Model 6005
Digital Multimeter

CIE

OPERATING MANUAL

We thank you very much for your purchase of our DIGITAL MULTIMETER. This MULTIMETER is a complexed and delicate instrument, having reliable construction, designed by our high and longexperienced technology. Before you start using this instrument, please be sure to read this instruction carefully and make yourself familiar with this instrument thoroughly it can be used for years to come be correct use.

CONTENTS

SECTION 1
INTRODUCTION

1 — 1 GENERAL

The Digital Multimeter is a versatile 4-1/2 digit instrument suitable for use in general electronic maintenance, production and laboratory. If features 0.05% DCV accuracy, integrated circuit electronics, solid-state LCD display, and push button switch selection. Some of the features of your instrument are:

* All VOM functions plus the versatile diode test and continuity test function are included as standard.
  —DC Voltage-$10\mu V$ to 100V
  —AC Voltage-$10\mu V$ to 750V (50Hz-50KHz)
  —DC Current-10nA to 10A
  —AC Current-10nA to 10A   (50Hz-5KHz)
  —Resistance-$10m\Omega$ to $20m\Omega$
* Continuity test: Provides an immediate visual and audible indication.
* Diode test: Have enough open circuit voltage to turn on silicon junction allowing a diode test.
* Battery operation: 2 years long life (6000 countinuous hours)
* Each range has:
  —Full auto-polarity operation.
  —Overrange indication.
* Dual slope integration measurement technique to insure noise-free measurements.
* Long term cailbration stability-1 year. Easy callibration-few adjustments. measurements.

SECTION TWO
SPECIFICATIONS

The following specification assume a 1-year calibration cycle and an operating temperature of 18°C to 28°C (64°F to 82°F) at relative humidity up to 70% or less.

2 — 1 DC Voltage

Ranges: ±200MV, ±2V, ±20V, ±200V, ±1000V.
Resolution: 0.05%μV on lowest range, a1V on 100V range.
X Accuracy: ±(0.05% of reading + 2 digits) on all ranges.
Response Time: < 1 second.
Input Impedance: 10MΩ on all ranges, except 11MΩ on 2V range.
Normal Mode Noise Rejection: ≥ 60dB at 50Hz or 60Hz.
Common Mode Noise Rejection: ≥ 90dB at DC, 50Hz and 60hz with 1KΩ unbalance.
Overload Protection: 1000V DC or peak AC, continuous.

2 — 2 AC Voltage (Average Sensing, RMS Calibrated Sinewave)

X   Accuracy: ±(% of reading + no. of digits)

Range	50 Hz	1 KHz	10 KHz	20 KHz	50 KHz
200 mV					
2 V	0.5% + 10		1% + 10		5% + 30
20 V					
200 V					
750 V	0.5% + 10		Not specified		

Response Time: ≤ 3 seconds
Input Impedance: 10MΩ in parallel with < 100pF, except 11MΩ or 2V range.
Common Mode Noise Rejection: > 60dB at 50Hz and 60Hz with 1KΩ unbalance.
Overload Protection: 1000V DC or rms AC, continuous, not to exceed the volthertz product of 10^7, except 200mV AC range (10 seconds maximum above 250 Vrms)
Volt-Hz Product: 10^7 max. (200V max. 50 KHz)

2 — 3 DC Current

Ranges: ±200μA, ±2mA, ±20mA, ±200mA, ±2000mA, ±10A.
Resolution 10nA on lowest range, 1mA on 10A range.
X Accuracy: ±(0.5% of reading + 10 digits) on all ranges, except ± (0.75% of reading + 10 digits) on 200mA, ±(2% of reading + 10 digits) on 2000mA, 10A ranges.
Response Time: ≤ 1 second.
Burden Voltage: 0.7V max. on 2A, 10A ranges, 0.3V max. on all other ranges.
Overload Protection: 2A/250V fuse protected, 10A range not fused, 10A max.

2 — 4 AC Current

Ranges: 200μA, 2mA, 20mA, 200mA, 2000mA, 10A.
Resolution: 10nA on lowest range, 1mA on 10A range.
X Accuracy: ±(0.75% of reading + 10 digits), 50Hz — 50Hz, 200μA through 200mA ranges, (±2% of reading + 10 digits), 50Hz — 5KHz, 2000mA, 10 A ranges.
Response Time: ≤ 3 seconds.
Burden Voltage: 0.7V max. on 2A,, 10A ranges, 0.3V max. on all other ranges.
Overload Protection: 2A/250V fuse protected, 10A range not fused, 10A max.

2 — 5 Resistance

Ranges: 200Ω, 2KΩ 20KΩ, 200KΩ, 2000KΩ, 20MΩ.
Resolution: 10mΩ on 200Ω range.
X Accuracy: ±(0.2% of reading + 20 digits) on 200Ω range.
    ±(0.15% of reading + 2 digits) on 2KΩ through 200KΩ ranges.
    ±(0.2% of reading + 2 digits) on 2000KΩ range.
    ±(2% of reading + 2 digits) on 20MΩ ranges.
Response Time: 10 seconds maximum on 20MΩ range, 2 seconds maximum on all other ranges, to rated accuracy.
Open Circuit Voltage: < 3.5V on all ranges.
Overload Protection: 250V DC or rms AC on all ranges.

2 — 6 Diode Test

Approx diode forward voltage, short, non conductance, good/defect test
Forward DC current: 1mA approx.
Reverse DC voltage: 3V approx.

2 — 7 Audio and Visual Continuity Checks

For all resistance ranges.
Overload protection: 250V DC/rms AC on all ranges.

2 — 8 Environmental

Temperature:
Normal operation: 18°C-28°C (64°F-82°F).
Usable condition: 0°C-50°C (32°F-122°F).
Storage: —20°C-+60°C (—30°F-140°F), < 80% R.H. Battery removed.
Temperature coefficient:
Less than 0.15 times the appliable accuracy specification per 0°C for 0°C to 18°C (32°F to 64.4°F) and 28°C to 50°C (82.4°F to 122°F)

2 — 9 Functional Characteristics

Maximum common mode voltage: 500V DC/AC rms.
Reading rate: 2 reading/sec: (approximate)
Polarity: Automatic
Overload indication: blanking of all digits except MSD, decimal point and sign appropriate.
Display: LCD 4-1/2 digit (19999/count), 0.4″ High.
Power supply: Six 1.5V D size batteries.
Battery life: 6000 continuous hours, nomial, under typical usage for 2 years.
Battery indication: Display indicates LO BAT.
Size: 21.4cm W x 26.5cm H x 10.0cm D, (8.4″W x 10.4″H x 3.9″D) approx.
Weight: 1.9 kg (67 ounces) approx.

2 — 10 Accessories (Furnished)

User's manual.
Test Leads
Battery: 1.5V six heavy-duty D size, (incide meter)
Spare fuse: 2A/250V (fast blow).

SECTION THREE
OPERATING INSTRUCTIONS

3 — 1 INTRODUCTION

This section contains instructions for using the multimeter for making DC voltage, AC voltage, DC current, AC current & ohms

WANING

To prevent potential electrical or fire hazard, do not expose the multimeter or its accessories to rain or moisture.

3 — 2 Power Requirements

This multimeter only operate on six 1 .5V heavy duty D size batteries. If battery replacement, to prevent electrical shock hazard, turn off multimeter and disconnect test leads before removing top case and do not operate multimeter with top case removed (except during calibration). Failure to turn off the instrument before installing the battery could result in damage to the battery if it is connected to the battery terminal incorrectly.

⚠ CAUTION

Do not apply a voltage greater than ± 500V DC or 500V peak between COM terminal and chasis ground or damage to the instrument will occur.

3 — 3 Overload Indication

The Multimeter is capable of displaying 19999 for all functions and ranges. There are maximum voltage limitations in DCV and ACV, however (see AC and DC voltage measurement paragraphs). In on overload condition where the input exceeds 19999, the last four digits blank and the overrange "1" and decimal point will be displayed. The polarity sign is also displayed in the DC volts and DC current function in the overload condition.

3 — 4 DC Voltage Measurements

⚠ CAUTION

Do not exceed a maximum input voltage of 1000V (DC + peak AC) on the 1000V range or damage to the instrument will occur.

The DC Voltage measurements can be made from 200mV to 1000V full-range Each range has a maximum display reading of 19999, However, the 1000V range is limited to maximum input of 1000V DC and peak AC.

3 — 5 AC Voltage Measurements

⚠ CAUTION

Maximum input voltage in the ACV FUNCTION is 750V rms. Do not exceed these voltages or damage to the instrument will occur.

The ACV FUNCTION has five ranges from 200mV to 750V. Each range has a maximum display reading of 19999, However, the 750V range is limited to a maximum AC input voltage of 750V.

3 — 6 Current Measurements

⚠ CUATION

Do not exceed a maximum input voltage of 250V DC + peak AC or a maximum DC or AC rms input current of 2A or the amps fuse will open.

3 — 7 AC Current Ranges

AC Current measurements are specified over a frequency range of 50Hz to 5kHz. There are five current ranges from 200μA to 10A.

3 — 8 DC Current Ranges

DC Current measurements can be made on five current ranges from 200μA to 10A.

3 — 9 OHMS Measurements

⚠ CAUTION

Do not apply voltage greater than ± 250V DC + Peak AC between the ohms and common input terminals in the ohms function or damage to the instrument will occur.

SECTION IV
RECALIBRATION

4 — 1 Adjustment Procedures

⚠ WARNING

Adjustment Procedures of section IV are intended for qualified services personnel only. To reduce the possibility of electrical shock, only qualified personnel are to perform maintenance duties.

4 — 2

The following procedures should be performed only after the Multimeter parts not meet specifications. Location of the Multimeter adjustments is shown in port location diagram.

4 — 3 Disassembly Procedure.

a. Turn the Multimeter off.
b. Remove four screws from the bottom shell.
c. Remove top shell.

4 — 4 DC Voltage Adjustments

A DC Standard is required for this adjustment
a. Set the Multimeter function to DCV and range to 200mV.
b. Apply + 190.00 mV to the input terminals from the DC Standard.
c. Adjust R43 for a Multimeter display of + 190.00 ± 1 digit.
d. Set the Multimeter function to DCV and range to 2V.
e. Apply + 190.00V to the input terminals from the DC Standard.
f. Adjust R10 for a Multimeter display of + 1.9000 ± 1 digit.
g. Set the Multimeter function to DCV and range to 20V.
h. Apply + 19.000V to the input terminals from the DC Standard.
i. Adjust R07 for a Multimeter display of 19.000 ± 1 digit.
j. Set the Multimeter function to DCV and range to 200V.
k. Apply + 190.00V to the input terminals from the DC Standard.
l. Adjust R05 for a Multimeter display of 190.00 ± 1 digit.

4 — 5 AC-DC Converter Adjustments

An AC Standard is required for this adjustment.
a. Set the Multimeter function to ACV and range to 200mV.
b. Apply 190.00mV. 50Hz to the input terminals from the AC Standard.
c. Adjust R20 for a Multimeter display of 190.00 ± 2 digits.
d. Set the Multimeter function to ACV and range to 200V.
e. Apply 100V 10KHz to the input terminals from the AC Standard.
f. Adjust C01 for a Multimeter display of 100.00 ± 10 digits.
g. Set the Multimeter function to ACV and range to 2V.
h. Apple 1.0000V 10KHz to the input terminals for the AC Standard.
i. Adjust C06 for a Multimeter display of 1.0000 ± 10 digits.
j. Set the Multimeter function to ACV and range to 20V.
k. Apply 10.000V 10KHz to the input terminals for the AC Standard.
l. Adjust C04 for a Multimeter display of 10.000 ± 10 digits.

Parts Location Digram