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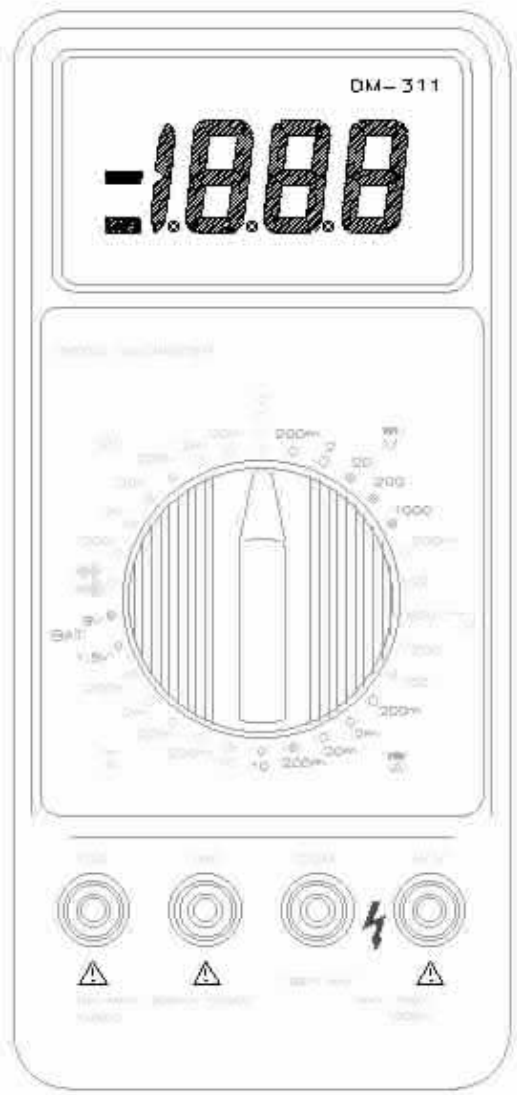
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Adjustment and Test procedure Manual

for digital multimeter

Model : DM-311



LG Precision Co., Ltd.

1999/8/12

Revision History

NO	Modification	ECN NO	Date	Name

n General Specifications of DM-311

Display : 3½ Digit Multimeter

Battery Life : Typical 200 hours

Operating Temperature : 0ºC ~ 40ºC (Below 80% RH)

Storage Temperature : -10ºC ~ 60ºC (Below 70% RH)

Accuracy guaranteed temperature : 23ºC ± 5ºC (Below 80% RH)

n Explanation of each part of DM-311

æĥ=**Terminal 10A**

Used for measuring DC/AC current below 10A current.

æĦ=**Terminal COM**

Used for commom terminal.

æĥ=**Terminal Ω-V**

Used for AC/DC voltage or resistance measure terminal.

æĨ=**Terminal mA**

Used for measuring DC/AC current below 200mA current

æĩ=**LCD display**

æĪ=**Rotary S/W**

Used for selecting mode and range

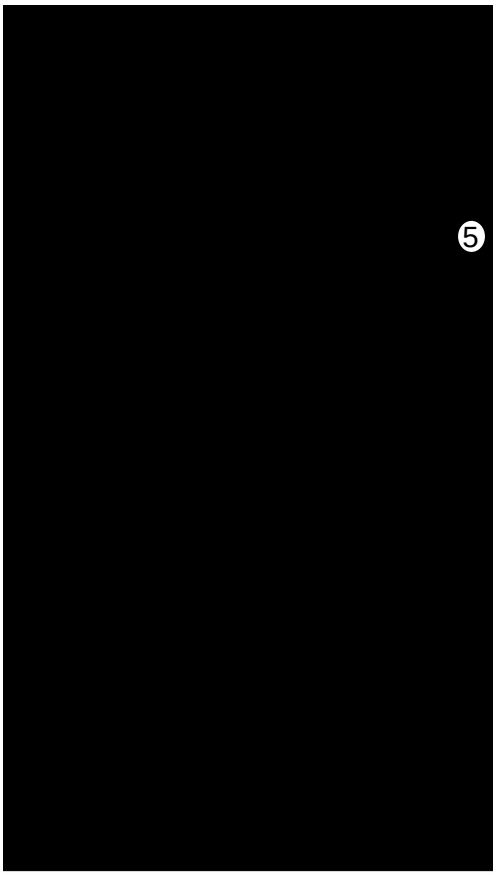


Fig 1 - Front View of DM-311

Note

Adjustment and Test of DM-311 should be conducted under proper test environment

Check temperature and relative humidity before adjustment and test.

Accuracy guaranteed temperature : 23ºC ± 5ºC (Below 80% RH)

n Test Equipment List

DMM Calibrator : 1 set

Decade Resistor : 1 set

DC Power Supply or 9V Battery

n Calibration Procedure

1. Power On Test

Set DM-311 to any mode by using Rotary S/W.

Check LCD display is turned on.

2. LCD Display Test

Check LCD Display to each range by selecting range with Rotary S/W. Below chart shows correct display

Function	LCD Display to each range
DC VOLTAGE	00.0 → .000 → 0.00 → 00.0 → 000
AC VOLTAGE	00.0 → .000 → 0.00 → 00.0 → 000
DC CURRENT	00.0 → .000 → 0.00 → 00.0 → 0.00
AC CURRENT	00.0 → .000 → 0.00 → 00.0 → 0.00
RESISTANCE	1 . → 1. →1 . →1 . →1. → 1 .
BAT	.000 → 0.00
DIODE & CONTINUITY	1

3. Low Battery Warning Display Test

Check a message, “BATT” on LCD display when Power supply or Battery Voltage goes under 6.4V.

4. Adjustment of DC voltage, AC voltage and DC current.

Item	Specification	Procedure
DC Voltage	189.8mV ~ 190.2mV	1. Set Rotary S/W to DC Voltage Mode 2. Apply DC 190mV to Terminal COM and Terminal V of DM-311 with a calibrator 3. Adjust VR1 to be displayed 190.0mV on LCD display
AC Voltage	189.5mV ~ 190.5mV	1. Set Rotary S/W to AC Voltage Mode 2. Apply AC 190mV/60Hz to Terminal COM and Terminal V of DM-311 with a calibrator 3. Adjust VR2 to be displayed 190.0mV on LCD display
DC Current	9.95A ~ 10.05 A	1. Set Rotary S/W to DC Current 10A Mode 2. Apply DC 10A current to terminal COM and terminal 10A of DM-311 with a calibrator 3. Adjust Mn Wire(R39) with ripper to be displayed 10.00A on LCD display.

5.Test

5-1 No Input on DC Voltage Mode

- Specification : ±00.1
- Set Rotary S/W to DC Voltage mode and check DM-311 to meet the above specification.

5-2 Short-circuit on DC Voltage Mode

- Specification : ±00.1
- Set Rotary S/W to DC Voltage mode and Short-circuit between COM terminal and V terminal
- Check DM-311 to meet the above specification.

5-3 DC Voltage Measurement Test

Set Rotary S/W to DC Voltage Mode and Apply below voltage to terminal COM and terminal V to each range with a calibrator

Range	Customer Specification	Factory Specification	Test DC Voltage
DC 200mV	±(0.5% + 1dgt)	±(0.4% + 1dgt)	190mV
DC 2V			1.9V
DC 20V			19V
DC 200V			190V
DC 1000V			1000V

5-4 AC Voltage Measurement Test

Set Rotary S/W to AC Voltage Mode and Apply below voltage to terminal COM and terminal V to each range with a calibrator. Check the measurement value to each frequency, 60Hz and 400Hz.

Range	Customer Specification	Factory Specification	Test AC Voltage
AC 200mV	±(0.75%+3dgt)	±(0.65%+3dgt)	190mV/60Hz 190mV/400Hz
AC 2V			1.9V/60Hz 1.9V/400Hz
AC 20V			19V/60Hz 19V/400Hz
AC 200V			190V/60Hz 190V/400Hz
AC 750V			750V/60Hz 750V/400Hz

5-5 DC Current Measurement Test

Set Rotary S/W to DC Current Mode and Apply below DC current to terminal COM and terminal mA to each range with a calibrator. Check the measurement value to each range

Range	Customer Specification	Factory Specification	Test DC Current
DC 200μA	±(1.0%+2dgt)	±(0.9%+2dgt)	190μA
DC 2mA			1.9mA
DC 20mA			19mA
DC 200mA			190mA



Apply below DC current to **to terminal COM and terminal 10A** with a calibrator.

Range	Customer Specification	Factory Specification	Test DC Current
DC 10A	±(1.5%+2dgt)	±(1.4%+2dgt)	9A

5-6 AC Current Measurement Test

Set Rotary S/W to AC Current 20mA Mode and Apply below AC current to terminal COM and terminal mA to each range with a calibrator. Check the measurement value to each range

Range	Customer Specification	Factory Specification	Test AC Current
AC 200μA	±(2.0%+2dgt)	±(1.9%+2dgt)	190μA/60Hz 190μA/400Hz
AC 2mA			1.9mA/60Hz 1.9mA/400Hz
AC 20mA			19mA/60Hz 19mA/400Hz
AC 200mA			190mA/60Hz 190mA/400Hz



Apply below AC current to **terminal COM and terminal 10A** with a calibrator.

Range	Customer Specification	Factory Specification	Test AC Current
AC 10A	±(3.0%+2dgt)	±(2.9%+2dgt)	9A/60Hz 9A/400Hz

5-7 Resistance Measurement Test

Set Rotary S/W to Resistance Measure Mode and Apply below resistance value to terminal COM and terminal V to each range with decade resistor. Check the measurement value to each range

Range	Customer Specification	Factory Specification	Test Resistance value
200Ω	±(0.5%+4dgt)	±(0.4%+4dgt)	190Ω
2kΩ	±(0.5%+1dgt)	±(0.4%+1dgt)	1.9kΩ
20kΩ			19kΩ
200kΩ			190kΩ
2MΩ			1.9MΩ
20MΩ	±(1.0%+1dgt)	±(0.9%+1dgt)	10MΩ

5-8 Diode & Continuity Test

Set Rotary S/W to diode & continuity test mode and apply a diode to terminal COM and terminal V with forward direction.

Range	Customer Specification	Factory Specification
Diode		Forward Direction : less than 450 Reverse Direction : more than 1

Set Rotary S/W to diode & continuity test mode and Short-circuit between terminal COM and terminal V. Buzzer will sound when measurement is less than 200 Ω

Range	Customer Specification	Factory Specification
Continuity		Open Circuit : 1 Short Circuit : less than 00.4

5-9 Battery Test

Set Rotary S/W to BAT 1.5V Range and apply below current to terminal COM and terminal V with a calibrator

Range	Customer Specification	Factory Specification	Test DC Current
1.5V		1.0 ~ 2.0	1.5mA
9V		6.0 ~ 9.0	7.5mA

5-10 Short-circuit ohm Test

Set Rotary S/W to Resistance measure mode and short-circuit between terminal COM and terminal V

Range	Customer Specification	Factory Specification
200Ω		Less than 0.4Ω

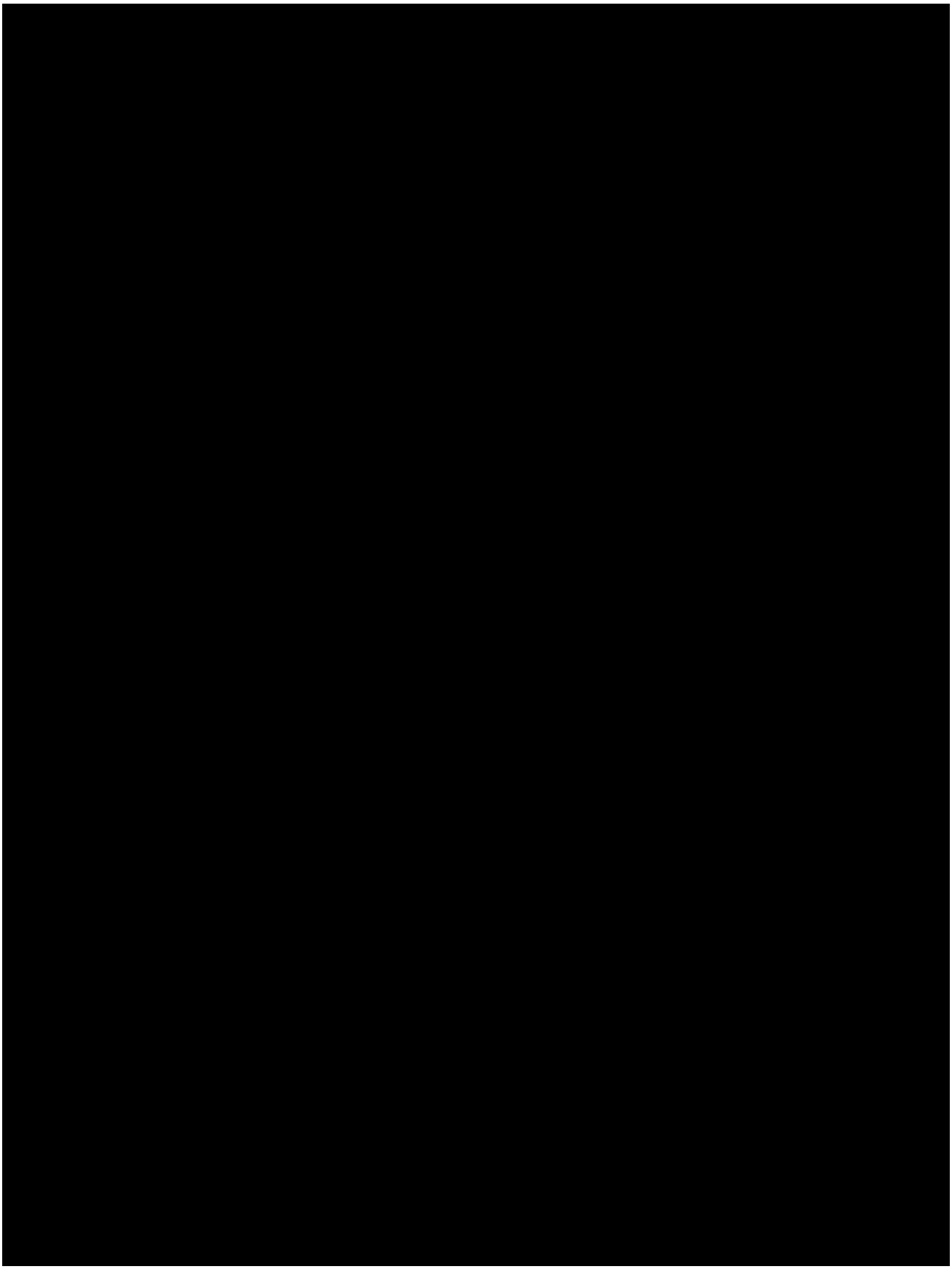
Appendix A) Bill of material

LGP P/N	Category	Specification	PCB F/N	Quantity
334-013-1	BUSHING	INPUT CORE BLACK DMM		1
334-013-2	BUSHING	INPUT CORE RED DMM		3
362-035	SPRING	SHIELD SPRING DMM	SP1	1
384-017-1	HOLDER	BAT SNAP 9V UL		1
418-100	FILM VINYL	PPI255 W=65.0 DMM M		1
513-556R3	PCB BARE B/D	DM-311 PCB REV 3		1
563-063-2	FUSE	250V 0.25A 50F UL&EU	F1	1
563-065	FUSE	250V 10A H216010 ULE14080	F2	1
563-068	FUSE	125V 1A 22NM MICRO 101L	F3	1
564-015	FUSE HOLDER	FUSE HOLDER FC51A(DMM)		4
571-317	VARIABLE RESISTOR	VR TMC3K 200 (SMD)	VR01	1
571-320	VARIABLE RESISTOR	VR TMC3K 2K (SMD)	VR02	1
573-126	RESISTOR	W.W 0.99 OHM 1W 0.5%	R38	1
573-142	RESISTOR	M.F 100 -OHM 1/4W -0.2/0.05%	R26	1
573-143	RESISTOR	M.G 9 MOHM 1/2W -0.2/0.05%	R21	1
573-144	RESISTOR	M.F 900 KOHM 1/4W -0.2/0.05%	R22	1
573-145	RESISTOR	M.F 90 KOHM 1/4W -0.2/0.05%	R23	1
573-146	RESISTOR	M.F 9 KOHM 1/4W -0.2/0.05%	R24	1
573-147	RESISTOR	M.F 900 OHM 1/4W -0.2/0.05%	R25	1
574-052-2	PTC	PT05MP-L1K6001	R27	1
574-052-2	PTC	PT05MP-L1K6001	R28	1
574-052-2	PTC	PT05MP-L1K6001	R27A	1
574-055	SPARK GAP	AG15PC 152FS-K2M DAIYOYDEN	SG1	1
581-160	CAPACITOR	ELEC 47UF 16V SRE-TYP	C08	1
581-160	CAPACITOR	ELEC 47UF 16V SRE-TYP	C09	1
581-162	CAPACITOR	ELEC 1UF 50V SRE-TYPE	C11	1
581-162	CAPACITOR	ELEC 1UF 50V SRE-TYPE	C13	1
581-162	CAPACITOR	ELEC 1UF 50V SRE-TYPE	C14	1
581-162	CAPACITOR	ELEC 1UF 50V SRE-TYPE	C15	1
581-176	CAPACITOR	ELEC 10UF 16V SRE-TYPE	C06	1
581-194	CAPACITOR	MP 0.22UF 63V K MMY168	C02	1
581-194	CAPACITOR	MP 0.22UF 63V K MMY168	C03	1
581-195	CAPACITOR	MP 0.1UF 63V J MMY168	C04	1
581-195	CAPACITOR	MP 0.1UF 63V J MMY168	C05	1
581-195	CAPACITOR	MP 0.1UF 63V J MMY168	C12	1
585-154-1	DIODE	RL105	D01	1
585-154-1	DIODE	RL105	D02	1
585-154-1	DIODE	RL105	D4,D5	2
585-248	DIODE	KDS226 (SMD) KEC	D03	1
591-647-2	IC	MC74HC00AD (SMD) MOTOROLA	U03	1
591-648	IC	TC7106ACKW A-D CON TELEDYNE	U01	1
591-650	IC	NJM062M-T1 OP-AMP NJRC	U04	1
591-660	IC	MC14070BD	U02	1

LGP P/N	Category	Specification	PCB F/N	Quantity
611-665	TRANSISTOR	KRC110S (SMD)	Q03	1
611-670	TRANSISTOR	KTC3875Y (SMD) SOT-23	Q01	1
611-670	TRANSISTOR	KTC3875Y (SMD) SOT-23	Q02	1
611-671	TRANSISTOR	SS8050 SAMSUNG	Q04	1
611-671	TRANSISTOR	SS8050 SAMSUNG	Q05	1
637-013	BUZZER	BUZZ SBT-11P	B1	1
873-028R	MN WIRE	MN WIRE CM2 10MOHM	R39	1
873-027	Mn WIRE CM2 DIA 1.6MM	Mn WIRE CM2 DIA1.6MM		1
CK1HI101J	CAPACITOR	CER 100PF 50V J (2012)	C01	1
CK1HI102K	CAPACITOR	CER 1000PF 50V K (2012)	C17	1
CK1HI221J	CAPACITOR	CER 220PF 50V J (2012)	C07	1
CK1HR104Z	CAPACITOR	CER 0.1UF 50V Z T.P	C16	1
RD0BP105J	RESISTOR	C.F 1 MOHM 1/4W 5%	R40	1
RD0CP102J	RESISTOR	C.F 1 KOHM 1/2W 5%	R47	1
RG0CP226J	RESISTOR	M.G 22 MOHM 1/2W 5%	R41	1
RMAH1000J	RESISTOR	M.F 100 -OHM 1/8W 5% (3216)	R46	1
RMAH1001F	RESISTOR	M.F 1 KOHM 1/8W 1% (3216)	R48	1
RMAH1002F	RESISTOR	M.F 10 KOHM 1/8W 1% (3216)	R42	1
RMAH1002F	RESISTOR	M.F 10 KOHM 1/8W 1% (3216)	R43	1
RMAH1003F	RESISTOR	M.F 100 KOHM 1/8W 1% (3216)	R01	1
RMAH1003J	RESISTOR	M.F 100 KOHM 1/8W 5% (3216)	R06	1
RMAH1003J	RESISTOR	M.F 100 KOHM 1/8W 5% (3216)	R30	1
RMAH1004F	RESISTOR	M.F 1 MOHM 1/8W 1% (3216)	R13	1
RMAH1004F	RESISTOR	M.F 1 MOHM 1/8W 1% (3216)	R14	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R03	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R07	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R08	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R10	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R11	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R12	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R31	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R32	1
RMAH1004J	RESISTOR	M.F 1 MOHM 1/8W 5% (3216)	R34	1
RMAH10R0J	RESISTOR	M.F 10 -OHM 1/8W 5% (3216)	R50	1
RMAH1102F	RESISTOR	M.F 11 KOHM 1/8W 1% (3216)	R17	1
RMAH1503J	RESISTOR	M.F 150 KOHM 1/8W 5% (3216)	R09	1
RMAH1802J	RESISTOR	M.F 18 KOHM 1/8W 5% (3216)	R05	1
RMAH2003J	RESISTOR	M.F 200 KOHM 1/8W 5% (3216)	R49	1
RMAH2201F	RESISTOR	M.F 2.2 KOHM 1/8W 1% (3216)	R16	1
RMAH3300F	RESISTOR	M.F 330 -OHM 1/8W 1% (3216)	R18	1
RMAH3301J	RESISTOR	M.F 3.3 KOHM 1/8W 5% (3216)	R45	1
RMAH4702F	RESISTOR	M.F 47 KOHM 1/8W 1% (3216)	R02	1
RMAH4702J	RESISTOR	M.F 47 KOHM 1/8W 5% (3216)	R04	1
RMAH4702J	RESISTOR	M.F 47 KOHM 1/8W 5% (3216)	R15	1
RMAH4703J	RESISTOR	M.F 470 KOHM 1/8W 5% (3216)	R44	1

LGP P/N	Category	Specification	PCB F/N	Quantity
RMAH5100J	RESISTOR	M.F 510 -OHM 1/8W 5% (3216)	R20	1
RMAH8200J	RESISTOR	M.F 820 -OHM 1/8W 5% (3216)	R19	1
RMAH8201F	RESISTOR	M.F 8.2 KOHM 1/8W 1% (3216)	R33	1
RMAH9103J	RESISTOR	M.F 910 KOHM 1/8W 5% (3216)	R29	1
RMBP9000D	RESISTOR	M.F 900 -OHM 1/4W .5%	R35	1
RMBP90R0D	RESISTOR	M.F 90 -OHM 1/4W .5%	R36	1
RMBP9R00D	RESISTOR	M.F 9 -OHM 1/4W .5%	R37	1

Appendix B) Schematic Diagram of DM-311



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