Service Guide

RIGOL

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DM3000 Series Digital Multimeter

DM3061/2/4
DM3051/2/4

Copyright Information

Safety Notices

Review the following safety precautions carefully before operating the instrument to avoid any personal injuries or damages to the instrument and any products connected to it.

To avoid potential hazards, it is necessary to use the instrument as specified by this user's guide only.

The instrument should be serviced by qualified personnel only.

Avoid Fire or Personal Injury.

Use Proper Power Cord. Use the power cord designed for the instrument as authorized in your country only.

Connect and Disconnect Correctly. Do not connect or disconnect test leads while they are connected to a voltage source.

Ground The Instrument. The instrument is grounded through the grounding conductor of the power cord. To avoid electric shock the instrument grounding conductor(s) must be grounded properly before making connections to the input or output terminals of the instrument.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and marks on the instrument. Follow the user's guide for further ratings information before making connections to the instrument.

Do Not Operate Without Covers. Do not operate the instrument with covers or panels removed.

Use Proper Fuse. Use the fuse of the type, voltage and current ratings as specified for the instrument.

Avoid Circuit or Wire Exposure. Do not touch exposed connections and components when power is on.

Do Not Operate With Suspected Failures. If you suspect there is damage with this product, you have it inspected by qualified service personnel authorized by **RIGOL** before further operations.

Provide proper ventilation.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive atmosphere.

Keep Product Surfaces Clean and Dry.

The disturbance test of all the models meet the limit values of A in the standard of EN 61326: 1997+A1+A2+A3, but can't meet the limit values of B.

WARNING

IEC Measurement Category II. The HI and LO input terminals may be connected to mains in IEC Category II installations for line voltages up to 300 VAC. To avoid the danger of electric shock, do not connect the inputs to mains for line voltages above 300 VAC.

Protection Limits: To avoid instrument damage and the risk of electric shock, do not exceed any of the Protection Limits defined in the following section.

IEC Measurement Category II Overvoltage Protection

To protect against the danger of electric shock, the **RIGOL** DM3000 series Digital Multimeter provides overvoltage protection for line-voltage mains connections meeting both of the following conditions: the HI and LO input terminals are connected to the mains under Measurement Category II conditions, defined below, and The mains are limited to a maximum line voltage of 300 VAC. IEC Measurement Category II includes electrical devices connected to mains at an outlet on a branch circuit.

Such devices include most small appliances, test equipment, and other devices that plug into a branch outlet or socket. The DM3000 series Digital Multimeter may be used to make measurements with the HI and LO inputs connected to mains in such devices, or to the branch outlet itself (up to 300 VAC). However, the DM3000 series Digital Multimeter may not be used with its HI and LO inputs connected to mains in permanently installed electrical devices such as the main circuit-breaker panel, sub-panel disconnect boxes, or permanently wired motors. Such devices and circuits are subject to overvoltage that may exceed the protection limits of the DM3000 series Digital Multimeter.

NOTE: Voltages above 300 VAC may be measured only in circuits that are isolated from mains. However, transient overvoltage is also present on circuits that are isolated from mains. The DM3000 series Digital Multimeter is designed to safely

withstand occasional transient overvoltage up to 2500 Vpk. Do not use this equipment to measure circuits where transient overvoltage could exceed this level.

Safety Terms and Symbols

Terms in This Guide. These terms may appear in this guide:

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

CAT II (300V): IEC Measurement Category II. Inputs may be connected to mains (up to 300 VAC) under Category II Overvoltage conditions.

Terms on the Product: These terms may appear on the product:

DANGER indicates an injury hazard may happen immediately.
WARNING indicates an injury hazard may not happen immediately.
CAUTION indicates that a potential damage to the instrument or other property may occur.

Symbols on the Product: These symbols may appear on the Instrument:

Hazardous Voltage

Refer to Instructions

Protective Earth Terminal

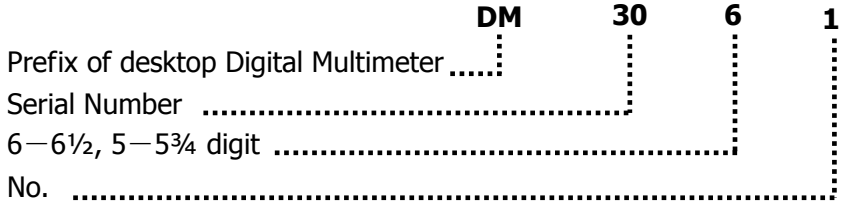
Chassis Ground

Earth Ground

General-Purpose Multimeter

The document covers the description and introduction of six models of DM3000 Series Digital Multimeter:
DM3061, DM3062, DM3064;
DM3051, DM3052, DM3054.

DM3000 Series Digital Multimeter naming rules:



1—Basic; 2—LAN/GPIB interface;
4—Multiplexer plate with the model and LAN/GPIB interface.

Application examples:
DM3061—6½ DM3000 series, Basic type.
DM3062—6½ DM3000 series, Basic type, equipped with LAN/GPIB module.
DM3064—6½ DM3000 series, Basic type, equipped with LAN/GPIB and multiplexer module.
DM3051—5¾ DM3000 series, Basic type.
DM3052—5¾ DM3000 series, Basic type, equipped with LAN/GPIB module.
DM3054—5¾ DM3000 series, Basic type, equipped with LAN/GPIB and multiplexer module.

RIGOL DM3000 Series Digital Multimeter is equipment designed for high-precision, multifunction, automation measurements. The series includes 6½ digits multimeter, with high-speed data acquisition, automatic measurements, multiplexer, mathematical operations, and flexible user sensor configurations etc.

DM3000 has a high-resolution monochrome LCD display system for simple waveform display and record. The concise and user-friendly layout of the front panel has a keyboard, and back lighted functional buttons, embedded with operating instructions makes the instrument more flexible, and capable. Interface includes RS-232, USB, LAN, and GPIB for disk storage and print. It supports virtual terminal display and control, and remote network access.

With the performance and characteristics given below, you will understand how DM3000 can satisfy your measurement requirements.

- Resolving Resolution: > 6½ digits and 2,400,000 Count;
- 50kSa/s data sampling rate can be used, such as the rapidly changing high-precision audio waveform data. Meanwhile waveform can be displayed on LCD Screen;
- 24 measurement functions
  - ✧ DC voltage and current, AC voltage and current, two-wire and four-wire resistance, capacitance, continuity test, diode test, frequency, cycle, ratio measurements, sensor measurement, and so on;
  - ✧ Math include: maximum, minimum, limit, average, dBm, dB;
  - ✧ Data acquisition functions include: data records, inspection, and automatic measurement;
- True RMS AC voltage and current measurement;
- 16-Channels multiplexer functional measurement and control software (optional);
- DC voltage >10GΩ input impedance to achieve the range of 48V (±24V);
- 10 groups measuring set-up storage and unlimited setup through PC interface;
- 256 x 64 pixel monochrome LCD;
- I/O: RS-232, USB, LAN and GPIB;
- Built-in USB Host to support USB disk and USB printer;
- Simple, convenient and flexible control software: Ultralogger and Ultrasensor.

Structure of This Document

Chapter 1 Performance Specifications
List the Performance specifications of DM3000 series.

Chapter 2 Quick Start
Help users to be familiar with the operating skills of DM3000.

Chapter 3 Performance Test
Introduce how to test the performance so as to know about its current state of DM3000 well.

Chapter 4 Calibration
Guide you how to calibrate DM3000.

Chapter 5 Disassembly and assembly
Introduce how to disassemble and assemble DM3000 in order to know about more details about its structure.

Chapter 6 Troubleshooting and General Care
Provide the methods of troubleshooting and general care.

Chapter 7 Service and Support
Information about Service and Support and the like.

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Chapter 1 Performance & Specifications

This chapter covers the following topics:

- Mechanical Specifications
- Technical Specifications

  Specifications of DM306x

  Specifications of DM305x

Mechanical Specifications

Weight: 2.5 kg
Dimension: W×H×D＝231.6mm×107mm×290.5mm

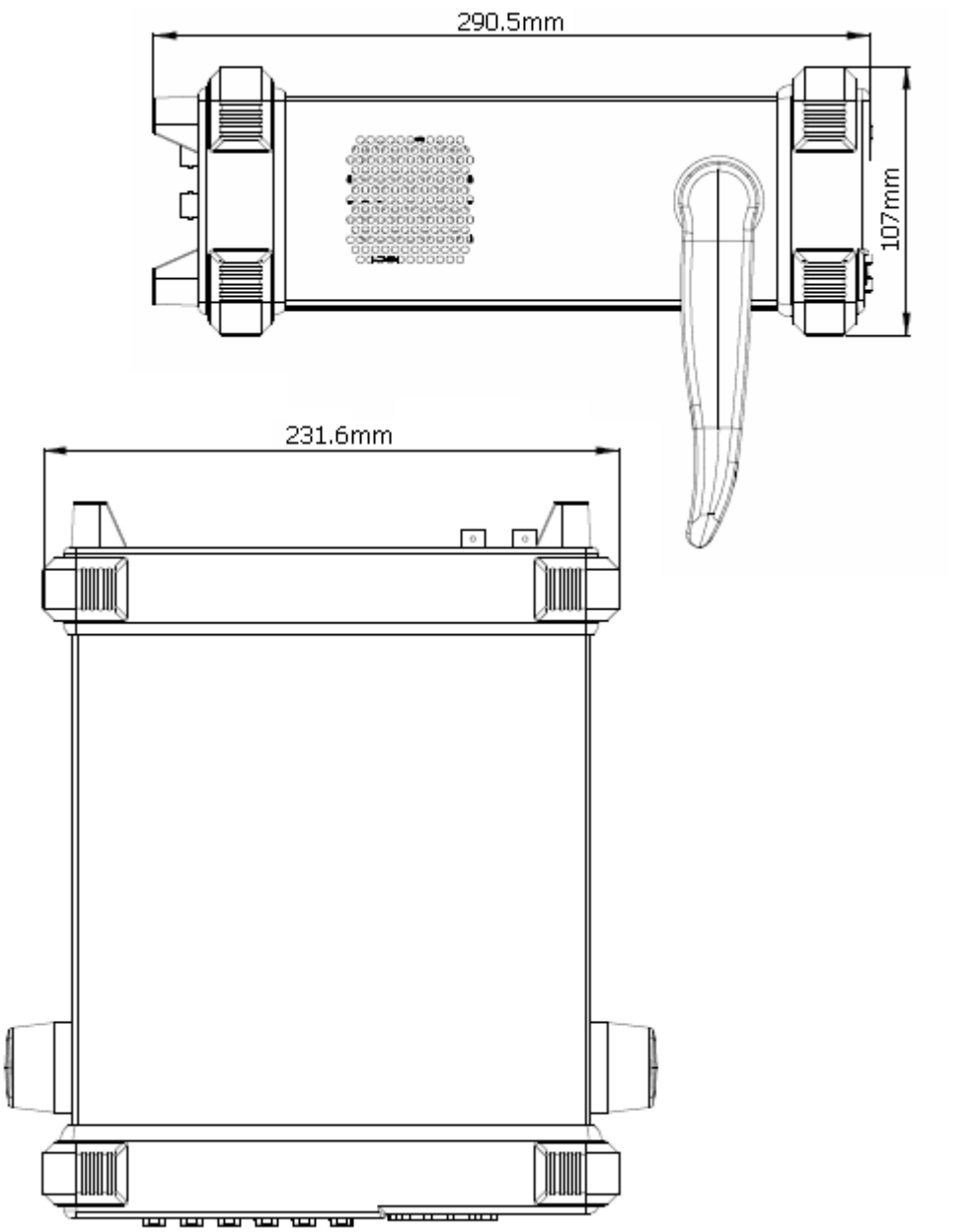

Figure 1-1 Dimension of DM3000

Technical Specifications

Specifications of DM306x

DC Characteristics

Accuracy Specifications (% of reading + % of range) [1]

Function	Range[3]	Test Current or Burden Voltage	24 Hour[2] Tcal±1℃	90 Day Tcal±5℃	1 Year Tcal±5℃	Temperature Coefficient 0 ℃ to (Tcal–5 ℃) (Tcal + 5 ℃) to 55 ℃
DC Voltage	200.0000mV		0.0030+0.00	0.0065+0.00	0.0085+0.00	0.0005+0.0007
	2.000000V		0.0020+0.00	0.0060+0.00	0.0078+0.00	0.0005+0.0001
	20.00000V		0.0020+0.00	0.0065+0.00	0.0085+0.00	0.0005+0.0001
	200.0000V		0.0020+0.00	0.0082+0.00	0.0100+0.00	0.0007+0.0002
	1000.000V[5]		0.0025+0.00	0.0095+0.00	0.0110+0.00	0.0010+0.0001
DC Current	2.000000mA	<0.03V	0.010+0.014	0.060+0.035	0.076+0.050	0.0027+0.0070
	20.00000mA	<0.3V	0.010+0.002	0.058+0.006	0.075+0.006	0.0027+0.0007
	200.0000mA	<0.3V	0.020+0.002	0.065+0.005	0.081+0.005	0.0027+0.0008
	1.000000A	<0.3V	0.020+0.016	0.065+0.030	0.073+0.030	0.0027+0.0062
	10.00000A [7]	<0.6V	0.300+0.020	0.330+0.020	0.330+0.020	0.0030+0.0025
Resistance[4]	200.0000Ω	1mA	0.0106+0.00	0.018+0.011	0.020+0.011	0.0008+0.0007
	2.000000kΩ	1mA	0.0022+0.00	0.010+0.002	0.015+0.002	0.0008+0.0001
	20.00000kΩ	100uA	0.0020+0.00	0.010+0.001	0.015+0.001	0.0008+0.0001
	200.0000kΩ	10uA	0.0020+0.00	0.010+0.001	0.015+0.001	0.0008+0.0001
	1.000000MΩ	2uA	0.0020+0.00	0.010+0.001	0.015+0.001	0.0008+0.0002
	10.00000MΩ	200nA	0.0112+0.00	0.0550+0.00	0.056+0.006	0.0060+0.0004
	100.0000MΩ	200nA||10M	0.300+0.010	0.800+0.011	0.800+0.015	0.1500+0.0002
Diode Test	2.4000V [6]	1mA	0.005+0.050	0.008+0.050	0.010+0.050	0.0010+0.0020
Continuity	2000Ω	1mA	0.005+0.050	0.008+0.050	0.010+0.050	0.0010+0.0020

Notes:

[1] Specifications are for 60 minute warm–up and set reading resolution as 6½.

[2] Relative to calibration standards.

[3] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[4] Specifications are for 4–wire resistance function, or 2–wire resistance using Math Null. Without Math Null, add 0.2 Ω additional errors in 2–wire resistance function.

[5] For each additional volt over ± 500 VDC add 0.02 mV of error.

[6] Accuracy specifications are for the voltage measured at the input terminals only. 1mA test current is typical. Variation in the current source will create some variation in the voltage drop across a diode junction.

[7] As continuous current higher than 7A DC or AC RMS, 30 seconds needs to be off after connecting 30s.

Settling Considerations:

Setting time of readings is affected by source impedance, cable dielectric characteristics and input signal changes. Generally, the Settling time of Common readings is about 1.5s when Low source impedance less than 1kΩ.

AC Characteristics

Accuracy Specifications (% of reading + % of range) [1]

Function	Range[3]	Frequency Range	24 Hour[2] Tcal±1℃	90 Day Tcal±5℃	1 Year Tcal±5℃	Temperature Coefficient 0℃ to (Tcal–5 ℃) (Tcal + 5 ℃) to 55 ℃
True RMS AC Voltage [4]	200.000mV	3Hz-10Hz	5.0+0.05	5.0+0.07	5.1+0.07	0.15+0.006
		10Hz-40Hz	0.53+0.05	0.57+0.06	0.60+0.07	0.035+0.004
		40Hz-20kHz	0.08++0.05	0.14+0.06	0.15+0.07	0.005+0.004
		20kHz-50kHz	0.10+0.05	0.14+0.06	0.16+0.05	0.011+0.005
		50kHz-100kHz	0.5+0.10	0.6+0.10	0.60+0.10	0.06+0.008
		100kHz-300kHz	4.0+0.80	4.5+0.80	4.50+0.80	0.2+0.02
	2.00000V to 750.00V	3Hz-10Hz	5.0+0.05	5.0+0.07	5.10+0.07	0.15+0.006
		10Hz-40Hz	0.35+0.05	0.37+0.06	0.38+0.07	0.035+0.003
		40Hz-20kHz	0.08+0.05	0.10+0.06	0.11+0.07	0.005+0.003
		20kHz-50kHz	0.40+0.05	0.40+0.06	0.40+0.07	0.011+0.005
		50kHz-100kHz	0.55+0.10	0.60+0.10	0.60+0.10	0.07+0.008
		100kHz-300kHz	4.0+0.80	4.0+0.80	4.00+0.80	0.2+0.02
True RMS AC Current[5]	20.0000mA	3Hz-10Hz	5.0+0.05	5.1+0.07	5.1+0.07	0.15+0.006
		10Hz-40Hz	0.55+0.05	0.61+0.06	0.64+0.07	0.035+0.006
		40Hz-5kHz	0.13+0.05	0.18+0.06	0.22+0.07	0.015+0.006
		5kHz-10kHz	0.20+0.25	0.2+0.25	0.22+0.25	0.03+0.006
	200.000mA	3Hz-10Hz	5.0+0.05	5.1+0.07	5.1+0.07	0.15+0.006
		10Hz-40Hz	0.55+0.05	0.62+0.06	0.64+0.07	0.035+0.006
		40Hz-5kHz	0.13+0.05	0.20+0.06	0.22+0.07	0.015+0.006
		5kHz-10kHz	0.20+0.25	0.20+0.25	0.22+0.25	0.03+0.006
	1.00000A	3Hz-10Hz	5.0+0.16	5.1+0.25	5.2+0. 27	0.24+0.047
		10Hz-40Hz	0.64+0.16	0.70+0.25	0.71+0.27	0.035+0.047
		40Hz-5kHz	0.22+0.16	0.28+0.25	0.29+0.27	0.015+0.047
		5kHz-10kHz	0.35+0.2	0.35+0.4	0.35+0.4	0.03+0.047
	10.0000A[7]	3Hz-1Hz	5.3+0.05	5.40+0.07	5.4+0.07	0.24+0.006
		10Hz-40Hz	0.8+0.05	0.9+0.06	0.9+0.07	0.035+0.006
		40Hz-5kHz	0.40+0.06	0.42+0.06	0.43+0.07	0.015+0.006
		5kHz-10kHz	0.42+0.1	0.42+0.1	0.43+0.1	0.03+0.006

Notes：

[1] Specifications are for 60 minute warm–up and set reading resolution as 5½.

[2] Relative to calibration standards.

[3] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[4] Specifications are for sine wave input >5% of range. For inputs from 1% to 5% of range and <50 kHz, add 0.1% of range additional error. For 50 kHz to 100 kHz, add 0.13% of range. 750 VAC range is limited to $8x10^7$ Volt-Hz.

[5] Specifications are for sine wave input >5% of range. Add 0.1% of the range for the sine wave input is 1%~5% of the range.

[6] Generally 30% of reading error existing at 100 kHz.

[7] As continuous current higher than 7A DC or AC RMS, 30 seconds needs to be off after connecting 30s.

Low Frequency Characteristics

Following three filter settings are available:

Slow: 3Hz~300 kHz

Mid: 20Hz~300 kHz

Fast: 200Hz~300 kHz

Measurement Considerations

Frequencies greater than upper settings are considered with no additional errors.

Settling Considerations

Applying >300VRMS (or >2ARMS) will cause self-heating in signal-conditioning components. These errors are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be less than 0.02% of reading and will generally dissipate within a few minutes.

Frequency and Period Characteristics

Accuracy Specifications (% of reading) [1]

Function	Range[3]	Frequency Range	24 Hour[2] Tcal±1℃	90 Day Tcal±5℃	1 Year Tcal±5℃	Temperature Coefficient 0 ℃ to (Tcal–5 ℃) (Tcal + 5 ℃) to 55 ℃
Frequency Period	200mV to 750V[3]	3Hz-5Hz	0.07	0.07	0.07	0.005
		5Hz-10Hz	0.04	0.04	0.04	0.005
		10Hz-40Hz	0.02	0.02	0.02	0.001
		40Hz-300kHz	0.005	0.006	0.007	0.001
	20mA to 10A [4]	3Hz-5Hz	0.07	0.07	0.07	0.005
		5Hz-10Hz	0.04	0.04	0.04	0.005
		10Hz-10kHz	0.005	0.006	0.007	0.001

Notes:

[1] Specifications are for 60 minute warm–up and set reading resolution as 6½.

[2] Relative to calibration standards.

[3] For AC input voltages 10% to 120% of range except special mark. 750V range is limited to 750VRMS. 200mV range is specified as full scale or greater inputs. For inputs from 20mV to 200mV, multiply total % of reading error by 10.

[4] For the 20mA, 200mA, 10A ranges, the AC input current from 10% to 120% of range except special mark. 1A range is specified as the AC input current from 50% to 120% of range.

Measurement Considerations

Errors are brought within all the frequency counters when measuring low–voltage, low–frequency signals. Shielding inputs could redound to reduce measuring errors brought from external noise.

Settling Considerations

Errors will occur when attempting to measure the frequency or period of an input following a dc offset voltage change. The input blocking RC time constant must be allowed to fully settle (up to 1 sec) before the most accurate measurements are possible.

Capacitance Characteristics

Accuracy Specifications (% of reading + % of range) [1]

Function	Range[2]	Test Current	1 Year Tcal±5℃	Temperature Coefficient 0 ℃ to (Tcal–5 ℃) (Tcal+ 5 ℃) to 55 ℃
Capacitance	2.000n**F**	200nA	2 + 2.5	0.05+0.05
	20.00n**F**	1uA	1 + 0.5	0.05+0.01
	200.0n**F**	10uA	1 + 0.5	0.01+0.01
	2.000u**F**	100uA	1 + 0.5	0.01+0.01
	20.00u**F**	1mA	1 + 0.5	0.01+0.01

Notes：

[1] Specifications are for 60 minute warm–up using Math Null. Additional errors may occur for non–film capacitors.

[2] Specifications are for 1% to 120% of range on the 2nF range and 10% to 120% of range on all other ranges.

Measuring Characteristics

DC Voltage

Measurement Method:	ΣΔ A/D conversion
Input Resistance:	
200mV, 2V, 20V ranges	Selectable 10MΩ ± 2% or >10GΩ
200V, 1000V ranges	10MΩ ± 2%

Resistance

Measurement Method:	4-wire or 2-wire. Current source referenced to LO input.
Open-circuit Voltage:	Limit less than 7V.
Max. Lead Resistance:	10% of range per lead for 200Ω, 1kΩ range. 1kΩ per lead
(4-wire ohms)	on all other ranges.
Input Protection:	1000V, all ranges.

DC Current

Shunt Resistor:	0.025Ω for 1A, 10A 1.025Ω for 200mA 11.025Ω for 2mA and 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Continuity / Diode Test

Measurement Method:	1mA ±0.2% test current, Limit in <7V
Response Time:	25 samples / sec
Continuity Threshold:	Adjustable from 1Ω to 2000Ω
Input Protection:	1000V

True RMS AC Voltage

Measurement Method:	AC-coupled True RMS – measures the ac component of input with up to 400Vdc of bias on any range.
Input Impedance:	1MΩ ± 2%, in parallel with <100pF
Input Protection:	750VRMS all ranges

True RMS AC Current

Measurement Method:	Direct coupled to the fuse and shunt. AC-coupled True RMS measurement (measures the ac component only)

Max. Input:	The DC + AC current peak value <300% of the range. The RMS current including DC current <10A.
Shunt Resistor:	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Frequency and Period

Measurement Method:	Reciprocal-counting technique. AC-coupled input using the ac voltage measurement function.
Input Impedance (Voltage Signal):	1MΩ ± 2%, in parallel with <100pF
Shunt Resistor (Current Signal):	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	750VRMS all ranges; Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Capacitance

Measurement Method:	Current input with measurement of resulting ramp.
Connection Type:	2-wire

Triggering and Memory

Samples per Trigger:	1 to 2,000,000
Trigger Delay:	0 to 3600 sec
Input Level:	TTL compatible (High level when left trigger input open)
Trigger Condition:	Selectable Rising, Falling, Low-level, High-level.
Input Impendence:	>20kΩ, in parallel with 400pF, AC-coupled
Delay:	<1μs
Min Pulsewidth:	1μs
VMC Output:	
Level:	TTL compatible (Input to ≥ 1kΩ load)
Output Polarity:	Selectable Positive, Negative
Output Impendence:	200Ω, typical
Nonvolatile Memory:	512K readings
Volatile Memory:	2M readings

Rear panel multiplexer function (only for the model equipped with multiplexer module)

Including the model of multiplexer card, the voltage limit of LO relative to safe ground falls to 200Vpeak (Max).

Channel: 12 voltages, 4 current, additional protections.

Measurement Type：2-wire resistance, capacitance, DC voltage, DC current, AC voltage, AC current, period, diode and frequency.

Work Characteristics：The precision of performance is consistent with the value measured from front panel. The switch time of multiplexer card is 50ms; the switch time of auto measurement is 600ms. (4½ digits)

Input Characteristic: Difference input voltage is 150Vpeak(Max); the isolated voltage in interchannel is 150Vpeak(Max)，the current terminal is input 1Apeak(Max), channel isolation > 60dB (@10KHz)，the voltage of all the terminal relative to safe ground is 150Vpeak(Max).

Input Protection: 2A restore the fuse in current channel, 250V limit voltage.
500mA melt the fuse in voltage channel with multiplexer card.

Real-time Clock

Precision:	1min/month (Environment Temperature >0℃)
Clock battery Life:	2 years

Sensor Measurement

Voltage, current, resistance and frequency random sensor

Math Functions

Null, Min/Max/Average, dBm, dB, Limit Test (with TTL output)

Other Functions

Reading Hold, Ratio Measurement

High-speed Sampling

50kSa/s (In Datalog function)

Reading Resolution

2,400,000 Count, >6½ digits

USB I/O Interface

USB Host, USB Device interface. It can support U-disk and USB printer.

Other I/O Interface

RS-232, GPIB (Selectable) support for SCPI command, LAN (Selectable)

General Specifications

Display:	256 x 64 pixels LCD to support multi-display, menu, multi-language help and waveform display.
Data Acquisition and Virtual:	Support Microsoft® Windows 98/Me, Windows 2000/XP
Power Supply:	100V/ 120V/ 220V/ 240V ±10%
Power Line Frequency:	45Hz to 66Hz
Power Consumption:	20VA peak
Operating Environment:	Full accuracy for 0℃ to 55℃, 95% R.H. at 40℃ non-condensing
Storage Temperature:	-20℃ to 70℃
Safety:	Measurement CAT II 300V, CAT I 1000V. Pollution degree 1.
Vibration & Shock:	Mil-T-28800E, Type III, Class 5 (Sine Only)
Weight:	2.5kg
Size (H x W x D):	107.0mm x 231.6mm x 290.5m

Specifications of DM305x

DC Characteristics

Accuracy Specifications (% of reading + % of range) [1]

Function	Range[2]	Test Current or Burden Voltage	Input Impedance	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
DC Voltage	400.000mV		10MΩ or>10GΩ	0.025 + 0.008	0.0015+0.0005
	4.00000V		10MΩ or>10GΩ	0.025 + 0.006	0.0010+0.0005
	40.0000V		10MΩ	0.025 + 0.006	0.0020+0.0005
	400.000V		10MΩ	0.030 + 0.006	0.0020+0.0005
	1000.00V[4]		10MΩ	0.030 + 0.005	0.0015+0.0005
DC Current	2.00000mA	<0.03V		0.050 + 0.070	0.0040+0.0070
	20.0000mA	<0.3V		0.050 + 0.008	0.0040+0.0007
	200.000mA	<0.3V		0.050 + 0.009	0.0040+0.0008
	1.00000A	<0.3V		0.100 + 0.070	0.0100+0.0062
	10.0000A[5]	<0.6V		0.200 + 0.007	0.0100+0.0007
Resistance[3]	400.000Ω	1mA		0.050 + 0.010	0.0030+0.0005
	4.00000kΩ	100uA		0.015 + 0.006	0.0030+0.0005
	40.0000kΩ	10uA		0.015 + 0.006	0.0030+0.0005
	400.000kΩ	2uA		0.030 + 0.007	0.0030+0.0005
	4.00000MΩ	200nA		0.060 + 0.010	0.0030+0.0005
	100.000MΩ	200nA ||10MΩ		2.00 + 0.005	0.1500+0.0005
Diode Test	2.4000V[6]	1mA		0.05 + 0.010	0.0050+0.0005
Continuity	2000Ω	1mA		0.05 + 0.010	0.0050+0.0005

Notes：

[1] Specifications are for 60 minute warm–up and set reading resolution as 5¾ and calibration temperature between 18 ℃ and 28 ℃.

[2] 20% over range on all ranges except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[3] Specifications are for 4–wire resistance function or 2–wire resistance using Math Null. Without Math Null, add 0.2 Ω additional errors in 2–wire resistance function.

[4] For each additional volt over ± 500 VDC add 0.02 mV of error.

[5] For current terminal, > 7A DC or ACRMS for 30 seconds ON and 30 seconds OFF.

[6] Accuracy specifications are for the voltage measured at the input terminals only. 1 mA test

current is typical.

Variation in the current source will create some variation in the voltage drop across a diode junction.

Settling Considerations

Reading settling times are affected by source impedance, cable dielectric characteristics, and input signal changes. Typically, settling time is 1.5s when source impedance less than 1kΩ.

AC Characteristics

Accuracy Specifications (% of reading + % of range) [1]

Function	Range[2]	Frequency Range	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
True RMS AC Voltage[3]	200.000mV	10Hz-45Hz	1.0 + 0.1	0.02+0.02
		45Hz-20kHz	0.2 + 0.1	0.02+0.02
		20kHz-50kHz	2.0 + 0.2	0.02+0.02
		50kHz-100kHz	4.0 + 0.2	0.02+0.02
	2V to 750.00V	10Hz-45Hz	1.0 + 0.1	0.02+0.02
		45Hz-20kHz	0.2 + 0.1	0.02+0.02
		20kHz-50kHz	1.0 + 0.1	0.02+0.02
		50kHz-100kHz	2.0 + 0.2	0.02+0.02
True RMS AC Current[4, 6]	20.0000mA	10Hz-45Hz	1.5+0.1	0.02+0.02
		45Hz-2kHz	0.5+0.1	0.02+0.02
		2kHz-10kHz	2.0+0.2	0.02+0.02
	200.000mA	10Hz-45Hz	1.5+0.1	0.02+0.02
		45Hz-2kHz	0.5+0.1	0.02+0.02
		2kHz-10kHz	2.0+0.2	0.02+0.02
	1.00000A	10Hz-45Hz	1.5+0.5	0.02+0.05
		45Hz-2kHz	0.5+0.5	0.02+0.05
		2kHz-10kHz	2.0+0.5	0.02+0.05
	10.0000A[6]	10Hz-45Hz	1.5+0.1	0.02+0.02
		45Hz-2kHz	0.5+0.1	0.02+0.02
		2kHz-5kHz	2.0+0.2	0.02+0.02

Notes：

[1] Specifications are for 60 minute warm–up and set reading resolution as 5½ and calibration temperature between 18 ℃ and 28 ℃.

[2] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[3] Specifications are for sine wave input >5% of range. For inputs from 1% to 5% of range and <50 kHz, add 0.1% of range additional error. For 50 kHz to 100 kHz, add 0.13% of range. 750Vac range limited to 100 kHz or $8x10^7$ Volt-Hz.

[4] Specifications are for sine wave input >5% of range. Add 0.1% of the range for the sine wave input is 1%~5% of the range.

[5] For current terminal, > 7A DC or ACRMS for 30 seconds ON and 30 seconds OFF.

[6] Typically 30% of reading error at 100 kHz.

Low Frequency Performance

Three filter settings are available:

Slow: 3Hz~300kHz

Mid: 20Hz~300kHz

Fast: 200Hz~300kHz

Measurement Considerations

Frequencies greater than upper filter settings are considered with no additional errors.

Settling Time Considerations

Applying >300VRMS (or >1ARMS) will cause self-heating in signal-conditioning components. These errors are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be less than 0.02% of reading and will generally dissipate within a few minutes.

Frequency and Period Characteristics

Accuracy Specifications (% of reading) [1]

Function	Range	Frequency Range	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
Frequency Period	200mV to 750V[2]	3Hz-5Hz	0.10	0.005
		5Hz-10Hz	0.07	0.005
		10Hz-40Hz	0.02	0.005
		40Hz-300kHz	0.02	0.005
	20mA to10A[3]	3Hz-5Hz	0.10	0.005
		5Hz-10Hz	0.07	0.005
		10Hz-10kHz	0.02	0.005

Notes：

[1] Specifications are for 60 minute warm–up.

[2] For AC input voltages 10% to 120% of range except where noted. 750V range limited to 750VRMS. 200mV range specifications are for full scale or greater inputs. For inputs from 20mV to 200mV, multiply total % of reading error by 10.

[3] For the 20mA, 200mA, 10A ranges, the AC input current from 10% to 120% of range except where noted. For 1A range, the AC input current from 50% to 120% of range except where noted.

Measurement Considerations

All frequency counters are susceptible to error when measuring low–voltage, low–frequency signals. Shielding inputs from external noise pickup is critical for minimizing measurement errors.

Settling Considerations

Errors will occur when attempting to measure the frequency or period of an input following a DC offset voltage change. The input blocking RC time constant must be allowed to fully settle (up to 1 sec) before the most accurate measurements are possible.

Capacitance Characteristics

Accuracy Specifications (% of reading + % of range) [1]

Function	Range[2]	Test Current	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
Capacitance	4.000n**F**	1uA	2 + 2.5	0.05+0.05
	40.00n**F**	10uA	1 + 0.5	0.05+0.01
	400.0n**F**	10uA	1 + 0.5	0.01+0.01
	4.000u**F**	1mA	1 + 0.5	0.01+0.01
	40.00u**F**	1mA	1 + 0.5	0.01+0.01
	200.0u**F**	1mA	1 + 0.5	0.01+0.01

Notes：

[1] Specifications are for 60 minute warm–up using Math Null. Additional errors may occur for non–film capacitors.

[2] Specifications are for 1% to 120% of range on the 4nF range and 10% to 120% of range on all other ranges.

Measuring Characteristics

DC Voltage

Measurement Method:	Sigma Delta A-to-D converter.
Input Resistance:	
400mV, 4V ranges	Selectable 10MΩ ± 2% or >10GΩ
40V, 400V, 1000V ranges	10MΩ ± 2%

Resistance

Measurement Method:	Selectable 4-wire or 2-wire.
	Current source referenced to LO input.
Open-circuit Voltage:	Limit in <7V.
Max. Lead Resistance:	10% of range per lead for 400Ω, 1kΩ per lead
(4-wire ohms)	on all other ranges.
Input Protection:	1000V on all ranges.

DC Current

Shunt Resistor:	0.025Ω for 1A, 10A
	1.025Ω for 200mA
	11.025Ω for 2mA, 20mA
Input Protection:	Externally accessible 10A, 250V fuse
	Internal 12A, 250V fuse

Continuity/Diode Test

Measurement Method:	1mA ±0.2% test current, Limit in <8V
Response Time:	25 samples / sec
Continuity Threshold:	Adjustable from 1Ω to 2000Ω
Input Protection:	1000V

True RMS AC Voltage

Measurement Method:	AC coupled true-RMS-measure the ac component of input with up to 400Vdc of bias on any range
Input Impedance:	1MΩ ± 2%, in parallel with 100pF
Input Protection:	750VRMS all ranges

True RMS AC Current

Measurement Method:	Direct coupled to the fuse and shunt. AC coupled true RMS

	measurement (measures the ac component only)
Max. Input:	The DC + AC current peak value <300% of the range. The RMS current including DC current <10A
Shunt Resistor:	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Frequency and Period

Measurement Method:	Reciprocal-counting technique. AC-coupled input using the ac voltage measurement function.
Input Impedance (Voltage Signal):	1MΩ ± 2%, in parallel with <150pF
Shunt Resistor (Current Signal):	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	750VRMS all ranges; Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Capacitance

Measurement Method:	Current input with measurement of resulting ramp.
Connection Type:	2-wire

Triggering and Memory

Samples per Trigger:	1 to 2,000,000
Trigger Delay:	0 to 3600 sec
Input Level:	TTL compatible (High level when left trigger input open)
Trigger Condition:	Selectable Rising, Falling, Low-level, High-level.
Input Impendence:	>20kΩ, in parallel with 400pF, AC-coupled
Delay:	<1μs
Min Pulse width:	1μs
VMC Output:	
Level:	TTL compatible (Input to ≥ 1kΩ load)
Output Polarity:	Selectable Positive, Negative
Output Impendence:	200Ω, typical
Nonvolatile Memory:	512K readings
Volatile Memory:	2M readings

Rear panel multiplexer function (only for the model with multiplexer module)

Including the model with multiplexer card, the voltage limit of LO relative to safe ground falls to 200Vpeak (Max).

Channel: 12 voltage, 4 current, additional protections.

Measurement Type：2-Wire resistance; Capacitance; DC Voltage; DC Current; AC Voltage; AC Current; period; Diode and Frequency.

Work Characteristics：The precision of performance and front panel measurement is the same. The switch time of multiplexer card is 50ms; the switch time of auto measurement is 600ms (4½).

Input Characteristic: different input voltage is 150Vpeak(Max); the isolated voltage between the channels is 150Vpeak(Max)，the current end is input 1Apeak(Max), channel isolation > 60dB (@10KHz)，the voltage of all the ends relative to safe ground is 150Vpeak(Max).

Input Protection: 2A restore the fuse in current channel, 250V limit voltage.
500mA melt the fuse in voltage channel with multiplexer card.

Real-time Clock

Precision:	1min/month (Environment Temperature >0℃)
Clock battery Life:	2 years

Sensor Measurement

Voltage, current, resistance and frequency random sensor

Math Functions

Null, Min/Max/Average, dBm, dB, Limit Test (with TTL output)

Other Functions

Reading Hold, Ratio Measurement

High-speed Sampling

50kSa/s (In Datalog function)

Reading Resolution

480,000 Count, >5¾ digits

USB I/O Interface

USB Host, USB Device interface. It can support U-disk and USB printer.

Other I/O Interface

RS-232, GPIB (Selectable) support for SCPI command, LAN (Selectable)

General Specifications

Display:	256 x 64 pixels LCD to support multi-display, menu, multi-language help and waveform display.
Data Acquisition and Virtual:	Support Microsoft® Windows 98/Me, Windows 2000/XP
Power Supply:	100V/ 120V/ 220V/ 240V ±10%
Power Line Frequency:	45Hz to 66Hz
Power Consumption:	20VA peak
Operating Environment:	Full accuracy for 0℃ to 55℃, 95% R.H. at 40℃ non-condensing
Storage Temperature:	-20℃ to 70℃
Safety:	Measurement CAT II 300V, CAT I 1000V. Pollution Degree 1.
Vibration & Shock:	Mil-T-28800E, Type III, Class 5 (Sine Only)
Weight:	2.5kg
Size (H x W x D):	107.0mm x 231.6mm x 290.5m

Chapter 2 Quick Start

The chapter mainly covers the following topics:

- General Inspection

  Inspect the Instrument

  Check the List of Accessories

- Handle Adjustment
- Introduction of Front Panel
- Introduction of Rear Panel
- Introduction of User Interface

General Inspection

Inspect the Instrument

Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

In case of any damage, or defect, or failure, notify the **RIGOL** Sales Representative. If the shipping container is damaged, or the protective material shows signs of stress, notify the carrier as well as your **RIGOL** sales office. Keep the shipping materials for the carrier's inspection.

RIGOL offices will arrange reparation or replacement at **RIGOL**'s option without waiting for claim settlement.

Check the List of Accessories

Check your accessories whether accord with the list **RIGOL** provides. If not, please contact **RIGOL** Sales Representative or sales office.

The list of accessories is given as follows:

- A USB Data Wire
- Two Test Lead Kits (red/black)
- A Power Cord that fits the standard of destination country
- A User's Guide
- Multiplexer Module (DM3064/3054)
- A Ultralogger Software CD-ROM
- Data Cables (DM3064/3054)
- Testing Certification
- Packing List

Handle Adjustment

To adjust the handle position of DM3000 Digital Multimeter, please grip the handle by the sides and pull it outward. Then, rotate the handle to the desired position as shown in figure 2-1, figure 2-2.

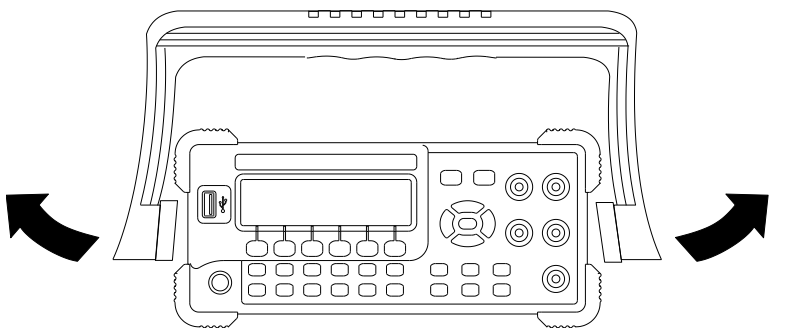

Figure 2-1 The Method of Adjusting Handle

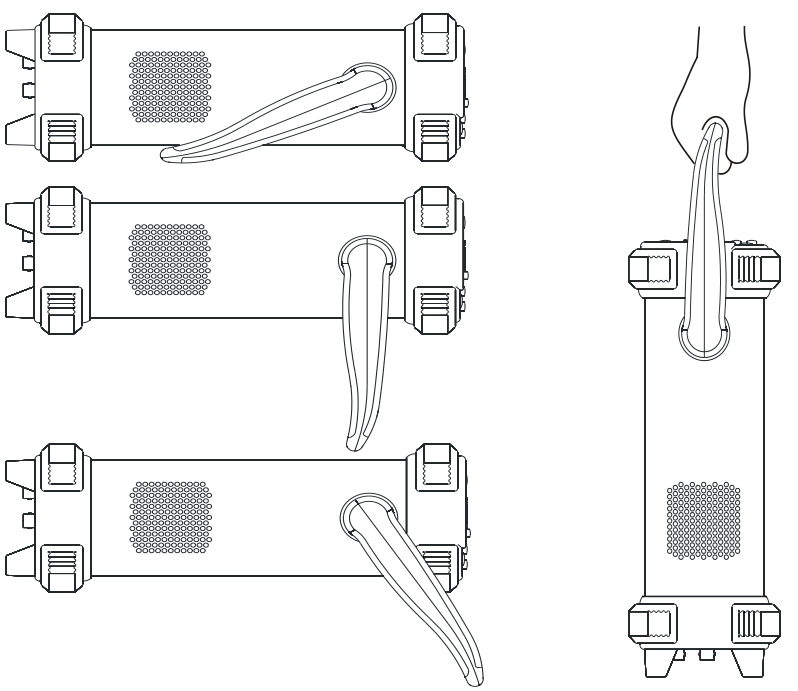

Figure 2-2 Adjustable Positions for Handle

Introduction of Front Panel

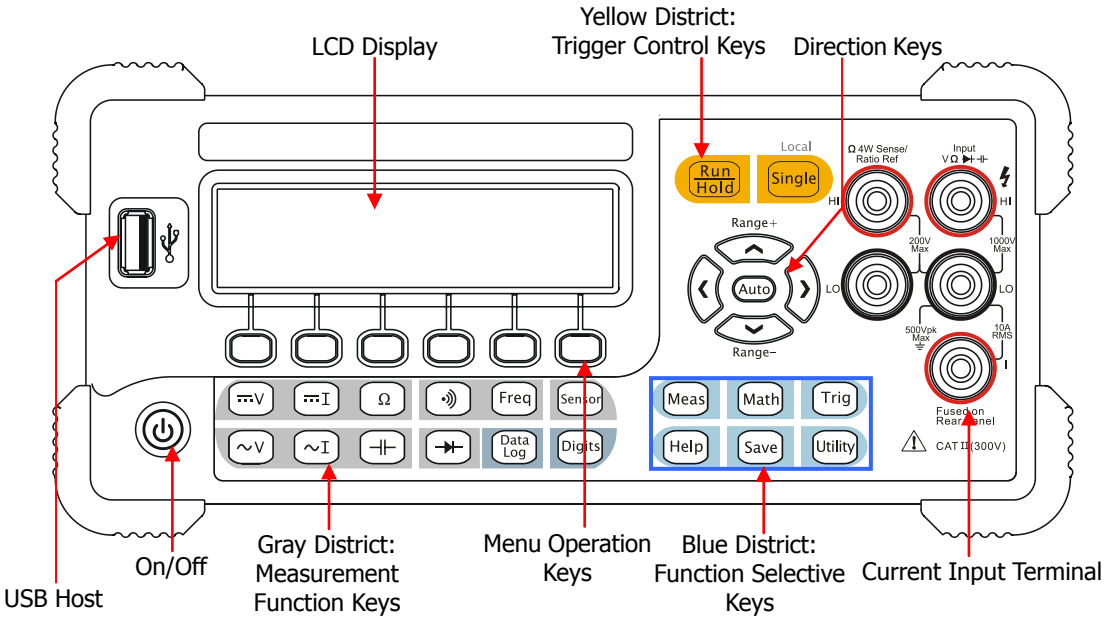

Figure 2-3 Sketch map of Front Panel

Gray Function Keys:	**Blue Function Keys:**
Measure DC Voltage	Set the System parameters
Measure DC Current	Open Math operation
Measure Resistance	Set Trigger and Parameter
Measure Continuity	Save and Recall
Measure Frequency	Set the Utility Functions
Measure Sensor	View the built-in Help System
Measure AC Voltage	
Measure AC Current	
Measure Capacitance	
Measure Diode	
Logging Data	
Set the Digit of Shown Data	

Introduction of Rear Panel

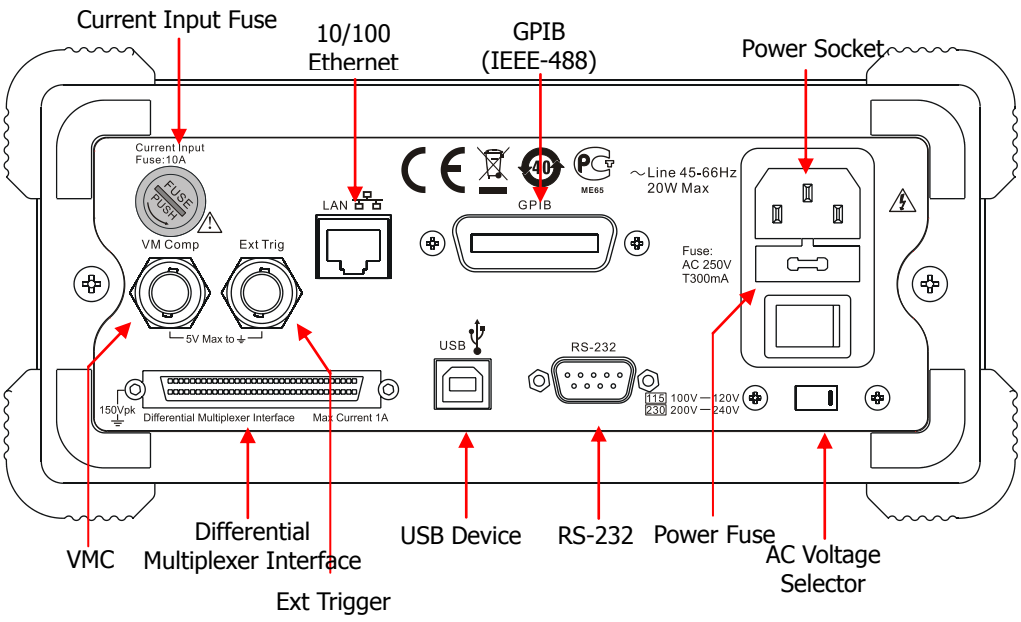

Figure 2-4 Sketch map of Rear Panel

Introduction of User Interface

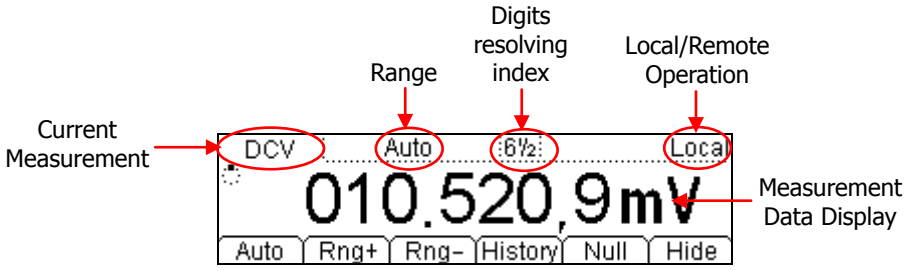

Figure 2-5 Sketch map of User Interface

Chapter 3 Performance Test

The chapter mainly covers the following topics:

- Equipments for Test
- Performance Test

  Quick Test

  Common Test

  Optional AC Voltage Test

  Optional AC Current Test

  Capacitance Test
- Software Connection Test

Equipments for Test

The equipments in table 3-1 are recommended for testing DM3000 Series Digital Multimeter (also for calibration). If the exact equipment is not available, use the accuracy requirements shown to select substitute test equipments.

Table 3-1 Recommended Equipments

Test and Calibration Item	Recommended Equipment	Accuracy Requirement
Zero Calibration	None	4-terminals short using only copper interconnections
DC Voltage	Fluke 5520A	<1/5 instrument 24 hour spec
Dc Current	Fluke 5520A	<1/5 instrument 24 hour spec
Resistance	Fluke 5520A	<1/5 instrument 24 hour spec
AC Voltage	Fluke 5520A	<1/5 instrument 24 hour spec
AC Current	Fluke 5520A	<1/5 instrument 24 hour spec
Frequency	Fluke 5520A	<1/5 instrument 24 hour spec
Capacitance	Fluke 5520A	<1/5 instrument 24 hour spec

Test Consideration

In order to make all the test results more creditable, you are suggested to comply with the following recommendations during testing:

1. Provide proper working voltage for equipments;
2. Ensure a stable test ambient with temperature between 18 °C and 28 °C;
3. Make sure the ambient relative humidity is less than 80%;
4. More than an hour's warm-up should be done before testing or calibrating;
5. Use copper connector to minimize thermal offset voltage;
6. Use Shielded Twisted Pair with double insulating layer as short as possible to minimize its resistance and noise.

Because DM3000 Series Digital Multimeter is a type of high accurate measurement instrument, you must take special care to protect testing procedure against other disturbs being produced.

Performance Test

You can select two different methods when testing by using the equipments listed in table 3-1: Quick test and Common test. The detailed explanations are given below.

Quick Test

Quick test is an eclectic project which can either speed up test or ensure the test results achieve to high confidence which contains parts of test items within Common test, additional, "Q" is designated for its short (in Common test).

NOTE

Quick test is not applicable for equipments with some abnormal components. The equipment failing the quick performance check must be used after calibrating or repairing.

Common Test

Common test is recommend be done once you got the instrument so as to do a complete evaluate for its performance. Generally, the test result is valid in 90-days. If the performance test is performed in 24-hours after calibration, the valid period is 24-hours.

NOTE

It is necessary to do the test again when exceed valid period since first successful test. The equipment failing test should not be used until have been calibrated or repaired.

1. Zero Offset Test

When testing Zero Offset, firstly apply a 4-wire short across the Input HI-Lo and Sense HI-Lo terminals (front terminals), then leave the current terminal open as shown in figure 3-1:

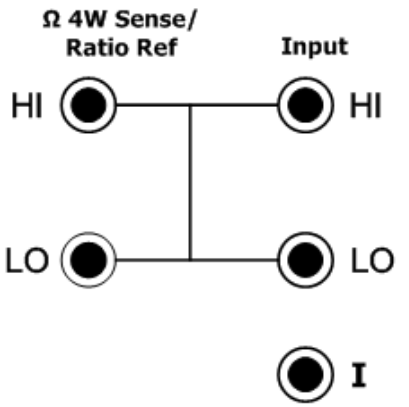

Figure 3-1
The Input HI-LO and Sense/Ref HI-LO Terminals in Short Circuit

Next, perform the test items in table 3-2 or table 3-3 one by one, then compare the test results with the error range in the tables.

Table 3-2 Zero Offset of the Standard Equipment (DM306X)

Input	Function	Quick Test point	Range	Error （1 year）
Open	DC Current		2.000000mA	±1μA
		Q	20.00000mA	±1.2μA
			200.0000 mA	±10μA
			1.000000A	±300μA
			10.00000A[1]	±2mA
Short	DC Voltage	Q	200.0000mV	±14μV
			2.000000V	±14μV
			20.00000V	±100μV
			200.0000V	±2.4mV
			1000.000V[2]	±10mV
Short	2-Wire Ohms/ 4-Wire Ohms[3]		200.0000Ω	±22mΩ
			2.000000kΩ	±40mΩ
			20.00000kΩ	±200mΩ
		Q	200.0000kΩ	±2Ω
			1.000000MΩ	±10Ω
			10.00000MΩ	±600Ω
			100.0000MΩ	±15kΩ

Notes:

[1] Continuous current more than DC 7A or AC RMS 7A should be 30 seconds Off and 30 seconds On;

[2] Each additional volt over ± 500VDC adds 0.02 mV of error;

[3] Errors in above table are corresponding to 2-wire resistance function in math Null. Without Math Null, the error is ± 0.2 Ω additional errors in 2–wire resistance function;

[4] The reading resolution of multimeter is 6½;

[5] Q: Optional quick test point.

Table 3-3 Zero Offset of the Standard Equipment (DM305X)

Input	Function	Quick Test Point	Range	Error (1 year)
Open	DC Current		2.000000mA	±1.4μA
		Q	20.00000mA	±1.6μA
			200.0000 mA	±18μA
			1.000000A	±700μA
			10.00000A[1]	±700μA
Short	DC Voltage	Q	400.0000mV	±32μV
			4.000000V	±240μV
			40.00000V	±2.4mV
			400.0000V	±24mV
			1000.000V[2]	±50mV
Short	2-Wire Ohms/ 4-Wire Ohms[3]		400.0000Ω	±40mΩ
			4.000000kΩ	±240mΩ
			40.00000 kΩ	±2.4Ω
		Q	400.0000 kΩ	±28Ω
			4.000000MΩ	±400Ω
			100.00000MΩ	±5kΩ

Notes:

[1] Continuous current more than DC 7A or AC RMS 7A should be 30 seconds Off after 30 seconds On;

[2] Each additional volt over ± 500 VDC adds 0.02 mV of error;

[3] Errors in above table are corresponding to 2-wire resistance function in math Null. Without Math Null, the error is ± 0.2 Ω additional errors in 2–wire resistance function;

[4] The reading resolution of multimeter is 5½;

[5] Q: Optional quick test point.

2. DC Gain Test

In DC gain test, input the standard signal output from test equipment into the input terminal of tested equipment; and compare the test results with error shown in the table 3-4 and 3-5.

Table 3-4 DC Gain Error of the Standard Equipment (DM306X)

Test Signal	Function	Quick Test Point	Range	Error (1 year)
2mA	DC Current		2.000000mA	±2.52μA
20mA		Q	20.00000mA	±16.2μA
200mA			200.0000 mA	±172μA
1A			1.000000A	±1.03mA
10A[1]			10.00000A	±35mA
200mV	DC Voltage	Q	200.0000mV	±31μV
2V			2.000000V	±170μV
20V		Q	20.00000V	±1.8mV
200V			200.0000V	±22.4mV
1000V[2]			1000.000V	±120mV
200.0000Ω	2-Wire Ohms/ 4-Wire Ohms[3]		200.0000Ω	±62mΩ
2.000000kΩ			2.000000kΩ	±340mΩ
20.00000kΩ		Q	20.00000kΩ	±3.2Ω
200.0000kΩ		Q	200.0000kΩ	±32Ω
1.000000MΩ			1.000000MΩ	±160Ω
10.00000MΩ			10.00000 MΩ	±6.2kΩ
100.0000MΩ			100.0000 MΩ	±815kΩ

Notes:

[1] Continuous current more than DC 7A or AC RMS 7A should be 30 seconds Off after 30 seconds On;

[2] Each additional volt over ± 500 VDC adds 0.02 mV of error;

[3] Errors in above table are corresponding to 2-wire resistance function in math Null. Without Math Null, the error is ± 0.2 Ω additional errors in 2–wire resistance function;

[4] The reading resolution of multimeter is 6½;

[5] Q: Optional quick test point.

Table 3-5 DC Gain Error of the Standard Equipment (DM305X)

Test Signal	Function	Quick Test Point	Range	Error (1 year)
2mA	DC Current		2.000000mA	±2.4μA
20mA		Q	20.00000mA	±11.6μA
200mA			200.0000 mA	±118μA
1A			1.000000A	±1.7mA
10A[1]			10.00000A	±20.7mA
400mV	DC Voltage		400.0000mV	±132μV
4V		Q	4.000000V	±1.24mV
40V		Q	40.00000V	±12.4mV
400V			400.0000V	±144mV
1000V[2]			1000.000V	±350mV
400.0000Ω	2-Wire Ohms/ 4-Wire Ohms[3]		400.0000Ω	±240mΩ
4.000000kΩ			4.000000kΩ	±840 mΩ
40.00000kΩ		Q	40.00000kΩ	±8.4Ω
400.000 kΩ		Q	400.0000kΩ	±148Ω
4.000000MΩ			4.000000MΩ	±2.8kΩ
100.00000MΩ			100.00000MΩ	±2.005MΩ

Notes:

[1] Continuous current more than DC 7A or AC RMS 7A should be 30 seconds ON and 30 seconds OFF;

[2] Each additional volt over ± 500 VDC adds 0.02 mV of error;

[3] Errors in above table are corresponding to 2-wire resistance function in math Null. Without Math Null, the error is ± 0.2 Ω additional errors in 2–wire resistance function;

[4] The reading resolution of multimeter is 5½;

[5] Q: Optional quick test point.

3. AC Voltage Gain Test

In AC voltage gain test, input the standard signal the test equipment outputs into the input terminal of tested equipment; and compare the test results with the error shown in the table 3-6 and 3-7.

Table 3-6 AC Voltage Gain Error of the standard equipment (DM306X)

Test Signal	Input Frequency	Quick Test Point	Range	Error (1 year)
200mV	1kHz	Q	200.000mV	±440μV
200mV	50kHz		200.000mV	±460μV
200mV	300kHz		200.000mV	±10.6mV
2V	1kHz	Q	2.00000V	±3.6mV
2V	50kHz		2.00000V	±9.4mV
2V	300kHz		2.00000V	±96mV
20V	1kHz	Q	20.0000V	±36mV
20V	50kHz		20.0000V	±94mV
20V	300kHz		20.0000V	±960mV
200V	1kHz	Q	200.000V	±360mV
200V	50kHz		200.000V	±940mV
200V	100kHz		200.000V	±1.4V
750V	1kHz	Q	750.00V	±1.35V
750V	10kHz		750.00V	±1.35V

Notes:

[1] Set the AC filter as slow (Meas → Filter → Slow);

[2] Set the reading resolution as 5½;

[3] Q: Optional quick test point.

Table 3-7 AC Voltage Gain Error of the Standard Equipment (DM305X)

Test Signal	Input Frequency	Quick Test Point	Range	Error (1 year)
200mV	1kHz	Q	200.000mV	±0.6mV
200mV	50kHz		200.000mV	±4.4mV
200mV	100kHz		200.000mV	±8.4mV
2V	1kHz	Q	2.00000V	±6mV
2V	50kHz		2.00000V	±22mV
2V	100kHz		2.00000V	±44mV
20V	1kHz	Q	20.0000V	±60mV
20V	50kHz		20.0000V	±220mV
20V	100kHz		20.0000V	±440V
200V	1kHz	Q	200.000V	±600mV
200V	50kHz		200.000V	±2.2V
200V	100kHz		200.000V	±4.4V
750V	1kHz	Q	750.00V	±2.25V
750V	10kHz		750.00V	±2.25V

Notes:

[1] Set the AC filter as slow (Meas → Filter → Slow);

[2] Set the reading resolution as 5½;

[3] Q: Optional quick test point.

4. AC Current Gain Test

In AC current gain test, input the standard signal the test equipment outputs into the input terminal of tested equipment; and compare the test results with the error shown in the table 3-8 and 3-9.

Table 3-8 AC Current Gain Error of the Standard Equipment (DM306X)

Test Signal	Input Frequency	Quick Test Point	Range	Error (1 year)
20mA	1kHz	Q	20.0000mA	±58μA
20mA	10kHz		20.0000mA	±90μA
200mA	1kHz	Q	20.0000mA	±580μA
200mA	10kHz		200.000mA	±940μA
1A	1kHz	Q	1.00000A	±5.6mA
1A	10kHz		1.00000A	±7.5mA
10A[1]	1kHz	Q	10.0000A	±96mA
10A[1]	5kHz		10.0000A	±96mA

Notes:

[1] Continuous current more than DC 7A or AC RMS 7A should be 30 seconds ON and 30 seconds OFF;

[2] Set the AC filter as slow (Meas → Filter → Slow);

[3] Set the reading resolution as 5½;

[4] Q: Optional quick test point.

Table 3-9 AC Current Gain Error of the Standard Equipment (DM305X)

Test Signal	Input Frequency	Quick Test Point	Range	Error (1 year)
20mA	1kHz	Q	20.0000mA	±120μA
20mA	10kHz		20.0000mA	±440μA
200mA	1kHz	Q	200.000mA	±1.2mA
200mA	10kHz		200.000mA	±4.4mA
1A	1kHz	Q	1.00000A	±10mA
1A	10kHz		1.00000A	±25mA
10A[1]	1kHz	Q	10.0000A	±60mA
10A[1]	5kHz		10.0000A	±220mA

Notes:

[1] Continuous current more than DC 7A or AC RMS 7A should be 30 seconds ON and 30 seconds OFF;

[2] Set the AC filter as slow (Meas → Filter → Slow);

[3] Set the reading resolution as 5½;

[4] Q: Optional quick test point.

5. Frequency Gain Test

In frequency gain test, input the standard signal the test equipment outputs into the input terminal of tested equipment; and compare the test results with the error shown in the table 3-10 and 3-11.

Table 3-10 Frequency Gain Error of the Standard Equipment (DM306X)

Test Signal	Frequency of Test Signal	Quick Test Point	Range	Error (1 year)
1V	5Hz		200.00000mV	3.5mHz
1V	10Hz		2.0000000V	4mHz
1V	40Hz		20.000000V	8mHz
1V	100kHz	Q	200.00000V	7Hz

Notes:

[1] Use coaxial-cable as the lead for the input signal;

[2] The reading resolution is 6½;

[3] Q: Optional quick test point.

Table 3-11 Frequency Gain Error of the Standard Equipment (DM305X)

Test Signal	Frequency of Test Signal	Quick Test Point	Range	Error (1 year)
1V	5Hz		200.00000mV	5mHz
1V	10Hz		2.0000000V	7mHz
1V	40Hz		20.000000V	8mHz
1V	100kHz	Q	200.00000V	20Hz

Notes:

[1] Use coaxial-cable as the lead for the input signal;

[2] The reading resolution is 5½;

[3] Q: Optional quick test point.

Optional AC Voltage Test

In optional AC voltage test, input the standard signal the test equipment outputs into the input terminal of tested equipment; and compare the test results with the error shown in the table 3-12 and 3-13.

Table 3-12 Accessional AC Voltage Test Error (DM306x)

Test Signal	Input Frequency	Range	Error (1 year)
2V	10Hz	2.000000V	±103.4mV
2V	1kHz	2.000000V	±3.6mV
2V	50kHz	2.000000V	±9.4mV
2V	100kHz	2.000000V	±14mV
2V	300kHz	2.000000V	±96mV
20V	1kHz	20.00000V	±36mV
200V	1kHz	200.0000V	±360mV
200mV	1kHz	200.0000mV	±440μV

Notes:

[1] Set the AC filter as slow (Meas → Filter → Slow);

[2] Set the reading resolution as 5½.

Table 3-13 Accessional AC Voltage Test Error（DM305X）

Test Signal	Input Frequency	Range	Error (1 year)
2V	10Hz	2.000000V	±22mV
2V	1kHz	2.000000V	±6mV
2V	50kHz	2.000000V	±22mV
2V	100kHz	2.000000V	±44mV
20V	1kHz	20.00000V	±60mV
200V	1kHz	200.0000V	±600mV
200mV	1kHz	200.0000mV	±600μV

Notes:

[1] Set the AC filter as slow (Meas → Filter → Slow);

[2] Set the reading resolution as 5½.

Optional AC Current Test

In optional AC current test, input the standard signal from testing equipment into equipment to be tested; and compare the test results with the errors shown in the table 3-14 and 3-15.

Table 3-14 Accessional AC Current Test Error（DM306X）

Current	Input Frequency	Range	Error (1 year)
20mA	10Hz	20.0000mA	±1.034mA
20mA	1kHz	20.0000mA	±58μA
20mA	10kHz	20.0000mA	±90mA
1A	1kHz	1.00000A	±5.6mA
200mA	1kHz	1.00000A	±3.28mA
20mA	1kHz	1.00000A	±2.758mA

Notes:

[1] Set the AC filter as slow (Meas → Filter → Slow);

[2] Set the reading resolution as 6½.

Table 3-15 Accessional AC Current Test Error（DM305X）

Current	Input Frequency	Range	Error (1 year)
20mA	10Hz	20.0000mA	±320μA
20mA	1kHz	20.0000mA	±120μA
20mA	10kHz	20.0000mA	±440μA
1A	1kHz	1.00000A	±10mA
200mA	1kHz	1.00000A	±6mA
20mA	1kHz	1.00000A	±5.1mA

Notes:

[1] Set the AC filter as slow (Meas → Filter → Slow);

[2] Set the reading resolution as 6½.

Capacitance Test

In capacitance test, input the standard signal from testing equipment into the equipment to be tested; and compare the test results with the error shown in the table 3-16 and 3-17.

Table 3-16 Capacitance Test Error of the Standard Equipment (DM306X)

Test Signal	Quick Check	Range	Error (1 year)
2nF		2.000nF	±90 pF
20nF		20.00nF	±300pF
200nF	Q	200.0nF	±3nF
2μF		2.000μF	±30nF
20μF	Q	20.00μF	±300nF
200μF		200.0μF	±3μF

Notes:

[1] Specifications are for 60 minutes warm–up using Math Null;

[2] Q: Optional quick test point.

Table 3-17 Capacitance Test Error of the Standard Equipment (DM305X)

Test Signal	Quick Check	Range	Error (1 year)
4nF		4.000nF	±180pF
40nF		40.00nF	±600pF
400nF	Q	400.0nF	±6nF
4μF		4.000μF	±60nF
40μF	Q	40.00μF	±600nF
200μF		200.0μF	±3μF

Notes:

[1] Specifications are for 60 minutes warm–up using Math Null;

[2] Q: Optional quick test point.

Software Connection Test

UltraLogger Connection Test

USB Device Interface of DM3000 can be used to connect the computer software UltraLogger，after successfully installing the software and USB driver and opening the software, you will see the figure 3-2 below.

Figure 3-2 UltraLogger is successfully connected

UltraSensor Connection Test

USB Device Interface of DM3000 can be used to connect the computer software UltraSensor; after successfully installing the software and USB driver and opening the software; press above the software interface, the color of light on the upper right of interface turns red into green, you will see the figure 3-3 below.

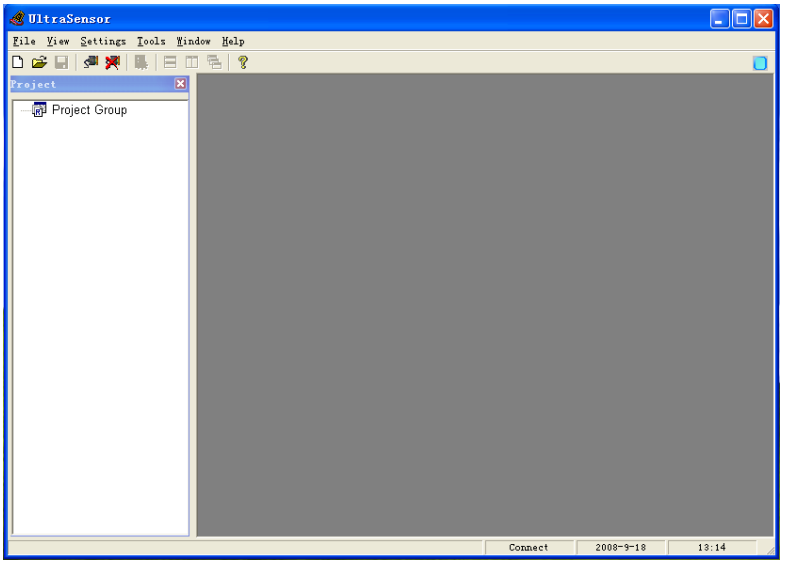

Figure 3-3 UltraSensor is successfully connected

NOTE

You can download the latest UltraLogger and UltraSensor software from the official website www.rigolna.com.

Chapter 4 Calibration

The chapter mainly covers the following topics:

- Calibration Security Code
- Calibration Notice
- DC Voltage, DC Current, Resistance Calibration
- AC Voltage and AC Current Calibration
- Frequency Calibration
- Capacitance Calibration

Calibration Security Code

Setting calibration security code can ensure that the multimeter could be calibrated only by authorized person. Before calibrating, firstly you must enter calibration security code.

The security code of Multimeter could be made of 10 characters at most which is from number "0~9" and letter "A~Z". Users can set the self-defined password.

The factory default of security code is "DMCAL", and when power is off or reset, security code will not be changed or lost.

Set or Reset Security Code

Press Utility, select T/C → PSW to enter the primary password by the direction buttons on front panel and set SecrOff, then enter a new code and press SecrOff to finish new setting.

Calibration Notice

Calibration Interval

The multimeter should be calibrated on a regular interval determined by the measurement accuracy requirement of your application. Generally, a 90 days interval is recommended, also a 1-year interval could be used for calibrating depending on your actual requirement. **RIGOL** does not recommend extending calibration intervals beyond 1 year for any application.

Whatever calibration interval you select, **RIGOL** suggests that completing re-adjustment should always be performed in conformity to its regulations offered by **RIGOL** during calibrating. If you actually do this, a good performance will be hold within interval to next calibration or longer.

Calibration Explanations

During calibrating, the calibration factor is determined by current input value and saved in non-volatile memory and will not be changed until next calibration. Basically two steps should be performed during calibrating: Zero Adjustment and Gain Adjustment (except for AC and frequency measurement).

DC Voltage, DC Current, Resistance Calibration

The calibration procedures of DC voltage, DC current and resistance are similar, so next will take the calibration of 4-wire resistance in the range of 20kΩ as an example to show you procedures.

1. Press Ω to select resistance measurement function, then press Rng+ or Rng- to set the range as 20kΩ and the reading resolution as 6½;

2. Press Utility, and select T/C → PSW to input the password by the direction buttons on front panel, then set SecrOff, next select Cal → Enter;

3. See figure 4-1, short the terminals of both Input HI-LO and Sense/Ref HI-LO via plugging into the short pin, and the current terminal is opened. Then select Zero to perform Zero Calibration;

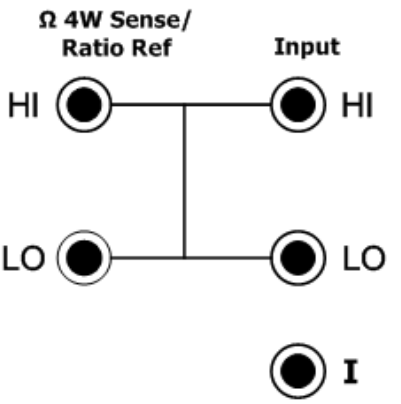

Figure 4-1 The Input HI-LO and Sense/Ref HI-LO Terminals in Short Circuit

4. Finally, connect the terminals of Input HI-LO and Sense/Ref HI-LO with corresponding terminals from Fluke 5520A, and set Fluke 5520A as 20 kΩ output (full range input), then select Gain to perform gain calibration. After calibrating, press Save to exit and complete calibration. Afterwards, perform other items list in table 4-1 in the same way.

NOTE

The calibration procedure must be performed carefully to avoid affecting instruments performance by wrong operations. Before calibrating, please pay your attention to "Test Consideration" in chapter 3.

Table 4-1 DC Zero and DC Gain Calibration Input Value (DM306X)

Function	Range	Zero	DC Gain Calibration Input Value
Resistance	200.0000Ω	0 (input terminal shorted)	200.0000Ω
	2.000000kΩ	0	2.000000kΩ
	20.00000kΩ	0	20.00000kΩ
	200.0000kΩ	0	200.0000kΩ
	10.00000MΩ	0	10.00000MΩ
	100.0000MΩ	0	100.0000MΩ
DC Voltage	200.0000mV	0 (input terminal shorted)	200.0000mV
	2.000000V	0	2.000000V
	20.00000V	0	20.00000V
	200.0000V	0	200.0000V
	1000.000V	0	1000.000V
DC Current	20.00000mA	0 (input terminal open)	20.00000mA
	200.0000mA	0	200.0000mA
	1.000000A	0	1.000000A
	10.00000A	0	10.00000A

Table 4-2 DC Zero and DC Gain Calibration Input Value (DM305X)

Function	Range	Zero	DC Gain Calibration Input Value
Resistance	400.000Ω	0 (input terminal shorted)	400.000Ω
	4.00000kΩ	0	4.00000kΩ
	40.0000kΩ	0	40.0000kΩ
	400.000kΩ	0	400.000kΩ
	4.00000MΩ	0	4.00000MΩ
	100.000MΩ	0	100.0000MΩ
DC Voltage	400.000mV	0 (input terminal shorted)	400.000mV
	4.00000V	0	4.00000V
	40.0000V	0	40.0000V
	400.000V	0	400.000V
	1000.00V	0	1000.00V
DC Current	20.0000mA	0 (input terminal open)	20.0000mA
	200.000mA	0	200.000mA
	1.00000A	0	1.00000A
	10.0000A	0	10.0000A

AC Voltage and AC Current Calibration

Comparing the calibration procedure with DC, when calibrating AC function Frequency correction and Middle range calibration are appended to be executed but Zero calibration. Take the calibration of AC voltage in the range of 200mV as an example:

1. Press (~V) to select AC voltage measurement function, then press Rng+ or Rng- to set the range as 200mV and the reading resolution as 5½;

2. Press (Utility), and select T/C → PSW to input password and set SecrOff, then select Cal → Enter;

3. Select Freq and select 50Hz frequency correction. Then input a sine wave of 100mV, 50Hz into the terminal of Input HI-LO by Fluke 5520A, after that, press Meas and select 200 kHz frequency correction. Next, input a sine wave of 200 kHz into the terminal of Input HI-LO by Fluke 5520A. Then press Meas and select Done to return to last menu.

4. Output a sine wave of 100mV, 1 kHz into the terminal of Input HI-LO by FLuke 5520A. Select Middle to perform middle range calibration, then go on output a sine wave of 200mV, 1kHz into the terminal of Input HI-LO by FLuke 5520A , after that, press Gain to perform full range calibration, finally select Save to exit and complete calibrating AC voltage in the range of 200mV. Afterwards, perform other items list in table 4-2 in the same way.

NOTE

Frequency correction is not required during calibrating AC current.

Table 4-3 AC Calibration Input Value

Function	Range	Frequency Correction Signal	Middle Calibration Signal	Full Range Calibration Signal
AC Voltage	200mV	50Hz/100mV	1kHZ/100mV	1kHz/200mV
		200kHz/100mV		
	2V	50Hz/1V	1kHz/1V	1kHz/2V
		200kHz/1V		
	20V	50Hz/3V	1kHz/10V	1kHz/20V
		200kHz/3V		
	200V	50Hz/10V	1kHz/100V	1kHz/200V
		200kHz/10V		
	750V	50Hz/10V	1kHz/375V	1kHz/750V
		200kHz/10V		
AC Current	2mA	Null	1kHz/1mA	1kHz/2mA
	20mA		1kHz/10mA	1kHz/20mA
	200mA		1kHz/100mA	1kHz/200mA
	1A		1kHz/500mA	1kHz/1A
	10A		1kHz/5A	1kHz/10A

Frequency Calibration

Frequency calibration is easier than others; generally just calibrate 2V range is enough. The frequency calibration procedure is:

1. Press Freq to select AC voltage measurement function, then press Rng+ or Rng- to set the range as 2V;
2. Press Utility , and select menu button T/C → PSW , input password, and set SecrOff , then select CAL → Enter ;
3. Input a sine wave of 1V, 450 kHz into the terminal of Input HI-LO by FLuke 5520A, and press Gain , finally select Save and exit.

Capacitance Calibration

The way to calibrating Capacitance is similar with AC but a little difference. It also includes Zero calibration and Gain calibration, but all the input terminals on front panel are opened. Please refer to the section "AC calibration" about the detailed procedure. The capacitance calibration input values are shown in table 4-3.

Table 4-4 Capacitance Calibration input Value

Function	Range	Zero	Gain Input
Capacitance	2nF	Input Null	2nF
	20nF		20nF
	200nF		200nF
	2μF		2μF
	20μF		20μF
	200μF		200μF

Chapter 5 Disassembly & Assembly

The chapter mainly covers the following topics:

- The Disassembly and Assembly Notice
- The 3D View of DM3000
- To Disassemble and AssembleHandle, Rear Panel and Metallic Shell
- To Disassemble and Assemble Fuse Socket, BNC Module and GPIB PCB
- To Disassemble and Assemble Filter Board and Transformer
- To Disassemble and Assemble Front Panel and LCD
- To Disassemble and Assemble Multiplexer Board, Motherboard and Key Board PCB

The Disassembly and Assembly Notice

Notice:

- Please don't disassemble the instrument except the work need
- Please don't disassemble the instrument except the professionals
- Please cut off the multimeter power when disassembling
- Please wear the anti-static hand-ring or take other anti-static measures when disassembling
- Please use the proper tools and disassemble in order
- Prevent the transfiguration of metallic parts and avoid to be injured when disassembling

Tools:

- Club screwdriver T10, T15
- Clamps

WARNING Before disassembling, please make sure the power is cut off. The operation stuff should be trained and have acquired the related qualification.

The 3D View of DM3000

The 3D views of DM3000 are shown in the figure 5-1 and figure 5-2. You should have a primary understanding of the main parts of the instrument before disassembling and assembling. In progress of disassembling or assembling, please operate gently and step by step. Note that please not scratch the surface of the device and damage PCB and so on by tools, see the Disassembly and Assembly Notice. The disassembly order suggested is given as followings (for example DM3064):

Handle → Rear Panel → Metallic Shell → Fuse Socket → BNC & GPIB PCB → Filter Board and Transformer → Front Panel and LCD → Multiplexer Board → Motherboard → Key Board PCB.

The assembly step is reverse.

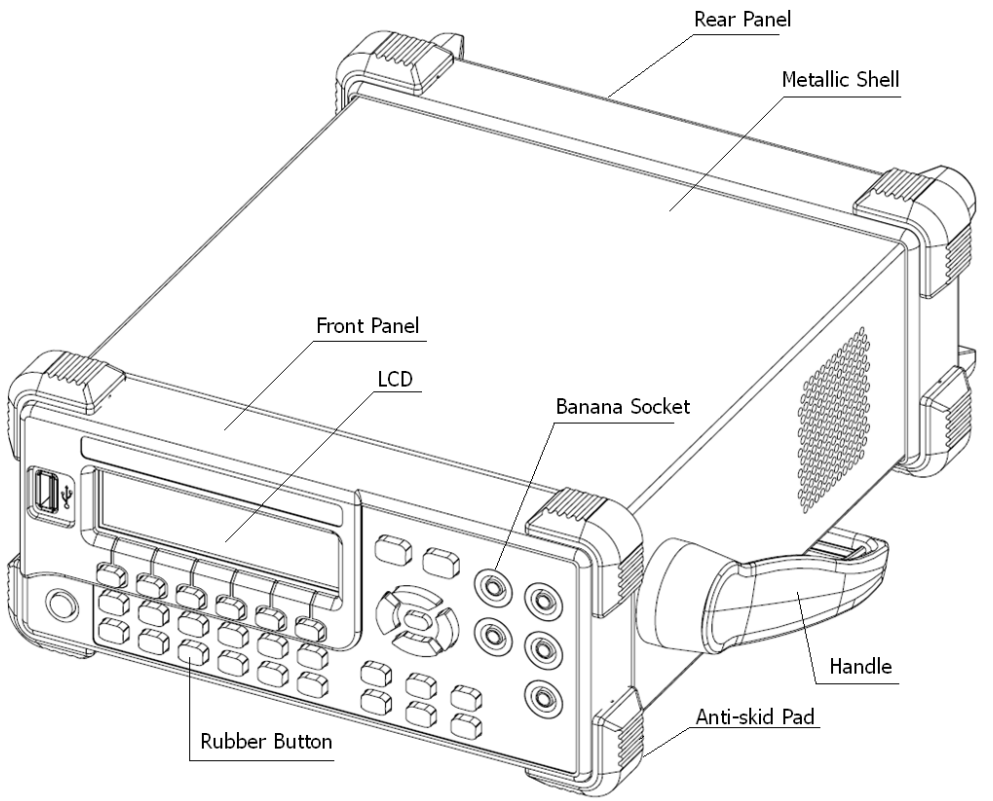

Figure 5-1 The Exterior 3D View of DM3000

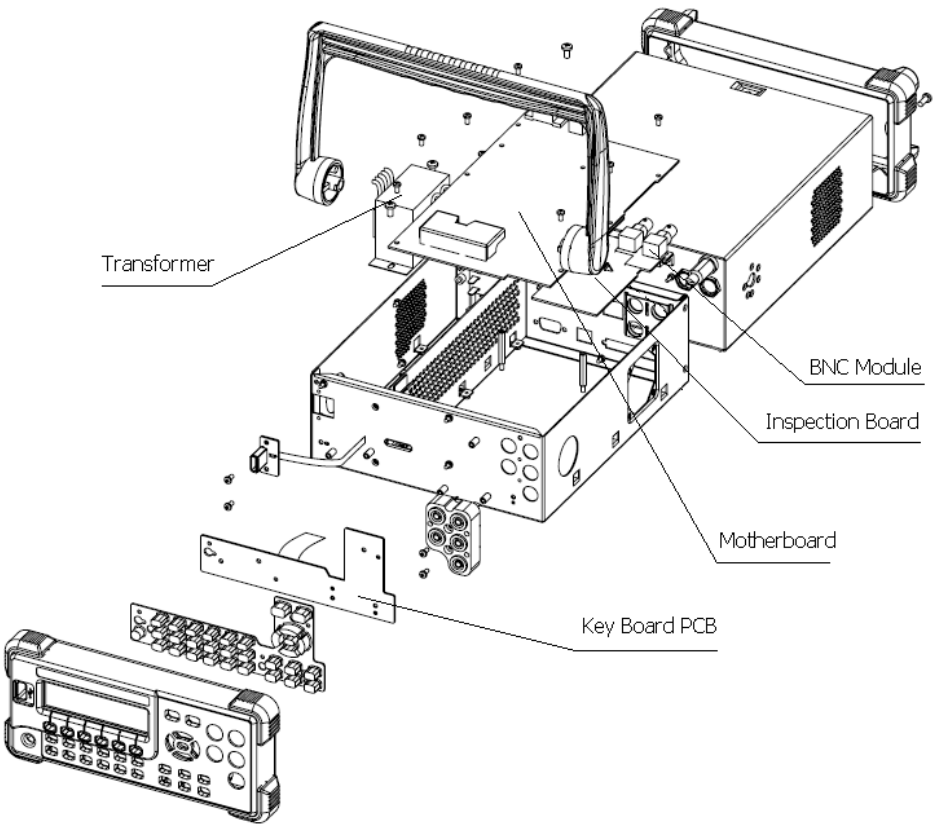

Figure 5-2 The Interior 3D View of DM3000

To Disassemble and Assemble Handle, Rear Panel and Metallic Shell

Grip both side of handle and pull it outward, then rotate the handle to the desired position in order to take it away. See figure 5-3. The disassembly method of rear panel and metallic shell is shown in the figure 5-4, figure 5-5.

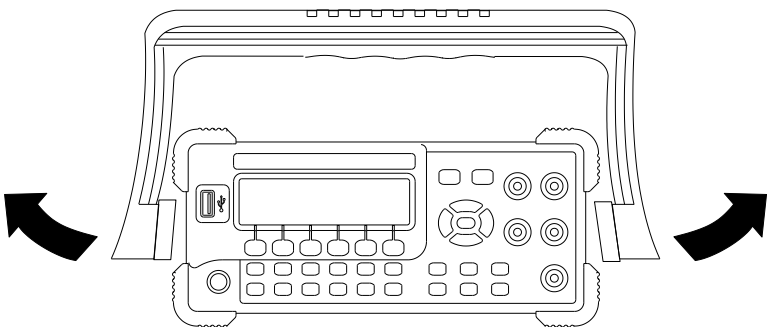

Figure 5-3 The Schematic of Disassembling and Assembling Handle

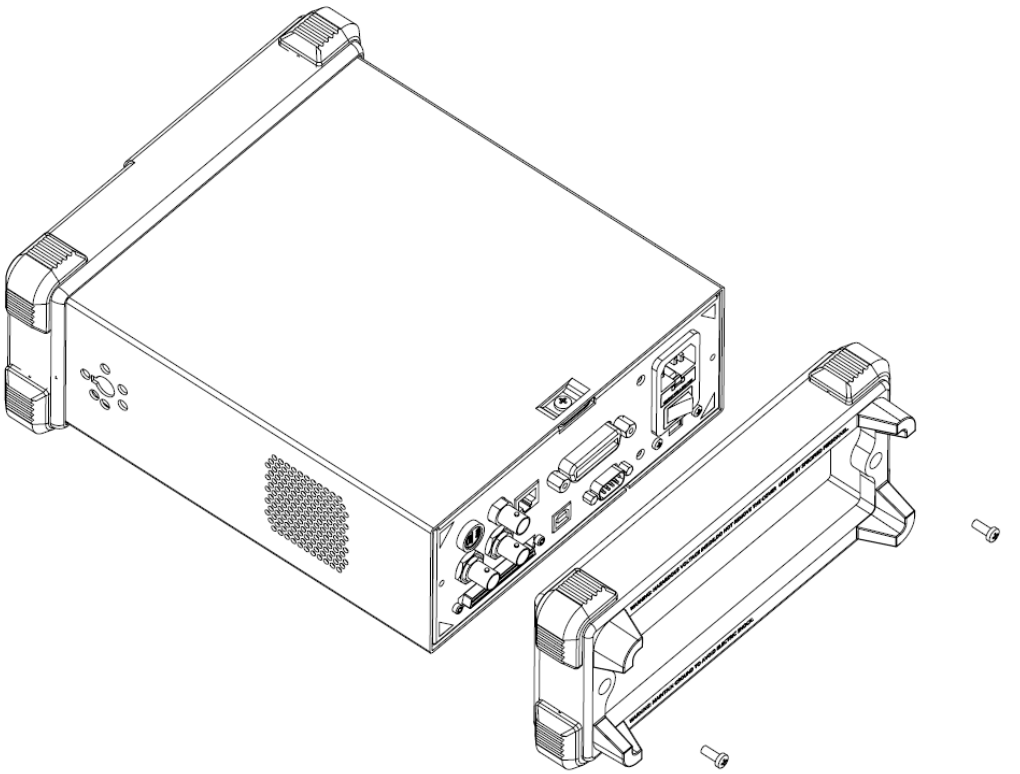

Figure 5-4 The Schematic of Disassembling and Assembling Rear Panel

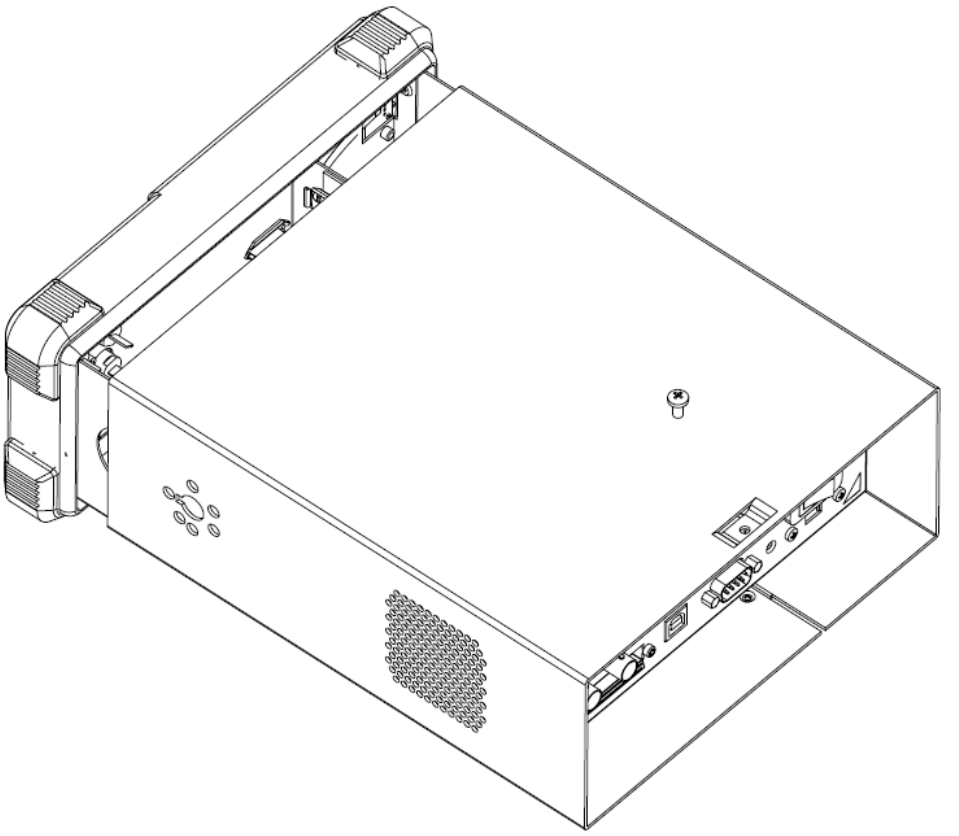

Figure 5-5 The Schematic of Disassembling and Assembling Metallic Shell

To Disassemble and Assemble Fuse Socket, BNC Module and GPIB PCB

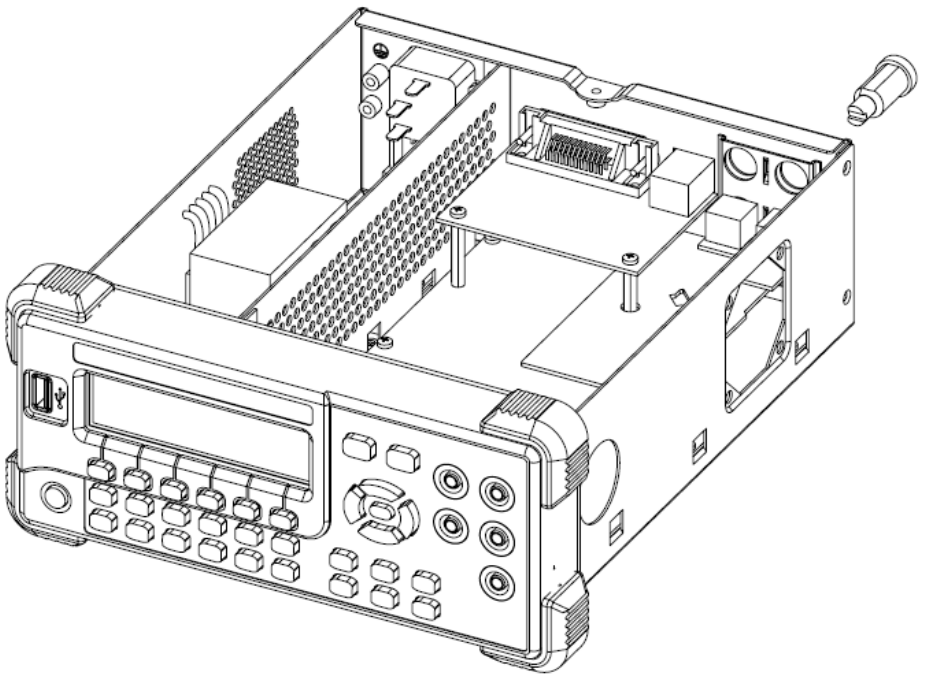

Figure 5-6 The Schematic of Disassembling and Assembling Fuse Socket

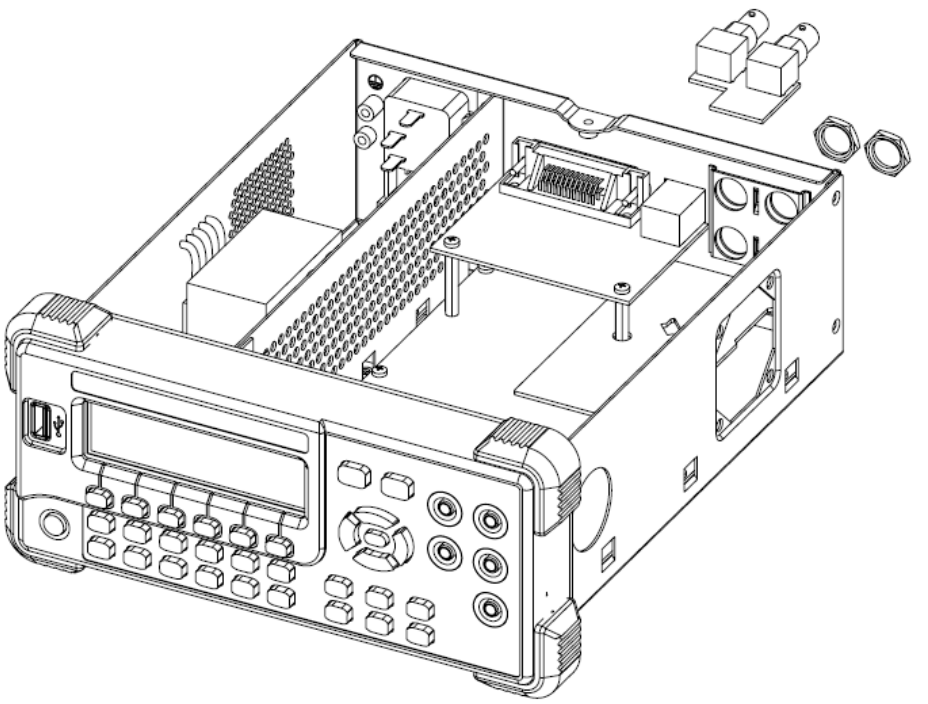

Figure 5-7 The Schematic of Disassembling and Assembling BNC Module

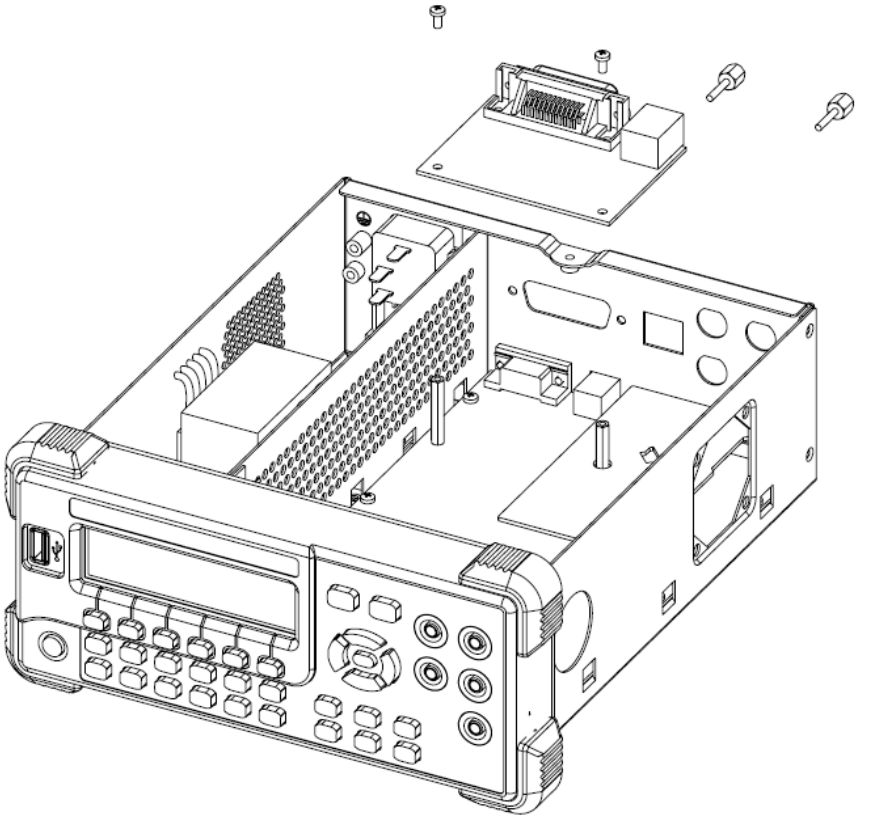

Figure 5-8 The Schematic of Disassembling and Assembling GPIB PCB

To Disassemble and Assemble Filter Board and Transformer

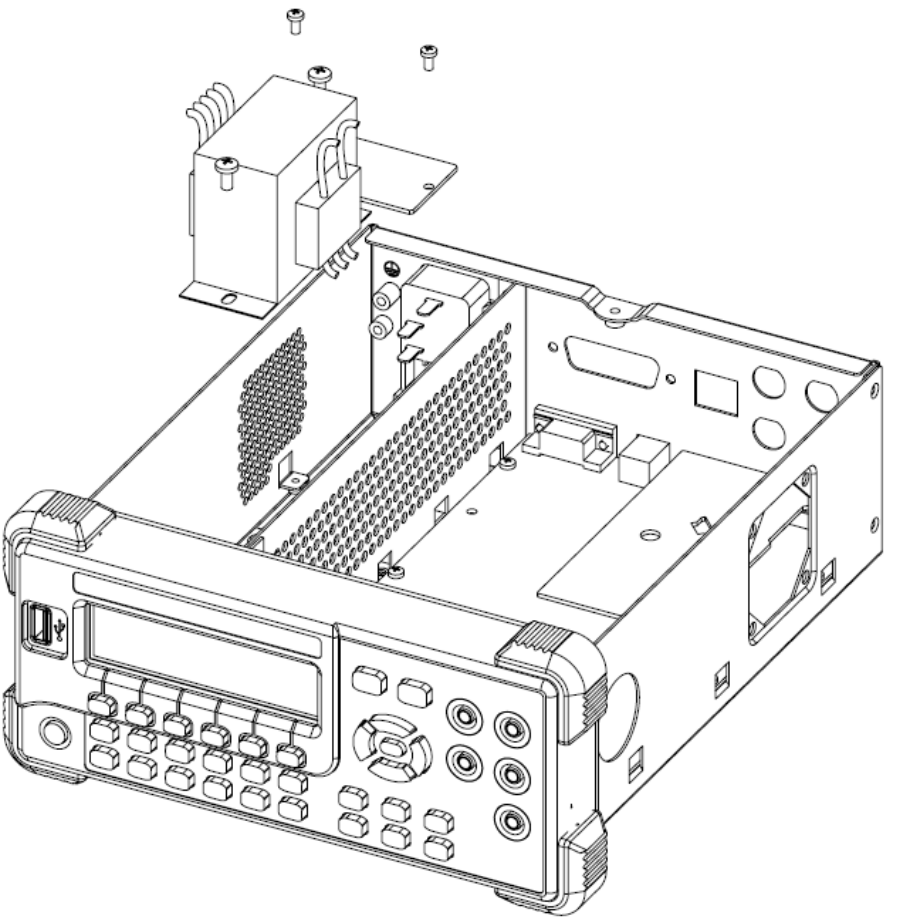

Figure 5-9 The Schematic of Disassembling and Assembling Filter Board and Transformer

To Disassemble and Assemble Front Panel and LCD

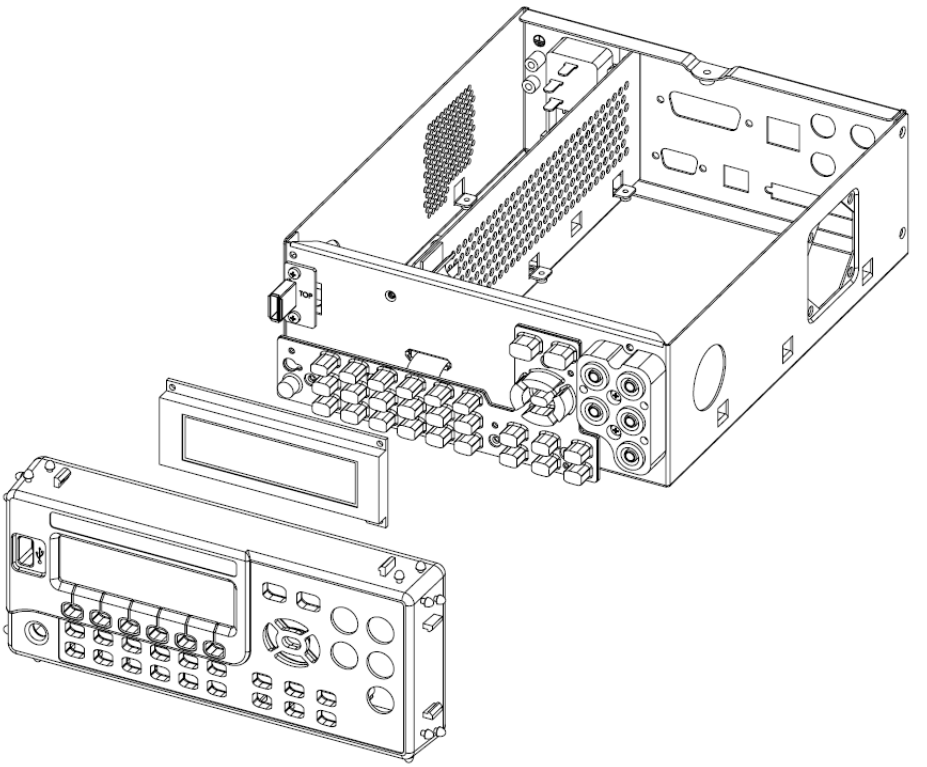

Figure 5-10 The Schematic of Disassembling and Assembling Front Panel and LCD

To Disassemble and Assemble Multiplexer Board, Motherboard and Key Board PCB

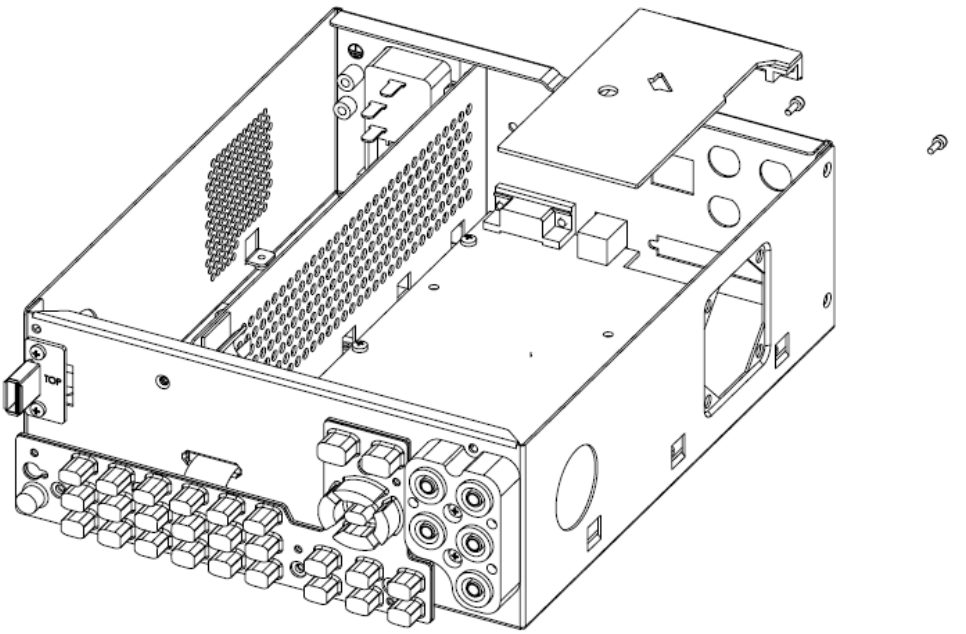

Figure 5-11 The Schematic of Disassembling and Assembling Multiplexer Board

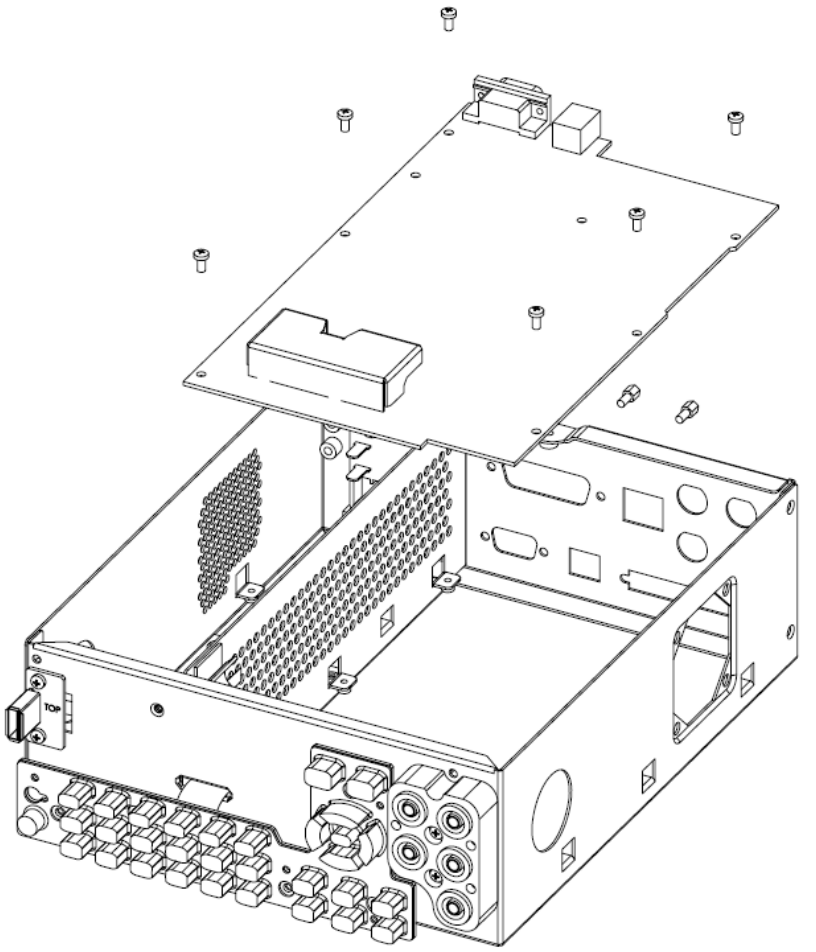

Figure 5-12 The Schematic of Disassembling and Assembling Motherborad

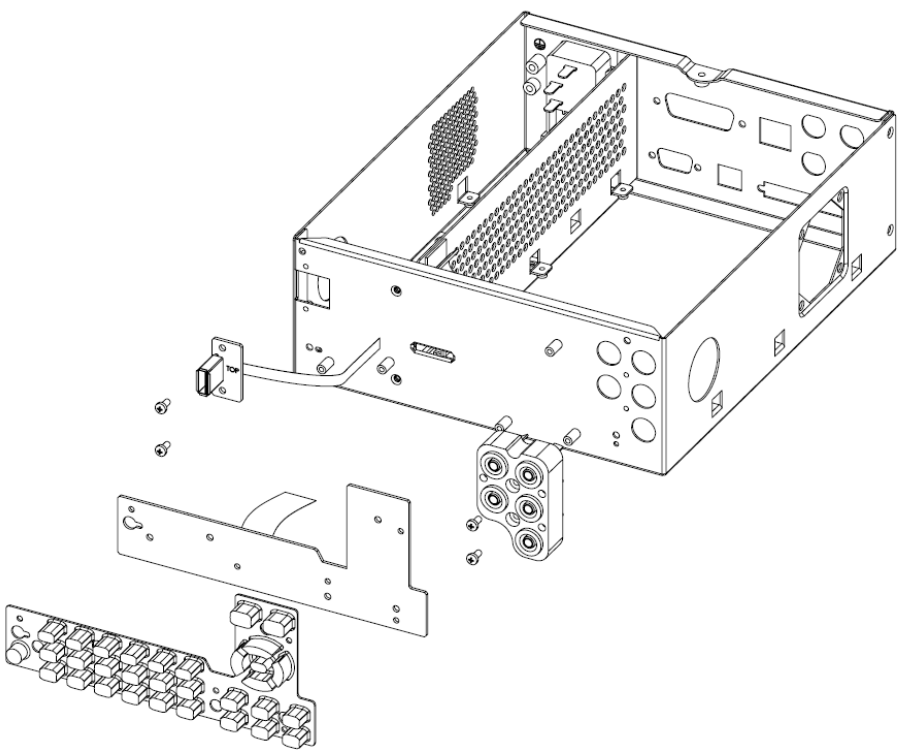

Figure 5-13 The Schematic of Disassembling and Assembling Key Board PCB

Above procedures and orders of disassembly and assembly are recommended to avoid the damage to equipment during operating and save your time.

Chapter 6 Troubleshooting & Maintenance

The chapter mainly covers the following topics:

- DM3000 Principle Introduction
- Troubleshooting

  Common Troubleshooting

  Components Inspection

  Replaceable Part List
- Maintenance and Cleaning

Even though great care was taken in the design of DM3000 series, problems may occur. So, please read this chapter carefully to get more information about troubleshooting and maintenance.

DM3000 Principle Introduction

The circuit of DM3000 series can be divided into floating circuit, grounding circuits and power input.

1. The floating circuit includes current fuse, front panel signal input end (banana socket) and measurement analog front-end which contains circuits such as the input protection of all the measurement function, function switch, signal transform conditioning, A/D conversion and control interface.

   The structural schematic diagram of circuit from DM3000 Series is as follows:

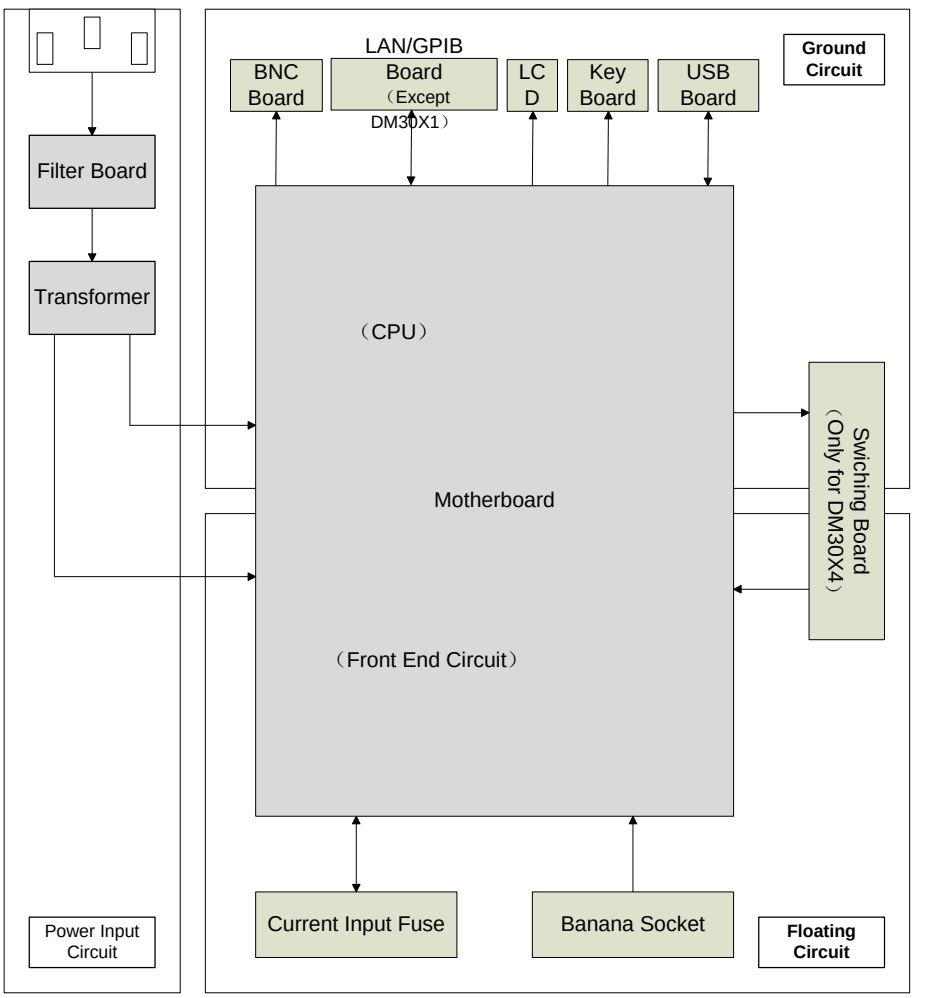

Figure 6-1 Circuit Diagram of DM3000 series

2. Ground circuit contains keyboard, LCD, USB Host, BNC board, LAN/GPIB board and the host CPU of motherboard.

3. The AC power inpour into the multimeter via power socket and connect with transformer through filter board that divides it into multi low voltage and floating into circuit and ground circuit respectively. The power supply of ground circuit is 9V AC voltage and the floating circuit is a group of 8.5V AC voltage and two groups of 17V AC voltage. The commutate, filter and regulation circuit in floating and grounding circuit transform the low-voltage AC into stable DC voltage and supply power to each circuit.

   - Connect the control circuit of multiplexer board with host CPU and then connect the output terminal of multiplexer board with analog front-end.

   - when measuring，the host CPU will send commands to control the analog front-end to switch function and range. Then the analog front-end return the result from A/D transform and cymometer to host CPU, eventually, the host CPU will calibrate these results and display according to control the LCD.

   - When multiplexer measuring, firstly the host CPU will control the analog front-end to switch to multiplex board, and then send commands to shift to certain channel, eventually, perform same procedures to get final result.

Troubleshooting

Common Troubleshooting

1. **After press the power switch, the multimeter is blank screen with nothing display:**
   (1) Check if the power is correctly connected.
   (2) Check if the main power switch on the Rear panel has been turn on.
   (3) Check if the power light on Front panel is bright.
   (4) Check if the safety fuse is blown; replace a new one if necessary.
   (5) Check if the power selector is in correct position.
   (6) If the unit still cannot work properly, please contact with your local **RIGOL** Service center.

Instruction of Power Supply Button:
Light: ON; Twinkle: STAND BY; Dark: OFF.

Tips:
How to change the fuse of power supply:
The electric power fuse locates within the fuse socket at the Rear panel of Multimeter which has already been equipped when the instrument leaves factory.
The replacing sequence for a fuse is:

- Disconnect the power. Use a tool to press the block down (as the dashed pointed in the picture) and then pull out the fuse socket.
- After replacing, put the fuse socket back into the slot.
- Check whether the voltage is in correct level.

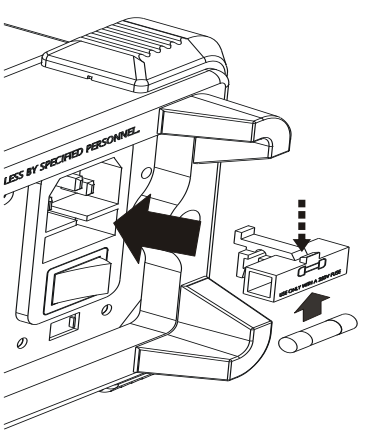

Figure 6-2 The Sketch Map of Fuse Replacement

CAUTION: Make sure the power is cut off before replacing fuse, and the specifications of fuse should be in accordance with the requirements in this manual.

2. When the reading display is incorrect:

(1) Check whether the range is consistent with test items.

(2) Check whether the recommended calibration date is exceed. If the testing value exceeds the range in corresponding accuracy index, please contact authorized calibration center of **RIGOL** to calibrate.

(3) If the instrument still can not work in the course of nature, please contact with your local **RIGOL** Service center.

3. When the back light of the screen is dark:

(1) Adjust its brightness and contrast.

(2) If the instrument still can not work in the course of nature, please contact with your local **RIGOL** Service center.

4. **When the multiplexer work abnormally:**

(1) Check whether the module connection cable and test lead is correctly connected.

(2) Check whether the multimeter could communicate with PC normally.;

(3) Check whether the correct range has been set to multiplexer test

(4) If the instrument still can not work in the course of nature, please contact with your local **RIGOL** Service center.

5. When the multimeter can not access into the test interface:

(1) Check whether you turn on the instrument following the requirements in manual

(2) Check whether GPIB/LAN extension board is connected with the motherboard normally.

(3) If the instrument still can not work in the course of nature, please contact with your local **RIGOL** Service center.

6. When the multimeter can not communicate with PC by its software:

(1) Check whether the USB cable is connected correctly.

(2) Take Windows system as example, check device manager to make sure whether PC recognizes the host machine connection.

(3) Check whether install the drive, you can download the drive program in the website www.rigol.com

(4) Check whether the software version is matching with current firmware version.;

(5) If the instrument still can not work in the course of nature, please contact with your

local **RIGOL** Service center..

7. **For the other malfunctions, please contact with RIGOL maintain ace centre or refer to "service and support.**

WARNING: Only authorized personnel by **RIGOL** could disassemble the instrument, or else no warranty would be available.

Components Inspection

From this part, you can get more information about malfunction in order to process hard troubleshooting by yourself.

1. Fuse

DM3000 have many fuse designs, the one can be changed by customer themselves is power instrument pipe and current fuse, the parameters are as follows:
Power fuse: 250V, 300mA, quick-break
Current fuse: 10A, quick-break

Inspection method:
Test the continuity by DM. If no connection beep, the fuse is supposed brown.

2. Power Frequency Transformer

DM3000 adopts power frequency transformer, and the power socket equips with fuse socket and power source switch. The voltage switch function extend the voltage adjust range all over the world. Voltage switch has options of 230V/115V, when the commercial power is 220V, you should select "230"; if the commercial power is 110V, you should select "115".

Inspection method:
Check the voltage among windings

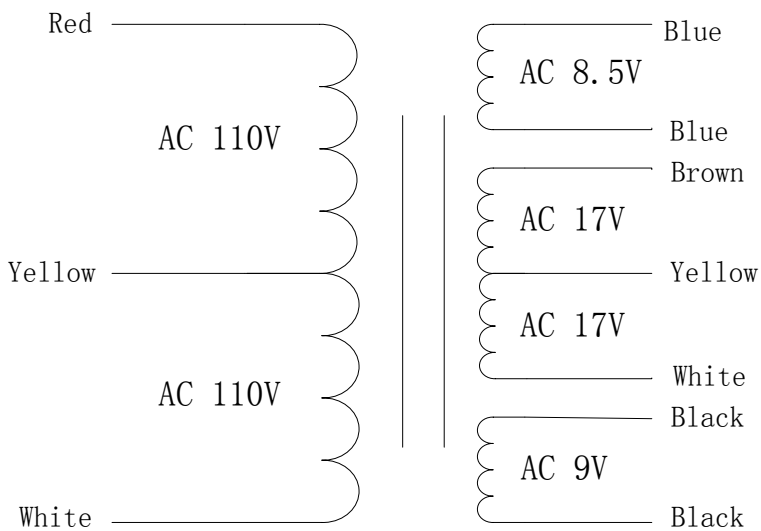

Figure 6-3 Transformer Sketch Map

Compare the measured voltages of each winding with table2.1, we can see that:

Table 6-1 Check Table of Voltages among Windings of Transformer

windings		Max(Vrms)	Min(Vrms)	Typical（Vrms）
Original side	White-Yellow	132	90	110
	White-Red	265	180	220
Vice side	Black-Black	10.8	7.3	9
	White-Yellow	21	14	17
	Yellow-Brown	21	14	17
	Blue-Blue	10.3	6.9	8.5

- If all the winding voltages among original side are 0, there might be something wrong with filter board or power source socket.
- If the original voltage is half or double of the typical value, inaccurate location might be selected by AC voltage selectors.
- If the vice side voltage is less than the minimum value, short circuit might be happened within mainboard. You can pull out the vice side socket of the transformer from the motherboard (please cut off the electricity before operating), then test the voltage in vice side. If the voltage is upturned, short circuit might be happened within mainboard or transformer malfunctions.

  If you make sure that it was the malfunction of Power frequency transformer, please contact **RIGOL**.

3. Display

DM3000 series utilize homochromatic LCD, support Power-on testing.

Inspection method:

Press the second menu operation key in the left side, at the same time turn on the multimeter, keep pressing for about 5 seconds until you hear beep. After that, multimeter starts testing display within a tip message on the screen "Press ·Help· Key to Switch, Hold ·Help· Key to Exit".

Press Help button, the screen would switch between Full white (all pixel are bright) and Full black (all pixel are put out).

Press Help button for about 2 seconds, the display return to normal measurement state.

If you make sure it was the malfunction of the screen, please contact **RIGOL**.

4. Keyboard

DM3000 series utilize LED backlight button design, which is more convenient and accurate.

Inspection method:
Press the first menu operation key in the left side, at the same time turn on the multimeter, keep pressing for about 5 seconds until you hear beep. After that, multimeter starts testing display. In this state, the basic measure keys, parameter keys and trigger control keys would twinkle and the screen displays keyboard testing menu. When you first press a button, the corresponding icon in the test interface would change to reverse video, after this,, the icon would vary with the button you have pressed.

If you make sure it was the malfunction of keyboard, please contact **RIGOL**.

Tips:
Some difficulties could be solved by recalling factory setup.
For example, parts of setup mistakes or Non-fault errors could be eliminated by this way:
Press Utility → System → Setup → Factory
It will be difficult to read the information on the interface if the display configuration is abnormal; we can recall the factory setup by another way to solve this problems:
Keep pressing the second menu operation key and turn on the multimeter. Keep pressing for about 5 seconds until you hear beep. After that, the mulitimeter will load the factory configuration automatically.

CAUTION: You can contact **RIGOL** technical support department or **RIGOL** authorized distributors when there is malfunction. Do not disassembly the instrument by yourself to avoid accident or losing.

Replaceable Part List

RIGOL provides some replaceable parts in order to maintain or update for users. Please see as the following table.

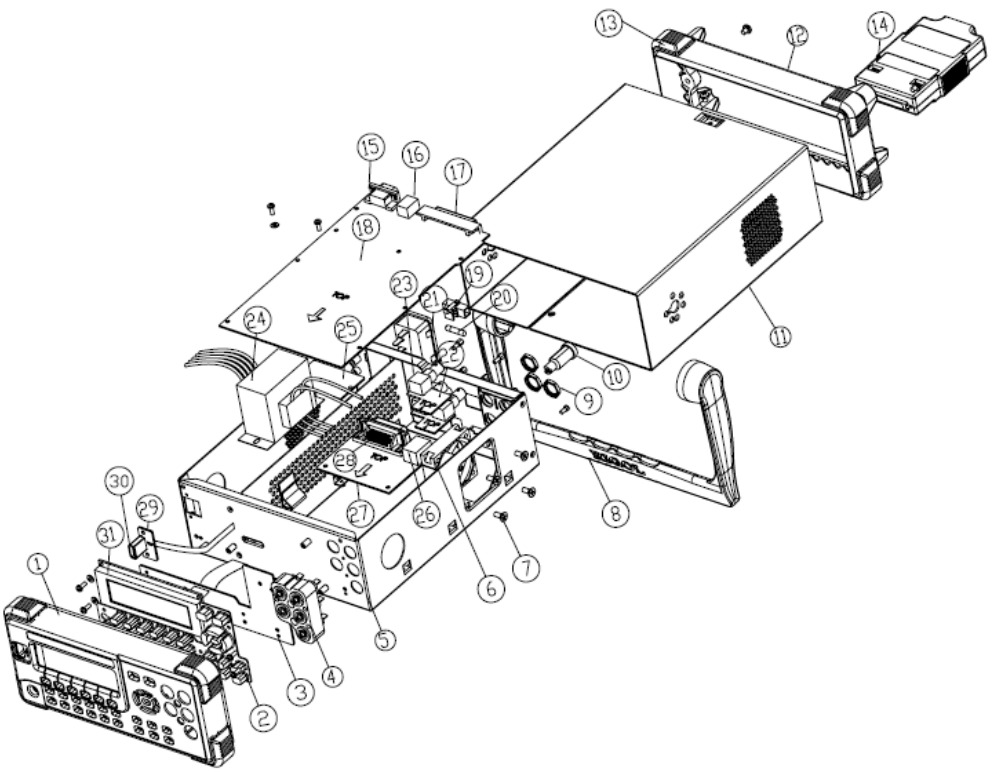

Table 6-2 Replaceable Part List

Part No.	Name
1	Front Panel
2	Rubber Keypad
3	Keyboard
4	Banana Socket
5	Metal Body
6	Fan
7	Screw
8	Handle
9	BNC Nut
10	10A Fuse
11	Outer Housing
12	Rear Panel
13	Non-slip Mat
14	Multiplexer Module
15	RS-232 Interface
16	USB Device Interface
17	Multiplexer Module Interface
18	Motherboard
19	Fuse Base
20	300mA Fuse
21	Power Outlet
22	Rear BNC Board
23	BNC(Plastic)
24	Power Frequency Transformer
25	Filter Board
26	LAN Interface
27	LAN&GPIB Board
28	GPIB Interface
29	Front USB Board
30	USB Host Interface
31	LCD screen

You can contact **RIGOL** technical support department or **RIGOL** authorized distributors to change the part, take a reference of chapter "**Contact Us**" to get the contact information.

Maintenance and Cleaning

System Maintenance

In order to ensure the running performance of instrument and extend useful time, please abide by the following advices:

1. Before operating please ensure that all the performance and particular using method. Have been taken into you memory and brain. For any puzzles please refer to Chapter 2.
2. Do operate or storage the instrument under the environment of dustproof, quakeproof, dampproof, antimagnetic, static-free and other relative requests as soon as possible. Meanwhile, do not expose it in the sun for a long time to avoid reducing the measurement precision and useful time.
3. Operating with malfunction is forbidden. If some malfunctions occurred duing running, please solve this problem first. Besides, test and calibrate the instrument within stated term to ensure the creditability of measurement.
4. Do the relevant neatening work after using.
5. Keep corresponding accessories safe for next using. Please refer to "Check the list of accessories" in Chapter 2.

General Care

Do not store or leave the instrument in where the LCD display will be exposed to direct sunlight for long periods of time.

Caution

To avoid damage to the instrument and test lead, do not expose them to sprays, liquids, or solvents.

Cleaning

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the instrument and test lead with a lint- free cloth. Take care to avoid scratching the clear plastic display filter.
2. Use a soft cloth dampened with water to clean the instrument, disconnect it from all power sources. If this instrument requires cleaning, and clean it with a mild detergent and water.. To avoid damage to the surface of the instrument, do not use any abrasive or chemical cleaning agent.

CAUTION: Make sure the instrument is completely dry before reconnecting it to a power source.

Chapter 7 Service & Support

Warranty

1. **RIGOL** Technologies, Inc. warrants its products' mainframe and accessories in materials and techniques within the warranty period. During the period of warranty, **RIGOL** guarantees to do free replacement or repair for products which are approved defective.
2. The mainframes of **RIGOL**' s products have a three-year warranty and the accessories such as probe and test pen (with the exception of power cord, USB and BNC cable) have a one-year warranty . In above-mentioned periods, any hardware or software error caused by quality flaws will be examined and repaired by **RIGOL** Maintenance Center or its authorized maintenance branch for free if the customer provides the warranty card and maintenance record card. **RIGOL** provides paid maintenance for products which exceed warranty period.
3. The warranty period starts from the date on the valid certificate of purchase (receipt or invoice). If the invoice can not be offered, the starting date will adopt the manufacture delivery date.
4. Warranty period extended plan. **RIGOL** extends warranty deadline to a maximum of three months (to compensation the time of transportation and storage by dealer) which is applied for only the customer who has sent back both the return receipt of warranty card and the copy of certificate invoice to **RIGOL** Maintenance Center (relative documents should be sent back within 30 days from date of purchase, subjected to local postmark or EMS delivery date).
5. For products with free maintenance, **RIGOL** promise to maintain the instrument within five working days and send back to you for free. For special transportation requirement, please contact the **RIGOL** Maintenance Center ahead of schedule.
6. The warranty is avoid when:
   (1) Accidental damage during transporting (please confer with insurance agency or transportation company about the compensation).
   (2) Malfunctions or damages caused by the wrong installation or operation in disallowed environment.
   (3) Surface damage by manmade factors such as burn, distortion by extrusion and the like.
   (4) Repaired by anyone who is not from **RIGOL** Maintenance Center or an authorized maintenance branch including disassemble and repair without permission, rebuild exceed authority, replace parts and tear up the warranty seal and so on.
   (5) Accidental damage by using a power supply or a power adapter not authorized by **RIGOL**.

(6) Malfunctions or damages caused by irresistible natural calamities, such as earthquake, lightning strike, etc.

7. About defective products not belongs to warranty bound (include exceed warranty period or extended warranty period), **RIGOL** will start to maintain after getting the admission from user, after repairing, we will send back to the owner of instrument within 5 working days as soon as we receive the upkeep and man-hour charge. If the owner refuse to repair, **RIGOL** Maintenance Center will send defective products back to its owner when receive formal affirm fax and man-hour charge for inspection. Concerning about problems occurred during transporting please refer to User Guide. If there are any doubts or difficulties please contact **RIGOL** Technical support department or Maintenance Center to avoid unnecessary damages.
8. For any direct or indirect losing caused by incorrect operations by users, **RIGOL** may take in hand only some maintenance responsibilities with rationality and maneuverability.
9. Malfunction instrument should be send back to **RIGOL** Maintenance Center for repairing and the carriage should be paid by consignor when repairing for second time in principle.
10. For special requirements for maintenance or service such as door-to-door service please contact with **RIGOL** Maintenance Center.

Warranties shown above are apply to the products sold by **RIGOL** Technologies, Inc. and its authorized dealers, any other form of warranty should be based on these. **RIGOL** Maintenance Center has the final power of interpretation with the maintenance affairs.

Contact Us

If you have any problem or requirement occurs when using our products, please contact **RIGOL** Technologies, Inc. or the local distributors.

In China: Please call
Tel: (86-10) 8070 6688
Fax:(86-10) 8070 5070
Service & Support Hotline: **800 810 0002**
9:00 am–5: 00 pm from Monday to Friday

Or by e-mail:
service@rigol.com

Or mail to:
RIGOL Technologies, Inc.
156# CaiHe Village, ShaHe Town, ChangPing District, Beijing, China
Post Code: 102206

Overseas: Contact the local **RIGOL** distributors or sales office.

For the latest product information and service, visit our website: www.rigolna.com
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