b>	4800/9600/19200/38400bps selectable by key.
<b>Parity</b>	None.
<b>Communication Protocol</b>	Modbus RTU.
<b>Connectable number of unit</b>	Max.32 unit per host computer.
<b>Communication error detection</b>	CRC check.

**9.16 Contact Input:**

1-Channel (Isolated) Non- voltage contact input, Maximum reverse voltage 6V, Maximum Forward voltage 50V, Capacity 24V DC, 10mA

**9.17 Transmitter Output:**

24V DC@50mA ( $\pm 10$  % accuracy)

**9.18 Isolation specification:**

- 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\*\*:

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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:** 20M $\Omega$  or more at 500 V DC between power terminals and grounding terminal.

### **9.19 Special Feature:**

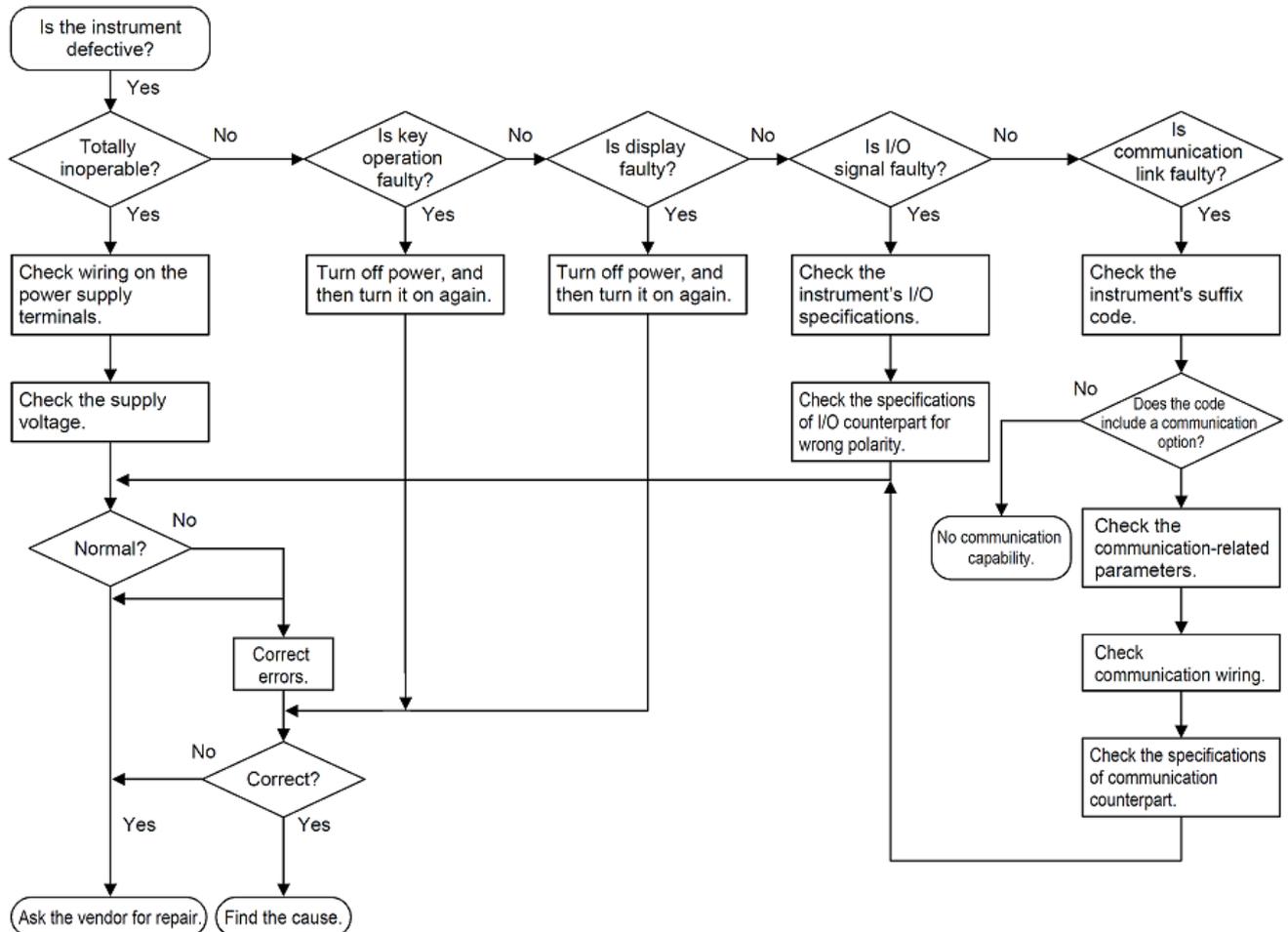
Square Root Extraction

Digital Filter                      0-60 Sec.

Input Scalability                    For Linear Input type

## 10. Appendix

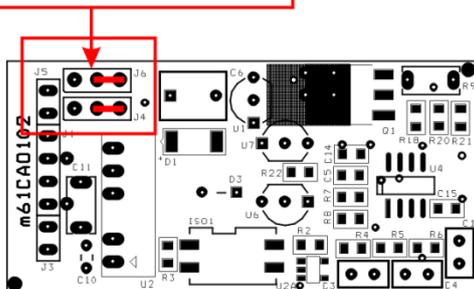
### 10.1 Troubleshooting



### 10.2 Jumper Location for Retransmission Output

Jumper Setting for Retransmission card: m61Cao102

**Jumper Settings for Current Output**



**Jumper Settings for Voltage Output**

