ADT875 Series Dry Well Calibrator

Additel 875 Series Dry Well Calibrator

————User's Manual

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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

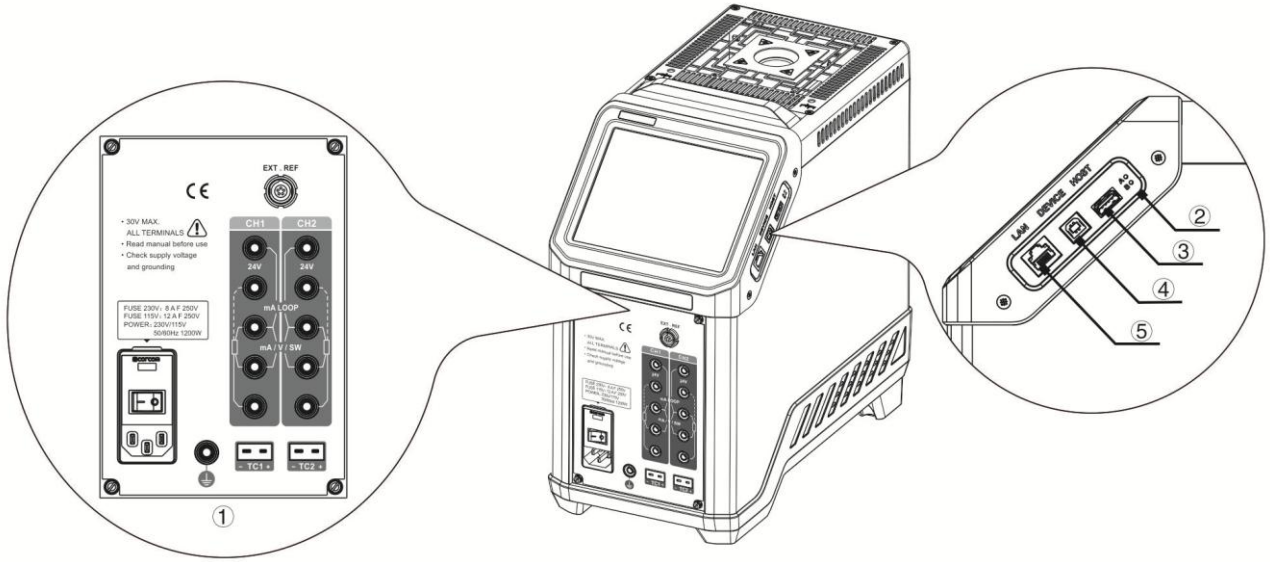


Figure 1 Basic Structure

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 115V：8A F 250V	230V：8A F 250V 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: Accepting S, R, K, B, N, E, J, T, C, D, G, L, and U
TC Measurement Accuracy (excl sensor)	Type K: ±0.13°C at 0°C ±0.15°C at 155°C ±0.18°C at 350°C ±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 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 8KV for air	
	Radiated Radio-frequency Electromagnetic Field Immunity	10V/m (80MHZ~1GHZ) 3V/m (1.4GHZ~2GHZ) 1V/m (2GHZ~2.7GHZ)	
	Immunity to Radio-frequency Induced Conducted Disturbance	3V/m (150kHZ~50MHZ)	
	Voltage Dip	0% for 1 cycle 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 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 ADT-660	ADT-155	ADT-350 ADT-660
Dry well	1 pc.	●	●	●	●
ADT110-875-L-INSERT-X (Selected Model)	1 pc.	●		●	
ADT110-875-H-INSERT-X (Selected Model)	1 pc.		●		●
Insulation Plug (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.

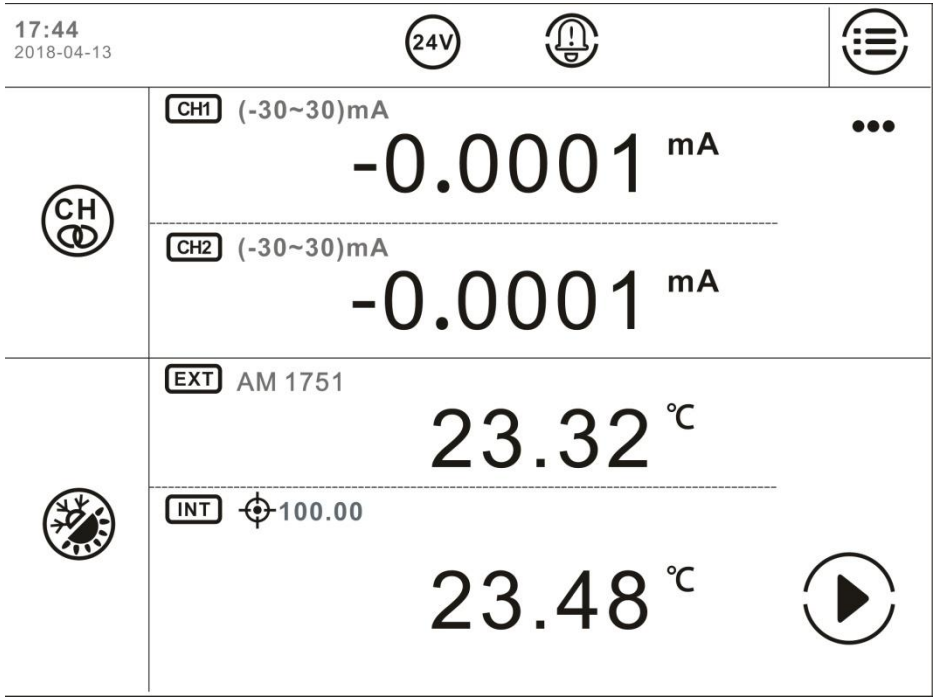


Figure 2 Main Screen

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

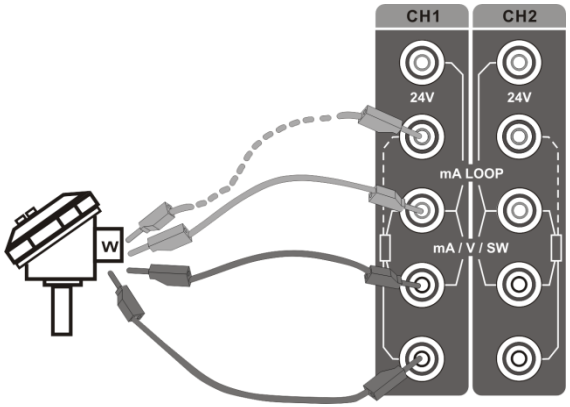


Figure 3 RTD Connection

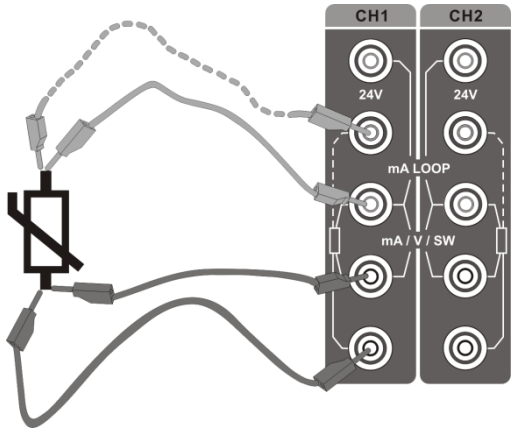


Figure 4 NTC Connection

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

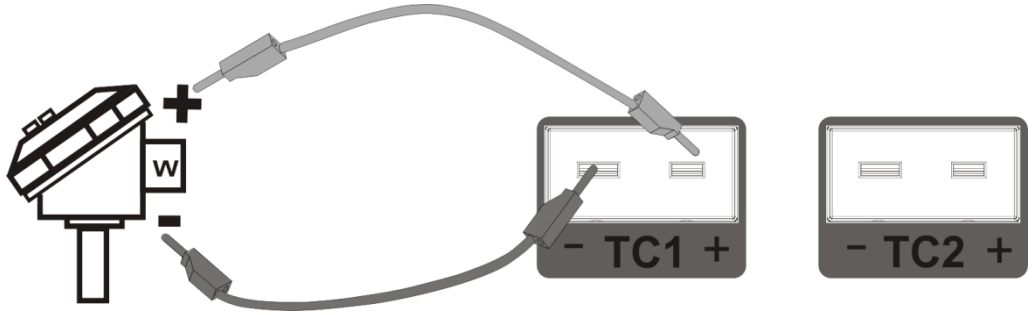


Figure 5 TC Connection

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. "EXT" means the dry well is using user entered custom values as the cold junction reference. **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

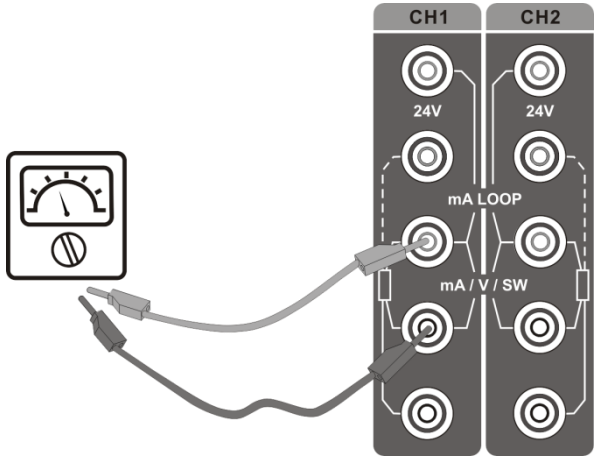


Figure 6 Current Measurement Connection

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

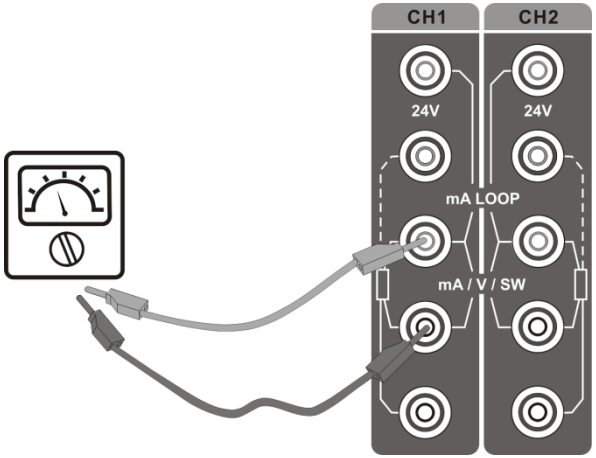


Figure 7 Voltage Measurement Connection

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

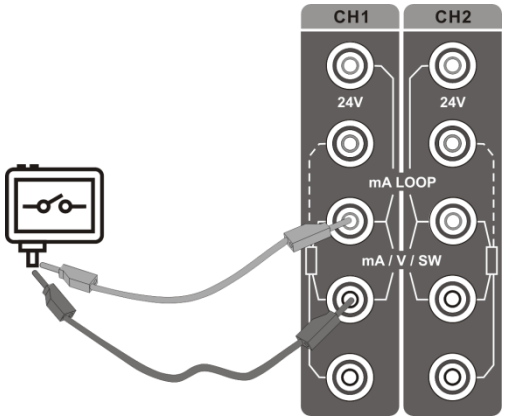


Figure 8 Switch Test Connection

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.

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2.3.7 Transmitter Measurement (including HART transmitter)

1. Connection

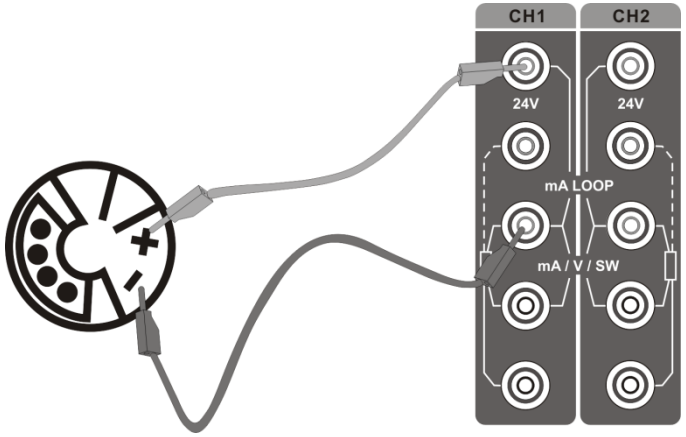


Figure 9 Transmitter Connection

◆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： Scientific：$1.1*10^{-2}$ 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: 1. Press sensors to select, then press  to delete 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. Enable: Password is necessary when deleting task data
Sensor Library (Only for ADT875PC)	Enable / Disable	Enable or disable Password Protection. 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:

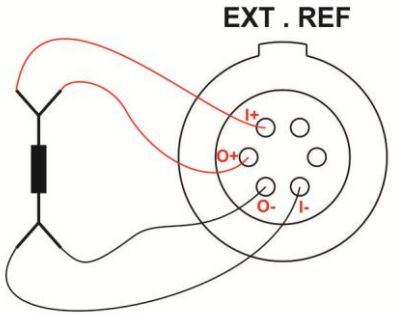


Figure 10 External Reference Connection

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:

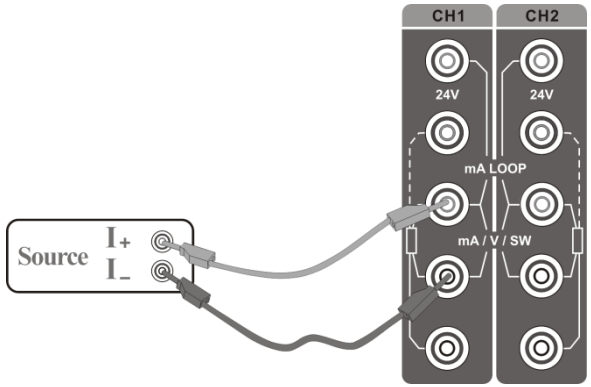


Figure 11 ±30 mA Measurement Calibration Connection

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:

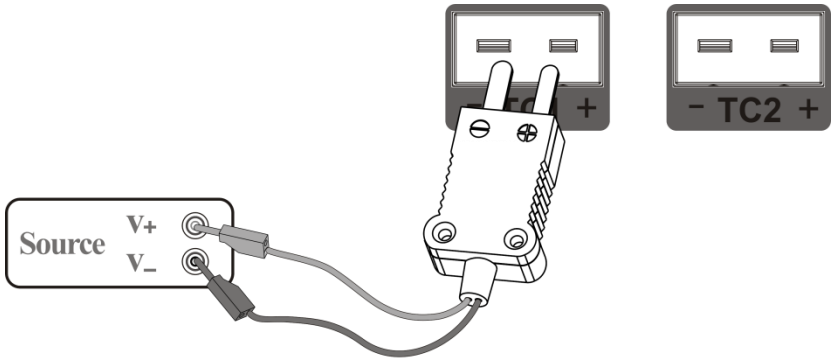


Figure 12 TC, (-75~75)mV Calibration Connection

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:

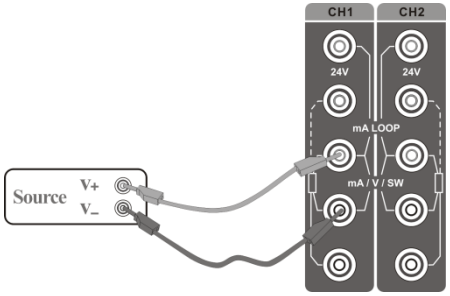


Figure 13 (-12~12)V & (-30~30)V Measurement Calibration Connection

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:

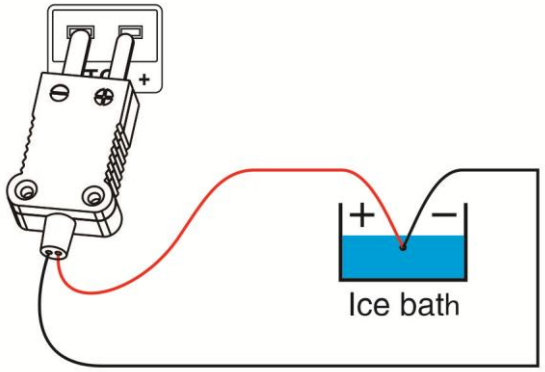


Figure 14 Cold Junction Calibration Connection

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 **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 **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 **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: 1. mA：4~20, 0~10, 0~20 2. V：0~5, 0~10, 4~20 3. Customize：-30~30(Click electrical signals to switch between mA and V.)	Output signal settings of the temperature transmitter under test
	HART Transmitter: 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 **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 **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. Output signal should be set if this function is enabled.
Output (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 (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 (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):

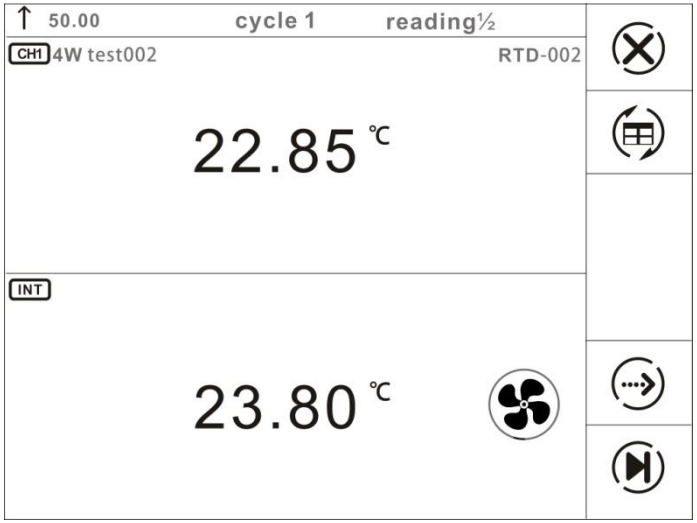


Figure 15 Typical Task Interface

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. **In temperature switch test, click  to switch display mode. The regular mode shows a temperature/time diagram.**
	•		Switch to the previous set point **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 **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 **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 **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 **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 **Dry well will start stability test only when it reaches the target temperature and meets the dwell time requirement**
Stability Test Time (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 (only available when Set Point Limit is enable)	Depends range of dry well	Set restriction range for set point **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: **Connected-CH 1 & CH 2 are the same measurement type** **Disconnected-CH 1 & CH2 are different from each other**
CH 1 / CH 2 (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 **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 **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 Off	Enable or disable channel, and select DUT type
Temperature Range	Depends on dry well model	Set switch test starting and ending temperatures **Dry well will only capture the switch activity within this temperature range**
Control Rate	Max, 0~100 ℃/min	Temperature control speed **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 (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. (only available when choosing No. as file name)	1~1000	Select starting number for the next snapshot name **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：

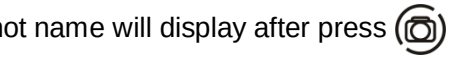
Current snapshot name will display after press 

◆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: Standard event register; Query event register; Operational event register; Status byte register; Error queue.	-	-
2	*IDN?	In inquiring the apparatus marking, the return data shall be divided into 2 parts: a. Product series No; b. Software version No.	-	Product series No. 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: 1. ID of channel 1 measurement unit, 2. Measurement value of channel 1, 3. ID of channel 1 electrical measurement signal,

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

No.	Command	Description	Parameter	Return Value
				20. Original value of external connection measurement, 21. Clock, 22. Error code, 23. 24V value, 24. AD temperature values (unit is degree Celsius) 25. 24V value of channel 1, 26. 24V value of channel 2, 27. Positive 2.5V voltage value, 28. Negative 2.5V voltage value, 29. Positive 5V voltage value, 30. Negative 2.5V voltage value, 31. 5.8V voltage value Note: 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. 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. 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.
2	MEASure[:SCALar]:AEINfo?	To acquire all electrical signal values	none	21 values, separated by comma: 1. electrical signal values of channel 1, 2. electrical signal original value of channel 1, 3. Cold junction electrical signal value of channel 1. 4. Cold junction electrical signal original value of channel 1 5. electrical signal values of channel 2, 6. electrical signal original value of channel 2 7. Cold junction electrical signal value of channel 2 8. Cold junction electrical signal original

No.	Command	Description	Parameter	Return Value
				value of channel 2 9. The value of external resistance, 10. the original value of external resistance, 11. the time stamp, 12. error 13. Total 24V, 14. AD temperature 15. The 24V of channel 1, 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: Specific value PV|SV|TV|FV: PV=current value (temperature sensor is the temperature value, electrical signal channel is the electrical measurement value, switch 1= switch on , 0=switch off SV= electrical measurement value TV= electrical measurement original value FV=cold-junction value (only the TC channel)	4 values, separated by comma: 1. ID of channel 1 measurement unit, 2. Value of channel 1, 3. ID of channel 2 measurement unit 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: “SensorName” , CJCType , Auto|Fixed, FixedValue	none
5	SENSe:ELECtricity:TCCHannel1|2?	To acquire the configurations 1|2 of TC channel	none	7 parameters, separated by comma: 1. Channel types 2. Measurement unit ID 3. Measurement lower limit 4. Measurement Upper limit 5. SensorName 6. CJCType 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: 1. "SensorName” 2. ”SensorSN”(can be zero if basic sensor applied) 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: 1. "basic sensor name" 2. New r0 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: 1. Channel types 2. Unit id

No.	Command	Description	Parameter	Return Value
				3. Measurement lower limit 4. Measurement Upper limit 5. SensorName 6. Wire type
9	SENSe:ELECtricity:CHITem1|2 <Item>	To set the types 1|2 of electrical measurement channel	1 value: Types of electrical measurement Item: 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: Electrical measurement type: Item: Current|Switch|RTD|TC|Volt|None	none
11	SENSe:ELECtricity:CHITem?	To acquire the electrical measurement channel type	none	2 parameters, comma separated: 1. Type of channel A 2. Type of channel B 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: 1. The unit ID of Measurement value, 2. measurement value, 3. electrical signal unit ID, 4. Measurement electrical value, 5. original electrical value, 6. extra parameter1 7. extra parameter 2

No.	Command	Description	Parameter	Return Value
				Note: 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. 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. 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:ElECtricity:CHINfo1|2?	To acquire the brief information 1/2 of current channels	none	4 values, comma separated: 1. channel types 2. unit ID 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: Channel type Item Current|Switch|RTD|TC|Volt|HART	3 values, comma separated: 1. Measurement lower limit 2. Measurement upper limit 3. Current unit ID
15	SENSe:ELECtricity:VOLTchannel1|2 <VoltType>	To set the configuration 1/2 of voltage channel	1 value: Channel configuration VoltType: Volt12|Volt30	none
16	SENSe:ELECtricity:VOLTchannel1|2?	To read the configuration 1/2 of voltage channel	none	1 value: Channel configuration: Volt12|Volt30
17	SENSe:ELECtricity:SWITchchannel1|2 <SwitchType>	To set the configuration 1/2 of switch channel	1 value: SwitchType: DryContact|WetContact|PNP|NPN	none
18	SENSe:ELECtricity:SWITchchannel1|2?	To read the configuration 1/2 of switch channel	none	1 value, comma separated: Switch types: DryContact|WetContact|PNP|NPN
19	SENSe:ELECtricity:ZERo1|2 <enable>	To zero or cancel zero for channel 1/2	1 value: Zero or cancel zero: 1|0|ON|OFF , ON=1= zero OFF=0= cancel zero	none
20	SENSe:ELECtricity:CJC:R0_?	To read the R0 value of cold-junction channel	none	4 values, comma separated: 1. Channel 1 cold-junction R0 manufacturer 2. Channel 2 cold-junction R0 manufacturer 3. Channel 1 cold-junction R0 user 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: 1. Manufacturer | User, 2. Password (the password of corresponding manufacturer and users. 3. R0	none
22	SENSe:ELECtricity:CHATtached?	To acquire that whether channel 1 and 2 are connected	none	1 value: 1=connected 0=disconnected
23	SENSe:ELECtricity:CHATtached <attached>	To connect or disconnect channel 1 and 2	1 value: Connected or not 1= connected 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: (the default temperature unit is Celsius. The first 8 values are data, the following 8 values are status) 1. Current temperature (according to temperature control types, equal to the internal/external temperature) 2. Internal temperature 3. External connection temperature 4. External differential temperature (used

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

No.	Command	Description	Parameter	Return Value
				5. Heating power (-1~1) 6. Fan power (0~1) 7. Stable or not”1|0” 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: 1. Target Temperature 2. Temperature Unit ID 3. Slew Type : 0 means percentage (0~100), 1 means the absolute value (unit temperature per minute) 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: Measure=0 (automatic)Control=1 Semi Auto Control=2 Manual control=3 Maintenance mode=4
6	[SOURce:]TEMPerature:TARGet <target_Temperature>,<unitId>	To set target temperature (automatic control)	2 values: 1. target_Temperature 2. temperature unit Id	none
7	[SOURce:]TEMPerature:TARGet?	To read target temperature	none	2 values, comma separated: 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: 1. Current temperature unit id 2. Fluctuation rate 3. Dwell time(1-600)minutes 4. Allowable deviation of target value 5. The percentage of temperature control speed 6. Absolute value of temperature control speed 7. Whether or not to enable the limit of set point 1|0 8. Lower limit of set point 9. Upper limit of set point 10. Temperature control configuration 11. Fan mode 1|0 Note: Temperature control configuration: 1. Internal temperature control =0 2. External temperature control=1 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: 1. unit ID 2. stability 3. DwellMinutes 4. TargetTolerance 5. slewType: 0 means in percentage (0~100) , 1 means in absolute value (temperature unit per minute) 6. SlewRate 7. IsEnableLimits: Whether or not to enable Limits of set point 8. Lower limit of set point 9. Upper limit of set point 10. Temperature control types(0=internal temperature control, 1= external temperature control, 2= external temperature control +external connection CH1temperature difference) 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: 1. fluctuation rate of temperature control 2. temperature unit Id	none
11	[SOURce:]TEMPerature:STABility?	To acquire fluctuation rate of temperature control	none	2 values, comma separated: 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: 1. Lower limit of fluctuation rate 2. upper limit of fluctuation rate 3. Temperature unit id, unit is Celsius
13	[SOURce:]TEMPerature:TARTolerance?	To read allowable deviation of target value	none	2 values comma separated: 1. allowable deviation of target value 2. Temperature unit id
14	[SOURce:]TEMPerature:TARTolerance <ttolerance>,< unitId >	To set allowable deviation of target value	2 values: 1. allowable deviation of target value 2. Temperature unit id	none
15	[SOURce:]TEMPerature:TARTolerance:LIMit?	To read allowable deviation range of target value	none	3 values, comma separated: 1. Lower limits of allowable deviation of target value 2. Upper limits of allowable deviation of target value 3. Temperature unit id, fixed Celsius
16	[SOURce:]TEMPerature:SLEW <slew>,< unitId >	To set temperature control rate	2 values: 1. Temperature control rate (temperature unit per minute) 2. temperature unit id	none
17	[SOURce:]TEMPerature:SLEW?	To read temperature control rate	none	2 values, separated by comma: 1. Temperature control rate (temperature

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

No.	Command	Description	Parameter	Return Value
				2.Upper limit of temperature control ability 3.Current unit id
24	[SOURce:]TEMPerature:SLIMit?	To read Lower and upper limits of temperature control	none	4 values, comma separated: 1. Whether or not to enable lower and upper limits control 2. Lower limit of temperature control 3. Upper limit of temperature control 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 1.IsEnable: Whether or not to enable low and upper limits 0=close 1= open up 2.lower limit 3.upper limit	none
26	[SOURce:]TEMPerature:CONFig?	To acquire operation state of temperature control	none	1 value: 0= internal temperature control 1= external control 2= double external temperature control for temperature filed calibration
27	[SOURce:]TEMPerature:CONFig <config>	To set operation state of temperature control	1 value: operating state 0= internal temperature control 1= external control 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: 1.damping ratio 2.Time constant 3.KKp 4.KTi 5.KTd 6.KTf
29	[SOURce:]TEMPerature:CONParams <damping>,<timeConst>,<kkp>,<kti>,<ktd>,<ktf>,	To set control parameters	6 values, comma separated: 1.damping ratio 2.Time constant 3.KKp 4.KTi 5.KTd 6.KTf	none
30	OUTPut:24V[:STATe] <enable>	To set24V state	1 value: 0=OFF 1=ON	none
31	OUTPut:24V[:STATe]?	To read 24V state	none	1 value: 0=OFF 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: 1.Manufactor: Factory calibration;	none

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

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

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

No.	Command	Description	Parameter	Return value
	ue”>,<year>,<month>,<day>		or user 3.unit id , 4.the number of calibration points 5.List of calibrated display values, comma separated 6. List of display values before calibration, comma separated year month 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: 1. Password of corresponding manufacturer or users 2. unit ID 3.The number of calibrated points 4. List of calibrated display values, comma separated 5.List of display values before calibration, comma separated 6.year, 7.month 8.day	none
8	CALibration:CONTroller:DATA:FIELd? Manufactor|User,<password>	To acquire calibration data of temperature field	2 values, comma separated: 1 Manufacturer calibration; User calibration 2. Corresponding manufacturer or user data	N*4+7 values, comma separated: unit ID,

No.	Command	Description	Parameter	Return value
				optimization height, environment temperature, The number of calibration points N, List of N temperature points, List of N internal control temperature difference, List of N temperature difference factor Kh, List of N temperature difference factor KI, Year, Month, 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: 1. User calibration 2. Corresponding user password 3. unit ID 4.Environment Temperature 5.The number of calibrated points 6.List of setting points, comma separated 7. "difftemps": List of temperature difference TmH-Tml, comma separated 8. year 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 1 Manufacturer calibration; User calibration 2.Corresponding manufacturer or user password 3.unitid, 4.optimization height (temporarily fixed with 62.5mm) 5.Environment Temperature 6. the number of calibrated points 7.List of setting points, comma separated 8."dts": List of internal control temperature difference, comma separated 9. "khs": List of temperature difference factor Kh, comma separated 10. "kls": List of temperature difference factor KI 11. year 12. month 13. day	none
11	CALibration:CONTroller:FRESet 1|2|3	Reset factory settings of control panel calibration data	1 parameter, stands for restoration project: 2=display value correction 3=vertical temperature field 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. Every item of calibration has 6 values, comma separated. Id name calibrated date operator remark 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 : Id	Two sets of calibration data, Semicolon separated : Revised data of temperature indicating values, N*2+5 parameters, comma separated : 1. Id unit id 2. the number of calibrated points N 3. N calibrated points

No.	Command	Description	Parameter	Return value
				4.N actual values 5.year 6.month 7.day Calibration data of Axial temperature field. , N*4+7 values, comma separated. 1.unit id 2.optimization height (mm) 3. environment temperature 4.the number of calibrated points M 5.M calibrated points 6.M control temperature difference 7.M pieces of kh 8.M pieces of KI 9. year 10.month 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; “CONTroller:HARDware”: Control hardware version number “EIECtricity:FIRMware”: Electrical measurement firmware version number “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 month 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 minute second	none
6	SYSTem:TIME?	To acquire system time	none	3 values , comma separated 1. hour

No.	Command	Description	Parameter	Return value
				2. minute 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 0， OFF: system is unlock	none
8	SYSTem:KLOCk?	To search local lock-out state of system,	none	1: lock-out 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 Attention: if the WiFi is turned on, the serial port of controller will be closed. During the time of WiFi turning on and connecting, the communication with controller is only done through Ethernet	1，ON 0，OFF	none
12	SYSTem:COMMunicate:SOCKet:WLAN[:STATe]?	To search WiFi state	none	1: WIFI on 0: WIFI off
13	SYSTem:COMMunicate:SOCKet:WLAN:ADDRess<IP address>	To set the IP address of WIFI 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 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 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 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; 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 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 2) “encryption Mode 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 ; 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, Initialization, SSIDNotFound SSIDNotConfigured, JoinFaile ScaningConfiguredSSID WaitingIPConfiguration 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: 1.Old Password/super administrative password 2.New Password 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: 1=on, 0=off
38	SYSTem:PASSword:ENABle:TASK <enable>	To set the protection password of task	1 value enable,0= close 1= open	none
39	SYSTem:PASSword:ENABle:SENSor?	To search sensor library password is opened or not	none	1 value Open or not 1=open 0=close
40	SYSTem:PASSword:ENABle:SENSor <enable>	To set sensor library password	1 value Enable or not, 0=close 1= open	none
41	SYSTem:VOLume?	To read system volume	none	1 value The percentage of system volume (0~100)
42	SYSTem:VOLume <per>	To design system volume	1 volume 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 1.Type: Percentage=percentage value=concrete value 2.Level： brightness	
2.	DISPlay:BRIGhtness? <type>	To read brightness	1 value Type: Percentage=percentage value=concrete value	brightness
3.	DISPlay:DECimals:CONTrol?	To acquire decimal digits of control temperature display	none	1 value: decimal digits
4.	DISPlay:DECimals:CONTrol <decimal>	To set decimal digits of control temperature display	1 value: decimal digit (0,3)	none
5.	DISPlay:DECimals:REF?	To acquire decimal digits of external temperature display	none	1 value: decimal digits
6.	DISPlay:DECimals:REF <decimal>	To design decimal digits of external temperature indication	1 value: decimal digit (0,3)	none
7.	DISPlay:DECimals:CHTemp?	To read decimal digits of external temperature measurement display	none	1 value decimal digits
8.	DISPlay:DECimals:CHTemp <decimal>	To set decimal digits of temperature measurement display	1 value: 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 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 (temporarily only support the return of system set interface)	none	To return back to the home screen from current interface (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: Supporting Theme Name 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: Character string without quotation, for example: zh-CN 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 Unit: unit name or unit ID "Unit_name" is the character string with quotation "unit_ID" is number	none
2	UNIT:TEMPerature?	To acquire system temperature unit	none	2 values, comma separated: 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 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 Index: initial position 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 Index: initial position 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 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 Index: initial position 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 Index: initial position 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 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 Index: initial position 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 RESult: To delete the result data INSTrument: To delete the instrument data Operation： To delete the all data Guid：According to ID, directly write in Guid "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 SenorType: RTD|SPRT|CVD|NTC|NTC_SH2|SMART|UUT Note: RTD=10 , SPRT=3 , CVD=2 , NTC=1 , NTC_SH2=12	1 value The number of custom sensors
2	SENSor:CATalog? <SensorType>,<offset>,<count>	To acquire the information of sensor head	3 values 1.SensorType:UUT|SPRT|RTD|CVD|NTC|NTC_SH2|SMART , Note: RTD=10 , SPRT=3 , CVD=2 , NTC=1 , NTC_SH2=12 2. Offset: Initial position offset , 3. count UUT means all sensors	3 values, comma separated 1. ClassName, actually is List<SensorHeader> 2. Base64 character data 3. CRC16 check code
3	SENSor:INFormations? <id>	To acquire the information of single sensor	1 value sensor id	3 values, comma separated 1. ClassName, actually is List<SensorHeader>

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

No.	Command	Description	Parameter	Return Value
				1=online; 0=offline 2. External connected sensor is smart or not, 1=smart; 0=not smart 3. Available, 1=available; 0= not available
9	SENSor:REF[:SENSorinfo]?	To acquire information of external connected sensor	none	7 values, comma separated: 1. Class name of sensor data 2. sensor id 3. sensor name 4. sensor SN 5. Smart sensor or not 6. Character data of Base64 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: 1.SensorType:SPRT|CVD 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: 1.SensorType:SPRT|CVD 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: 1.POWer= power grid quality 2.STEP=phase step test 3.SWITch=switch test 4.SNAPshot=snapshot 5.CONTrolcurve=control curve	1 value: 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: 1. App: Applicable type 2. Index: Serial NO. of data	1 value" Character string of data Json (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: 1. App: Applicable type 2. Index: Serial NO. of data	none
4	APPLication:DATas:DIAGnosis:RESult:LENGth? <"path">	To read control curve application data length	1 value: file path	1 value: the length of data
5	APPLication:DATas:DIAGnosis:RESult:DATa? <"path">,<Index>,<Count>	To read control curve application data	3 values, comma separated: 1. "path": file path 2. "Index": Offset Address of initiation 3. "Count": Length	2 values, comma separated: 1. Real data, Base64 character data 2. CRC16 check code

A1.11HART Communication

No.	Command	Description	Parameter	Return Value
1.	HART:SEARCH Start|Stop|Zero[,<Numeric>][,<Numeric>]	HART searching	Start：Start searching Stop：Stop searching Zero：only searching address 0 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 AO：simulated current value %：range percentage SV：secondary variable TV：Tertiary variable FV：Quaternary variable LoopCurrent：Loop Current
5.	HART:ONLDEVice:PROCess PV|AO|%|SV|TV|FV|LoopCurrent	To switch process variable	PV：Process variable AO：simulated current value %：range percentage SV：secondary variable TV：Tertiary variable FV：Quaternary variable 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 "value": value (with character string or figure of quotation mark)	
9.	HART:ONLDEVice:INFO?	To search HART instrument information	None or <parameters. Names> Name list of parameter: Tag Manufacturer Devicetype Deviceid writeprotect date message descriptor finalassemble preambles universalrev hardwarerev softwarerev 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 Or return corresponding values according to specific parameter	No parameters or<parameter name> Name list of parameters: sn	All sensor parameter will be returned if no parameter entered. Corresponding value will be

			unit lrl url minspan	returned if specific parameter entered.
11.	HART:ONLDEVice:OUTput?	Return all HART output value Or return corresponding value according to specific parameter	None or <parameters. Names> Name list of parameters: unit lrv urv damping transferFunction	All HART output parameter will be returned if no parameter entered. 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: 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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