PRESYS | Instruments

Advanced Pressure Calibrator
PCA-570

PCA-570-RM

PCA-570-DT

TECHNICAL MANUAL

EM0431-01

IMPORTANT RECOMMENDATIONS:

- Whenever possible keep the PCA-570 in dry environment.

- The fuse protecting the current measuring circuit, code 01.02.0277-21, is a special component. So, only replace it with another original one, in order not to impair the accuracy of the PCA-570.

- In case of failure, contact **PRESYS** Technical Assistance.

- Being without daily use, leave it on for one hour before starting the activities.

The conditions of guarantee can be found at available in our site:
www.presys.com.br/garantia

Table of contents

1 - INTRODUCTION

1.1. General Description

The Advanced Pressure Calibrator **PCA-570** has levels of performance only comparable to laboratory standards, having accuracy from to 0,025 % of full scale. It allows the measurement of several pressure ranges, as well as the measurement and generation of volt and mA signals. It is designed to offer the necessary resources in order to facilitate the work of keeping the process instruments adjusted and calibrated.

Its construction considers the use in the field, includes items of great value as: Bag with shoulder strap allowing freedom for hands, 5.7" display with backlight led facilitating visibility in environments with little lighting, rechargeable battery and large memory capacity to store the values obtained allowing their transfer to the microcomputer when necessary. Besides these, several factors can be cited constructive which aggregate quality and efficiency to PCA-570, including predict your utilization not only in field as also in rack (Version **RM** – *Rack Mounting*, Version **DT** – *Desktop*).

Incorporates to most modern union concepts such as adjustments and calibrations with informatics, where the data are shared by both the instrument and the computer, giving efficiency to the treatment of information, in the form of emission of reports and certificates, of the automated management of tasks and of the organization and archiving of data, that is, it covers a whole context directed to the fulfillment of quality procedures, mainly related to the ISO-9000 standard. It also has HART® communication (optional) for reading and settings parameters of field devices that have this protocol.

Can be providing with until four pressure sockets. So, in a single calibrator, can have different ranges of pressure, for example: vacuum, 0 to 100 psi, 0 to 1000 psi and 0 to 3000 psi, or any other combination of the ranges available. It can also be purchased with a certain number of sensors capsules and later be added others sensors. For adding pressure sensors beyond of available in the calibrator, there is a possibility of acquisition of external pressure module (MPYA) that communicates with the PCA-570 via USB port.

Other optional is the high accuracy sensor that, from its numerous functions, can function as default thermometer. So, at the same time as indicates the reference temperature, possibility the calibration of any other temperature sensor.

1.2. Specifications

Pressure capsule

Can be put until 4 pressure capsules in the PCA-570, with ranges varying of 25 mbar until 700 bar.

Ranges *	Resolution	Accuracy**	Observations
(0) 25 mbar	0,001	± 0,05 %	Gauge pressure. Using with air or inert gases.
(1) 70 mbar	0,0001	± 0,05 %	
(2) 350 mbar	0,0001	± 0,025 %	
(3) 1 bar	0,0001	± 0,025 %	Gauge or absolute pressure. Using with fluids (gases or liquids) compatible with 316 L stainless steel.
(4) 2 bar	0,0001	± 0,025 %	
(5) 7 bar	0,001	± 0,025 %	
(6) 20 bar	0,001	± 0,025 %	
(7) 35 bar	0,01	± 0,025 %	
(8) 70 bar	0,01	± 0,025 %	
(9) 210 bar	0,01	± 0,025 %	
(10) 350 bar	0,1	± 0,025 %	
(11) 700 bar	0,1	± 0,05 %	
(12) Others on request.			

(*) Absolute pressure (ranges 3 to 8), gauge, vacuum (only for range 3), composed (of range 3 to 8) or differential (of range 0 to 2).
(**) Percentage of full scale.
Note: The differential capsule occupied two pressure sockets.

Obs.: Optional **BR** (**Barometric Reference** – 15 psia)
Sensor for measurement of barometric pressure. Can be used for simulate the indication of absolute pressure in the other ranges. Accuracy of ± 0,02 % FS (15 psia).

The values of accuracy includes a period of one year and ambient temperature of 20 and 26 °C. Outside this range, the thermal stability is the 0,005 % FS / °C, with reference to 23 °C. Such values are achieved through compensation algorithms of temperature about pressure measurement.

Auxiliart Inputs and Outputs

Input Ranges		Resolution	Accuracy	Observations
Volt -10 V to 11 V		0,0001 V	± 0,02 % FS*	$R_{input} > 1$ MΩ
	11 V to 45 V	0,0001 V	± 0,02 % FS	
mA -5 mA to 24,5 mA		0,0001 mA	± 0,01 % FS	$R_{input} < 120$ Ω

Probe Range**	Resolution	Accuracy***	Observations
Pt-100 -200 to 850 °C / -328 to 1562 °F	0,01 °C / 0,01 °F	± 0,1 °C / ± 0,2 °F	IEC 60751

Output Ranges		Resolution	Accuracy	Observations
volt -0,5 V to 12 V		0,0001 V	± 0,02 % FS	$R_{output} < 0,3$ Ω
mA 0 to 24 mA		0,0001 mA	± 0,02 % FS	$R_{maximum} = 700$ Ω
Transmissor a dois fios (XTR)	4 mA to 24 mA	0,0001 mA	± 0,02 % FS	$V_{maximum} = 60$ V

(*) FS = Full scale.
(**) **Probe** is a independent input for reference thermoresistance, for use with default thermometer.
(***) The accuracy mentioned is relative only in the input of PCA-570.

The values of accuracy include a period of one year and ambient temperature between 20 and 26 °C. Outside this range, the thermal stability is the 0,001 % FS / °C, with reference to 23 °C.

Optionals

Probe

The **Probe** is a Pt-100 to four wires of high accuracy, provided on request. The calibrator input accepts *Callendar-Van Dusen* and ITS-90 curves correction coefficients.

Pressure Module MPYA

Independent module for pressure measurement, provided on request. The MPYA communicates with **PCA-570** which performs the pressure indication. Consult the MPYA specifications on Presys website.

Generals Specifications

Four-wire thermoresistance measurement (probe). Table IEC 60751, *Callendar-Van Dusen* or ITS-90 configurable.

Regulated Power supply for transmitters (TPS): 24 Vcc, with protection for short-circuit (30 mA).

Contact input for pressure switch calibration.

Input/output isolation: 50 Vcc.

Warm-up time: 5 minutes.

Operating temperature: 0 a 50 °C.

Humidity relative: 0 a 90 % UR.

Pneumatic connection: 1/4" NPTF (Obs.: 1/8" NPTF only for range 0 – 10000 psi or higher).

Overpressure: up to twice the full scale of the capsule (for capsules up to 5000 psi).

Engineering Units: Temperature: °C, °F, K; Pressure: psi, bar, mbar, MPa, kPa, Pa, atm, at, mH_2O, $mH_2O@4°C$, mmH_2O, $mmH_2O@4°C$, cmH_2O, $cmH_2O@4°C$, ftH_2O, $ftH_2O@4°C$, inH_2O, $inH_2O@4°C$, $inH_2O@60°F$, torr, mmHg, mmHg@0°C, cmHg, cmHg@0°C, inHg, inHg@0°C, inHg@60°F, gf/cm^2, kgf/cm^2, kgf/m^2.

Integrated Web server. Ethernet Communication, USB port or WiFi (with use of optional adapter).

HART® communication protocol (optional)..

Calibration certificate (optional).

1 year warranty.

6

Field Service Version (PCA-570). Ideal for Field use.

Rechargeable batteries with duration up to 8 hours with 12 mA current output and 50% screen brightness.

Included accessories: technical manual, leads test, USB x micro USB cable, network cable, carrying case and battery charger.

Dimensions: 140 mm x 250 mm x 80 mm (HxWxD).

Weight: nominal 1.5 kg.

Rack Mounting **Version (PCA-570-RM). Ideal for mounting on a bench or 19" rack.**

Power supply from 100 to 240 Vac, 50 / 60 Hz.

Included accessories: technical manual, USB cable (A/B), network cable and leads test.

Dimensions: 132 mm x 483 mm x 250 mm (HxWxD).

Weight: 4.0 kg nominal.

***Desktop* Version (PCA-570-DT). Ideal for bench use.**

Power supply from 100 to 240 Vac, 50 / 60 Hz.

Included accessories: technical manual, USB x micro USB cable, network cable, and test leads.

Dimensions: 132 mm x 308 mm x 275 mm (HxWxD).

Weight: 3,0 kg nominal.

Notes:

* PCA-570 and ISOPLAN are trademarks of Presys.
* Changes can be made to the instrument by changing the specifications described in this technical manual.
* HART® is a trademark of *FieldComm Group*.

1.3. Special Software Features

- Special functions:

1) SCALE: scale both input and output.
2) CONV: converts any input to any output, galvanically isolated.
3) RAMP: increasing or decreasing ramps with configurable run times and plateau.
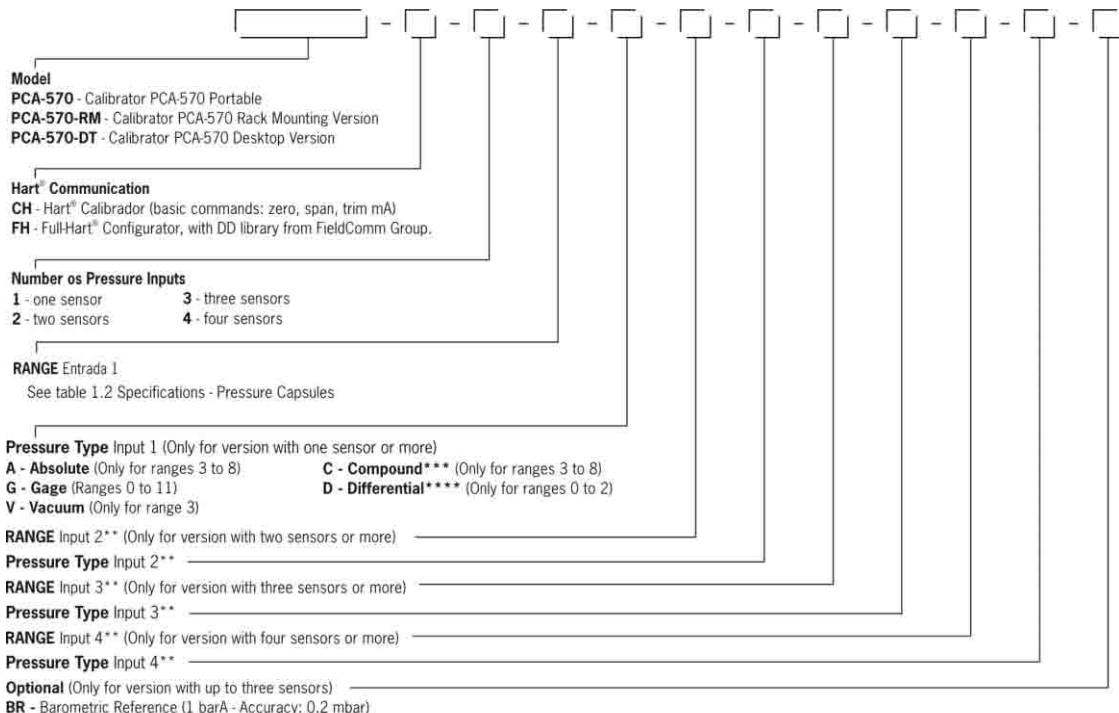**4) STEP:** steps or setpoints with configurable times.

- Memory manager: Storage of user-defined configuration types.

- Automated tasks: creation of calibration work orders and automatic execution of calibrations, storage of obtained data, and emission of reports and certificates.

- *Data Logger*: monitoring the input or output signals, storing and displaying the data in graphs or tables.

- *Help Desk*: storing and viewing videos and documents on the calibrator itself.

1.4. Order Code

Model
PCA-570 - Calibrator PCA-570 Portable
PCA-570-RM - Calibrator PCA-570 Rack Mounting Version
PCA-570-DT - Calibrator PCA-570 Desktop Version

Hart® Communication
CH - Hart® Calibrador (basic commands: zero, span, trim mA)
FH - Full-Hart® Configurator, with DD library from FieldComm Group.

Number os Pressure Inputs
1 - one sensor   **3** - three sensors
2 - two sensors   **4** - four sensors

RANGE Entrada 1
See table 1.2 Specifications - Pressure Capsules

Pressure Type Input 1 (Only for version with one sensor or more)
A - Absolute (Only for ranges 3 to 8)   **C - Compound***** (Only for ranges 3 to 8)
G - Gage (Ranges 0 to 11)   **D - Differential****** (Only for ranges 0 to 2)
V - Vacuum (Only for range 3)

RANGE Input 2** (Only for version with two sensors or more) ——————
Pressure Type Input 2** ——————
RANGE Input 3** (Only for version with three sensors or more) ——————
Pressure Type Input 3** ——————
RANGE Input 4** (Only for version with four sensors or more) ——————
Pressure Type Input 4** ——————

Optional (Only for version with up to three sensors) ——————
BR - Barometric Reference (1 barA - Accuracy: 0.2 mbar)
Sensor for ambient pressure measurement. Can be used for simulated indication of absolute pressure on the other sensors.

(*) Percentage of full scale   (**) Same code as input 1
(***) From -1 bar to full scale of range (****) The differential sensor occupies two pressure outlets.

2 - OPERATION

2.1. Party identification

PCA-570 Portable

Front Panel
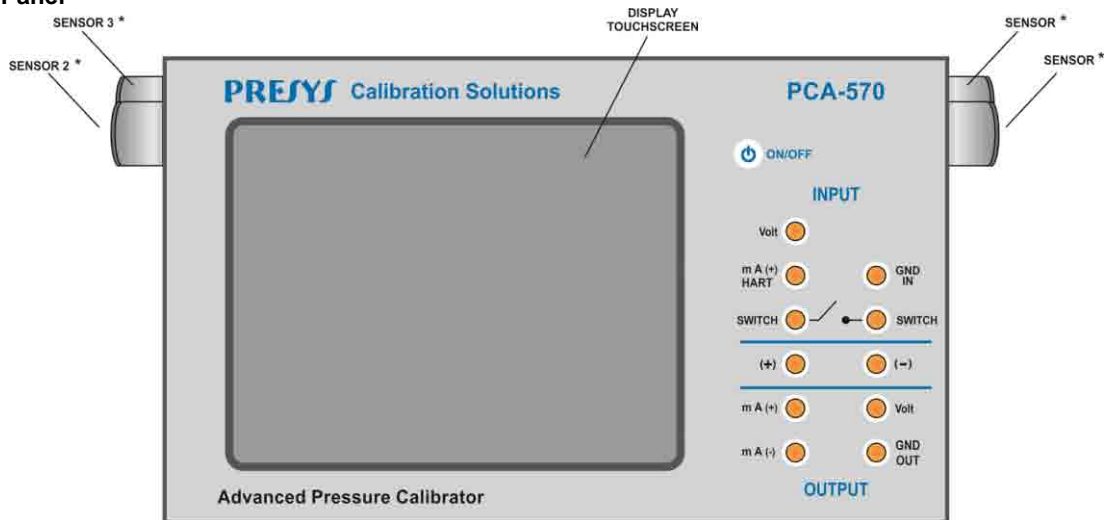
*Pressure capsules are optional modules

Fig. 01 - Front Panel – PCA-570

Left side panel

Right side panel
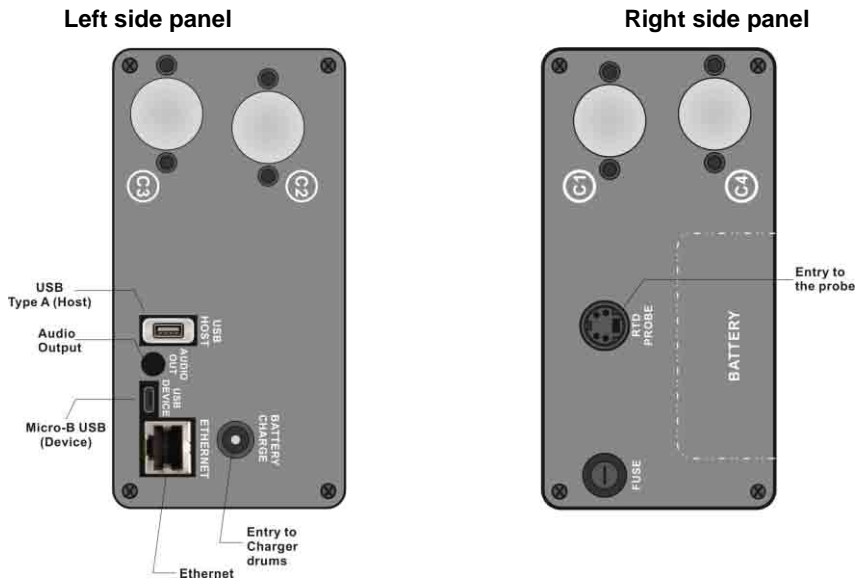
Fig. 02 - Side panels – PCA-570

Accessories: The carrying bag has three compartments, one to hold the calibrator and the others to hold various accessories including test leads, spare fuse, handles for carrying and field use, and a technical manual.

Optional: are optional the pressure capsules, high accuracy temperature sensor (**PROBE**), the pressure module (**MPYA**) beyond **ISOPLAN** software. The optional are describe in the specific manual.

PCA-570-RM (*Rack Mounting Version*)
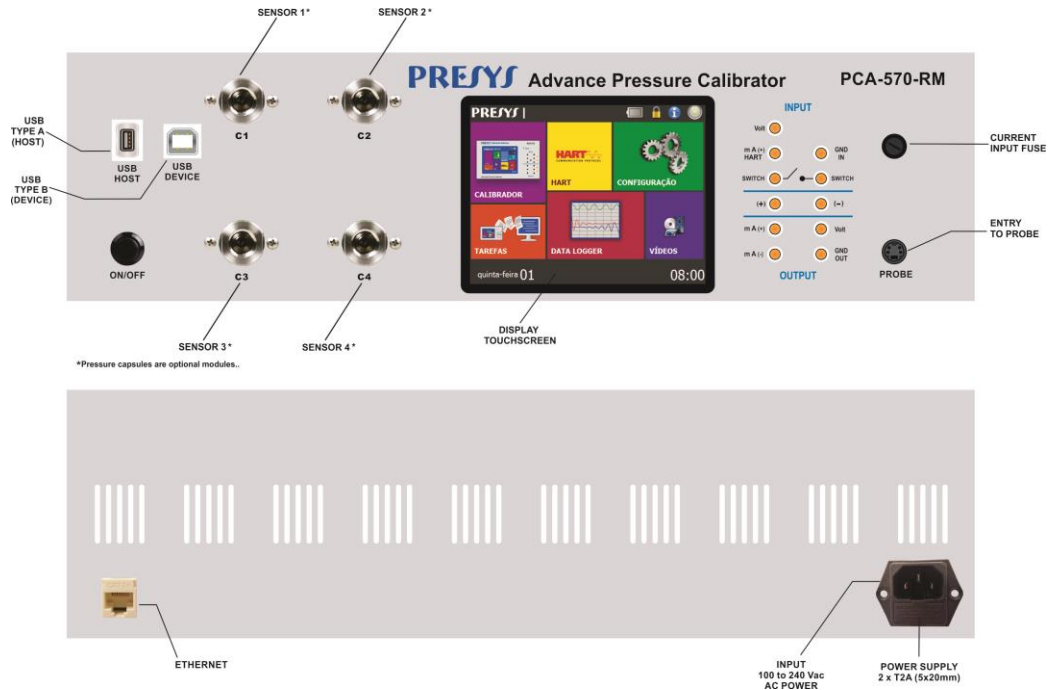
Fig. 04 - Front and Back Panels – PCA-570-RM

PCA-570-DT (*Desktop Version*)
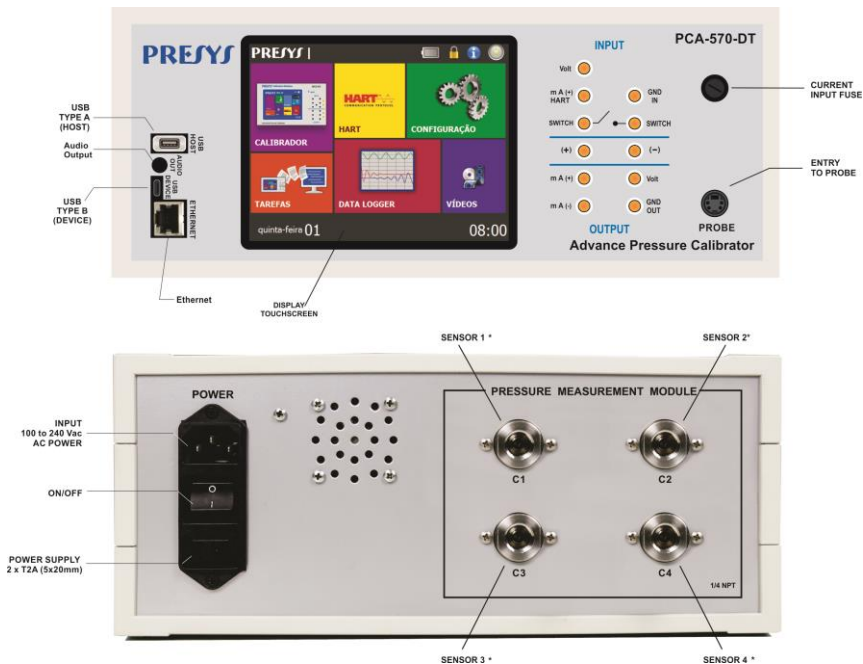
Fig. 05 - Front and Back Panels – PCA-570-DT

2.2. Battery and charger (only for PCA-570 Portable)

The PCA-570 is providing with battery rechargeable allowing up to 10 hours of continuous use. This autonomy is reduced according to the active functions. A charger is include that can be connected to a voltage of 100 to 240 Vac. The time for a full charge is 3 hours.

The level of battery is indicated in main screen, as shown below.

Fig. 06 - Main Screen
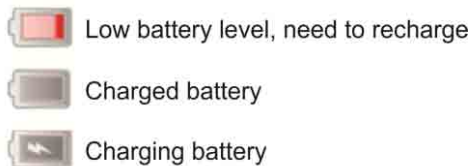
Fig. 07 - Battery Levels

Clicking on the battery icon brings up the next screen. This screen shows the battery charge (in percent), the current (positive value if the battery is being charged and negative otherwise), and the estimated runtime of the instrument based on battery consumption.

Fig. 08 - Battery *Status*

The charger charges the battery at the same time as it powers the calibrator, allowing the calibrator to be used normally while the battery is being charged.

The batteries used by the PCA-570 are Lithium Polymer (Li-Po). This rechargeable battery technology doesn't have the undesirable memory effect characteristics of its Nickel Cadmium (Ni-Cd) predecessors.

To avoid explosion or fire, only use the battery charger supplied by Presys, don't short circuit and don't damage the battery.

2.3. Using the PCA-570: basics functions

When turned on, the calibrator performs a self-test routine and shows the date of the last calibration. In case of failure, an error message is displayed; restart the device and if the problem persists, call technical assistance.

After the self-test, the *display* starts showing the main screen as shown in the **figure 06**.
The main screen is divided into 6 functions:

CALIBRATOR – selects input / output functions, see section 2.4.
HART® – optional module, allows communication with devices that have HART® protocol, see section 2.5.
SETTINGS – general instrument settings, see section 3.
TASKS – executa calibrações automaticamente, ver seção 2.7.
DATA LOGGER – records measurements over time, making it possible to view them in graph or table, see section 2.6.
HELP DESK – has videos made by PRESYS to assist in the use of the calibrator and can also store videos and documents made by the user, see section 2.9.

2.4. Calibrator

To select input or output functions, from the main screen, press the button **CALIBRATOR**. The following screen appears.

Fig. 09 - Calibrator Function

Channel 1 is shown in the upper part, and channel 2 in the lower part. This screen can be changed in the option **Layout** from Fast Browser menu.

The icon shows a **Fast Browser**, with options for Main Screen (**HOME**), *Data-Logger*, **Tasks** and option to enable/disable **Channel 2**. Press **More Options**, there are options for selecting **Layout, Memory Manager** (see section 2.4.6), **AD/RATIO** (see section 2.4.7) and **BARGRAPH** (see section 2.4.8). In addition, brings up

information about Input and Output settings and the IP address. Press **Back** to return to calibrator mode or **HOME** for the Main Screen.

Fig. 10 - Fast Browser and Secondary Menu

The channel 1 can only be configurable as input. The channel 2 can be configurable as output (default setting) or input. The channel 2 allows PRESSURE and PROBE measurement. An example of using channel 2 as input is a calibration of the pressure transmitter, when you want measure the transmitter current (input mA in CA-1) and pressure also (input PRESSURE in CA-2). For use the channel 2 as input, press the icon 🖼 and enable the option **CA-2**. For use the channel 2 as output, desable the option **CA-2**. For back Main Screen of the Calibrator press the button **BACK**. For go to Main Screen, press the icon🖼, and the button **HOME**.

2.4.1. Measurement or input functions

a) Input type setting

Press the button **INPUT CA-1**, select through the menu the type of measure signal and use the electrical bornes correspondents (see **figure 16 – Input Connections** or press the button **HELP**).

Fig. 11 - Select Input Type

PROBE refers to temperature measurement with a Pt-100 4-wire optional. With use of probe can be measure temperature of -200,00 °C to 850,00 °C with high accuracy. For **PROBE** input, you should choose the type of default table used, the number of wire connected (2, 3 or 4 wire) and the temperature scale (ITS-90 or IPTS-68). Also the option of setting the *Callendar-Van Dusen* or ITS-90 coefficients of the sensor, selecting the option **CVD** or **ITS-90** and the desired curve in the ID list. For create new CVD or ITS-90 coefficients or edit the existing, select between the two options and press the button of edit > **ADDTION**. The curves create appears in the list with an

identification describe in ID. Select **SETTINGS** for insert one identification or TAG for sensor in **ID** and inform the range of using in **MIN** and **MAX**. Select **PARAMETERS** for insert the sensor curve, usually stated on the calibration certificate of the same.

For *Callendar-Van Dusen*: Fill the value of R0 (Resistance at 0 °C) and the parameters A, B and C along with its exponents.
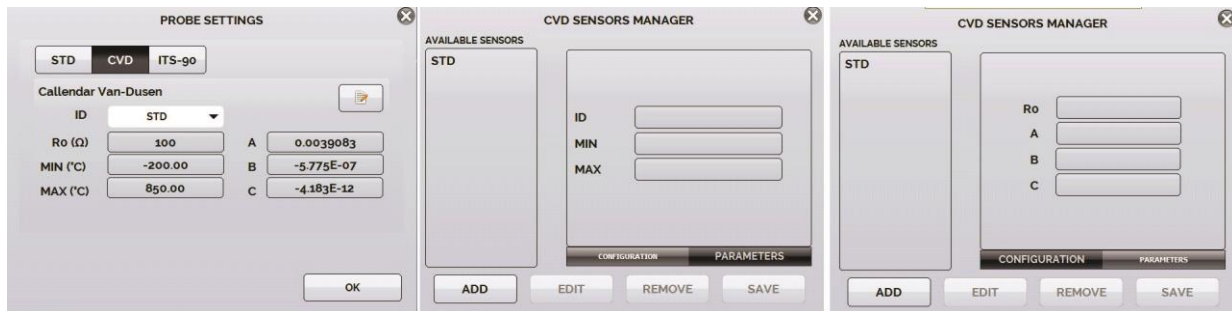
Fig. 12 - Configurable the *Callendar-Van Dusen* coefficients.

For ITS-90: Fill the value of RPTW (Resistance at 0,01 °C) and select the range for negative and/or positive curve before insert the parameters along with its exponents.
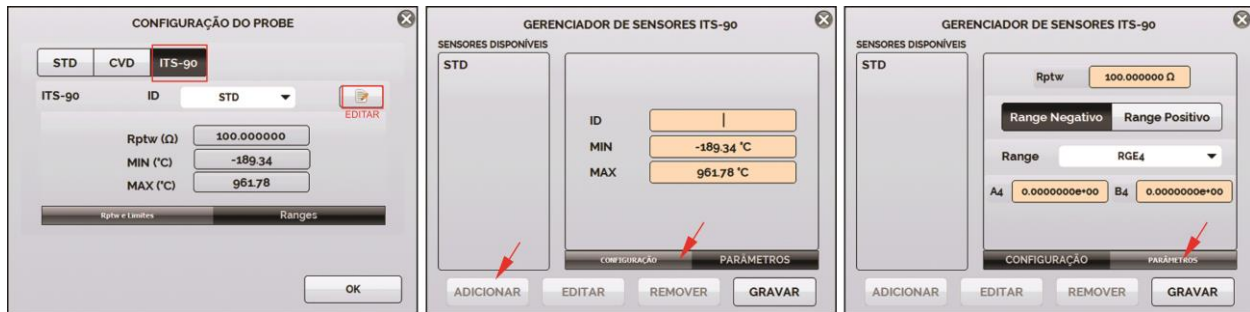
Fig. 13 - Configurable the ITS-90 coefficients.

Negative Range: Access the coefficients to be used for temperatures below or equal to the triple point temperature of water (0,01 °C).

Recommended Temperature Range (Negative)		Coefficients
Range 4	-189,3442 °C to 0,01 °C	A4 , B4
Range 5	-38,8344 °C to 0,01 °C	A5 , B5

Positive Range: Access the coefficients to be used for temperatures above to the triple point temperature of water (0,01 ° C).

Recommended Temperature Range (Positive)		Coefficients
Range 6	0,01 °C to 961,78 °C	A6 , B6 , C6 , D6
Range 7	0,01 °C to 660,323 °C	A7 , B7 , C7
Range 8	0,01 °C to 419,527 °C	A8 , B8
Range 9	0,01 °C to 231,928 °C	A9 , B9
Range 10	0,01 °C to 156,5985 °C	A10
Range 11	0,01 °C to 29,7646 °C	A11
Range 5	0,01 °C to 29,7646 °C	A5 , B5

A, B, C, D: ITS-90 coefficients

Note that the POSITIVE groups and NEGATIVE groups include a common interval: Range 5. Case may be necessary using your coefficients for the positives and negatives interval, set up the coefficients equally for the positives and negatives intervals. The values of coefficients can be find in the reference sensor certificate.

After fill the white spaces, click in the Button **RECORD** and confirm. The new sensor is now available to be chosen in the list. For edit a sensor data, select and press the buttons **EDIT**. For remove a sensor, select and press **DELETE**.

The option **PRESSURE** concerns pressure measurement with the **PCA-570** through of pressure capsules (optional). You should select also the capsule to be read (C1, C2, C3 or C4). For use the optional **BR** – barometric capsule for indicate the pressure of any other capsule in the Absolute mode, use the Channel-2 (Enable the channel-2 in the Fast Browser > **CH-2**). Select the capsule to be used, click in the icon of gear and select **ABS**. When pressure module is connected (optional) **MPYA** in the USB port on **PCA-570**, in the option **PRESSURE** will also pop up the option to choose the module as pressure input.

The **SWITCH** input (CONTACT) count for measure the continuity of an external contact connected at the input **SWITCH** on **PCA-570**. When there is continuity, the input show **CLOSE**, the opposite show **OPEN**.

By selecting previously the indication of pressure in the channel-2, in **SWITCH** is enable the function of automated **PRESSURE SWITCH** test. On this function is possible verify the values of opening and closing contact at pressure switch. For this, is necessary a pressure source that varies in a ramp more slowly, for high precision. For this tests, is recommended increase the read rate of the A/D converter to FAST. See more information's in the section **2.4.7 -** A/D RATIO.

Select **SWITCH** and then **PRESSURE SWITCH**. The next screen is shown. Fill the camps of pressure switch identification and the values to **TRIP** (value for closing/opening of pressure switch relé), **DEAD ZONE** (value of pressure switch hysteresis) and **TRIP ERROR**/**DEAD ZONE ERROR** (values of tolerance for error of trip and dead zone for pressure switch approval/disapproval). For issue of test report, use the function **TASKS**.

Fig. 14 - Pressure Switch Test

Whenever the input signal is below or above of the input ranges established on item 1.2 de Specifications the *display* indicate **UNDER** or **OVER**, respectively.

The temperature and pressure units can be changed clicking on the unit (°C, °F, psi, atm etc.) and selecting the option desired in the list.

Fig. 15 - Unit type selection

The option **NONE** disable the input function.

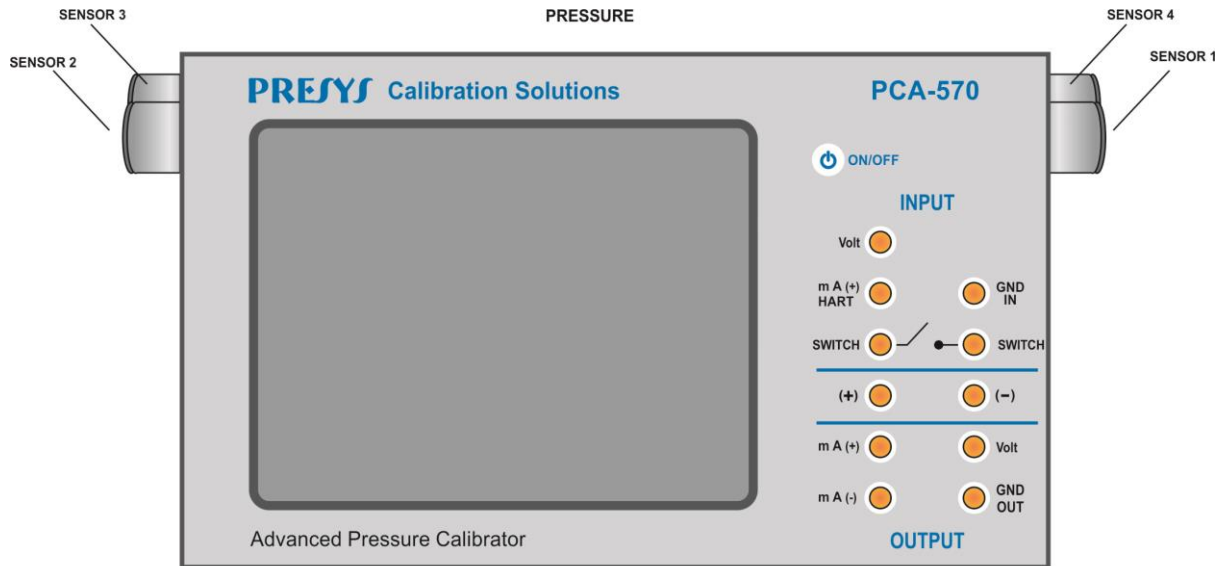**b) Input Connections or Measure**

25
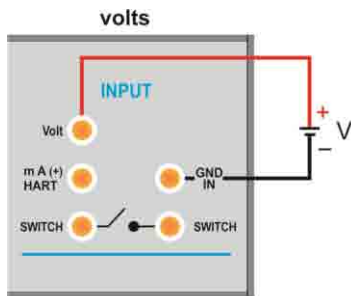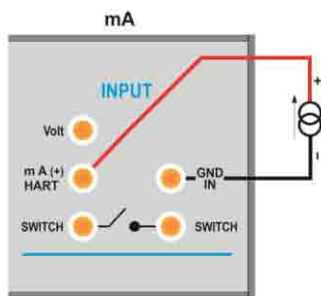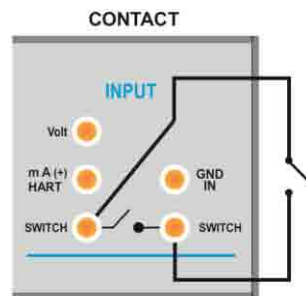
Fig. 16 - Input Connections

(D)

OBS.: For RM and DT versions, verify the position of the capsules in the **figures 04 and 05**, respectively.

Fig. 16 - (*Cont.*) Input Connections

c) PROBE Connections (optional).

Connect the **PROBE** to the PCA-570 so that the polarity identifications coincide. See figure below.
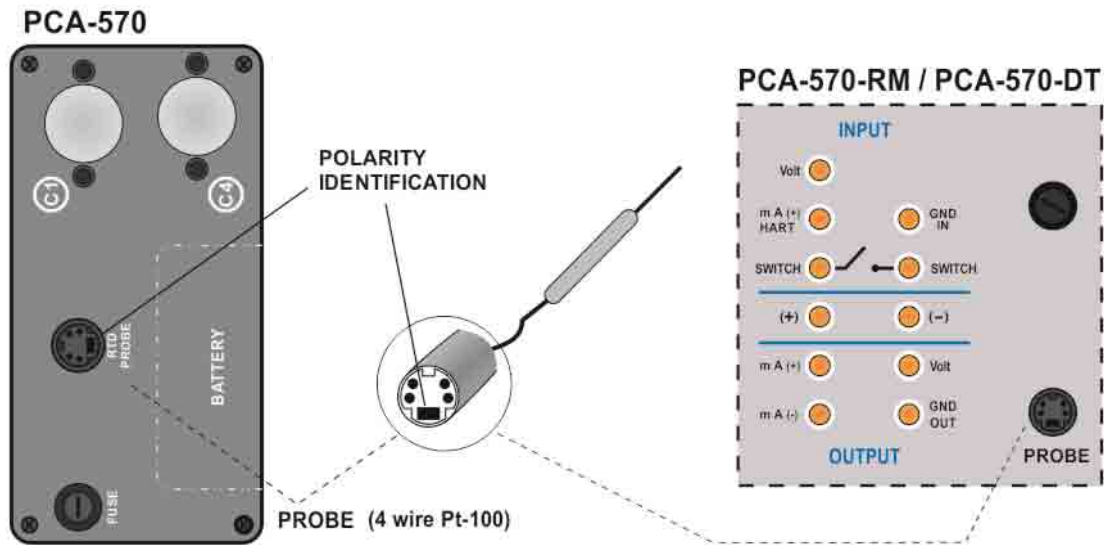
Fig. 17 - Probe Connections

2.4.2. Generation or output functions

a) Output type configuration

Press the button **OUTPUT**, select through of menu the type of signal to be generated and use the electrical bornes correspondents (see **figure 20 – Output Connections** or press the button **HELP**).

Fig. 18 - Output Type Selection

For change the output value, press on the number and type the desired value in the keyboard.

Another way to change the output value is modify each digit separately, in fixed steps. To this, keep pressed the output value for at least 3 seconds, choose the digit you desired changing (the digit selected is indicated with the arrow ∨ and ∧), and press the buttons ∨ and ∧ for changing the *setpoint*. For go out this edit mode, keep pressed the output value for at least 3 seconds.

29

Press on the output value   Enter the desired value

Press on the output value,
for at least 3 seconds.

Select the desired digit
and press the buttons

Fig. 19 - Changing the output value

The option **NONE** disable the output function.

b) Generation or Output Connections
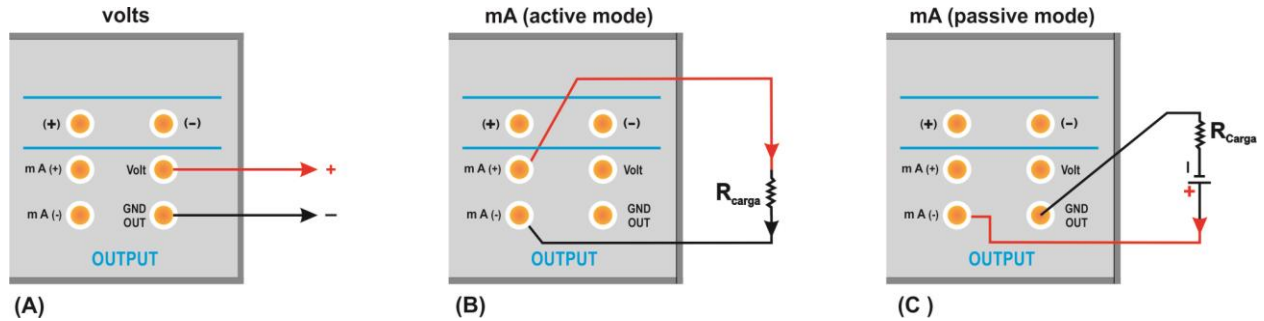
Fig. 20 - Output Connections

2.4.3. Available Power Supplies

The PCA-570 has two galvanically isolated voltage sources: TPS and +22,5 Vcc of output, both with protection against short-circuit (limited current to 30 mA).
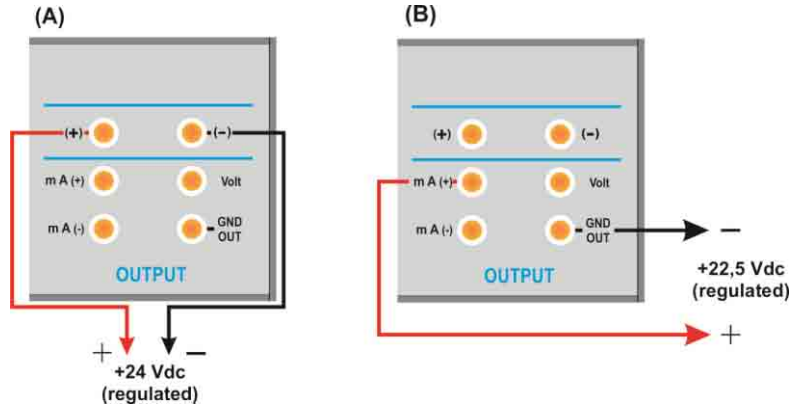
Fig. 21 - Power Supply

2.4.4. Special Input Functions

Selecting **SPECIAL FUNCTIONS** in the input channel, appears into *display*:
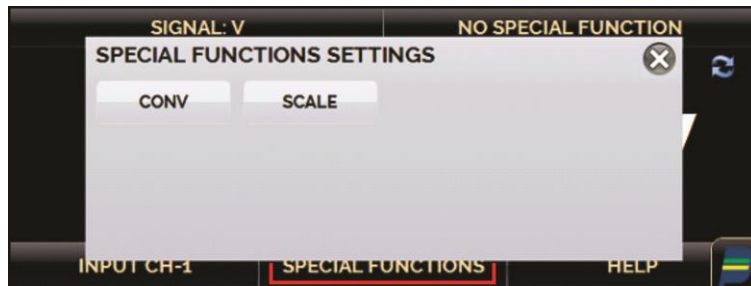
Fig. 22 - Special input functions

The selected function will be effect about the input previously selected.

After select and configurable the special function, for activate it change the key for **ON** and confirm in OK. For disable the function change the key for **OFF**. To change the key status, just click on it.

When haven't special function activated, in the corner right superior of screen appears a message **NONE SPECIAL FUNCTIONS.**

a) SCALE Function

Establish a linear relation between input signal on PCA-570 and what is shown in to *display*, according to the graphic below.
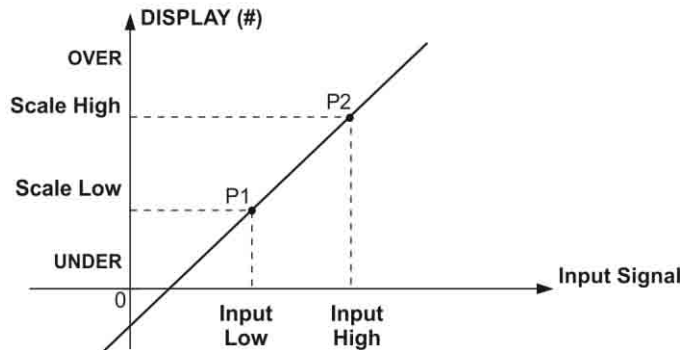
Fig. 23 - SCALE Function (LINEAR)

The indication in to *display* staggered (#) can be changed to represent any unit, such as: m/s, m3/s, %, etc.

The number of decimal digits shown in to *display* is configurable it 0 to 4.

The upper input value must necessarily be higher that the lower input value. Conversely, the scale values upper and lower can be having any relationship with each other: biggest, smaller or equal and including being signaled. Therefore, can be establishing relations direct or reverse.

The contact input can't be staggered.

In case of current input, can be establish a linear relation as per illustrated previously or quadratic (option **QUAD**), as shown below.
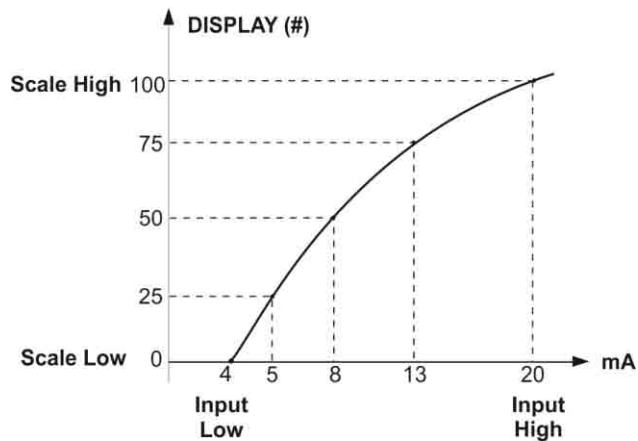
Fig. 24 - SCALE Function (QUADRATIC)

b) CONV Function

Through the function **CONV,** PCA-570 can be convert any input signal to any output signal, with galvanic isolation. It can, therefore behave like a real transmitter.

Once selected the input and the output of PCA-570, should fill the four parameters, showed in the following graph.
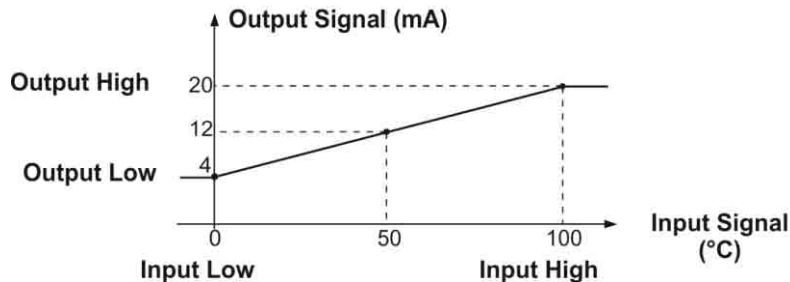
Fig. 25 - CONV Function

The upper output value must always be higher than the lower output value. The upper and lower input values must never be equal to each other. Therefore, any kind of direct or reverse retransmission from input to output can be achieved.

2.4.5. Special Output Functions

Select the **SPECIAL FUNCTIONS** in the output channel appears in to *display*:
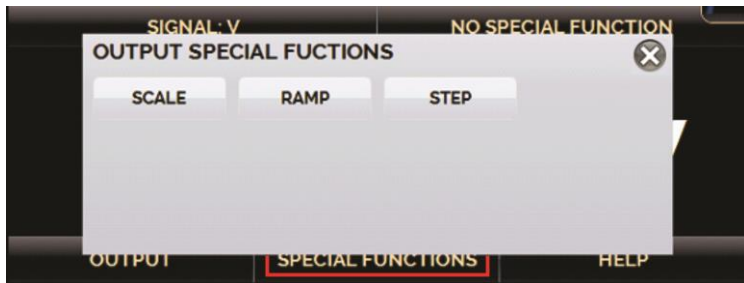
Fig. 26 - Special output functions

The selected function will be effect about the input previously selected.

After select and configurable the special function, for activate it change the key for ON and confirm in OK. For disable the function change the key for OFF. To change the key status, just click on it.

When haven't special function activated, in the corner right superior of screen appears a message **NONE SPECIAL FUNCTIONS.**

a) RAMP function

With this programming the output in the **PCA-570** varies automatically, producing ramps and levels can be programmed for actuate a once or continuously.

Must enter beginning and end values of the range within which the output will excursion (**MIN** and **MAX**), and also the value of **TIME** (in seconds) desired for one complete excursion of range. Other value what can be configured is the duration of the level (**WAIT**), in other words, the time whereby remains constant between two ramps.

After configurable the special function and activate (change the key for ON in the special function) and press **OK**. For initiate the ramp, press the icon from chronometer. The ramp is executed continuously according to the strategy defined (up, down, up/down). To stop, press STOP.

b) STEP Programming

The **STEP** programming goes to the output from **PCA-570** varies in pre-defined steps. It is useful in calibrations where certain scale points are checked; for example 0% — 25% — 50% — 75% — 100%.

To generate the *setpoint*, you should defined the points minimum and maximum of range (**MIN** and **MAX**), the percentage of output variation for each step (**%**), and generate the list (button). Also there's the option to add or delete manually any points of values of *setpoint* list (button 🔵 add the point in the list, button ❌ delete the point selected, button 🗙 remove all the points of the list).

If you want each step to be reached automatically after a preset **time** has elapsed, you must set the time in seconds. In this situation the steps are swept automatically and uninterruptedly. By activating the function and pressing **OK**, the output starts **STEP** programming, always starting from the beginning of the range. To go to the next step you must press ↑. By pressing ↓ you go to the previous step. Pressing the chronometer icon, the steps are swept automatically and uninterruptedly according to the set time. To stop, press STOP.

c) SCALE Function

The output scaling on PCA-570 allows it to simulate the operation of a transmitter. In this case, the indication of *display* scaling (#) simulate the input of transmitter (which can be changed by pressing on the number indicated in the display and entering the desired value), and as an output signal we can have any of the signals generated by the PCA-570 (for example, 4 to 20 mA).

The output SCALE function relates the output signal generated by the PCA-570 to what is shown in the display, as in the example shown below.

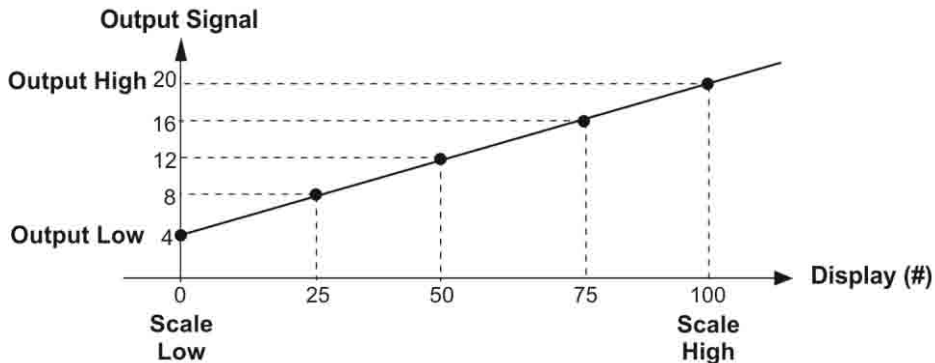The scaled (#) display indication can be changed to represent any unit such as: m/s, m3/s, %, etc.

Fig. 27 - SCALE Function (LINEAR)

The number of decimal places shown in the display is configurable from 0 to 4.

The upper value of the output must necessarily be greater than the lower value of the output. On the other hand, the upper and lower values of the scale can have any relation to each other, as long as they are not equal. Thus, direct or inverse relationships can be established.

Any type of output can be scaled.

In the case of the current output, in the same way as the input, a linear relationship can be established as illustrated above or quadratic (**QUAD** option), as illustrated below.
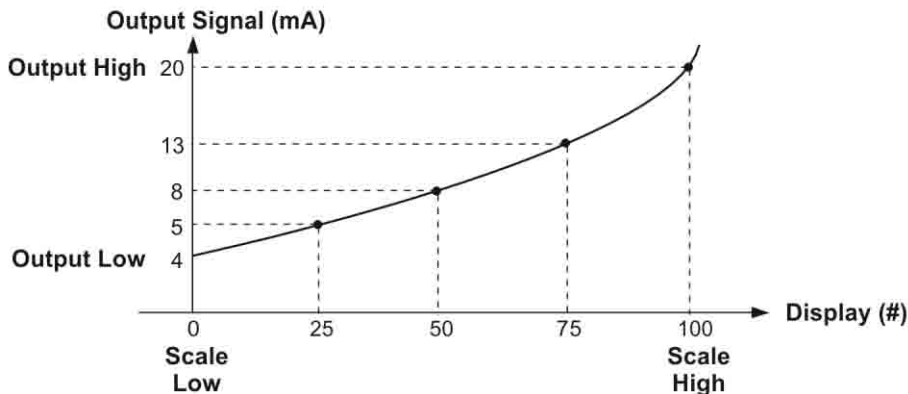

Fig. 28 - SCALE Function (QUADRATIC)

2.4.6. Save Actual Configuration (Memory Manager)

The PCA-570 calibrator supports several special functions that may become frequently used. In these situations it is useful to store such settings in the instrument in order to save time.

After setting the calibrator the way you want (input type, output type, special functions), press the icon **>** **MORE OPTIONS**, and the button **MEMÓRY MANAGER**. At the bottom of the screen you can give this setting a name and a description. Presses the button **SAVE**.

The operation that was being performed by the **PCA-570** is now stored in the memory identified by its name. To return to this configuration, even after turning the calibrator off and on, enter the **MEMORY MANAGER** option and select the desired configuration name and press the **LOAD** button.

The **SET-STANDARD** button sets the actual calibrator configuration as the default setting. Thus, each time the **PCA-570** is turned on, this will be the initial calibrator setting.

2.4.7. AD/Ratio

The **PCA-570** multi calibrator allows you to change the conversion rate of the Analog-to-Digital Converter. At faster rates, the readings displayed in gauge mode are updated more frequently, and at slower rates, the calibrator takes more readings and updates the values at a lower frequency.

For tests where reading speed is important, such as pressure switch and thermostat tests, it is recommended to use a faster rate that can "capture" the value closest to relay open/close. For calibrations and other tests, it is recommended to use a slower conversion rate, which gives more accurate readings.

To change the conversion rate, press the icon **>** **MORE OPTIONS**, and the button **AD/RATIO**. Select between FAST, MEDIUM and SLOW.

2.4.8. Bar Graph

The **PCA-570** calibrator allows monitoring a input and include alarms of HIGH and LOW for range.

To configure the alarm, press the icon ▓ **> MORE OPTIONS**, and the button **BARGRAPH**. Select between the alarms of HIGH and/or LOW. Press EMIT SOUND so that the calibrator emits a beep in alarm. In EVENTS is possible verify a time list whereby the alarm detect values outside the registered tolerance. Press the icon 🔧 it returns to calibrator menu, keeping the monitoring bar on the side.

Press the icon📄, a screen for the stability/leakage test is presented. Select the time in seconds and click START to run the test. Choose in which unit the results will be presented in engineering unit for seconds (S), minutes (M), or hours (H).

2.4.9. Calibration examples

a) Pressure Transmitter Calibration

Use the PCA-570 **TPS** supply to power the two-wire 24V DC transmitter and make the power connection as shown below. Select **mA** (current) from the **Input CA-1** from the PCA-570 and **Pressure** in the Input CA-2. To enable channel 2 as input, press the 📄 and enable the option **CA-2**. To return to the Calibrator screen, press the **BACK** button.
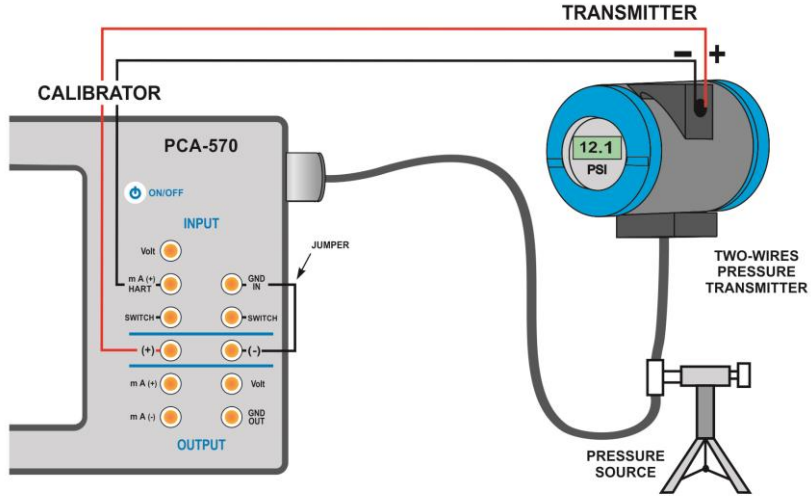
Fig. 29 - Pressure Transmitter Calibration

The current input readings can be scaled to pressure using the SCALE option (**see 2.4.4.a**). In this way the error between the input and output of the pressure transmitter is easily calculated.

b) Pressure Switch Check

Pressure switches are instruments with a pressure input and a relay alarm. The relay is activated whenever the input pressure goes above or below a certain alarm setpoint.

Connect the relay output of the pressure switch to the contact input of the **PCA-570**, **SWITCH** terminals, and make the pneumatic connections illustrated in the following figure.
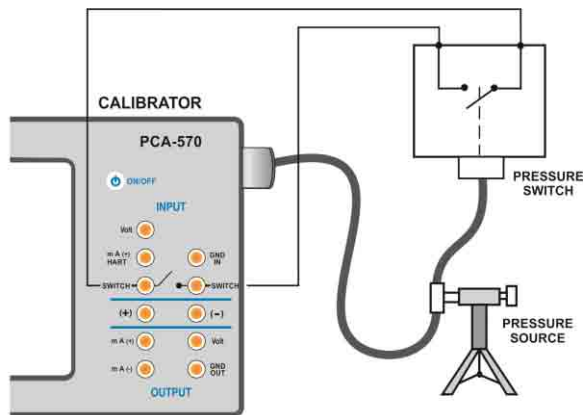

Fig. 30 - Pressure Switch

Channel 2 must be enabled and **PRESSURE** selected. The corresponding capsule must be selected. On **channel 1**, select **SWITCH** input, enable the **PRESSURE** option.

The **PCA-570** then displays the pressure measurement and the state of the contact (open or closed).

Press the **RUN** button to start the test after filling in all the required fields.

Vary the pressure manually or with the help of an automatic controller. The instant the relay changes position, the pressure switch alarm setpoint is shown on the display, both the change from open to closed, and from closed to open.

2.5. HART®

The PCA-570 can be used to read and set parameters from instruments that have a HART® communication protocol. The HART® protocol allows a digital communication between the master (in this case, the PCA-570 calibrator) and the slave (field instrument) superimposed on the 4 to 20 mA analog signal. To access this function, from the main menu, select the HART® option.

The HART® communication of the PCA-570 calibrator is an optional module. The calibrator has three versions: **NH** (no HART® communication), **CH** (HART® calibrator) and **FH** (Full-HART® configurator, with **DD** library).

The **CH** option has basic and universal commands for HART® communication (zero, span, trim mA, ...), which allow the adjustment of the range of the instrument, monitoring of the primary variable, adjustment of current, etc. The **FH** option, in addition to the basic and universal commands, is supplied with the DD (Device Description) library from FieldComm Group and allows the configuration of parameters specific to each instrument.

The following description is valid for both the **CH** and **FH** options.

2.5.1. HART® connections

When you select HART® from the main menu, you will see **mA INPUT + HART and HART ONLY (INCLUDING NETWORK)** on the screen. The internal resistor (250 Ω) can also be enabled or not. The option must be chosen according to the type of connection that will be made.

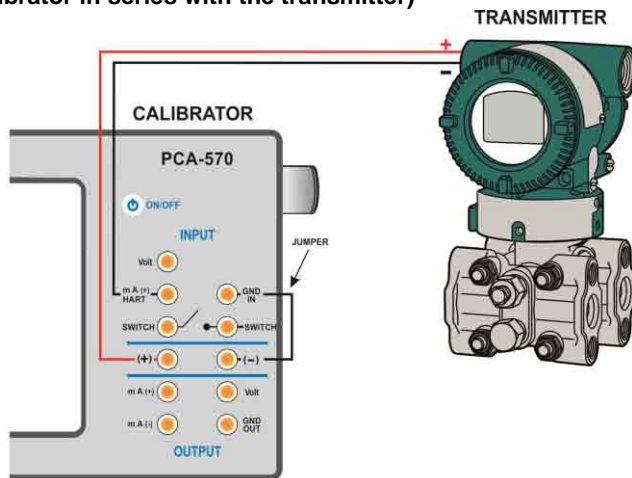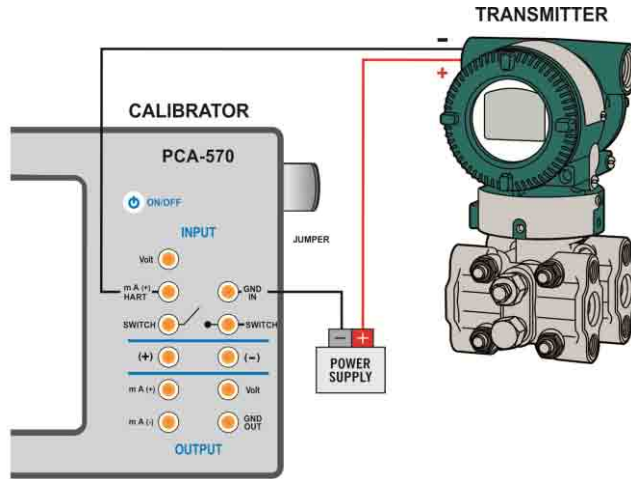**a) mA + HART® INPUT (Calibrator in series with the transmitter)**

Fig. 31 - Transmitter powered by the calibrator's own TPS
mA + HART® input (Internal resistor enabled)

Fig. 32 - Transmitter powered by external source
mA + HART® input (internal resistor enabled)

For the connections shown in **figures 31 and 32**, use the option **mA INPUT + HART® and INTERNAL RESISTOR enabled**. In this mode, the 250 Ω HART® resistor is enabled internally, in series with the calibrator's mA input. The calibrator will be able to measure the transmitter current and also read and set parameters via HART®. If the internal resistor isn't enabled, an external resistor of at least 150 Ω must be inserted in series with the mA input. To power the transmitter, the PCA-570 TPS supply (**Fig. 31**) or an external supply (**Fig. 32**) may be used.
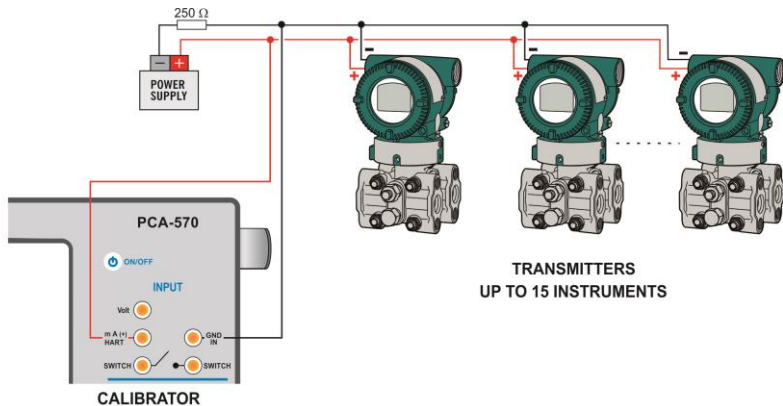
b) HART ONLY (Calibrator in parallel with transmitter)

Fig. 33 - HART® only

IMPORTANT: Before connecting the calibrator to the transmitter(s) as shown above, make sure that the mA input is not configured on the PCA-570 (Enter the Calibrator menu and select any non-mA input or select none)

For the connection shown in **Figure 33**, use the **HART® ONLY** option. In this mode, the internal resistor and the mA input are disabled. The HART® resistor of at least 250 Ω must be inserted externally in series with the power supply and the transmitter. In this case, the calibrator doesn't perform the current measurement of the transmitter, but can read and configure its parameters via HART®.

2.5.2. Starting Communication

Entering the **HART**® menu, the following screen is shown. Enabling the option **HART**® **CONFIGURATOR** (only for **FH** version) the calibrator will allow access to the Full Hart software (DD library) with all the device parameters. Disabling this function, the **CH** software starts with the basic and universal commands for Hart® communication (zero, span, trim mA etc.).
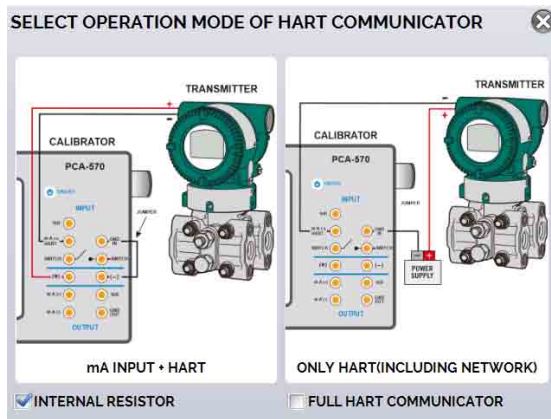

Fig. 34 - Choosing between CH or FH

Then you must define the internal resistor (250 Ω) and the HART® connection type setting (**mA Input + HART**® or **HART**® **Only**).

For the CH option, you must enter the **ADDRESS** of the instrument you wish to communicate with and press the **CONNECT** button. If the address of the instrument is not known, you can press the search button 🔍, which will search for instruments in the address range 0 to 15. For the **FH** option the device is found automatically.

Up to 15 instruments are allowed in a HART® network (addresses 1 to 15). In a connection with a single field instrument with address 0, in the **mA INPUT + HART® connection**, the primary variable can be read either analog (4 to 20 mA) or digitally (HART®). In the network connection, the only way to read the primary variable is digitally (**HART® ONLY**).

2.5.3. HART® Transmitter Measurement Range Adjustment (CH Option)

While the instrument is being connected, the **DESCRIPTION** tab shows information about the identification of the instrument, such as TAG, manufacturer, description, message, date, measurement range and input filter (damping). Some of these parameters can be changed in the **STANDARD SETUP**.

On the **DESCRIPTION** tab, the **MIN** and **MAX** fields indicate the measurement range of the HART® transmitter. For PV (primary variable) equal to the MIN value, the transmitter should generate 4 mA. For PV (primary variable) equal to the **MAX** value, the transmitter should generate 20 mA. The maximum allowable range of the transmitter is shown above (**RANGE...**). To edit the working range of the transmitter, simply change the **MAX** and **MIN** values and press the **SAVE RANGE** button

In this screen you can also edit the unit of the primary variable and the input filter (*damping*).

Fig. 35 - HART® transmitter measurement range adjustment

2.5.4. Adjusting the Measuring Range of the HART® Transmitter with Reference (Option CH)

The working range of the transmitter can also be adjusted by generating the minimum and maximum values of the desired range at the transmitter input and setting these values to minimum and maximum (reference setting).

Select mA input and press the **HART®** button. Connect the transmitter to mA Input. The reference value injected into the transmitter can be generated or measured by the PCA-570 itself. To do this, before connecting the Hart instrument, from the main menu, select **CALIBRATOR** and select for **CA-2** the desired signal type.

For example, for a pressure transmitter, channel-2 must be set as **Pressure** Input and the pressure must be manually generated (with a pump, for example) and connected to the PCA-570. To enable channel 2 as input, press the icon and enable the **CA-2** option. To return to the Calibrator screen press the BACK button. The channel-2 measurement or generation signal will act as the default value for the instrument's range setting.

Fig. 36 - HART® Fast Adjustment with Reference

Generate at the transmitter input the signal corresponding to the lower range value and press the button ▬. The transmitter will generate 4 mA for this value. Generate the signal corresponding to the upper range value and press the button ✚. The transmitter will generate 20 mA for this value.

Another way to adjust with reference is to enter the HART option. Go back to the main menu by pressing the icon and the **START** button. Select the **HART®** option, set the connection type, address and then press **CONNECT**.

For this configuration, select the **MONITORING** tab. This screen shows the value of the primary variable (**PV**) read by HART® (digital), the current that the transmitter wants to generate (**AO - DIGITAL OUTPUT**), and the current measured by the PCA-570 (**ANALOGIC READ**).

To adjust the transmitter range, generate the signal at the transmitter input corresponding to the lower range value and press the ↓**Range Inf** button. The transmitter should generate 4 mA for this value. Generate the signal at the transmitter input corresponding to the upper range value and press ↑**Range Sup**. The transmitter should generate 20 mA for this value.
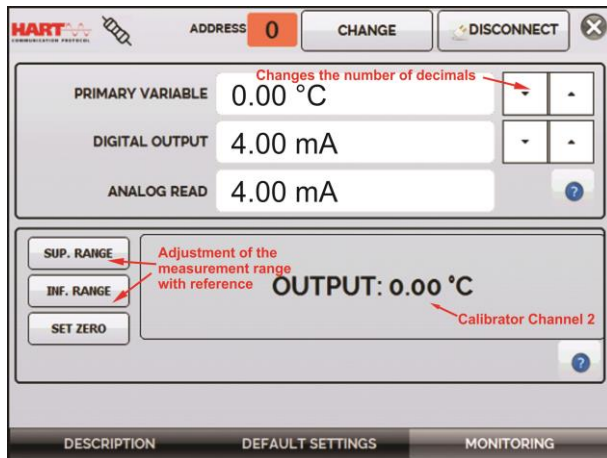

Fig. 37 - Adjusting the measuring range of the HART® transmitter with reference

In the **MONITORING** screen, in addition to the indication of the primary PV variable and the transmitter current, the value measured or generated by the PCA-570 at the CA-2 is shown. If the CA-2 is configured as an output, press on the number to change the output value.

2.5.5. HART® Transmitter mA Output Adjustment

In the **STANDARD SETUP** tab, you can adjust the HART® transmitter current output (Output Trim) according to the PCA-570 current measurement. You can only make this adjustment when the PCA-570 is connected to a single transmitter with address 0, with connection type **mA INPUT + HART**®, since the calibrator must measure current to make the adjustment.

Before making the adjustment the current output of the transmitter can be checked by pressing the **CHECK** button. The transmitter will now generate fixed currents (4 mA, 8 mA, 12 mA, 16 mA, 20 mA) and the calibrator will display the measured values for each point.

To make the adjustment automatically, simply press the **AUTO** button. The calibrator will command the transmitter to generate 4 and 20 mA (fix), measure these points, and adjust the output (trim). The adjustment is complete when the message **D/A Adjustment Complete** appears.

The **WAITING TIME** field sets the settling time (in seconds) for each point.
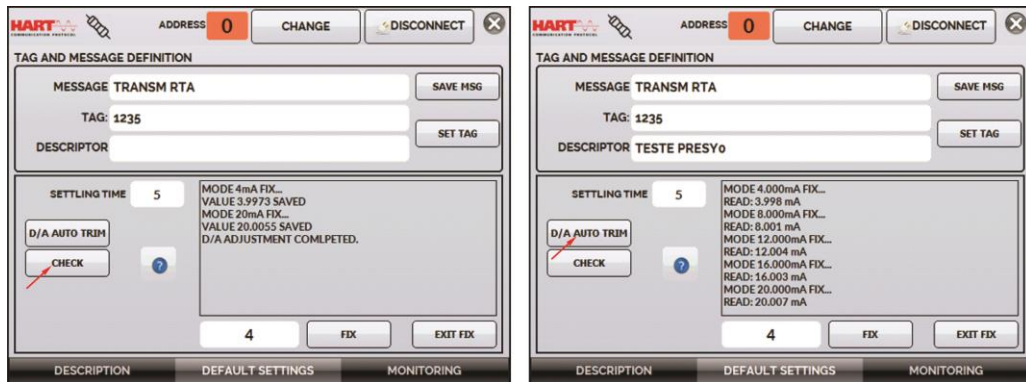
Fig. 38 - Checking / Adjusting the mA output of the HART® transmitter

2.5.6. Full-Hart Configurator (FH Option)

If the **HART® CONFIGURATOR** option is enabled, the **FH** software starts. For this option, the instrument is automatically found and the screen indicates the basic, universal and specific parameters (DD library).

To start the HART configurator you must wait for the PCA-570 to read all parameters from the instrument. The PCA-570 will display the message: *Reading device information. Please wait...* Once connected, the bottom of the screen will show the TAG, model of the connected instrument and the DD (Device Description) file used.

You can open the instrument's configuration tree, located in the left part of the screen. This tree changes according to the instrument, as each Hart transmitter has its own specific commands.
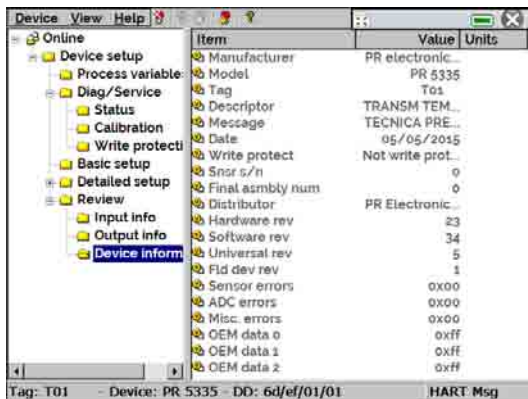
Fig. 39 - Device Parameters

Double-click the parameter you want to change and change the value.

Parameters identified by the icon have methods. To change them, double-click the parameter and follow the steps.

For other parameters, after editing, the field value turns yellow, indicating that a change has been made but not yet saved in the transmitter. To confirm press the button . To cancel press .

To view the mA Input value or change the output setpoint, press the button [■]:
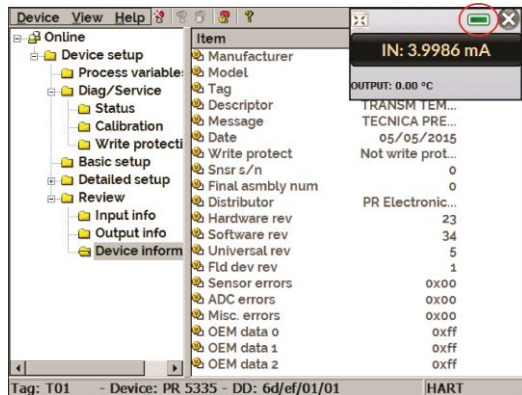
Fig. 40 - PCA-570 Input and Output Values

To view the device status, enter the menu **VIEW** and then in **DEVICE CONDITION**:
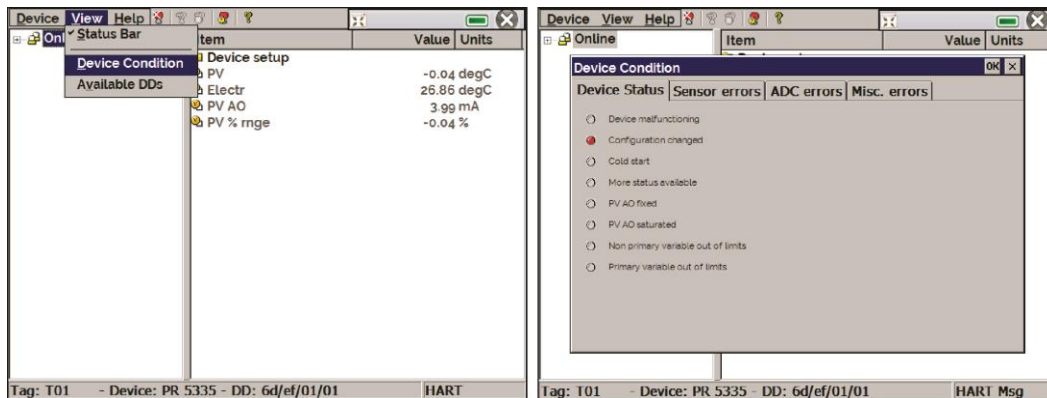
Fig. 41 - *Device Status*

To save the entire configuration of a Hart® instrument connected to the PCA-570, you can use the **Document Device**, from the menu **DEVICE**. This function is useful for saving the configuration of an instrument for later **downloading** to another instrument of the same model, or for **backing up** the settings.

Press **DEVICE > DOCUMENT DEVICE**, fill in the field **File Name** with a name for the configuration and press **Save Device Config**. Optionally, you can write a description of the configuration in the **Notes** field.
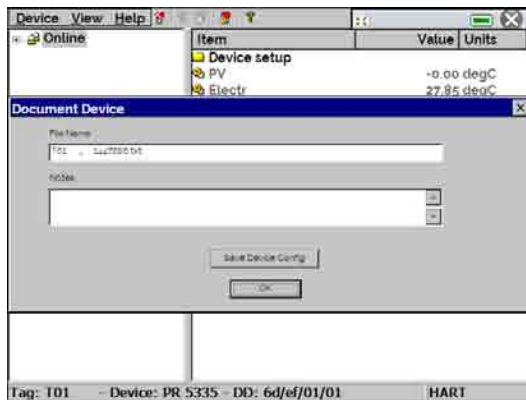
Fig. 42 - Saving a Device Configuration

When you want to load the saved configuration into an instrument, access the menu **DEVICE > DOWNLOAD/VIEW**. To select the configuration file, double-click on it.

Press the button **WRITE** to realize the *download* of the configuration file for the connected instrument. Before the instrument is fully configured, some confirmation messages will be displayed. To cancel, press **X**. To continue, press **OK**. At the end of the configuration, the message **Configuration Write Complete** is displayed.

2.6. Data Logger

The PCA-570 allows you to record a series of measurements over time for viewing the data in graph or table format.

Select **CALIBRATOR** from the main menu and edit the desired signal type on channel 1 and channel 2. Press the icon ![icon] and the option **DATA LOGGER**. The calibrator will automatically start collecting the points and placing each measurement on the graph.

For the measurements to be saved, the **REC** button must be pressed (see **figure 43**). With this option selected, all the points (measurement, time) are saved in an internal file in the PCA-570, which can be used to generate a table or graph.

Fig. 43 - *Data Logger*

Fig. 44 - *Data Logger* Configuration Menu

Entering the Configuration menu, in the **CONFIG** option, you can edit the graph's background color, line color and thickness, sampling rate (in seconds) and configure the graph's x (time) and y (measurements) axes.
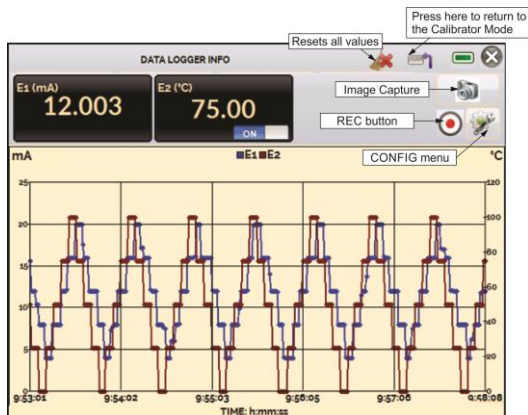
The collection of values can also be programmed to start at a certain date and time in the **LOGGER** option. Configure the start and end time of the collection. During the selected period, the collected points are saved in an internal file in the PCA-570.

To view a saved file press the **OPEN** button, select the desired file, and press **LOAD**. The file name contains the date and time that the measurements were taken.

The **SHEET** button allows you to view the data in table format, with the date and time of the measurement, and the measured values. If the user wants to export the current data to a *.csv* file that can be opened in spreadsheet software, press the **SAVE** button and indicate the name and where it will be saved. The button 🔵 saves the current screenshot as a *.png* file. All saved screenshots can be viewed in the **PICTURE** menu. These files are saved on the calibrator's *internal SD card*. If a *USB stick* is connected to the PCA 570, you can choose whether to save the file to the SD card or to the *USB stick*.

To access the files saved in the calibrator, connect the USB cable to the computer (USB Type-A) and to the PCA-570 (USB Type-B, see figures 02, 04 and 05, portable, *Rack mount* and *desktop* versions respectively).

2.7. Automated Tasks

In the **PCA-570**, automatic calibration jobs can be generated and run. This option can be used to generate calibration work orders for various instrument types. The tasks issue documents with the results and can be issued Calibration Reports. Configure in the menu **TASKS > ADVANCED TASK OPTIONS** the desired option.
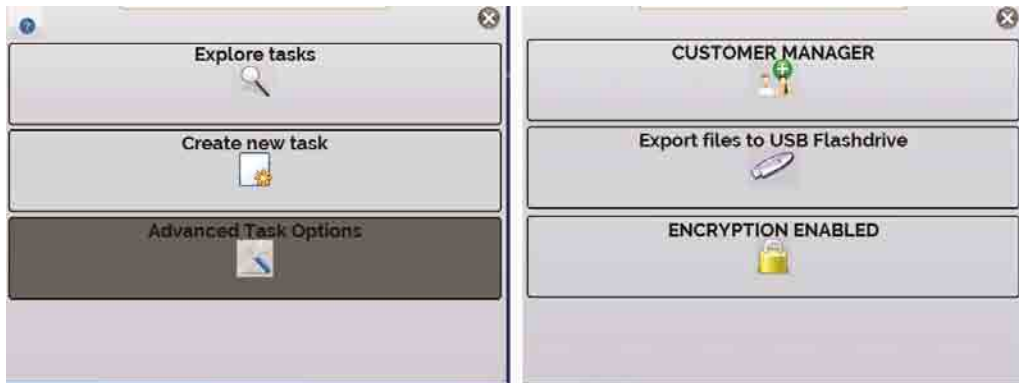

Fig. 45 - Advanced Task Options

Report Generator Mode

In the option to issue calibration reports, a more simplified document will be issued, with the calibration data, both AS LEFT (final) and AS FOUND (preliminary), if any. It states whether the calibrated instrument is PASS/ FAIL according to the registered acceptance criteria.

2.7.1. Creating Tasks

To generate tasks, from the main menu, select **CALIBRATOR**. Select the desired signal type on channel 1 and channel 2. For example, to calibrate a pressure transmitter, on the output enable CA-2 and select Pressure, and on the input select mA (which will be connected to the current output of the transmitter). For a voltage indicator, for example, select output V (which will be connected to the indicator's input) and input none (the instrument's display must be entered manually).

Press the icon ![icon], and select **TASKS > CREATE NEW TASK**.

Fill in, at least, the serial number of the instrument to be calibrated, TAG of the instrument, time to stabilize each point (waiting time, in seconds). In Acceptance you can enable if the certificate will show a Pass/Fail report. In this case, you must also fill in the maximum error allowed for the instrument to be calibrated (in % of the *span*, reading or full scale). Filling the stabilization time with the value 0 (zero), the calibrator asks the operator to confirm manually the acquisition of the point.

Fig. 46 - Task Information

When finalizing the task information, select the **Preliminary/Final** bar. Add each calibration point (**point,** channel 2 of the calibrator) and its corresponding expected value (**expected**, channel 1 - calibrator input), both in the **As found** calibration (calibration done before adjustment) and **As left** (calibration done after adjustment). The points can also be generated with the help of the **AUTO** button. By pressing this button, simply enter the maximum and minimum values of the calibration range and the number of points and a list of points will be generated considering equal steps and a linear scale. Also fill in the number of repetitions (rep.) of the readings, and the calibration strategy (start to end point ↑, end to start point ↓, etc.). By filling the **REP** field of the **As found** calibration with the value 0, the task will only have the As left calibration. The **REP** field of the **As left** calibration must be filled in with the minimum value 1.

64

Fig. 47 - Task Points and Strategy

Select the **Review and Save** bar. Choose a name/identification number for your task. If you want to save the template of this task, for later use in creating other tasks, press **SAVE MODEL** and give it a name. When you want to open this template again, in the task creation screen, press **OPEN MODEL**.

Click **CREATE** to create the task. The task is now saved in the calibrator and can be executed.

Fig. 48 - Identifying the Task

2.7.2. Running tasks

To execute a created task, from the main menu choose **TASKS > EXPLORE TASKS**. A list appears with the identification of the work orders created and not yet executed in WAITING. Select the desired task and press **OK**. Make the necessary connections between the calibrator and the instrument to be calibrated and press **START.**
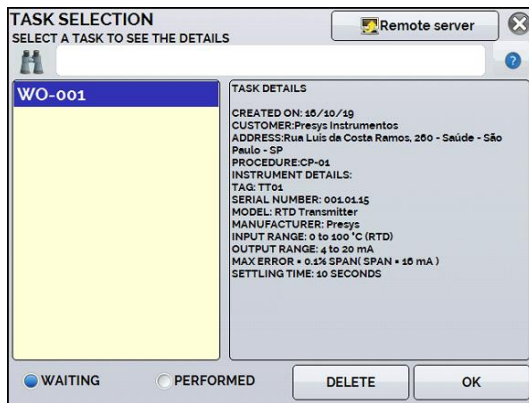
Fig. 49 - Identifying the Task

The **PCA-570** starts to perform the calibration automatically, generating the *setpoints* registered in the task and taking the reading from the instrument to be calibrated. If **NONE** is selected for the calibrator input or output, the calibrator prompts you to enter the data manually. The result is displayed on the screen, and a progress bar indicates the remaining calibration time. At the end of the calibration, a report is presented with the values generated, the values obtained, how much was expected, and the errors. If the error is above the value registered for the task, the line appears in red.

The first time a task is executed, it is saved as *As found* (before adjustment). If it is run again, it will be saved as *As left* (after adjustment). Tasks created with only *As left* are run only once. The results are saved in the calibrator and can be viewed at any time in the **RUN** option.

2.7.3. Visualizing results

After a task has been performed, it remains saved in the calibrator.

To view the results of a calibration in the **PCA-570**, from the main menu select **TASKS > EXPLORE TASKS**.

Select the **RUN** option. The list will now show only those tasks that have been performed. Select the desired work order and press **OK**. The screen will show the report with the calibration points, the values obtained, how much was expected, and the errors. If the error is above the value registered for the task, the line appears in red. If a certificate is being issued, it will also show the value of the measurement uncertainty.

Fig. 50 - Task Results

The **CREATE DOCUMENT** option saves the task data as a PDF file in the internal memory of the calibrator (SD card), which can be printed or accessed via computer.

To print the Calibration Report or Certificate, press the printer icon 🖨. The printer must have been previously configured in **SETTINGS > SYSTEM > PRINT CONF** (see section 3.4) and must be connected to the USB Host port of the **PCA-570** (see figures **02, 04 and 05**, Handheld, *Rack Mounting* and *Desktop* versions respectively).

To access the files saved on the calibrator's SD card, connect the USB cable to the computer (USB type A) and to the **PCA-570** (USB type B - Device, see Figures **02, 04 and 05**, portable, *Rack Mounting* and *Desktop* versions, respectively). The tasks are saved inside the **TASKSREPORTS** folder, identified by the registered TAG number.

To save all tasks to a connected external hard drive or USB stick, go to **TASKS > ADVANCED TASK OPTIONS > EXPORT RESULTS TO PEN-DRIVE**.

The logo can be changed to one of your own. To do this, plug a **PENDRIVE** with the logo file into the **PCA-570's** USB port. Go to the menu **TASKS > ADVANCED TASK OPTIONS > ADVANCED > CERTIFICATE MODEL MANAGER > LOAD LOGO** select the file by name (it must have the extension .jpg). We recommend an image size close to 200 x 200 pixels.

To add your signature to the Report/Certificate, create a signed user in the System menu (see section 3.4 System) and enable password-protected access.

2.7.4. Advanced Task Options

As said before, in the **ADVANCED TASK OPTIONS** option you can choose between issuing reports or calibration certificates with uncertainty. For the calibration certificates with uncertainty there are also customization and registration options.

Entering the **ADVANCED** option you can configure/register the following options:

- **CERTIFICATE NUMBERING OPTIONS:** Choose between manual and automatic numbering of certificates (select AUTO for automatic or leave unselected for manual); For manual selection, the certificate/report number will be equal to the Task ID (see Figure 50).
- **CUSTOMER MANAGER:** Customer registration, ideal for calibration service providers**;**
- **PROCEDURE MANAGER:** Registration of calibration procedures, whose short description will appear on the issued certificates, as well as specific remarks about the calibration;
- **CERTIFICATE MODEL MANAGER:** In this option you can customize the certificate, inserting a header, footer, company logo, and standard remarks that will appear on the certificate.
- **CERTIFICATE MANAGEMENT:** Settings for the presentation of the data collected in the tasks:

    DECIMAL SEPARATOR: Choice of decimal separator between point or comma;

    DATA DISPLAY: Standard (display of all readings of the point plus the calculated average), Summary (display of only the average) and General (simplified display of data);

    GROUPING: Grouping Points (group all the values obtained for each point), Rising and Falling (display the values obtained in rising and falling readings separately);

    PERIODICITY: Frequency, in months, of calibration of the calibrator.

    CERTIFICATES you can activate/deactivate calibrator calibration certificates for the execution of tasks.

2.8. Help Desk

The calibrator allows the viewing of videos and documents. Videos can be viewed while a calibration is being performed, and are intended to assist in the use of the calibrator. Documents can be, for example, calibration procedures or instructions that can be stored and viewed on the calibrator itself.

From the main menu, when you select **HELP DESK** and the **VIDEOS** tab, a list of video categories will appear. Select the desired category and video. Press **FULL SCREEN** to view the video full screen, or **WINDOW** for reduced screen. Selecting the window option allows you to view the video while using the functions of the calibrator.

To insert new videos into the calibrator, connect the USB cable to the computer (USB Type-A) and to the PCA-570 (USB Type-B, see figures 02, 04 and 05, handheld, *Rack Mounting* and *desktop* versions). Open the VIDEOS folder. Copy the video(s) into some subfolder (category) of the VIDEOS folder. If you prefer to create a new category, simply create a new folder within VIDEOS with the name of the desired category and copy the file into this folder.

To insert documents, such as procedures or instructions, the files must be converted to PNG files and must be saved inside the HELP folder of the sd-card, create a folder with the name of the document and insert it in this folder. To make the process easier, there are PDF converter software for the files in the correct form. We recommend that the file be in presentation format, for better viewing on the calibrator screen.

3 - SETTINGS

The **SETTINGS** menu has 4 divisions (tabs at the bottom): **DATE AND TIME, NETWORK, SERVICES** and **SYSTEM** described below:

3.1. Date and Time

In the date and time bar you can set the date, time and time zone for the calibrator. It is also possible to set the decimal separator for CSV files between comma and period.

3.2. Network

In the **NETWORK** tab it is possible to configure the IP address of the calibrator for communication with the computer and the Wi-fi (wireless) network. The IP address can be configured dynamically (**DHCP**) or can have a fixed address (Disable the **DHCP** option and change the desired addresses).

The Wi-Fi communication is performed via a USB/WIFI adapter (optional item). In the **NETWORK** tab it is possible to configure the device name (name that the calibrator will be displayed in the network). Selecting **CONFIGURATE WIRELESS NETWORK** (**WIFI**) the user visualizes the available networks and configures which network he/she wants to connect to.

By connecting the calibrator to the network it is possible to view and print Reports/Certificates of the tasks through the computer. Press the network icon to access the configured IP address once connected to the network. When connected to the wireless network, the icon will be that of Wifi .
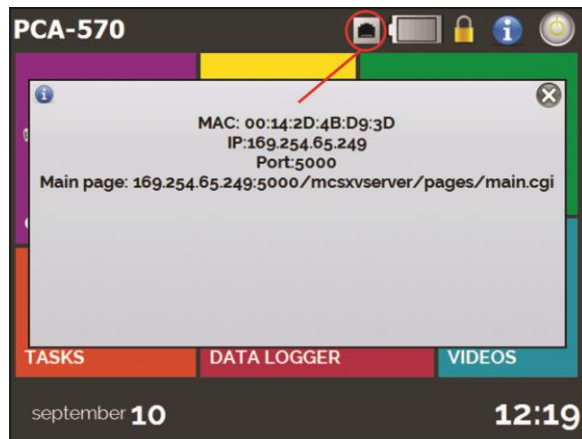
Fig. 51 - IP address

3.3. Services

In the **SERVICES** bar the user can configure the calibrator's communication types, among other settings. The options are:

- **REMOTE ACCESS -** Access options via *WEBSERVER* (Remote Server) and via VNC (*Virtual Network Computing*)

- **SERIAL COMMUNICATION -** Serial communication settings
- **FILE SHARING -** Options to allow/deny access to file sharing and configuration of access passwords
- **SERVER ADDRESS -** Setting the Remote Server Address
- **START MODE -** The user selects whether he or she prefers the calibrator to start in calibrator mode or on the main screen.
  The types of communication are described below.

3.3.1 Remote Access - *Web Server*

To access the calibrator's integrated *web server* activate the option in the NETWORK tab. Connect the calibrator to the network via Ethernet cable or Wi-Fi. To access the *web server*, open the browser on your computer and enter the following address. To verify the IP address, see **figure 52**.

<calibrator_IP_address>:5000/mcsxvserver/pages/main.cgi
User: *admin*
Password: *xvmaster*

Fig. 52 - Web Server

On the *Web Server*, you can monitor the calibrator screen, change the output type and value, and read the signals from the inputs.

3.3.2 Remote Access - VNC

Virtual Network Computing (or only **VNC**) is a graphical desktop sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer or device. By enabling this option, the calibrator's screen can be accessed directly on the computer.

For access via VNC, it is necessary to download and install a VNC viewer program, some of which are freely available on the Internet. Connect the calibrator to the network via Ethernet cable or Wi-Fi. Set the VNC viewer to the IP address indicated in the network icon (Figure 52) and connect. When prompted, use the password "adm". This password can be changed later in the **NETWORK > USB & FILE SHARING > SECURITY** tab of the calibrator.

3.3.3 SCPI Commands List

To control the calibrator using SCPI commands, connect a serial cable to the USB Type A port on the **PCA-570** (see section **2.1** of this manual, "Part Identification"). Connect the cable to the computer's serial port. In the **SETTINGS > NETWORK > SERIAL COMMUNICATION** menu, enable serial communication (**RUN** switch to `ON`).

Communication Parameters:
Parity: none
Data bits: 8
Baud rate and Stop Bits: configurable in the SERIAL COMMUNICATION menu

Below are some examples of SCPI commands for the PCA-570 calibrator. For a complete list please consult Presys.

*IDN?

Description: Instrument identification**.**
Parameters: ---
Answer: Manufacturer, ID, Serial Number, Software Version

*CLS

Description: Clears the error list.
Parameters: ---
Answer: ---

MEASure:PRESsure?

Description: Pressure reading.
Parameters: ---
Answer: Pressure reading | Unit

UNIT[:PRESsure]?

Description: Current pressure unit.
Parameters: ---
Answer: Current pressure unit

UNIT[:PRESsure] <unit>

Description: Sets the pressure unit.
Parameters:

Answer: ---

SYSTem:ERRor[:NEXT]?

Description: Checks the error list.
Parameters: ---
Answer: Last Error

MEASure[:SCALar]:CURRent[:DC]?

Description: mA Input Reading
Parameters: ---
Answer: mA reading

MEASure[:SCALar]:VOLTage[:DC]?

Description: V Input Reading
Parameters: ---
Answer: V reading

3.4. System

In the **SYSTEM** tab you can configure the calibrator volume*, touch screen* setting, calibrator identification, language, printer, and security options.

- **Touch Screen Options**

To adjust the screen, press **TOUCH SCREEN OPTIONS**. Press the center of the + signs on the screen (use of the *touch screen* stylus is recommended). After calibration, press the screen again at any point. Confirm the adjustment and return to the **SYSTEM** screen.

- **Language Setting**

Select the desired language and confirm with **OK**. The system must be restarted to save the new configuration.

- **Calibrator Identification**

In this option you can identify the calibrator by choosing a TAG, company name (OWNER), and location.

- **Sound Options**

Press + or - to set a value for the audio volume.

- **Security Options**

Initially, the instrument does not have a password. This setting can be changed in **SECURITY OPTIONS**.

To create a new user, press the key icon 🔑 and then the user icon 🗝. Select **NEW**, fill in the blanks and press **CREATE**. You can add a signature to be used when issuing the **TASKS** function reports and certificates. To do so, select the user and press **SIGN**.

Note the functions that each user level has access to in the table below:

User Level	Function				
	Calibrator	**Tasks**	**Hart®**	*Data-Logger*	**Settings**
Operator	✓	✓	✗	✗	✗
Tec	✓	✓	✓	✓	✗
Admin	✓	✓	✓	✓	✓

To limit access to the system, press the key icon 🔑 and then the padlock icon 🔒 in the menu **CONFIGURATIONS > SYSTEM**. The next time the Calibrator is turned on, you will be prompted for a login and password. To unlock the system, log in as an <u>Admin</u> level user and press the lock icon until it is open again.

Never delete all Admin level users when using password access!

- **PRINT CONF**

Sets the printer language (PCL3/PCL5e/PCL3G etc.).

- **Cal. adjustment**

Adjustment Level, password protected. See section **4 - Adjust** for more information.

4 - ADJUST

Warning: Only enter the following options after you fully understand them. Otherwise, it may be necessary to return the instrument to the factory for recalibration!

Select the **CAL ADJUST** option under **SETUP > SYSTEM**. Use the password **9875** to access the following menu.

The password acts as a protection for the adjustment ranges. After entering the password, the screen shows the options **GENERAL, INPUTS, and OUTPUTS**. In the **GENERAL** option you can retrieve the factory adjustment file and also change the date of the last calibration, if any adjustments have been made.

For adjustment, choose between inputs, outputs and pressure adjustment (General tab).
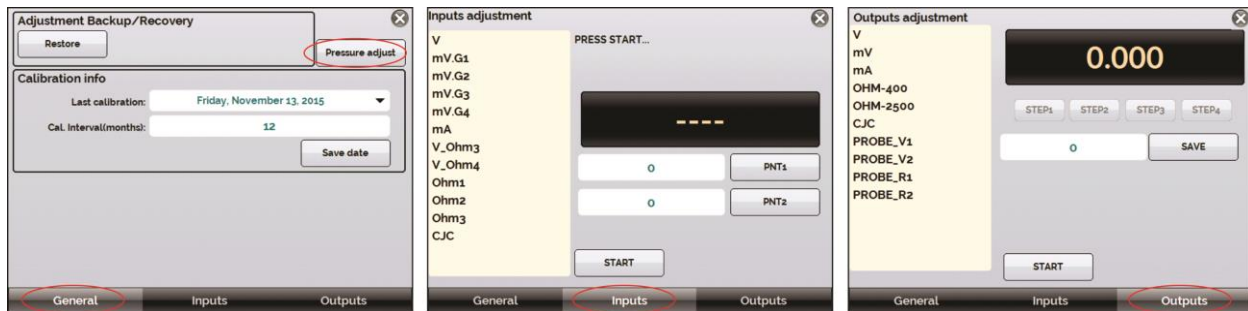
Fig. 53 - Adjust Options

4.1. Input Adjustment

1) Input V, mA

Select the corresponding mnemonic and press the **START** button. Apply the signals corresponding to the table below.

Note that the values applied should only be close to the values in the table.

After applying the signal, record the values at the 1st and 2nd calibration points (PNT1 and PNT2).

Input V	PNT1	PNT2
Single Range	0,0000 V	11,0000 V

Input mA	PNT1	PNT2
Single Range	0,0000 mA	20,0000 mA

4.2. Output Adjustment

The adjustment of the outputs (except for Probe) is done in steps (STEPS). For each STEP the calibrator generates a signal to be measured and recorded.

1) Output V, mA

For these output ranges the screen will show three buttons: **STEP1, STEP2, and STEP3**. Select **STEP1**. The generated signal should be measured by a standard and the value should be saved by pressing the **SAVE** button. Repeat the procedure for **STEP2 and STEP3**.

2) Probe Adjustment

First, identify the connector pins for the **Probe** according to the figure below.
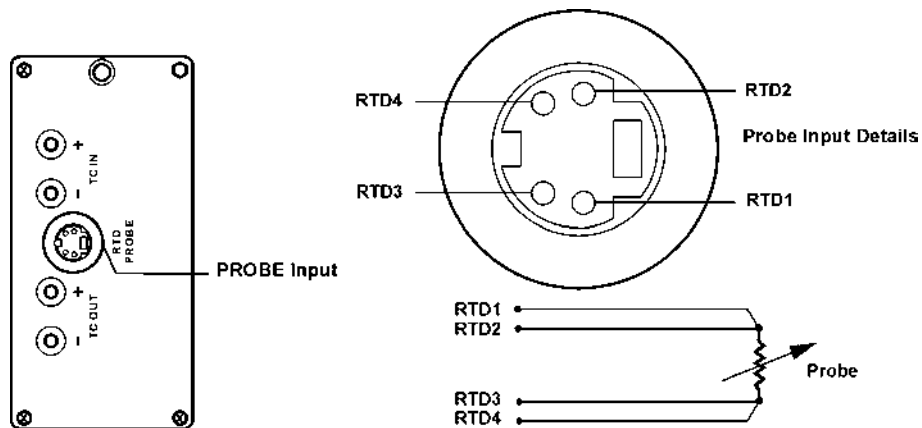
Fig. 54 - Probe Input Connection

The adjustment of **PROBE** is realized in two steps:

a) mV signal application:

Signal mV	Terminals	Bornes	PNT1	PNT2
V_2	RTD2(+)*	GND OUT (-)	70,000mV	120,000 mV
V_1	RTD2(+)*	GND OUT (-)	120,000mV	600,00 mV

(*) RTD2, for the adjustment of the **PROBE**, has as reference the terminals of Figure 55. If necessary, it is possible to acquire a probe connector adapter with output for terminals type J121 (female). Order code: 06.07.0017-00.

b) Application of Standard Resistors:

Connect a decade of standard resistors or resistors to the probe connector at the RTD1, RTD2, RTD3 and RTD4 positions, as shown in Figure 57.

resistors	PNT1	PNT2
R_2	20,000 Ω	50,000 Ω
R_1	100,000 Ω	500,000 Ω

4.3. Pressure Calibration

By pressing **PRESSURE ADJUST** on the **GENERAL** bar, there are 3 options**: mV ADJUST, PRESSURE ADJUST, and PARAMETER SETTING**. Enter the **PRESSURE ADJUST** option.

The sensor adjustment consists of applying at least two pressure values: one near the minimum range value and one at the range full scale.

The number of set points can be increased depending on the pressure sensor. Select **CONFIGURE POINTS** to change the number of points and their respective *setpoints*.
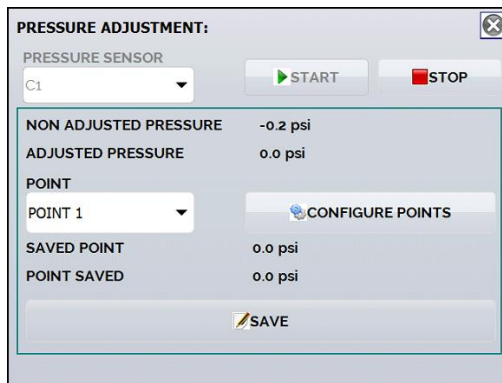
Fig. 55 - Pressure Adjustment

Select a pressure cap between **C1, C2, C3 and C4**. Press **START**.
Choose a setpoint and check the pressure to be applied. Apply the pressure and click the **RECORD** button.

5 - MAINTENANCE

5.1. Battery Replacement (only for PCA-570 portable)

To change the battery in the PCA-570, proceed as follows:

- Loosen the battery cover screws - figure 57 (A);

- Disconnect and pull out the battery - figure 57 (B) and (C);

- Insert the new battery and connect it - figure 57 (D);

- Close the cover - figure 57 (E).

Fig. 56 - Battery Replacement

5.2. Power input fuse replacement

To replace the PCA-570 power fuse, proceed as follows:

- Turn the fuse holder counterclockwise (figure 58 A). Try to use a plastic tool to avoid damaging the fuse holder;

- The fuse holder will be loose - figure 58 (B);

- Pull the fuse holder and remove the fuse - figure 58 (C);

- Insert the spare fuse. It is located in the PCA-570 carrying case;

Fig. 57 - Power input fuse replacement

6 - PRESSURE UNITS CONVERSION

psi	bar	mbar	MPa	kPa
1	$6,894757 \times 10^{-2}$	$6,894757 \times 10^{1}$	$6,894757 \times 10^{-3}$	$6,894757$

psi	Pa	atm	at	mmH$_2$O
1	$6,894757 \times 10^{3}$	$6,804605 \times 10^{-2}$	$7,030696 \times 10^{-2}$	$7,030696 \times 10^{2}$

psi	mmH$_2$O@4°C	cmH$_2$O	cmH$_2$O@4°C	ftH$_2$O
1	$7,030889 \times 10^{2}$	$7,030696 \times 10^{1}$	$7,030889 \times 10^{1}$	$2,306659$

psi	ftH$_2$O@4°C	inH$_2$O	inH$_2$O@4°C	inH$_2$O@60°F
1	$2,306726$	$2,767990 \times 10^{1}$	$2,768067 \times 10^{1}$	$2,770759 \times 10^{1}$

psi	torr	mmHg	mmHg@0°C	cmHg
1	$5,171500 \times 10^{1}$	$5,171500 \times 10^{1}$	$5,171507 \times 10^{1}$	$5,171500$

psi	cmHg@0°C	inHg	inHg@0°C	inHg@60°F
1	5,171507	2,036024	2,036026	2,041772

psi	gf/cm^2	kgf/cm^2	kgf/m^2
1	7,030696 x 10^1	7,030696 x 10^{-2}	7,030696 x 10^2

Reference: Guide for the Use of the International System of Units (SI) – NIST Special publication 811 – 2008 Edition.

Observations

- The readjustment of the PCA-570 must be performed at the reference temperature and humidity conditions.

- For the best calibration condition, comply with the minimum *warm-up* time of two hours and unplug the battery charger from the PCA-570 for at least one hour before use.

- The standards used for readjustment of the PCA-570 should have an accuracy at least 3 times better than the PCA-570 accuracies given in this manual.