User guide of Paperless recorder

PR-5618

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Contents

Introduction

Paperless paper PR5618 can be used to measure, display and record the values of industrial signals such as thermocouples, thermos resists, mA, millivolts, volts, frequencies and binary values.

Hardware Features

- 5/6- inch colored screen with resistive touch screen
- Up to 16 16-bit universal input channels with 1.5KVDC three- way electric isolation
- 10 Digital outputs (with SSR or OPEN COLLECTOR, Relay[normally open & normally close])
- Two completely isolated analog outputs (milliamp)
- Modbus serial port (AFP, ASCII, RTU)
- Power supply 100 ~ 240VAC
- Metal box with standard dimensions 144mm * 144mm*200mm

Software features

Display data in different ways (vertical and horizontal graph, digital and bar graph)

- Accurately calculates the Total amount for each function
- Solar Hijri and AD clock
- Ability to formulate (support various mathematical functions)
- PID controller for controlling industrial processes
- Connect to MODBUS network
- Connect to a dedicated OPC UA Server
- Activate and deactivate digital outputs using math formulas
- Calibration of the input / output software

Usage

- Record industrial process data
- Flow measurement for liquids and gases
- Record and measure the values of oxygen sensors (and various sensors)
- Measuring and displaying Total

Device Diagram Block

The device is composed of the following parts as shown below:

- 16 universal input channels
- 10 digital output channels (with SSR or OPEN COLLECTOR, Relay [normally open & normally close])
- 2 analog output channels (milliamp)
- Serial port RS485
- Computation and control section
- Display and touch screen
- USB port
- Power supply

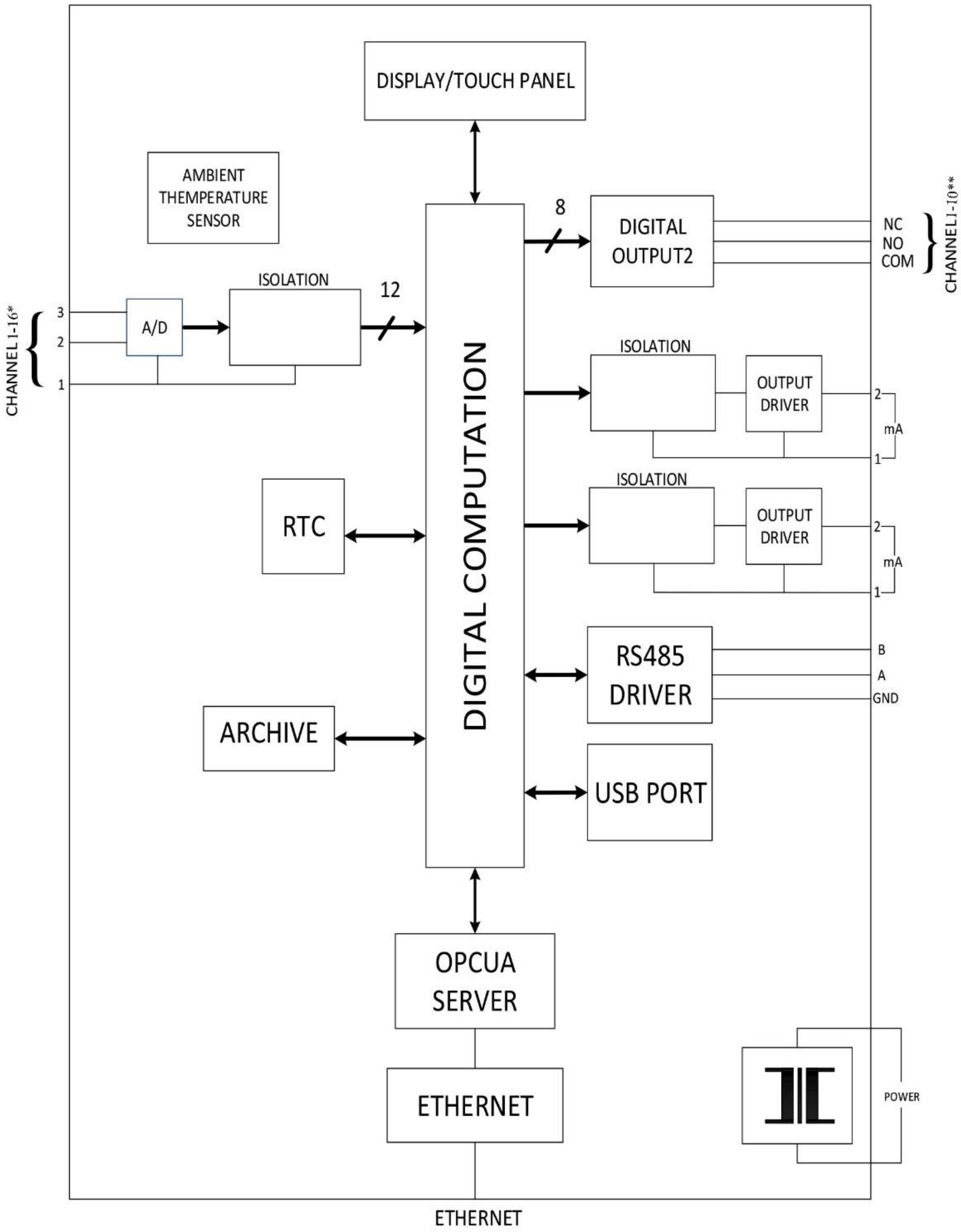


Figure 1: Device diagram block

* Ability to order the desired number from 1 to 24

** Ability to order from 1 to 10

Figure 2:Screen view (front of the device)

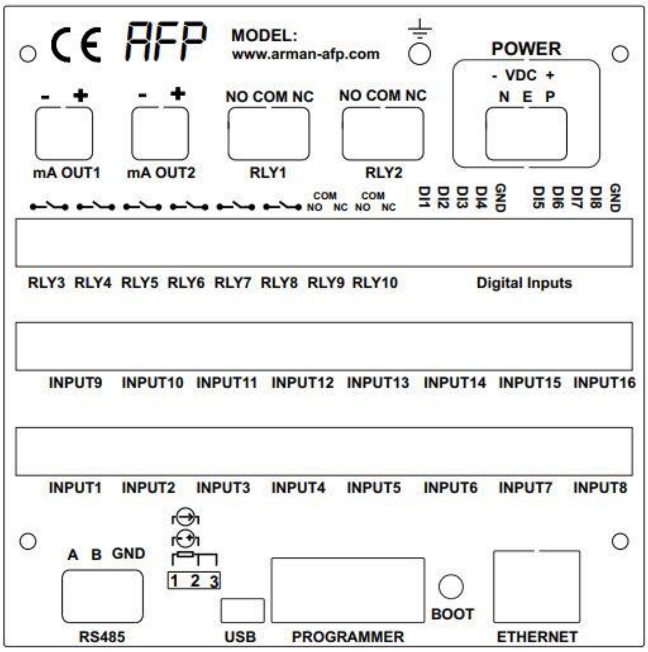


Figure 3:Connector view behind the device

System function

Analog device input

This section is able to measure various types of common industrial signals. Figure 1-2 shows the connection between different signal types to the device's input connector.

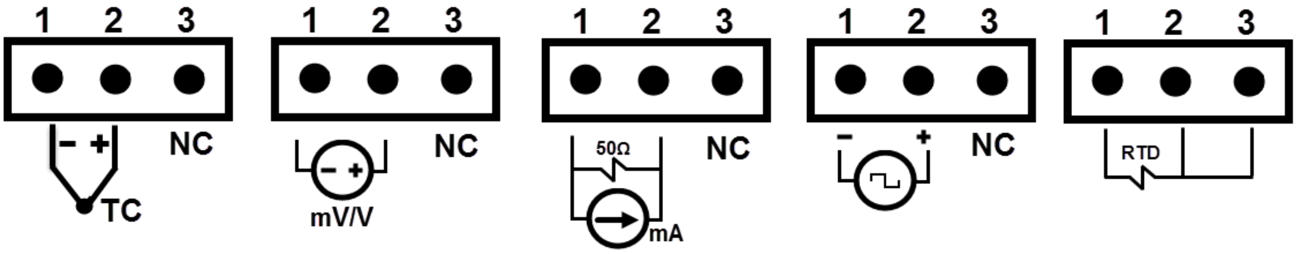


Figure 2.1: How to connect different signal types to the input connector

The channel number 1 has an ambient temperature measurement sensor (T_a). The T_a value can be used as a cold point when measuring the temperature by the thermocouple. Figure 2-2 illustrates the internal block diagram of an input channel.

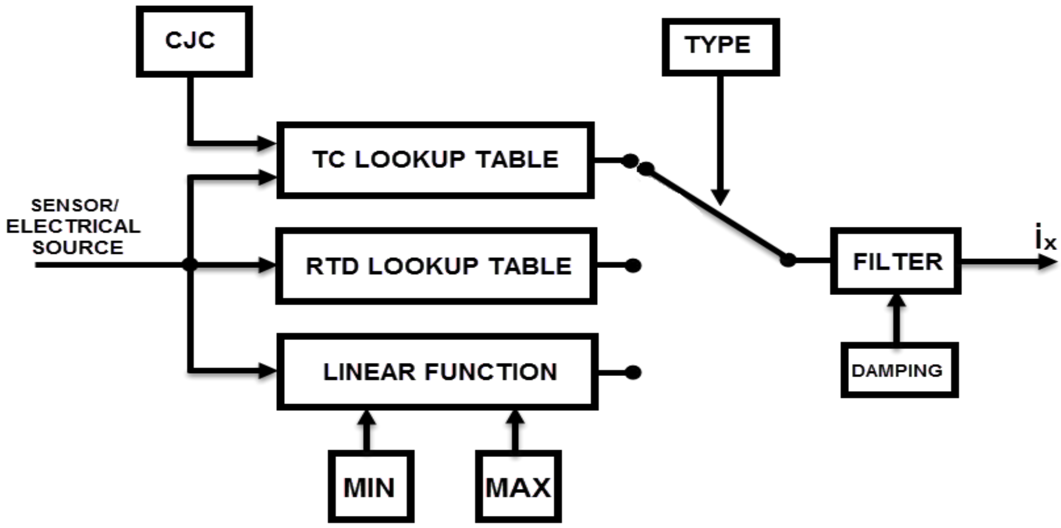


Figure 2-2: Internal block diagram of an input channel

Each channel measures the sensor value (millivolt, volt, milliamp, frequency, Resistance) and depending on the type of connected sensor, the thermocouple table, the thermo-static table, or the linear equation defined by the parameters Min and Max, Calculates the main value of the temperature. Then, this value of the digital down pass filter, whose temporal constant is set by the Damping parameter, is passed to eliminate the potential adverse fluctuations existing on

the signal. The final output of the channels named I_1 to I_16 is named for channels 1 to 16, respectively and they are available.
When using a thermocouple, the cold point temperature (CJC) is required to obtain the correct temperature value. The CJC value is calculated from the equation that will be defined for the CJC equation.
If the thermocouple wires come straight to the back of the device without changing the wires, then the CJC equation should be equal to T_a. Otherwise, another equation must be used.

Computation and control section

This is the main part of the device, built by the powerful ARM processor. Different tasks are assigned to this section as outlined in Figure 1. These tasks include:

- Display information on screen in different modes
- Receive orders through the touch screen and process them
- Get the numerical values generated in each channel and process them
- Receive orders from the serial port and send a reply to the requester
- Record data in device database
- Output update (analogue and digital)
- Exchange data via USB port

The variables displayed numerically on the screen, or plotted as graphs and bar graphs, are computed in this section and are named by the Pen name.

There are 24 pen in this device and are available as P1... P24. Each pen has the parameters that defines its attributes. These parameters are:

- Pen size*:* This parameter specifies the pen thickness when plotting the graph.
- Color: This parameter specifies the color of each pen.
- Name: This parameter specifies the name of each pen, which is usually the same as the name of the signal in the industrial process.
- Unit: This parameter specifies the unit of each item, such as Kg / hour or M3 / min.
- Min/ Max: These parameters limit the range of changes to each pen when plotting or displaying graphs.
- H, HH, L, LL: These parameters specify the range of alarms for each pen, and they are available for each pen as: (L_1, ..., L_{24}), (H_1, ..., H_{24}), (LL_1, ..., LL_{24}), (HH_1, ..., HH_{24}).

- Set point: This parameter specifies the set point value for the PID controller.
- Pen equation: By this parameter, the equation defining the pen is determined. This equation is defined by various mathematical functions based on various variables and constant numbers.

Alarm Levels for Pen

If the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the status of the warning. If the value of a pen is greater than H or less than L, we will be in a warning state.

The red color indicates the alarm status. If the value of a pen exceeds a greater amount of HH, or be less than LL, we are in alert status.

Note: When defining the equation of a pen, you can use the previous value obtained from the same formula. For example, if the P1 + 1 equation is used for P1, P1 will one unit in each period of the calculation.

Calculation period

The calculations are carried out on a device periodically, and in each period, the following steps are performed respectively (the period of calculation is one second):

- Reading the measured values of each channel (I1, ..., I16) from Channel 1 to 16 respectively
- Calculates the value of each function (F1, ..., F6) from function 1 to 6 respectively
- Calculate the amount of each pen (P1, ..., P24) from pen 1 to pen 24 respectively
- Detecting the activation and deactivation conditions of digital outputs from relay 1 to relay 10 (The condition of activation is considered first).
- Analog output update

Note: When defining the functions for each pen or relay or CJC equation, attention is required in the order of calculations.

The order of the operation applied to the input and the conversion of the Input to the Pen is as follows:

- In the Setting menu, in the Input submenu, for each entry value Input1... Input16, two min and max values are set manually. In this case, the values of each pen are scaled between min and max values and are saved in variables I1... I16.

Note: As you know, the output of the thermocouple is based on the degree of centigrade, so there is no need to enter the values of Min and Max.

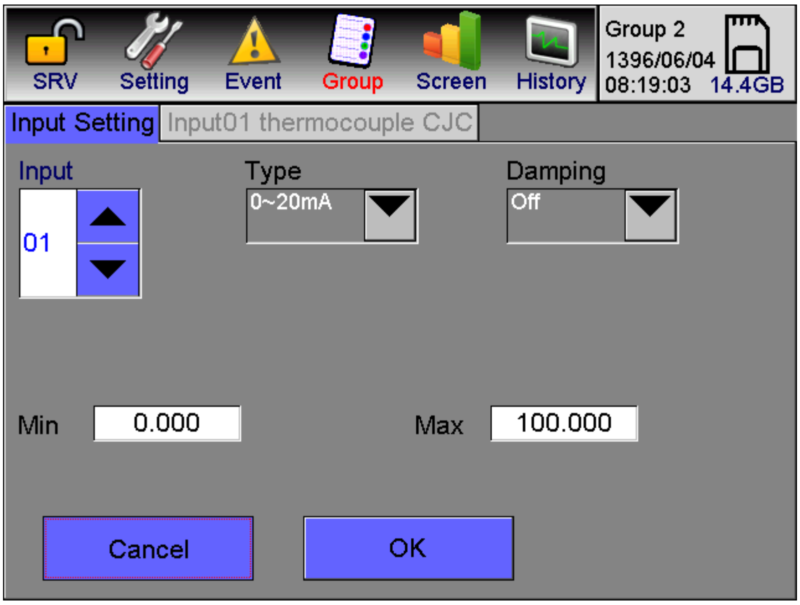


Figure 2-3

Note: The order of the calculations is that, in the first stage inputs are read and saved in variables I1... I16. Then the value of the functions (variables F1... F6) is calculated, and then the amount of fonts (variables P1... P24) is computed and this operation is performed sequentially once in a second.

- In the Setting menu, in the Function submenu, the values of I1... I16 are converted to values F1... F6 by using the formulas that are available in the Function-equation section by default.
- If in the Function-equation section, the variables F1, ..., F6 themselves are also used, because of the calculations performed sequentially and at specified time periods (once in a second), then the value stored in F1, ..., F6 in the previous period (one second before), are used in new calculations.

- In the Setting menu, in the Pen submenu, the values of variables F1... F6 are converted to F1... F6 by default by using the formulas contained in the pen-equation.

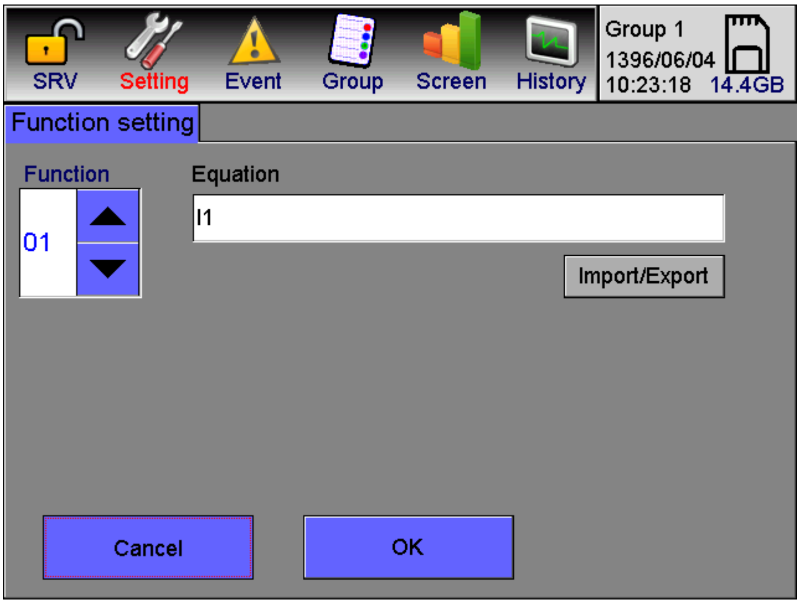


Figure 2-4

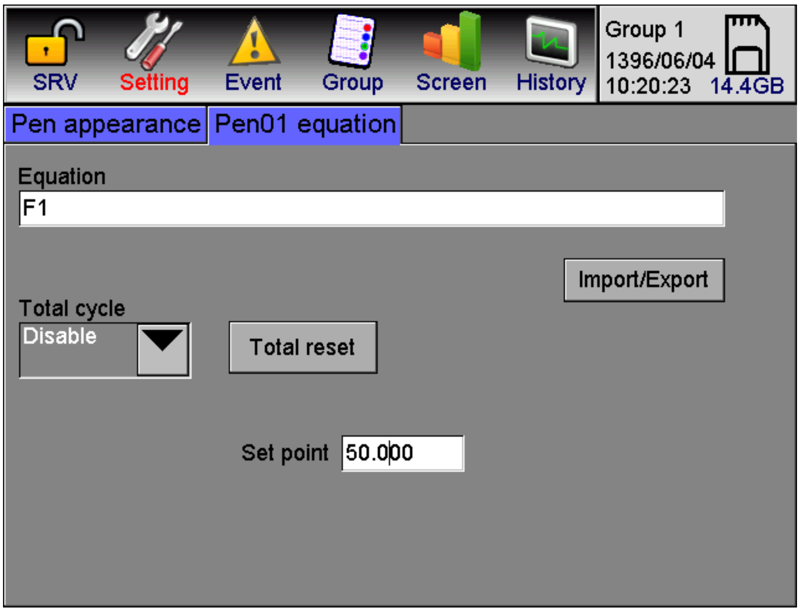


Figure 2-5

Note: If in the Pen-equation section, the variables P1... P24 are also used, because of the calculations performed sequentially and at specified time periods (once every second), then the value stored in P1... P24 in the previous period (once in a second), are used in new calculations. In the end, values P1... P24 are scaled between min and max, and Horizontal tendencies, Vertical bar graph, Horizontal bar graph, Single indicator, Group indicator and Black indicator are displayed.

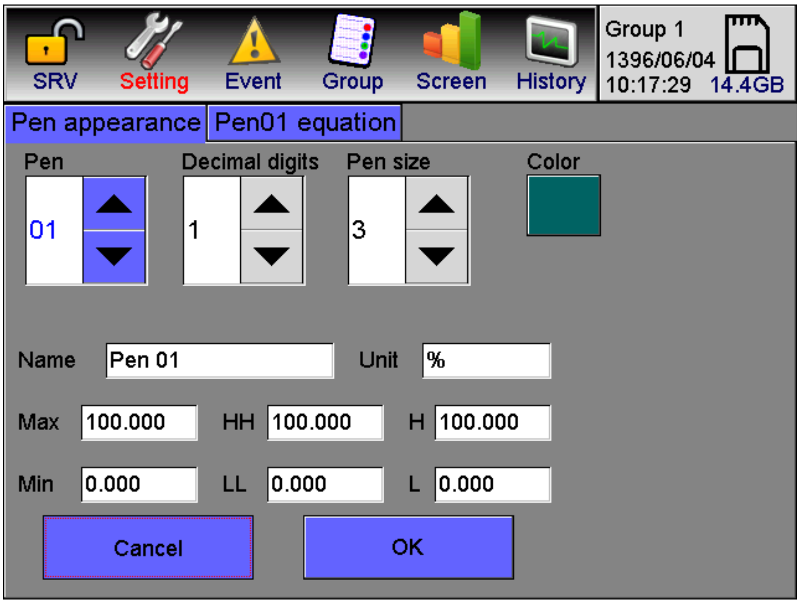


Figure 2-6

In the Pen appearance tab, the specifications for each pen, the number of decimal places, the size of the pen, the color of the pen, the name of the pen, the unit, and the min and max values are set. Also, for each pen, values are set to HH, H, LL, and L, which specify the allowed range of pens. Unauthorized limits for pens are displayed as alarms; if the value of a pen is greater than H or less than L, we are in the warning state with yellow color, and if the value of a pen exceeds a higher HH value or be less than LL, we will be in the warning status with red color.

Note: If you want to set one of the pens as an analog output, go to the Setting menu, in Analog output submenu and use the Assigned pen section to select one of the P1... P24 pens by the Output part, in order to refer to one of the two analog outputs. Through the Type section, the output power range can also be adjusted. Then the value of the selected pen is scaled between min and max set by ourselves and is used as analog output.

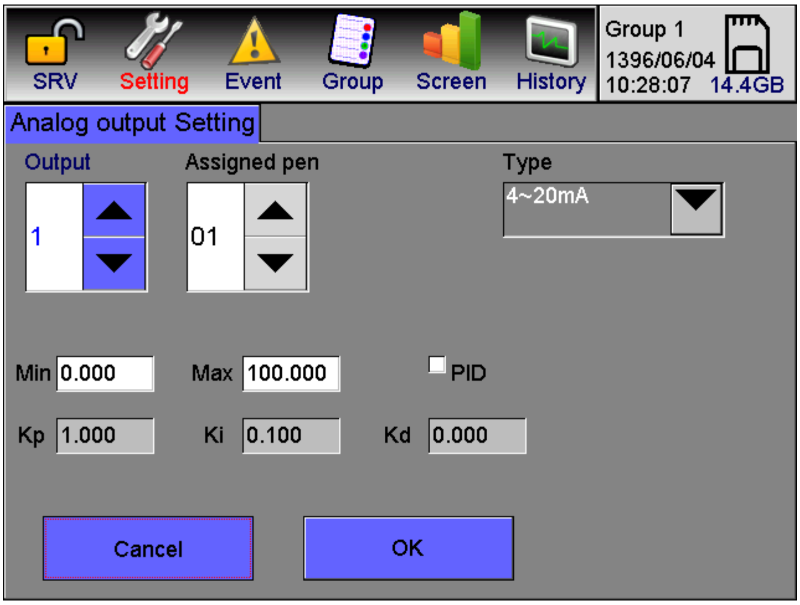


Figure 2-7

If you need a PID controller, the K_p, K_i and K_d are adjustable by activating the corresponding checkbox.

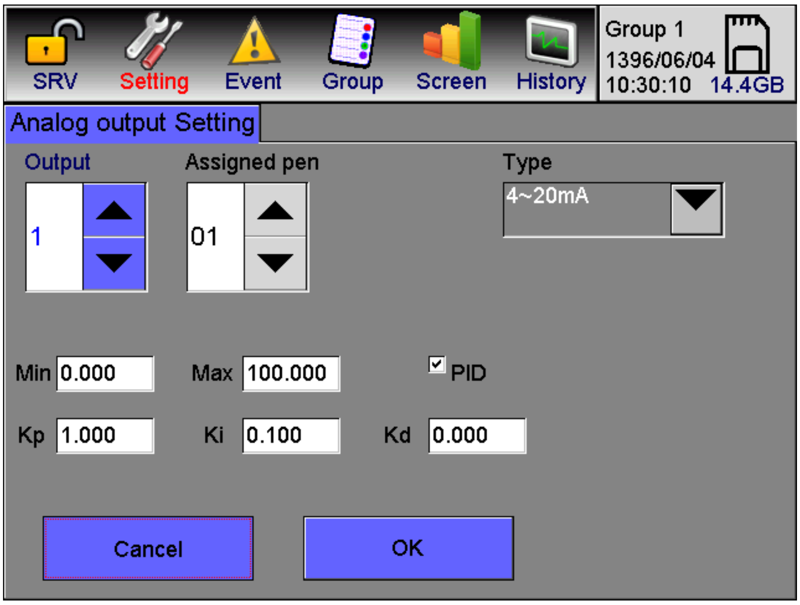


Figure 2-8

- The relationship between Input, I, F and P;

As mentioned above, to convert an Input to I, the Inputs are scaled between min and max, and converted to I. (Except when the input is a thermocouple or a RTD).

To convert I to F, use the Function-equation section and use the Pen-equation to convert F to P. In the Function-equation section, by default, the values of I are directly set equal to F, and in the Pen-equation section, by default, the values of F are directly set equal to P. Otherwise, you can use existing formulas. A remarkable point about using these formulas is that you can use all the variables Input, I, F, and P in the formulas. Given the fact that if these variables are used, the last saved value in the variable in the previous period, in the past one second, is used;

Note: The order in which the calculations are performed is read in the first step of the inputs and is saved in variables I1, ..., I16. Then the value of the functions (variables F1, ..., F6) is calculated and then the amount of fonts (variables P1, ..., P24) is computed and these operations are performed sequentially once in a second.

Example: In this example, in the Function-equation section, we set F4 equals to sin (F4) + 3 * P6 + I2.

It should be noted that the F4, P6, and I2 variables are the last saved value of the previous period (one second before).

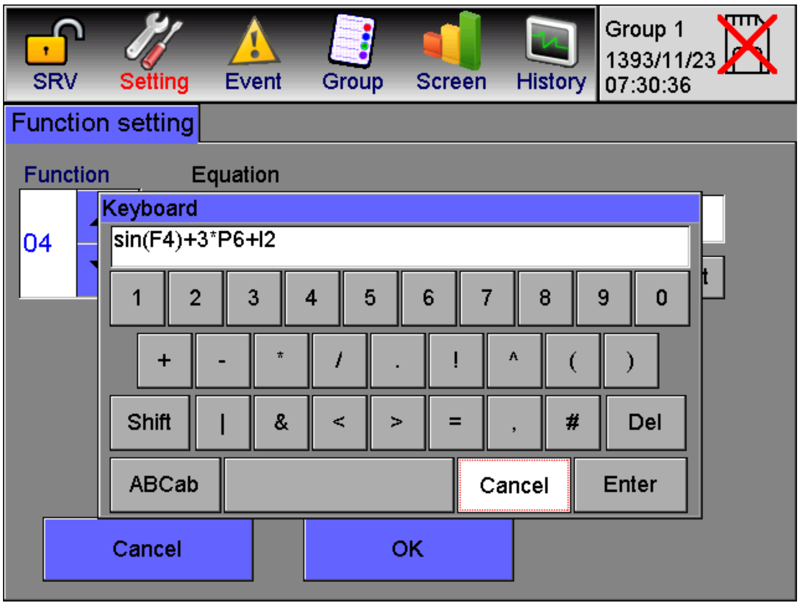


Figure 2-9

Example: In this example, in the Pen-equation section, we set the value of P10 equal to tanI5 + avg (P5, P1) + sqrtF18.

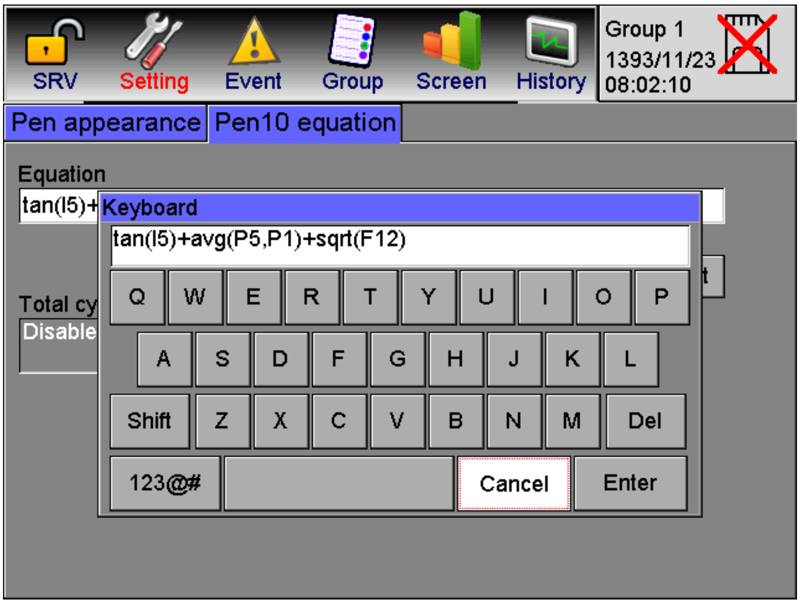


Figure 2-10

It should be noted that the variables F12, P5, and I5 are the last saved values of the previous period (one second before).

Analog Output

The block diagram of the analog output section is shown in Figure 2-11.

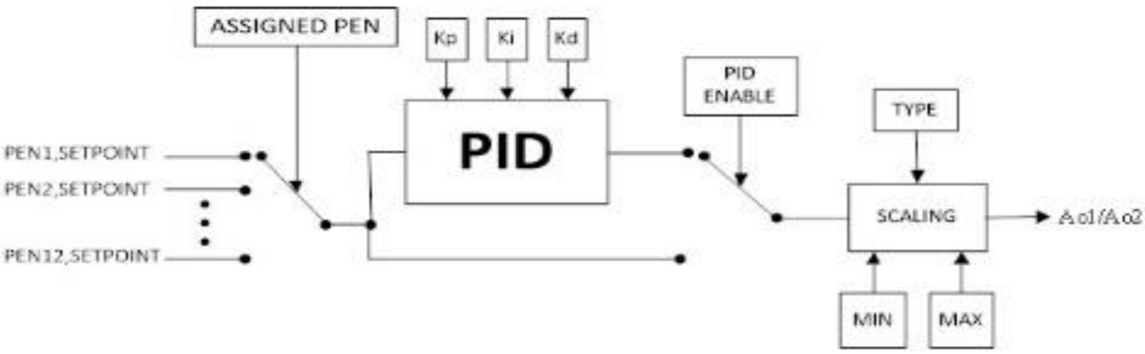


Figure 2-11: Block diagram of the analog output section

Analog output is based on milliamp. This value is calculated based on the settings for this section. Also, by activating the PID unit, you can use this section (output unit) to control a process.

Parameters related to this section are:

Assigned pen: This parameter determines the effective pen in the calculations of this section.

Type: If the type is one of the types of 0 ~ 20mA or 0 ~ 5mA, when the corresponding PEN value is NA, the analog output is "0.000mA", and if one of the types is 4 ~ 20mA, when the corresponding PEN value is NA, the analog output is "2000 mA ".

Min/ Max: By these two parameters, the output range of the milliamp signal is adjusted.
PID: If this parameter is activated, the analog output value will be updated based on PID calculations and with regard to the parameters Set point, Kp, Ki, Kd and the current value of the selected pen.

Note: The output value of this section (analog output) will be available as AO1 and AO2.

Example:
By setting the parameters of the output section as follows, the output of type 4 to 20 milliamp is defined and is dependent on the PEN1 equation and the output current range (4 to 20 milliamps) will be between 0 to 100 steps of graduation (SCALE).

Assigned PEN: 1

Type: 4~ 20 mA

Min: 0

Max: 100

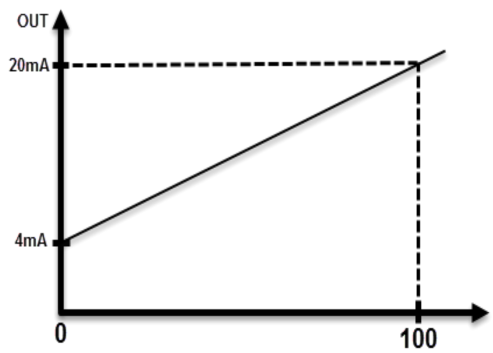


Figure 2-2: Output current range (4 to 20 milliamps) between 0 and 100

Digital output (relay)

This section is responsible for turning on or off the digital output (relay, SSR, OPEN, and COLECTOR) and acts as Figure 2-14.

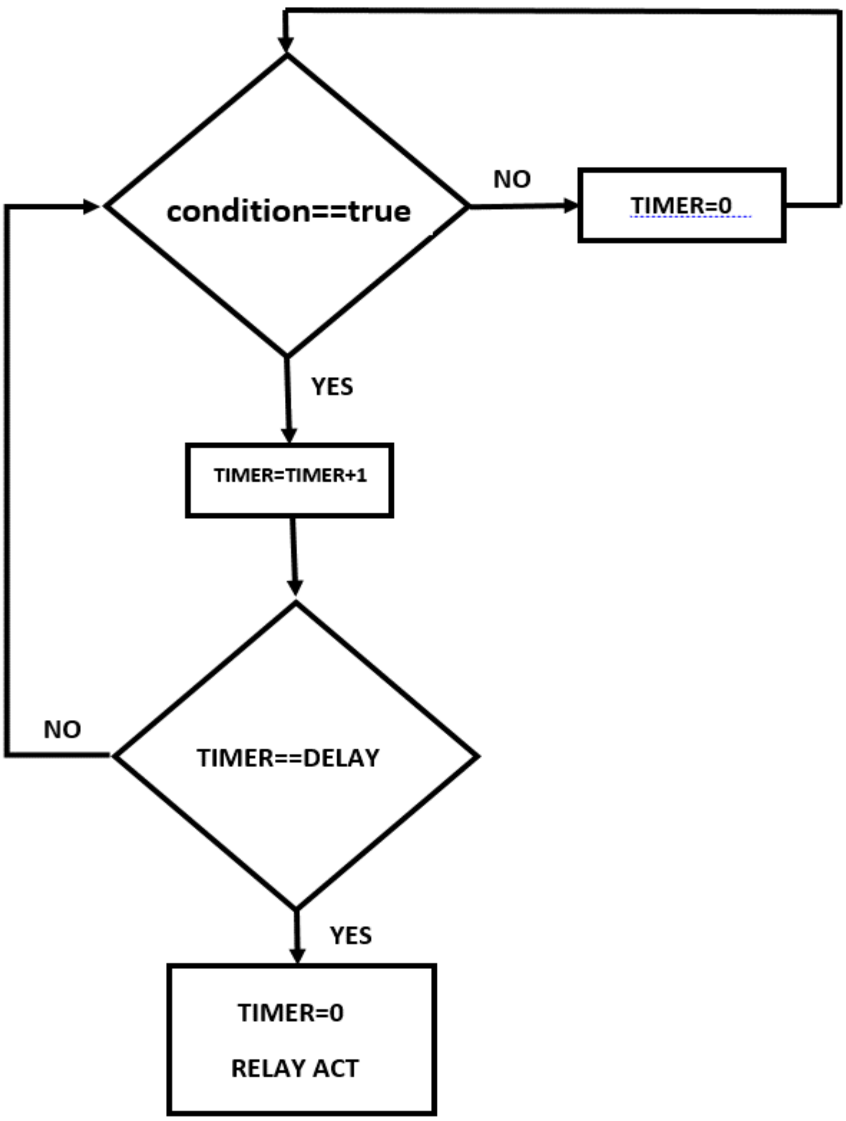


Figure 2-14: Flowchart of the Digital Output Function (Relay)

First, the condition defined for the On condition is investigated. If this condition is set, the relay startup timer starts to count, and if the value of this timer reaches the On delay, the relay will turn on. If the On condition is not set, the timer will be switched on and reset. If the relay switching on condition was not set, the relay switching off condition is checked and if the condition is set, the relay shutdown timer starts counting. If the timer reaches the Off delay, the relay will turn off. If the condition of the Off condition is not set, the shutdown timer resets.

The outputs of this part with the names R1 to R10 are available for relays 1 to 10, respectively.

Note: Digital output timer increases by one unit per second.

Note: If ON CONDITION and OFF CONDITION are activated simultaneously, the condition of ON CONDITION is priority.

Menu structure

The device menu is shown in the top of 2-15.

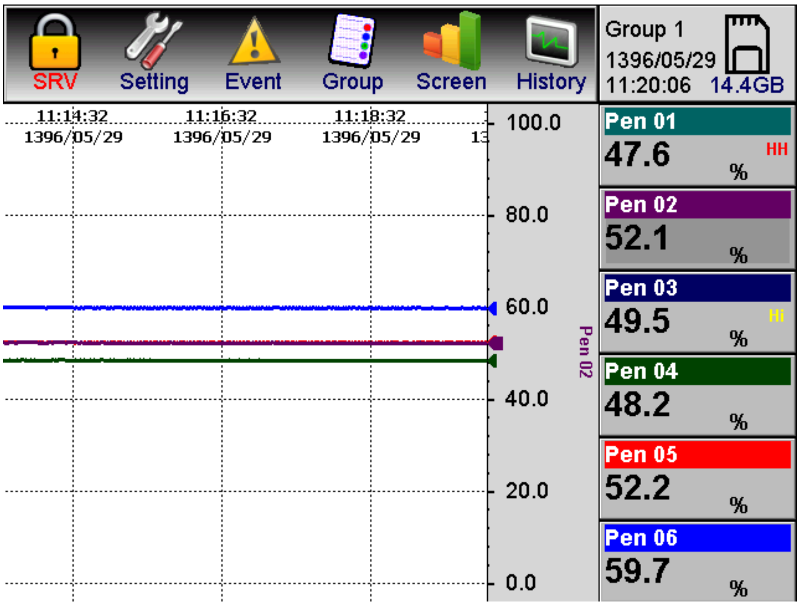


Figure 2-15: Login to device menu

Log in: This section is used to enter the user at different levels of access.

Setting :This menu is used to view and change the settings of the device. The level of access to this section is fully explained in the Log in menu chapter.

Event: Here are the events that are created in the system.

Group: This menu consists of three groups, through which you can access the channels that were assigned to each group in the Setting menu, in Group submenu.

Screen: In this menu, the types of pages displayed on this device can be viewed.

History: This menu is used to view changes to device pens.

User access

Log in menu

To log in and access different menus according to the user's manual, the login menu is used, which is shown in Figure 3-1.

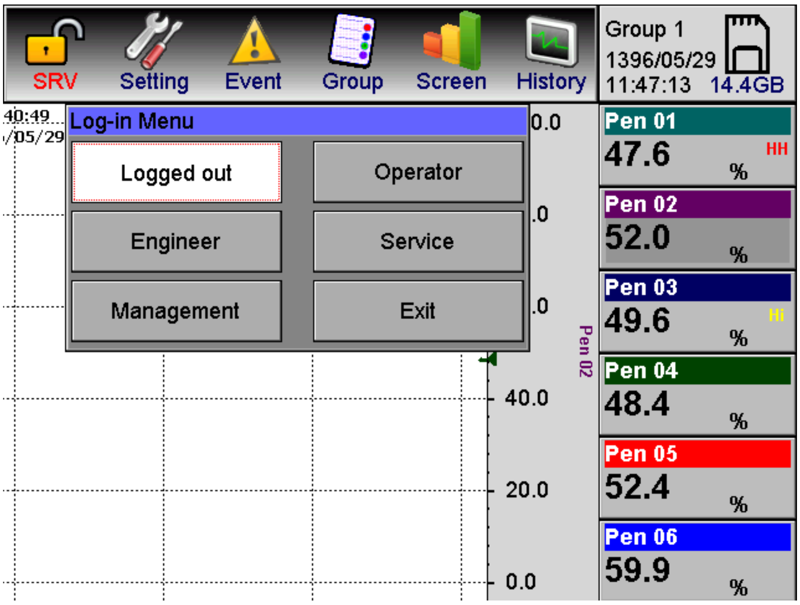


Figure 3-1: Login to the Log in menu

There are three types of user interfaces with different access levels:

Operator: In this type of user mode, the access level is limited, and the user can only view the data and has no access to device settings. Available menus in this mode include:

1. Event
2. Group
3. Screen
4. History

The username and password of the device for the user mode are OPR and OPR.

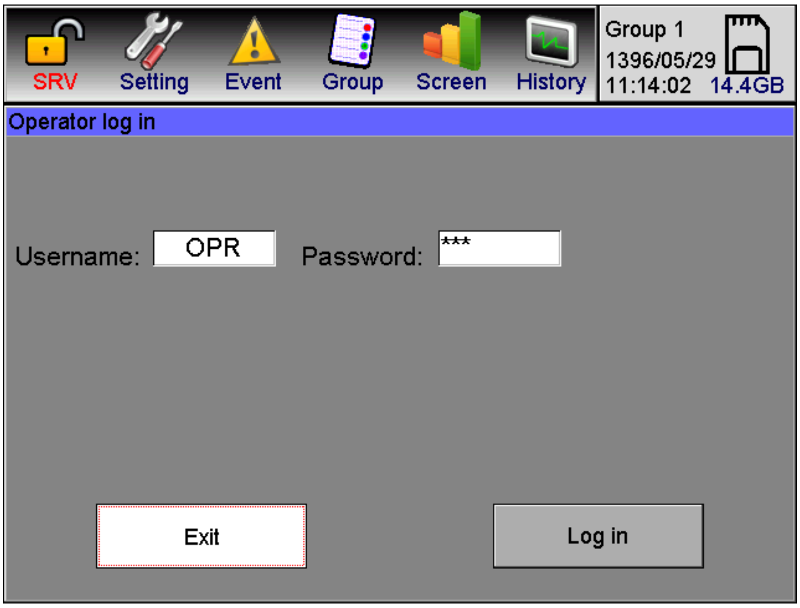


Figure 3-2: Default username and password for the operator

Engineer: In this user mode, there is no access to the important settings of the device, and the user can only access Clear graph, RTC, Back light, preferences, Communication, and Group from the Setting menu in addition to the menus that are listed in the Operator Mode.

Default Username and password of the device are ENG and ENG for this user mode.

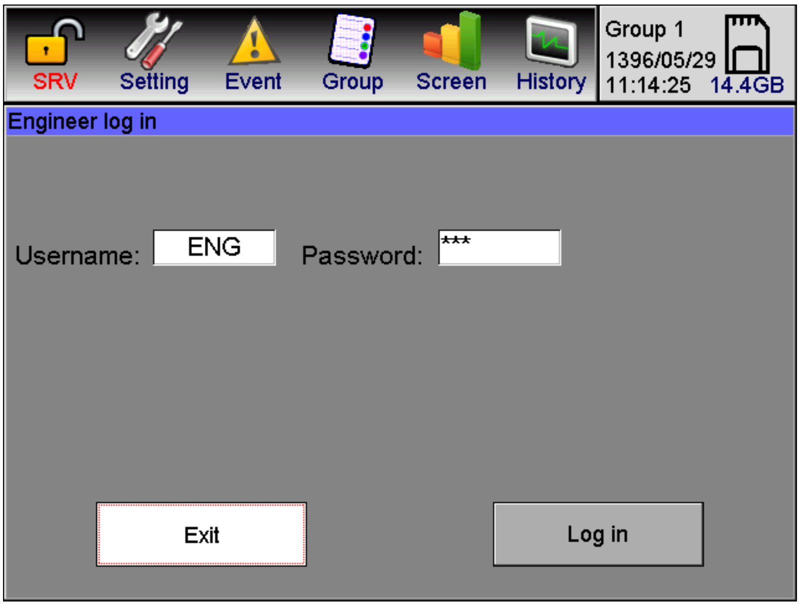


Figure 3-3: Default username and password for Engineer

Service: In this user mode, access to all parts of the menu is possible. There is also the possibility of managing existing users or defining a new user.

The default username and password for the device are SRV and SRV.

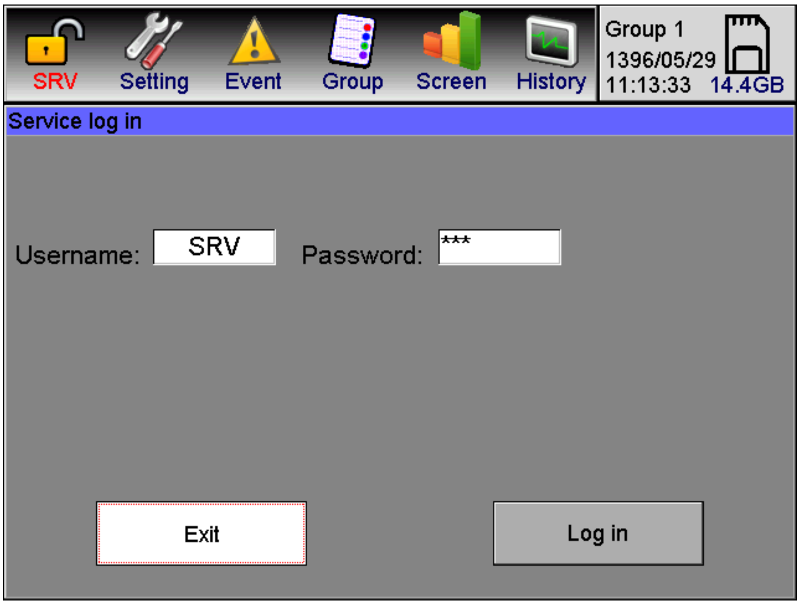


Figure 4-3: Default username and password for service

Management: In this section, the service user can manage users defined on the device.

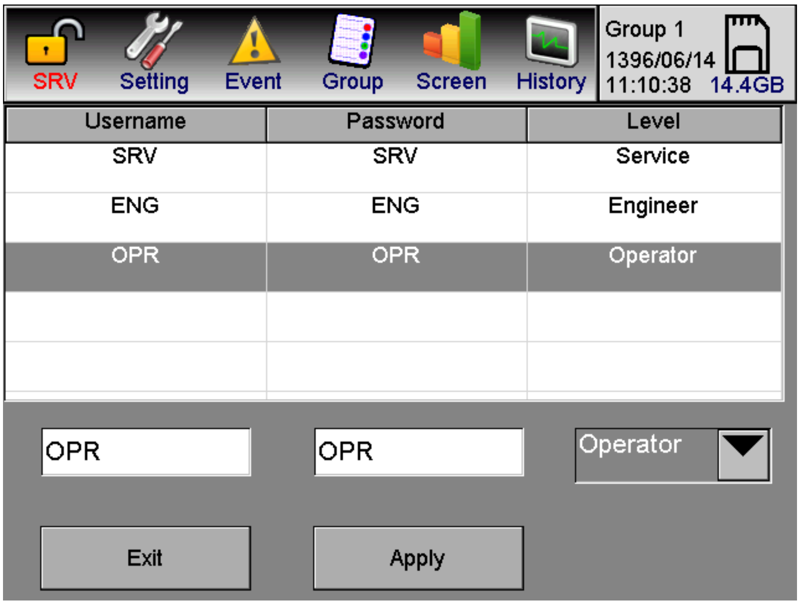


Figure 3-5: Management page

Setting

Setting menu

In this section you can do all the settings for the device. Enter the Setting menu via the top menu shown in Figure 2-15. The settings for various parameters will be visible and set in this submenu.

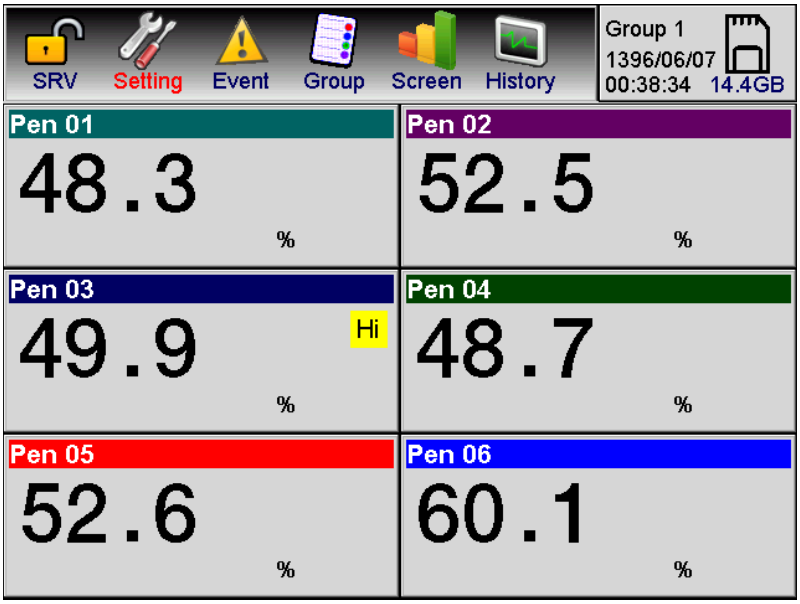


Figure 4-1: Login to device menu

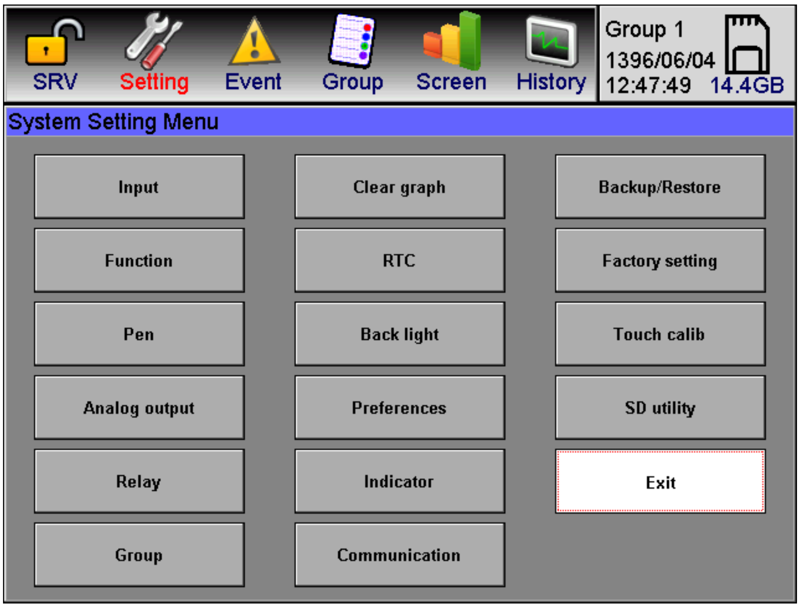


Figure 4-2: Setting menu

Note: To access all device settings, the user must be logged on to the Service level. If it is logged on to the Engineer level, it will only have access to the Group, Clear graph, RTC, Backlight, Communication settings, and if it is at the Operator level, it will not have permission to enter the settings menu.

Now let's introduce some of the parameters in the Setting submenu.

Input

In this section, you can make all adjustments to the input signals of the device. Figure 4-3 illustrates this menu. This section consists of two parts:

1. Input setting tab

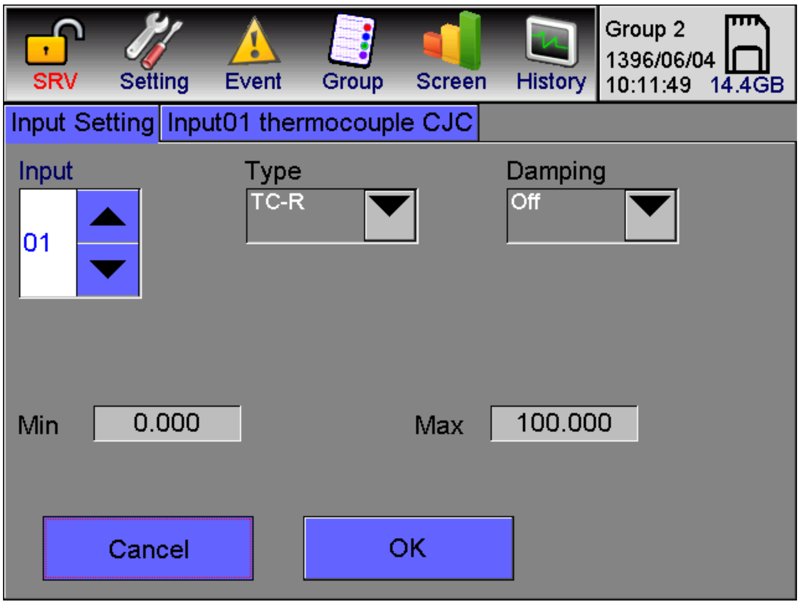


Figure 4-3: Input setting tab

Input

Use the Input option to select the desired input signal. Once the channel is selected, the selected channel data will be displayed to you. In the PR5618 model there is a possibility to connect up to 16 input signals to the device.

Type

Select the desired type from the Type menu to set the input signal type. Types of thermocouples, volts, millivolts, mill amperes and ... can be selected.

Damping

In order to mitigate the adverse fluctuations existing on the input signal, a downstream filter is considered for each input. To activate this coefficient, you can reduce the fluctuation of the Damping menu by selecting a time-out of 1 to 10 seconds.

Note: If the damping is off, the filter will be removed and the more damping factor, the greater the amount of signal fluctuation and the response to the input changes will be slower.

Min**:** In order to set the minimum value of the input channel, the required values are applied here.

Max :To set the maximum value of the input channel, the required value is applied here.

Note: As you know, the output of the thermocouple is based on the degree of centigrade, so there is no need to enter the values of Min and Max.

In Table 4-1, the name of the selected signal types is listed:

$TC-K, TC-B, TC-E, TC-J, TC-S, \ldots$	Types of thermocouples (Thermocouples begin with two TC letters)
$-100mV \sim +100mV, 0\sim 1V, 0\sim 10V, \ldots.$	Types of voltage signals
$0\sim 5\text{mA}, 0\sim 20\text{mA}, 4\sim 20\text{mA}$	Types of current signals
$PT100, JPT100, NI100, \ldots$	Types of RTD
$FREQUENCY\ (0\sim 10KHz)$	Frequency Input
$BINARY\ INPUT$	Binary input

Table 4-1

Note: If the type of input channel is of a thermocouple type, the CJC thermocouple input tab is activated.

Input thermocouple CJC tab

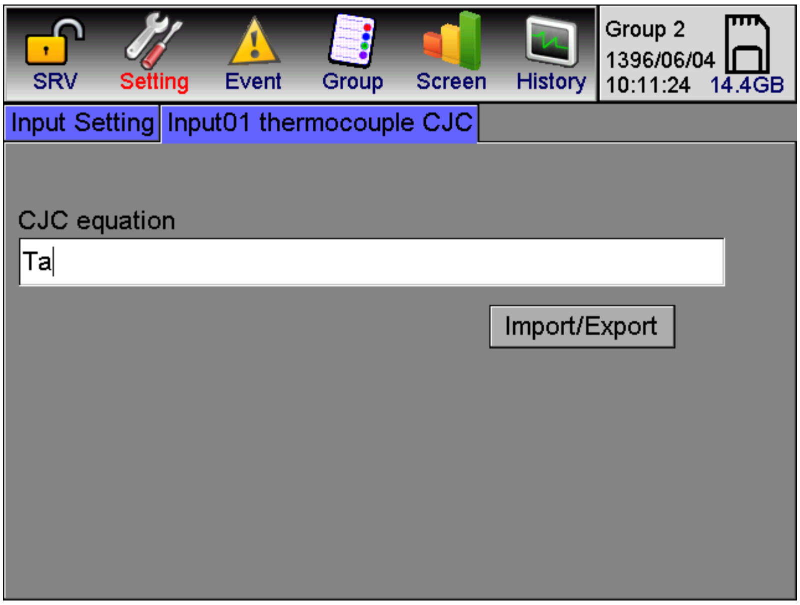


Figure 4-4: Input thermocouple CJC tab

In this section, you can adjust the settings for calculating the temperature of the cold spot of the CJC thermocouple.

When using a thermocouple, the cold spot of CJC is required to obtain the correct temperature value. The CJC value is calculated from the equation that will be defined for the CJC equation.

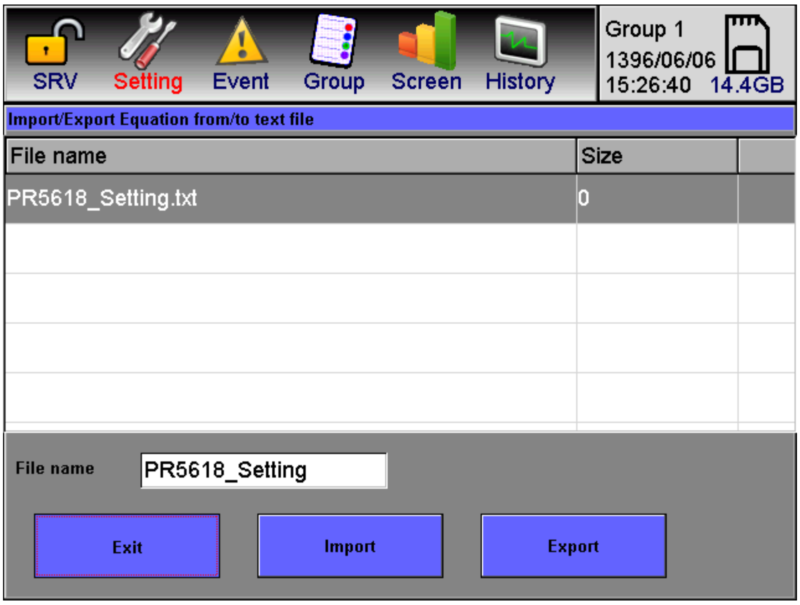


Figure 4-5: Import / Export on the CJC thermocouple Input tab

Note: If the thermocouple wires are mounted directly to the back of the device without changing, then the CJC equation should be equal to Ta; otherwise, another appropriate equation should be used. To transfer the data of this formula to another device, by pressing the Import / Export button, the formula text is selected in the txt file and saved on the USB flash memory. This button is also used to use equations that are located on another device or using a computer to transfer to a device in a file with a txt suffix.

Note: The output values of this section, called I1, ..., I16, will be available.

Note: To make changes before leaving, you must press the OK button.

Function:

In this section, three functions F1, ..., F6 are defined mathematically. It should be noted that the output values of these functions are updated after reading and calculating inputs I1, ..., I16.

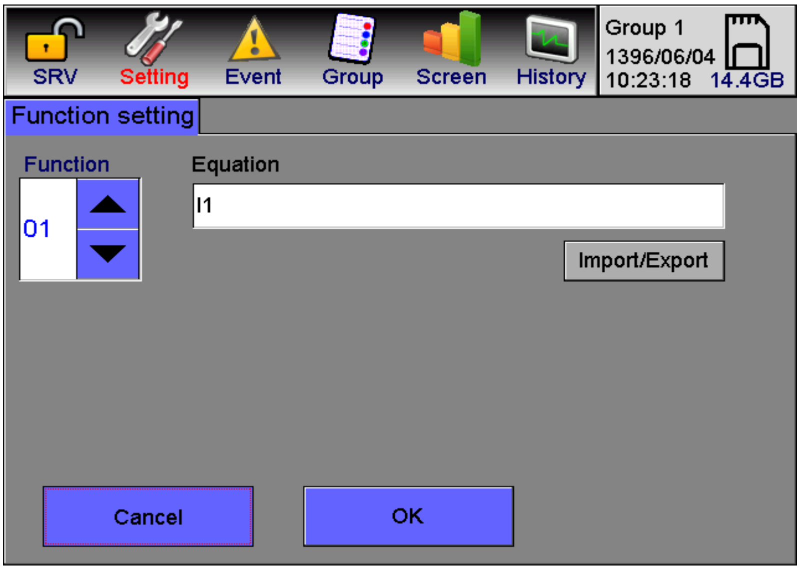


Figure 4-6: Function setting

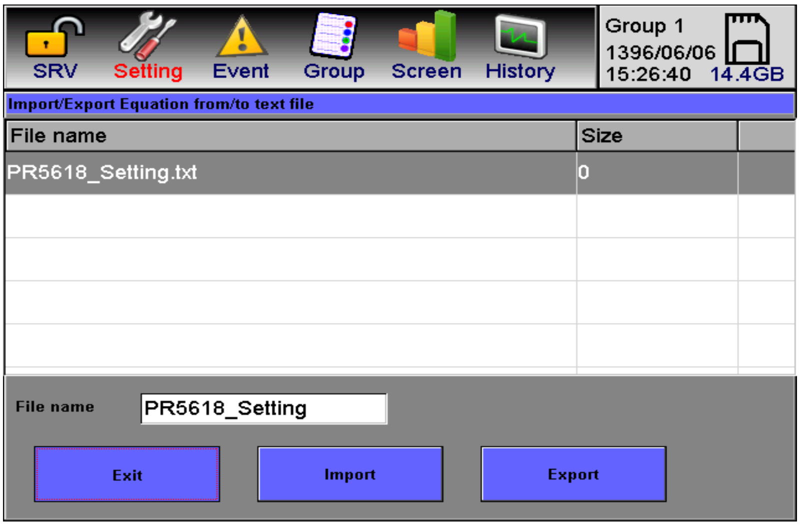
Function: In this section, the desired function is selectable.

Equation: In this section, the formula for the selected function is set.

Import / Export: To transfer this formula to another device by pressing the Import / Export button, the formula text in the txt file that is selected is saved on the USB flash memory. This button is also used to

use equations that are located on another device or using a computer to transfer to a device in a file with a txt suffix.

Figure 4-7: Import / Export in Function



Note: The outputs of this section are available as F1, ..., F6.

Note: To make changes before leaving, you must press the OK button.

Pen

In this section, all settings related to the variables that are displayed numerically on the screen or in the form of graphs and bar graphs and named by the pen name, can be done.

Pen appearance tab

Pen: Pen can be selected from pen 1 to 24. Once selected, the pen data will be displayed to you.

Decimal digits: This parameter specifies that several decimal places should be used when displaying the number of characters desired. For example, if number 2 is selected, the pen number will be displayed with two decimal places.

Pen Size: This parameter specifies the pen type thickness when plotting the graph.

Color :This parameter specifies the color of each pen.

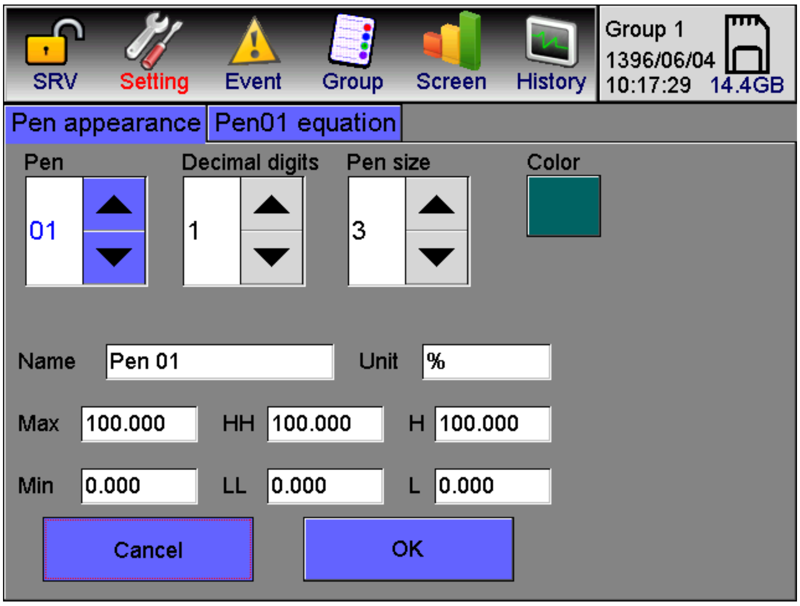


Figure 4-8: Pen appearance tab

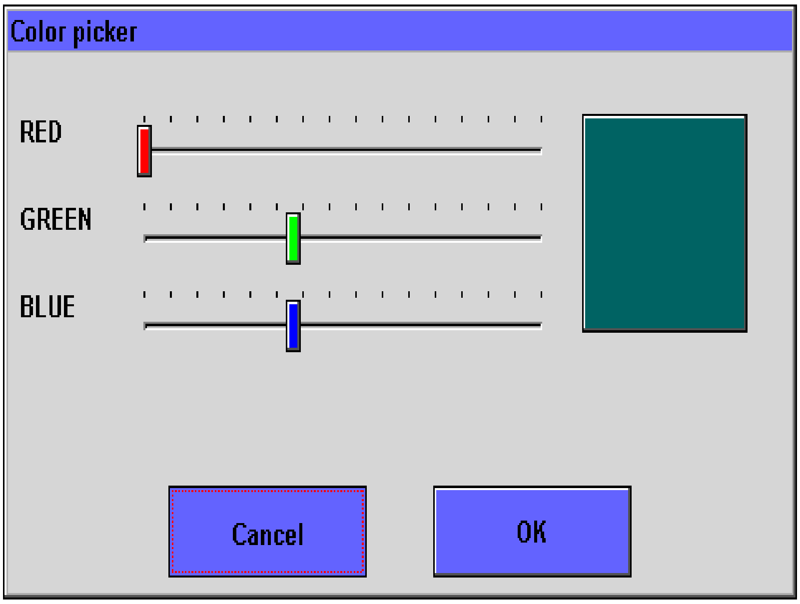


Figure 4-9: Displays how to specify the color of each pen

Name: This parameter specifies the name of each pen, which is usually the same as the name of the signal in the industrial process. The device accepts 19 characters for the name.

Unit: This parameter specifies the unit of each pen, such as Kg / hour or M3 / min. Acceptable number of characters for a unit is 14.

Max, Min: These parameters limit the variation of each pen when drawing a graph or displaying a bar graph.

HH, H, L, LL: These parameters specify the range of alarms for each pen and are: (HH24, ..., HH1), (H24, ..., H1), (L24, ..., L1), (LL24, ..., LL1).

They are available for each item. (See alarms for more details)

Pen equation tab

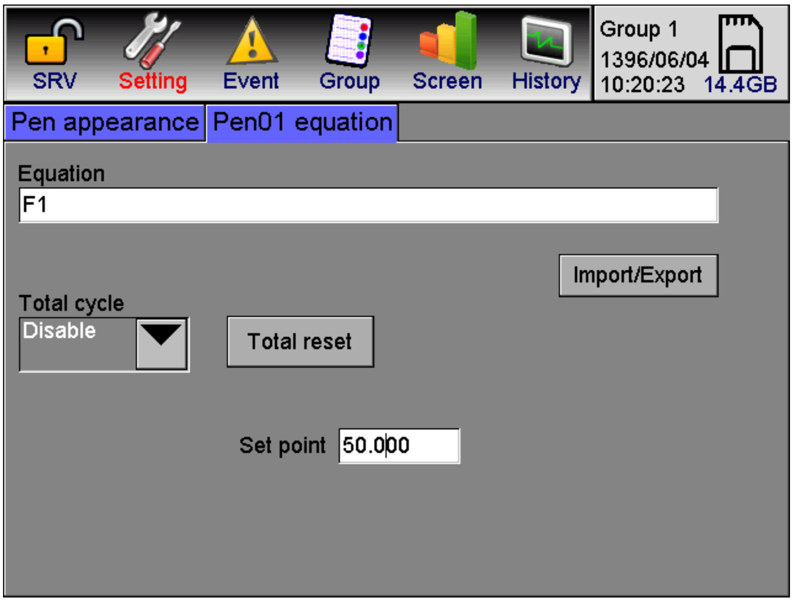


Figure 4-10: Pen equation tab

Equation: This parameter is defined by the equation that defines the pen. This equation is defined by various mathematical functions based on various variables and constant numbers.

Note: When defining the equation of a pen, you can use the previous value obtained from the same formula. For example, if the P1 + 1 equation is used for P1, P1 will increase the value of one unit in each computation period.

Import / Export: To transfer this formula to another device by pressing the Import / Export button, the formula text in the txt file that is selected is saved on the USB flash memory. This button is also used to use equations that are located on another device or using a computer to transfer to a device in a file with a txt suffix.

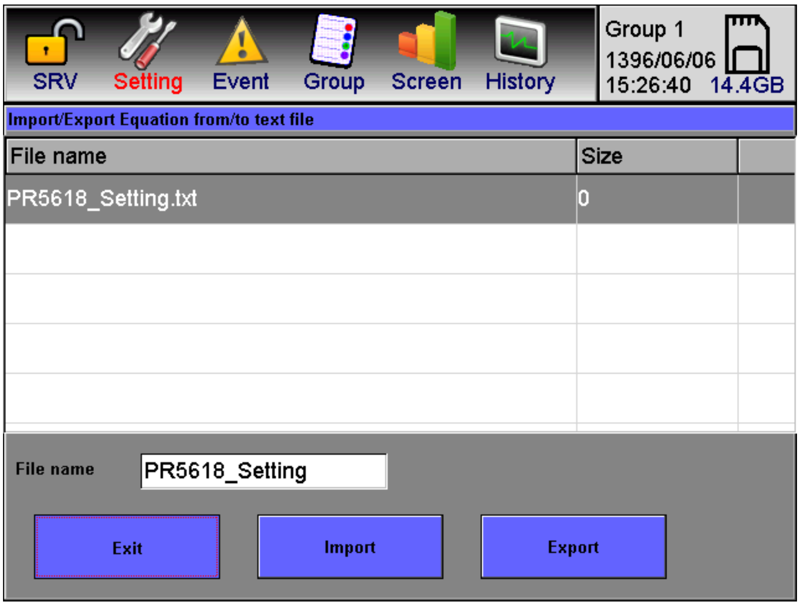


Figure 4-11: Import / Export on the pen equation tab

Total cycle: To set the time cycle of the cumulative pen, in this menu items of (Sec, Minute, and Hour) can be selected. (This option is more useful when the recorder is used as a flow computer.)

Note: If the value of this parameter is Disable, it will not be displayed on the Total page.

Total reset: This parameter is used to zero the cumulative amount of the font (counting from the first).

Set point : This parameter specifies the set point value for the PID controller.

Note: The output values of this section will be available with the names P1,...,P24

Note: To make changes before leaving, you must press the OK button.

Analog output

In this section, the settings for the analog output channel are available. Analog output based on milliamp. You can also use these outputs to control a process using the PID block.

Output: The output is selectable. Once the desired output is selected, its data will be displayed. There are two current output on this device.

Assigned pen: There are Two current output in this device. Its instantaneous value is attributable to the value of one of the device pens.

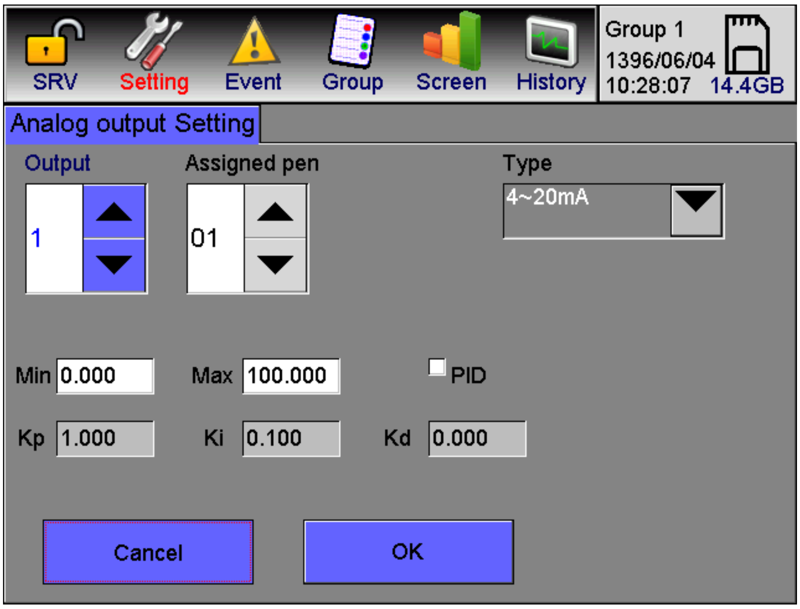


Figure 4-18: Analog output without existing PID controller

Type: This parameter is used to determine the type of output mA (0 ~ 5 mA or 0 ~ 20 mA or 4 ~ 20 mA).

Max/ Min: By these two parameters, the milliamp output signal range is set.

PID: If this parameter is activated, the analog output value is updated based on the PID calculations and according to the parameters Set point, Kp, Ki, Kd and the current value of the selected pen. The Kp, Kd and Ki values must be set according to the controlling process.

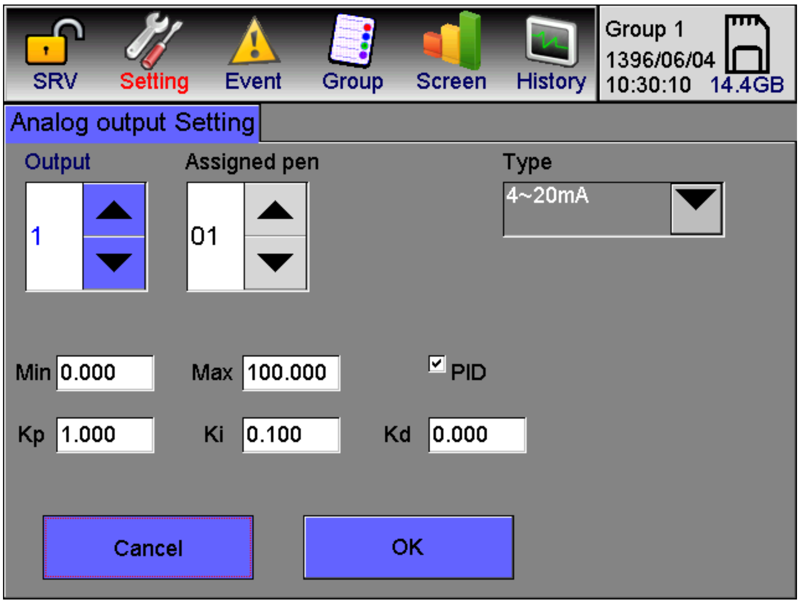


Figure 4-13: Analog output with PID controller

Note: The outputs of this section are available as AO1 and AO2.

Note: To make changes before leaving, you must press the OK button.

Digital outputs

In this section, the settings for turning the digital output on can be done.

This section is responsible for turning on or off the digital output (relay, SSR, OPEN, and COLLECTOR) and acts as Figure 2-14.

First, the condition defined for the On condition is investigated. If this condition is present, the relay startup timer starts counting, and if the value of this timer reaches the On delay, the relay will turn on. If the On condition is not set, the timer will be switched on and reset. Further, if the relay on condition was not set, the condition for shutting down the relay is checked, and if this condition is present, the relay shutdown timer starts counting, and if the timer reaches the Off delay, the relay will turn off. If the condition of the Off condition is not set, the shutdown timer will reset.

The outputs of this part with the names R1 to R10 are available for relays 1 to 10, respectively.

Note: Digital output timer increase by one unit per second.

Note: If ON CONDITION and OFF CONDITION are activated simultaneously, the condition of ON CONDITION is priority.

Relay: The Digital output is selectable. Once the Digital output is selected, its information will be displayed. There are 10 Digital outputs in this device.

On condition: In this section the Digital output turning on condition is specified.

Off condition: In this section, the Digital output shutdown condition is specified.

On delay: After the Digital output On condition is set, the Digital output timer starts counting, and if this timer reaches the On delay, the Digital output will turn on. If the On condition is not satisfied, the timer will be reset.

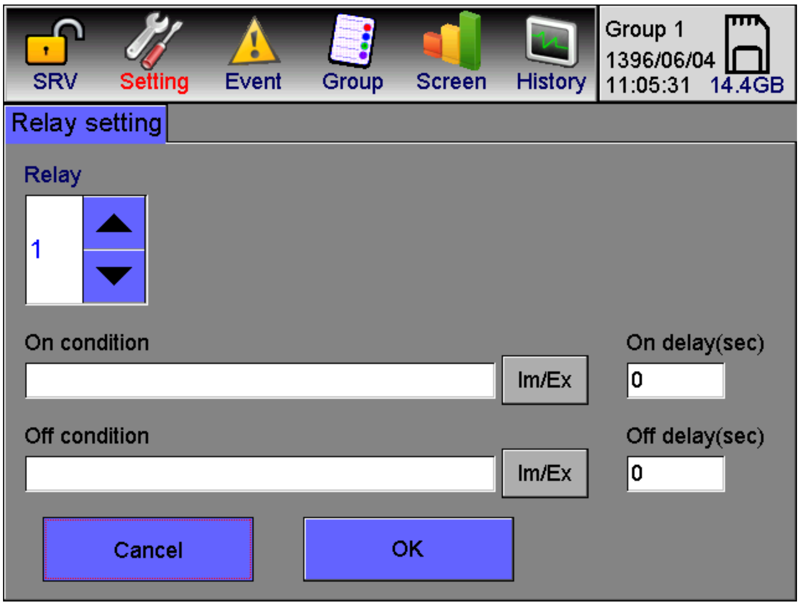


Figure 4-14: Relay

Off delay: If the relay Off condition was not satisfied, the relay turning off condition is checked. If this condition is present, the relay shutdown timer starts counting, and if the value of this timer reaches the "Off delay", the relay will turn off. If the Off condition is not set, the shutdown timer will reset.

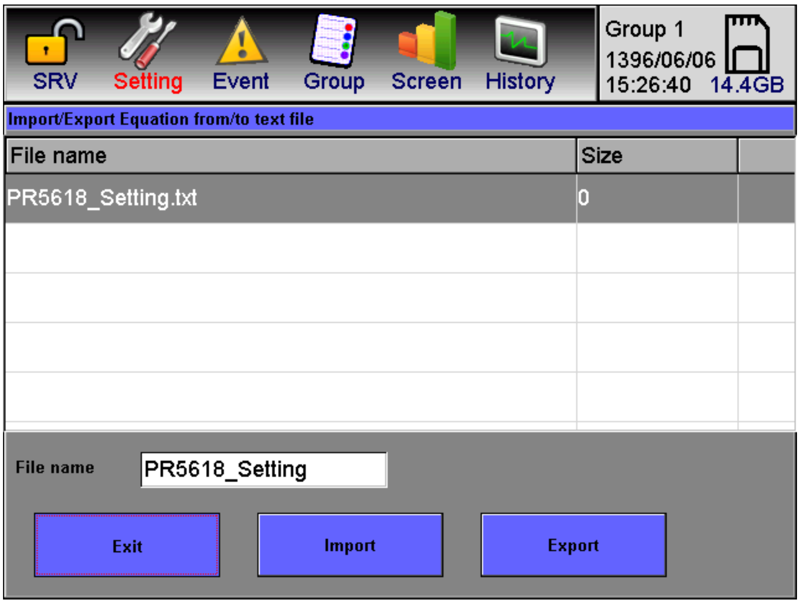


Figure 4-15: Import / Export on the Relay tab

Import / Export: To transfer this formula to another device by pressing the Import / Export button, the formula text is saved in the txt file that is selected on the USB flash memory. This button is also used to use equations that are located on another device or using a computer to transfer to a device in a file with a txt suffix.

Note: To make changes before leaving, you must press the OK button.

Group

In this section, the settings for the device groups can be performed.

Group: In this section the members of the group are specified. Which can be assigned from one to Fore groups (each with six members).

Note: If the font corresponding to each member is set to zero, this pen is removed from the screens.

Name: Enter the name of each group.

Note: For each pen with the first letter of the word "Member" from M1 to M6, we refer to a number from 1 to 6. If the number corresponding to each member is equal to zero, the pen of that member of the page will be deleted.

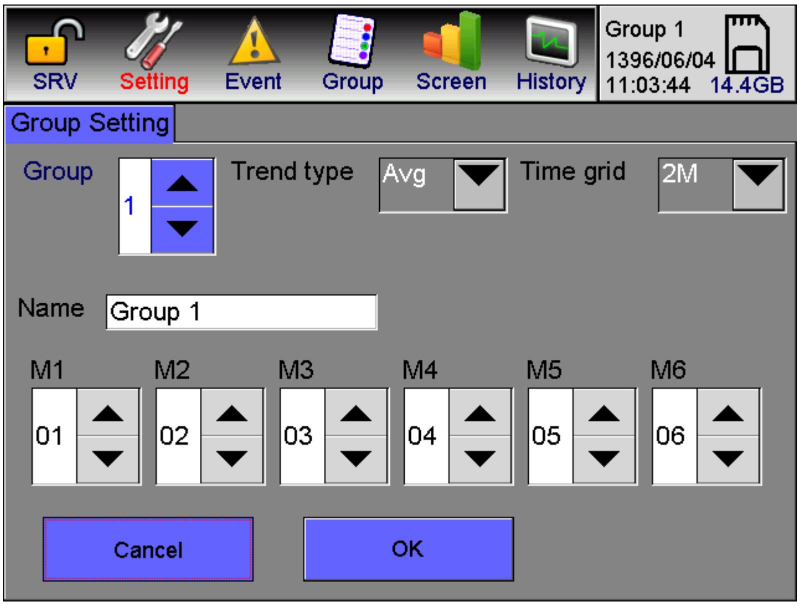


Figure 4-16: Group setting

Trend type: This parameter is used to set the type of points for graphs. For example, if the Time grid value is greater than 1min, because the number of samples taken is greater than the number of points that can be displayed in the graph, the system will draw the next point on the plot based on the selected value for this parameter. (Minimum samples taken after the last point drawn, Maximum of samples obtained after the last point drawn, Average samples obtained after the last spot drawn and the Sample of the last instance of the samples obtained from the last spot drawn.)

Time grid: The distance of each grid of the axis of time in graphs is determined using this parameter.

Time grid	Time duration of displaying data in online history
6 sec	2.5h
30sec	12h
1min	24h
2min	48h
5min	5day
15min	15day
30min	30day
1h	2month
3h	6month
4h	8month
6h	12month
12h	24month

Note: To apply the changes before leaving, you must press the OK button.

Clear graph: By pressing this button, the curves on the graph display pages are cleared and begin to draw the graph from the current moment.

RTC

This section is used to set the system clock.

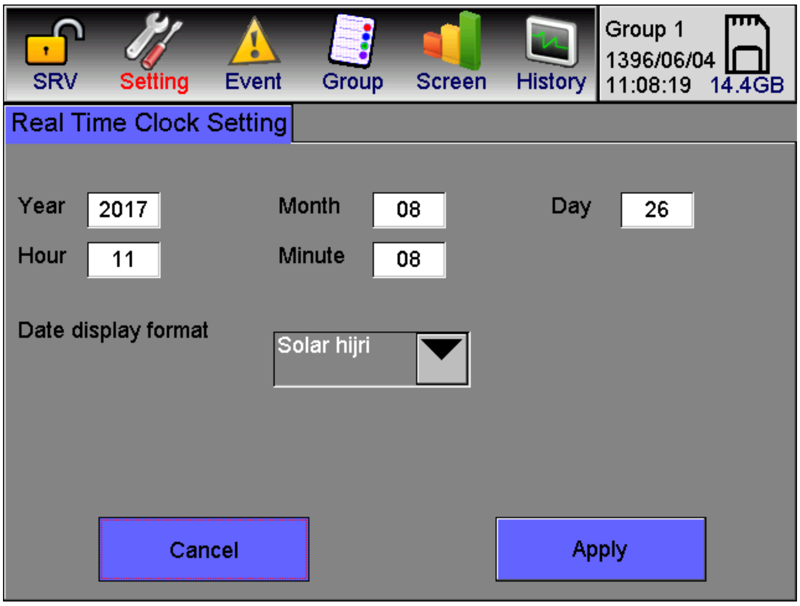


Figure 4-17: RTC section

Year

In order to set the year of the system, enter the current year in the Year section.

Month

In order to set the month of the system, enter the current month in the Month section.

Day

In order to set the day of the system, enter the current day in the Day section.

Note: The date entered must be of the AD type.

Hour

In order to set the system clock, enter the current hour in Hour section.

Minute

In order to set the system clock, enter the current minute in Minute section.

Date display format

To set the display type of the system history, select the date type from the Date display format menu.

Note: To apply the changes before leaving, you must press the Apply button.

Backlight

The LED screen is used to adjust the brightness when the screen is active and the duration that the screen is active.

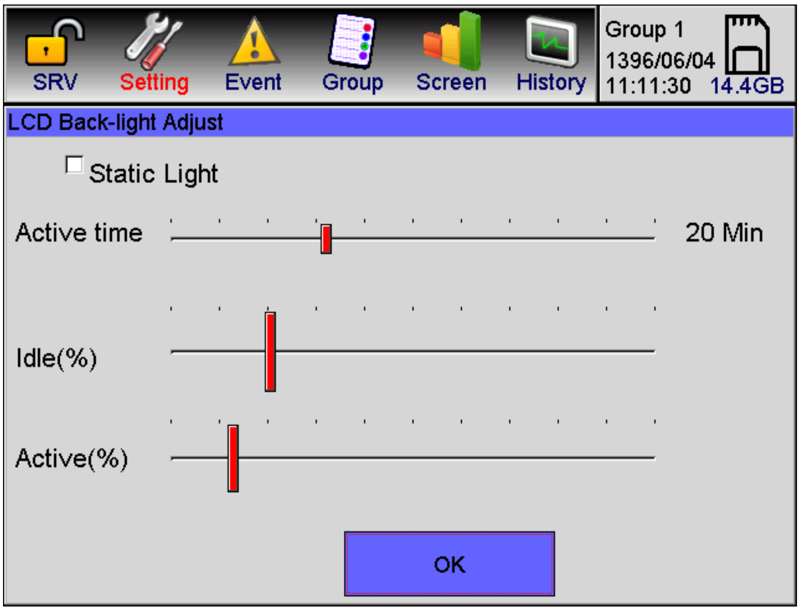


Figure 4-18: Adjust the light of the LED screen in the back light without activating Static light

Active time

The amount of time the screen is turned on, after the last touch, is set by this parameter.

Idle

The brightness of the display when it is inactive is performed by this parameter.

Active

The brightness of the screen at the time of activation is set by this parameter.

Note: If the Static light option is ticked, the screen will always remain on and the two Active Time and Idle options will be disabled. Only page brightness can be customizable for the user.

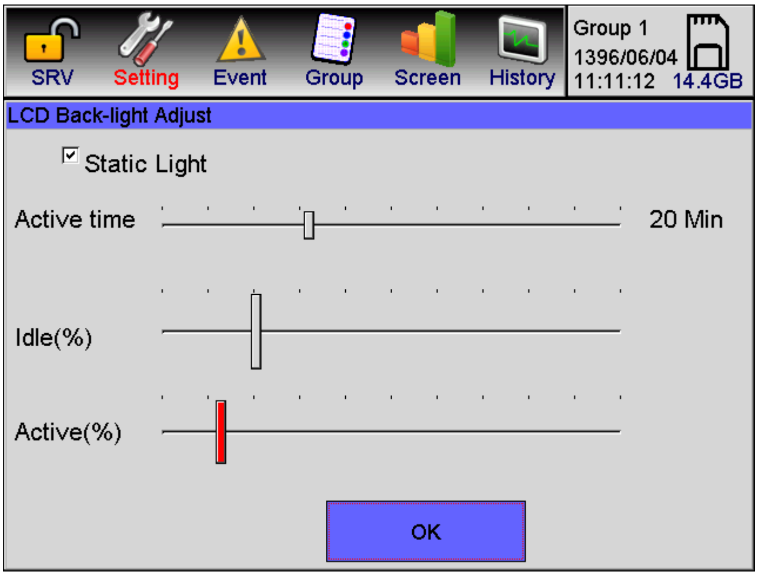


Figure 4-19: Adjust the light of the LED screen in the back light with the activation of Static light

Note: To make changes before leaving, you must press the OK button.

Preferences

In this section, the settings for the device name, pen, display screen, the background color of the graph pages and the type of default indicator are selected.

Name

The device name is adjustable in this section. This name is used in network applications by the naming of hard-copy, backup, and restore files. The device does not accept more than 12 characters for its name.

Group

In this section, the group is selected from 1 to 4 groups.

Pen

In this section, one of the pens is selected from 1 to 24.

Home page

This screen is displayed at first when the system is turned on.

Graph back color

You can use either black or white to adjust the background color of the graphs.

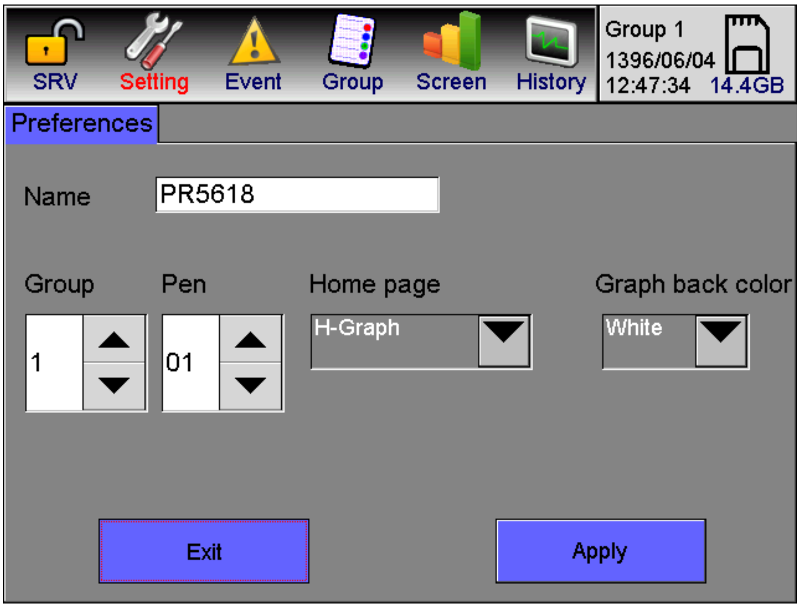


Figure 4-20: Preferences

Note: To apply the changes before leaving, you must press the Apply button.

Communication

In this section, the communication protocol, speed, parity, stop bit for the RS485 serial port can be adjusted.

In the address field, the device address is set in the MODBUS network.

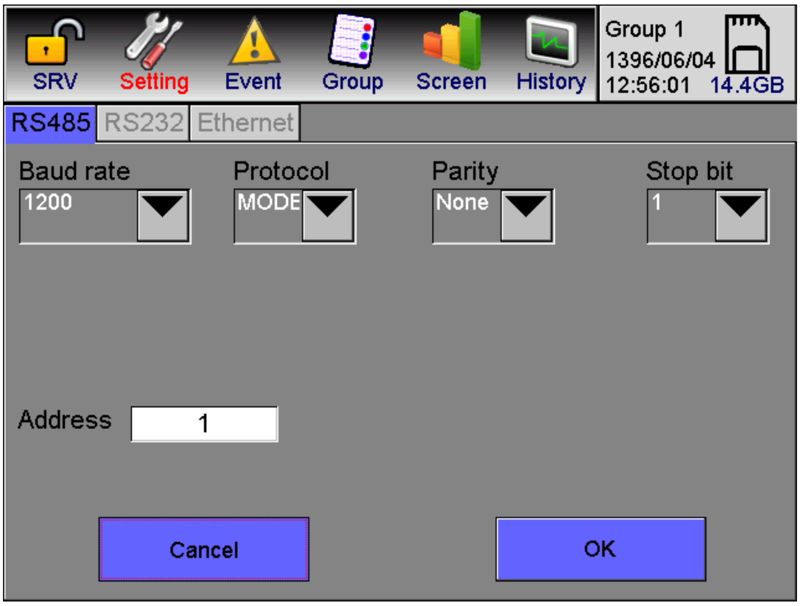


Figure 4-21: Communication

Note: To make changes before leaving, you must press the OK button.

Read pen values over the Modbus network

Pens real time value	Function code (Hex)	Register Address(Hex)	Words
Pen1[1]	03/04	0000	2
Pen2	03/04	0002	2
Pen3	03/04	0004	2
Pen4	03/04	0006	2
Pen5	03/04	0008	2
Pen6	03/04	000A	2
Pen7	03/04	000C	2
Pen7	03/04	000E	2
Pen9	03/04	0010	2
Pen10	03/04	0012	2
Pen11	03/04	0014	2
Pen12	03/04	0016	2
Pen13	03/04	0018	2

[1] فرمت داده‌ی pen ارسالی به نحوی است که ابتدا word پر ارزش سپس word کم ارزش، byte پر ارزش سپس byte کم ارزش ارسال می‌شود.

Pen14	03/04	001A	2
Pen15	03/04	001C	2
Pen16	03/04	001E	2
Pen17	03/04	0020	2
Pen18	03/04	0022	2
Pen19	03/04	0024	2
Pen20	03/04	0026	2
Pen21	03/04	0028	2
Pen22	03/04	0030	2
Pen23	03/04	0032	2
Pen24	03/04	0034	2

Backup/ Restore

This option is used to save and restore device settings data.

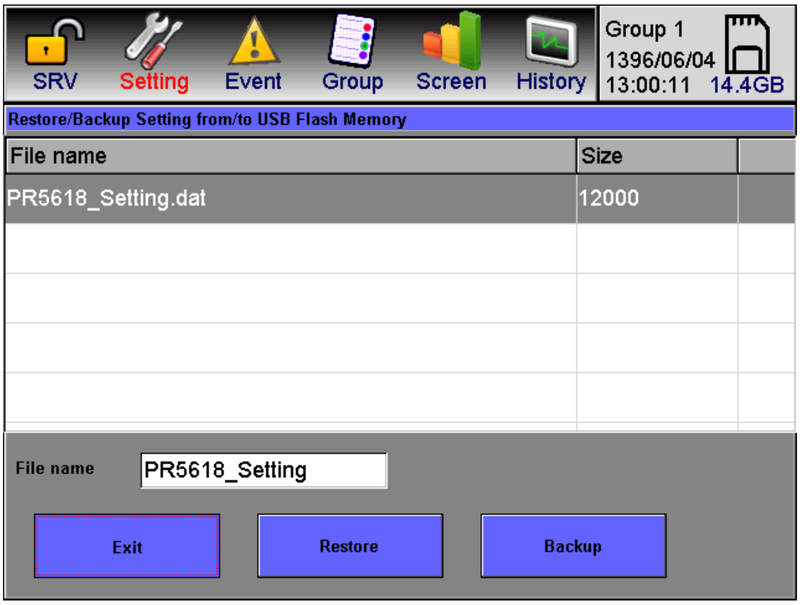


Figure 4-22: Backup/ Restorer

To save the device settings data, you can select one of the files in the USB flash drive from the list of files displayed, or create a new file (by entering the filename in the File name field) and save the data in the file by pressing the Backup button.

To retrieve device settings data from the list of files displayed, select the file you want and press the Restore button. All parameters of the device's settings are initialized with this.

Note: This save and restore is appropriate for copying device settings and using settings for another device.

Factory setting

This option is used to return the device's settings to the initial settings.

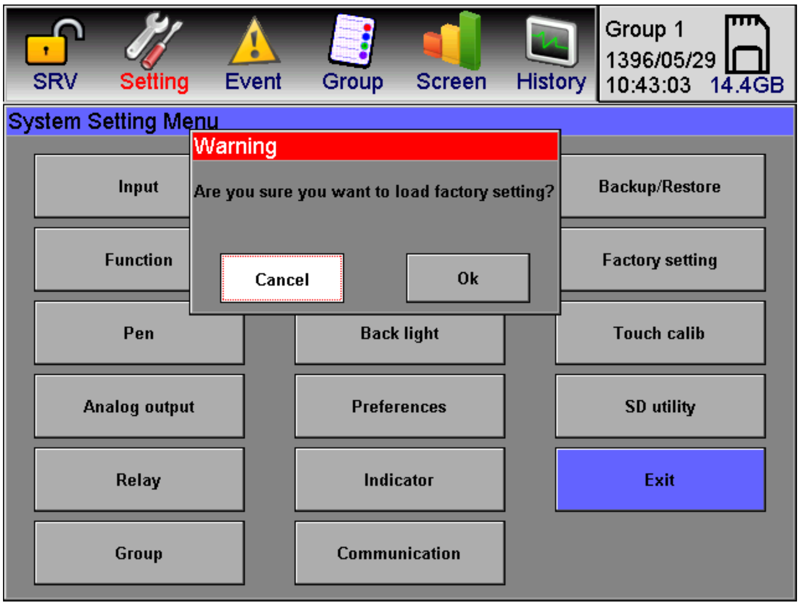


Figure 4-23: Factory setting

Touch calib

This parameter is used to set the touch screen.

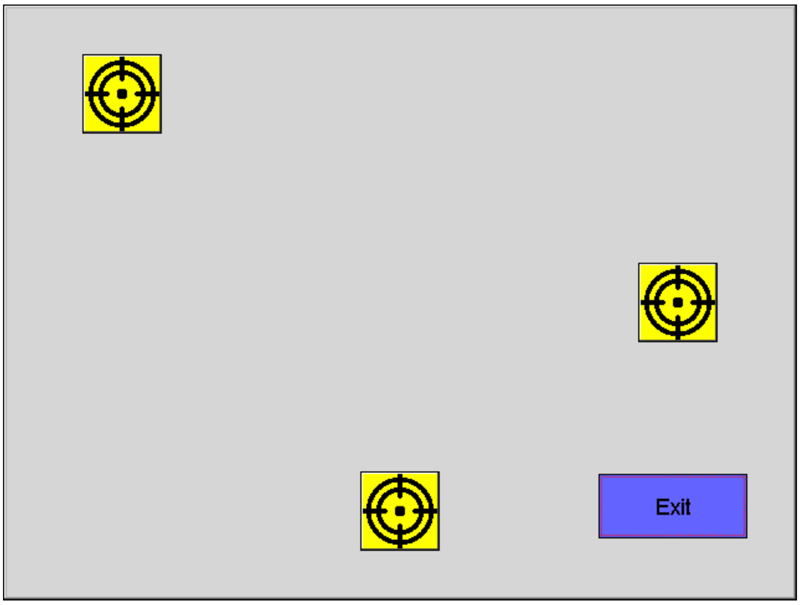


Figure 4-24: Touch calib screen to calibrate the device

Whenever the user feels that the screen needs to adjust the touch, this page is used. In this way, the center of the three points displayed is touched with an appropriate viewing angle and then exit from this page.

SD utility

The user can use this in order to manage the SD memory of the device.

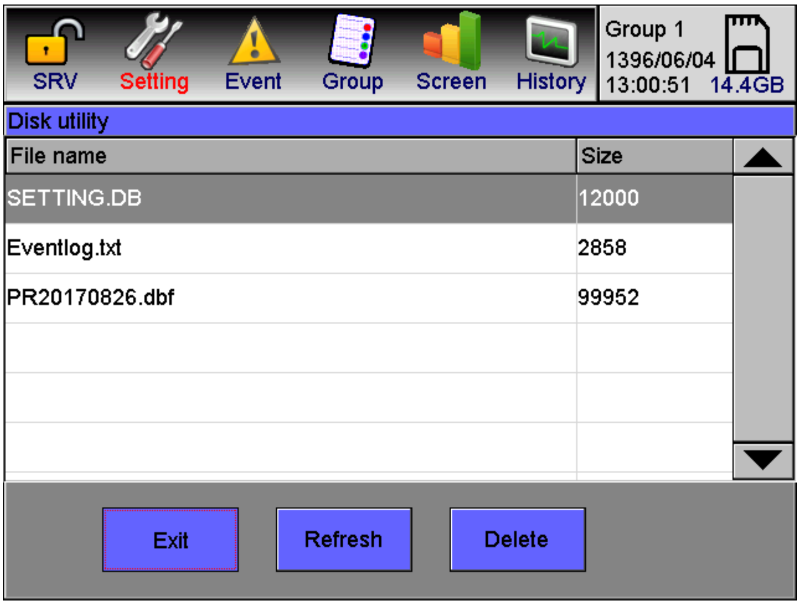


Figure 4-25: SD utility page for memory management

If necessary, you can select unused files and then delete them by pressing the Delete button.

Event menu

This menu allows you to view events and respond to relays.

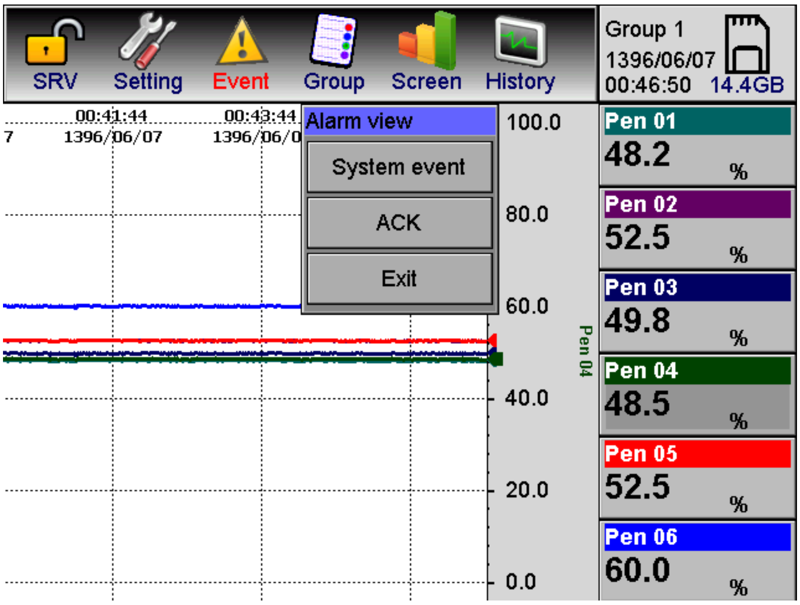


Figure 5-1: Event menu

System event

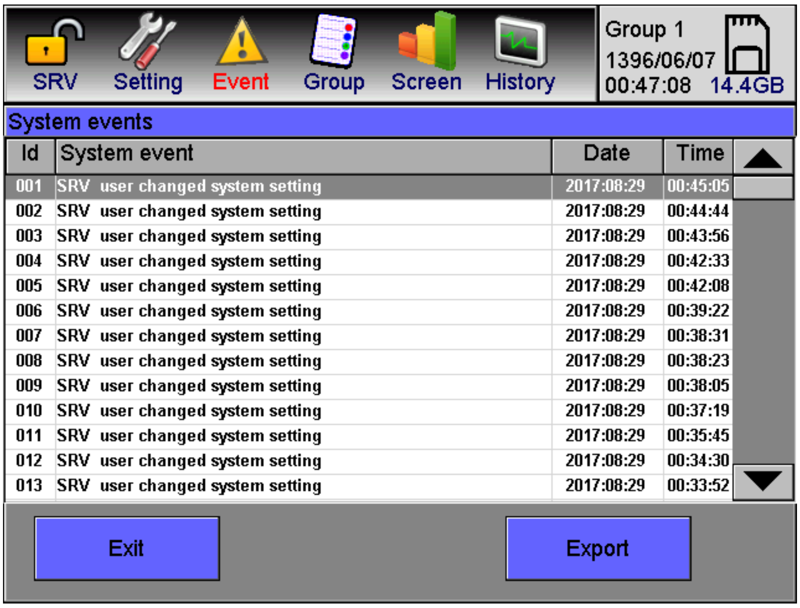


Figure 5-2: System event

- This menu is used to view events occurring in the system. These events include all the changes the user has set in the device's settings, such as turning the device on and off.

ACK

Use this section to remove alarms.

Screen menu

In this section, the pen data available on the device can be displayed in various graphs, bar graphs and digital graphs.

Inside the user's menu, the user enters the Screen section and, depending on the need, can choose between 8 screens for displaying data.

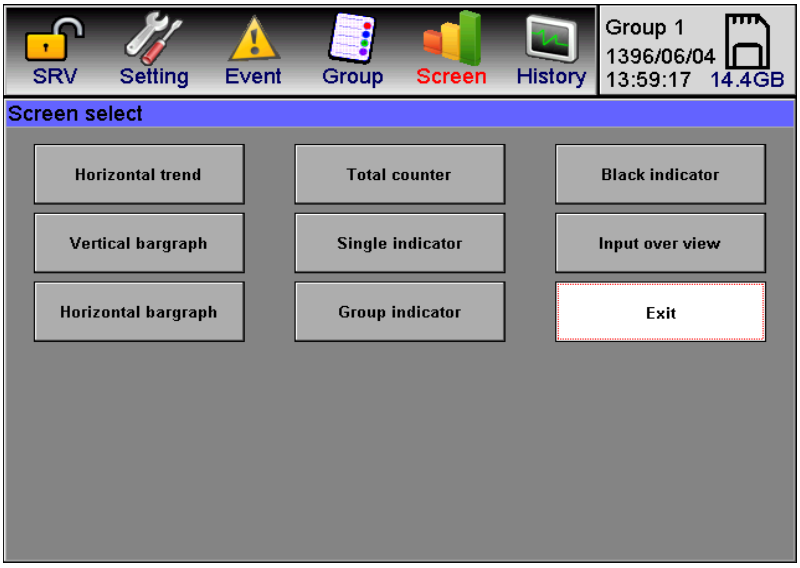


Figure 5-3: Screen menu

Note: To access the Device Screen menu, the user needs to be logged on at least at the operator level to enable this section.

Now we are introducing individual pages in the screen submenu.

Horizontal trend

In this section, the user can view values from one to twenty-four characters in the device, numerically, with its unit, and displaying the alarms (if any) as well as in the vertical graph.

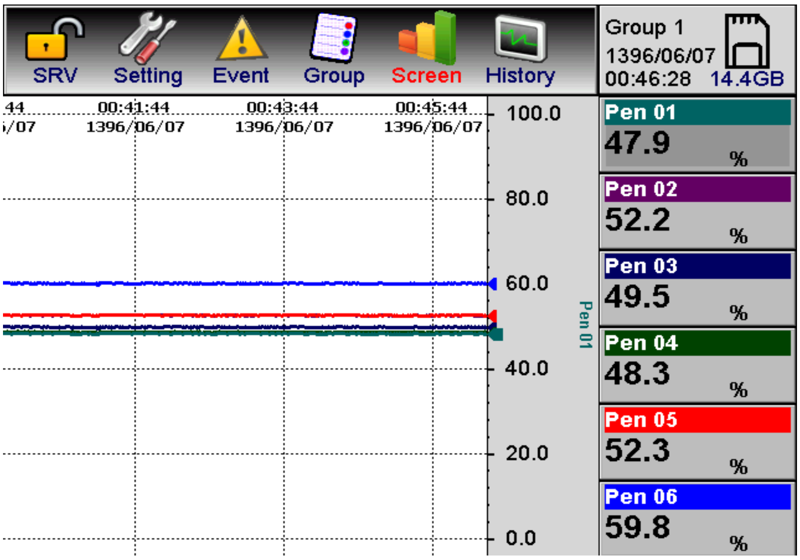


Figure 5-4: Displaying the font size of the device numerically with their unit in the Horizontal trend

On this screen, once in a second is given to a pen which its graph is being drawn. In this case, the background of that pen darkens, the pen name and its range are written in the upper part of the chart.

Note: If the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the warning status. If the value of a font is greater than H or less than L, we will be in a warning state.

The red color indicates the alert status. If the value of a pen exceeds a greater amount of HH, or less than LL, we are in alert status. (For more information, see Alarms section).

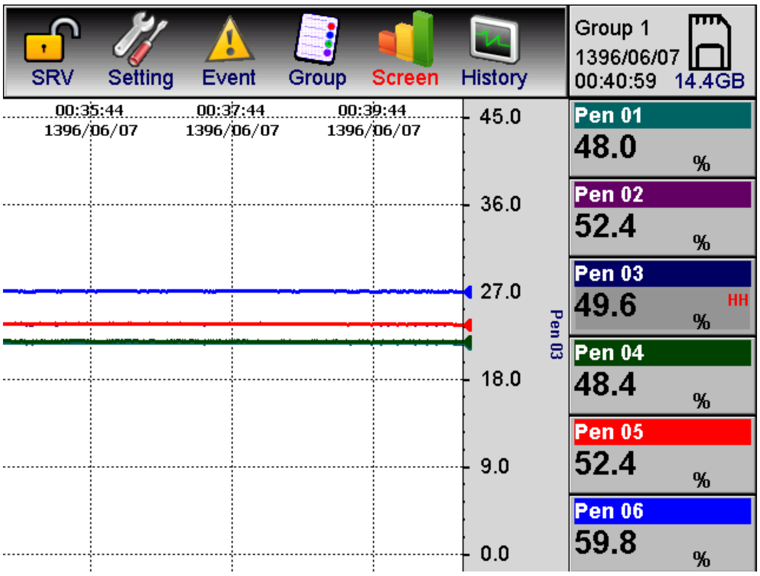


Figure 5-5: Show the alarms in the Horizontal trend

Note: If the pen group setting is equal to zero for each member, the pen will be deleted from the screen.

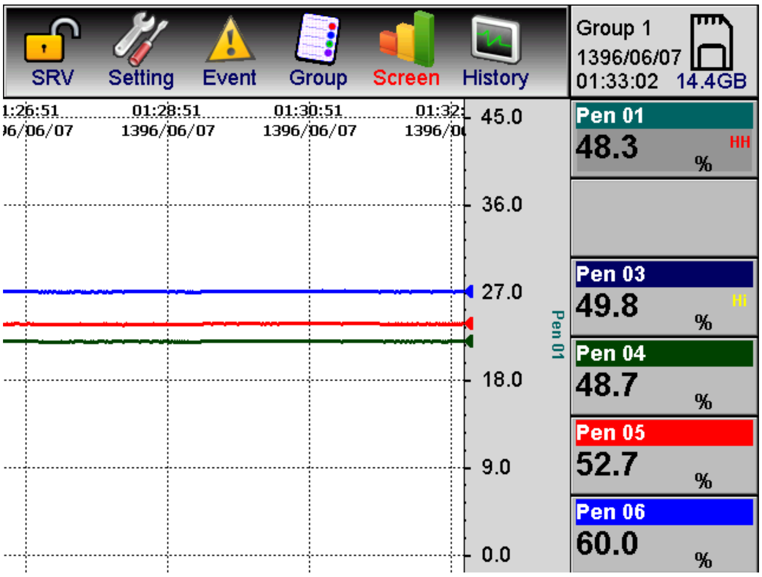


Figure 5-6: Removing a pen from the screen as a result of zeroing the pen corresponding to that member

Vertical bar graph

In this section, the user can view the values from one to twenty-four characters in the device, numerically, with its unit, and displaying the alarms (if any) as well as in the vertical bar graph.

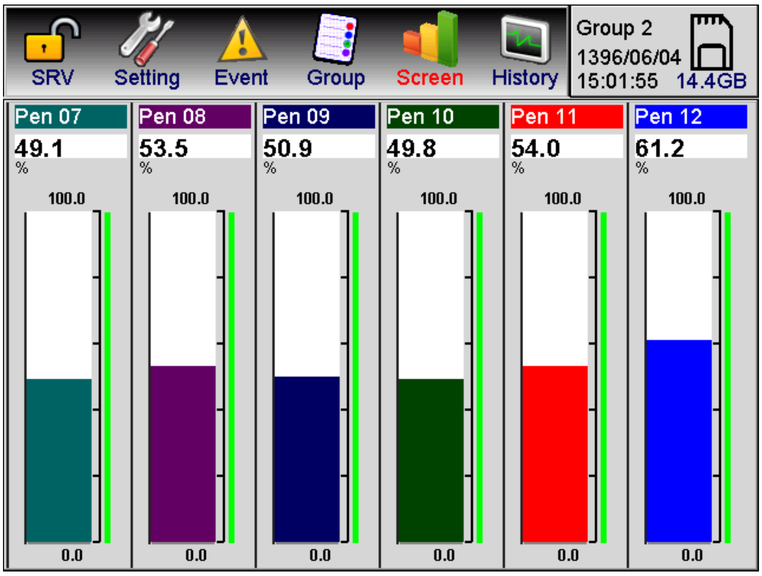


Figure 5-7: How to display the values of the pens in the Vertical bar graph

Note: If there are alarms on each pen, the color of the bar changes according to the status of the existing alarms.

If the instantaneous value of a pen is between l (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the warning status. If the value of a font is greater than H or less than L, we will be in a warning state.

The red color indicates the alert status. If the value of a pen exceeds a greater amount of HH, or less than LL, we are in alert status. (For more information, see Alarms section).

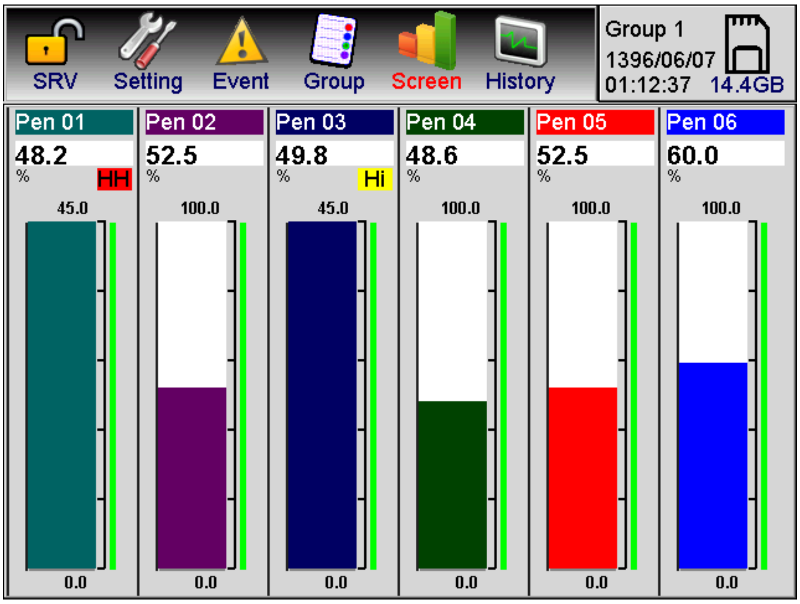


Figure 5-8: Existing alarms on a pen and the changing color according to the situation in the bar graph

Note: If the pen group setting is equal to zero for each member, the pen will be deleted from the screen.

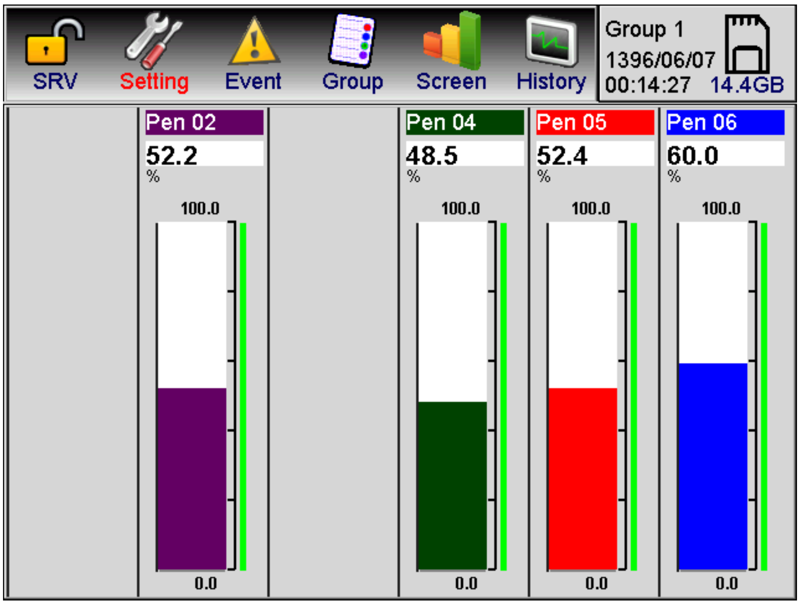


Figure 5-9: Zeroing the corresponding pen with two members and removing two pen from the page in the Vertical bar graph section.

Horizontal bar graph

In this section, the user can view the values from one to twenty-four characters in the device numerically with their units and displaying the alarms (if any) as well as in the horizontal bar graph.

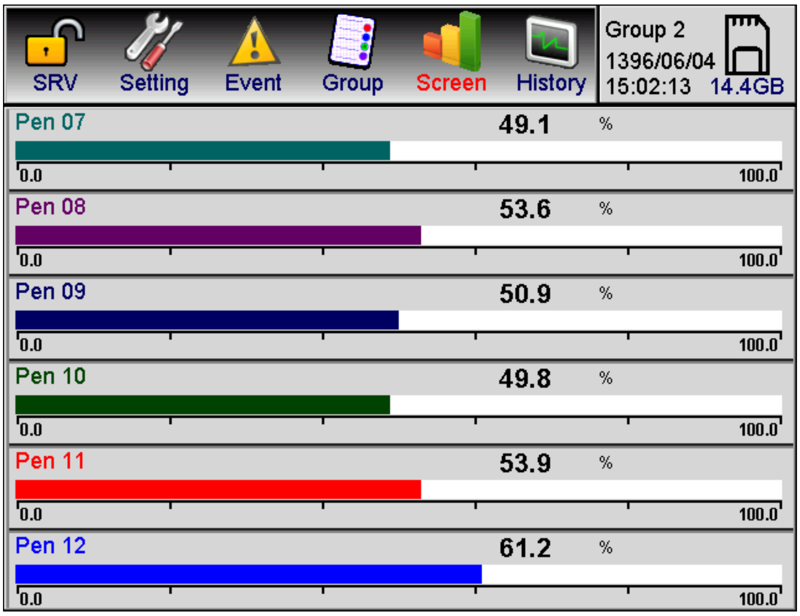


Figure 5-10: How to display the amount of pens in the Horizontal bar graph

Note: If there are alarms on each pen, the color of the bar changes according to the status of the existing alarms.

If the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the warning status. If the value of a pen is greater than H or less than L, we will be in a warning state.

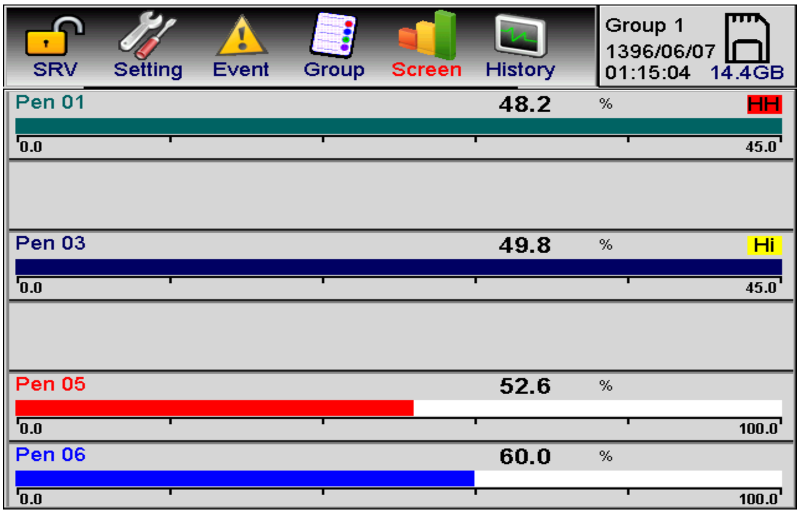


Figure 5-11: Zeroing the corresponding pen with two members and removing two pens from the Horizontal bar graph page

The red color indicates the alarm status. If the value of a pen exceeds a greater amount of HH, or less than LL, we are in alert status. (For more information, see Alarms section).

Total count

In this section, the user can see the cumulative amount of the default pen (the pen selected in the preference page) along with its instantaneous value, its unit, and alarms (if any).

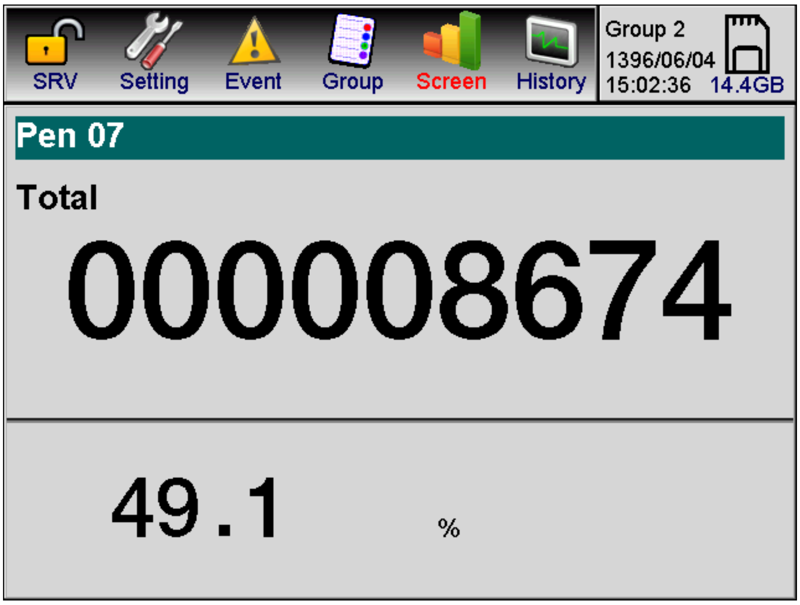


Figure 5-12: Total count

Figure 5-13: Total count display when Total cycle parameter value is Disable

Note: If the default value for the Total cycle parameter is Disable in the font settings section, the page does not display a value for the total number.

Single indicator

In this section, the user can view the amount of the default pen (the pen selected on the preference page) along with the graph, unit, and alarms (if any).

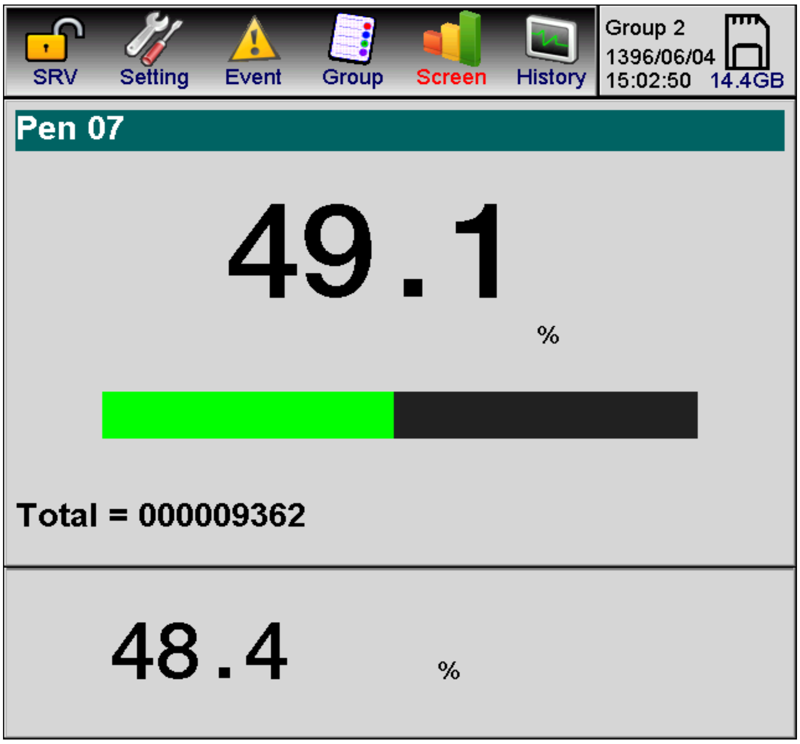


Figure 5-14: Single indicator

Note: If there is an alarm for each pen, the color of the bar changes according to the status of the alarms.

If the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the warning status. If the value of a pen is greater than H or less than L, we will be in a warning state.

The red color indicates the alert status. If the value of a pen exceeds a greater amount of HH, or less than LL, we are in alert status. (For more information, see Alarms section).

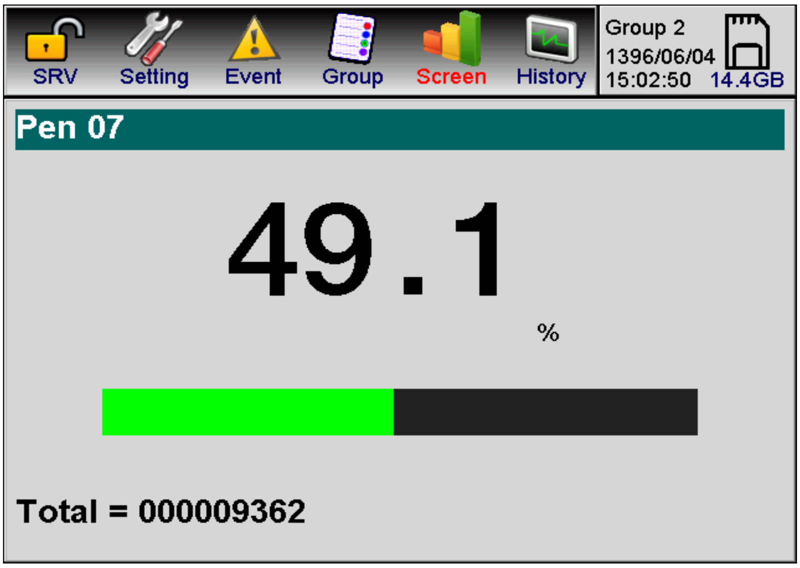


Figure 5-15: Green is a sign of the absence of alarms.

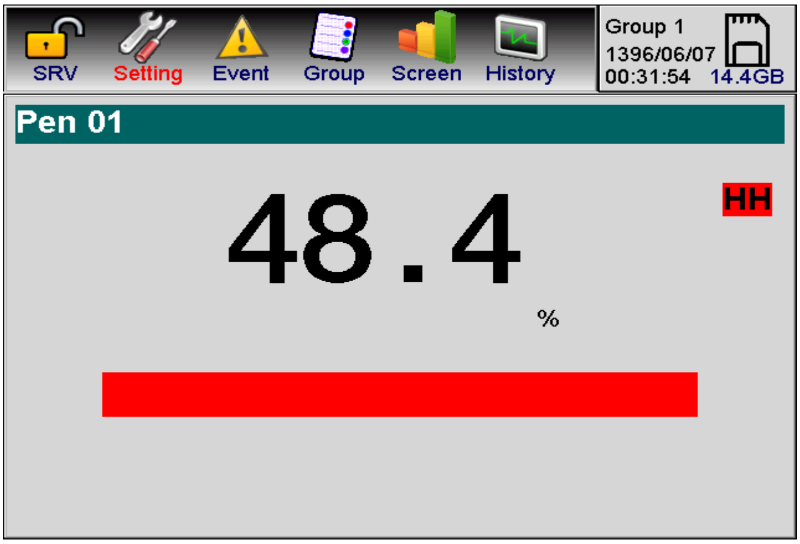


Figure 5-16: Displays the red color as an alert when the pen amount is higher than the HH value

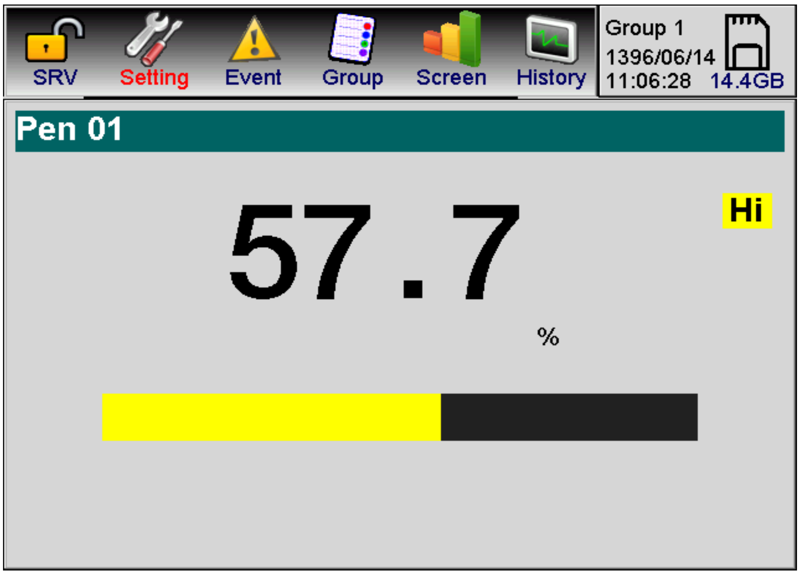


Figure 5-17: Displays the yellow color as a warning when the pen value is higher than Hi

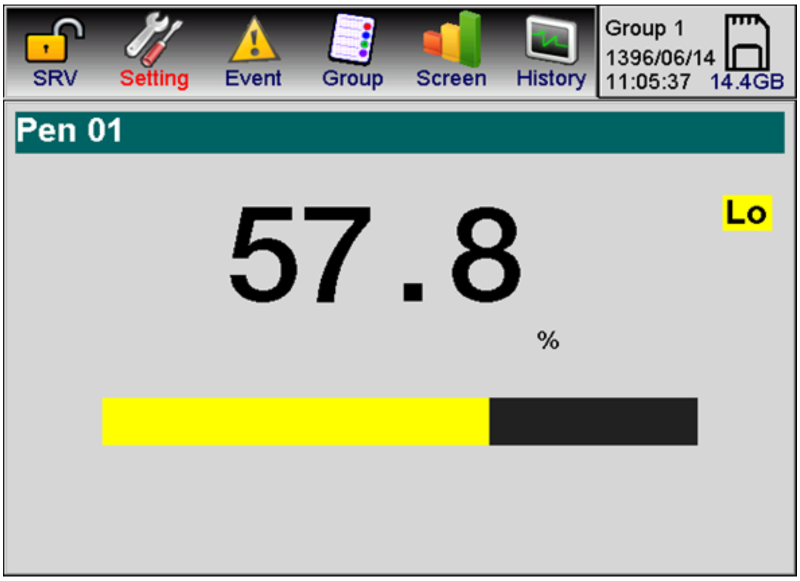


Figure 5-18: Displays the yellow color as a warning when the value of the font is less than Low

Group indicator

In this section, the user can see the amount of the pens assigned to the group members in the Group section in the Setting menu, along with its unit and alarms (if any).

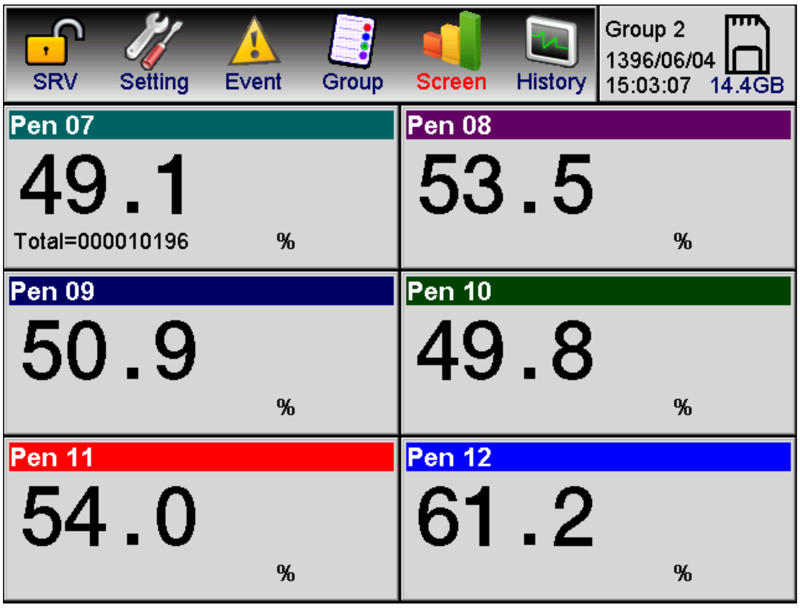


Figure 5-19: Group indicator

Note: If there is an alert for each pen, the color of the bar changes according to the status of the alarms.

If the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the warning status. If the value of a pen is greater than H or less than L, we will be in a warning state.

The red color indicates the alert status. If the value of a pen exceeds a greater amount of HH, or less than LL, we are in alert status. (For more information, see Alarms section).

Note: If the pen for each member is set to zero in Group setting, the pen is removed from this screen.

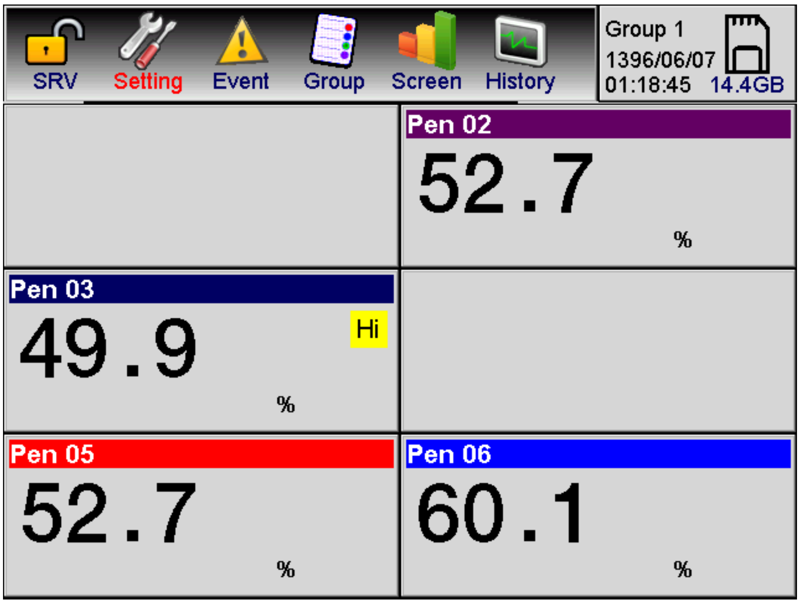


Figure 5-20: Zeroing the corresponding pen with two members and removing these two pens from the page in the Group indicator section

Black indicator

In this section, the user can see the instantaneous amount of the pens along with the units and alarms (if any).

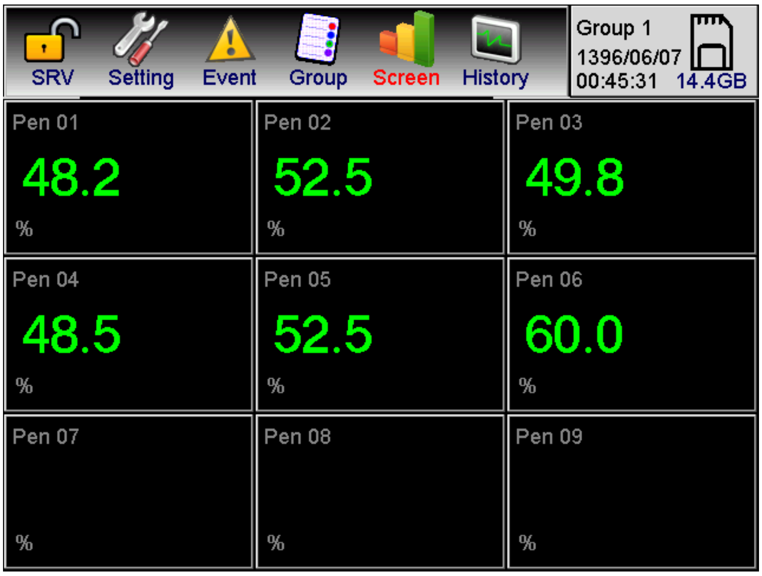


Figure 5-21: Black indicator

Note: If there is an alert for each pen, the color of the bar changes according to the status of the alarms.

If the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition.

The yellow color indicates the warning status. If the value of a pen is greater than H or less than L, we will be in a warning state.

The red color indicates the alert status. If the value of a pen exceeds a greater amount of HH, or less than LL, we are in alert status. (For more information, see Alarms section).

Note: In the Default page setting section, the number of pens that can be displayed on this screen is selectable from 1 to 18 pens.

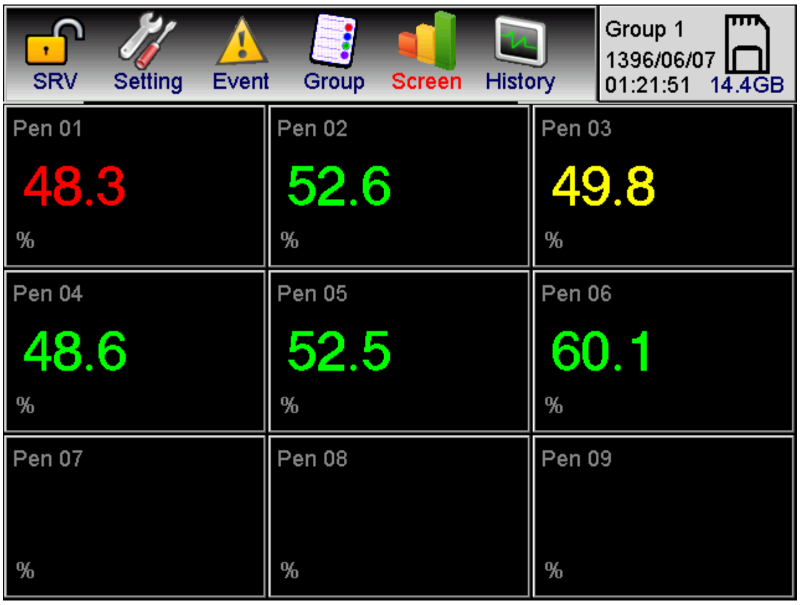


Figure 5-22: Changing the pen color according to the existing alarm status

Figure 5-23: Displaying 7 of the 18 pens in the Black indicator section

Note: If the pen for each member is set to zero in Group setting, the pen is removed from this screen.

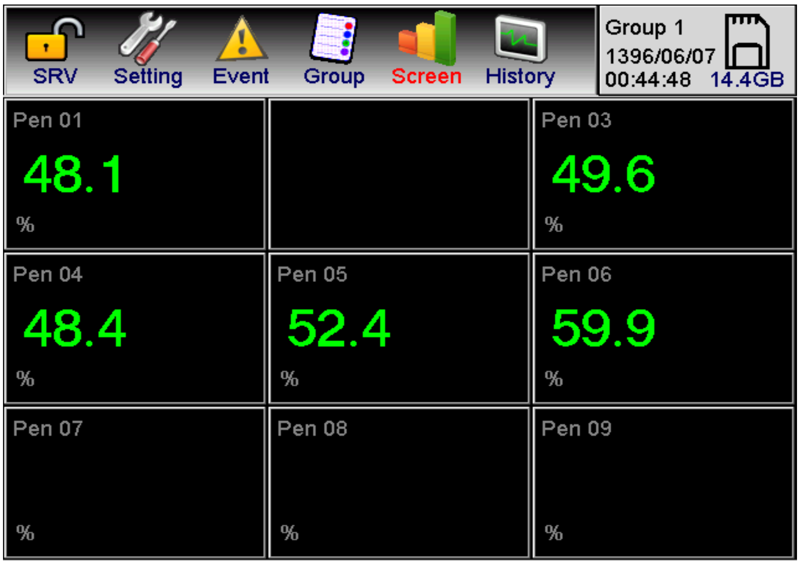


Figure 5-24: Zeroing the corresponding pen with two members and removing these two pens from the screen in the Black indicator

Input overview

To view the instantaneous values of the electrical parameter of each input device, this page is used.

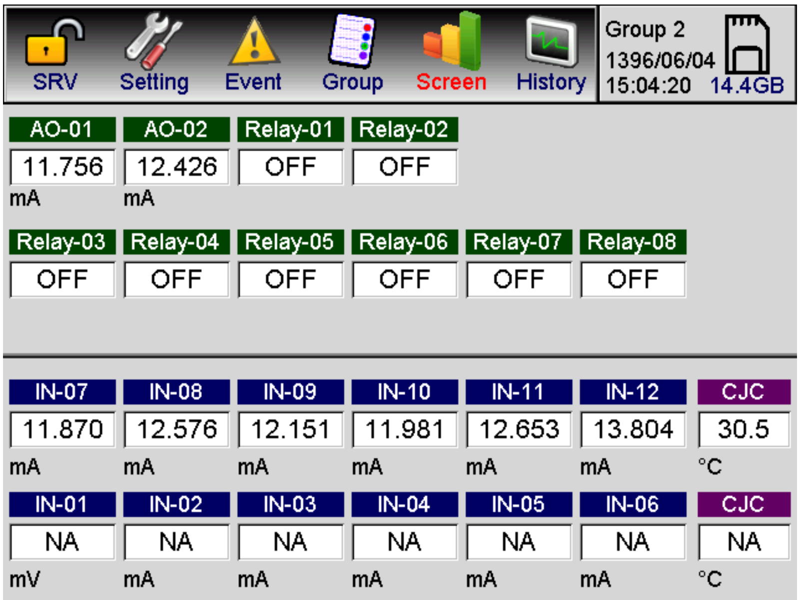


Fig. 5-25: View the instantaneous values of the electrical parameter of each input of the device in the Input overview section.

The number is shown and its unit is appropriate for the input type. For example, if the type of input is thermocouple or thermos resistant, the value displayed is mV. Or, if the input type is 4 ~ 20 mA, the value displayed is mA.

The CJC value shown on this page is equal to the temperature read by the temperature sensor mounted on the card. The upper line also shows the amount of current output and the status of the two relays. You can also use this page to calibrate the device as explained in the calibration section.

History menu

This menu is used to view the status of each pen in the past. In this section, the data is loaded from the archive section on the page.

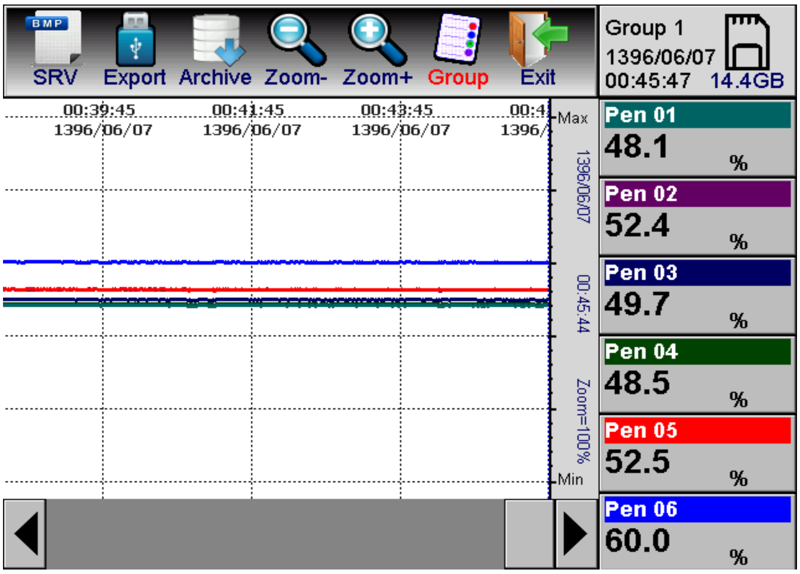


Figure 5-26: History menu

This device has data storage capability for at least 5 years depending on its memory capacity. To view data in the History of the device, in the Online History section, data can be viewed online since the device was turned on, depending on the time grid setting from several hours to several months. There is also all data for at least 5 years in the archive, which can be accessed by visiting the History of the device in the Archive section, and can view the date of that day and also extract the Excel file on the flash.

Export

This option is used to transfer data about a graph of a time period that depends on the time grid in the Group Setting. This data is stored on the USB flash drive, by the device name as an Excel file. The file can easily be analyzed in an Excel environment.

Note: Flash memory format must be Fat32.

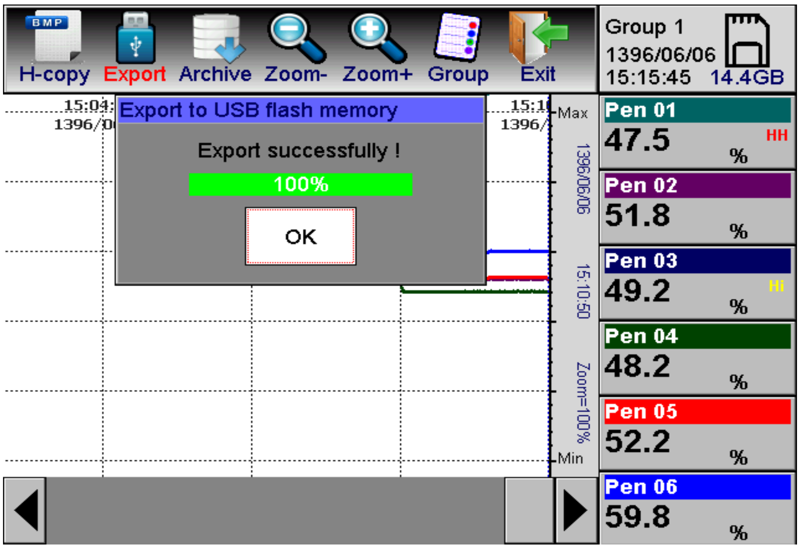


Figure 5-27: Export option in the History menu

Archive

The data of a specific day in the archive is visible in this section by entering data about that day.

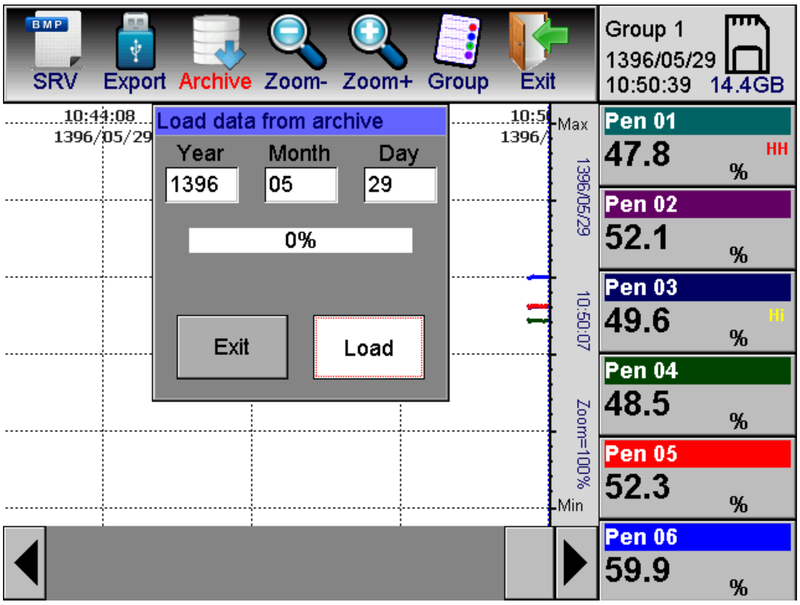


Figure 5-28: Archive option in the History menu

Zoom+, Zoom-

The two options are used to zoom in and out.

Home

This option is used to return to the main menu of the device.

Note: To save specific time data, first go to the Archive section and enter the date of the data we have, and then select the Load option. The history entry is saved as an Excel file by the Export section and will be easily accessible.

Attachment 1

Formulating

Formulating is one of the most important features of this device, which makes it possible to do a variety of tasks with this device. We have some formulations as well as some conditional sentences along with a number of examples.

List of available functions are as below:

$Pow(x,n)$	Calculates x^n.
$Mod(x,y)$	Returns the remainder of x by dividing y.
$Sqrt(x)$	Returns the second root of x.
$Cbrt(x)$	Returns the third root of x.
$Log2(x)$	Calculates the second base Log x.
$Log(x)$	Calculates the tenth base of Log x.
$Ln(x)$	Calculates Ln(x).
$Exp(x)$	Calculates the value of the nip to x.
$Exp2(x)$	Calculates 2^x.
$Sin(x)$	Calculates sin x. (x is based on radian.)
$cos(x)$	Calculates cos x. (x is based on radian.)
$Tan(x)$	Calculates tan x. (x is based on radian.)
$Asin(x)$	Calculates the amount of Arc sin in the x variable. (x is based on radian.)
$Acos(x)$	Calculates the amount of Arc cos in the x variable. (x is based on radian.)
$Atan(x)$	Calculates the amount of Arc tan in the x variable. (x is based on radian.)
$Atan2(x)$	Calculates the amount of Arc tan in the x variable. (Only the main angle is calculated.)
$Abs(x)$	Calculates the absolute value of x.
$Fabs(x)$	Calculates the absolute value of x. (The answer is a decimal number.)
$Floor(x)$	Calculates the bracket of x.
$Round(x)$	Rounds the value of x.
$Min(X1, X2, \dots., X10)$	Returns the smallest of the input parameters. (This function has a maximum of 10 inputs.)
$Max(x1, X2, \dots\dots, X10)$	Returns the largest value of the input parameters (this function has a maximum of 10 inputs.)
$Avg(X1, X2, \dots., X10)$	Returns the average of the input parameters (This function has a maximum of 10 entries.)

Variables

To access input values (read) and device output; some variables are considered. The list of these variables is as follows:

Ta	The ambient temperature is accessible by this variable.
Sec	The instantaneous value of second in the system's clock is accessible by this variable.
$Minute$	The instantaneous value of minute in the system's clock is accessible by this variable.
$Hour$	The instantaneous value of hour in the system's clock is accessible by this variable.
Day	The number of the day from the current date is accessible by this variable.
$Month$	The number of the month from the current date is accessible by this variable.
$Year$	The number of the year from the current date is accessible by this variable.
$I1, \dots, I16$	With the exception of the amount received from thermocouple sensors and thermo-resistant, the numerical value of the desired channel (channels 1 to 3) determined by the linear equation and defined by the min and max parameters will scale to a new value. These new values, as well as temperatures read from thermocouple and thermos resistant, are available within these variables.
$P1, \dots, P24$	The values obtained from the equations of each pen are available in these variables.
$O1$	Holds the current value of current 1 output. Flow output is in milliamps and in decimal form.
$R1, R10$	Holds the status of turn off and on in output relay. (If it is on, the value is 1 and if it is off, the value is zero.)
$HHx \quad (x = 1, \dots, 16)$	Holds the maximum amount of a pen.
$LLx \quad (x = 1, \dots, 16)$	Holds the minimum amount of a pen.
$Hx \quad (x = 1, \dots, 16)$	Holds the maximum amount of a pen.
$Lx \quad (x = 1, \dots, 16)$	Holds the minimum amount of a pen.

How to use functions and variables?

1	$I1$	Given the input configuration 1 as the flow input, the output follows the input current 1. (Like jumper input 1 to output)
2	$log(I1 + I2/2)$	
3	$Avg(I1, \ldots, I3)$	Assuming three temperature sensors in three points of an environment and connecting them to inputs of one to three, the average environmental temperature is calculated.
4	$Min(I1, \ldots, I3)$	By connecting three pressure sensors to the inputs of one to three, the minimum pressure sensor is displayed.
5	$I2/60$	Assuming placing the second input in the frequency meter mode and connecting it to the turbine's turret sensor, the frequency will be calculated by dividing the number of input pulses by 60.
6	$Avg(p1, I1)$	Assuming the temperature sensor is connected to input number 1, a kind of filter is created by this phrase that prevents unwanted fluctuations.
7	$(I1 + I1\verb|^|2 + I1\verb|^|3 + I1\verb|^|4)/(I1 +$ $)I1\verb|^|2 + I1\verb|^|3 + I1\verb|^|4 + I1\verb|^|$	
8	$I1/2.5 \times 1000$	Assuming the connection of a pressure transducer with a frequency output (one mill bar equivalent to 2.5 Hz), the input of i1 calculates the equation of input pressure in terms of bar.
9	$Equation\ in\ pen2$: $exp((I2 * 4 * 8.31441)/(8.31 * (I1 + 273.16))$	An oxygen sensor in the smoke (zirconium oxide) is connected to the input channel 2 and a thermocouple (which reads the core temperature of the sensor) is connected to Channel 1. The equation, written in pen2, represents the output value of the sensor.

It should be noted that these variables are read-only and you can't write anything in them.

Using control commands to command relays number one and two

The list of commands you can use is as follows

<table>
<tr><th>operator</th><th>Usage</th></tr>
<tr><td>==</td><td>Evaluate the equivalence of the two variables</td></tr>
<tr><td>></td><td>Check of being smaller</td></tr>
<tr><td><</td><td>Check of being larger</td></tr>
<tr><td>>=</td><td>Compare being larger or equal between two variables</td></tr>
<tr><td><=</td><td>Compare being smaller or equal between two variables</td></tr>
<tr><td>! =</td><td>Check the inequality of two values</td></tr>
<tr><td>&&</td><td>Check the validity of the two conditions simultaneously (and operator)</td></tr>
<tr><td>||</td><td>Check the validity of one or both of the two conditions (OR operator)</td></tr>
<tr><td>!</td><td>Reverse check result (NOT operator)</td></tr>
</table>

To control and place the condition for the on or off status of each of the relay outputs in the setting screen, enter the Relay menu. The relay field is equal to the relay we intend to control. In the on condition field, enter the condition or conditions that activates when the relay is set up. In the off condition field, enter the condition or conditions that causes the relay to be deactivated.

1	$On\ condition:$ $i1 > 50$ $Off\ condition:$ $i1 < 40$	Assuming that the thermocouple is connected to input number 1, if the temperature is increased by 50 ° C, the relay is activated and the relay switches off if the temperature is lower than 40 ° C.
2	$On\ condition:$ $i1 > i2$ $Off\ condition:$ $i2 <= i1$	If the value of I1 is greater than I2, the relay is activated and otherwise it is deactivated.
3	$On\ condition:$ $(sec == 20)\&\&(min == 30)\&\&(hour =$ $= 18)$ $Off\ condition:$ $(sec == 20)\&\&(min == 40)\&\&(hour =$ $= 18)$	The relay turns on at 18:30:20 pm for 10 minutes and turns off after ten minutes.
4	$On\ condition:$ $i1 > 50 \vert\vert\ i2 > 10$ $Off\ condition:$ $i1 < 50\&\&\ i2 < 10$	Assuming the thermocouple is connected to the input 1 and the pressure sensor to the input 2, if the temperature is increased more than 50 ° C or the pressure is greater than 10 bar, the relay is activated and if the input of number 1 is less than 50 at the same time and the input 2 is less than 10, relay is disabled.
5	$On\ condition\ \ (Relay1):$ $avg(i1,i2) == 50\ \&\&\ (R2 == 1)\&\&(!\,i3)$ $Off\ condition\ (Relay1):\ i3$	Assuming two RTDs are connected to inputs 1 and 2, the input configuration number 3, as a digital input, if the average temperature of both sensors is 50 ° C and the relay number 2 is also active, the relay Number 1 is activated. If the input number 3 is activated, the relay number one is deactivated.
6	$On\ condition\ \ (Relay1):$ $avg(i1,i2) == 50\ \&\&\ (R2 == ON)\&\&(!\,i3$ $Off\ condition\ (Relay1):\ i3$	The preceding example can be written like this.
7	$On\ condition:\ !\,R1$ $Off\ condition:\ R1$	The relay number one regularly switches on and off every second (0.5 Hz frequency)
8	$On\ condition:\ Ta >= 50$ $Off\ condition:\ Ta < 45$	If the ambient temperature is greater than 50 ° C, the relay is activated and, if it is lower than 45 °, the relay is deactivated.
9	$On\ condition:$ $(i1 == 1)\ \vert\vert\ (i2 >= 3333\ )\ \vert\vert(i3 >= 3333$ $Off\ condition:$ $(i1! = 1)\ \&\&(i2 < 3333)\ \&\&(i3 < 3333)$	Assuming input configuration number 1 as digital input and inputs number two and three as inputs of frequency and connection of sensor turbine to inputs two and three, and circuit breaker connection to input number 1, with the turbine speed rising (in Each of the inputs of two and three) or the circuit breaker opens, the relay is activated.

10	$On\ condition:$ $(p1 > HH1) \|\| (p1 < LL1)$ $Off\ condition:$ $(p1 =< HH1)\ \&\&\ (p1 >= LL1)$	If the value of pen 1 is greater than or less than the limit, the relay will be activated, and if the value of item 1is in the allowed range, the relay will turn off.
11	$On\ condition:$ $(Ta >= 50\ \&\&\ i1 >= 40) \|\| (P1 >= HH1$ $Off\ condition:$ $(Ta < 45\ \&\&\ i1 < 35)\ \&\&\ (P1 < HH1)$	If the ambient temperature is greater than 50 ° C and at the same time, the temperature reading from channel 1 is more than 40 ° C, the relay is activated. Also if the value of pen 1 is exceeds the maximum value, the relay will be activated. If all input values are lower than the permitted value, the relay will turn off.
12	$ON\ CONDITION\ (RELAY1):$ $R2 == OFF$ $OFF\ CONDITION\ (RELAY1):$ $R2 == ON$	In this case, the relay number 1 is in the opposite position with the relay number one.
13	$ON\ CONDITION\ (RELAY1):$ $P1 > 50\ \&\&\ TR >= 6$ $OFF\ CONDITION\ (RELAY1):$ $P1 < 45 \|\| TR < 6$	In places where the device's input signals are received, signals from other devices (e.g., isolators) are taken, and all of these devices may be powered or disconnected simultaneously. When the devices are turned on (or the power is interrupted) due to the fact that the time of stabilization of all the devices is not the same, a signal with some incorrect signal can be applied to the input at the moment of turning on the device and cause the false command To make. To avoid this problem, conditions that directly stimulate the quantities generated by other devices can depend on the duration of the system being switched on. In this case, you can consider the time in seconds as the process's sustainability time, so that no order is issued within this period. For example, consider the case where the input signal number 1 of this device is connected to an isolator and converted to a temperature degree by pen (PEN) number one. Supply of the isolator and PR5618 are also provided at a common source. If the power is interrupted, due to a 6-second delay in checking the temperature rise condition, the possibility of an error alarm will be lost.

Attachment 2

Calibration

Input Calibration

If you need to calibrate each of the device inputs, the following conditions must be met at first:

1. The device must be turned on and the Warm Up time must be passed. (About 15 minutes)
2. Log on to the device at the service level.

The device must be calibrated in 4 different types of signals. Signal measurement calibration must first be performed in mV like a thermocouple. Each step of the calibration has two parts:

Part 1: Then, in the screen menu, enter the Input Overview section and a screen opens as shown in Figure A-2. Then, by touching the numerical area of the desired channel, in accordance with Figure B-2, the Analog Input Calibration window opens; then the offset button should be touched. This will calibrate the offset value if the above is followed.

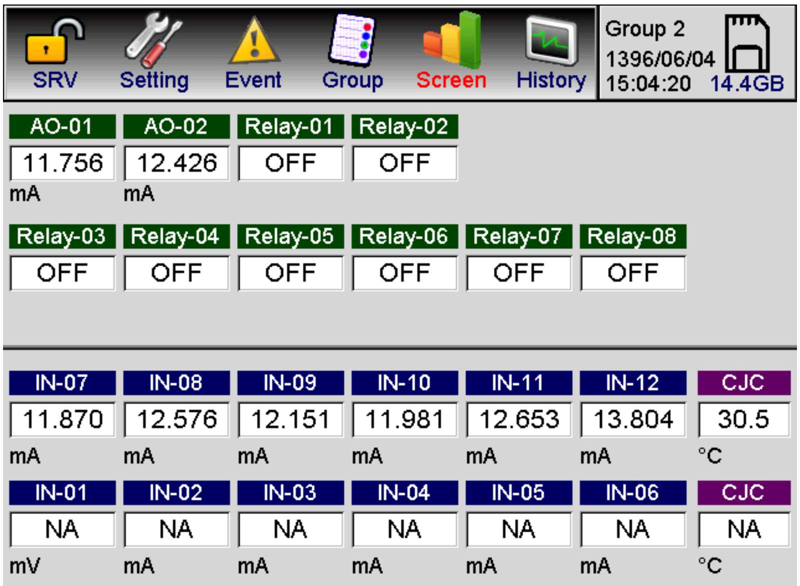


Figure A-2: Input overview page

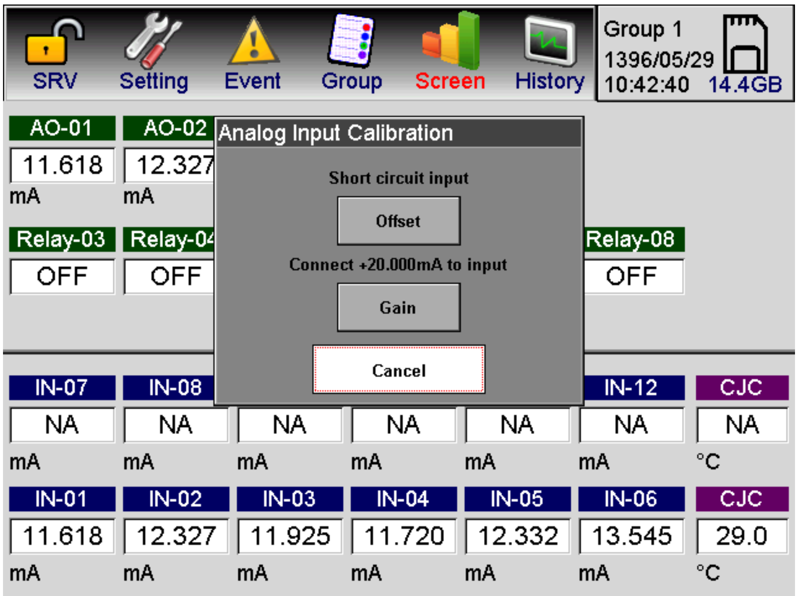


Figure B-2: Analog Input Calibration window

Offset calibration is performed for all inputs in this way.

Part 2: It is the Calibration of the input Gain value. To do this follow the below structure:

For the mV calibration, the exact value of 400 mV,

For calibration -1 ~ 1V and 0 ~ 1V, the exact value of 1.800,

For calibration of voltages above 5V, exact value of 8.000,

For the calibration of the mA measurement, an exact value of 20.000 mA,

And for the calibration of the thermos resistant, a precision resistor of 500 Ohm should be connected to the input.

Then, by touching the numeric area of the desired channel, the calibration window opens. Then the Gain button should be touched. This will calibrate the Gain value if the above is followed.

Note: The calibration order of each input should be as follows:

1. Gain offset calibration, with input type of mV
2. Gain offset calibration, input type 0 ~ 1V
3. Gain offset calibration, input type 0 ~ 10V
4. Gain offset calibration, input type 4 ~ 20 mA
5. Gain offset calibration, input type is thermos resistant.

Calibration of mA outputs

First, by pressing the output numeric area on the Input overview screen and opening the calibration window as shown in Figure C-2, enter the Gain value equal to one and press the Calibrate button. Then attach a precision milliamp meter to the desired output and obtain the desired output Gain by the following formula:

Gain = (The value measured by a precision Ma meter / ideal output value)

Then enter the value obtained for Gain through the calibration page and touch the Calibrate key.

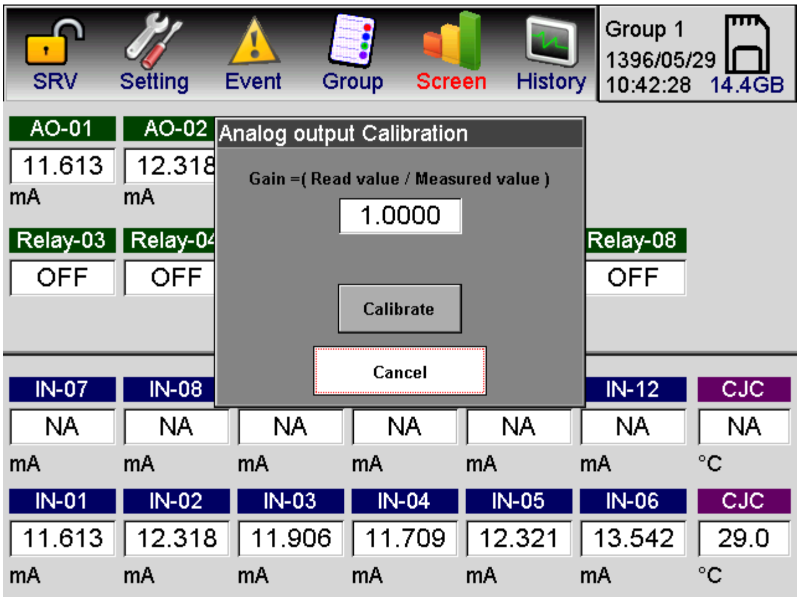


Figure C-2: Analog output calibration window

If all the above steps are done correctly the output will be calibrated.

Attachment 3

Alarms

• How do we get yellow and red alarms in the device?

In the SETTING menu, in the PEN submenu, for each item from 1 to 24, values are set as HH, H, LL, and L. Whenever the instantaneous value of a pen is between L (LOW) and H (HIGH), that pen has no alarms and is in normal condition. Yellow indicates the warning status. If the value of a pen is greater than H or less than L, we are in a warning state. Red indicates the alert status. If the value of a pen is greater than HH or less than LL, we are in an alert status.

How to display different alarms

- In Horizontal trend submenu, if there are alarms on any of the pens (as shown in Figure A-3), the alarms are shown yellow in Hi and L modes, and red in HH and LL modes in the numeric part of the pens containing alarms.

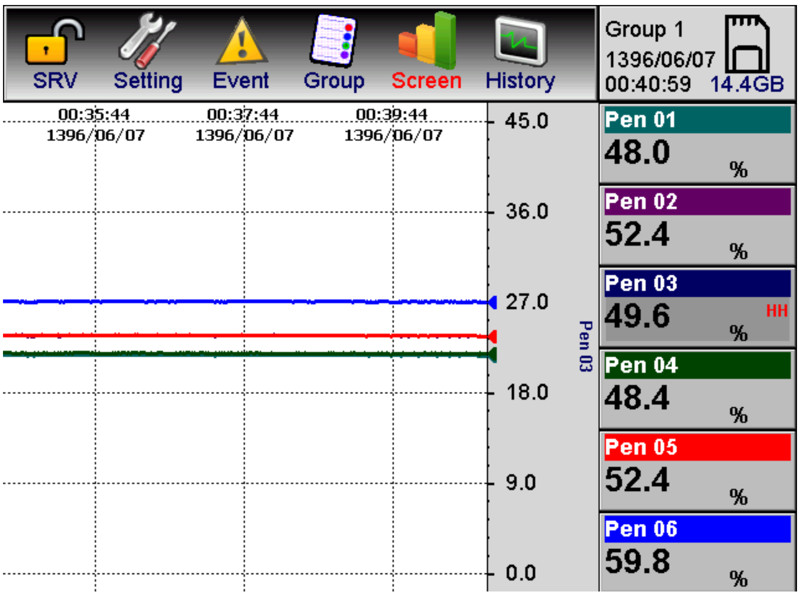


Figure A-3: Displaying alarms in Horizontal trend

- In vertical bar graph submenu, if there are alarms on any of the pens (as shown in Figure B-3), the alarms are shown yellow in Hi and L modes, and red in HH and LL modes under the numeric part of the pens containing alarms.

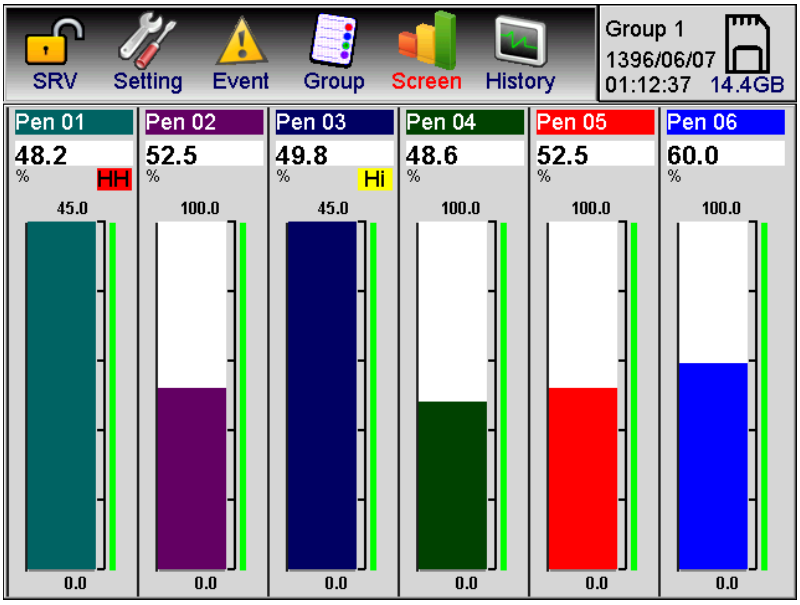


Figure B-3: Displaying alarms in Vertical bar graph

- In the Horizontal bar graph menu, if there are alarms on any of the pens (as shown in Figure C-3), the yellow alarms in Hi and L modes, and the red ones in HH and LL modes at the end of pen bar graph with alarms is displayed.
- In the Single Indicator submenu, if there are alarms on any of the pens (as shown in Figures D-3, E-3, and F-3), the alarms are displayed in yellow in Hi and L modes, and in red in HH and LL modes in the pen bar with alarms. If it is normal, the color of the bar graph will be green.

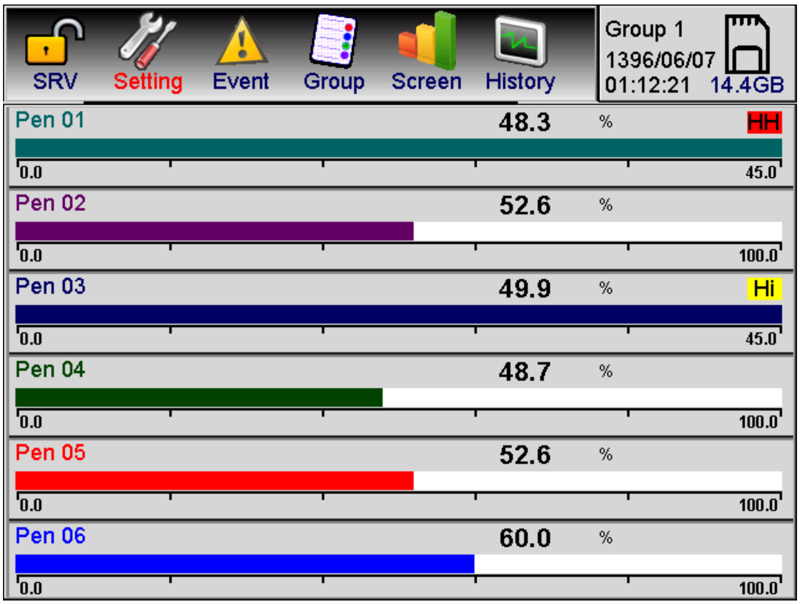


Figure D-3: Displaying alarm in Horizontal bar graph

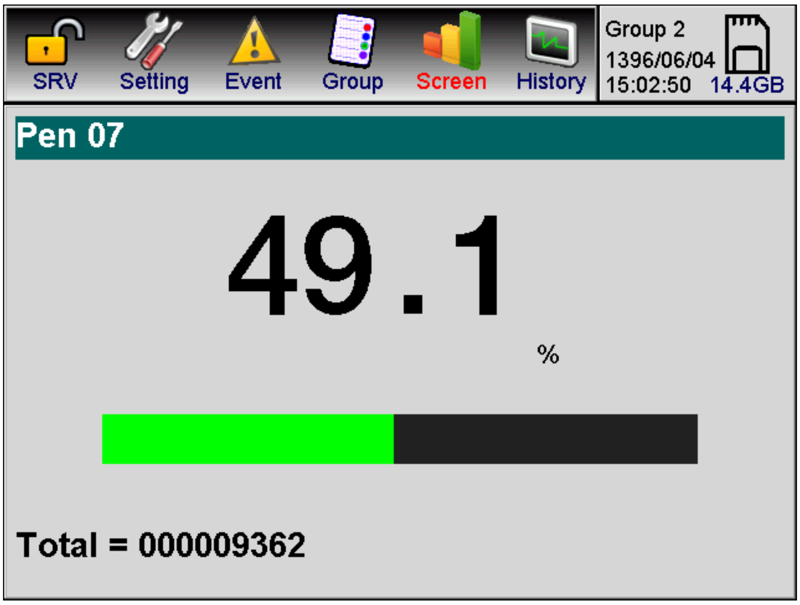


Figure E-3: No alarms in Single Indicator

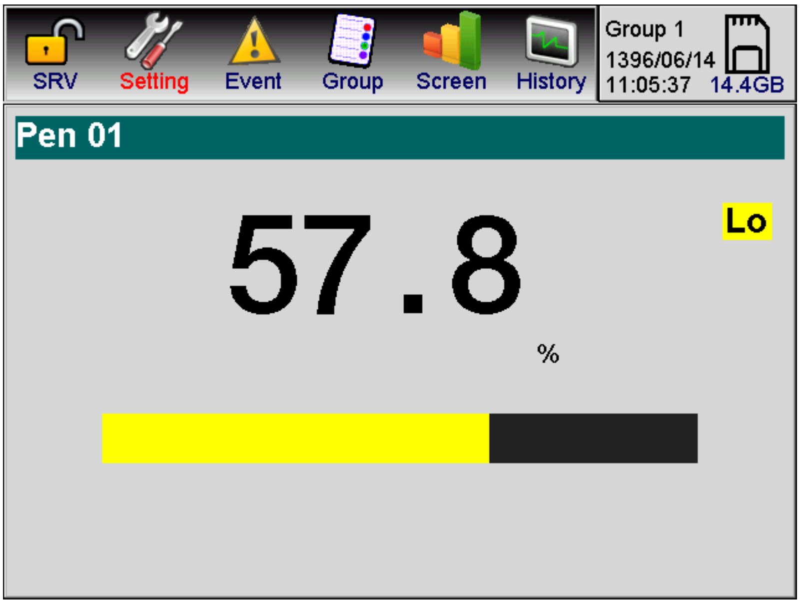


Figure F-3: Displaying alarm in Single indicator

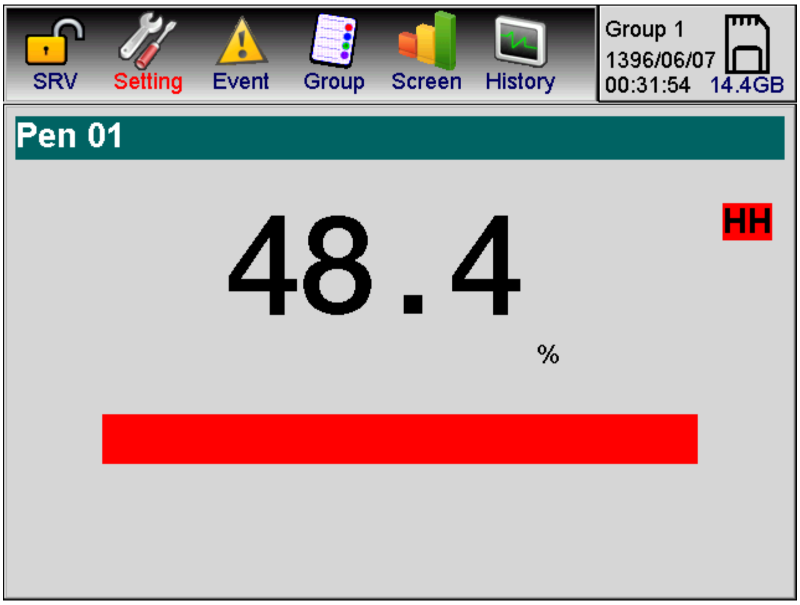


Figure G-3: Displaying alarm in Single indicator

- In the Group Indicator submenu, if there are alarms on any of the pens (as shown in Figures H-3 and I-3), the yellow alarms in Hi and L modes, and the red ones in HH and LL is displayed in the numeric part of the pen with alarms.

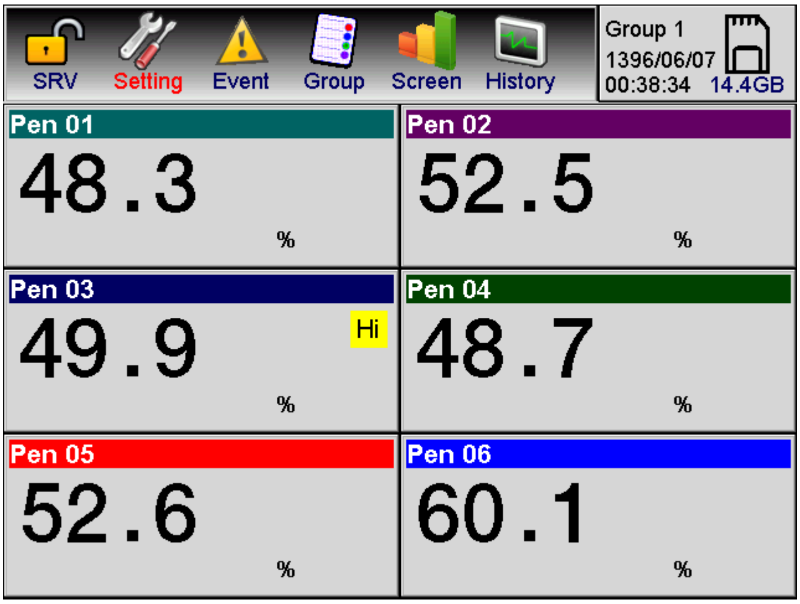


Figure H-3: Displaying alarm in Group indicator

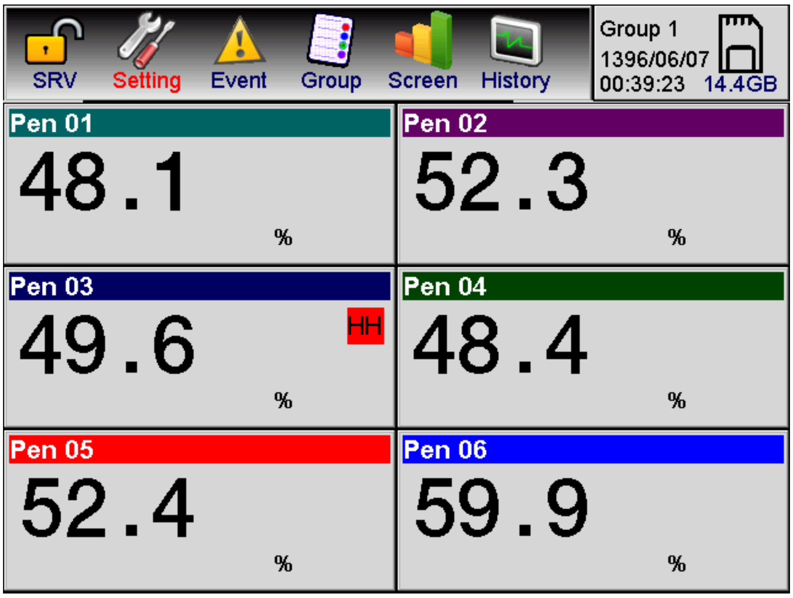


Figure I-3: Displaying alarm in Group indicator

- In the Black indicator submenu, if there are alarms on any of the pens (as shown in Figure J-3), the alarms are displayed by changing color in the numeric values. If there are any alarms, the numbers are yellow in Hi and L modes. , And are displayed in red in HH and LL modes.

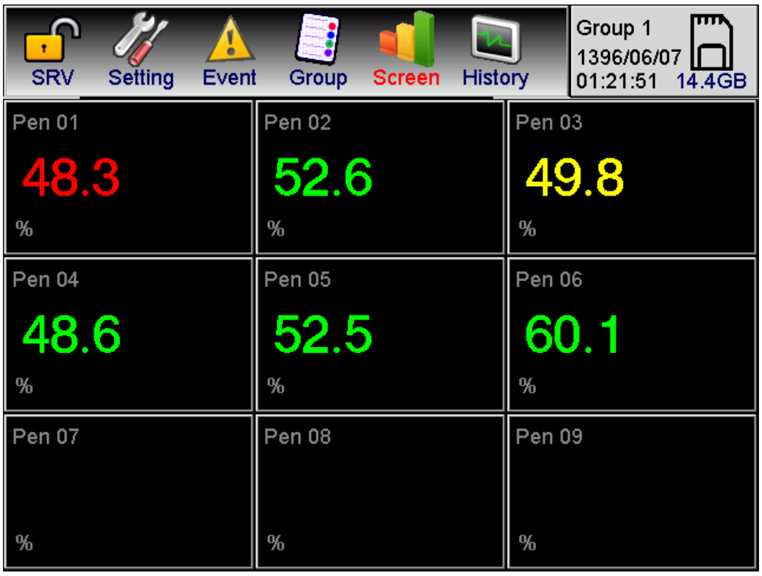


Figure J-3: Displaying alarm in Black indicator

Attachment 4

How to connect different signals to inputs

This device has sixteen 16-bit universal input channels with 1.5KVDC three-way electrical isolation, each channel containing three input pins. The pin number 1 is negative in all input channels (-) and pin number 2 is positive (+) in all input channels.

- If the input is a current type (mA), the negative part is connected to pin 1 and the positive part to pin 2.
- If the input is a voltage type, the negative part is connected to pin 1 and the positive part to pin 2.
- If the input is a thermocouple type, the negative part is connected to pin 1 and the positive part to pin 2.
- If the input is a frequency type, the negative part is connected to pin 1 and the positive part is connected to pin 2.
- If the input is RTD type, since the input has three wires, the common part is connected to pin 1 and the other two parts is connected to pin 2 and 3. (To connect temperature sensor RTD, PT100…, these sensors must be connected to the device according to the RTD column in Figure 1.)

Figure A-4 shows how the different signals and sensors are connected to the input of the device.

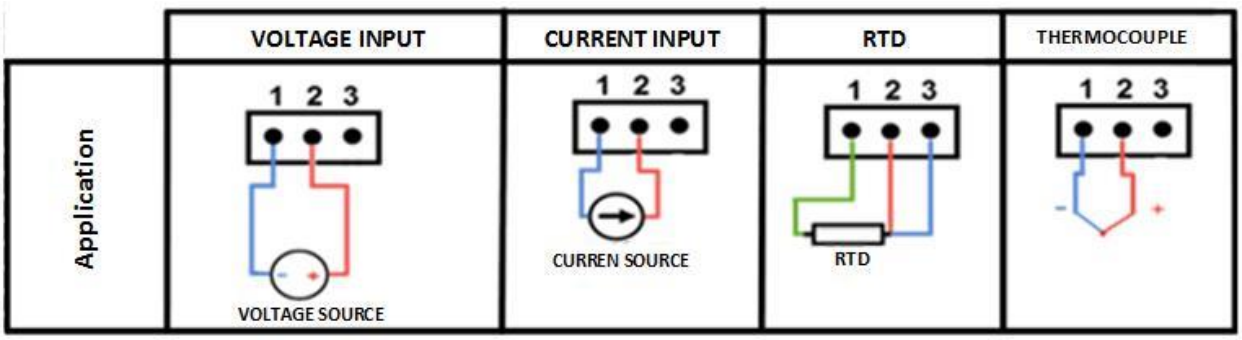


Figure A-4: How to connect signals and different sensors to inputs

Outputs

This device has two current analog outputs and 10 digital outputs as relays according to Figure B-4:

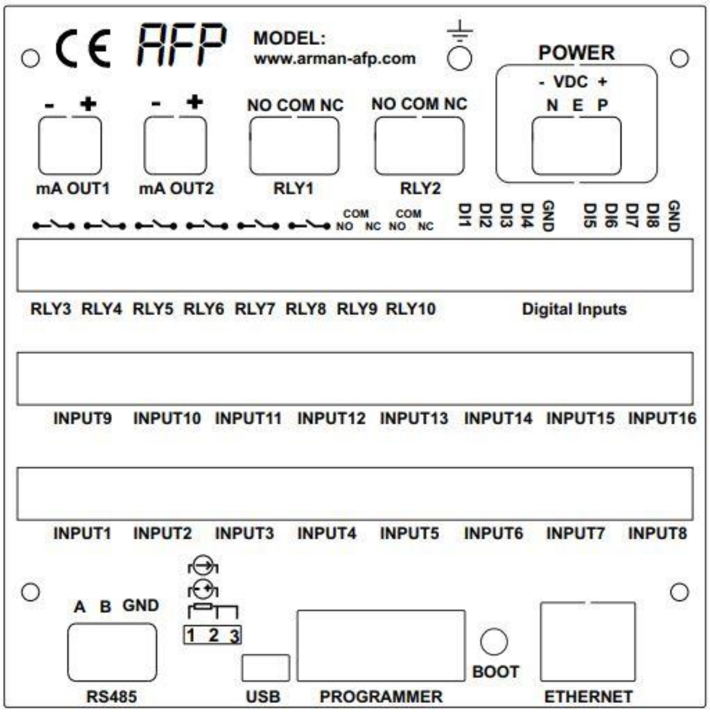


Figure B-4: Connections in back of the device

Output relays

This section is responsible for turning digital output on or off (relay, SSR, OPEN, COLECTOR) and operates as shown in Figure C-4:

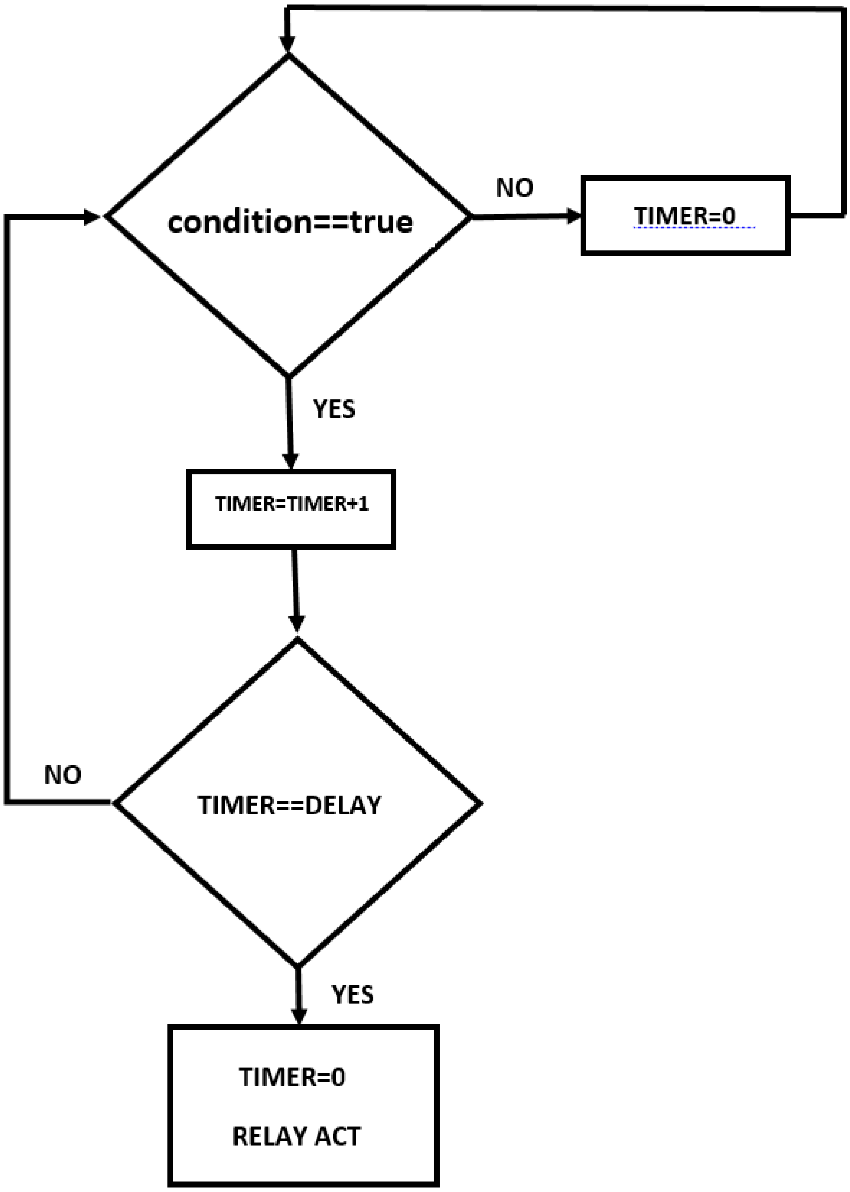


Figure C-4: How the relay outputs work

First, the condition defined for On condition is examined; If this condition is set, the relay timer starts counting and if the timer value reaches On delay the relay will turn on. If the On condition is not set, the timer will turn on and reset. Then if the relay turning off condition is not set, the relay turning off condition is checked and if this condition is set the turning off timer starts counting. If the timer value reaches Off delay, the relay will turn off. If the Off condition is not set, the turning off timer will reset. (It is replaceable with ssr output and open collector if needed.)

Analog output

The block diagram of the analog output section is shown in Figure D-4.

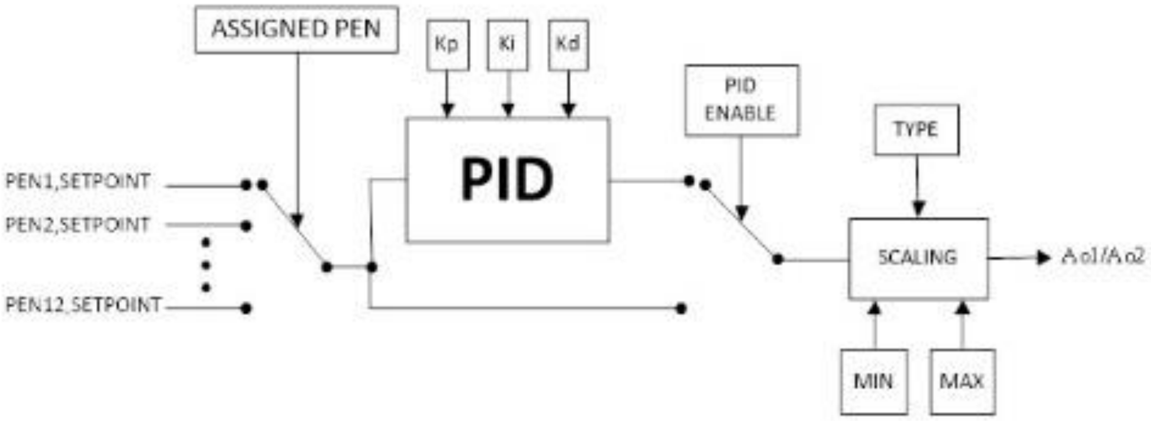


Figure D-4: Block diagram of the analog output section

The analog output value is based on mA. This value is calculated based on the related settings to this section. Also, by activating the PID unit, this section can be used to control a process.

The parameters for this section are:

Assigned PEN

This parameter determines the effective font in the calculations of this section.

Type

This parameter determines the type of analog output and can be displayed in one of three modes: 4 ~ 20 mA 0 ~ 20 mA and 0 ~ 5 mA.

Min, Max

These two parameters adjust the output range of the mA signal.

PID

If this parameter is enabled, the analog output value is updated based on the PID calculations based on the set point, Kp, Ki, Kd parameters and the current value of the selected font.

Ordering code

PR5618	

code	Analog Inputs
A	8-channel
B	16-channel
C	24-channel

code	Digital Inputs*
A	0-channel
B	8-channel
C	16-channel
D	24-channel

code	Analog Outputs
1	1-channel
2	2-channel

code	Digital Outputs **
A	2-channel
B	6-channel
C	10-channel
D	14-channel

code	Digital Output Types
R	Relay (NO & NC)
S	SSR
O	Open-Collector

code	communication
A	RS485
B	ETHERNET
C	RS485 & ETHERNET

code	Power
H	80~260 VAC/VDC
L	24 VDC +/-20%

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Note:

* In Relay Type there are two contacts, NO (normally open) and NC (normally close).