PR series
User Manual - Full Version

BrainChild

UMFPR01B
2nd Edition, 08/2015

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Safety

This recorder is compliant with the requirements of EN61010-1, UL 61010C-1 & CSA C22.2 No. 24-93. The protection provided by the recorder may be impaired if it is used in a manner inconsistent with its intended purpose, or in an environment that exceeds the specifications of the recorder. Brainchild Electronic Co., Ltd. is not liable if the customer fails to comply with these requirements.

Safety Symbols

The following symbols may be seen in the user manual or on recorder labeling.

Caution

Protective Earth

DC Supply

Safety Notes and Precautions

1. Before any connection is made, the protective earth terminal should be connected first. To avoid making the recorder dangerous under fault conditions, any interruption of the protective Earth conductor inside or outside the recorder is prohibited. Even in the case of a portable unit, the protective earth terminal must remain connected if the recorder is connected to any hazardous voltage.

2. Keep signal and supply voltage wiring separated from one another. If this is impractical, use shielded cables for signal wiring. Double insulation should be used for signal wiring when the recorder is used with hazardous voltage.

3. Do not use the recorder where there is high vibration or a high magnetic field. This could cause damage or error of measurement.

4. All maintenance or repairs should be carried out with power disconnected to avoid personal injury or damage to the unit.

5. In areas with conductive pollution, adequate ventilation, filtering and sealing must be installed.

6. When cleaning the recorder, handle carefully and use soft dry cloth. Avoid the use of abrasives, or any sharp or hard objects which would damage the display.

7. Do not operate the recorder if any part has been removed or disassembled. Consult your nearest dealer at once.

Static Electricity

Appropriate precautions must be taken when handling the recorder. The circuit board components are susceptible to damage caused by electrostatic discharge. Take static electricity precautions while handling and inserting USB memory into the recorder.

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NOTE: IF THE USER REQUIRES TO QUICKLY OR BRIEFLY KNOW DETAILS OF THE FUNCTIONS , PLEASE REFER THE QUICK USER MANUAL

1. General Description

1.1 Unique features of recorder

The PR series is a well-designed new generation paperless recorders with many outstanding features as follows:

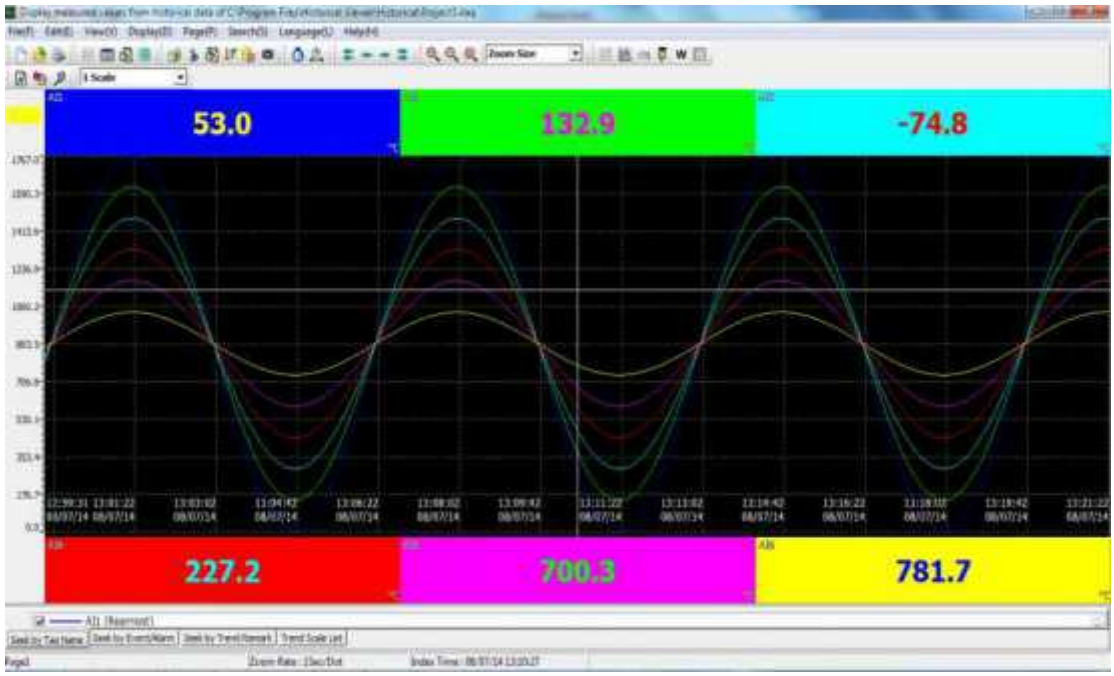
Hardware

- Three sizes including 4.3", 5.6″ and 12.1"
- PR10, with a 4.3" display, with 3 or 6 universal analog inputs and 24 Optional External Channels
- PR20, with a 5.6" display, with 6, 12 , 18 or 24 universal analog inputs and 48 Optional External Channels
- PR30, with a 12.1" display, with 6, 12, 18, 24, 30, 36, 42 or 48 universal analog inputs and 96 Optional External Channels
- TFT Color LCD, Touch screen & high resolution
- 100 millisecond sample rate and data logging
- High accuracy 24-bit A-D Analog Input
- 16-bit D-A Analog Output
- Digital input, maximum 100 Hz.
- Plug & play I/O cards (AI, AO, DI, DO) for easy expansion
- On-board SD card slot for Internal memory
- USB slot for external storage
- 171 mm short depth
- Ethernet as standard with optional RS-232 or RS422/RS485 communication
- Two USB Host ports for downloading the data or connect to Printer
- IP65 / NEMA 4X water-resistant

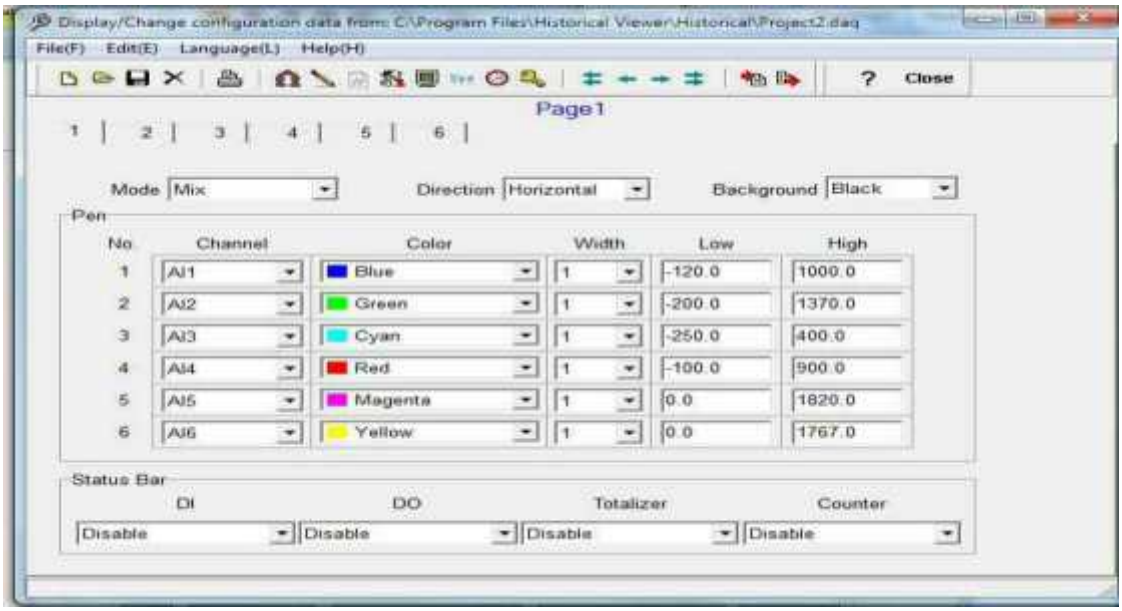
Firmware and PC Software

- Free Basic software for configuration, Historical viewer
- Extensive Software- Data Acquisition Software for configuration, Historical viewer and Real time viewer
- View Circular Trends in PR30
- Additional Panel Studio Software for editing and customizing displays
- Display values in Digital, Real time trends, Historical trends, Bar graphs etc.
- Real time and Historical alarms
- Event management, Jobs linked with events
- Reports (Daily, Weekly and Monthly)
- Timers, Optional -Counters, Totalizers, Math channels and CFR-21
- Customized messages for alarms
- Alarms by email directly from paperless recorder
- Batch control, log data in batches
- 100 msec. data logging and historical data archival tools
- Display screen rotation
- Dynamic Data Exchange via PC software
- Search data with reference to time and period, then Export to spread sheets
- Data logging by value change or time base
- Start/Stop data logging functions which can be linked with real time clock or events

Historical Viewer in Free and Extensive Software:

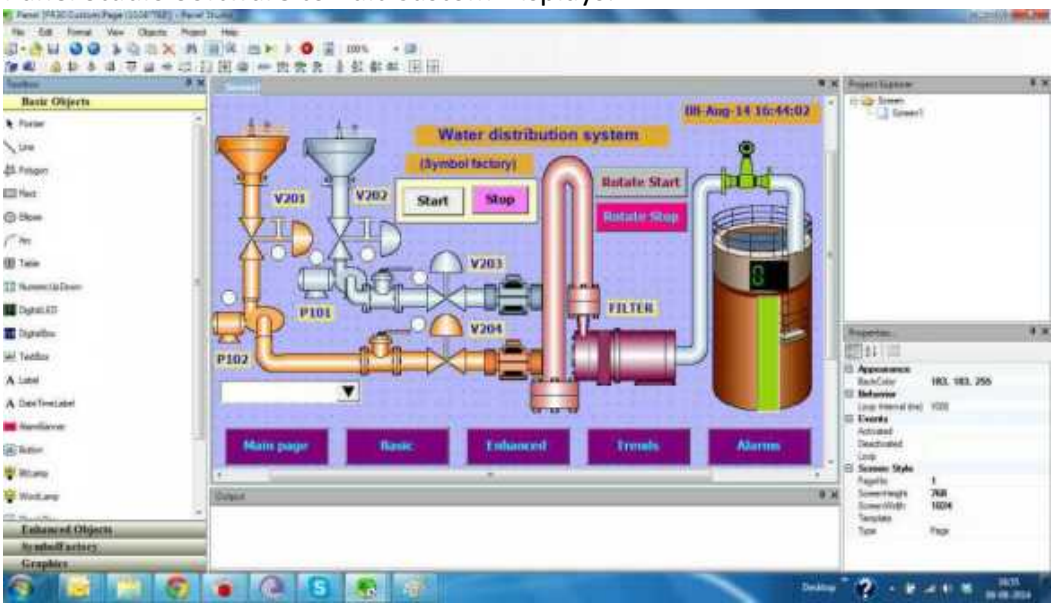


Configuration Editing in either Free or Extensive Software:

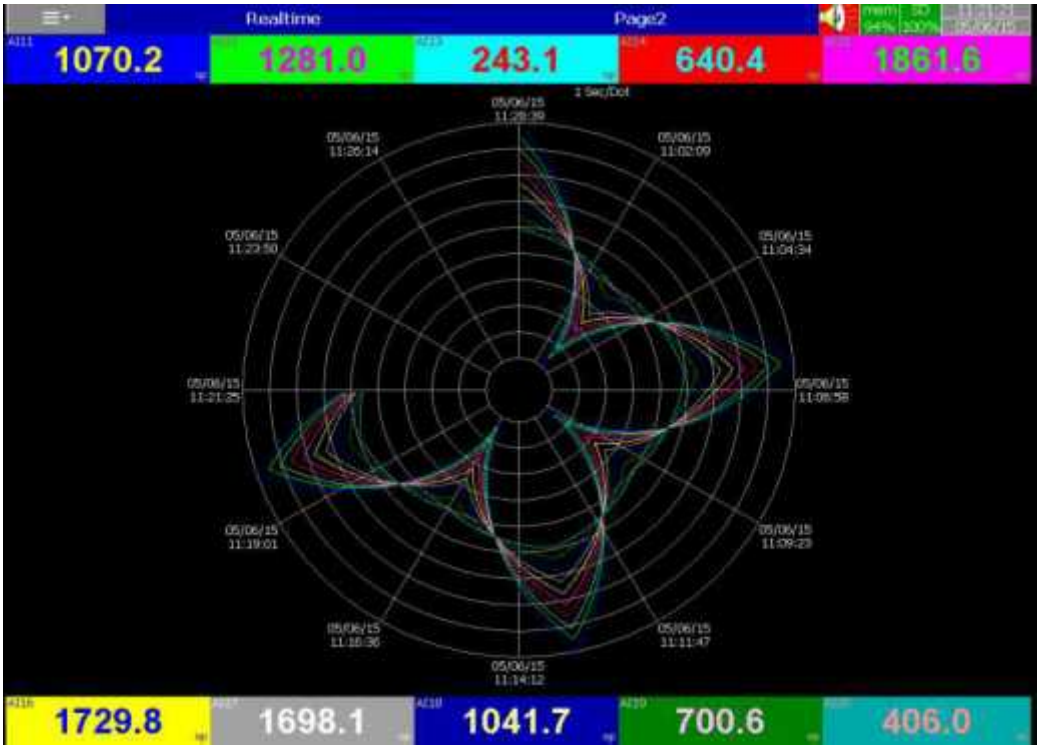


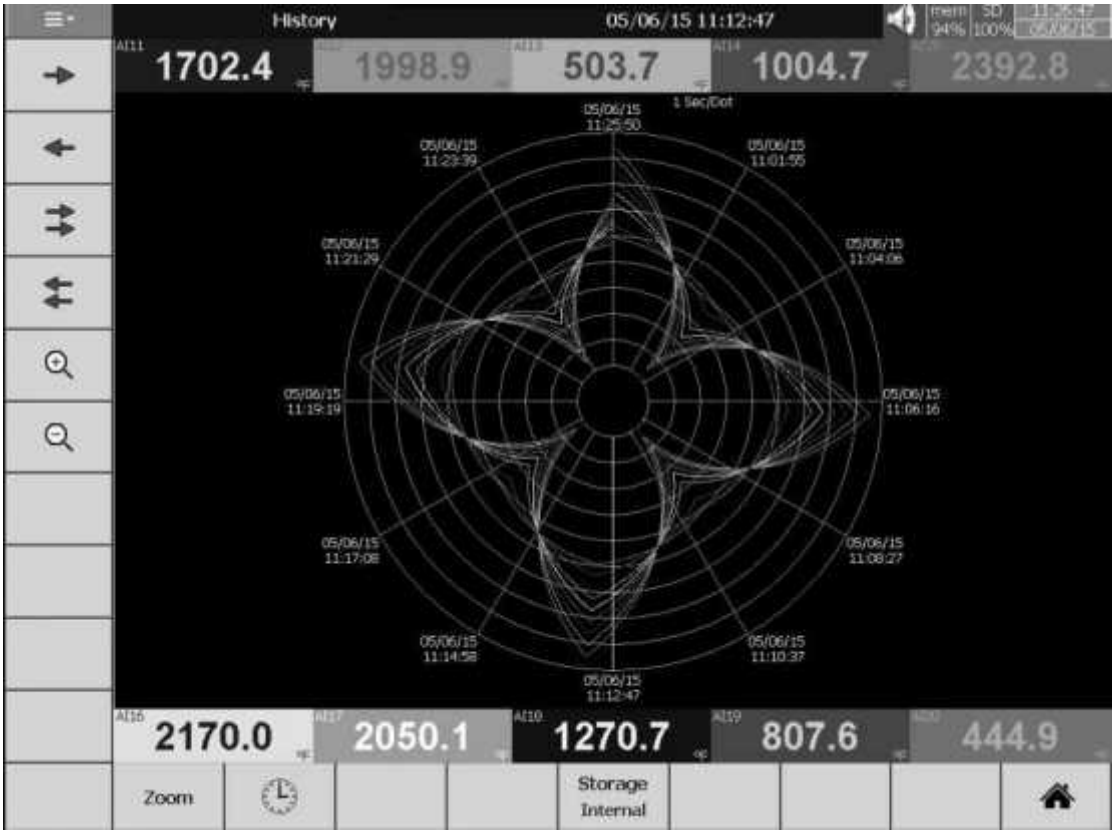
Extensive Software- Data Acquisition Studio with Real-time Viewer:

Panel Studio Software to Edit Custom Displays:



Circular Trends in PR30:





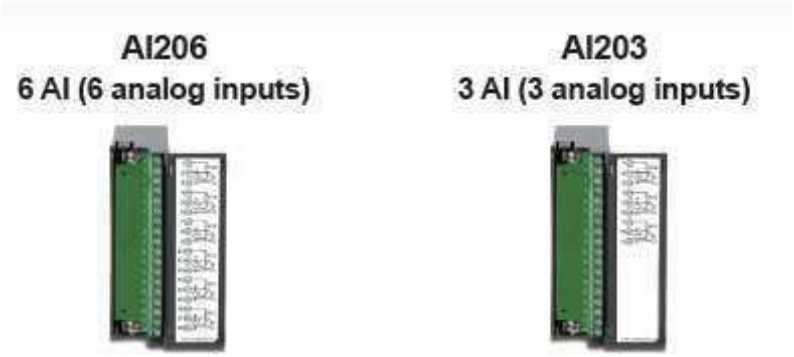
1.2 Comparison of PR series Recorders

Description	PR10	PR20	PR30
Display Size	**4.3”**	**5.6”**	**12.1”**
Analog Inputs (Maximum)	**6**	**24**	**48**
Math Channels (Maximum)	**15**	**40**	**60**
External Channels (Other devices)	**24**	**48**	**96**
Total Pages	**8**	**20**	**21**
Pens/Page (Maximum)	**6**	**6**	**10**
Batches (Maximum)	**1**	**1**	**1**

1.3 Expandable Input and Output cards

The recorder is equipped with rear expansion slots, which work flexibly with the following plug & play I/O cards.

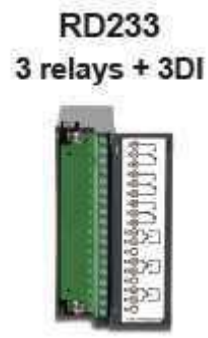
Analog Input cards (part number AI206 & AI203): These two cards are used for 3 or 6-channel analog inputs. Each input is isolated from each other to avoid noise and to ensure stable measurement.



Relay Output card (RO206): Each card includes 6 alarm relays. Contacts are rated 5 Amp/240 VAC

Digital Input card (DI206): Each card includes 6 channels. Logic Low: -5V minimum, 0.8V maximum, Logic High: 3.5V minimum, 24V maximum

Combination Relay Output and Digital Input Card (RD233): Each Card includes 3 digital Inputs and 3 Relay Outputs. For Digital Inputs, Logic Low: -5V minimum, 0.8V maximum, Logic High: -3.5V minimum, 24V maximum. For Relay Outputs, the Contacts are rated 5 Amp/240 VAC



Analog Output cards (AO206): Each card includes 6 channels. They are used for 4-20mA, 0-20mA current output, 0-5V, 1-5V, 0-10VDC voltage output.

1.4 Communication

The standard communication interface is Ethernet with protocol IEEE 802.3 – 10/100 Base T. Other options are RS-232 / RS-422 / RS-485.
Details are explained in Chapter 2.6 - RS-232, RS-422, RS-485 wiring

1.5 External Storage media

There are two types of External storage for the recorder, SD card and USB. If the recorder is used with **6-channel inputs**, we've made an easy chart to show the maximum days based on available memory.

Log speed	SD card	16GB	32GB
1 second		15, 808 days	31,616 days
10 seconds		158,032 days	316,064 days
120 seconds		1,896,304 days	3,792,608 days

* The above is an approximation , Each record of data uses 2 or 4 bytes of memory depending on the data type.

For ex: Selected data size = 2 bytes

If the Log Speed (the recording speed of measured data) is set to the fastest speed at 1 second per data, then for a six channels, a 16GB SD Card will last approximately 15, 808 days [16GB / (2 bytes x 24 hours x 60 minutes x 60 seconds x 6 Channels].

The following formula is to calculate how many days a USB disk can do saving before it is full.

# of days = (The capacity of SD card memory x Log Speed) / (2 x # of hours per day x 60 x 60 x Number of channels)

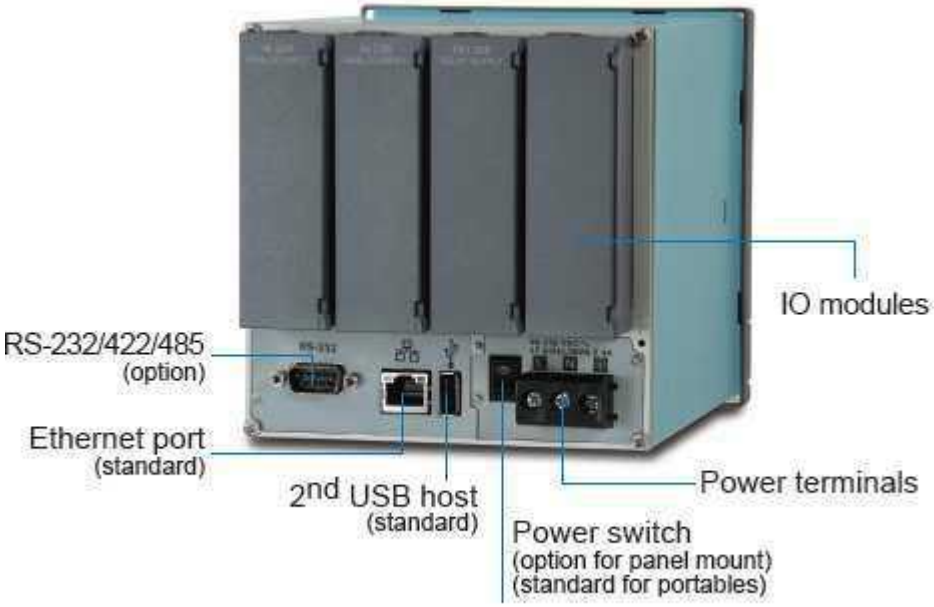
If the User is using USB to store data, to avoid losing recorded data while transferring to PC, it is necessary to insert USB memory back again into the recorder soon after loading recorded data onto PC. Otherwise, data may not be recorded while the USB is absent.

1.6 Smart Mechanism

The recorded data is stored in the manufacturer's special binary format. It is not possible to manipulate or modify the recorded data. This feature fully guarantees the security of the data.

Front View:

Rear View:



1.7 Ordering codes and accessories

1.7.1 PR10 Ordering code

PR1003 (3 Analog Inputs) – □ □ □ □ □ □ □ □
1 2 3 4 5 6 7 8

1 Additional Inputs and Outputs*
0: none
6: 3 relays + 3 DI

PR1006 (6 Analog Inputs)

1 Additional Inputs and Outputs
0: none
1: 6 relays
3: 6DI
6: 3 relays + 3 DI
7: 6 relays + 6 DI

2 Power
A: 90-250 VAC, 50/60 Hz
D: 11-36 VDC

3 Communication
0: standard Ethernet interface
1: Ethernet + RS-232
2: Ethernet + RS-422/485

4 Firmware
0: Standard Version
1: Plus Version 1 with extra mathematics, external channels, batch & FDA 21 CFR part11
2: Plus Version 2 with editable custom display and Panel Studio software
3: Plus Version 3- includes Plus version 1+2 above

5 PC Software
1: Free Basic Software of Historical Viewer and Configuration
2: Extensive software Data Acquisition Studio
(Real Time Viewer + Historical Viewer + Configuration)

6 Mounting types, Power Cord & Switch

0: panel mount, no power cord, no power switch
1: panel mount, no power cord, power switch
2: portable, UL & CSA power cord, power switch
3: portable, VDE power cord, power switch
4: portable, SAA power cord, power switch
5: portable, BS power cord, power switch
6: portable, no power cord, power switch

7 & 8 Special options

00: none
01: 16G SD card
02: 32G SD card

*DI- Digital Input

1.7.2 PR20 Ordering code

PR2003 (3 Analog Inputs) – □ □ □ □ □ □ □ □
1 2 3 4 5 6 7 8

1 Other Inputs and Outputs*
- 0: none
- 6: 3 relays + 3 DI
- C: 3 relays + 3 DI + 6 AO

PR2006 (6 Analog Inputs)

1 Other Inputs and Outputs*
- 0: none
- 1: 6 Relays
- 3: 6 DI
- 5: 6 AO
- 6: 3 relays + 3 DI
- 7: 6 relays + 6 DI
- A: 6 relays + 6 AO
- B: 6 DI + 6 AO
- C: 3 relays + 3 DI + 6 AO
- D: 6 relays + 6 DI + 6 AO

PR2012 (12 Analog Inputs)

1 Other Inputs and Outputs*
- 0: none
- 1: 6 Relays
- 2: 12 Relays
- 3: 6 DI
- 4: 12 DI
- 5: 6 AO
- 6: 3 relays + 3 DI
- 7: 6 relays + 6 DI
- 8: 9 relays + 3 DI
- 9: 3 relays + 9 DI
- A: 6 relays + 6 AO
- B: 6 DI + 6 AO
- C: 3 relays + 3 DI + 6 AO

PR2018 (18 Analog Inputs)

1 Other Inputs and Outputs*
- 0: none
- 1: 6 Relays
- 3: 6 DI

5: 6 AO
6: 3 relays + 3 DI

PR2024 (24 Analog Inputs)

1 Other Inputs and Outputs*
0: none

2 Power
A: 90-250 VAC, 50/60 Hz
D: 11-36 VDC

3 Communication
0: standard Ethernet interface
1: Ethernet + RS-232
2: Ethernet + RS-422/485

4 Firmware
0: Standard Version
1: Plus Version 1 with extra mathematics, external channels, batch & FDA21 CFR Part 11
2: Plus Version 2 with editable custom display and Panel Studio software

3: Plus Version 3- includes Plus version 1 and 2

5 PC Software
1: Free Basic Software of Historical Viewer and Configuration
2: Extensive software Data Acquisition Studio
(Real Time Viewer + Historical Viewer + Configuration)

6 Mounting types, Power Cord & Switch
0: panel mount, no power cord, no power switch
1: panel mount, no power cord, power switch
2: portable, UL & CSA power cord, power switch
3: portable, VDE power cord, power switch
4: portable, SAA power cord, power switch
5: portable, BS power cord, power switch
6: portable, no power cord, power switch

7&8 Special options
00: none
01: 16G SD card
02: 32G SD card

*DI- Digital Input
AO-Analog Retransmission Output

1.7.3 PR30 Ordering code

PR3006 (6 Analog Inputs) – □ □ □ □ □ □ □ □ □ □
PR3012 (12 Analog Inputs) **1 2 3 4 5 6 7 8 9 10**
PR3018 (18 Analog Inputs)
PR3024 (24 Analog Inputs)
PR3030 (30 Analog Inputs)
PR3036 (36 Analog Inputs)
PR3042 (42 Analog Inputs)
PR3048 (48 Analog Inputs)

1 Relay Outputs
0: none
1: 6 Relays
2: 12 Relays
3: 18 Relays
4: 24 Relays

2 Digital Inputs
0: none
1: 6 Channels
2: 12 Channels
3: 18 Channels

3 Analog Outputs
0: none
1: 6 Channels
2: 12 Channels

4 Power
A: 90-250 VAC, 50/60 Hz
D: 11-36 VDC

5 Communication
0: standard Ethernet interface
1: Ethernet + RS-232
2: Ethernet + RS-422/485

6 Firmware
0: Standard Version
1: Plus Version 1 with extra mathematics, external channels, batch & FDA21 CFR Part 11
2: Plus Version 2 with editable custom display and Panel Studio software

3: Plus Version 3- includes Plus version 1 and 2

7 PC Software

1: Free Basic Software of Historical Viewer and Configuration
2: Extensive software Data Acquisition Studio
(Real Time Viewer + Historical Viewer + Configuration)

8 Mounting types, Power Cord & Switch

0: panel mount, no power cord, no power switch
1: panel mount, no power cord, power switch
2: portable, UL & CSA power cord, power switch
3: portable, VDE power cord, power switch
4: portable, SAA power cord, power switch
5: portable, BS power cord, power switch
6: portable, no power cord, power switch

9&10 Special options

00: none
01: 16G SD card
02: 32G SD card

1.7.4 Accessories:

Part no.	Descriptions
AI203	3-channel analog input card (TC, RTD, mA, V, mV)
AI206	6-channel analog input card (TC, RTD, mA, V, mV)
RO206	6-channel relay output card
DI206	6-channel digital input card
RD233	3-channel Relay output and 3-channel digital input card
AO206	6-channel analog output card
IF232	RS-232 communication module for PR10 and PR20
IF485	RS-422/485 communication module for PR10 and PR20
IF232A	RS-232 communication module for PR30
IF485A	RS-422/485 communication module for PR30
PM201	90-250VAC 47-63Hz panel mount power supply board without power switch for PR10 and PR20
PM202	90-250VAC 47-63Hz panel mount power supply board with power switch for PR10 and PR20
PM203	90-250VAC 47-63Hz portable power supply board with power switch for PR10 and PR20
PM211	11-36VDC panel mount power supply board without power switch for PR10 and PR20
PM212	11-36VDC panel mount power supply board with power switch for PR10 and PR20
PM213	11-36VDC portable power supply board with power switch for PR10 and PR20
PM301	90-250VAC 47-63Hz panel mount power supply board without power switch for PR30
PM302	90-250VAC 47-63Hz panel mount power supply board with power switch for PR30
PM303	90-250VAC 47-63Hz portable power supply board with power switch for PR30
PM311	11-36VDC panel mount power supply board without power switch for PR30
PM312	11-36VDC panel mount power supply board with power switch for PR30
PM313	11-36VDC portable power supply board with power switch for PR30

Notes:

- The rear Slots of the recorder will only accept certain Input or output cards in any combination based on selected model.

- For example, PR10 has 4 empty slots. But only 3 slots can be used. In one slot, it needs 1 pc. of either a 3 or 6 channel analog input card. The other slot can be used as per the combination showed in the ordering code.

- The basic PC software is supplied free with the recorder. There is an additional charge for the extensive Data Acquisition Software supplied with communication of RS-232/422/485 or Ethernet.

- The Ordering Code for various standard model Recorders with an AC supply and without any additional options are as follows:

PR1003- 0A001000
PR2003- 0A001000
PR3006- 000A001000

1.8 Specifications

Power:

PR10 and PR20:
90-250VAC, 47-63Hz, 52VA, 26W maximum
11-36VDC, 26VA, 26W maximum

PR30:
90-250VAC, 47-63Hz, 110VA, 62W maximum
11-36VDC, 62VA, 62W maximum

Display:
PR10: LCD, 480 x 272 pixel resolution, 65K color
PR20: LCD, 640 x 480 pixel resolution, 65K color
PR30: LCD, 1024 x 768 pixel resolution, 65K color

Memory:
256MB storage memory on board.

Analog Input Cards (AI20X):

Channels: AI203 ~ 3 channels, AI206 ~ 6 channels
Resolution: 24 bits
Sampling Rate: 10 times/ second
Maximum Rating: RTD input ±20V
T/C and Voltage input ± 65V
mA input ±10V
Temperature Effect: ±0.1uV ±15PPM of reading for all inputs except mA, ±30PPM of reading for mA input
Sensor Lead Resistance Effect:
T/C: 0.32PPM of reading/ohm 3-wire RTD: 2.6 ˚C /ohm of resistance difference of two leads (Based on ℃ measurement temperature for PT100)
2-wire RTD: 2.6 ˚C /ohm of resistance sum of two leads (Based on ℃ measurement temperature for PT100)

Burn-out Current: 10uA
Common Mode Rejection Ratio (CMRR): 120dB
Normal Mode Rejection Ratio (NMRR): 55dB
Isolation Breakdown Voltage between channels: 1500VAC min.
Sensor Break Detection:
Sensor opened for TC, RTD and mV inputs, below 1 mA for 4-20mA input, below 0.25V for 1-5V inputs, unavailable for other inputs
Sensor Break Responding Time: Within 1 seconds for TC, RTD and mV inputs, 0.1 second for 4-20 mA and 1-5V inputs

Characteristics:

Type	Range	Accuracy at 25 ˚C	Input Impedance
J	-120 ~ 1000 ˚C (-184 ~ 1832 ˚F)	±1 ˚C	3.12MΩ
K	-200 ~ 1370 ˚C (-328 ~ 2498 ˚F)	±1 ˚C	3.12MΩ
T	-250 ~ 400˚C (-418 ~ 752˚F)	±1 ˚C	3.12MΩ
E	-100 ~ 900 ˚C (-148 ~ 1652 ˚F)	±1 ˚C	3.12MΩ
B	0 ~ 1820 ˚C (32 ~ 3308 ˚F)	±2˚C (200 ~ 1820 ˚C)	3.12MΩ
R	0 ~ 1768 ˚C (32 ~ 3214 ˚F)	±2 ˚C	3.12MΩ
S	0 ~ 1768 ˚C (32 ~ 3214 ˚F)	±2 ˚C	3.12MΩ
N	-250 ~ 1300 ˚C (-418 ~ 2372 ˚F)	±1 ˚C	3.12MΩ
L	-200 ~ 900 ˚C (-328 ~ 1652 ˚F)	±1 ˚C	3.12MΩ
U	-200 ~ 600˚C (-328 ~ 1112 ˚F)	±1 ˚C	3.12MΩ
P	0 ~ 1395 ˚C (32~2543 ˚F)	±1 ˚C	3.12MΩ
W5	0 ~ 2315 ˚C (32 ~ 4199˚F)	±1 ˚C	3.12MΩ
W3	0 ~ 2315˚C (32 ~ 4199 ˚F)	±1 ˚C	3.12MΩ
LR	-200 ~ 800 ˚C (-328 ~ 1472 ˚F)	±1 ˚C	3.12MΩ
A1	0 ~ 2500 ˚C (-32 ~ 4532 ˚F)	±1 ˚C	3.12MΩ
A2	0 ~ 1800 ˚C (-32 ~ 3272 ˚F)	±1 ˚C	3.12MΩ
A3	0 ~ 1800 ˚C (-32 ~ 3272 ˚F)	±1 ˚C	3.12MΩ
M	-200 ~ 100 ˚C (-328 ~ 212 ˚F)	±1 ˚C	3.12MΩ

PT50 (α = 0.00385)	-200 ~ 850 ˚C (-328 ~ 1562 ˚F)	±0.4 ˚C	2.0KΩ
PT100 (α = 0.00385)	-200 ~ 850 ˚C (-328~ 1562 ˚F)	±0.4 ˚C	2.0KΩ
PT200 (α = 0.00385)	-200 ~ 850 ˚C (-328 ~ 1562 ˚F)	±0.4 ˚C	2.0KΩ
PT500 (α = 0.00385)	-200 ~ 850 ˚C (-328 ~ 1562 ˚F)	±0.4 ˚C	2.0KΩ
PT1000 (α = 0.00385)	-200 ~ 350 ˚C (-328 ~ 662 ˚F)	±0.4 ˚C	2.0KΩ
PT50 (α = 0.00391)	-200 ~ 850 ˚C (-328 ~ 1562 ˚F)	±0.4 ˚C	2.0KΩ
PT100 (α = 0.00391)	-200 ~ 850 ˚C (-328 ~ 1562 ˚F)	±0.4 ˚C	2.0KΩ
JPT50 (α = 0.003916)	-200 ~ 600 ˚C (-328 ~ 1112 ˚F)	±0.4 ˚C	2.0KΩ
JPT100 (α = 0.003916)	-200 ~ 600 ˚C (-328 ~ 1112 ˚F)	±0.4 ˚C	2.0KΩ
JPT200 (α = 0.003916)	-200 ~ 600 ˚C (-328 ~ 1112 ˚F)	±0.4 ˚C	2.0KΩ
JPT500 (α = 0.003916)	-200 ~ 600 ˚C (-328 ~ 1112 ˚F)	±0.4 ˚C	2.0KΩ
JPT1000 (α = 0.003916)	-200 ~350 ˚C (-328 ~ 662 ˚F)	±0.4 ˚C	2.0KΩ
Cu50 (α = 0.00426)	-50 ~ 200 ˚C (-58 ~392 ˚F)	±0.4 ˚C	2.0KΩ
Cu100 (α = 0.00426)	-50 ~ 200 ˚C (-58 ~392 ˚F)	±0.4 ˚C	2.0KΩ
Cu50 (α = 0.00428)	-180 ~ 200 ˚C (-292 ~392 ˚F)	±0.4 ˚C	2.0KΩ
Cu100 (α = 0.00428)	-180 ~ 200 ˚C (-292 ~392 ˚F)	±0.4 ˚C	2.0KΩ
Ni100 (α = 0.00617)	-60 ~ 180 ˚C (-76 ~356 ˚F)	±0.4 ˚C	2.0KΩ
Ni200 (α = 0.00617)	-60 ~ 180 ˚C (-76 ~356 ˚F)	±0.4 ˚C	2.0KΩ
Ni500 (α = 0.00617)	-60 ~ 180 ˚C (-76 ~356 ˚F)	±0.4 ˚C	2.0KΩ
Ni1000 (α = 0.00617)	-60 ~ 180 ˚C (-76 ~356 ˚F)	±0.4 ˚C	2.0KΩ
Cu10 (α = 0.00427)	-200 ~ 260 ˚C (-328 ~500 ˚F)	±0.1 ˚C	2.0KΩ
±20mA	-26 ~ 26mA	±0.05%	75Ω
±60mV	-122 ~ 122mV	±0.05%	3.12MΩ
±200mV	-243 ~ 243mV	±0.05%	3.12MΩ
±1V	-1.58 ~ 1.58mV	±0.05%	3.12MΩ
±2V	-3.16 ~ 3.16mV	±0.05%	3.12MΩ
±6V	-6.32 ~ 6.32V	±0.05%	3.12MΩ
±20V	-25.3 ~ 25.3V	±0.05%	3.12MΩ
±50V	-50.6 ~ 50.6V	±0.05%	3.12MΩ
0.4 ~ 2V	-3.16 ~ 3.16V	±0.05%	3.12MΩ

1 ~ 5V	-6.32 ~ 6.32V	±0.05%	3.12MΩ

Digital Input Card (DI206):

Channels: 6 per card
Logic Low: -5V minimum, 0.8V maximum
Logic High: 3.5V minimum, 24V maximum
External pull-down Resistance: 1KΩ maximum
External pull-up Resistance: 1.5MΩ minimum

Relay Output Card (RO206):

Channels: 6 per card
Contact Form: N.O. & N.C. (form C)
Relay Rating: 5A/240 VAC, life cycles 200,000 for resistive load

Analog Output Card (AO206):

Channels: 6 per card
Output signal: 4-20mA, 0-20mA, 0-5V, 1-5V, 0-10V
Resolution: 16 bits
Accuracy: ±0.05% of Span ±0.0025% /˚C
Load Resistance: 0-500 ohms (current), 10K ohms minimum (voltage)
Output Regulation: 0.01% for full load change
Output Setting Time: 0.1 second (stable to 99.9%)
Isolation Breakdown Voltage: 1500VAC at 50/60Hz for 1 minute
Integral Linearity Error: ±0.005% of Span
Temperature Effect: ±0.0025% of Span /˚C

COMM Module (IF232 and IF485):

Interface: RS-232 (1 unit), RS-485 or RS-422 (up to 247 units)
Protocol: Modbus Protocol RTU mode
Address: 1-247
Baud Rate: 9.6 ~ 115.2 Kbits/sec.
Measured data Bits: 7 or 8 bits
Parity Bit: None, Even or Odd
Stop Bit: 1 or 2 bits

Standard Ethernet Communication:

Protocol: Modbus TCP/IP, 10/100 Base T
Ports: AUI (Attachment Unit Interface) and RJ-45, Auto- detect capability

Real time clock accuracy vs. temperature inside of housing

Temperature inside housing	typical error per month
10 ~ 40 ˚C	18 seconds

0 ˚C or 50 ˚C	52 seconds
-10˚C or 60 ˚C	107 seconds

Environmental & Physical:

Operating Temperature: 0 ~ 50 ˚C
Storage Temperature: -30 ~ 70 ˚C
Humidity: 20 to 90% RH (non-condensing), maximum relative humidity 90% is for ambient temperature up to 38˚C decreasing linearly to 50% relative humidity at 50˚C
Altitude: 2000 M maximum
Insulation Resistance: 20 M ohms min. (at 500 VDC)
Dielectric Strength: 2300VAC, 50/60 Hz for 1 minute between power terminal and earth
Vibration Resistance: 10-55 Hz, 10m/ s^2 for 2 hours
Shock Resistance: 30m/ s^2 (3g) for operation, 20g for transportation
Operation Position: no inclined restriction
Dimensions: Panel Mount style: 144(W) x 144(H) x 193mm (D) (for PR10/20)
288(W) x 288(H) x 194mm (D) (for PR30)
Standard Panel Cutout: 137 x 137mm (for PR10/20)
281 x 281mm (for PR30)

Approval Standards:

Safety: UL61010C-1, CSA C22.2 No. 24-93
CE: EN61010-1 (IEC1010-1) over voltage category II, Pollution degree 2

Protective Class: IP 65 front panel for indoor use,
IP 20 housing and terminals

EMC:
Emission: EN61326-1 (EN55022 class A, EN61000-3-2, EN61000-3-3)

Immunity: EN61326-1 (EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11)

2. Installation and wiring

2.1 Unpacking

If any damage is found while unpacking, the user should contact the local representative at once. It is suggested that the special packaging is retained for possible future requirements.

2.2 Installation

⚠ **Remove stains from this equipment using a soft, dry cloth. Do not use harsh chemicals, volatile solvents such as thinner or strong detergents to clean the equipment in order to avoid deformation.**

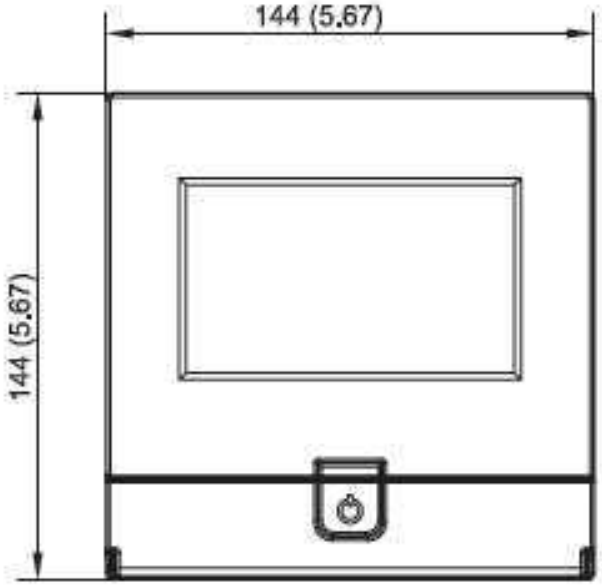
The recorder is designed for indoor use and not in any hazardous area. It should be kept away from shock, vibration, and electromagnetic fields such as variable frequency drives, motors and transformers.
It is intended to operate under the following environmental conditions:

Pollution Degree Level II	IEC1010-1(EN61010-1)
Temperature	0 ~ 50 ˚C
Humidity	20 ~ 90 % RH (non-condensing)
Power	90 ~ 250 VAC, 50/60 Hz or 11-36VDC
Altitude	2000M maximum

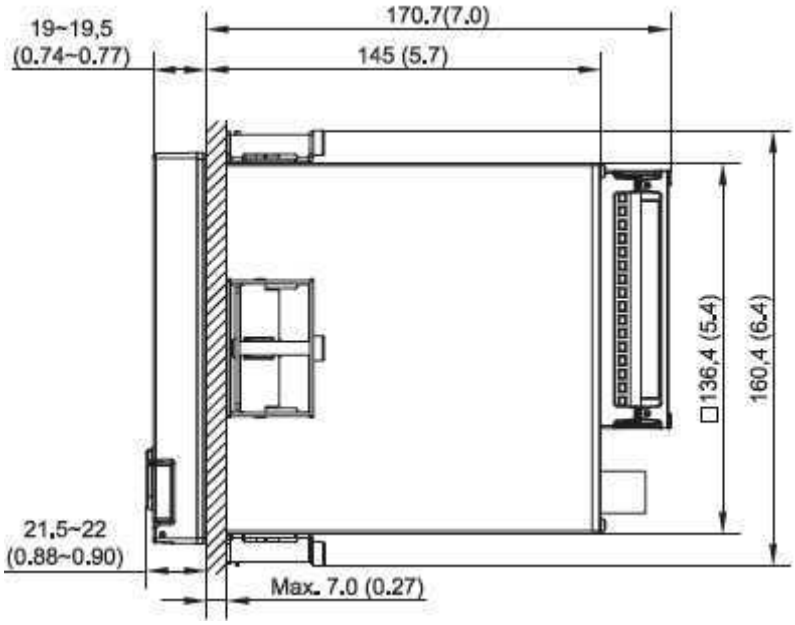
2.3 Panel mounting style

PR10:

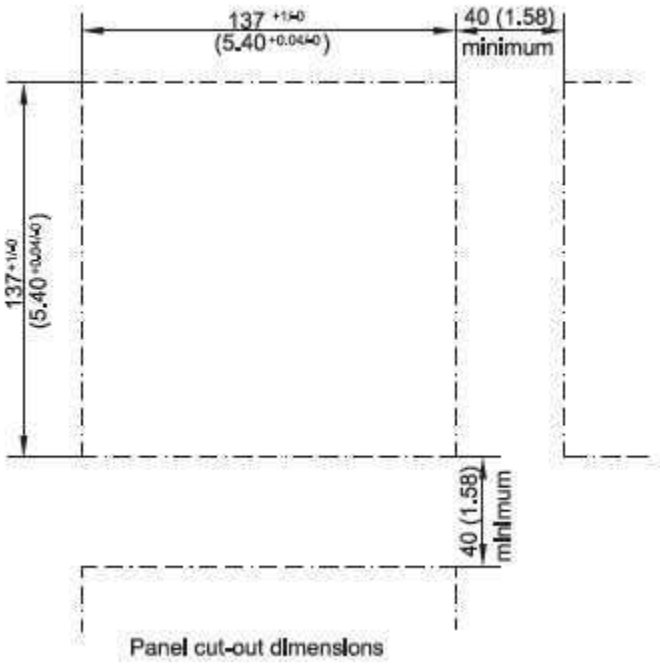
Front Side



Right Side

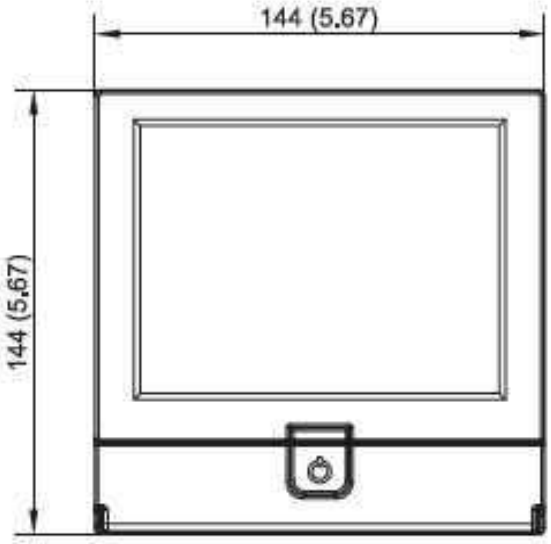


Panel Cut Out Dimensions

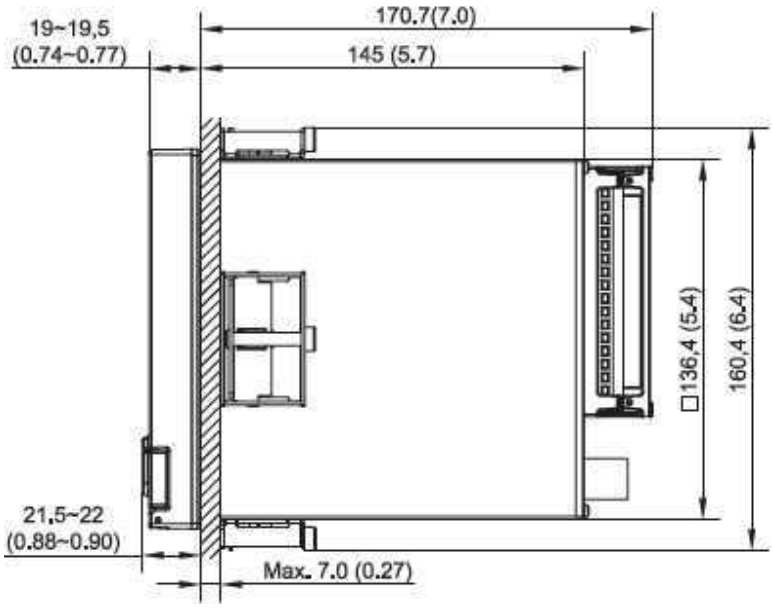


PR20:

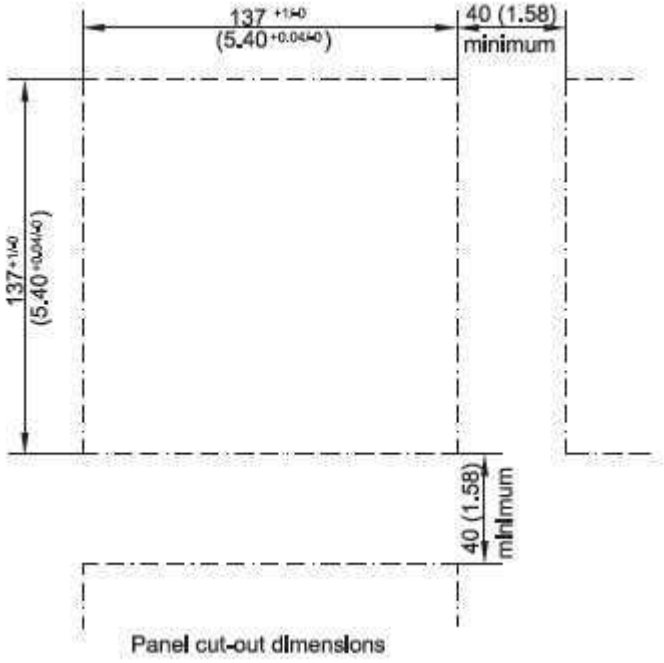
Front Side



Right Side

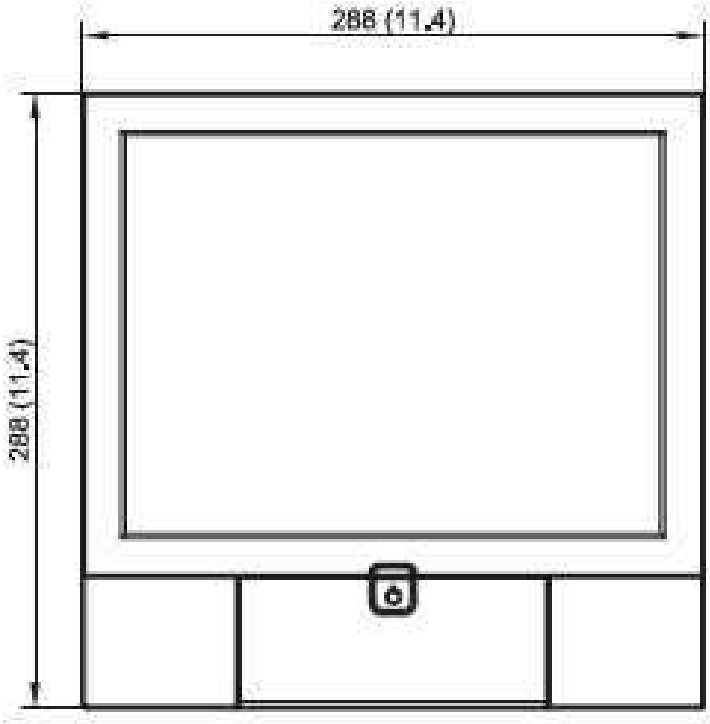


Panel Cut Out Dimensions

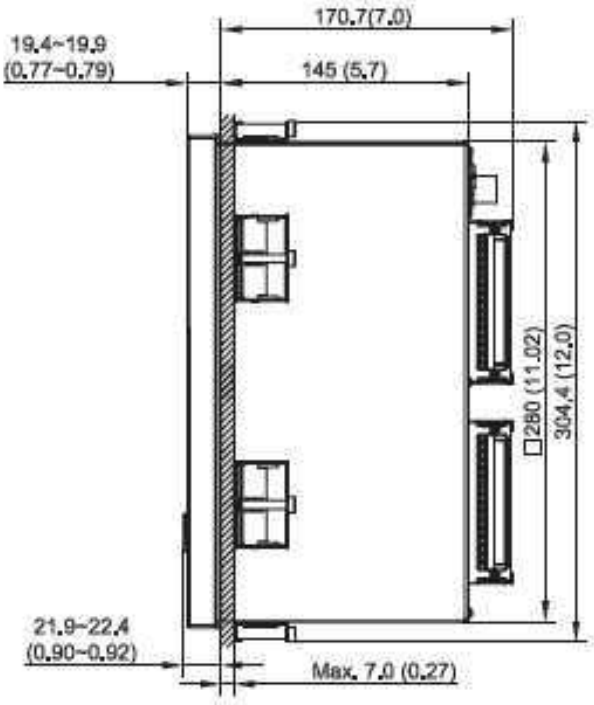


PR30:

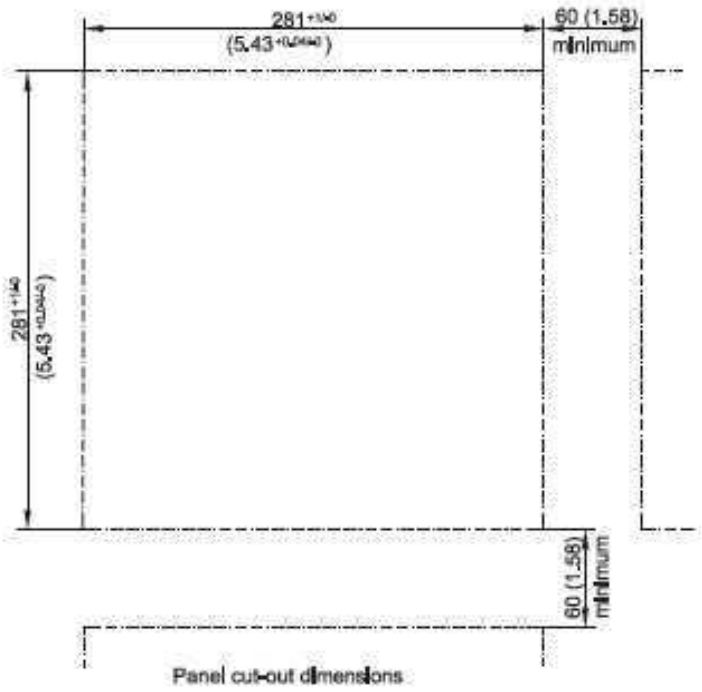
Front Side



Right Side



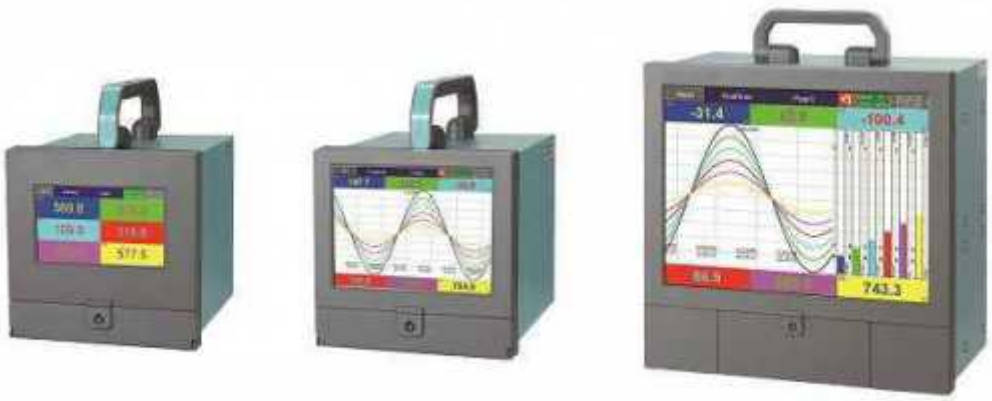
Panel Cut Out Dimensions



Note:

- Do not over tighten mounting clamp screws that could result in distortion of the case.
- There is no mounting angle restriction.

Portable styles:



2.4 Setup input and output

Analog input cards (part numbers AI206 and AI203)

AI206 and AI203 are analog input cards in 3 and 6 channels respectively. Each card includes universal inputs of TC (J, K, T, E, B, R, S, N, L, U, P, W5, W3, LR, A1, A2, A3, and M), RTD, mV, mA, V. The accepted input types and sensor range for each type are listed in clause 1.8 of chapter 1. Plug the card into the rear slot then power on. The recorder will automatically detect the card and display the specific input type, then show its location in a specific slot when the user is in Configuration Mode.
To select a specific input, please press menu and then the Config button to get into the configuration window. In the configuration window, press up/down and enter key to select AI to get into AI setting window. In the AI setting window, move the selected focus to the item "Type" under the node "Sensor", then press the enter key to select the desired sensor type. Press OK when finished. All other items are similar to set up. The item "Events" can be added to do further control.

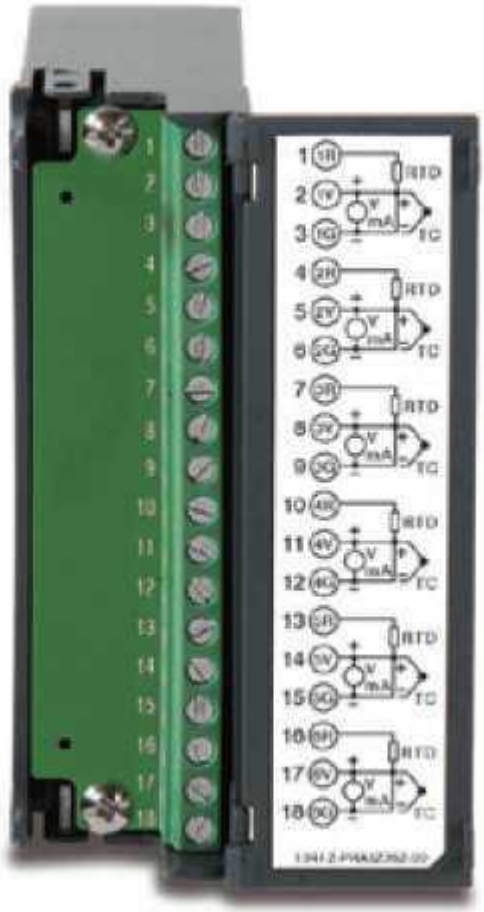
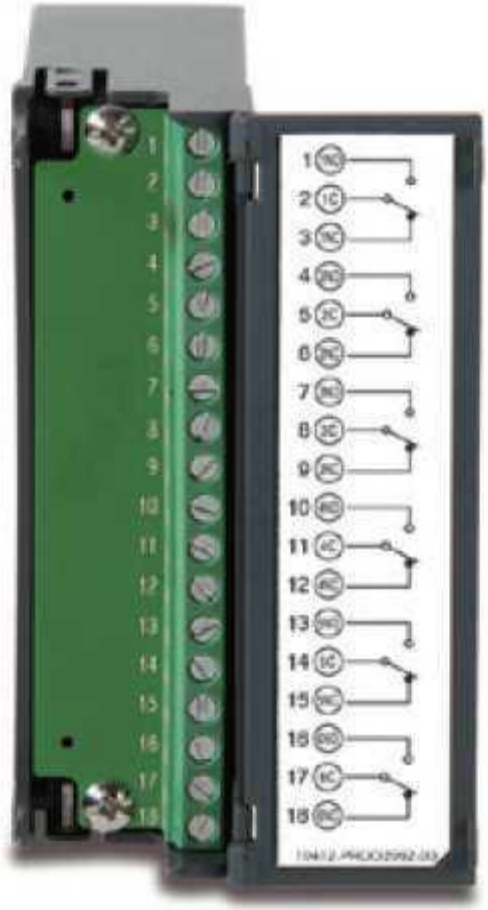


Figure 2 – 15 (AI206)

Relay Output card (RO206) / 6 relay alarm card

The relay output card includes 6 relays rated 5 Amp/240 VAC each. Plug the card into a rear slot and power on the recorder. The recorder will automatically detect the card and display the output type and its location in a specific slot in **System Info** mode while doing the configuration.

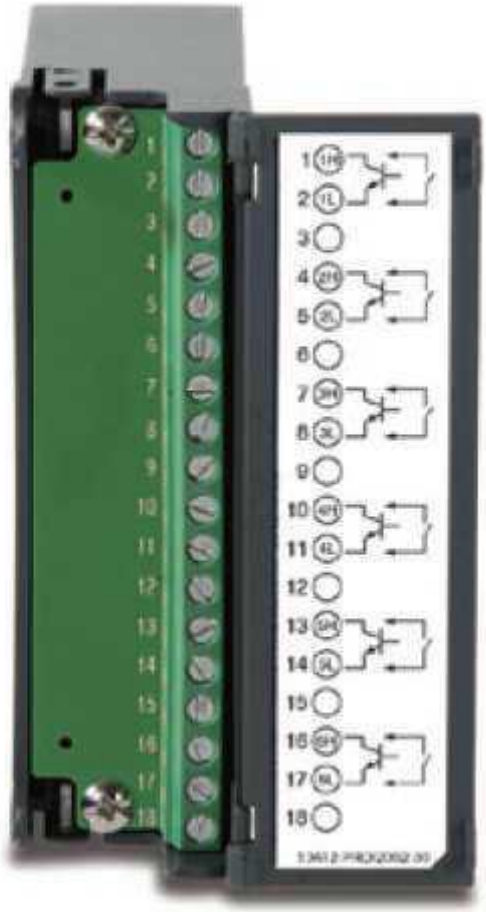
To set up the relay output card, please press **menu** and then the **Config** button to get into the configuration window. In the configuration window, press up/down and enter key to select DO and to get into the DO setting window. In the DO setting window, the setup steps are similar to AI. The item "Reverse" is to reverse the output status.



Digital Input card (DI206)

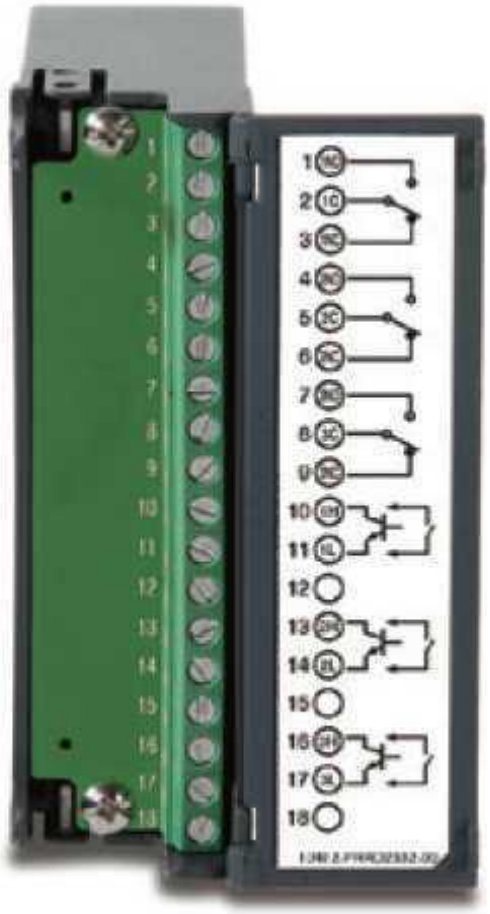
This card includes 6 channels of event inputs. As above, plug the card into rear slot and power on the recorder. The recorder will automatically detect it, and then display the input type and its location in a specific slot in **System Info** mode while doing the configuration.

To set up the digital input card, please press **menu** and then the **Config** button to get into the configuration window. In the configuration window, press up/down and enter key to select DI and get into the DI setting window. In the DI setting window, the setup steps are similar to AI. The item "Type" is for the user to decide if this channel will have a logic level or Pulse Counter input. If you select Pulse Counter, the item "Frequency" will appear for you to select input frequency (100Hz,). The item "Events" can be added to do further control.



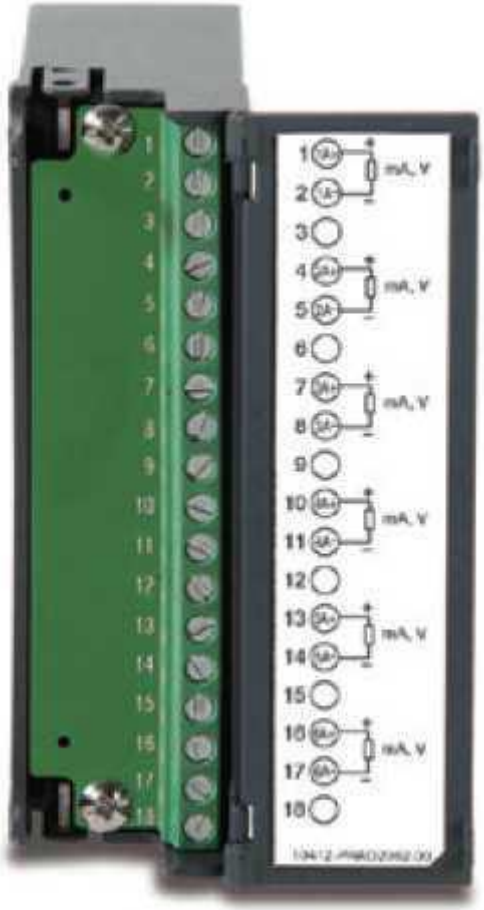
Combination Digital Input and Output card (RD233)

This card includes 3 relays rated 5 Amp/240VAC each and 3 Channels of Digital Inputs. As above, plug the card into rear slot and power on the recorder. The recorder will automatically detect it, and then display the input type and also a Relay. The first 3 combination are for relays (Terminal 1 to 9) and last 3 combination are for Digital inputs (Terminals 10 to 18). The setup is similar to relay output card and digital input card.



Analog output cards (AO206)

These cards are 6-channel current output cards. They are used to retransmit process values to other devices like meters, controllers, ect.
To set up the analog output card, please press the menu and then the Config button to get into the configuration window. In the configuration window, press the up/down and enter key to select AO. This will get you into the AO setting window. In the AO setting window, the setup steps are similar to AI. The item "Type" is to decide whether to output current or voltage. The item "Output" is to select the output range for current or voltage (0-10, 4-20mA, ect.). The item "Expression" is a math expression field where the user can input an expression to control the output value.

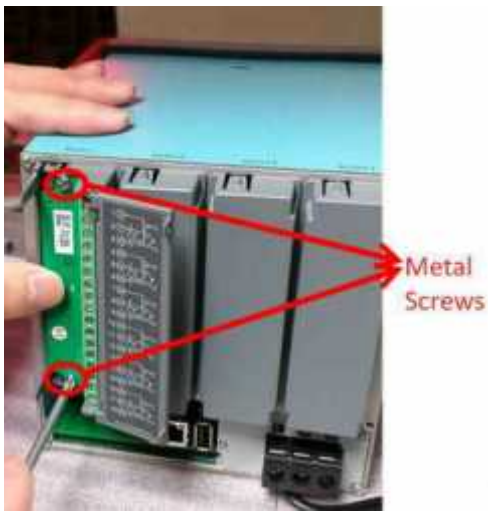


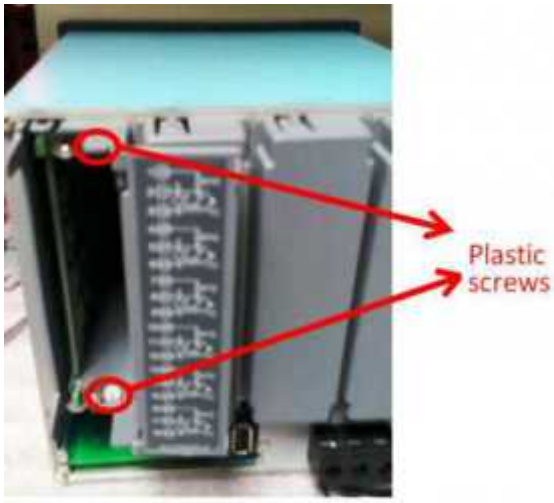
<u>Note 1:</u> The IO Cards should not be removed or Inserted to the PR when the Power is ON. This should be carried out in the Power OFF Condition only.

<u>Note 2:</u> In the PR30, the Analog Input card should be inserted in slots 1 to 8 only. It should not be inserted in slots 9 to 16.

<u>Note 3:</u> The below pictures explain how to install a new AI card into a recorder slot:

Information regarding removing the IO Cards from PR.
For removing the IO Card, First remove the metal screws then plastic screws, after that press the lock on the top and bottom of the Card and pull to remove it. Failing to do so will damage the IO Card. Please follow the below pictures for more information.
The Maximum Torque for the metal screw is 3Kg-cm (2.6in-lb) and the Maximum Torque for the plastic screw is 0.8Kgf-cm (.7in-lb).





Note 4: **For some industries who prefer/favour circular displays, PR30 can offer this unique feature and set the display speed for each page/circle in 30 minutes, 1, 2, 4, 8, 12 hours, 1, 2 days, or 1, 2, 4 weeks.**

Note 5: **Calibrate: Sometimes the field calibration is required for high accuracy. In this case, a qualified engineer can do the necessary calibration.**

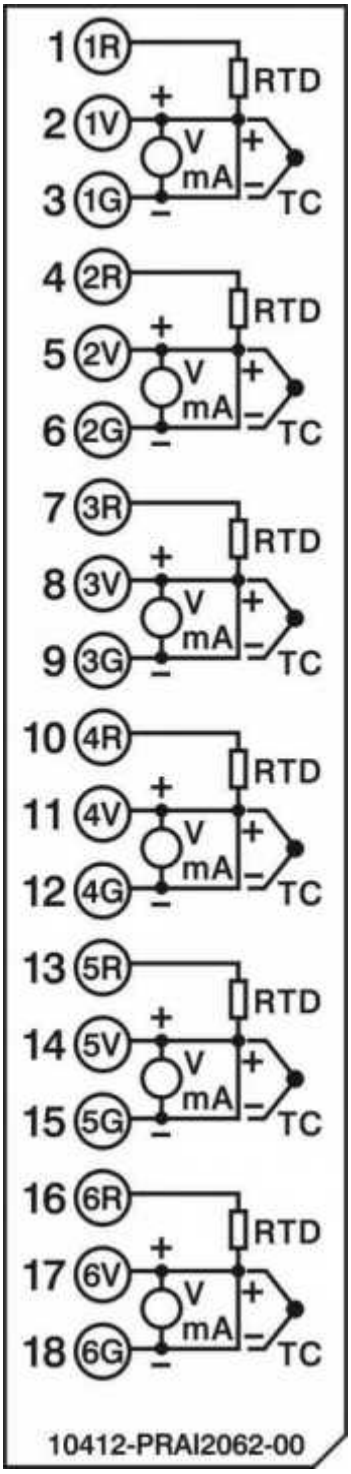
Note 6: **For Thermocouple Inputs, a 1 hour warm up is necessary for initial set up.**

Note 7: **Circular Trends are only available for the PR30 mode.**

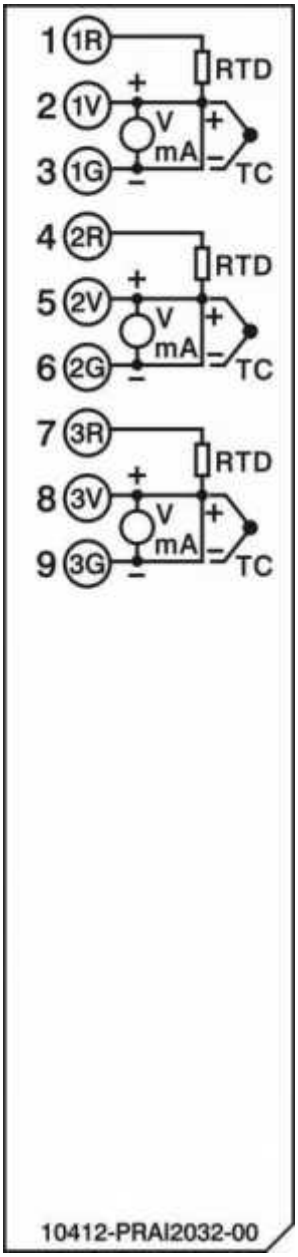
2.5 Wiring of the cards

⚠ **Wiring Precautions**

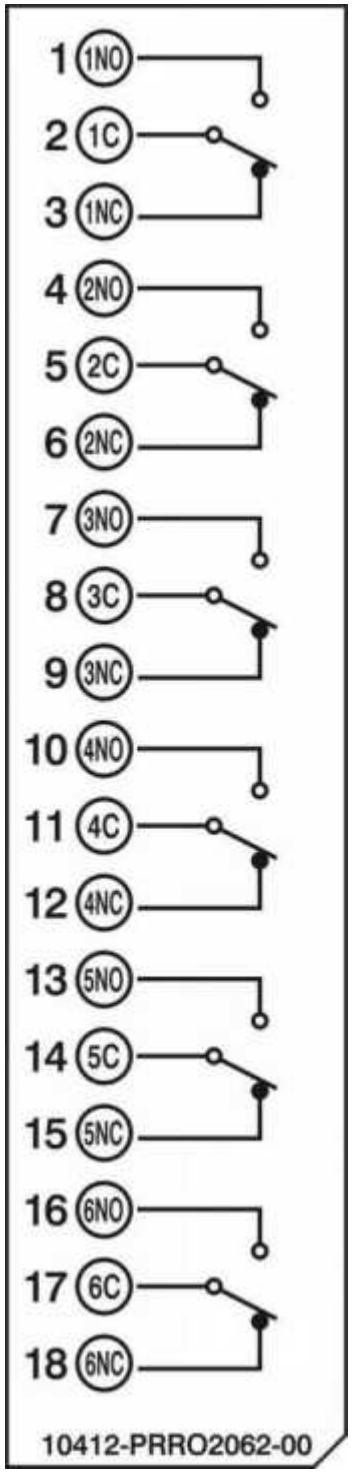
1. **Care must be taken to ensure that the maximum voltage rating specified on the label is not exceeded.**
2. **For the panel-mount version, it is recommended that near an external fuse or an external switch rated at 2A/250 VAC should be used.**
3. **Beware not to over tighten the terminals screws. The torque should not exceed 0.4 N-m (3.6 Lb-in or 4.0 Kg F-cm).**
4. **With the exception of the thermocouple wires, all wires should be stranded copper conductor with maximum gauge of 18 AWG.**
5. **Connect a grounding conductor with 1.6mm diameter minimum to provide protective grounding prior to turning on the equipment.**



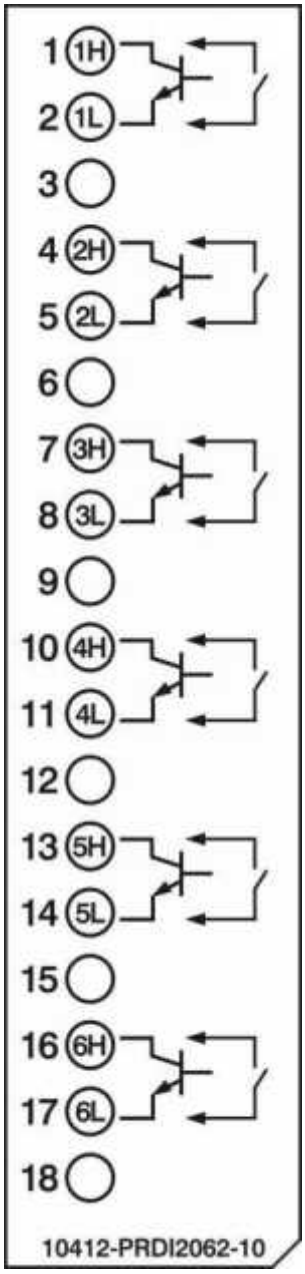
Analog Input Card AI206



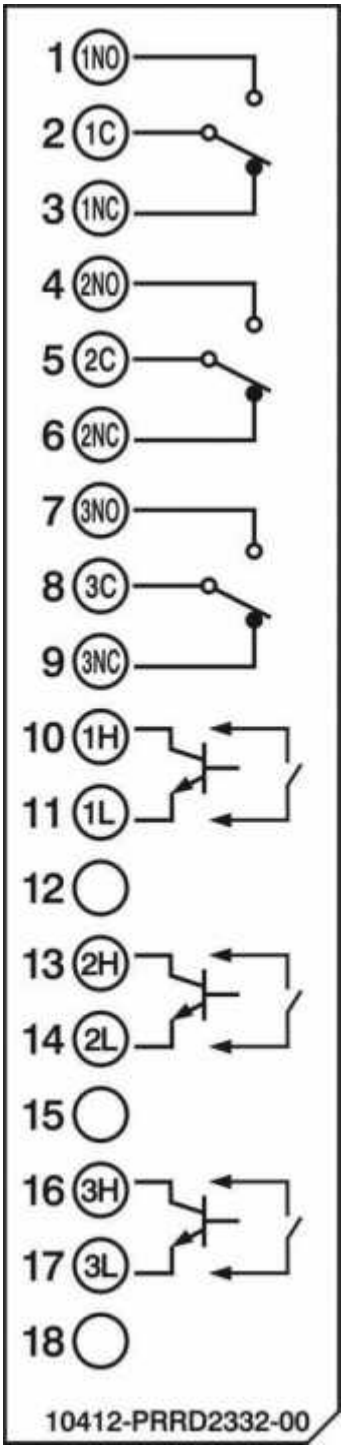
Analog Input Card AI203



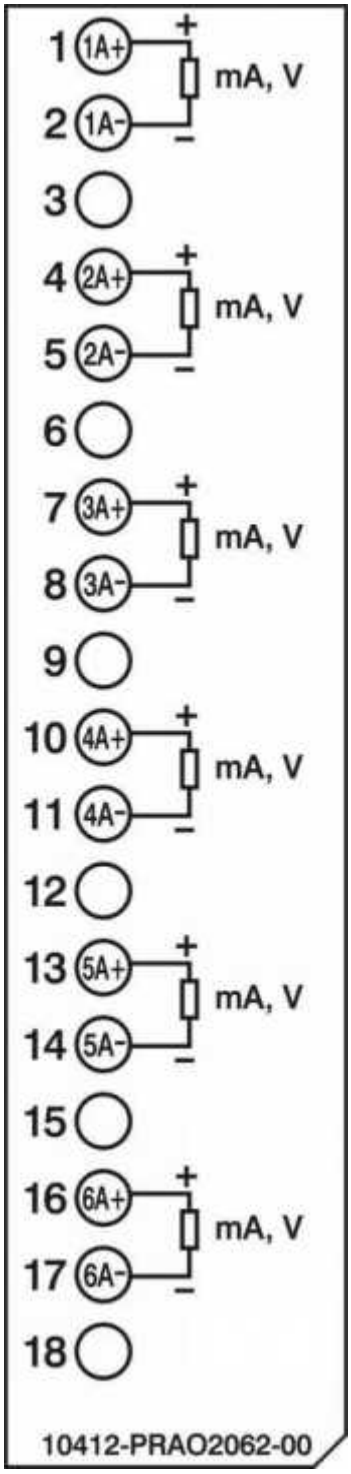
Relay output card (RO206)



Digital input card (DI206)



Relay output and digital input card (RD233)



Analog output card (AO206)

2.6 RS-232, RS-422, and RS-485 wiring

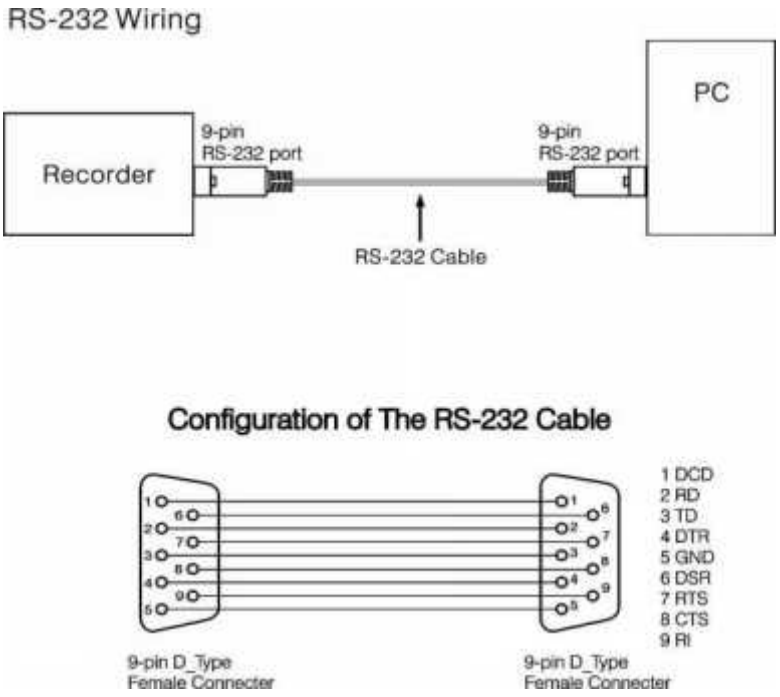
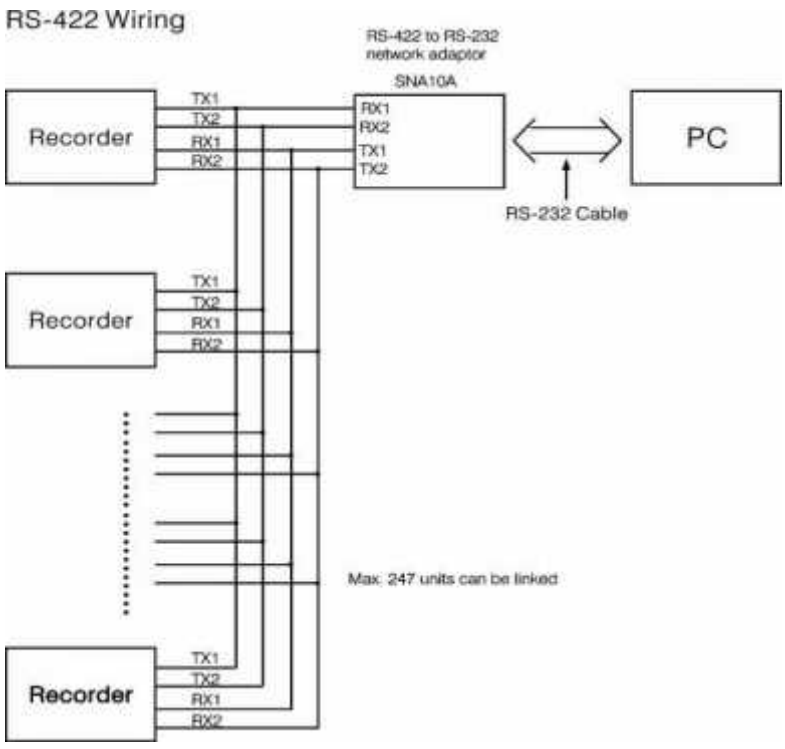
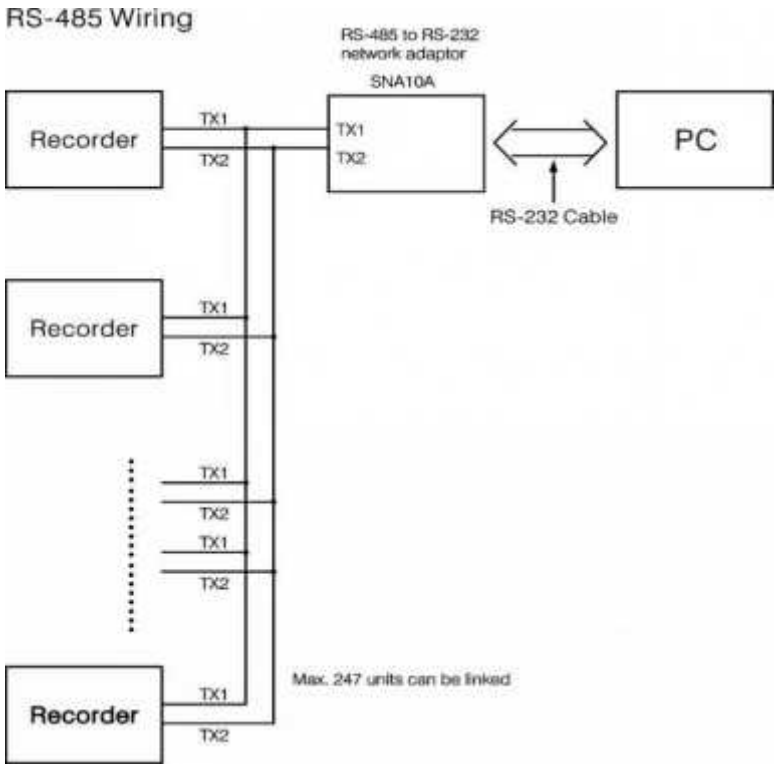


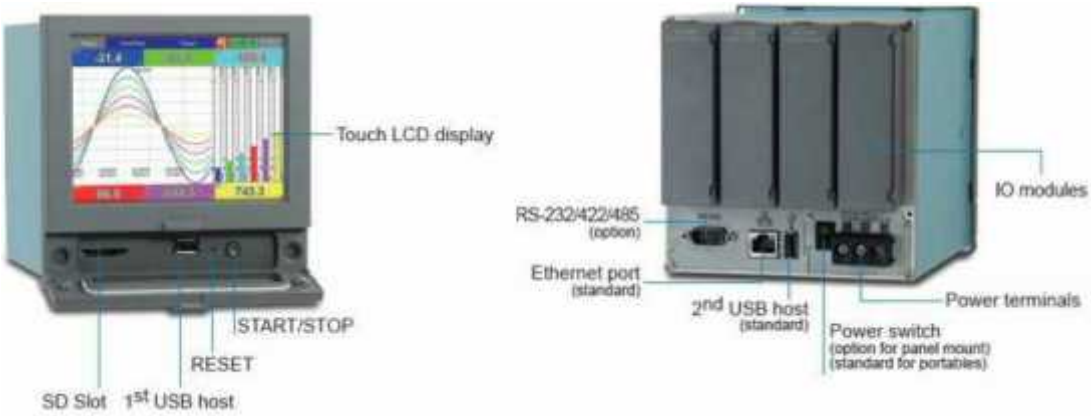
Figure 2 – 24





2.7 External Memory Card:

There two types of external storage for the User. One is the SD card and other is USB memory. There are two slots for inserting USB memory, one in the front and other on the rear side of the recorder. If bigger capacity USB memory is required, the user may buy it locally. The SD card slot is in the front side. Please see the below figures for more information.



Note:

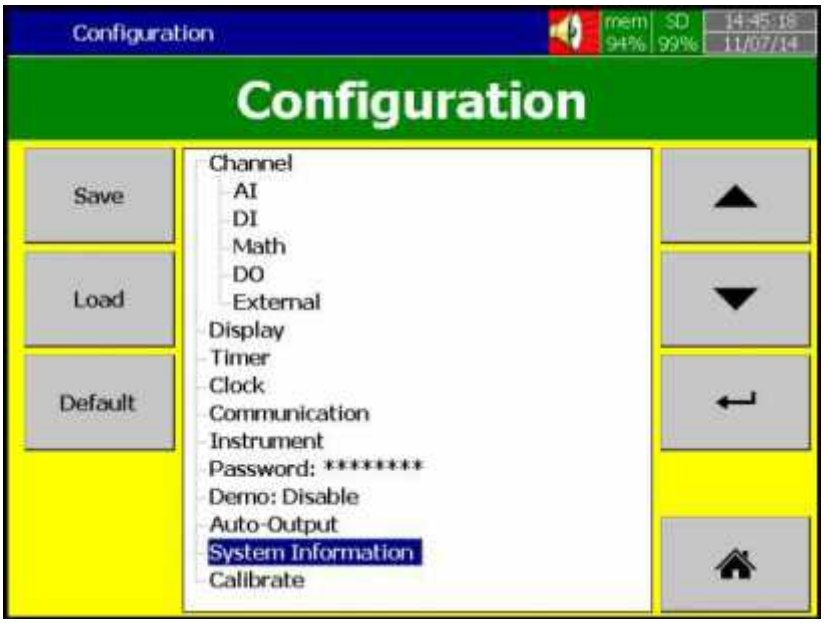
- To read measured data and events on USB memory and SD card Memory, it is necessary to install either the free basic software or the Extensive Data Acquisition software on PC first.

3. BASIC FUNCTIONS OF RECORDERS

In this chapter we will be briefly explaining the functions that are available in the recorder.

3.1 Configuration

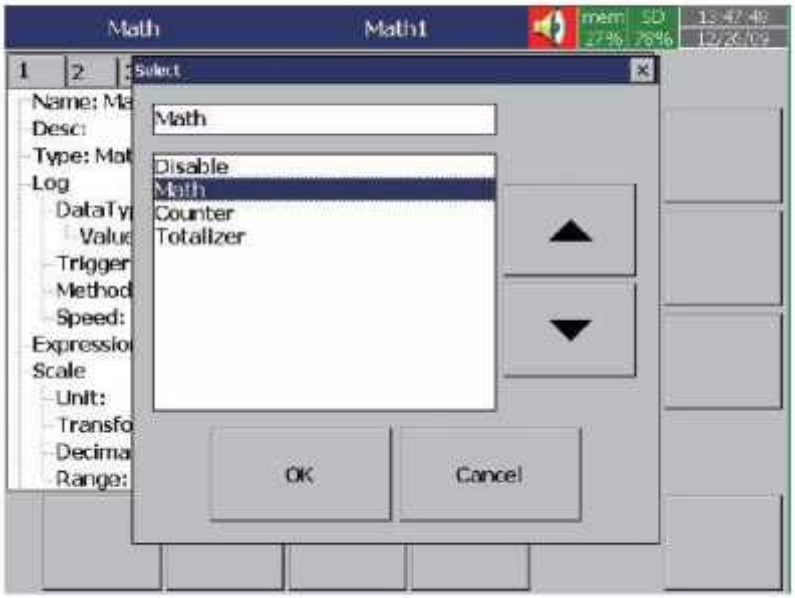
The configuration in the recorder follows a tree type layout. This makes it easy for users to go through the different sub menus easily and to not miss any setting.



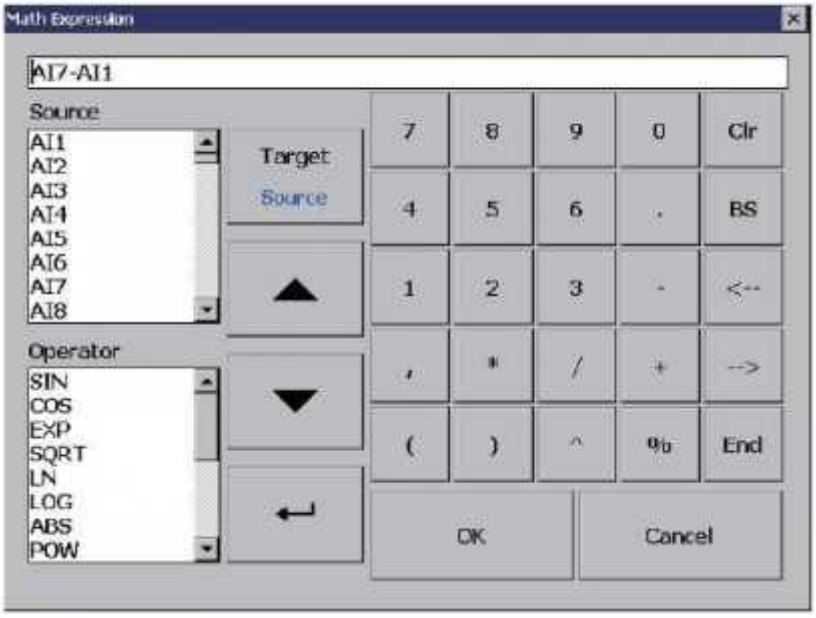
3.2 Standard and Plus Version of Firmware

The standard version of firmware will have only Input configuration, and does not include Math, External channels, Custom Edited Display, Batch, or FDA CFR part11 functions. However, the plus version includes all the above listed functions.

Math: It includes Math, Counter & Totalizer.



Math Expression is keyed in an easy way.



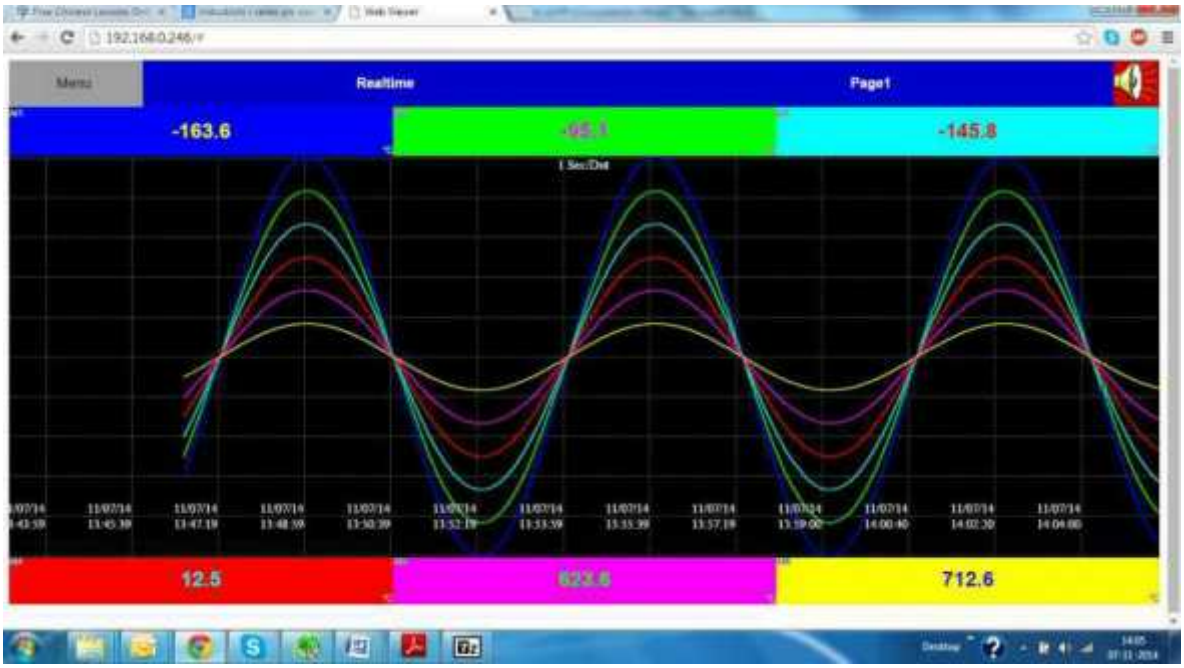
3.3 Communication with Third Party Interfaces

The Recorder has the flexibility to communicate with Third party Interfaces via protocols such as Modbus TCP/IP or Serial connections as either a Modbus Master or Modbus Slave. The detailed settings related information can be found in Chapter 4, Configuration, Section 4.5.

3.4 Information Accessibility through WEB

Web Server:

The Recorder Trend and Digital data can be viewed in any place in the world if we have Web Server connectivity. For this the Recorder should be connected to Internet with a fixed IP address provided by the Internet Service provider.



Email:

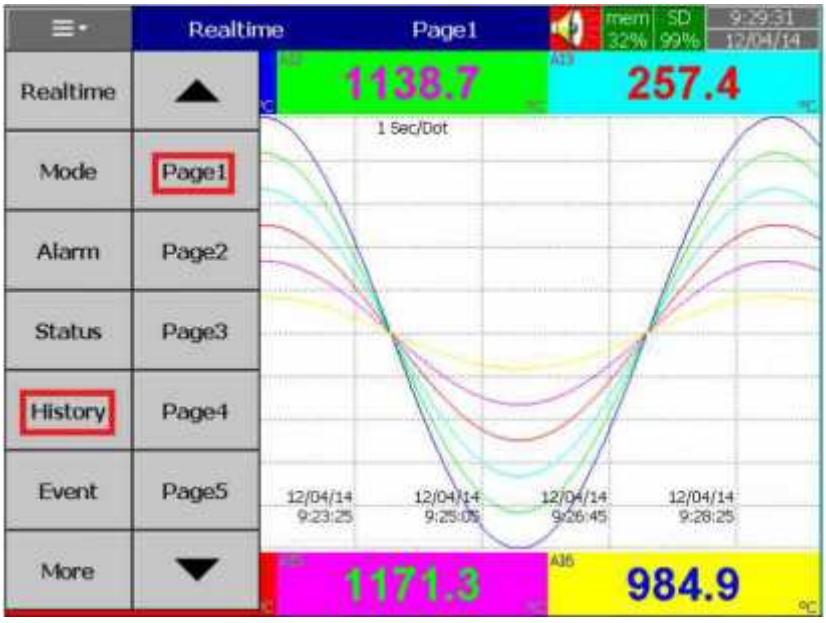
All Important Data events can sent as an email. The detailed settings related information can be found in Chapter 4, Configuration, Section 4.5.

3.5 Handwriting Messages on Trend Screens

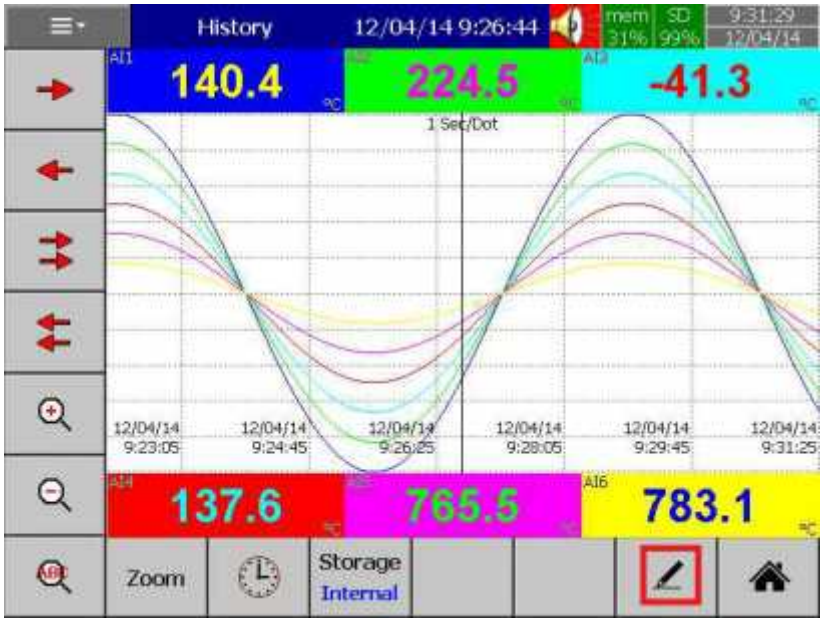
Handwriting Messages on Trend Screens is very handy for process associates to highlight important events.

The User can write handwritten messages using a stylus on Historical Trend screens. This is shown in the below picture.

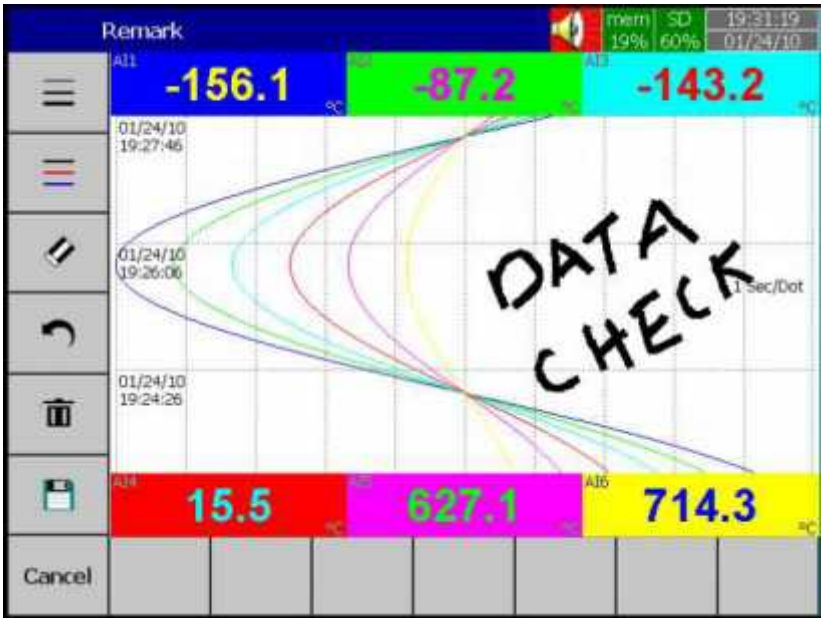
When the User navigates through (Menu) - ⟶ History⟶Page 1, as shown in the below screen.



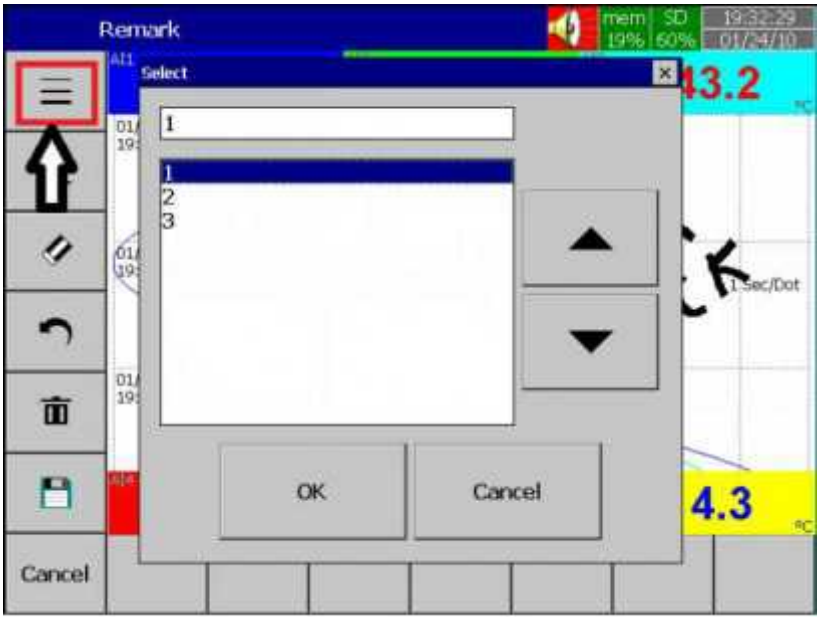
If the User wants to write a message, they can press the pen symbol as shown in the red square in the screen below



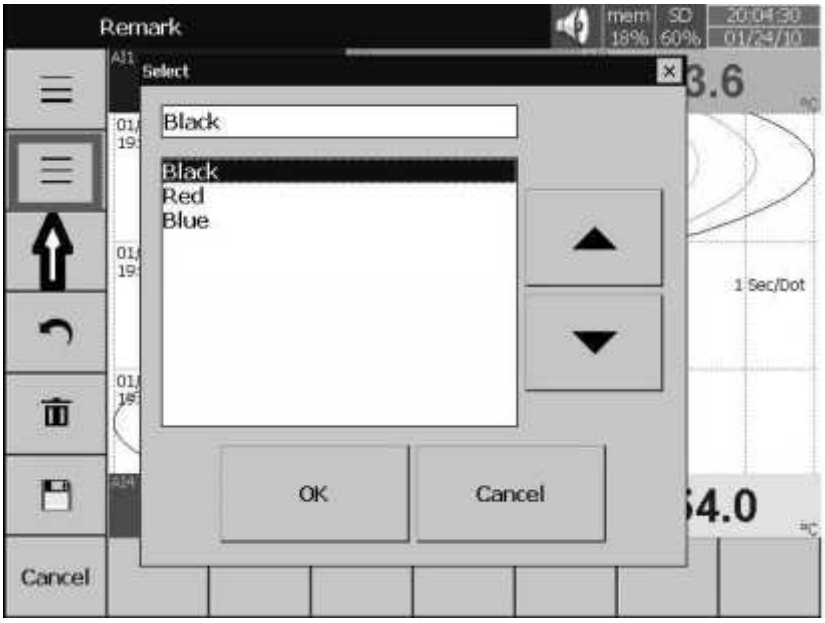
Then using the stylus, the User can write any message in Historical Trend Pages as shown below.



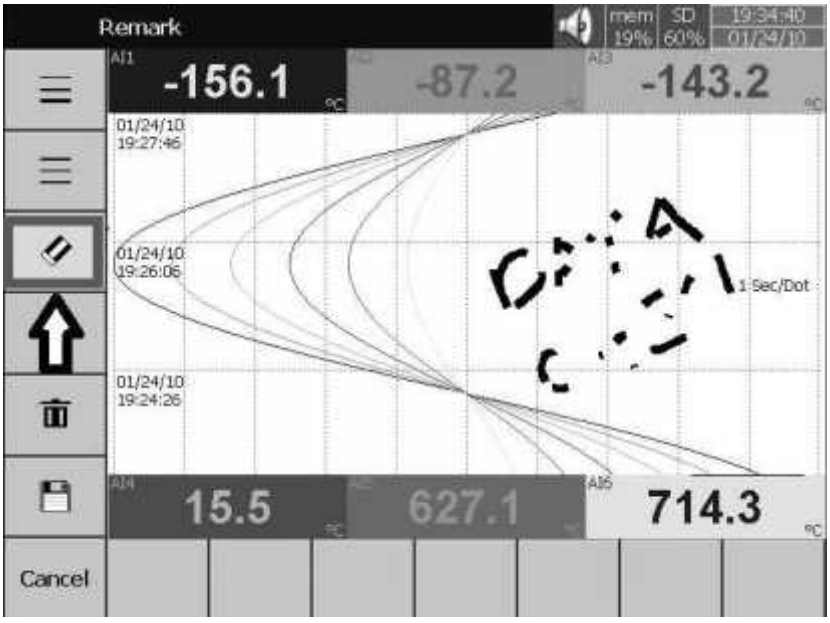
If the User wants to change the width of the written message, he/she can choose the width of pen as shown in the screen below. The menu to change the width is shown by the arrow pointing to the red box.



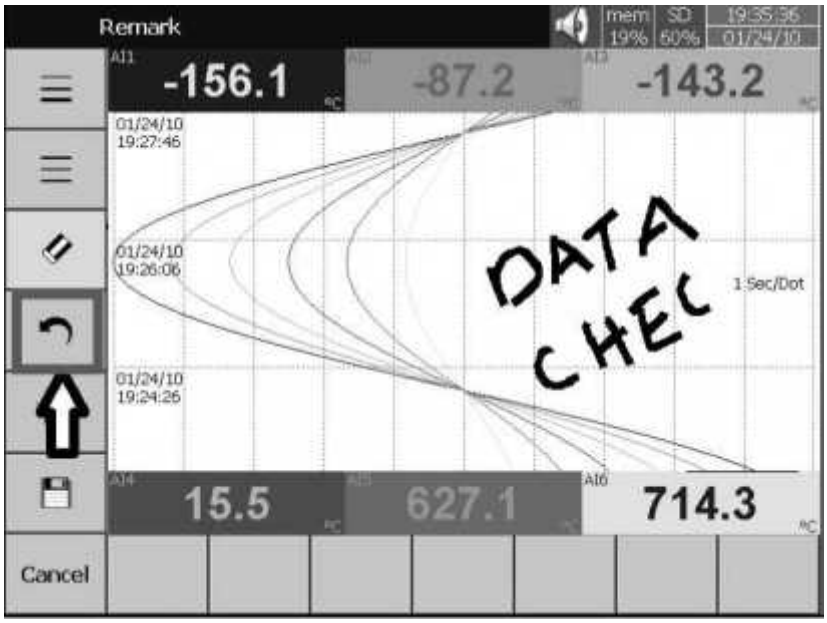
If the User wants to change color of the pen, he/she can change it by pressing the menu shown in the red box in the picture below.



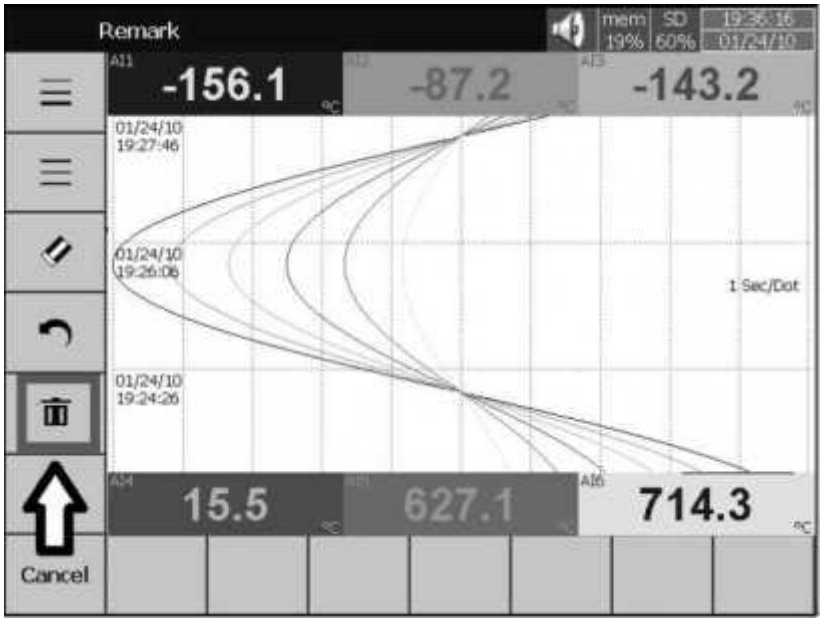
If the User wants to erase part of a message, he/she can do this by pressing the menu (shown in the red box in the picture below), and erase part of the message.



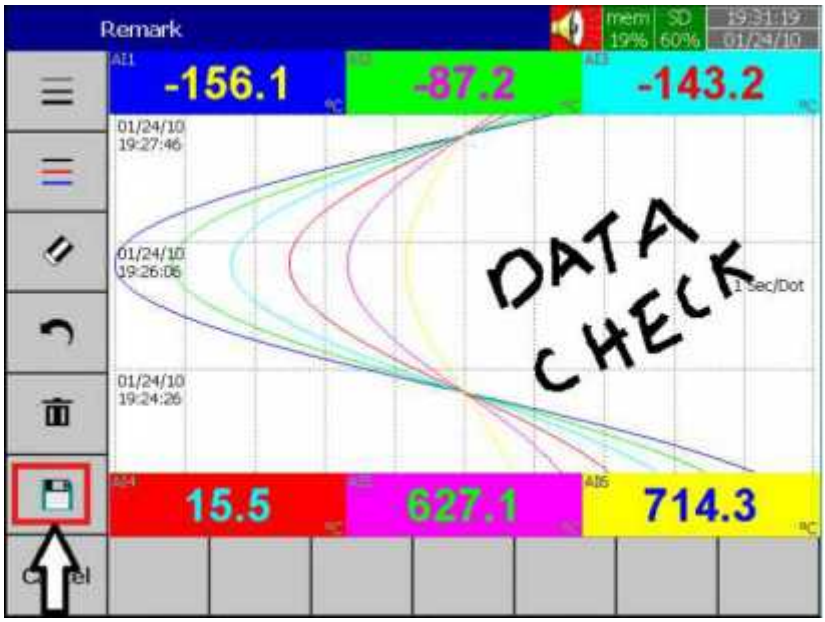
If the User wants to undo part of a message, he/she can do this by pressing the undo symbol (shown in the red box in the picture below). This will undo the last part of the message.



If the User wants to delete the written message, he/she can this do by pressing the delete symbol (shown in the red box in the picture below), and this will delete the written message.



If the User wants to save the written message, he/she can do this by pressing the “save” symbol (shown in the red box in the picture below). This will save the written message.



3.6 Custom Edited Display Screens

(We call it a Custom Page on the device and Custom Page Editor on PC software)

In Plus versions, the PC software Panel Studio allows users to have custom edited displays linked with Analog and Digital Tags.

3.7 Analog Input Log Speed Flexibility

The Analog input can be logged at various speeds such as 100ms, 1, 2, 5, 10, 20, 50 Dot/sec and 1 or 2 dot/min. The User has a lot of flexibility in logging speeds.

3.8 High Speed Input

The Digital input can accessed as normal Logic or a High frequency pulse.

3.9 System Clock Synchronization via Internet

The Recorder System clock can be synchronized via internet and Summer Saving Time can be defined. The detailed settings related information can be found in Chapter 4, Configuration, Section 4.4.

3.10 Increased Security in Password configuration

The password can be configured as normal or CFR-21. For normal, there is only one password defined but for CFR-21 three 9 levels of password definition. The related settings information can be found in Chapter 4, Configuration, Section 4.7.

3.11 Auto Output to Printer

The daily or shift reports data can be printed automatically by a Printer. The related settings information can be found in Chapter 4, Configuration, Section 4.9.

3.12 External Channels

Besides AI and DI inputs, the Recorders can accept inputs through Modbus communication. The PR10, PR20, and PR30 can have a maximum of up to 24, 48 and 96 channels respectively. The related settings information can be found in Chapter 4, Configuration, Section 4.1.6.

3.13 Batch

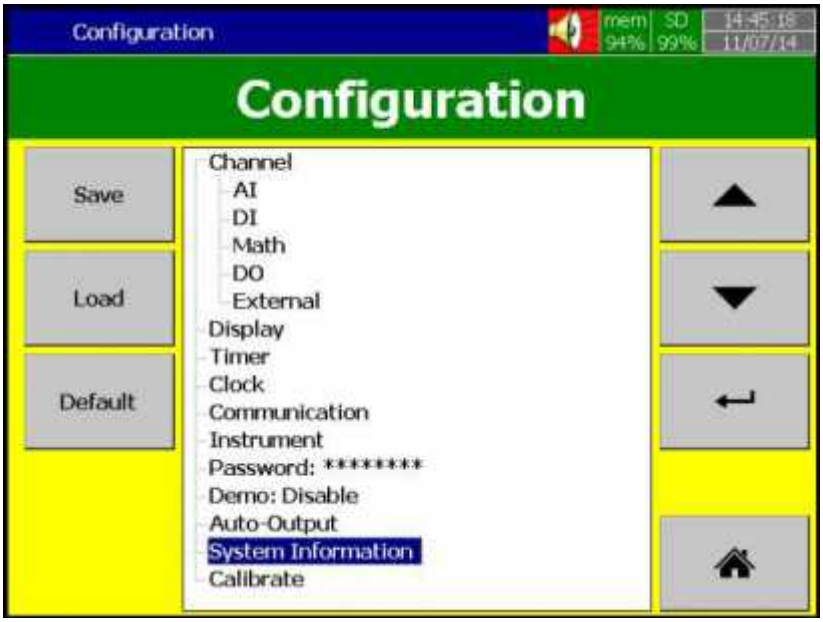
Using this function, the recorded data can be stored in batches per shift. This makes it easy for the production personnel, and for quality and quantity management.

3.14 FDA 21 CFR PART 11

This feature is meant to comply with U.S. Food and Drug Administration with human health concern. When this feature is enabled, the recorded data cannot be manipulated.

4. CONFIGURATION

Press  (“**Menu**”), then the **”More”** soft button to enter Configuration mode. A vertical list appears with a provision to configure Channel, Tools, Message, Display, Instrument, Security, Auto-Output, Demo, and system Information. In addition, the Save, Load, Default and Home soft buttons also appear.



Soft buttons

 Enter key

 Up directional key

 Down directional key

 Home key

Various options are available to enter into configuration mode

Option-1: Select the mode by pressing up & down directional keys, then press “**Enter”** key

Option-2: Select the required mode directly with a touch, then press “Enter” key

Option-3: Select the required mode by pressing the mode two times quickly, it is same as a double click from a mouse

Save: Save configuration from the recorder to a USB Stick or an SD Card.
To read the configuration from a USB Stick for the first time or any time the configuration has been changed, it is important to press the "Save" soft button to save configuration changes to the USB Stick* or SD Card *beforehand.

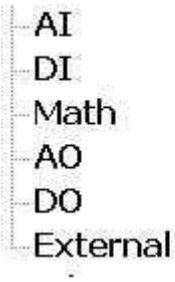
Load: Load configuration from a USB stick or SD Card to the recorder.

Default: If the configuration is set incorrectly, "Default" is a useful key to recall the default settings for the analog input card inserted into rear expansion slot.

Home: Returns the User to the home page.

4.1 Channel

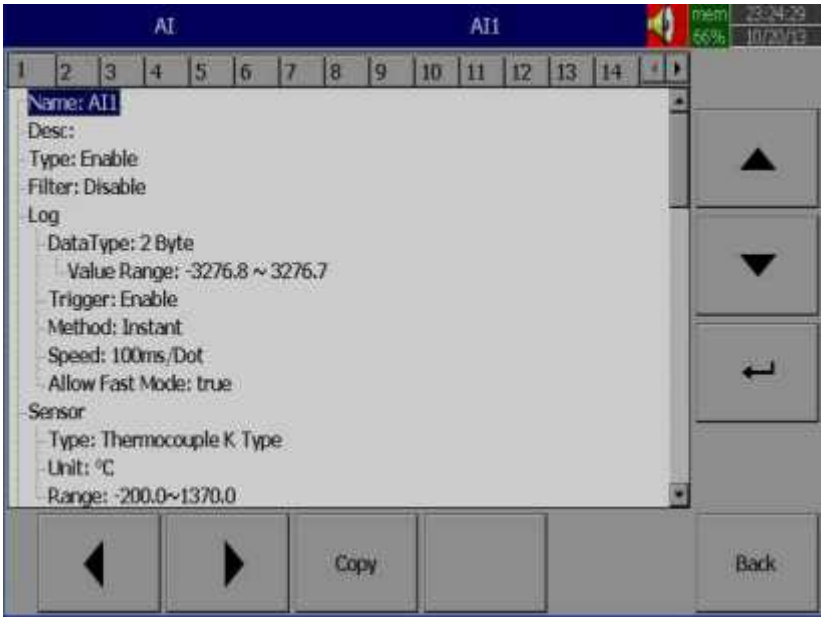
Path:  (Menu)-More-Config-Channel



This section is to configure different type of channels. Analog Input (AI), Digital Input (DI), Math, Analog Output (AO), Digital Output and External device channels.

4.1.1 Analog Input

After entering the Configuration mode, in "Channel", select "**AI**", then Press the "**Enter"** key to get into Analog Input Channel mode. It displays the Analog input **AI1** as the first analog input channel configuration page. Press directional keys 〈 〉 at the bottom to select other channels. Press directional keys↑↓ on the right hand side to select the column. ***After completing Configuration, press "Back" soft button, then press "Home" soft button to return to main display. All configurations will be saved automatically.***



Copy: For example, to copy the channel configuration from channel 1 to channel 2, select the source channel, in this case AI1 (or whatever the channel is named), press on "Copy" button. Now, a "Paste" button will get enabled, go to target channel, say channel 2, and then press on "Paste" button.

Name: Enables the User to define the name for each channel with a maximum of 18 characters.

Select "Name", then Press "**Enter**", soft button, a keyboard with several keys appear. Press "**Shift**" to select special characters. Press "**Caps**" to select capital letters. Press soft key "**OK**" after entering a new channel name.

Desc: The description about a specific channel on the display.

Type: Option available to enable or disable the channel from selection

Filter: It is to reduce the noise of input signal before sampling. It is possible to select range from 1 to 16 sec. It is a soft filter available to reduce fast variation of analog inputs. It gives a moving average value. For example, if the filter value is set as 5 sec for AI1, it means all the samples collected in the last 5 sec shall be averaged, and the value is available to record as per Log method.

Log:

Data Type: 2 byte

2 byte range**:** -32767 to +32767

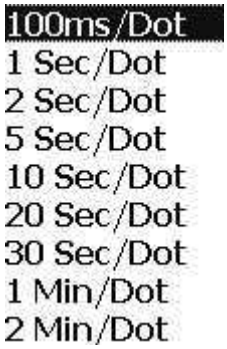
Trigger: Two options are available

a) Disable: Select disable while the recording of a specific channel is not required at this time
b) Enable: Select Enable while the recording of a specific channel is required at this time

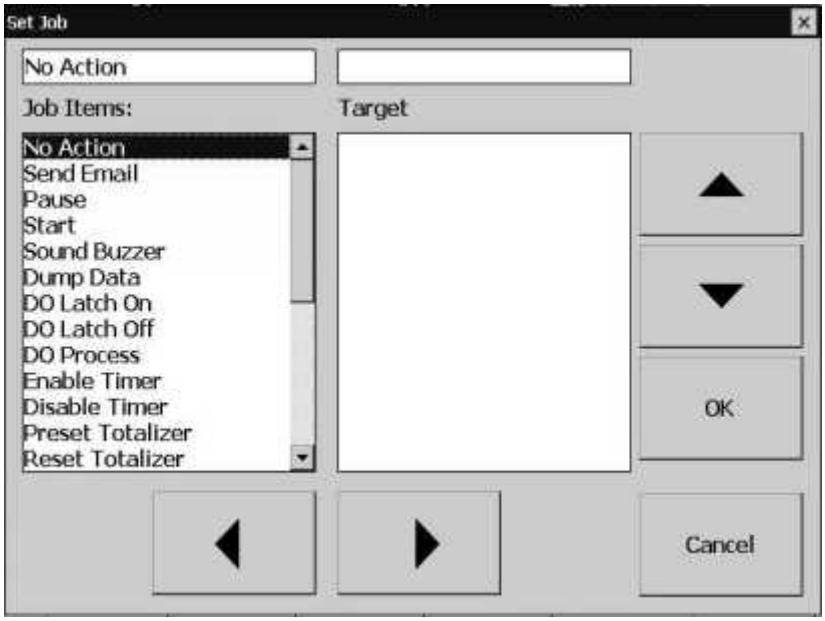
Method: This is the method of logging measured data. Select the column and press “enter”. Then choose the Log method of Instant, Average, Minimum or Maximum data.

Instant: logging the last measured data at the sampling interval
Average: logging the averaged measured data at the sampling interval
Minimum: logging the minimum measured data at the sampling interval
Maximum: logging the maximum measured data at the sampling interval

Speed: It is the logging speed (recording speed) of measured data.
Select Log Speed column, then choose one of the following

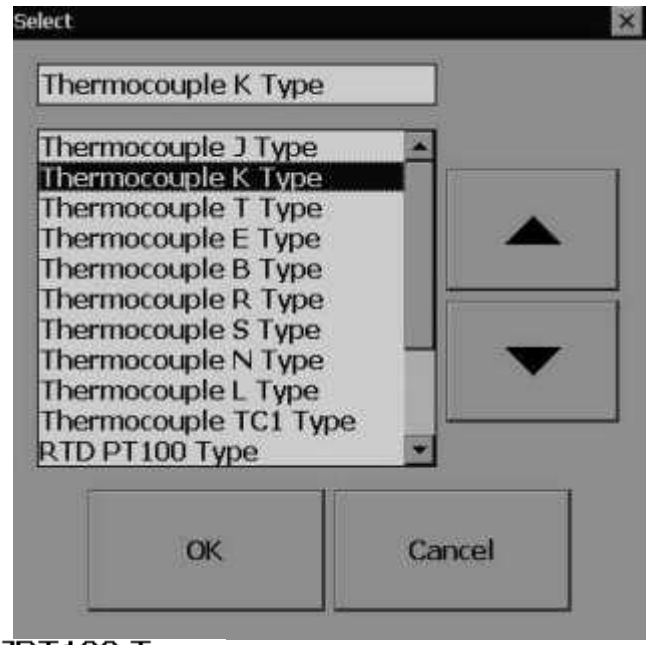


(Auto)Set Jobs under Events



Sensor
- Type: Thermocouple K Type, °C
- Unit: °C
- Range: -200.0~1370.0

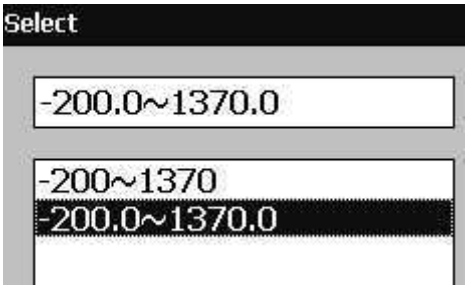
Type: Select the sensor input type for the Channel**.**

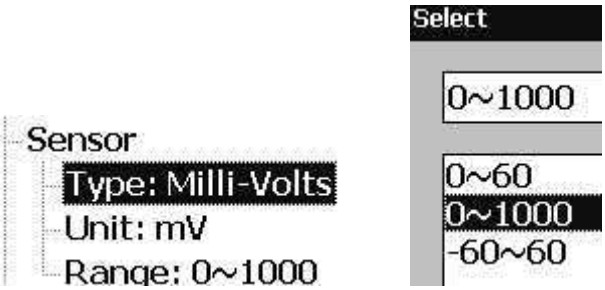


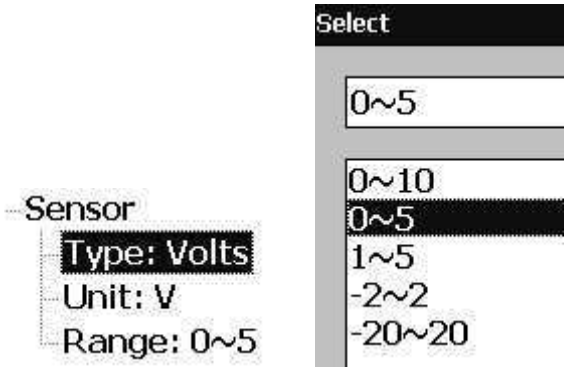
RTD JPT100 Type
RTD RTD1 Type
Milli-Volts
Volts
Current

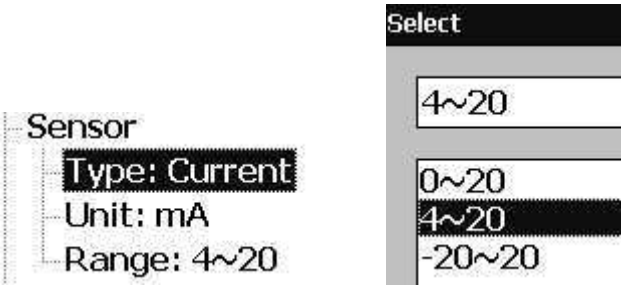
Unit: The engineering unit of input.

Range: Select based on Sensor type









Scale: Appears only for linear inputs Ex: mV, Voltage, current etc..

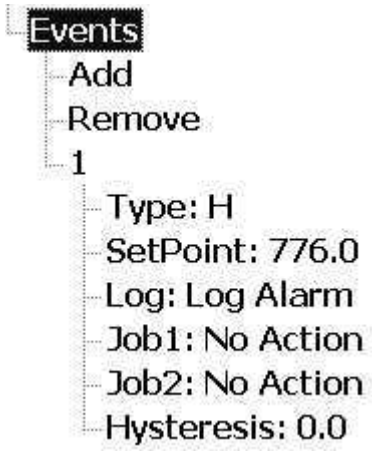
Offset: It is offset value to correct the sensor error.

Gain: It is a multiplier to correct the sensor error.
The correct value = (the process value x gain) + offset

Events

Events are frequently used for Alarm purposes. Events can also be used for digital outputs (DO), Timer, Totalizer, Counter or Report.

Maximum five events are possible to set for each Analog Input
Press “Add” to add new event
Press “Remove” to remove selected event



Type: There are various types of H, L, HH, LL, Dev+, Dev-, and Error to be selected for a job
or Alarm purpose

H: High limit. When the process is over high limit, the alarm or job is actuated.

L: Low limit. Any the process is lower than low limit, the alarm or job is actuated

HH: High high limit, to set up another limit higher than high limit for double warning.

LL: Low low limit, to set up another limit lower than low limit for double warning.
Dev+: Trigger event on positive deviation of process value. The job or alarm is activated when process value is deviated by greater than the setpoint+the process value.

For example:
Set point =10
At 10.00.01 Hrs, Tag1=40
At 10.00.02 Hrs, Tag1 = 51
Then, job or alarm is activated

Dev-: Trigger event on negative deviation of process value .The job or alarm is activated when the process value is deviated by less than the set point-the process value.

For ex: Set point =10
At 10.00.01 Hrs, Tag1=40
At 10.00.02 Hrs, Tag1 = 29
Then, job or alarm is activated.

Error: On channel error, an alarm or job is activated

Setpoint: To set up the process value for actuating Job1 and /or Job2

Alarm

Log Alarm: Record alarms

Log Alarm (Auto Ack): Record alarms and acknowledge automatically

Log Event: Record events

Job1, Job2: When an event occurs, the task to be performed is called the job. A typical example is to trigger **an alarm buzzer** in the event of a high temperature. Each pen can accept five different types of events (or alarms) and each event can create two jobs. Please note that a job under Event is different from a job created by pressing the **Operate** key. The former is actuated by an event, and the latter is actuated by manual control, no event necessary.

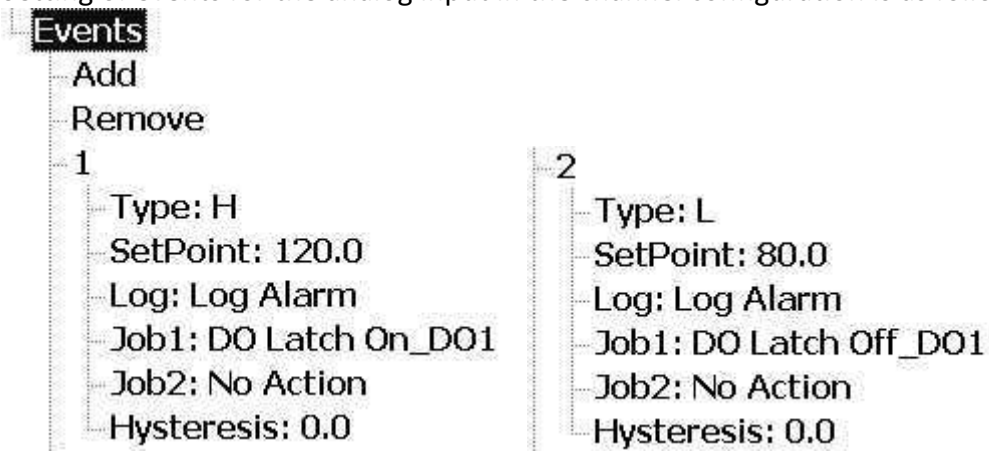
Note: Please refer to the section "Jobs" for full details about various jobs available

Hysteresis: To avoid it been activated too often, the Log Alarm or relay can set for no reaction. Hysteresis value can be defined for the event trigger set point

Example1

If the temperature is increased to more than 120 ^{O}C, log alarm and switch on digital output 1. When the temperature is decreased to less than 80 ^{O}C, log the alarm and switch off the digital output1.

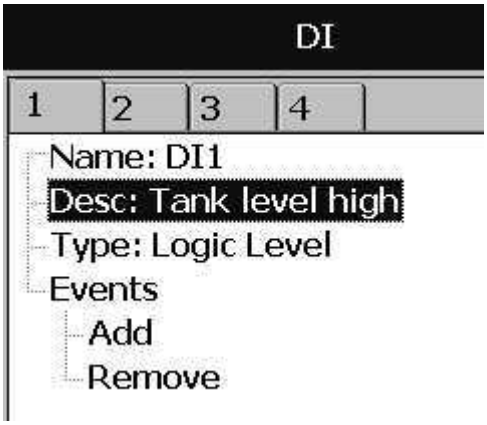
Setting of events for the analog input in the channel configuration is as follows..



4.1.2 Digital Input

Path:  (Menu)-Config-DI

After entering the Configuration mode, in the Channel, select DI then Press the "**Enter"** soft button to get into Digital Input Channel configuration page.



Name: Define the name for the Digital Input Channel. A maximum of 18 characters is allowed for the name.

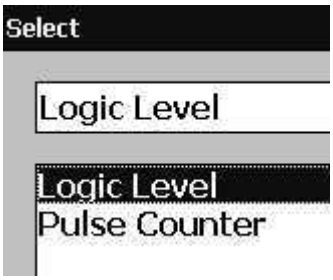
Description: Define detail description for the channel.

Type: Logic Level

Logic Level: This selection activates digital logic, which is either one or zero with low frequency which is less than 1Hz, such as an external relay.

Pulse Counter: With this selection, we can feed high speed inputs (high Frequency, up to 100Hz)

Select Logic Level and press “Enter” key



Events: A maximum of 2 events are supported for every digital Input channel.
A maximum of two jobs can be configured for each event.

**Note: Events will not appear if Logic Level selected as Pulse Counter*

Add: Press “Add” to add events to the Digital Input

Remove: Press “Remove” to remove events from the Digital Input

Type: Select Low, L or High, H

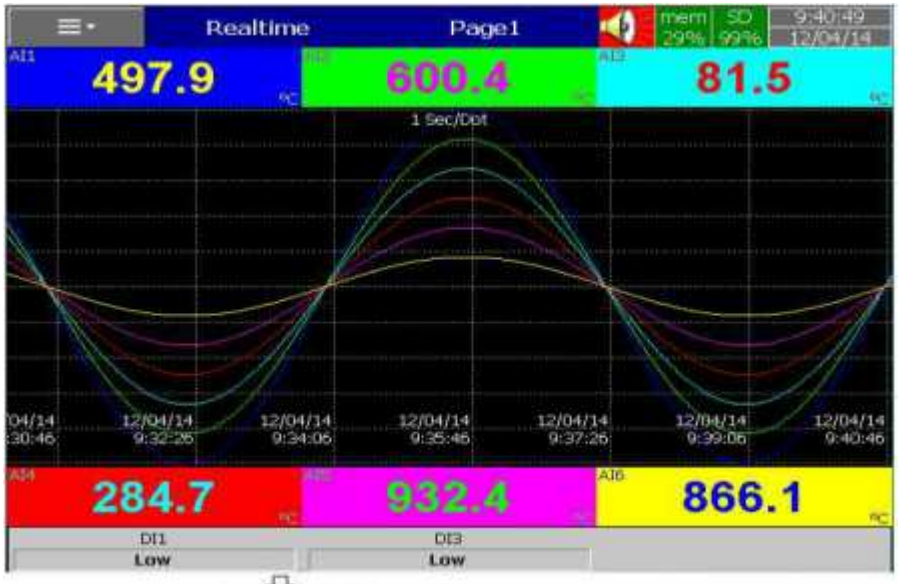
Job1, Job2: To configure a Job, select Job1, the press the Enter button. It will show a list of all the available jobs. Select the required Job.

Note: Number of digital inputs shown one t DI screen depends on number of Digital input cards inserted in the paperless recorder.

Sample applications of Digital input …

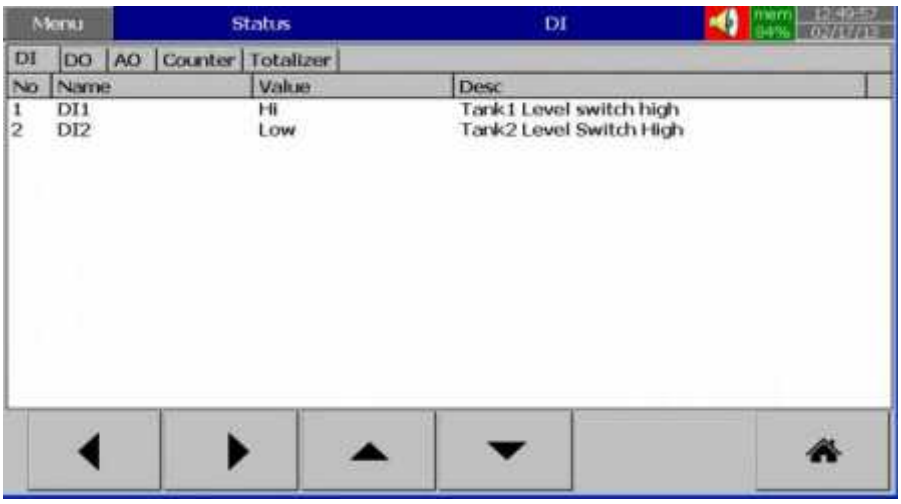
After pressing a “Start” switch, latch ON Digital Ouput1
After pressing a “Pause” switch, latch Off Digital Output1
Start Timer, Stop Timer
Reset Totalizer, Reset Counter
Reset MaxMinAve values of all the channels etc..

It is possible to display Digital input status via status bar on any page in the paperless recorder. If digital input is not enabled, it shows as “Low”. Presence of an enabled digital input shall be shown as “High”. See the picture below.
To configure status bar, refer section “**Display**”



Status Bar and Digital Input Status

Digital Input status can also monitored from the (Menu). Press “Status” and then select “DI”, it will show the Digital Input Status as follows.



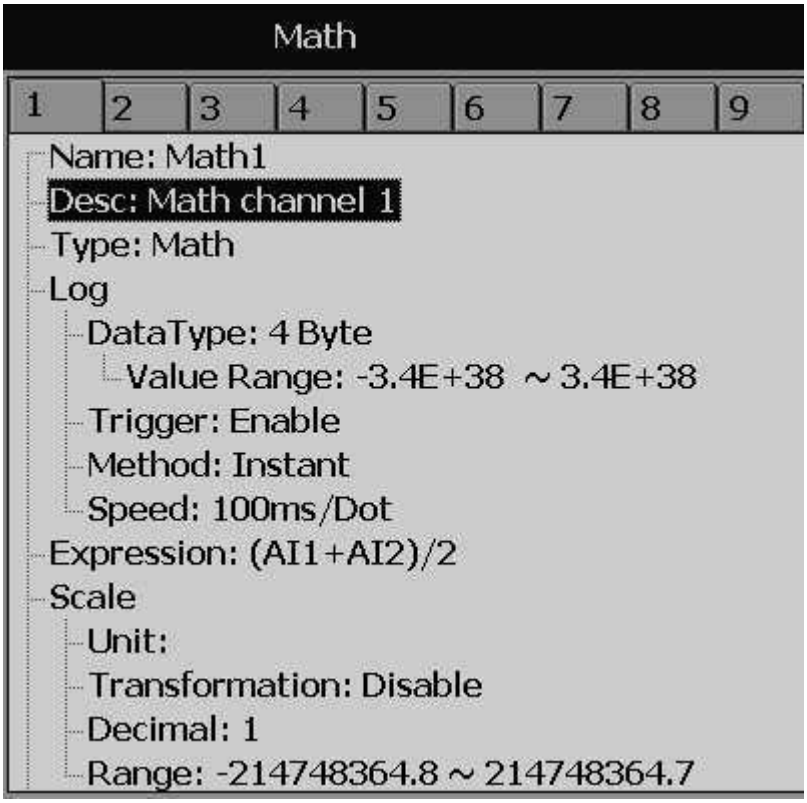
4.1.3 Math Channel

Maximum no. of Math channels in various PR series Recorders are as follows

PR Recorder	PR10	PR20	PR30
Maximum Math Channels	15	40	60

Path:  (Menu)-More-Config-Math

After entering the Configuration mode, in Channel, select Math, then Press the "**Enter"** soft button to get into Math Channel configuration page.



Name: Define the name of the Math channel

Desc: Define the detail description for the channel name

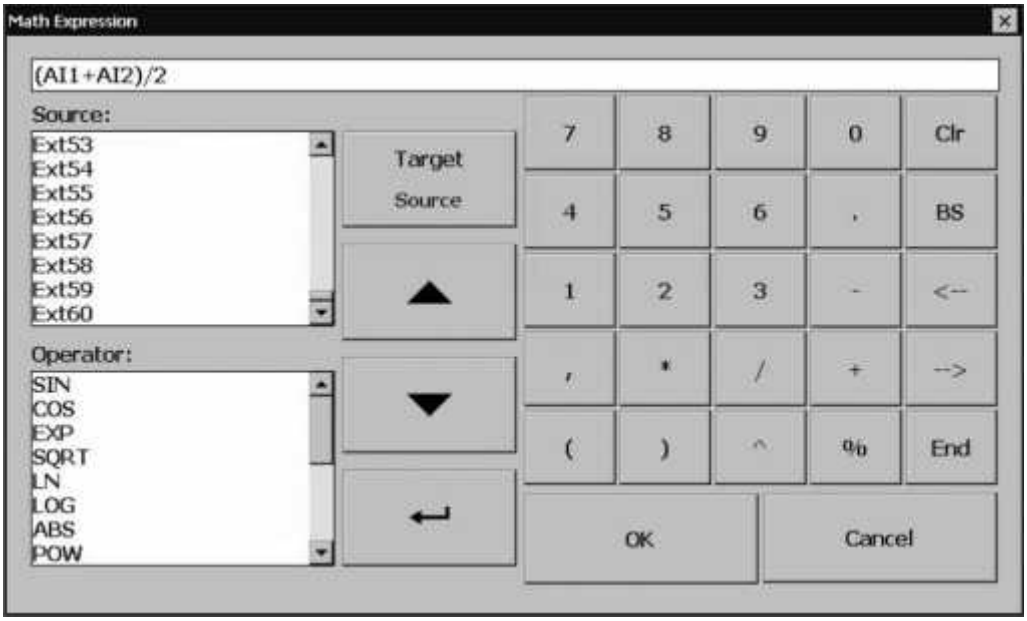
Type: Specify either Math, Totalizer or Counter

Note: Based on selection at "Type", configuration details will be changed. For ex: Type=Math has different configuration details compared with Type = Totalizer or Type = Counter

Log data type, Trigger, Method, Speed: Same as Analog Input

Press **Back** key and then press "**Home**" soft button go to Real time display and memorize the Math settings.

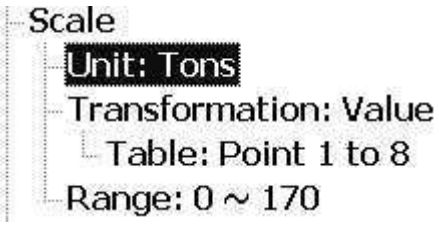
Enter Expression column, it appears Source, Operator and a keyboard.



The Source covers all available Analog inputs, Digital Inputs, Math inputs, external channels.

The Operators are mathematical expressions described below**.**

Use Source, Operator and keyboard to define the Math equation.

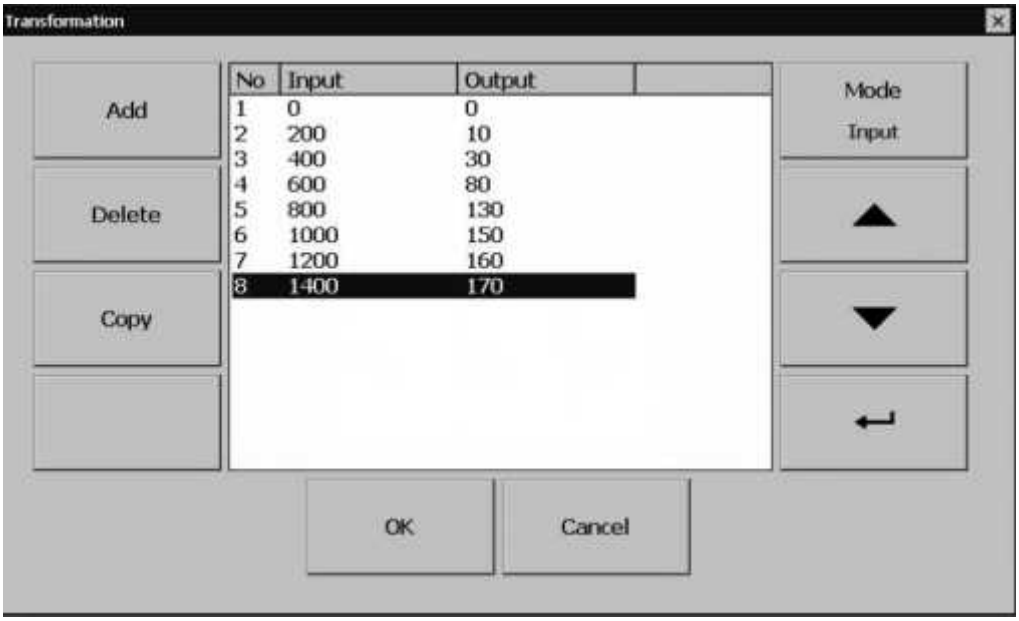


Transformation: Select disable, value or Math channel. This function mainly used to display process values obtained from Non-linearization table

Table: Select disable, value or Math channel

Maximum 64 rows can be entered in the Transformation table

Ex: A chemical tank has a non-linear shape. The level is 0 to 1400 cms. The Recorder should display 0 to 170 Tons as per following table



Add: Press “Add” soft button to add a new row into the Transformation table

Delete: Press “Delete” soft button to delete existing row from the Transformation table

Copy: Press to copy existing row in the Transformation table to create a duplicate entry

Mode: Press to toggle between Input and Output entries in the Transformation table

Up & Down: To navigate among rows in the Transformation table

4.1.3.1 Math Expression

Expressions	Mathematics Functions
+	Addition
-	Subtraction
*	Multiplication
/	Division
SIN(x)	sin(x)
COS(x)	cos(x)
EXP(x)	e^x
SQRT(x)	Square root of x
LN(x)	$\log_e(x)$
LOG(x)	$\log_{10}(x)$
ABS(x)	Absolute of x
POW (x,y)	x^y
ROUND(x)	The closest integral number to x
HI(x,y)	The bigger value between x and y
INV(x)	1/x
TG(x)	tan(x)
CTG(x)	1/tan(x)
ASIN(x)	$Sin^{-1}(x)$
ACOS(x)	$Cos^{-1}(x)$
ATG(x)	$Tan^{-1}(x)$
x%y	Remainder of x/y
x^y	x^y

4.1.3.2 Math Eample-1

Relative Humidity – PR20 Math application

*How to Calculate Relative Humidity - Theory

Requirement: Two Analog Inputs, Type: RTD
AI1: To measure dry bulb temperature
AI2: To measure wet bulb temperature

First calculate the saturation vapor pressure (E) for both the dry-bulb (Td) and wet-bulb (Tw) temperatures using the following equations:

Ew = 0.61078*EXP((17.269*Tw)/(Tw+237.3))*(Td-Tw)
Ed = 0.61078*EXP((17.269*Td)/(Td+237.3))*(Td-Tw)

In the above equations the temperatures units are Celsius and the saturation vapor pressure units are millibars. The function "EXP" is the exponential and not raising something to an exponent.

Then calculate actual vapor pressure (Ea) using the following equation:
Ea = Ew-0.63*(Td-Tw)

Relative Humidity is then calculated using the following equation:
RH = (Ea/Ed)*100
The units of relative humidity are in percent.

Here is an example of the using the equations:

Assume that your dry-bulb temperature (Td) = 40 C and your wet-bulb temperature (Tw) = 30 C.

Ew = 0.61078*EXP ((17.269*Tw)/ (Tw+237.3))*(Td-Tw)
Ew = 0.61078*EXP ((17.269*30)/ (30+237.3))*(40-30)
Ew = 42.4262 millibars

Ed = 0.61078*EXP ((17.269*Td)/ (Td +237.3))*(Td-Tw)
Ed = 0.61078*EXP ((17.269 * 40)/ (40+237.3))*(40-30)
Ed = 73.7416 millibars

Ea = Ew-0.63*(Td-Tw)
Ea = 42.4262 - 0.63*(40-30)
Ea = 36.1262 millibars

RH = (Ea/Ed)*100
RH = (36.1262/73.7416)*100
RH = 48.99 %

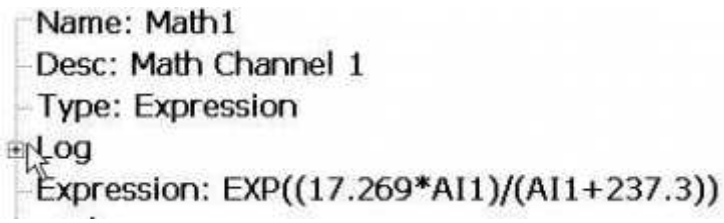
* End of Theory

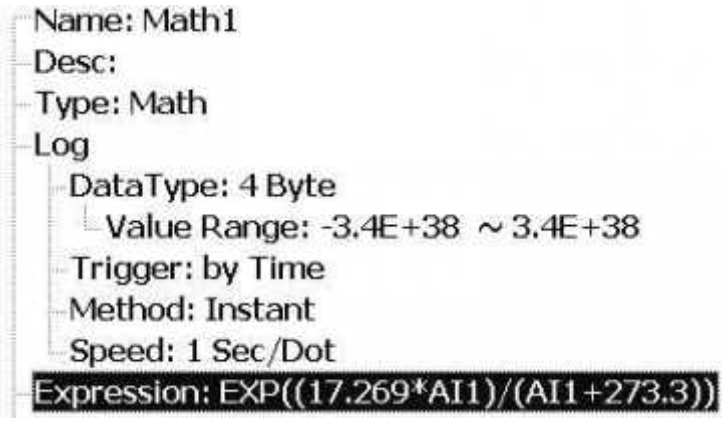
5 Math channels are required to calculate one RH.
Td = AI1, analog input for dry bulb temperature (PT100)
Tw =AI2, analog input for wet bulb temperature (PT100)

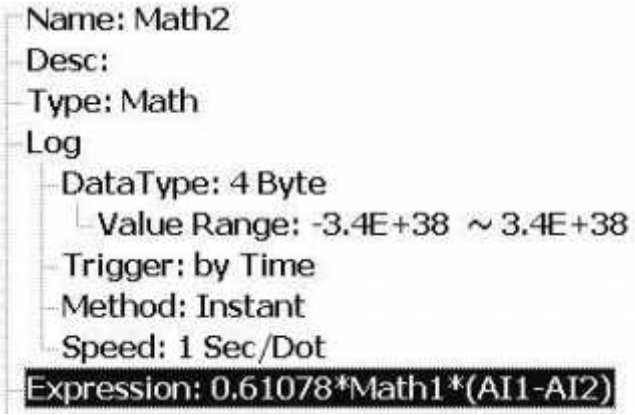
Math1 = EXP ((17.269*AI1)/ (AI1+237.3))
Math2 = Ed1 = 0.61078*Math1*(AI1-AI2)

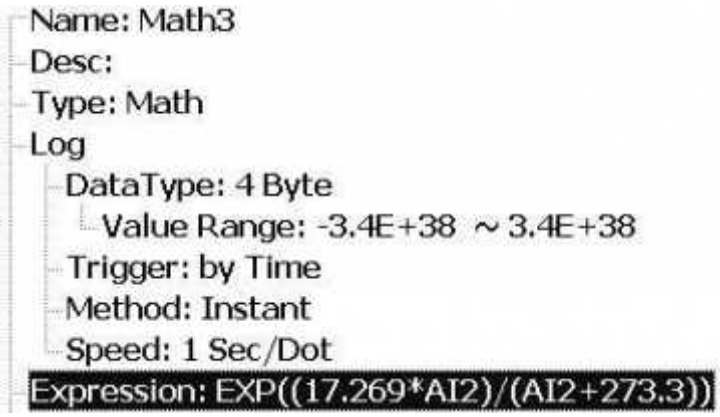
Math3 = EXP ((17.269*AI2)/ (AI2+237.3))
Math4 = Ew1 = 0.61078*Math3*(AI1-AI2)

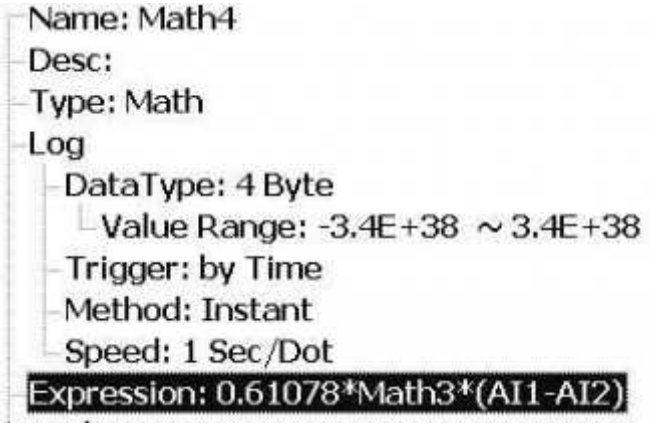
Ea = Ew - 0.63 * (Td - Tw)
Math5= RH1 = ((Math4-0.63*(AI1-AI2))/Math2)*100

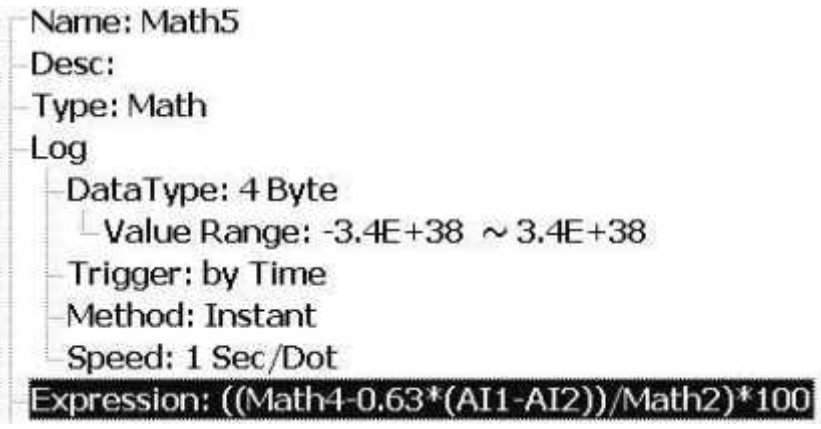












Now, in Math5, you will get Relative humidity in %

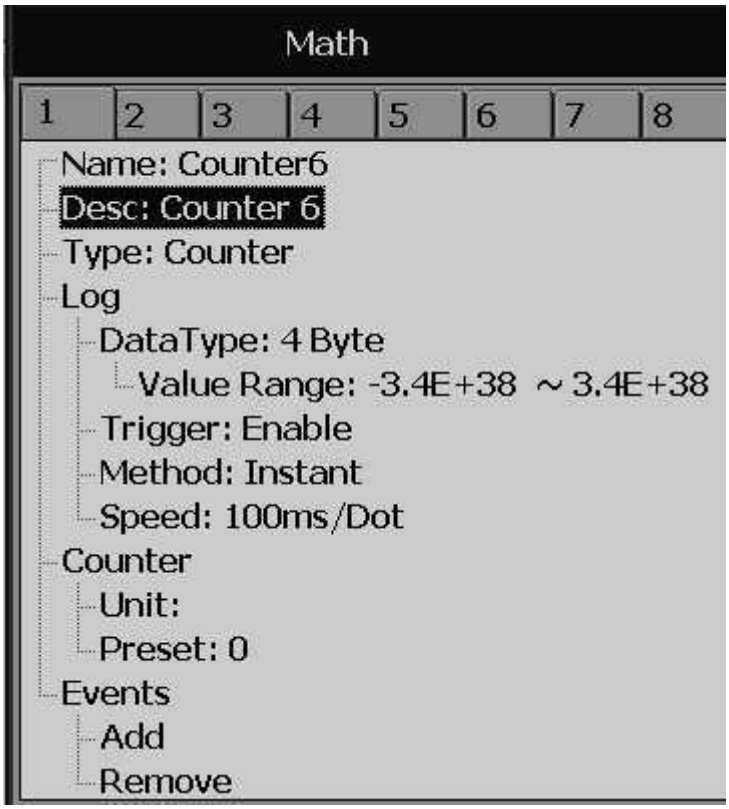
Five events are supported for every Math channel and two jobs are available in every event, the same as the Analog input channel.

Math channels are virtual channels. They contain measured values based on equations. These values can be recorded similar to physically connected Analog inputs and display digital values, trends, bar graphs etc.

4.1.3.3 Counter

Path:  (Menu)-More-Config/Math

Select ***Type*** = ***Counter***



Press directional keys 〈 〉 at the bottom to select one of the Math channel for the Counter operation.

Name: Defines the name of counter, max. 18 characters allowed

Desc: Defines the description for a specific counter on the display

Type: Select ***Counter***

Counter

Unit: Defines the unit of counter

Preset: Defines the preset value for the counter.

Event: Defines the type, Set point, Log, Job1 or Job2 & Hysteresis

Type: Select one of the options: H, L, HH, LL, Dev+, Dev-, Error

Set point: Defines the set point trigger of Counter value to initiate Jobs and/or Log alarms

Log: Select Log Alarm, Log Alarm (Auto Ack.), or Log Event

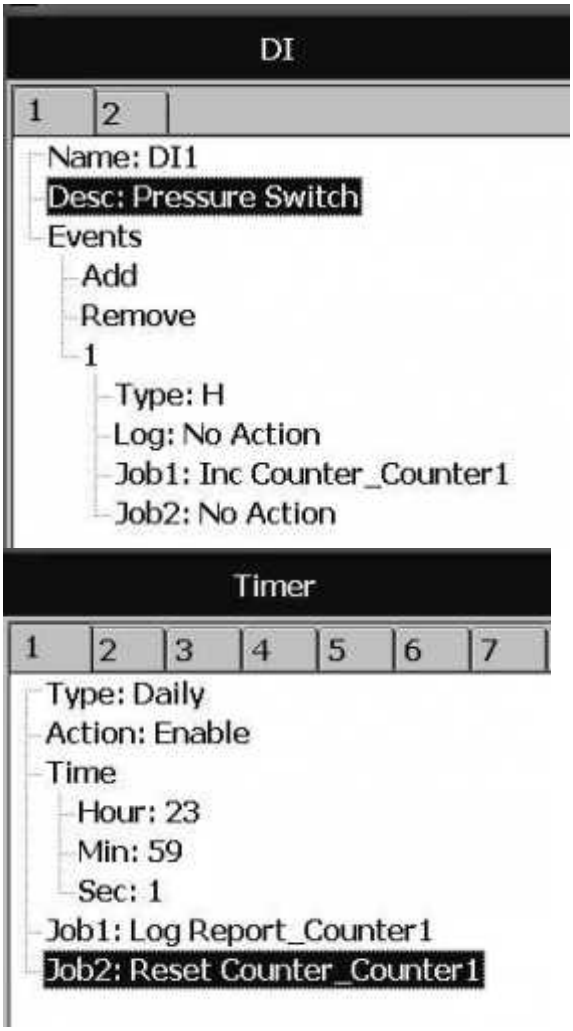
Job1, Job2: various jobs can be assigned, 2 jobs for each counter

Hysteresis: To avoid jobs have been activated too often, it can set for no reaction.
Hysteresis value can be defined for the event trigger set point

4.1.3.4 Counter Example-1

The operator wishes to know the number of occurrences of an event in a day. Let's say the pressure switch in DI1 goes logic high

Digital input1 is used for a Pressure switch. High signal indicates High pressure, Low signal indicates normal pressure



(Reset Counter1 historical data in order to log new data for the next day)

Archive historical data by pressing the following.

(Menu)-Event-Report, Select Daily in the Mode

If values meet the following conditions, recorder will change notation from traditional to scientific

a. the value is more than 10^5 or less than 1/(10^5)
b. the value digit-length in display exceeds the allowed range

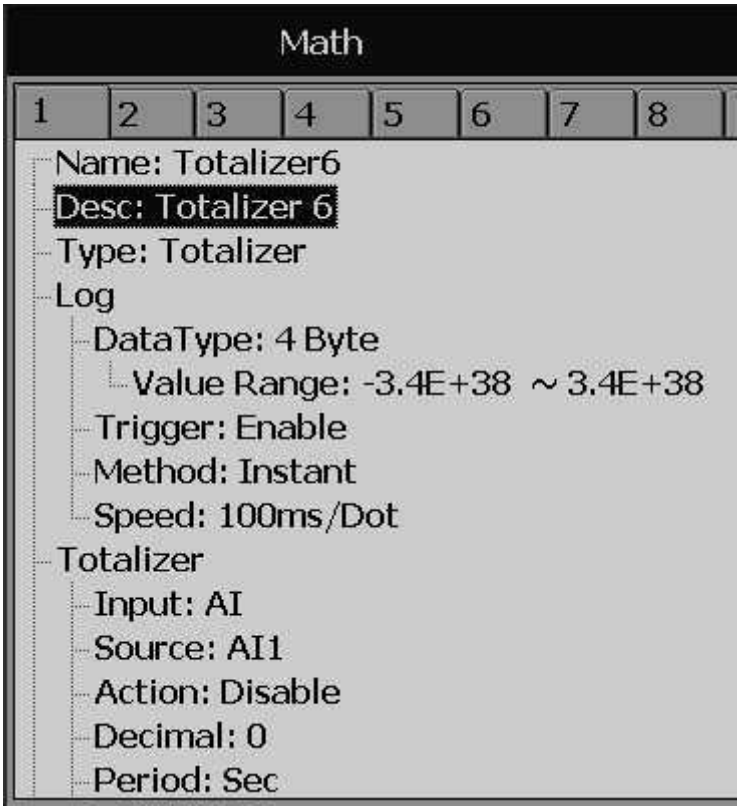
Ex: Up to 5 digits, counter displays value directly, let's say 0-99999.
100000 will be shown as 1E5, which means 5 zero's after 1
4294967295 will be shown as 4.29497E9 etc.

4.1.3.5 Totalizer

In our new generation Recorder, the Totalizer is a part of Math channels.

Configuration Path: (Menu)-More-Config-Math

Select ***Type*** = ***Totalizer***



Press directional keys 〈 〉 at the bottom to select from available Totalizers

Name: Defines the name of the Totalizer, Maximum 18 characters allowed

Desc: Defines the description for a specific Totalizer on the display

Type: Select “Totalizer”

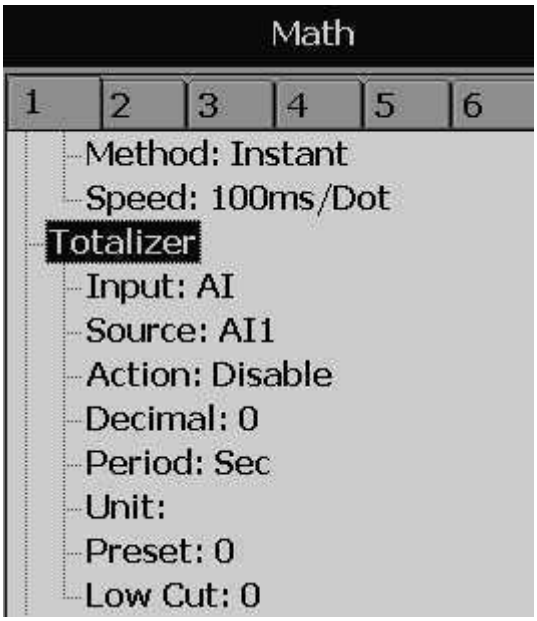
Log: Same as Analog input configuration

Totalizer:

Input: Analog Input (AI) or Pulse Counter (DI)

Source: Select the source for the Totalizer from Analog input/Math/Counter/Totalizer

Action: Disables or enables the Totalizer



Decimal: Defines the decimal point for the Totalizer

Period: Selects if seconds, minutes or hours are used for the Totalizer

Unit: Defines the unit of totalizing

Preset: Defines the preset value for the Totalizer.

Low Cut: Defines the Low Cut for the Totalizer.

For ex: If 0.0 is set as Low cut, then, if source channel AI1 is less than 0.0, the Totalizer value will not go to negative.

Event: Total 5 events are supported for each Math channel. Defines the type, Set point, Log, Job1 or Job2 & Hysteresis

Type: Select one of options, H, L, HH, LL, Dev+, Dev-, Error

Set point: Defines the set point trigger of Totalizer value to initiate Jobs and/or Log alarms

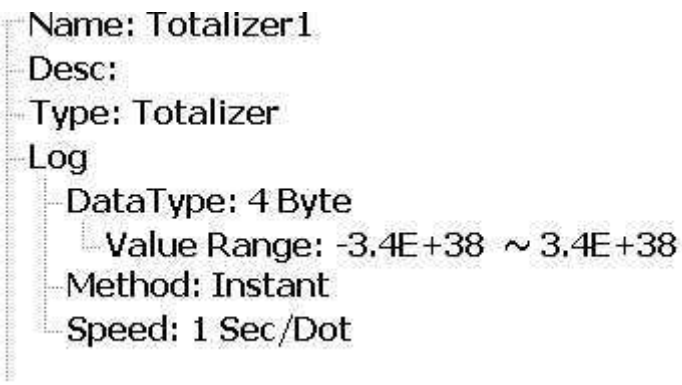
Log: User can select one of Log Alarm, Log Alarm (Auto Ack.), or Log Event

Job1, Job2: various jobs can be configured, 2 jobs for each Totalizer

Hysteresis: To avoid jobs from being activated too often, the hysteresis can set to avoid nuisance tripping. Hysteresis values can be defined for the event trigger set point

4.1.3.6 Totalizer Example-1

Water flow rate is in M^3/Sec. The operator wants to know about total water discharged and wants this information in daily, weekly and monthly reports



Reset Totalizer1 historical data in order to log new data for the next day

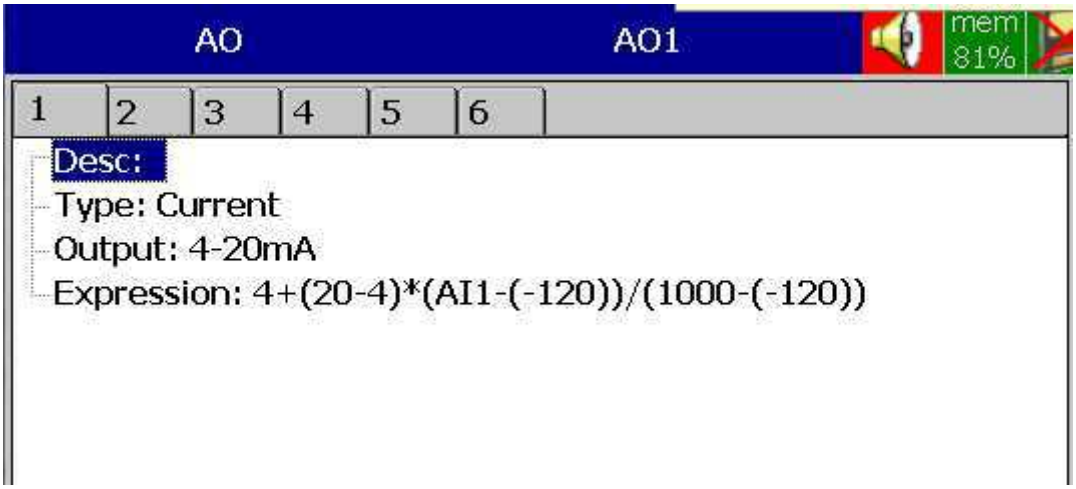
Archive historical data by pressing the following.

Path:  (Menu)-Event-Report

Select **Daily** in the **Mode** to see reports on daily basis. To navigate to another day, press on Left and right arrows below the **Mode** button. Select **Weekly** in the **Mode** to see weekly reports, or select **Monthly** on the **Mode** to see Monthly reports.

4.1.4 Analog Output

After entering the Configuration screen, in the Channel section, select AO, then Press the "**Enter"** soft button to get into Analog Output Channel configuration page.



Desc: Define detail description for the channel name

Type: Current, Voltage

Output: Select either disable, 0 to 20mA , 4-20mA, 0-5V, 1-5V, 0-10VDC

Expression: This is similar to Math channel.

4.1.5 Digital Output

Desc: Define detail description for the channel name

Reverse: Enable this if Reverse operation is required for the Digital Output.

For ex: If reverse is disabled, the relay output is Normally Open (NO). In case if you need to have a Normally Closed (NC) relay at Recorder Power ON, then enable “Reverse” for the selected Digital Output. The Relay output shall be normally closed.

4.1.6 External

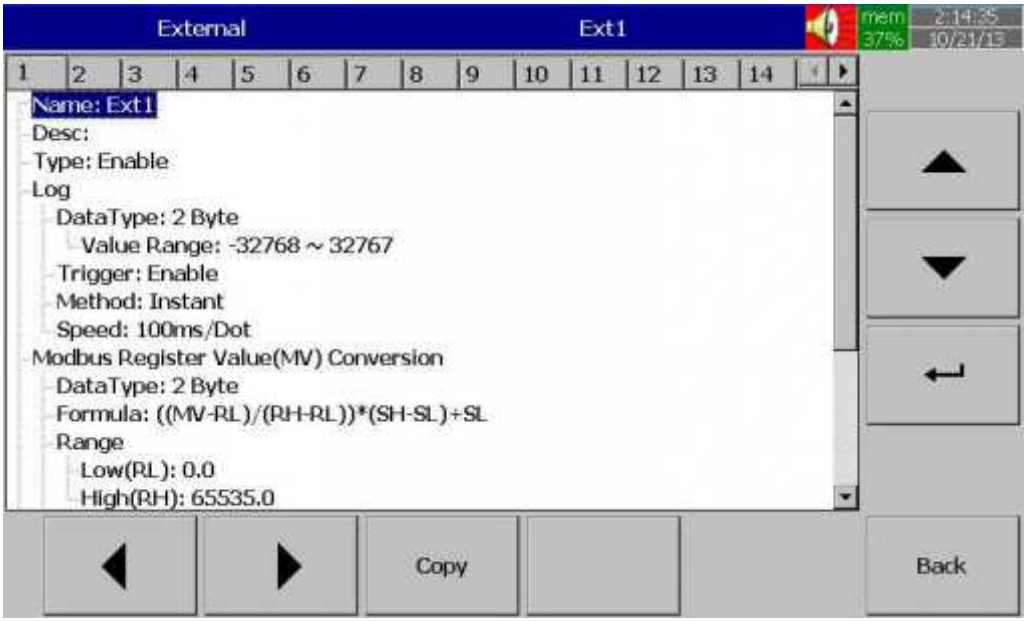
This is to access data from the external devices.

Maximum no. of external channels in various PR series Recorders are as follows

PR Recorder	PR10	PR20	PR30
Maximum External Channels	24	48	96

All the properties are similar to Analog Input channel.

More details about external channels are available at section “Communication”



Please refer section “Communication” for examples of external channels

4.1.7 Jobs

Various types of jobs can be selected as follows.

No Action: Do nothing

Send Email: Send Email directly from Recorder

Pause: Stop logging data.

Start: Start logging data.

Sound Buzzer: Sound the buzzer. It stops once any key is pressed.

Dump Data: To dump data from internal memory to external memory.

DO Latch On: Set digital output / relay on, and then select Target, let’s say from one of DO 1 to DO 6. The relay is latched when it is activated.

DO Latch Off: Set digital output / relay off, and then select Target, let’s say from one of DO 1 to DO 6. The relay is un-latched when it is activated.

DO Process: Set digital output / relay on for process high or low, and then select the target, let's say from 1 of DO 1 to DO 6. The relay is not going to be latched when it is activated.

Enable Timer: Start the timer, and then select Target timers

Disable Timer: Stop the timer, and then select Target from Timers

Preset Totalizer: set a preset value to the target Totalizer.

Reset Totalizer: Reset Totalizer to zero. Select a single Target Totalizer or All totalizers

Enable Totalizer: Starts the Totalizer. Select a single Target Totalizer or All totalizers

Disable Totalizer: Stops the Totalizer. Select a single Target Totalizer or All totalizers

Preset Counter: set a preset value to the target counter.

Reset Counter: Resets the counter to zero. Select a single Target counter or all counters

Inc Counter: Increases the counter by 1. Select a Target counter or all counters

Dec Counter: Decrease the counter by 1. Select a Target counter or all counters

Log Report: Make a report for Counter, Totalizer, Analog inputs (Min/Max/Avg), Math (Min/Max/Avg), All Counters, All Totalizers, and All Channels (Min/Max/Avg). Choose this column, and the report will be presented as described in section "**Reports**".

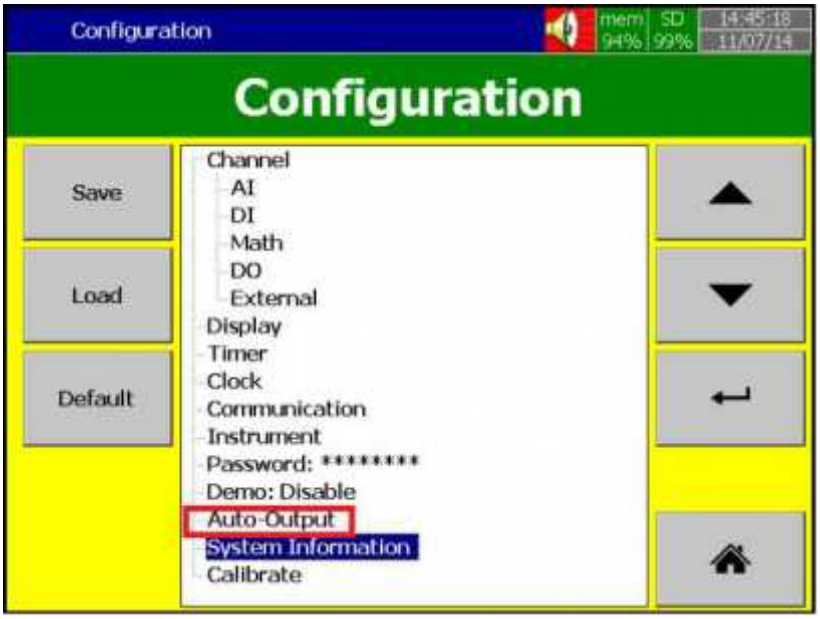
Reset MinMaxAve: In the Report function, after logging the Min/Max/Avg data of AI and Math channels for one day for example, this will reset historical data in order to log new data for the next day. It is also possible to reset the Min/Max/Avg for "All Channels" at one step.

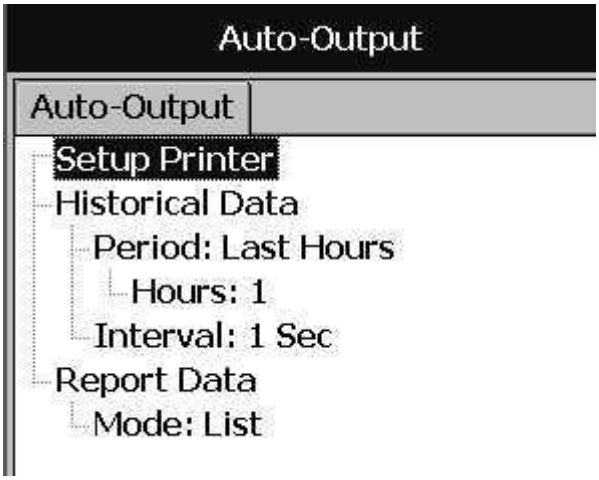
Print: If a printer is connected to the Paperless Recorder via the USB port or Ethernet, the following print jobs can be triggered from "events"

Print Historical data
Print Event List
Print Report List
Print Snapshot

The time period of Print depends on the configuration available at

(Menu)-More-Config-Auto-Output





Note: Please refer section “Auto Output” for more details about options available

Note:

- In any mode , the sampling rate of the recorder is fixed at 100 milli seconds, i.e. 10 samples are collected per second. If the logging speed is set at 1 second in Instant mode, the recorder logs the last of ten measured data values. For the same speed in Average mode, the recorder logs using the average of the Ten measured data values. For the same speed in the Maximum or Minimum mode, then the recorder logs using the maximum or minimum of the Ten measured data values.

Sampling		Logging (historical trend)	Display (real time)
Instant	100mS	the last of 10 points of data	last of 10 points of data
Averaged	100mS	the average of 10 points of data	last of 10 points of data
Maximum	100mS	the maximum of 10 points of data	last of 10 points of data
Minimum	100mS	the minimum of 10 measured data	last of 10 points of data

Press "**Home**" key to return to real-time display, all configurations will be memorized

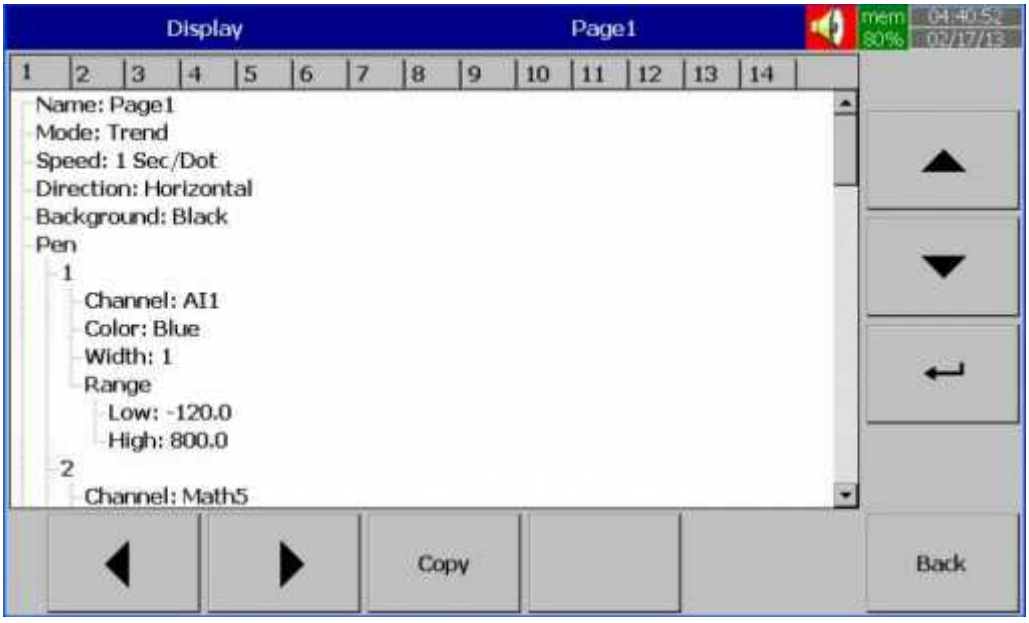
- The Digital output DO card with relays can be set in Job1 and/or Job2. It can be viewed in "System Info" mode after it is installed into a Slot.

4.2 Display

Path:  (Menu)-More-Config-Display

Select "**Display"**, then press the "**Enter"** Soft button to get into the Display mode configuration page (shown on the following page).

	PR10	PR20	PR30
Display pages	8	20	21
Pens/Page	6	6	10



Name: Defines the name of the display page

Mode: Defines the default method of displaying data for the page.
Options are: Trend, Bar, Digital, Mix, Circular (only for PR30) and Disable modes.

* Circular Trends are only available in the PR30 model.

For Circular Trends

Speed: This is the display speed. Available options are 100 msec/dot, 1 Sec/dot, 2 Sec/dot, 5 Sec/dot, 10 Sec/dot, 20 Sec/dot, 30 Sec/dot, 1 min/dot, 5 min/dot, 10 min/Page, 30 min/Page, 1 hour/Page, 2 hour/Page, 4 hour/Page, 8 hour/Page, 12 hour/Page and 1 Day/Page.

Direction: Sets the trend direction to be horizontal or vertical.

Background: Sets the background color of Trend mode to black or white

Pen: For a specific channel, this defines the drawing pen, its color, width, Range Low and Range High for the display.

Channel: Selects a specific analog input, Math, Counter, Totalizer, External channels. Select Disable if a specific channel is not required to be displayed.

Color: Selects the color for each pen.

Width: Selects the width of trend, 1-thin, 2-medium, 3-wide.

Low: Defines the low scale for a pen on the display.
High: Defines the high scale for a pen on the display.
Note:

- To illustrate the difference between Display Hi, Display Lo, Scale Hi, and Scale Low, here is a typical example, with input 0-10V, Scale Low=0.00, Scale Hi=100.00, to have better resolution and vision on Bar, set the Display Lo=0.00 and Display Hi=50.00 so that the Bar displays from value 0.00 to 50.00.

- The decimal point is defined by Scale Hi and Scale Low, and not by Display Hi, or Display Lo.

4.2.1 Status Bar

Status Bar: To make it convenient when viewing the status of Digital Input, Digital Output, Math channel, Totalizer, Counter and AO, the user may enable these items in the status bar. The Status bar is displayed at Lower part of the page. A maximum of 10

tags can be displayed in each Status bar. One status bar can be configured for each page.

Note: Status bar configuration is not shared in all the pages. You may define a different setup for status bars in each page per your requirements.

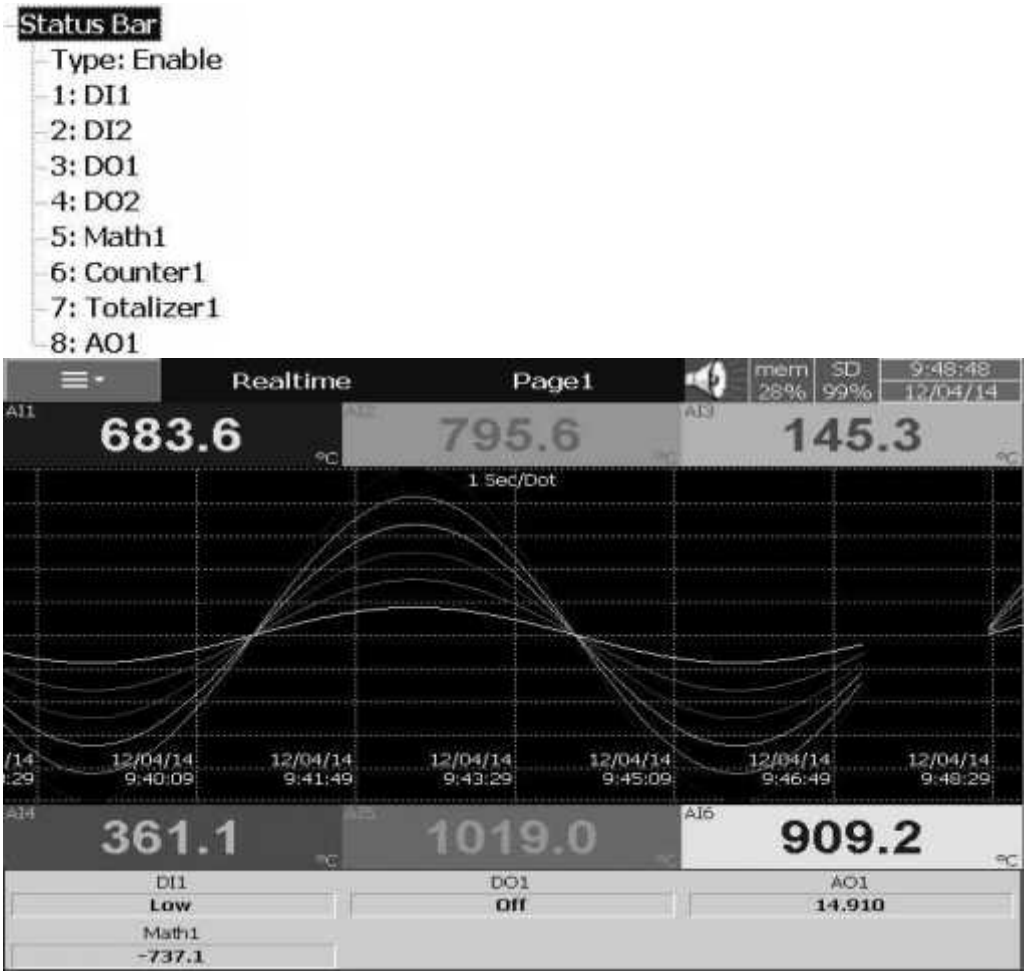
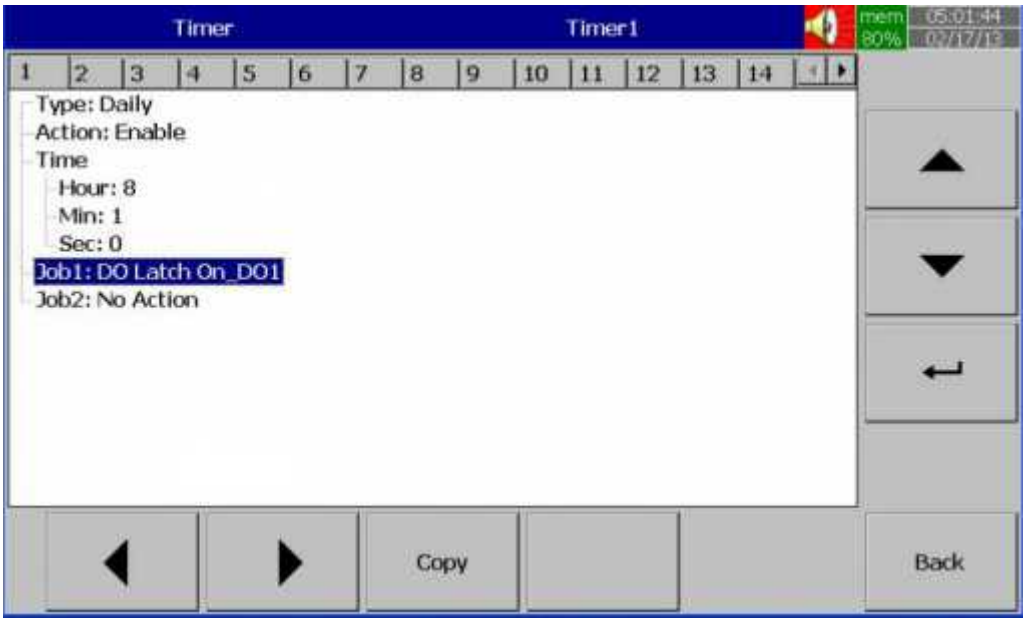


Fig: Status bar display in Real time

4.3 Timer

Path: ☰(Menu)-More-Config-Timer



Press directional keys 〈 〉 at the bottom to select from one of 20 available timers.

Type: Countdown, Repeat Countdown, Daily, Weekly or Monthly.

Countdown: Defines the interval of time, e.g. days, hours, minutes and seconds. (Not the Actual Time)

Repeat Countdown: Repeats the previous countdown (Not the Actual Time)

Daily, Weekly or Monthly: The timer works in selected interval of Real Time.

Action: Disables or enables the timer.

Job1, Job2: 2 jobs can be configured for each timer.

4.3.1.1 Timer Example-1

Switch on water pump every day at 8.00am and switch off at 10.00am

This application requires a “Daily” timer which works with Real Time Clock.

Configuration settings are as follows.

Timer1

Type: Daily Action: Enable
Time – Hour: 8 Min: 0 Sec: 0
Job1: DO Latch On, Target: DO1
Job2: No Action

Timer2

Type: Daily Action: Enable
Time – Hour: 10 Min: 0 Sec: 0
Job1: DO Latch Off, Target: DO1
Job2: No Action

4.3.1.2 Timer Example-2

Let’s say, when a digital input high event is triggered by high pressure, you would like to switch on a relay after a 10 seconds delay.

Digital Input1

Event1
Type: H
Job1: Enable Timer, Target: Timer1
Job2: No Action

Event2
Type: L
Job1: DO Latch Off, Target: DO1
Job2: No Action

Timer1

Type: Countdown, Action: Disable
Time – Hour: 0 Min: 0 Sec: 10
Job1: DO Latch On, Target: DO1
Job2: No Action

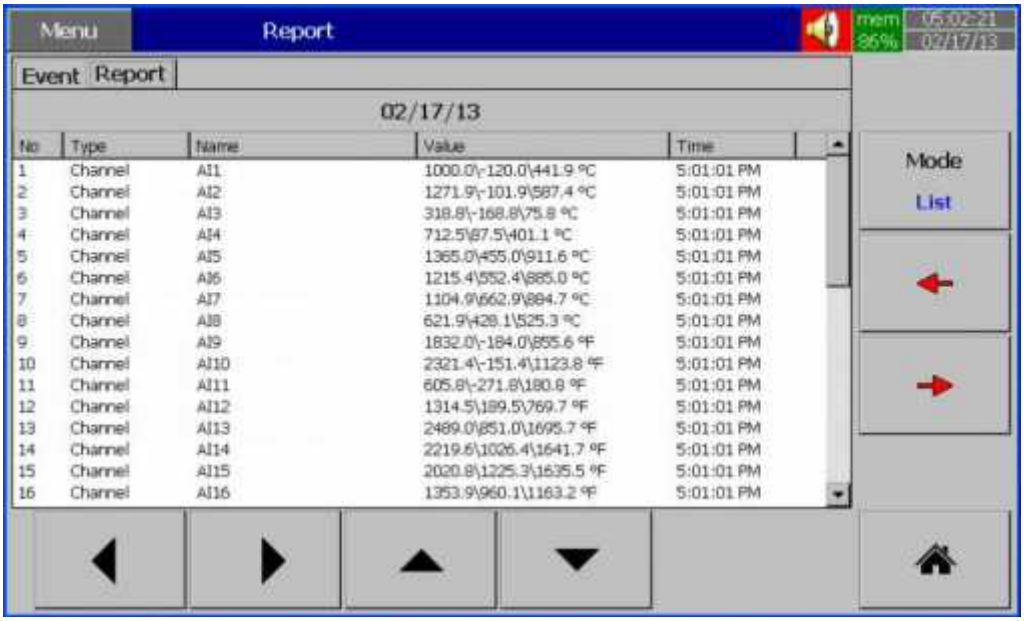
4.3.1.3 Timer Example-3

Timer & Report:

A manager plans to get a **daily** report from the recorder about the **minimum, maximum and average** values of the process every day. After production has finished, he can press **Menu**, then **Event**, then he selects **Report** and presses the **Mode** key to select the **Daily** mode. He then is able to view the report like in the figure shown below

Timer1

Type: Daily Action: Enable
Time – Hour: 17 Min: 01
Job1: Log Report Target: ALL CH MinMaxAve
Job2: Reset Min/Max/AveTarget: ALL CH
(Reset historical data in order to logging new data for the next day.)



4.4 Clock

Path: ☰(Menu)-More-Config-Clock

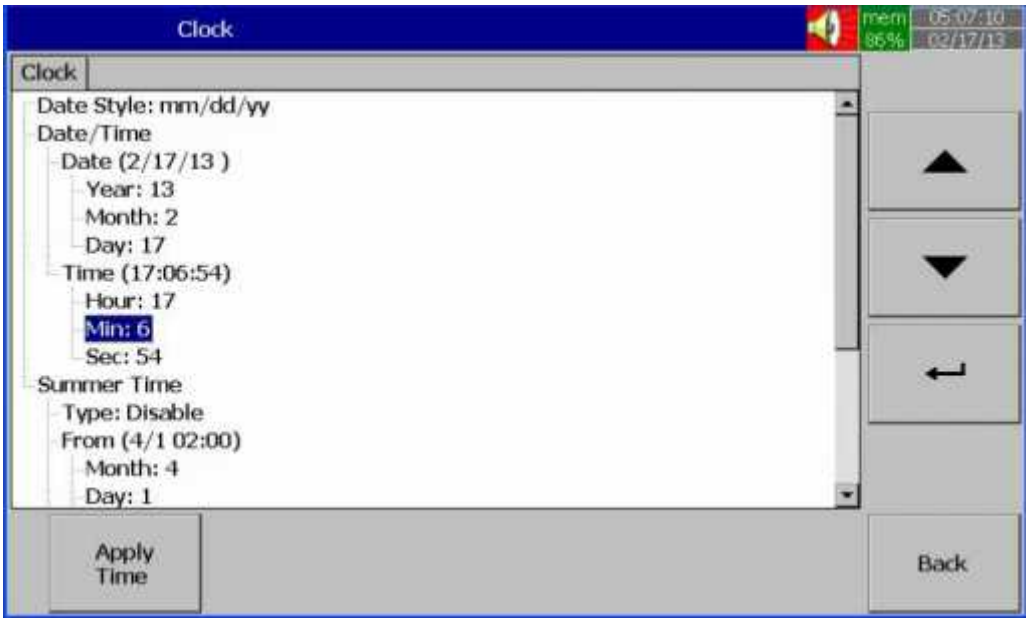


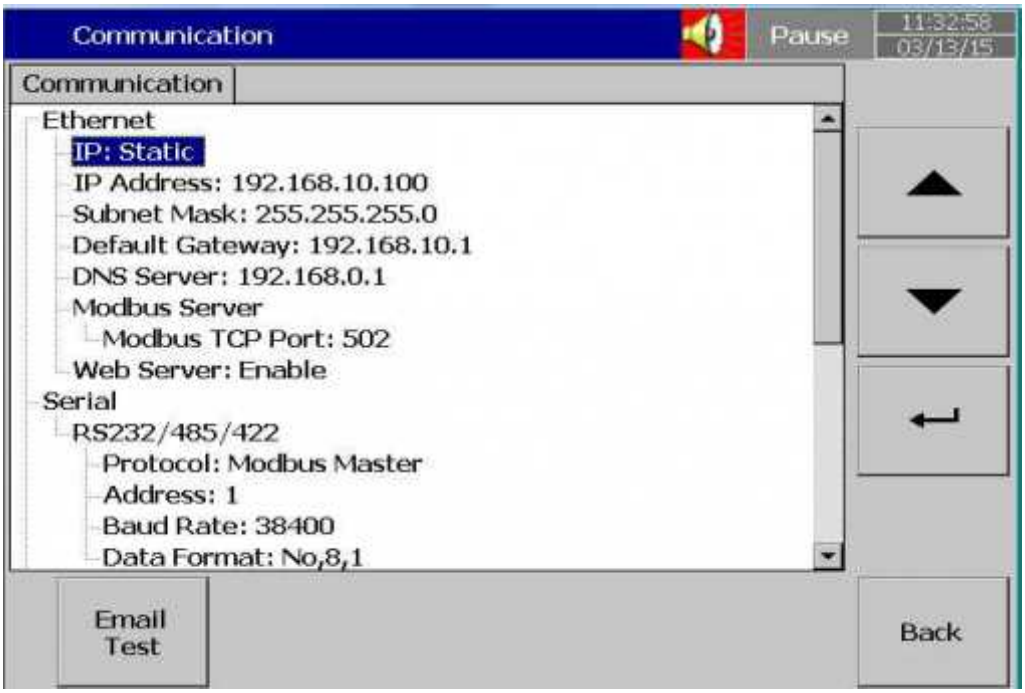
Fig: Clock configuration page in Paperless Recorder

Date Style: Selects either month/date/year or date/month/year

Date/Time: Set up the local time. Use directional keys Up/Down to select the column, press "**Enter**" soft button to change the clock data. Then press the "**Apply Time"** Soft button to apply it to the recorder.

Summer time: In some countries of North America and Europe, clocks are adjusted forward one hour near the start of spring and are adjusted backward in autumn. This is commonly referred to as Daylight Savings Time. We refer to this as "Summer Time". A Summer time set provision is available in the paperless recorder. In **Summer time**, Select **Type**: Enable and then set Start (Month, Day, Hour, Min) and End (Month, Day, Hour, Min) details.

4.5 Communication



Ethernet

IP: DHCP/STATIC

Select **DHCP** if the server on the network automatically allocates the IP address for the recorder.

Select **STATIC** to manually set a fixed address for the recorder.

IP Address: Defines the current address of the recorder on the network

Subnet Mask: Defines the current **Subnet Mask** address on the network

Default Gateway: Defines the current Gateway address.

DNS Server: This is required if the recorder is to be connected to Internet

Modbus Server: When configured as Slave Recorder is act as Server in Modbus Connectivity

Modbus TCP Port: Default: 502 for Modbus TCP

Serial:

Protocol: Modbus RTU Master/ Modbus RTU Slave

Address: Address of Master/Slave in the network

Baud rate: 9600/14400/19200/38400/57600/115200

Data format: None, 8, 1 or Odd, 8, 1 or Even, 8, 1

Modbus Client/Master:

Sample Rate:

Ethernet: 100 msec/dot, 1 sec/dot, 2 sec/Dot, 5 sec/dot, 10 sec/dot
Timeout : The default timeout is 100ms
Serial: 100 msec/dot, 1 sec/dot, 2 sec/Dot, 5 sec/dot, 10 sec/dot
Timeout : The default timeout is 100ms
Interval between 2 commands : The default timeout is 10ms

Email: Enable/Disable

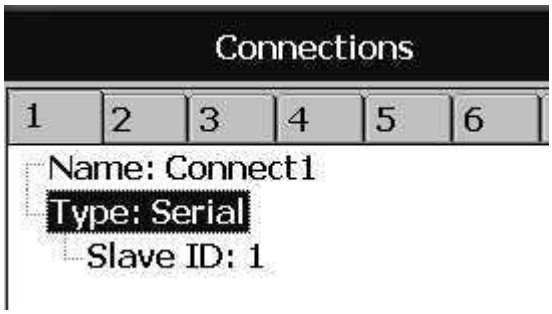
Press' "Email Test" and check mail function

If any problems with Email delivery, it will show error as shown attached

4.5.1 Connections

There are a total of 16 connections available

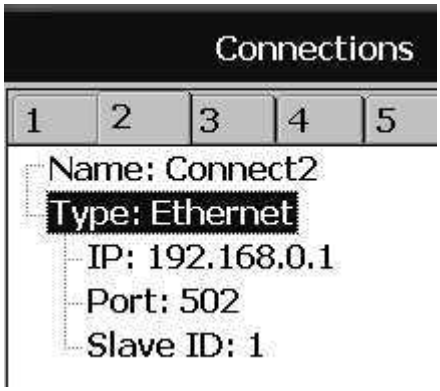
Each connection can be configured as either Serial or Ethernet



Name: Connection name

Type: Serial/Ethernet

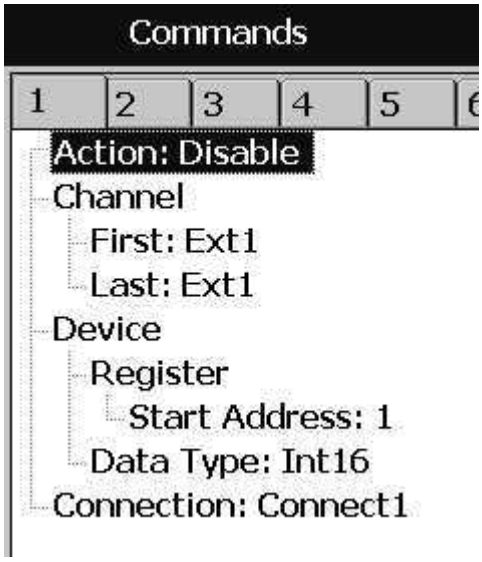
Slave ID: If Recorder is Modbus RTU Master, then, all the Slaves need to be configured in the connections.



IP: This is enabled only if Type = Ethernet selected at any connection

4.5.2 Commands

A total of 16 commands are available



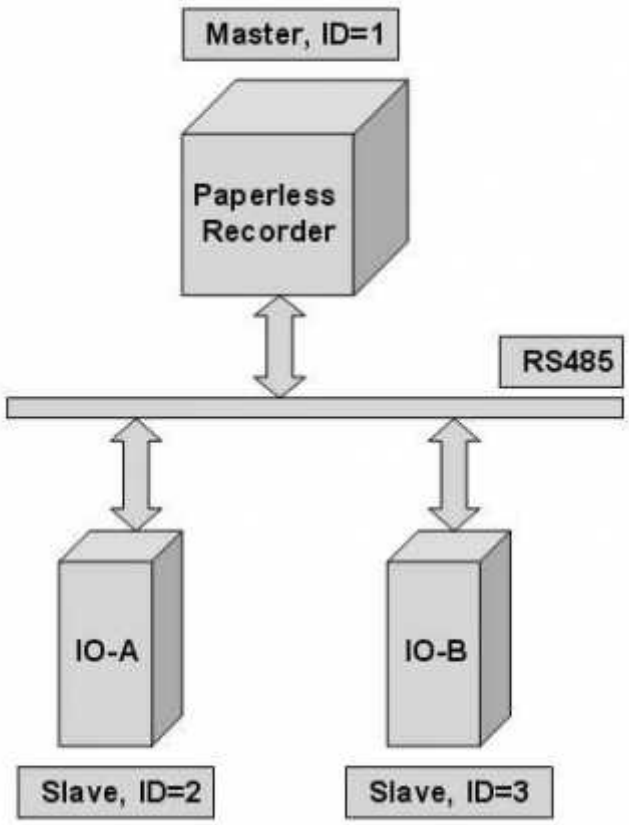
Action: Enable/Disable

To Channel:
First: Enter first external channel details, Ex : Ext1
Last: Enter last external channel details, Ex: Ext24

From Device
Register:
Start: Address: Enter Start register address
Data Type: Int16/Uint16/Int32_B/Int32_L, UInt32_B, UInt32_L, Float_B, Float_L
Connection: Select the required connection

4.5.3 Modbus RTU Master, Example1

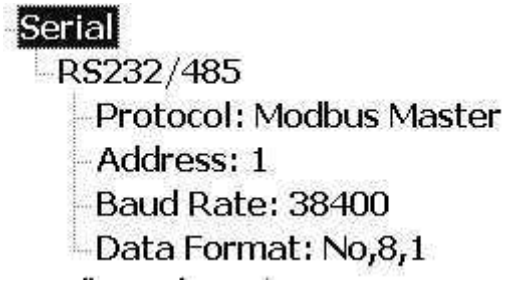
Master: Paperless Recorder
Slaves: External IO modules, 2 nos. each with 8 channel Analog inputs



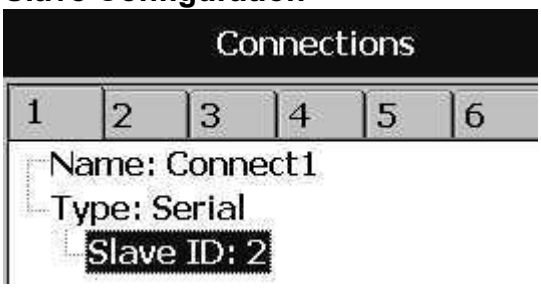
Modbus Address	Register Name	Low Limit	High Limit	Access
30002	Analog Input 1	0	4095	R
30003	Analog Input 2	0	4095	R
30004	Analog Input 3	0	4095	R
30005	Analog Input 4	0	4095	R
30006	Analog Input 5	0	4095	R
30007	Analog Input 6	0	4095	R
30008	Analog Input 7	0	4095	R
30009	Analog Input 8	0	4095	R

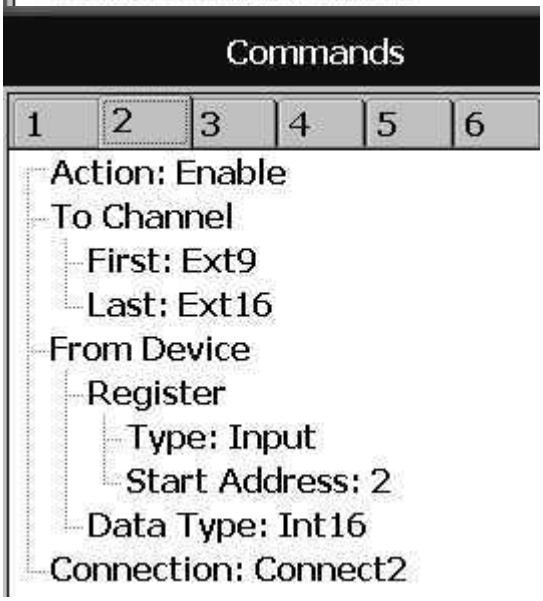
Fig: External IO modules Register table

Master Configuration



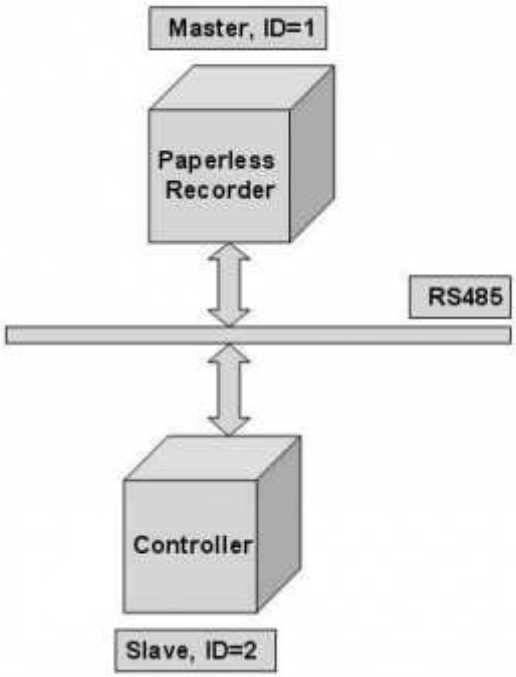
Slave Configuration





4.5.4 Modbus RTU Master, Example2

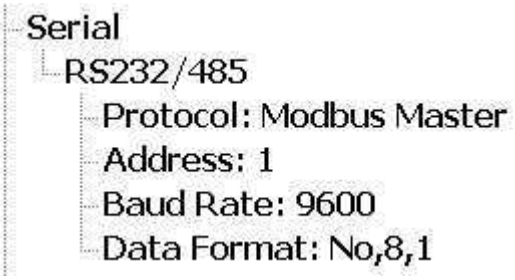
Master: Paperless Recorder
Slave: PID Controller



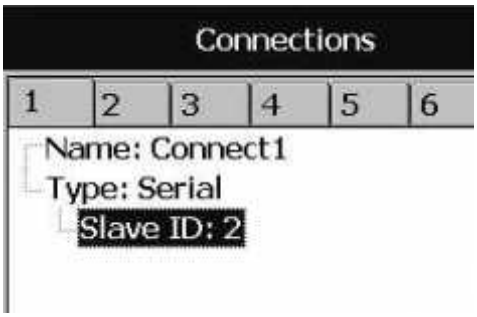
Register Address	Parameter Notation	Parameter Description	Range	Default Value	Data type
128	PV	Process value	Low: -32768 High: 32767	—	R
129	SV	Set point value for control	Low: SPLO High: SPHI	—	R

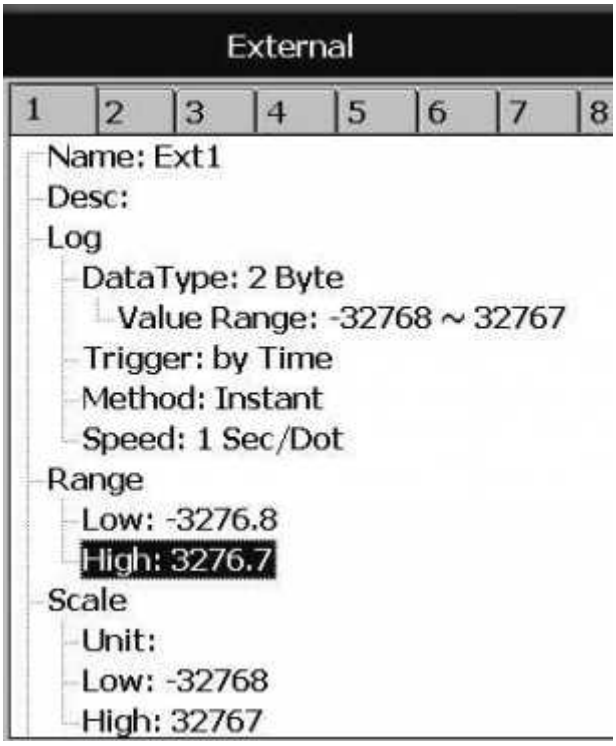
Fig: External PID Controller Register table

Master Configuration



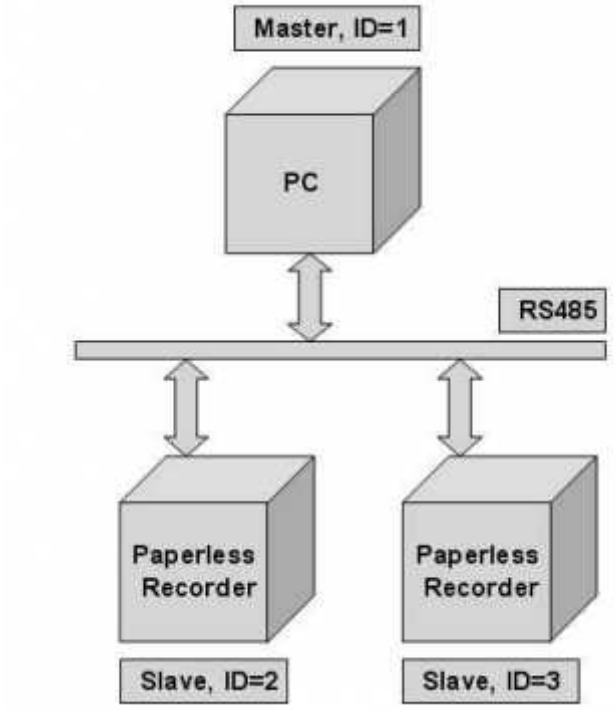
Slave Configuration





4.5.5 Modbus RTU Slave, Example

Master: PC, Modbus RTU OPC Server
Slaves: Paperless Recorders, 2 nos. each with 6 channel Analog inputs



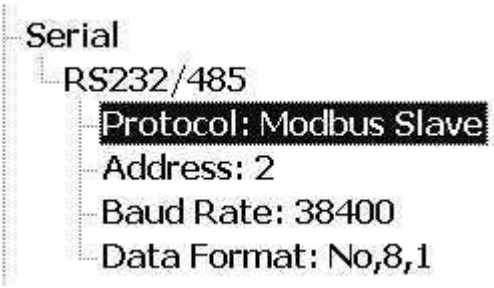
1. Input Register Parameter Table

Address	Notation	Parameter	Scale Low	Scale High	Notes
0	AI1PV	AI1 process value	*1	*1	R
1	AI2PV	AI2 process value	*1	*1	R
2	AI3PV	AI3 process value	*1	*1	R
3	AI4PV	AI4 process value	*1	*1	R
4	AI5PV	AI5 process value	*1	*1	R
5	AI6PV	AI6 process value	*1	*1	R
6	AI7PV	AI7 process value	*1	*1	R

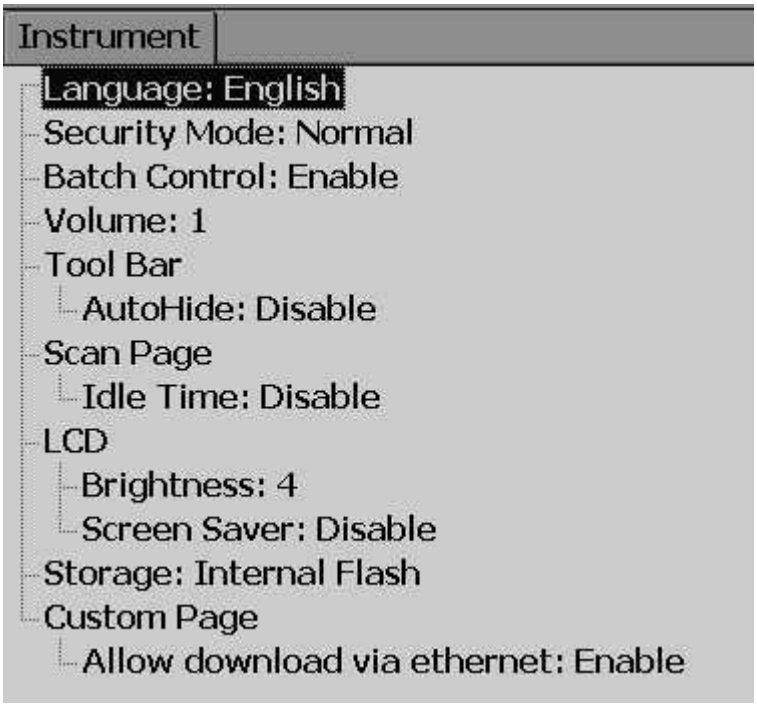
*1: The scale high/low value are define in the following table for

Conditions	DP=0	DP=1	DP=2	DP=3	DP=4	DP=5
Scale low	-19999	-1999.9	-199.99	-19.999	-1.9999	-0.19999
Scale high	45536	4553.6	455.36	45.536	4.5536	0.45536

Fig: Paperless Recorder (Slave) Register table and scaling information



4.6 Instrument



Language: A total of 20 languages are supported. They include English, Simplified Chinese, Traditional Chinese, Japanese, Korean, French, German, Italian, Polish, Spanish, Portuguese, Brazil Portuguese, Russian, Thai, Czech, Danish, Dutch, Swedish, Turkish & Greek.

Security: Select Normal or CFR-21 security. More details available at section "Security"

Batch Control: Disable and Enable options available for the selection. Refer section "Batch Control" for more details.

Volume: When the screen is touched, you can hear a "beep" sound. Select Disable to switch off the beeper. Select value 1 to 10 for volume control. 1 is minimum sound and 10 for maximum sound

Tool bar: On left side of the display page, the tool bar appears for configuration**.**
Auto Hide: Select 10 Sec or 20 Sec or 30 Sec or 60 Sec to hide the tool bar if the user does not operate recorder via touch screen for the set time interval. Select "disable" if auto-hide is not required on specific set time

Scan Page: The User can set Automatic scanning of display pages for fixed time when enabled . The Fixed times are 1minute to 10 minutes.

Idle time: If touch screen is not used for the set idle time, then the display pages will start scrolling as per defined scan rate. Select 1 to 10 Min. for the idle time if display scroll feature is required, otherwise select "disable".

Scan Rate: This is the scroll time for the display pages. Select a time interval between 5 sec to 30 sec. This time interval is effective only if the “idle time” is enabled and the selected time is between 1 to 10 min

LCD:

Brightness: Select level between 0 and 6. 0 is the lowest brightness and 6 is for the highest possible brightness

Screensaver: To prolong the life of the LCD display, it is suggested to set the display turn-off time to 1, 10, 20, 30, 40, 50 or 60 minutes after the last time the user operates the recorder. ***Screensaver default time is set to 10minutes from the factory.*** The recorder continues to record data while it is in screen saving mode. The display turns on again by touching the LCD screen

Storage: Select internal flash memory or SD card

Custom page: User can use this setting to enable or disable custom pages downloaded via Ethernet.

Allow download via Ethernet: Enable/disable

4.7 Security

4.7.1 Normal

Path:  (Menu)-More-Config-select Instrument, then press “Enter”

Select “Security” = Normal

If normal security is selected, users will need to key in a common password with a maximum of 18 characters. Once the password has been entered, the user needs to key in the password whenever **Config**, **Dump**, **Clear** or **Operate** soft keys are required. These keys enable the user to do configuration, dump data, clear data or manually operate the job. For easy access **Config**, **Dump**, **Clear** or **Operate** soft keys, the user may ignore the password by leaving the password field blank. If a password is not entered initially, there is no password required.

How to enter simple password

 (Menu)-More-Config, select Password, press “Enter”, then key-in the passwor

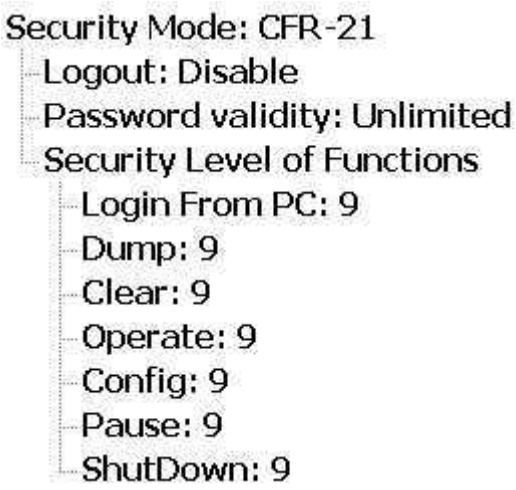
4.7.2 CFR-21

If the higher security CFR-21 is selected, it requires the recorder to operate with more restricted rules which comply with **FDA 21 CFR Part 11**

It has time limit during operation. If the user does not press ay keys in a predefined period of time (which can be selected between 1 to 20 minutes using LogOut function), the user needs to key in the password again. It also offers an audit trail function to record the user, the timing, and what type work the user was doing on the recorder. Incorrect password and unauthorized operation will be recorded into the event list as well.The maximum number of users available in FDA 21 CFR Part 11 Security Mode is 30.

In  (Menu)-More-Config-Select **Instrument**, press “Enter” soft button.

Select Security = CFR-21.



LogOut: Time selection available from 1 min. to 20 min. This selection is visible only if CFR-21 is selected

If no user operates the Paperless Recorder for the above set duration, the current user will be logged out automatically

Password validity:

Password validity can be set for 30, 60 or 90 days. After the preset amount of days, it will require the user to key in a new password, or keep the old one for an additional 30, 60 or 90 days.

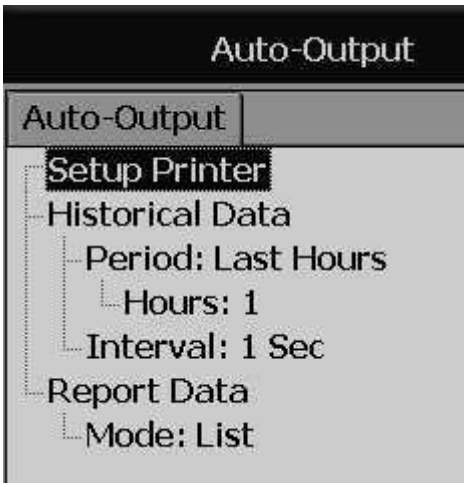
Security levels:

0 to 9 levels are supported
9 is the highest authority level, 0 is the lowest

4.8 Demo

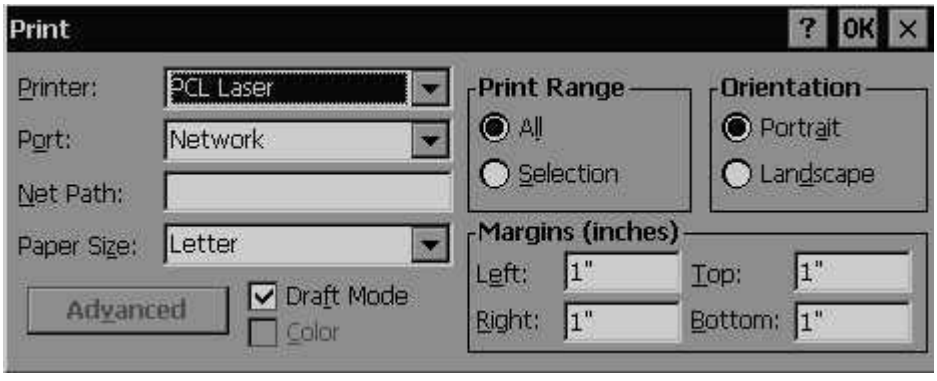
The Demo mode is a simulation mode used as a sales tool for demonstration purposes. It is set to simulate AI analog inputs and Math functions.
*To start the automatic demonstration, first enable **Demo mode**, then turn the power OFF and Power ON to make it effective. To stop the automatic demonstration and return to real mode with real inputs, first disable Demo mode, then turn the power off and Power ON.*

4.9 Auto-Output



Setup Printer: It is to configure printer

Select **Setup Printer** and then press the “Enter” soft button



Two kinds of printers are supported. One is USB printer for page printing and another is Serial printer for Line printing

Applications: Print Historical data, events, & Reports and snapshot directly from Paperless Recorder.

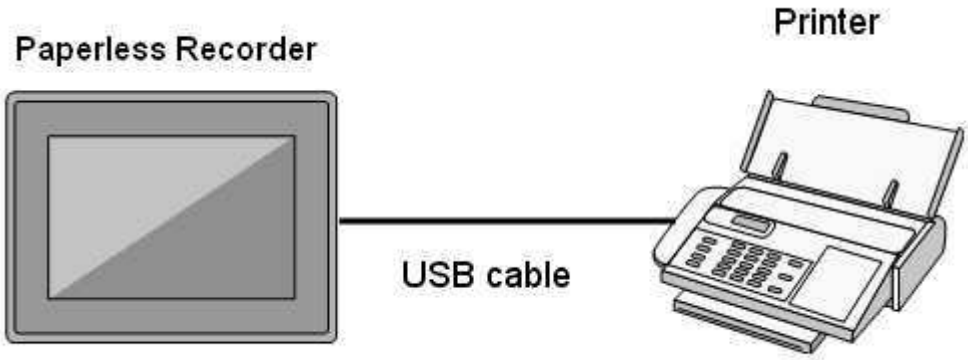
4.9.1 USB Printer

Generally, USB printer support PCL protocol. It means, it will support Page Print, but not line print. We support PCL language 4, 5 & 6

If USB printer supports ESCP protocol similar to EPSON LQ300+, then, it is possible to take line print.

Please refer Printer user manual for exact protocol details

Do not use USB printer supporting only PCL to print single line alarms, otherwise, pages will be wasted



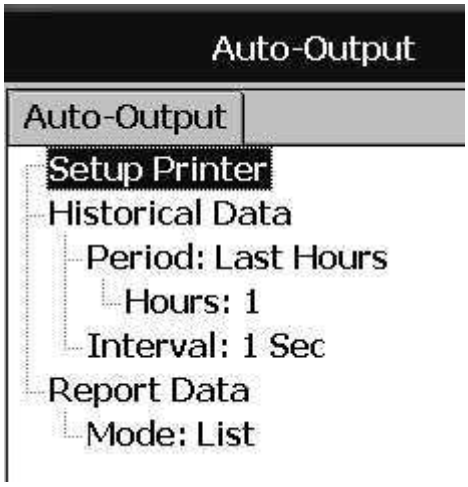
Procedure

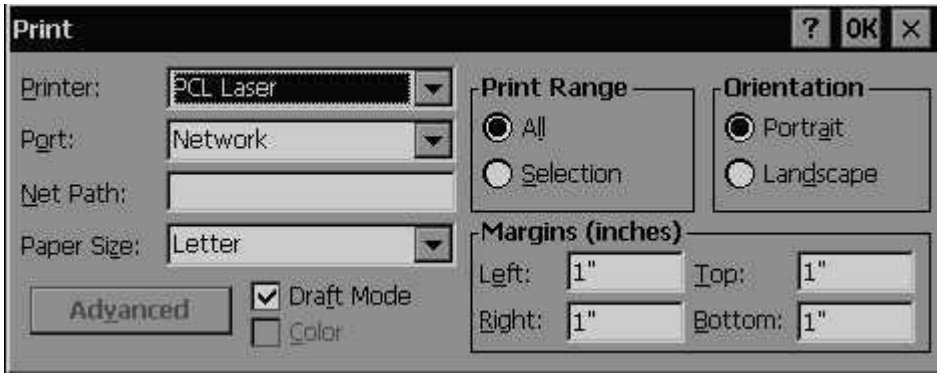
Connect Recorder to Printer via USB cable

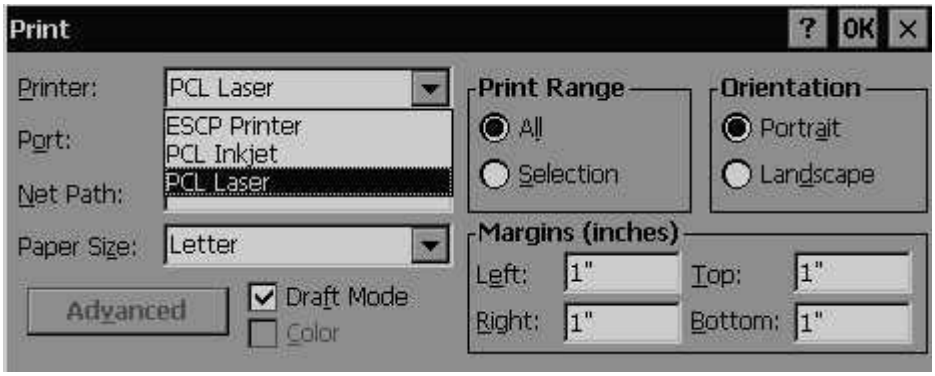
Power ON Printer

Path: (Menu)-More-Config-Auto-Print, Enter

Select “Setup Printer”, press “Enter” soft button







Printer: PCL Laser, ESCP printer, PCL Inkjet available by default. Select one from the list as per printer model connected to the Paperless Recorder

Port: It shows "Network" by default. Once a printer is connected to the USB port, it will show "LPT1" for the USB printer. Select "LPT1"

Net Path: It is required to enter the correct network path here only if both Printer and Paperless Recorder are connected to a LAN network

Paper Size: A4, B5, Legal and Letter are supported

Draft mode: By default, it is selected. If more quality print is required, deselect Draft Mode

Color: Enabled for Inkjet printer

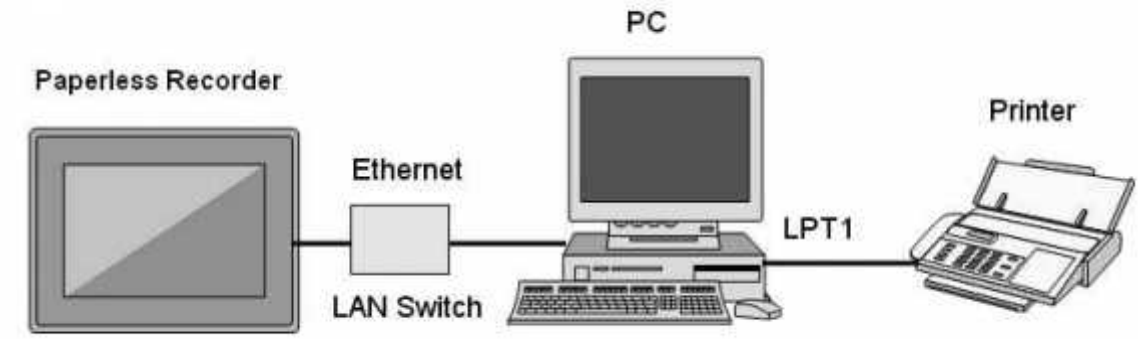
Orientation: Select Portrait/Landscape as per requirements

Note: Margins & Print Range are not working at this time.

Now, setup is ready at Paperless Recorder

4.9.2 Network Printer (LPT1)

Serial printer will print minimum one line and is generally used for printing Real time alarms. Also, it can be used for printing historical data and alarms from the Paperless Recorder. ESCP language id supported, so any printer supporting ESCP like LQ300+ can be used. The LPT1 port of a PC can be connected to a Serial printer directly. However, it needs to have a Printer driver installed in PC first, and share it for network use via Ethernet.



Procedure

Connect Paperless Recorder to PC via Ethernet

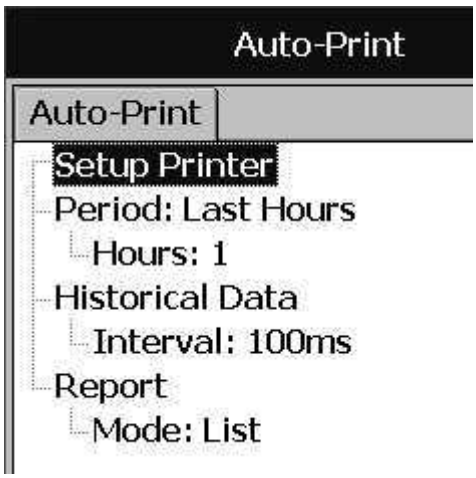
Install Printer driver in PC. Share Printer for network use

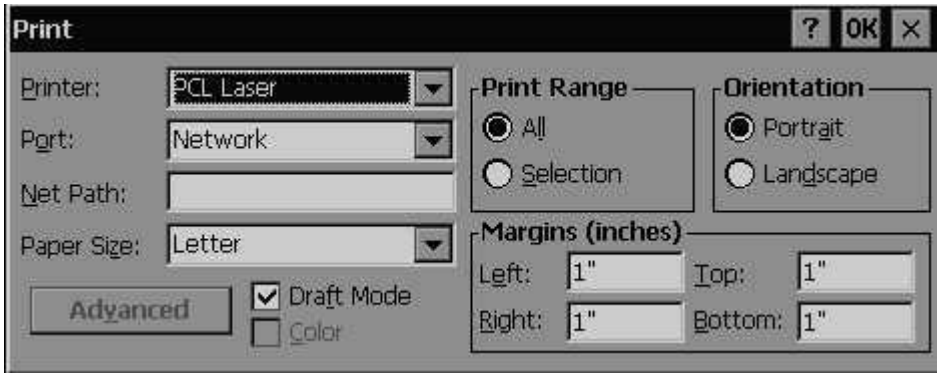
Connect Printer to PC via LPT1

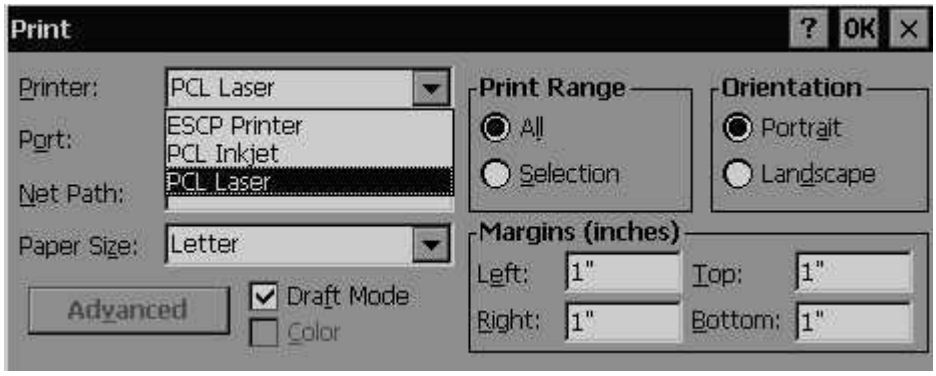
Power ON Printer

In Paperless Recorder, at Path, select (Menu)-More-Config-Auto-Print, Enter

Select “Setup Printer”, press “Enter” soft button







Select ESCP printer.

Then, enter the proper Net Path. Ex: \\PC1\LQ300

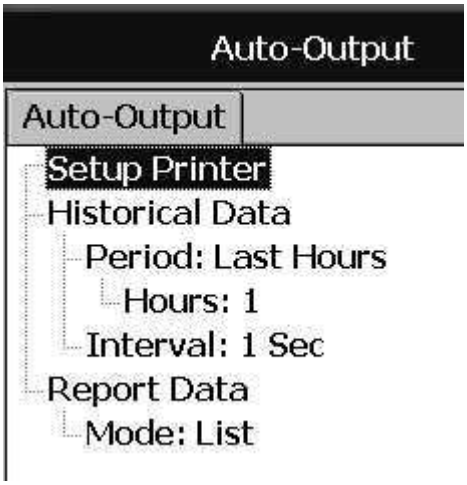
PC1 is computer name and LQ300 is shared printer driver for network use

Now, the setup is ready at the Paperless Recorder

4.9.3 Print Historical data

Configure USB Printer or Network printer as explained in earlier section

In Paperless Recorder, at Path, select (Menu) -More-Config-Auto-Output, Enter



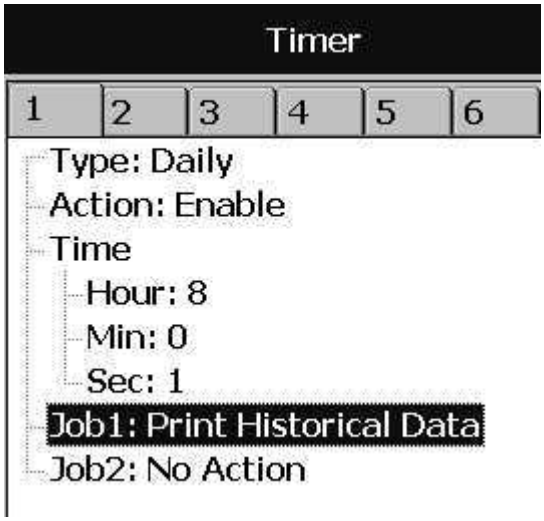
Period: Select Last hours or Last days

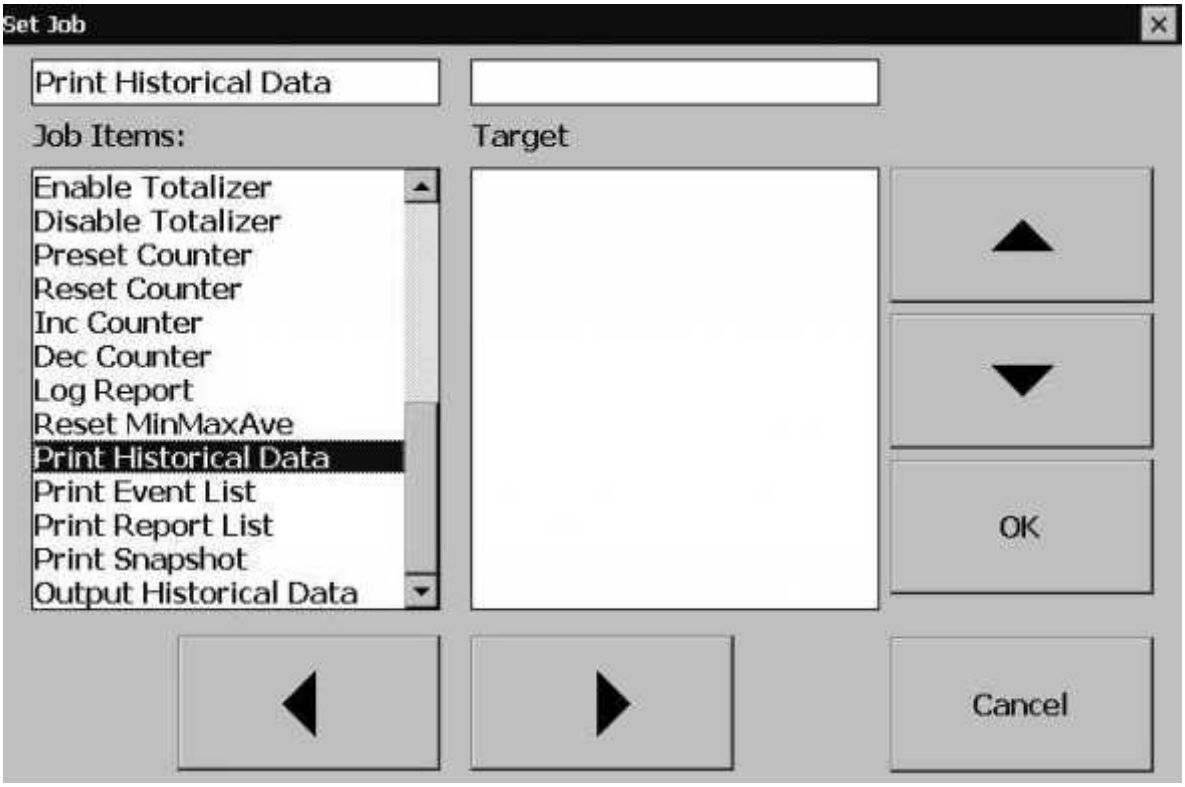
Hours/Days: Select no. of hours or no. of days as per above selection

Interval: Select intervals of 100 msec/1 sec/2 sec/ 5sec/ 10 sec/ 20 sec/ 30 sec/ 1 min/ 5 min/ 10 min.

The Print function is available in the Job list and can be initiated in various ways.

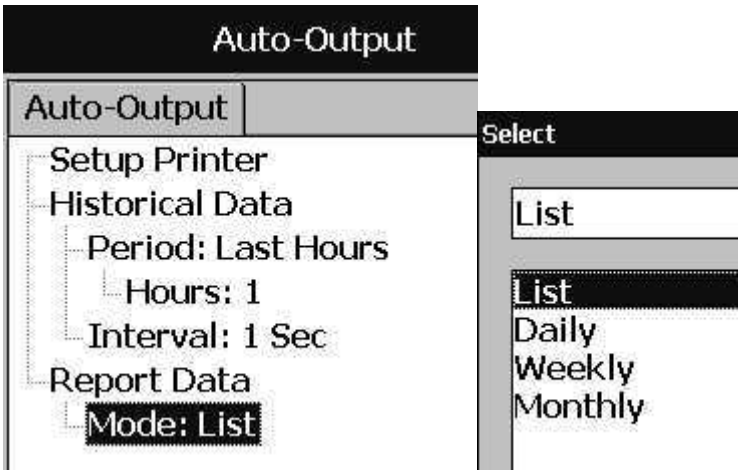
Ex: Print historical data of last 1 hr. and do this every day at 8.00 hrs



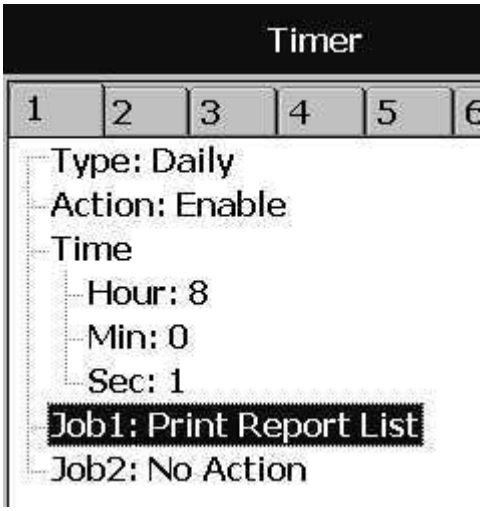


4.9.4 Print Reports

In Paperless Recorder, at Path, select ☰ (Menu)-More-Config-Auto-Output, Enter

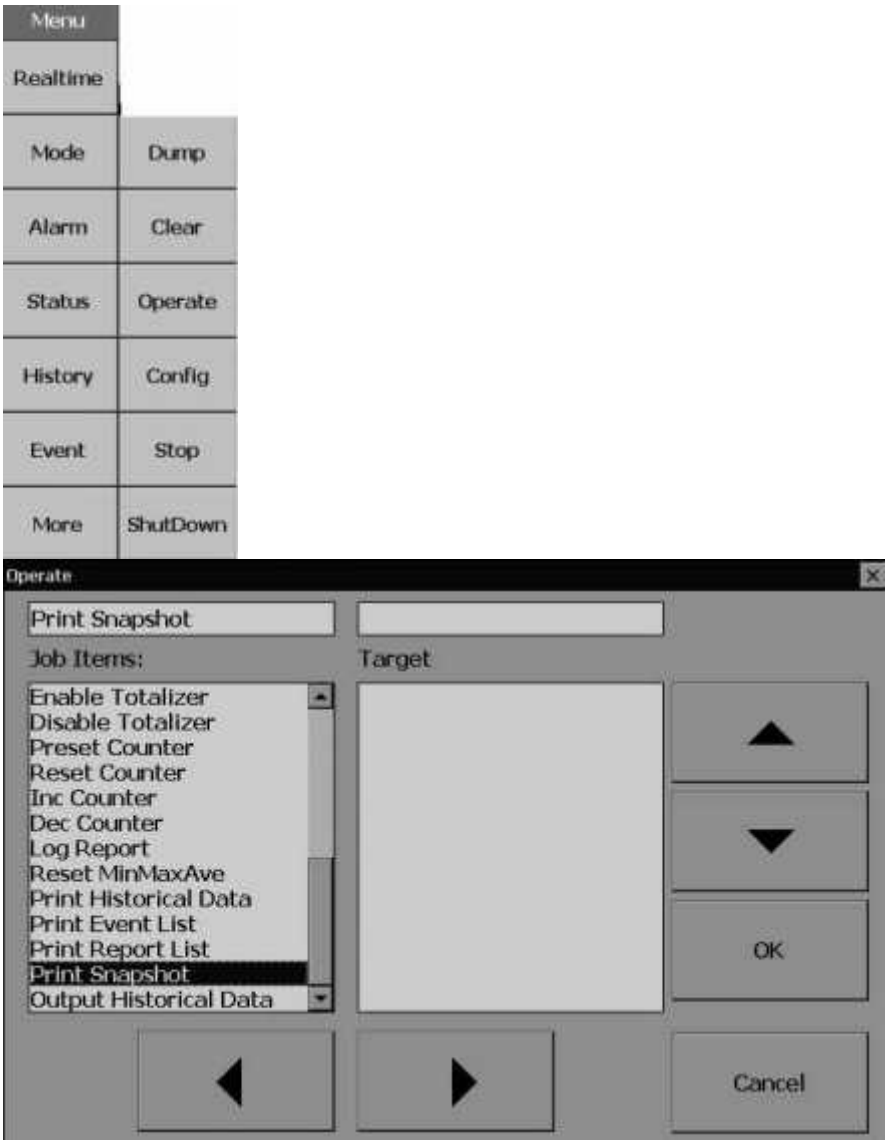


In the **Mode**, select which kind of Reports are required. Available options include Daily Reports, Weekly Reports and Monthly Reports



4.9.5 Print Snapshot

(Menu)-More-Operate-Print Snapshot



4.10 System Info

Path: ☰ (Menu)-More-Config-System Information

The system information includes System version, Internal and External memory, Ethernet IP address and Slots status

Version: The firmware version of the recorder.

Memory (Free / Total):

> **Internal**: Indicates the percentage of free memory compared to total memory available in internal flash card
>
> **External**: Indicates the percentage of free memory compared to total memory available in external memory devices of SD and USB.

A small icon on the top right indicates the percentage of free memory e.g.: Mem 96 %

Address:

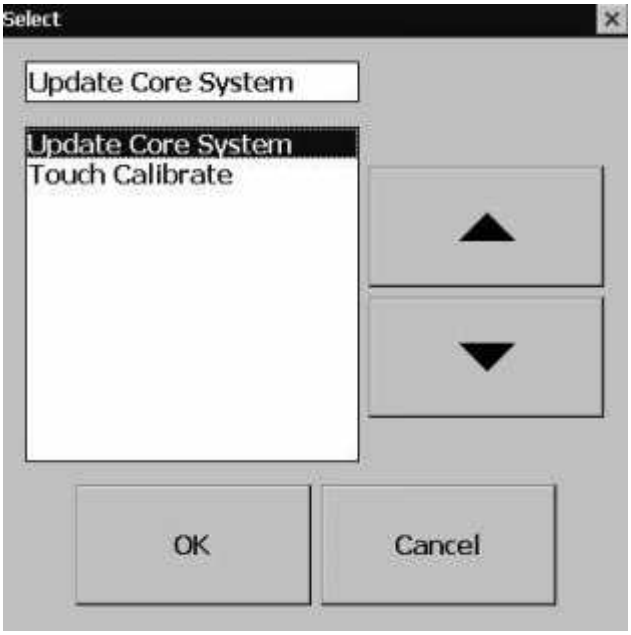
> **MAC**: Displays the MAC address of Paperless Recorder
> **IP address**: Displays the IP address for the Paperless Recorder

Slot 1..5: Indicates the status of all Slots and the cards that have been inserted. The cards include Analog Input AI, Digital Input DI and Digital Output DO & AO.

4.10.1.1 Upgrade Firmware

Path:  (Menu)-More-Config-System Information-Maintain

Maintain: The Maintain button is located at left lower side in System Info. page. It is the button to upgrade the firmware and calibrate the touch screen in the paperless recorder



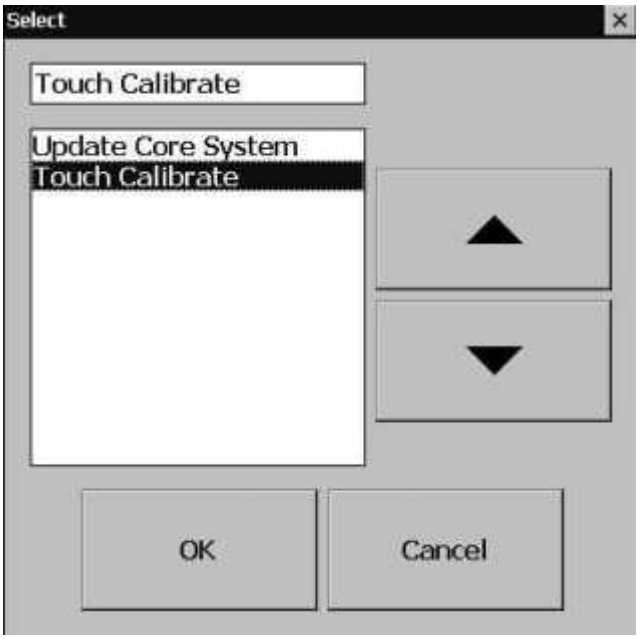
Upgrade Core System:

This is to upgrade firmware in the paperless recorder. Contact factory/supplier for the latest firmware files. Please download firmware file to a USB stick or SD Card then, insert the USB stick into USB port or SD Card at SD card Slot in the Paperless Recorder. Select the External Storage to SD Card or USB flash on the External Storage Setting depends on the storage inserted. Select “Update Core System”, then click the “OK” button. It may take a few seconds to finish the process. Please note that the power to the recordershould be not switched off during this upgrade process

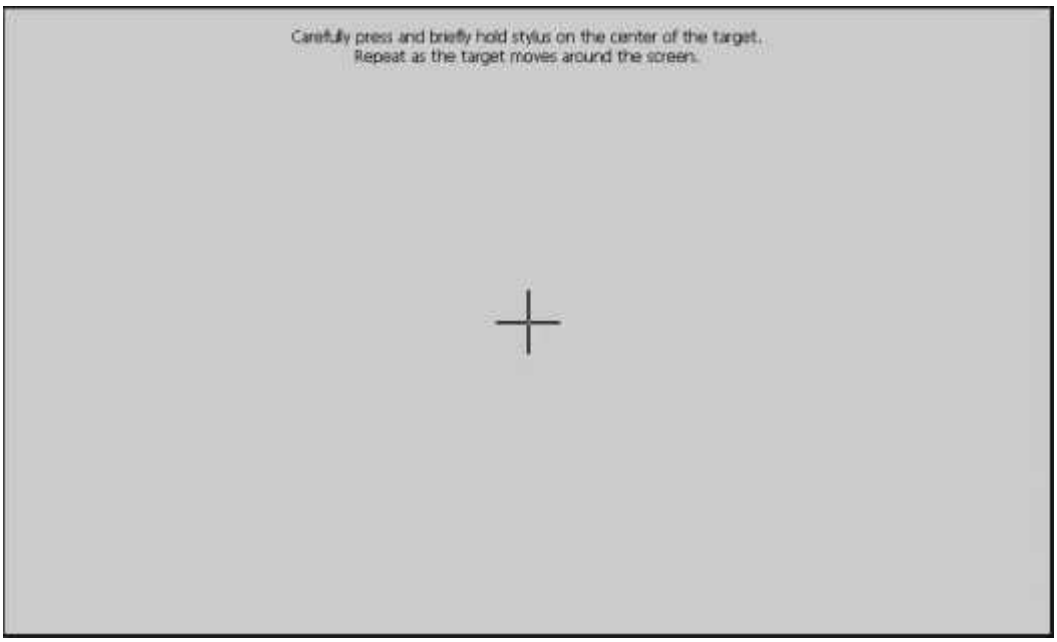
4.10.1.2 Calibrate Touch Screen

Path:  (Menu)-More-Config-System Information-Maintain

Maintain: The Maintain button is located at left lower side in System Info. page. It is the button to upgrade the firmware and Calibrate touch screen in paperless recorder



This is used to calibrate the touch screen. A "+" symbol appears in the center of the LCD screen. Carefully press and briefly hold a stylus or finger on the center of the target. Repeat this procedure as the target moves around the screen. Just touch the screen to complete the screen calibration. This procedure helps to locate pointer via touch screen and properly select the objects during operation of the recorder

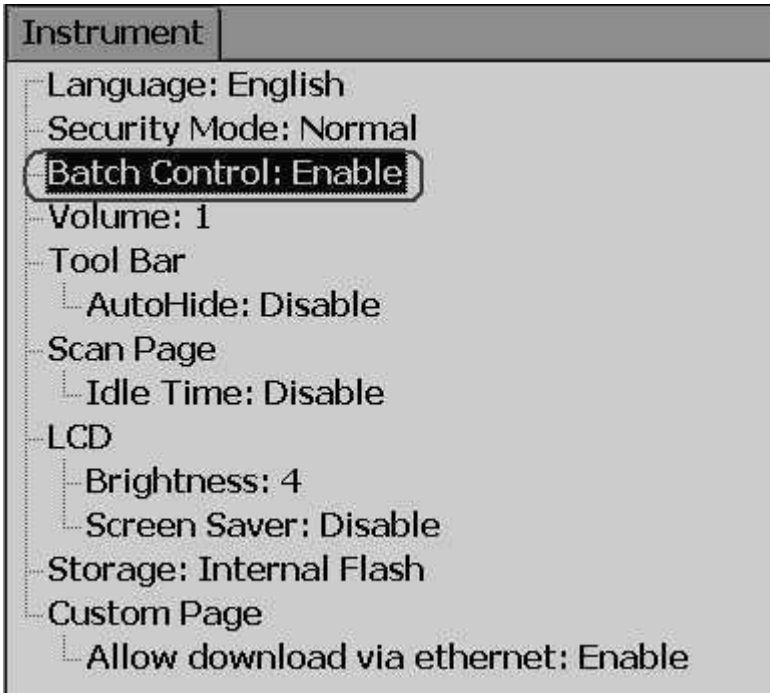


4.11 Batch Control

This feature is to store data in a different folder for every batch and archive data later with reference to a batch.

Path:  (Menu) - More-Config- Instrument

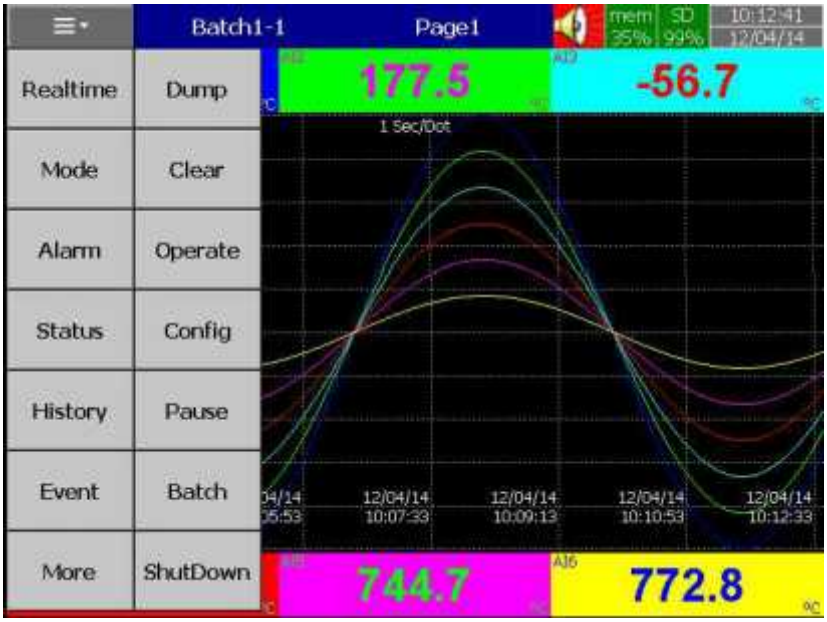
Select Batch Control and press “Enter” key. Select “Enable”. Press “Ok”



Press “Back”

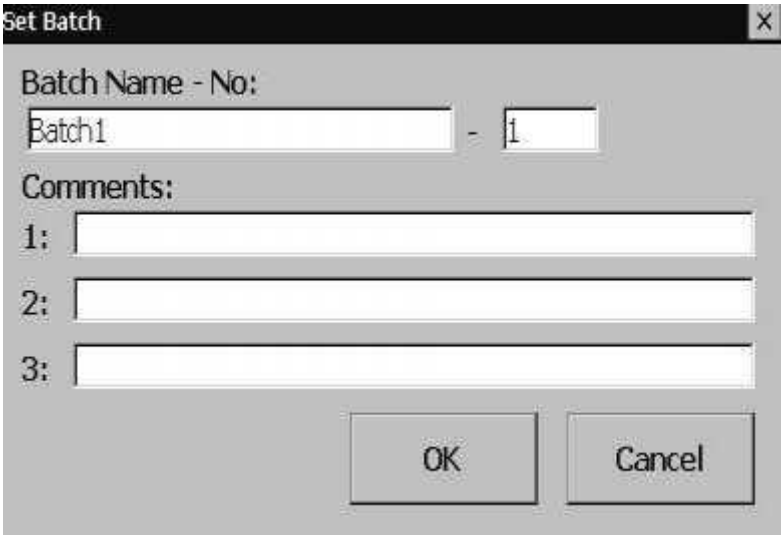
Press “OK”, then, press “Home” Soft key to save these settings

Power the recorder OFF then ON, then in the  (Menu), the Batch soft key will be shown as below



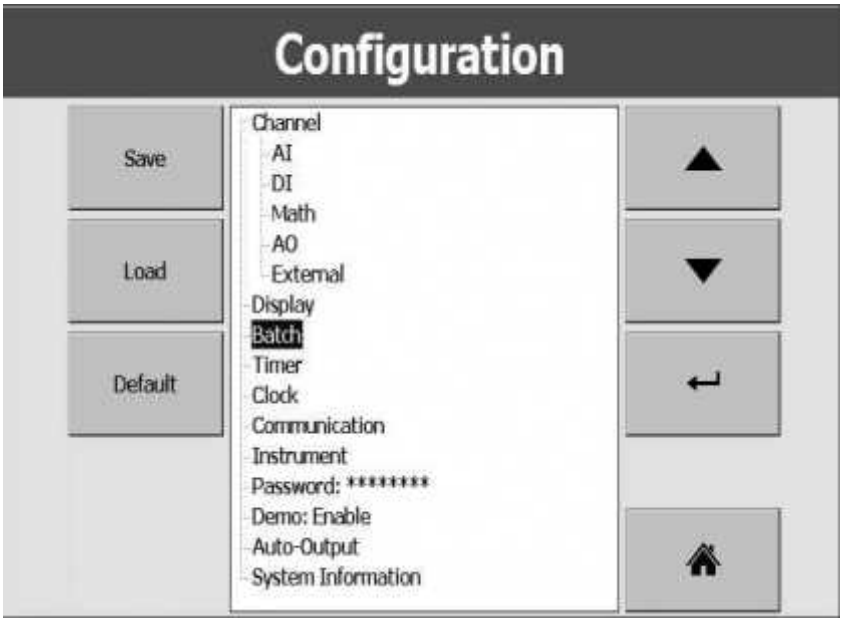
Note: “Batch” soft key will appear only after Batch Control enabled as explained above

Press on Batch and it shows the following screen

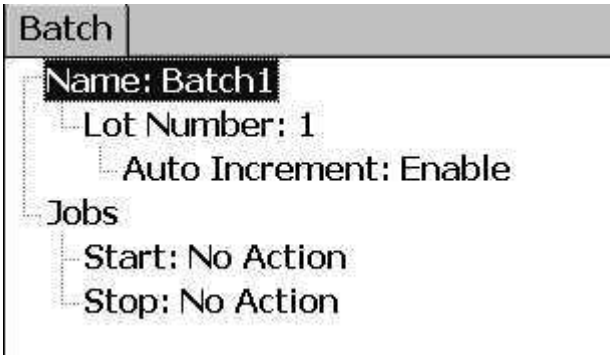


Operator can enter a maximum of three comments for any batch.

In the (Menu)-More-Config, select “Batch”, press “Enter” key



It will show the Batch control settings as shown below



Name: Enter Batch name. A maximum of 18 characters is allowed. By default, the name is Batch1.

Lot Number: Enter the Lot number. If Auto increment is enabled, then Lot numbers will be incremented automatically by the recorder, Batch1-1, Batch1-2, Batch1-3 etc. during every start of a new batch

Jobs: Two events, Start, Stop are available

Start: Start means Jobs that should be done during start of a new batch
Stop: Stop means Jobs that should be done during stop of a batch

Note: When batch control is enabled, the recorder will be in Pause mode by default initially and it requires Starting of the recorder from the Menu by pressing at ≡ (Menu) - More than "Start". When recorder is not logging any data, Pause status shall be shown in the Top right area of the recorder as shown below

How to do the batch control

Press on ≡ ("Menu"), "More", then "Start". Batch number will be shown in the recorder Top area.

To Stop this batch, press on "Menu", "More", then "Pause". It gives a message "Saving data" and updates batch data in the internal memory of the paperless recorder.

4.11.1.1 Batch Example-1

The operator wants to start a batch every day at 8.00am and stop the batch at 12.00am.

Configuration

Timer1

Type: Daily Action: Enable
Time – Hour: 8 Min: 0 Sec: 1
Job1: Start
Job2: No Action

Timer2

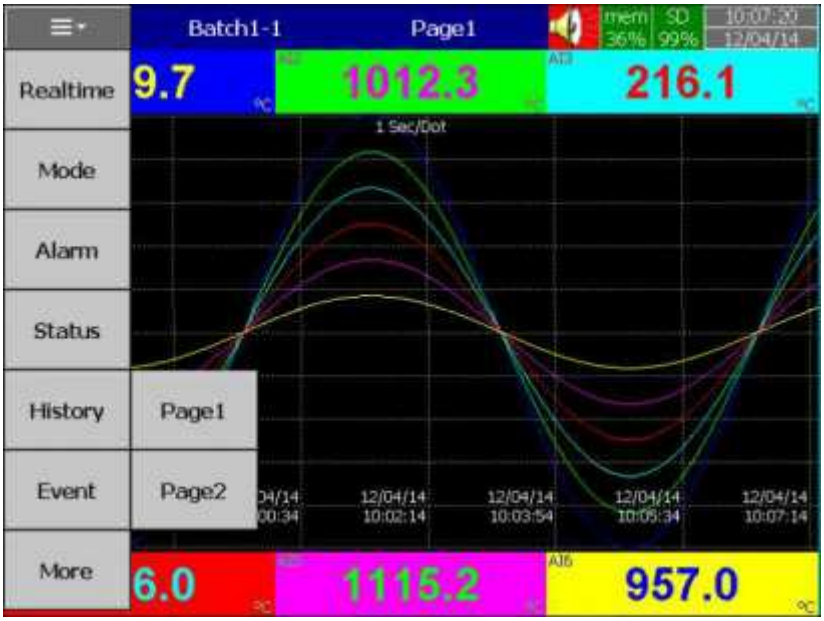
Type: Daily Action: Enable
Time – Hour: 12 Min: 0 Sec: 1
Job1: Pause
Job2: No Action

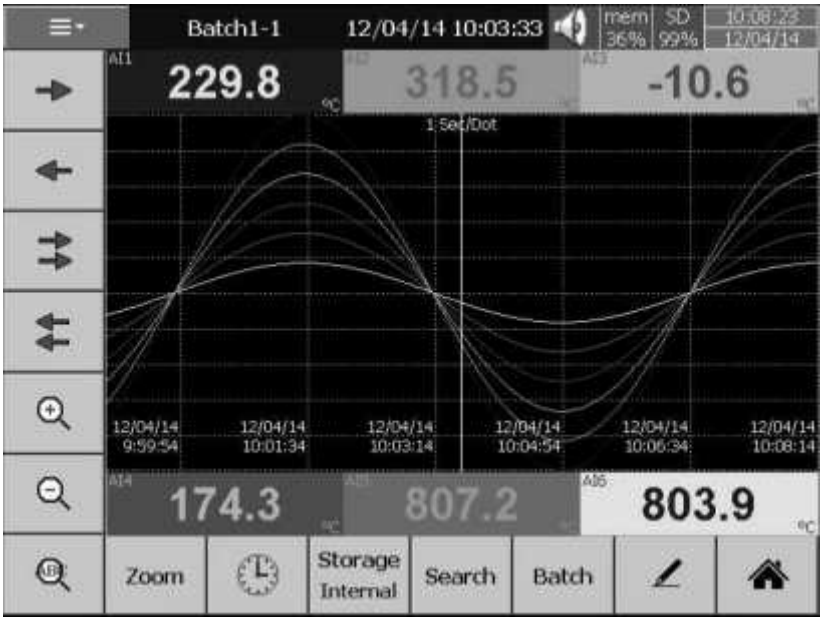
How to view batch data in Recorder

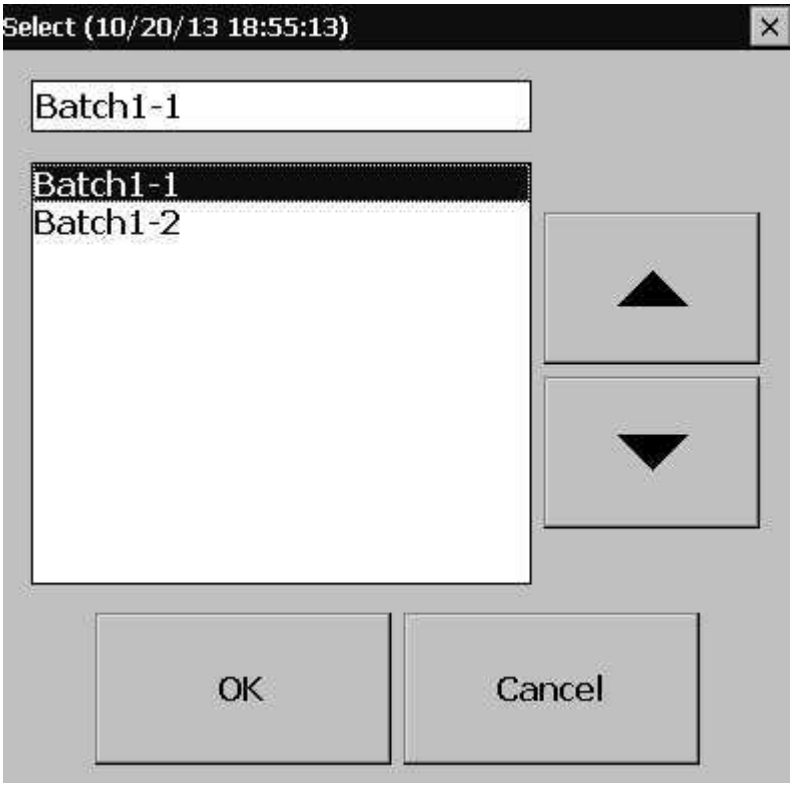
Press on  (Menu)-History-Page1

Press “Search”, select required Batch and press “Ok”

Batch details including lot number can be archived by pressing soft key “Batch”

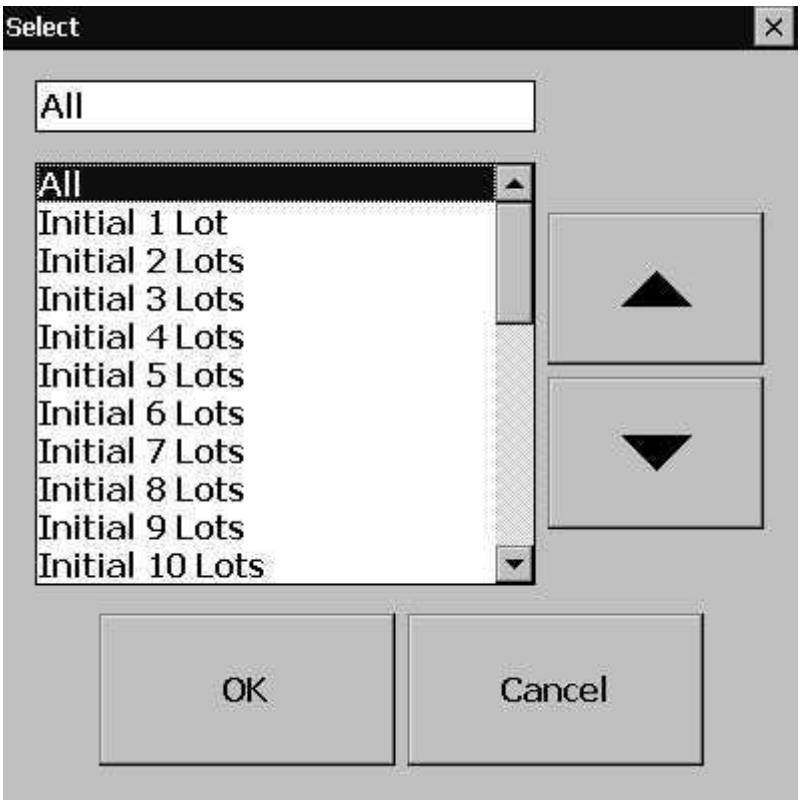

Batch1-1
Page1
mem
36%
SD
99%
10:07:20
12/04/14
Realtime
Mode
Alarm
Status
History
Page1
Event
Page2
More
9.7
1012.3
216.1
1 Sec/Dot
12/04/14
10:02:14
12/04/14
10:03:54
12/04/14
10:05:34
12/04/14
10:07:14
6.0
1115.2
957.0


Batch1-1
12/04/14 10:03:33
mem
36%
SD
99%
10:08:23
12/04/14
229.8
318.5
-10.6
1 Sec/Dot
12/04/14
9:59:54
12/04/14
10:01:34
12/04/14
10:03:14
12/04/14
10:04:54
12/04/14
10:06:34
12/04/14
10:08:14
174.3
807.2
803.9
Zoom
Storage
Internal
Search
Batch



How to Dump Batch data to external USB memory

Press on (Menu)-More then press on Dump

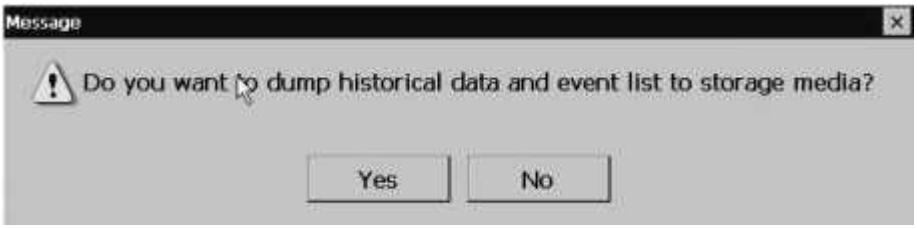


Select “All” or required lots and press “OK”

For ex: Batch1-1, Batch 1-2, Batch1-3 are available
Initial 1 Lot means, Batch1-1
Initial 2 Lots means, Batch1-1 and Batch1-2
Initial 3 Lots means, Batch1-1, Batch1-2 and Batch1-3

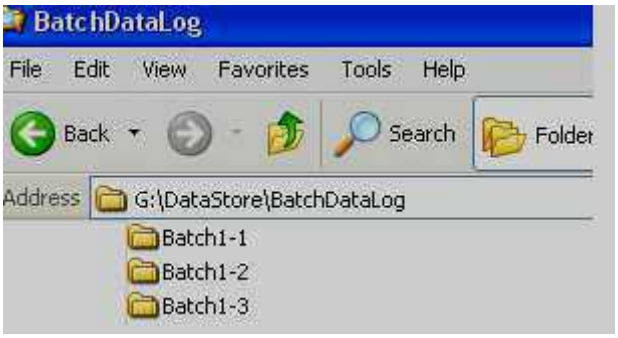
Note: Provision not available to dump only specific lot.

Please refer Instrument->Data Transfer-> Transfer and Remain



Press on “Yes” to dump data from internal memory to external SD Card or USB memory.

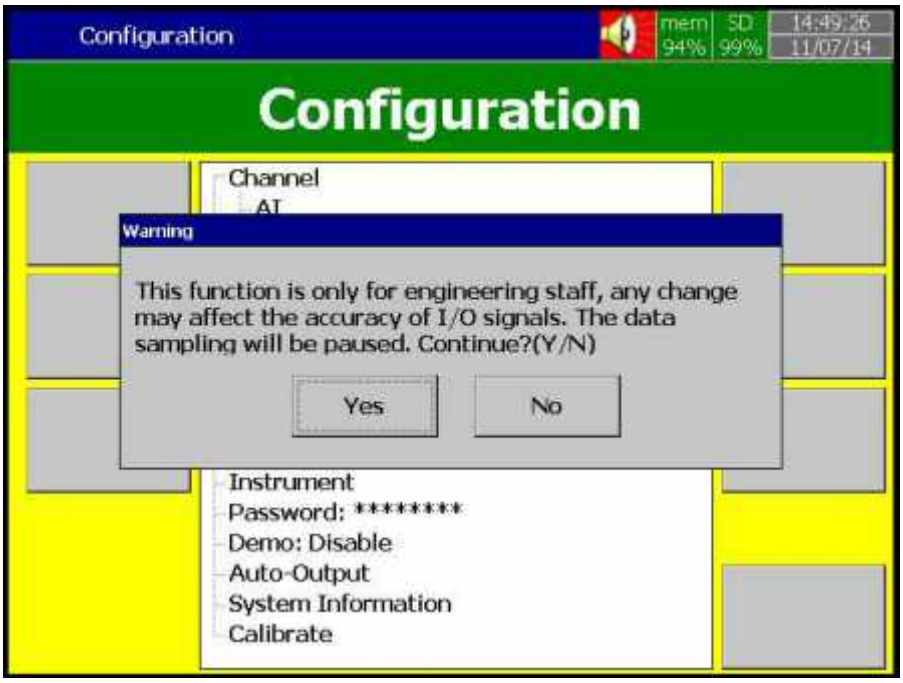
If you have 3 batches, let’s say Batch1-1, Batch1-2 and Batch1-3, then you can see three different folders in the external USB memory card after completing of dump



Please note that the data available in USB memory is in a proprietary format to avoid any kind of tampering. You will need PC software to view this data.

4.12 Calibrate

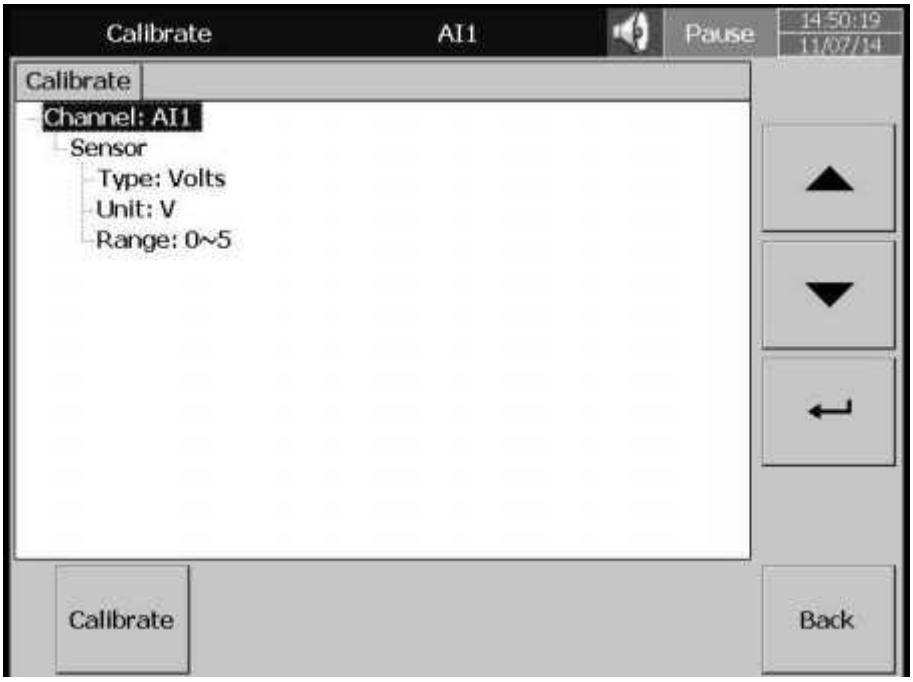
This function is used for calibrating Individual Analog channel.



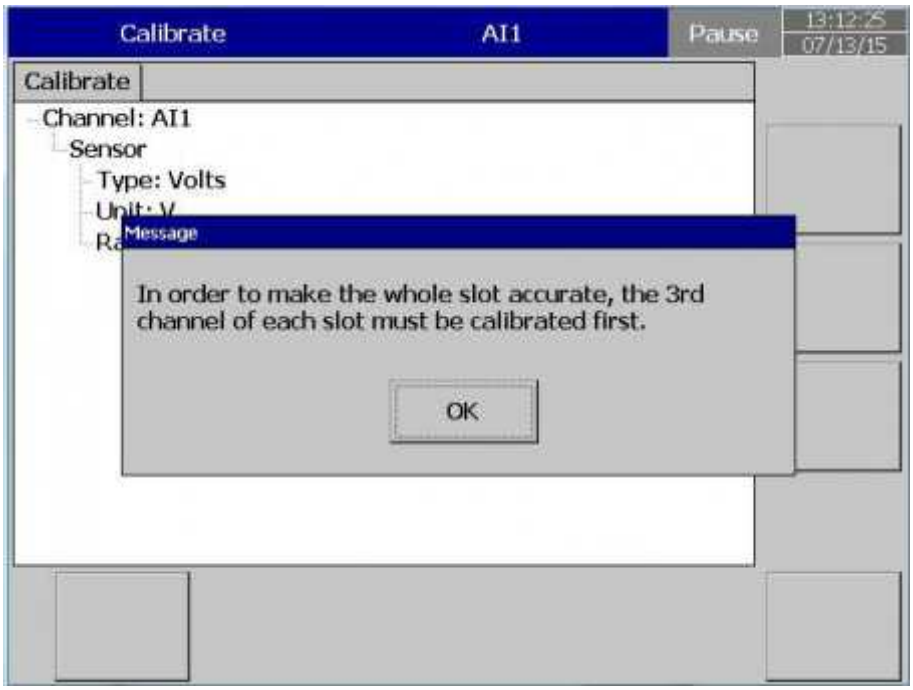
Example 1:

Calibrate an AI with 0-5V

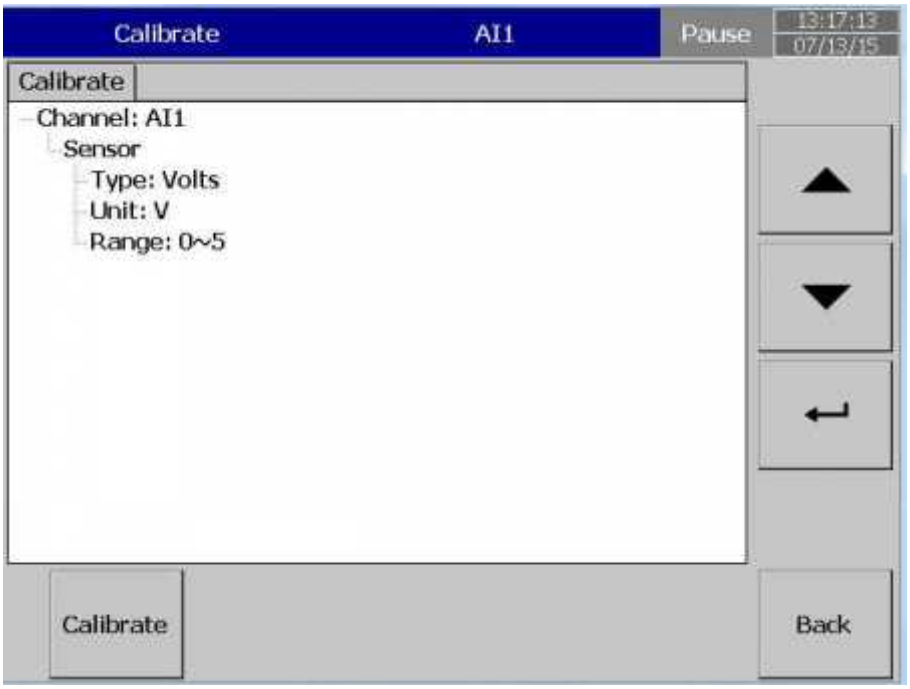
When you click Calibrate menu, the user can see the below screen. Please click calibrate as shown in the below screen



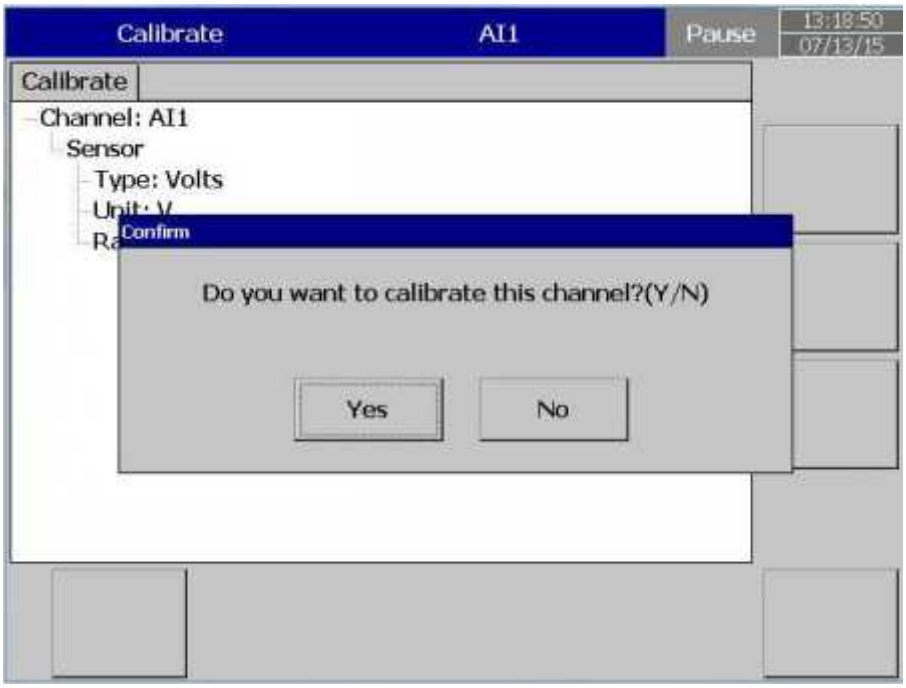
Please note that , Inorder to calibrate the whole Module slot accurately , the 3rd channel of each slot nust be calibrated first. Click OK.



Now click Calibrate button as shown below.

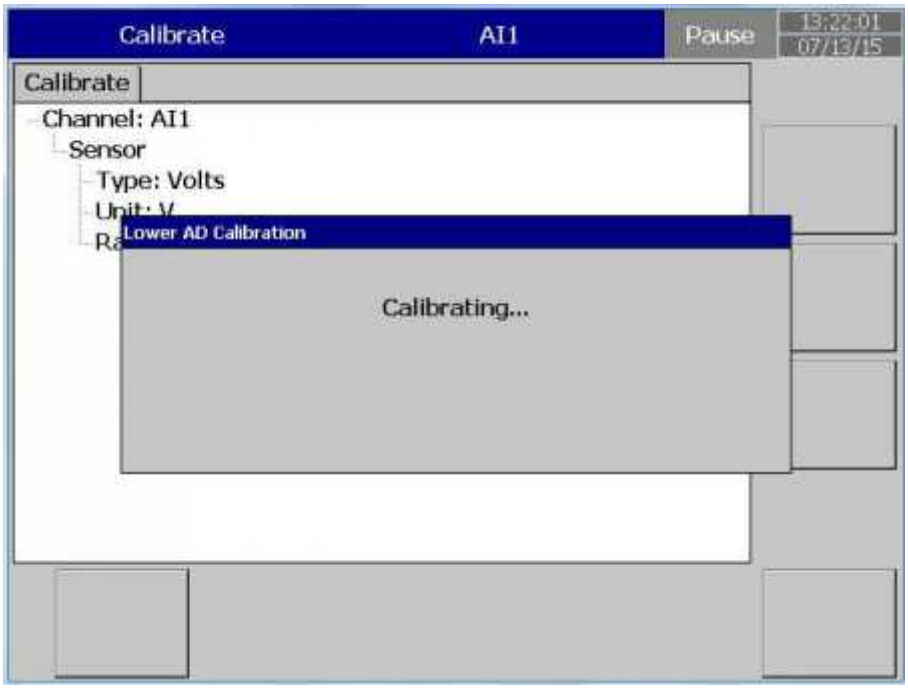


Click yes and proceed with the calibration process

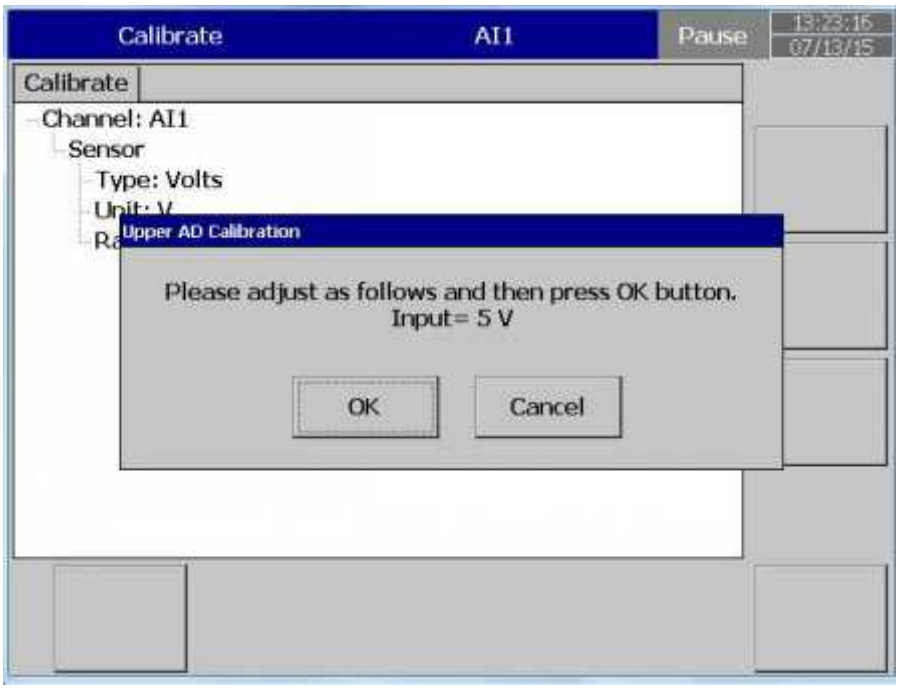


Please follow the next instruction, input 0V in to the input which can be seen in below screen

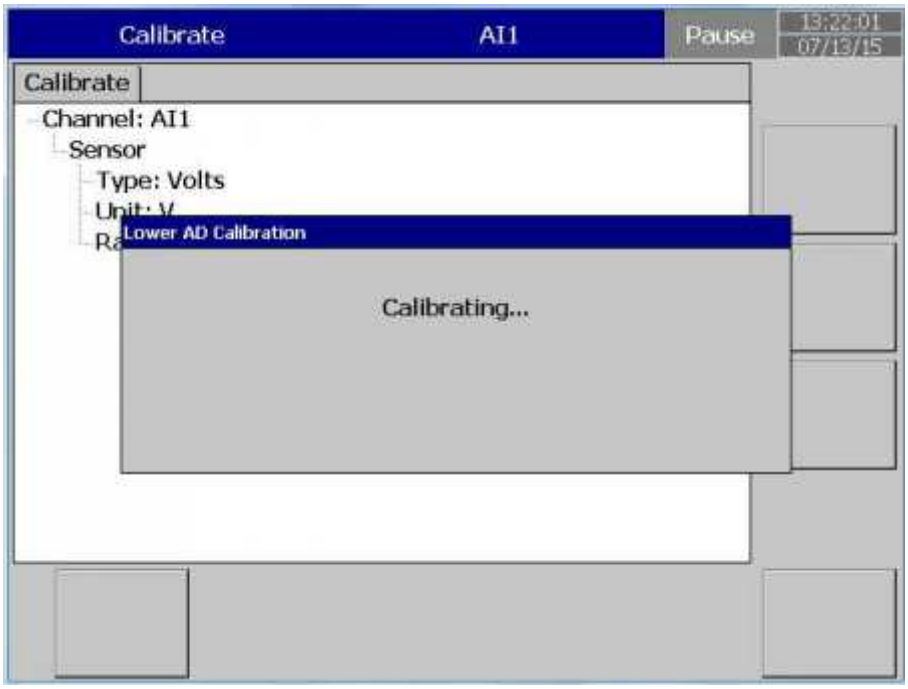
After you input 0V and select ok, the user can see the below screen.
Now follow the next instruction.



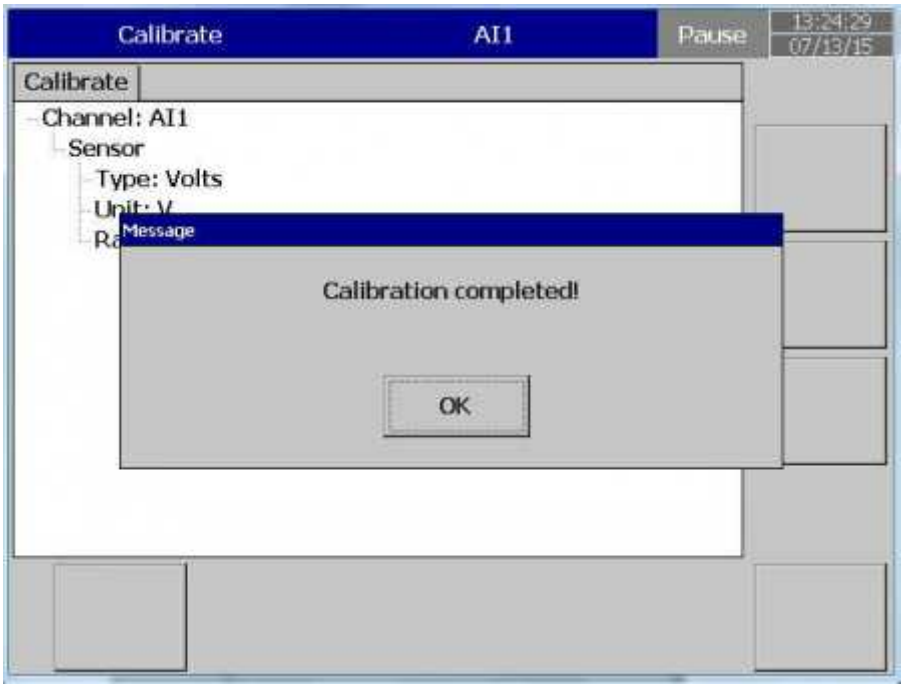
Now input 5V and click ok



After you input 5V and select ok, the user can see the below screen
Now follow the next instruction.

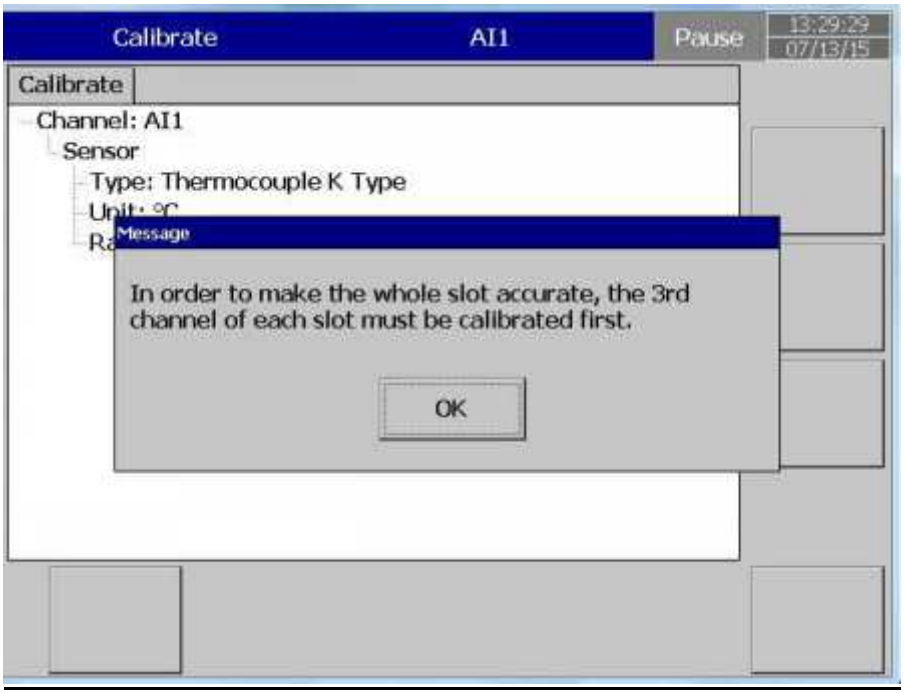


When the calibration is done successfully, the user can see below screen.

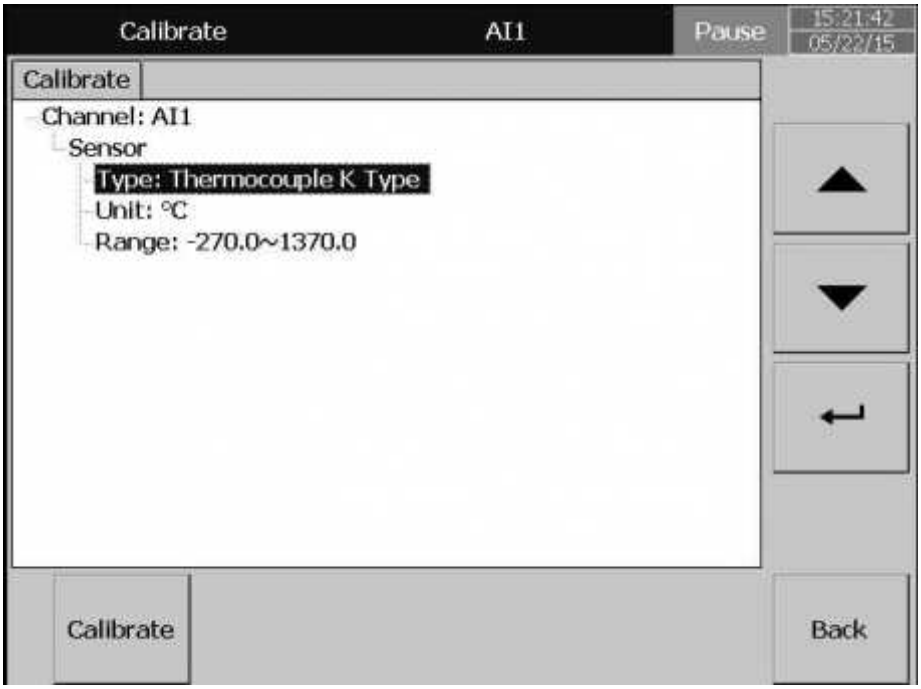


Example 2:
Calibrate an AI with K-Type Thermocouple

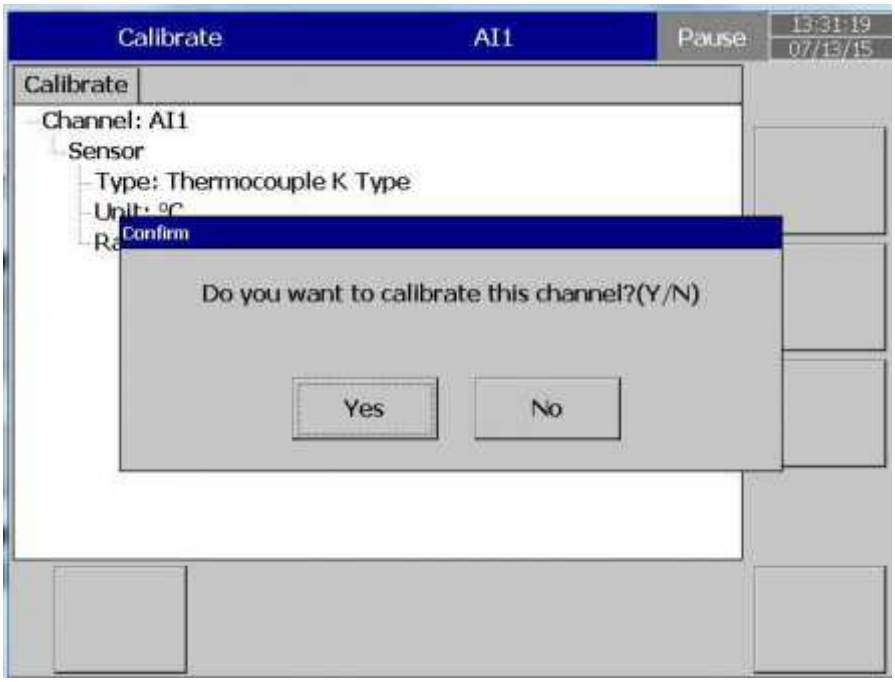
Please note that , Inorder to calibrate the whole Module slot accurately , the 3rd channel of each slot nust be calibrated first. Click OK.



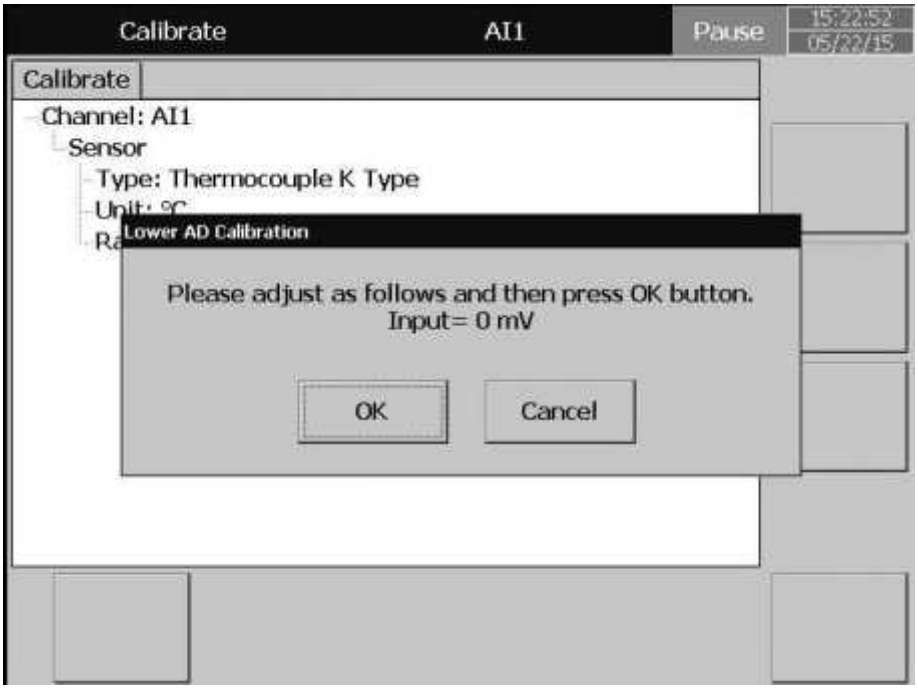
When you click Calibrate menu, the user can see the below screen. Please click calibrate as shown in the below screen



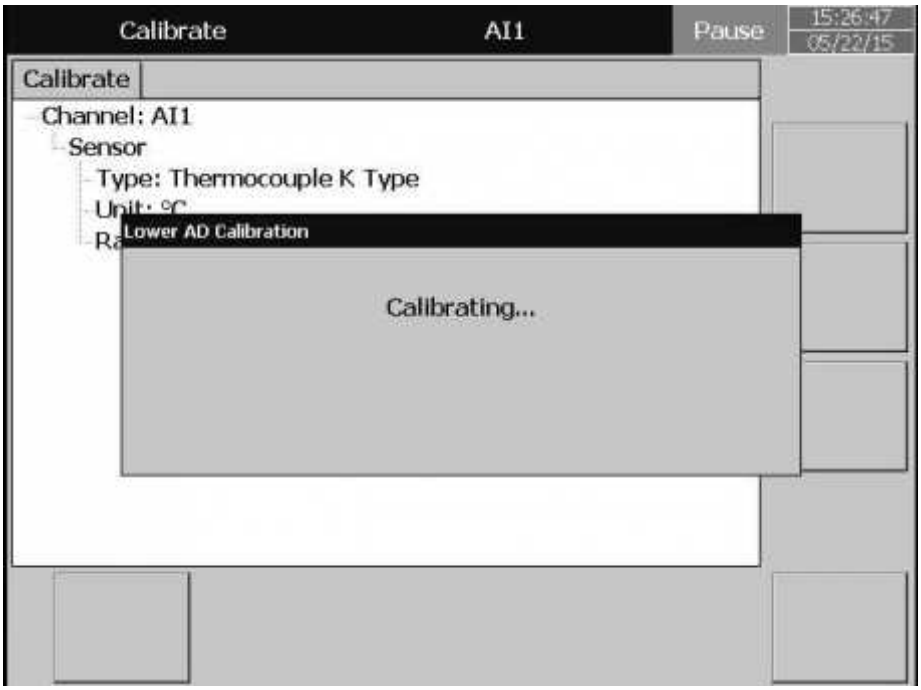
Click yes and proceed with the calibration process



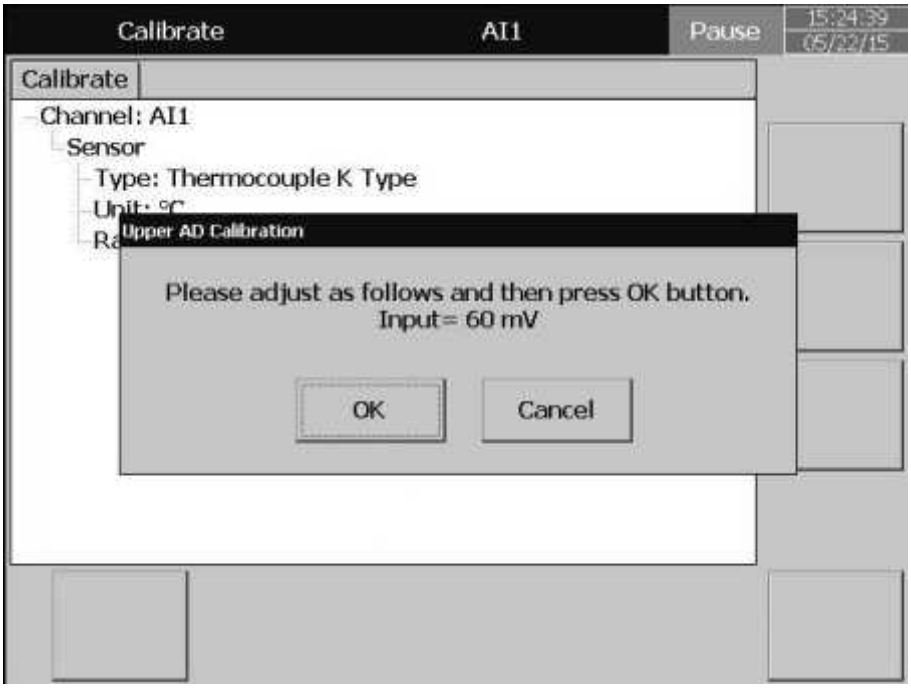
Please follow the next instruction, input 0 mV in to the input which can be seen in below screen



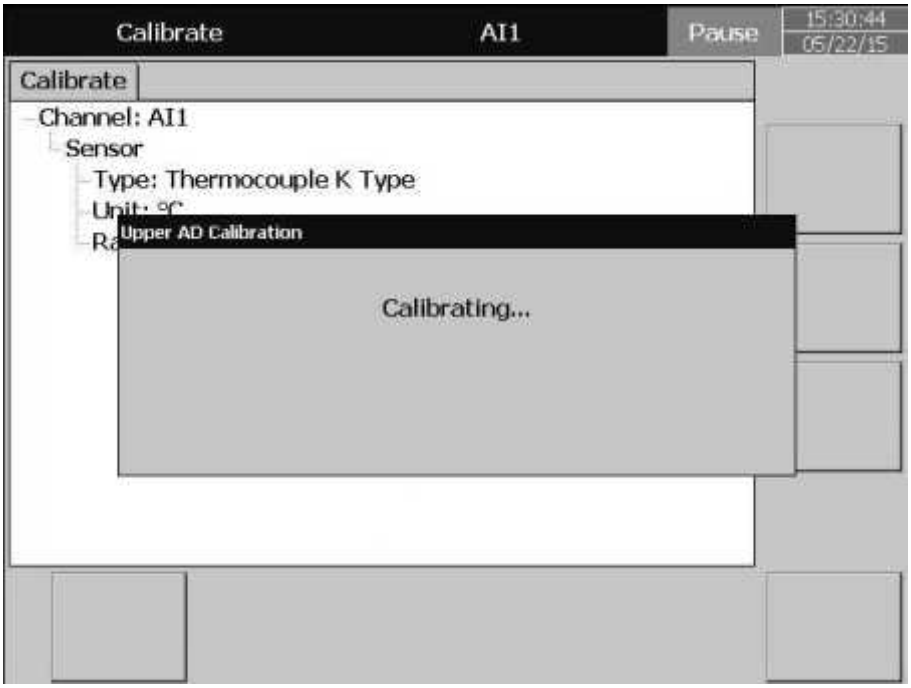
After you input 0V and select ok, the user can see the below screen.
Now follow the next instruction.



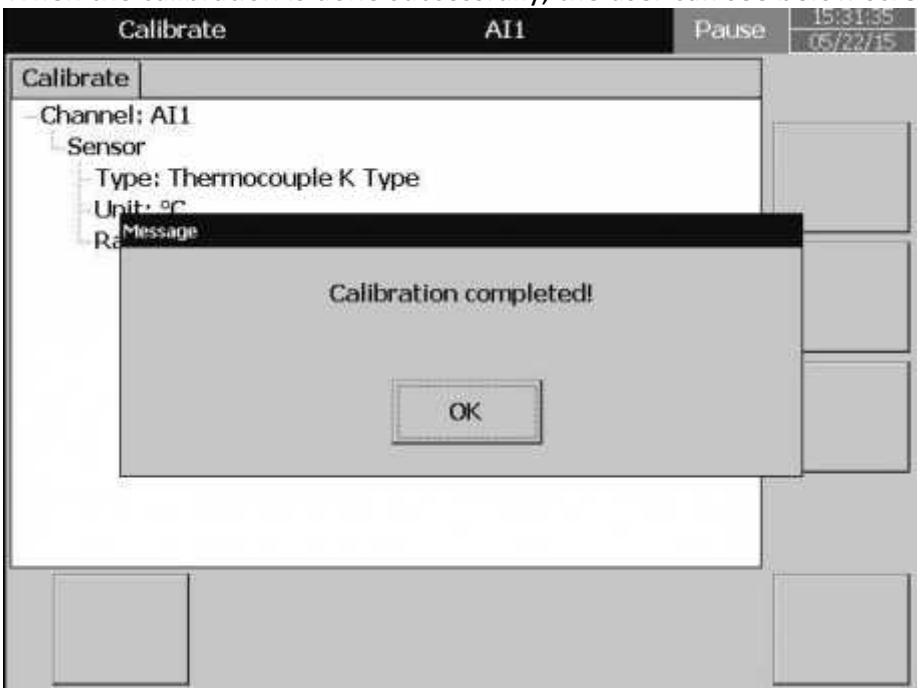
Now input 60mV and click ok



After you input 60 mV and select ok, the user can see the below screen
Now follow the next instruction.

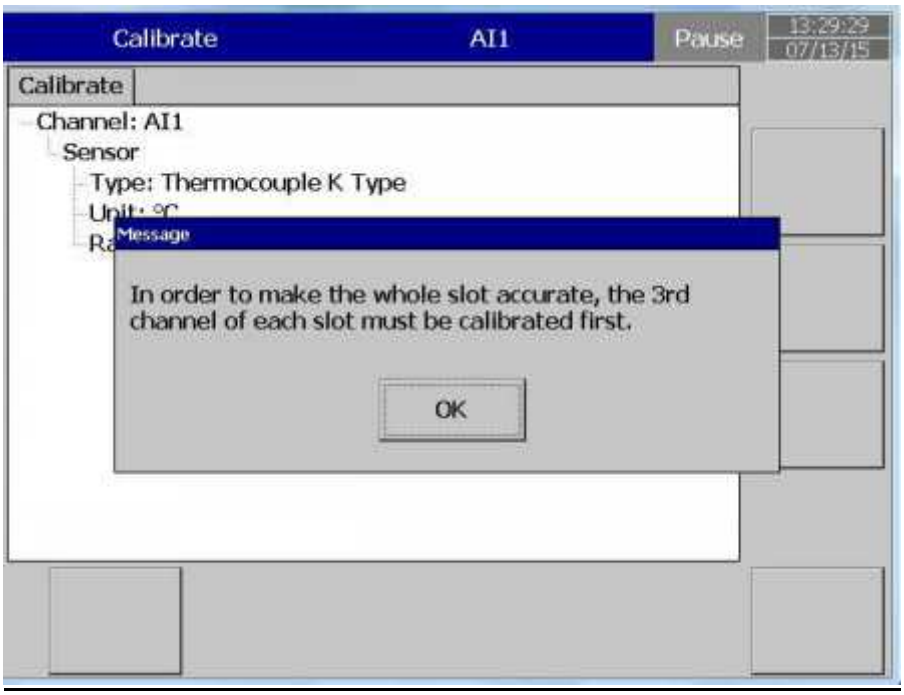


When the calibration is done successfully, the user can see below screen

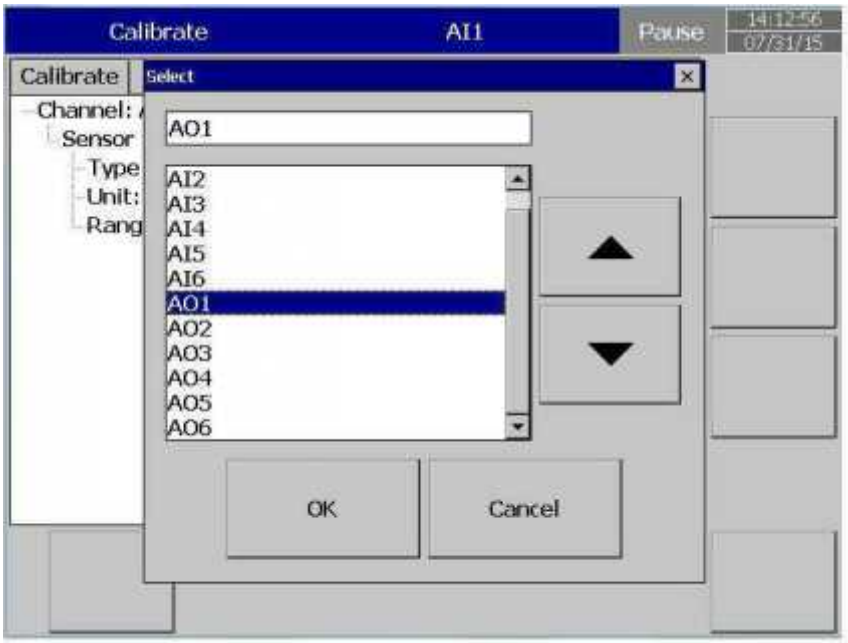


Calibrate an AO with 4-20mA

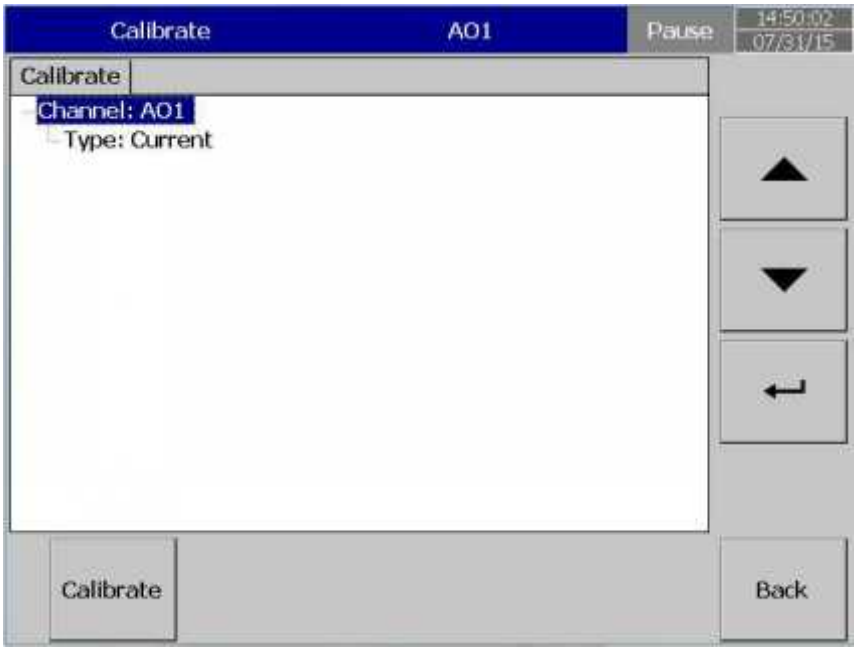
When you click Calibrate menu, the user can see the below screen. Please click calibrate as shown in the below screen

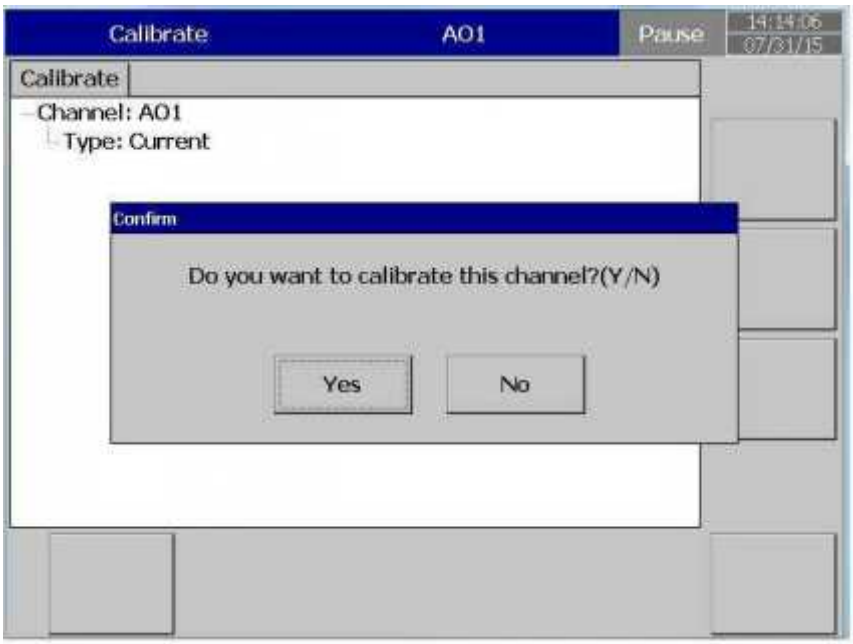


Click ok and proceed and select the channnel of Analog Output to be calibrated.

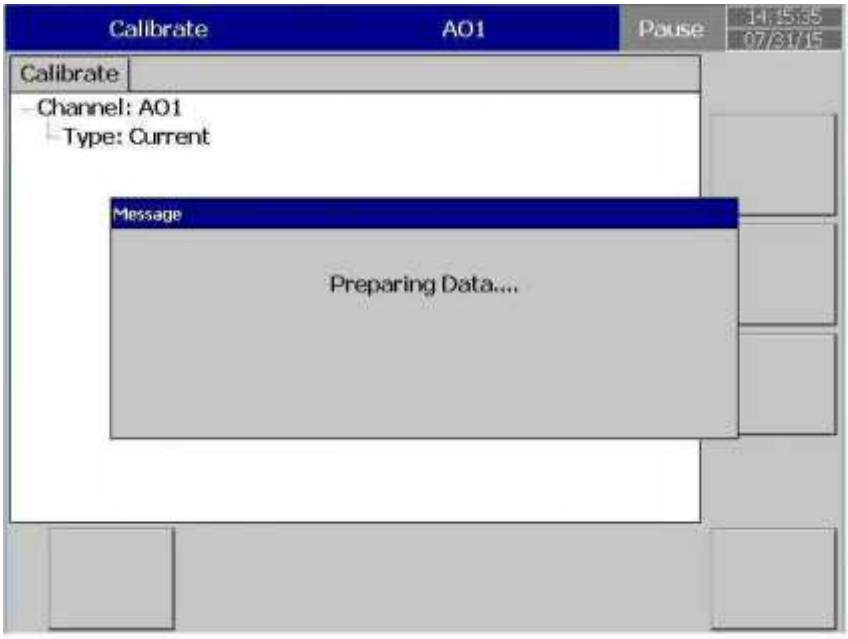


Confirm the channel to calibrate and click "Calibrate" and "yes" in the next screen

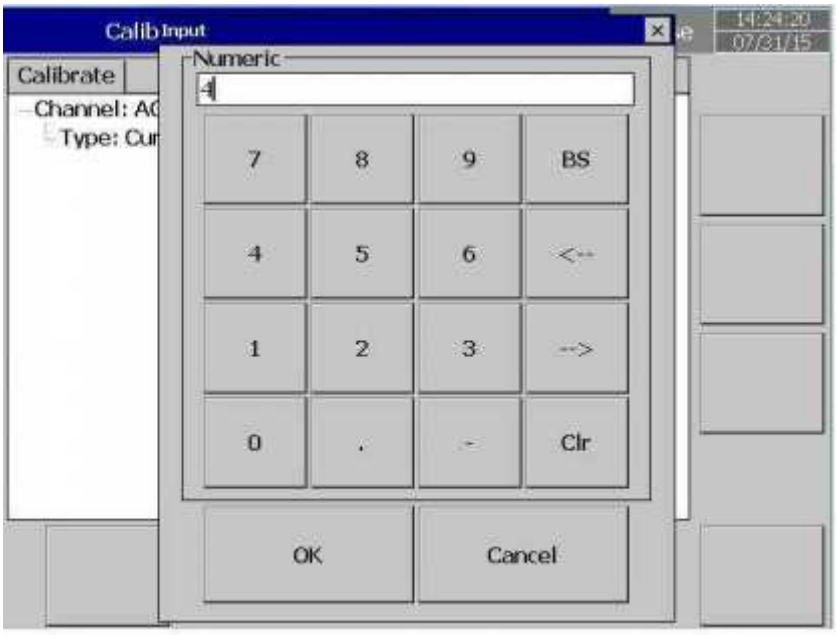




Please connect current meter before calibrating and click ok

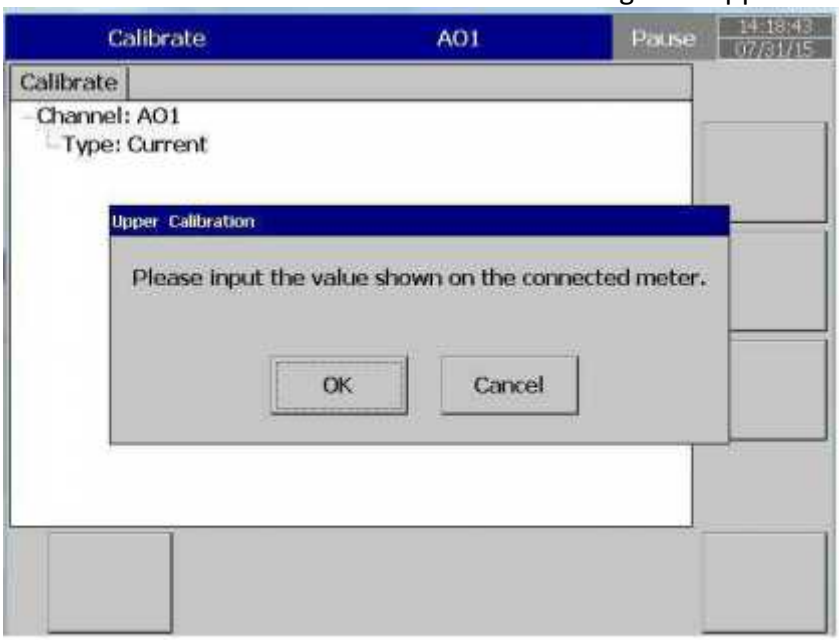


Then , input the value for Lower calibration , ie 2.7308 mA after clicking ok

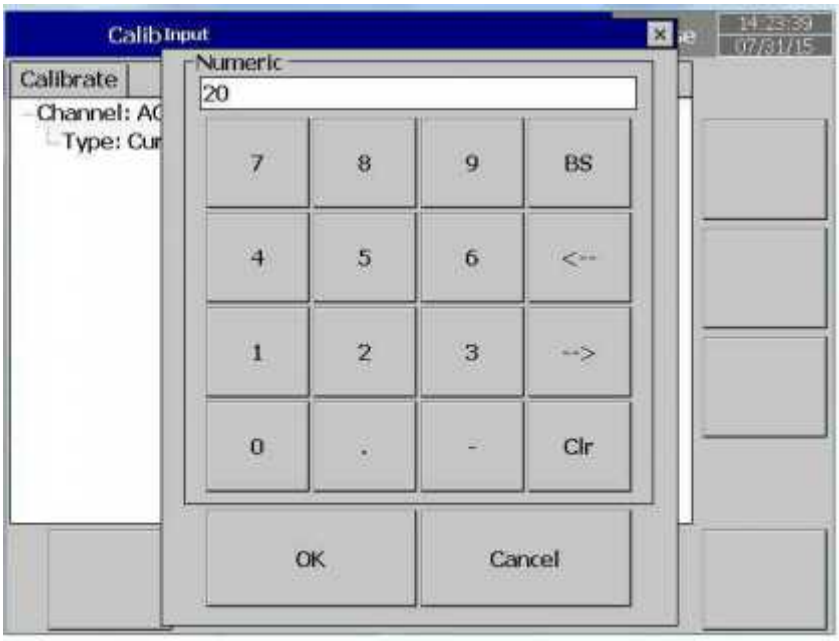


Lower calibration is in progress

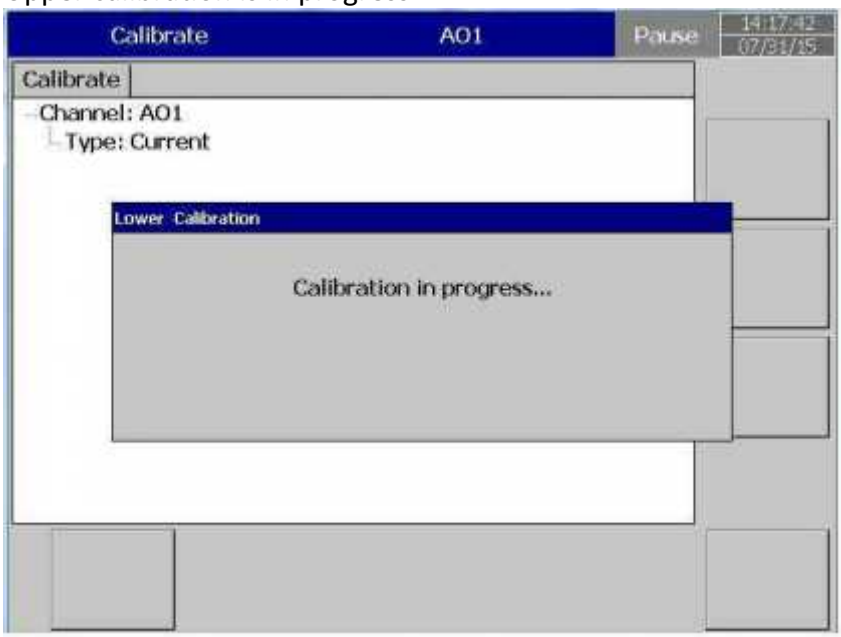
After we finish Lower calibration now we need go for Upper calibration



After click ok on the above enter upper calibration value as 18.745 mA and click ok

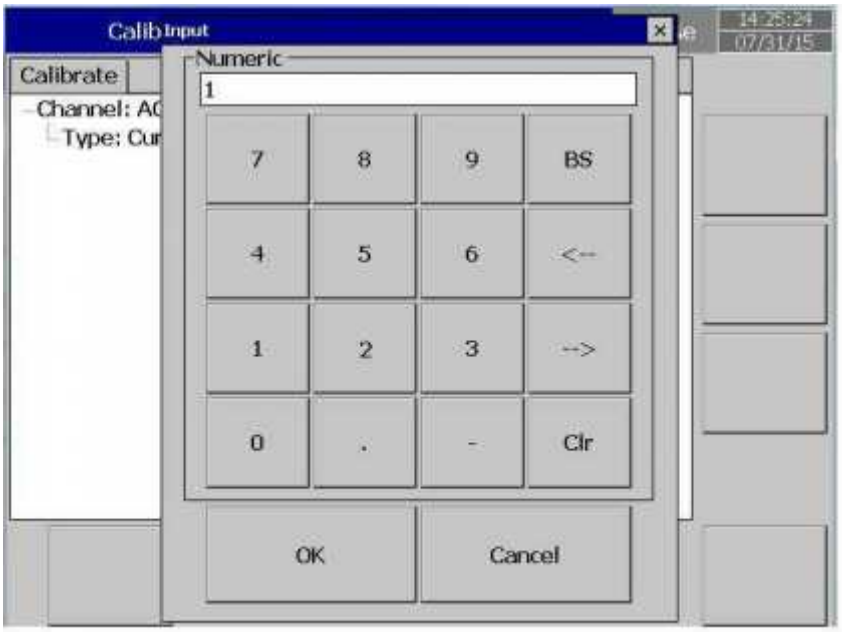


Upper calibration is in progress

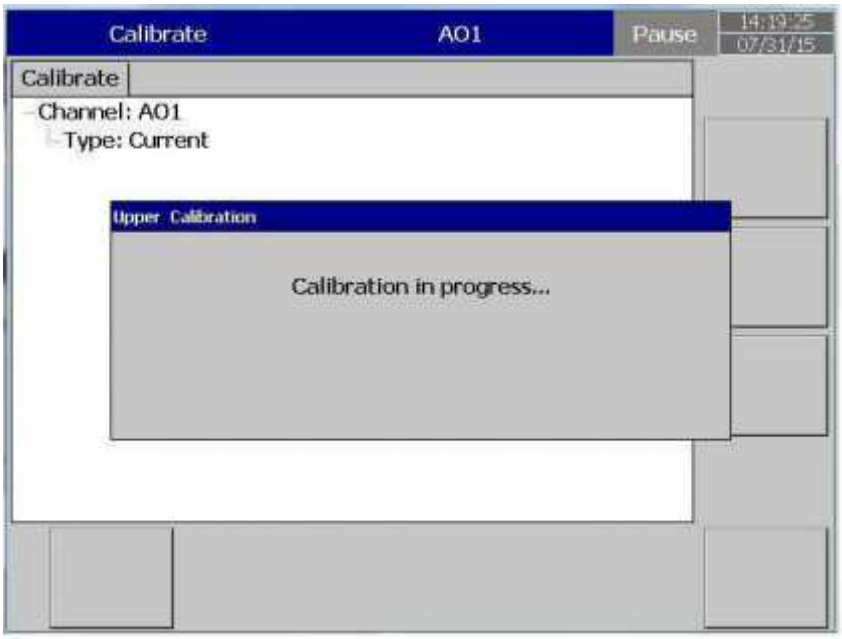


After we finish Upper calibration now we need go for entering Offset

we enter 3.7554 mA as offset



Offset calibration in progress



When the calibration is complete , we can see the below screen

Note:

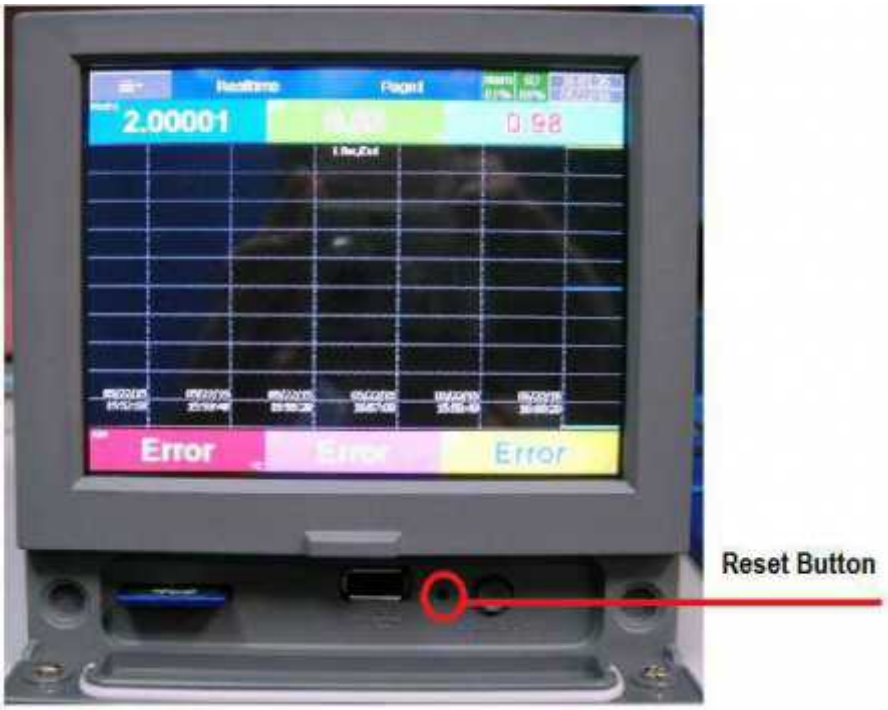
Channell #3 should be calibrated first in all types of Analog Input cards.

An analog temperature sensor is installed in channel # 3. When channel # 3 is calibrating, the cold junction voltage measured by this temperature sensor will be loaded into a register.

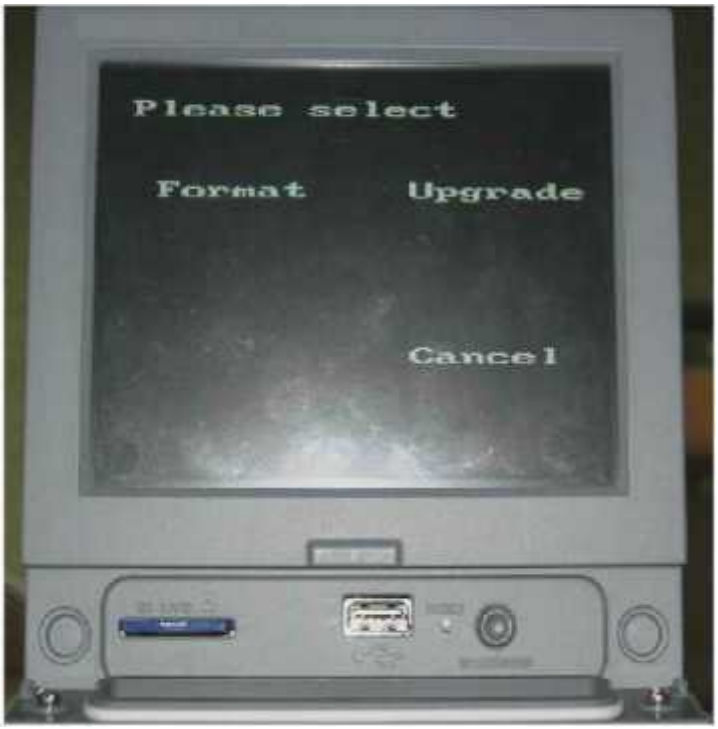
If channel # 3 is not calibrated, the default value of cold junction voltage will be used for all channels. It does not matter what order you perform calibration after calibrating input 3, there is no need to follow a sequence, and any one of T/C, RTD, mA or VDC can be done independently.

4.13 Procedure To Reset and Restore Factory Default Settings

Power ON the Recorder while Pressing the Reset Button



Now the Screen will appear like below



Format:

Press the Format Button for at least 3 Seconds to return the Recorder to factory Settings.
After the Recorder is done formatting, it will ask for Screen Calibration.
Do the Screen Calibration.
The recorder has now been returned to factory default settings.

Upgrade:
Download the Firmware from the FTP Link Given
Copy the File to the SD Card. Be sure the SD card is formatted to FAT32.
Insert the SD Card to the SD Card Slot on the Recorder.
Press Upgrade Button for at least 3 Seconds to upgrade the image from SD Card.
Follow the on-Screen instructions.