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A Sonepar Company

User's Manual

Temperature Indicator

409-4IN

409-6IN

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Contents

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. 409-4INis 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)
409-6IN	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.

1.3 Accessory

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

No	Item name	Part number	Qty	Remarks
1	Mounting Clamps	-	1	409-4IN

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

⚠ WARNING	*This indicates a danger that may result in death or serious injury if not avoided.*
⚠ CAUTION	*This indicates a danger that may result in minor or moderate injury or only a physical damage if not avoided.*

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.

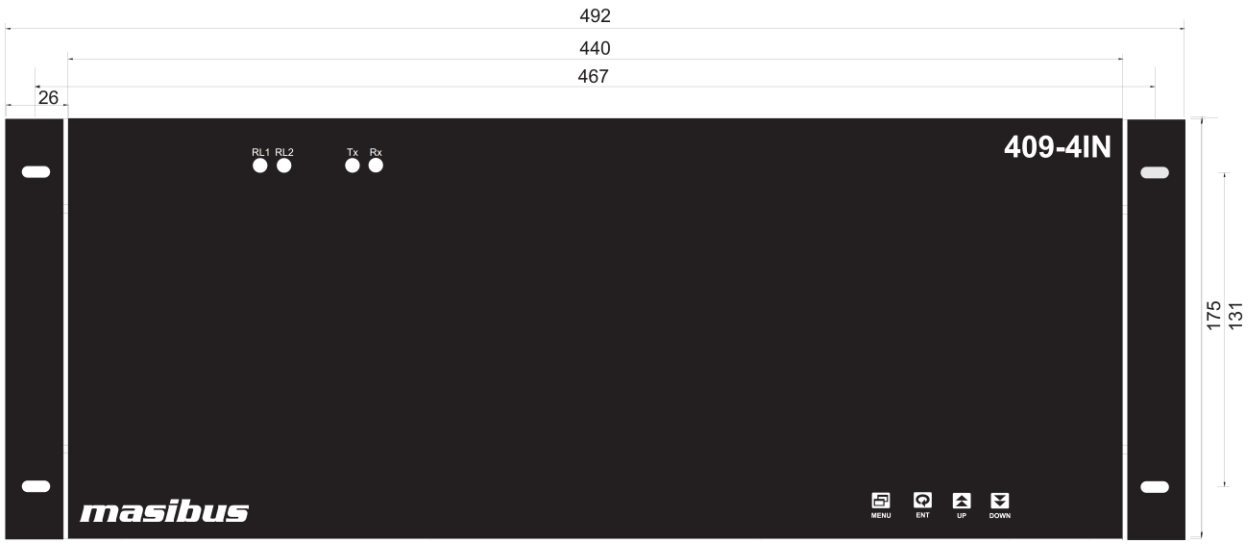


Fig 1. Front Panel for Wall Mount 409-4IN

Fig 2. Front Panel for Panel Mount 409-4IN

409-6IN

Name of Part	Symbol	Function
UP key		• Increment the Value of any Parameter • User presses during RUN mode to invoke segment testing mode*.
DOWN key		• Decrement the Value of any Parameter. • Shows ambient value for T/C Input in RUN mode.
MENU key		• Shows different SET Points, if pressed in RUN mode. • In Sub Menu it can be used to get to the next Parameter.
ENTER key		• Use as an acknowledgement for Alarm Status. • 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.
PV (Present Value) Display	PV	• 4 digital 4 inch RED Display • Display process value. • Display parameter name when user set parameter. • Display Parameter Value when in Edit mode. • Display error message when an error occurs.
Relay-1 Indication	RL1	• ON when Relay-1 is energized & OFF otherwise.
Relay-2 Indication	RL2	• ON when Relay-2 is energized & OFF otherwise.
TX Indication	Tx	• ON when device is transmitting some Data (RS-485).
RX Indication	Rx	• ON when device is receiving some Data (RS-485).

- 409-4IN: All digits segments display one after another. Example. 1111, 2222, 3333to 9.9.9.9. After that unit will be in run mode.

4. Terminal Arrangement Diagram

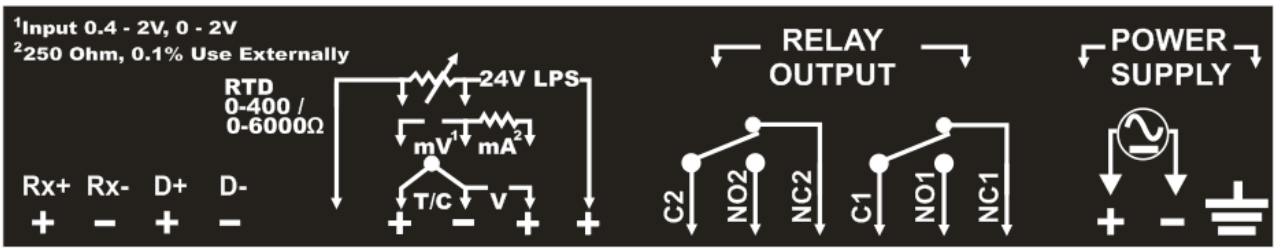


Fig 3. Terminal Arrangement for Panel Mount for 409-4IN

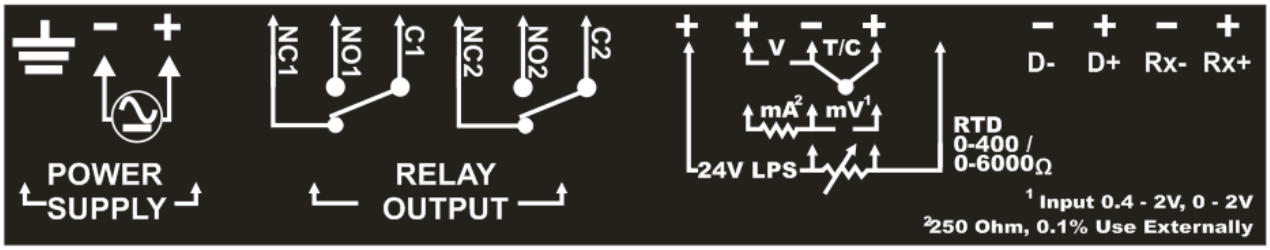
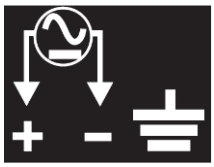
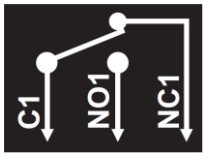
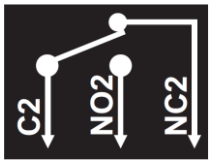
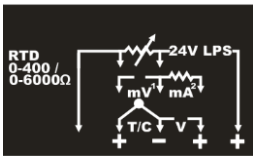


Fig 4. Terminal Arrangement for Wall mount for 409-4IN & 409-6IN

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	
TC- / V- / mV-/LPS-	For Thermocouple,	

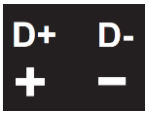
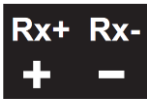
TC+/ V+/mV+	RTD ,Linear, and mV Input	
RTD common	For RTD Input Only (Three wire Compensation).	
D+	Rs-485 Communication (Serial Input)	
D-		
Rx+ Rx-	Retransmission Output	

Table 3.

5. Configuration Guidelines

5.1 Menu Parameter List

Display	Name	Description	Default Value
INPT (inpt)	INPUT Type	Set PV Input Type **tC e/tC j/tC K/tC t/tC b/tC r/tC s/rtd.1/0-.4K/0-6K /1-10/0-10/0-5v/1-5v/ 0-2V/.4-2/1020/1-75/0-75/serl/4-20/0-20/mstr**	1-5V
DP (dp)	Decimal Point	Set position of Decimal Point on Display. **0/0.0/0.00/0.000 /0.0000** 0 : 0 1 : .0 2 : .00 3 : .000 4 : .0000[2]	1 (.0)
ZERO (zero)	Zero	Can be set to any value within the Input Range & less the SPAN Value.	-199.9[3] (If 1-5V)
SPAN (span)	Span	Can be set to any value within the Input Range & greater the ZERO Value.	999.9[4] (If 1-5V)
INLO (inlo)	Input Low Value	Can be set to any value within the Input Range & less the SPAN Value.	1.000 (if 1-5V)

INHI (inhi)	Input High Value	Can be set to any value within the Input Range & greater the ZERO Value.	5.000 (1-5V)
CAL	**Calibration**		
CALZ (Calz)	Calibration Zero	Calibration Zero for PV Input	-
CALS (Cals)	Calibration Span	Calibration Span for PV Input	-
CALA (Amb)	Ambient	Ambient Adjustment	-
Rtr	**Retransmission**		
RE V (rETR)	Retransmission voltage	Retransmission Output Type This output is according to PV input. Zero & Span acts as Min & Max value of retransmission o/p scale respectively. **0-10v/0-5v/1-5v** 0 : 0-10V 1 : 0-5V 2 : 1-5V Voltage or Current is Jumper Selectable from the Hardware.	0 (0-10)
RTmA (rtma)	Retransmission current	Retransmission Output Type This output is according to PV input. Zero & Span acts as Min & Max value of retransmission o/p scale respectively. **4-20/0-20** 0 : 4-20mA 1 : 0-20mA Voltage or Current is Jumper Selectable from the Hardware.	0 (4-20mA)
Rcal	**Retransmission calibration**		
RETZ (RETZ)	Retransmission-ZERO	Calibration Zero for Retransmission Output	-

RETS (RETS)	Retransmission-SPAN	Calibration Span for Retransmission Output	-
Alarm	**Alarm Logic**		
ATYP (ATYP)	Alarm Type	Set which Set Point to shown in SV display in RUN mode while device is in Auto Mode **HH/HL/LL** 0 : HH 1 : HL 2 : LL	2 (LL)
SEL **(SEL)**		Selection for Alarm 1 & 2. **AL1/AL2** 0: AL1 1: AL2	-
Al1/AL2 **(AL1/AL2)**	Alarm 1/Alarm 2	Set which Set Point to shown in SV display in RUN mode while device is in Auto Mode **Alrm/Trip** 0 : ALRM 1 : TRIP	0 (ALRM)
LACH (LACH)	Latch	Enable or Disable Latch **yes/no** 0 : YES 1 : NO	1 (NO)
HYST (HYST)	Hysteresis	Hysteresis Value for Relay 0.0 to 25.5	0.1
OPES (opes)	OPEN Sensor Status	Set Control O/P & Retransmission state when Input OPEN condition. **up/down** 0 : UP 1 : DOWN	0 (UP)
ST-1 **(st-1)**	Set Point 1	Range Depending on PV sensor type selected	10.0
ST-2 **(st-2)**	Set Point 2	Range Depending on PV sensor type selected	10.0
RDLY	Relay Delay	Relay Delay is amount of time (in sec), that Relay will	0 sec

(**rdLY**)	(For Relay)	wait before getting ON after the ON condition occurs. 1 to 9999 sec	
CTRl (**CTRL**)	Control Relay	Select Control Relay Status **on/off** 0 : ON 1 : OFF	1 (OFF)
COM	**Communication**		
SRNO (**srno**)	Serial No	Unit ID for Modbus-RS485 Communication 1 to 247	1
BAUD (**baud**)	Baud Rate	Set Modbus RS485 Communication Baud Rate **4800/9600/19.2k /38.4k** 0 : 4800 (4800 bps) 1 : 9600 (9600 bps) 2 : 19.2K (19200bps) 3 : 38.4K (38400bps)	1 (9600)
MTYP (**mtyp**)	Modbus Type	Enable or Disable Modbus type **A/ B** 0 : A 1 : B	0 (A)
DTYP* (**DYTP**)	Data Type	Read Data Type 3 or 4	3
ADRS* (**ADRS**)	Address	Address Range 1 to 9000	1
TSCN* (**TSCN**)	Scan Rate	Scan Rate 100 to 5000 ms	1000
DFRT* (**DFRT**)	Data Format	Data Format **INT/Long/Flot/slong/Sflt** 0 : Integer 1 : Long 2 : Float 3 : Swap Long 4 : Swap Float	0 (INT)
CBRK (**CBRK**)	PV value if Connection breaks	PV After timeout (Connection Break) Last/---- 0: Last 1: ----	Last
SQRT (**sqrt**)	Square Root	Enable or Disable Square Root **yes/no**	0 (NO)

		0 : YES 1 : NO	
FLTR (**fltr**)	Filter	Filter is time (in sec), that PV will wait before getting to its value afterfilter set. 0-60 sec	0
TOUT **(TOUT)**	Time Out	Time Out is time (in sec), For Display PV 1-32 sec	1
[1]BRHT (**brHt**)	Brightness	Adjust Brightness of the 7-segment Display. 10 to 100	100
PASS (**pass**)	Password	Set Device Password 0 to 99	1

*Applicable for Master input only

[1] Applicable for 409-4IN only

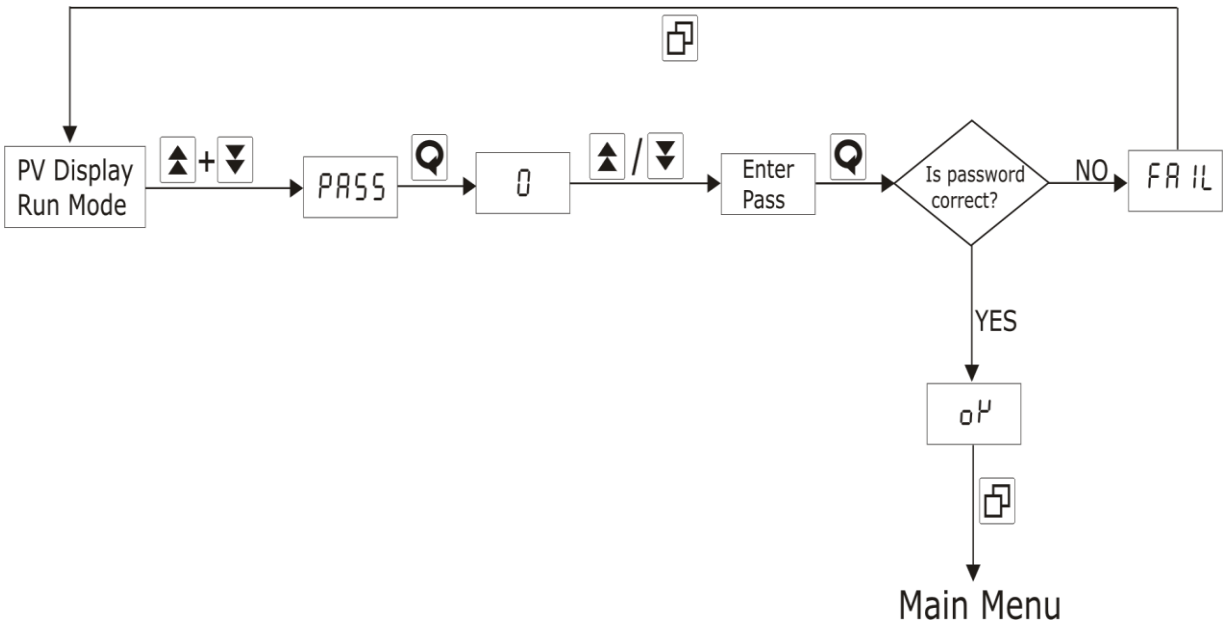
[2] Applicable for 409-6IN 5 digit only

[3] For 409-6IN 5 digit : -1999.9

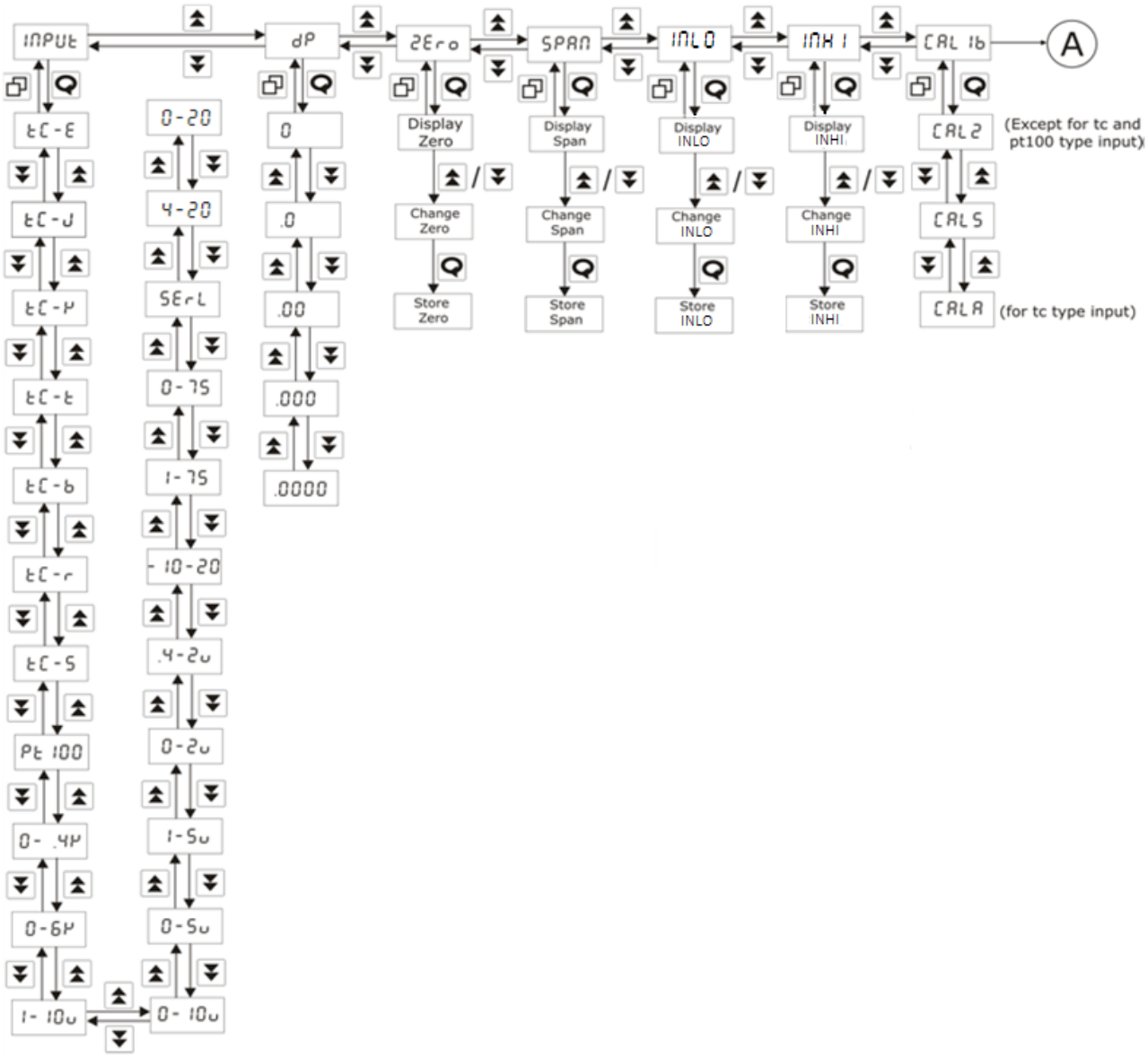
[4] For 409-6IN 5 digit : 9999.9

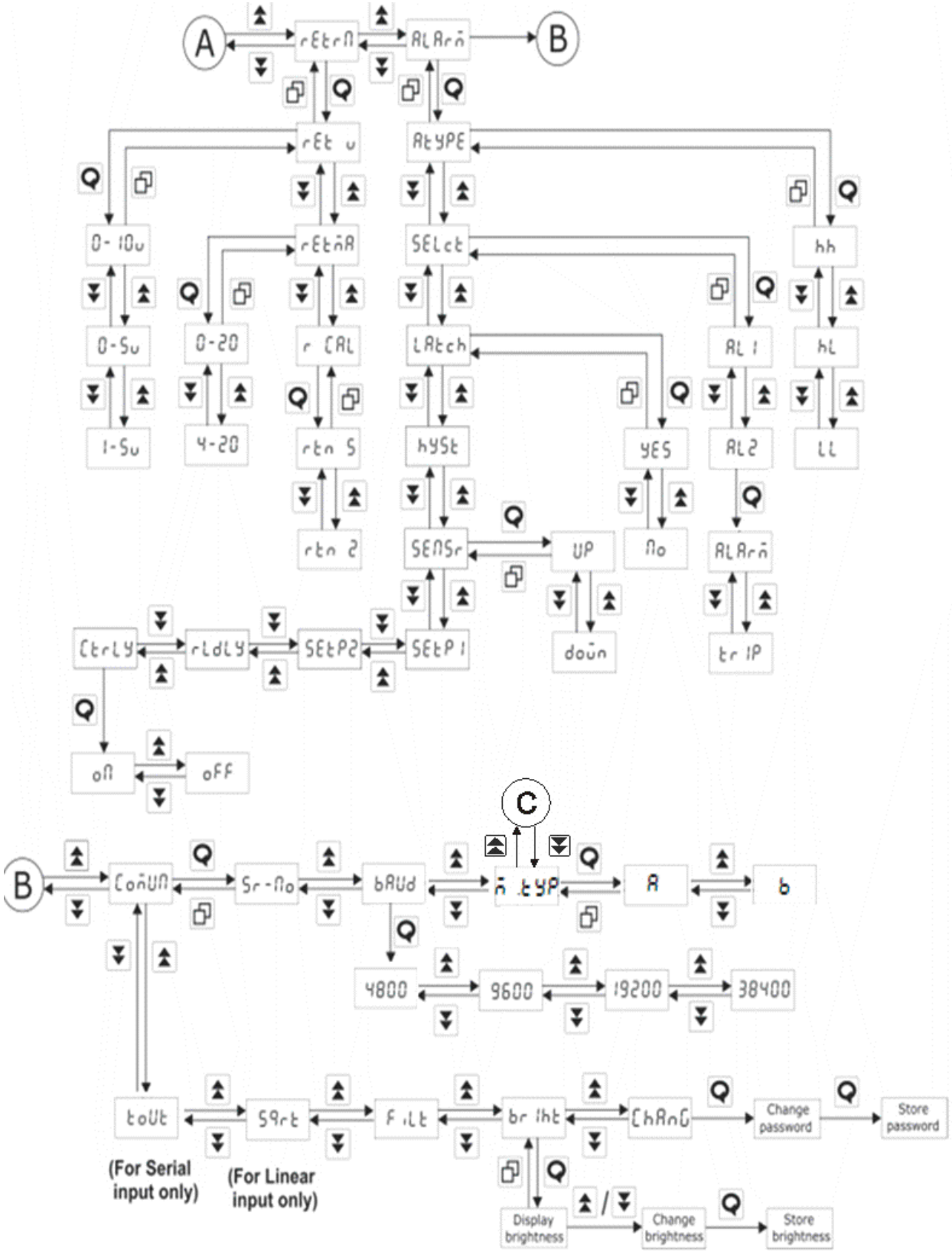
Table 4.

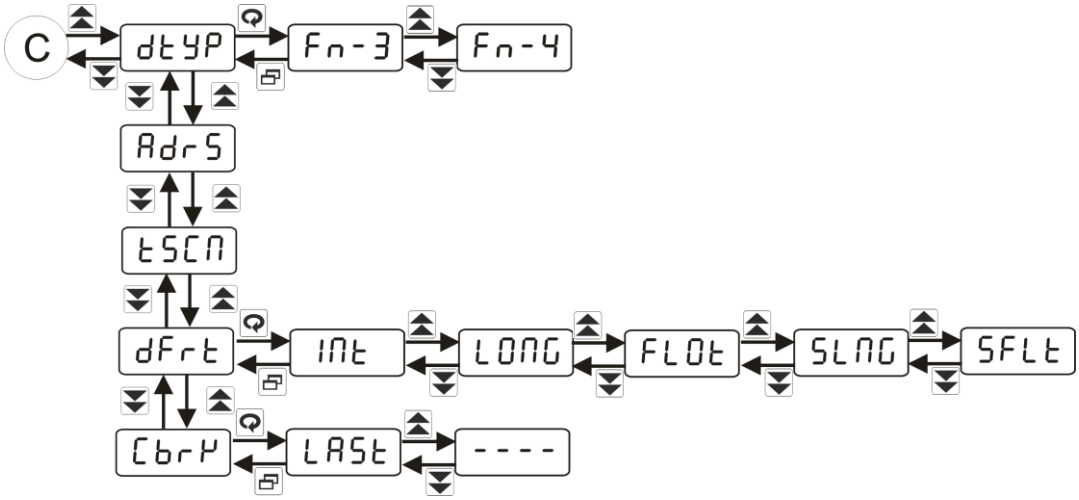
5.2 Menu Layout



5.3 Main Menu


INPUt
dP
2Ero
SPAN
INLO
INH I
CAL Ib
A
tC-E
tC-J
tC-P
tC-t
tC-b
tC-r
tC-S
Pt 100
0- .4P
0-6P
1- 10u
0-20
4-20
SErL
0-7S
1-7S
- 10-20
.4-2u
0-2u
1-5u
0-5u
0- 10u
0
.0
.00
.000
.0000
Display Zero
Change Zero
Store Zero
Display Span
Change Span
Store Span
Display INLO
Change INLO
Store INLO
Display INHI
Change INHI
Store INHI
CAL2
CALS
CALA
(Except for tc and pt100 type input)
(for tc type input)


A
rEtrN
ALArñ
B
rEt u
AtyPE
0-10u
0-5u
1-5u
0-20
4-20
rEtñA
r CAL
rtn S
rtn 2
SELct
LAtch
hySt
SENSr
UP
doün
YES
no
hh
hL
LL
AL1
AL2
ALArñ
trIP
CtrLY
rLdLY
SEtP2
SEtP1
oñ
oFF
C
B
CoñUN
Sr-No
bAUd
ñ tyP
A
b
4800
9600
19200
38400
toUt
SArt
FiLt
br iht
ChAnG
Change password
Store password
Display brightness
Change brightness
Store brightness
(For Serial input only)
(For Linear input only)



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

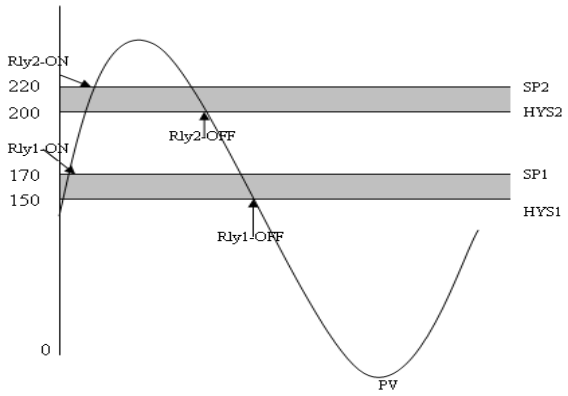


Fig 5.

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.

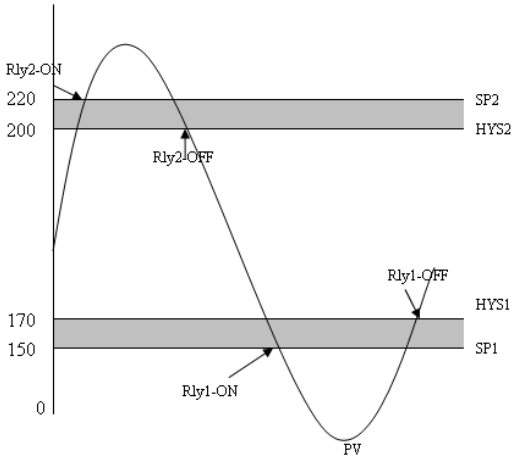


Fig 6.

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.

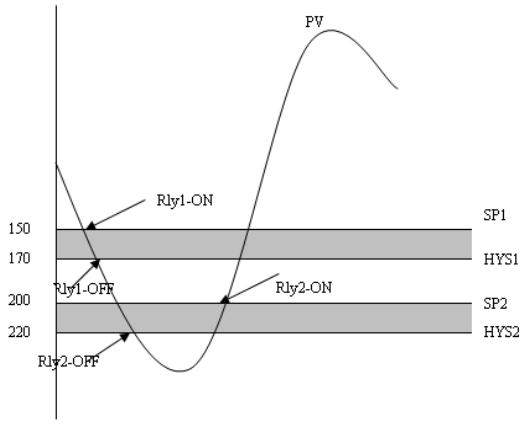


Fig 7.

AL1-Low, AL2-Very Low

SP2>SP1

If PV<SP1 then => 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 table7, 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
-10 to 20mV DC	OPEN
±75mV	OPEN
0-75mV	OPEN
Serial	-----
4-20mA	OPEN
0-20mA	UNDR
Master	-----

Table 5.

Note: If set zero/span for input type is less then 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 then 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.

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(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
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.

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.

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 "CalIb" 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 "Calz" for zero calibration;"CALS" for span calibration and "CALA" 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 "CALS" or "CALA".
5) Input type other then thermocouple display will be either "CALZ" or "CALS" because for other inputs (except thermocouple) ambient calibration is not required.
6) To perform zero calibration, press ENTER key when display shows "CALZ". 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.

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 “RETZ” for zero calibration;”RETS” 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 “RETZ”. 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 ForMtyp : A

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.	[1]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
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
31.	Data Type	40037	Unsigned char	3	4	R/W
32.	Address	40038	Unsigned integer	1	9000	R/W
33.	Scan Rate	40039	Unsigned integer	100	5000	R/W
34.	Data Format	40040	Unsigned char	0	4	R/W
35.	PV value if Connection breaks	40041	Unsigned char	0	1	R/W
36.	Process value	40051	Swapped Long	-19999	99999	R
37.	Zero display	40053	Swapped Long	-19999	99999	R/W
38.	Span display	40055	Swapped Long	-19999	99999	R/W
39.	Set point 1	40057	Swapped Long	-19999	99999	R/W
40.	Set point 2	40059	Swapped Long	-19999	99999	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 , 25 = Modbus master
- *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.
- 409-6IN 5 digit:
  - If Span Display value is greater than 32759 ,PV Values when OPEN: 100001, UNDER: 100002, OVER: 100003, doPEN: 100004.
  - If Span Display value is less than 32760 ,PV Values when OPEN: 32767, UNDER: 32765, OVER: 32766, doPEN: 32762
- 409-6IN 4 digit , 409-4IN:
  - Values when OPEN: – 32766, UNDER: – 32768, OVER: – 32767, doPEN: -32765.
- *Decimal point: 0=0, 1= .0, 2=.00, 3=.000,(4=.0000 for 409-6IN 5 digit)
- *Sqrt: 0 = YES, 1 = NO
- *Filt: 0 = No Filter, 1-60 = Filter used.
- Data Format : 0 = Integer, 1 = Long, 2 = Float, 3 = Swap Long, 4 = Swap Float
- PV value if Connection breaks: 0 = Last PV, 1 = “----”
- [1] in 409-6IN Modbus register address shows version no.

8.1.2Parameter Address Details ForMtyp : b (405-4IN)

Sr. No.	Analog Parameters	Absolute Address	Type of Access	Type	Value Applicable
1*	Process Value	40001	R/*W	Int	As Per spc. 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.

9. Technical Specifications

9.1 Display:

Model	409-4IN	409-6IN	
Process Value	4" Four-digit Seven segment Red LED	6" (4 digit)	4.5" (5 digit)
		P10 based Red- Led High brightness module,(32X16 dots)	
Status Indication	4 Red LED's for (Alarm and Tx/Rx)		
Keys	Menu, Enter, Increase, Decrease		

9.2 Input:

Input	Type	Range	Accuracy
	E	-200 to 1000 ºC	
	J	-200 to 1200 ºC	

TC	K	-200 to 1350 ºC	±0.1 % Of Full Span ± 1 Digit
	T	-200 to 400 ºC	
	B	450 to 1800 ºC	
	R	0 to 1750 ºC	
	S	0 to 1750 ºC	
RTD	Pt 100	-200 to 850 ºC	
DC Current	4-20 mA	-1999 to 9999,	
	0-20 mA		
DC Voltage	0-5 V	-1999 to 9999,	
	1-5 V		
	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 ºC

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

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: ±0.25% of full Span

Load Resistance for current O/P: 600 Ω or less

Load Resistance for Voltage O/P: 2 KΩ or more

9.6 Supply voltage:

Supply Voltage	85-265VAC/ 125-300VDC
Optional	24V (±10%) DC

Power consumption	409-4IN <10 VA 409-6IN <30 VA

9.7 Insulation resistance:

Between Power supply terminal and ground terminal, 500V DC 50MΩ.

9.8 Environment:

Ambient: 0 to 55 ºC.

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

9.9 Physical Specification

Model	**409-4IN**		**409-6IN**
Enclosure Protection	**IP20**	**IP65**	**IP65**
Mounting	19" Rack / Panel Mount /Wall Mount	Wall Mount	Wall Mount
Enclosure material	MS Powder Coated		
Dimensions(in mm)	440(W) x 75(H) x 70(D)	500(W) x 300(H) x 120(D)	405(W) x 250(H) x 90(D)
Panel Cutout(in mm)	444 (+0.8) x175 (+0.8)	-	-
Weight	3 Kg (Approx.)	8.3 Kg (Approx.)	5 Kg (Approx.)
Terminal Cable Size	2.5mm²	2.5mm²	2.5mm²
Standard Accessories	2 Nos. Clamp, 2 Handle for 19" Rack / Panel Mount	4 Nos. Wall Mounting Bracket. 3 Nos. of PG 13 Gland (For Cable entry).	3 Nos. of PG 16 Gland (For Cable entry).

9.10 Communication

Communication Interface Based on EIA RS-485.

Communication method Half-duplex communication start stop synchronous.

Communication Speed 4800/9600/19200/38400bps selectable by key.

Parity	None.
Communication Protocol	Modbus RTU.
Connectable number of unit	Max.32 unit per host computer.
Communication error detection	CRC check.

9.11 Contact Input:

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

9.12 Transmitter Output:

24V DC@50mA (±10 % accuracy)

9.13 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**:

  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.

9.14 Special Feature:

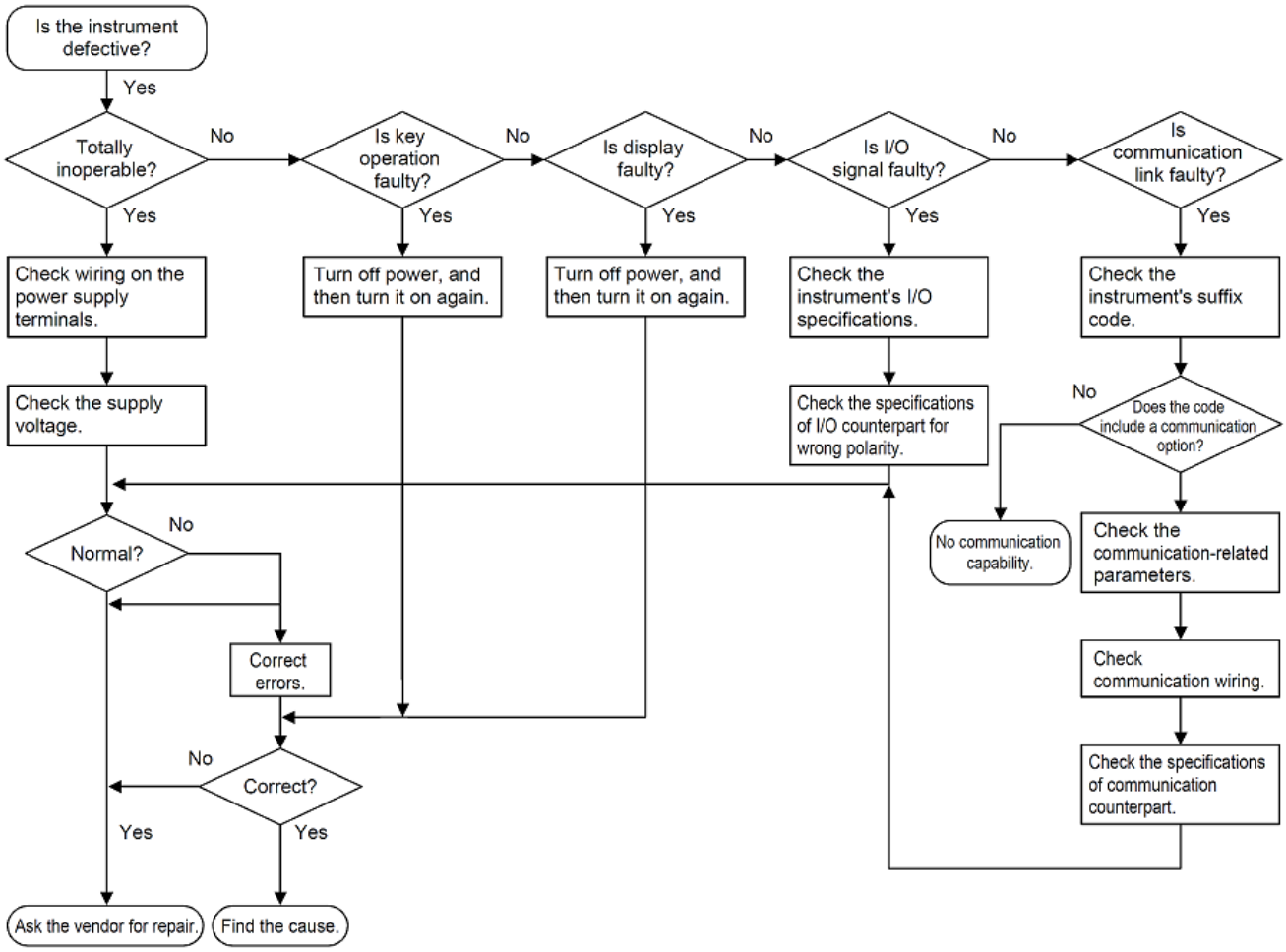
Square RootExtraction

Digital Filter 0-60 Sec.

Input Scalability For Linear Input type

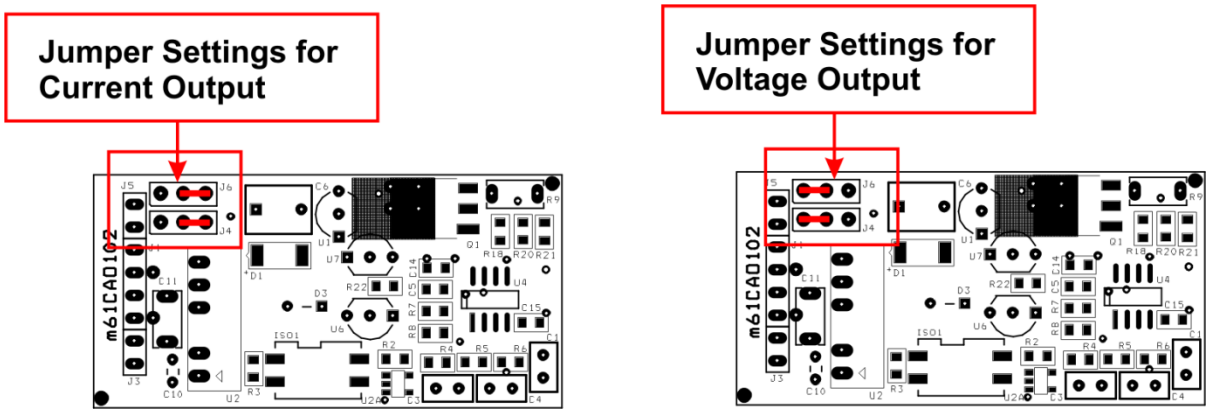
10. Appendix

10.1 Troubleshooting



10.2 Jumper Location for Retransmission Output

Jumper Setting for Retransmission card: m61Cao102



10.1 Square Root Linearization

The formula for square root is:

$$PV = Zero + [(Span - Zero)\sqrt{Vinput - Vlow/(Vhigh - Vlow)}\,]$$

Where: Span is the high end of process variable

Zero is the low end of process variable

Vinput is actual voltage or current value of input

Vhigh is the high end of input signal range (5V or 20mA)

Vlow is the high end of input signal range (1V or 4mA)

Example:PV is 0-1000

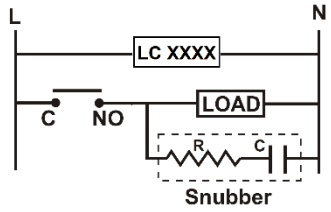
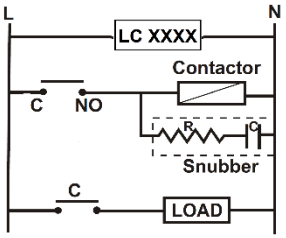
Input signal range is 1-5V

Input signal is 3V

PV will be,

$$PV = 0 + [(1000-0)\sqrt{(3-1)/(5-1)}\,] = 707$$

10.2 Load connection

For load current less than 0.5A	For bigger loads, use interposing relay / contactor
	

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.