PROGRAMMABLE ONOFF CONTROLLER

X96A
VER 29.93

INSTRUCTIONS FOR USE

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	DESCRIPTION	PAGE

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1. IMPORTANT SAFETY INFORMATION

1.1 Installation

Check that the supply voltage given to the instrument is as specified on the terminals of the instrument. To avoid shock hazard prevent live parts being touched and follow wiring diagram and regulations.

1.2 Warranty

Radix Electrosystems Pvt. Ltd. warrants this product to be free of defects in workmanship and materials for one year from the date of purchase.

1. Defects in workmanship and materials will be serviced free of charge during the warranty period. Labour required for rectifying the defects is also covered by this warranty. Any further claims are excluded.

2. Warranty servicing does not extend the period of warranty for the entire instrument or for the parts that have been replaced.

3. From the warranty are excluded :
   a) all damage caused by improper handling, e.g. non-observance of the operating instructions, subjecting the product to excessive heat, moisture, corrosion, etc.
   b) damage caused by the intervention of the buyer or by unauthorised third parties
   c) transport damage from the manufacturer to the dealer or user or on the way to servicing
   d) parts subject to normal wear, e.g. relays.

4. Any liability for direct or indirect consequential damages caused by the instrument is excluded, even if the defect of the instrument is covered by the warranty.

   Radix liability for any breach of this agreement shall not exceed the purchase price paid.

5. Any further claims, based on any title, are excluded.

6. In case repair service is required under this factory warranty, please send the instrument, indicating the exact address of the sender and defect, carefully packed, postage paid, to : Radix Microsystems, B-1, 2nd Floor, Ghanshyam Indl. Estate, Off Veera Desai Road, Andheri (West), Mumbai - 400 053.

2. OVERVIEW

2.1 Introduction

X96A is a microcontroller based user programmable ONOFF controller with 4 digit LED display for displaying measured values and another 4-digit LED display for displaying settings.

X96A has two universal inputs, upto 4 relays & 2 current outputs. It is operated by 3 user friendly keys.

2.2 Specifications

INPUTS

No. of inputs	: 2 (input 1, input 2)

Input group 1
(common for both inputs)

Thermocouple	: B, E, J, K, N, R, S, T
RTD	: Pt100, 3-wire
Voltage	: 0~50 mV
Current	: 0~20 mA, 4~20 mA

Input group 2
(common for both inputs)

Thermocouple	: B, C, D, E, G, J, K, N, R, S, T
RTD	: Pt100, 3-wire, Cu53
Current	: 0~20 mA, 4~20 mA, Square root (for input 1)
Voltage	: 0~50 mV Through DIP selection following voltage inputs are available : 0~1 V, 0~5 V, 0~10 V, 0~10 mV, 0~100 mV, 0~200 mV
Transmitter supply	: 22 V nominal, 30 mA max
Range limits	: See Table 1
Accuracy	: See Table 1
Cold junction compensation	: Automatic
Sensor break protection	: User programmable

INDICATION

Process variable	: Upper : 4 digit, 7 segment 0.56" (14.2 mm) red LED display
Setpoint	: Lower : 4 digit, 7 segment 0.56" (14.2 mm) green LED display
Status indication	: LEDs for relay status LEDs for setpoint indication LEDs for communication

OUTPUTS

No. of relays	: 0/ 1 / 2 / 3 / 4
Relay contact type	: NO-C-NC
Relay contact rating	: 5A / 230V AC, resistive
SSR drive	: 12 V DC drive signal for external SSR
No. of analog outputs	: 0 / 1 / 2 (current or voltage)
Current output	: 4~20 mA/0~20 mA/20~4 mA /20~0 mA isolated from input
Maximum load for current output	: 500 ohms
Voltage output	: 0~10 V / user specified
Load for voltage output	: >10 Kohms

COMMUNICATION

|	
Port	: RS485
Protocol	: Modbus RTU
Slave ID	: User programmable (1~256)

OTHER

|	
Programming	: Through 3 tactile keys
Dimensions (in mm)	: 96(H) x 96(W) x 100(D)
Mounting	: Panel mount
Panel cutout	: 92 x 92 mm
Supply voltage	: a) 85~265 V AC, 50/60 Hz b) 20~35 V DC (optional)
Power consumption	: 4 watts maximum
Operating ambient temperature	: 0~50 °C
Relative humidity	: Below 90%, non condensing

2.3 Power On

On application of power to the instrument, version number is displayed.
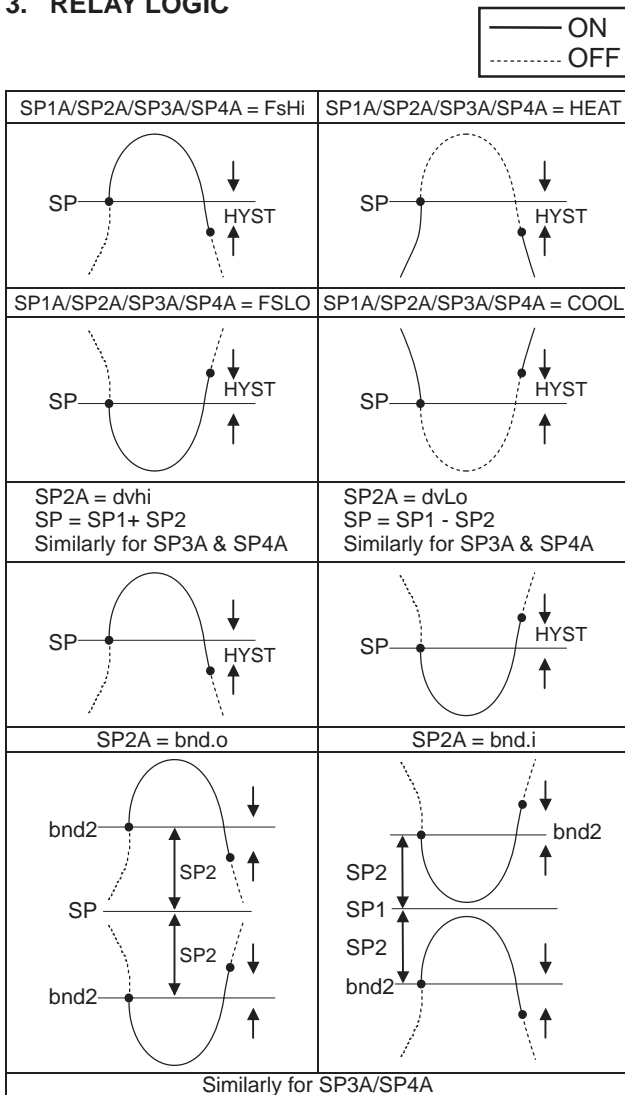
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2.4 Front Panel

Fig 1

2.5 Connection Diagram

△ Check supply voltage with instrument sticker
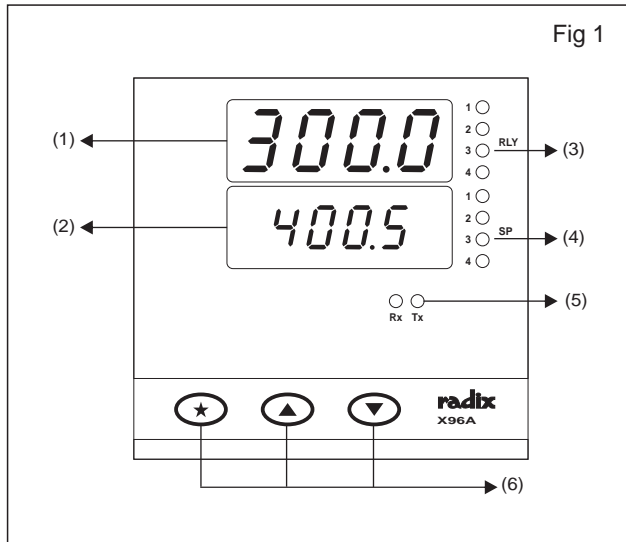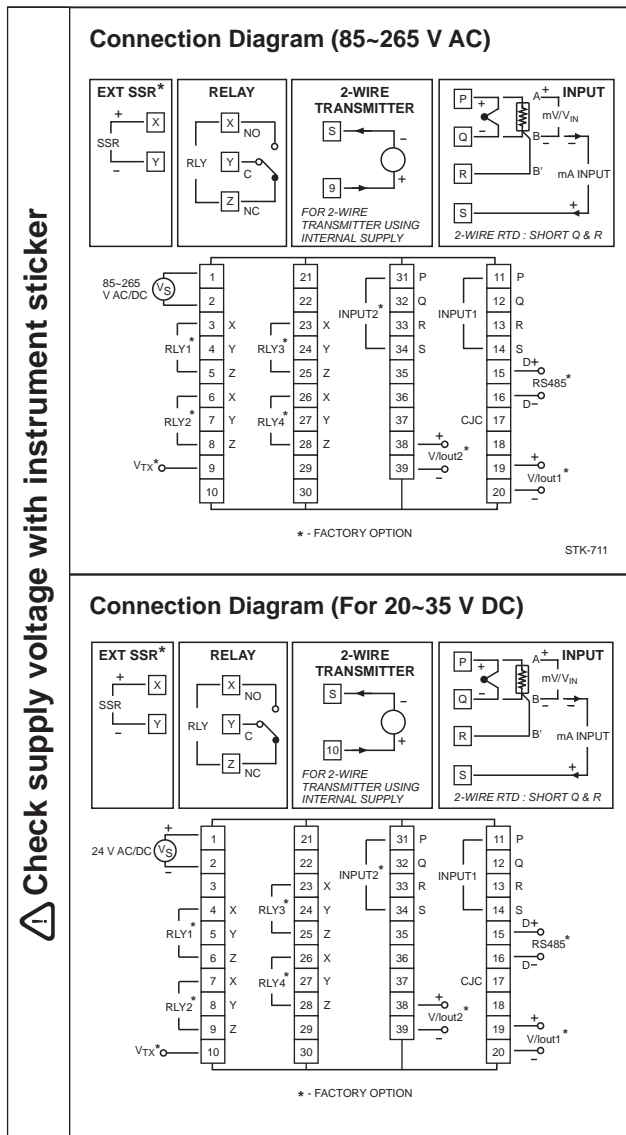
2.6 Display & Control Key Functions (Refer 2.4)

Refer Fig 1	Indicator/ Display	Function
(1)	Measured input value (PV) Display	Displays the measured input value (PV) or the error message if an error occurs. Displays a parameter symbol in program mode.
(2)	Setpoint (SP) Display	Displays setpoints (SP1, SP2, SP3 or SP4 or input2) (as selected by user)
(3)	Relay status indicator LEDs	When the relays get ON or OFF, the respective LEDs become, ON or OFF
(4)	Setpoint status indicator LEDs	Indicate which setpoint is displayed on lower row
(5)	Serial communication status indicator	Indicate that serial communication is in process.
(6)	★	In run mode, allows to enter setpoint mode. In program mode, allows to change value of parameter. In program mode, at parameter "VEr" if pressed for 6 sec, allows to enter calibration level.
	▲	Scrolls forward through the programmable parameters in program mode. Allows to increment the value of the selected parameter. In run mode, resets alarm when in latch alarm mode.
	▼	Scrolls backward through the programmable parameters in program mode. Allows to decrement the value of the selected parameter.

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TABLE 1						
SENSOR / INPUT	**RANGE LIMITS (°C / EU)**		**RANGE IN WHICH ACCURACY IS SPECIFIED**		**TYPICAL ACCURACY AT 30 °C (°C / EU)**	**WORST CASE ACCURACY (°C / EU)**
	LOW SCALE	**HIGH SCALE**	**LOW SCALE**	**HIGH SCALE**		
Input Group 1						
Pt - 6% Rh / Pt - 30% Rh (B)	400	1820	400	1820	± 3	± 5
Chromel / Constantan (E)	-270	850	0	850	± 1	± 3
Iron / Constantan (J)	-210	760	0	760	± 1	± 3
Chromel / Alumel (K)	-270	1372	-50	1200	± 1	± 3
Nicrosil / Nisil (N)	-270	1300	-50	1200	± 1	± 3
Pt / Pt - 13% Rh (R)	0	1760	400	1760	± 2	± 5
Pt / Pt - 10% Rh (S)	0	1760	400	1760	± 2	± 5
Copper / Constantan (T)	-270	400	-200	400	± 1	± 3
Pt100, 3-wire	-200	850	-200	600	± 0.3	± 1.0
Linear (0~50 mV, 0~20 mA, 4~20 mA)	-1999	9999	-1999	9999	± 5 EU	± 20 EU
Input Group 2						
The following inputs are available in Input Group 2 in addition to inputs of Input Group 1.						
Tungsten - 5% Rh / Tungsten - 26% Rh (C)	0	2320	0	2320	± 3	± 5
Tungsten - 3% Rh / Tungsten - 25% Rh (D)	0	2310	0	2310	± 3	± 5
Tungsten / Tungsten - 26% Rh (G)	0	2310	0	2310	± 3	± 5
Cu53	0	180	0	180	± 0.3	± 0.5
Linear (0~10 mV, 0~100 mV, 0~200 mV, 0~1 V, 0~5 V, 0~10 V)	-1999	9999	-1999	9999	± 5 EU	± 20 EU
Linear (4~20 mA) with square root	0	9999	0	9999	± 10 EU	± 40 EU

3. RELAY LOGIC

3.1 TIME PROPORTIONAL CONTROL

3.2 Alarm Output

a) Latch (Ltch)
In latch output, once relay gets ON, it remains 'ON' until alarm is acknowledged by ▲ key.

b) Hold
In alarm condition if instrument switched ON then it doesn't show alarm output, it shows alarm condition in second cycle when alarm appears.

c) Ltch.Hold
It is the combination of latch & Hold outputs.

4. BIAS MODE

In run mode upper display shows input1 and lower display shows input2. Press ✳ + ▲ together to enter into bias mode

Upper display will show input1 and lower display will flash "bia.1" (bias1 name) and its value alternately

To adjust the input1 press ▲ or ▼. Input1(upper display) will get modified accordingly and the new bias value will also be seen on the lower display.

After the input1 is modified to the desired value save the new bias1 by pressing ✳.

The lower display will show input2 and upper will flash "bia.2" and its value alternately. Follow above procedure to adjust input2 (▲ or ▼)

After the input2 is modified to the desired value save the new bias2 by pressing ✳. The instrument will return to run mode with both the upper & lower display showing the modified input 1& 2

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5. PROGRAM MODE GUIDE

To enter program mode, press & hold ▲ & ▼ keys together, in run mode.

Press ✲ + ▲ keys to increment the value of the selected parameter or increment the level, & press ✲ + ▼ keys to decrement the value of the selected parameter, or decrement the level.

Use ▲ key to go to next parameter.

Use ▼ key to go to previous parameter.

To exit from the program mode & enter run mode, press ▲ & ▼ keys together.

5.1 LEVEL init
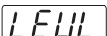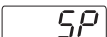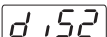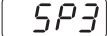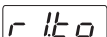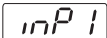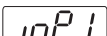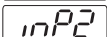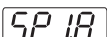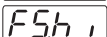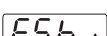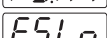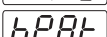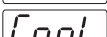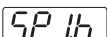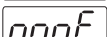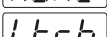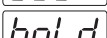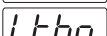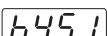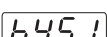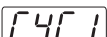
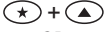| STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
1	Selection of level init	✲ + ▲ OR ✲ + ▼	*LEUL* **PV** *in it* **SP**	Selection of level init from option SP, inp, iout, init
2	Enter level init	▲	*br n.r* **PV** *dddd* **SP**	Next parameter is displayed
3	Selection of burn option for relays	✲ + ▲ OR ✲ + ▼	to *dddd* **SP** *uuuu* **SP**	Status of relay o/p when sensor fail occurs is selected from options u - up scale : At sensor fail condition relays remain on d - down scale : At sensor fail condition relays remain off
4	Storing of burn option for relays	▲	*br n.o* **PV** *dd* **SP**	Burn option for relays is stored & next parameter is displayed
5	Selection of burn option for analog output	✲ + ▲ OR ✲ + ▼	to *dd* **SP** *uu* **SP**	Status of analog o/p when sensor burnout occurs for eg : For 4 - 20mA type u : up scale : At sensor fail analog o/p is 20mA d : Downscale : At sensor fail analog o/p is 4 mA
6	Storing of burn option for analog output	▲	*Pr.o 1* **PV** *oFF* **SP**	Burn option for analog o/p is stored & next parameter is displayed
7	Setting of Pr.o1	✲ + ▲ OR ✲ + ▼	*Pr.o 1* **PV** *50* **SP**	% o/p for first current o/p when sensor fail occurs. For eg. for 4-20mA type OFF : 4mA 50% : 12mA 100% : 20mA
8	Storing of Pr.o1	▲	*Pr.o2* **PV** *oFF* **SP**	Pr.o1 is stored & next parameter is displayed
9	Setting of Pr.o2	✲ + ▲ OR ✲ + ▼	*Pr.o2* **PV** *50* **SP**	% o/p for second current o/p when sensor fail occurs for eg : for 4~20mA type OFF : 4mA 50% : 12mA 100% : 20mA
10	Storing of Pr.o2	▲	*r r'd* **PV** *dddd* **SP**	Pr.o2 is stored & next parameter is displayed
11	Selection of reverse / direct mode	✲ + ▲ OR ✲ + ▼	to *dddd* **SP** *rrrr* **SP**	Output relay mode d - direct action of relay r - reverse action of relay

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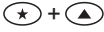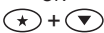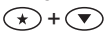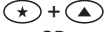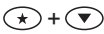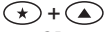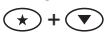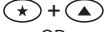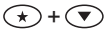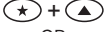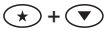
STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
12	Storing of reverse / direct mode	▲	`SPLӼ` PV `oFF` SP	Next parameter is displayed
13	Selection of setpoint lock	★ + ▲ OR ★ + ▼	`oFF` SP `on` SP	Select lock for setpoint from options Off : SP can be changed On : SP cannot be changed
14	Storing of setpoint lock	▲	`PGLӼ` PV `oFF` SP	Setpoint lock is stored & next parameter is displayed
15	Selection of parameter lock	★ + ▲ OR ★ + ▼	`oFF` SP `on` SP	Parameter lock is selected from options : Off : Parameters can be changed On : Parameters cannot be changed
16	Storing of parameter lock	▲	`FLtr` PV `A` SP	Parameter lock is stored & next parameter is displayed
17	Selection of software filter for input	★ + ▲ OR ★ + ▼	to `A` SP `F` SP	Software Input Filter FL A - no filtering (no-averaging) FL B - averaging of 1 samples of ADC FL C - averaging of 2 samples of ADC FL d - averaging of 4 samples of ADC FL E - averaging of 6 samples of ADC FL F - averaging of 8 samples of ADC
18	Storing of software filter	▲	`id` PV `1` SP	Software filter is stored & next parameter is displayed
19	Set serial ID for communication	★ + ▲ OR ★ + ▼	`id` PV `2` SP	Adjust serial id for communication
20	Storing of serial ID	▲	Version No.	Serial id is stored & next parameter is displayed
21	To enter calibration level	★	Version No.	
22	To access next parameter	▲	`rSEt` PV `nonE` SP	Next parameter is displayed
23	Selection of reset function	★ + ▲ OR ★ + ▼	`nonE` PV `ALL` SP	Select options for reset function none : No reset All : Press ▲ & ▼ keys together to reset the instrument to factory set value.
24		▲	`LEUL` PV `in it` SP	Level init is displayed

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5.2 Level Setpoint

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
25	Selection of level setpoint	▲ + ▼	`LEUL` PV `SP` SP	Selection of level init from option SP, inp, iout, init
26	To enter setpoint level	▲	`diS2` PV `SP1` SP	First parameter in level SP is displayed
27	Selection of parameter to be displayed on second row	★ + ▲ OR ★ + ▼	`SP1` SP `SP2` SP `SP3` SP `SP4` SP `inP2` SP	Parameter to be displayed on second row is selected from options : SP1, SP2, SP3, SP4, INP2
28	Storing of diS2	▲	`r1.to` PV `inP1` SP	diS2 parameter is stored & next parameter is displayed.
29	Selection of assignment of relay1	★ + ▲ OR ★ + ▼	`inP1` SP `inP2` SP	Relay 1 is assigned to Input 1 or Input 2
30	Storing of relay1 assignment	▲	`SP1.A` PV `FS.hi` SP	Relay 1 assignment is stored & next parameter is displayed
31	Selection of alarm type for relay1	★ + ▲ OR ★ + ▼	`FS.hi` SP `FS.Lo` SP `hEAt` SP `CooL` SP	Alarm type for relay1 is selected from options : FS.hi : High alarm FS.Lo : Low alarm heat : Heat mode cool : Cool mode
32	Storing of alarm type for relay1	▲	`SP1.b` PV `nonE` SP	Relay1 alarm type is stored & next parameter is displayed.
33	Selection of mode of alarm for relay1	★ + ▲ OR ★ + ▼	`nonE` SP `Ltch` SP `hoLd` SP `Lt.ho` SP	Alarm mode is selected from options : nonE Ltch : Latch mode hold : Hold mode Lt.ho : Latch + hold mode
34	Storing of alarm mode for relay1	▲	`hyS.1` PV `bnd.1` PV `0.1` SP	Alarm mode from relay1 is stored and next parameter is displayed.
35	Set hysterisis/band1 value for relay1	★ + ▲ OR ★ + ▼	`hyS.1` PV `bnd.1` PV `1.0` SP	Hysterisis 1 is adjusted.
36	Storing of hysterisis 1/band 1	▲	`CyC1` PV `onoF` SP	Hysterisis / band is stored. Cycle time for relay 1 is displayed (seen only if SP1.A=heat or cool)

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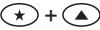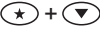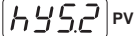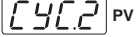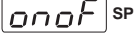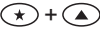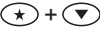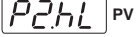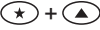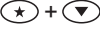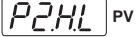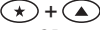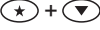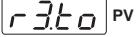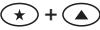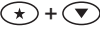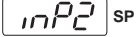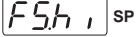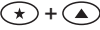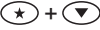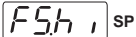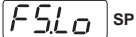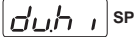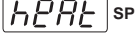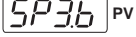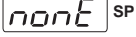
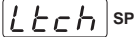| STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
37	Set cycle time for proportional mode	(★) + (▲) OR (★) + (▼)	`CYC.1` PV `5` SP	Adjust cycle time for relay1
38	Storing of cycle time1	(▲)	`P 1.HL` PV `100.0` SP	Cycle time 1 is stored & next parameter is displayed.
39	Set maximum limit	(★) + (▲) OR (★) + (▼)	`P 1.HL` PV `90.0` SP	Max limit of output power for SP1
40	Storing of maximum limit	(▲)	`P 1.LL` PV `0.0` SP	Max limit is stored & next parameter is displayed
41	Set minimum limit	(★) + (▲) OR (★) + (▼)	`P 1.LL` PV `10.0` SP	Min limit of output power for SP1
42	Storing of minimum limit	(▲)	`r2.to` PV `inP 1` SP	Minimum limit is stored & next parameter is displayed.
43	Selection of assignment of relay2	(★) + (▲) OR (★) + (▼)	`inP 1` SP `inP2` SP	Relay 2 is assigned to Input 1 or Input 2
44	Storing of relay 2 assignment	(▲)	`SP2.A` PV `FS.h i` SP	Relay 2 assignment is stored & next parameter is displayed.
45	Selection of alarm type for relay2	(★) + (▲) OR (★) + (▼)	`FS.h i` SP `FS.Lo` SP `du.h i` SP `du.Lo` SP `bnd.i` SP `bnd.o` SP `hEAt` SP `Cool` SP	Alarm type for relay2 is selected from option : FS.hi : High alarm FS.Lo : Low alarm du.hi : Deviation high alarm du.Lo : Deviation low alarm bnd.i : Band in alarm bnd.o : Band out alarm heat : heat mode cool : cool mode
46	Storing of alarm type for relay2	(▲)	`SP2.b` PV `nonE` SP	Relay2 alarm type is stored & next parameter is displayed.
47	Selection of alarm mode for relay 2	(★) + (▲) OR (★) + (▼)	`nonE` SP `Ltch` SP `hoLd` SP `Lt.ho` SP	Alarm mode for relay 2 is selected from options : nonE Ltch : Latch mode hold : Hold mode Lt.ho : Latch + hold mode
48	Storing of alarm mode for relay2	(▲)	`hYS.2` PV `bnd.2` PV `0.1` SP	Alarm mode from relay2 is stored and next parameter is displayed.

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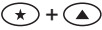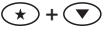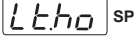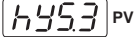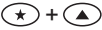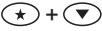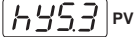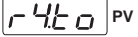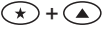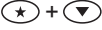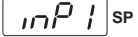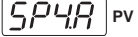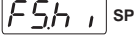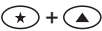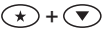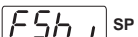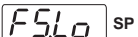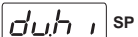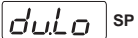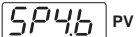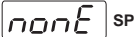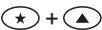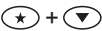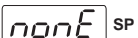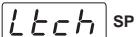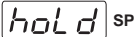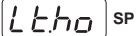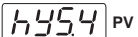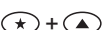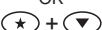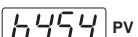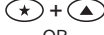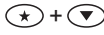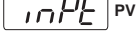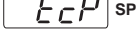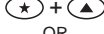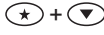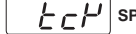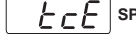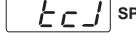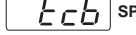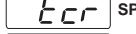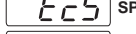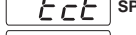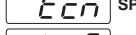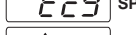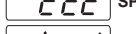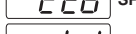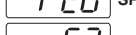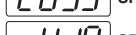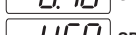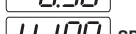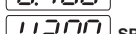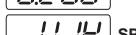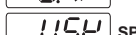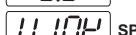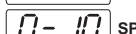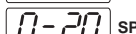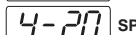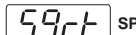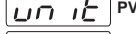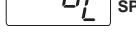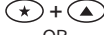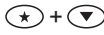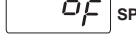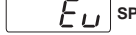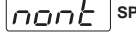
STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
49	Set hysterisis/band value for relay2	✦ + ▲ OR ✦ + ▼	hYS.2 PV bnd.2 PV 1.0 SP	Hysterisis 2/band 2 is adjusted.
50	Storing of hysterisis 2/ band 2	▲	CYC.2 PV onoF SP	Hysterisis 2 / band 2 is stored. Cycle time for relay 2 is displayed. (Seen only if SP2.A=heat or cool)
51	Set cycle time for proportional mode	✦ + ▲ OR ✦ + ▼	CYC.2 PV 5 SP	Adjust cycle time for relay2
52	Storing of cycle time	▲	P2.HL PV 90.0 SP	Cycle time for relay2 is stored & next parameter is displayed.
53	Adjust max limit	✦ + ▲ OR ✦ + ▼	P2.HL PV 100.0 SP	Maximum limit of output power for SP2
54	Store max limit	▲	P2.L.L PV 0.0 SP	Maximum limit is stored & next parameter is displayed.
55	Adjust min limit	✦ + ▲ OR ✦ + ▼	P2.L.L PV 10.0 SP	Minimum limit of output power for SP2 is adjusted.
56	Storing of minimum limit	▲	r3.to PV inP1 SP	Minimum limit is stored & next parameter is displayed.
57	Selection of assignment of relay3	✦ + ▲ OR ✦ + ▼	inP1 SP inP2 SP	Relay 3 is assigned to Input 1 or Input 2
58	Storing of relay 3 assignment	▲	SP3.A PV FS.h i SP	Relay 3 assignment is stored & next parameter is displayed.
59	Select alarm type for relay3	✦ + ▲ OR ✦ + ▼	FS.h i SP FS.Lo SP du.h i SP du.Lo SP bnd.i SP bnd.o SP hEAt SP Cool SP	Alarm type for relay3 is selected from options : FS.hi : High alarm FS.Lo : Low alarm du.hi : Deviation high alarm du.Lo : Deviation low alarm bnd.i : Band in alarm bnd.o : Band out alarm heat : heat mode cool : cool mode
60	Storing of alarm type for relay3	▲	SP3.b PV nonE SP	Relay3 alarm type is stored & next parameter is displayed.

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Cont... **Level Setpoint**

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
61	Selection of alarm mode for relay 3	★ + ▲ OR ★ + ▼	`nonE` SP `Ltch` SP `hoLd` SP `Lt.ho` SP	Alarm mode for relay 3 is selected from options : nonE Ltch : Latch mode hold : Hold mode Lt.ho : Latch + hold mode
62	Storing of alarm mode for relay3	▲	`hYS.3` PV `0.1` SP	Alarm mode for relay3 is stored and next parameter is displayed.
63	Set hysterisis value for relay3	★ + ▲ OR ★ + ▼	`hYS.3` PV `1.0` SP	Hysterisis 3 is adjusted.
64	Storing of hysterisis 3	▲	`r4.to` PV `inP1` SP	Hysterisis 3 is stored & next parameter is displayed.
65	Selection of assignment of relay 4	★ + ▲ OR ★ + ▼	`inP1` SP `inP2` SP	Relay 4 is assigned to Input 1 or Input 2.
66	Storing of relay 4 assignment	▲	`SP4.A` PV `FS.hi` SP	Relay 4 assignment is stored & next parameter is displayed.
67	Select type of alarm for relay4	★ + ▲ OR ★ + ▼	`FS.hi` SP `FS.Lo` SP `du.hi` SP `du.Lo` SP `bnd.i` SP `bnd.o` SP `hEAt` SP `CooL` SP	Alarm type for relay4 is selected from option : FS.hi : High alarm FS.Lo : Low alarm du.hi : Deviation high alarm du.Lo : Deviation low alarm bnd.i : Band in alarm bnd.o : Band out alarm heat : heat mode cool : cool mode
68	Storing of alarm type for relay4	▲	`SP4.b` PV `nonE` SP	Alarm type is stored & next parameter is displayed
69	Selection of alarm mode	★ + ▲ OR ★ + ▼	`nonE` SP `Ltch` SP `hoLd` SP `Lt.ho` SP	Alarm mode is selected from options : nonE Ltch : Latch mode hold : Hold mode Lt.ho : Latch + hold mode
70	Storing of alarm mode for relay4	▲	`hYS.4` PV `0.1` SP	Alarm mode for relay4 is stored and next parameter is displayed.
71	Set hysterisis value for relay4	★ + ▲ OR ★ + ▼	`hYS.4` PV `1.0` SP	Hysterisis 4 is adjusted.
72	Storing of hysterisis 4	▲	`LEUL` PV `SP` SP	Hysterisis 4 is stored & next parameter is displayed.

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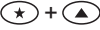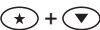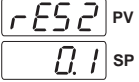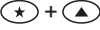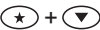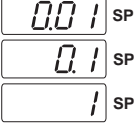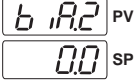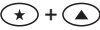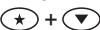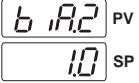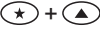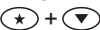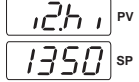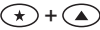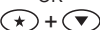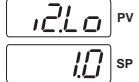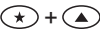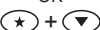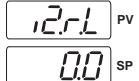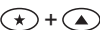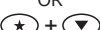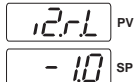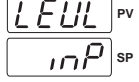
5.3 LEVEL inP

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
73	Selection of level input	⭐+🔼 OR ⭐+🔽	`LEUL` PV `inP` SP	Select inP level from options : SP, inP, iout, init
74	Enter level inP	🔼	`inPt` PV `tcH` SP	First parameter of level inP is displayed
75	To select input1	⭐+🔼 OR ⭐+🔽	`tcH` SP `tcE` SP `tcJ` SP `tcb` SP `tcr` SP `tc5` SP `tct` SP `tcn` SP `tc9` SP `tcc` SP `tcd` SP `rtd` SP `cu53` SP `U.10` SP `U.50` SP `U.100` SP `U.200` SP `U.1H` SP `U.5H` SP `U.10H` SP `0-10` SP `0-20` SP `4-20` SP `59.rt` SP	Select input from options : TCK : K type thermocouple TCE : E type thermocouple TCJ : J type thermocouple TCB : B type thermocouple TCR : R type thermocouple TCS : S type thermocouple TCT : T type thermocouple TCN : N type thermocouple TCG : G type thermocouple TCC : C type thermocouple TCD : D type thermocouple RTD : Pt100 CU53: V.10 : 0~10 mV input V.50 : 0~50 mV input V.100 : 0~100 mV input V.200 : 0~200 mV input V.1K : 0~1 V input V.5K : 0~5 V input V.10K : 0~10 V input 0-10 : 0~10 mA input 0-20 : 0~20 mA input 4-20 : 4~20 mA input 20-4 : 20~4 mA input Sqrt : Square root input Note : TC S, TC G, TC C, TC D , Cu53, 0~10 mV, 0~100 mV, 0~200 mV, 0~1 V, 0~5 V, 0~10 V & square root inputs are available only in input group 2
76	Storing of input1	🔼	`un it` PV `oC` SP	Input is stored & next parameter is displayed
77	Selection of unit for display	⭐+🔼 OR ⭐+🔽	`oC` SP `oF` SP `Eu` SP `nonE` SP	Unit is selected from options : Degree Centigrade Degree Farrenite Engineering unit for linear input only

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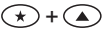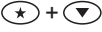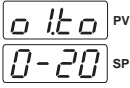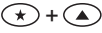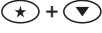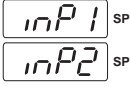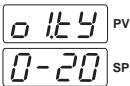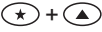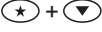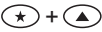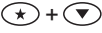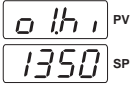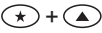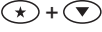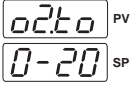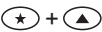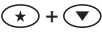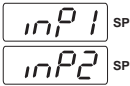
STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
78	Storing of unit	▲	`rE51` PV `0.1` SP	Unit is stored & next parameter is displayed
79	Selection of resolution for display1 & input A	★ + ▲ OR ★ + ▼	`0.01` SP `0.1` SP `1` SP	Resolution is selected from options : 0.01 0.1 1
80	Storing of resolution	▲	`biA.1` PV `0.0` SP	Resolution is stored and next parameter is displayed.
81	Set bias for input1	★ + ▲ OR ★ + ▼	`biA.1` PV `1.0` SP	Adjust bias for input 1
82	Store bias for input 1	▲	`i1.hi` PV `1000` SP	Bias for input 1 is stored & next parameter is displayed.
83	Set high scale value for input 1	★ + ▲ OR ★ + ▼	`i1.hi` PV `1950` SP	Adjust the high scale value for input1
84	Store high scale value for input1	▲	`i1.Lo` PV `0.0` SP	High scale for input1 is stored & next parameter is displayed
85	Set low scale value	★ + ▲ OR ★ + ▼	`i1.Lo` PV `1.0` SP	Adjust low scale value of input1
86	Storing of low scale1	▲	`i1.r.h` PV `50.0` SP	Low scale value 1 is stored & next parameter is displayed
87	Set maximum range of input1 selected	★ + ▲ OR ★ + ▼	`i1.r.h` PV `40.0` SP	Maximum range of input is adjusted. This parameter will be displayed only if linear mV/V input type is selected (i.e. 0~50mV, 0~10 mV, 0~100mV, 0~1V, 0~5V, 0~10V)
88	Storing of maximum range of input1	▲	`i1.r.L` PV `0.0` SP	Maximum range of input1 is stored & next parameter is displayed
89	Set minimum range of input1	★ + ▲ OR ★ + ▼	`i1.r.L` PV `- 1.0` SP	Minimum range of input is adjusted. This parameter will be displayed only if linear mV/V input type is selected (i.e. 0~50mV, 0~10 mV, 0~100mV, 0~1V, 0~5V, 0~10V)
90	Storing of minimum range of input1	▲	`inP2` PV `tC-H` SP	Minimum range is stored & next parameter is displayed

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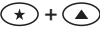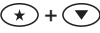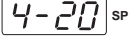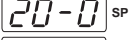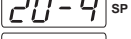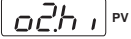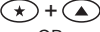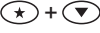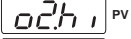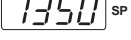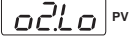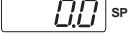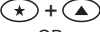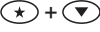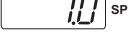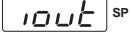
STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
91	To select input2	(★) + (▲) OR (★) + (▼)	Same as 75	Same as 75 Except for square root input
92	Storing of input 2	(▲)	r E5 2 PV 0.1 SP	Input 2 is stored & next parameter is displayed
93	Selection of resolution for display2 & input 2	(★) + (▲) OR (★) + (▼)	0.0 1 SP 0.1 SP 1 SP	Resolution is selected from options : 0.01 0.1 1
94	Storing of resolution 2	(▲)	b iA.2 PV 0.0 SP	Resolution 2 is stored & next parameter is displayed
95	Set bias of input2	(★) + (▲) OR (★) + (▼)	b iA.2 PV 1.0 SP	Adjust bias for input 2
96	Store bias for input 2	(▲)	i2.h i PV 100.0 SP	Bias for input 2 is stored & next parameter is displayed
97	Set high scale value for input2	(★) + (▲) OR (★) + (▼)	i2.h i PV 135.0 SP	Adjust high scale value for input2
98	Storing of high scale2	(▲)	i2.Lo PV 0.0 SP	Highscale2 is stored & next parameter is displayed
99	Set low scale value for input2	(★) + (▲) OR (★) + (▼)	i2.Lo PV 1.0 SP	Adjust low scale value for input2
100	Storing of low scale2	(▲)	i2.r.h PV 50.0 SP	Low scale 2 is stored & next parameter is displayed
101	Set maximum range of input2	(★) + (▲) OR (★) + (▼)	i2.r.h PV 40.0 SP	Maximum range of input is adjusted. This parameter will be displayed only if linear mV/V input type is selected (i.e. 0~50mV, 0~10 mV, 0~100mV, 0~1V, 0~5V, 0~10V)
102	Storing of maximum range of input2	(▲)	i2.r.L PV 0.0 SP	Maximum range of input2 is stored & next parameter is displayed
103	Set minimum range of input2	(★) + (▲) OR (★) + (▼)	i2.r.L PV - 1.0 SP	Minimum range of input is adjusted. This parameter will be displayed only if linear mV/V input type is selected (i.e. 0~50mV, 0~10 mV, 0~100mV, 0~2V, 0~5V, 0~10V)
104	Storing of minimum range of input2 selected	(▲)	LEUL PV inP SP	Minimum range is stored & next parameter is displayed

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5.4 LEVEL iout

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
105	Selection of output level	★ + ▲ OR ★ + ▼	`LEUL` PV `iout` SP	Select iout from options: SP, inp, iout, init
106	Enter level iout	▲	`o1.to` PV `0-20` SP	First parameter in level iout is displayed
107	Selection of assignment of output 1	★ + ▲ OR ★ + ▼	`inP1` SP `inP2` SP	Output 1 is assigned to : Input 1 or Input 2
108	Store output 1 assignment	▲	`o1.tY` PV `0-20` SP	Output1 assignment is stored & next parameter is displayed
109	Selection of type of output1 (retransmission)	★ + ▲ OR ★ + ▼	`0-20` SP `4-20` SP `20-0` SP `20-4` SP `Udc` SP	Select from options 0-20, 4-20, 20-4, 20-0, Volt output
110	Storing of type of output 1	▲	`o1.hi` PV `1000` SP	Output 1 type is stored & next parameter is displayed
111	Set high scale for output 1	★ + ▲ OR ★ + ▼	`o1.hi` PV `1350` SP	Adjust high scale for output1
112	Storing of high scale for output 1	▲	`o1.Lo` PV `0.0` SP	High scale value for output 1 is stored & next parameter is displayed
113	Set low scale value for output 1	★ + ▲ OR ★ + ▼	`o1.Lo` PV `1.0` SP	Adjust low scale value for output1
114	Storing of low scale for output 1	▲	`o2.to` PV `0-20` SP	Low scale value for output 1 is stored & next parameter is displayed.
115	Selection of assignment of output 2	★ + ▲ OR ★ + ▼	`inP1` SP `inP2` SP	Output 2 is assigned to : Input 1, Input 2
116	Storing of output 2 assignment	▲	`o2.tY` PV `0-20` SP	Output 2 assignment is stored & next parameter is displayed

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STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
117	Selection of type of output2 (retransmission)	★ + ▲ OR ★ + ▼	$0-20$ SP $4-20$ SP $20-0$ SP $20-4$ SP Udc SP	Select from options 0-20, 4-20, 20-4, 20-0, Volt output
118	Storing of type of output2	▲	$o2.hi$ PV 1000 SP	Output 2 type is stored & next parameter is displayed
119	Set high scale for output2	★ + ▲ OR ★ + ▼	$o2.hi$ PV 1350 SP	Adjust high scale for output 2
120	Storing of high scale for output2	▲	$o2.Lo$ PV 0.0 SP	High scale value for output2 is stored & next parameter is displayed
121	Set low scale value for output2	★ + ▲ OR ★ + ▼	$o2.Lo$ PV 1.0 SP	Adjust lowscale value of output 2
122	Storing of low scale value for output2	▲	$LEUL$ PV $iout$ SP	Low scale value of output 2 is stored & next parameter is displayed

5.5 LEVEL CAL

To enter calibration level press ★, when version number is being displayed in "init" level.

Note : Do not proceed through this section unless there is definite need to re-calibrate the instrument. All previous calibration data will be lost. Do not attempt recalibration unless you have available appropriate calibration equipment. If calibration data is lost, you will need to return the instrument to your supplier who may charge you a service fee to recalibrate the instrument.

The instrument will calculate the constants while exiting from program mode & store them in memory. Calibration should be done with all parameters properly set (I/P, unit etc.)

Complete calibration of the instrument requires calibration of
A. INPUT CALIBRATION
a) 0~50 mV
b) CJC
c) RTD
d) 4~20 mA input
e) Calibration of Input2
B. OUTPUT CALIBRATION
e) 4~20 mA output1
f)   4~20 mA output2

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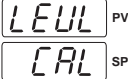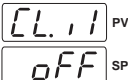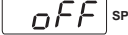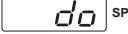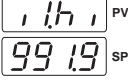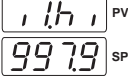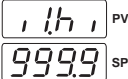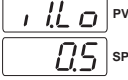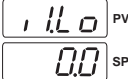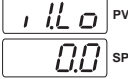
A. INPUT CALIBRATION

Calibrate the displayed reading from the front panel. With this facility the zero & span calibration errors can be adjusted.

Select "input" correctly from level input. For eg. for rtd calibration select input "Pt100", for mV/TC calibration select input "V50" (0~50 mV). For CJC calibration select input "TC K". For mA calibration select input either "0~20" or "4~20".

For better accuracy select maximum range of high scale & low scale (level input)

a) 0~50 mV Calibration (Select option "V50" of parameter "inp1" in level input)

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
123	Calibration level	⭐ when version no. is displayed in level init	LEUL PV CAL SP	Level cal is selected
124	Enter level Cal	▲	CL.i1 PV oFF SP	First parameter of level cal is displayed.
125	Calibration of 0~50mV (input 1)	⭐ + ▲ OR ⭐ + ▼	oFF SP on SP do SP	Select options Off : Calibration off On : Calibration on Do : Allows to do calibration
126	Calibration of input1	▲	i.h i PV 991.9 SP	
127	To calibrate higher limit, feed 50 mV through calibrator	⭐	i.h i PV 997.9 SP	Uncalibrated high value is displayed.
128	Adjust the display	⭐ + ▲ OR ⭐ + ▼	i.h i PV 999.9 SP	Adjust the display till it corresponds to the higher limit of input
129	Store higher limit. To calibrate lower limit feed 0mV through calibrator	▲	i.Lo PV 0.5 SP	Uncalibrated low value is displayed
130	Adjust the display	⭐ + ▲ OR ⭐ + ▼	i.Lo PV 0.0 SP	Adjust the display till it corresponds to lower limit of input selected
131	To save calibration & exit	▲ + ▼	i.Lo PV 0.0 SP	Calibration is saved & program enters run mode

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b) CJC (TC K calibration. Select "tc K" option of parameter "inp1" in level input) :For CJC calibration short the input terminals (ter11 & ter12) with K type thermocouple wire.

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
132	Calibration level	⭐ when version no. is displayed in level init	LEVL PV / CAL SP	Level cal is selected
133	Enter level Cal	▲	CL.11 PV / oFF SP	First parameter of level Cal is displayed.
134	Calibration of TC K (input1)	⭐ + ▲ OR ⭐ + ▼	oFF PV / on SP / do SP	Select options Off : Calibration off On : Calibration on Do : Allows to do calibration
135	Calibration of CJC	▲	CJC PV / 20.5 SP	
136	Calibrate CJC	⭐	CJC PV / 22.3 SP	Uncalibrated CJC is displayed.
137	Adjust the display	⭐ + ▲ OR ⭐ + ▼	CJC PV / 25.3 SP	Adjust the CJC till it corresponds to the standard thermometer
138	To save calibration & exit	▲ + ▼	CJC PV / 25.3 SP	Calibration is saved & program enters run mode

c) Pt100 calibration (select option "rtd" of parameter "inp1" in level inp)

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
139	Calibration level	⭐ when version no. is displayed in level init	LEVL PV / CAL SP	Level cal is selected
140	Enter level Cal	▲	CL.11 PV / oFF SP	First parameter of level cal is displayed.
141	Calibration of Pt100 (input1)	⭐ + ▲ OR ⭐ + ▼	oFF SP / on SP / do SP	Select options Off : Calibration off On : Calibration on Do : Allows to do calibration
142	Calibration of Pt100	▲	11h1 PV / 99 1.9 SP	

Cont...

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... Cont. Pt100 calibration

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
143	To calibrate higher limit, feed 247.06 ohm(corresponding to 400 °C) from decade box	★	ı ıh ı PV / 397.9 SP	Uncalibrated high value is displayed.
144	Adjust the display	★ + ▲ OR ★ + ▼	ı ıh ı PV / 400.0 SP	Adjust the display to the required temperature (400 °C)
145	Store higher limit. To calibrate lower limit, feed 100ohm (corresponding to 0 °C) through decade box	★	ı ıLo PV / 0.5 SP	Uncalibrated low value is displayed
146	Adjust the display	★ + ▲ OR ★ + ▼	ı ıLo PV / 0.0 SP	Adjust the display to required temperature (0°C)
147	To save calibration & exit	▲ + ▼	ı ıLo PV / 0.0 SP	Calibration is saved & program enters run mode

d) 4~20 mA input calibration. (Select option "4~20" of parameter "inp1" in level inp)

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
148	Calibration level	★ when version no. is displayed in level init	LEUL PV / CAL SP	Level cal is selected
149	Enter level Cal	▲	CL.ı1 PV / oFF SP	First parameter of level cal is displayed.
150	Calibration of 4~20 mA (input1)	★ + ▲ OR ★ + ▼	oFF SP / on SP / do SP	Select options Off : Calibration off On : Calibration on Do : Allows to do calibration
151	Calibration of 4~20 mA	▲	ı ıh ı PV / 991.9 SP	
152	To calibrate higher limit, feed 20mA through calibrator	★	ı ıh ı PV / 996.0 SP	Uncalibrated high value of input is displayed.
153	Adjust the display	★ + ▲ OR ★ + ▼	ı ıh ı PV / 999.9 SP	Adjust the display till it corresponds to the higher limit of input

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... Cont. 4~20 mA input calibration

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
154	Store higher limit. To calibrate lower limit, feed 4mA through calibrator	★	`ı lLo` PV `0.5` SP	Uncalibrated low value is displayed
155	Adjust the display	★ + ▲ OR ★ + ▼	`ı lLo` PV `0.0` SP	Adjust the display till it corresponds to the lower limit of input
156	To save calibration & exit	▲ + ▼	`ı lLo` PV `0.0` SP	Calibration is saved & program enters run mode
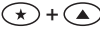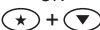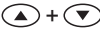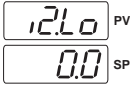
e) Calibration of Input2

i) Calibration of 0-50 mV. Select "v50" option of parameter "inp2" in level inp

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
157	Calibration level	★ when version no. is displayed in level init	`LEUL` PV `CAL` SP	Level cal is selected
158	Enter level Cal	▲	`CL. ı l` PV `oFF` SP	First parameter of level cal is displayed.
159	Calibration of input 2	▲	`CL. ı2` PV `oFF` SP	Parameter for calibration of input 2 is displayed
160	Calibration of 0~50 mV (input2)	★ + ▲ OR ★ + ▼	`oFF` SP `on` SP `do` SP	Select options Off : Calibration off On : Calibration on Do : Allows to do calibration
161	Calibration of 0~50mV	▲	`ı2.hı` PV `99 l.9` SP	
162	To calibrate higher limit, feed 50 mV through calibrator	★	`ı2.hı` PV `99 7.9` SP	Uncalibrated high value is displayed.
163	Adjust the display	★ + ▲ OR ★ + ▼	`ı2.hı` PV `999.9` SP	Adjust the display till it corresponds to the higher limit of input
164	Store higher limit. To calibrate lower limit, feed 0mV through calibrator	★	`ı2.Lo` PV `0.5` SP	Uncalibrated low value is displayed

Cont...

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... Cont. Calibration of 0-50 mV

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
165	Adjust the display	(★) + (▲) OR (★) + (▼)	i2.Lo PV 0.0 SP	Adjust the display till it corresponds to lower limit of input selected
166	To save calibration & exit	(▲) + (▼)	i2.Lo PV 0.0 SP	Calibration is saved & program enters run mode
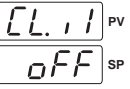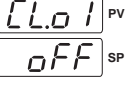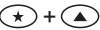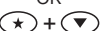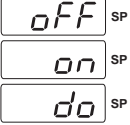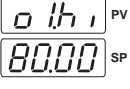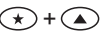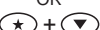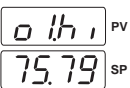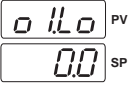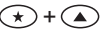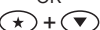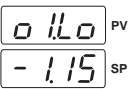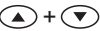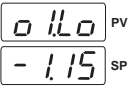
Follow steps 159 to 166 to do calibration for other inputs (rtd, 4~20) of input 2

B. LINEAR OUTPUT CALIBRATION

Calibration of linear current / voltage output can be done through front panel., With this facility ZERO & SPAN calibration error in current / voltage output can be adjusted.
Select "4-20" option of parameter "o1.ty" in level iout.
Connect current meter at the output terminal
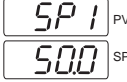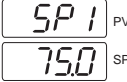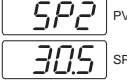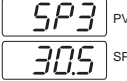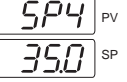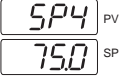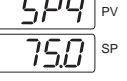
STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
167	Calibration level	(★) when version no. is displayed in level init	LEVL PV CAL SP	Level cal is selected
168	Enter level Cal	(▲)	CL.i1 PV oFF SP	First parameter of level cal is displayed.
169	Calibration of output 1	Press (▲) key till display shows CL.01	CL.o1 PV oFF SP	Calibration parameter of output 1 is displayed
170	Calibration of output 1	(★) + (▲) OR (★) + (▼)	oFF SP on SP do SP	Select options Off : Calbration off On : Calibration on Do : Allows to do calibration
171	To do calibration of output 1	(▲)	o1.hi PV 80.00 SP	
172	Calibrate higher limit	(★) + (▲) OR (★) + (▼)	o1.hi PV 75.79 SP	Adjust the display till current output on meter is 20 mA
173	Store higher limit.	(▲)	o1.Lo PV 0.0 SP	
174	Calibrate lower limit	(★) + (▲) OR (★) + (▼)	o1.Lo PV -1.15 SP	Adjust the display till current output on meter is 4mA
175	To save calibration & exit	(▲) + (▼)	o1.Lo PV -1.15 SP	Calibration is saved & program enters run mode

Follow the above steps for calibration of current output2

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6. SETPOINT MODE GUIDE

Press ▲ key to increment the value of the selected parameter & press ▼ key to decrement the value of the selected parameter.

STEP NO.	DESCRIPTION	KEY TO BE PRESSED	DISPLAY	ACTION
176	Enter setpoint mode	★ for 3 seconds	5P 1 PV / 50.0 SP	While in run mode
177	Set value of setpoint1	▲ OR ▼	5P 1 PV / 75.0 SP	Setpoint1 is adjusted
178	Storing of setpoint1	★	5P2 PV / 30.0 SP	Adjusted setpoint1 gets stored & next parameter is displayed.
179	Set value of setpoint2	▲ OR ▼	5P2 PV / 30.5 SP	Setpoint2 is adjusted.
180	Storing of setpoint2	★	5P3 PV / 30.5 SP	Adjusted setpoint2 gets stored & next parameter is displayed.
181	Set value of setpoint3	▲ OR ▼	5P3 PV / 75.0 SP	Setpoint3 is adjusted.
182	Storing of setpoint3	★	5P4 PV / 35.0 SP	Adjusted setpoint3 gets stored & next parameter is displayed.
183	Set value of setpoint 4	▲ OR ▼	5P4 PV / 75.0 SP	Setpoint4 is adjusted.
184	Store setpoint4 & exit from setpoint mode	★	5P4 PV / 75.0 SP	Enter run mode

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7. TROUBLE SHOOTING

7.1 Error Message

Display	Cause	Solution
Err	This message can occur while exiting from program mode. The cause is improper selection of some parameter.	Press ▲ key which will show the wrongly selected parameters & its value. Correct it.
$FA\,iL$	This message occurs if input wires are not connected or broken	Check input signal
$rPoL$	This message occurs in case of negative over range / under range at input	Check input wiring
$dFLt$	This message occurs, if any parameter is corrupted	Set the corrupted parameters to their default values.

8. DATA CORRUPTION

In case of user programmed data corruption, a message 'dfLt' is given immediately on power on & the instrument does not proceed further until the corrupted data is cleared by user.

The user has to reset the instrument by selecting "all" option of reset parameter in level init. Press ▲ & ▼ keys together to go ahead. All parameters are set to their default values. Instrument now requires initial selection which includes input & unit.

After pressing ▲ & ▼ keys together, it displays 'inpt none'. Select the desired input using ★ + ▲ key.

After selecting input, press ▲ key once it displays 'unit none'. Select the desired unit using ★ + ▲ key.

When selection is over, press ▲ & ▼ keys together which will enable the instrument to enter 'run' mode.

9. DIP SETTING FOR NON STANDARD INPUT

DIP SWA   DIP SWB
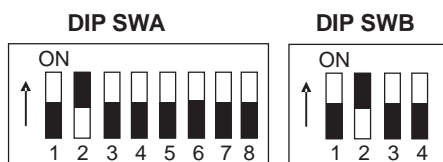
INPUT	SW1								SW2			
	1	2	3	4	5	6	7	8	1	2	3	4
0~1 V	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
0~5 V	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
0~10 V	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
0~10 mV	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF
0~100 mV	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
0~200 mV	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
TC/0~50 mV	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
RTD/Cu53	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF
mA	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF

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FOR COMMUNICATION PROTOCOL PLEASE REFER BELOW.

10. INTRODUCTION

The MODBUS/RTU protocol is messaging structure, widely used to establish master - slave communications between intelligent devices. A modbus message sent from a master to slave tells the selected slave what to do and what information to send back. The MODBUS/RTU protocol works with RS232, RS485 and RS422 standards.

11. SETTING THE SLAVE ADDRESS

Slave address (Serial ID) is programmable parameter. Refer to instruction manual.

12. RADIX PRODUCTS INCORPORATING MODBUS / RTU PROTOCOL

At present, the following products have the MODBUS/RTU protocol incorporated :

1. Programmable 16-channel scanner - ISOSCAN
2. PID controller - X Series
3. RPM/Rate Indicators - R490, RC722, …
4. Humidity & temperature controller - HX96A

13. SETTINGS

Band rate	9600
Start bit	1
Data bit	8
Stop bit	1
Parity	none

14. FUNCTIONS

When a message is sent from a master to a slave device the function code tells the slave what kind of action to perform. Generally, the following functions are implemented in Radix MODBUS products :
3 READ HOLDING REGISTERS
16 PRESET MULTIPLE REGISTERS

15. ADDRESSES

	Parameter	Type	Hex address	Absolute address
RO	PV1-input1	Float	01	40001
RO	PV2-input2	Float	03	40003
RW	SP1	Float	0D	40013
RW	SP2	Float	0F	40015
RW	SP3	Float	11	40017
RW	SP4	Float	13	40019
RO	Relay Status	Integer	15	40021
RO	Alarm Status	Integer	16	40022
RO	2nd row display Indicator	Integer	17	40023

16. RS-485 SYSTEM CONFIGURATION

ISOSCAN / X96A / HX96A is connected on RS485 bus. This consists of :

a) Host computer
b) RS232 to RS485 convertor
c) Intelligent devices (ISOSCAN, HX96A, X96A etc.)
d) RS485 bus