FLUKE®

Instruction Sheet

85RF

INTRODUCTION

The 85RF High Frequency Probe is designed to convert a dc voltmeter into a high frequency (100 kHz to 500 MHz) ac voltmeter. Conversion from ac to dc is accomplished on a one-to-one basis and includes a range of 0.25 to 30V rms. The probe's dc output is calibrated to be equivalent to the rms value of a sine wave input.

SPECIFICATIONS

AC to DC RATIO: 1:1

RATIO ACCURACY: (At 25 MHz and loaded with 10 MΩ)

Above 0.5V: ± 0.5 dB

Below 0.5V: ± 1.0 dB

Add ± 0.2 dB in RF fields of 1 to 3 V/m

FREQUENCY RESPONSE: (Relative to 25 MHz)

100 kHz to 100 MHz ± 0.5 dB

*100 MHz to 200 MHz ± 2.0 dB

*200 MHz to 500 MHz ± 3.0 dB

*Referred to high and low inputs at probe tip.

EXTENDED FREQUENCY RESPONSE:

Useful for relative readings from 20 kHz to 700 MHz.

RESPONSE:

Responds to the peak value of an input and is calibrated to read rms value of a sine wave.

VOLTAGE RANGE: 0.25 to 30V rms

MAXIMUM INPUT VOLTAGE: 30V rms, 200V dc

INPUT CAPACITANCE: Approximately 3 pF

TEMPERATURE RANGE:

Operating: +10°C to +35°C

Storage: -40°C to +75°C

HUMIDITY: <90% R.H.

OUTPUT CONNECTOR: Fits standard 0.75-inch dual banana connectors

ACCESSORY: BNC to Probe Adapter, P/N 574756

VOLTMETER COMPATIBILITY

The 85RF is compatible with any dc voltmeter that has an input resistance of 10 megohms, ±10%. Voltmeters with higher input resistances can be used if an external shunt is placed across their input terminals. The shunt value is selected to reduce the input resistance to 10 megohms.

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OPERATION

Use the following procedure to operate the 85RF Probe.

1. Connect the probe output to a compatible voltmeter using a suitable shunt if required. Probe output low must be connected to voltmeter low.
2. Select an appropriate voltage range (1V dc reading per 1V rms probe input).
3. Connect the input low (clip lead or tip shield) to earth ground.

WARNING

INPUT LOW IS INTENDED TO BE CONNECTED TO EARTH GROUND. TO AVIOD ELECTRICAL SHOCK, INPUT LOW (CLIP LEAD OR TIP SHIELD) MUST BE CONNECTED TO POTENTIALS OF LESS THAN 30V AC, 42V PEAK, OR 60V DC.

a. Measurements at frequencies below 100 MHz can be made by grounding the 4-inch clip lead supplied with the probe, then touching the probe tip to the circuit under test.

b. Measurements above 100 MHz must be made using minimum cable lengths to terminated 50-ohm system. One inch of unterminated coaxial cable (such as a BNC adapter and 50-ohm termination) is sufficiently short for up to 300 MHz.

c. Measurements above 300 MHz must have the probe tip and tip shield (input high and low) touching the circuit under test to realize the rated accuracy of the probe. Lead lengths even less than 1 inch may cause significant errors.

CAUTION

To avoid probe damage, the dc component of the input signal must not exceed 200 volts, including transients. 30V ac rms and 200V dc are the maximum inputs to the probe. This allows measurements of an ac signal riding on a dc voltage of up to 200V. The input capacitor charges to the peak value of ac plus dc. If the dc level is then changed by more than 200V, the resulting transient may damage the probe. The chance of damage can be minimized by discharging the input capacitor at the end of each measurement. This is done by momentarily touching the probe tip to the ground clip.

THEORY OF OPERATION

Circuitry within the 85RF consists of a capacitor-coupled rectifier circuit which responds to the peak value of the input waveform. The output is a positive dc voltage which is calibrated to be equivalent to the rms value of a sine wave input. See Figure 1. R1, R2, R3. and CR2 form a divider to properly scale the dc output when the probe output is connected to a dc voltmeter having a 10-megohm input resistance. Diode CR2 compensates for the low level linearity error caused by diode CR1.

MAINTENANCE

Performance Test/Calibration

The performance test is designed to ensure that the 85RF is operating within specifications. Use the procedure as an acceptance test and/or calibration procedure (the probe has one adjustment). The recommended calibration interval is one year.

1. Set up the equipment as shown in Figure 2. Using the leveled sine function of the scope output, set the AC

calibrator signal generator for 1V rms at 25 MHz and the DMM to measure 1V dc.

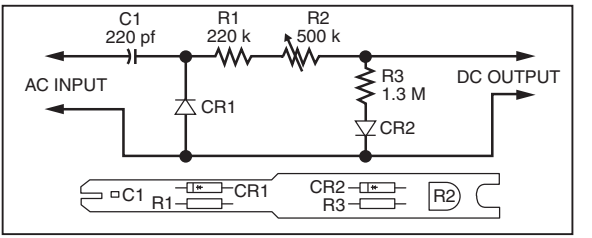
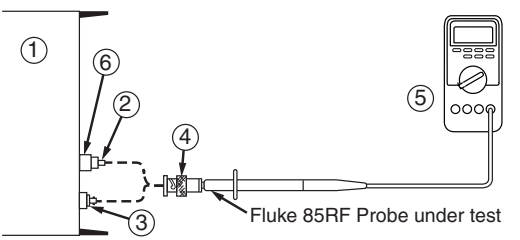


Figure 1. Schematic Diagram



Required Equipment List

The following equipment (or equivalent) is required for testing the performance of the 85RF:

	EQUIPMENT TYPE	RECOMMENDED MODEL
①	AC Calibrator	Fluke 5520A-SC600
②	50-Ohm Feed Thru Termination	Fluke Y9103
③	BNC Jack to Banana Plug Adapter	Fluke Y9108
④	BNC to Probe Adapter	Fluke P/N 574756
⑤	Digital Multimeter, 3-1/2 Digit (DMM)	Fluke 87-III
⑥	BNC Jack to Jack Adapter	Pomona 3283

Figure 2.
Equipment Configuration for Performance Testing

2. The DMM should read between 0.950 and 1.050V dc. If the probe is functioning but is not within these limits, access and adjust R2 for a DMM reading between 0.990 and 1.010V dc. Reassemble the probe.
3. Transfer the unit under test to the Normal output of the calibrator and reduce the output level to 0.250V rms 1 MHz. The DMM should read between 0.223 and 0.280V dc.
4. Set the AC Calibrator to STDBY, decrease the frequency to 100 kHz, and increase the voltage to 30V ac rms. (Do not exceed this value.)

5. Return the AC Calibrator to OPER. The DMM should read between 28.3 and 31.8V dc

6. Return the UUT to the scope output and set the level sine to 1V rms 160 MHz. The DMM should read between 0.9 and 1.12V dc. Increase the frequency to 450 MHZ. The DMM should read between 0.70 and 1.41V dc.

Troubleshooting

Isolate a problem to the probe by verifying the operation of the probe's input source and output DMM. Most probe malfunctions are caused by the failure of diodes CR1 or CR2. Suspect CR1 if there is no output when an input is applied to the probe. Excessive linearity error may be due to the failure of CR2. Use a continuity test for in-circuit diode testing. If the diodes are good, check the input and output connections to the printed circuit board and the continuity of the output cable.

CAUTION

The diodes have glass bodies; care should be taken to avoid stressing them, particularly when preparing the leads. The diodes are also subject to failure from overheating. When soldering, hold the lead near the diode body with a pair of needle nose pliers. Avoid excessive heat.

Probe Disassembly

Use the following procedure to access the probe's internal components, including the calibration adjustment R2:

1. Unscrew the bend relief and slide it away from the probe.
2. Lift off the probe cover. R2 is exposed.
3. Remove the probe tip by carefully grasping the tip with a pair of pliers and drawing it out of the front of the probe.
4. Unscrew the ground lead from the probe body.
5. Lift the rear of the printed circuit board slightly and pull it firmly away from the probe tip.
6. To reassemble the probe, logically reverse this procedure. Make sure that the gold pin on the front of the printed circuit board centers properly in the tip and that the ground-lead nut is aligned with the hole in the probe body.

Cleaning

Use a soft cloth dampened in a mild solution of detergent and water to clean the 85RF. Do not use solvents.

85RF PARTS LIST

	DESCRIPTION	PART NO.
C1	Cap, Ceramic Chip, 220 pF	758078
CR1	Diode, Germanium	629261
CR2	Diode, Silicon	639922
R1	Resistor, cf, 220k	348953
R2	Resistor, Var, 500k	574624
R3	Resistor, cf, 1.3M	442558
	Body, Probe	606988
	Cover, Probe	581751
	Tip, Probe	607267
	Wire, Ground Assy	607291
	Decal, Probe	585842
	Contact, Ground	586560
	Contact, Twist Pin	294991
	Tip, Insulated	583682
	Tip, IC	583674

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