# INSTRUCTION MANUAL

EN


# ADM1055

5½ Digit Multimeter

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The latest revisions of this manual, device drivers, and software tools can be downloaded from: http://www.aimtti.com/support

# 1. PRODUCT DESCRIPTION

The ADM1055 offers high-precision measurement with 5½ digit resolution and 0.02% basic DC accuracy. It supports ultra-fine measurements with sensitivities down to 1µV, 1mΩ, 10nA, 0.01Hz, and 100pF.

Featuring a simple touch operated GUI with customisable display options, the ADM1055 is quick and intuitive to setup. Measurement modes are directly selectable from the front panel hard keys and to make things even easier, especially in educational settings, the ADM1055 features illuminated terminals. The correct inputs light up depending on the selected function, guiding the user and helping prevent connection errors.

In addition to the standard numeric display, the ADM1055 also includes bar chart, histogram, and statistical analysis modes. Helping users to visualise trends, and monitor signal stability in real time. An integrated resettable current trip protects both the instrument and the DUT, without requiring fuse replacement.

The trigger system enables batch measurement and analysis. Users can define the number of readings required, then trigger to start. The meter resets statistics, records the set count, then holds the result for review. The ADM1055 includes built-in math tools to simplify analysis and speed up test workflows.

The A series comes equipped with SCPI compliant commands and plug and play USB connectivity. Full access to the Aim-TTi Test Bridge software is provided free with no additional hidden costs. Aim-TTi Test Bridge PC software is available as free download from the Aim-TTi website, which can be used to control up to 4 instruments simultaneously.

# 2. SAFETY

## Symbols

This instruction manual contains information and warnings which must be followed by the user to ensure safe operation and to retain the instrument in a safe condition.

The following symbols are displayed on the instrument and throughout the manual, to ensure the safety of the user and the instrument, all information must be read before proceeding.

**WARNING**

Indicates a hazard that, if not avoided, could result in injury or death.

**CAUTION**

Indicates a hazard that could damage the product and may result in loss of important data or invalidation of the warranty.

**NOTE**

Indicates a helpful tip.

**EXAMPLE**

Indicates an example to show further details.

| | | | |
|---|---|---|---|
|  | Caution, possibility of electric shock | UK CA | UKCA 'UK Conformity Assessed' marking is a certification mark that affirms conformity with the applicable requirements for products sold within Great Britain |
|  | Caution, possibility of damage | | |
| O | Mains supply OFF | CE | 'CE' marking is a certification mark that affirms the good's conformity with European health, safety, and environmental protection standards |
| I | Mains supply ON | | |
|  | Standby supply. Instrument is not disconnected from AC mains power when switch is off. |  | WEEE (do not dispose in household waste) |
| ~ | Alternating current |  | Earth (ground) terminal |
|  | Protective Earth terminal |  | The terminal is connected to chassis ground |
| CAT II | Measurement Category II. Inputs may be connected to AC mains power under Category II overvoltage conditions | | |

## Safety Notices

This instrument is:

- A safety Class I instrument according to IEC classification and has been designed to meet the requirements of EN61010-1, EN61010-2-030 & EN61010-2-033 (relevant parts of the 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' standards).
- Designed for indoor use in a Pollution Degree 2 environment in the temperature range 5°C to 40°C, 20%- 80% RH (non-condensing). It may occasionally be subjected to temperatures between +5°C and –10°C without degradation of its safety. Do not operate while condensation is present.
- Tested in accordance with EN61010-1 and has been supplied in a safe condition. This instruction manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the instrument in a safe condition.
- It has been designed for measurement use to 600VDC/430VACrms in circuits isolated from AC mains power (derived secondary circuits within an equipment) with occasional transient over-voltages. It can also be used for CAT II (Measurement Category II) use to 300VDC/ACrms. CAT II is local domestic supply level, e.g. portable equipment and appliances. For this equipment 2500V is the maximum peak transient overvoltage that can be tolerated by any terminal with respect to earth ground without impairing safety.

**WARNING**

Do not operate while condensation is present.

Do not operate outside its rated supply voltages or environmental range.

THIS INSTRUMENT MUST BE EARTHED.

Ensure that only fuses with the required rated current and of the specified type are used for replacement.

The use of makeshift fuses and the short-circuiting of fuse holders is prohibited.

Use of this instrument in a manner not specified by these instructions may impair the safety protection provided.

Any interruption of the mains earth connector, inside or outside, will make the instrument dangerous. Intentional interruption is prohibited. The protective action must not be negated by the use of an extension cord without a protective conductor.

Any adjustment, maintenance, and repair of the opened instrument under voltage must be avoided. When connected, terminals may be live and opening the covers or removal of parts (except those that can be accessed by hand) may expose live parts.

To avoid electric shock or damage to the instrument, never allow water to get inside the case. If the instrument is clearly defective, or has been subject to mechanical damage, excessive moisture, or chemical corrosion, the safety protection may be impaired, and it must be withdrawn from use and returned for repair.

**CAUTION**

Do not wet when cleaning; use only a soft dry cloth to clean the screen.

Do not use a sharp or pointed objects to operate the touch screen.

Take care not to restrict the inlet vents at the front of the instrument.

Multimeter Test Leads

The test leads supplied meet the requirements of IEC 61010-031 and are rated to 1000V Cat III. Use only the test leads provided. Alternative test leads should be rated to at least 1000V, 600V (Cat III) and 10A current capability.

# 3. INSTALLATION

## Mains Operating Voltage

This instrument has a universal input range and will operate from a nominal 110V or 240V mains supply without adjustment. Check that the local supply meets the AC Input requirement given in the Specification see '*Technical Specifications*'.

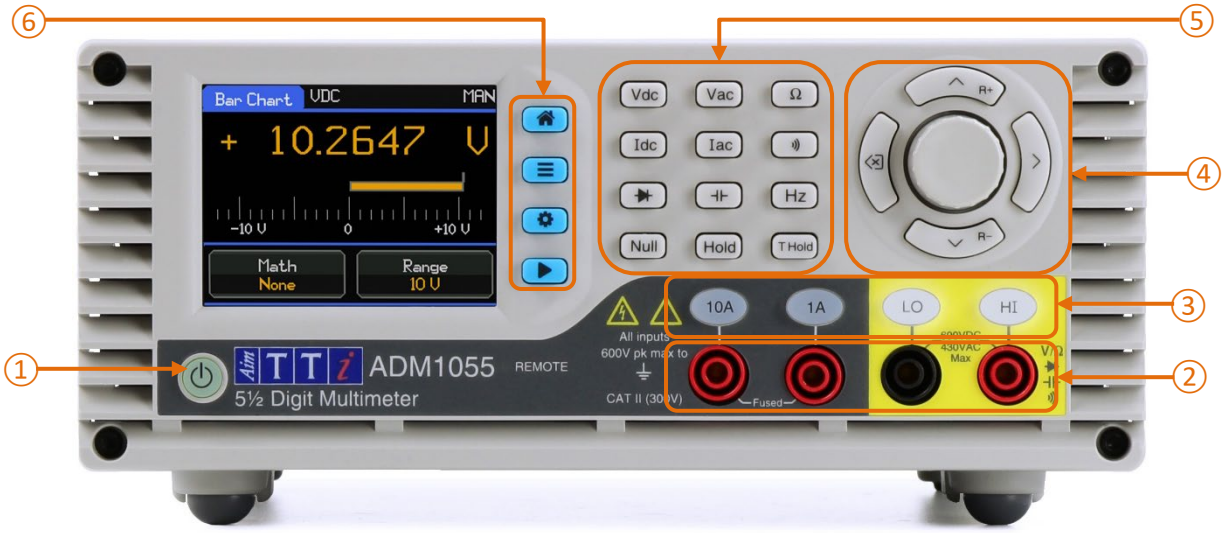
## Mains Lead

Connect the instrument to the AC supply using the mains lead provided. Should a mains plug be required for a different mains outlet socket, a suitably rated and approved mains lead set should be used, which is fitted with the required wall plug and an IEC60320 C13 connector for the instrument end. To determine the minimum current rating of the lead set for the intended AC supply, refer to the power rating information on the equipment or in the Specification.

## Mounting

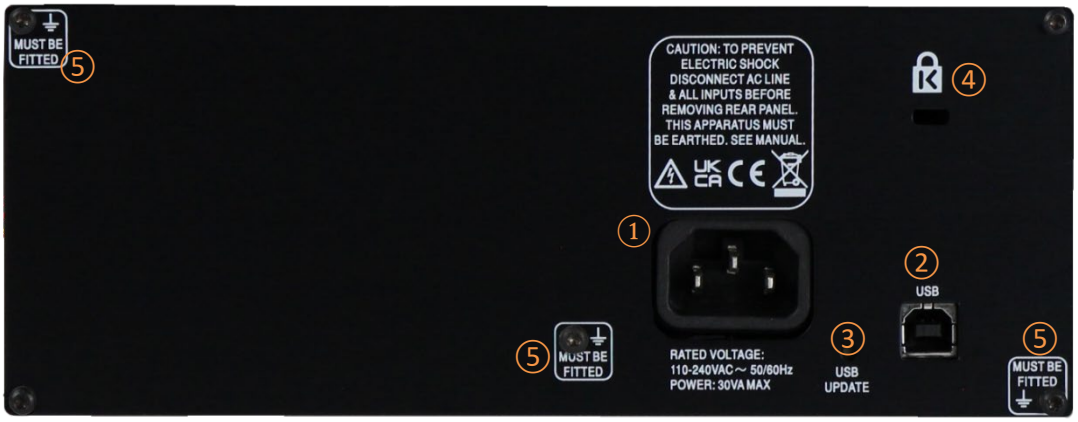
This instrument is suitable for bench use. The front feet include a tilt mechanism for optimal panel angle.

# 4. INSTRUMENT OVERVIEW




| | | |
|---|---|---|
| ① | Standby | Standby supply. Instrument is not disconnected from AC mains power when switch is off. LED is illuminated when AC power is connected. |
| ② | Input Sockets | The input sockets are 4mm safety sockets on a 19mm pitch designed to accept 4mm safety plugs with fixed or retractable shrouds. All sockets are rated to 600Vpeak with respect to earth ground. Safety will be maintained if voltages up to 600Vpeak are accidentally applied between inappropriate terminals in excess of their marked ratings, but restoration of normal operation may require replacement of protection devices (e.g. current range fuses). |
| | ⚠ | The input impedance between HI and LO is nominally 10MΩ on dc ranges and 1MΩ on ac ranges. The black LO socket is considered less positive than the red socket. The maximum voltage that can be applied between HI & LO is 600Vdc, 430Vrms (600Vpeak). The sockets are rated to 300V CAT II. |
| | | The 1A/10A current sockets are low impedance; see '*Technical Specifications*' for details of the voltage burden on each range at full scale between 1A/10A and LO. The black LO socket is considered less positive than the black 1A/10A sockets. The 1A socket is protected with a current trip circuit and a 1.6A (F) 1kV HRC fuse, and the 10A socket with a 10A (F) 600V fuse; see '*Maintenance*', for replacement details. |
| ③ | Terminal guides | For each function, the correct input terminals are indicated with the illumination of the key above. |
| ④ | Rotary knob and directional keypad | Turn the knob clockwise to initiate, once the desired button/ field has been selected, press to 'okay' an entry. See '*Initial operation*'. Pressing the up and down arrows will change the Range, see '*Measurement Range Selection*'. |
| ⑤ | Measurement function keys | Measurement Function keys allow direct selection of the function from the front panel, see '*Making Basic Measurements*'. |
| ⑥ | Menu keys | Home , Configure , Utilities, Trigger |

# 4 - Instrument Overview




| | | |
|---|---|---|
| ① | AC power inlet | Connect to AC mains using the power lead provided. See *'Mains Lead'* for more details. |
| ② | USB | The USB port accepts a standard USB cable. The Windows plug-and-play functions should automatically recognise that the instrument has been connected. |
| ③ | USB update | Used to update firmware via USB, see *'Firmware Update'* for more details. |
| ④ | Security lock slot | |
| ⑤ | Earth bond screws ⚠ | Must be fitted to ensure a safe earth bond. |

# 5. GETTING STARTED

## Using this manual

This section is a general introduction to the operation of the instrument and is intended to be read before using the instrument for the first time.

In this manual front panel, keys and sockets are shown in capitals, e.g., ON, OFF. Text and messages displayed on the LCD are shown in a different font, e.g., Range, Math.

The descriptions in this manual relate to using the instrument via the touch screen, alternatively, the hard keys and rotary knob can be used. See '*Navigation*' for details on how to use the instrument in this way.

This instrument provides to option to select an alternative colour theme for the display, all screenshots in this manual show the default theme. If an alternative theme is used, the instrument will still function in the same way, but displays may vary.

## Switching on

Connect the instrument to the AC supply using the mains lead provided.

Press the STANDBY button. At power up, the instrument displays the product name and firmware version whilst initialising the application.

Loading takes a few seconds, after which the home screen is displayed.

**WARNING**

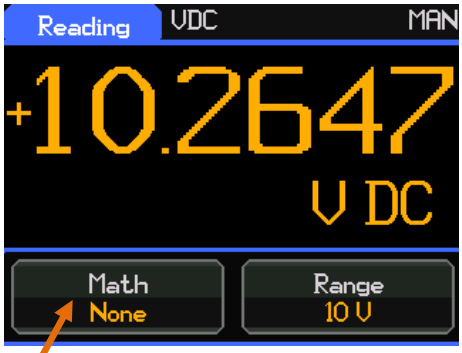
To fully disconnect from the AC supply, unplug the mains cord from the back of the instrument or switch off at the AC supply outlet; make sure that the means of disconnection are readily accessible. Disconnect from the AC supply when not in use.

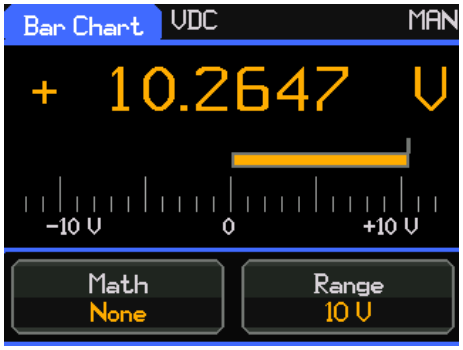
# Overview

## Home/ Display Screens

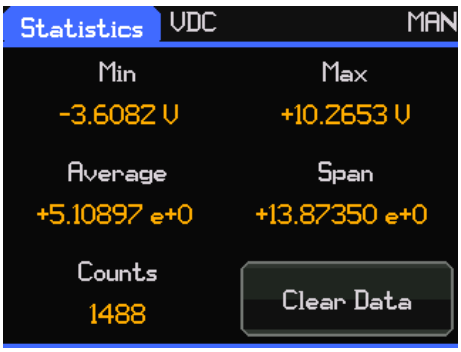
① Displayed information.

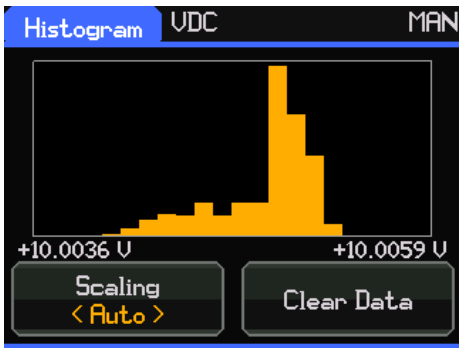
The display type can be changed by pressing the key, or via the menu.




② Menu Button- Press to navigate to a further menu.




## Menu Screen


③ Parameter toggle- Displays the description in white and the set value of the field in yellow (with brackets), Press to toggle between the available options.

④ Parameter- Displays the description in white and the set value of the field in yellow, press to edit via pop-up or numeric editing screen (see below).

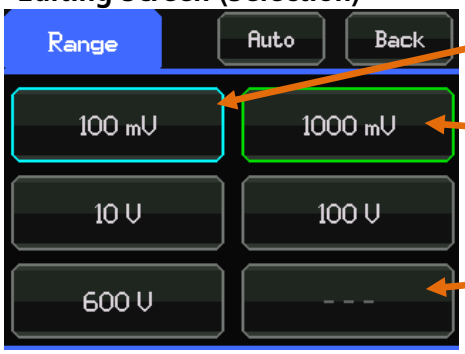
## Editing Screen (Numeric)


⑤ Back button- Press to return to the previous screen.

⑥ Numeric Field- See '*Editing a numeric* field' for more details.

⑦ Action button- An action button doesn't contain a parameter (e.g. ③, ④). Press to action, the change will be executed immediately.

### Editing Screen (Selection)

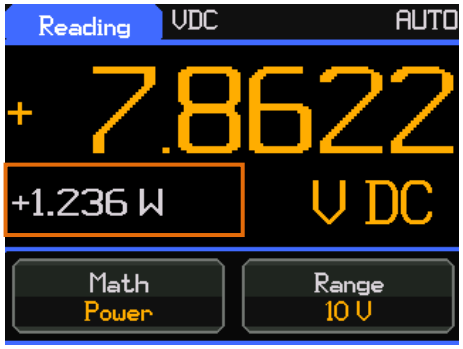



⑧ Highlighted- Shows the active position of the encoder navigation position in blue.

⑨ Selected/ Active- Shows the currently selected option. Press to select the required option.

⑩ Disabled/ Inactive- Text is greyed out if the action is not available.

### Secondary Display

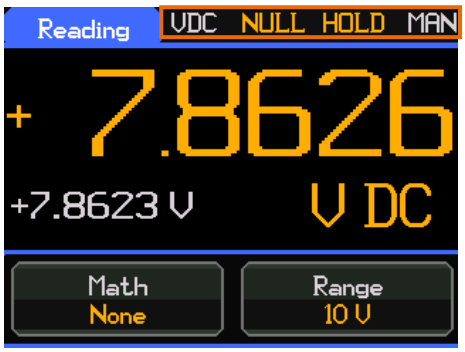



(Available on the Reading display) The secondary display is primarily used to show the Math function results. Other information, e.g. Hz in AC measurements, and source current in Ohms measurements, are also shown in this area if no Math function is active.

If Hold, T Hold or Null are active the secondary display will show the live reading. The Math function will always take priority.

### Status bar

The status bar is located at the top of the home screen, this contains information about the status of the instrument.




| Displayed text | Description |
|---|---|
| **Man** *or* **Auto** | Range setting. |
| **VDC** *or* **VAC** *or* **OHM** *or* **IDC** *or* **IAC** *or* **CONT** *or* **DIO** *or* **CAP** *or* **FREQ** | Measurement function setting. |
| **HOLD** *or* **THOLD** *or* **TRIG** | Hold or Trigger status. |
| **NULL** | Null active: Measurement has been stored and subtracted from all future readings. |

# Initial operation

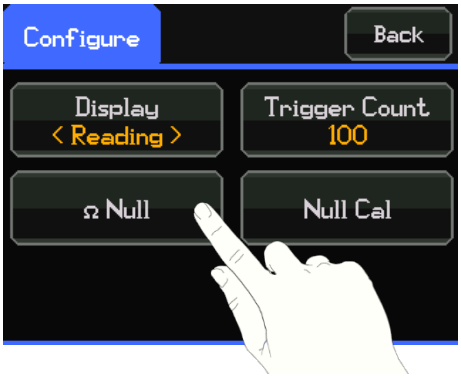
The user interface can be navigated using the touch screen or the rotary knob.

Most settings can be made quickly and easily using the hard keys on the front panel. Advanced settings can be accessed via the on screen menus using the touch GUI, or rotary knob.

## Navigation

### Navigation using touch

Touch to select the required button or field.




### Navigation using the rotary knob.

Use the rotary knob to highlight the field or button and press the knob to ‘okay' the action. When an editable field is selected, adjustments can be made by turning the knob until the required value is selected. Press the knob to action the change.

## Editing a numeric field

### Editing a numeric field using the rotary knob and directional keys


Select the editable field using the knob, press to enter the active editing state. Alternatively, jump straight to the editing state by touching the editable field.

Turning the rotary control will increment or decrement the numeric value in steps determined by the position of the edit cursor (green digit); the cursor is moved by one digit to the left or right using the directional keys. A further press of the knob will exit the editing mode. Alternatively, exit the editing state by touching the editable field.

Pressing the Revert button on the touch screen while in the editing state will return to the value as set on initial entry of the screen this value is displayed on the button.

Press and hold the left arrow key <x] key to enter the default value; pressing the Live Reading button enters the live reading as the set value.

# 6. MAKING BASIC MEASUREMENTS

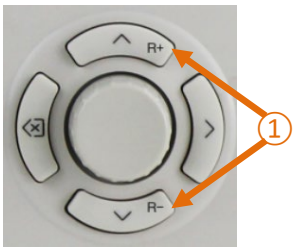
## Scale Length

The scale length is 120,000 counts (unless otherwise stated) giving a maximum measured value for each range of 119,999. Thus, for the 100V range the maximum measured value is 119.999 volts. Accuracies are quoted in terms of a percentage of the measured value plus a number of least significant digits.

**NOTE**

Safety considerations limit the maximum voltage and current that can be measured to below the scale length maximum.

## Measurement Range Selection




When a Measurement Function is first selected, the lowest range is set and MAN is shown in the status bar. Pressing either of the arrow keys ① (Range+/Range-) will change the range to the next range available. Pressing the right arrow key > will change the instrument into auto-ranging operation.

The range can also be changed with the Range button on the GUI, this is available on the home screen when the Reading or Bar Chart display is active.

**NOTE**

The 10A range, which uses a different input socket from mA measurements, can only be selected manually. Once 10A has been selected, however, this setting will be retained for current measurement until it is returned to mA.

## Measurement Function Selection

The measurement function is selected with the hard keys on the front panel.


**NOTE**

All measured data is cleared when the measurement function is changed.

## Voltage Measurements Vdc Vac

Having selected Vdc or Vac, voltage measurements are made using the HI socket and the LO socket. Five manual measurement ranges are available from 100mV to 600V (dc) or 430V (ac).

The meter will show a minus sign (on dc measurements) when the voltage applied to the HI socket is more negative than that applied to the LO socket.

The maximum voltage that can be applied between HI and LO is 600V DC or 430V AC; damage to the instrument may result if this limit is exceeded.

**WARNING**

The maximum input voltage to ground must not exceed 600V peak. Safety will be impaired if these ratings are exceeded, see Safety section at the beginning of the manual.

## Current Measurements Idc Iac

Having selected Idc or Iac, current measurements up to 1.2A (1200.00mA) are made using the 1A socket and the LO socket; current measurements up to 10A are made using the 10A and LO sockets. The meter will show a minus sign (on dc measurements) when the polarity of the current is such that it flows out of the 1A or 10A sockets rather than into it.

Using the 1A socket 4 measurement ranges (auto or manual) are available from 1mA to 1000mA. Measurements up to 10A can be made using the 10A socket having manually ranged to 10A with the up arrow key (R+) [∧] or selected the range using the touch menu. Current protection is provided, see '*Over Current Protection*' for more details.

Hz measurement is shown in secondary display when AC current (Iac) measurements are active.

**NOTE**

After measuring high currents (i.e. above half scale) using the 1A or 10A ranges, thermal voltages are generated that may create errors when making measurements on the most sensitive dc voltage, current or Ohms ranges immediately afterwards. To ensure that the specified accuracy is maintained, allow 10 minutes for the thermal effects to reduce before making sensitive measurements.

## Resistance Measurements Ω

Pressing Ω selects resistance measurement. Six resistance measurement ranges (auto or manual) are available from 100Ω to 10MΩ.

Resistance measurements are made using the HI and LO sockets.

The effects of test lead resistance can be removed using Ω Null if required, see *Ohms Null* for more details.

## Continuity Measurements 

Pressing  selects continuity measurement. Continuity and diode checks are made using the HI and LO sockets.

Setting continuity causes the 100Ω range to be selected such that readings below approximately 10Ω will sound the continuity buzzer. Readings above the range maximum will be displayed in red.

## Diode Checks 

Pressing  selects diode check. Setting diode check causes the 1000mV range to be selected and a current of approximately 1mA to flow out of the HI socket. With the anode of the diode connected to this terminal the diode forward voltage will be shown. Reverse diode connection readings will be displayed in red.

## Frequency Measurements 


Pressing 

selects frequency measurement. Measurements are made using the HI and LO sockets. Four ranges (100Hz to 100kHz) are available, giving resolutions of 10mHz to 10Hz respectively over an operating frequency range of <10Hz to 120kHz. Reciprocal counting techniques ensure fast reading updates (4 readings/second) even on the lowest range.

Measurements are made using the ac Volts input circuitry which is auto-ranged to provide suitable sensitivity. At low signal levels use a screened lead and an adaptor (BNC to 4mm plugs, 19mm pitch) to preserve signal quality and avoid spurious readings from stray pick-up. The minimum measurable signal is <30mV rms across the frequency range (100mV range) or <10% of range maximum for other ac voltage and current ranges.

## Capacitance Measurements 

Pressing  selects capacitance measurement. Measurements are made using the INPUT HI and LO sockets within the yellow area of the panel. Four ranges (100nF to 100µF) are available with 1200 count full scale giving resolutions of 100pF to 100nF respectively.

Zero calibration at the factory is carried out with no test leads connected; ideally, capacitors to be measured should be connected directly to the sockets. Test leads, if used, should be kept as short as possible to minimise stray capacitance but nevertheless a non-zero reading will generally be present when the lowest ranges are selected. To eliminate this offset it is recommended that the meter reading is nulled, once the required range has been selected, with the test leads in their measurement positions but no capacitor connected.

**NOTE**

Because the capacitor is discharged between each measurement, the reading rate on the 100µF range is slower.

## Over Voltage Protection

When making measurements of Resistance, Capacitance, Continuity or Diode checks using the HI and LO sockets, an internal protection circuit protects the current source from source voltages. If a voltage of greater than typically 10V is applied to the HI and LO sockets the protection circuit will be engaged, the buzzer will sound and a pop-up will appear, press OK to continue. After completion of the trip event, the measurement mode is set to Vdc to show the over-voltage that is being applied to the input sockets.

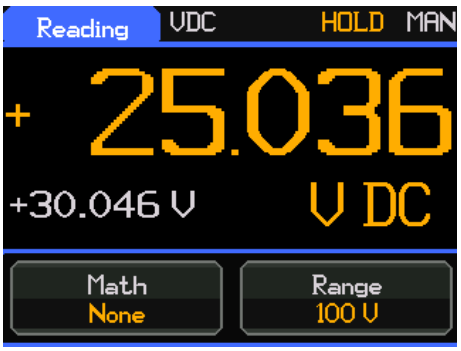
## Over Current Protection

The 1mA, 10mA, 100mA, and 1000mA ranges, using the 1A socket, are protected by a current trip circuit up to 48V, and a 1.6A (F) HRC fuse for over 48V. The 10A range, using the 10A socket, is protected by a 10A (F) HRC fuse. If the current trip is engaged, the buzzer will sound and a pop-up will appear. Remove the cause of the trip and press OK to continue.

# 7. Additional Functions

## Measurement Hold

Pressing the Hold key will freeze the meter on the primary display, HOLD is shown in the status bar and the secondary display will continue to update with live measurements. Hold is cancelled by pressing Hold again, or by changing range or function.




## Touch and Hold (T Hold)

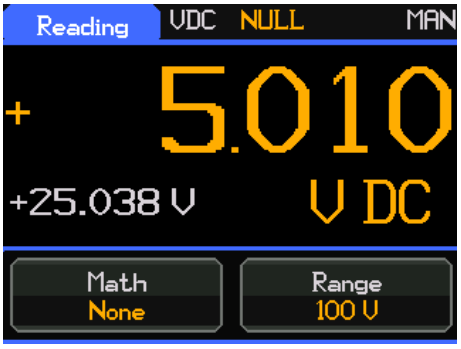
Pressing the T Hold key will freeze the meter on the primary display until a new non-zero measurement has been detected; this allows the user to touch-probe the measurement point, remove the probes and read the meter afterwards. It is not available for Ohms, Continuity, or Diode Test measurements.

When active, THOLD is displayed in the status bar, and each new reading is indicated by a beep sound. Measurement update is slow, and small changes to the signal that occur after the probes have been connected will not be shown T Hold is cancelled by pressing the T Hold key again or by changing the measurement parameter or range.

**NOTE**

Care should be taken when using T Hold with the most sensitive voltage ranges; when the probes are lifted from the circuit being measured, their high impedance means that stray pick-up might generate another valid reading and the true T Hold reading may be lost.

## Measurement Null




Pressing the Null key will store the measurement and subtract it from all future readings displayed on the primary display, NULL will be displayed in the status bar and the secondary display will show the live measurement without null applied. Null is cancelled by pressing Null again, or by changing the measurement function.

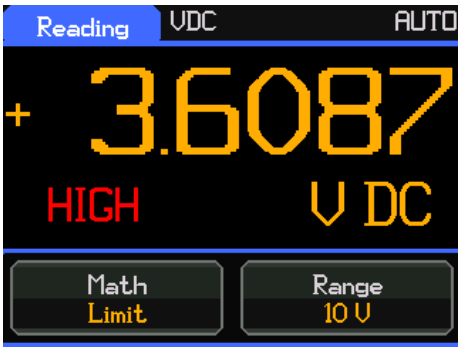
# 8. Math Functions


| Measurement Function | Limits | Ax+B | Deviation | Power | dB |
|---|---|---|---|---|---|
| Voltage dc | ● | ● | ● | ● | - |
| Voltage ac | ● | ● | ● | ● | ● |
| Current, Resistance, Continuity, Diode check, Frequency and Capacitance | ● | ● | ● | - | - |

Math settings/ values are retained for any range, if the parameter/ mode is changed all math functions are reset to Off.


**Live reading:** All parameters, (except dB ref) allow a live reading from the home screen to be used as the value. This is set in the numeric editing screen using the Live Reading button.

## Limits



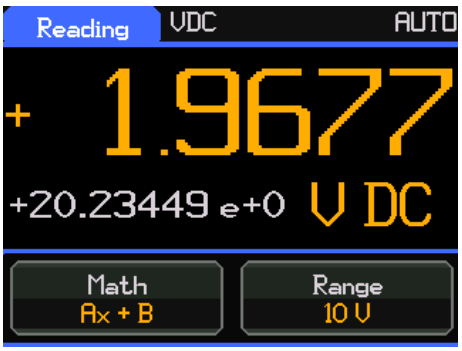

High and low limits can be set, against which the reading is compared. When running, the main display shows the actual reading and the secondary display will show the following:

PASS: If the reading is between or equal to the set points.

HIGH: if the reading is higher than the set limit.

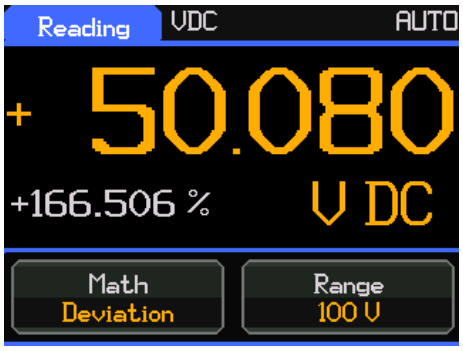
LOW: if the reading is lower than the set limit.

The limits can be set anywhere in the range ±000000 to ±999999. Press and hold the left arrow <x] key to enter the default value of +000000; pressing the Live Reading button enters the current reading as the set value.




## Ax + b

When running, the scaled value (Ax + b) is shown in the secondary display and the normal value (x) is shown in the main display.
A is variable from ±00.0001 to ±99.9999, the default value is +01.0000.
b is a floating point number variable over the range ±000000 to ±999999.

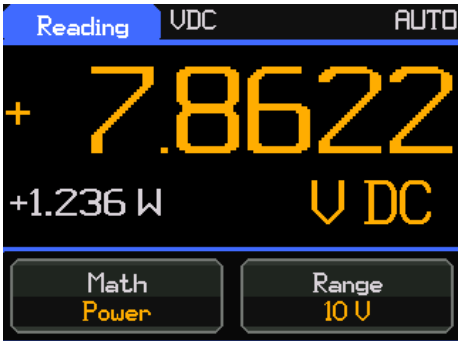



## Deviation

The Deviation function displays the percentage deviation of the measurement from a reference value in the secondary display. The main display shows the normal reading.

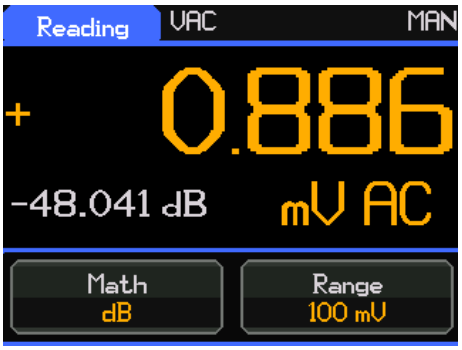
$$\text{Deviation \%} = \frac{\text{Reading - Reference}}{\text{Reference}} \%$$

The Deviation maximum display is ±999.999% and the resolution is fixed at 0.001%.




## Power

The Watts function calculates power using the formula:
Watts = V2/R
It can only be run when Vdc or Vac are selected. The reference impedance can be set anywhere between 0.1 and 99999.9Ω.



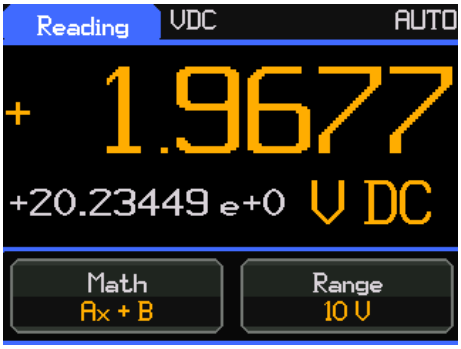

## dB

The dB function displays the measurement in dBm relative to 600Ω or other user-entered impedance.
It can only be run when Vac is selected. The reference impedance can be set anywhere between 1 and 9999Ω.

# 9. CONFIGURE MENU

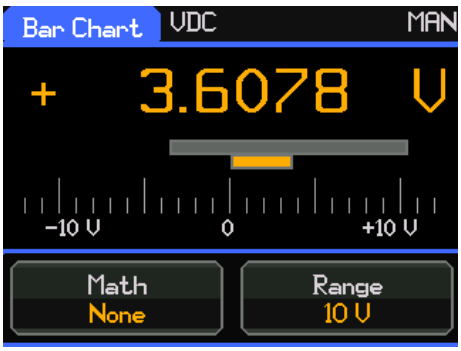
## Display

The display type can be switched between Reading, Bar Chart, Statistics and Histogram.




### Reading

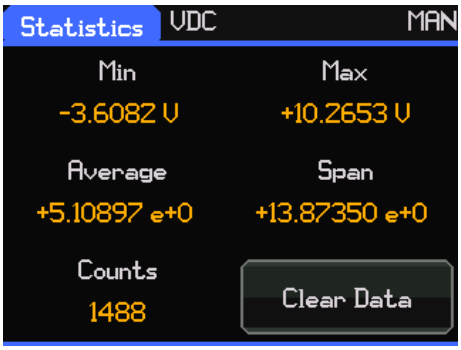
The Reading display contains the menus for adding Math functions and Range selection alongside large digits displaying the measurement reading and, where applicable, the secondary display.




### Bar Chart

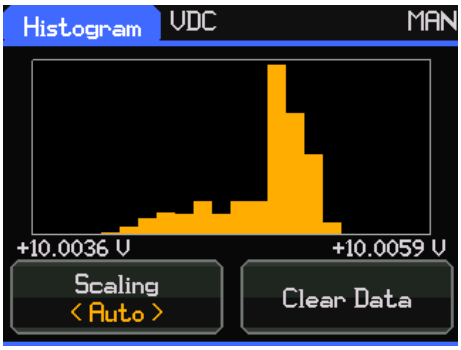
The Bar Chart display contains the menus for adding Math functions and Range selection alongside and analogue style bar chart. The scale is fixed to the selected range.

The grey bar shows the min/max values and span of the measurement readings.
The orange bar shows the live reading.




### Statistics

Min: The minimum measurement taken during the number of counts.
Max: The maximum measurement taken during the number of counts.
Average: The mean average of the measurements taken during the number of counts.
Span: The span of the value between the minimum and maximum value.
Counts: The number of measurements taken.
Clear Data will clear the measurement data shown up until that point. The data will be reset and will continue to be recorded again, starting the count from 0. Data is also cleared if the measurement function is changed.




### Histogram

Scaling: Scaling can be set to Auto or Fixed. The two readings displayed either side of the histogram show the minimum and maximum readings. The Histogram has 20 fixed bins. When set to Auto, the Histogram will resize according to the measurements taken.
When set to Fixed, the Histogram will remain at the scale at the time of fixing. If Fixed is selected before any measurements are taken, 20 readings will be taken before fixing. In cases where the minimum and maximum values are the same, nothing will be shown.

## Trigger count

The trigger can be set to perform a number of measurements from 1 to 100k using the trigger count menu, the default is 100. The trigger is activated using the ▶ key, see *'Trigger'* for more details..

## Ohms Null

Residual test lead resistance can be nulled out using the Ohms Null facility as follows:

Connect the test leads together and press the Ω Null button. The range is set to 100Ω and the meter stores the reading that it detects after 5 seconds provided that it is less than 1.000Ω (1000 counts). A pop-up will appear when the null is completed and the display will show zero ohms.

If the reading cannot be nulled, because the offset is too large, a pop-up will appear to show that the Ohms Null has failed.

The Ohms Null is stored as a floating point value which is used on all ranges; it is not lost when the function is changed or when the instrument is turned off. Ohms Null can be cancelled by pressing Ω Null and not generating a sub 1.000Ω reading within the next 5 seconds, or by restoring the instrument to factory defaults.

Normal Null can be used together with Ohms Null.

## Null Cal

An automatic zero calibration (Null Cal) is performed every time that the instrument is switched on. However, if the instrument has been stored at a temperature outside the specified operating range, and is switched on before it has fully acclimatised to the working environment, accuracy may be affected as the meter's temperature changes.

To ensure optimum accuracy, particularly on the lower current and voltage ranges, zero calibration can be repeated when the meter has acclimatised by pressing the Null Cal button. A pop-up will appear to confirm that Null Cal is being performed.

**NOTE**

It is recommended that the Null Cal is performed after 1 hour warm up or before acquiring measurements for highly accurate test.

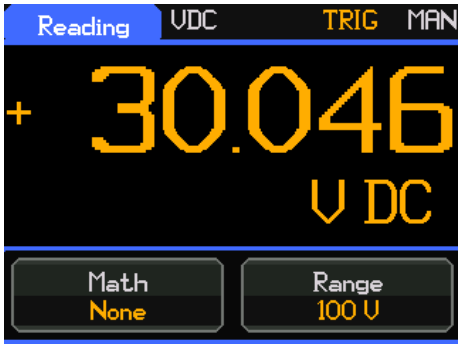
# 10. TRIGGER

The trigger system enables batch measurement and analysis. Users can define the number of readings required (trigger count), then trigger to start. The meter resets statistics, records the set count, then holds the result for review.

The trigger count is accessed via the Configure menu key .


Set the Trigger count using the Trigger count menu numeric entry, see *'Editing a numeric field'* for more details. It can be set to perform a number of measurements from 1 to 100k using the trigger count menu, the default is 100.

Activate the trigger using the key or by sending the remote command *TRG. Once triggered, TRG will be shown in the status bar.




**NOTE**

Activating the trigger will clear any previous measurements taken.

The progress of the number of measurement counts can be viewed in the statistics display.

Once the measurements have been taken, the final measurement will be held until the HOLD key is pressed or the trigger is run again.

Once the triggered measurement count is complete, the results can be reviewed and evaluated using the various analysis displays provided, see *'Display'* for more details.

# 11. UTILITIES MENU


## Power On

The state in which the instrument will power on can be toggled between **Last Settings** and **Defaults**. To change the Power-on state, press the **Power-on State** button.

**Last Settings:** Instrument will automatically load the settings that the unit was powered down with.

**Defaults:** Unit will power up with the default values- see '*Default Values*' for more information.

## Buzzer

A buzzer is incorporated that produces a 'beep' when a touch button is pressed, or an error occurs. By default, the buzzer is disabled **<Off>.** This can be enabled by pressing the **Buzzer** button to show **<On>** as the status.

## Store/ Recall


6 memory slots are provided, allowing the user to store and recall the settings for the instrument.

To save a setup, select the Store menu by pressing the **Store** tab ①, then press any **Slot** button ②, a pop-up will appear asking to confirm the store. Press **OK** to save the file.

To load a setup, select the recall menu by pressing the **Recall** tab ③, then press the required **Slot** button ②, a pop-up will appear asking to confirm the Recall. Press **OK** to recall the file.

Slots that have data saved to them will have **Saved** as the status, otherwise **Empty** is shown. Slots can be overwritten with new data at any time.

## Reset Defaults

This function can be used to return most of the instrument settings back to the factory default values as listed in '*Default Values*' The Store memories are unaffected. Press the Reset Defaults button to reset, a pop-up will appear asking to Confirm Reset Defaults.

## Display Settings

### Theme


A range of colour themes are available, each providing a different coloured base for the user interface. Press the Theme button repeatedly to scroll through the options, the user interface colour will change to preview the colour theme. The default theme is Blue.

<Blue> // <Orange> // <Green> // <Pink> // <Light> // <Classic>

### Backlight

To adjust the brightness of the display, press the Backlight button and select from the options.

# 12. REMOTE OPERATION

## General

### Remote and Local Operation

At power-on, the instrument will be in the local state. In this state, all front panel operations are possible. When the instrument receives a command from an interface the remote state will be entered, and the Remote LED will illuminate. In this state the front panel user interface can still be navigated but no changes to parameters are possible. The instrument may be returned to the local state by pressing the key; however, the effect of this action will only remain until the instrument receives another character from the interface, when the remote state will once again be entered. Returning to Local by this action will keep the settings at their last remotely set values.

## Remote Interface Configuration

The ADM can be remotely controlled via its USB connection.

The USB interface enumerates as a Communications Class device and interacts with application software through a standard virtual COM port device driver on the PC. The instrument firmware can be updated in the field via the USB port; see *'Firmware Update'* for more details.

## USB Interface

Using the USB interface for remote control requires a Communications Device Class driver on the PC to provide a virtual COM port instance.

Windows 10 and later will automatically install a suitable driver. In earlier versions of Windows, a suitable driver is provided by Microsoft, but it is not installed by default. The data (.INF) file to control the installation is provided on the website: www.aimtti.com

If required, unzip the contents of the downloaded USB driver.

**NOTE**

The same driver is also used by many other TTi instruments and may already be known to the PC.

### Installing USB driver for the first time

To install the driver for the first time:

- First switch the unit On.
- Then connect the USB port to PC.

**NOTE**

In Windows 10 or later, the driver is automatically installed by the operating system.

The Windows plug and play functions should automatically recognise the attachment of new hardware to the USB interface and (possibly after searching the internet for some time) prompt for the location of a suitable driver.

Follow the Windows prompts and point to the downloaded driver file named USB_ARM_VCP_xxx.INF, where xxx is a version number.

In some cases, Windows will not complete this procedure (especially recent versions which search the internet first, looking for the unique Vendor ID and Product ID), in which case the instrument will show in Device Manager as “not working properly”. If this happens, select this device, right click, and choose “update driver software...”, followed by: “browse this computer for driver software...”; then locate the downloaded .INF file.

Once Windows has installed the device driver it will assign a COM port number to this particular unit. This number will depend on previous COM port assignments on this PC, and it may be necessary to use Device Manager to discover it. Each instrument has a unique USB identifier which is remembered by the system, so it will receive the same COM port number whenever it is attached to the same PC (regardless of the physical interface socket used), even though the COM port will disappear while the instrument is disconnected or switched off. Other instruments will receive different COM port numbers.

**NOTE**

A different PC will not necessarily assign the same COM port number to a particular instrument (it depends on the history of installations). Device Manager can be used to change the assignments given.

### Command Timing

There are no dependent parameters, coupled parameters, overlapping commands, expression program data elements or compound command program headers.

All commands are separate and sequential and are executed when parsed and immediately considered complete. To provide useful functionality, the Operation Complete bit (bit 0) in the Standard Event Status Register is only ever set by the *OPC command. Either the *OPC command or the *OPC? query can be used for device synchronisation due to the sequential nature of remote operations.

## Status Reporting

Error status is maintained using a set of registers; these are described in the following paragraphs and shown on the Status Model at the end of this section.

### Standard Event Status and Standard Event Status Enable Registers

Any bits set in the Standard Event Status Register which correspond to bits set in the Standard Event Status Enable Register will cause the ESB bit to be set in the Status Byte Register.

The Standard Event Status Register is read and cleared by the *ESR? command. The Standard Event Status Enable register is set by the *ESE<NR1> command and read by the *ESE? command.

On power up this register is set to 0 for all interface instances.

Bit 7 Set when power is first applied to the instrument.
Bit 6 User Request (Not used).
Bit 5 Set when a syntax type error is detected in a command from the bus. The parser is reset and parsing continues at the next byte in the input stream

| | |
|---|---|
| Bit 4 | Set when an error is encountered while attempting to execute a completely parsed command. The appropriate error number will be reported in the Execution Error Register. |
| Bit 3 | Not used. |
| Bit 2 | Set when a query occurs. The appropriate error number will be reported in the Query Error Register, see 'Error messages' section. |
| Bit 1 | Not used. |
| Bit 0 | Set in response to the '*OPC' command |

### Status Byte Register

The Status Byte Register is read either by the *STB? command, which will return MSS in bit 6, or by a Serial Poll which will return RQS in bit 6.

On power up this register is set to 0 for all interface instances.

| | | |
|---|---|---|
| Bit 7 | OPEN | This bit is set if any bits in the STATus:OPERation:CONDition register correspond to bits set in the STATus:OPERation:ENABle register. |
| Bit 6 | RQS/ MSS | This bit, as defined by IEEE Std. 488.2, contains both the Requesting Service message and the Master Status Summary message. RQS is returned in response to a Serial Poll and MSS is returned in response to the *STB? command. |
| Bit 5 | ESB | This bit is set if any bits set in the Standard Event Status Register correspond to bits set in the Standard Event Status Enable Register. |
| Bit 4 | MAV | This will be set when the instrument has a response message formatted and ready to send to the controller. The bit will be cleared after the Response Message Terminator has been sent. |
| Bit 3 | | Not used. |
| Bit 2 | EAV | Error Queue is not empty. This will be set when there is one or more entries in the error queue. |
| Bit 1 | | Not used. |
| Bit 0 | INST | Set when a limit/trip has been detected on any of the channels from operation instrument summary register (OISR). |

### Operation Instrument Summary Register

Any bits set in the Operation Instrument Summary Enable registers which correspond to bits set in the Operation Instrument Summary Register will cause the INST bit to be set in the Status Byte Register.

The Operation Instrument Summary Register is read and cleared by the *OISR? command. The Operation Instrument Summary Enable register is set by the *OISE <NR1> command and read by the *OISE? command.

It is a bit field where each bit has the following significance.

On power up this register is set to 0 for all interface instances.

| | |
|---|---|
| Bit 15 | Reserved for future use |
| Bit 14 | Reserved for future use |
| Bit 13 | Reserved for future use |
| Bit 12 | Reserved for future use |
| Bit 11 | Summary of ETR4 and ETE4 registers |
| Bit 10 | Summary of ISR4 and ISE4 registers |
| Bit 9 | Summary of CSR4 and CSE4 registers |
| Bit 8 | Summary of ETR3 and ETE3 registers |
| Bit 7 | Summary of ISR3 and ISE3 registers |

Bit 6 Summary of CSR3 and CSE3 registers
Bit 5 Summary of ETR2 and ETE2 registers
Bit 4 Summary of ISR2 and ISE2 registers
Bit 3 Summary of CSR2 and CSE2 registers
Bit 2 Summary of ETR1 and ETE1 registers
Bit 1 Summary of ISR1 and ISE1 registers
Bit 0 Summary of CSR1 and CSE1 registers

### Channel Status and Channel Status Enable Registers

Their purpose is to inform the controller of entry to and/or exit from any conditions since the last read.

Any bits set in the Channel Status Register (CSR<N>) which correspond to bits set in the Channel Status Enable register (CSE<N>) will cause the CSR<N> bit to be set in the Operation Instrument Summary Register, where <N> is 1 for output 1.

The Channel Status Register is read and cleared by the CSR<N>? command. The Channel Status Enable register is set by the CSE<N> <NR1> command and read by the CSE<N>? command.

On power up this register is set to 0 for all interface instances.

Bit 15 Reserved for future use
Bit 14 Reserved for future use
Bit 13 Reserved for future use
Bit 12 Reserved for future use
Bit 11 Reserved for future use
Bit 10 Reserved for future use
Bit 9 Reserved for future use
Bit 8 Reserved for future use
Bit 7 Reserved for future use
Bit 6 Reserved for future use
Bit 5 Reserved for future use
Bit 4 Set when output modulation is enabled
Bit 3 Set when output is clipped.
Bit 2 Set when output enters power limit (unregulated mode)
Bit 1 Set when output enters current limit (constant current mode)
Bit 0 Set when output enters voltage limit (constant voltage mode)

### Input State Register

Their purpose is to inform the controller of entry to and/or exit from any conditions since the last read.

Any bits set in the Input State Register (ISR<N>) which correspond to bits set in the Input State Enable register (ISE<N>) will cause the ISR<N> bit to be set in the Operation Instrument Summary, where <N> is 1 for output 1.

The Input State Register is read and cleared by the ISR<N>? command. The Input State Enable register is set by the ISE<N> <NR1> command and read by the ISE<N>? command.

On power up this register is set to 0 for all interface instances.

Bit 15 Reserved for future use
Bit 14 Reserved for future use
Bit 13 Reserved for future use
Bit 12 Reserved for future use

| | |
|---|---|
| Bit 11 | Reserved for future use |
| Bit 10 | Reserved for future use |
| Bit 9 | Reserved for future use |
| Bit 8 | Reserved for future use |
| Bit 7 | Reserved for future use |
| Bit 6 | Reserved for future use |
| Bit 5 | Low Voltage Limiting Event |
| Bit 4 | Duty cycle protect: Set in 600W mode if the permitted power and time limit is exceeded. If no action is taken, an Over Power Protect Trip will follow 10 seconds later. |
| Bit 3 | The load is not conducting current because the source voltage is below the dropout voltage setting. |
| Bit 2 | The load is not conducting the current expected because the power limit circuit is restricting it. |
| Bit 1 | The load cannot conduct the current required because there is insufficient voltage from the source. |
| Bit 0 | Reports the present state of the input enable setting. |

### Event Trip Register

Their purpose is to inform the controller of entry to and/or exit from any conditions since the last read.

Any bits set in the Event Trip Register (ETR<N>) which correspond to bits set in the Event Trip Enable register (ETE<N>) will cause the ETR<N> bit to be set in the Operation Instrument Summary, where <N> is 1 for output 1.

The Input State Register is read and cleared by the ETR<N>? command. The Input State Enable register is set by the ETE<N> <NR1> command and read by the ETE<N>? command.

On power up this register is set to 0 for all interface instances.

| | |
|---|---|
| Bit 15 | Reserved for future use |
| Bit 14 | Reserved for future use |
| Bit 13 | Reserved for future use |
| Bit 12 | Reserved for future use |
| Bit 11 | Reserved for future use |
| Bit 10 | Reserved for future use |
| Bit 9 | Set when a Powerflex event trip occurs. |
| Bit 8 | Set when a low voltage event trip occurs. |
| Bit 7 | Set when a high power event trip occurs. |
| Bit 6 | Set when Triplink event occurs. |
| Bit 5 | Set when hardware fault event occurs. |
| Bit 4 | Set when sense trip event occurs. |
| Bit 3 | Set when OTP event trip occurs. |
| Bit 2 | Set when OPP event trip occurs. |
| Bit 1 | Set when OCP event trip occurs. |
| Bit 0 | Set when OVP event trip occurs. |

### Execution Error Register

This register contains a number representing the last error encountered over the current interface. The Execution Error Register is read and cleared using the 'EER?' command. On power up this register is set to 0 for all interface instances.

Error messages have the following meaning:

| | |
|---|---|
| 0 | No error encountered |
| 101 | Command error |
| 103 | Data out of range |
| 104 | Command execution error. The command is valid, but a parameter is invalid or not valid in the current circumstances. |

### Standard Event Status Register

| | |
|---|---|
| Bit 7 | Set when power is first applied to the instrument. |
| Bit 6 | User Request (Not used). |
| Bit 5 | Set when a syntax type error is detected in a command from the bus. The parser is reset and parsing continues at the next byte in the input stream |
| Bit 4 | Set when an error is encountered while attempting to execute a completely parsed command. The appropriate error number will be reported in the Execution Error Register. |
| Bit 3 | Not used. |
| Bit 2 | Set when a query occurs. The appropriate error number will be reported in the Query Error Register, see 'Error messages' section. |
| Bit 1 | Not used. |
| Bit 0 | Set in response to the '*OPC' command |

### Operation Status Register

Any bits set in the Operation Status Enable register which correspond to bits set in the Operation Status Register will cause the OPEN bit to be set in the Status Byte Request Register.

The Operation Status Register is read and cleared by the *OSR? command. The Operation Status Enable register is set by the *OSE <NR1> command and read by the *OSE? command.

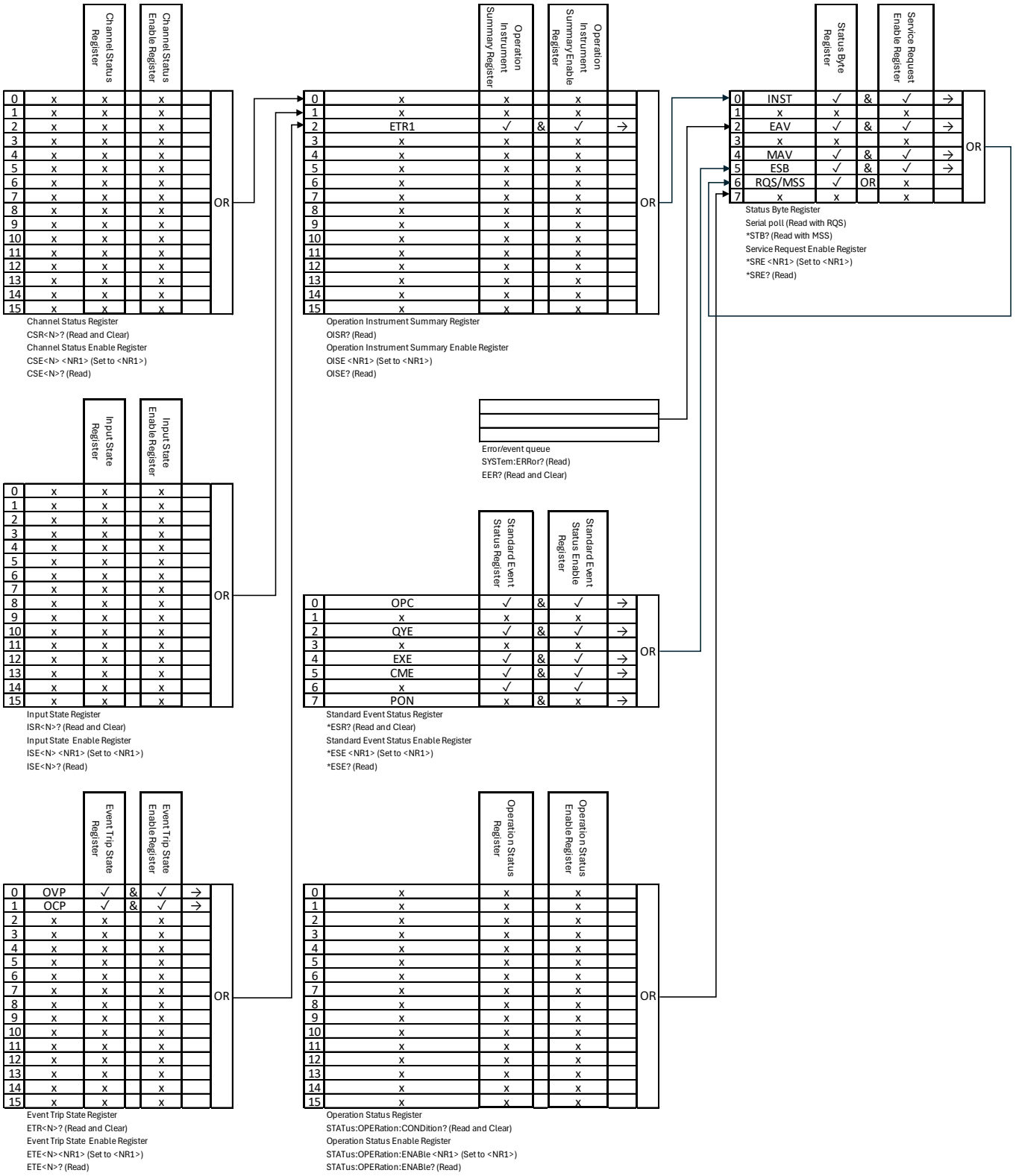
On power up this register is set to 0 for all interface instances.

### STATus:OPERation:CONDition / STATus:OPERation:ENABle

| | |
|---|---|
| Bit 15 | Reserved for future use |
| Bit 14 | Reserved for future use |
| Bit 13 | Reserved for future use |
| Bit 12 | There are measurements available in the buffer. |
| Bit 11 | Sequence mode running. |
| Bit 10 | Sequence mode currently active. |
| Bit 9 | Trigger in global pin detected. |
| Bit 8 | Set when the current calibration or test failed. |
| Bit 7 | Set when the instrument is currently performing a correction. |
| Bit 6 | Set when the instrument is in a "wait for arm" state of the trigger model. |
| Bit 5 | Set when the instrument is in a "wait for trigger" state of the trigger model. |
| Bit 4 | Set when the instrument is actively measuring. |
| Bit 3 | Set when a sweep is in progress. |
| Bit 2 | Set when the instrument is currently changing its range. |
| Bit 1 | Set when the instrument is waiting for signals it controls to stabilize enough to begin measurements. |
| Bit 0 | Set when the instrument is currently performing a calibration. |

# 12 - Remote Operation

## ADM1055 Status Model



# 13. SCPI COMMANDS

## SCPI Overview

This instrument uses SCPI (Standard Commands for Programmable Instruments) commands for remote control. The commands are based on SCPI Version 1999 and follow the syntax and rules including commands that are not taken from the SCPI standard. These commands are separated into two groups: common and subsystem.

Common commands are defined by the IEEE 488.2 standard to perform common instrument functions such as querying the status or resetting to default parameters.

Subsystem commands perform instrument specific functions and allow all operating parameters to be configured and queried. They are arranged in groups which correspond to particular functionality of the instrument. A tree structure is used extending to one or more levels below the root.

Square brackets ([ ]) are used to represent a keyword that is optional for the command. Uppercase letters are used to differentiate between the short and long form version of keywords.

**EXAMPLE**

The following command is used to change the measurement function to measure DC current:

[SENSe:]FUNCtion “CURRent[:DC]”

The parameter must be enclosed in quotes e.g. "CURRent[:DC]"

The above command can also be executed in below listed formats and they will all set the measurement function to measure DC current:

SENS:FUNC “CURR:DC”

FUNC “CURR”

---

Multiple SCPI commands can be combined into a single message using a semicolon as separator.

**EXAMPLE**

The combined message below will change the measurement function to measure DC current and the range to 1000mA. The appropriate range is selected based on the value sent.

[SENSe:]FUNCtion "CURRent[:DC]";:[SENSe:]CURRent[:DC]:RANGe 0.9

You can send any of the following to get the same result:
SENSe:FUNCtion "CURRent:DC";:SENSe:CURRent:DC:RANGe 0.9

SENS:FUNC "CURR:DC";:SENS:CURR:DC:RANG 0.9

FUNC "CURR";:CURR:RANG 0.9

The colon : character after ; in the above example is used to reset the SCPI parser to the root level. If the multiple commands in a single message are from the same SCPI subsystem then the colon may be omitted. A message terminator (typically a ‘new line’ character) completes the message and resets the current path to the root.

---

## EXAMPLE

The combined message below will enable the Math AXB function and set both A and B parameters:

Full commands:

CALCulate:MATH:TYPE AXB;CALCulate:MATH:AXB:A 1.23;CALCulate:MATH:AXB:B 2.34

Can be shortened to:

CALC:MATH:TYPE AXB;AXB:A 1.23;B 2.34

If the next command after a ; is in the same part or further down the tree the first part of the tree can be omitted.

## Parameter Data Format

| | |
|---|---|
| <NR1> | Digits with no fractional part, i.e., an integer Example: 451 |
| <NR2> | Digits with an explicit decimal point. Example: 0.451 |
| <NR3> | Digits with an explicit decimal point and an exponent. Example: 45.1e+01 |
| <NRF> | A number in any format. Example: 12, 12·00, 1·2 e1 and 120 e-1 are all accepted as the number 12 |
| <CPD> | <CHARACTER PROGRAM DATA>, i.e., a short mnemonic or string such as ON or OFF. Multiple CPDs in a command are shown as <CPD1>, <CPD2>, <CPD3>, etc. |
| <CRD> | <CHARACTER RESPONSE DATA> Returns a short mnemonic or string. Only the short form of the parameter is returned. |
| <Bool> | Boolean data. Example: 0 \| 1 or ON \| OFF |
| <Quad> | A number in dotted quad notation. |
| <Unquoted String> | String data without any quotation. |

## SCPI Subsystems

| | |
|---|---|
| :SENSe | The SENSe subsystem contains the commands for configuring measurement modes. |
| :CALCulate | The CALCulate subsystem contains the commands for configuring any calculations performed on the primary signal sense reading. |
| :TRIGger | The TRIGger subsystem contains the commands for configuring measurement triggering. |
| :STATus | The STATus subsystem is used to query the Operation Condition Register. |
| :SYSTem | The SYSTem subsystem is used for a number of functions not associated with the input signal, such as configuring the USB. |

## Query commands

All commands (with the exception of any set in Orange) can be presented as a query command by adding '?' at the end, this will return the current set value or parameter as <...> Commands set in Blue are query only.

### Global

***IDN?**

Query the instrument identification. The exact response is determined by the instrument configuration and is of the form of <Manufacturer, Model,Serial No., XX.xx>

**FW?**

Query the instrument firmware versions.

### Status

***STB?**

Query the value of the Status Byte register in <NR1> numeric format. The response is <NR1>. See *'Status Reporting'* for details.

***SRE <NR1>**

Set or return the Status Byte Enable register in <NR1> numeric format. The query response is <NR1>. See *'Status Reporting'* for details.

**OISR?**

Query the Operation Instrument Summary Register in <NR1> numeric format. The response is <NR1>. See *'Status Reporting'* for details.

**OISE <NR1>**

Set or return the Operation Instrument Summary Enable register in <NR1> numeric format. The query response is <NR1>. See *'Status Reporting'* for details.

**ETR1?**

Query the value of the Event Trip Register in <NR1> numeric format. The response is <NR1>. See *'Status Reporting'* section for details.

**ETE1 <NR1>**

Set or return the value of the Event Trip Enable register in <NR1> numeric format. The query response is <NR1>. See *'Status Reporting'* for details.

**EER?**

Query the most recent error number. The response is <NR1>.

***ESR?**

Query the value in the Standard Event Status Register in <NR1> numeric format. The register is then cleared. The response is <NR1>. See *'Status Reporting'* for details.

***ESE <NR1>**

Query the value in the Standard Event Status Enable register in <NR1> numeric format. The response is <NR1>. See *'Status Reporting'* for details.

***OPC**

Set the Operation Complete bit (bit 0) in the Standard Event Status Register. This will happen immediately when the command is executed because of the sequential nature of all operations. Querying returns a 1 when all pending device operations have completed. Can be used to verify when a long-running command has completed.

**STATus:OPERation:CONDition?**

Query the Status Operation Condition register. The response is <NR1>. See *'Status Reporting'* for details.

**STATus:OPERation:ENABle <NR1>**

Set or return the Status Operation Enable register. The query response is <NR1>. See *'Status Reporting'* for details.

**QER?**

Query and clear Query Error Register. The response is <NR1>.

***TRG**

Start a Trigger and Hold run.

***RST**

Reset the instrument parameters to their default values.

***CLS**

Clear Status. Clears the Status structure. This indirectly clears the Status Byte Register.

## System

**SYSTem:ERRor[:NEXT]?**

Query the next error from the error log. If the log is empty "0, No Error" is returned.

**SYSTem:TRIGger**

Start a Trigger and Hold run.

**SYSTem:LOCal**

Go to local. Stops the instrument from being in remote mode. Same as pressing Home when the 'Remote' LED is lit. When another command is received, the instrument will return to remote mode.

**[SENSe:]PROTection:CLEar**

Attempt to clear all trips.

## Trigger

**TRIGger:COUNt <NR1>**

Set or return the number of measurements that will be taken in a Trigger and Hold run.

## Sense

**[SENSe:]FUNCtion <String>**

Set or return the measurement function to <String> VOLTage[:DC]|VOLTage:AC|CURRent[:DC]|CURRent:AC|RESistance|CONTinuity|DIODe|FREQuency|CAPacitance. The parameter must be enclosed in quotes e.g. FUNC "VOLT:AC" will put it in AC Voltage measurement Mode. The query response is <String>.

**[SENSe:]FUNCtion:UNIT?**

Query the primary measurement units.

**[SENSe:]FUNCtion:UNIT2?**

Query the secondary measurement units.

**[SENSe:]HOLD[:STATe] <Bool>**

Set or return the Hold function enabled state. The query response is <NR1>.

**[SENSe:]THOLd[:STATe] <Bool>**

Set or return the Touch Hold function enabled state. The query response is <NR1>.

**[SENSe:]ZERo[:ONCe]**

Perform an Auto Zero.

## Voltage

DC

**[SENSe:]VOLTage[:DC]:RANGe <NRF>**

Set or return the DC Voltage range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]VOLTage[:DC]:RANGe:AUTO[:STATe] <Bool>**

Set or return the DC Voltage auto range enabled state. The query response is <NR1>.

AC

**[SENSe:]VOLTage:AC:RANGe <NRF>**

Set or return the AC Voltage range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]VOLTage:AC:RANGe:AUTO[:STATe] <Bool>**

Set or return the AC Voltage auto range enabled state. The query response is <NR1>.

## Current

DC

**[SENSe:]CURRent[:DC]:RANGe <NRF>**

Set or return the DC Current range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]CURRent[:DC]:RANGe:AUTO[:STATe] <Bool>**

Set or return the DC Current auto range enabled state. The query response is <NR1>.

AC

**[SENSe:]CURRent:AC:RANGe <NRF>**

Set or return the AC Current range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]CURRent:AC:RANGe:AUTO[:STATe] <Bool>**

Set or return the AC Current auto range enabled state. The query response is <NR1>.

## Resistance

**[SENSe:]RESistance:RANGe <NRF>**

Set or return the Resistance range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]RESistance:RANGe:AUTO[:STATe] <Bool>**

Set or return the Resistance auto range enabled state. The query response is <NR1>.

**[SENSe:]RESistance:NULL**

Perform a Resistance Null to null out the resistance of any cables connected to the instrument.

## Capacitance

**[SENSe:]CAPacitance:RANGe <NRF>**

Set or return the Capacitance range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]CAPacitance:RANGe:AUTO[:STATe] <Bool>**

Set or return the Capacitance auto range enabled state. The query response is <NR1>.

## Frequency

**[SENSe:]FREQuency:RANGe <NRF>**

Set or return the Frequency range. The query response is <NRF>. When auto range is enabled it returns the active range. The appropriate range is selected based on the value sent.

**[SENSe:]FREQuency:RANGe:AUTO[:STATe] <Bool>**

Set or return the Frequency auto range enabled state. The query response is <NR1>.

## Measure

**READ?**

Query the primary measurement. See *'Overview'* for more details. The response is <NRF>.

**READ2?**

Query the secondary measurement. See *'Overview'* for more details. Response is one of the following <NRF>|NONE|HIGH|PASS|LOW. High, pass and low are returned if MATH is set to limit. None is returned if there is no secondary measurement in this function.

## Calculate

**CALCulate:MATH:TYPE <String>**

Set or return the Math function type to <String> OFF|LIMits|AXB|DEViation|POWer|DB. The query response is <String>.

**CALCulate:NULL[:STATe] <Bool>**

Set or return the Null function enabled state. The query response is <NR1>.

## Statistics

**CALCulate:MATH:MINimum?**

Return the minimum value since the function was selected or the Reset command was sent. The response is <NRF>.

**CALCulate:MATH:MAXimum?**

Return the maximum value since the function was selected or the Reset command was sent. The response is <NRF>.

**CALCulate:MATH:AVERage?**

Return the average value since the function was selected or the Reset command was sent. The response is <NRF>.

**CALCulate:MATH:SPAN?**

Return the difference between the maximum and minimum statistics. The response is <NRF>.

**CALCulate:MATH:RESet**

Reset the statistics.

## Limits

**CALCulate:MATH:LIMits:HIGH <NRF>**

Set or return the high level limit to <NRF>. Query returns <NRF>.

**CALCulate:MATH:LIMits:LOW <NRF>**

Set or return the low level limit to <NRF>. Query returns <NRF>.

### AXB

**CALCulate:MATH:AXB:A <NRF>**

Set or return the A level to <NRF>. Query returns <NRF>.

**CALCulate:MATH:AXB:B <NRF>**

Set or return the B level to <NRF>. Query returns <NRF>.

### Deviation

**CALCulate:MATH:DEViation <NRF>**

Set or return the Deviation level to <NRF>. Query returns <NRF>.

### Power

**CALCulate:MATH:POWer <NRF>**

Set or return the Reference Impedance to <NRF>. Query returns <NRF>.

### Decibels

**CALCulate:MATH:DB <NRF>**

Set or return the Reference Impedance to <NRF>. Query returns <NRF>.

# 14. MAINTENANCE

The Manufacturers or their agents overseas will provide a repair service for any unit developing a fault. Where owners wish to undertake their own maintenance work, this should only be done by skilled personnel in conjunction with the Service Guide, which may be requested directly from the Manufacturers or their agents overseas.

## Cleaning

If the instrument requires cleaning use a cloth that is only lightly dampened with water or a mild detergent, to avoid damage to the case never clean with solvents.

**WARNING**

To avoid electric shock, or damage to the instrument, never allow water to get inside the case.

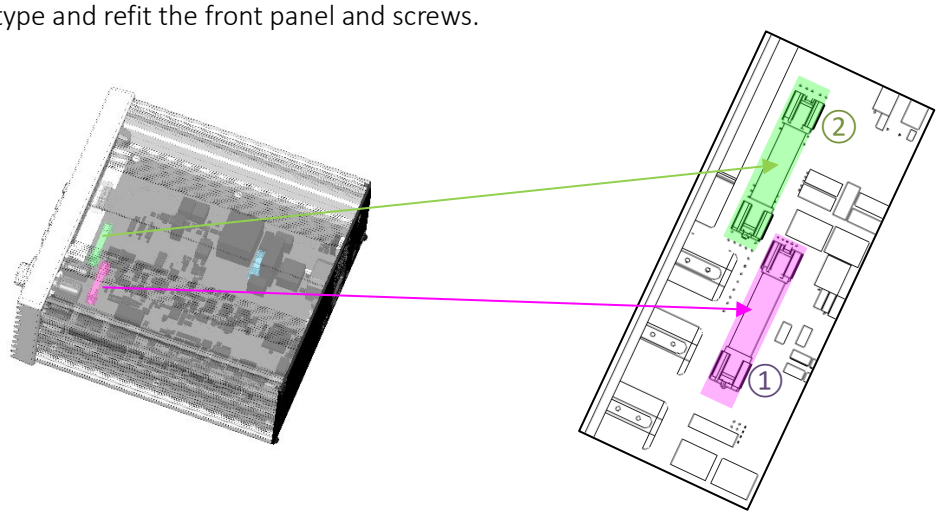
## Fuse Replacement

To replace the fuse, first disconnect the instrument from the AC supply.

**WARNING**

Disconnect the instrument from all voltage sources.

The current range fuses can be accessed by removing just the front panel. To remove the front panel, remove the 4 screws from the corners. Replace the fuse with one of the correct type and refit the front panel and screws.




### Current Range Fuse

The 1mA, 10mA, 100mA, and 1000mA ranges, using the 1A socket, are protected by a current trip circuit up to 48V, and a 1.6A (F) 1kV HRC fuse for over 48 V ①.

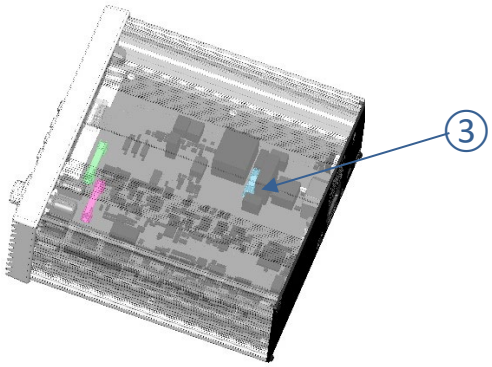
The 10A range, using the 10A socket, is protected by a 10A (F) 600V HRC fuse ②.

### Internal AC Power Fuse

To replace the Internal AC Power Fuse, remove the front panel as described in '*Fuse Replacement'*. Then remove the top cover by removing the top 2 screws on the rear panel and sliding the top cover away. Replace the fuse with one of the correct type and refit the top cover and front panel with the screws provided.

**WARNING**

The rear panel contains 'Earth Bond' screws, these must be refitted to ensure a safe earth bond.




③ The correct fuse type is: 1A 250V HRC time-lag (T), 5 x 20mm

Make sure that only fuses of the required rated current and specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse-holders is prohibited.

**NOTE**

The main function of the fuse is to make the instrument safe and limit damage in the event of failure. If a fuse fails it is therefore very likely that the replacement will also blow, because the instrument has developed a fault; in such circumstances the instrument will need to be returned to the manufacturer for service.

## Calibration

To ensure that the accuracy of the instrument remains within specification the calibration must be checked (and if necessary adjusted) annually. The procedure is detailed in the Service Guide, which also lists the calibrated test equipment required.

## Firmware Update

The firmware of the instrument can be updated through the USB port using a PC software utility available from the manufacturer. This uses a HID (human interface device) USB class driver which will already be installed on any PC with a USB port.

Before the firmware can be updated the instrument must be placed in a special mode that enables it to accept the update. Unless the instrument is placed in this mode it cannot be updated.

- Ensure that the USB interface is connected and the instrument is powered on. The instrument should be connected to the PC with a USB cable.
- Press and hold the 'USB UPDATE' button on the rear panel. If this has been done correctly then 'Firmware Update' will be displayed on the display.
- The instrument will now wait for an update from the PC via the USB connection and the Windows based update utility can now be run.
- The latest Firmware update, together with file transfer utility can be downloaded from https://www.aimtti.com/
- Once downloaded, unzip the file, and run the File Transfer Utility application.
- Within the File Transfer Utility application, select File and Open.
- Open the ADM1055.ttiupd file.
- Select Start Update.
- The instrument will power cycle and be ready to use one the update is complete.

**NOTE**

After a Firmware update, the settings will automatically be reset to default.

# 15. TECHNICAL SPECIFICATIONS

## Measurement Parameters and Accuracy

Accuracies apply for 1 year 19°C to 25°C after 30 minutes warm-up.
Temperature coefficient outside these limits is <0.1 x quoted range accuracy per °C.
General specifications apply for the temperature range 5°C to 40°C.
Typical specifications are determined by design and are not guaranteed.

The scale length is 120,000 counts (unless otherwise stated) giving a maximum measured value for each range of 119,999. Thus, for the 100V range the maximum measured value is 119.999 volts
Accuracies are quoted in terms of a percentage of the measured value plus a number of least significant counts.



Reading Rate: 4 readings per second.

| DC Voltage | | |
|---|---|---|
| Range | Accuracy ± (% of reading + counts) | Resolution |
| 100.000mV | 0.02% + 5* | 1uV |
| 1000.00mV | 0.02% + 3 | 10uV |
| 10.0000V | 0.025% + 3 | 100uV |
| 100.000V | 0.025% + 3 | 1mV |
| 600.00V | 0.04% + 6 | 10mV |
| Typical Input Impedance: | 10MΩ//<1000pF | |
| Maximum Input: | 600V DC or AC peak, any range. | |
| CMR: | 1kΩ unbalanced CMR is >90dB at DC/50Hz/60Hz. | |

**after null*

| AC Voltage | True RMS | | | |
|---|---|---|---|---|
| Range | Accuracy ± (% of reading + counts) | | | Resolution |
| | 45Hz – 10kHz | 10kHz – 30kHz | 30kHz – 50kHz | |
| 100.000mV | 0.2% + 200 | 1.5% + 300 | - | 1uV |
| 1000.00mV | 0.2% + 100 | 0.5% + 100 | 2% + 250 | 10uV |
| 10.0000V | 0.2% + 100 | 0.5% + 100 | 2% + 250 | 100uV |
| 100.000V | 0.2% + 100 | 0.5% + 100 | 2% + 250 | 1mV |
| 430.00V | 0.2% + 100 | 0.5% + 100 | 2% + 250 | 10mV |
| Accuracy specifications apply for readings between 10,000 and 120,000 counts. | | | | |
| Maximum crest factor = 3 at nominal range maximum. | | | | |
| Input Impedance: | 1MΩ//<1000pF | | | |
| Maximum Input: | 430V rms, 600V peak; any range. | | | |
| CMR: | 1kΩ Unbalanced CMR is >70dB at DC/50Hz/60Hz | | | |

# 15 - Technical Specifications

| Resistance | | |
|---|---|---|
| Range | Accuracy ± (% of reading + counts) | Resolution |
| 100.000Ω | 0.075% + 8 | 1mΩ |
| 1000.00Ω | 0.075% + 3 | 10mΩ |
| 10.0000kΩ | 0.075% + 3 | 100mΩ |
| 100.000kΩ | 0.075% + 3 | 1Ω |
| 1000.00kΩ | 0.5% + 5 | 10Ω |
| 10.0000MΩ | 0.5% + 5 | 100Ω |
| Maximum Input: | 600V DC or AC rms, any range. | |
| Max. O/C Voltage: | 3.5V | |

| DC Current | | |
|---|---|---|
| Range | Accuracy ± (% of reading + counts) | Resolution |
| 1.00000mA | 0.05% + 5 | 10nA |
| 10.0000mA | 0.05% + 5 | 100nA |
| 100.000mA | 0.05% + 5 | 1µA |
| 1000.00mA | 0.2% + 5 | 10µA |
| 10.0000A(<5A) | 0.2% + 5 | 100µA |
| 10.0000A(>5A) | 0.5% + 10 | 100µA |
| Maximum Input: | mA ranges- 1.6A DC or AC rms, 48V resettable trip circuit, 600V fuse protected. | |
| | 10A range- 10A DC or AC rms, 600V, fuse protected. | |
| Voltage Burden: | 1mA range ≤125mV; | |
| | 10mA range ≤140mV; | |
| | 100mA range ≤180mV; | |
| | 1A range ≤800mV; | |
| | 10A ranges ≤600mV; | |

| AC Current | True RMS (45Hz – 10kHz) | |
|---|---|---|
| Range | Accuracy ± (% of reading + counts) | Resolution |
| 1.00000mA | 0.35% + 20 | 10nA |
| 10.0000mA | 0.35% + 20 | 100nA |
| 100.000mA | 0.35% + 20 | 1µA |
| 1000.00mA | 0.5% + 20 | 10µA |
| 10.0000A(<5A) | 0.5% + 20 | 100µA |
| 10.0000A(>5A) | 1.0% + 20 | 100µA |
| Accuracy specifications apply for readings between 10,000 and 120,000 counts. | | |
| Maximum crest factor = | 3 is typically 0.5% | |
| Maximum Input: | mA ranges- 1.6A DC or AC rms, 48V resettable trip circuit, 600V fuse protected. | |
| | 10A range- 10A DC or AC rms, 600V, fuse protected. | |
| Voltage Burden: | 1mA range ≤125mV; | |
| | 10mA range ≤140mV; | |
| | 100mA range ≤180mV; | |
| | 1A range ≤800mV; | |
| | 10A ranges ≤600mV; | |

| Frequency | | |
|---|---|---|
| Range | Accuracy ± (% of reading + counts) | Resolution |
| 100.00Hz | 0.01% + 1 | 10mHz |
| 1000.0Hz | 0.01% + 1 | 100mHz |
| 10.000kHz | 0.01% + 1 | 1Hz |
| 100.00kHz | 0.01% + 1 | 10Hz |
| Scale Length: | 12,000 counts | |
| Frequency Range: | 10Hz to >100kHz | |
| Input sensitivity: | Better than 30mVrms (100mV range); better than 10% of range for all other Vac and Iac ranges. | |

| Capacitance | | |
|---|---|---|
| Range | Accuracy ± (% of reading + counts) | Resolution |
| 100.0nF | 2% + 5 | 100pF |
| 1.000µF | 2% + 5 | 1nF |
| 10.00µF | 2% + 5 | 10nF |
| 100.0µF | 2% + 5 | 100nF |
| Scale Length: | 1200 counts | |

Continuity and Diode Test

| | |
|---|---|
| Continuity: | 100Ω range selected; audible tone sounds for impedance <10Ω. |
| Diode Test: | Test current approximately 1mA; displays voltages up to 1.2V. |
| Max. O/C Voltage: | 3.5V |
| Maximum Input: | 600V DC or AC rms, any range. |

## Computing Functions & Statistics

| | |
|---|---|
| Null (relative) | Stores current reading and subtracts it from future readings. |
| Ω Null | Additional non-volatile function for nulling test lead resistance. |
| Hold | Reading is frozen. |
| T Hold | (Touch & Hold) Reading is frozen when stable. |
| % Deviation: | Displays % deviation from entered reference value. |
| Ax+b: | Linear scaling of results, with offset. |
| Limits: | Reading displayed with HI, LO, or PASS with respect to user-defined high and low limits. |
| dB: | Displays measurement in dBm relative to 600Ω or other user-entered impedance. |
| Power: | Calculates V2/R and displays in Watts with respect to a user-defined impedance. |
| Min/Max: | Minimum and maximum reading stored. |
| Average: | Mean of readings. |
| Span: | Span of readings (between minimum and maximum). |
| Counts: | Number of readings included within statistical analysis. |

## Interfaces

| | |
|---|---|
| USB | Full digital remote control facilities are available through the USB interface.<br>Standard USB 2.0 hardware connection. Implemented as virtual-COM port.<br>SCPI compatible |
| Remote Command Processing Time | Typically < 100ms |

## General

| | |
|---|---|
| Terminals | 4mm Banana sockets on 19mm spacing. |
| Display | 2.8" IPS TFT (320x240) Backlit, 4W resistive touch. |
| Data Entry | Resistive touch screen user interface navigation, hard key measurement function selection, value entry by directional keys or by rotary control. |
| Stored Settings | Up to 6 complete instrument set-ups may be stored in non-volatile memory. |
| Size and Weight | 213.3 x 227.6 x 98.2 mm (WxDxH)<br>1.3kg |
| Power | 110-240VAC ±10% 50/60Hz; 30VA max.<br>Installation Category II. |
| Operating Range | +5°C to 40°C, 20-80% RH. |
| Storage Range | -20°C to + 60°C. |
| Cooling | Natural convection, no fan. |
| Environmental | Indoor use at altitudes up to 2000m, Pollution Degree 2. |
| Safety & EMC | Complies with EN61010-1, EN61010-2-030, EN61010-2-033 & EN61326-1.<br>Measurement Category II to 300V.<br>All inputs 600Vpk max to ground. |
| Security | Kensington Lock |

*Thurlby Thandar Instruments Ltd. operates a policy of continuous development and reserves the right to alter specifications without prior notice.*

# 16. DEFAULT VALUES

When supplied from the factory the instrument is set as follows:

| | |
|---|---|
| Measurement Function | VDC |
| Range | 100mV (Manual) |
| Math | None |
| Null | Off |
| Hold | Off |
| T-Hold | Off |
| High Limit | 1.0 |
| Low Limit | -1.0 |
| A | 10.0 |
| B | 100.0e-3 |
| Deviation | 1.0 |
| Power Ref | 50Ω |
| dB Ref | 50Ω |
| Trigger Count | 100 |

### System Level Settings

| | |
|---|---|
| Power-On state | Defaults |
| Buzzer | Off |
| Brightness | 80% |
| Theme | Blue |

The default values can be restored from the “Reset to factory Defaults” function – see ‘*Reset Defaults’*.

# 17. SCPI COMMANDS INDEX

# 17 - SCPI Commands index

## EXCELLENCE THROUGH EXPERIENCE

**Aim-TTi is the trading name of Thurlby Thandar Instruments Ltd. (TTi), one of Europe's leading manufacturers of test and measurement instruments.**

**The company has wide experience in the design and manufacture of advanced test instruments and power supplies built up over more than thirty years.**

**The company is based in the United Kingdom, and all products are built at the main facility in Huntingdon, close to the famous university city of Cambridge.**

## TRACEABLE QUALITY SYSTEMS

**TTi is an ISO9001 registered company operating fully traceable quality systems for all processes from design through to final calibration.**

**ISO9001:2015**

**Certificate number FM 20695**

## WHERE TO BUY AIM-TTI PRODUCTS

**Aim-TTi products are widely available from a network of distributors and agents in more than sixty countries across the world.**

**To find your local distributor, please visit our website which provides full contact details.**

**Designed and built in Europe by:**

**Thurlby Thandar Instruments Ltd.**
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