RIGOL

Service Guide

DM3058 Digital Multimeter

Jan. 2009
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Product Certification

RIGOL guarantees this product conforms to the standards of national and industrial. Meanwhile, the related standards conform to other ISO will get further. At present, DM3058 has passed CE certification and cTUVus certification.

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 use the instrument as specified by this user's guide only.

Use Proper Power Cord.
Only the power cord designed for the instrument and authorized by local country could be used.

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 connecting with the input or output terminals of the instrument.

Connect the Test Leads Correctly
Please connect the test leads strictly in accordance with the operation method introduced in this manual.

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 connecting.

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

Use Proper Fuse.
Please use the fuse with specified voltage and current rating.

Avoid Circuit or Wire Exposure.

Do not touch exposed connections and components when power-on.

Do Not Operate With Suspected Failures.

If suspected damage occurs to the instrument, have it inspected by qualified service personnel before further operations.

Keep Well Ventilation.
Inadequately ventilated will cause the temperature rises and damage the device. Please keep well ventilation and check the intake and fan regularly.

Do Not Operate in Wet/Damp Conditions.

In order to avoid short circuit to the interior of the device or electric shock, please do not operate in a humid environment.

Do Not Operate in an Explosive atmosphere.

In order to avoid damages to the device or personal injury, please operate far away from an explosive atmosphere.

Keep Product Surfaces Clean and Dry.

In order to prevent the performance of the device from influencing by dust or water in air, please keep the surface of device clean and dry.

Safety Terms and Symbols

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

WARNING

Warning statements indicate the conditions or practices that could result in injury or loss of life.

CAUTION

Caution statements indicate the conditions or practices that could result in damage to this product or other property.

CAT I (1000 V)

IEC Measurement Category II. The maximum voltage can be measured by HI-LO terminal is 1000 Vpk.

CAT II (600 V)

IEC Measurement Category II. Inputs may be connected to mains (up to 600 VAC) under Category II over voltage conditions.

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

DANGER indicates an injury or hazard that may immediately happen.
WARNING indicates an injury or hazard that may immediately happen.
CAUTION indicates that a potential damage to the instrument or other property might occur.

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

Hazardous Voltage

Refer to Instructions

Protective Earth Terminal

Chassis Ground

Earth Ground

DM3058 Digital Multimeter Overview

RIGOL DM3058 is an instrument especially designed for the needs of high-precision, multifunction, and automation measurements. It realized a combination of basic measurement function and multifold math functions as well as Random Sensor measurement function.

The DM3058 holds a high-resolution monochrome LCD display system with clear keyboard layout and operation hints to make it easier and agility to use. Besides, it can support multi-interface such as RS-232, USB, LAN and GPIB also for U-disk. Meanwhile, you can also operate it at will via Virtual Terminal Display and Control as well as Remote Network Access.

Main features:

- Rear 5 ½ digits resolution.
- Measurement speed: 2.5, 20 and 120 reading/s.
- Double Display function enables to display two types of characteristic for one signal synchronously.
- Preset and Ordinary dual mode directly switch. Preset mode enable to stored configuration quickly.
- Three types of way for setting Power Supply: Power on, Default, Switch.
- Measuring Speed: 2.5reading/s, 20reading/s and 120reading/s.
- DC Voltage Range: 200mV ~ 1000V.
- DC Current Range: 200uA ~ 10A.
- True-RMS, AC Voltage Range: 200mV ~ 750V.
- True-RMS, AC Voltage Current: 20mA ~ 10A.
- Resistance Range: 200Ω~ 100MΩ, 2, 4 Wire Resistance Measurement.
- Capacitance Range: 2nF ~ 10000uF.
- Frequency Range: 20Hz ~ 1MHz.
- Continuity and Diode Test.
- Random Sensor Measurement function，Built-in Thermocouple compensate in Cold Terminal.
- Abundant Math operations: Max, Min, Average, P/F, dBm, dB, Relative Measurement, Standard Deviation and Vertical chart.
- Configuration clone for backup all the configuration within instrument into other DM3058 via U-disc or Clone.
- Built-in 10 groups of Save Configuration could be easily Save or Recall and Config by Remote Control System.
- Support USB, GPIB, RS-232 and LAN remote control as well as USB-TMC 488.2 Basic, LXI-C Criterion and SCPI Language.
- In possession of compatible Commands with both Agilent 34401A and Fluke 45.
- Three kinds of management for Power Supply include PwrOn, Default and Power.
- Chinese and English Menu and Help System Online.
- Provides with Control Software on PC and Edit Software for Random Sensor.

Structure of this Document

Chapter 1 Performance & Specifications
List the Performance specifications of DM3058 series.

Chapter 2 Quick Start
Help users to be familiar with the operating skills of DM3058.

Chapter 3 Performance Test
Introduce how to test the performance so as to know about its current state of DM3058 well.

Chapter 4 Calibration
Guide you how to calibrate DM3058.

Chapter 5 Disassembly & Assembly
Introduce how to disassemble and assemble DM3058 in order to know about more details about its structure.

Chapter 6 Troubleshooting & Maintenance
Provide the methods of troubleshooting and general care.

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

Contents

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Table Contents

Chapter 1 Performance & Specifications

This chapter covers the following topics:

- General Technical Specifications
- Electric Technical Specifications
  DC Characteristics
  AC Characteristics
  Frequency/Period Characteristics
  Capacitance Characteristics
  Other Measurement Characteristics
  Application of Analog Filter

General Technical Specifications

Power Supply:
AC 100 V ~ 120 V, 45 Hz ~ 440 Hz
AC 200 V ~ 240 V, 45 Hz ~ 66 Hz
Power consumption: 20 VA peak value

Dimension:
Height: 107.0 mm
Width: 231.6 mm
Depth: 290.5 mm
Weight: 2.5 kg

Display:
256×64 LCD display, support dual display, menu, Chinese and English languages, operation help.

Working Environment:
Precision 0 ℃ ~ 50 ℃, 80% R.H., 40 ℃, No coagulation.
Storage Temperate: -20 ℃ ~ 70 ℃.
Impact and Shake: According with MIL-T-28800E, III level, 5 Level (Only Sine).
Height above sea level: upper limit 3000 m.

Safety:
According with IEC61010-1: 2001.
Measure CAT I 1000 V, CAT II 600 V.
Class of pollution: 2.

Remote Interface: GPIB, 10/100Mbit LAN, USB2.0 Full Speed Device & Host (Support U-disk) and RS232 interface.

Programming Language: RIGOL 3058 SCPI, FLUKE45, Agilent 34401A.

LXI Compatibility: LXI Class C, Version 1.1.

Warm-up Time: 30 mins.

Electric Technical Specifications

DC Characteristics

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

Function	Range[2]	Test Current or Burden Voltage	1 Year 23 ℃±5 ℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
DC Voltage	200.000 mV		0.015 + 0.004	0.0015 + 0.0005
	2.00000 V		0.015 + 0.003	0.0010 + 0.0005
	20.0000 V		0.015 + 0.004	0.0020 + 0.0005
	200.000 V		0.015 + 0.003	0.0015 + 0.0005
	1000.00 V[4]		0.015 + 0.003	0.0015 + 0.0005
DC Current[8]	200.000 μA	<8 mV	0.055 + 0.005	0.003 + 0.001
	2.00000 mA	<80 mV	0.055 + 0.005	0.002 + 0.001
	20.0000 mA	<0.05 V	0.095 + 0.020	0.008 + 0.001
	200.000 mA	<0.5 V	0.070 + 0.008	0.005 + 0.001
	2.00000 A	<0.1 V	0.170 + 0.020	0.013 + 0.001
	10.0000 A[5]	<0.3 V	0.250 + 0.010	0.008 + 0.001
Resistance[3]	200.000 Ω	1 mA	0.030 + 0.005	0.0030 + 0.0006
	2.00000 kΩ	1 mA	0.020 + 0.003	0.0030 + 0.0005
	20.0000 kΩ	100 μA	0.020 + 0.003	0.0030 + 0.0005
	200.000 kΩ	10 μA	0.020 + 0.003	0.0030 + 0.0005
	2.00000 MΩ	1 μA	0.040 + 0.004	0.0040 + 0.0005
	10.0000 MΩ	200nA	0.250 + 0.003	0.0100 + 0.0005
	100.000 MΩ	200 nA || 10 MΩ	1.75 + 0.004	0.2000 + 0.0005
Diode Test	2.0000 V[6]	1 mA	0.05 + 0.01	0.0050 + 0.0005
Continuity	2000 Ω	1 mA	0.05 + 0.01	0.0050 + 0.0005

Remarks:

[1] Specifications are for 0.5 hour warm-up, "Slow" measure and calibration temperature 18 ℃ ~ 28 ℃.

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

[3] Specifications are for 4-wire measure or 2-wire measure under "REF" operation. ± 0.2 Ω of extra errors will be generated when perform 2-wire measure without "REF" operation.

[4] Plus 0.02 mV of error per 1V after the first ±500 VDC.

[5] 30 seconds OFF after 30 seconds ON is recommend for the continuous current higher than DC 7 A or AC RMS 7 A.

[6] Accuracy specifications are only for Input terminal measuring. The typical value of current under measure is 1 mA. Voltage drop at the diode junction may vary with changes of current supply.

DC Voltage

Input Resistance: 200 mV and 2 V range 10 MΩ or >10 GΩ selectable
(Input signals which exceed ±2.5 V in these ranges will pass the 100 kΩ (typical) clamp resistance).
20 V, 200 V and 1000 V range 10 MΩ±2%

Input offset current: <90 pA, 25 ℃

Input Protection: 1000 V on all ranges
CMRR (common mode rejection ratio): 120 dB (For the 1 kΩ unbalanced resistance in LO lead, maximum ±500 VDC).
NMRR (normal mode rejection ratio): 80 dB at "slow" measurement rate
Add 20 dB when open the "AC filter" (Settling time adds 0.35 s (source impedance near zero))

Resistance
Measurement Method: 4-wire resistance or 2-wire resistance optional
For current source refer to LO input.
Open-circuit Voltage: P/F in <8 V.
Max. Lead Resistance: 10% of ranges, on the range of 200 Ω, for each lead.
1 kΩ, on all other ranges, for each lead.
Input Protection: 1000 V on all ranges.

DC Current
Shunt Resistor: 200 μA sampling voltage<8mV
2 mA sampling voltage<80mV
1 Ω for 20 mA, 200 mA
0.01 Ω for 2 A, 10 A
Input Protection: Rear panel: accessible 10 A, 250 V fast-melt fuse
Internal 12 A, 250 V slow-melt fuse

Continuity / Diode Test
Measurement Method: 1 mA ±5% current source, <8 V open-circuit voltage
Response Time: 123 samples / sec, with beeper
Continuity Threshold: Adjustable from 1 Ω to 2000 Ω
Input Protection: 1000 V

Setting time attentions:
The setup time about voltage measurement is influenced by source resistance and media characteristics of cable as well as input signal.

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]	200.000 mV	20 Hz – 45 Hz	1.5 + 0.10	0.01 + 0.005
		45 Hz – 20 kHz	0.2 + 0.05	0.01 + 0.005
		20 kHz – 50 kHz	1.0 + 0.05	0.01 + 0.005
		50 kHz – 100 kHz	3.0 + 0.05	0.05 + 0.010
	2.00000 V	20 Hz – 4 5Hz	1.5 + 0.10	0.01 + 0.005
		45 Hz – 20 kHz	0.2 + 0.05	0.01 + 0.005
		20 kHz – 50 kHz	1.0 + 0.05	0.01 + 0.005
		50 kHz – 100 kHz	3.0 + 0.05	0.05 + 0.010
	20.0000 V	20 Hz – 45 Hz	1.5 + 0.10	0.01 + 0.005
		45 Hz – 20 kHz	0.2 + 0.05	0.01 + 0.005
		20 kHz – 50 kHz	1.0 + 0.05	0.01 + 0.005
		50 kHz – 100 kHz	3.0 + 0.05	0.05 + 0.010
	200.000 V	20 Hz – 45 Hz	1.5 + 0.10	0.01 + 0.005
		45 Hz – 20 kHz	0.2 + 0.05	0.01 + 0.005
		20 kHz – 50 kHz	1.0 + 0.05	0.01 + 0.005
		50 kHz – 100 kHz	3.0 + 0.05	0.05 + 0.010
	750.000 V	20 Hz – 45 Hz	1.5 + 0.10	0.01 + 0.005
		4 5Hz – 20 kHz	0.2 + 0.05	0.01 + 0.005
		20 kHz – 50 kHz	1.0 + 0.05	0.01 + 0.005
		50 kHz – 100 kHz	3.0 + 0.05	0.05 + 0.010
True RMS AC Current[5]	20.0000 mA	20 Hz - 45 Hz	1.5 + 0.10	0.015 + 0.015
		45 Hz - 2 kHz	0.50 + 0.10	0.015 + 0.006
		2 kHz - 10 kHz	2.50 + 0.20	0.015 + 0.006
	200.000 mA	20 Hz - 45 Hz	1.50 + 0.10	0.015 + 0.005
		45 Hz - 2 kHz	0.30 + 0.10	0.015 + 0.005
		2 kHz - 10 kHz	2.50 + 0.20	0.015 + 0.005
	2.00000 A	20Hz - 45Hz	1.50 + 0.20	0.015 + 0.005
		45 Hz - 2 kHz	0.50 + 0.20	0.015 + 0.005
		2 kHz - 10 kHz	2.50 + 0.20	0.015 + 0.005
	10.0000 A[5]	20 Hz - 45 Hz	1.50 + 0.15	0.015 + 0.005
		45 Hz - 2 kHz	0.50 + 0.15	0.015 + 0.005
		2 kHz - 5 kHz	2.50 + 0.20	0.015 + 0.005

Additional wave crest factor error (not Sine)[6]	
Wave crest coefficient	**Error (% range)**
1 - 2	0.05
2 - 3	0.2

Remarks:

[1] Specifications are for 0.5 hour warm-up, "Slow" measure and calibration temperature 18℃ ~ 28℃.

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

[3] Specifications are for amplitude of sine wave input >5% of range. 750 V range limited to 8x107 Volt-Hz. 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.

[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] 30 seconds OFF after 30 seconds ON is recommend for the continuous current higher than DC 7 A or AC RMS 7 A.
[6] For frequency<100 Hz.

True RMS AC Voltage

Measurement Method:	AC coupled true RMS measure - up to 1000 V DC bias are permitted on every range.
Crest factor:	≤ 3 at full scale
Input Impedance:	1 MΩ ± 2% in parallel with 100 pF on any ranges
Input Protection:	750 VRMS on all ranges
AC filter bandwidth:	20 Hz ~ 100 kHz

CMRR (common mode rejection ratio): 60 dB (For the 1kΩ imbalance resistance among LO lead and <60 Hz, maximum ±500 VDC).

True RMS AC Current

Measurement Method:	DC coupled to the fuse and shunt. AC coupled true RMS measurement (measures the ac component only)
Crest factor:	Crest factor on full range ≤ 3
Max. Input:	The DC + AC current peak value <300% of the range. The RMS current including DC current is <10 A.
Shunt Resistor:	0.01 Ω for 2 A, 10 A 1 Ω for 20 mA, 200 mA
Input Protection:	Rear panel: accessible 10 A, 250 V fast-melt fuse Internal 12 A, 250 V slow-melt fuse

Setting time attentions:
Make sure that the RC return on input terminal has been in a stable state completely (higher than 1 s) before accurate measurement.
Input >300 Vrms (or >5 Arms) will cause the self heating of the signal conditioning component to generate error, this error is included in the characteristics of the instrument. Internal temperature variation results from the self heating will cause additional an error on ac range that is lower than 0.03% of readings, and it will disappear after a few minutes.

Frequency/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	200 mV to 750 V[2]	20 Hz – 2 kHz	0.01 + 0.003	0.002 + 0.001
		2 kHz – 20 kHz	0.01 + 0.003	0.002 + 0.001
		20 kHz – 200 kHz	0.01 + 0.003	0.002 + 0.001
		200 kHz – 1 MHz	0.01 + 0.006	0.002 + 0.002
	20 mA to 10 A[3]	20 Hz – 2 kHz	0.01 + 0.003	0.002 + 0.001
		2 kHz – 10 kHz	0.01 + 0.003	0.002 + 0.001

Rremarks:

[1] Specifications are for 0.5 hour warm-up.

[2] Except for special marks, the AC input voltage is 15% to 120% of range when <100 kHz, and 40% to 120% of range when >100 kHz. 750 V range is limited to 750 VRMS. 200mV range is for full scale or higher. For inputs between 30 mV and 200mV, multiply total % of reading error by 10.

[3] For AC input current from 15% to 120% of range except where noted. 20 mA range specifications are for full scale. For inputs from 5 mA to 20 mA, multiply total % of reading error by 10. 10 A range is for AC input current from 25% to 100% of range.

Frequency and Period

Measurement Method: Reciprocal-counting technique. AC-coupled input using the AC voltage or AC current measurement function.

Measurement attentions:

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.

Setting time attentions:

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)[1,2]

Function	Range[2]	Test Current	1 Year 23 ℃ ± 5 ℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
Capacitance	2.000 nF	200 nA	3 + 1.0	0.08 + 0.002
	20.00 nF	200 nA	1 + 0.5	0.02 + 0.001
	200.0 nF	2 μA	1 + 0.5	0.02 + 0.001
	2.000 μF	10 μA	1 + 0.5	0.02 + 0.001
	200 μF	100 μA	1 + 0.5	0.02 + 0.001
	10000 μF	1 mA	2 + 0.5	0.02 + 0.001

Remarks:

[1] Specifications are for 0.5 hour warm-up and "REF" operation. Using of non-film capacitor may generate additional errors.

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

Capacitance

Measurement Method: Current input with measurement of resulting ramp.
Connection Type: 2-wire
Input Protection: 1000 V on all ranges

Measurement attentions:

Measurement of small capacitance is easily affected by external noise thus to cause measurement error, disable input will reduce this error.

Other Measurement Characteristics

Triggering and Memory

Samples per Trigger:	1 to 2,000
Trigger Delay:	8 ms to 2000 ms
External trigger input:	
Input Level:	TTL compatible (High level when left trigger input open)
Trigger Condition:	Selectable Rising, Falling, Low-level, High-level.
Input Impendence:	>20 kΩ, in parallel with 400 pF, DC-coupled
Min Pulse Width:	500 μs
VMC Output:	
Electric Level:	TTL compensate (Input>=1 kΩ load)
Output polarity:	positive, negative (selectable)
Output impedance:	200 Ω, typical

Arbitrary sensor measurement

Support for multiply types of sensor such as Thermocouple, DC Voltage, DC Current, Resistance (2-wire or 4-wire) and Frequency output; With thermocouple compensation at cold junction.
Output Polarity: straight polarity and negative polarity optional
Preset ITS-90 transform of B, E, J, K, N, R, S and T thermocouple and transform of platinum Pt100, Pt385 resistance temperature sensor.

Math function

Pass/Fail, RELative, Maximum/Minimum/Average, dBm, dB, Hold, Histogram, standard deviation.

History function

Volatile Memory: 2000 reading history record.

Nonvolatile Memory:
10 groups history data storage (2000 readings/group)
10 groups sensor data storage (1000 readings/group)
10 groups instrument settings storage
10 groups random sensor settings storage
Support U-disk external storage extend

Application of Analog Filter

The analog filter of DM3058 can be used to reduce the influence to measured results from AC component in DC mode. For the most measures, the filter may not require, but sometimes it can improve the DC measurement. For instance, if the DC electrical source to be measured has a big AC ripple, it can be reduced by the analog filter.

The analog filter cannot be used to filter the internal noise inside the meter, and which is no use when measure short circuit in DC mode or measure the output of precise DC calibration instrument, furthermore, on the contrary, it may lead l in additional noise and a bigger reading offset. To reduce the offset, the multimeter should be cleared under the selected range and reading rate before using the analog filter. If you cannot clear the multimeter, the measured results will have errors as shown in table A1 and A2. For other ranges and reading rates exclusive of the list, the additional error can be omitted.

Table A1: Analog Filter Error in DCV measurement

Range	Reading Rate	Additional Analog Filter Error
200 mV	Slow	10 μV
	Medium	20 μV
	Fast	20 μV
2 V	Slow	15 μV
	Medium	20 μV
	Fast	20 μV
20 V	Slow	0.8 mV
	Medium	1 mV
	Fast	1 mV

Table A2: Analog Filter Error in DCI measurement

Range	Reading Rate	Additional Analog Filter Error
200 μA	Slow	0.002% range
	Medium	0.005% range
	Fast	0.005% range
20 mA, 2 A	Slow	0.040% range
	Medium	0.060% range
	Fast	0.080% range
200 mA	Slow	0.004% range
	Medium	0.010% range
	Fast	0.010% range
10 A	Slow	0.008% range
	Medium	0.010% range
	Fast	0.010% range

Chapter 2 Quick Start

The chapter mainly covers the following topics:

- General Inspection
  Inspect the Instrument
  Check the List of Accessories
- Handle Adjustment
- Front Panel
- Rear Panel
- User Interface
  Double Display
  Single Display

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 Power Cord that fits the standard of destination country
- A USB Data Cable
- Two Test Leads (red/black)
- Two Alligator Clips (black and red)
- A backup fuse
- Quick Guide
- User's Guide and Application software (CD-ROM)
- Testing Certification
- Packing List

Handle Adjustment

To adjust the handle position of DM3058 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.

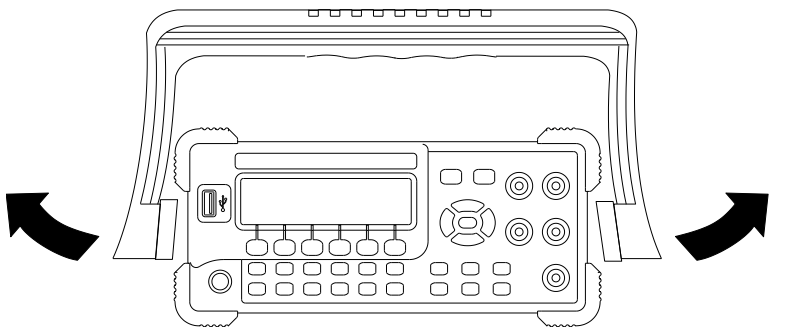

Figure 2-1 The Method of Adjusting Handle

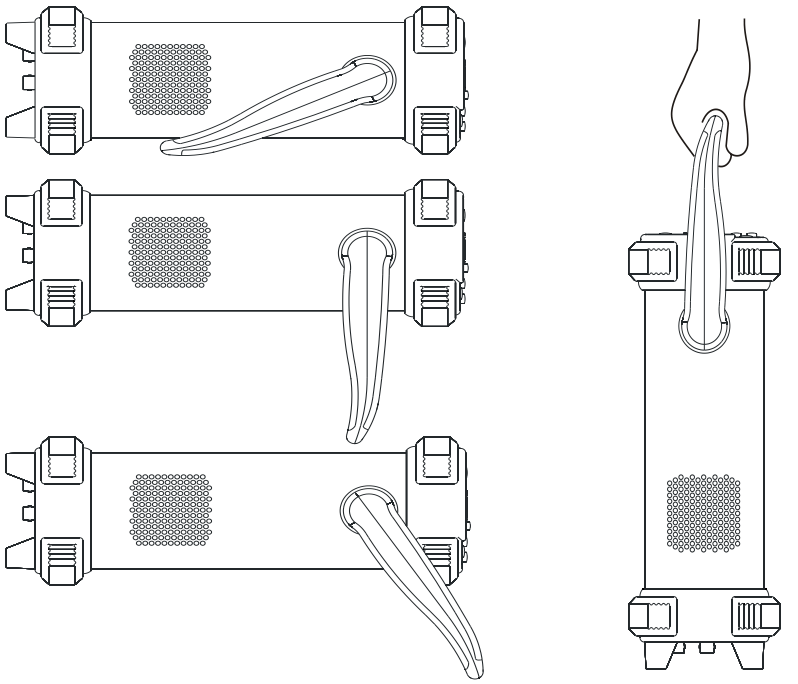

Figure 2-2 Adjustable Positions for Handle

Front Panel

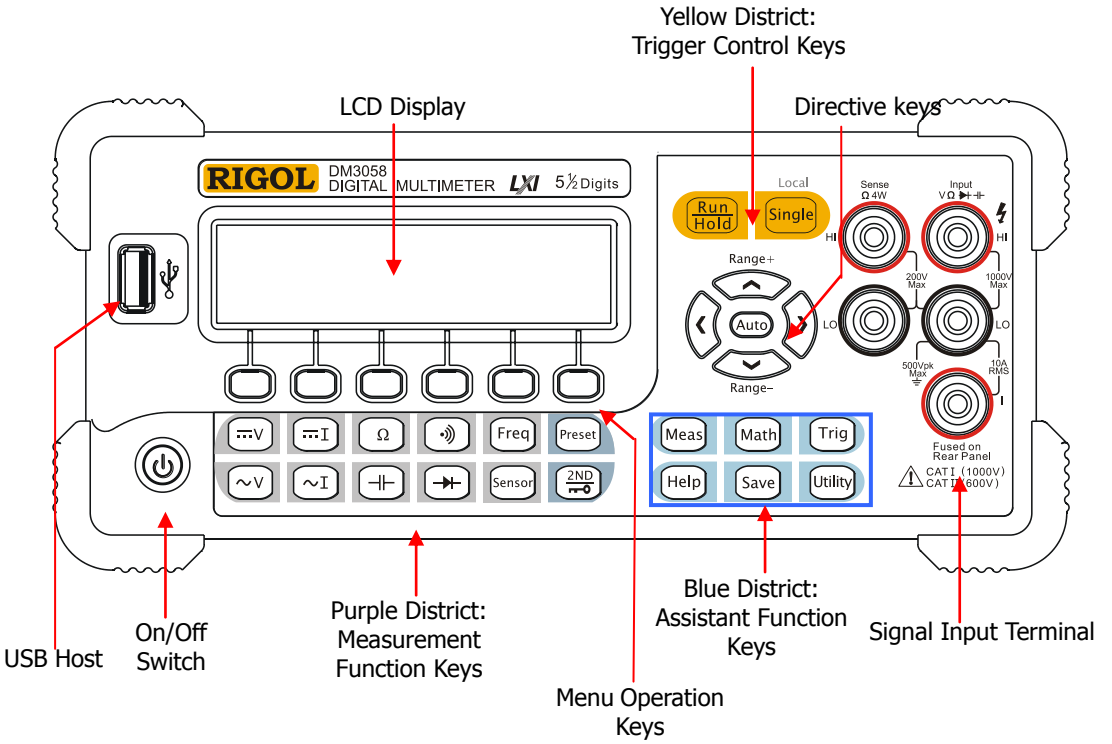

Figure 2-3 Sketch map of Front Panel

Gray Function Keys:

- Measure DC Voltage
- Measure DC Current
- Measure Resistance
- Measure Continuity
- Measure Frequency
- Preset Mode
- Measure AC Voltage
- Measure AC Current
- Measure Capacitance
- Measure Diode
- Measure Sensor
- Secondly Function

Blue Function Keys:

- Meas — Set the System parameters
- Math — Enable Math operation
- Trig — Set Trigger and Parameter
- Save — Save and Recall
- Utility — Set the secondary function
- Help — View the built-in Help System

Rear Panel

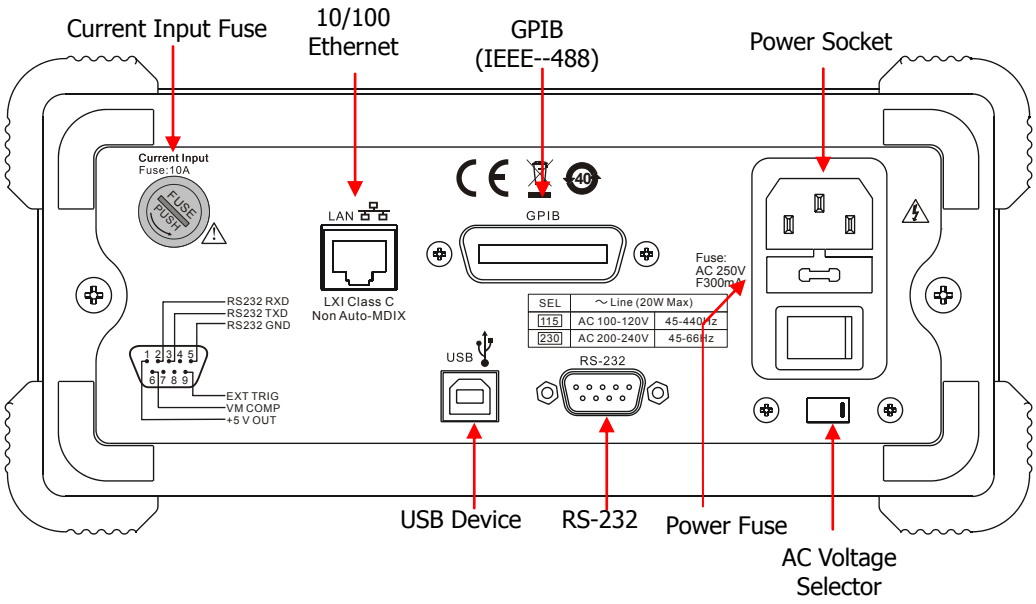

Figure 2-4 Sketch map of Rear Panel

User Interface

Double Display

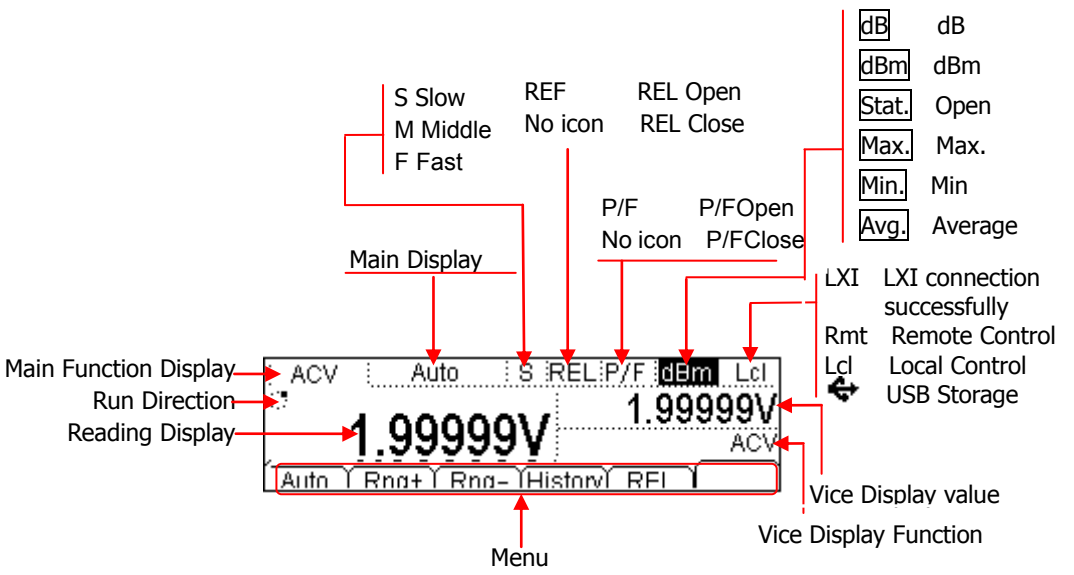

Figure 2-5 Explanatory drawing of Double display interface

Single Display

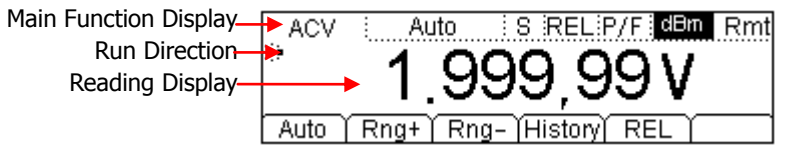

Figure 2-6 Explanatory drawing of Single display interface

Chapter 3 Performance Test

The chapter mainly covers the following topics:

- Calibration Interval
- Calibration Instructions
- Testing Equipments
- Performance Verification Test
- Input Connections
- Testing Conditions
- Verification Testing
  Zero Offset Test
  Gain Test

Calibration Interval

In order to keep the accuracy while measuring, the meter must be calibrated periodically, and the calibration interval depends on the requirements for accuracy of measurement,
As for the applications needs higher accuracy, 90 day's intervals are recommended; besides, 1 year's interval is acceptable in most cases.
No matter in what kind of applications, **RIGOL** does not recommend the calibration interval is more than 1 year.

Calibration Instructions

RIGOL suggests you do a completer calibration within interval regardless of what kind of interval you have selected so as to ensure the accuracy of the meter is not going beyond the specifications within next interval.
Except for recalibrate the meter, or even though pass the performance test still can not ensure the meter is within the limits of test.

Testing Equipments

The equipments in table 3-1 are recommended for testing DM3058 Digital Multimeter (also for calibration). If the exact equipment is not available, use the one that can meet the **Accuracy Requirement** shown in the following table. .

Table 3-1 List of 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 1 year spec
Dc Current	Fluke 5520A	<1/5 instrument 1 year spec
Resistance	Fluke 5520A	<1/5 instrument 1 year spec
AC Voltage	Fluke 5520A	<1/5 instrument 1 year spec
AC Current	Fluke 5520A	<1/5 instrument 1 year spec
Frequency	Fluke 5520A	<1/5 instrument 1 year spec
Capacitance	Fluke 5520A	<1/5 instrument 1 year spec

Performance Verification Test

The test is used to verify the measuring performance of the instrument. The specifications listed in user's manual of DM3058 are used while verifying through two kinds of testing model: Quick test or Common test.

Quick Test

Quick test is an eclectic project which can either speed up test or ensure a high confidence level while testing. With least test items, Quick test could evaluate the excursion of accuracy used in normal state but unable to inspect whether the elements are invalidation or not. In common test, "Q" may appear instead of Quick Test.

NOTE

Quick test is not applicable for equipments with some of abnormal components. The equipment failed to quick performance check should not be used until have been calibrated or repaired.

Common Test

Common test is recommend to be done once you got the instrument so as to do a complete evaluate for its performance. Generally, the test result is compared with the Errors in one year. If performances test pass, do again after calibration interval time.

NOTE

The equipment failed to test should not be used until have been calibrated or repaired.

Input Connections

4-teriinal shortcircuiter which is made of copper or copper alloy with low thermoemf must be used for zero offset test. Coaxial-cable is adopted when calibrating capacitance whose shielding layer is connected with LO terminal. For the other calibrations, please use Teflon Shielded Twisted Pair with isolation as short as possible to connect with the Multimeter or calibration instrument; both HI and LO must be twisted pair, and also for HI-Sense and LO-Sense; cable shielding layer must be grounded. Through using above connection, the influence from low thermoemf and exterior interference could be reduced.

Testing Conditions

For best performance, please adhere to following advices throughout all testing processes:

1. Keep the instruments operating in proper voltage all the time.
2. Make sure that the ambient temperature during testing between 18 °C and 18 °C. It would be perfect if calibrate between 23°C and ± 2 °C.
3. Ensure the relative humidity less than 80%.
4. Warm-up the instrument at least one hour before testing or calibrating.
5. Use the copper connector to reduce the effection from thermoelectric potential.
6. Use Teflon Shielded Twisted Pair with isolation as short as possible in order to reduce the effection form exterior disturb.
7. Grounding the shield of both twisted-pair and coaxial-cable, as well as the LO terminal of calibration instrument if no special requirement.

Owing to DM3058 designed for high precision, so you must be more than careful while testing or calibrating in order to avoid errors. In an optimal situation, the accuracy of standard source for inspection and calibration must be five times at least than the accuracy of testing instrument.

While perform the gain calibration for DC voltage, DC current and resistance, the "0"output of calibration instrument must be correct. In order to reduce the connection errors, enough warm up must be done before reconnecting cables or shortcircuiter every time. Generally, the preheating time is about 5 mins.

Verification Testing

Zero Offset Test

This test is used to inspect the performance of zero offset of the device, and which is required only when regular offsets happened to function or range.

Verification procedure:

1. Read "**Testing Conditions**" carefully before start.
2. Short-circuit the Input HI-LO and Sense HI-LO using 4-terminal shortcircuiter and open circuit of input terminal of current, see as Figure 3-1.
3. Test the functions and ranges listed in Table 3-2 item by item. And then set the rate of reading as "Slow" and disable all the math operations.
4. Compare the testing results with the test limits listed in table.

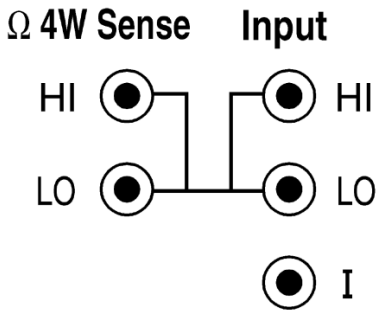

Figure 3-1 The Input HI-LO and Sense/Ref HI-LO Terminals in Short Circuit

Table 3-2 Zero Offset of the Standard Equipment

Function[1]	Range	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Lower limit
DC Voltage	200.000 mV	short	Q	8 μV	-8 μV
	2.00000 V	short		60 μV	-60 μV
	20.0000 V	short		800 μV	-800μ V
	200.000 V	short		6 mV	-6 mV
	1000.00 V	short		30 mV	-30 mV
DC Current	200.000 μA	open	Q	10 nA	-10 nA
	2.00000 mA	open		100 nA	-100 nA
	20.0000 mA	open	Q	4 μA	-4 μA
	200.000 mA	open		16 μA	-16 μA
	2.00000 A	open		400 μA	-400 μA
	10.0000 A	open		1 mA	-1 mA

Zero Offset of the Standard Equipment (Continued)

Function[1]	Range	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Lower limit
Resistance[2]	200.000 Ω	short	Q	10 mΩ	-10 mΩ
	2.00000 kΩ	short		60 mΩ	-60 mΩ
	20.0000 kΩ	short		600 mΩ	-600 mΩ
	200.000 kΩ	short		6 Ω	-6 Ω
	2.00000 MΩ	short	Q	80 Ω	-80Ω
	10.0000 MΩ	short		300 Ω	-300 Ω
	100.000 MΩ	short		4 kΩ	-4 kΩ

Remarks:
[1] The rate of reading is "Slow".
[2] Specifications are for "REL" operation under 4-waire or 2-wair resistance measuring. If "REL" operation is disabling under 2-wair resistance measuring, 0.2 Ω additional errors are needed.
[3] Q denotes optional quick test point.

Gain Test

This test is used to inspect the accuracy of the device in full range, and which is required only when regular offsets happened to function or range.

1. Verification procedure of DC Gain:

(1) Read "**Testing Conditions**" carefully before start.
(2) Connect the input terminal of the meter with calibration instrument.
(3) Test the functions and ranges listed in Table 3-3 item by item. And then set the rate of reading as "Slow" and disable all the math operations. When measure DC Voltage or DC Current, please shut off "filter".
(4) Input signals listed in Table 3-3 using calibration instrument and compare the test results with test limits listed. (Make sure that the calibration instrument is in a state of output)

Table 3-3 DC Gain Errors of the Standard Equipment

Function[1]	Range	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Lower limit
DC Voltage	200.000 mV	200 mV		200.038 mV	199.962 mV
	200.000 mV	-200 mV		-199.962 mV	-200.038 mV
	2.00000 V	2 V	Q	2.00036 V	1.99964 V
	2.00000 V	-2 V	Q	-1.99964 V	-2.00036 V
	20.0000 V	20 V	Q	20.0038 V	19.9962 V
	20.0000 V	-20 V	Q	-19.9962 V	-20.0038 V
	200.000 V	200 V		200.036 V	199.964 V

DC Gain Errors of the Standard Equipment (Continued)

Function[1]	Range	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Lower limit
DC Voltage	200.000 V	-200 V		-199.964 V	-200.036 V
	1000.00 V	1000 V		1000.19 V	999.81 V
	1000.00 V	-1000 V		-999.81 V	-1000.19 V
DC Current	200.000 μA	200 μA	Q	200.120 μA	199.880 μA
	200.000 μA	-200 μA	Q	-199.880 μA	-200.120 μA
	2.00000 mA	2 mA		2.00120 mA	1.99880 mA
	2.00000 mA	-2 mA		-1.99880 mA	-2.00120 mA
	20.0000 mA	20 mA	Q	20.0230 mA	19.9770 mA
	20.0000 mA	-20 mA	Q	-19.9770 mA	-20.0230 mA
	200.000 mA	200 mA		200.156 mA	199.844 mA
	200.000 mA	-200 mA		-199.844 mA	-200.156 mA
	2.00000 A	2 A	Q	2.00380 A	1.99620 A
	2.00000 A	-2 A		-1.99620 A	-2.00380 A
	10.0000 A	10 A		10.0260 A	9.9740 A
	10.0000 A	-10 A		-9.9740 A	-10.0260 A
Resistance[2]	200.000 Ω	200 Ω		200.070 Ω	199.930 Ω
	2.00000 kΩ	2 kΩ	Q	2.00046 kΩ	1.99954 kΩ
	20.0000 kΩ	20 kΩ		20.0046 kΩ	19.9954 kΩ
	200.000 kΩ	200 kΩ		200.046 kΩ	199.954 kΩ
	2.00000 MΩ	2 MΩ	Q	2.00088 MΩ	1.99912 MΩ
	10.0000 MΩ	10 MΩ		10.0253 MΩ	9.9747 MΩ
	100.000 MΩ[4]	100 MΩ		101.754 MΩ	98.246 MΩ

Remarks:

[1] The rate of reading is "Slow".

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

[3] Specifications are for "REL" operation under 4-wire or 2-wire resistance measuring. If "REL" operation is disabling under 2-wire resistance measuring, 0.2 Ω additional errors are needed.

[4] Only verify but calibrate; use 2-wire resistance function.

[5] Q denotes optional quick test point.

2. Verification procedure of AC Voltage Gain:

(1) Read "**Testing Conditions**" carefully before start.
(2) Connect the input terminal of the meter with calibration instrument.
(3) Test the functions and ranges listed in Table 3-4 item by item. And then set the rate of reading as "Slow" and disable all the math operations.
(4) Input signals listed in Table 3-4 using calibration instrument and compare the test results with test limits listed. (Make sure that the calibration instrument is in a state of output)

Table 3-4 AC Voltage Gain Error of the standard equipment

Function[1]	Range	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Upper limit
200.000 mV	10 mV	100 kHz	Q	10.660 mV	9.340 mV
	200 mV	20 Hz		203.200 mV	196.800 mV
	200 mV	45 Hz		200.500 mV	199.500 mV
	200 mV	20 kHz	Q	200.500 mV	199.500 mV
	200 mV	50 kHz		202.100 mV	197.900 mV
	200 mV	100 kHz		206.100 mV	193.900 mV
2.00000 V	100 mV	100 kHz		0.10660 V	0.09340 V
	2 V	20 Hz	Q	2.03200 V	1.96800 V
	2 V	45 Hz	Q	2.00500 V	1.99500 V
	2 V	20 kHz	Q	2.00500 V	1.99500 V
	2 V	50 kHz	Q	2.02100 V	1.97900 V
	2 V	100 kHz	Q	2.06100 V	1.93900 V
20.0000 V	1 V	100 kHz		1.0660 V	0.9340 V
	20 V	20 Hz		20.3200 V	19.6800 V
	20 V	45 Hz		20.0500 V	19.9500 V
	20 V	20 kHz	Q	20.0500 V	19.9500 V
	20 V	50 kHz		20.2100 V	19.7900 V
	20 V	100 kHz		20.6100 V	19.3900 V
200.000 V	10 V	100 kHz		10.660 V	9.340 V
	200 V	20 Hz		203.200 V	196.800 V
	200 V	45 Hz		200.500 V	199.500 V
	200 V	20 kHz	Q	200.500 V	199.500 V
	200 V	50 kHz		202.100 V	197.900 V
	200 V	100 kHz		206.100 V	193.900 V
750.00 V	37.5 V	100 kHz		39.98 V	35.03 V
	320 V	20 Hz		325.55 V	314.45 V
	320 V	45 Hz		321.02 V	318.99 V
	320 V	20 kHz	Q	321.02 V	318.99 V
	320 V	50 kHz		323.58 V	316.43 V
	320 V	100 kHz		329.98 V	310.03 V
	750 V	1 kHz	Q	751.88 V	748.13 V

Remarks:

[1] The rate of reading is "Slow".

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

[3] Q denotes optional quick test point.

3. Verification procedure of AC Current Gain:

(1) Read "**Testing Conditions**" carefully before start.

(2) Connect the input terminal of the meter with calibration instrument.

(3) Test the ranges listed in Table 3-5 item by item. And then set the rate of reading as "Slow" and disable all the math operations.
(4) Input signals listed in Table 3-5 using calibration instrument and compare the test results with test limits listed. (Make sure that the calibration instrument is in a state of output)

Table 3-5 AC Current Gain Error of the Standard Equipment

Function[1]	Range	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Upper limit
20.0000 mA	1 mA	1 kHz	Q	1.0450 mA	0.9550 mA
	20 mA	20 Hz		20.3200 mA	19.6800 mA
	20 mA	45 Hz		20.1200 mA	19.8800 mA
	20 mA	2 kHz	Q	20.1200 mA	19.8800 mA
	20 mA	10 kHz		20.5400 mA	19.4600 mA
200.000 mA	10 mA	1 kHz		10.430 mA	9.570 mA
	200 mA	20 Hz	Q	203.200 mA	196.800 mA
	200 mA	45 Hz	Q	200.800 mA	199.200 mA
	200 mA	2 kHz	Q	200.800 mA	199.200 mA
	200 mA	10 kHz	Q	205.400 mA	194.600 mA
2.00000 A	100 mA	1 kHz		0.10650 A	0.09350 A
	2 A	20 Hz		2.03400 A	1.96600 A
	2 A	45 Hz		2.01400 A	1.98600 A
	2 A	2 kHz	Q	2.01400 A	1.98600 A
	2 A	10 kHz		2.05400 A	1.94600 A
10.0000 A[2]	500 mA	1 kHz		0.5275 A	0.4725 A
	10 A	20 Hz		10.1650 A	9.8350 A
	10 A	45 Hz		10.0650 A	9.9350 A
	10 A	2 kHz	Q	10.0650 A	9.9350 A
	10 A	5 kHz		10.2700 A	9.7300 A

Remarks:
[1] The rate of reading is "Slow".
[2] Continuous current more than DC 7 A or AC RMS 7 A should be 30 seconds Off after 30 seconds On.
[3] Q denotes optional quick test point.

4. Verification procedure of Frequency Gain:

(1) Read "**Testing Conditions**" carefully before start.
(2) Connect the input terminal of the meter with calibration instrument.
(3) Select the range of 200 mV and Manual and disable all the math operations.
(4) Input signals listed in Table 3-6 using calibration instrument and compare the test results with test limits listed. (Make sure that the calibration instrument is in a state of output)

Table 3-6 Frequency Gain Error of the Standard Equipment

Virtual value	Frequency	Input signal	Quick Test	Test limits (1 year)	
				Upper limit	Upper limit
200 mV	20 Hz		200 mV	20.0620Hz	19.9380Hz
200 mV	1 MHz	Q	200 mV	1.00016MHz	0.99984MHz

Remarks:
[1] Q denotes optional quick test point.

5. Verification procedure of Capacitance Gain:

(1) Read "**Testing Conditions**" carefully before start.
(2) Switch to Capacitance measure and select the ranges listed in Table 3-7.
(3) Connect the input terminal of the meter with shielded cable and hang the other in the air. Then enable "REL" operation.
(4) Connect the terminal hang in the air with calibration instrument.
(5) Input signals listed in Table 3-7 using calibration instrument and compare the test results with test limits listed. (Make sure that the calibration instrument is in a state of output)
(6) Repeat step (2) (3) (4) (5) to finish verification.

Table 3-7 Accessional AC Voltage Test Error

Range[1]	Testing Signals	Quick Test	Test limits (1 year)	
			Upper limit	
2.000 nF	2 nF	Q	2.080 nF	1.920 nF
20.00 nF	20 nF		20.30 nF	19.70 nF
200.0 nF	200 nF		203.0 nF	197.0 nF
2.000 μF	2 μF	Q	2.030 μF	1.970 μF
200.0 μF	200 μF		203.0 μF	197.0 μF
10000 μF	10000 μF		10250 μF	9750 μF

Remarks:
[1] Specifications are for "REF" operation.
[2] Q denotes optional quick test point

Chapter 4 Calibration

The chapter mainly covers the following topics:

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

Calibration Protection

The protection is used to avoid unexpected or non-authoritative calibration. DM3058 is in a state of calibration protection before delivery. Before calibrating, correct security code must be input to release protection.

The calibration code could be made of 10 characters at most which is from number "0~9" and letter "A~Z". To modify the code, correct former code must be input at first. Once you save the new code, it would not be lost even if power down or reset the meter.

The default of calibration code is "DMCAL".

Set or Reset Security Code

To input or set code, please use "up" and "down" key to select character and "left" or "right" key to move the position of cursor. If press "up" or "down" key, the character will roll between "0~9, A~Z, space".

To reset code, Press Utility , select T/C → PSW to input the former code via direction keys on front panel and set SecrOff , then enter a new code and press SecrOff .

NOTE

Please record your new code. If forget, please try to default code.

Calibration Notices

The type of calibration is composed of Factory calibration and User calibration. The parameters calibrate by **RIGOL** or the third party authorized by **RIGOL** is saved as Factory calibration parameters. The User calibration parameters are the ones getting from following operations, and which will not cover factory's or lost even if power down. You can set the type of current calibration parameters via menu, or resume the user calibration parameter to default.

To reset code, Press Utility , select T/C → PSW to input correct code and set SecrOff . Then, press Cal to enter the calibration menu and start calibrating, the results you get are the use calibration parameters, and which could be resume to defaults if select

default . Select On/Off as "On" and the instrument will amend the measuring result according to user calibration parameters. Conversely, factory parameters will be rested on.

DC Voltage, DC Current, Resistance Calibration

The calibration procedures of DC voltage, DC current and resistance are all divided into two steps: Zero calibration and Gain calibration. Zero calibration must be done firstly while you calibrate.

The calibration procedure of DC voltage, DC current and resistance are almost similar. Take 4-wire resistance (20 kΩ) as reference to show you the procedure.

1. Read "**Testing Equipments**" and "**Testing Conditions**".

2. Press Ω and enable 4-wire measure. Then separately set the range as 20kΩ and the reading resolution as "Slow".

3. Press Utility, and select T/C → PSW to input code. Then set SecrOff and select Cal → Enter .

4. See figure 4-1, short the terminals of both Input HI-LO and Sense/Ref HI-LO through 4-terminal shortcircuiter, and then press Zero to execute calibration. The results will display in the table of UnCal 0 .

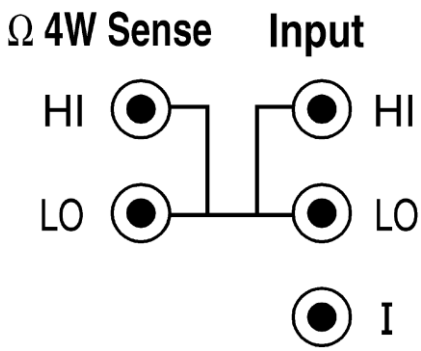

Figure 4-1 The Input HI-LO and Sense/Ref HI-LO Terminals in Short Circuit

5. When finish calibration, connect the terminals of Input HI-LO and Sense/Ref HI-LO with corresponding output terminal, and enable 4-wire resistance measure (20 kΩ). Then enable the output of calibration instrument and press Gain to start calibrating until the output is stable. The results will display in the table of UnCal G .

6. After finishing above steps, press Save to store the parameters have been calibrated and exit.

NOTE

You must be very cautious about calibrating in order to avoid detrimental effection for the performance of instrument owing to misoperation. Before calibrate, please read "**Testing Conditions**" in Chapter3.

Table 4-1 DC Zero and DC Gain Calibration Input Value

Function	Range	Zero	DC Gain Calibration Input Value
DC Voltage	200.000 mV	short	200.000 mV
	2.00000 V	short	2.00000 V
	20.0000 V	short	20.0000 V
	200.000 V	short	200.000 V
	1000.00 V	short	1000.00 V
DC Current	200.000 μA	open	200.000 μA
	2.00000 mA	open	2.00000 mA
	20.0000 mA	open	20.0000 mA
	200.000 mA	open	200.000 mA
	2.00000 A	open	2.00000 A
	10.0000 A	open	10.0000 A
Resistance	200.000 Ω	short	200.000 Ω
	2.00000 kΩ	short	2.00000 kΩ
	20.0000 kΩ	short	20.0000 kΩ
	200.000 kΩ	short	200.000 kΩ
	2.00000 MΩ	short	2.00000 MΩ
	10.0000 MΩ	short	10.0000 MΩ

Remark:
[1] Short circuit using 4-terminal shortcircuiter.

AC Voltage and AC Current Calibration

The calibration procedures of AC voltage and AC current are all divided into two steps: Middle range calibration and Gain calibration. Zero calibration must be done firstly while you calibrate. Take AC voltage (200 mV) as reference to show you the procedure:

1. Read "**Testing Equipments**" and "**Testing Conditions**".
2. Press (~V) and enable AC voltage measure, and then separately set the range as 20kΩ and the reading resolution as "Slow".
3. Press (Utility) , and select T/C → PSW to input password and set SecrOff , then select Cal → Enter ;
4. Connect the voltage output of calibration instrument with HI-LO of the meter. Then, set the output of calibration instrument as Sine, 100 mV, 1 KHz. Next, enable the output and press Gain to start calibrating until it is stable. The results will display in the table of UnCal G .
5. After finishing above steps, select Save to store the parameters have been calibrated and exit.

Table 4-2 AC Calibration Input Value

Function	Range	Middle Calibration [1]	Full Range Calibration
AC Voltage	200 mV	1 kHz/100 mV	1 kHz/200 mV
	2 V	1 kHz/1 V	1 kHz/2 V
	20 V	1 kHz/10 V	1 kHz/20 V
	200 V	1 kHz/100 V	1 kHz/200 V
	750 V	1 kHz/375 V	1 kHz/750 V
AC Current	20 mA	1 kHz/10 mA	1 kHz/20 mA
	200 mA	1 kHz/100 mA	1 kHz/200 mA
	2 A	1 kHz/1 A	1 kHz/2 A
	10 A	1 kHz/5 A	1 kHz/10 A

Frequency Calibration

As for Frequency, only Gain is required to be calibrated, the procedures are:

1. Read "**Testing Equipments**" and "**Testing Conditions**".
2. Press (Freq) and enable frequency measure, then set the range as 2V, Manual.
3. Press (Utility) , and select T/C → PSW to input password; then, set SecrOff and select CAL → Enter .
4. Connect the voltage output of calibration instrument with HI-LO of the meter.

Then, set the output of calibration instrument as Sine, 2 V, 100 kHz. Next, enable the output and press Gain to start calibrating until it is stable. The results will display in the table of UnCal G .

5. After finishing above steps, select Save to store the parameters have been calibrated and exit.

Capacitance Calibration

As for capacitance, both Zero and Gin calibration are required to be executed. Take Capacitance in 2 nF as reference to show you the procedure:

1. Read "**Testing Equipments**" and "**Testing Conditions**".

2. Press Freq and enable frequency measure, then set the range as 2V, Manual.

3. Press Utility , and select T/C → PSW to input password; then, set SecrOff and select CAL → Enter.

4. Connect one end of the cable that used to connect with the HI-LO input terminal of the meter, then open another end, and connect the cable shielding layer to Chassis Ground. Nest, press Zero to execute calibration. The results will display in the table of UnCal 0 .

5. Connect the end hang in the air with the output of calibration instrument. Then, set the output of calibration instrument as 2 nF. Next, enable the output and press Gain to start calibrating until it is stable. The results will display in the table of UnCal 0 .

6. After finishing above steps, select Save to store the parameters have been calibrated and exit.

Table 4-3 Capacitance Calibration input Value

Function	Range	Zero	Gain Input
Capacitance	2 nF	Open	2 nF
	20 nF	Open	20 nF
	200 nF	Open	200 nF
	2 μF	Open	2 μF
	200 μF	Open	200 μF
	10000 μF	Open	10000 μF

Chapter 5 Disassembly & Assembly

The chapter mainly covers the following topics:

- The Disassembly and Assembly Notice
- The 3D View of DM3058
- To Disassemble and Assemble Handle
- To Disassemble and Assemble Rear Panel
- To Disassemble and Assemble Metallic Shell
- To Disassemble and Assemble Fuse Socket
- To Disassemble and Assemble GPIB PCB
- To Disassemble and Assemble Filter Board &
- To Disassemble and Assemble Front Panel & LCD
- To Disassemble and Assemble Motherboard
- To Disassemble and Assemble Key Board PCB

The Disassembly and Assembly Notices

Notices:

- 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 before disassembly
- Please wear the anti-static hand-ring or take other anti-static measures when disassembling
- Please use proper tools and disassemble in order
- Prevent metallic parts from transfiguration and avoid being scratched when disassembling

Toolse:

- Club screwdriver T10, T15
- Diagonal cutting pliers

WARNING

Before disassembling, please make sure the power is cut off.
The operator should be trained or had related qualification.

The 3D View of DM3058

In order to help you have a primary understanding of the structure of DM3058, the following parts show you its interior and exterior skeleton drawing. Besides, the disassembly and assembly procedures are also provided to reference.

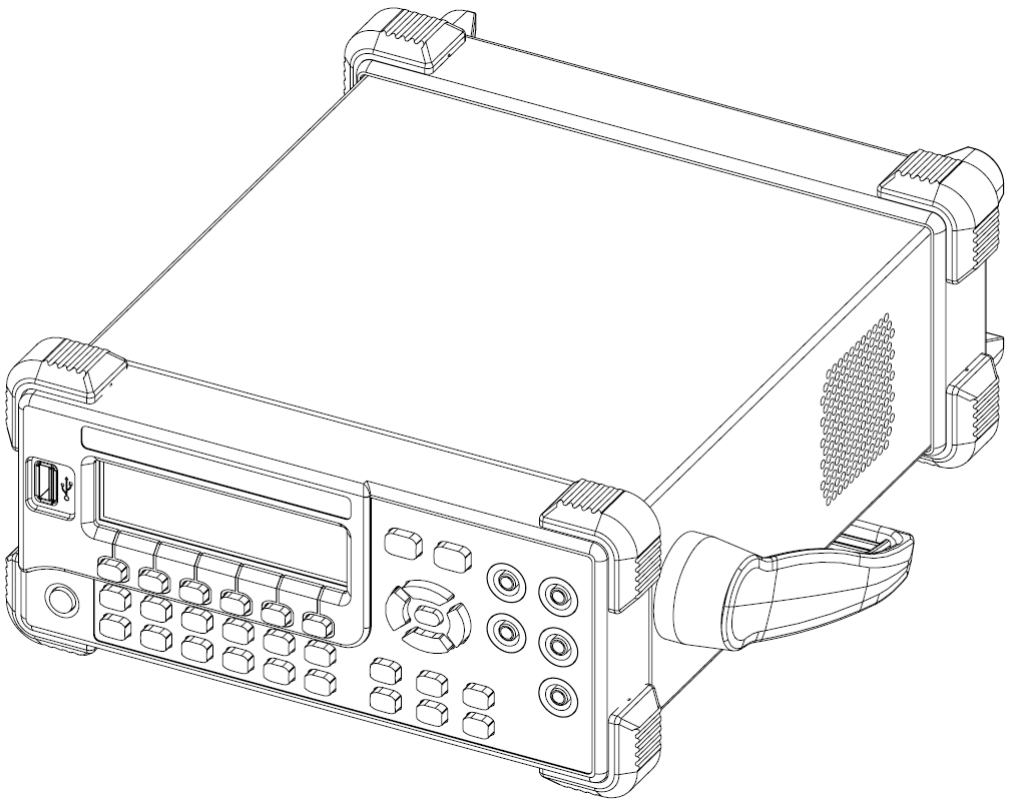

Figure 5-1 The Exterior 3D View of DM3058

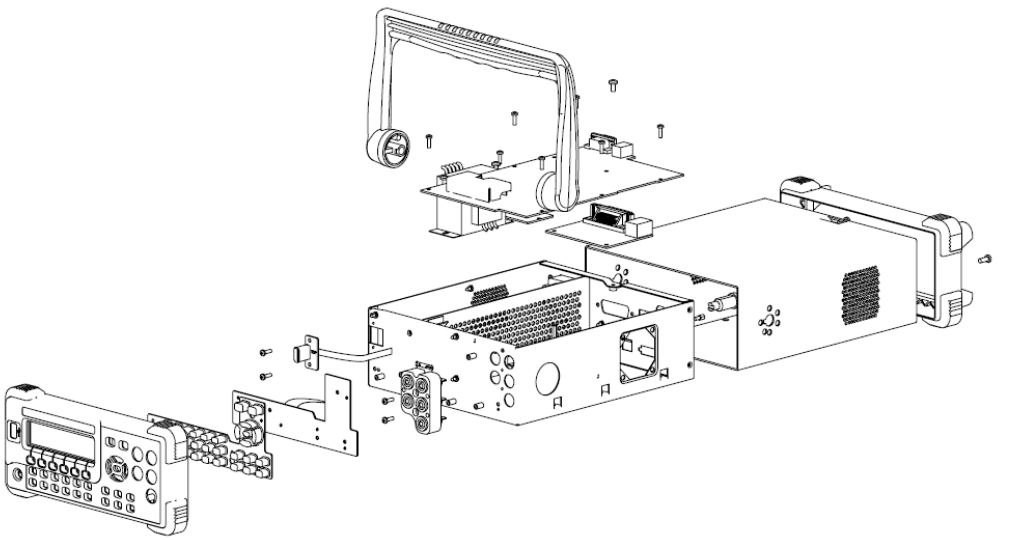

Figure 5-2 The Interior 3D View of DM3058

Please acquaint the main parts before starting. In progress of disassembling or assembling, operate gently and step by step. Note that please do not scratch the surface of the device and damage PCB and so on, for the details please refer to Disassembly and Assembly Notices.

Recommend disassembly procedures:

Handle → **Rear Panel** → **Metallic Shell** → **GPIB PCB** → **Filter Band** and **Industrial Frequency Transformer** → **Front Panel and LCD** → **Motherboard** → **Key Board**

About assembly, please operate in reverse orders.

To Disassemble and Assemble Handle

Grip the handle in both sides and pull it outward, then rotate it to the desired position to take it away. For the position of the handle please refer to following figure.

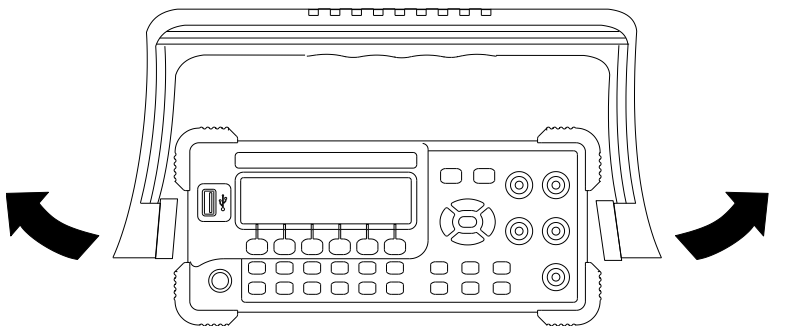

Figure 5-3 The Schematic of Disassembling and Assembling Handle

To Disassemble and Assemble Rear Panel

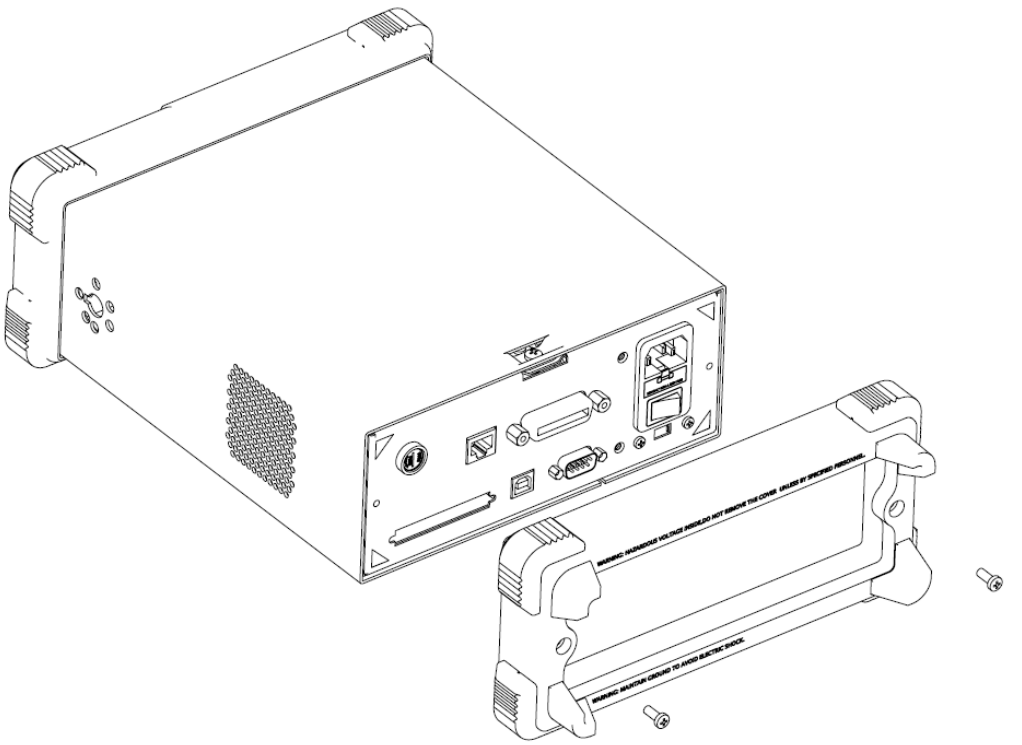

Figure 5-4 The Schematic of Disassembling and Assembling Rear Panel

To Disassemble and Assemble Metallic Shell

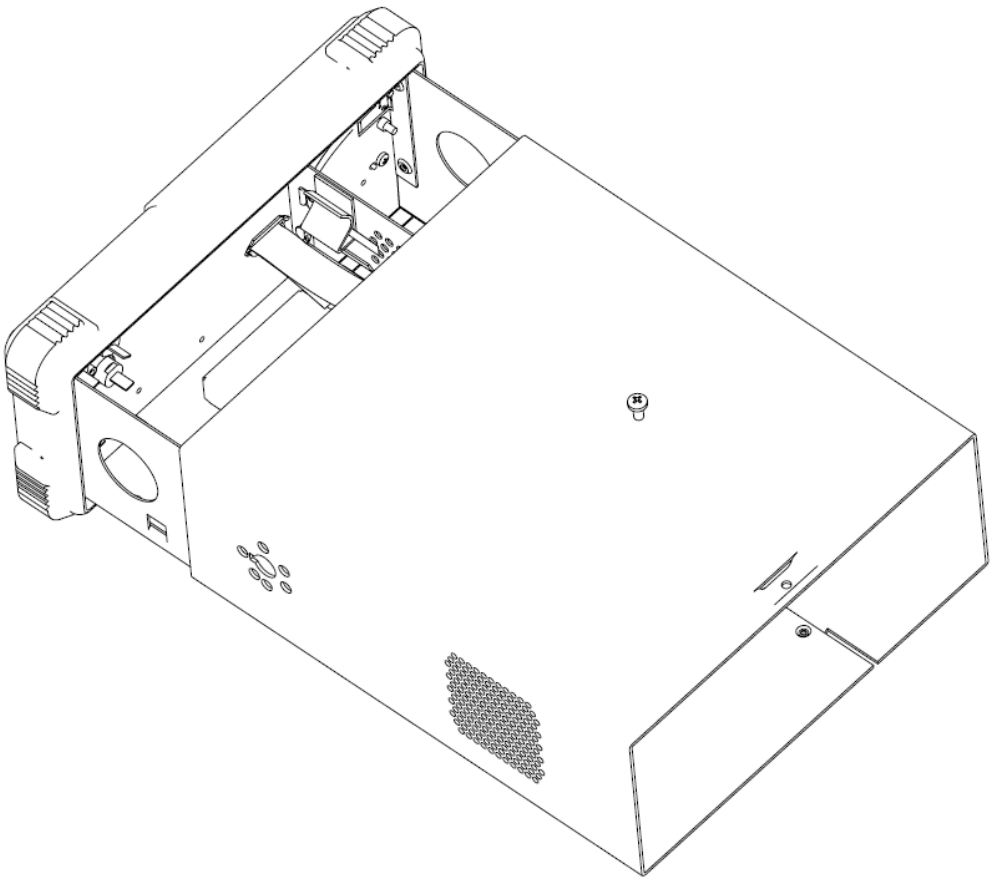

Figure 5-5 The Schematic of Disassembling and Assembling Metallic Shell

To Disassemble and Assemble Fuse Socket

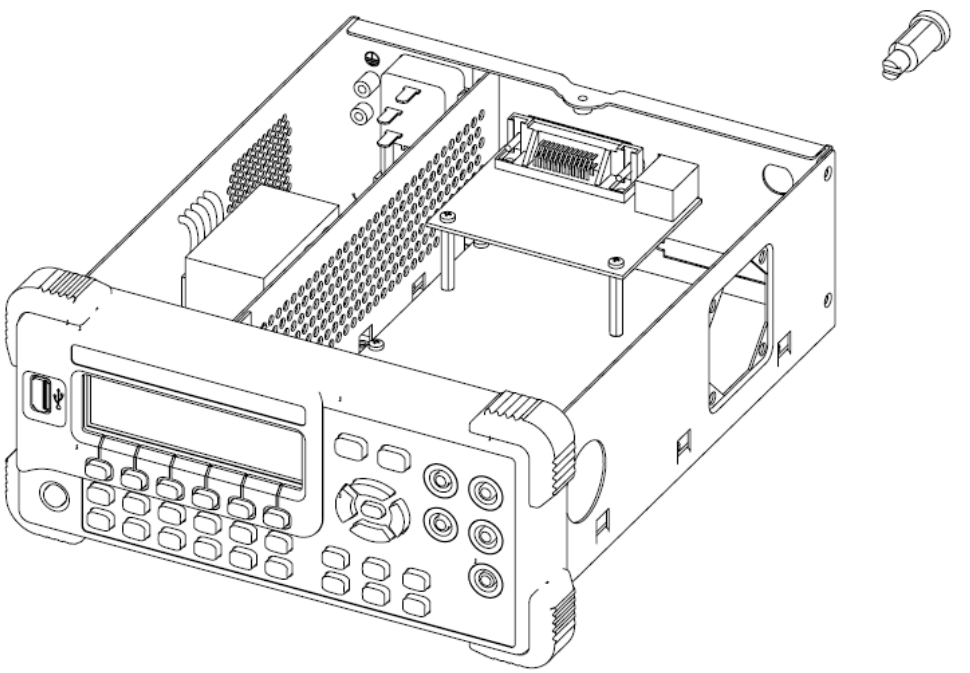

Figure 5-6 The Schematic of Disassembling and Assembling Fuse Socket

To Disassemble and Assemble GPIB PCB

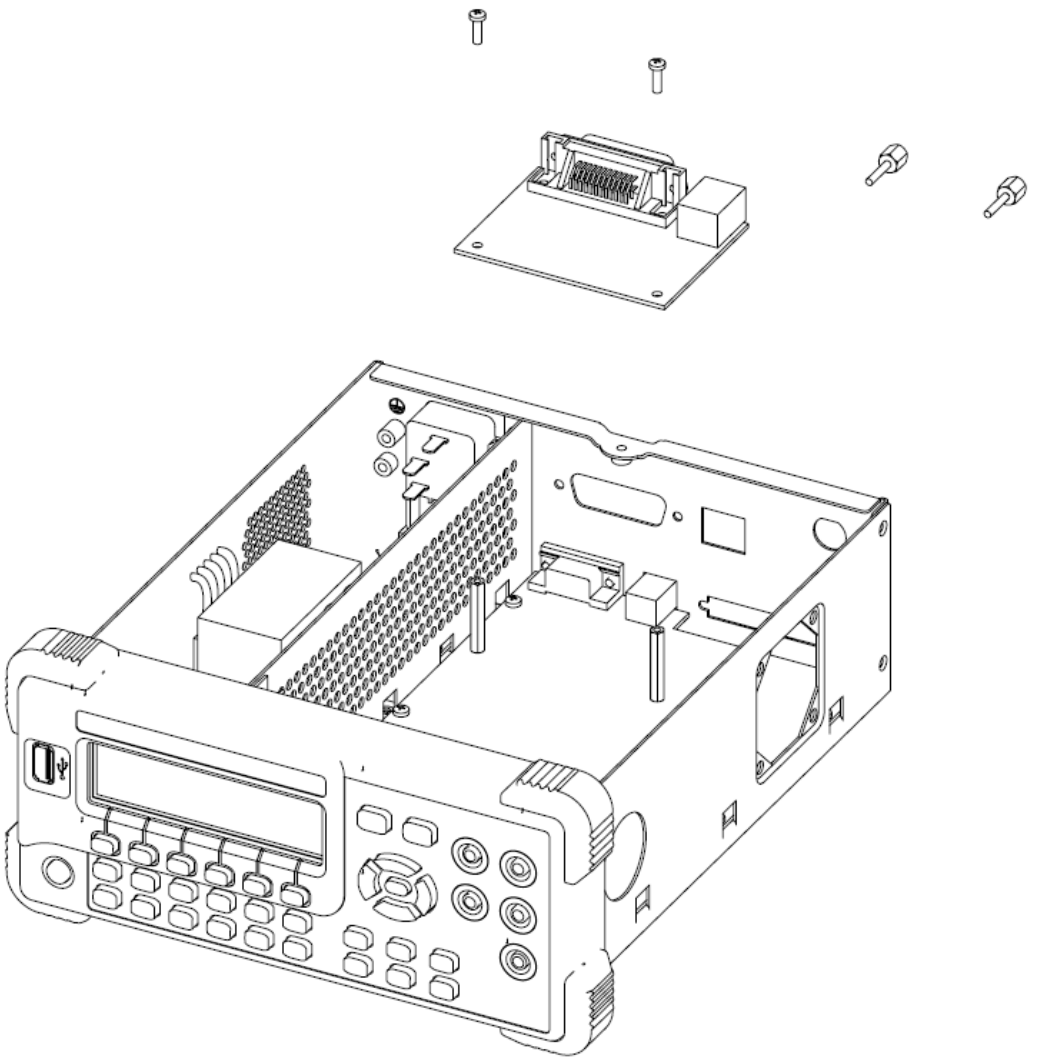

Figure 5-7 The Schematic of Disassembling and Assembling GPIB PCB

To Disassemble and Assemble Filter Board & Transformer

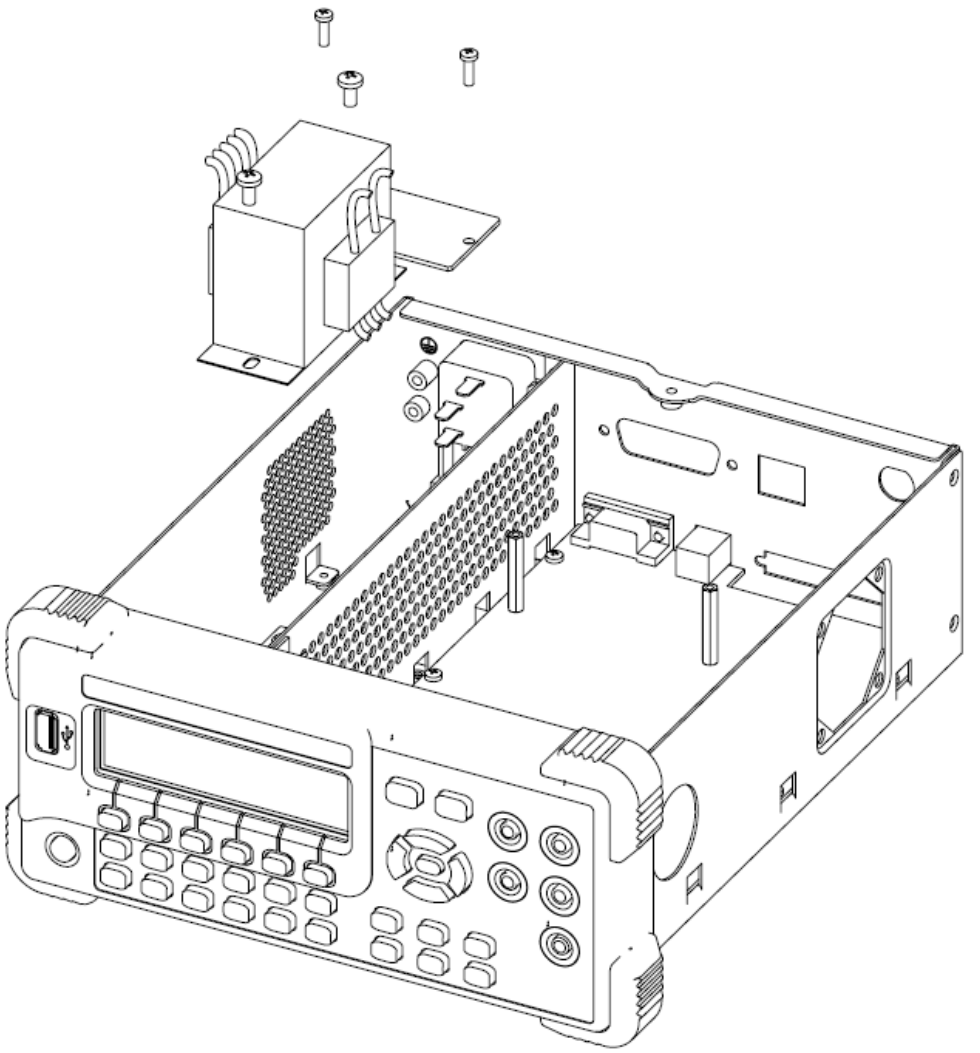

Figure 5-8 The Schematic of Disassembling and Assembling Filter Board and Transformer

To Disassemble and Assemble Front Panel & LCD

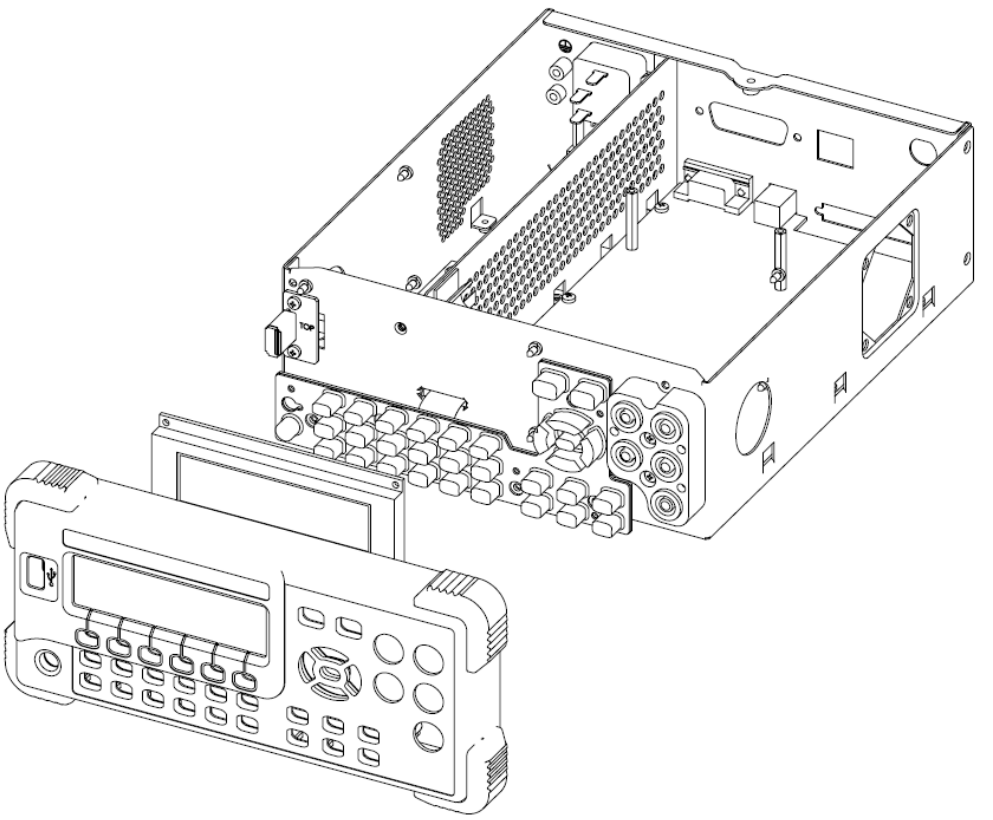

Figure 5-9 The Schematic of Disassembling and Assembling Front Panel and LCD

To Disassemble and Assemble Motherboard

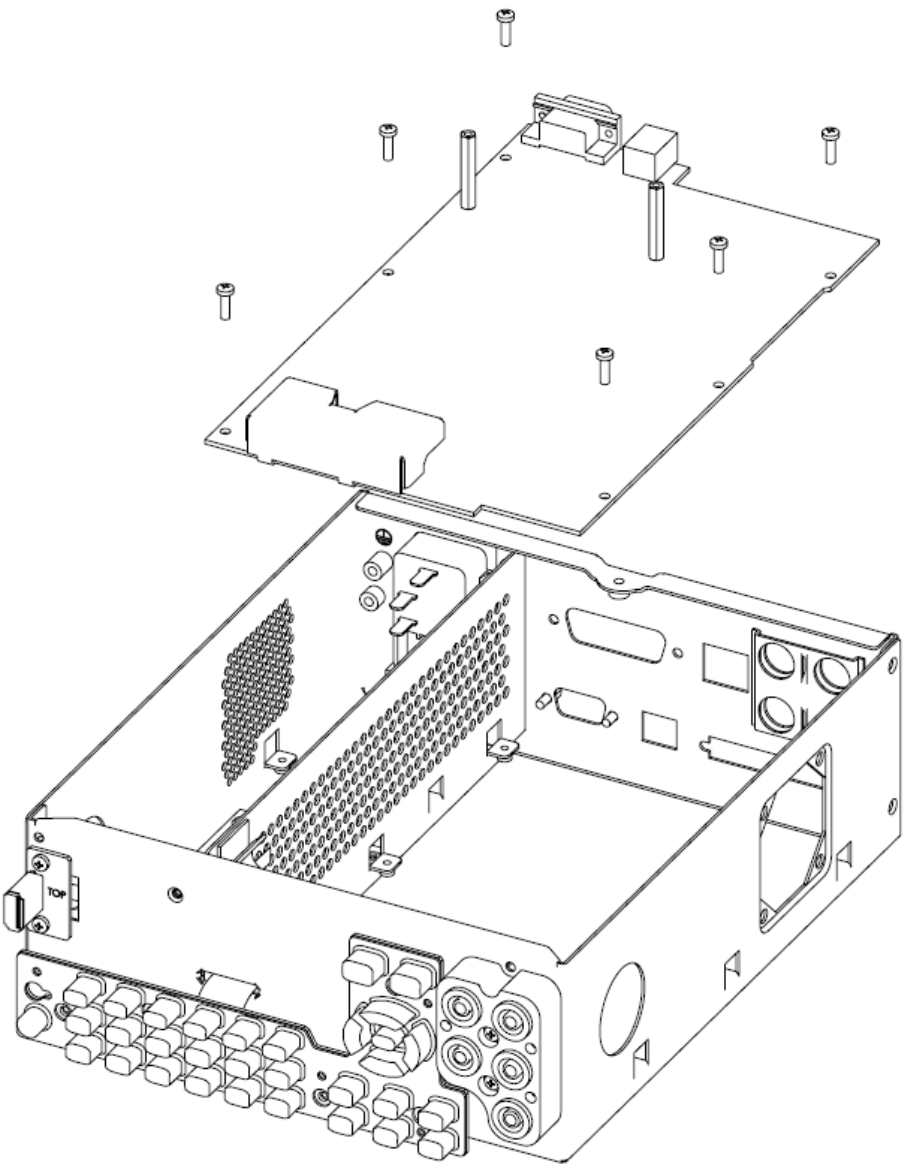

Figure 5-10 The Schematic of Disassembling and Assembling Motherboard

To Disassemble and Assemble Key Board PCB

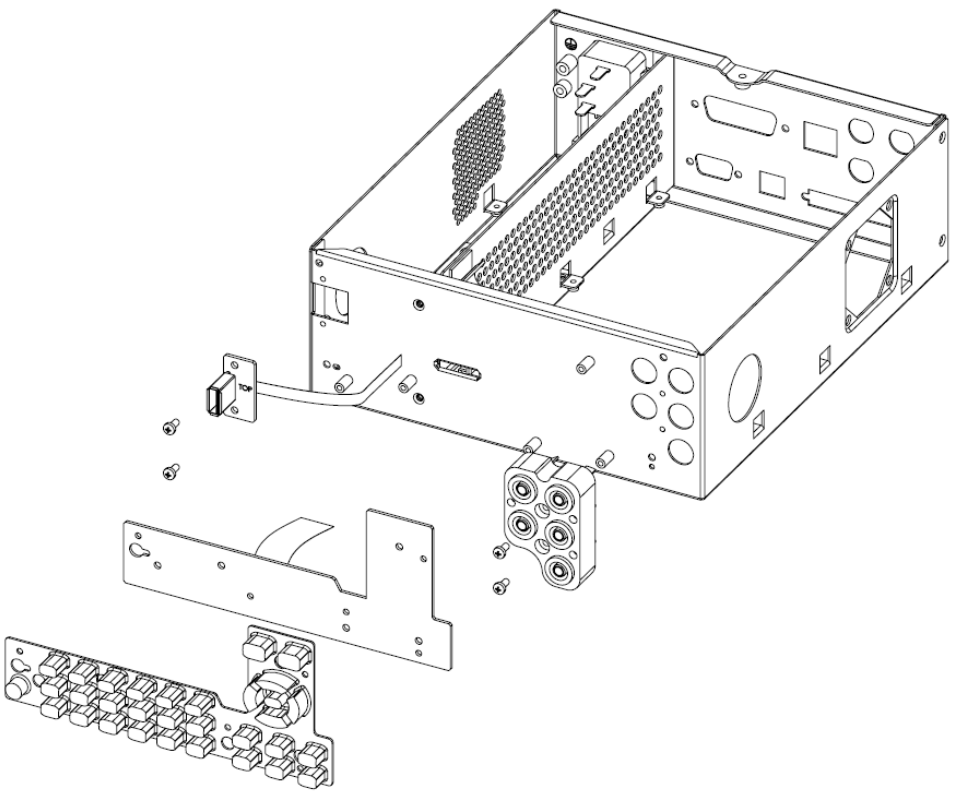

Figure 5-11 The Schematic of Disassembling and Assembling Key Board PCB

We amicably suggest you obey above orders or methods as possible as you can while disassemble or assemble in order to avoid damages to equipment and save your time.

Chapter 6 Troubleshooting & Maintenance

The chapter mainly covers the following topics:

- DM3058 Principle
- Troubleshooting
  Common Troubleshooting
  Components Inspection
  Replaceable Part list
- Maintenance and Cleaning

DM3058 Principle Summary

The circuit of DM3058 can be divided into floating circuit, grounding circuits and power input.

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

In the following functional block diagram of circuit of DM3058, each box represents an alternative component part.

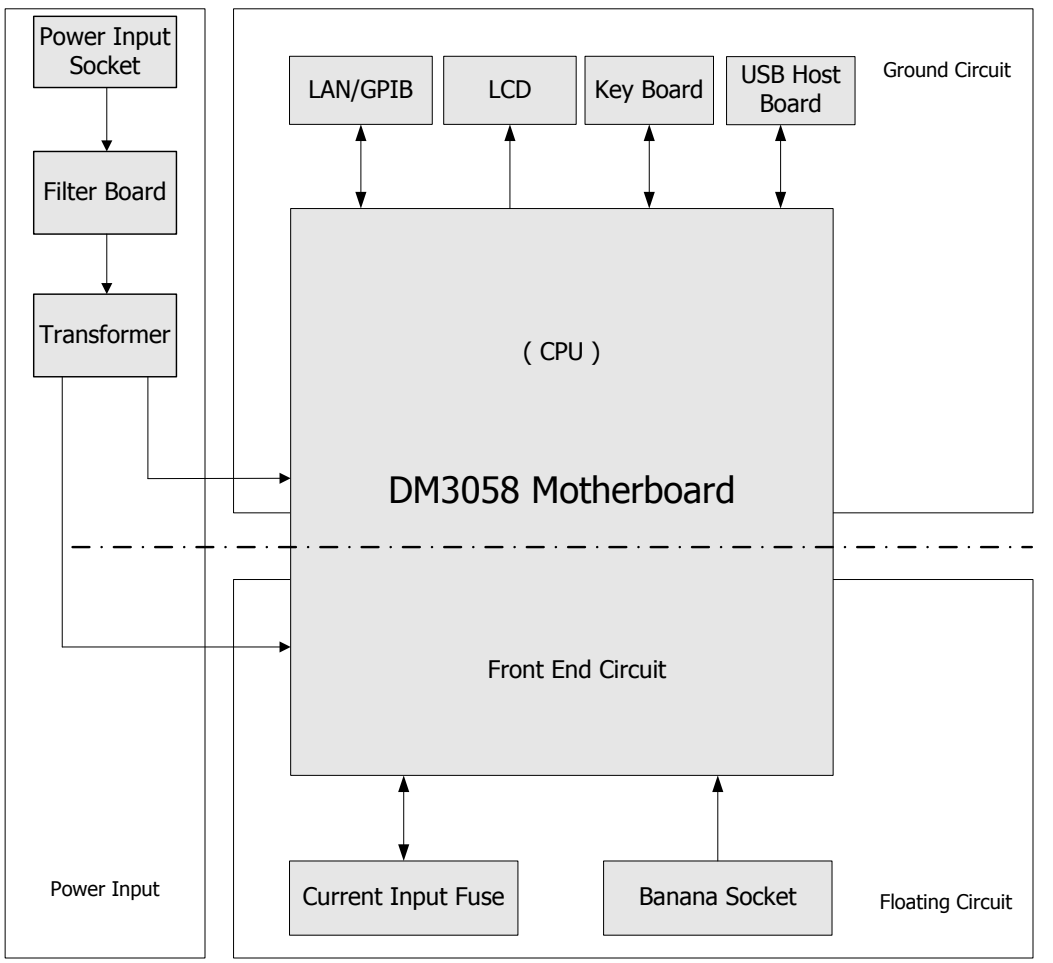

Figure 6-1 Circuit Diagram of DM3058

2. Ground circuit contains most circuit such as keyboard, LCD, USB Host, BNC board, LAN/GPIB board and the host CPU.

3. The AC supply inpour the meter via power socket and connect to transformer through filter board, from which, it will be stepped down or divided into multi low voltage and then respectively supply for floating circuit and grounding circuits. The power supply of ground circuit is 9 VAC and the floating circuit supplied separately by a set of 8.5 VAC and two sets of 17 VAC voltages. Related rectification circuit and filter circuit as well as voltage-stabilized circuit are designed in both circuits for transform the low ACV into the stable DCV and supply for each circuit.

When measuring, the host CPU will send commands to control the analog front-end switching 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 based on LCD module.

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 power switch on Rear panel has been turned 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.

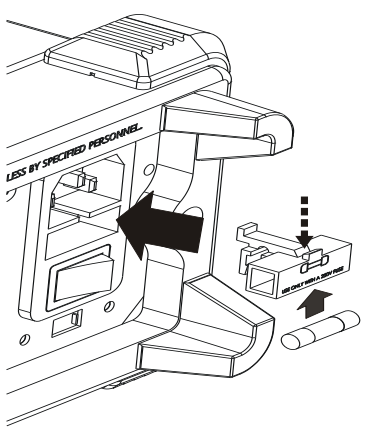

Figure 6-2 The Sketch Map of Fuse Replacement

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 of small capacitance is not stable or the offset is a little bigger:

(1) Shielded cable must be used to connect the capacitance while measuring small capacitance so as to reduce the influence to result from exterior interference.

(2) Cut off the capacitance under measure, clear Zero offset by '"REL" operation.

3. When the excursion occurs in the level of μV during measuring voltage:

(1) Warm up the meter according to the regulation.

(2) Measure signal by Manual range.

(3) Use pure copper cable to reduce thermoemf, after connecting, do not read until warm up.

4. **When the reading is stable and is not "0" while HI-LP terminal is short in Voltage measure mode:**

(1) Disable all the math operations.

(2) Disable calibration, for the operations please refer to "**Calibration Instructions**".

(3) Check whether the power supply of meter is normal or not.

(4) Check whether warm up the meter upon request.

5. When the backlight of screen is dark:

(1) Regulate the brightness and contrast of backlight.

(2) Refer to "**Display**

6. When fail to connect with the meter via RS-232 interface:

(1) Check whether the serial settings of both serial cable and host computer are the same, please refer to "Interface settings" in User's Guide.

(2) Check whether the serial cable is still connected.

(3) Check whether both RXD and TXD terminal of serial cable are connected correctly.

(4) Check whether the "Print" function is closed while using command to control the meter.

7. When fail to connect with the meter via GPIB interface:

(1) Check whether the address of GPIB interface is correct; please refer to Interface Setting in User's Guide.

(2) Check whether the GPIB cable is still connected.

(3) Ensure that whether the edition of software is match with the edition of current firmware.

8. When fail to connect with the meter via LAN interface:

(1) Check whether the type of netting twine is correct and still connected.
(2) Check whether the indicator light of network connections of the meter is in normal state; if not, that denotes there may be something wrong about LAN.
(3) Check whether the address of both DHCP and IP and the settings of DNS are in accordance with the configuration of all LANs.
(4) Try to open DHCP and Auto IP to enable network assign IP address.
(5) Check whether the IP address you access at the moment is the same with the address of the meter.

9. When fail to connect with the meter via USB interface:

(1) Check whether the USB data cable is still connected.
(2) Check whether install a proper driver; if not, please download a new one from **RIGOL** website.
(3) Check whether the software could divide the meter correctly if PC connects multiple USB devices.

10. When the readings change slowly or stop reading:

(1) Check whether the trigger interval has already been modified; if so, please resume to defaults.
(2) Check whether the button "Single" is in "ON" (ever bright); if so, please press "RUN" and exist Single mode.
(3) Check whether turn on Exterior Trigger; if so, please disable it.

11. When can not enter Measure interface after power on"

(1) Cut off the power more than 5 seconds and restart the meter.
(2) If still fail to enter, please cut off all the exterior devices connecting to it and restart.

12. For the other malfunctions, please contact with RIGOL maintenance 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 advanced troubleshooting by yourself.

1. Fuse

DM3058 has three types of fuse which are: power fuse, current input fuse on rear panel and inside current input fuse of mainboard, the parameters are as follows:

Power fuse: 300 mA, AC 250 V, quick-break
Current input fuse on rear panel: 10 A, AC 250 V, quick-melt
Inside current input fuse of mainboard: 12 A, AC 250 V, slow-melt
Current fuse: 10 A, quick-break
Note: The last two fuses adopt series to protect the current input

Inspection method: Take out the fuse and execute continuity test using meter. The current input fuse can be tested using another method: separately insect the two test leads into socket LO and I and switch to continuity test; short-circuit the test leads, if the testing result is Connecting, which denotes the fuse is normal, if not, which denotes the fuse may be melted.

2. Power Frequency Transformer

DM3058 adopts power frequency transformer to supply, and the power socket equips with fuse socket and switch. You can select the input winding for transformer through voltage switcher so as to suit different mains voltage. For the country equips 220V voltage, switch to 230V or else damages to device may happen; for the country equips 110V voltage, switch to 115V or else the device can not start up.

Inspection procedure:

(1) Cut off the power supply.
(2) Setup the voltage switcher.
(3) Open the cage.
(4) Re-power on and switch the power to the position of "1".
(5) Check the voltage between every winding of transformer.
(6) Cur off the power supply again.
(7) Clearing faults and re-inspect, then fit up the case.

WARNING

Once you open the chassis and power-on, any parts of your body is forbidden touching with the conductor inside to avoid electric shock!

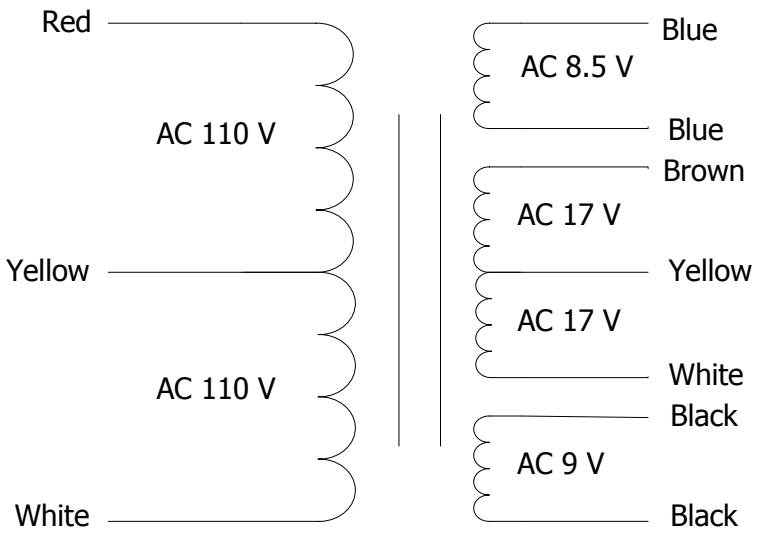

Figure 6-3 Transformer Sketch Map

Compare the measured voltages of each winding with the ones in Table 6-1, 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

(1) If all the winding voltages among original side are 0, there might be something wrong with filter board or power socket.
(2) If the original voltage is half or double of the typical value, inaccurate location might be selected by AC voltage selectors.
(3) 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.

3. Display

DM3058 utilize LCD self-check program to inspect its bright point, scotoma, backlight and display control circuit.

Inspection method:

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

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 the brightness of LCD out of control, please enter into normal operating state and adjust the brightness and contrast in the menu of "Utility" to verify the real fault cause more. IF the brightness cannot be adjusted, which denotes there may be something wrong about mainboard. If LCD can not shine, LCD module or mainboard may have been damaged.

If bright point or scotoma occurs, the LCD module may be damaged.

Before replace the parts, please try to pull out the connecting line between LCD and mainboard and reconnect and test to get rid of the trouble to connectivity.

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

4. Keyboard

DM3058 utilize Keyboard self-check program to inspect whether its button and backlight are normal.

Inspection method:

Press the first menu operation key in the left side, and turn on the multimeter at the same time. 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 no movement happens after you pressed the button, there may be something wrong about button or relative circuit.

If the backlight of some or all buttons does not wink while you execute self-check, that denotes there may be something wrong about backlight or relative circuit.

Before replace the parts, please try to pull out the connecting line between LCD and mainboard and reconnect and test to get rid of the trouble to connectivity.

If you verify that it was the malfunction of keyboard, please replace a new keyboard board or (and) rubber button.

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; here we can recall the factory setup by another way to solve this problem: 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 multimeter will load the factory configuration automatically.

CAUTION

If some malfunctions occur, please contact **RIGOL** technical support department or authorized distributors by **RIGOL**. Do not disassembly the instrument by yourself to avoid accident or losing.

Replaceable Part list

RIGOL provides some replaceable parts for you to maintain or update. Please see following table.

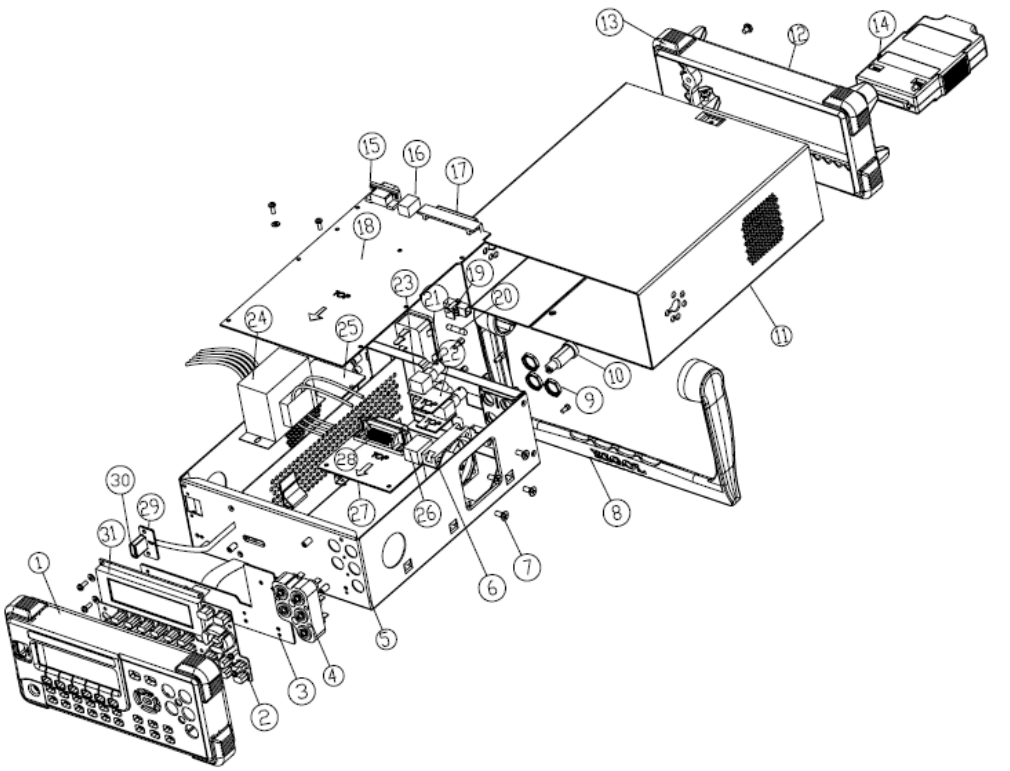

Table 6-2 Replaceable Part List

Part No.	Name	Quantity
1	Front Panel	1
2	Handle	1
3	Rubber Keypad	1
4	Banana Socket	1
5	Rear Panel	1
6	Non-slip Mat	8
7	Metal Shell A	1
8	Shielding	1
9	Clapboardt	1
10	Metal Shell B	1
11	Shell	1
12	Rear BNC stator	1
13	Stay plate of Transformer	1
14	Button PCB	1
15	PCB-GPIB&LAN	1
16	PCB-USB	1
17	Mainboard	1
18	Filter PCB	1
19	M3-28 Brass stud	2
20	300mA Fuse	2
21	Nip of Winding displacement	1
22	Fuse socket on Power supply	1
23	Fuse on Power supply	1
24	DB9 Bolt	2
25	LA Bolt	2
26	USB	1
27	DB9-male	1
28	LCD screen	1
29	FuseHolder	1
30	GPIB-24PIN-female	1
31	Net interface	1
32	Voltage Selector	1
33	Electric Outlet	1
34	Transformer	1
35	USB Host Interface	1
36	Banana interface	5
37	Nut for Banana interface	5
38	GB_CROSS_SCREWS_TYPE3	2
39	GB_CROSS_SCREWS_TYPE3	2
40	GB_CROSS_SCREWS_TYPE128	7
41	GB_CROSS_SCREWS_TYPE1	15
42	GB_CROSS_SCREWS_TYPE1	3

For the above parts, please contact **RIGOL** technical support department or **RIGOL** authorized distributors to order and refer to "**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 during 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 power source.

Chapter 7 Service & Support

The chapter mainly covers the following topics:

- Warranty
- Contact Us

Warranty

RIGOL warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment from an authorized **RIGOL** distributor. If a product proves defective within the respective period, **RIGOL** will provide repair or replacement as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest **RIGOL** sales and service office.

RIGOL do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose.

RIGOL will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

Contact Us

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

Domestic: 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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