

anbai **Applent** Instruments  
INSTRUMENTS

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English

Rev.A0

**[ AT47xx Multi-channel Temperature Meter ]**

User's Guide

## Safety Summary

 Warning  Dangerour:

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.

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Disclaimer	The Applent Instruments assumes no liability for the customer's failure to comply with these requirements.
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Ground The Instrument	To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.
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DO NOT Operate In An Explosive Atmosphere	Do not operate the instrument in the presence of inflammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
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Keep away from live circuit	Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.
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Operations not included in the manual are forbidden	The protection measurements will be failure while beyond the scope.
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Warning: TO AVOIDE INSTRUMENT DAMAGED, PLEASE DO NOT PUT DC VOLT OR CURRENT IN THE TESR TERMINAL MAKE SURE THE CAPACITOR IS DISCHARGED BEFORE TESTING

Safety Sign:



Provide double insulation or reinforced insulation protection

Waste Electrical and Electronic Equipment (WEEE) order 2002/96/EC



Do not leave in the trash can

## CERTIFICTION, LIMITED & LIMITATION OF LIABILITY

**Applent Instruments, Inc.** (shortened form **Applent**) certifies that this product met its published specifications at the time of shipment from the factory. Applent further certifies that its calibration measurements are traceable to the People's Republic of China National Institute of Standards and Technology, to the extent allowed by the Institution's calibration facility or by the calibration facilities of other International Standards Organization members.

This Applent instrument product is warranted against defects in material and workmanship for a period corresponding to the individual warranty periods of its component products. **The warranty period is 1 year and begins on the date of shipment.** During the warranty period, Applent will, at its option, either repair or replace products that prove to be defective. This warranty extends only to the original buyer or end-user customer of a Applent authorized reseller, and does not apply to fuses, disposable batteries or to any product which, in Applent's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling.

For warranty service or repair, this product must be returned to a service facility designated by Applent. The buyer shall prepay shipping charges to Applent and the Buyer shall pay all shipping charges, duties, and taxes for products returned to Applent from another country.

Applent warrants that its software and firmware designated by Applent for use with an instrument will execute its programming instruction when properly installed on that instrument. Applent does not warrant that the operation of the instrument, or software, or firmware, will be uninterrupted or error free.

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside the environmental specifications for the product, or improper site preparation or maintenance.

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. APPLMENT SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT, RELIANCE OR ANY OTHER THEORY.

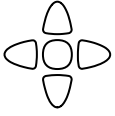
People's Republic of China  
Jiangsu Province  
Changzhou Applent Instruments Inc.  
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# 1. Unpacking and Inspection



This chapter provides the following information:

- Packing List
- Power Supply
- Operation Environment
- Cleaning
- Instrument Handle

## 1.1 Packing List

After you receive the instrument, carry out checks during unpacking according to the following procedure. Check that the packing box or shock-absorbing material used to package the instrument has not been damaged.

Referring to the packing list, check that all packaged items supplied with the meter have been provided as per the specified optioned.

If damaged or accessories shortage, please contact the sales department or our agent.

## 1.2 Power Supply

AT47xx can only be used in the following power supply conditions:

Voltage: 90V-260VAC

Power: 30VA MAX



**Warning:** To prevent risk of electric shock, connect the power supply ground  
If the user replace the power cord, make sure the power cord to a reliable connection.

## 1.3 Operation Environment

Ensure the operation environment meets the following requirements

Temperature Range: 0°C ~ 55°C ,

Humidity: 23°C, < 70%RH

Altitude: 0~2000m

## 1.4 Cleaning

Do not attempt to clean the internal of AT47xx



**Warning:**  
Don't Use Organic Solvents (such as alcohol or gasoline) to clean the Instrument.

Use a dry cloth or a cloth slightly dipped in water to clean the casing.

## 1.5 Instrument Handle

Instrument handle can be adjusted, both hands gripping the handles on both sides, gently pull to both sides, and then rotate the handle. The handle can be adjusted to four positions, as shown below:

Figure 1-1 The instrument handle (schematics, panel graphics and is not)

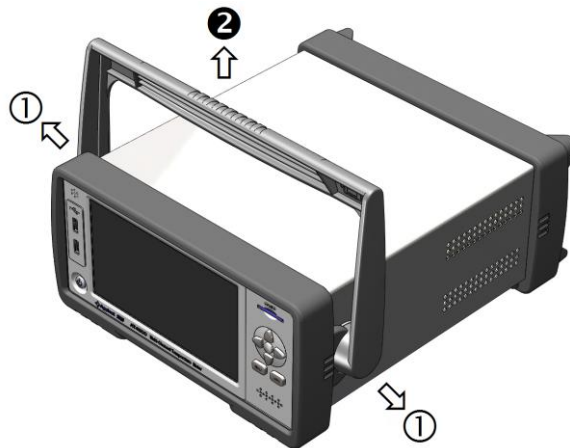


View 1: Position of a both hands holding the handles on both sides , gently pill to the sides until you can rotate freely ,and the switch to the View 2



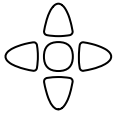
Carrying Position

View 2: Hands holding the handles on both sides at the same time , gently pull to both sides until it can be freely rotated position ,and the switch to the mobile location.



Remove Handle (Lift the handle perpendicular to the unit while pulling it in the direction of 1.)

## 2. Overview



This chapter provides the following information:

- Overview
- Main Specification
- Main Function

### 2.1 Introduction

Thank you for purchasing AT47xx Multi-channel Temperature Meter

The Applent AT47xx adopts high-performance ARM microprocessor control, collects multi-channel temperature data simultaneously. The AT47xx can be extended to 64 channels, compatible with a variety of temperature sensors, fast response, data stability while with the burnout detection function. Also you can separately calibrate the data of each channel.

Configuration USB-232C (virtual serial port) interface, through the software to achieve data acquisition, analysis and printing.

AT47xx Supports USB disk storage and save the sampling data real-time.

### 2.2 Main Specifications

- Graduation: thermocouple J ,K, T, E, S, N, B,R
- Measurement Range: -200.0°C~1800.0°C (change according to different thermocouple type)
- Resolution: 0.1°C
- Channel: 8 channels (can be extended to 64 channels)
- Sample Rate: slow, med, fast

### 2.3 Main Functions

#### 2.3.1 Functions

1. Comparator Setting
2. Beep Setting
3. Baud Rate Setting
4. Temperature Unit Setting

#### 2.3.2 Sorting Setting

Build-in sorting data, each temperature data can be set both up limit and low limit

#### 2.3.3 Correction Function

Each channel data can be corrected by the user.

#### 2.3.4 FAT Save Function

Users are allowed to create file suffix [.csv], every channel data can be saved in USB memory (do not support removable hard disk)

#### 2.3.5 System Setting

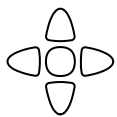
1. Keypad Lock Function
2. Switch both in English and Chinese
3. Date and Time Setting
4. Administrator and user accounts, password is available to the administrator

#### 2.3.6 Remote Control

Support Max 115200bps baud rate, compatible with SCPI protocol, ASCII transfer



## 3. Startup

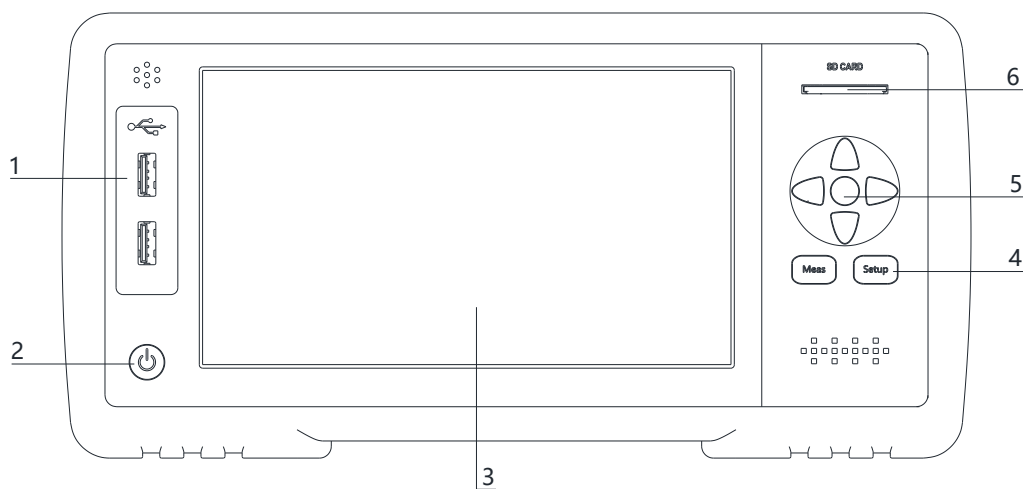


This chapter provides the following information:

- A tour of front and back panel
- Connection of the thermocouple

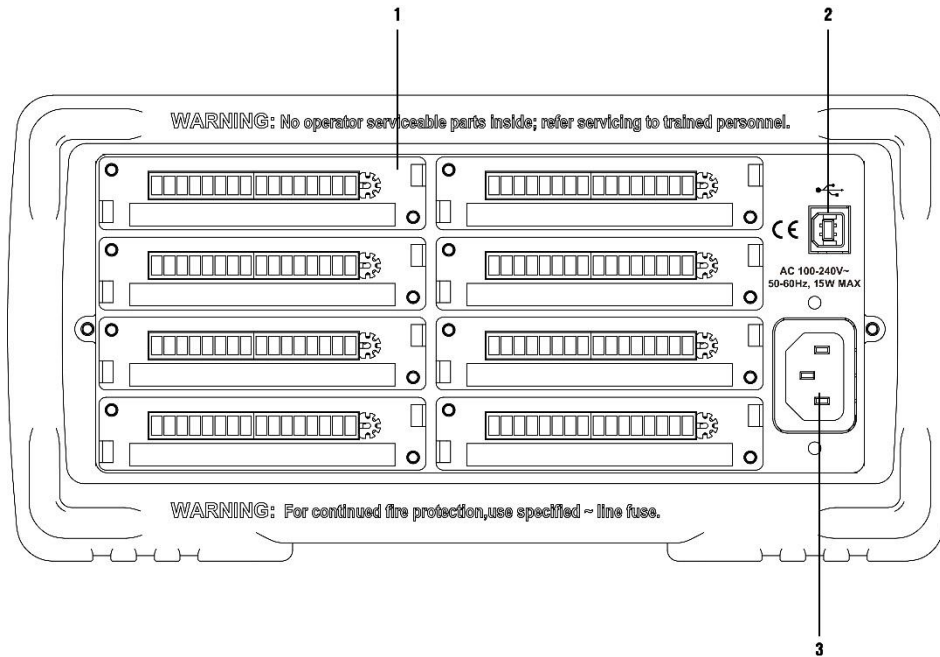
### 3.1 A tour of front and back panel

Figure 3-1 Front panel description



No	Description
1	USB Disk Port (USB-Host)
2	Power Switch
3	LCD Display
4	Meas and Setup key
5	Cursor Key
6	SD Disk Port (SD-Host)

Figure 3-2 Back panel description



No	Description
1	Connection port
2	US-232C interface
3	Power outlet

### 3.2 Connection of the thermocouple



Figure 3-3 Thermocouple Terminals

PIN 1	Channel 1, positive pole of the thermocouple
PIN 2	Channel 1, negative pole of the thermocouple
PIN 3	Channel 2, positive pole of the thermocouple
PIN 4	Channel 2, negative pole of the thermocouple
PIN 5	Channel 3, positive pole of the thermocouple
PIN 6	Channel 3, negative pole of the thermocouple
PIN 7	Channel 4, positive pole of the thermocouple
PIN 8	Channel 4, negative pole of the thermocouple
PIN 9	Channel 5, positive pole of the thermocouple
PIN 10	Channel 5, negative pole of the thermocouple
PIN 11	Channel 6, positive pole of the thermocouple
PIN 12	Channel 6, negative pole of the thermocouple
PIN 13	Channel 7, positive pole of the thermocouple
PIN 14	Channel 7, negative pole of the thermocouple

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PIN 15	Channel 8, positive pole of the thermocouple
PIN 16	Channel 8, negative pole of the thermocouple

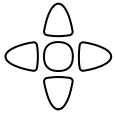


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**Channel segregation between voltage of 350 v  
dc, ac 230 v**

---

## 4. [Meas] Page



This chapter provides the following information:

- <Measure Display> Page
- <GRAPH Display> Page
- <HISTOGRAM Display> Page
- <CHAN SETUP> Page

### 4.1 <MEASURE DISPLAY> Page

When press the [Meas] key, the <MEAS DISPLAY> page appears.

<MEASURE DISPLAY> page mainly highlights the measurement results, and current sorting results will be displayed in different font and color.

**Tip:** Measuring data and sorting result are only valid in Meas page. U-disk storage device data logging function is only valid in Meas page, Bar Chart pad and Graph page

Figure 4-1 Display 8 Page

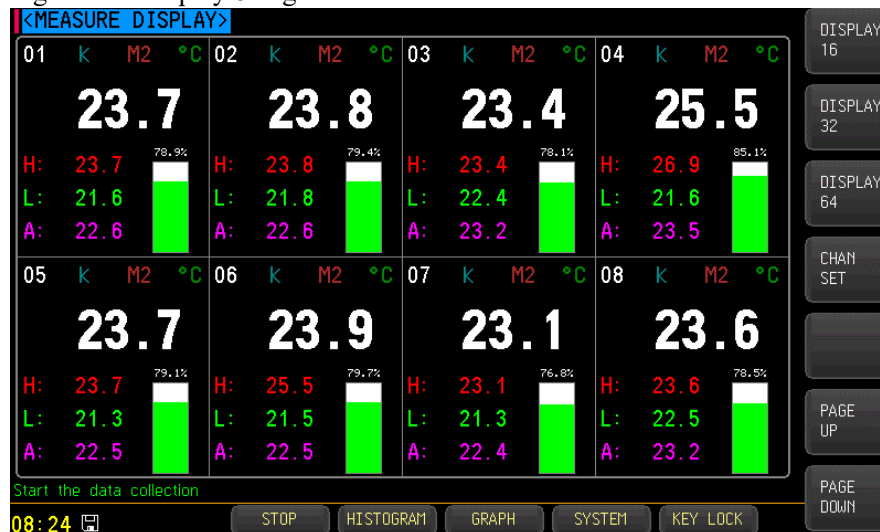


Figure 4-1

1	Channel ID
2	Temperature maximum
3	Temperature minimum
4	Temperature average
5	Sensor index
6	Mould ID
7	Temperature unit

Figure 4-2 Display 16 Page



Figure 4-3 Display 32 Page

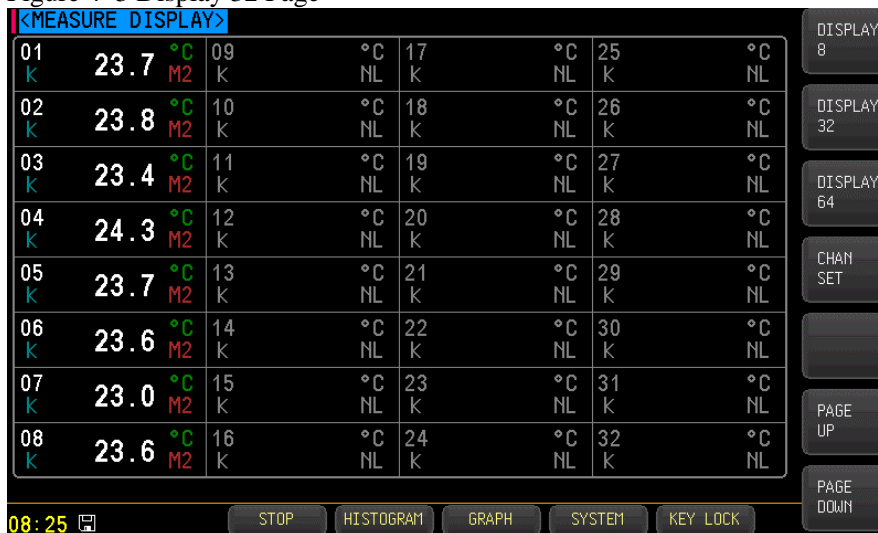
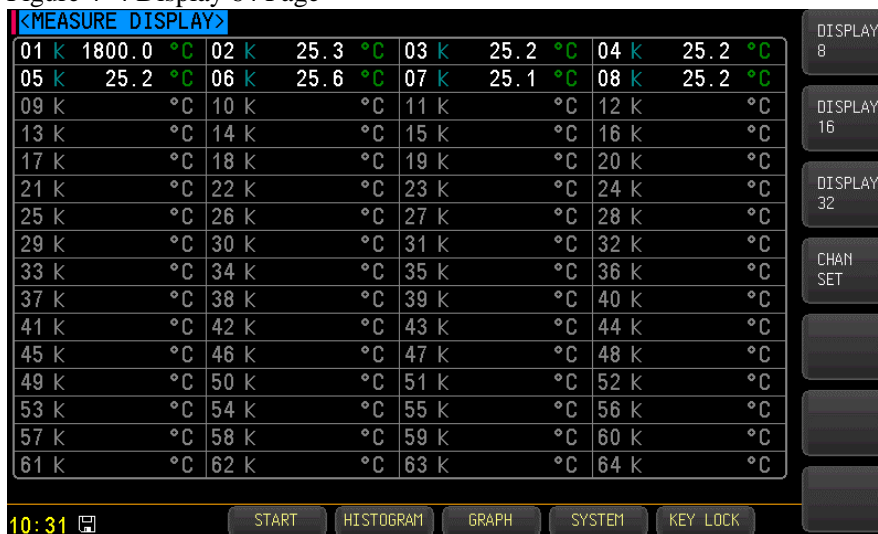


Figure 4-4 Display 64 Page



According Bottom key "start" to start data collection, according "stop" termination of data collection.

## 4.2 <GRAPH DISPLAY> Page

Press[Meas] key and then side soft key [GRAPH] to enter <GRAPH DISPLAY> page

Figure 4-5 <GRAPH DISPLAY> Page



### 4.2.1 [01] Setting

■ Steps to set ON/OFF:

Step 1	Press [Meas] key to enter <MEASURE DISPLAY> page
Step 2	Press [GRAPH] soft key to enter <GRAPH DISPLAY> page
Step 3	Use the cursor keys to select [01] field
Step 4	Use soft key to select
	<b>Soft Key                      Function</b>
	OFF                              Turn off the current channel display
	ON                                Turn on the current channel display

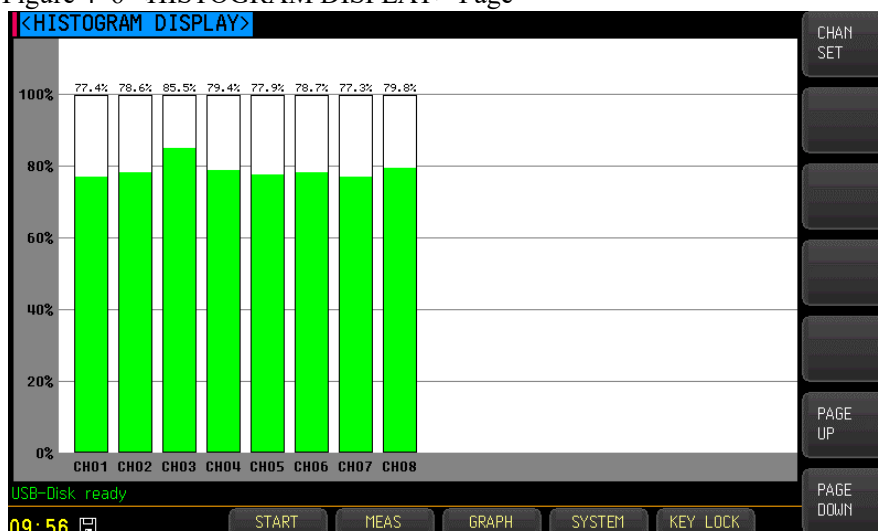
\*The same steps to set other channels

Soft Keys	Function
Y AXIS UP	Graph move up
Y AXIS DOWN	Graph move down
X AXIS LEFT	Graph move left
X AXIS RIGHT	Graph move right
Y AXIS MAGNIFY	Y-axis unit spacing magnify
Y AXIS NARROW	Y-axis unit spacing narrow
X AXIS MAGNIFY	X-axis unit spacing magnify
X AXIS NARROW	X-axis unit spacing narrow
TRACK	Graph tracing
RESET	Reset
PAGE UP	Page up
PAGE DOWN	Page down

## 4.3 <HISTOGRAM DISPLAY> Page

Press[Meas] key and then side soft key [HISTOGRAM] to enter <HISTOGRAM DISPLAY> page

Figure 4-6 &lt;HISTOGRAM DISPLAY&gt; Page



## 4.4 <CHAN SETUP> Page

Press [Meas] key and then side soft key [CHAN SET] to enter <CHAN SETUP> page

Note: Measurement data and sorting results only validity in the page of <Measure Display>

Figure 4-7 &lt;CHAN SETUP&gt; Page

CHAN	SENSOR	VALUE	LOW	HIGH	DELTA	UNIT
01	TC-K	25.3	0.0	30.0	0.0	°C
02	TC-K	25.3	0.0	30.0	0.0	°C
03	TC-K	25.2	0.0	30.0	0.0	°C
04	TC-K	25.2	0.0	30.0	0.0	°C
05	TC-K	25.2	0.0	30.0	0.0	°C
06	TC-K	25.6	0.0	30.0	0.0	°C
07	TC-K	25.1	0.0	30.0	0.0	°C
08	TC-K	25.2	0.0	30.0	0.0	°C

### 4.4.1 [SENSOR] Setting

#### ■ Steps to set SENSOR:

Step 1	Press [Meas] key to enter <MEASURE DISPLAY> page	
Step 2	Press [CHAN SET] soft key to enter <CHAN SETUP> page	
Step 3	Use the cursor keys to select [TC-K] field	
Step 4	Use soft key to select	
	Soft Key	Function
	TC-K	Setting the thermocouple K type
	TC-T	Setting the thermocouple T type
	TC-J	Setting the thermocouple J type
	TC-N	Setting the thermocouple N type
	TC-E	Setting the thermocouple E type
	TC-S	Setting the thermocouple S type
	TC-R	Setting the thermocouple R type
	TC-B	Setting the thermocouple B type
	ONEKEY SET	Set other channels sensor model for the current sensor model

### 4.4.2 [LOW] Setting

#### ■ Steps to set Low:

Step 1	Press [Meas] key to enter <MEASURE DISPLAY> page	
Step 2	Press [CHAN SET] soft key to enter <CHAN SETUP> page	
Step 3	Use soft keys to select [-200.0] field	
Step 4	Use numeric key to input low value, then press [Enter] to end	
	<b>Soft Key</b>	<b>Function</b>
	RESET	Under the current channel limit restore factory Settings
	ONEKEY SET	Set other channels of low limit for the low limit of the current channels

#### 4.4.3 [HIGH] Setting

■ Steps to set High:

Step 1	Press [Meas] key to enter <MEASURE DISPLAY> page	
Step 2	Press [CHAN SET] soft key to enter <CHAN SETUP> page	
Step 3	Use soft keys to select [1800.0] field	
Step 4	Use numeric key to input low value, then press [Enter] to end	
	<b>Soft Key</b>	<b>Function</b>
	RESET	Under the current channel limit restore factory Settings
	ONEKEY SET	Set other channels of high limit for the high limit of the current channels

\*The same steps to set other channels

#### 4.4.4 [DELTA] Setting

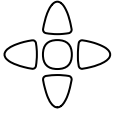
■ Steps to set Delta:

Step 1	Press [Meas] key to enter <MEASURE DISPLAY> page	
Step 2	Press [CHAN SET] soft key to enter <CHAN SETUP> page	
Step 3	Use soft keys to select [0.0] field	
Step 4	Use numeric key to input low value, then press [Enter] to end	
	<b>Soft Key</b>	<b>Function</b>
	INPUT	Input correction temperature value in selected channel, using numeric key to input data, press [Enter] to end
	DELETE	Delete the select channel correction temperature values
	ONEKEY SET	Enter the correction value of the user's current page, then press [Enter] to end the setting
	ONEKEY RESET	Delete the correction value of the user's current page

\*The same steps to set other channels



## 5. [Setup] Page



This chapter provides the following information:

- <SETUP> Page
- <CHAN SET> (refer to < MEASURE DISPLAY>)
- <GUEST CAL> Page

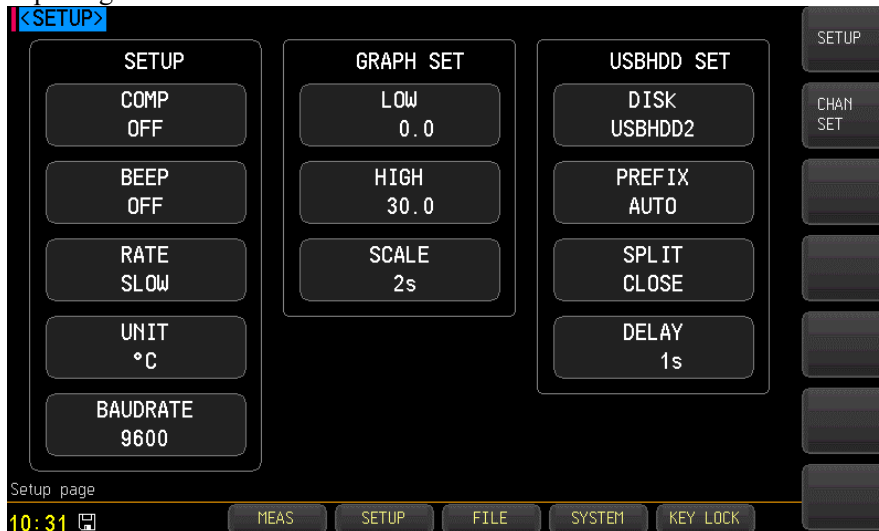
### 5.1 <Setup> Page

At any time, press [Setup] key to enter <Setup> page

<Setup> page can complete all settings concerned with the measurement, measurement and sorting results will not displayed and the instrument is in waiting state. Following parameters are included:

- COMP – The Comparator function Settings
- RATE – The Rate function Settings
- BEEP – The Beep function Setting
- UNIT – The Unit function Setting
- BAUDRATE – The Baudrate Setting
- LOW – The Graph Low Limit Setting
- HIGH – The Graph High Limit Setting
- SCALE – The Graph Scale Setting
- DISK – The FAT Select Setting
- PREFIX – The File Prefix Setting
- SPLIT – The File Split Setting
- DELAY – The File Delay Setting

Figure 5-1 <Setup> Page



#### 5.1.1 [COMP] Setting

Comparator setting includes: ON and OFF

- To set up the comparator ON/OFF

Step 1	Press [Setup] key to enter <SETUP> page	
Step 2	Use the cursor keys to select [COMP] field	
Step 3	Use soft key to select	
	Soft Key	Function
	OFF	Turn off the comparator function and comp icon disappeared
	ON	Turn on the comparator function to ON and comp appeared

#### 5.1.2 [RATE] Setting

There are three kinds rate: Slow, Med and Fast

- Steps to set the speed

Step 1	Press [Setup] key to enter < SETUP > page	
Step 2	Use cursor keys to select [RATE] field	
Step 3	Use function key to select	
	<b>Soft Key</b>	<b>Function</b>
	SLOW	Set the sampling rate 1s
	MED	Set the sampling rate 0.5s
	FAST	Set the sampling rate 0.2s, 16 channels below optional

### 5.1.3 [BEEP] Setting

Beep Feature includes: OFF and ON

#### ■ Steps to set beep feature

Step 1	Press [Setup] key to enter < SETUP > page	
Step 2	Use cursor keys to select [BEEP] field	
Step 3	Use soft keys to select	
	<b>Soft Key</b>	<b>Function</b>
	OFF	Turn off the Beep feature
	ON	Turn on the Beep feature

### 5.1.4 [UNIT] Setting

Units Includes: °C, K, °F.

#### ■ Steps to Set the Unit:

Step 1	Press [Setup] key to enter < SETUP > page	
Step 2	Use cursor keys to select [UNIT] field	
Step 3	Use function keys to select	
	<b>Soft Key</b>	<b>Function</b>
	°C	Degree Celsius
	K	Degree Kelvin
	°F	Degree Fahrenheit

### 5.1.5 [BAUDRATE] Setting

In order to correct communication, please make sure the baud rate set up correctly, PC with different baud rate will not be able to correct the communication instrument. 232 interface using SCPI language for programming.

RS-232 configuration is as follows:

Data bits: 8-bit  
 Stop bits: 1-bit  
 Parity: none

#### ■ Steps to set up the baud rate

Step 1	Press [Setup] key to enter < SETUP > page	
Step 2	Use cursor keys to select [BAUD] field	
Step 3	Use side soft keys to select baud rate	
	<b>Soft Key</b>	<b>Function</b>
	9600	Chose the baud rate if you use the opto-isolated communication converter
	19200	
	38400	
	57600	
	115200	Chose this high-speed baud rate while communication with the PC

### 5.1.6 [LOW] Setting

Graph low setting:

#### ■ Steps to set low

Step 1	Press Shortcut[Setup] to enter <SETUP> page	
Step 2	Use the cursor keys to select[-200.0]field	
Step 3	Use numeric key to input low limit value, then press [Enter] to end	

### 5.1.7 [HIGH] Setting

Graph high setting:

#### ■ Steps to set high

Step 1	Press Shortcut[Setup] to enter <SETUP> page	
Step 2	Use the cursor keys to select[1800.0]field	
Step 3	Use numeric key to input high limit value, then press [Enter] to end	

### 5.1.8 [SCALE] Setting

Scale setting includes:

#### ■ Steps to set the scale

Step 1	Press Shortcut[Setup] to enter <SETUP> page	
Step 2	Use the cursor keys to select[SCALE]field	
Step 3	Use function key to select	
	Function Keys	Function
	1s	Graph the timeline Setting
	2s	Graph the timeline Setting
	5s	Graph the timeline Setting
	10s	Graph the timeline Setting
	20s	Graph the timeline Setting
	30s	Graph the timeline Setting
	1m	Graph the timeline Setting
	2m	Graph the timeline Setting

### 5.1.9 [PREFIX] Setting

Prefix setting includes:

■ Steps to set the prefix

Step 1	Press Shortcut[Setup] to enter <SETUP> page
Step 2	Use the cursor keys to select[AUTO]field
Step 3	Create a new file prefix. Example: the input file named "AUTO", the actual file called "Applent0001. csv"

### 5.1.10 [SPLIT] Setting

Split setting includes: CLOSE ,10m,20m,30m and 1h

■ Steps to set the split

Step 1	Press Shortcut[Setup] to enter <SETUP> page	
Step 2	Use the cursor keys to select[SPLIT]field	
Step 3	Use function key to select	
	Soft Keys	Function
	CLOSE	Shut down automatically split function
	10m	save the new file in about 10 minutes
	20m	save the new file in about 20 minutes
	30m	save the new file in about 30 minutes
	1h	save the new file in about 1 hours

### 5.1.11 [DELAY] Setting

Disk recording interval Settings

■ Steps to set the delay

Step 1	Press Shortcut[Setup] to enter <SETUP> page
Step 2	Use the cursor keys to select[SPLIT]field, select function [CLOSE]
Step 3	Use the cursor keys to select[DELAY]field
Step 4	Use numeric key to input delay time, then press [Enter] to end.

Tip:

USB data logging is only available in **[MEAS]**, **[HISTOGRAM]** or **[GRAPH]** page. Data logging time

Is instrument internal as the criterion. When instrument internal clocking stops working, data logging will stop working too. When internal clocking does not work, users need to change internal battery.

Data includes two parts, logging time and corresponding channel temperature.

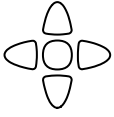
Example:

File path: AT4708/2018-04-12/AUTO0001.csv

Data format is float, reserve the last digit of decimal point, use “,” as division of channel.

File Name		AUTO001.csv						
Trigger Time		2016/12/10 10:16:48						
Channel	1	2	3	4	5	6	7	8
Type	TC-K	TC-K	TC-K	TC-K	TC-K	TC-K	TC-K	TC-K
Time(s)	°C	°C	°C	°C	°C	°C	°C	°C
0	28.0	28.1	1005	19.2	32.4	54.3	21.6	41.9
1	28.1	28.0	100.4	19.2	32.4	54.2	21.5	42.0
2	28.0	28.1	100.5	19.1	32.3	54.2	21.5	42.0
3	28.0	28.1	100.5	19.2	32.4	54.2	21.5	42.0
4	28.1	28.1	100.5	19.1	32.4	54.2	21.6	41.9

## 6. System Configuration



This chapter provides the following information:

- <SYSTEM CONFIG> Page
- <SYSTEM INFORMATION> Page
- <SERVICE> Page

### 6.1 <SYSTEM CONFIG> Page

In any place, just press shortcut [Setup] and select taskbar key [SYSTEM] to enter <SYSTEM CONFIG> page

<System Configuration> Page Includes the following settings:

- Language Setting
- Date/Time Setting

Figure 6-1 System Configuration Page



#### 6.1.1 [Language]

AT47xx supports both English and Chinese

##### ■ Steps to setup language

Step 1	Press [Setup] key						
Step 2	Press bottom soft key [SYSTEM] in taskbar to enter <SYSTEM CONFIG> page						
Step 3	Use cursor key to select [LANGUAGE] field						
Step 4	Use side soft key to select language						
	<table border="1"> <thead> <tr> <th>Soft Key</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>ENGLISH</td> <td>English</td> </tr> <tr> <td>CHINESE</td> <td>Chinese</td> </tr> </tbody> </table>	Soft Key	Function	ENGLISH	English	CHINESE	Chinese
Soft Key	Function						
ENGLISH	English						
CHINESE	Chinese						

#### 6.1.2 Setting the system [DATE]

AT47xx features a built-in 24-hour clock.

##### ■ Steps to setup date

Step 1	Press [Setup] key												
Step 2	Press bottom soft key [SYSTEM] to enter <SYSTEM CONFIG> page												
Step 3	Use cursor key to select [DATE] field												
Step 4	Use soft key to set date												
	<table border="1"> <thead> <tr> <th>Soft Key</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>YEAR INCR+</td> <td>+1 year</td> </tr> <tr> <td>YEAR DECR-</td> <td>-1 year</td> </tr> <tr> <td>MONTH INCR+</td> <td>+1 month</td> </tr> <tr> <td>MONTH DECR-</td> <td>-1 month</td> </tr> <tr> <td>DAY INCR+</td> <td>+1 day</td> </tr> </tbody> </table>	Soft Key	Function	YEAR INCR+	+1 year	YEAR DECR-	-1 year	MONTH INCR+	+1 month	MONTH DECR-	-1 month	DAY INCR+	+1 day
Soft Key	Function												
YEAR INCR+	+1 year												
YEAR DECR-	-1 year												
MONTH INCR+	+1 month												
MONTH DECR-	-1 month												
DAY INCR+	+1 day												

	DAY DECR-	-1 day
--	-----------	--------

### 6.1.3 Setting the system [TIME]

#### ■ Steps to setup time

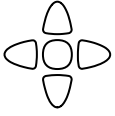
Step 1	Press [Setup] key	
Step 2	Select bottom soft key [SYSTEM], enter <SYSTEM CONFIG> page	
Step 3	Use cursor key to select [TIME] field	
Step 4	Use soft key to set time	
	<b>Soft Key</b>	<b>Function</b>
	HOUR INCR+	+1 Hour
	HOUR DECR-	-1 Hour
	MINUTE INCR+	+1 Minute
	MINUTE DECR-	-1Minute
	SECOND INCR+	+1Second
	SECOND DECR-	-1 Second

## 6.2 <SYSTEM SERVICE> Page



This page is used to calibrate data while input market. Non-professional person is forbidden.

## 7. File Operation



This chapter provides the following information

- <FILE> Page

### 7.1 < FILE > Page

When press the [Setup] key followed by [FILE] bottom soft key, the <FILE> page appears. Some system settings will be saved into this file. The file will be loaded at power up.

<FILE> page includes the following settings

- FILE

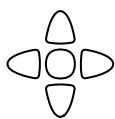
Figure 7-1 <CATALOG> Page



#### ■ Steps to File Settings

Step 1	Press [Setup] key
Step 2	Press [FILE] bottom soft key to enter <FILE> page
Step 3	Use cursor key to select [SYSTEM DEFAULT] field
Step 4	Use soft key to setup file.
	<b>Function Key</b> <b>Function</b>
	SAVE            Save the current settings
	RECALL        Load the saved settings
	ERASE         Delete the saved settings and the settings will be reset to system default.

## 8. Remote Control



This chapter provides the following information to remotely control the AT47xx via the USB-232C interface. This chapter provides the following information

- About USB-232C Interface
- Select Baud Rate.
- About SCPI

### 8.1 About USB-232C

Due to elimination of RS232 interface, which makes communication with PC difficult, so our company provides USB-232C interface, to make it easy to connect to PC by USB interface.

Computer has very mature support for RS232, this is very helpful for programmer's programming, they can recognize our company's USB-232 interface on Windows 7 and higher operating system, also the drive program is installed automatically, programmer is able to control instrument by virtual RS232 interface

### 8.2 To Select Baud Rate

Before you can control the AT47xx by issuing RS-232 commands from built-in RS-232 controller connected via its DB-9 connector, you have to configure the RS-232 baud rate.

The AT47xx's built-in RS-232 interface uses the SCPI language.

The configuration of RS-232

RS-232 configuration is as follows:

Data bits: 8-bit

Stop bits: 1-bit

Parity: none

**To set up the baud rate**

- Step 1. Press the [Setup] key
- Step 2. Use the cursor key to select [BAUD] field
- Step 3. Use the soft keys to select baud rate.

Soft key	Function
9600	
19200	
38400	
57600	
115200	Recommend

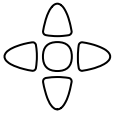
### 8.3 SCPI Language

Standard Commands for Programmable Instruments (SCPI) is fully supported by the



NOTE:  
AT47xx ONLY supports the SCPI Language.

## 9. Command Reference



This chapter contains reference information on programming AT47xx with the SCPI commands.

- Terminator
- Notation Conventions and Definitions
- Header and Parameters
- Command Reference

This chapter provides descriptions of all the AT47xx's available RS-232 commands which correspond to Standard Commands for Programmable Instruments (SCPI) command sets, listed in functional subsystem order.

### 9.1 Terminator

**<NL>**: The EOI line is asserted by New Line or ASCII Line Feed character (decimal 10, Hex 0x0A, or ASCII '\n')

### 9.2 Notation Conventions and Definitions

The following conventions and definitions are used in this chapter to describe RS-232 operation.

< > Angular brackets enclose words or characters that are used to symbolize a program code parameter or an RS-232 command.

[ ] A square bracket indicates that the enclosed items are optional.

\n Command Terminator

### 9.3 Command Structure

The AT47xx commands are divided into two types: Common commands and SCPI commands.

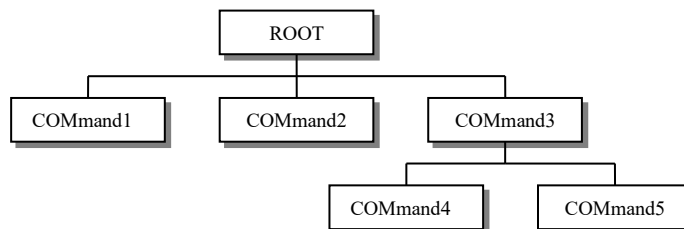
The common commands are defined in IEEE std. 488.2-1987, and these commands are common for all devices. The SCPI commands are used to control all of the AT47xx's functions.

The SCPI commands are tree structured three levels deep. The highest level commands are called the subsystem commands in this manual. So the lower level commands are legal only when the subsystem commands have been selected.

A colon (:) is used to separate the higher level commands and the lower level commands.

Semicolon (;) A semicolon does not change the current path but separates two commands in the same message.

Figure 9-1 Command Tree Example



Example:

```

ROOT:COMmand3:COMmand5 ppp
ROOT Subsystem Command
  COMmand3 Level 2
    COMmand5 Level 3
      ppp Parameter
  
```

- The basic rules of the command tree are as follows.



- Letter case (upper and lower) is ignored.  
For example,  
**ROOT:COMMAND3 = root:command3**
- Spaces ( \_ used to indicate a space) must not be placed before and/or after the colon (:).  
For example,  
**☒ root\_ :\_ command3 → ☑ root:command3**
- The command can be completely spelled out or in abbreviated. (The rules for command abbreviation are described later in this section)  
For example,  
**root:command3 = root:com3**
- The command header should be followed by a question mark (?) to generate a query for that command.  
For example,  
**root:com3?**
- The semicolon (;) can be used as a separator to execute multiple commands on a single line. The multiple command rules are as follows.  
Commands at the same level and in the same subsystem command group can be separated by a semicolon (;) on a multiple command line.  
For example,  
**root:com3:com5 ppp;☐com4 ppp**  
To restart commands from the highest level, a semicolon (;) must be used as the separator, and then a leading colon (:), which shows that the restarted command is a command at the top of the command tree, must follow.  
For example,  
**root:com3:com5 ppp;☐:root:com1 ppp**



The AT47xx accepts the three forms of the same SCPI commands: all upper case, all lower case, and mixed upper and lower case.

## 9.4 Header and Parameters

The commands consist of a command header and parameters. (See the following.)

Example: **comp:nom 100.0e3**

Header      Parameter

- Headers can be of the long form or the short form. The long form allows easier understanding of the program code and the short form allows more efficient use of the computer.
- Parameters may be of two types as follows.
  - (A) Character Data and String Data  
Character data consists of ASCII characters. The abbreviation rules are the same as the rules for command headers.
  - (B) Numeric Data
    - (a) <integer>: For example, 1,+123,-123
    - (b) <float>: For example, 1.23e3, 5.67e-3, 123k, 1.23M, 2.34G, 1.234
    - (c) <scifloat>: For example, +1.23456e+03

The available range for numeric data is 9.9E37. When numeric data is used as a parameter, the suffix multiplier mnemonics and suffix units (The suffix multiplier must be used with the suffix unit) can be used for some commands as follows.

Table 9-1 Multiplier Mnemonics

Definition	Mnemonic
1E18 (EXA)	EX
1E15 (PETA)	PE
1E12 (TERA)	T
1E9 (GIGA)	G
1E6 (MEGA)	MA
1E3 (KILO)	K
1E-3 (MILLI)	M
1E-6 (MICRO)	U

1E-9 (NANO)	N
1E-12 (PICO)	P
1E-15 (PEMTO)	F
1E-18 (ATTO)	A

## 9.5 Command Reference

All commands in this reference are fully explained and listed in the following functional command order.

- MEAS Subsystem
- SYST Subsystem
- FETCH Subsystem
- ERROR Subsystem
- IDN?

### 9.5.1 MEAS SUBSYSTEM

The MEAS Subsystem command group sets the meas page.

Figure 9-2 MEAS Command Tree

<b>Meas</b>	<b>:MODEL</b>	{tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b}
	<b>:RATE</b>	{fast,med,slow}
	<b>:KEYLOCK</b>	{on,off}
	<b>:START</b>	{on,off}
	<b>:CMODEL</b>	<para>,<level>
	<b>:CHANON</b>	<para>,<on,off>
	<b>:LOW</b>	<level>
	<b>:CLOW</b>	<para>,<level>
	<b>:HIGH</b>	<level>
	<b>:CHIGH</b>	<para>,<level>
	<b>:SENSOR</b>	{tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b}
	<b>:FONT</b>	{fong24,font18,font16,font6x9}

#### 9.5.1.1 MEAS:MODEL

The :MODEL command sets the Model.

<b>Command Syntax</b>	<b>MEAS:MODEL &lt;tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b&gt;</b>
<b>Example</b>	<b>SEND&gt; MEAS:MODEL TC-T&lt;NL&gt; //Set MODEL to T-type thermocouple</b>
<b>Query Syntax</b>	<b>MEAS:MODEL?</b>
<b>Query Response</b>	<b>&lt; tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b &gt;&lt;NL&gt;</b>
<b>Example</b>	<b>SEND&gt; MEAS:MODEL?&lt;NL&gt; RET&gt; tc-t&lt;NL&gt;</b>

#### 9.5.1.2 MEAS:RATE

The :RATE command sets the Speed.

<b>Command Syntax</b>	<b>MEAS:RATE &lt;fast,med,slow&gt;</b>
<b>Example</b>	<b>SEND&gt; MEAS:RATE fast&lt;NL&gt; //Set to fast speed</b>
<b>Query Syntax</b>	<b>MEAS:RATE?</b>
<b>Query Response</b>	<b>&lt;fast,med,slow&gt;&lt;NL&gt;</b>
<b>Example</b>	<b>SEND&gt; MEAS:RATE?&lt;NL&gt; RET&gt; fast&lt;NL&gt;</b>

#### 9.5.1.3 MEAS:KEYLOCK

The :KEYLOCK command sets the KEYPAD.

<b>Command Syntax</b>	<b>MEAS:KEYLOCK &lt;on,off&gt;</b>
<b>Example</b>	<b>SEND&gt; MEAS:KEYLOCK off&lt;NL&gt; //Set to close Keypad</b>
<b>Query Syntax</b>	<b>MEAS:KEYLOCK?</b>

Query Response	<on,off><NL>
Example	SEND> MEAS:KEYLOCK?<NL> RET> on<NL>

#### 9.5.1.4 MEAS:START

The :START command sets the sample.

Command Syntax	MEAS:START <on,off>
Example	SEND> MEAS:START off<NL> //Set to start sample
Query Syntax	MEAS:START?
Query Response	<on,off><NL>
Example	SEND> MEAS:START?<NL> RET> on<NL>

#### 9.5.1.5 MEAS:CMODEL

The :CMODEL command sets the MODEL of each channel.

Command Syntax	MEAS:CMODEL <para>,< tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b >
Example	SEND> MEAS:CMODEL <001>,<tc-t> //Set the channel 001 model for T-type thermocouple
Query Syntax	MEAS:CMODEL?
Query Response	< tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b >
Example	SEND> MEAS:CMODEL?<NL> RET> < tc-t,tc-t >

#### 9.5.1.6 MEAS:CHANON

The :CHANON command sets the status of each channel.

Command Syntax	MEAS:CMODEL <para>,<on,off>
Example	SEND> MEAS:CMODEL <001>,<on> //Set the channel 001 open
Query Syntax	MEAS:CHANON?
Query Response	< on,off>
Example	SEND> MEAS:CHANON?<NL> RET> < ON,ON,ON,ON,ON,ON >

#### 9.5.1.7 MEAS:LOW

The :LOW command sets the low value of all channel.

Command Syntax	MEAS:LOW <float>
Example	SEND> MEAS:LOW <-200.0> //Set the all channel low limit -200.0
Query Syntax	MEAS:LOW?
Query Response	< float,float >
Example	SEND> MEAS:LOW?<NL> RET> < -2.00000e+02, -2.00000e+02 >

#### 9.5.1.8 MEAS:CLOW

The :CLOW command sets the low value of each channel.

Command Syntax	MEAS:CLOW <para>,<float>
Example	SEND> MEAS:CLOW <001>,<-200.0> //Set the channel 001 low limit -200.0

### 9.5.1.9 MEAS:HIGH

The :HIGH command sets the high value of all channel.

Command Syntax	MEAS:HIGH <float>
Example	SEND> MEAS:HIGH <1800.0> //Set the all channel high limit 1800.0
Query Syntax	MEAS:HIGH?
Query Response	< float, float >
Example	SEND> MEAS:HIGH?<NL> RET> < 1.80000e+02, 1.80000e+02 >

### 9.5.1.10 MEAS:CHIGH

The :CHIGH command sets the high value of each channel.

Command Syntax	MEAS:CHIGH <para>,<float>
Example	SEND> MEAS:CHIGH <001>,<1800.0> //Set the channel 001highw limit 1800.0

### 9.5.1.11 MEAS:SENSOR

The :SENSOR command acquiring the sensor of each channel.

Command Syntax	MEAS:SENSOR
Example	SEND> MEAS:SENSOR <NL> RET> < tc-t,tc-k,tc-j,tc-n,tc-e,tc-s,tc-r,tc-b ><NL>

### 9.5.1.12 MEAS:FONT

The :FONT command set the font of measure display.

Command Syntax	MEAS:FONT < font24,font18,font16,font6x9>
Example	SEND> MEAS:FONT font24<NL> //Set the measure display of FONT24

## 9.5.2 SYST SUBSYSTEM

The SYST Subsystem command group sets the setup page.

Figure 9-3 SYST Command Tree

Meas	:COMP	{on,off}
	:BEEP	{on,off}
	:UNIT	{cel, kel, fah}

### 9.5.2.1 SYST:COMP

The :COMP command sets the comp feature.

Command Syntax	MEAS:COMP <on,off>
Example	SEND> SYST:comp on<NL> //Set to open comparator
Query Syntax	MEAS:comp?
Query Response	<on,off><NL>
Example	SEND> SYST:comp?<NL> RET> on<NL>

### 9.5.2.2 SYST:BEEP

The :BEEP command sets the beep feature.

Command Syntax	MEAS:BEEP <on,off>
----------------	--------------------

Example	<code>SEND&gt; SYST:beep on &lt;NL&gt; //Set to open beep</code>
Query Syntax	<code>MEAS:beep?</code>
Query Response	<code>&lt;on,off&gt;&lt;NL&gt;</code>
Example	<code>SEND&gt; SYST:beep?&lt;NL&gt;</code> <code>RET&gt; on&lt;NL&gt;</code>

### 9.5.2.3 SYST:UNIT

The :UNIT command sets the unit feature.

Command Syntax	<code>MEAS:UNIT &lt;cel, kel, fah&gt;</code>
Parameter	<code>&lt;cel, kel, fah&gt;</code> <code>cel: Degrees Celsius</code> <code>kel: Degrees Kelvin</code> <code>fah: Fahrenheit</code>
Example	<code>SEND&gt; SYST:unit cel&lt;NL&gt; //Set to Degrees Celsius</code>
Query Syntax	<code>MEAS:unit?</code>
Query Response	<code>&lt;°C, K, F&gt;&lt;NL&gt;</code>
Example	<code>SEND&gt; SYST:unit?&lt;NL&gt;</code> <code>RET&gt; °C&lt;NL&gt;</code>

### 9.5.3 FETCH SUBSYSTEM

The FETCH subsystem command group is a sensor-only command which retrieves the measurement data taken by measurement(s) initiated by a trigger, and places the data into the output buffer

Figure 9-4 FETCH Command Tree

<code>fetch?</code>	
---------------------	--

#### 9.5.3.1 FETCH?

The FETCH? retrieves the latest measurement data and comparator result.

Query Syntax	<code>Fetch?</code>
Query Response	<code>&lt;float, float, float&gt;&lt;NL&gt;</code> <code>//Returns the number related to the number of channels</code>
Example	<code>SEND&gt; fetch?&lt;NL&gt;</code> <code>RET&gt; +1.00000e-05, +1.00000e-05, +1.00000e-05&lt;NL&gt;</code>

### 9.5.4 ERROR SUBSYSTEM

The ERRor subsystem retrieves last error information.

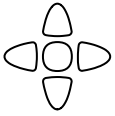
Query Syntax	<code>ERROR?</code>
Query Response	<code>Error string</code>
Example	<code>SEND&gt; ERR?&lt;NL&gt;</code> <code>RET&gt; no error&lt;NL&gt;</code>

### 9.5.5 IDN SUBSYSTEM

The \*IDN? query returns the instrument ID.

Query Syntax	<code>IDN? Or *IDN?</code>
Query Response	<code>&lt;MODEL&gt;, &lt;Revision&gt;, &lt;SN&gt;, &lt;Manufacturer&gt;</code>

## 10. Accuracy



This chapter provides the following information:

- Accuracy

### 10.1 Accuracy

**Instrument Accuracy does not include the standard contact compensation Precision.**

Model	Range (°C)	Accuracy (°C)
T	-150°C to 0°C	±1.0°C
	0°C to 400°C	±0.8°C
K	-100°C to 0°C	±1.2°C
	0°C to 1350°C	±0.8°C
J	-100°C to 0°C	±1.0°C
	0°C to 1200°C	±0.7°C
N	-100°C to 0°C	±1.5°C
	0°C to 1300°C	±0.9°C
E	-100°C to 0°C	±0.9°C
	0°C to 850°C	±0.7°C
S	0°C to 100°C	±4.5°C
	100°C to 300°C	±3.0°C
	300°C to 1750°C	±2.2°C
R	0°C to 100°C	±4.5°C
	100°C to 300°C	±3.0°C
	300°C to 1750°C	±2.2°C
B	600°C to 800°C	±5.5°C
	800°C to 1000°C	±3.8°C
	1000°C to 1800°C	±2.5°C

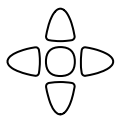
**Standard connection compensation need to add ±0.5°C based on thermocouple measuring accuracy.**

**The measuring accuracy of thermocouple sensor gives priority to sensor supplier's standard.**

---

# 11. Specification

---



This chapter provides the following information:

- General Specification
  - Specifications
  - Dimension
- 

---

## 11.1 General Specification

The Data is Achieved under the Following Conditions:

- Temperature:  $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$
- Humidity:  $\leq 65\%$  R.H.
- Warm-up Time:  $> 60$  minutes
- Calibration Time: 12 months

Test Environment:

- Temperature and humidity range:  $15^{\circ}\text{C}\sim 35^{\circ}\text{C}$ , 80% RH or less
- Storage temperature and humidity range:  $10^{\circ}\text{C}\sim 40^{\circ}\text{C}$ , 10~90% RH

Thermocouple Type:	T,K,J,N,E,S,R,B
Display:	5 digits
Test Speed:	Fast, Medium, Slow
Max Reading:	$1800.0^{\circ}\text{C}$
Min Reading:	$-200.0^{\circ}\text{C}$
Data Logger:	USB Disk
Beep:	ON/OFF
Interface:	USB-232C Interface
Program Language:	SCPI
Auxiliary Function:	Keypad Lock

## 11.2 Specifications

- 7.0 inches, 800×600, TFT-LCD touch screen
- Comparator (Sorting) Function.
- Keypad Lock Function
- Language: English and Chinese
- Build-in USB-232C interface
- Compatible SCPI Instruction Set

## 11.3 Dimension

