# Advanced Test Equipment Corp.

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Additel

## ADT875 Series Dry Well Calibrator

# Additel 875 Series Dry Well Calibrator

## ————User's Manual

Latest version at www.additel.com

[Version:1903V04]

Additel Corporation

## STATEMENT

This user's manual provides operating and safety instructions for the ADT875 Series Dry Well Calibrator. To ensure correct operation and safety, please follow the instructions in this manual. Additel Corporation reserves the right to change the contents and other information contained in this manual without notice. For the most up-to-date manual, please visit www.additel.com.

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# Welcome

The Additel 875 Series Dry Well Calibrators combine excellent performance in stability, radial and axial uniformity, loading with speed, ruggedness and portability. The Process Calibrator option adds the capabilities of a three-channel thermometer readout and a documenting process calibrator. This option includes the ability to measure a reference PRT and two devices under test channels, which can measure, mA, voltage, switch, RTD or thermocouple. When utilizing a reference PRT, the user can control the dry well set point using the external reference PRT for improved performance and periodic self calibration.

# How to Contact Additel

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# Safety Information

**WARNINGS -** identify action or condition that may be hazards to the user.

**CAUTIONS -** identify action or condition that may damage the calibrator or the equipment under test.

**WARNINGS：**

**To prevent personal injury, please follow this user manual.**

**To prevent possible electrical shock, fire, or personal injury, please:**

### 1. General：

- ◆ Check product exterior before use
- ◆ Read and follow all instructions carefully
- ◆ Dry well calibrator should be used by trained personnel only
- ◆ Before initial use, or after storage in humid environments, or anytime the dry well calibrator has not been used for more than 10 days, the dry well calibrator needs to be started with "Dry-out" function over 2 hours first to meet all safety requirements and specifications, see section 5.3
- ◆ Do NOT use the product if it is damaged or operates incorrectly
- ◆ Do NOT use in flammable, high humidity, or dusty environments
- ◆ Turn off the power switch before unplugging the power cord

### 2. High Temperature：

- ◆ Dry well calibrator has a high temperature warning symbol  , this symbol indicates when the block temperature is over 50℃
- ◆ Do NOT touch or remove the probe or insert when the high temperature warning symbol is on
- ◆ Verify the status of the high temperature indicator prior to each use to avoid potential harm when handling the unit, probes and inserts
- ◆ Keep fingers, hands and other body parts clear of the heat shield at all times
- ◆ Do NOT touch any part of the dry well other than the touch screen, electrical measurement board and power switch, when the high temperature indicator is Active.

### 3. Electrical：

- ◆ Double check power connection, fuse model and installation before use
- ◆ Do NOT open the dry well exterior. High voltage is present when the unit is plugged in
- ◆ Do NOT apply more than 30V AC or DC to any of the process calibrator inputs (ADT875PC only)
- ◆ Do NOT use any test leads other than those provided with the dry well calibrator (ADT875PC only)
- ◆ Disconnect all test leads before switching to other electrical measurement functions (ADT875PC only)

**CAUTIONS：**

**To prevent instrument damage, please follow this user manual.**

**To prevent possible electrical shock, fire, or instrument damage, please:**

- ◆ Do NOT shake, drop, or bump the calibrator while in use
- ◆ Do NOT use any power cord other than the one provided with the dry well calibrator
- ◆ Do NOT unplug the power cord while in use
- ◆ Do NOT clean the dry well with liquid, please contact Additel for cleaning process
- ◆ Do NOT drop anything into the dry well slowly and carful place inserts and probes into the dry well calibrator. To avoid damaging the unit, it is best to use the insert removal tool when both inserting and removing inserts.

# 1. Introduction

## 1.1 Model Information

Table 1 Model Information

| Specification | ADT875PC | | | ADT875 | | |
|---|---|---|---|---|---|---|
| | -155 | -350 | -660 | -155 | -350 | -660 |
| Temperature Range | （-40~155）℃ | （33~350）℃ | （33~660）℃ | （-40~155）℃ | （33~350）℃ | （33~660）℃ |
| mA/mV/V/Ω Measurement | ● | ● | ● | | | |
| DC 24V Output | ● | ● | ● | | | |
| HART Communication | ● | ● | ● | | | |
| Switch Test | ● | ● | ● | | | |
| External PRT (Temperature Control) | ● | ● | ● | | | |
| Task Function | ● | ● | ● | | | |
| Database | ● | ● | ● | | | |
| Self Calibration | Auto & Manual Mode | Auto & Manual Mode | Auto & Manual Mode | Manual Mode | Manual Mode | Manual Mode |
| Application | ● | ● | ● | ● | ● | ● |
| Intelligent Diagnosis | ● | ● | ● | ● | ● | ● |
| Remote Control | ● | ● | ● | ● | ● | ● |
| Weight | 9.9 kg (21.8 lbs) | 8.6 kg (17.2 lbs) | | 9.8 kg (19.6 lbs) | 8.5 kg (17.0 lbs) | |

## 1.2 Basic Structure

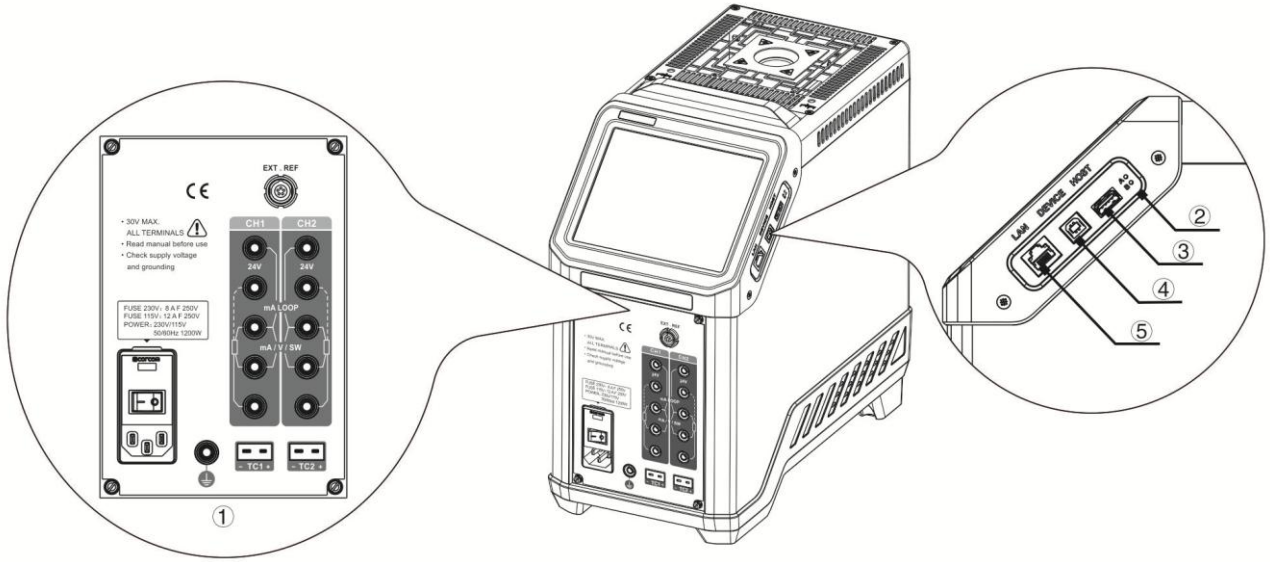


Figure 1 Basic Structure

Table 2 Basic Structure

| No. | Description |
|---|---|
| 1 | Electrical Measurement Panel |
| 2 | Factory Restore Button |
| 3 | USB Port (Host) |
| 4 | USB Port (Device) |
| 5 | Network Cable Port |

## 1.3 Features

- Three models ranging from -40℃ to 660℃
- Portable, rugged, and quick to temperature
- Metrology-level performance in stability, uniformity, accuracy and loading effect
- Dual-zone control
- Process calibrator option provides a multi-channel readout for use with a reference thermometer, RTDs and TCs, as well as task documentation, switch testing and HART communication
- Color touch screen display
- Choose your own range option
- Set point control by reference PRT
- Self-calibration feature

## 1.4 Environmental Conditions

◆Working Temperature: (0~50) ℃ / (32~122) ℉ (Accuracy guarantee: 8℃~38℃ / 46℉~100℉)
◆Storage Temperature: (-20~60) ℃ / (-4~140) ℉
◆Humidity: 0 ~ 90% (0℃ ~ 50℃ or 32℉ ~ 122℉), RH (non-condensing)
◆Atmosphere Pressure: Less than 3,000 m (9,800 ft)
◆Protect Level: IP20

# 1.5 Technical Specifications

1. General：

Table 3 General Specifications

| Specification | ADT875PC / ADT875 | | |
|---|---|---|---|
| | 875-155 | 875-350 | 875-660 |
| Dimensions | 320 x 170 x 330 mm (12.6 x 6.7 x 13.0 in) | | |
| Power Supply | (90-242)VAC，(45-65)Hz, 580W | (90-242)VAC，(45-65)Hz, 1200W | |
| Fuse | 230V：4A F 250V<br>115V：8A F 250V | 230V：8A F 250V<br>115V：16A F 250V | |
| Display | 6.5 in (165 mm) color touch screen | | |
| Communication | USB A, USB B, RJ45, Wi-Fi, Bluetooth | | |
| Localization | English, Chinese, Japanese, Russian, German, French, Italian, and Spanish | | |
| Temperature Unit | ℃, ℉, K | | |
| Temperature Resolution | 0.01℃ / 0.01℉/ 0.01 K | | |
| Compliance | CE | | |

2. Dry Well：

Table 4 Dry Well Specifications

| Specification | ADT875PC / ADT875 | | |
|---|---|---|---|
| | -155 | -350 | -660 |
| Temperature Range at 23℃ | -40°C to 155°C | 33°C to 350°C | 33°C to 660°C |
| Display Accuracy | ±0.18°C at Full Range | ±0.2°C at Full Range | ±0.3°C at 33°C |
| | | | ±0.3°C at 420°C |
| | | | ±0.5°C at 660°C |
| Stability (30 min) | ±0.01°C at Full Range | ±0.02°C at Full Range | ±0.02°C at 33°C |
| | | | ±0.03°C at 50°C |
| | | | ±0.04°C at 420°C |
| | | | ±0.04°C at 660°C |
| Axial Uniformity at 60 mm (2.4 in) | ±0.07°C at Full Range | ±0.04°C at 33°C | ±0.05°C at 33°C |
| | | ±0.1°C at 200°C | ±0.3°C at 420°C |
| | | ±0.2°C at 350°C | ±0.5°C at 660°C |
| Radial Uniformity | ±0.01°C at Full Range | ±0.01°C at 33°C | ±0.02°C at 33°C |
| | | ±0.015°C at 200°C | ±0.05°C at 420°C |
| | | ±0.02°C at 350°C | ±0.1°C at 660°C |
| Loading Effect | ±0.1°C (Display Sensor) | ±0.15°C (Display Sensor) | ±0.15°C (Display Sensor) |
| | ±0.02°C (External Sensor) | ±0.015°C (External Sensor) | ±0.025°C (External Sensor) |
| Hysteresis (Display Sensor) | 0.025°C | 0.03°C | 0.1°C |
| Immersion Depth | 150 mm (5.9 in) | | |

| Insert OD | 25.8 mm (1.02 in) | 24.8 mm (0.98 in) | |
|---|---|---|---|
| Heating Time | 13 min: -40°C to 155°C | 5 min: 33°C to 350°C | 15 min: 33°C to 660°C |
| | 5 min: -40°C to 23°C | | |
| | 8 min: 23°C to 155°C | | |
| Cooling Time | 28 min: 155°C to -40°C | 15 min: 350°C to 100°C | 23 min: 660°C to 100°C |
| | 8 min: 155°C to 23°C | 10 min: 100°C to 50°C | 12 min: 100°C to 50°C |
| | 20 min: 23°C to -40°C | 10 min: 50°C to 33°C | 12 min: 50°C to 33°C |
| Typical Time to Stability | 10 min | | |

## 3. Electrical Measurement（Only for ADT875PC）

Table 5 Electrical Measurement Specifications

| Specification | Description |
|---|---|
| Readout Accuracy for 100 ohm PRT (Probe Accuracy Not Included) | ±0.009°C at -40°C |
| | ±0.010°C at 0°C |
| | ±0.012°C at 50°C |
| | ±0.017°C at 155°C |
| | ±0.019°C at 200°C |
| | ±0.026°C at 350°C |
| | ±0.030°C at 420°C |
| | ±0.042°C at 660°C |
| Readout Resolution | 1 mΩ |
| Reference Resistance Range | 0 Ω to 400 Ω |
| Reference Resistance Accuracy | 0 Ω to 50 Ω: 0.002 Ω |
| | 50 Ω to 400 Ω: 0.004% RD |
| Reference Characterizations | ITS-90, CVD, IEC-751, Resistance |
| Reference Measurement Capability | 4-wire PRT |
| Reference Probe Connection | 6-pin lemo smart connector |
| RTD Channels | 2 |
| RTD Measurement Accuracy (excl sensor) | 0 Ω to 25 Ω: 0.002 Ω |
| | 25 Ω to 400 Ω: 0.008% RD |
| | 400 Ω to 4K Ω: 0.004% RD |

| | |
|---|---|
| RTD Measurement Resolution | 0 Ω to 400 Ω: 1 mΩ |
| | 400 Ω to 4K Ω: 0.01 Ω |
| RTD Measurement Resistance Range | 0 Ω to 4K Ω |
| RTD Characterizations | PT10, PT25, PT50, PT100, PT200, PT500, PT1000, CU10, CU50, CU100, NI100, NI120 |
| RTD Connection | Four 4 mm input jacks |
| RTD Channels | 2 channels. Both accept 2, 3, or 4-wire RTDs |
| TC Channel | 2 |
| TC Measurement Channels | Mini TC terminals:<br>Accepting S, R, K, B, N, E, J, T, C, D, G, L, and U |
| TC Measurement Accuracy (excl sensor) | Type K:<br>±0.13°C at 0°C<br>±0.15°C at 155°C<br>±0.18°C at 350°C<br>±0.24°C at 660°C |
| TC Range | –100 mV to 100 mV |
| TC Resolution | 0.001 mV, Input Impedance <1 MΩ |
| TC Voltage Accuracy | 0.02% RD + 5 µV |
| Internal CJC Accuracy | ±0.35 °C (ambient from 0 °C to 50 °C) |
| Current Range | –30 mA to 30 mA |
| Current Accuracy | 0.02% RD + 2 µA |
| Current Resolution | 0.001 mA, Input Impedance: < 10Ω |
| Voltage Range | –30 V to 30 V |

| | |
|---|---|
| Voltage Accuracy | ±0.02% RD + 2 mV |
| Voltage Resolution | 0.001 V; Input impedance: < 1MΩ |
| Switch Test | Mechanical or Electrical |
| DC 24V Output | 24 V ±1 V, MAX60 mA |
| Hart Communication | Optional (ADT875PC Model) |
| Documentation | Up to 1,000 tasks capable of storing up to 10 results. Each task contains as found and as left data. The snap shot feature allows for screen captures. Also records auto step and ramp functions. |
| Temperature Coefficient<br>0℃ to 8℃ and 38℃ to 50℃ | ADT875(PC)-155: ±0.005 °C/°C |
| | ADT875(PC)-350/660: ±0.01 °C/°C |
| | Ref Readout: ±1 ppm FS/°C |
| | RTD Readouts: ±2 ppm FS/°C |
| | TC Readouts: ±5 ppm FS/°C |
| | Current: ±10 ppm FS/°C |
| | Voltage: ±10 ppm FS/°C |

## 4. Compliance and Mechanical Testing

Table 6 Compliance and Mechanical Testing Specifications

| Subject | Specification | Description | |
|---|---|---|---|
| **EMC-Directive** | Electrostatic Discharge Immunity | 4VK for contact<br>8KV for air | |
| | Radiated Radio-frequency Electromagnetic Field Immunity | 10V/m (80MHZ~1GHZ)<br>3V/m (1.4GHZ~2GHZ)<br>1V/m (2GHZ~2.7GHZ) | |
| | Immunity to Radio-frequency Induced Conducted Disturbance | 3V/m (150kHZ~50MHZ) | |
| | Voltage Dip | 0% for 1 cycle<br>40% for 10 cycles, and 70% for 25 cycles | |
| | Short Interruption | 0% for 250 cycles | |
| | Pulse Group | 1KV (Measuring & Communication Cable) | 5ns, 5kHz |
| | | 2KV (Power Cord) | 50ns, 5kHz |
| | Surge | 1KV (Line-to-line) / 2KV (Line-to-ground) | |
| | Radio-frequency Radiated Electromagnetic Disturbance Limit | Class B | |
| | Radio-frequency Induced Conducted Disturbance Limit | Class B | |
| **LVD-Directive** | Insulation Voltage | 1KV: 875 and 875PC - 350 & 660<br>2KV: 875 and 875PC - 155 | |
| | Insulation Resistance | ＞ 1GΩ when tested at 1KV | |
| **Mechanical Testing** | Vibration Test | 2g (10 ~ 500HZ) , 30 minutes for 2 sides | |
| | Impact Test | 4g, 3 times | |
| | Drop Test | 500mm | |

5. TC Measurement Specification and Calculation (Only for ADT875PC)

Table 7 TC Measurement Specification and Calculation

| TC Type | Temperature (℃) | Error (℃)* | TC Type | Temperature (℃) | Error (℃)* | TC Type | Temperature (℃) | Error (℃) |
|---|---|---|---|---|---|---|---|---|
| B | 250 | ±2 | J | -40 | ±0.1 | R | -40 | ±1.23 |
| | 350 | ±1.44 | | 0 | ±0.1 | | 0 | ±0.95 |
| | 660 | ±0.84 | | 155 | ±0.12 | | 155 | ±0.63 |
| C | 0 | ±0.38 | | 350 | ±0.16 | | 350 | ±0.56 |
| | 155 | ±0.34 | | 660 | ±0.21 | | 660 | ±0.54 |
| | 350 | ±0.33 | K | -40 | ±0.13 | S | -40 | ±1.16 |
| | 660 | ±0.38 | | 0 | ±0.13 | | 0 | ±0.93 |
| D | 0 | ±0.52 | | 155 | ±0.16 | | 155 | ±0.65 |
| | 155 | ±0.37 | | 350 | ±0.19 | | 350 | ±0.6 |
| | 350 | ±0.33 | | 660 | ±0.25 | | 660 | ±0.6 |
| | 660 | ±0.36 | L | -40 | ±0.1 | T | -40 | ±0.14 |
| E | -40 | ±0.09 | | 0 | ±0.1 | | 0 | ±0.13 |
| | 0 | ±0.09 | | 155 | ±0.12 | | 155 | ±0.13 |
| | 155 | ±0.1 | | 350 | ±0.16 | | 350 | ±0.15 |
| | 350 | ±0.13 | | 660 | ±0.21 | | 400 | ±0.15 |
| | 660 | ±0.19 | N | -40 | ±0.2 | U | -40 | ±0.14 |
| G | 0 | ±3.85 | | 0 | ±0.2 | | 0 | ±0.13 |
| | 155 | ±0.71 | | 155 | ±0.19 | | 155 | ±0.13 |
| | 350 | ±0.43 | | 350 | ±0.2 | | 350 | ±0.14 |
| | 660 | ±0.36 | | 660 | ±0.24 | | 600 | ±0.17 |

* Excluding cold junction compensation errors.

## 1.6 Standard Equipment

Table 8 Standard Equipment

| Model | Quantity | ADT875PC | | ADT875 | |
|---|---|---|---|---|---|
| | | ADT-155 | ADT-350<br>ADT-660 | ADT-155 | ADT-350<br>ADT-660 |
| Dry well | 1 pc. | ● | ● | ● | ● |
| ADT110-875-L-INSERT-X<br>(Selected Model) | 1 pc. | ● | | ● | |
| ADT110-875-H-INSERT-X<br>(Selected Model) | 1 pc. | | ● | | ● |
| Insulation Plug<br>(Selected Model) | 1 pc. | ● | | ● | |
| Silica Gel Plug | 1 pc. | ● | | ● | |
| Thermal Shield | 1 pc. | | ● | | ● |
| Insert Removal Tool | 1 pc. | ● | ● | ● | ● |
| Test Leads | 2 set (6 pcs.) | ● | ● | | |
| USB Cable | 1 pc. | ● | ● | ● | ● |
| CD Manual | 1 pc. | ● | ● | ● | ● |
| Certificate of Calibration | 1 pc. | ● | ● | ● | ● |

# 2. Operation

## 2.1 Main Screen

The main operation interface includes two screens, the upper DUT measurement channel and the lower temperature output channel.

①Status Bar：Includes date and time, cloud storage status , 24V power status , intelligence diagnose center , screenshot , electrical measurement channel switch , and system menu icon .

**Note: All icons (except date and time) on the status bar can be selected via the touch screen to manage and select options.**

② DUT measurement window (only for ADT875PC): Includes external measurement readings and sensor type (RTD or TC measurement), automatic cold junction temperature (only for TC measurement), current or resistance measurements, real-time data of electrical measurement and data analysis

③ Temperature output window: Includes target temperature set point **0.00**, real-time temperature data and temperature control play/pause button .

◆The external PRT sensor can be used as a temperature control sensor: The external sensor window will automatically be displayed when the external PRT sensor is connected. Please see section 2.3 for how to set the external PRT as control sensor. Once the external PRT has been selected as control sensor, click on the **0.00** icon in the window to set the target temperature.

④ Screen lock：Press on the top right corner of the screen and select "Screen Lock" to lock the touch display.

◆Unlock：Press on the top right corner of the screen to unlock the touch display.

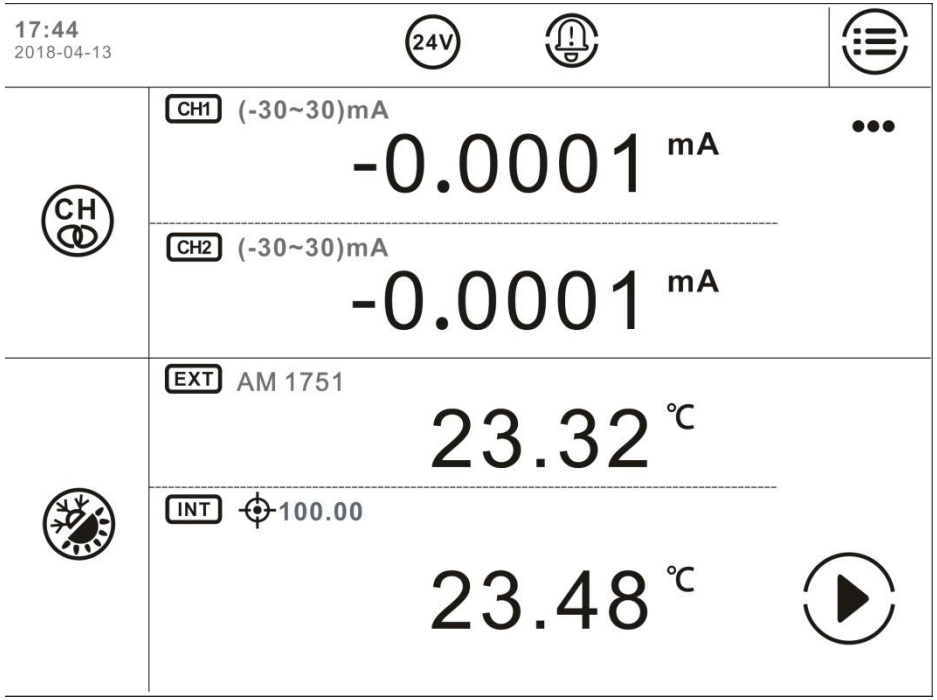


Figure 2 Main Screen

## 2.2 System Temperature Unit Setup

System temperature display units can be changed through the system menu or main screen

◆Once the system display temperature units are changed, all related parameters in the system will be changed, except nonrelated sensor and DUT information

1. System Menu：

Press  on the top right corner of the screen → "Setup" → "Personalization" → "Temperature Unit" → Select temperature unit

2. Main Screen：

Press the temperature unit on the temperature display screen - Select desired temperature unit

## 2.3 Temperature Output

**1. Temperature output settings**

Press the  icon on the left of the temperature display screen to enter the menu. This menu includes control parameters and reference parameters:

(1)Control Program Settings：

Table 9 Control Program Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Stability Tolerance | Dependant on the system temperature units selected | The condition is met when temperature varies within this range. |
| Stabilization Time | 1~120 | The condition is met when the stabilized time of temperature control exceeds the set value. Unit: min |
| Set Point Tolerance | Dependant on the system temperature units selected | The condition is met when the difference between the measured temperature and the target value is within this range. |
| Control Rate | Max value depends on system temperature units selected | Choose fastest or customize the temperature control rate. Customized rate is indicated on the process bar. |
| Set Point Limits | Enable / Disable | Limit the range of temperature control |
| Restriction Range (When set point limit is enabled) | Depends on dry well model | The temperature will not exceed the upper and lower limits |

(2) Control Reference Parameter：

Table 10 Control Reference Parameter

| Subject | Valid Value | Comment |
|---|---|---|
| Select Reference | INT / EXT | Select the internal sensor (INT) or external sensor (EXT) to be the control sensor |
| Select Ext as reference automatically | On/ Off | OFF will default the control sensor to be internal sensor on start up. ON will default the control sensor to be the external sensor on start up |
| **Internal Sensor** | | |
| Resolution | 1, 0.1, 0.01 | Temperature display resolution |
| Sensor Signal | Read only | Measured temperature of internal sensor |
| Diff | Read only | The temperature difference between bottom and top sensor of dry well |
| **External Sensor（Only for ADT875PC）** | | |
| Ext.Ref Resolution | 1, 0.1, 0.01, 0.001 | Temperature display resolution |
| Sensor Signal | Read only | Measured temperature of external sensor |
| Sensor Information | Read only | Information of external sensor |

**2. Target Temperature Input：**

Press the Target Temperature icon INT , or real-time temperature data area, then input the target temperature value through the numeric keyboard. The target set point should be set within the temperature range of the dry well, which is restricted by different model numbers and customized set points. Press Enter or press to confirm. Temperature control of the dry well calibrator will start automatically.

**3. Start/Pause Temperature Control:**

Temperature control can be initiated or paused by pressing START or PAUSE on the right of the dry-well temperature display screen.

**4. Temperature Control Stabilization**

Temperature control will stabilize when the control conditions are met. The display value will turn green accompanied by a beep when the unit is stable.

# 2.4 DUT Measurement (Only for ADT875PC)

### 2.4.1 DUT Settings

Press (when CH1 and CH2 are always measuring the same measurement type) / (when CH1 and CH2 are measuring different measurement types) on the left of the DUT measurement channel screen to enter DUT settings, which includes channel settings, sensor testing and electrical signal.

Table 11 DUT Settings

| Subject | Valid Value | Comment |
|---|---|---|
| **Channel Setting** | | |
| CH1 & CH2 Connection | Connected /Disconnected | Selecting whether the two-channel measurement types are the same: **Connected =Same; Disconnected = Different** |
| CH1 & CH2 Measurement subject (when CH1 and CH2 are connected) | RTD, TC, current, voltage, switch test, HART (transmitter), N/A | Selecting a subject of DUT channel measurement |
| CH1 (CH2) Measurement subject (when CH1 and CH2 are disconnected) | | |
| **Sensor Under Test** | | |
| Temperature Resolution | 1, 0.1, 0.01 | Temperature display resolution |
| Stability Tolerance | ≥0.005 | One of the conditions for temperature control and stability. The condition is met when temperature varies within this range. Unit:℃ |
| Stability Time | 1~120 | One of the conditions to for temperature control and stabilization. The condition is met when the stabilized time exceeds the set point. Unit: min |
| **Electrical Signal** | | |
| mA & V Resolution | 1, 0.1, 0.01, 0.001, 0.0001 | Display resolution of current and voltage measurements |

Press on the lower right to confirm.

◆Press ●●● on the DUT measurement screen and select "Close" to close any or both of the electrical measurement channels.

### 2.4.2 Thermal Resistance (RTD) & NTC Measurement

**1. Connection**

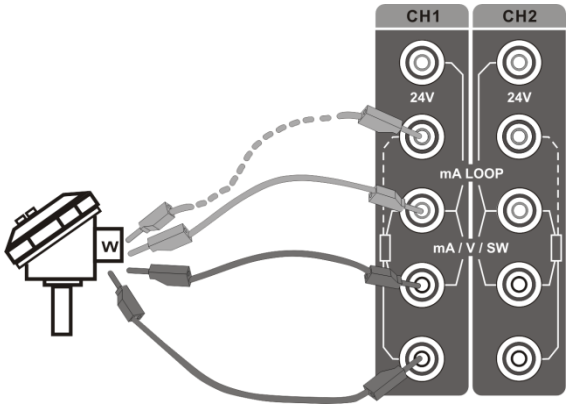


Figure 3 RTD Connection

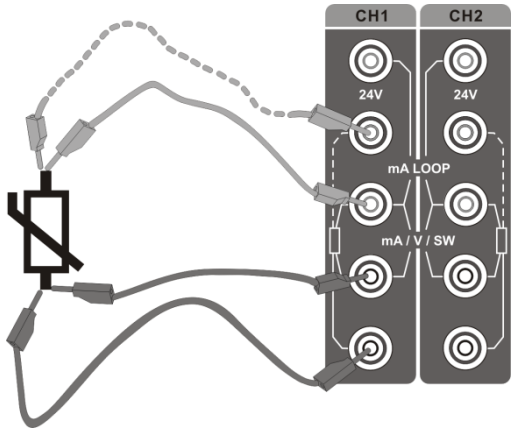


Figure 4 NTC Connection

## 2. Measurement Settings

Press (when CH1 and CH2 are always measuring the same measurement type)/ (when CH1 and CH2 are measuring different measurement types from each other) on the left of DUT measurement channel screen to enter the DUT setting screen. Select CH1 or CH2 or CH1&CH2 to enter the channel setting screen. Press “Measurement” and select RTD (thermal resistance), and the unit will return to the channel setting screen.

2.1 Sensor Type

Press “Sensor Type” to enter the sensor selection screen.

2.1.1 Default Sensor

The default sensor can be selected from the sensor library.

2.1.2 Custom Sensor

Press on the right side of the screen to add a new sensor, please see section 3.2 Sensor Library for how to add a custom sensor.

2.2 Wire Type Selection

Table 12 RTD Wire Selection

| Subject | Valid Value | Comment |
|---|---|---|
| Wire | 2, 3, 4 | RTD Wire selection |

## 3. Starting a Measurement

Press on the lower right of the screen after selecting the sensor and wire type, the system will then return to the DUT setting screen.

Press , again and the system will return to the main screen.

The DUT channel will show “------“ with an audible beep if there is an error in the RTD connection.

Please see section 2.3 for more info regarding the calibrator temperature output.

### 2.4.3 Thermal Couple (TC) Measurement

**1. Connection**

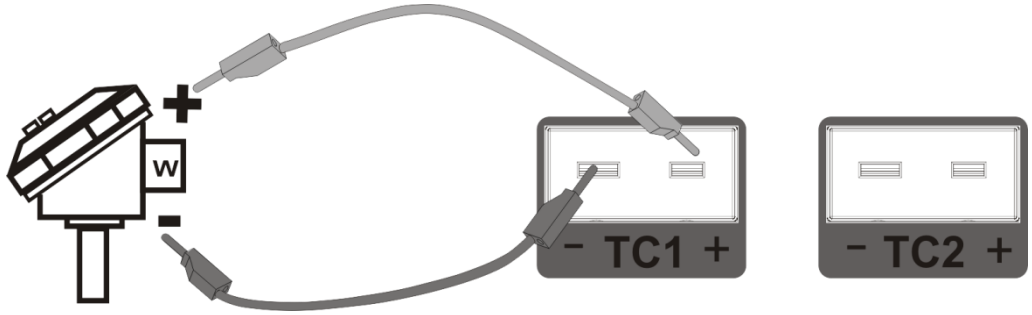


Figure 5 TC Connection

**2. Measurement Settings**

Press CH (when CH1 and CH2 are always measuring the same measurement type)/ CH (when CH1 and CH2 are measuring different measurement types from each other) on the left of DUT measurement channel screen to enter the DUT setting screen. Select CH1 or CH2 or CH1&CH2 to enter the channel setting screen. Press “Measurement” and select TC (thermal couple), and the unit will return to the channel setting screen.

2.1 Thermal Couple (TC) Type

Press sensor type to enter the sensor selection screen:

2.1.1 Default Sensor

System default sensors are as follows:

mV, S, R, B, K, N, E, J, T, C, D, G, L, U, LR, A, 10μV/℃, 1mV/℃

2.1.2 Cold Junction Type

Table 13 Cold Junction Type

| Subject | Valid Value | Comment |
|---|---|---|
| Cold Junction Type | INT / EXT | "INT" means the calibrator is the using internal sensor as the cold junction reference.<br>"EXT" means the dry well is using user entered custom values as the cold junction reference.<br>**Note: There is no need to choose the cold junction type when mV is selected as the sensor type.** |
| Ext CJC value (when selecting Ext) | Numeric Content | Set customer value for the cold junction compensation value |

**3. Starting a Measurement**

Press ✓ on the lower right of the screen after the sensor and cold junction type is selected. The unit will return to the DUT setting screen.

Press ✓, again and the unit will jump back to the main screen.

The DUT channel will show "------" with an audible beep if there is an error in the TC connection.

Please see section 2.3 for more information regarding the temperature output.

### 2.3.4 Current (mA) Measurement

**1. Connection**

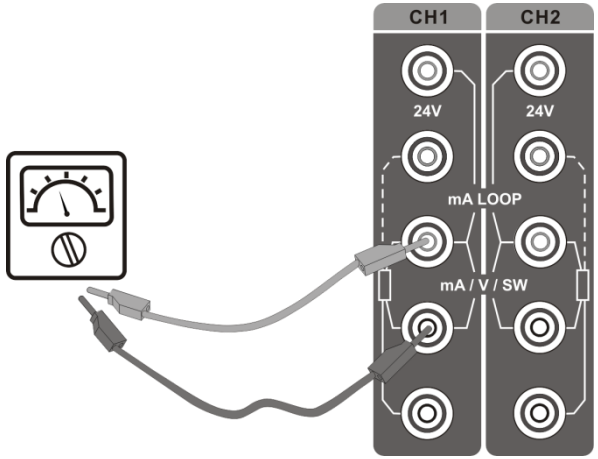


Figure 6 Current Measurement Connection

**2. Measurement Settings**

Press CH (when CH1 and CH2 are always measuring the same measurement type)/ CH (when CH1 and CH2 are measuring different measurement types from each other) on the left of DUT measurement channel screen to enter the DUT setting screen. Select CH1 or CH2 or CH1&CH2 to enter the channel setting screen. Press “Measurement” and select mA measurement, and the unit will return to the channel setting screen.

**3. Starting a Measurement**

Press ✓ on the lower right screen, the unit will return to DUT setting screen.
Press ✓ again and, the unit will return to the main screen.
Please see section 2.3 for more information regarding the temperature output.

### 2.3.5 Voltage (V) Measurement

**1. Connection**

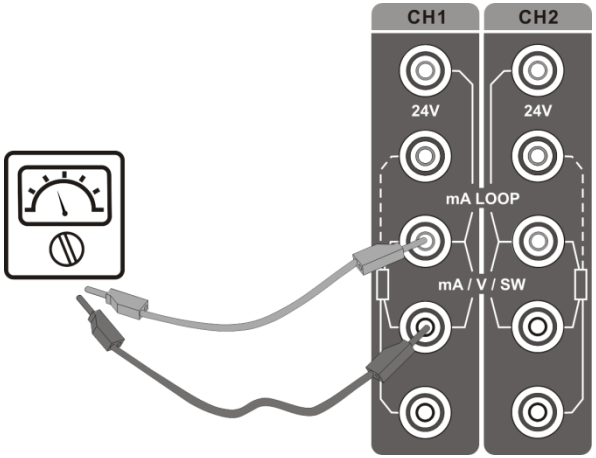


Figure 7 Voltage Measurement Connection

**2. Measurement Settings**

Press (CH)(when CH1 and CH2 are always measuring the same measurement type)/ (CH)(when CH1 and CH2 are measuring different measurement types from each other) on the left of DUT measurement channel screen to enter the DUT setting screen. Select CH1 or CH2 or CH1&CH2 to enter the channel setting screen. Press “Measurement” and select voltage (V) measurement, and the unit will return to the channel setting screen.

Table 14 Voltage Selection

| Subject | Valid Value | Comment |
|---|---|---|
| Range | 12V, 30V | Select a voltage measurement range scale |

**3. Starting a Measurement**

Press ✓ on the lower right of the screen, the system will return to the DUT setting screen.

Press ✓ again and the unit will return to the main screen.

Please see section 2.3 for more information regarding the temperature output.

### 2.3.6 Switch Test

**1. Connection**

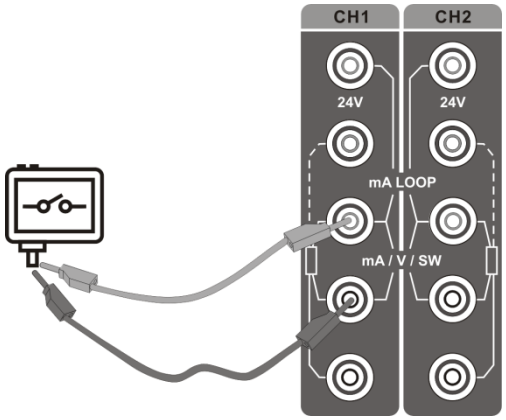


Figure 8 Switch Test Connection

**2. Measurement Settings**

Press (when CH1 and CH2 are always measuring the same measurement type)/ (when CH1 and CH2 are measuring different measurement types from each other) on the left of DUT measurement channel screen to enter the DUT setting screen. Select CH1 or CH2 or CH1&CH2 to enter the channel setting screen. Press “Measurement” and select Switch, and the unit will return to the channel setting screen.

Table 15 Switch Type Selection

| Subject | Valid Value | Comment |
|---|---|---|
| Switch Type | Dry contact, Wet contact, PNP, NPN | Temperature switch type |

**3. Starting a Measurement**

Press ✓ on the lower right of the screen and the unit will return to DUT setting screen.

Press ✓ again and the unit will return to the main screen.

Please see section 2.3 for more information regarding the temperature output.

.

### 2.3.7 Transmitter Measurement (including HART transmitter)

**1. Connection**

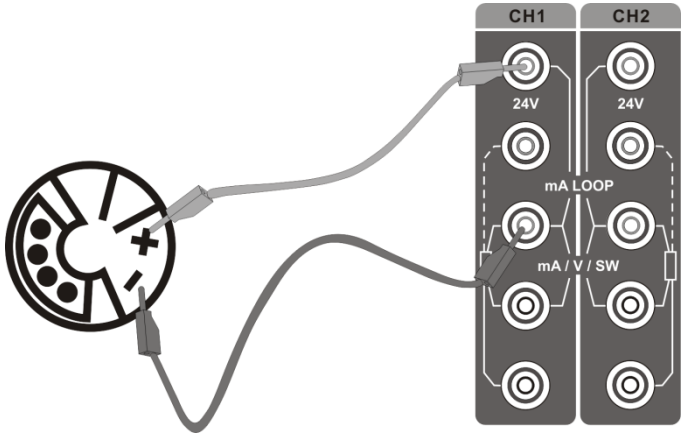


Figure 9 Transmitter Connection

**◆Only CH1 is available for HART transmitter**

**2. Transmitter Settings**

Press (when CH1 and CH2 are always measuring the same measurement type)/ (when CH1 and CH2 are measuring different measurement types from each other) on the left of DUT measurement channel screen to enter the DUT setting screen. Select CH1 or CH2 or CH1&CH2 to enter the channel setting screen. Select HART, and the unit will return to the channel setting screen.

Press and the unit will return to the main screen.

Please see section 2.3 for more information regarding the temperature output.

2.1 Poll

The dry well will search for available transmitter automatically.

If additional searches are needed, press ••• on the upper right of DUT measurement channel screen then press on the right of the screen.

Press the name of the target transmitter when searching is completed, then press ✓ on the lower right of the screen.
The unit will return to the main screen and read the measured data of the transmitter.

2.2 Settings (some functions are HART only)

Press ●●● on the upper right of DUT measurement channel screen, and select Settings to enter the transmitter setting screen.

1. Device Information:

Table 16 Transmitter Information

| Subject | Valid Value | Comment |
|---|---|---|
| Manufacturer | Read only | Manufacturer of the transmitter |
| Device Type | Read only | Type of the transmitter |
| Device ID | Read only | Device ID of the transmitter |
| Tag | Alphanumeric content (8 max length) | Custom label of the transmitter |
| Date | 2000/1/1~2099/12/31 | Date setting |
| Write-protect | Read only | Protection type |
| Message | Alphanumeric content (20 max length) | Custom information |
| Descriptor | Alphanumeric content (20 max length) | Custom description |
| Final Assembly Number | Support numeric input, no more than 20 characters | The final assembly number of the transmitter |
| Preambles | 5~20 | The preamble number of the transmitter |
| Universal Version | Read only | Universal version of the transmitter |
| Software Version | Read only | Software version of the transmitter |
| Hardware Version | Read only | Hardware version of the transmitter |
| Device Version | Read only | Device version of the transmitter |

2. Sensor:

Read only information on transmitter's unit, upper-lower limits, and the minimum span.

3. Device Output:

Table 17 Transmitter Output Information

| Subject | Valid Value | Comment |
|---|---|---|
| Process Variable/Range Units | User selectable | Measurement unit of the transmitter |
| Lower Limit of PV Range | Support numeric input, lower limit expanding 10% | Lower limit of the process variable |
| Upper limit of PV Range | Support numeric input, upper limit expanding 10% | Upper limit of the process variable |
| Transfer Function | Linear, Square Root | Transfer function of the transmitter |
| Alarm State | Read only | Alarm state of the transmitter |
| Damping | Support numeric input, ≥0 | Damping time |
| Poll Address | 0~15 | Poll address of the transmitter |
| Burst Mode | Read only | Burst mode state |
| Burst Command | Read only | Burst command depends on different transmitters |

2.3 Service

Press the icon on the right of DUT measurement channel screen, select “Service” to enter the transmitter setting screen.

1. Current Loop Test

Customers can compare and calibrate the current output signal of the transmitter and the current measurement signal of the Calibrator through a current loop test.

◆ This function will be enabled only when the poll address of the transmitter is 0.

1) Intercept the current measurement signal through the numeric keyboard or press the button “Fetch”, and apply by pressing Enter or pressing the confirm button.

2) A few seconds later, the calibrator will send output current value of the transmitter and current measurement value of the calibrator. Adjustment should be made if the difference is out of tolerance.

2. D/A Adjustment

Customers can adjust the current output of the transmitter at zero and full scale through D/A adjustment.

◆This function will be enabled only when the poll address of the transmitter is 0.

① D/A Zero

1) Intercept the current measurement signal (4mA as the typical value) through the numeric keyboard or press the button “obtain”, and apply by pressing Enter or pressing the confirm button.

2) A few seconds later, the calibrator will send instruction to the transmitter to adjust the current output at zero.

② D/A Gain

1) Intercept the current measurement signal (20mA as the typical value) through the numeric keyboard or press the button “obtain”, and apply by pressing Enter or pressing the confirm button.

2) A few seconds later, the calibrator will send instruction to the transmitter to adjust the current output at full scale.

2.4 Process

Press ●●● on the right of DUT measurement channel screen and select “Process Quantity” to enter the transmitter setting screen, which allows the customers to select the process variable of the transmitter:

Table 18 HART Device Variable

| Subject | Comment |
|---|---|
| Process Variable | The unit of the master variable depends on the setting of the transmitter. Please refer to transmitter output setting for details. |
| PVAO | Output current of the transmitter, unit: mA |
| Percentage | The percentage of temperature readout in the temperature range of the transmitter |
| Loop Current | Loop current of the transmitter, unit: mA |

**3. Starting a Measurement**

Please refer to section 2.3 for operation on calibrator temperature output.

# 3. System Setup

To enter the system setup menu, please select "Setup" under Main Menu .

◆Any changes made in the Setup will become the default values after the calibrator is rebooted.

◆Necessary information has to be completed, otherwise system will prohibit the next step with notification.

## 3.1 Communication

### 3.1.1 Ethernet

Connect the dry well to a computer through the Network port.

Table 19 Ethernet Address Type Setting

| Subject | Valid Value | Comment |
|---|---|---|
| Address Type | DHCP / Static | Ethernet address acquisition mode |

◆All information in Table 18 is required and entered manually when static address acquisition mode is selected:

Table 20 Ethernet Settings

| Subject | Valid Value | Comment |
|---|---|---|
| IP Address | 0.0.0.0 ~ 255.255.255.255 | Dry well IP address |
| Netmask | 0.0.0.0 ~ 255.255.255.255 | Dry well subnet mask |
| Gateway | 0.0.0.0 ~ 255.255.255.255 | Dry well gateway |
| Network Port | Read Only | Dry well network port |
| Physical Address | Read Only | Dry well Physical address |

Port number and MAC address information are read only.

◆All information in Table 18 above is filled in automatically when DHCP address acquisition mode is selected.

Press on the bottom left corner of screen to confirm.

### 3.1.2 WLAN

Connect the dry well to a computer through Wi-Fi.

Table 21 WLAN Settings

| Subject | Valid Value | Comment |
|---|---|---|
| WLAN | On / Off | Enable or disable Wi-Fi communication function |
| SSID | Depends on network environment (only available when WLAN is on) | Select Wi-Fi router |
| Advanced | DHCP / Static | Network address acquisition mode |
| Network Port | Read Only | Dry well network port |
| Physical Address | Read Only | Dry well Physical address |

◆All information in Table 20 is required and entered manually when static address acquisition mode is selected:

Table 22 Wi-Fi Address Settings

| Subject | Valid Value | Comment |
|---|---|---|
| IP Address | 0.0.0.0 ~ 255.255.255.255 | Dry well IP address |
| Subnet Mask | 0.0.0.0 ~ 255.255.255.255 | Dry well subnet mask |
| Gateway | 0.0.0.0 ~ 255.255.255.255 | Dry well gateway |

Port number and MAC address information are read only.

◆All information in Table 20 above is filled in automatically when DHCP address acquisition mode is selected.

Wi-Fi settings are applied immediately, press  on the top left corner for previous menu.

### 3.1.3 Bluetooth®

Connect dry well with computer through Bluetooth®.

Table 23 Bluetooth Settings

| Subject | Valid Value | Comment |
|---|---|---|
| BT Name | Alphanumeric content (14 max length) | Dry well Bluetooth name |
| Radio Mode | On / Off | Enable or disable Bluetooth function |
| Connected Devices | Display the connected devices | Click the disconnect |

Bluetooth settings are applied immediately, press on the top left corner for previous menu.

### 3.1.4 ACloud Service

Upload data onto ACloud server for remote control

Table 24 ACloud Service Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Enable | On / Off | Enable or disable cloud service function |
| Account | Alphanumeric content (16 max length) | Cloud server account |
| Interval | 1~100 | Interval time between each reading, unit: sec |

◆◆Symbol on the title bar of main screen indicates that the cloud service is enabled.

Note: Cloud Service move to "Setup" interface, Click "ACloud Service", Press" Additel Link", If a device is connected in ACloud, the name of the organization or company will appear on the screen. User account and state of remote control authority will be listed below.

Touch the right corner two-dimension code icon and use the Additel Link APP. Next will appear two-dimension code, Please scan and remote control authority will be assigned to current APP account and any connected devices can be removed.

## 3.2 Sensor Library (Only for ADT875PC)

Sensor information can be stored in the sensor library for future use. Five types of sensors are available: Smart Sensor, ITS-90, CVD, RTD, and NTC. Press sensor type to enter sub-menu, then press sensor name to enter sensor information page.

### 3.2.1 General Management

1. Display Settings:

Press ⚙ on the bottom right corner of the screen to set the sensor list display contents：

Table 25 Sensor Display Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Digital Display Format | Scientific / Decimal | Select parameter display mode：<br>Scientific：$1.1*10^{-2}$<br>Decimal：0.011 |
| RTD | Model & Name / Serial Number | Select display contents |
| ITS-90 | | |
| CVD | | |
| NTC | | |
| Smart Sensor | | |

2. Sub-menu:

Management function icons in the sub-menu are listed below:

Table 26 General Management Icons in Sensor Library

| Icon | Comment | Intelligent Sensor | ITS-90 | CVD | RTD | NTC |
|---|---|---|---|---|---|---|
|  | Add a new sensor | ● | ● | ● | ● | ● |
|  | Add a new sensor based on selected sensor as template | ● | ● | ● | | |
|  | Export selected sensor data into connected PRT sensor | ● | ● | ● | | |
|  | Delete sensors:<br>1. Press sensors to select, then press  to delete<br>2. Press  to delete all sensors | ● | ● | ● | ● | ● |

3. Sensor information:

Management function Icons in the sensor information page are listed below:

Table 27 Management Icons in Sensor Information Page

| Icon | Comment | Intelligent Sensor | ITS-90 | CVD | RTD | NTC |
|---|---|---|---|---|---|---|
|  | Edit selected sensor | ● | ● | ● | ● | ● |
|  | Delete selected sensor | ● | ● | ● | ● | ● |
|  | Export selected sensor data into connected PRT sensor | ● | ● | ● | | |

### 3.2.2 Smart Sensor

Table 28 Smart Sensor Information

| Subject | Valid Value | Comment |
|---|---|---|
| Model / Name | Alphanumeric content (14 max length) | Sensor type and name |
| Serial Number | Alphanumeric content (14 max length) | Sensor serial number |
| Sensor Type | ITS-90 / CVD | Sensor type, different type applies different calculation parameters and equations. See tables below. |
| Temperature Range | Depends on system temperature units | Temperature range, unit: mirrors system units |
| Calibration Date | 2000/1/1~2099/12/31 | Calibration date |
| Next Calibration Date | 2000/1/1~2099/12/31 | Calibration due date |
| Note | Alphanumeric content (14 max length) | Note |

1. Select ITS-90 sensor type:

Table 29 ITS-90 Information

| ITS-90 | | |
|---|---|---|
| **Subject** | **Valid Value** | **Comment** |
| Negative temperature parameters coefficients | A4, b4: （-200~0）℃ | Negative temperature parameters selection |
| | A5, b5: （-40~0）℃ | |
| | N/A | |
| Positive temperature parameter coefficients | A6, b6, c6, d, W660.323: （0~960）℃ | Positive temperature parameter selection |
| | A7, b7, c7: （0~660）℃ | |
| | A8, b8: （0~420）℃ | |
| | A9, b9: （0~232）℃ | |
| | A10: （0~157）℃ | |
| | A11: （0~30）℃ | |
| Rtp（Ω） | Numeric content | Parameters for the sensor calculation equation, please refer to the sensor calibration certificate. |
| a4 | | |
| b4 | | |
| a6 | | |
| b6 | | |
| c6 | | |
| d | | |
| W（660.323℃） | | |

2. Select CVD sensor type:

Table 30 CVD Information

| CVD | | |
|---|---|---|
| **Subject** | **Valid Value** | **Comment** |
| R0 (Ω) | Numeric content | Parameters for the sensor calculation equation, please refer to the sensor calibration certificate. |
| a | Numeric content | |
| b | | |
| c | | |

### 3.2.3 ITS-90

See table 27 & 28 for ITS-90 information.

### 3.2.4 CVD

See table 27 & 29 for CVD information.

### 3.2.5 RTD

Table 31 RTD Information

| Subject | Valid Value | Comment |
|---|---|---|
| Model / Name | Alphanumeric content (14 max length) | RTD type and name |
| Serial Number | Alphanumeric content (14 max length) | RTD serial number |
| Temperature Range | Depends on system temperature units | Temperature range, unit: mirrors system units |
| R0 (Ω) | Numeric content | Resistance value at 0℃ |
| Note | Alphanumeric content (14 max length) | Note |

### 3.2.6 NTC

Table 32 NTC Information

| Subject | Valid Value | Comment |
|---|---|---|
| Model Name | Alphanumeric content (14 max length) | NTC type and name |
| Serial Number | Alphanumeric content (14 max length) | NTC serial number |
| Temperature Range | Depends on system temperature unit | Temperature range, unit: mirrors system units |
| NTC Type | NTC / Steinhart-Hart | Sensor type, different types apply different calculation parameters and equations. See tables below. |
| Calibration Date | 2000/1/1~2099/12/31 | Calibration date |
| Next Calibration Date | 2000/1/1~2099/12/31 | Calibration due date |
| Note | Alphanumeric content (14 max length) | Note |

1. Select NTC sensor type:

Table 33 NTC Information

| Subject | Valid Value | Comment |
|---|---|---|
| Rtn | Numeric content | Parameters for the sensor calculation equation, please refer to the sensor calibration certificate. |
| Tn | | |
| β | | |

2. Select Hart sensor type:

Table 34 Hart Information

| Subject | Valid Value | Comment |
|---|---|---|
| a | Numeric content | Parameters for the sensor calculation equation, please refer to the sensor calibration certificate. |
| b | | |
| c | | |

## 3.3 Power Grid Settings (Only for ADT875PC/875 - 350 & 660)

Two types of power supply voltages are available: 220V & 110V

◆Please check and select the correct voltage

◆Please check fuse value when voltage settings are changed

◆The dry well will detect the power supply voltage each time of use, an error notification will be displayed if the voltage selection is different from the supply voltage

◆A password is necessary when switching to another voltage, see section 3.4 Password Protection for more information. The default password is:123456

## 3.4 Password Protection

Table 35 Password Protection

| Subject | Valid Value | Comment |
|---|---|---|
| Edit Password | Numeric content (20 max length) | Password setup, default password is: 123456 |
| Task (Only for ADT875PC) | Enable / Disable | Enable or disable Password Protection.<br>Enable: Password is necessary when deleting task data |
| Sensor Library (Only for ADT875PC) | Enable / Disable | Enable or disable Password Protection.<br>Enable: Password is necessary when deleting sensor library data |

◆Password applies on: Tasks (when enabled), Sensor Library (when enabled), Power Grid Settings, System Calibration, Restore, and Updates.

# 3.5 Services

### 3.5.1 Calibration

Password applies when entering calibration menu, default password: 123456

◆Please refer to section 3.4 Password Protection to change the password

Password applies when entering Maintenance menu, default password: 123456

◆Maintenance records can be increased.

Password applies when entering System Update menu, default password: 123456

◆Automatic update function can be set

Table 36 System Calibration General Information

| Subject | ADT875 | ADT875PC | Recommended operator | Comment |
|---|---|---|---|---|
| Self Calibration | Manual mode only | Manual & Auto mode | User | Only the latest data will be saved |
| Electric Calibration | Manual mode only | Manual mode only | Third-party organization, National Lab, or Periodic Calibration | Only the latest data will be saved |
| Temperature Calibration | Manual mode only | Manual & Auto mode | Third-party organization, National Lab, or Periodic Calibration | Every data will be saved and listed |
| Axial Homogeneity Calibration | Manual mode only | Manual & Auto mode | Third-party organization, National Lab, or Periodic Calibration | Every data will be saved and listed |
| Calibration Data Entry | Manual mode only | Manual mode only | Third-party organization, National Lab, or Periodic Calibration | Every data will be saved and listed |

#### 3.5.1.1 Self Calibration

To calibrate dry well display sensor.

**-Manual Calibration Mode:**

**How to set the calibration points：**

Press to enter the calibration point configuration interface if necessary, otherwise please press for the next step.

Click each calibration point to modify the value.

◆The number of calibration point can be increased to a maximum of 7 or reduced to a minimum of 3

**How to connect：**

Please put the $T_{ref}$ (Standard Sensor) to reach the bottom (0 mm) of the dry well calibrator.

◆For -875PC, please also plug the connector of $T_{ref}$ (Smart Standard Sensor) to the EXT.REF port of dry well electrical measurement board.

◆Or follow the instruction displayed on screen for correct connection.

**How to use：**

1. Calibration execution:

1.1 At each calibration point, press on the right column of the table to execute the calibration

1.2 When temperature is stable, press Fetch button to collect standard sensor measurement value (-875PC), or click the corresponding cell of $T_{ref}$ column to input the value (-875 & -875PC)

◆Please judge whether the temperature is stable manually.

2. Save the calibration data:

Press to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

**-Automatic Calibration Mode (-875PC with smart standard sensor only)**

**How to set the calibration points：**

Press  to enter the calibration point configuration interface if necessary, otherwise please press  for the next step.

Click each calibration point to modify the value.

◆The number of calibration point can be increased to a maximum of 7 or reduced to a minimum of 3

**How to connect：**

Please put the $T_{ref}$ (Standard Sensor) to reach the bottom (0 mm) of the dry well calibrator.

Also plug the connector of $T_{ref}$ (Smart Standard Sensor) to the EXT.REF port of dry well electrical measurement board.

◆Or follow the instruction displayed on screen for correct connection.

**How to use：**

1. Calibration execution:

The dry well will execute the self calibration automatically

2. Save the calibration data:

Press  to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

### 3.5.1.2 Electrical Calibration

**1. General Information**

Display Icons on the right side of each calibration menu are listed below:

Table 37 General Display Icons in Electrical Calibration

| Icon | Comment | Ext.REF | CH1 & CH2 | | | | |
|---|---|---|---|---|---|---|---|
| | | | ±30 mV Measurement | TC (±75 mV) Measurement | ±12 V & ±30 V Measurement | 400Ω (4W) & 4000Ω (4W) Measurement | Cold Junction Calibration |
|  | Cancel the calibration, no data will be saved. | ● | ● | ● | ● | ● | ● |
|  | Restore the factory data | ● | ● | ● | ● | ● | ● |
|  | Cancel the zeroing | | ● | ● | ● | | |

**2. Ext.REF**

To calibrate the resistance measurement of Ext.REF connector, please prepare standard resistance source.

◆The number of set points cannot be changed, but set point values can be changed by pressing and inputting new values

◆The last calibration date is shown below the set point table

**Connection diagram:**

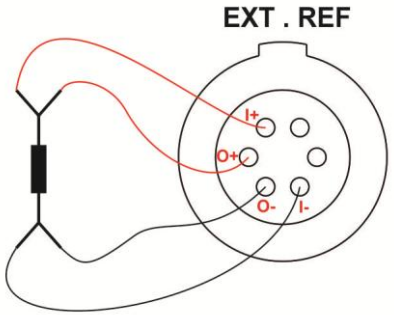


Figure 10 External Reference Connection

**Calibration Instructions:**

1 Press ▶ to start the calibration process. All referece data will need to be input manually.

2 Press ⏭ to record data and move to the next set point, or press ⏮ to delete current data and move to the previous set point.

3 Press 💾 to save the calibration result after all set points are done.

◆The dry well will apply the calibration data automatically once the data is saved.

**3. CH 1 & CH2**

**1. ±30 mA Measurement**

To calibrate the current measurement for CH1 and CH2:

◆The number of set points cannot be changed, but set point values can be changed by pressing and inputting the new values.

**How to Connect:**

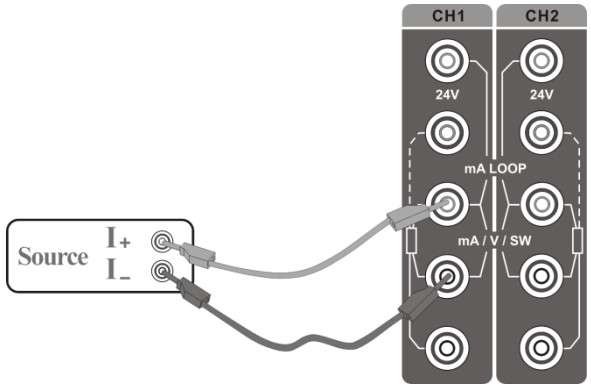


Figure 11 ±30 mA Measurement Calibration Connection

**Calibration Instructions：**

1 Press ▶ to start calibration process

2 Output the current from your standard which corresponds to the calibration set point value

3 When the Measured Value is stable, press ⏭ to record data and move to the next calibration point, or press ⏮ to return to the previous point to retake the data

4 Once the calibration has finished, press 💾 to save the data

◆The dry well will apply the calibration data automatically once the data is saved.

**2. TC, (-75~75)mV**

To calibrate the TC measurement for CH1 and CH2:

◆The set point values of TC,(-75~75)mV cannot be changed

◆Press set point value on the left side of table to enter set point edit interface in which data is entered

**How to Connect:**

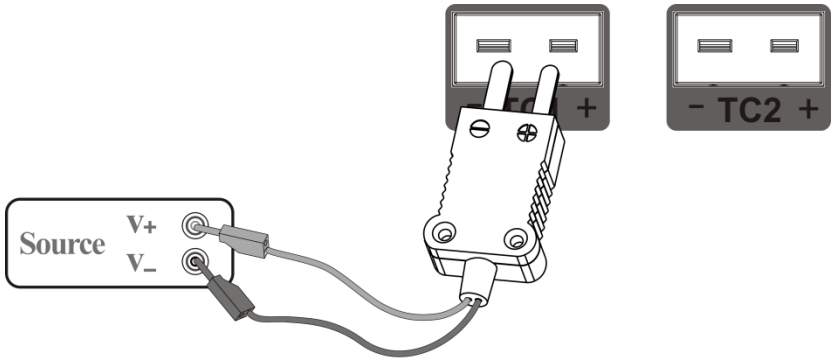


Figure 12 TC, (-75~75)mV Calibration Connection

**Calibration Instructions：**

1 Press ▶ to start calibration process

2 Output voltage from the standard to dry well corresponding to the calibration set point

3 When Measured Value is stable, press ⏭ to record data and move to the next calibration point, or press ⏮ to return to the previous point to retake the data

4 Once calibration has finished press 💾 to save the data

◆The dry well will apply the calibration data automatically once the data is saved.

**3. (-12~12)V & (-30~30)V**

◆The number of set points (-12~12)V & (-30~30) cannot be changed

◆Press the set point value on the left side of table to enter set point edit interface in which data is entered

**How to Connect:**

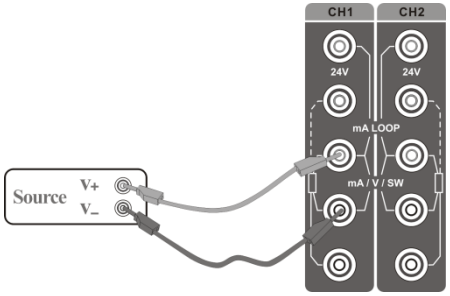


Figure 13 (-12~12)V & (-30~30)V Measurement Calibration Connection

**Calibration Instructions：**

1 Press to start calibration process

2 Output voltage from the standard to the dry well corresponding to the calibration set point

3 When the Measured Value is stable, press to record data and move to the next calibration point, or press to return to the previous point to retake the data

4 Once calibration has finished press to save the data

◆The dry well will apply the calibration data automatically once the data is saved.

**4. 400Ω (4W) & 4000Ω (4W)**

◆The set point number for 400Ω（4W）& 4000Ω（4W）cannot be changed

◆Press the set point value on the left side of table to enter set point edit interface in which data can entered

◆The latest calibration date is shown under the table

**How to Connect:**

◆Correct electrical connection: please see Figure 3 RTD Connection

**How to Execute：**

1 Press to start calibration process

2 Output resistance from the standard to dry well corresponding to calibration set point

3 When the Measured Value is stable, press to record the data and move to the next calibration point, or press to return to the previous point to retake the data

4 Once calibration has finished, press to save the data

◆The dry well will apply the calibration data automatically once the data is saved.

## 5. Cold Junction Calibration

◆Please select cold junction sensor type. Available type are: S, R, B, K, N, E, J, T, C, D, G, L, U, LR, A, 10μV/℃, 1mV/℃

**How to Connect:**

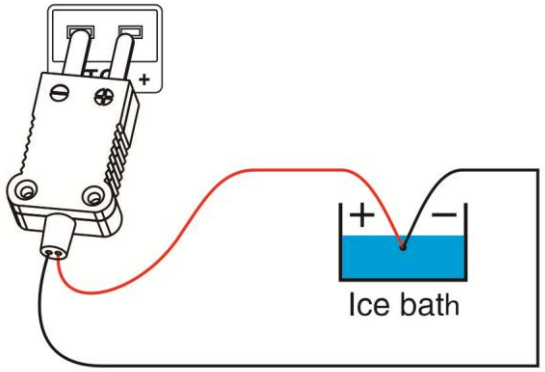


Figure 14 Cold Junction Calibration Connection

**Calibration Instructions：**

1 The cold junction temperature is adjusted by clicking the set point value and changing it.

2 Press (save) to save the cold junction calibration result

◆The dry well will apply the calibration data automatically once the data is saved.

#### 3.5.1.3 Temperature Calibration

To calibrate dry well display sensor.

◆**Recommended for execute by third-party organization, national lab, or periodic calibration**

◆Every executed temperature calibration will be stored in calibration history menu, please refer to 3.5.1.6 Calibration History for more information

**-Manual Calibration Mode:**

**How to set the calibration points：**

Press to enter the calibration point configuration interface if necessary, otherwise please press for the next step.

Click each calibration point to modify the value.

◆The number of calibration point can be increased to a maximum of 7 or reduced to a minimum of 3

**How to connect：**

Please put the $T_{ref}$ (Standard Sensor) to reach the bottom (0 mm) of the dry well calibrator.

◆For -875PC, please also plug the connector of $T_{ref}$ (Smart Standard Sensor) to the EXT.REF port of dry well electrical measurement board.

◆Or follow the instruction displayed on screen after the calibration point configuration interface for correct connection.

**How to use：**

1. Calibration execution:

1.1 At each calibration point, press on the right column of the table to execute the calibration

1.2 When temperature is stable, press Fetch button to collect standard sensor measurement value (-875PC), or click the corresponding cell of $T_{ref}$ column to input the value (-875 & -875PC)

◆Please judge whether the temperature is stable manually.

2. Save the calibration data:

Press to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

**-Automatic Calibration Mode (-875PC with smart standard sensor only)**

**How to set the calibration points：**

Press  to enter the calibration point configuration interface if necessary, otherwise please press  for the next step.

Click each calibration point to modify the value.

◆The number of calibration point can be increased to a maximum of 7 or reduced to a minimum of 3

**How to connect：**

Please put the $T_{ref}$ (Standard Sensor) to reach the bottom (0 mm) of the dry well calibrator.

Also plug the connector of $T_{ref}$ (Smart Standard Sensor) to the EXT.REF port of dry well electrical measurement board.

◆Or follow the instruction displayed on screen for correct connection.

**How to use：**

1. Calibration execution:

The dry well will execute the self calibration automatically

2. Save the calibration data:

Press  to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

### 3.5.1.4 Axial Homogeneity Calibration

To calibrate dry well axial uniformity, the latest axial homogeneity calibration data will be listed

◆**Recommended for execute by third-party organization, national lab, or periodic calibration**

◆Please use a stable PRT with a sensor length of no more than 5 mm to perform the axial homogeneity calibration

◆Every executed axial homogeneity calibration will be stored in calibration history menu, please refer to 3.5.1.6 Calibration History for more information

**-Manual Calibration Mode**

**How to set the calibration points：**

Press  to enter the calibration point configuration interface if necessary, otherwise please press  for the next step.

Click each calibration point to modify the value.

◆The number of calibration point is fixed to 7.

**How to connect：**

Please follow the instruction displayed on screen for correct connection.

◆Please calculate the height of step 1 (H1) by following equation (unit: mm):

$$H1 = \frac{40 - \mathrm{Lgrd}}{2}$$

H1: The distance/height from the bottom of the sensor to the bottom of the dry well

$L_{grd}$: The length of the sensor

**How to use：**

1. Calibration execution:

1.1 Move the sensor until reach the H1 height calculated by equation above

1.2 At each set point, press  on the right column of the table to execute the calibration

1.3 When temperature is stable, click the corresponding cell of $T_{grd}$(0 mm) column to input the value

◆Please judge whether the temperature is stable manually.

1.4 Raise the sensor until the distance/height from the bottom of the sensor to the bottom of the dry well is 60mm

1.5 When temperature is stable, click the corresponding cell of $T_{grd}$(60 mm) column to input the value

◆Please judge whether the temperature is stable manually.

3. Save the calibration data:

Press to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

**-Automatic Calibration Mode (-875PC with a smart standard sensor ($T_{ref}$) and a RTD ($T_{grd}$) only)**

**◆Automatic axial homogeneity calibration will not only cover the axial homogeneity data, but also the self/temperature calibration data.**

**How to set the calibration points：**

Press to enter the calibration point configuration interface if necessary, otherwise please press for the next step.

Click each calibration point to modify the value.

◆The number of calibration point is fixed to 7.

**How to connect：**

Please follow the instruction displayed on screen for correct connection.

◆$T_{ref}$ is the external reference PRT

◆$T_{grd}$ is the PRT for axial temperature homogeneity testing.

**How to use：**

1. Sensor height setup:

1.1 Click $L_{ref}$ and $L_{grd}$ on the top of screen to setup the sensing section length of the sensor.

2. Standard sensor configuration:

Check or select $T_{ref}$ and $T_{grd}$ sensor.

◆The "Other" option of Standard sensors will be available when connect to other Additel's product.

3. Calibration execution:

3.1 Please follow the instruction displayed on screen to place the $T_{ref}$ and $T_{grd}$ sensor.

◆Please calculate the height of step 1 (H1) by following equation (unit: mm):

$$H1 = \frac{\mathrm{Lref} - \mathrm{Lgrd}}{2}$$

H1: The distance/height from the bottom of the Tgrd sensor to the bottom of the dry well

$L_{ref}$: The length of the $T_{ref}$ sensor

$L_{grd}$: The length of the $T_{grd}$ sensor

3.2 Press ⏭ for the automatic axial homogeneity testing, please wait until step 1 is done.

3.3 Raise the $T_{grd}$ sensor until the distance/height from the bottom of the $T_{grd}$ sensor to the bottom of the dry well is 60mm

3.4 Press ⏭ for the automatic axial homogeneity calibration, please wait until step 2 is done.

4. Save the calibration data:

Press 💾 to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

#### 3.5.1.5 Calibration Data Entry

To input and apply the calibration data manually including temperature calibration and axial homogeneity calibration.

◆**Recommended for execute by third-party organization, national lab, or periodic calibration**

◆Every entered calibration data will be stored in calibration history menu, please refer to 3.5.1.6 Calibration History for more information

◆The dry well will NOT control the temperature for calibration data entry function

**-Temperature Calibration**

**How to set the calibration points：**

Press  to enter the calibration point configuration interface if necessary, otherwise please press  for the next step.

Click each calibration point to modify the value.

◆The number of calibration point can be increased to a maximum of 7 or reduced to a minimum of 3

**How to use：**

1. Data input:

Click the corresponding cell of Int.Ref and Ext.Ref column to input the value

2. Save the calibration data:

Press  to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

**-Axial Homogeneity Calibration**

**How to set the calibration points：**

Press  to enter the calibration point configuration interface if necessary, otherwise please press  for the next step.

Click each calibration point to modify the value.

◆The number of calibration point is fixed to 7.

**How to use：**

1. Data input:

Click the corresponding cell of $T_{grd}$(0mm) and $T_{grd}$(60mm) column to input the value

2. Save the calibration data:

Press  to save and apply the calibration data when all calibration points are complete.

◆The dry well will apply the calibration data automatically once the data is saved.

### 3.5.1.6 Calibration History

Calibration history consist of three parts: Manufacturer Calibration Data, User Calibration Data, and Period Calibration Data

Table 38 Calibration History

| Subject | Data Source | Recommended operator | Delete |
|---|---|---|---|
| Manufacturer Calibration Data | Factory data | | |
| User Calibration Data | Self calibration data: Latest self calibration data | ● (User) | ● |
| | Axial homogeneity calibration data: The manufacturer calibration data or the previous applied period calibration data | | |
| Period Calibration Data | All periodic calibration data is listed, one history will be added after each recalibration | ● (Third Party Organization or User) | ● |

**Note: If period calibration recalibration data is applied, the recalibrations after this date will turn gray and be automatically deleted on the next recalibration.**

**◆Invalid data can be re-activate before it is deleted**

Each calibration history including axial homogeneity calibration and self calibration data:

◆For axial homogeneity calibration operation, please refer to section 3.5.1.3 Axial Homogeneity Calibration

◆For self calibration operation, please refer to section 3.5.1.4 Self Calibration

**How to use:**

1. Select a data to enter data information interface
2. Double check the axial homogeneity calibration and self calibration data first, then press to apply

### 3.5.2 Restore

Resets all data to factory data

◆Default password: 123456

◆Password is editable, please refer to section 3.4 Password Protection

◆Restore operation will not apply dry well factory data, please refer to section 3.5.1.2 Calibration History for factory data applying

◆User data (including task data, sensor library, etc.) will not be deleted when restore is selected

### 3.5.3 Updates

To update dry well firmware:

1). Copy the update file into an USB root directory

2). Insert USB into dry well USB port

3). Select Updates by USB on calibrator

4). Press ✓ to start update process

5). Wait for the update to complete in which a notification will be given

◆Password：123456

◆To change the password, please refer to section 3.4 Password Protection

◆The USB has to be in FAT16 or FAT32 type

# 3.6 Personalization

### 3.6.1 Temperature Unit

Three units are available: ℃, ℉, and K

◆Once this unit is changed, all related temperature units for other menus will be changed automatically, except for the sensor library and task function

### 3.6.2 Date and Time

Table 39 Date and Time Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Time | 00:00 ~ 23:59 | Time |
| Date | 2000-1-1 ~ 2099-12-31 | Date |
| Date Format | YYYY-MMDD /MM-DD-YYYY / DD-MM-YYYY | Date format |
| Date Separator | -，/，. | Date format separator |

### 3.6.3 Language

Dry well is equipped with a multi-language user interface. Use this menu to change from the offered languages.

### 3.6.4 Sound

Table 40 Sound Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Touch Beep | On / Off | Enable or disable touch beep |
| Prompt Beep | On / Off | Enable or disable prompt beep |
| Over range beep | On / Off | Enable or disable over range beep |
| Volume | 0~100 | Adjust beep volume, unit: % |

### 3.6.5 Contrast

Press the bar to adjust screen contrast

### 3.6.7 Screen Saver

Dry well will turn off the screen for power saving if it is not used over set time.

◆To activate, please touch the screen

◆Available selections: 1 min, 5 min, 10 min, 30 min, 60 min, or Never

### 3.6.8 Display Mode

Switch to **Light Theme** or **Dark Theme**.

## 3.7 Product Information

Dry well information is read only:

1. General Information: Including model, serial number and range information
2. Version Information: Including main host, system version, control board, electric board, Wi-Fi, and Bluetooth information

◆The firmware version number normally means the main board version number, please provide the to the customer service if necessary.

# 4 Task (Only for ADT875PC)

## 4.1 Task Settings

### 4.1.1 Stable Judgment Condition Setup

Press  on the bottom right corner of task main interface to select temperature stable judgment condition

REF: Temperature stable judgment is based on whether the temperature of internal or external sensor is stable (depends on which sensor is selected as control sensor, see section 2.1)

DUT: Temperature stable judgment is based on whether the temperature of DUT is stable

Both: Temperature stable judgment is based on whether the temperature of internal or external sensor and DUT is stable

## 4.2 Device Center

All DUTs can be managed in Device Center.

### 4.2.1 DUT Management

1. Click “Added DUT” to view the DUT information.
2. Click  on the right to add a DUT. Please refer to section 4.2.2 to 4.2.10 on how to add a DUT.
3. Click  to delete an added task. Tasks to be deleted can be selected according to users’ needs and click  to delete. Or click  to delete all the test tasks.
4. Click  to search added DUTs. The search conditions are as follows:

Table 41 DUT search conditions in Device Center menu

| Subject | Valid Value | Comment |
|---|---|---|
| Category | Thermal resistance, thermocouple, NTC, temperature transmitter, temperature switch, liquid in glass thermometer, temperature controller, bimetallic thermometer, pressure thermometer, thermostat transmitter, surface thermometer , digital thermometer, all | Select the category of DUT. All as default. |
| Name | Alphanumeric content (16 max length) | Input the name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Input the Serial Number of DUT |
| Executed | Yes / No / All | Whether the DUT has executed any tasks on the dry well calibration depends on if there is test data. |
| Create Time | Start time：2000-1-1 ~ 2099-12-31 | Searching the time range when the DUT is created. For example: DUT created between Jan 1, 2018 to Dec 31, 2018. |
| | End time：2000-1-1 ~ 2099-12-31 | |

Click on the lower right to apply search conditions. DUTs conforming to the conditions will appear in the list.

◆Click to delete all the input search conditions.

### 4.2.2 RTD

◆Click  to select the task information of an existing sensor as a template

Table 42 RTD Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location or area |
| Notes | Alphanumeric content (16 max length) | Information about the DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| RTD Type | Pt(385), Pt(3910), Pt(3911), Pt(3916), Pt(3926), Cu(426), Cu(427), Cu(428), Ni(500), Ni(617), Ni(618), Ni(672), CVD | Select RTD type |
| Tolerance | RTD: Depends on the needs of the users | The tolerance of the DUT<br>**Please refer to section 4.2.11 for tolerance settings.** |
| | Industrial Class: RTD, C, B, A, AA | Industrial class of RTD |
| Resolution | 1, 0.1, 0.01, 0.001 | The resolution of RTD |
| Wire | Two-wire / three-wire / four-wire | Select the wire type |
| R0 | Numeric content | The R0 value of the thermal resistance at zero. |

Click  on the lower right to save.

### 4.2.3 TC

Table 43 TC Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location or area |
| Notes | Alphanumeric content (16 max length) | Information about the DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| TC Type | A, B, C, D, E, G, J, K, L, LR, N, R, S, T, U | The type of thermal couple under test |
| Tolerance | TC: Depends on the needs of the users | The tolerance of the DUT<br>**Please refer to section 4.2.11 for tolerance settings.** |
| | Industrial Class: I, II, III | Industrial class of TC |
| Resolution | 1, 0.1, 0.01, 0.001 | The resolution of TC |
| CJC Type | Int / Ext | Select the type of cold junction compensation. The compensation value has to be input manually when selecting fixed mode. |

Click  on the lower right to save.

### 4.2.4 Thermistor

◆Click  to select the task information of an existing sensor as a template

Table 44 NTC Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| Tolerance | TC: Numeric content | The tolerance of the DUT<br>**Please refer to section 4.2.11 for tolerance settings.** |
| Wire | Two-wire / three-wire / four-wire | Select the wire type |
| Rtn | Numeric content | The Rtn value of NTC under test |
| Tn | Numeric content | The Tn value of NTC under test |
| β | Numeric content | The β value of NTC under test |

Click  on the lower right to save.

### 4.2.5 Transmitter

Table 45 Temperature Transmitter Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial Number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Input | Depends on the unit of temperature | Click temperature units to switch. |
| Output | Analog signals:<br>1. mA：4~20, 0~10, 0~20<br>2. V：0~5, 0~10, 4~20<br>3. Customize：-30~30(Click electrical signals to switch between mA and V.) | Output signal settings of the temperature transmitter under test |
| | HART Transmitter:<br>Major variable, percentage, Output current, loop current | |
| Accuracy | 0.1%, 0.2%, 0.5%, 1%, 1.5%, 2%, 2.5%, custom | Users can set special accuracy by selecting custom options. Unit: %. |
| Resolution | 1, 0.1, 0.01, 0.001 | The resolution of transmitter |
| Transfer Function | Linear / Square Root | Transform function of the transmitter |

Click ✓ on the lower right to save

### 4.2.6 Switch

Table 46 Switch Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial Number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| Set Point Range | Depends on the range of the switch | The anticipated temperature the switch will change states |
| The range of set point | Depends on the range of the switch | The open and close or set and reset temperatures of the switch |
| Switch Type | normally open / normally closed | Type of switch |
| Set point error | Depends on the range of the switch | Accuracy of the DUT |
| Switch Channel Type | Dry contact, wet contact, NPN switch, PNP switch | Channel type of switch |
| Dead band | Depends on the range of the switch | The band of temperature when the switch will set and then reset. |

Click  on the lower right to save

### 4.2.7 Liquid-In-Glass and Surface Thermometers

Table 47 Liquid-In-Glass Thermometer and Surface Thermometer Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial Number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| Tolerance | Depends on the needs of the users | The accuracy of the DUT<br>**Please refer to Chapter 4.2.11 for accuracy settings.** |
| Scale Interval | Depends on the range of the DUT | The temperature difference represented by each scale of the DUT |

Click  on the lower right to save

### 4.2.8 Temperature Controller

Table 48 Temperature Controller Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial Number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| Tolerance | Depends on the needs of the users | The accuracy of the DUT<br>**Please refer to Chapter 4.2.11 for accuracy settings.** |
| Scale Interval | Depends on the range of the DUT | The display resolution of the DUT |
| Electric Contact Count | 0, 1, 2 | Number of electric contacts of the DUT. An electric contact value should be set if it is not zero. The upper and lower limits, valid value and unit depend on the range. |

Click  on the lower right to save

### 4.2.9 Bimetallic Thermometer, Filled System Thermometer, and Transformer Thermometer

Table 49 Bimetallic Thermometer, Filled System Thermometer, and Transformer Thermometer Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial Number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Range | Depends on the unit of temperature | Click temperature units to switch. |
| Accuracy | 1%, 1.5%, 2%, 2.5%, 4%, custom | Users can set a custom accuracy. The unit should be %. |
| Scale Interval | Depends on the range of the thermometer | The display resolution of the DUT |
| Electric Contact Count | 0, 1, 2 | Number of electric contacts of the DUT. An electric contact value should be set if it is not zero. The upper and lower limits, valid value and unit depend on the range. |

Click ✓ on the lower right to save

### 4.2.10 Digital Thermometer

Table 50 Digital Thermometer Task Information

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Name of DUT |
| Serial Number | Alphanumeric content (16 max length) | Serial Number of DUT |
| Location | Alphanumeric content (16 max length) | DUT location |
| Notes | Alphanumeric content (16 max length) | Comment information of DUT |
| Owner | Alphanumeric content (16 max length) | DUT owner |
| Input | Depends on the unit of temperature | Click temperature units to switch. |
| Accuracy | 1%, 1.5%, 2%, 2.5%, 4%, custom | Users can set a custom accuracy. Unit: % |
| Scale Internal | Depends on DUT | The temperature difference represented by each scale of the DUT |
| Electrical Contact Count | 0, 1, 2 | Number of electrics contact of the DUT. An electric contact value should be set if it is not zero. The upper and lower limits, valid value and unit depend on the range. |
| Output Enable | open / close | Select if the digital thermometer has an analog output.<br>Output signal should be set if this function is enabled. |
| Output<br>(only when output is enabled) | -30~30 | The output signal range of the DUT. The unit depends on the measurement of current or voltage (Click the unit of electric signal to switch between mA and V). |
| Analog output accuracy<br>(only when output is enabled) | 1%, 1.5%, 2%, 2.5%, 4%, custom | Users can set a custom accuracy by custom options. Unit: % |

Click ✓ on the lower right to save

### 4.2.11 Tolerance Setting of DUT

Apart from standard tolerance settings, the dry well calibrator also supports three sub selections.

◆In the setting interface, every highlighted value can be revised.

### 4.1.10.1 Tolerance Setting

The dry well calibrator provides two types of tolerance setting:

1. Fixed Tolerance

Fixed tolerance setting can be applied to such DUT as liquid-in-glass thermometers.

For example: **(-XXX ~ XXX)℃ ± (0.2 ℃)**

How to set temperature range:

Click and change value to set the temperature range

How to set a fixed tolerance:

Click fixed tolerance value (the highlighted value, as 0.2 in the example above), and enter the selection page. The default tolerances are: 0.1, 0.15, 0.3, 0.5, 1, 2.5 and custom.

◆Custom values can be selected. The unit depends on the DUT's unit setting.

2. Fixed Tolerance + % of Reading Tolerance

Fixed and % of reading tolerance setting can be applied to such DUTs as resistance, thermocouple, and surface thermometers.

For example: **(-XXX ~ XXX)℃ ± (0.1 ℃ + 0.002 * l t l)**

How to set fixed and % of reading tolerance:

1. Fixed tolerance setting: Click fixed tolerance value (the highlighted value, as 0.1 in the example above), and enter the selection page. The default tolerances are: 0.1, 0.15, 0.3, 0.5, 1, 2.5 and custom.

2. % of Reading tolerance setting: Click % of reading tolerance value (the highlighted value, as in 0.002 in the example above), and enter the selection page. The default tolerances are: 0.001, 0.002, 0.004, 0.005, 0.008, 0.01 and custom.

◆Custom values can be selected. The unit depends on the DUT's unit setting.

#### 4.1.10.2 Subsection Setting

The dry well calibrator allows users to list the tolerance in different subsections, and set the tolerances respectively in order to meet different demands.

How to set subsection tolerances:

1. Click ^ / v to add or reduce the number of sections. Or click the number on the right to input the sections through the keyboard.
2. Please refer to 4.1.10.1 to set the tolerance for every subsection.

◆ The dry well calibrator supports as many as three subsections of tolerance.

## 4.3 Test Center

All the tasks can be managed in test center.

### 4.3.1 Test Task Management

1 Click “Add Task” to view the task information.

◆ On task information screen, the user can:

1) Click to enter the task screen. The dry well calibrator will perform the task again according to the previous device and task. Please refer to Chapter 4.3 to perform task actions.

2) Click to use the current test settings as a template

◆ The new task of the DUT cannot be revised. Please refer to the following instructions for task configuration.

3) On the task settings information screen, the contents with the icon › can be revised. Please refer to Chapter 4.2.2 for task settings operation.

2. Click to add new task. Click in the center of the screen and select a DUT from device center. The basic information of the selected DUT will be shown, and a task setting menu will be listed according to the type of the DUT.

3. Click to delete the added tasks. Click to delete a single task, or click to delete multiple tasks.

4. Click to search the tasks. The search conditions are as follows:

Table 51 Search Settings in the Test Center

| Subject | Valid Value | Comment |
|---|---|---|
| Task Name | Alphanumeric content (16 max length) | Input the name of the task |
| DUT Name | Alphanumeric content (16 max length) | Input the name of the DUT |
| S/N | Alphanumeric content (16 max length) | Input the serial number of the DUT |
| Executed | Yes / No / All | Yes means the task has test data associated with it. |
| Create Time | Start time：2000-1-1 ~ 2099-12-31 | The time range when the DUT was created. |
| | End time：2000-1-1 ~ 2099-12-31 | |
| Update Time | Start time：2000-1-1 ~ 2099-12-31 | Search the time range of the latest task update. |
| | End time：2000-1-1 ~ 2099-12-31 | |

Click  to apply the search conditions. The results conforming to the conditions will appear in the list.

◆Click  to delete all the input search conditions.

### 4.3.2 Task Settings

Task settings include basic information setting, control setting, device setting, set point list, and indication error, etc.

#### 4.3.2.1 Dual-Channel Test

The DUT types which support dual-channel tests are as follows:

Table 52 Dual-Channel Test Compatibility Information

| Type of DUT | Available for Dual Channel Test |
|---|---|
| Thermal resistance (RTD) | ● |
| Thermocouple (TC) | ● |
| Thermistor | ● |
| Temperature transmitter | |
| Temperature switch | |
| Liquid in Glass thermometer | ● |
| Temperature controller | |
| Bimetallic thermometer | |
| Filled System thermometer | |
| Transformer Thermometer | |
| Surface thermometer | ● |
| Digital thermometer | |

As for DUTs supporting dual channel test, click ⊕ to add a second DUT when one is already selected.

#### 4.3.2.2 Basic Information Settings

The DUTs which support setting basic information are as follows:

Table 53 Basic Information Setting Compatibility in the Task Menu

| Type of DUT | Basic information | | Run settings | | | | |
|---|---|---|---|---|---|---|---|
| | Task Name | Notes | Repeats | Stroke | Dwell time | Number of Readings | Reading intervals |
| Thermal resistance (RTD) | ● | ● | ● | ● | ● | ● | ● |
| Thermocouple (TC) | ● | ● | ● | ● | ● | ● | ● |
| Thermistor | ● | ● | ● | ● | ● | ● | ● |
| Temperature transmitter | ● | ● | ● | ● | ● | ● | ● |
| Temperature switch | ● | ● | ● | | | | |
| Liquid in Glass thermometer | ● | ● | ● | ● | ● | ● | ● |
| Temperature controller | ● | ● | ● | ● | ● | ● | ● |
| Bimetallic thermometer | ● | ● | ● | ● | ● | ● | ● |
| Filled System thermometer | ● | ● | ● | ● | ● | ● | ● |
| Transformer Thermometer | ● | ● | ● | ● | ● | ● | ● |
| Surface thermometer | ● | ● | ● | ● | ● | ● | ● |
| Digital thermometer | ● | ● | ● | ● | ● | ● | ● |

The basic information setting include the following:

Table 54 Basic Information Setting in the Task Menu

| Subject | Valid Value | Comment |
|---|---|---|
| **Basic Information Settings** | | |
| Task Name | Alphanumeric content (16 max length) | Name of the task |
| Notes | Alphanumeric content (16 max length) | Comment for the task |
| **Run Settings** | | |
| Repeats | 1 / 2 / 3 | The number of times a test repeats |
| Stroke | One way / round trip | The operation mode of the task |
| Dwell time | 1~60 | The time that the test point is stable before each reading. Unit: min |
| Number of Readings | 1~6 | The number of readings the dry well calibrator measures after the dwell time. |
| Reading intervals | 0~3600 | The intervals between every reading. Unit: sec |

Click  to apply the changes.

#### 4.3.2.3 Control Settings

The DUTs supported control settings are as follows:

Temperature control settings which determine temperature stability are as follows:

Table 55 Temperature Control Settings in the Task Menu

| Subject | Valid Value | Comment |
|---|---|---|
| Select REF | INT / EXT | Select Internal（INT）or external（EXT）sensor as the reference standard |
| Stability Tolerance | 0.04~10 | The allowed range of temperature fluctuation |
| Stabilization time | 1~60 | The time in which stability is determined. Unit: minute |
| Set Point Tolerance | 0~20 | The allowed difference between the reading of the standard temperature and the target temperature |

◆The temperature is considered stable when stability tolerance, stabilization time and set point tolerance are within the allowed range.

#### 4.3.2.4 DUT Settings

The DUTs supported device settings are as follows:

Table 56 Device Settings Compatibility in the Task Menu

| Type of DUT | DUT 1 & DUT 2 Information | Stability Tolerance | Stabilization Time | Control Rate | CH 1 & CH 2 Selection |
|---|---|---|---|---|---|
| Thermal resistance (RTD) | ● | ● | ● | | ● |
| Thermocouple (TC) | ● | ● | ● | | ● |
| Thermistor | ● | ● | ● | | ● |
| Temperature transmitter | ● | ● | ● | | ● |
| Temperature switch | ● | | | ● | ● |
| Liquid in Glass thermometer | ● | | | | |
| Temperature controller | ● | | | | |
| Bimetallic thermometer | ● | | | | |
| Filled System thermometer | ● | | | | |
| Transformer Thermometer | ● | | | | |
| Surface thermometer | ● | | | | |
| Digital thermometer | ● | | | | |

◆Stability tolerance and stabilization time are only available when stable judgment condition is set to Both, please refer to section 4.1.1.

Device setting selections includes:

Table 57 Device Settings Compatibility Instruction

| Subject | Valid Value | Comment |
|---|---|---|
| DUT 1 & DUT 2 Information | Depends on the selected DUT. Refer to Chapter 4.2 for details. | Editable information about the DUT. |
| Stability Tolerance | 0.04~10 | The stability tolerance particularly for a DUT can be set here. |
| Stabilization Time | 1~60 | The stability time particularly for a DUT can be set here. Unit: minute |
| Control Rate | 0~30 | Temperature control rate of the dry well calibrator, unit: temperature unit/minute **Temperature control rate is only applied within the set point range of the temperature switch. Please refer to Chapter 3.1.6 for details.** |
| CH 1 & CH 2 Selection | CH 1 (/CH 2) | Set the corresponding DUTs for Channel 1 and Channel 2, which depends on whether the DUT supports dual channel test and the connection. |

#### 4.3.2.5 Set Point List / Indication Error Test

All types of DUTs support the set point list function (Indication Error Test will be used as title for some types of DUT).

◆The dry well calibrator supports 1 to 17 set point settings. The set points can be added or reduced through ^ and v button on the right, or click the numbers of the set points and input the number through the keyboard.

◆The set points are one-way. For example: If round trip is selected in the basic task setting, and the set points are 3 (0, 50, 100), then the actual set points run in the task will be 6(0, 50, 100,100, 50, 0).

#### 4.3.2.6 Contact Test

Electric contact test function only supports such DUTs as bimetallic thermometer with more than zero electric contacts, and temperature controller. When electric contact test is checked, the settings are as follows:

Table 58 Electric Contact Test Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Control rate | Up to the temperature unit | Set the temperature control rate of the electric contact |
| The first electric contact value | CH 1 / CH 2 | Select the channel for the first electric contact |
| The second electric contact value<br>(only for the device with two electric contacts) | CH 1 / CH 2 | Select the channel for the second electric contact |

◆Either one or both of electric contacts and indication error test should be selected. Indication error test is checked as default.

# 4.4 Task Performance

### 4.4.1 DUT and Test Setting Selection

Task performance is able to start when DUT and task configuration are complete.

◆**How to operate:**
①Selected the added task setting, enter the task setting screen. Task settings can be changed here.
②After task setting, click  to enter task performance screen. Please refer to Chapter 4.3.2 for details.
◆All the setting changes will be effective and replace the previous changes after clicking CONFIRM button.

### 4.4.2 Task Performance

A wire connection diagram will show on the task performance screen to suggest the correct way to make the connection.
◆**Only CH1 supports HART transmitters**
**Note: Please check the wire connection of the DUT carefully. The wrong connection may damage the dry well calibrator or the DUT.**

#### 4.4.2.1 Typical Task Screen

The typical task screen of the dry well calibrator is shown in the picture below (except temperature switch):

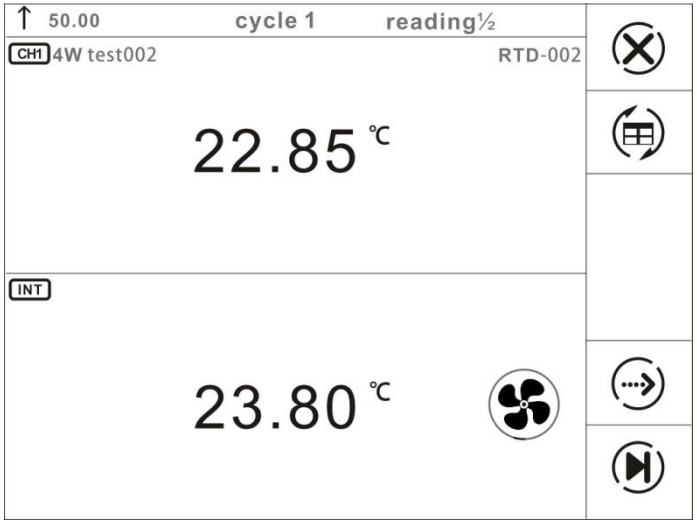


Figure 15 Typical Task Interface

1. The lower part shows the dry well temperature, and the upper part shows the return value of the DUT.

◆DUTs such as thermal resistance, and thermocouple, etc., the reading is automatically collected and cannot be revised by the users.

◆DUTs such as liquid-in-glass thermometer, and bimetallic thermometer which the dry well calibrator cannot collect the reading automatically, the user can click on the return value and input the reading through the keyboard after the temperature is stable in required dwell time.

2. The bar on top of the screen shows the current temperature set point and cycle times.

3. The standard buttons are on the right of the screen:

Table 59 Button Instruction on Typical Task Interface

| Icon | Manual Mode  | Automatic Mode  | Comment |
|---|---|---|---|
|  | • | • | Exit the task and the current data acquired will be cleared. |
|  | • | • | Switch the display mode between regular mode and table mode. The DUT readings can be revised in the two modes.<br>**In temperature switch test, click  to switch display mode. The regular mode shows a temperature/time diagram.** |
|  | • | | Switch to the previous set point<br>**The data of this set point will be cleared and the temperature control will automatically switch to the previous set point.** |
|  | • | • | Switch to the next set point<br>**The standard value and the DUT readings will be saved and the dry well will control to the next set point.** |
|  | • | | Skip the current set point<br>**The value of this set point will be skipped and will not be shown in the final report.** |
|  | | • | Pause or continue with the current task |
| ↑ 50.00 cycle 1 | • | • | Shows the current cycle times and the numbers of set points in current cycle<br>**This example means the dry well is ascending to 50 degrees as the set point under the first cycle** |

#### 4.4.2.2 Thermal resistance(RTD), thermocouple(TC), thermistor, and temperature transmitter

◆ **Only CH1 supports HART transmitters**

The dry well calibrator provides manual and automatic performance modes for the DUTs above.

1. Manual Performance

1) Click  on the lower right to start performance. The temperature will be automatically controlled to the first set point.
2) The temperature output value will become green when the temperature is stable, with dwell time is shown after the dry well is stable.
3) The dwell time will become green when it meets the requirement.
4) Click  to record the data and proceed to the next set point.
5) When all the set points are tested, click  to enter task report screen. The test data will be saved here. Please refer to Chapter 4.4 for details.

2. Automatic Performance

1) Click  on lower right to start the task. The dry well calibrator will start controlling automatically.
2) When all the set points are tested, click  to enter task report screen. The user can redo the test or save the data of this test. Please refer to Chapter4.4 for details.

#### 4.4.2.3 Temperature Switch

The dry well calibrator only provides automatic performance mode for temperature switch.

1) Click  on lower right to start the test. The dry well calibrator will start controlling automatically.
2) When all the set points are tested, click  to enter task report screen. The user can redo the test or save the data of this test. Please refer to Chapter4.4 for details.

#### 4.4.2.4 Liquid-in-Glass Thermometer, Temperature Controller, Bimetallic Thermometer, Filled System Thermometer, Transformer Thermometer, Surface Thermometer, and Digital Thermometer

The dry well calibrator only provides manual performance modes for the DUTs above.

1. Manual Mode:

1) Click  in the lower right to start the test. The dry well will automatically control to the first set point.
2) The temperature output value will become green when the temperature is stable, with the dwell time shown.
3) The dwell time will become green when it meets the requirement.
4) Click the DUT's value on the screen, and input the current reading through the key board. Click Enter key to apply the value, and the dry well will proceed to the next set point.
5) When all the set points are complete, click  to enter task report screen. The user can redo the test or save the data of this test. Please refer to Chapter4.4 for details

2. Automatic Mode:

1) Click  in the lower right to start the test. The dry well calibrator will control automatically to the first set point.
2) When the temperature reaches the set point, the system will automatically take the standard value and the DUT's reading. The user can click and revise the DUT's reading manually if desired.

◆When the temperature reaches the set point, the user should revise the DUT's reading within the dwell time.

◆When the dwell time meets the requirement, the dry well will move to the next set point. The DUT's previous reading cannot be edited at this point.

3) When all the set points are tested, click  to enter task report screen. The user can redo the test or save the data of this test. Please refer to Chapter4.4 for details

# 4.5 End of Task

### 4.5.1 Task Report

The user can view all the data in the task report screen.

◆As for a dual channel task, click the DUT names on the top of the screen to view reports for different DUTs.

Table 60 Icon Meanings

| Icon | Comment |
|---|---|
|  | Exit the task. All the data of the current task will be cleared. |
|  | The current task will restart again. All the data of the current task will be cleared. |
|  | Save the data of this test. Please refer to Chapter 4.4.2 for details. |

### 4.5.2 Task Data Saving

When the task is completed, the dry well will proceed to a screen where the test results can be saved.

**How to setup:**

Table 61 Task Saving Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Operator | Alphanumeric content (16 max length) | Input the information of the operator |
| Time | 2000-1-1 ~ 2099-12-31 | Input the time of the task performance |
| Environmental Temperature | Up to the temperature unit | Input the environmental temperature |
| Environmental Humidity | 0~100 | Input the environmental humidity, Unit: %RH |

**How to use:**

When the settings are saved, the user can choose to save the task data as “as found” or “as left”, or “both”, and click the CONFIRM button on the lower right to save.

◆Press ⊗ to cancel and go back to the task report screen.

# 4.6 Data Center

### 4.6.1 Data Viewing

Click the test data existing in the data center to view the test information and test data.

◆On data information screen, press  to redo the task. The user cannot change device or the test in this process.

### 4.6.2 Data Deletion

Press  to enter data deletion screen and delete the existing task data.

**How to use:**

1. Click the task data to be deleted (multiple can be selected)
2. Press  to delete the selected data.

◆Press  to delete all the data.

### 4.6.3 Data Search

Click  to search the task data.

**How to Use**

1. The user can select 4 Subjects from the list below:

Table 62 Task Data Searching Subject Selection

| No. | Subject Name | Description |
|---|---|---|
| 1 | DUT Name | Name of DUT |
| 2 | DUT Category | Category of DUT |
| 3 | Test Name | Task name |
| 4 | Result Type | Select As Found, As Left or Both |
| 5 | DUT S/N | Serial number of DUT |
| 6 | Operator | Operator name |
| 7 | Passed | Whether the DUT has passed the calibration |
| 8 | Test Date | Date of test |

2. Click  to apply the settings.
3. Click the highlighted part of the search list subjects to select the keywords.

◆Keyword selection is not case sensitive and supports partial keyword searching. Please refer to Example 1.

◆Cancel the keyword selection by deleting all the keywords. Please refer to Example 2.

Example 1: Name of device → click “All” → input “lg” → click  → all the devices with “lg” in the name will be listed.

Example 2: Name of device → click “lg” → Delete All → click  → cancel the search with the key word “lg”.

# 5. Application

## 5.1 Temperature Converter

**How to setup:**

1.TC：

Table 63 Temperature Converter for TC

| Subject | Valid Value | Comment |
|---|---|---|
| Sensor Type | S, R, B, K, N, E, J, T, C, D, G, L, U, LR, A, 10μV/℃, 1mV/℃ | Select TC type |
| Electric Signal | Depends on sensor type | Electrical signal output from TC, unit: mV<br>**Please input Ext CJC Value for correct calculation result** |
| Celsius | Depends on sensor type | Celsius degree, unit: ℃ |
| Kelvin | Depends on sensor type | Kelvin degree, unit: K |
| Fahrenheit | Depends on sensor type | Fahrenheit degree, unit: ℉ |
| Ext CJC Value | -10~50 | Fixed cold junction value, used for electrical signal calculation, unit: ℃ |

For example, type K TC:

1. Input 20℃，corresponding 68℉ and 293.15K will be calculated by the dry well.
2. Once the Electric Signal needs to be calculated the Ext CJC Value shall be inputted as the compensated Electric Signal.

2. RTD

Table 64 Temperature Converter for RTD

| Subject | Valid Value | Comment |
|---|---|---|
| Sensor Type | All available RTD, ITS-90, CVD and NTC from sensor library | Select RTD type |
| Electric Signal | Depends on sensor type | Electrical signal output from RTD, unit: Ω |
| Celsius | Depends on sensor type | Celsius degree, unit: ℃ |
| Kelvin | Depends on sensor type | Kelvin degree, unit: K |
| Fahrenheit | Depends on sensor type | Fahrenheit degree, unit: ℉ |

**How to use:**

Press the known subject and input the corresponding value, other subject values will be calculated by the dry well.

## 5.2 Temperature Control Data Logging

**How to setup:**

1. General settings:

Table 65 Temperature Control Data Logging General Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Start Temperature | Current Temperature / Custom Temperature (value depends on temperature unit) | Data logging function will start after the dry well reaches the start temperature |
| End Temperature | Depends on dry well model | Data logging function will end after the dry well reaches the end temperature |
| Control Settings | Refer to Control Settings table below | Control settings |
| Interval | 1~60 | Data logging interval, unit: sec |
| Dwell Time | 1~60 | Dwell time after the dry well reaches the target temperature in the stability test, unit: min |
| Stability Test | Enable / Disable | Enable or disable stability test<br>**Dry well will start stability test only when it reaches the target temperature and meets the dwell time requirement** |
| Stability Test Time<br>(only available when stability test is on) | 1~60 | Logging time after the dwell time is reached during the stability test, unit: min |
| CH 1 & CH 2 | Refer to UUT Settings table below | Channel settings |

2. Control Settings:

Table 66 Data Logging Control Settings

| Subject | Valid Value | Comment |
|---|---|---|
| **Control Program** | | |
| Stability Tolerance | 0.04~10 | Temperature stability after set point is reached |
| Stabilization Time | 1~120 | Dwell time after dry well reach the stability criteria is meet , unit: min |
| Set Point Tolerance | 0~20 | The difference between display temperature and set point |
| Control Rate | Max, 0~100 ℃/min | The target slew rate at which the dry well increases or decreases temperature |
| Set Point Limit | Enable / Disable | Enable or disable set point limit |
| Restriction Range<br>(only available when Set Point Limit is enable) | Depends range of dry well | Set restriction range for set point<br>**Dry well will only apply custom control rate within this restriction range** |
| **Control Reference** | | |
| Control Resolution | 1, 0.1, 0.01 | Set temperature control resolution, which changes the sensor signal resolution as well (see below) |
| Sensor Signal | Read only | Sensor display value, resolution depends on control resolution (see above) |

3. UUT settings:

Table 67 Data Logging UUT Settings

| Subject | Valid Value | Comment |
|---|---|---|
| **General settings** | | |
| CH 1 & CH 2 Connection | Connected / Disconnected | Selecting whether the two-channel measurement type is the same:<br>**Connected-CH 1 & CH 2 are the same measurement type**<br>**Disconnected-CH 1 & CH2 are different from each other** |
| CH 1 / CH 2<br>(Measurement Subject) | RTD, TC, mA, V, Off | Set channel measurement type. **Please select voltage range when testing RTD or TC** |
| Stability Tolerance | ≥0.005 | Set temperature stability tolerance, unit: ℃ |
| **Channel settings（Only available when measuring current or voltage）** | | |
| Measure Range | -30~30 | Set measurement range, unit depends on current or voltage (press electrical unit to switch between current and voltage measurement) |
| Scale Range | Depends on dry well model | Set scale range |

**How to use：**

1) Press ▶ on the lower-right to start data logging. The dry well will start temperature control and data logging automatically. It may take a few minutes of preparation before control is initiated.

◆During data logging, press ■ on the lower right to stop data logging process and the logged data will not be saved.

2) Once temperature control data logging is finished, a result interface will be shown where data can be saved.

**How to review：**

To review saved temperature control data, press on the right side to review saved data logging files

◆ To delete files, press to delete a file or press to delete multiple files.

## 5.3 Dehumidification

◆**After a extended time of inactivity, the dry well may need to be dehumidified. The dehumidification process is a 2 hour automated process to remove moisture that may have built up in the dry well and could cause damage.**

**How to setup：**

Table 68 Dehumidification Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Dehumidification Temperature | Depends on system temperature unit | Set dehumidification temperature |
| Dwell Time | ≥10 | Set dehumidification time |

**How to use：**

1) To start dehumidification process, press ▶ on the lower right corner

2) To terminate dehumidification process, press ■ and wait for process to end.

## 5.4 Line Voltage Test (Only for ADT875PC/875 - 350 & 660)

**How to setup：**

In the setting interface:

1. Supply Power: Input actual power supply voltage, valid value: (90~254) V
2. Frequency: Input actual power supply frequency, valid value: (45~65) Hz

**How to use：**

1. Press  on the bottom right corner to start line voltage test.

◆During the test, supply power voltage will be recorded based on time line, the default test time is 5 min.

◆During the test, press  to stop and dry well will proceed to the report interface and all collected test results can be saved or abandoned

**How to review：**

To review saved data, press  at setting interface, all saved data will be displayed

◆Press  to export all saved data to a USB drive

◆To delete files, press  to delete a single file or press  to delete multiple files

## 5.5 Step Test

**How to setup：**

Table 69 Step Test Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Range | Depends on dry well model | Set step test range |
| Stroke | One way (N points) | Select step test stroke |
| | Round trip 1 (2N-1 points) | |
| | Round trip 2 (21 points max) | |
| Dwell Time | 1 ~ 240 | Dwell time for stabilization before each reading, unit: min |
| Repeat | 1 / 2 / 3 | Number of test cycles |
| Set Points | Refer to section 4.2.2.5 set point settings | Set the value and quantity of set points |
| CH 1 & CH 2 | Refer to section 2.4 DUT information | Set DUT settings |
| Control Settings | Refer to section 2.3 Control Settings | Set dry well temperature control settings |

**How to save a configuration：**

Twenty step test configurations can be save with a unique name and test date

1) To enter setup saving interface, press in step test settings interface

2) To save a new setup select one from the list, then press

**How to run a saved configuration：**

To run a saved configuration, press on the right side then select desired configuration.

**How to use：**

1) Press ▶ to enter step test operation

2) Icon introduction：

Table 70 Step Test Icons Instruction

| Icon | Comment |
|---|---|
| ▶ | Start step test |
| ⏮ ⏭ | Switch to previous or next set point |
| ↻ | Cancel current step test and re-start the step test from the first set point of the first cycle<br>**All data within this test will be deleted** |
| ▦ | Switch display mode between chart and table |
| ↑ 100.00 cycle 2 | Display current cycle and set point number<br>**This icon shown on the left means the dry well is reaching to ascending 100 degree set point under the second cycle** |
| ✕ | Stop the current step test and enter report interface, all data of current test can be saved |

3) Regular operation：

Press ▶ to start the test, dry well will control to the first set point

**◆How to review：**

To review saved data, press 📄 on the right side.

◆To delete saved data, press 🗑 to delete a single file or press 🗑 to delete multiple files

## 5.6 Switch Test

**How to setup：**

Table 71 Switch Test Settings

| Subject | Valid Value | Comment |
|---|---|---|
| CH 1 & CH 2 | On: Dry contact, Wet contact, NPN switch, PNP switch<br>Off | Enable or disable channel, and select DUT type |
| Temperature Range | Depends on dry well model | Set switch test starting and ending temperatures<br>**Dry well will only capture the switch activity within this temperature range** |
| Control Rate | Max, 0~100 ℃/min | Temperature control speed<br>**Dry well will only apply this control rate when actual temperature is within the temperature range set above** |
| Stroke | One way / Round trip | Select switch test stroke method |
| Repeat | 1, 2, 3 | Set switch test cycle times |

**How to use：**

1) Press ▶ on the bottom right corner to enter switch test interface

2) Current temperature value and switch status will be displayed on the screen

◆Press to switch display mode between chart and table

1. Chart：Display switch test process under current cycle

2. Table：List all data under each cycle

3) Press ■ to stop switch test

**How to review data:**

At switch set up interface, press  to enter switch test data table, all saved data will be displayed

◆To delete saved data, press  to delete a single record or press  to delete multiple records

## 5.7 Snapshot

**How to setup：**

Table 72 Snapshot Settings

| Subject | Valid Value | Comment |
|---|---|---|
| Snapshot | On / Off | Enable or disable snapshot function |
| Storage Path | Local / USB | Select snapshot storage path |
| Storage Amount<br>(only available when using local storage path) | Read only | Display the current quantity of snapshots can be stored in local storage |
| File Prefix | Alphanumeric content (16 max length) | Edit prefix of snapshot name |
| File Name | Time / No. | Select snapshot naming method by time or number |
| Start No.<br>(only available when choosing No. as file name) | 1~1000 | Select starting number for the next snapshot name<br>**If selected number is occupied, dry well will use the closest available number following selected number** |

**How to use：**

To execute a snapshot, press  on the top of screen

**How to review：**

Press  to review saved snapshot, swipe the screen to view others

◆Only the snapshots under selected saving path can be viewed. Please change the saving path to view more snapshot under different saving path.

1. Local path：

Current snapshot name will display after press 

◆Press  on the right side to transfer all snapshots into a USB drive

◆Press  on the right side to delete all local path snapshots

2. USB drive：

◆Please check USB connection first

Current snapshot name will display after press 

# Appendix 1: ADT875 SCPI Command List

## A1.1 IEEE488.2

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | *CLS | The command removes the following registers:<br>Standard event register;<br>Query event register;<br>Operational event register;<br>Status byte register;<br>Error queue. | - | - |
| 2 | *IDN? | In inquiring the apparatus marking, the return data shall be divided into 2 parts:<br>a. Product series No;<br>b. Software version No. | - | Product series No.<br>and software Ver. No. |
| 3 | *RST | Reset main program | - | - |

## A1.2 Measurement and configuration

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | MEASure[:SCALar]:AELectricity? | Read all electrical measurement signals | N/A | 31 values, separated by comma:<br>1. ID of channel 1 measurement unit,<br>2. Measurement value of channel 1,<br>3. ID of channel 1 electrical measurement signal, |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 4. Electrical measurement value of channel 1,<br>5. Original electrical measurement value of channel 1,<br>6. Extra parameter 1 of channel 1,<br>7. Extra parameter 2 of channel 1,<br>8. ID of channel 2 measurement unit,<br>9. Measurement value of channel 2,<br>10. ID of channel 2 electrical measurement signal,<br>11. Electrical measurement value of channel 2,<br>12. Original electrical measurement value of channel 2,<br>13. Extra parameter 1 of channel 2,<br>14. Extra parameter 2 of channel 2,<br>15. External connection is online or offline,<br>16. External sensor types (1=Smart, 2= Customized),<br>17. ID of external connection measurement unit,<br>18. Value of external connection measurement,<br>19. External connection ohm measurement value, |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 20. Original value of external connection measurement,<br>21. Clock,<br>22. Error code,<br>23. 24V value,<br>24. AD temperature values (unit is degree Celsius)<br>25. 24V value of channel 1,<br>26. 24V value of channel 2,<br>27. Positive 2.5V voltage value,<br>28. Negative 2.5V voltage value,<br>29. Positive 5V voltage value,<br>30. Negative 2.5V voltage value,<br>31. 5.8V voltage value<br><br>Note:<br>If electrical measurement project is TC, then the extra parameter 1 is cold-junction value(unit is degree Celsius) and the extra parameter 2 is not used.<br><br>If the electrical measurement project is RTD, the extra parameter 1 is the value of three-wire resistance measurement Ra and the extra parameter 2 is the value of Rb, |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | these two values is meaningless if two or four wire resistance applied.<br><br>If the electrical measurement project is switch, the extra parameter 1 is the temperature value of the last activate point, the extra parameter 2 is the temperature value of reciprocal second activate point,<br>The unit is fixed to degree Celsius,<br>the temperature value comes from the temperature control standard. |
| 2 | MEASure[:SCALar]:AEINfo? | To acquire all electrical signal values | none | 21 values, separated by comma:<br>1. electrical signal values of channel 1,<br>2. electrical signal original value of channel 1,<br>3. Cold junction electrical signal value of channel 1.<br>4. Cold junction electrical signal original value of channel 1<br>5. electrical signal values of channel 2,<br>6. electrical signal original value of channel 2<br>7. Cold junction electrical signal value of channel 2<br>8. Cold junction electrical signal original |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | value of channel 2<br>9. The value of external resistance,<br>10. the original value of external resistance,<br>11. the time stamp,<br>12. error<br>13. Total 24V,<br>14. AD temperature<br>15. The 24V of channel 1,<br>16-21. the 24 V, 2.5V , -2.5V , 5V , -5V , 5.8V of channel 2 |
| 3 | MEASure[:SCALar]:CH? <value> | To acquire the values of channel 1 and 2 | 1 value:<br>Specific value PV\|SV\|TV\|FV:<br><br>PV=current value (temperature sensor is the temperature value, electrical signal channel is the electrical measurement value, switch 1= switch on , 0=switch off<br><br>SV= electrical measurement value<br><br>TV= electrical measurement original value<br><br>FV=cold-junction value (only the TC channel) | 4 values, separated by comma:<br>1. ID of channel 1 measurement unit,<br>2. Value of channel 1,<br>3. ID of channel 2 measurement unit<br>4. Value of channel 2 |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 4 | SENSe:ELECtricity:TCCHannel1\|2 <"SensorName">,<CJCType> ,<FixedValue> | To set the configurations 1\|2 of TC channel | 3 values, separated by comma:<br>“SensorName” ,<br>CJCType ,<br>Auto\|Fixed,<br>FixedValue | none |
| 5 | SENSe:ELECtricity:TCCHannel1\|2? | To acquire the configurations 1\|2 of TC channel | none | 7 parameters, separated by comma:<br>1. Channel types<br>2. Measurement unit ID<br>3. Measurement lower limit<br>4. Measurement Upper limit<br>5. SensorName<br>6. CJCType<br>7. Cold-junction Fixed Value |
| 6 | SENSe:ELECtricity:RTDChannel1\|2 <"SensorName">,<”SensorSN”>,<2\|3\|4> | To set the configurations 1\|2 of RTD channel | 3 values, separated by comma:<br>1. "SensorName”<br>2. ”SensorSN”( can be zero if basic sensor applied)<br>3. Wire type: 2\|3\|4 | none |
| 7 | SENSe:ELECtricity:RTDChannel:LRTD#(1,2) <”SensorName”>,<r0>,2\|3\|4 | To fast set the configurations 1\|2 of RTD channel | 3 values, separated by comma:<br>1. "basic sensor name"<br>2. New r0<br>3. Wire type: 2\|3\|4 | none |
| 8 | SENSe:ELECtricity:RTDChannel1\|2? | To acquire the configurations 1\|2 of RTD channel | none | 6 parameters, separated by comma:<br>1. Channel types<br>2. Unit id |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 3. Measurement lower limit<br>4. Measurement Upper limit<br>5. SensorName<br>6. Wire type |
| 9 | SENSe:ELECtricity:CHITem1\|2 <Item> | To set the types 1\|2 of electrical measurement channel | 1 value:<br>Types of electrical measurement<br>Item:<br>CURRent\|SWITch\|RTD\|TC\|Volt\|HART\|None | none |
| 10 | SENSe:ELECtricity:CHANsItem <Item> | To set electrical measurement channels A and B at the same time | 1 value:<br>Electrical measurement type:<br>Item: Current\|Switch\|RTD\|TC\|Volt\|None | none |
| 11 | SENSe:ELECtricity:CHITem? | To acquire the electrical measurement channel type | none | 2 parameters, comma separated:<br>1. Type of channel A<br>2. Type of channel B<br>mA,mV(TC),Switch,R400,R4k,TC,RTD,None |
| 12 | MEASure[:SCALar]:ELECtricity1\|2\|3? | To acquire the measurement data 1\|2\|3 of current electrical measurement | none | 7 values, comma separated:<br>1. The unit ID of Measurement value,<br>2. measurement value,<br>3. electrical signal unit ID,<br>4. Measurement electrical value,<br>5. original electrical value,<br>6. extra parameter1<br>7. extra parameter 2 |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | Note:<br>If electrical measurement project is TC, then the extra parameter 1 is cold-junction value (unit is degree Celsius) and the extra parameter 2 is not used.<br><br>If the electrical measurement project is RTD, the extra parameter 1 is the value of three-wire resistance measurement Ra and the extra parameter 2 is the value of Rb, these two values is meaningless if two or four wire resistance applied.<br><br>If the electrical measurement project is switch, the extra parameter 1 is the temperature value of the last activate point, the extra parameter 2 is the temperature value of reciprocal second activate point, The unit is fixed to degree Celsius, the temperature value comes from the temperature control standard. |
| 13 | SENSe:EIECtricity:CHINfo1\|2? | To acquire the brief information 1/2 of current channels | none | 4 values, comma separated:<br>1. channel types<br>2. unit ID<br>3. Measurement lower limit |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 4. Measurement upper limit |
| 14 | SENSe:ElECtricity:RANGe1\|2? <Item> | To acquire the range 1\|2 of one project channel | 1 value:<br>Channel type Item<br>Current\|Switch\|RTD\|TC\|Volt\|HART | 3 values, comma separated:<br>1. Measurement lower limit<br>2. Measurement upper limit<br>3. Current unit ID |
| 15 | SENSe:ELECtricity:VOLTchannel1\|2 <VoltType> | To set the configuration 1/2 of voltage channel | 1 value:<br>Channel configuration VoltType:<br>Volt12\|Volt30 | none |
| 16 | SENSe:ELECtricity:VOLTchannel1\|2? | To read the configuration 1/2 of voltage channel | none | 1 value:<br>Channel configuration: Volt12\|Volt30 |
| 17 | SENSe:ELECtricity:SWITchchannel1\|2 <SwitchType> | To set the configuration 1/2 of switch channel | 1 value:<br>SwitchType:<br>DryContact\|WetContact\|PNP\|NPN | none |
| 18 | SENSe:ELECtricity:SWITchchannel1\|2? | To read the configuration 1/2 of switch channel | none | 1 value, comma separated:<br>Switch types:<br>DryContact\|WetContact\|PNP\|NPN |
| 19 | SENSe:ELECtricity:ZERo1\|2 <enable> | To zero or cancel zero for channel 1/2 | 1 value:<br>Zero or cancel zero: 1\|0\|ON\|OFF ,<br>ON=1= zero<br>OFF=0= cancel zero | none |
| 20 | SENSe:ELECtricity:CJC:R0_? | To read the R0 value of cold-junction channel | none | 4 values, comma separated:<br>1. Channel 1 cold-junction R0 manufacturer<br>2. Channel 2 cold-junction R0 manufacturer<br>3. Channel 1 cold-junction R0 user<br>4. Channel 2 cold-junction R0 user |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 21 | SENSe:ELECtricity:CJC:R0_1\|2 Manufactor\|User,<password>,<r0> | To set R0 value of cold-junction channel foe 1/2 channel | 3 values:<br>1. Manufacturer \| User,<br>2. Password (the password of corresponding manufacturer and users.<br>3. R0 | none |
| 22 | SENSe:ELECtricity:CHATtached? | To acquire that whether channel 1 and 2 are connected | none | 1 value:<br>1=connected<br>0=disconnected |
| 23 | SENSe:ELECtricity:CHATtached <attached> | To connect or disconnect channel 1 and 2 | 1 value:<br>Connected or not<br>1= connected<br>0= disconnected | none |

## A1.3 Output

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | MEASure[:SCALar][:TEMPerature]? | To acquire the conditions and data of current control board | none | 18 values, comma separated:<br>(the default temperature unit is Celsius. The first 8 values are data, the following 8 values are status)<br>1. Current temperature ( according to temperature control types, equal to the internal/external temperature)<br>2. Internal temperature<br>3. External connection temperature<br>4. External differential temperature (used |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | for temperature field calibration)<br>5. Original values of internal temperature ( before temperature field)<br>6. Original resistance value (default unit is Ohm)<br>7. Internal difference temperature<br>8. voltage values of Internal difference (default unit is mV)<br>9. the current control state ,<br>10. stable or not<br>11. reach target value or not<br>12. High level (-1~1)<br>13. Low level (-1~1)<br>14. Fan output (0~1)<br>15. Inlet air temperature(indoor temperature)<br>16. electric current<br>17. voltage<br>18. error information |
| 2 | MEASure[:SCALar]:CONTrol? | To acquire the current control data | none | 8 values, comma separated:<br>1. The current temperature unit ID<br>2. the current temperature<br>3. Difference temperature (used for the temperature field calibration)<br>4. current control state |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 5. Heating power ( -1~1 )<br>6. Fan power ( 0~1 )<br>7. Stable or not”1\|0”<br>8. Reach target value or not ”1\|0” |
| 3 | [SOURce:]TEMPerature:STATus:MEASure | To enter measurement state | none | none |
| 4 | [SOURce:]TEMPerature:STATus:CONTrol <TargetTemperature>,<unitId>[,<slewType >,<SlewRate>] | To enter control state | 4 values:<br>1. Target Temperature<br>2. Temperature Unit ID<br>3. Slew Type : 0 means percentage (0~100), 1 means the absolute value ( unit temperature per minute)<br>SlewRate: the temperature control speed (can be eliminated, the current temperature control speed will be as the default value) | none |
| 5 | [SOURce:]TEMPerature:STATus? | To read the temperature control state | none | 1 value:<br>Measure=0<br>(automatic)Control=1<br>Semi Auto Control=2<br>Manual control=3<br>Maintenance mode=4 |
| 6 | [SOURce:]TEMPerature:TARGet <target_Temperature>,<unitId> | To set target temperature (automatic control) | 2 values:<br>1. target_Temperature<br>2. temperature unit Id | none |
| 7 | [SOURce:]TEMPerature:TARGet? | To read target temperature | none | 2 values, comma separated:<br>Current target temperature |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | Current temperature unit ID |
| 8 | [SOURce:]TEMPerature:OPTions? | To read control configuration | none | 11 values, comma separated:<br>1. Current temperature unit id<br>2. Fluctuation rate<br>3. Dwell time(1-600)minutes<br>4. Allowable deviation of target value<br>5. The percentage of temperature control speed<br>6. Absolute value of temperature control speed<br>7. Whether or not to enable the limit of set point 1\|0<br>8. Lower limit of set point<br>9. Upper limit of set point<br>10. Temperature control configuration<br>11. Fan mode 1\|0<br><br>Note: Temperature control configuration:<br>1. Internal temperature control =0<br>2. External temperature control=1<br>3. External temperature control + external connection temperature difference=2(temperature filed calibration) |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 9 | [SOURce:]TEMPerature:OPTions <unitId>,<stability>,<DwellMinutes>,<TargetTolerance>,<slewType>,<SlewRate>,<IsEnableLimits>,<LimitsLower>,<LimitsUpper>,<ControlConfig>,<AirValueState> | To set Temperature control configuration | 11 values:<br>1. unit ID<br>2. stability<br>3. DwellMinutes<br>4. TargetTolerance<br>5. slewType: 0 means in percentage ( 0~100 ) , 1 means in absolute value ( temperature unit per minute )<br>6. SlewRate<br>7. IsEnableLimits: Whether or not to enable Limits of set point<br>8. Lower limit of set point<br>9. Upper limit of set point<br>10. Temperature control types(0=internal temperature control,<br>1= external temperature control,<br>2= external temperature control +external connection CH1temperature difference)<br>11. Air Value state(0= close,1=open up, only for high temperature dry well ) | none |
| 10 | [SOURce:]TEMPerature:STABility <sta>,<unitId> | To set the fluctuation rate of temperature control | 2 values:<br>1. fluctuation rate of temperature control<br>2. temperature unit Id | none |
| 11 | [SOURce:]TEMPerature:STABility? | To acquire fluctuation rate of temperature control | none | 2 values, comma separated:<br>1. fluctuation rate of temperature control |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 2. temperature unit Id |
| 12 | [SOURce:]TEMPerature:STABility:LIMit? | To read fluctuation rate range of temperature control | none | 3 values, comma separated:<br>1. Lower limit of fluctuation rate<br>2. upper limit of fluctuation rate<br>3. Temperature unit id, unit is Celsius |
| 13 | [SOURce:]TEMPerature:TARTolerance? | To read allowable deviation of target value | none | 2 values comma separated:<br>1. allowable deviation of target value<br>2. Temperature unit id |
| 14 | [SOURce:]TEMPerature:TARTolerance <ttolerance>,< unitId > | To set allowable deviation of target value | 2 values:<br>1. allowable deviation of target value<br>2. Temperature unit id | none |
| 15 | [SOURce:]TEMPerature:TARTolerance:LIMit? | To read allowable deviation range of target value | none | 3 values, comma separated:<br>1. Lower limits of allowable deviation of target value<br>2. Upper limits of allowable deviation of target value<br>3.<br>Temperature unit id, fixed Celsius |
| 16 | [SOURce:]TEMPerature:SLEW <slew>,< unitId > | To set temperature control rate | 2 values:<br>1. Temperature control rate (temperature unit per minute)<br>2. temperature unit id | none |
| 17 | [SOURce:]TEMPerature:SLEW? | To read temperature control rate | none | 2 values, separated by comma:<br>1. Temperature control rate (temperature |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | unit per minute)<br>2. Temperature unit ID (fixed in Celsius) |
| 18 | [SOURce:]TEMPerature:PERSlew <slew> | To set temperature control rate | 1 value:<br>slew :<br>temperature control speed rate (percentage 0~100) | none |
| 19 | [SOURce:]TEMPerature:PERSlew? | To read temperature control rate | none | 1 value<br>slew :<br>temperature control speed rate (percentage 0~100) |
| 20 | [SOURce:]TEMPerature:SLEW:LIMit? | To read the upper and lower limits of temperature control speed (absolute value, ℃/minute | none | 3 values, comma separated:<br>1. Lower limit of temperature control speed<br>2. Upper limit of temperature control speed<br>3. Temperature unit id, fixed in Celsius |
| 21 | [SOURce:]TEMPerature:SLEW:PERLimit? | To read lower and upper limits of temperature control rate in percentage | none | 2 values , comma separated:<br>1. Lower limits of temperature control speed in percentage, fixed to 0<br>2. Upper limits of temperature control speed in percentage, fixed to 100 |
| 22 | [SOURce:]TEMPerature:SETPoints:LIMit? | To read lower and upper limits of temperature control rate | none | 3 values, comma separated:<br>1.Lower limits of temperature control<br>2.upper limits of temperature control<br>3.current unit id |
| 23 | [SOURce:]TEMPerature:CLIMit? | To read lower and upper limits of temperature control | none | 3 values, comma separated:<br>1.Lower limit of temperature control ability |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 2.Upper limit of temperature control ability<br>3.Current unit id |
| 24 | [SOURce:]TEMPerature:SLIMit? | To read Lower and upper limits of temperature control | none | 4 values, comma separated:<br>1. Whether or not to enable lower and upper limits control<br>2. Lower limit of temperature control<br>3. Upper limit of temperature control<br>4.Current unit id |
| 25 | [SOURce:]TEMPerature:SLIMit <IsEnable>,<lower>,<upper> | To set lower and upper limits of temperature control | 3 values, unit is fixed with Celsius<br>1.IsEnable:<br>Whether or not to enable low and upper limits 0=close 1= open up<br>2.lower limit<br>3.upper limit | none |
| 26 | [SOURce:]TEMPerature:CONFig? | To acquire operation state of temperature control | none | 1 value:<br>0= internal temperature control<br>1= external control<br>2= double external temperature control for temperature filed calibration |
| 27 | [SOURce:]TEMPerature:CONFig <config> | To set operation state of temperature control | 1 value:<br>operating state<br>0= internal temperature control<br>1= external control<br>2= double external temperature control for temperature filed calibration | none |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 28 | [SOURce:]TEMPerature:CONParams? | To read control parameters | none | 6 values, comma separated:<br>1.damping ratio<br>2.Time constant<br>3.KKp<br>4.KTi<br>5.KTd<br>6.KTf |
| 29 | [SOURce:]TEMPerature:CONParams <damping>,<timeConst>,<kkp>,<kti>,<ktd>,<ktf>, | To set control parameters | 6 values, comma separated:<br>1.damping ratio<br>2.Time constant<br>3.KKp<br>4.KTi<br>5.KTd<br>6.KTf | none |
| 30 | OUTPut:24V[:STATe] <enable> | To set24V state | 1 value:<br>0=OFF<br>1=ON | none |
| 31 | OUTPut:24V[:STATe]? | To read 24V state | none | 1 value:<br>0=OFF<br>1=ON |

## A1.4 Calibration

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| 1 | CALibration:ElECtricity:DATA Manufactor\|User,<password>,<item>, | Write electrical measurement calibration data | 10 values:<br>1.Manufactor: Factory calibration; | none |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | <unitID>,<count>,<"points">,<"values">,<year>,<month>,<day> | | User: User calibration<br>2.Corresponding manufacturer or user password<br>3.item: measurement subject:<br><br>0-A channel ,mA measurement<br>1-B channel mA measurement<br>2-A channel TC mV measurement<br>3-B channel TC mV measurement<br>4-A channel TC cold-junction measurement<br>5-Bchannel, TC cold-junction measurement<br>6-A channel400Ω two- wire resistance measurement<br>7-B channel 400Ω two- wire resistance measurement<br>8-A channel 400Ω three- wire resistance measurement<br>9-B channel 400Ω three- wire resistance measurement<br>10-A channel 400Ω four- wire resistance measurement<br>11-B channel 400Ω four- wire resistance measurement<br>12-A channel 4kΩ two- wire resistance measurement | |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | 13-B channel 4kΩ two- wire resistance measurement<br>14-A channel 4kΩ three- wire resistance measurement<br>15-B channel 4kΩ three- wire resistance measurement<br>16-A channel 4kΩ four- wire resistance measurement<br>17-B channel 4kΩ four- wire resistance measurement<br>18-standard resistance measurement channel<br>19-A channel dry contact switch<br>20-B channel dry switch<br>21-A channel HART<br>22-B channel HART<br>23-A channel -12V~12Vmeasurement<br>24-B channel 12V~12V measurement<br>25-Achannel -30V~30V measurement<br>26-Bchannel30V~30V measurement<br>27-Achannel NPN switch<br>28-Bchannel NPN switch<br>29-Achannel PNP switch<br>30-Bchannel PNP switch<br>31-Achannel wet connection switch | |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | 32-Bchannel wet connection switch<br><br>4. unit id<br>5. The number of calibration points<br>6. calibrated points (character string with quotation mark, comma separated)<br>7.standard value (character string with quotation mark, comma separated)<br>8.year:<br>9.month<br>10.day | |
| 2 | CALibration:ELECtricity:DATA? Manufactor\|User,<password>,<ItemID> | To acquire electrical measurement calibration data | 3 values:<br>1 Manufacturer calibration; User calibration<br>2.Password of corresponding manufacturer or user<br>3. Item: save as above | N*2+5 values, comma separated:<br>Unit id,<br>The number of calibrated points : N,<br>List of standard values: N,<br>List of calibration points: N,<br>Year,<br>Month,<br>Day, |
| 3 | CALibration:ELECtricity:PRESet <Item> | Reset factory setting of electrical measurement panel calibration data | 1 value:<br>Item: save as above | none |
| 4 | CALibration:CONTroller:DATA:INDication? Manufactor\|User,<password> | To acquire calibrated data of temperature display values | 2 values, comma separated:<br>1 Manufacturer calibration; User calibration | N*2+5 values, comma separated: |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | 2.Password of corresponding manufacturer or user | Unit id,<br>The number of calibrated points: N,<br>List of N calibrated display values,<br>List of resistance values of N internal sensors<br>year<br>month<br>day |
| 5 | CALibration:CONTroller:DATA:INDication: INCRement User,<password>.<unitid>,<calCount>,<"ExtValue">,<"IntValue">,<year>,<month>,<day> | To set correction data increment of temperature display value | 9 values, comma separated:<br>1.user calibration<br>2.user password<br>3.unit ID<br>4. the number of calibration points<br>5. ExtValue: List of calibrated display values, comma separated<br>6. IntValue: List of display values before calibration, comma separated<br>7.year<br>8.month ,<br>9.day , | none |
| 6 | CALibration:CONTroller:DATA:INDication: ABSolute Manufactor\|User,<password>.<unitid>,<calCount>,<"ExtValue">,<"IntVal | To set absolute formula of temperature display values correction data | 9 values, comma separated:<br>1 Manufacturer calibration; User calibration<br>2.Password of corresponding manufacturer | none |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | ue”>,<year>,<month>,<day> | | or user<br>3.unit id ,<br>4.the number of calibration points<br>5.List of calibrated display values, comma separated<br>6. List of display values before calibration, comma separated<br>year<br>month<br>day | |
| 7 | CALibration:CONTroller:DATA:FACTorsecondorder:INDication:ABSolute <password>. <unitid>,<calCount>,<”ExtValue”>,<”IntResistance”>,<year>,<month>,<day> | Write factory display correction data, based on factory dry-well self-calibrated indication value correction | 8 values, comma separated:<br>1. Password of corresponding manufacturer or users<br>2. unit ID<br>3.The number of calibrated points<br>4. List of calibrated display values, comma separated<br>5.List of display values before calibration, comma separated<br>6.year,<br>7.month<br>8.day | none |
| 8 | CALibration:CONTroller:DATA:FIELd? Manufactor\|User,<password> | To acquire calibration data of temperature field | 2 values, comma separated:<br>1 Manufacturer calibration; User calibration<br>2. Corresponding manufacturer or user data | N*4+7 values, comma separated:<br>unit ID, |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | | optimization height,<br>environment temperature,<br>The number of calibration points N,<br>List of N temperature points,<br>List of N internal control temperature difference,<br>List of N temperature difference factor Kh,<br>List of N temperature difference factor KI,<br>Year,<br>Month,<br>Day, |
| 9 | CALibration:CONTroller:DATA:FIELd:INCRement User,<password>,<unitid>,<environmentTemp>,<calCount>,<"setpoints">,<"difftemps">,<year>,<month>,<day> | Write temperature field calibration data, incremental | 10 values, comma separated:<br>1. User calibration<br>2. Corresponding user password<br>3. unit ID<br>4.Environment Temperature<br>5.The number of calibrated points<br>6.List of setting points, comma separated<br>7. "difftemps": List of temperature difference TmH-Tml, comma separated<br>8. year<br>9.month | none |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | 10.day | |
| 10 | CALibration:CONTroller:DATA:FIELd:ABSolute Manufactor\|User,<password>,<unitid>,<optHeight>,<environmentTemp>,<calCount>,<"setpoints">,<"dts">,<"khs">,<"kls">,<year>,<month>,<day> | Write temperature field calibration data, absolute formula | 13 values, comma separated<br>1 Manufacturer calibration; User calibration<br>2.Corresponding manufacturer or user password<br>3.unitid,<br>4.optimization height<br>(temporarily fixed with 62.5mm)<br>5.Environment Temperature<br>6. the number of calibrated points<br>7.List of setting points, comma separated<br>8."dts": List of internal control temperature difference, comma separated<br>9. "khs": List of temperature difference factor Kh, comma separated<br>10. "kls": List of temperature difference factor KI<br>11. year<br>12. month<br>13. day | none |
| 11 | CALibration:CONTroller:FRESet 1\|2\|3 | Reset factory settings of control panel calibration data | 1 parameter, stands for restoration project:<br>2=display value correction<br>3=vertical temperature field<br>1=AC voltage calibration | none |
| 12 | CALibration:CONTroller:PERiod:COUNt? | To acquire the total number of temperature | none | 1 value: |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | calibration data | | The total number of data |
| 13 | CALibration:CONTroller:PERiod:HEADer? | To acquire data head information of temperature calibration | none | N terms of calibration data, semicolon separated.<br><br>Every item of calibration has 6 values, comma separated.<br>Id<br>name<br>calibrated date<br>operator<br>remark<br>Data source 0=axial temperature field,1 =indicating values calibration,2=dry well self-calibration |
| 14 | CALibration:CONTroller:PERiod:INFo? <id> | To acquire detailed data of temperature calibration | 1 value :<br>Id | Two sets of calibration data, Semicolon separated :<br><br>Revised data of temperature indicating values, N*2+5 parameters, comma separated :<br>1. Id unit id<br>2. the number of calibrated points N<br>3. N calibrated points |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | | 4.N actual values<br>5.year<br>6.month<br>7.day<br><br>Calibration data of Axial temperature field. , N*4+7 values, comma separated.<br>1.unit id<br>2.optimization height ( mm )<br>3. environment temperature<br>4.the number of calibrated points M<br>5.M calibrated points<br>6.M control temperature difference<br>7.M pieces of kh<br>8.M pieces of KI<br>9. year<br>10.month<br>11. day |

## A1.5 System

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| 1 | SYSTem:VERSion? [<module>] | Query the version number of different | “APPLication”: Firmware version number | version NO. |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | modules according to the parameter. If parameter ignored, then return the SCPI version number followed by the system | “CONTroller:FIRMware”: Control firmware version number;<br>“CONTroller:HARDware”: Control hardware version number<br>“EIECtricity:FIRMware”: Electrical measurement firmware version number<br>“EIECtricity:HARDware”: Electrical measurement hardware version number | |
| 2 | SYSTem:ERRor[:NEXT]? | Query the next error item in the error queue and delete the item from the queue. Error queue can store 50 error messages, if more than 50, the last one will be replaced by -350, "queue overflow" instead. System power down or CLS command can clear the error queue. | none | wrong information |
| 3 | SYSTem:DATE<year>,<month>,<day> | To set the date of system | year<br>month<br>day | none |
| 4 | SYSTem:DATE? | To search the date of system | - | Year ,month day |
| 5 | SYSTem:TIME<hour>,<minute>,<second> | To design the date of system | hour<br>minute<br>second | none |
| 6 | SYSTem:TIME? | To acquire system time | none | 3 values , comma separated<br>1. hour |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | | | 2. minute<br>3. second |
| 7 | SYSTem:KLOCk <Boolean>\|ON\|OFF | To set local lock-out state of system, only to lock out the functional operation of panel | 1， ON: system is locked<br>0， OFF: system is unlock | none |
| 8 | SYSTem:KLOCk? | To search local lock-out state of system, | none | 1: lock-out<br>0: unlock |
| 9 | SYSTem:BEEPer:ALARm <Boolean>\|ON\|OFF | To set warning tone state | On or Off | none |
| 10 | SYSTem:BEEPer:TOUCh <Boolean>\|ON\|OFF | To set keypad tone state | On or Off | none |
| 11 | SYSTem:COMMunicate:SOCKet:WLAN[:STATe] <Boolean>\|ON\|OFF | To set WIFI state<br>Attention: if the WiFi is turned on, the serial port of controller will be closed.<br><br>During the time of WiFi turning on and connecting, the communication with controller is only done through Ethernet | 1，ON<br>0，OFF | none |
| 12 | SYSTem:COMMunicate:SOCKet:WLAN[:STATe]? | To search WiFi state | none | 1: WIFI on<br>0: WIFI off |
| 13 | SYSTem:COMMunicate:SOCKet:WLAN:ADDRess<IP address> | To set the IP address of WIFI<br><br>Before designing the DHCP、IP subset mask and gateway of WIFI, please confirm that the wifi module has been turned on and doesn't connect with any hot spots. | IP address: character string without quotation, format is <NR1>.<NR1>.<NR1>.<NR1> | none |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| 14 | SYSTem:COMMunicate:SOCKet:WLAN:ADDRess? | To search the IP address of WIFI | none | IP address |
| 15 | SYSTem:COMMunicate:SOCKet:WLAN:MASK <IP address> | To set subnet mask of wifi<br><br>Please confirm that the wifi module has been turned on and doesn't connect with any hot spots before set DHCP, IP subset mask and gateway of WIFI. | IP address: character string without quotation, format is <NR1>.<NR1>.<NR1>.<NR1> | none |
| 16 | SYSTem:COMMunicate:SOCKet:WLAN:MASK? | To search subnet mask of WIFI | none | IP address |
| 17 | SYSTem:COMMunicate:SOCKet:WLAN:GATeway <IPaddress> | To set gateway of wifi<br><br>Please confirm that the wifi module has been turned on and doesn't connect with any hot spots before set DHCP, IP subset mask and gateway of WIFI. | IP address: character string without quotation, format is <NR1>.<NR1>.<NR1>.<NR1> | none |
| 18 | SYSTem:COMMunicate:SOCKet:WLAN:GATeway? | To search gateway of wifi | none | IP address |
| 19 | SYSTem:COMMunicate:SOCKet:WLAN:MAC? | To search physical address of wifi | none | Physical address |
| 20 | SYSTem:COMMunicate:SOCKet:WLAN:DHCP[:STATe] <Boolean>\|OFF\|ON | To set WIFI DHCP state<br><br>Please confirm that the wifi module has been turned on and doesn't connect with any hot spots before set DHCP, IP subset | 1=ON: open DHCP;<br>0=OFF: close DHCP | none |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | | mask and gateway of WIFI. | | |
| 21 | SYSTem:COMMunicate:SOCKet:WLAN:DHCP[:STATe]? | To search WIFIDHCP state | none | 1: DHCP on<br>0: DHCP off |
| 22 | SYSTem:COMMunicate:SOCKet:WLAN:SSID? [ALL] | If the parameter is "ALL", the search will be done and all the searched SSID names and the ways of encryption will be returned. If the parameter is overlooked, the result will return back to the current connected SSID name and the ways of encryption, if there is no connections or no searched hot spots, then return " " | none | {[“ssid: way of encryption”]} |
| 23 | SYSTem:COMMunicate:SOCKet:WLAN:CONNect <”ssid”>,<”encryptionMode”>[,<”password”>] | Connect WiFi to specific hot spot | 1 )”ssid : hot spot name, the character string with quotation<br><br>2) “encryption Mode<br>WEP_OFF , WEP_ON , WEP_AUTO , WPA_PSK , WPA_TKIP , WPA2_PSK , WPA2_AES , CCKM_TKIP , WEP_CKIP , WEP_AUTO_CKIP , CCKM_AES ,WPA_PSK_AES ,WPA_AES , WPA2_PSK_TKIP , WPA2_TKIP , WAPI_PSK , WAPI_CERT ;<br><br>3) password”: the character string with quotation | none |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| 24 | SYSTem:COMMunicate:SOCKet:WLAN:CONNect? | To search the connection state of wifi | none | Successfully,<br>Initialization,<br>SSIDNotFound<br>SSIDNotConfigured,<br>JoinFaile<br>ScaningConfiguredSSID<br>WaitingIPConfiguration<br>ModuleJoinedListeningSockets |
| 25 | SYSTem:COMMunicate:SOCKet:WLAN:DISConnect | To Break the wifi connection | none | none |
| 26 | SYSTem:COMMunicate:SOCKet:WLAN:DBM? | To search signal strength and dBm value of WIFI | none | DBM Value, unit is dBm |
| 27 | SYSTem:COMMunicate:SOCKet:ETHernet:DHCP? | To acquire DHCP state of Ethernet | none | 1=DHCP，0=static |
| 28 | SYSTem:COMMunicate:SOCKet:ETHernet:DHCP <enable> | To design DHCP state of Ethernet | Enable or not，1=ON，0=OFF | none |
| 29 | SYSTem:COMMunicate:SOCKet:ETHernet:ADDRess? | To acquire IP address of Ethernet | none | IP address |
| 30 | SYSTem:COMMunicate:SOCKet:ETHernet:ADDRess <ip> | To design the IP address of Ethernet under the static state | IP address | none |
| 31 | SYSTem:COMMunicate:SOCKet:ETHernet:MASK? | To acquire subnet mask of Ethernet | none | Subnet mask |
| 32 | SYSTem:COMMunicate:SOCKet:ETHernet:MASK <mask> | To set subnet mask of Ethernet under the static state | Subnet mask | none |
| 33 | SYSTem:COMMunicate:SOCKet:ETHernet:G | To acquire gateway of Ethernet | none | gateway |

| No. | Command | Description | Parameter | Return value |
|---|---|---|---|---|
| | ATeway? | | | |
| 34 | SYSTem:COMMunicate:SOCKet:ETHernet:GATeway <gateway> | To design gateway of Ethernet under the static state | gateway | none |
| 35 | SYSTem:COMMunicate:SOCKet:ETHernet:PHYSicaladdress? | To read physical address of Ethernet | none | physical address |
| 36 | SYSTem:PASSword:EDIT <oldPassword>,<newPassword>,<newPasswordRepeat> | To edit the user password | 3 values, comma separated, password is only consist of number:<br>1.Old Password/super administrative password<br>2.New Password<br>3.New Password Repeat | none |
| 37 | SYSTem:PASSword:ENABle:TASK? | To search that the protection of mission password is opened or not | none | 1 value:<br>1=on, 0=off |
| 38 | SYSTem:PASSword:ENABle:TASK <enable> | To set the protection password of task | 1 value<br>enable,0= close 1= open | none |
| 39 | SYSTem:PASSword:ENABle:SENSor? | To search sensor library password is opened or not | none | 1 value<br>Open or not 1=open 0=close |
| 40 | SYSTem:PASSword:ENABle:SENSor <enable> | To set sensor library password | 1 value<br>Enable or not, 0=close 1= open | none |
| 41 | SYSTem:VOLume? | To read system volume | none | 1 value<br>The percentage of system volume ( 0~100 ) |
| 42 | SYSTem:VOLume <per> | To design system volume | 1 volume<br>per， per The percentage of system volume ( 0~100 ) | none |

## A1.6 Display

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1. | DISPlay:BRIGhtness <type>,<level> | To set brightness | 2 values, comma separated<br>1.Type:<br>Percentage=percentage value=concrete value<br>2.Level： brightness | |
| 2. | DISPlay:BRIGhtness? <type> | To read brightness | 1 value<br>Type:<br>Percentage=percentage value=concrete value | brightness |
| 3. | DISPlay:DECimals:CONTrol? | To acquire decimal digits of control temperature display | none | 1 value:<br>decimal digits |
| 4. | DISPlay:DECimals:CONTrol <decimal> | To set decimal digits of control temperature display | 1 value:<br>decimal digit (0,3) | none |
| 5. | DISPlay:DECimals:REF? | To acquire decimal digits of external temperature display | none | 1 value:<br>decimal digits |
| 6. | DISPlay:DECimals:REF <decimal> | To design decimal digits of external temperature indication | 1 value:<br>decimal digit (0,3) | none |
| 7. | DISPlay:DECimals:CHTemp? | To read decimal digits of external temperature measurement display | none | 1 value<br>decimal digits |
| 8. | DISPlay:DECimals:CHTemp <decimal> | To set decimal digits of temperature measurement display | 1 value:<br>decimal digit (0,3) | To set decimal digits of temperature measurement display |

| | | | | |
|---|---|---|---|---|
| 9. | DISPlay:DECimals:ELECtric? | To read decimal digits of current, voltage, resistance measurement display | none | To read decimal digits of current, voltage, resistance measurement display |
| 10. | DISPlay:DECimals:ELECtric <decimal> | To set indicating decimal digits of current, voltage, resistance measurement display | 1 value<br>decimal digits (0,4) | To set indicating decimal digits of current, voltage, resistance measurement display |
| 11. | DISPlay:HOME? | To search on the home screen or not | none | To search on the home screen or not |
| 12. | DISPlay:HOME | To return back to the home screen from current interface<br>( temporarily only support the return of system set interface) | none | To return back to the home screen from current interface<br>( temporarily only support the return of system set interface) |
| 13. | DISPlay:THEMe? | To acquire current theme mode | none | To acquire current theme mode |
| 14. | DISPlay:THEMe:ALLNames? | To acquire names of all current supporting themes | none | To acquire names of all current supporting themes |
| 15. | DISPlay:THEMe <themeName>[,<isReboot>] | To set system theme( after reset, it will work) | 2 values, comma separated:<br>Supporting Theme Name<br>Restart or not, can be omitted, if omitted, the default value is restart. | To set system theme( after reset, it will work) |
| 16. | DISPlay:LANGuage? | To search current system language | none | To search current system language |
| 17. | DISPlay:LANGuage languageName[,isReboot] | To set current system language | Language Name:<br>Character string without quotation, for example: zh-CN<br><br>isReboot: | To set current system language |

| | | | | |
|---|---|---|---|---|
| | | | Optional parameters, Boolean value, after finish, to restart instruments or not , default value is to restart instruments. | |

## A1.7 Unit

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | UNIT:TEMPerature <unit_ID>\|<"unit_name"> | To set system temperature unit | 1 value<br>Unit: unit name or unit ID<br>"Unit_name" is the character string with quotation<br>"unit_ID" is number | none |
| 2 | UNIT:TEMPerature? | To acquire system temperature unit | none | 2 values, comma separated:<br>1.Name of temperature unit, 2. Temperature unit ID |

## A1.8 Task

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | TASK:INSTrument:COUNt? | To search the number of devices | None | The number of devices |
| 2 | TASK:INSTrument:RESult:COUNt? <Guid> | To search the result of device quantity searching | Guid: Device Guid | the result of device quantity searching |
| 3 | TASK:INSTrument:CATalog? < index >,< count > | To read information of device list | Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 4 | TASK:INSTrument:RESult:CATalog? <Guid>,< index >,< count > | To read result information list under device list | Guid: Device ID<br>Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 5 | TASK:INSTrument:INFo? <Guid> | To read detailed information of devices | Guid: Device ID | ClassName, character data of |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | Base64, CRC16 check code |
| 6 | TASK:INSTrument:RESult:CLEAr <Guid> | To delete all results under device list | Guid: Device ID | |
| 7 | TASK:INSTrument:SEARch:COUNt? <"condition"> | To find the number of devices according to searching conditions | Search keyword "condition": JSon character string , no line break in JSon character string | The number of devices |
| 8 | TASK:INSTrument:SEARch:CATalog? <"condition">,< index >,< count > | To read information of device list according to searching conditions | Search keyword "condition": JSon character string , no line break in JSon character string<br>Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 9 | TASK:TEST:COUNt? | To search the number of tasks | | the number of tasks |
| 10 | TASK:TEST:RESult:COUNt? <Guid> | To search the number of task results | Guid: Guid of tasks | result quantity under tasks |
| 11 | TASK:TEST:CATalog? < index >,< count > | To read information of task list | Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 12 | TASK:TEST:RESult:CATalog? < Guid >,< index >,< count > | To read information of task result list | Guid: tasks ID<br>Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 13 | TASK:TEST:INFo? <Guid> | To read the detailed information of tasks | Guid: tasks ID | ClassName, character data of Base64, CRC16 check code |
| 14 | TASK:TEST:RESult:CLEAr <Guid> | To delete all task results | Guid: tasks ID | |
| 15 | TASK:TEST:SEARch:COUNt? <"condition"> | To find the number of tasks according to conditions | Search keyword "condition": JSon character string , no line break in JSon character string | The number of tasks matching keyword |
| 16 | TASK:TEST:SEARch:CATalog? <"condition">,< index >,< count > | According to conditions, to read the information of tasks list | Search keyword "condition": JSon character string , no line break in JSon character | ClassName, character data of Base64, CRC16 check code |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | string<br>Index: initial position<br>Count: quantity ( 0-10 ) | |
| 17 | TASK:RESult:COUNt? | To search the number of results | | The number of result |
| 18 | TASK:RESult:CATalog? <index>,<count> | To read information of result list | Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 19 | TASK:RESult:INFo? <Guid> | To read detailed information of result | Guid: result ID | ClassName, character data of Base64, CRC16 check code |
| 20 | TASK:RESult:SEARch:COUNt? <"condition"> | According to conditions, to search the number of results | Search keyword "condition": JSon character string , no line break in JSon character string | The number of results matching conditions |
| 21 | TASK:RESult:SEARch:CATalog? <"condition">,<index>,<count> | According to conditions, to read the information of result list | Search keyword "condition": JSon character string , no line break in JSon character string<br>Index: initial position<br>Count: quantity ( 0-10 ) | ClassName, character data of Base64, CRC16 check code |
| 22 | TASK:DELete TASK\|RESult\|INSTrument, <Operation> | To delete tasks\results\devices | TASK: To delete the task data<br>RESult: To delete the result data<br>INSTrument: To delete the instrument data<br><br>Operation：<br>To delete the all data<br>Guid：According to ID, directly write in Guid<br>"Guids"： The character string is consist of Guid, comma separated. | |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 23 | TASK:ADD:TEST <data> | To add task | data: data (base64 encoding characters) | |
| 24 | TASK:ADD:INSTrument <calssname>,<data> | To add device | Classname: Instrument class data: data(Base encoding characters) | |
| 25 | TASK:ADD:RESult < data > | To add result | data: data(Base64 character string) | |

## A1.9 Sensor

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | SENSor:COUNt? <SenorType> | To acquire the number of sensors | 1 value<br>SenorType: RTD\|SPRT\|CVD\|NTC\|NTC_SH2\|SMART\|UUT<br>Note: RTD=10 , SPRT=3 , CVD=2 , NTC=1 , NTC_SH2=12 | 1 value<br>The number of custom sensors |
| 2 | SENSor:CATalog? <SensorType>,<offset>,<count> | To acquire the information of sensor head | 3 values<br>1.SensorType:UUT\|SPRT\|RTD\|CVD\|NTC\|NTC_SH2\|SMART ,<br>Note: RTD=10 , SPRT=3 , CVD=2 , NTC=1 , NTC_SH2=12<br>2. Offset: Initial position offset ,<br>3. count<br>UUT means all sensors | 3 values, comma separated<br>1. ClassName, actually is List<SensorHeader><br>2. Base64 character data<br>3. CRC16 check code |
| 3 | SENSor:INFormations? <id> | To acquire the information of single sensor | 1 value<br>sensor id | 3 values, comma separated<br>1. ClassName, actually is List<SensorHeader> |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 2. Base64 character data<br>3. CRC16 check code |
| 4 | SENSor:SETSensorinfo:ADD<br><SensorType >,< "Info"> | Create a new sensor | 2 values<br>SensorType:RTD\|SPRT\|CVD\|NTC\|NTC_SH2 ,<br>Note: RTD=10 , SPRT=3 , CVD=2 , NTC=1 , NTC_SH2=12<br>"Info" is the character data of Base64 | none |
| 5 | SENSor:SETSensorinfo:UPDate<br><SensorType >,< "Info"> | To modify sensor | 2 values<br>SensorType:RTD\|SPRT\|CVD\|NTC\|NTC_SH2 ,<br>Note: RTD=10 , SPRT=3 , CVD=2 , NTC=1 , NTC_SH2=12<br>"Info" is the character data of Base64 | none |
| 6 | SENSor:Delete <"ids"> | To delete sensor | 1 value<br>Sensor ids, comma separated in the quotation mark. | none |
| 7 | SENSor:SEARch? <"condition"> | To search sensor | 1 value, comma separated:<br>Sensor searching keyword "condition":<br>Base64 character data | 3 values, comma separated:<br>1. ClassName, actually is List< SensorHeader ><br>2. Base64 character data<br>3. CRC16 check code |
| 8 | SENSor:REF:AVAilable? | To acquire online state of external connected sensor | none | 3 values, comma separated:<br>1. External connected sensor is online or not, |

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | 1=online; 0=offline<br>2. External connected sensor is smart or not,<br>1=smart; 0=not smart<br>3. Available,<br>1=available; 0= not available |
| 9 | SENSor:REF[:SENSorinfo]? | To acquire information of external connected sensor | none | 7 values, comma separated:<br>1. Class name of sensor data<br>2. sensor id<br>3. sensor name<br>4. sensor SN<br>5. Smart sensor or not<br>6. Character data of Base64<br>7. CRC16 check code |
| 10 | SENSor:REF[:SENSorinfo]:ORDinary <SensorType >,< "Info"> | To set information of ORDinary external connected sensor, write sensor into library and work as the external connected sensor directly, the non-smart external connected sensor must be online | 2 values:<br>1.SensorType:SPRT\|CVD<br>2."Info" is the character data of Base64 | none |
| 11 | SENSor:REF[:SENSorinfo]:SMARt <SensorType >,< "Info"> | To set information of Smart external connected sensor, the smart external connected sensor must be online | 2 values:<br>1.SensorType:SPRT\|CVD<br>2."Info" is the character data of Base64 | none |

## A1.10 Application

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | APPLication:DATas:COUNt? <App> | To acquire the number of application data | 1 value, applicable type:<br>1.POWer= power grid quality<br>2.STEP=phase step test<br>3.SWITch=switch test<br>4.SNAPshot=snapshot<br>5.CONTrolcurve=control curve | 1 value:<br>the number of data |
| 2 | APPLication:DATas:DATa? <App>,<Index> | To acquire the configuration of applicable data and specific data (except control curve) | 2 values, comma separated:<br>1. App: Applicable type<br>2. Index: Serial NO. of data | 1 value"<br>Character string of data Json<br>(Snapshoot is the character data of Base64, control curve only control configuration, no actual data) |
| 3 | APPLication:DATas:DELete <App>,<Index> | To delete application data | 2 values, comma separated:<br>1. App: Applicable type<br>2. Index: Serial NO. of data | none |
| 4 | APPLication:DATas:DIAGnosis:RESult:LENGth? <"path"> | To read control curve application data length | 1 value:<br>file path | 1 value:<br>the length of data |
| 5 | APPLication:DATas:DIAGnosis:RESult:DATa? <"path">,<Index>,<Count> | To read control curve application data | 3 values, comma separated:<br>1. "path": file path<br>2. "Index": Offset Address of initiation<br>3. "Count": Length | 2 values, comma separated:<br>1. Real data, Base64 character data<br>2. CRC16 check code |

## A1.11HART Communication

| No. | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1. | HART:SEARCH<br>Start\|Stop\|Zero[,<Numeric>][,<Numeric>] | HART searching | Start：Start searching<br>Stop：Stop searching<br>Zero：only searching address 0<br>Notes: "Start" and "Stop" can be followed by address range parameter , for example: “,0,15” | |
| 2. | HART:DEVICES? | To return back to the searched device list (Address and instrument type) | | |
| 3. | HART:CONnect<address> | To connect with the searched device | Address | |
| 4. | HART:ONLDEVice:PROCess? | | - | PV：Process variable<br>AO：simulated current value<br>%：range percentage<br>SV：secondary variable<br>TV：Tertiary variable<br>FV：Quaternary variable<br>LoopCurrent：Loop Current |
| 5. | HART:ONLDEVice:PROCess<br>PV\|AO\|%\|SV\|TV\|FV\|LoopCurrent | To switch process variable | PV：Process variable<br>AO：simulated current value<br>%：range percentage<br>SV：secondary variable<br>TV：Tertiary variable<br>FV：Quaternary variable<br>LoopCurrent：Loop Current | - |

| | | | | |
|---|---|---|---|---|
| 6. | HART:ONLDEVice:PROCess:VALue? | To read the value of process variable | | the value of process variable |
| 7. | HART:ONLDEVice:PARameter? <"name"> | To search parameters | "name": Parameters name | |
| 8. | HART:ONLDEVice:PARameter[:ECHO] <"name">,<"value">\|<value> | To set parameters | "name": Parameters name<br>"value": value (with character string or figure of quotation mark ) | |
| 9. | HART:ONLDEVice:INFO? | To search HART instrument information | None or <parameters. Names><br>Name list of parameter:<br>Tag<br>Manufacturer<br>Devicetype<br>Deviceid<br>writeprotect<br>date<br>message<br>descriptor<br>finalassemble<br>preambles<br>universalrev<br>hardwarerev<br>softwarerev<br>devicerev | All device information will be returned if no parameter entered. Corresponding value will be returned if specific parameter entered. |
| 10. | HART:ONLDEVice:SENSor? | Return all parameter values to sensor<br>Or return corresponding values according to specific parameter | No parameters or<parameter name><br>Name list of parameters:<br>sn | All sensor parameter will be returned if no parameter entered. Corresponding value will be |

| | | | | |
|---|---|---|---|---|
| | | | unit<br>lrl<br>url<br>minspan | returned if specific parameter entered. |
| 11. | HART:ONLDEVice:OUTput? | Return all HART output value<br>Or return corresponding value according to specific parameter | None or <parameters. Names><br>Name list of parameters:<br>unit<br>lrv<br>urv<br>damping<br>transferFunction | All HART output parameter will be returned if no parameter entered.<br>Corresponding value will be returned if specific parameter entered. |
| 12. | HART:ONLDEVice:CONNected? | To check HART instrument device is connected or not. | none | 1 value:<br>1=connected; 0=disconnected |

### A1.12 SCPI Unit ID

| Unit ID | Unit |
|---|---|
| 2000 | text unit |
| 32767 | empty unit |
| 1211 | mA |
| 1212 | μA |
| 1209 | A |
| 1240 | V |
| 1241 | mV |
| 1281 | Ω |
| 1284 | kΩ |
| 1283 | MΩ |

| | |
|---|---|
| 1000 | K |
| 1001 | ℃ |
| 1002 | ℉ |
| 1003 | °R |
| 999 | °Re |
| 1005 | ° |
| 1342 | % |
| 1133 | kPa |
| 1130 | Pa |
| 1131 | GPa |
| 1132 | MPa |
| 1134 | mPa |
| 1135 | μPa |
| 1136 | hPa |
| 1137 | bar |
| 1138 | mbar |
| 1139 | torr |
| 1140 | atm |
| 1141 | psi |
| 1142 | psia |
| 1143 | psig |
| 1144 | $gf/cm^2$ |
| 1145 | $kgf/cm^2$ |
| 1147 | inH2O@4°C |
| 1148 | inH2O@68°F |

| | |
|---|---|
| 1150 | mmH2O@4°C |
| 1151 | mmH2O@20°C |
| 1153 | ftH2O@4°C |
| 1154 | ftH2O@68°F |
| 1156 | inHg@0°C |
| 1158 | mmHg@0°C |
| 2001 | mtorr |
| 2002 | $lb/ft^2$ |
| 2003 | tsi |
| 2004 | psf |
| 2005 | inH2O@60°F |
| 2006 | ftH2O@60°F |
| 2007 | cmH2O@4°C |
| 2008 | mH2O@4°C |
| 2009 | cmHg@0°C |
| 2010 | mHg@0°C |
| 2011 | $kgf/m^2$ |

### A1.13 Default Industrial Sensor

| Sensor type | Sensor name (used in command) |
|---|---|
| R400 | 400Ω/R400 |
| R4k | 4kΩ/R4k |
| Pt100-385 | Pt100(385) |
| Pt10-385 | Pt10(385) |
| Pt50-385 | Pt50(385) |
| Pt200-385 | Pt200(385) |
| Pt400-385 | Pt400(385) |
| Pt1000-385 | Pt1000(385) |
| Pt25-385 | Pt25(385) |
| Pt100-3916 | Pt100(3916) |
| Pt100-3926 | Pt100(3926) |
| Pt100-391 | Pt100(391) |
| Cu100-428 | Cu100(428) |
| Cu50-428 | Cu50(428) |
| Cu10-427 | Cu10(427) |
| Ni100-617 | Ni100(617) |
| Ni100-617 | Ni100(618) |
| Ni120-672 | Ni120(672) |
| Ni1000 | Ni1000 |
| TC-S | S |
| TC-R | R |
| TC-B | B |
| TC-K | K |

| | |
|---|---|
| TC-N | N |
| TC-E | E |
| TC-J | J |
| TC-T | T |
| TC-C | C |
| TC-D | D |
| TC-G | G |
| TC-L | L |
| TC-U | U |
| TC-LR | LR |
| TC-A | A |
| mV | mV |

## A1.14 Error Definition

| No. | Error code | Description |
|---|---|---|
| 1 | 0 | No error |
| **Wrong command** | | |
| 2 | 120 | Wrong command parameter |
| 3 | -108 | Too much Parameters or the command which is not allowed to have parameters |
| 4 | -109 | Missed parameter |
| 5 | -110 | Command head error |
| 6 | -114 | Head suffix out of range |
| 7 | -123 | Numeric overflow, the exponent absolute value of the number is greater than 43 |
| 8 | -151 | Invalid string data |
| 9 | -171 | Invalid expression |
| **Execution error** | | |
| 10 | -200 | Execution error |
| 11 | -221 | Settings conflict |
| 12 | -222 | Data out of range |
| 13 | -223 | Too much data |
| 14 | -224 | Illegal parameter value |
| 15 | -230 | Data corrupt or stale |
| 16 | -240 | Hardware error |
| 17 | -256 | File name not found |
| 18 | -282 | Illegal program name |
| 19 | 220 | Measure error |

| No. | Error code | Description |
|---|---|---|
| 20 | 221 | Failed to set meaure function |
| 21 | 222 | Failed to read measure value |
| 22 | 240 | Control error |
| 23 | 260 | Calibration error |
| 24 | 261 | Calibration secured |
| 25 | 262 | Invalid calibration secure code |
| 26 | 263 | Missing calibration value |
| 27 | 264 | Missing calibration data |
| 28 | 265 | Failed to set calibration function |
| 29 | 266 | Calibration data is not enough |
| 30 | 271 | Setion_name_not_found |
| 31 | 272 | Key_name_not_found |
| 32 | 291 | Update secured |
| 33 | 292 | Invalid update secure code |
| 34 | 293 | Not found the service pack |
| 35 | 294 | The service pack unavailable |
| 36 | 295 | AppUpdate not found |
| **Device error** | | |
| 37 | -310 | System error |
| 38 | -311 | Memory error |
| 39 | -350 | Queue overflow |
| 40 | -360 | Communication error |
| 41 | 301 | Internal module is not connected |
| 42 | 302 | External module is not connected |

| No. | Error code | Description |
|---|---|---|
| 43 | 303 | Supply module is not connected |
| 44 | 304 | Vacuum module is not connected |
| 45 | 361 | Open WLAN Failed |
| 46 | 362 | Set WLAN address mode failed |
| 47 | 363 | Set WLAN address failed |
| 48 | 364 | Communication port to WIFI module is not open |
| 49 | 365 | WLANisnotconnected |

## A1.15 Status Byte Register

Status byte register shows the information of other state registers, the value is unlocked. The corresponding bits of status byte register will be zeroed if an event register is zeroed. The bits are defined as follows:

| Bit | Decimal value | Definition | Description |
|---|---|---|---|
| 0 | 1 | unused | always 0 |
| 1 | 2 | unused | always 0 |
| 2 | 4 | Error queue | Error queue is not empty |
| 3 | 8 | Question data | One or several bits of question data register are set to 1 (corresponding bits of enabling register must be enable) |
| 4 | 16 | unused | always 0 |
| 5 | 32 | Standard event | One or several bits of standard event register are set to 1 (corresponding bits of enabling register must be enable) |
| 6 | 64 | Service request | One or several bits outside this bit are set to 1 (corresponding bits of enabling register must be enable) |
| 7 | 128 | Operation state | One or several bits of operation state register are set to 1 (corresponding bits of enabling register must be enable) |

## A1.16 Standard Event Register

Standard event register shows the following events: power on, grammatical error of commands, the error of self-testing or self calibration, or a *OPC orders have been executed. The bits are defined as follows:

| Bit | Decimal value | Definition | Description |
|---|---|---|---|
| 0 | 1 | Operation finished | All commands before *OPC are all executed |
| 1 | 2 | unused | always 0 |
| 2 | 4 | unused | always 0 |
| 3 | 8 | Instrument error | Self-testing , self-calibration or overloading error |
| 4 | 16 | Execution error | Execution error happened |
| 5 | 32 | Wrong command | Command grammatical error |
| 6 | 64 | unused | always 0 |
| 7 | 128 | Power on | Powered on |

## A1.17 Question data register

Question data register shows the information of testing results, for example: out of range and so on. The bits are defined as follows:

| Bit | Decimal value | Definition | Description |
|---|---|---|---|
| 0 | 1 | Voltage overload | Voltage over range |
| 1 | 2 | Current overload | Current over range |
| 2 | 4 | unused | always 0 |
| 3 | 8 | unused | always 0 |
| 4 | 16 | unused | always 0 |
| 5 | 32 | unused | always 0 |
| 6 | 64 | unused | always 0 |
| 7 | 128 | unused | always 0 |
| 8 | 256 | unused | always 0 |
| 9 | 512 | Pressure overload | Pressure out of range |
| 10 | 1024 | unused | always 0 |
| 11 | 2048 | unused | always 0 |
| 12 | 4096 | unused | always 0 |
| 13 | 8192 | unused | always 0 |
| 14 | 16384 | unused | always 0 |
| 15 | 32768 | unused | always 0 |

### A1.18 Operation Status Register

Operation status register shows the regular operation information of device. The bits are defined as follows:

| Bit | Decimal value | Definition | Description |
|---|---|---|---|
| 0 | 1 | unused | always 0 |
| 1 | 2 | unused | always 0 |
| 2 | 4 | unused | always 0 |
| 3 | 8 | unused | always 0 |
| 4 | 16 | Under measurement | Device is initiative to take a pressure measurement |
| 5 | 32 | unused | always 0 |
| 6 | 64 | unused | always 0 |
| 7 | 128 | Pressure overload | always 0 |
| 8 | 256 | unused | always 0 |
| 9 | 512 | unused | always 0 |
| 10 | 1024 | unused | always 0 |
| 11 | 2048 | unused | always 0 |
| 12 | 4096 | unused | always 0 |
| 13 | 8192 | unused | always 0 |
| 14 | 16384 | unused | always 0 |
| 15 | 32768 | unused | always 0 |

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