THURLBY THANDAR INSTRUMENTS

1705

High resolution bench/portable true RMS multimeter

Dual display, dual measurement

High accuracy, resolution & bandwidth

performance beyond the capability of hand-helds

Dual display system

The 1705 has both a main display and a secondary display. The two displays can be used for a variety of purposes:

- *To show the selected range in addition to the measurement units (e.g. 100mA dc).*
- *To display a measurement in two different units (e.g. ac volts and dBm).*
- *To display the result of a calculated function (e.g. Ωs value and % deviation).*
- *To measure and display two parameters of one signal (e.g. ac and dc volts).* ✶
- *To measure and display two different signals (e.g. ac volts and dc current).* ✶

High resolution & accuracy

The 1705 is a 4¼ digit meter with a scale length of 12,000 counts and a resolution of 10µV, 10mΩ and 0.1µA.

Combined with a high basic dcV accuracy of 0.04%, it provides measurements that are an order of magnitude better than most hand-held DMMs.

Auto or manual ranging

The 1705 offers fully automatic ranging on all functions. Alternatively, ranges can be selected manually.

Unlike other meters, the range value can be clearly shown on the secondary display avoiding any possibility of confusion.

Mains or battery operation

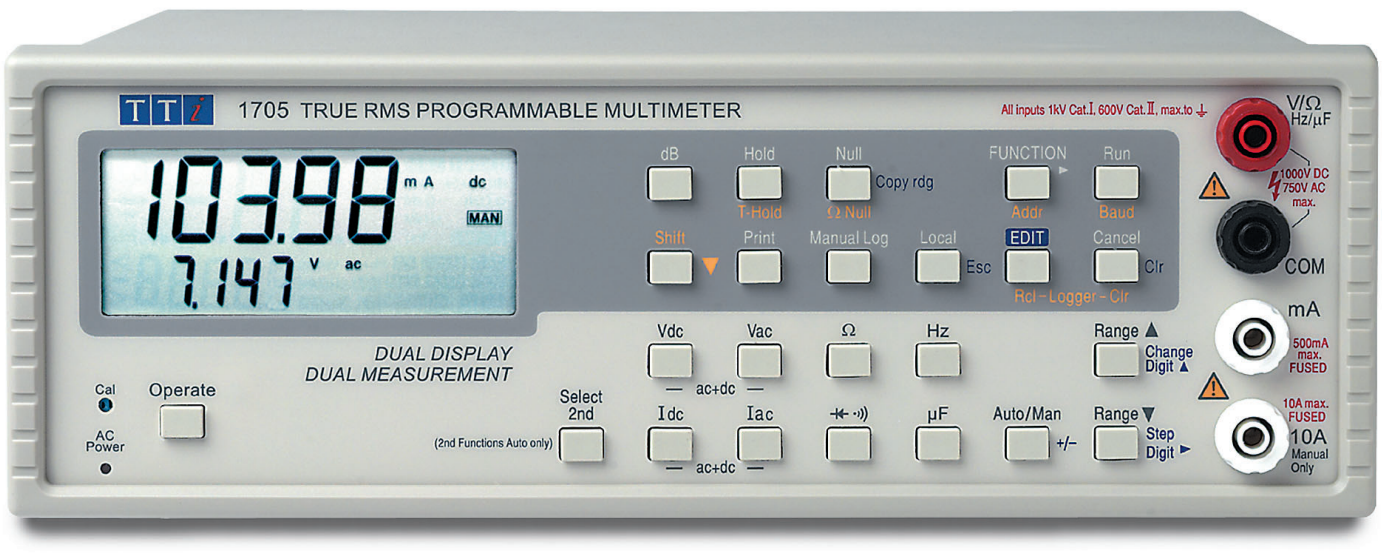
The 1705 can operate either from ac mains or from batteries (disposable or rechargeable). In battery mode it can operate for up to 80 hours.

Dual measurement ✶

The 1705 can measure and display two signals simultaneously. These can be two parameters of one signal (e.g. ac volts & dc volts) or two signals applied to different sockets (e.g. ac volts & ac current).

Examples

Main display	Secondary display	Signal inputs
dc Volts	ac Volts	1
dc Volts	ac Amps	2
ac Volts	Frequency	1
ac Volts	dc Amps	2
dc Amps	ac Amps	1
ac Amps	ac Volts	2



- *High performance 12,000 count autoranging DMM*
- *High accuracy and resolution: 0.04%, 10µV, 10mΩ*
- *Dual display and dual measurement technology* ✶
- *Large and clear LCD (17mm digits) with annunciators* ✶✶
- *True RMS ac functions; Frequency and Capacitance*
- *Wide range of computing functions, e.g. Ax + b*
- *100 step data-logger, timed or triggered logging*
- *RS232 interface standard, GPIB interface optional*
- *Mains and battery operation as standard*

Closed case calibration

The 1705 stores its calibration constants in protected memory and can be recalibrated without ever opening the case.

Full safety protection

The 1705 incorporates extensive protection against damage from accidental overloads on all ranges including 10 Amps.

It also meets the stringent safety requirements of EN61010-1 for measurements up to 1kV (Cat. I) or 600V (Cat. II).

Dual displays & dual measurement

'smart' functions, RS232 or GPIB interfaces

Wide true RMS ac

The 1705 provides True RMS ac response which gives accurate measurements regardless of the waveform shape.

The wide bandwidth attenuator provides high accuracy within the audio band and gives extended response to avoid errors when measuring switching waveforms.

Measurements are normally ac coupled but, when required, the true RMS value of the ac plus dc components can be shown.

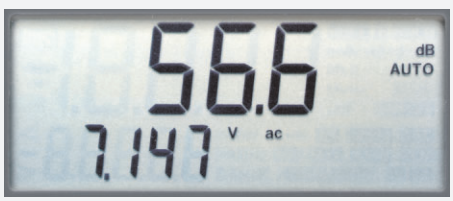
Frequency & capacitance

The 1705 offers high accuracy frequency measurement (better than 0.01%) from 10Hz to 120kHz. It uses a reciprocal counting technique to give up to 0.01Hz resolution at 10 readings per second.

The 1705 also incorporates capacitance measurement in four ranges up to 120µF.

More information

The 1705 has a number of powerful built-in functions designed to make life easier for the user. Most of these functions make use of the dual displays to provide extra information.



Examples

Function	Main display	Secondary display
dB	dBm	ac Volts
Null	nulled value	raw value
Power	ac Volts	V^2/R
VA	dc Amps	Volts x Amps
Limits	Resistance	Hi/Lo/Pass
Ax + B	dc Volts	Weight

Tracking 'hold'

The T-Hold function freezes the display every time a new but stable reading is detected. This avoids the problem of trying to watch the test points and the display simultaneously. Alternatively, a simple Hold function is also available.

Relative measurement

The null function stores the current reading and subtracts it from future readings giving a 'relative' display. The nulled and normal readings can be viewed together.

A separate Ω-null function retains an independent null value for resistance measurements enabling test lead resistance to be permanently nulled out.

Smart functions for added power

dB measurements

AC voltages can be displayed in dB as well as voltage Built-in zero reference scaling enables voltages to be displayed in dBm relative to any required impedance.

Linear scaling with offset

This function enables a reading to be multiplied by a scale factor (A) and for an offset (b) to be added or subtracted.

This means, for example, that the electrical output of a transducer can be scaled to give a direct readout of the physical parameter e.g. temperature or weight. It is particularly useful with 4-20mA current loops.

Limits comparison

This function enables the reading to be tested against high and low limits set by the user. The display then shows HI, LO or PASS in addition to the measurement result.

Percentage deviation (Δ%)

This function enables the meter to display the percentage amount by which the reading differs from a nominal value chosen by the user. It is invaluable for measuring tolerance or stability.

Min-Max storage

The Min-Max function stores the highest and lowest values of a set of readings.

This facility has many uses such as checking for power supply glitches, recording peak temperature excursions and avoiding 'missed' readings when using the Logger function.

Power measurement in Watts or VA

In addition to dBs, the 1705 can measure power in Watts or VA.

For resistive loads the Watts function calculates V^2/R for any load resistance between 1Ω and 10kΩ, a particularly useful function for audio measurements.

The VA function makes use of the dual measurement capability and displays the product of voltage and current.

Automatic data logging

The 1705 can store up to 100 readings at any required time interval from 1 reading per second up to 1 reading every 3 hours.

A simple recall sequence allows the readings to be scrolled onto the display whenever required. Alternatively results can be downloaded using RS232 or GPIB.

As a result, tedious time related measurement sequences can be handled automatically without disrupting your work.

Manual storage of readings is also available eliminating the need for paper and pencil when making a series of measurements. Storage can also be triggered from contact closure or the digital interfaces.

Full bus control via RS-232 or GPIB

The 1705 has an RS-232 interface as standard which can be used for remote control and read-back of measurements.

As well as operating as a conventional RS-232 interface, it can also be used in addressable mode whereby up to 32 instruments can be linked to one PC serial port as part of a TTi 'ARC' system. A GPIB interface is available as an option.

* *The 1705 uses a true dual measurement, dual display technique licensed under U.S. Patent No. 4 825 392. Low cost meters incorporating two displays do not have the same functionality.*

** *Screen illustrations are at approximately 70% of actual size.*

Technical Specifications

ACCURACY (Main Measurement Functions)

Accuracies apply for 1 year, 19°C to 25°C. Temperature coefficient outside these limits is <0.1 x quoted range accuracy per °C

DC Volts

Range	Accuracy	Resolution	Notes
100mV	0.06% ± 3 dig.	10µV	Input impedance 10MΩ nominal Max. input 1kV DC or AC pk NMR: >60dB @ 50/60Hz CMR: >90dB @ DC/50Hz/60Hz
1V	0.04% ± 2 dig.	100µV	
10V	0.06% ± 2 dig.	1mV	
100V	0.06% ± 2 dig.	10mV	
1000V	0.06% ± 2 dig.	100mV	

AC Volts (True RMS)

Range	Accuracy			Resolution
	45Hz - 10kHz	10kHz - 20kHz	20kHz - 50kHz	
100mV	0.2% ± 20 dig.	1% ± 20 dig.	N/A	10µV
1V		0.2% ± 20 dig.	1% ± 50 dig.	100µV
10V			1% ± 80 dig.	1mV
100V			1% ± 80 dig.	10mV
750V			N/A	100mV

1V, 10V, 100V ranges are <1dB down at 100kHz. AC accuracies apply above 1,000 counts. Additional error at crest factor = 3 is typically 0.2%. Input impedance = 1MΩ nominal. Max. input = 750V rms, 1kV pk. 1kΩ unbalanced CMR = >60dB at DC/50Hz/60Hz.

Resistance

Range	Accuracy	Resolution	Notes
100Ω	0.1% ± 3 dig.	10mΩ	Max. input 300V DC or AC rms any range. Max. open circuit voltage 4V
1000Ω	0.08% ± 2 dig.	100mΩ	
10kΩ	0.09% ± 2 dig.	1Ω	
100kΩ	0.09% ± 2 dig.	10Ω	
1000kΩ	0.12% ± 2 dig.	100Ω	
10MΩ	0.5% ± 2 dig.	1kΩ	
20MΩ	0.5% ± 2 dig.	10kΩ	

DC Current

Range	Accuracy	Resolution	Notes
1mA	0.1% ± 3 dig.	0.1µA	Max. input 500mA Voltage burden <250mV
100mA	0.1% ± 3 dig.	10µA	
10A (up to 1A)	0.3% ± 3 dig.	1mA	Max. input 10A Voltage burden <500mV
10A (up to 5A)	1.0% ± 4 dig.	1mA	
10A (up to 10A)	3% ± 10 dig.	1mA	

AC Current (True RMS)

Range	Accuracy	Resolution	Notes
1mA	0.35% ± 20 dig.	0.1µA	Max. input 500mA Voltage burden <250mV
100mA	0.35% ± 20 dig.	10µA	
10A (up to 1A)	0.5% ± 20 dig.	1mA	Max. input 10A Voltage burden <500mV
10A (up to 5A)	1.2% ± 20 dig.	1mA	
10A (up to 10A)	3% ± 20 dig.	1mA	

Accuracies apply over 45Hz to 10kHz for readings above 1000 counts. Additional error at crest factor = 3 is typically 0.2%.

Frequency

Range	Accuracy	Resolution	Notes
100Hz	0.01% ± 1 dig.	0.01Hz	Sensitivity better than 30mV (100mV range), better than 10% of range (other Vac & Iac ranges)
1000Hz		0.1Hz	
10kHz		1Hz	
100kHz		10Hz	

Capacitance

Range	Accuracy	Resolution	Notes
10nF	2% ± 5 dig.	10pF	Scale length 1200 counts
100nF		100pF	
1µF		1nF	
10µF		10nF	
100µF	5% ± 5 dig.	100nF	

OTHER MEASUREMENT FUNCTIONS

Continuity

Selects 1000Ω range and sounds audible tone for impedance <10Ω. Sampling rate 20/sec. Max. input 300V DC or AC rms.

Diode Test

Displays voltages up to 1.2V at a test current of 0.5mA. Max. open circuit voltage 4V. Max. input 300V DC or AC rms.

AC + DC Volts, AC + DC Current

Displays the True RMS value of the ac and dc components of the waveform. Accuracy is equal to the sum of the ac and dc accuracies for the selected range.

DISPLAY

Display Type:	High contrast LCD. Main display 4½ digits 17mm high, secondary display 5 digits 10mm high.
Scale Length:	4¼ digits (12,000 counts) in most modes.
Annunciators:	LCD - annunciators for all ranges, functions and program modes.
Reading Rate:	Varies with function, maximum 4/sec.
Overrange:	Display flashes 12000 if input too great for range.
Overflow:	Displays -Or- if calculated result overflows display.

COMPUTING FUNCTIONS

Null (Relative)	Stores current reading and subtracts it from future readings.
Ohms Null:	Additional non-volatile function for nulling test lead resistance.
Hold:	Reading is frozen.
T-Hold:	Reading is frozen when stable.
dB:	Displays measurement in dBm relative to 600Ω or other user-entered impedance.
AC plus DC:	The RMS value of the ac plus dc parts of the signal is calculated and displayed.
% 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.
Min/Max:	Minimum and maximum reading stored.
Power:	Calculates V^2/R and displays in Watts with respect to a user-defined impedance.
VA:	Calculates and displays Volts x Amps.
Data Logger:	Manual or automatic storage of 100 measurements. Storage interval 1s to 9999s, manually from keyboard, or by remote contact closure or interface command.

INTERFACES

RS232:	Baud rates 2400, 9600 or 19200. Complies fully with the ARC (Addressable RS232 Chain) interface standard. Address selectable from the front panel.
GPIB (option):	The 1705 can be specified with an IEEE-488 interface. This version operates only from AC mains.

POWER REQUIREMENTS

AC Input:	115/230 Volts AC nominal 50/60Hz by internal adjustment; 5VA max.
Batteries:	6 x C cells, disposable or rechargeable.
Battery Life:	>150 hours from alkaline disposable cells, typically 70 hours from rechargeable cells.

GENERAL

Operating Range: +50°C to + 40°C, 20% to 80% RH
Storage Range: -20°C to + 60°C
EMC & Safety: Complies with EN61326 and EN61010-1 respectively
Size and Weight: 260(W) x 88(H) x 235(D)mm, excl. handle/feet. 2.0kg.

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

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