



UNIVERSAL INPUT 4 DIGIT PROCESS INDICATOR

Model : PI 542A

INSTRUCTION MANUAL

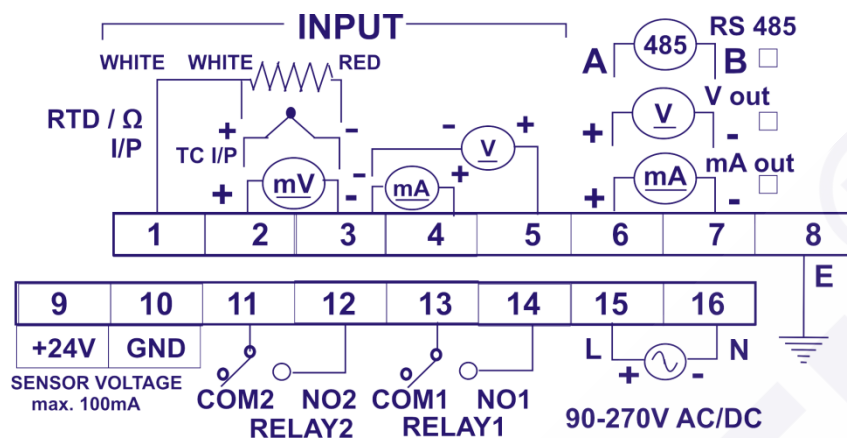


1. SPECIFICATION

Model	PI 542A
Display	4 Digit 0.5 " 7 segment RED LED
Password Access	Provided for user & supervisory settings
Temperature Inputs(selectable)	RTD - PT 100, Thermocouples - J, K, R, S, T, B, N, E
Analog Inputs(selectable)	mA , mV , Volt
Input & Display Ranges for Temp. Inputs (user Limit settable)	RTD - PT 100 - (-199 to 850°C / -327 to 1562°F) TC - J - (-199 to 1200°C / -327 to 2192°F) TC - K - (-199 to 1370°C / -327 to 2498°F) TC - R - (-40 to 1760°C / -40 to 3200°F) TC - S - (-50 to 1760°C / -58 to 3200°F) TC - T - (-199 to 390°C / -327 to 734°F) TC - B - (200 to 1800°C / 392 to 3272°F) TC - N - (-199 to 1290°C / -327 to 2354°F) TC - E - (-199 to 900°C / -327 to 1832°F) Ohms - (0 to 400 Ω)
Input Ranges for Analog Inputs	0 to + 20 mA / 0 to + 70 mV / 0 to + 10 Volt
Display Range for Analog Inputs	-1999 to + 9999 (scalable)
Temp. Input Resolution*	1 , 0.1 (selectable)(* 0.1 for selected types only)
Analog Input Resolution	1 , 0.1 , 0.01, 0.001 (selectable)
Display Hold based on delay (optional factory preset table)	Peak, valley & Average (selectable)
Hold delay	0 to 999 secs (selectable)
Tare option(optional factory preset table)	Provided on Front "Shift" key
Relay Output	2 Relay (5 A Rated)
Sensor Supply Output	24 V DC $\pm$ 10 % / 100mA Max. Load
Relay Status(selectable)	OFF, High, Low, High Low, Band, Diff. Hi Lo, Diff. band for each Relay
Relay Set point	High & Low Set point for each Relay (selectable)
Relay Cyclic Delay	0 to 250 sec for each Relay (selectable)
Relay Hysteresis	0 to 1000 counts for each Relay (selectable)
Analog Output *	Galvanically Isolated 4 - 20 mA (or) 0 - 10 V O/P (* optional factory presettable against order)
Mounting	Panel Mounting
Over all Dimension	96 x 48 x 110 (W x H x D) mm
Cut out Dimension	92 x 44(W x H) mm
Operating Environment	0 to 50°C / 20 to 95 % RH non condensing
Power Supply	90 to 270 V AC/DC 50Hz
Weight (Approx.)	350 g

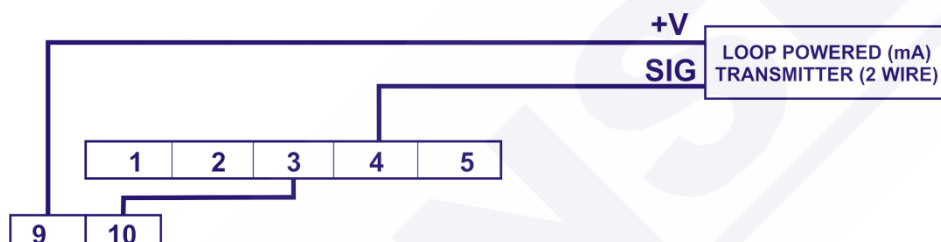
NOTE : Due to continuous improvements, Published specifications may change without notice

2. CONNECTION DETAILS

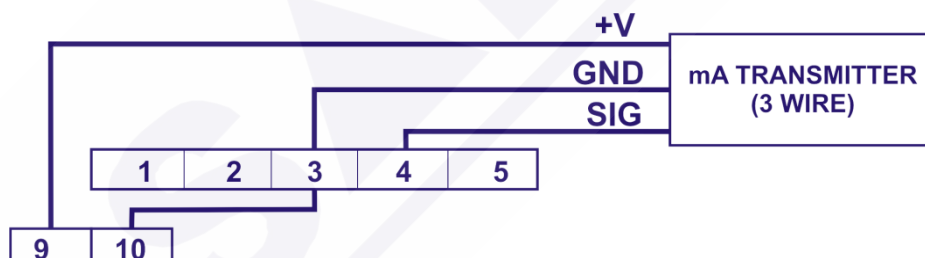


3. WIRING DETAILS

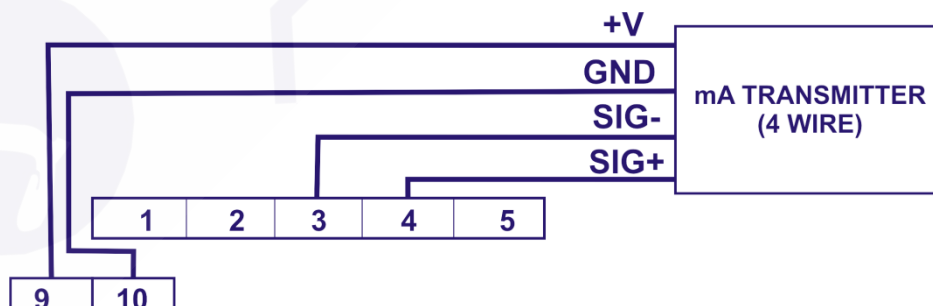
3.1. LOOP POWERED (mA) TRANSMITTER (2 wire)



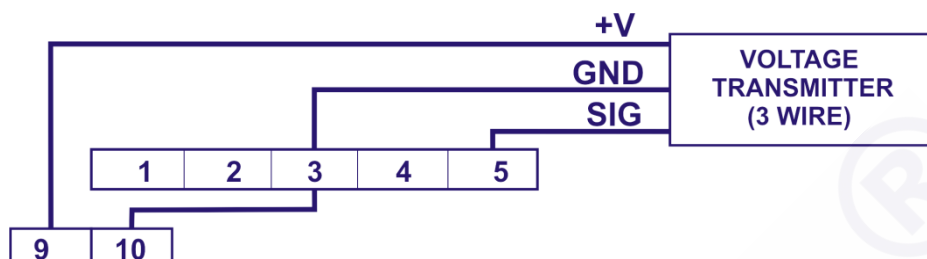
3.2. CURRENT(mA) TRANSMITTER (3 wire)



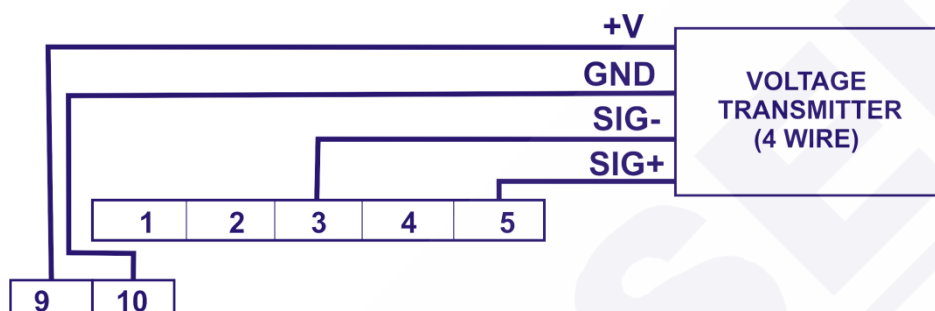
3.3. CURRENT(mA) TRANSMITTER (4 wire)



3.4. VOLTAGE TRANSMITTER (3 wire)



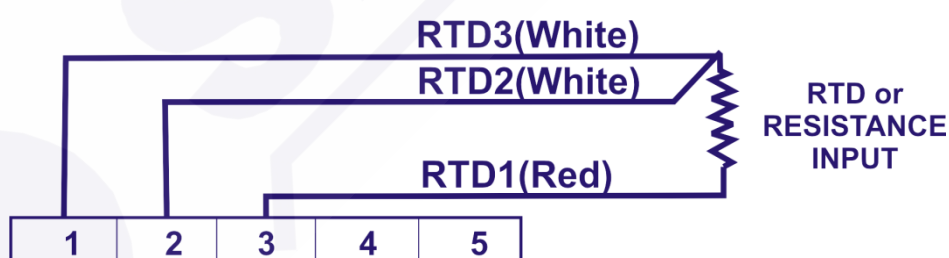
3.5. VOLTAGE TRANSMITTER (4 wire)



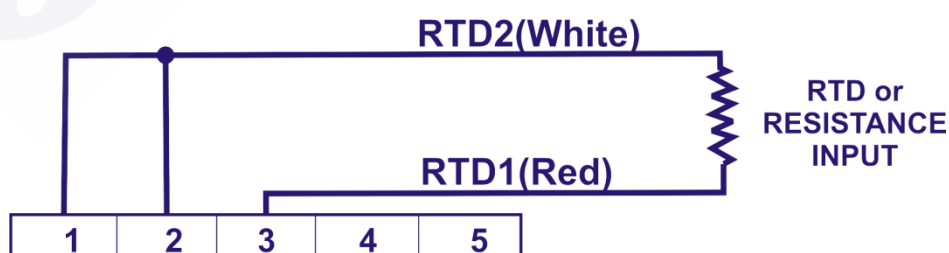
3.6. THERMOCOUPLE(TC) or mV INPUT



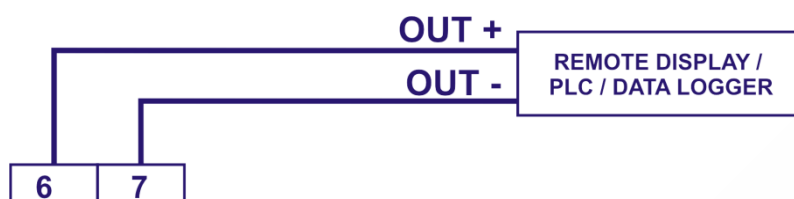
3.7. 3w RTD or RESISTANCE INPUT



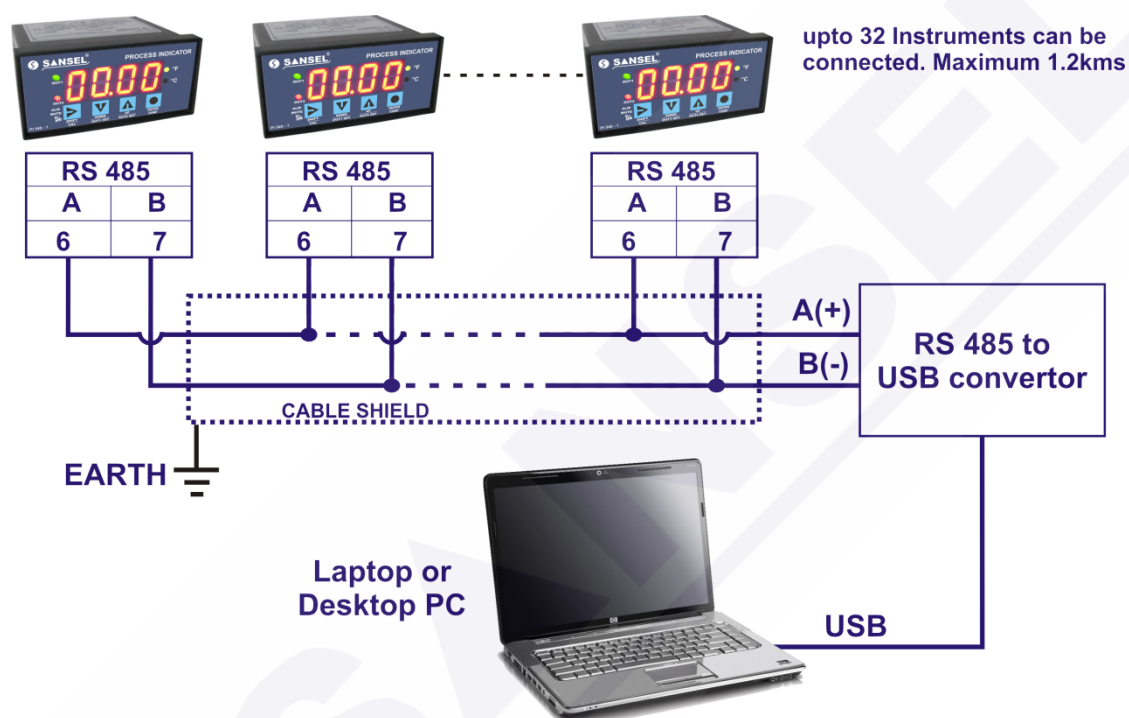
3.8. 2w RTD or RESISTANCE INPUT



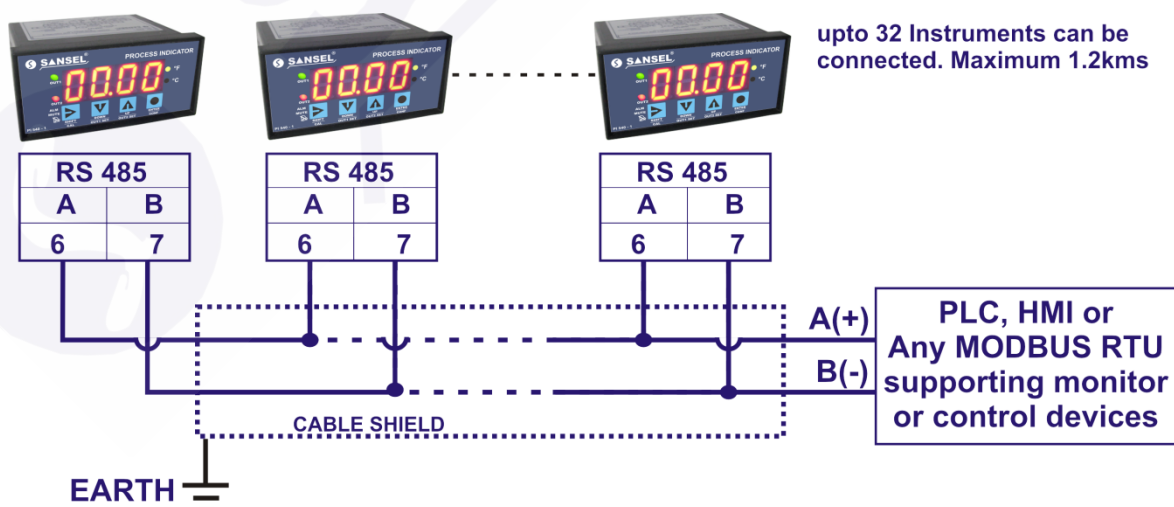
3.9. ANALOG RETRANSMISSION OUTPUT



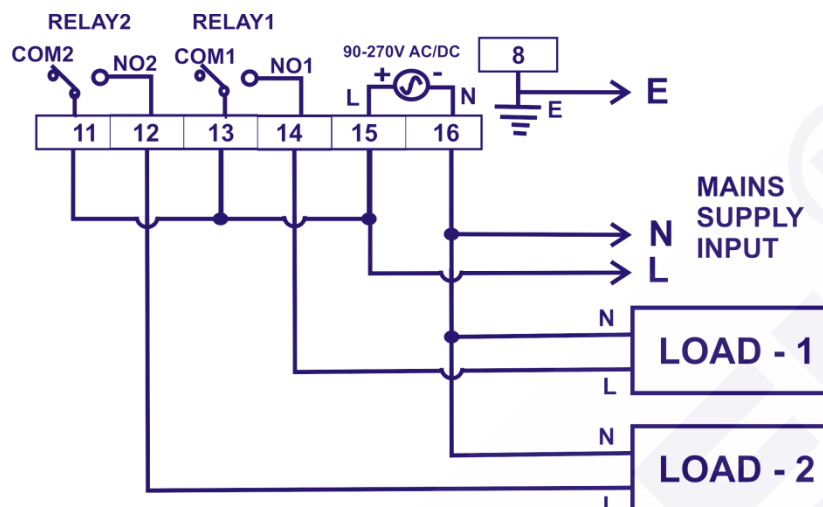
3.10. PC COMMUNICATION THROUGH RS 485



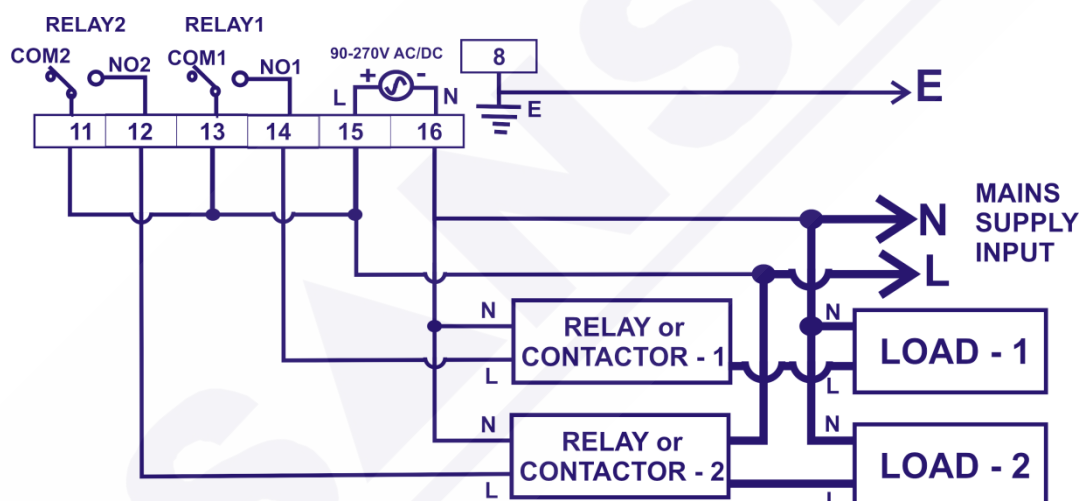
3.11. PLC, HMI or Other MODBUS RTU supporting Device connection



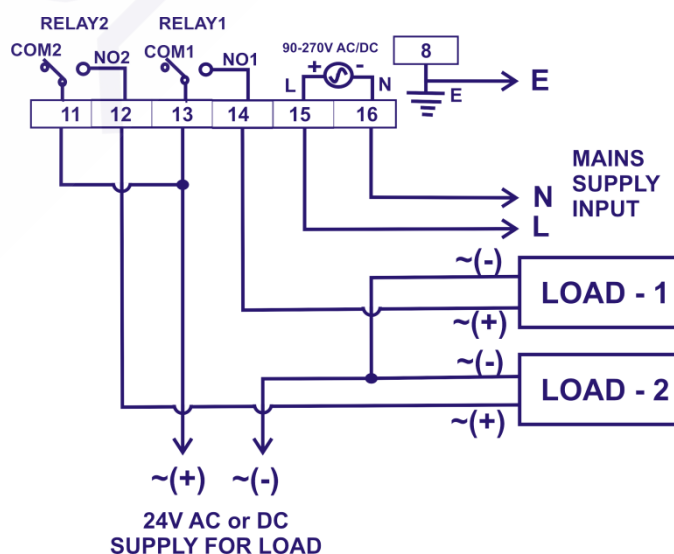
3.12. WIRING OF RELAY OUTPUT TO LOAD (SUPPLY 230V AC / BELOW 1kW LOAD)



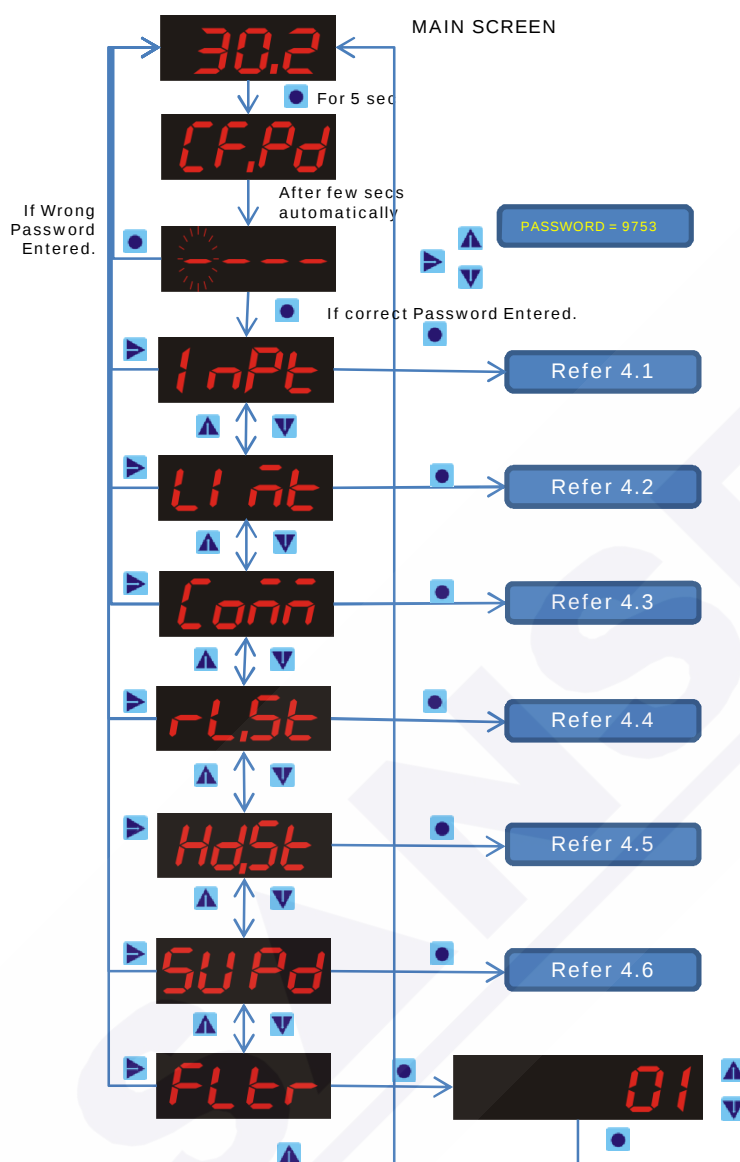
3.13. WIRING OF RELAY OUTPUT TO LOAD (SUPPLY 230V AC / ABOVE 1kW LOAD)



3.14. WIRING OF RELAY OUTPUT TO LOAD (SUPPLY 24V AC / DC)

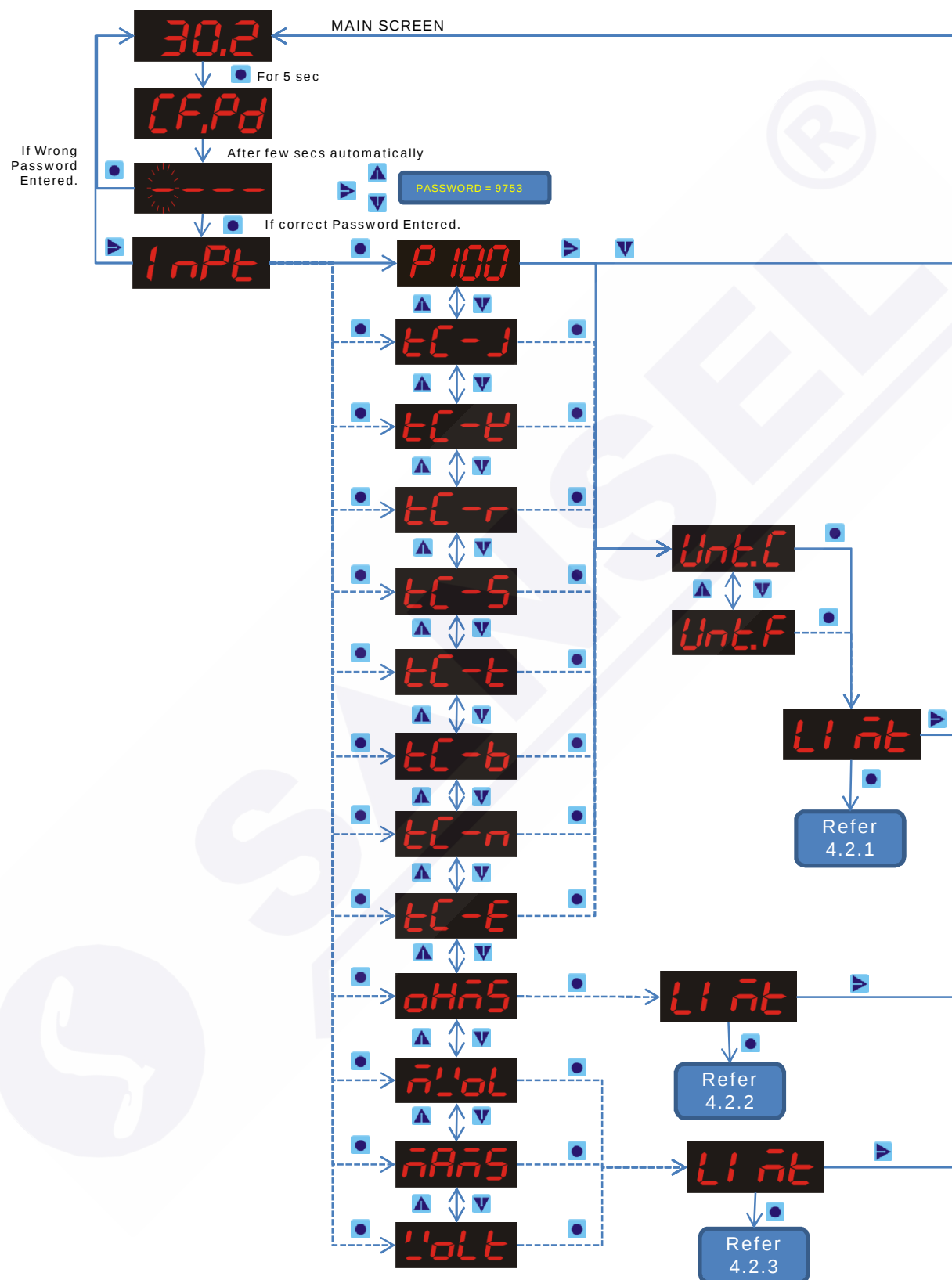


4. PROGRAMMING AND CONFIGURATION



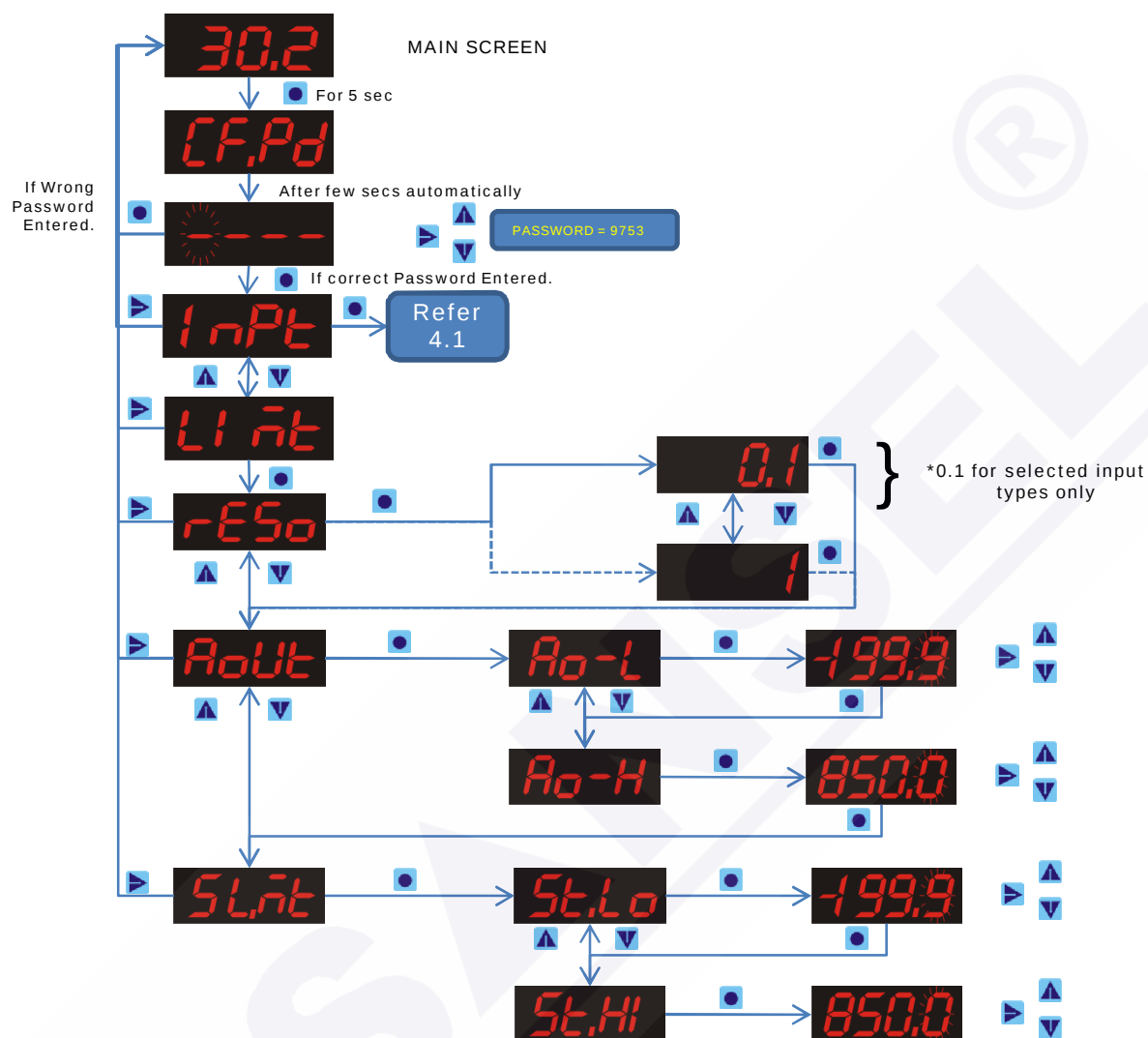
SYMBOL	NAME	DESCRIPTION
CF.Pd	CONFIGURATION PASSWORD	To protect all settings menus from unauthorized persons.
InPt	INPUT TYPE SELECTION	To change the "SENSOR or INPUT TYPE".
LI.Lt	LIMITS SETTINGS	To Configure Output Setvalue Limits, Resolution, Analog Input scale, Analog Display scale, Analog Output limits.
Co.nn	COMMUNICATION SETTINGS	To Configure the Communication parameter. Slave ID, Baud rate, Parity.
rLSt	RELAY & ALARM OUTPUT SETTINGS	To Configure the Output – 1 & 2 mode, Cyclic delay, Hysteresis, Alarm Function, Alarm Reset, Alarm Relay mode.
SUPd	SET VALUE PASSWORD SETTINGS	To Switch ON, OFF & Change the Set Value password
FLt.r	FILTER CONSTANT	To Configure the Filter Constant value between 1 to 10.

4 .1. INPUT TYPE SELECTION

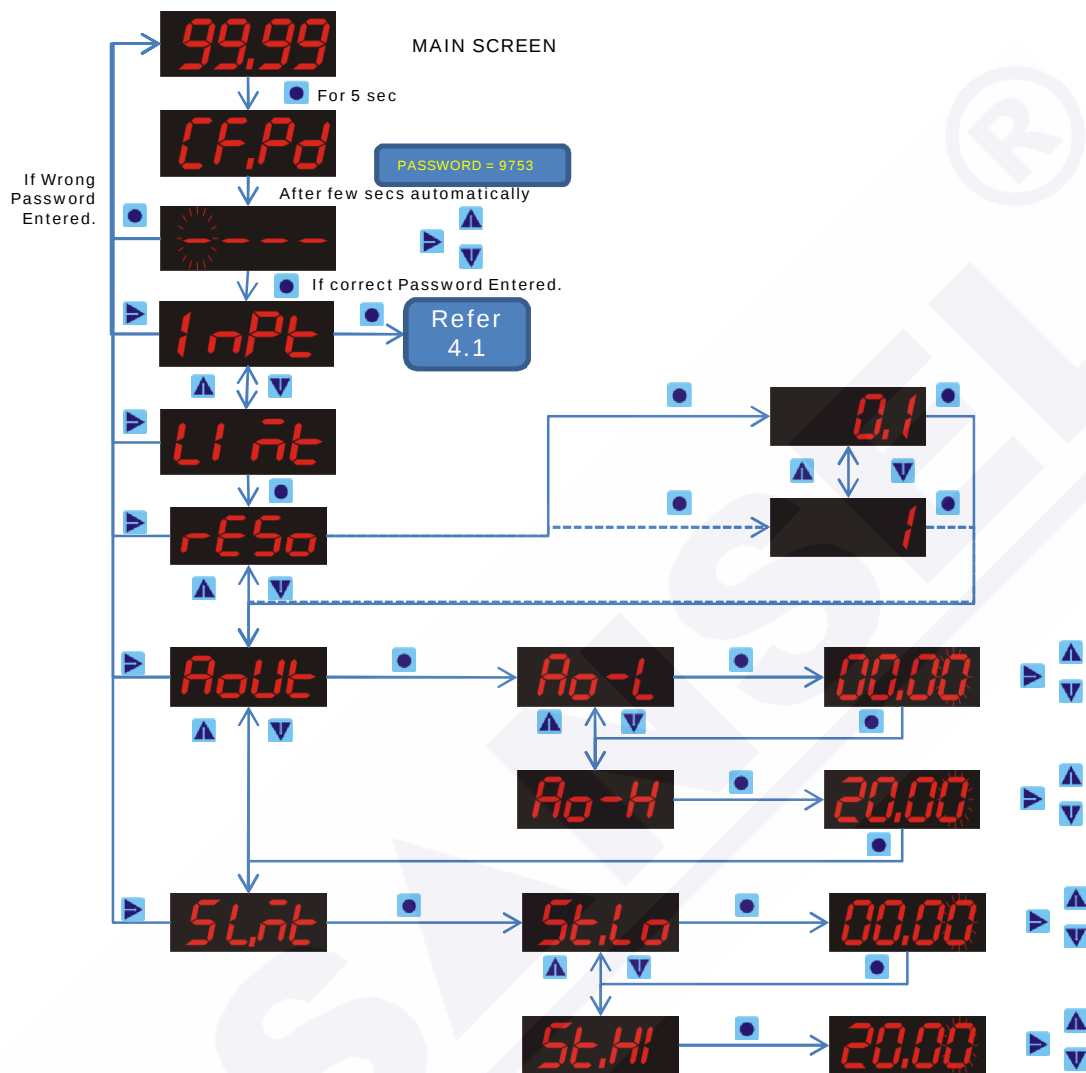


4.2. LIMITS SETTINGS

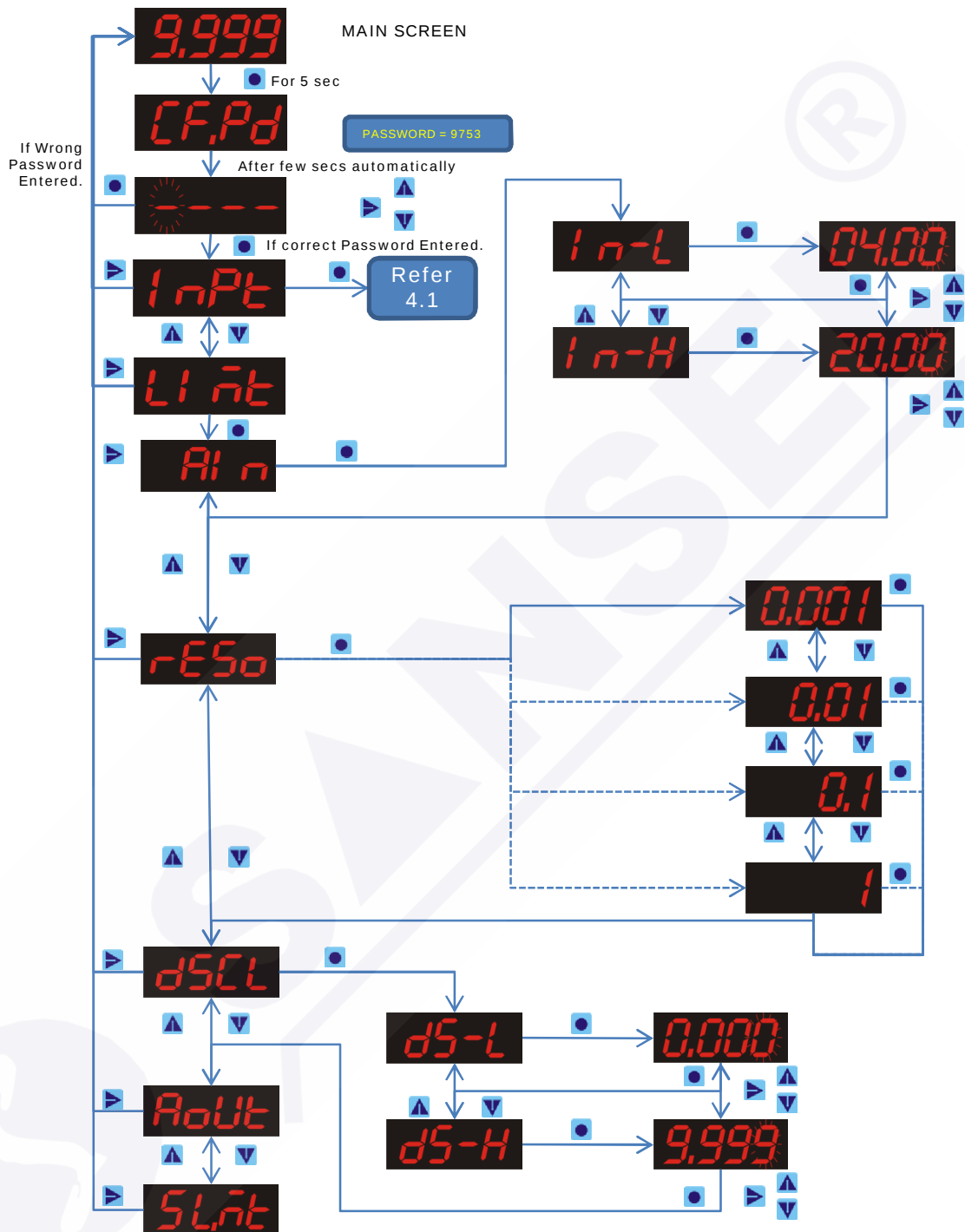
4.2.1. For Temperature Sensor Inputs (RTD & TC)



4.2.2. For Resistance Inputs (Ohms)

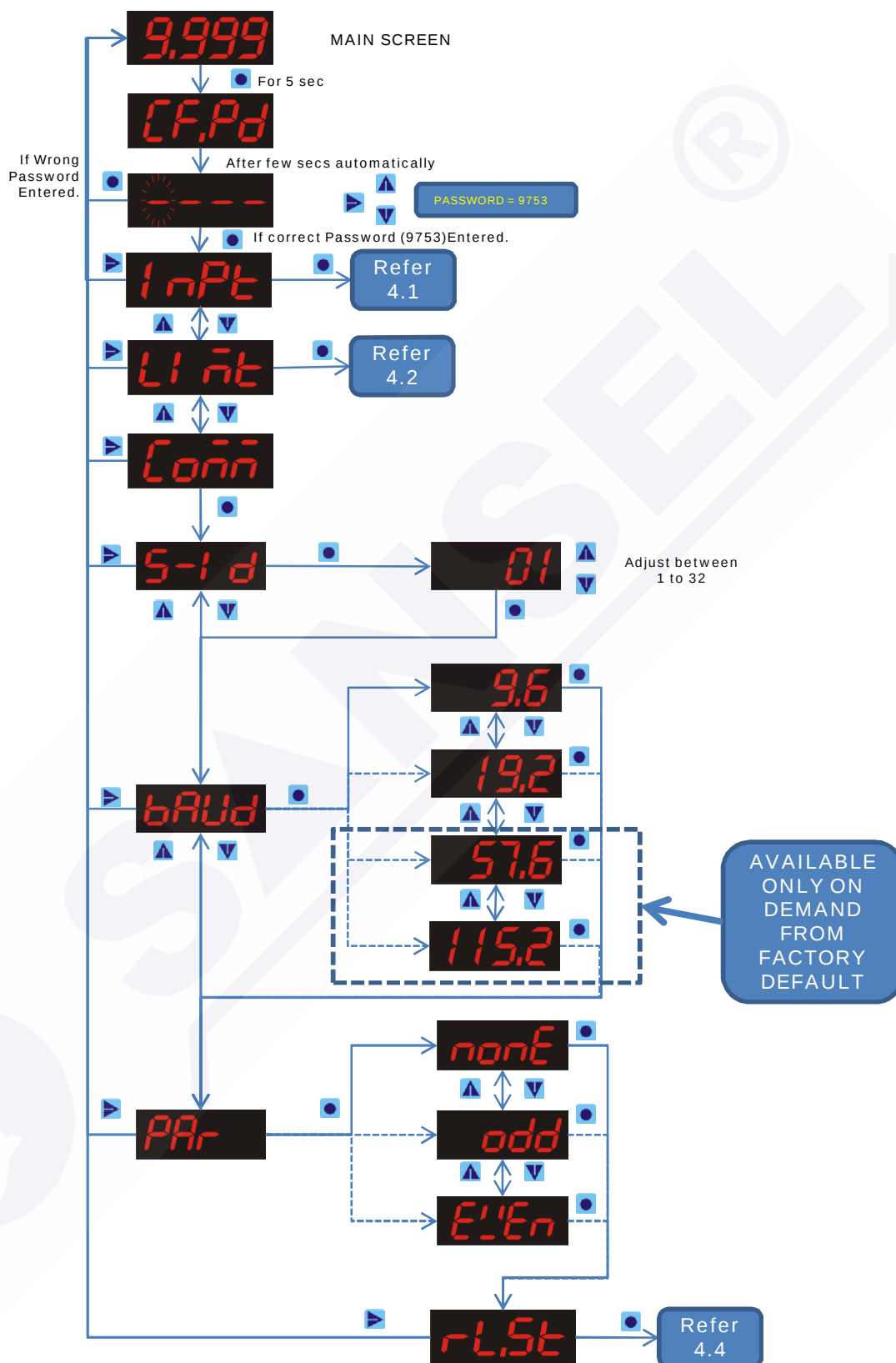


4.2.3. For Analog Inputs (mV, mA, Volt)



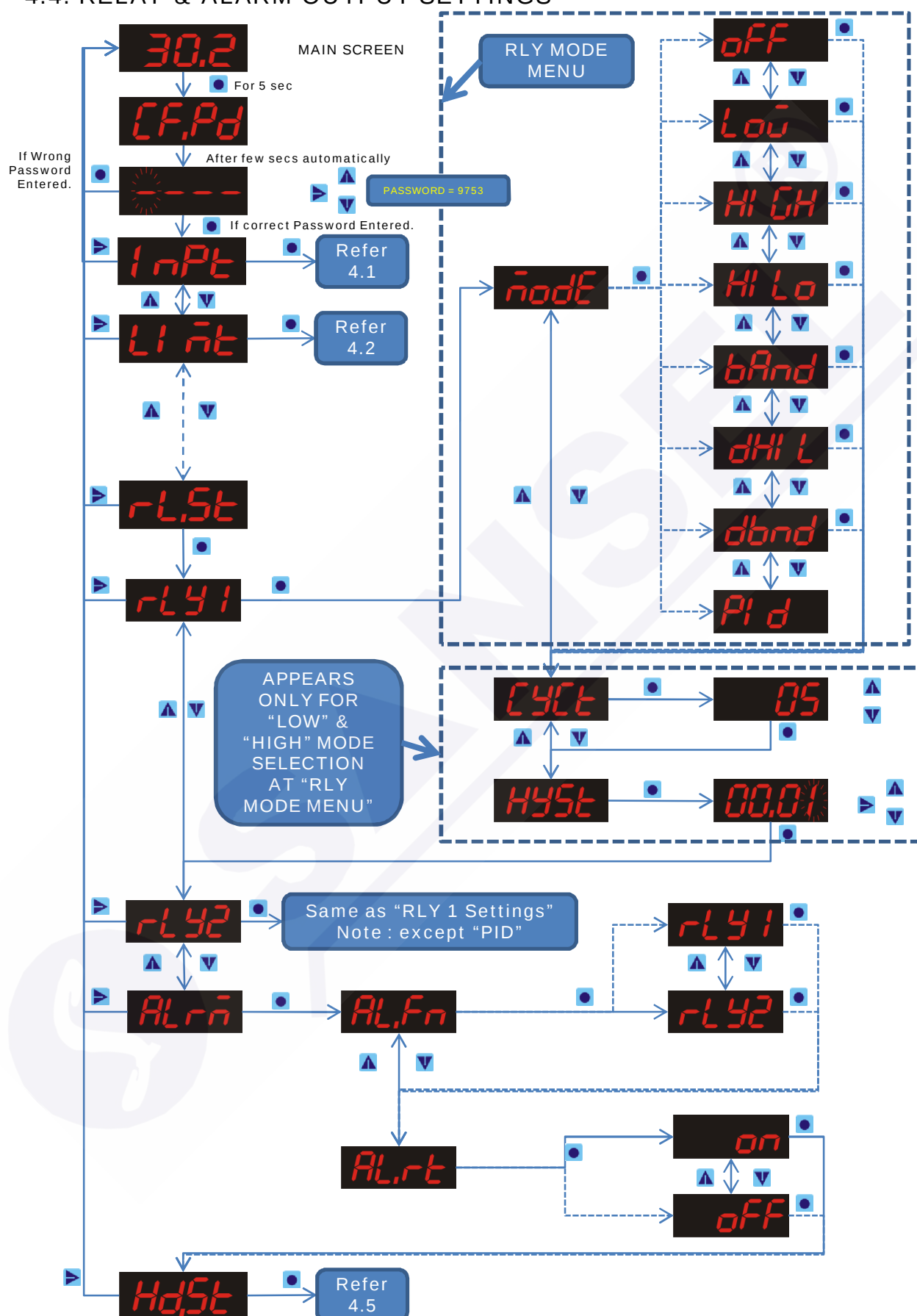
4.3. COMMUNICATION SETTINGS (optional)

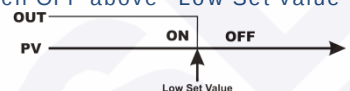
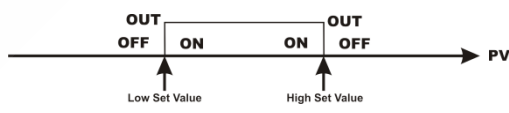
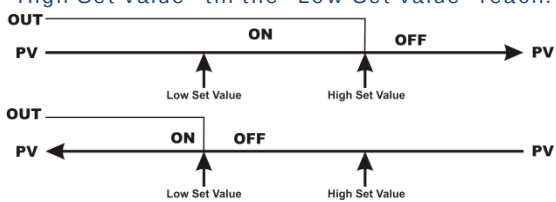
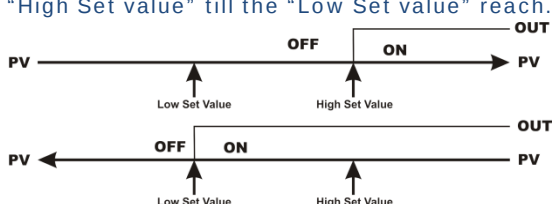
(Note : This menu visible only if enabled in factory)



SYMBOL	NAME	DESCRIPTION
rESo	PROCESS VALUE RESOLUTION	To Select the required "Resolution" of Process Value(PV) as per selected Input type.
RoUt	ANALOG RETRANSMISSION OUTPUT LIMIT	To Configure the "Analog Retransmission Output" range low and high limits.
Ro-L	ANALOG RETRANSMISSION OUTPUT LOW LIMIT	To Configure the "Analog Retransmission Output Low Limit" for "4mA" output.
Ro-H	ANALOG RETRANSMISSION OUTPUT HIGH LIMIT	To Configure the "Analog Retransmission Output High Limit" for "20mA" output.
SLt	SET VALUE LIMIT	To Configure the "Relay" Set value low and high limits.
StLo	SET VALUE LOW LIMIT	To Configure the "Relay" Set value low limits.
StHi	SET VALUE HIGH LIMIT	To Configure the "Relay" Set value high limits.
RI n	ANALOG INPUT LIMIT	To Configure the "Analog Input" range low and high limits.
In-L	ANALOG INPUT LOW LIMIT	To Configure the "Analog Input Low Limit" as per selected input type.
In-H	ANALOG INPUT HIGH LIMIT	To Configure the "Analog Input High Limit" as per selected input type..
dSCL	DISPLAY SCALE LIMIT	To Configure the Process Value(PV) "Display Scale" range low and high limits.
dS-L	DISPLAY SCALE LOW LIMIT	To Configure the "Display Scale Low Limit"(-1999 to 9999 counts).
dS-H	DISPLAY SCALE HIGH LIMIT	To Configure the "Display Scale High Limit"(-1999 to 9999 counts)..
S-ID	COMMUNICATION SLAVE ID	To Configure the "Slave ID" to PI 542A Instrument between 1 to 32.
bAUD	COMMUNICATION BAUD RATE	To Configure the "Baud Rate" to PI 542A Instrument between 9600, 19200, 57600 & 115200 bps. Note : 57600 & 115200 bps baud rate supports on special hardware need to be installed on request at factory.
PAR	COMMUNICATION PARITY	To Configure the "Parity" to PI 542A Instrument between None, Odd, & Even.

4.4. RELAY & ALARM OUTPUT SETTINGS

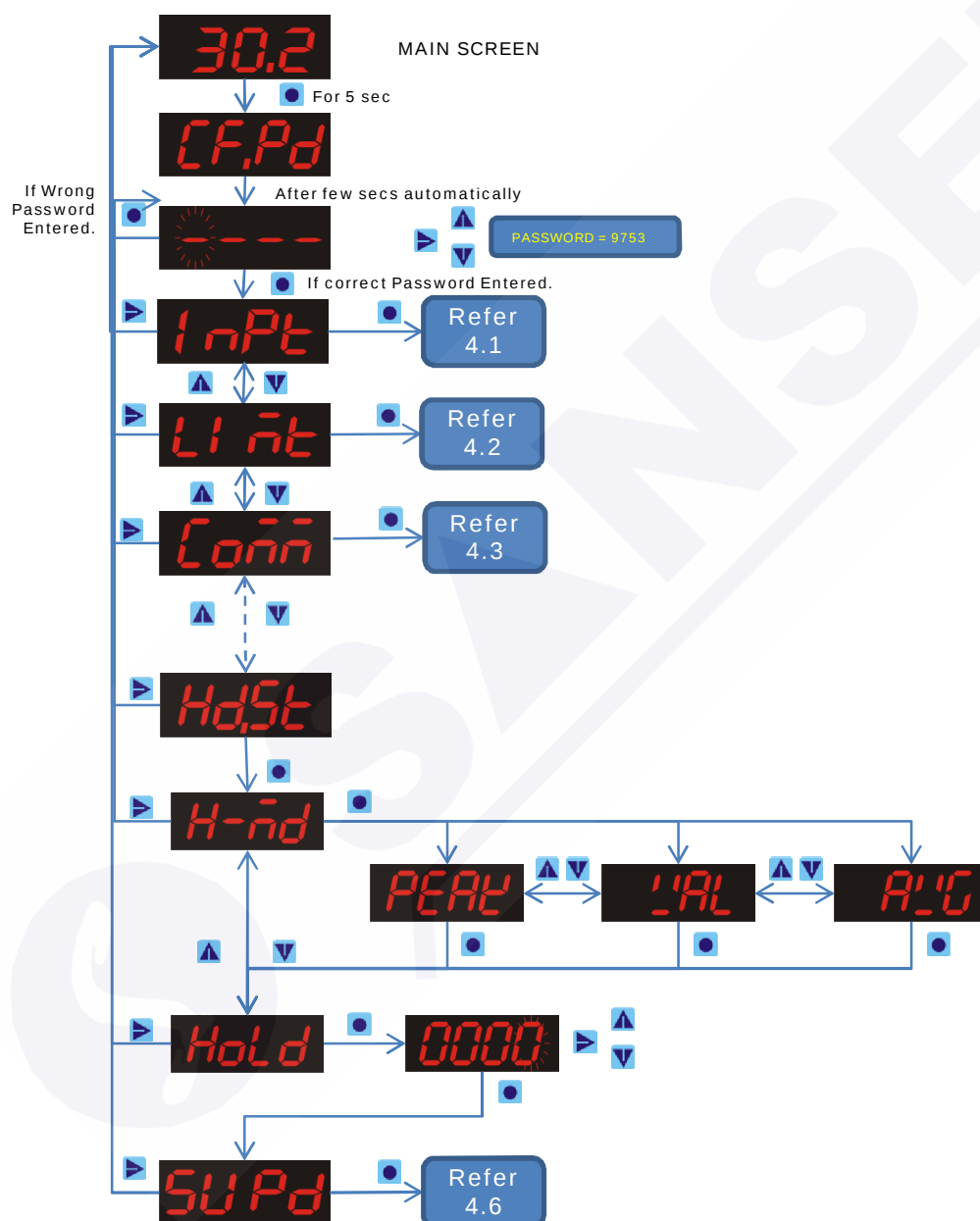


SYMBOL	NAME	DESCRIPTION
RLY1	RELAY – 1 SETTINGS	To Configure the “Relay – 1 settings”.
RLY2	RELAY – 2 SETTINGS	To Configure the “Relay – 2 settings”.
ALrñ	ALARM SETTINGS	To Configure the “Alarm settings”.
ñode	RELAY OUTPUT MODE	To Configure the “Relay Output Mode”.
HYSt	RELAY OUTPUT HYSTERESIS	To Configure the “Relay Output Hysteresis”.
CYCl	RELAY OUTPUT CYCLIC ON DELAY	To Configure the “Relay Output Cyclic ON delay”.
oFF	RELAY OFF	To Switch OFF the “Relay Output” at any condition of PV.
Loū	LOW	To Switch ON “Relay Output” during PV below “Low Set value” and Switch OFF above “Low Set value”. 
HI CH	HIGH	To Switch ON “Relay Output” during PV above “High Set value” and Switch OFF below “High Set value”. 
HI Lo	HIGH & LOW	To Switch ON “Relay Output” during PV above “High Set value” and below “Low Set value”. Switch OFF between both set values. 
bAnd	BAND	To Switch OFF “Relay Output” during PV above “High Set value” and below “Low Set value”. Switch ON between both set values. 
dHi L	DIFFERENTIAL HIGH & LOW	To Switch ON “Relay Output” during PV below “Low Set value” till the “High Set value” reach. Then Switch OFF after reaching “High Set value” till the “Low Set value” reach. 
dbnd	DIFFERENTIAL BAND	To Switch OFF “Relay Output” during PV below “Low Set value” till the “High Set value” reach. Then Switch ON after reaching “High Set value” till the “Low Set value” reach. 

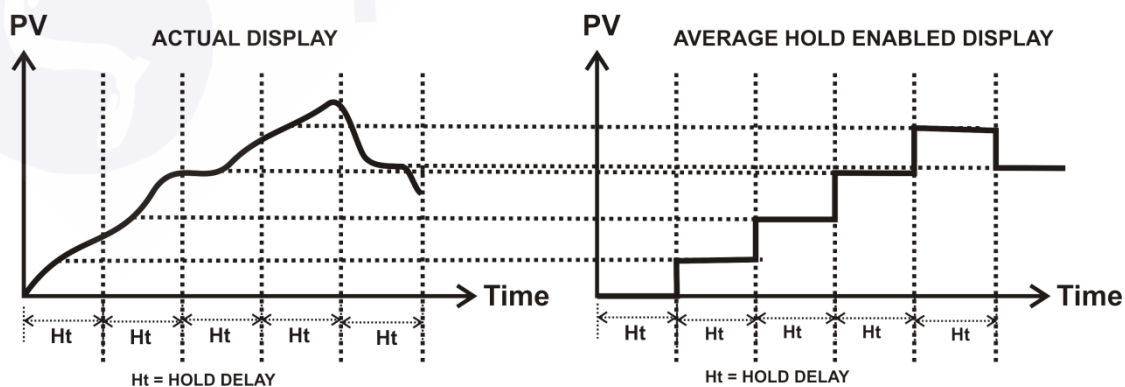
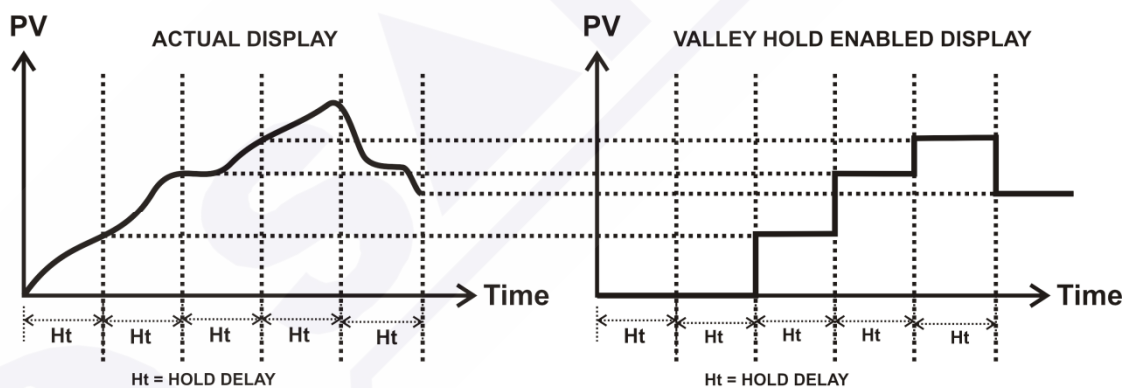
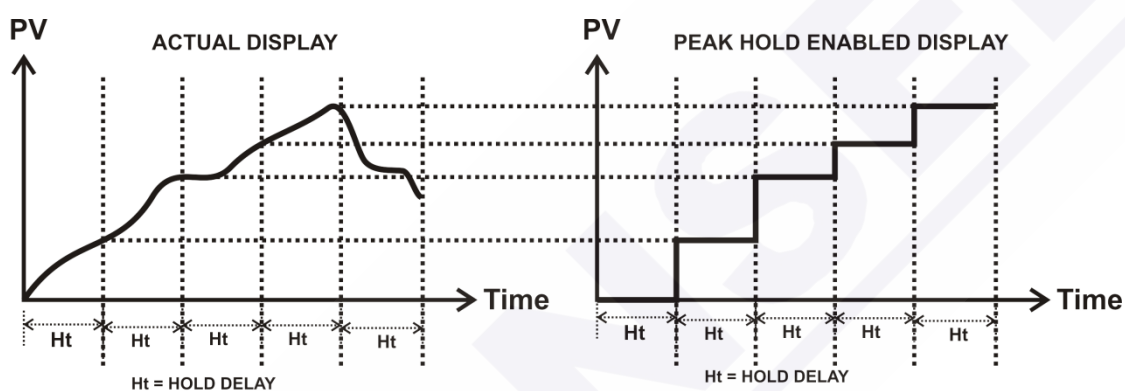
PId	PID MODE	For future use. Note : Don't select this mode.
ALFn	ALARM FUNCTION	To Configure the "Alarm Function", to which relay output activate for Alarm output.
ALrt	ALARM RESET	To Configure the "Alarm Reset". During alarm output activated, need to "Reset" the output by pressing front "ALM MUTE" key. The Reset will be "Enable(ON)" or "Disable(OFF)" using this function.

4.5. DISPLAY HOLD SETTINGS (optional)

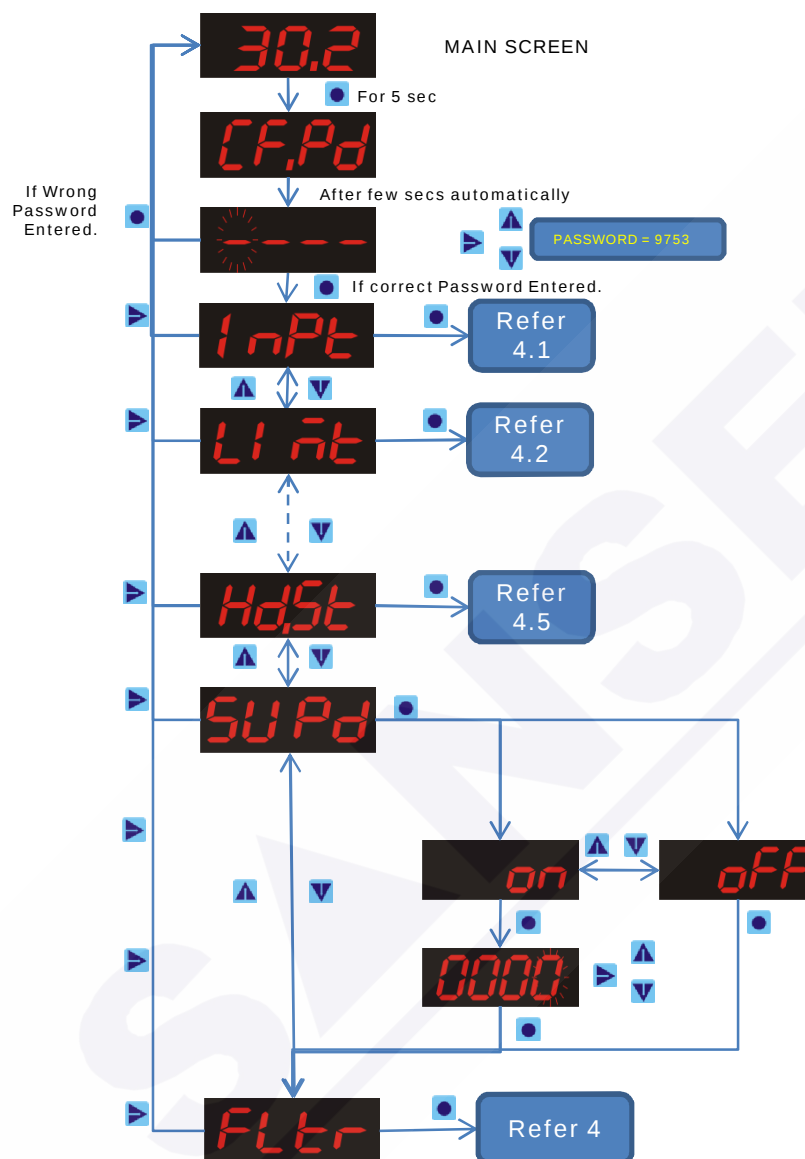
(Note : This menu visible only if enabled in factory)



SYMBOL	NAME	DESCRIPTION
HdSt	DISPLAY (PV) HOLD SETTINGS	To Configure the "Display (PV) Hold settings".
H-Mod	HOLD MODE SELECTION	To Select the "Hold mode".
PEAK	PEAK HOLD	To Configure the "Peak Hold Mode".
VAL	VALLEY HOLD	To Configure the "Valley Hold Mode".
Avg	AVERAGE HOLD	To Configure the "Average Hold Mode".
Hold	HOLD DELAY	To Configure the "Display Hold delay" between 0 to 999 sec.



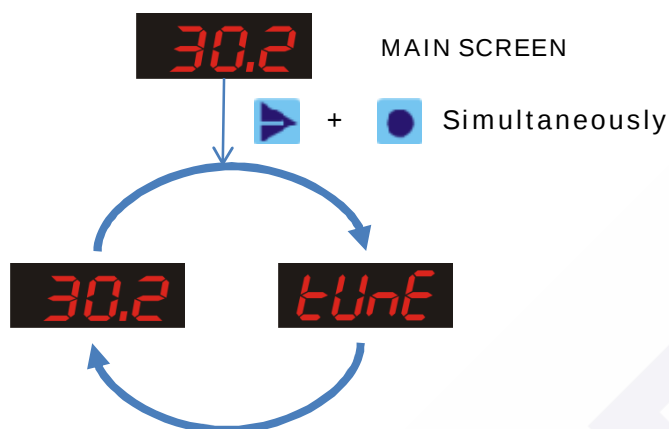
4.6. SET VALUE PASSWORD SETTINGS



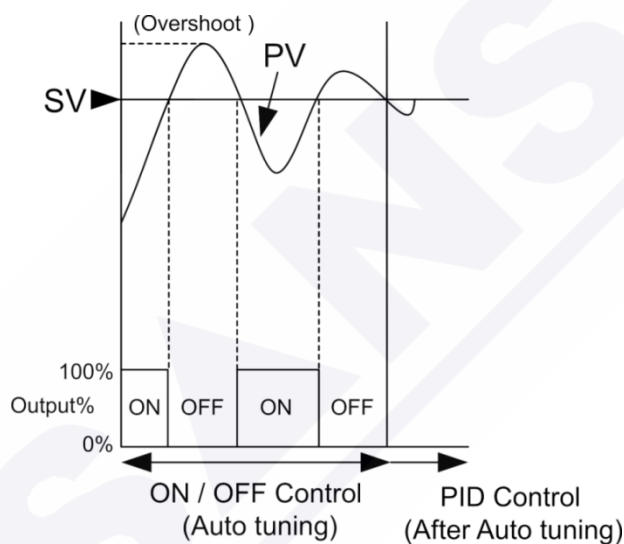
SYMBOL	NAME	DESCRIPTION
on	PASSWORD ON	To Enable(ON) Relay Set value entry password.
off	PASSWORD OFF	To Disable(OFF) Relay Set value entry password.

4.7. PID AUTO TUNING

NOTE : IT WORKS ONLY "RELAY – 1 MODE" SELECTED AS "PID" (Refer 4.5.)

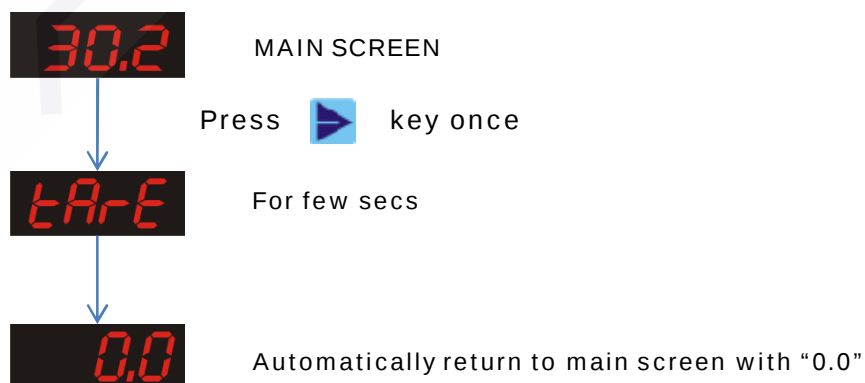


Display flash between main screen & "tune" till the Auto tune process end.



4.8. TARE OPTION (optional)

(Note : This option works only, if option enabled in factory on customer request during order)



5. CALIBRATION PROCEDURE FOR PI 542A

5.1. PROCESS VALUE (PV) CALIBRATION

For better accuracy, Calibration of the PI 542A is recommended. In addition, the PI 542A must be recalibrated whenever:

- The sensor is replaced.
- After testing long term in high temperature.
- Where high accuracy is required.
- At least twice an year.

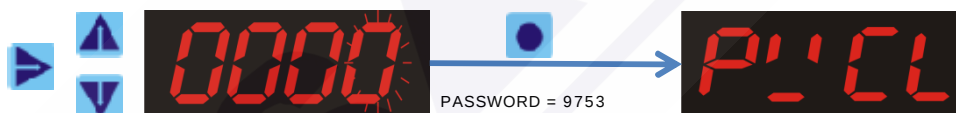
NOTE : For Best results, calibrate with certified accurate standard source. Follow the steps given below to field calibrate the PI 542A . PI 542A has a 2 POINT(zero & span) calibration.

STEP 1 : Adjust "Process Value(PV)" using standard source to give a constant minimum Input

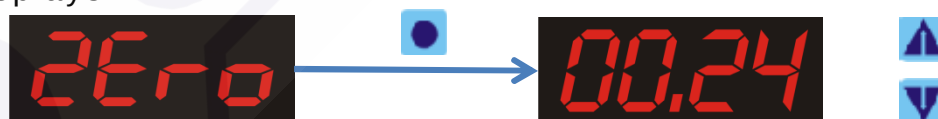
STEP 2 : Measure PV for a test time period (ex. 1 min)

STEP 3 : If error occurs in the minimum reading, adjust the error using following steps, otherwise ignore it.

STEP 4 : In Main Screen, to Enter into the "Zero Calibration" Mode, Press MODE Key till the "CONF" password screen appear. Then enter the password, the display enters the PV calibration



STEP 5 : Then press ENTER Key to enter into the "Zero Calibration" the Display Shows "ZERO", again press ENTER key the minimum error read displays.



STEP 6 : Then use UP & DN keys to adjust the error reading to master reading and press ENTER Key again to save and exit to main screen.

STEP 7 : Measure PV for a test time period (ex. 1 min)

STEP 8 : If error occurs in the maximum reading, adjust the error using following steps, otherwise ignore it.

STEP 9 : In Main Screen, to Enter into the “Span Calibration” Mode, Press MODE Key till the “CONF” password screen appear. Then enter the password, the display enters the PV calibration



STEP 10 : Then press ENTER Key to enter into the “Span Calibration” the Display Shows “ZERO”, press UP key to scroll the display to “SPAN” as follows.



STEP 11 : Then press ENTER Key the maximum error read displays, use UP & DN keys to adjust the error reading to master reading and press ENTER Key to save and exit to main screen.



5.2. ANALOG RETRANSMISSION OUTPUT CALIBRATION

For better accuracy, Calibration of the PI 542A Analog output is recommended with the master measure unit(like mA / V measurable multi meter) or any remote display unit. In addition, the PI 542A must be recalibrated whenever:

- The measure or display unit is replaced.
- After testing long term in high temperature.
- Where high accuracy is required.
- At least twice an year.

NOTE : For Best results, calibrate with certified accurate standard measure. Follow the steps given below to field calibrate the PI 542A analog output. PI 542A has a 2 POINT(zero & span) analog output calibration.

STEP 1 : Connect the Analog Output of PI 542A Analog output to master measure or remote display unit (Refer 3.9.).

STEP 2 : In Main Screen, to Enter into the “Analog output Calibration” Mode, Press MODE Key till the Display Shows “PV-CAL”, now press UP key the display enters the “Analog output calibration mode.



STEP 3 : Then press ENTER Key to enter into the output “zero calibration” the Display Shows “ZERO”, again press ENTER key the display shows “Zero”, now press ENTER key the display shows present “zero” count value, simultaneously “Analog output” terminal gives the minimum output (4mA).



STEP 6 : Then use UP & DN keys to roll over 0 – 9 and move blinking digit by MODE key to adjust the zero count value to adjust the output measure read to 4mA and press ENTER Key to save and enter into the output “SPAN” calibration mode as follows.



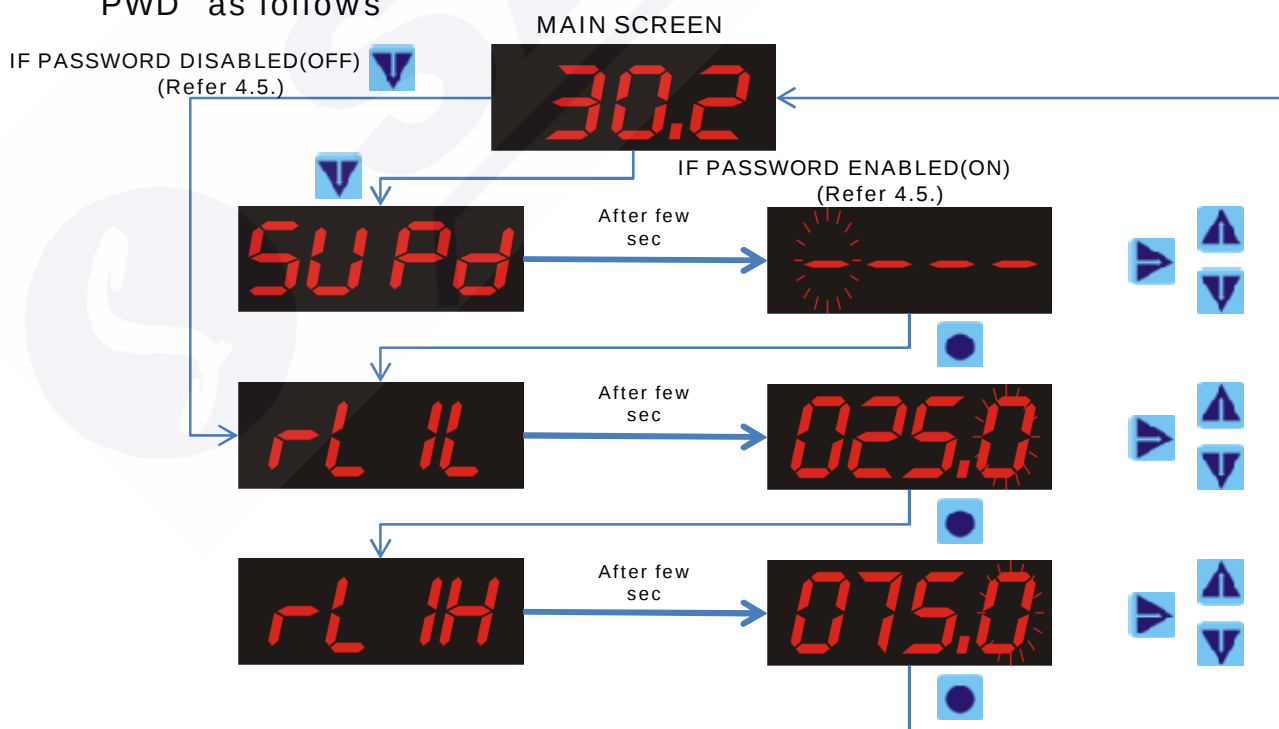
STEP 7 : Then use UP & DN keys to roll over 0 – 9 and move blinking digit by MODE key to adjust the Span count value to adjust the output measure read to 20mA and press ENTER Key to save and exit to main screen.

6. RELAY OUTPUT SETVALUE

This Relay set values used to alert the local operator by glowing audible buzzer attached inbuilt(optional) in PI 542A & also used to control any process using relay contact(5A rated). To view & Configure the “RELAY SETVALUES” follow the steps below.

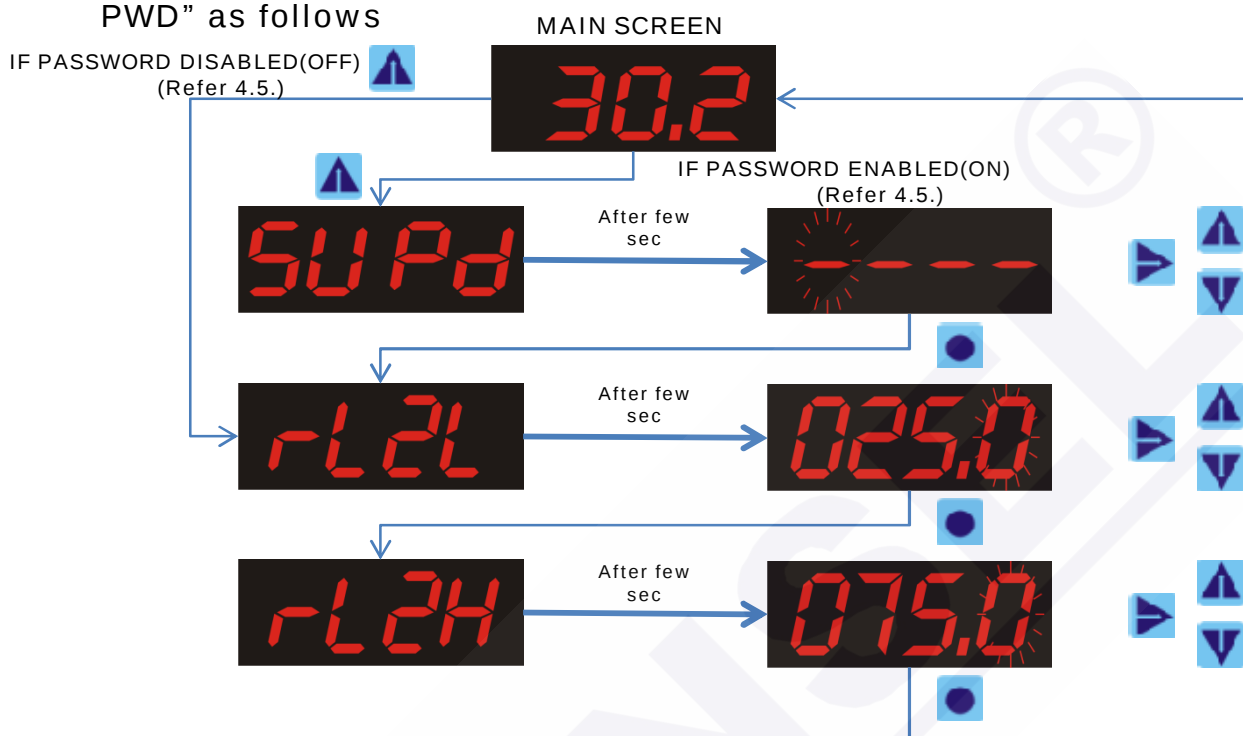
6.1. RELAY – 1 SET VALUE

In Main Screen, Press DN Key till the Display Shows “SV – PWD” as follows



6.2. RELAY – 2 SET VALUE

In Main Screen, Press UP Key till the Display Shows “SV – PWD” as follows



7. MODBUS PROTOCOL DETAILS

7.1. MODBUS ADDRESSES

This is a complete list of parameters MODBUS Addresses available in the PI 542A .

Parameter	Address	Data format	Function	Actual value count(A)	Factor *	Description
Process value (PV)	0	integer	Read only	-1999 to 9999	See Table **	Actual reading of PV
Output – 1 low set	1	integer	Read & write	As per set limit – 1		Output – 1 low set value
Output – 1 High set	2	integer	Read & write	As per set limit – 1		Output – 1 high set value
Output – 2 low set	3	integer	Read & write	As per set limit – 2		Output – 2 low set value
Output – 2 High set	4	integer	Read & write	As per set limit – 2		Output – 2 high set value
Analog Input low	5	integer	Read & write	As per type	= A /100	Analog input limits For mV → 0 to 70.00mV For mA → 0 to 20.00mA For Volt → 0 to 10.00V
Analog Input High	6	integer	Read & write	As per type		
Display Scale Low	7	integer	Read & write	-1999 to 9999	See Table **	Display Scale Low Limit
Display Scale High	8	integer	Read & write	-1999 to 9999		Display Scale High Limit
Analog Out Low	9	integer	Read & write	As per Display scale		Analog Out Low Limit
Analog Out High	10	integer	Read & write	As per Display scale		Analog Out High Limit

Parameter	Address	Data format	Function	Actual value count(A)	Factor *	Description
low set limit	11	integer	Read & write	-1999 to 9999	See Table **	Set value low set limit
high set limit	12	integer	Read & write	-1999 to 9999		Set value high set limit
Output – 1 cyclic time	19	integer	Read & write	0 to 250	=A/1	Output – 1 cyclic time value in seconds
Output – 1 Hysteresis	20	integer	Read & write	0 to 250		Output – 1 Hysteresis value
Output – 2 cyclic time	21	Integer	Read & write	0 to 13		Output – 2 cyclic time value in seconds
Output – 2 Hysteresis	22	integer	Read & write	0 to 1		Output – 2 Hysteresis value
SV password	23	integer	Read & write	0 to 9999		SV password value
Input type	52	Integer	Read & write	0 to 13		0 → RTD-PT 100, 1 → TC-J, 2 → TC-K, 3 → TC-R, 4 → TC-S, 5 → TC-T, 6 → TC-B, 7 → TC-N, 8 → TC-E, 9 → OHMS, 10 → mV, 11 → mA, 12 → Volt
Unit	53	integer	Read & write	0 to 1		0 → DegC, 1 → DegF
Resolution	54	integer	Read & write	0 to 5		0 → 1, 1 → 0.1, 2 → 0.01, 3 → 0.001, 4 → 0.0001, 5 → 0.00001
Output – 1 control Mode	55	integer	Read & write	0 to 7		0 → OFF, 1 → Low, 2 → High, 3 → High Low, 4 → Band, 5 → Differential High Low, 6 → Differential Band, 7 → PID
Output – 2 control Mode	56	integer	Read & write	0 to 6		0 → OFF, 1 → Low, 2 → High, 3 → High Low, 4 → Band, 5 → Differential High Low, 6 → Differential Band
SV password on/off	57	integer	Read & write	0 to 1		0 → OFF, 1 → ON
Filter constant	58	integer	Read & write	1 to 20		Display Filter constant value
Slave Id	59	integer	Read & write	1 to 32		Communication Slave address
Baud rate	60	integer	Read & write	0 to 3		0 → 9600, 1 → 19200, 2 → 57600, 3 → 115200
Parity	61	integer	Read & write	0 to 2		0 → None, 1 → Odd, 2 → Even
AutoTune Enable	62	integer	Read & write	0 to 1		0 → Off, 1 → On
Control Action	63	integer	Read & write	0 to 1		0 → Heat, 1 → Cool
Alarm Mode	64	integer	Read & write	0 to 2		0 → Off, 1 → Relay1, 2 → Relay2
Alarm Reset	65	integer	Read & write	0 to 1		0 → Off, 1 → On
Status bits	66	bit	Read only	0 to 1		Bit 0 → Out – 1 Bit 1 → Out – 2 Bit 2 → OPEN SENSOR Bit 3 → below LOW limit Bit 4 → Above HIGH limit
Tare	67	integer	Read & write	0 to 1		0 → Off, 1 → On

Note : *Read Final value of any above parameter, after applying the “Actual read” to “Factor” given.
 ** Read Final value of some selected parameters above, as per table below.

Resolution	Factor**	Resolution	Factor**
1	=A/1	0.01	=A/100
0.1	=A/10	0.001	=A/1000

7.2. MODBUS MASTER QUERY AND RESPONSE FEEDBACKS FROM PI 542A

PI 542A supports the RTU Mode in MODBUS communications. This device acts like a slave device in the MODBUS network. The slave address with which the unit is Configurable(Ref. 4.3) between 1 to 32(decimal). PI 542A supports functions 03 of the MODBUS protocol.

7.2.1.COMMUNICATION PARAMETERS:

Baud Rate : 9600(Configurable Ref. 4.3)
 Flow Control : NONE
 No of data bits : 8
 Parity : NONE(Configurable Ref. 4.3)
 No of Stop Bits : 1(Configurable Ref. 4.3)

7.2.2. SUPPORTED FUNCTIONS AND SCOPE:

Function 03 – Read Holding registers

7.2.3. QUERY FROM MASTER DEVICE

Field Name	Example (Hex)
Slave Address	01
Function	03
Start Address Hi(Refer 7.2.5)	00
Start Address Lo(Refer 7.2.5)	00
No of Registers to read Hi	00
No of Registers to read Lo	01
Error Check	CRC

The above example is a typical example of supported format for function # 03.

7.2.4. RESPONSE FROM PI 542A

Field Name	Example (Hex)
Slave Address	01
Function	03
Byte Count	02
Data Hi	xx
Data Lo	xx
Error Check	CRC

7.2.5. MODBUS QUERY LIST IN HEX DECIMAL(hex)

Parameter	Function	Address	No. of Registers to Read Hi	No. of Registers to Read Lo
Process value (PV)	03	00	00	02
Output – 1 low set	03	01	00	02
Output – 1 High set	03	02	00	02
Output – 2 low set	03	03	00	02
Output – 2 High set	03	04	00	02
Analog Input low	03	05	00	02
Analog Input High	03	06	00	02
Display Scale Low	03	07	00	02
Display Scale High	03	08	00	02
Analog Out Low	03	09	00	02
Analog Out High	03	0A	00	02
low set limit	03	0B	00	02
high set limit	03	0C	00	02
Output – 1 cyclic time	03	13	00	02
Output – 1 Hysteresis	03	14	00	02
Output – 2 cyclic time	03	15	00	02
Output – 2 Hysteresis	03	16	00	02
SV password	03	17	00	01
Input type	03	34	00	01
Unit	03	35	00	01
Resolution	03	36	00	01
Output – 1 control Mode	03	37	00	01
Output – 2 control Mode	03	38	00	01
SV password on/off	03	39	00	01
Filter constant	03	3A	00	01

Parameter	Function	Address	No. of Registers to Read Hi	No. of Registers to Read Lo
Slave Id	03	3B	00	01
Baud rate	03	3C	00	01
Parity	03	3D	00	01
AutoTune Enable	03	3E	00	01
Control Action	03	3F	00	01
Alarm Mode	03	40	00	01
Alarm Reset	03	41	00	01
Status bits	03	42	00	01
Tare	03	43	00	01

7.2.6. MORE ON UNSUPPORTED FUNCTIONS:

Unsupported functions will not return a response from PI 542A. However continuing development will ensure that more Functions will be added to this model in future releases. For specific Functional requirements please contact us.

8. CONTACT US

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