N1500 - UNIVERSAL PROCESS INDICATOR

INSTRUCTIONS MANUAL

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1. PRESENTATION

N1500 is a universal process indicator which accepts a large variety of input signals and sensors.

A five-digit LED display shows measured value and all programming parameters.

Instrument configuration is achieved from the keyboard, without any hardware change.

The user should read this manual thoroughly before using the instrument. It is a fine electronic device and should be used accordingly for best results.

Some of the features of the basic version are:

- Universal input: Pt100, thermocouples, 4-20mA, 0-50mV and 0-5V
- 24Vcc power supply for remote transmitters excitation
- **Maximum** and **minimum** memory
- **Hold** function
- **Peak** and **hold**
- **Tare**

Options are:

- Process Variable retransmission in 0-20mA or 4-20mA
- RS485 MODBUS RTU serial communication
- Regulated 10Vdc or 5Vdc power supply for load cells
- 3rd and 4th alarm relays
- Digital input

The front panel is shown below.

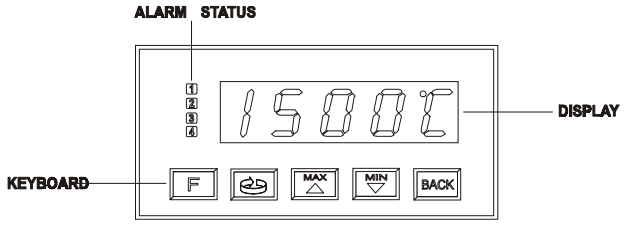


Figure 1 - Front panel identification

Display: Shows process variable (PV) and the programming prompts.
Alarm LEDs 1, 2, 3 and 4: show alarm status.

INDEX key - This key is used to access the programming menu and prompts.

BACK key - This key is used to go back to the previously reached prompt in the menu cycle.

UP / MAX key and **DOWN / MIN** - Used to increase and decrease parameters values. These keys are also used to display maximum and minimum values stored in memory..

Special FUNCTION key - This special function key is used for pre-programmed functions as explained in the SPECIAL FUNCTION KEY section of this manual.

2. SPECIFICATIONS

- Power: 85 to 264Vac, 50/60 Hz switching power supply
- Maximum consumption: 4VA
- Relays: 3A / 250Vac SPST
- All input signals are factory calibrated. Thermocouples are calibrated to NBS standards, RTDs to DIN standards.
- Internal resolution: 19500 levels, display: 12000 levels (-1999 to 9999)
- Sampling rate: 4 measurements per second for t/c and RTD
  20 measurements for 0-50mA, 4-20mA and 0-5V
- Accuracy: Thermocouples J, K, T and N: 0.25% of full scale ±1°C.
  Thermocouples E, R, S and B: 0.25% of full scale ±3°C.
  Pt100: 0.2% of full scale
  Current or voltage: 0.2% of full scale
- Warm up time: 15 minutes
- Input impedance: 0-50mV, Pt100 and thermocouples: >10MΩ
  0-5V: > 1MΩ
  4-20mA: 22Ω
- Pt100 measure: 3-wire circuit, 170µA excitation current.
- PV 4-20mA retransmission resolution: 1500 levels, 550Ω max.
- Working conditions: 0 to 55°C, 35 to 85% relative humidity.
- Protection: IP54 front panel
  IP66 with polycarbonate cover
- Enclosure: high impact ABS
- Weight: 250g basic version; 330g with options
- Dimension: 48×96×131mm
- Panel cut out: 45×92mm

3. PROCESS VARIABLE INPUT - PV

The Process Variable input type should be keyboard programmed by the user according to the codes shown on table 1 (refer to INPUT TYPE parameter "InTyP").

All input types are factory calibrated and no additional calibration is required.

Thermocouples are calibrated to NBS standards. RTD's are calibrated to DIN 43760 (α=0.00385).

TIPO	CODE	CARACTERÍSTICAS
J	tc J	Range: -50 to 760°C (-58 to 1400°F)
K	tc K	Range: -90 to 1370°C (-130 to 2498°F)
T	tc t	Range: -100 to 400°C (-148 to 752°F)
E	tc E	Range: -35 to 720°C (-31 to 1328°F)
N	tc n	Range: -90 to 1300°C (-130 to 2372°F)
R	tc r	Range: 0 to 1760°C (-32 to 3200°F)
S	tc S	Range: 0 to 1760°C (-32 to 3200°F)
B	tc b	Range: 150 to 1820°C (302 to 3308°F)
Pt100	Pt 100	Range: -199.9 to 530.0°C (-327.8 to 986.0°F)
Pt100	Pt 100	Range: -200 to 530°C (-328 to 986°F)
4-20mA	L in J	Linearizes J. Adjustable range: -110 to 760°C
4-20mA	L in K	Linearizes K. Adjustable range.: -150 to 1370°C
4-20mA	L in t	Linearizes T. Adjustable range.: -160 to 400°C
4-20mA	L in E	Linearizes E. Adjustable range.: -90 to 720°C
4-20mA	L in n	Linearizes N. Adjustable range -150 to 1300°C
4-20mA	L in r	Linearizes R. Adjustable range 0 to 1760°C
4-20mA	L in S	Linearizes S. Adjustable range.: 0 to 1760°C
4-20mA	L in b	Linearizes B. Adjustable range.: 100 to 1820°C
4-20mA	L inPt	Linearizes Pt100. Adj. range.:-200.0 to 530.0°C
4-20mA	L inPt	Linearizes Pt100. Adj. range.: -200 to 530°C
0 -50mV	0-50	Linear. Adjustable range.: -1999 to 9999
4-20mA	4-20	Linear. Adjustable range.: -1999 to 9999
0-5V	0-5	Linear. Adjustable range.: -1999 to 9999
0 to 50mV	c.0-50	User defined linearization
4-20mA	c.4-20	User defined linearization
0 a 5V	c.0-5	User defined linearization

Table 1 - Input type codes

4. ALARMS

The indicator features 2 alarm outputs in the basic version and up to 4 alarms outputs as options.

Each alarm has a corresponding LED anunciator in the front panel to show alarm status.

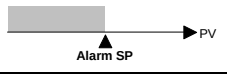
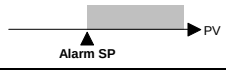
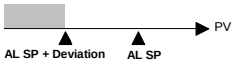
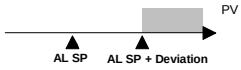
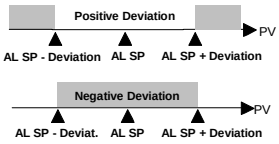
TYPE	PROMPT	ACTION
Disabled	oFF	Alarm is inactive
Sensor Break (**i**nput **Err**or)	iErr	Alarm will go ON if sensor breaks, input signal is out of range or Pt100 is shorted.
Low Alarm (**Lo**w)	Lo	
High Alarm (**Hi**gh)	HI	
Diferential Low (**dif**erential **Lo**w)	dIF.Lo	
Diferential High (**dif**erential **Hi**gh)	dIF.HI	
Diferential (**dif**erential)	dIF	

Table 2 - Alarm functions

4.1 ALARM FUNCTIONS

The alarms can set to operate in six different functions: Sensor break, Low Alarm, High Alarm, Differential Low, Differential High or Differential (Band). These functions are shown in table 2 and described as follows

4.1.1 Sensor break

The alarm will go ON whenever the sensor breaks or is badly connected.

4.1.2 Low alarm

The alarm relay will go ON whenever the measured value is below the alarm set point.

4.1.3 High alarm

The alarm relay will be ON whenever the measured value is **above** the alarm set point.

4.1.4 Differential (Band)

For differential alarm 2 parameters must be set: Differential **Al**arm **Ref**erence value (ALrEF) or alarm setpoint and Alarm Deviation (Band).

For a positive deviation the alarm will switch on whenever the measured value is **out** of the band defined as:

(ALrEF - Deviation) and (ALrEF + Deviation)

For a negative deviation the alarm will be switched on whenever the measured value is **within** the band defined above.

4.1.5 Differential Low

The alarm relay will be ON whenever the measured value is **below** the band defined as:

(ALrEF - Deviation)

4.1.6 Differential High

Alarm relay will be ON when the measured value is **above** the band defined as:

(ALrEF + Deviation)

4.2 ALARM INITIAL BLOCKING

The initial blocking option inhibits the alarm from being recognized if an alarm condition is present when the controller is first energized. The alarm will actuate only after the occurrence of a non alarm condition followed by a new occurrence for the alarm.

The initial blocking is disabled for the **sensor break** alarm function.

4.3 ALARM TIMER

The alarms can be programmed to have timer functions where the user can set a delayed alarm action, just one pulse in an alarm event, or an oscillator function with sequential pulses.

Table 3 shows these advanced functions. Times T1 and T2 can be programmed from 0 to 6500 seconds (refer to item 8.2). Set 0 (zero) at the T1 and T2 prompt for a normal non-timer alarm operation.

The LEDs alarm anunciators will go ON whenever there is an alarm condition regardless of the present alarm status which may be temporarily off because of timer action.

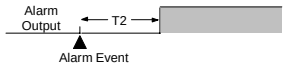
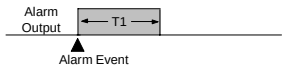
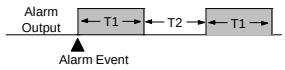
Advanced Function	T1	T2	ACTION
Normal Operation	0	0	
Delayed	0	1s to 6500s	
Pulse	1s to 6500s	0	
Oscillator	1s to 6500s	1s to 6500s	

Table 3 - Timer Alarm Functions

5. SPECIAL FUNCTIONS

5.1 MAXIMUM AND MINIMUM

The indicator memorizes the measured maximum and minimum values (peak and valley). These two values are shown by pressing either the **MAX** or **MIN** key. Pressing both keys simultaneously will clear the memory for a new peak and valley detection.

5.2 SPECIAL FUNCTION KEY AND DIGITAL INPUT

The **F** key and the optional digital input can execute special functions according to the user selection.

These functions can be chosen independently to the **F** key or to the digital input. Figure 10 shows how to activate the digital input. A closed contact or a short circuit at terminals 8 and 9 is recognized as activating the digital input.

The special functions for the **F** key and for the digital input are explained as follows.

5.2.1 Hold

The **hold** function freezes the measured value in the display. Each touch at the **F** key or closing the digital input alternates from **hold** to normal mode.

Whenever the indicator is in the **hold** mode a "HoLd" message is briefly displayed to show the operator that the displayed value is the frozen value and not the present reading.

5.2.2 *Peak Hold*

The indicator turns automatically to **Peak Hold** mode whenever the **F** key or the digital input are programmed for "PHoLd"

This operation mode makes the indicator display only the maximum reading value from the time the key was pressed of the digital input was activated.

Each activation of the **F** key or digital input triggers a new **Peak Hold** cycle and the display resets with a new peak value.

5.2.3 RESEt - Clears maximum and minimum

This function works the same way as the MAX and MIN keys pressed simultaneously, as explained in the 5.1 section.

If this "rESEt" function is programmed, for every touch of the **F** key or activation of the digital input the memory will be cleared and a new cycle of maximum and minimum will start.

5.2.4 AL.oFF - Alarm blocking

This function allows the user to block or inhibit the alarm relays by pressing the F key or by activating the digital input. Each touch of the key or activation of the digital input will alternate the function from ON to OFF and vice-versa.

If an alarm situation occurs, the respective alarm status LEDs in the front panel will light regardless of the relay alarm blocking status.

5.2.5 Tare

This function is used to zero the display. The tare residual values is subtracted or added to the total measured value. This functions is generally used with load cells and strain gauges and applies to linear 4-20mA, 0-50mV and 0-5V inputs.

5.3 PROCESS VARIABLE RETRANSMISSION

As an option, the indicator can be supplied with an isolated 0-20mA or 4-20mA analog output for Process Variable (PV) retransmission.

The PV values which define the range of the 0-20mA or 4-20mA retransmission can be programmed by the user in the **high and low indication limits**.

When available, this current output will be always active.

For a voltage output signal an external shunt (calibrated resistor) should be installed at the analog output terminals.

5.4 CUSTOMIZED LINEARIZATION.

Three types of signals can be user customized to fit special linearization profiles. That is, the operator can configure the instrument to read non-standard crescent non-linear signals with high accuracy. The three signal types are: **c.0-50**, **c.4-20** and **c.0-5**. When selected, the indicator will prompt the **Customized Linearization Cycle**.

The signal input will be divided in up to 19 user-defined segments as to reduce the error between the input signal and the indicated value.

In the **Customized Linearization Cycle** the user will find the **inP.01** prompt which is the starting point of the first segment and defines the minimum value of the input signal. Next prompt is **out.01** which corresponds to the desired indication value for the starting point. **inP.02** is the starting poin of the second segment and **out.02** is its value to be displayed.

In **inP.01** the user defines the minimum value for the selected input type: 0.0mV for **c.0-50**, 4.0mA for **c.4-20** and 0.0V for **c.0-5**.

When fewer than 19 segments are needed for the linearization, the user can define the upper value of the selected input type at the last needed segment.

Note: The parameters **Input Low Limit** and **Input High Limit** must be defined before the customized linearization.

For this mode the sampling time is limited to 4 measurements per second.

6. INSTALLATION

6.1 PANEL ASSEMBLY

Remove the fixing clamps from the instrument. Insert the unit into the panel cut-out and slide the fixing clamps from the rear. Tighten the two fixing screws.

Figure 2 shows how to mount the instrument.

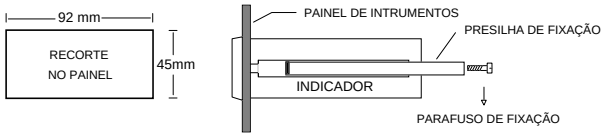


Figure 2 - Mounting the indicator in the panel cut-out.

6.2 ELECTRICAL CONNECTIONS

The internal electronics can be removed from the front panel without any cable disassembly. The input signals and power connections are shown below.

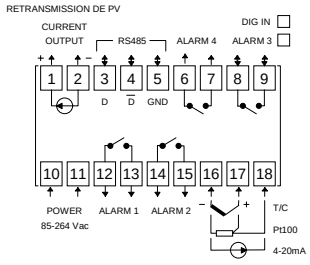


Figure 3 - Back panel terminals

6.2.1 Recommendations for Installation

- Input signal wires should be laid out away from power lines and preferably inside grounded conduits.
- Instrument mains should be suitable for this purpose and wires should not be shared with high consumption motors and inductors.
- RC filters (47Ω and 100nF) are highly recommended for valve and contactor coils, etc.

6.2.2 Sensor or input signal connection

These connections should be well done and terminals must be well tightened.

Thermocouples must be installed with proper extension or compensation cables.

Pt100 RTDs must be 3-wire connected and the wires connected to terminals 17 and 18 should have the same electrical resistance (same wire gauge) for proper cable distance compensation.

Four-wire RTDs can be connected by disregarding the fourth wire since cable compensation this unique 3-wire topology matches the 4-wire classical compensation. Two-wire RTDs can be connected by shortening terminals 17 and 18 and connecting the RTD to terminals 16 and 17.

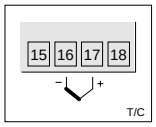


Figure 4 - Thermocouples

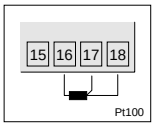


Figure 5 - Three-wire RTD

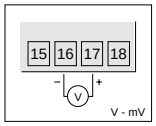


Figure 6 - Voltage measurement

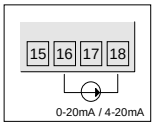


Figure 7 - Current measurement

Two-wire transmitters can be powered by an internal 24Vdc power supply. An internal jumper should be properly placed to insert the 24Vdc power supply in series with the current loop. Figure 8 shows the jumper switched from "NORMAL" to “2 WIRE Tx 24 PS” position. The indicator should be properly programmed to accept 4-20mA input.

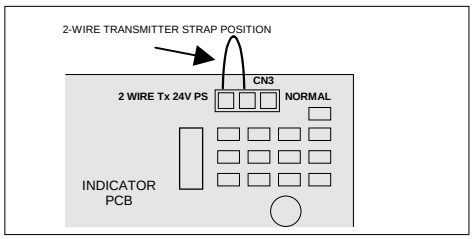


Figure 8 - Internal PCB detail.

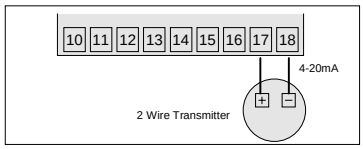


Figure 9 - Two-wire transmitter with internal 24Vdc power supply.

6.2.3 Digital Input (Dig In)

The digital input can be used by connecting a switch (or equivalent) to terminals 8 and 9, as shown in Figure 10.

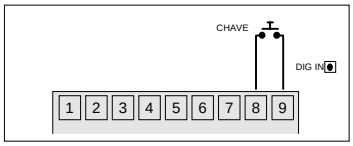


Figure 10 - Digital input connection

7. OPERATION

For best results this indicator requires correct setting of parameters as input type (t/c, Pt100, 4-20mA, etc), alarms actuation point, alarm function, etc.

These parameters are divided in five levels or groups of parameters which we will refer to as CYCLES.

Cycle	Access
1- Work	free access
2- Alarms	reserved access
3- Functions	
4- Configuration	
5- Customized Linearization	
6- Calibration	

Table 4 - Parameters Cycles

The work cycle has free access. All other cycles require a certain combination of key strokes to be accessed. The combination is:

INDEX and BACK keys pressed simultaneously

Within a certain cycle just press INDEX to go to the following parameters. At the end of each cycle the display will go back to the work cycle.

At the desired prompt just press the **MAX** or **MIN** key to change this parameter accordingly.

All changes are recorded in non-volatile memory as we move to next prompt.

After 25 seconds with no key pressed the indicator will return to the measuring cycle (work cycle).

7.1 CYCLE PROTECTION

The values of parameters of a certain cycle can be protected against non-authorized users.

The protected parameters can still be viewed but can not be changed.

To protect a cycle just press the **BACK** and **MAX** keys for 3 seconds at the beginning of the referred cycle. To unlock this cycle just press the same keys again for 3 seconds.

The display will briefly blink confirming that the locking or unlocking of the cycle.

8. PROGRAMMING THE INDICATOR

8.1 WORK CYCLE

This is the first and main cycle. At power up the indicator will display the Process Variable (PV). The alarm setpoints are also displayed at this cycle. To run through this cycle just press the INDEX key.

Whenever an alarm is set with differential function the respective alarm setpoint is blocked (SP.AL1, SP.AL2, ...) and the display shows "**diF**" to advise the operator that this is a configuration parameter and that the respective deviation value must be programmed at the Alarms Cycle. The "**AL.rEF**" prompt will be displayed showing the reference value for the alarm with differential function.

TELA	PROMPT PARAMETER DESCRIPTION
8.8.8.8.8.	**Measure** Shows the measured variable. For Pt100 or thermocouples the display will show the absolute temperature value. For 4-20mA, 0-50mV and 0-5V inputs the display shows the values defined in the **in.LoL**" and " InH iL" prompts. With the **hold** function programmed the display shows the frozen variable and alternates with the message "HoLd". Likewise, with ***Peak Hold*** function programmed the high limit is displayed with the "P.HoLd" prompt alternately. Should any fault situation occur the indicator will display an error message which can be identified at item 11 of this manual.
AL.rEF	**Differential Alarm Reference Value** - This prompt is shown only when there is an alarm programmed with differential function.
SP.AL 1 SP.AL2 SP.AL3 SP.AL4	**Set Points of Alarms 1, 2, 3 and 4** - Defines the operation point of each alarm programmed with "Lo" or "H i" function. Note: When the alarms are programmed with differential function, the alarm setpoint cannot be changed at this cycle and a "d iF" message will be shown. The SP differential (deviation) value is set at the Alarm Cycle.

8.2 ALARM CYCLE

Fu.AL 1 Fu.AL2 Fu.AL3 Fu.AL4	**Alarm Function** - Defines the alarms 1, 2, 3 and 4 function, as defined in item 4.1 oFF : Alarm off iErr : Broken or Shorted Sensor Lo : Low value H i : High value d iFL : Differential low d iFH : Differential high d iF : Differential
dF.AL 1 dF.AL2 dF.AL3 dF.AL4	**Differential SP for Alarms 1, 2, 3 and 4** - Defines the deviation value from the alarm setpoint in relation to the Reference Value defined in the "AL d iF" prompt. Note: This value cannot be changed at this cycle for alarms with non-differential function and the "Ab5" is then displayed.
HY.AL 1 HY.AL2	**Alarm Hysteresis** This is the difference from the measured value to the point where the alarm is turned ON and OFF.
HY.AL3 HY.AL4	
bL.AL 1 bL.AL2 bL.AL3 bL.AL4	**Alarm Blocking** Should any alarm condition occur, each alarm can be disabled when energizing the indicator. Refer to item 4.3.
AL 1t 1 AL 1t2 AL2t 1 AL2t2 AL3t 1 AL3t2 AL4t 1 AL4t2	**Time Alarms** The user can set delayed or sequential alarms as shown in table 3 by defining times T1 and T2. To disable this function just set zero for T1 and T2.

8.3 FUNCTION CYCLES

F.Func	**F KEY FUNCTION** - Options are oFF - Key no used. hoLd - Hold PV AL.oFF - Alarm disabled rESEt - Resets Peak and Valley PHoLd - Peak Hold tArE - Tare zeroing These functions are described in item 5.2.
d iG. In	**Digital Input Function** - The same function available for the **F** key: oFF - hoLd - AL.oFF - rESEt - PHoLd - tArE Refer to item 5.2.
F iLtr	**Input Digital Filter** - Adjustable from 0 to 20, this is used to reduce instability of the measured value. 0 means the filter is off and 20 means maximum filtering. The higher the filter value the lower is the measured value response.
oFSEt	**Display Offset** - This a value which is added to the PV to offset any measurement deviation or sensor error. The offset is shown directly in the programmed engineering unit. For °F measurements the null reference is at 32°F.
bAud	**Baud Rate** - Serial digital communication speed in **bps**. Programmable: 1200, 2400, 4800, 9600 and 19200 bps.
AdrES	**Communication Address** - A number which identifies the instrument in a multidrop network.

8.4 CONFIGURATION CYCLE

In.tYP	**Input Type** - Selects the input signal or sensor type to be connected to the PV terminals. Refer to table 1. Changing this parameter will change all other parameters related to PV and alarms, therefore it should be the first parameter to be set.
dP.Pos	**Decimal Point Position** - Defines the decimal point position in the displayed value. This applies to linear input types 0 to 50mV, 4 to 20mA and 0 to 5V as selected at the " InLYP" prompt.
un it	**Temperature Unit** - Selects °C or °F indication. This prompt is not shown for input types 0 to 50mV, 4 to 20mA and 0 to 5V as selected at the " InLYP" prompt.

Sroot	**Square Root** - This prompt is only shown for input types 0 to 50mV, 4 to 20mA and 0 to 5V as selected at the " intYP" prompt. Set "YES" and the square root will be applied to the measured value within the limits programmed in " inLoL" and " inHiL". The display will show the low limit value should the input signal be below 1% of the range.
inLoL	**Input Low Limit** - Sets the low limit for input type 0 to 50mV, 4 to 20mA or 0 to 5V. When the **PV Retransmition** is used this limit defines the corresponding 4mA (or 0mA) in relation to the input value.
inHiL	**Input High Limit** - Sets the high limit for input type 0 to 50mV, 4 to 20mA or 0 to 5V. When the **PV Retransmition** is used this limit defines the corresponding 20mA in relation to the input value.

SCALE	**Scale Factor** - Multiplies the displayed value by 10 to increase measured range.
outtY	**Analog Output Type** - Selects the analog output type to either 0 to 20mA or 4 to 20mA.

8.5 CUSTOMIZED LINEARIZATION CYCLE

inP.01 inP.20	Define the extreme points (lower and upper) of the customized linearization. Values must be in the input signal unit: 0 to 50 mV, 4 to 20mA or 0 to 5Vdc.
out.01 out.20	Define the proportional indications in respect to each segment of the customized linearization. Values are in desired indication unit (within the **Indication Lower and Upper Limits**).

Figure 15 shows the cycles and parameters flowchart.

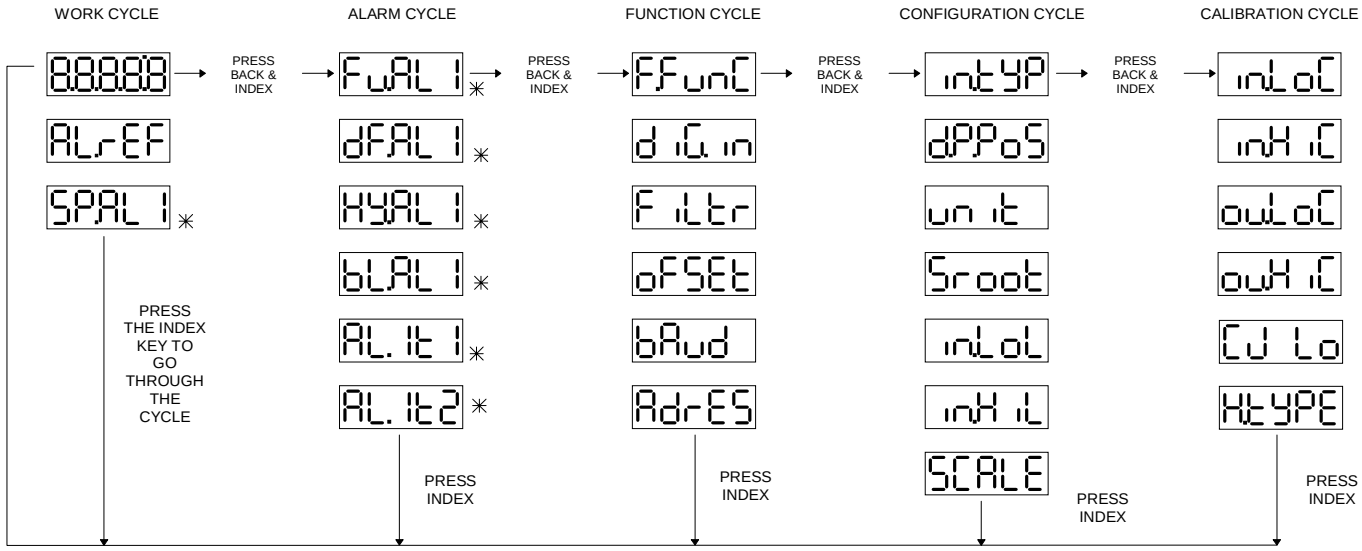


Figure 15 - Cycles and parameters flowchart

* These parameters need to be programmed for each available alarm.

8.6 CALIBRATION CYCLE

All input types are factory calibrated and field calibration is seldom necessary. Should it be required the calibration should only be done by experienced personnel.

If this cycle is accidentally accessed do not touch the ▲ or ▼ keys. Just press the index key and go through all cycles until the display shows the main or operation menu.

inLoC	**Input Low Calibration** - Sets the Process Variable low calibration (offset). Several key strokes at ▲ or ▼ might be necessary to increment one digit.
inHiC	**Input Hi Calibration** - Sets the Process Variable span calibration (gain). Several key strokes at ▲ or ▼ might be necessary to increment one digit.
ouLoC	**Analog Output Low Calibration** - Sets the analog current output low calibration (offset).
ouHiC	**Analog Output Span Calibration** - Sets the analog current output high calibration (span).
CJ Lo	**Cold Junction Calibration** - Allows the user to adjust the this calibration directly in degrees for achieving best results with thermocouples.
HtYPE	**Hardware Type** - This parameters adapts the software to the hardware available and should not be changed by the user. 0 - No options 1 - With alarms 3 and 4 2 - With digital input

9. DIGITAL COMMUNICATION

The indicator can be supplied with an assyncronous RS-485 digital communication interface for master-slave connection to a host computer or SCADA systems.

The indicator works as a slave only and all commands are started by the computer which sends a request to the slave address. The addressed unit sends back the requested reply.

Broadcast commands (addressed to all indicator units in a multidrop network) are accepted but no reply is sent back in this case.

9.1 CHARACTERISTICS

RS-485 compatibility with two-wire connection from the host to up to 31 slaves in a multidrop network topology. Up to 247 units can be addressed by the MODBUS RTU protocol.

Maximum network distance: 4,000 feet. Optically isolated signals.

Selectable baud rate: 1200, 2400, 4800, 9600 or 19200 bps.

Number of data bits: 8, without parity. Stop bits: 1

9.2 RS485 INTERFACE ELECTRICAL CONNECTION

The RS-485 signals are:

D: Bi-direcional data line.

$\overline{D}$: Inverted bi-direcional data line.

⏚: Ground (optional). To be used in noisy environments for achieving best results.

Figure 16 shows an example of an RS-485 network. If the computer does not have an RS-485 port available an external RS232↔RS485 converter should be used.

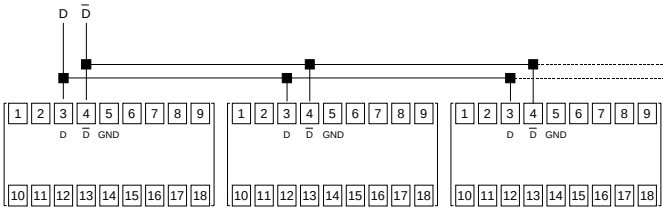


Figure 16 - RS-485 network connection

Two parameter must be properly configured:

Baud rate (bRUd) and the indicator address (AdrES).

10. PROBLEMS WITH THE INDICATOR

Connection errors or improper configuration will result in malfunctioning of the indicator. Carefully revise all cable connections and programming parameters before operating the unit.

Some error messages will help the user identify possible problems.

Message	Possible Problem
uuuuu	Measured value is above the programmed sensor or input signal limit.
nnnnn	Measured value is below the programmed sensor or input signal limit.
-----	Open input. No sensor is connected or the sensor is broken.
Err 1	Pt100 cable resistance is too high or the sensor is badly connected.

Different messages other than the ones above should be reported to the manufacturer. Please inform the serial number if this should occur. the serial number can be viewed at the display by pressing the **BACK** key for about 3 seconds.

The software version of the instrument can be viewed at the time the unit is powered.

The instrument might display false error messages when wrongly programmed or when connected to a sensor for which it was not programmed.

Manual Code 5001082 A v1.3x

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