English

User Manual

Current Calibrator PCE-RTD 20

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1 Safety notes

Please read this manual carefully and completely before you use the device for the first time. The device may only be used by qualified personnel and repaired by PCE Instruments personnel. Damage or injuries caused by non-observance of the manual are excluded from our liability and not covered by our warranty.

- The device must only be used as described in this instruction manual. If used otherwise, this can cause dangerous situations for the user and damage to the meter.
- The instrument may only be used if the environmental conditions (temperature, relative humidity, …) are within the ranges stated in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture.
- Do not expose the device to shocks or strong vibrations.
- The case should only be opened by qualified PCE Instruments personnel.
- Never use the instrument when your hands are wet.
- You must not make any technical changes to the device.
- The appliance should only be cleaned with a damp cloth. Use only pH-neutral cleaner, no abrasives or solvents.
- The device must only be used with accessories from PCE Instruments or equivalent.
- Before each use, inspect the case for visible damage. If any damage is visible, do not use the device.
- Do not use the instrument in explosive atmospheres.
- The measurement range as stated in the specifications must not be exceeded under any circumstances.
- To prevent electrical shocks or damage to the instrument, do not connect more than 30 V between the terminals, or between the terminals and the ground.
- This instrument uses a Lithium-Ion battery pack. To prevent an explosion or fire, do not short circuit, do not disassemble and keep it safe from damage.
- To prevent battery leakage or heat generation, only use the battery charger in the temperature range 0 … 45 °C (32 … 113 °F).
- To make sure the display shows the correct data, disconnect the test leads before you set the power to on or change to another measure or source function.
- To prevent damage to the display, do not use sharp objects on the screen.
- Only sufficiently skilled persons may use the meter. Qualifications from an approved training establishment may be necessary.
- Follow good engineering practice at all times.
- Non-observance of the safety notes can cause damage to the device and injuries to the user.

We do not assume liability for printing errors or any other mistakes in this manual.

We expressly point to our general guarantee terms which can be found in our general terms of business.

If you have any questions please contact PCE Instruments. The contact details can be found at the end of this manual.

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2 PCE-TTC 30 Hardware Parts and Accessories

2.1 Unpacking and Inspection

At the factory each new PCE-RTD 20 passes a careful inspection. It should be free of scrapes and scratches and in proper operation order upon receipt. The receiver should, however, inspect the unit for any damage that may have occurred during transit. If there are signs of obvious mechanical damage, package contents are incomplete, or the instrument does not operate according to specifications, contact the purchasing sales office as soon as possible.

Delivery contents:
1 x RTD Calibrator PCE-RTD 20
3 x Laboratory cables with 2 mm plug
3 x 2 mm laboratory cables with alligator clips
3 x Adapter 2 mm on 4 mm laboratory cable
1 x Mini USB cable
1 x Power supply 5V / 1 A
1 x Carrying bag
1 x User manual

The software can be downloaded here: https://www.pce-instruments.com/english/download-win_4.htm

If you have to return the instrument to the factory for any reason, use the original packing whenever possible. Include a detailed description of the reason for the return.

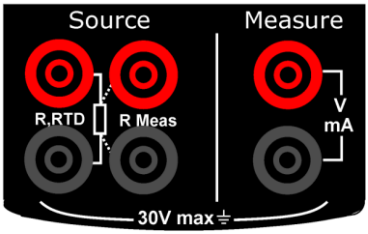
2.2 Operational Sections and Connections

All sections and connections are presented in detail on the next pages.

Note: Keep in mind that the next picture (as well as all pictures of PCE-RTD 20 in this manual) has an example configuration of modules. The configuration of your PCE-RTD 20 may vary significantly from the one in the picture.

1 Terminal Connection for RTD Measure and Source and EM Measure
2 Keypad Section
3 Color Display
4 USB Connection Slot for PC Communication and Charging

2.2.1 Terminal Connections



EM Measure Terminals

Input Terminal for measuring voltage, current and supplying loop power.

EM Measure Terminals	
mA	Range: 0.000 … 24.000 mA Resolution: 0.001 mA
mA(24V)	Range: 0.000 … 24.000 mA Resolution: 0.001 mA
V	Range: 0.000 … 30.000 V Resolution: 0.001 V

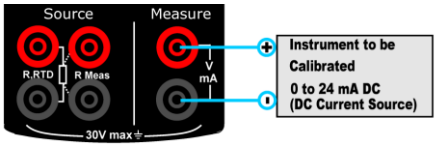
Current Measurement

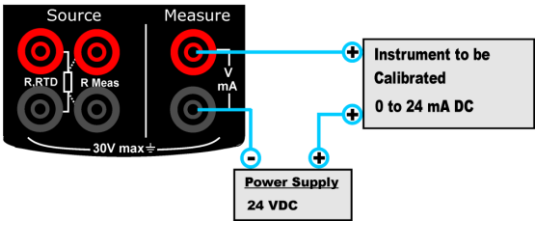
The PCE-RTD 20 supports current measurement using either PCE-RTD 20 as the loop power supply while at the same time measuring the current or simply measuring the current while an external power supply is used.

The following picture displays the connection for Current Measurement for different mode. And also different ways of providing the supply power to the loop.

mA Current Measurement

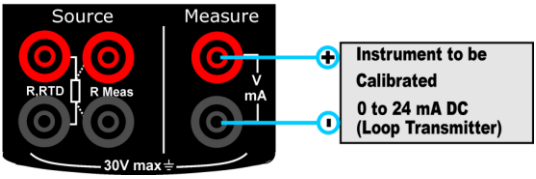
In this mode, the PCE-RTD 20 does not provide any supply voltage. For proper measurement the external device should capable of providing the voltage supply. If the external device should not capable, an external Power Supply should be connected in series.





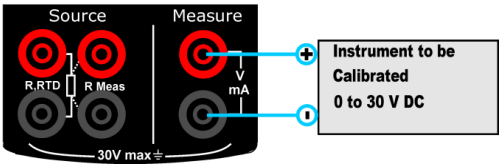
mA Read Power Current Measurement

In this mode, the PCE-RTD 20 works as Loop Power Supply while at the same time measuring the current.



Voltage Measurement

The PCE-RTD 20 is capable of voltage Measurement with two voltage measurement ranges. The following picture displays the connection for Voltage Measurement for different mode.

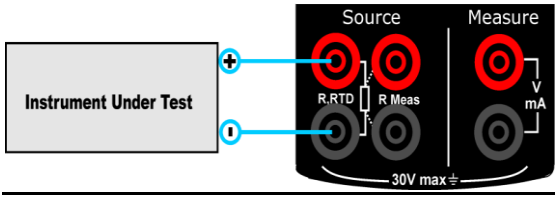


RTD Terminals

Terminals for measuring and simulating RTD. For RTD/Ω types refer to the specifications.

RTD/Resistance simulation

The PCE-RTD 20 is capable of RTD/Resistance generation. The following picture displays the connection for RTD and Resistance simulation. In RTD simulation RTD 20 mimics an RTD. The instrument under test generates the current for the RTD measurement.
The PCE-RTD 20 controls the voltage across its terminals so that the resistance (voltage to Current ratio) corresponds to the simulated temperature. Use of 2-, 3-or 4-wire connection is up to the receiver instrument. Use only the two leftmost terminals with every wiring option. Connect the possible third and fourth wire according to the
Requirements of the connected instrument but use only the two left most terminals.

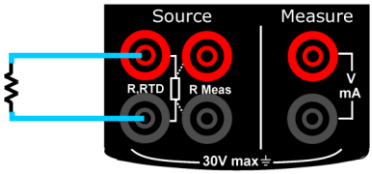


RTD/Resistance measurement

The PCE-RTD 20 is capable of RTD/Resistance measurement. The following picture displays the connection for RTD and Resistance measurement.

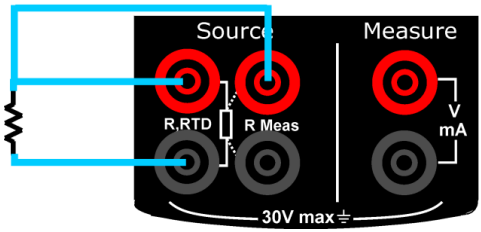
2-Wire RTD Measurement

Two leftmost terminals are used in 2-wire systems. The PCE-RTD 20 displays the selected wiring system in run page. PCE-RTD 20 sources current through the resistor and measure the voltage drop across same terminals. The result is acceptable, if the resistance of the connection wires is significantly smaller than actual measured resistance.



3-Wire RTD Measurement

The PCE-RTD 20 sources current through the resistor and measure the voltage drop across the entire current loop and across the upper side connection wire as shown in figure. If both left side connection wires are identical, the PCE-RTD 20 can compensate for the resistance of the connection wires.



4-Wire RTD Measurement

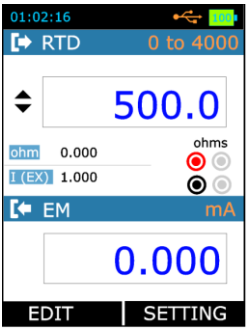
The PCE-RTD 20 sources current through the resistor from two left side terminals and measure the voltage drop across the resistor from the two right side terminals. The 4-wire method gives the resistance between the terminals of the resistor; it is insensitive to the resistance of the connection wires.

2.2.2 KeyPad

The PCE-LOC 20 has six different keys. The key description is given below.

F1	This key has different functionalities in different menus. These are shown in the bottom left part of the display.
F2	This key has different functionalities in different menus. These are shown in the bottom left part of the display.
▼	- Scroll down to next parameter - Decrease value of digit in Editbox
▲	- Scroll down to previous parameter - Increase value of digit in Editbox
MENU ENTER	- Enter menu when in Run mode - Save edited parameter to memory
LOG	- Log current reading in memory if device is in Run mode and log mode is manual - When not in Run mode, this key is used to enter Run mode - Press and hold (approx. 2 s) to turn meter on/off

2.2.3 Display



- LCD with a 2.4” color display
- Resolution of 240x320 pixels
- Supporting 262K colors

2.2.4 USB Connection

- The USB connection is located at the top of the PCE-LOC 20. It is a USB mini B-Type female connector.
- It can be used for PC communication and for charging the device.
- The USB cable supplied with the device is USB A-type male to USB B-type male. It is used for connecting charger and PC.

2.2.5 Stand for Table Top Use

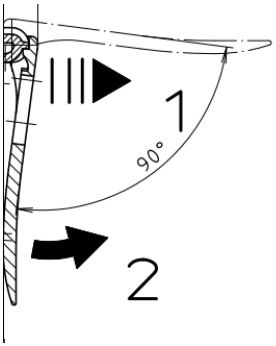
- This stand offers the best support for table top use which gives good viewing angle when the PCE-RTD 20 is placed on a table.
- Procedure to open stand:

is being engraved on the top of the stand.

You should pull a bit first.

is being engraved on the bottom of the stand. Now during first pull of above you can release this lower part easily so that you can

maneuver the stand as you like.



2.3 Power Options

There are three power options:

- Lithium-Ion battery: All the instrument functions are available with a charged battery.
- 5 V DC charging adaptor: It supplies power to the instrument and charges the battery at the same time. It charges the battery when the instrument is on or off.
- USB mini Type B connection: This charges the battery when the instrument is off and increases the battery life when the instrument is on.

2.4 Battery

The Device uses 2300mAh Lithium-Ion battery.

WARNING

- To prevent an explosion or fire, do not short circuit, do not disassemble, and keep it safe from damage.
- To prevent an explosion or fire, use only the supplied battery, battery charger and USB cable.
- To prevent battery leakage or heat generation, only use the battery charger in the temperature range 0 … 45 °C (32 … 113 °F).

When you set the power on, the battery symbol at the top of the display shows the charging status. To get more information on the battery, go to the Battery Info Page in the Setting menu.

2.4.1 Charging time

Charging method	Charging time (to full capacity)
External Charging Adaptor	≈ 5 hours

Note:
USB mini Type B connector charges the battery when the instrument is off and increases the battery life when the instrument is on.

2.4.2 Operating Time

Operation	Battery Duration
Continuous operation (measure or source)	>18 hours
Continuous operation (12mA (24V) measure)	> 8 hours

These are typical operating times for a new, fully charged Li-Ion battery pack with these settings:

- *Backlight Intensity* set to 5% (Default: 100%)
- *Backlight Timeout* set to 0 (0=Infinite) (Default: 0)

Power saving options: To get the best battery duration, set a low value for the *Backlight Intensity* (40%) and a short *Timeout*.

The maximum operating time without recharging varies depending on the usage and brightness setting of the display light. Also the generated output and the usage of the 24 V transmitter supply affect the maximum operating time.

Notes:

- The PCE-RTD 20's memory and the internal clock/calendar use a small amount of power although the calibrator is switched off. Remember to check the capacity of the batteries from time to time although the PCE-RTD 20 is not in use.
- Do not leave the PCE-RTD 20 without a Battery Pack or an Empty Battery for a long time. The PCE-RTD 20 may lose its settings if it is left without a support voltage for an extended period.

3 Start Up and Basic Operations

3.1 Power ON or OFF

To power ON the instrument, press and release the **LOG/Power** button until the display comes on. During the power on sequence, the instrument shows a startup message and then shows the applicable data.
To power OFF the instrument, press and hold (≈ 2 seconds) the same button again. When the power is off, the last set of configuration options stays in memory.

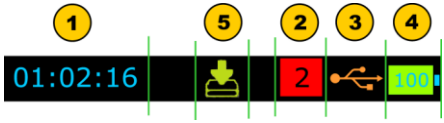
3.2 User Interface

Everytime the PCE-RTD 20 is switched on, the startup message ends in RUN Page.
3 display modes are available in RUN Page.

1. RTD Measure/Source Mode
2. EM Measure Mode
3. RTD Measure/Source + EM Measure Mode

This Display Mode can be selected from MENU→DISPLAY Page.
In case of Dual Mode Display Screen is divided into two parts. Due to that only few additional info will appear on RUN Page. But Which Information to be shows can be selectable in Display Mode Menu.

3.2.1 Status Bar



The status bar at the top of the display is visible only in RUN Page. It is divided into five main sections.

1	Time in HH:MM:SS format Available in two formats 1. 24 hour (default) 2. 12 hour This setting is available in Date/Time in Settings Menu
2	Error Code Indicator This icon is visible if any on-board peripherals like RTC, ADC, DAC, etc. are not working properly, see chapter 5 Maintenance & Troubleshooting. The List of error codes available in this device is given below.

Error code	Description
0	Memory corrupted or device unable to read/write it
1	RTC not working properly
2	Device unable to read battery information
3	Measure mode not working
4	Device unable to get source feedback reading
5	Data log memory corrupt
6	Source mode not working
9	More than one error from above list is occurring

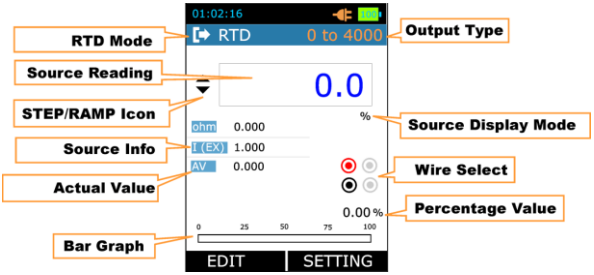
3	USB Connection Status Icon Icon is visible if USB charging adaptor or USB data cable is connected to the device. Icon is different for both indications, see below. USB data cable is connected and communication with PC is available USB charging adaptor is connected. Battery starts charging.
4	Battery Charge Percentage Indicator Always visible in Run page; battery % is shown in the centre of the icon and the icon background is filled with green, yellow or red color if battery % is >= 50%, >= 20 and <20 respectively.
5	Data Logging Enable Status Indicator Icon is visible if data logging is enabled and will flash when a data log is stored to the memory

3.2.2 Function key Bar

The function key bar at the bottom of the display is visible all the time. 2 function keys are available. The meaning of the function keys varies depending on the situation. A blank function key text means that the function is disabled at the moment.

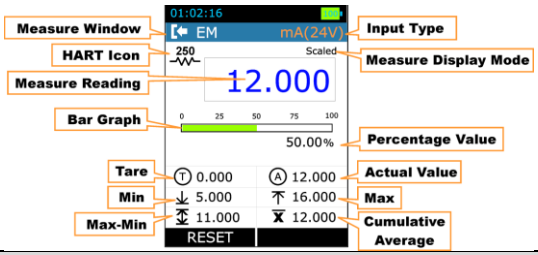
3.2.3 Display Mode

RTD Mode



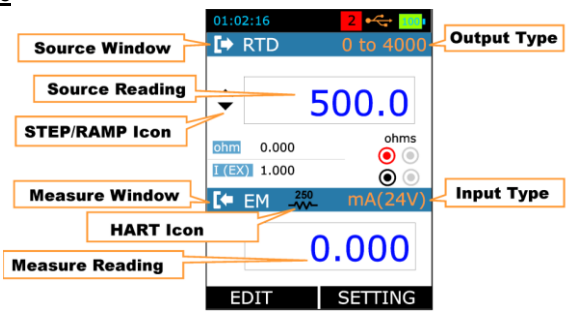
<table>
<tr><th colspan="2">RTD Display Mode</th></tr>
<tr><td>RTD Mode</td><td>Shows the Current RTD Mode
<table><tr><td> </td><td>RTD Measure Mode</td></tr><tr><td> </td><td>RTD Source Mode</td></tr></table></td></tr>
<tr><td>Output Type</td><td>Shows the current RTD Type</td></tr>
<tr><td>Source Reading</td><td>Shows the RTD Source reading according to RTD Type</td></tr>
<tr><td>STEP/RAMP Icon</td><td>Shows the Icon indicating STEP/RAMP mode. Only applicable if RTD mode is SOURCE
<table><tr><td> </td><td>Manual Step</td></tr><tr><td> </td><td>Step UP</td></tr><tr><td> </td><td>Step DOWN</td></tr></table><table><tr><td> </td><td>Rising Ramp</td></tr><tr><td> </td><td>Falling Ramp</td></tr><tr><td> </td><td>Ramp Hold @ 0%</td></tr><tr><td> </td><td>Ramp Hold @ 100%</td></tr></table></td></tr>
<tr><td>Additional Info</td><td>Shows the Addition Information according to TC Mode & Additional Info selected in MENU →DISPLAY→TC terminal</td></tr>
<tr><td>Bar Graph</td><td>Horizontal Bar graph according to RTD Percentage Value (0.00% … 100.00%). The value scales according to RTD reading and Input 0% and 100% value as set in MENU →DISPLAY→RTD terminal Menu</td></tr>
<tr><td>Percentage Value</td><td>The Percentage Value in according to RTD Reading</td></tr>
<tr><td>Wire Select</td><td>Shows which RTD configuration is used (2-wire, 3-wire, 4-wire)</td></tr>
<tr><td>Source Display Mode</td><td>Shows which display mode is selected either percentage or actual</td></tr>
<tr><td>Actual Value</td><td>When display mode percentage Actual value bar display the actual source value</td></tr>
<tr><td>Source Info</td><td>When RTD is in source mode it shows the excitation current which comes from the measure device</td></tr>
</table>

EM Measure Mode



Measure Window	
Input Type	The Input Type mA: mA Current Input mA(24V): mA Current (Read Power-24V) Input V: V Voltage Input
Measure Display Mode	The Measure Reading Display Mode Actual: Displays the Raw Input Value without any scaling Percentage: Displays the Percentage Value. Scaled: Displays the Scaled Value
Measure Reading	The Reading as per the Measure Display Mode
HART Icon	HART Enable Status Icon This icon will appear if HART is enabled from *MENU →SETTING →HART* page. (This icon is visible for mA(24V) Input Type only. For other Input Types this will invisible regardless of HART settings)
Bar Graph	Horizontal Bar graph according to Input Percentage Value (0.00% … 100.00%).
Percentage Value	The Percentage Value in Percentage according to Input Value.
Tare	The Tare Value Set from *MENU→DISPLAY→EM Terminal-Tare* page
Actual Value	The Raw Input Value without any scaling This will appear only if **Main Display** in *MENU→DISPLAY→EM Terminal is* set to **PERCENTAGE/SCALED.**
Min	Displays the minimum value found after a measurement was started or minimum was reset.
Max	Displays the maximum value found after a measurement was started or maximum was reset.
Max-Min	Displays the Maximum-Minimum value found after a measurement was started or Maximum-Minimum was reset.
Cumulative Average	Displays the Cumulative Average value found after a measurement was started or Cumulative Average was reset.

RTD + EM Mode



RTD + EM Mode	
Output Type **Source Reading** **STEP/RAMP Icon** **Source window**	Refer RTD Display Mode above
Input Type **Measure Reading** **HART Icon**	Refer EM Display Mode above

3.2.4 Display Operations

There are mainly four types of widgets available in the Device Menu.

i. ListBox
ii. EditBox
iii. CheckBox
iv. RadioButtonBox

The below section will show how to change the value of the different widgets.

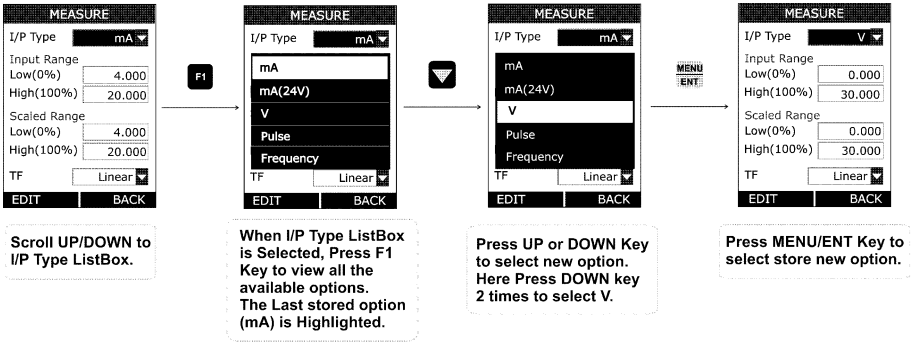
i. ListBox

ListBox are used when there is a limited amount of preset values. You have to select one of the available options. The list of available options is displayed in the Centre part.

A ListBoxList opens when you press the **F1**key. Use **UP/DOWN** key to scroll through the available options. Select one of the options with the **ENTER** key.

Example: How to change of Input Type (I/P Type) from mA to V.

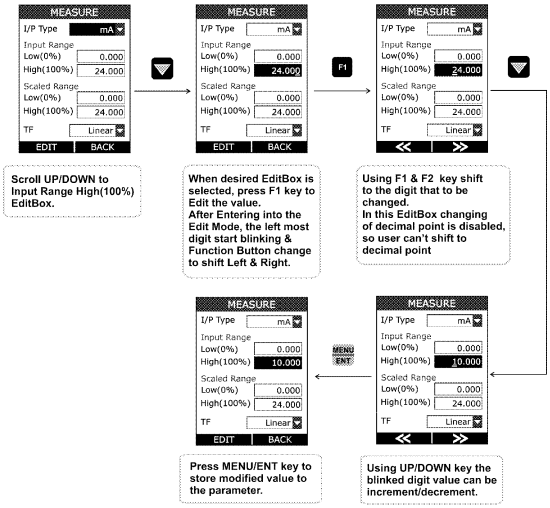
This Option is available in *MENU→EM SETUP* Page



ii. EditBox

EditBox is used where a large range of value can be possible for a parameter.

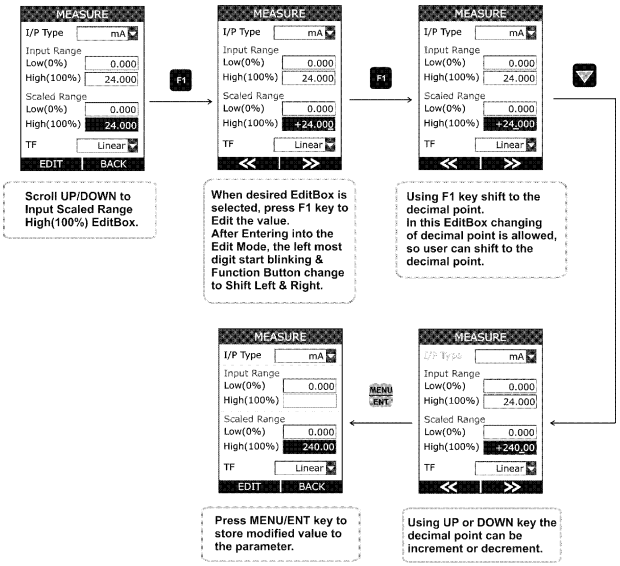
To edit the value of an EditBox press **F1** key. After that EditBox enters into the Edit mode where **F1**&**F2** keys are works as shifter. User can shift to desired digit and using **UP** or **DOWN** key digit value can be incremented or decremented. The modified value can be saved using **MENU/ENT** key.



The above figure shows the example how to change Input High (100%) Range from 24.000 to 10.000 mA.

There are mainly 2 types of EditBox in this device. In most of the EditBox changing of decimal point and changing of sign is not allowed. But there are few EditBox, where these are allowed. Examples Scaled Low (0%) &High (100%) etc.

The below figure shown the example how to change decimal point of the Input Scaled High (100%) Range.

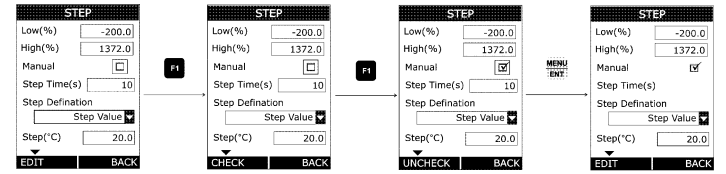


To change the sign of the value, shift to the sign digit and pressing UP or DOWN key will toggle the sign.

iii. CheckBox

CheckBox is used where Binary Value (1/0, True/False) is available for any parameter.

To change the CheckBox status press **F1** key. This will enter into the edit mode. In this mode status can be toggled by pressing **F1** key. Press **MENU/ENT** key to store new status.



Scroll UP/DOWN to Step Manual CheckBox.

When desired CheckBox is selected, press F1 key to enter into Edit mode. After Entering into the Edit Mode, F1 Function Button change to CHECK/UNCHECK according to current status.

Press F1 key to change CheckBox status.

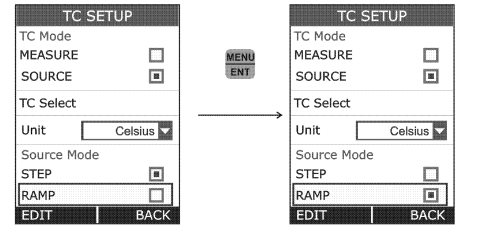
Press MENU/ENT key to store new CheckBox status.

iv. RadioButtonBox

RadioButtonBox is used where very few values can be possible and all the available values need to be visible.

In this device, two types of RadioButtonBox are available. One with 1 value can be selectable and the other where 1 or 2 values can be selectable at a time.
In RadioButtonBox, the other option can be selected by pressing **MENU/ENT** key on that option. When pressing this key the new option will be selected and the other option will be disabled.

Below an example is given, how to change RTD Source Mode from STEP to RAMP.



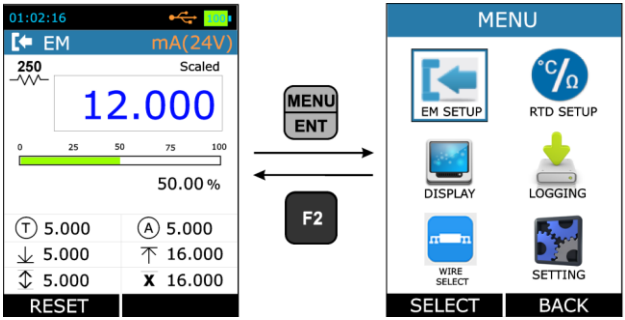
Scroll UP/DOWN to Desired RadioButtonBox option.

Press MENU/ENT key to select the option. Now the new option is selected and other option will be disabled.

4 MENU Layout

4.1 MENU page

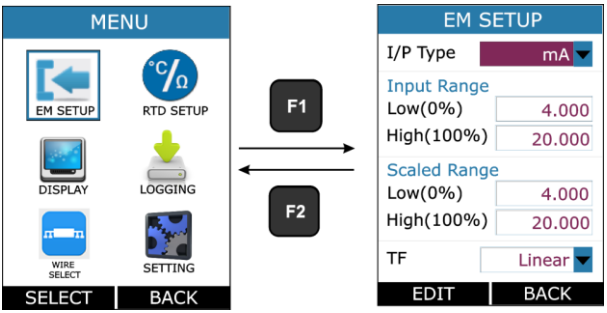
There are mainly six Menus in this device.
To enter into the MENU page press **MENU/ENT** key and press **F2** key to come out from Menu page.



EM SETUP	Contains Parameters related to EM Measure Mode like Input Type, Range etc.
RTD SETUP	Contains Parameters related to RTD like RTD Mode, RTD Type etc.
DISPLAY	Contains Parameters related to different display mode for RUN page
LOGGING	Contains Parameters related to Data Logging.
Wire Select	Contains Parameters related to wire selection mode
SETTINGS	Contains Parameters related to General Settings of the device like display, Date/Time, Calibration, Reset, etc.

4.2 MEASURE Page

This Page is appears in *RUN →MENU →EM SETUP.*



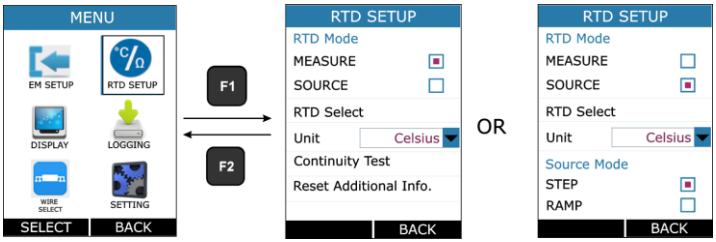
This page contains parameters related to EM Measure like Input Type, Input Range, Scaling and Transfer Function. The Description of the Parameters appear on this page is given below.

Parameter Name	Description / Options
I/P Type (Input Type)	Measure Input Type Available Options: mA : 0.000 … 24.000 mA DC mA(24V) : 0.000 … 24.000 mA DC V : 0.000 … 30.000 V DC
Input Range **Low (0%)**	Low Range for Measure Input Range: Default Input Low to **Input Range High (100%)** This parameter is enabled if **Main Display** in *MENU* →*DISPLAY* →*EM SETUP* is set to **Percentage** or **Scaled.**
Input Range **High (100%)**	High Range for Measure Input Range: **Input Range Low(0%)**to Default Input High This parameter is enabled if **Main Display** in *MENU* →*DISPLAY* →*EM SETUP* is set to **Percentage** or **Scaled.**
Scaled Input Range **Low (0%)**	Scaling Low Range for Measure Input Range: -99999 to **Scaled Input Range High (100%)** Decimal Point for this EditBox is changeable. This parameter is enabled if **Main Display** in *MENU* →*DISPLAY* →*EM SETUP* is set to **Scaled.**
Scaled Input Range **High (100%)**	Scaling High Range for Measure Input Range: **Scaled Input Range Low(0%)**to 99999 Decimal Point for this EditBox is changeable. This parameter is enabled if **Main Display** in *MENU* →*DISPLAY* →*EM SETUP* is set to **Scaled.**

TF (Transfer Function)	Transfer Function for Scaling Available Options: Linear x^2 (x^2) x^(1/2) (√x) This parameter is enabled if **Main Display** in *MENU →DISPLAY →EM SETUP* is set to **Scaled.**

4.3 SOURCE Page

This Page is appears in *RUN →MENU →RTD SETUP.*

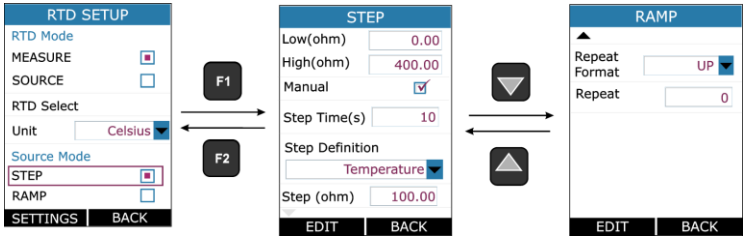


This page contains parameters related to RTD like RTD Mode Type, RTD select, Unit, RTD Source Mode etc. The Description of the Parameters appear on this page is given below.

Parameter Name	Description / Options
RTD Mode	RTD Mode Available Options: MEASURE SOURCE
RTD Select	Select the RTD Type for Measurement / Simulation Refer section 6 on page 48 for more details on RTD type and its available range.
RTD Unit **Unit**	Measure/Source Reading Unit Available Options: Celsius Fahrenheit Kelvin
Continuity Test	To test continuity This Option appear only if RTD Mode is MEASURE.

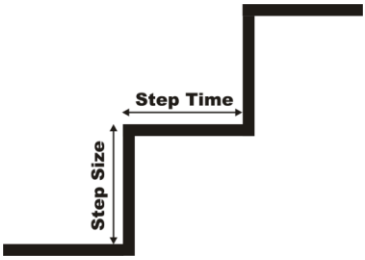
Reset Additional Info	Reset the Additional Info. Like Min, Max of Measure RTD. This option appear only if RTD Mode is MEASURE.
Source Mode	RTD Source Output Format This option appear only if RTD Mode is *SOURCE*. Available Options: STEP RAMP At a time one can be selectable. Press F1 key on the one of the option for more settings.

4.3.1 STEP Page



Parameter Name	Description / Options
Low	Starting Value of Step Enter value according to RTD Display Mode. If display mode is actual enter value in ohms and if display mode is %, enter value in %.
High	Ending Value of Step Enter value according to RTD Display Mode. If display mode is actual enter value in ohms and if display mode is %, enter value in %.
Manual (Output Type)	Step Manual Mode Selection CheckBox Ticking this checkbox will enable Step Manual Mode. And Un-ticking will enable Auto Step Mode.
Step Time (s)	Enter the time for a single step in seconds, Range: 1 … 9999 This parameter is enabled only for Auto Step Mode (Manual CheckBox is un-checked)

Step Definition	Step Definition for the Step function Available Options: Temperature (Appear only if RTD Display mode is Actual) Percentage (Appear only if RTD Display mode is Percentage) User Defined
Step	Step Value in Temperature/mV/% according to RTD Display Mode and RTD unit Only appears if Step Definition is Temperature or Percentage.
Define Steps	User Defined Step value for Manual and Auto Step Mode This option appears only if Step Definition is User Defined. Maximum 10 step value can be configured. First enter the no of step and then define step value in serial order.
Repeat Format	How the stepping should be done. Available Options: UP DOWN UP/DOWN DOWN/UP This parameter is enabled only for Auto Step Mode (Manual CheckBox is un-checked)
Repeat Repeat Counts	Defines how many times the steps are repeated Range: 1 … 9999 This parameter is enabled only for Auto Step Mode (Manual CheckBox is un-checked)



Manual Stepping

To Enable Manual Stepping, select Source Type as STEP and Check the Manual CheckBox.

If this mode is enabled, icon will appear in Source Display Window in RUN Page.

Pressing UP or DOWN key in RUN Page will Increment or Decrement Source Value by Step specified in STEP Page.

In RUN Page, Source Value can directly change by Pressing **F1** key (EDIT) and modifying value like in EditBox. And STEP Setting can be accessed directly by **F2** key (SETTING).

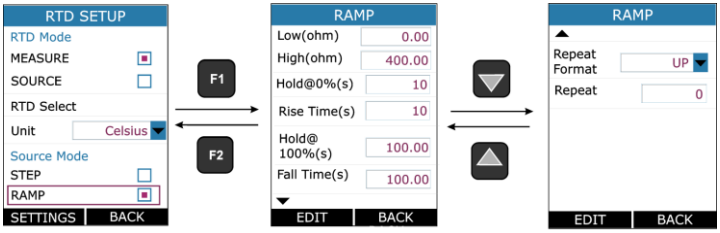
Auto Stepping

To Enable Auto Stepping, select Source Type as STEP and Un-Check the Manual CheckBox.

If this mode is enabled, (Step UP) or (Step Down) icon will appear in Source Display Window in RUN Page and F1 and F2 Button change to **START** and **SETTING** respectively. Automated Step can be started by Pressing **F1** key (START). After that F1 and F2 key will change to **PAUSE** and **STOP** respectively. So by pressing F1 and F2 key running STEP can be PAUSE or STOP at any time in RUN Page.
STEP Setting can be accessed directly by **F2** key (SETTING).

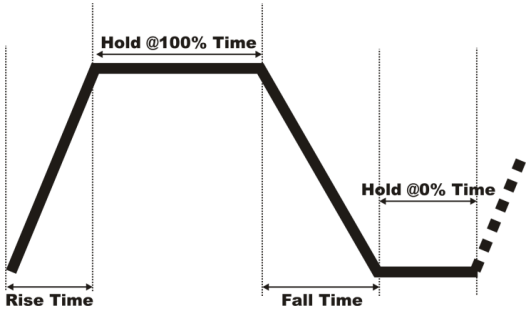
Note: While STEP is running, STEP settings are not accessible and Source Page Parameter settings can't be changed. Stop STEP before changing any settings.

4.3.2 RAMP Page



Parameter Name	Description / Options
Low	Starting Value of Ramp Enter value according to RTD Display Mode. If display mode is actual enter value in ohms and if display mode is %, enter value in %.
High	Ending Value of Ramp Enter value according to RTD Display Mode. If display mode is actual enter value in ohms and if display mode is %, enter value in %.
Hold@0%(s)	Time to wait at Low (0%) level in second This parameter is used for **Repeat Format UP/DOWN** or **DOWN/UP**. Range: 0 … 9999

Rise Time (s)	Time to Increase from Low to High Level Range: 1 … 9999
Hold@100%(s)	Time to wait at High (100%) level in second This parameter is use for **Repeat Format UP/DOWN** or **DOWN/UP**. Range: 0 … 9999
Fall Time (s)	Time to decrease from High to Low Level Range: 1 … 9999
Repeat Format	How the Ramp should be done Available Options: UP DOWN UP/DOWN DOWN/UP
Repeat Repeat Counts	Defines how many times the steps are repeated Range: 1 … 9999



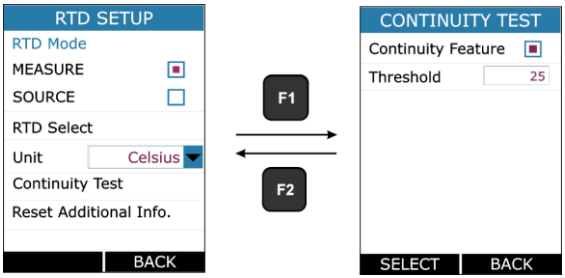
Starting the RAMP

To Enable Ramp, select Source Type as RAMP.

If this mode is enabled, (Rising Ramp) or (Falling Ramp) or (Ramp Hold @ 100%) or (Ramp Hold @ 0%) icon will appear in Source Display Window according to current RAMP mode in RUN Page and F1 and F2 Button change to **START** and **SETTING** respectively.

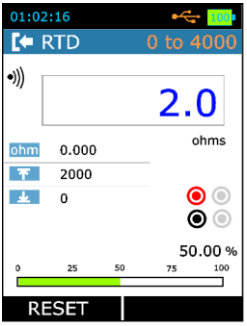
RAMP can be started by Pressing **F1** key (START). After that F1 and F2 key will change to **PAUSE** and **STOP** respectively. So by pressing F1 and F2 key running RAMP can be PAUSE or STOP at any time in RUN Page.

4.3.3 Continuity Test



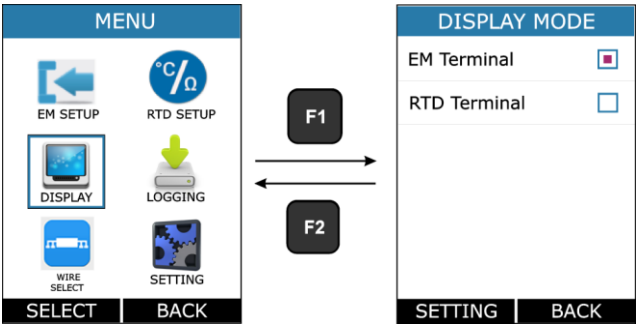
Parameter Name	Description / Options
Continuity Feature	Continuity Feature Selection RadioButtonBox Selecting RadioButtonBox will enable continuity feature for RTD Measure Mode.
Threshold	Enter the threshold value of resistance up to which continuity test is applied. Range: 0 … 100

When Testing Continuity Beep sounds and continuity symbol appear on run page as shown in below figure. When resistance between the Ω Measure terminal is less than 25Ω (or defined in threshold parameter). To test the continuity remove power from the circuit to be tested.



4.4 DISPLAY Page

This Page is appears in *RUN →MENU →DISPLAY.*



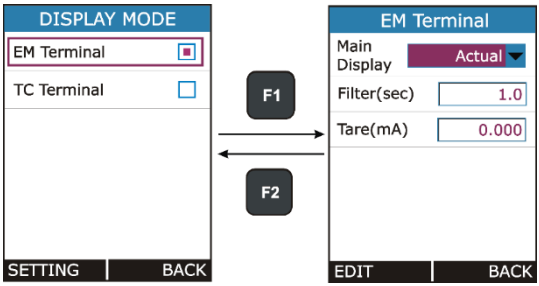
There is mainly three RUN Display Mode possible in this device. And this mode can be selected from the above Page. What information to be shown in each RUN Display Mode can be defined by this page.

In this page there is one RadioButtonBox. At a time one or two option can be selected. The possible combinations are given below.

1	EM (Electrical Measurement) Only
2	RTD (Measure/Source) Only
3	EM + RTD

4.4.1 EM Display Settings

This Page is appears in RUN →MENU →DISPLAY →EM Terminal.



<table>
<tr><th>Parameter Name</th><th>Description / Options</th></tr>
<tr><td>Main Display</td><td>Select which Reading to be display as a Main Reading (Reading Displays in Box in RUN Page).

<u>Available Options:</u>

<table>
<tr><td>Actual</td><td>Display the Actual Input Value</td></tr>
<tr><td>Percentage</td><td>Display the Percentage Value of the Input

The Value depends on Input Range. These settings are available from MENU →EM SETUP.</td></tr>
<tr><td>Scaled</td><td>Display the Scaled Value of the Input

The Scale Value depends on Input Range, Input Scaled Range and Transfer Function. These settings are available from MENU →EM SETUP.</td></tr>
</table>
</td></tr>
<tr><td>Filter(sec)</td><td>1st Order IIR Low Pass Filter for Input Reading
Filter is useful when a measurement signal contains unwanted noise.

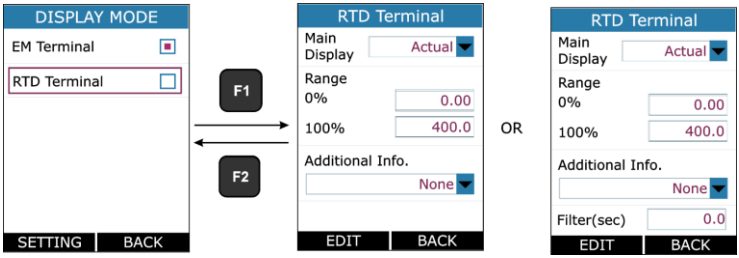
<u>Range:</u>
0.0 … 60.0 sec</td></tr>
<tr><td>Tare(unit)</td><td>The Tare value is subtracted from the reading of the measured value. Here unit is changed according to current Input Type and Measure Display Mode.

<u>Range:</u>
In accordance with Input Range and Measure Display Mode.

Note: Beware of the problems that may result in not seeing the true measurement value.</td></tr>
</table>

4.4.2 RTD Display Settings

This Page is appears in RUN →MENU →DISPLAY →RTD Terminal.



<table>
<tr><th>Parameter Name</th><th>Description / Options</th></tr>
<tr><td>Main Display</td><td>Select which Reading to be display as a Main Reading (Reading Displays in Box in RUN Page).

<u>Available Options:</u>

<table><tr><td>Actual</td><td>Display the Actual RTD/Resistance Value</td></tr><tr><td>Percentage</td><td>Display the Percentage Value of RTD/Resistance according to value set in 0% and 100%.</td></tr></table></td></tr>
<tr><td>0%</td><td>Low Value in Temperature/ohms for (0-100%) scaling</td></tr>
<tr><td>100%</td><td>High Value in Temperature/ohms for (0-100%) scaling</td></tr>
<tr><td>Additional Info.1</td><td>Choose which information to be shown as RTD Mode Additional Information on RUN Page.

<u>Available Options for RTD Measure Mode:</u>

<table><tr><th>Options</th><th>Icon</th><th>Description</th></tr><tr><td>None</td><td>-</td><td>No info is visible.</td></tr><tr><td>Actual Value</td><td>AV</td><td>Shows the Actual RTD Temperature/ohms value without any scaling.
This option is available only if RTD Display Mode is Percentage.</td></tr><tr><td>Maximum</td><td>⤒</td><td>Shows the Maximum measured reading from the time when info last reset.</td></tr><tr><td>Minimum</td><td>⤓</td><td>Shows the Minimum measured reading from the time when info last reset.</td></tr><tr><td>Min & Max</td><td>-</td><td>Shows the Minimum and Maximum value both together. This option available only for RTD Display mode.</td></tr></table></td></tr>
</table>

<table>
<tr><td></td><td>Available Options for RTD Source Mode:

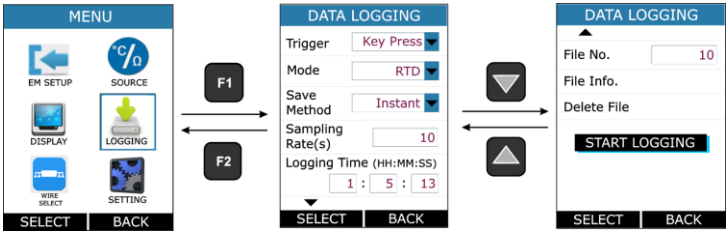
<table><tr><th>Options</th><th>Icon</th><th>Description</th></tr><tr><td>None</td><td>-</td><td>No info is visible.</td></tr><tr><td>Actual Value</td><td>AV</td><td>Shows the Actual RTD Temperature/ohms value without any scaling.
This option is available only if RTD Display Mode is Percentage.</td></tr><tr><td>Excitation Current</td><td>I (EX)</td><td>Shows the current which is sourced by instrument under test.</td></tr></table></td></tr>
<tr><td>Filter(sec)</td><td>1st Order IIR Low Pass Filter for RTD Measure Reading.
This option is available only for RTD mode is Measure.
Filter is useful when a measurement signal contains unwanted noise.

Range:
0.0 … 60.0 sec</td></tr>
</table>

4.5 DATA LOGGING Page

This section gives examples of how to log Readings with time and date over a set time period or on a key press. Logged data is stored in a user defined file in internal memory.

This Page is appears in *RUN →MENU →LOGGING.*



Parameter Name	Description / Options
Trigger	Data Logging Trigger Mode Selection Available Options: <table><tr><td>Key Press</td><td>Log Data on pressing LOG from RUN key Page.</td></tr><tr><td>Periodic</td><td>Log Data periodically at every Sampling Rate for total time specified by Logging Time.</td></tr></table>

<table>
<tr><td>Mode</td><td>Data Mode Selection for Logging

<u>Available Options:</u>

<table><tr><td>EM</td><td>Log only EM Measure Readings.</td></tr><tr><td>RTD</td><td>Log only RTD Terminal Readings.</td></tr><tr><td>EM+RTD</td><td>Log EM MeasureandRTD Terminal both Readings.</td></tr></table>
This parameter is enabled only for Periodic Trigger.</td></tr>
<tr><td>Save Method</td><td>Reading Type selection for Logging

<u>Available Options:</u>
Instant
Min
Max
Average
All

This parameter is enabled only for Periodic Trigger.</td></tr>
<tr><td>Sampling Rate(s)</td><td>Sampling Rate for Periodic Data Logging in seconds

<u>Range:</u>
1 … 9999

This parameter is enabled only for Periodic Trigger.</td></tr>
<tr><td>Logging Time (HH:MM:SS)</td><td>Total Logging Time in HH:MM:SS Format for Periodic Logging.

This parameter is enabled only for Periodic Trigger.</td></tr>
<tr><td>File No.</td><td>File Number.

<u>Range:</u>
1 … 25

This parameter is enabled only for Periodic Trigger.</td></tr>
<tr><td>File Info.</td><td>Shows the information of stored files. This information contains Logging Start Time & Date and No of Samples stored in the file.</td></tr>
<tr><td>File Delete</td><td>Delete stored file.</td></tr>
<tr><td>START LOGGING</td><td>Press F1 key while selecting this button to start the Logging.</td></tr>
</table>

Notes:

- Maximum no. of readings that can be stored in

Logging Mode	Max. Reading
Periodic	150000
Key Press	528

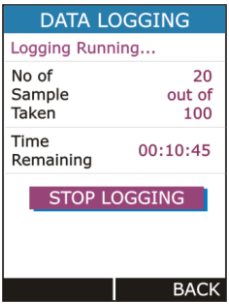
- In Periodic mode, changing of any Measure or Source parameter is not allowed. So while Periodic Logging is Running, the user can't enter into *MEASURE*, *SOURCE* and *DISPLAY* menu. But in Key Press Logging mode, there is no restriction.

- In Periodic Mode, if an error message like "*Not Sufficient Memory*" comes while starting the Logging, try reducing the logging time or increase the sampling period or try deleting some existing files.

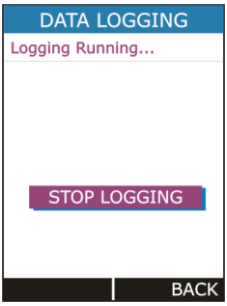
- In Key Press Mode, if the no. of samples reaches its maximum limit that is 484, the next sample will start from the first overwriting the memory.

- While Logging is running, entering into the *LOGGING* menu shows below page.

for Periodic Mode



for Key Press Mode



- For Periodic Mode, this page contains information of Number of Samples Taken and Time Remaining for Logging in HH:MM: SS.

- Both Periodic and Key Press logging can be stop manually by pressing F1 key on STOP LOGGING Button. For Periodic Mode, Logging will automatically stopped when defined log time ends and a message "*LOGGING DONE*" pops up.

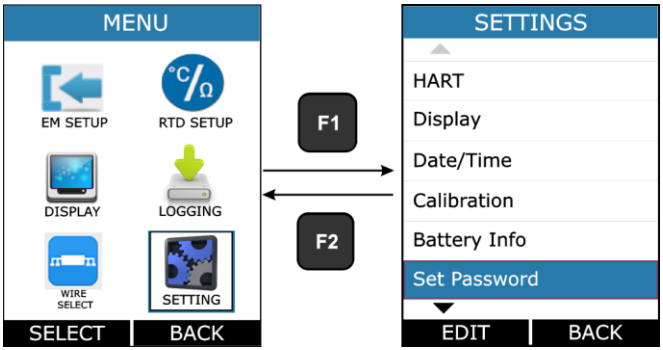
Transferring the Results to a Personal Computer:

A 32-bit Windows® software called **mCAL+.exe** can be downloaded here: https://www.pce-instruments.com/english/download-win_4.htm. Start this software just as any other Windows® software.

All communication between the PC and PCE-LOC 20 is initiated from **mCAL+.exe**.
More information on the software can be found in the separate software manual.

4.6 SETTING Page

This Page is appears in *RUN →MENU →SETTING.*

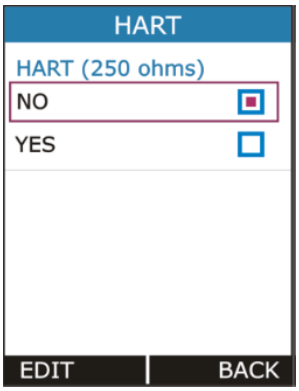


All the available Settings Options are given below.

i. HART
ii. Display
iii. Date/Time
iv. Calibration
v. Battery Info.
vi. Set Password
vii. Factory Reset
viii. About Us

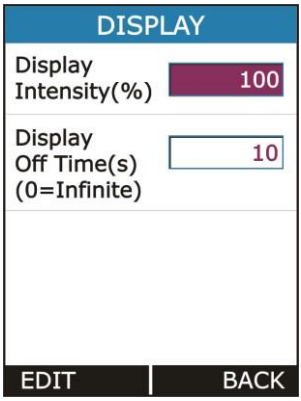
Press F1 key to Enter into the settings of any option. Description of all settings given below.

4.6.1 HART Settings



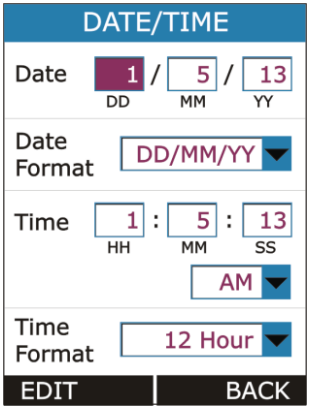
Select YES to add a Series resistor (250Ω) into the mA circuit. You can then use this instrument together with a HART® communicator to set up and calibrate HART® devices. This option is applicable for mA(24V) Read Power Input Type Only.

4.6.2 Display Settings



Display Intensity	Display Brightness Settings. Range: 5 to 100
Display Off Time	Standby Time in second after which display will turn Off. To turn the display off press any key. Range: 0 to 9999 sec Setting 0 will disable this feature. That means display will never turn off automatically.

4.6.3 Date/Time Settings



To set the Time + Date of the device.

2 date formats are supported in this device: **DD/MM/YY** and **MM/DD/YY**. This is useful only in Data Logging, to decide in which format the Date is to be stored.

2 time formats are supported in this device: **24 Hour** and **12 Hour**. This is to select in which format the time should be displayed on Run page and time to be stored in Data Logging.

AM/PM selection is enabled only for 12 Hour Time Format.

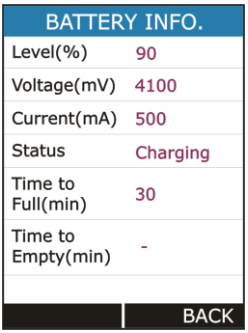
4.6.4 Calibration

The instrument is factory calibrated for the specified range, but due to long term drift of components, re-calibration may be necessary in some cases. For calibrating the instrument, a reliable source is required. This source should be at least ten times accurate compared to the range of the instrument.

Note: PCE Instruments can provide a calibration service that is traceable to international standards.

We recommend that you return the instrument to the manufacturer or an approved service agent for calibration. If you use an alternative calibration facility, make sure that it uses these standards.

4.6.5 Battery Info



This page shows the basic battery Information.

- Battery Level (Percentage)
- Battery Voltage (in mV)
- Current (in mA)
- Battery Status
- Time to Full (in min)
- Time to Empty (in min)

4.6.6 About Calibrator

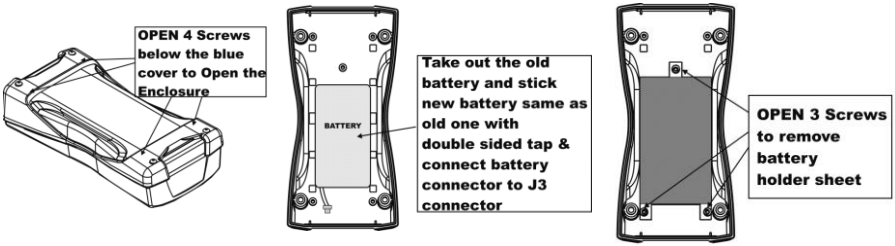
This Page illustrates the Connection diagrams for valid connections to this device.

5 Maintenance & Troubleshooting

5.1 Common Problems

Problem	Possible Causes
Device Not Starting Up	• Battery Discharged • Battery Connection Loose
Reading Fluctuation/ Reading OPEN	• Wrong / Loose Connections
Error Code on status bar	• One of the peripheral not working properly. (Solution: Restart the Device if still error code showing contact factory)
Calibration Out	• Distortion in due to external noise connection (Solution: Check connection. If still out contact factory or Recalibrate Device in authorized cal-lab.)
Battery Not Charging	• Battery Connection Loose • Battery Dead

5.2 Replacing the Battery



6 Technical Specifications

Measuring range	Resolution	Accuracy (by Mw.)
Measuring parameter voltage DC V		
0 ... 30V	0.001V	± 0.02% v.Mw. + 2 Dgt
Measuring parameter current DC mA		
0 ... 24-mA	0.001-mA	± 0.02% v.Mw. + 2 Dgt
Measurement parameter resistance		
0 ... 400 Ω	0.01 Ω	± 0.02% v.Mw. + 0.01Ω
Pt10 ... Pt1000		
-200 ... 200°C / -328 ... 392°F	Pt10 ... Pt400: 0.01°C / 0.018°F	± 0.2°C / 0.36°F
200 ... 600°C / 392 ... 1112°F	Pt500 ... Pt100: 0.1°C / 0.18°F	± 0.3°C / 0.54°F
600 ... 850°C / 1112 ... 1562°F		± 0.1°C / 0.18°F
Ni100		
-60 ... 180°C / -76 ... 356°F	0.01°C / 0.018°F	± 0.1°C / 0.18°F
Ni120		
-80 ... 260°C / - 112 ... 500°F		± 0.1°C / 0.18°F
Cu10		
-200 ... 260°C / -328 ... 500°F		± 0.2°C / 0.36°F
*In 4-wire measuring mode, a resolution of up to 0.01 Ω in the range 0 ... 1600 Ω is possible. The specified accuracy applies to the 4-wire measuring mode. With 3-wire measurement, measurement inaccuracy increases by 1°C / 1.8°F (Pt10 / Cu10), 0.6°C / 1.08°F (Pt50 / Cu50) and 0.4°C / 0.72°F (remaining types).		
Simulation area	**Resolution**	**Accuracy***
Simulation parameter resistance		
0 ... 400 Ω	0.01 Ω	± 0.02% v.Mw. + 0.01Ω
400 ... 4000 Ω	0.1 Ω	± 0.02% v.Mw. + 0.015Ω
Simulation parameters Pt10 ... Pt1000		
-200 ... 200°C / -328 ... 392°F	Pt10 ... Pt400: 0.01	± 0.15°C / 0.27°F
200 ... 600°C / 392 ... 1112°F	Pt500 ... Pt100: 0.1	± 0.25°C / 0.45°F
600 ... 850°C / 1112 ... 1562°F		± 0.15°C / 0.27°F
Simulation parameter Ni100		
-60 ... 180°C	0.01°C / 0.018°F	± 0.15°C / 0.27°F
Simulation parameter Ni120		
-80 ... 260°C	0.01°C / 0.018°F	± 0.15°C / 0.27°F
Simulation parameter Cu10		
-200 ... 260°C	0.01°C / 0.018°F	± 0.8°C / 1.4°F
*Accuracy is valid at a current of> 0.2-mA or> 0.4-mA.		
Compatible RTD sensor	Pt10 (385), Pt50 (385), Pt100 (385), Pt200 (385), Pt400 (385), Pt500 (385), Pt1000 (385), Pt10 (3926) Ni100 (672), Ni (618), Ni120 (672), Cu10 (427), Cu50 (427), Cu100 (427)	

General Specifications PCE-RTD 20	
Display modes	Measurement: mA / V / Ω / RTD Simulation: Ω / RTD
Temperature units	° C / ° F / K
Current of RTD measurement	About 300 µA
Maximum current simulation	3-mA (0 ... 650 Ω) I < 2V / Rsim (650 ... 4000 Ω)
Maximum input voltage	30V DC
Temperature coefficient	<30 ppm
Input impedance	Voltage measurement:> 1 MΩ Current measurement: 10 Ω
Response time	<100 ms
Refresh rate display	10 Hz
Data storage	Internal memory 150000 readings
Interface	USB 2.0
Display	2.4" TFT LCD 240 x 320 pixels LED illuminated
Output voltage current loop	24V DC / 24-mA
HART mA loop resistance	250 Ω ± 20%
Special features	Step and ramp function Automatic and manual mode √x, x2: For the measuring function
Continuity test	Adjustable threshold up to 100 Ω
Power supply	3.7V / 2300-mAh Li-ion battery
Charging time	About 5 h
Power adapter	Input: 100 ... 240V AC / 50/60 Hz Output: 5V / 1 A DC
Battery life	Approx. 15 h: Simulation and measurement with low LCD illumination Approx. 8 h: Measurement with low LCD illumination
Dimensions	162 x 82 x 40 mm / 6.4 x 3.2 x 1.6 in
Weight	About 300 g / < 1 lb
Degree of protection	IP20
Operating conditions	Battery operation: 0 ... 55°C / 32 ... 131°F, 30 ... 90% RH Mains operation: 0 ... 45°C / 32 ... 113°F, 30 ... 90% RH
Storage conditions	-20 .. 60°C / -4 ... 140°F, 30 ... 90% rh non-condensing
Heating time	About 15 minutes

7 Warranty

You can read our warranty terms in our General Business Terms which you can find here: https://www.pce-instruments.com/english/terms.

8 Disposal

For the disposal of batteries in the EU, the 2006/66/EC directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose.

In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law.

For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations.

If you have any questions, please contact PCE Instruments.

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