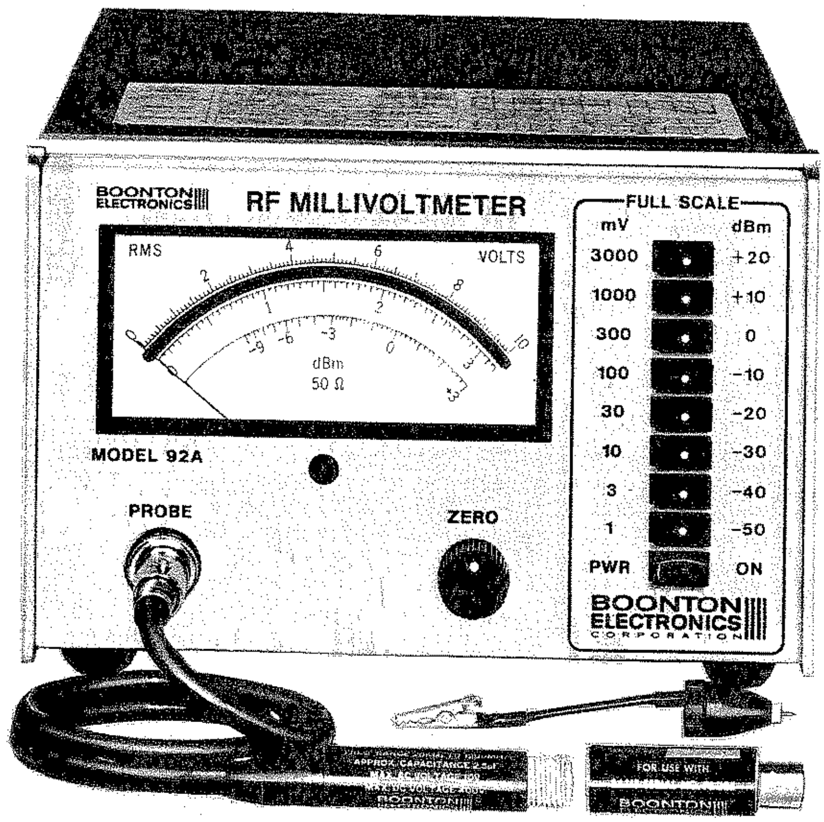
MODELS 92A / 92AB

PROGRAMMABLE RF MILLIVOLTMETER



92A/AB
b-1271

BOONTON
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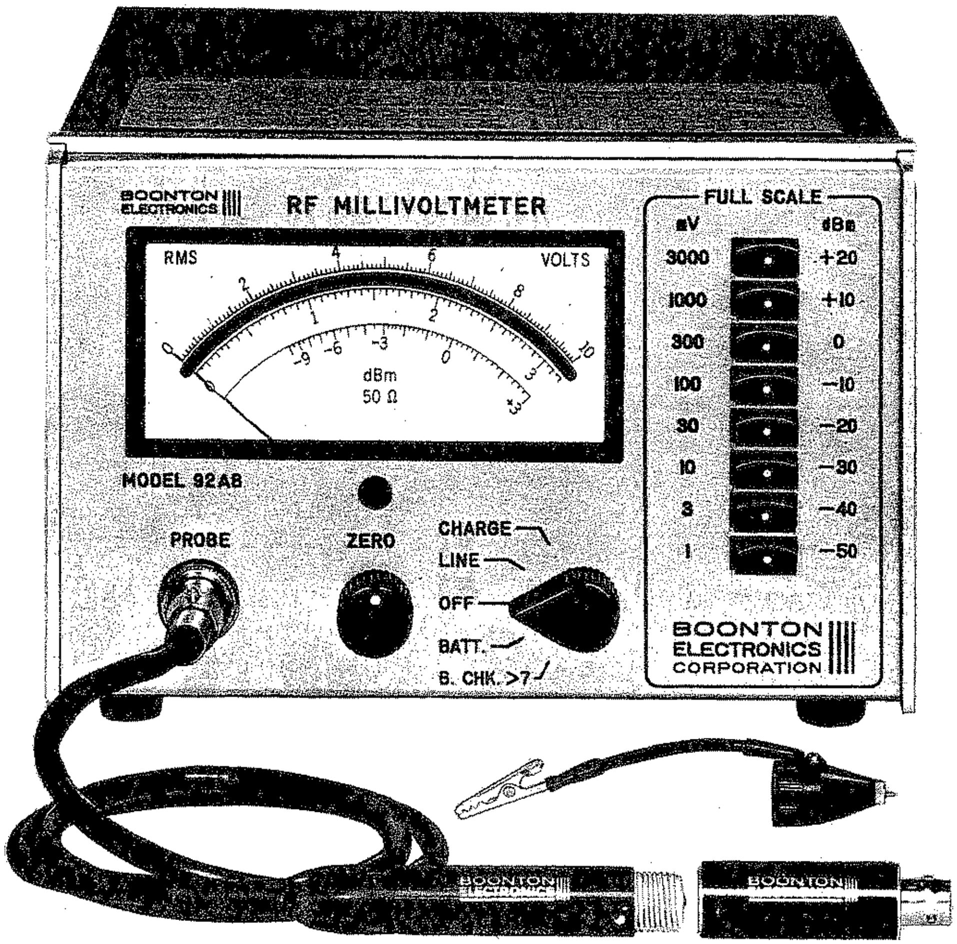


MODEL 92AB

BATTERY OPERATED RF MILLIVOLTMETER

92A/AB
a-371

A

CHAPTER I

INTRODUCTION

1.1 GENERAL

The Model 92 Series RF Millivoltmeter provides an accurate readout of measurements from the low radio frequencies to the gigahertz region, over a voltage range of 200 μV to 3 volts. It is a programmable, solid-state instrument of high sensitivity and accuracy, characterized by high input impedance (see Figs. 1 and 2), excellent stability, and low noise.

The Model 92 exhibits true rms response for input signals up to 30 millivolts, gradually approaching peak-to-peak above this level. The meter, however, is calibrated in rms above this region.

Input and output connections for external control and readout are provided by a 22-pin card-edge connector at the rear of the instrument.

A linear dc output, whose level is proportional to the rf input voltage, is also provided at a rear connector. This may be used to drive a recorder, remote indicator, or other analog devices.

The 92 offers a convenient and accurate means for making a wide variety of measurements. Typical uses of this instrument include:

In transistor testing the instrument may be used to measure β, f_t, and other transistor parameters.

VSWR and return loss measurement using the Model 92 Series with bridge methods, directional couplers, and adjustable or slotted lines.

Gain and loss measurements in wide-band amplifiers, including such design characteristics as stage gain, flatness of the pass band, upper cut-off or corner frequency, negative feedback factors, and other parameters.

Proper adjustment of tuned circuits in narrow-band amplifiers.

The adjustment, measurement of performance, and evaluation of rf filter parameters.

Measurement of vswr or return loss and attenuation of rf attenuators.

Measurement of output levels of signal generators, adjustment of baluns, harmonic distortion of rf signals, and adjustment of circuits for minimum voltage (null) or maximum voltage (peak).

The Model 92 is available in several optional configurations with a basic accuracy of 1% rdg. +1% fs. The standard features of the instrument are:

Remote programmability
Measures from 200 μV to 3V* from 10 kHz to 1.2 GHz.
True rms response to 30 mV**
Convenient push-button ranging.
DC analog output.
High input resistance, low input capacitance.
Overload protection to 400 Vdc to 10 Vac.
VSWR less than 1.15 up to 1.2 GHz.

* To 300V, up to 700 MHz, with accessory 100:1 divider.
** To 3V, up to 700 MHz, with accessory 100:1 divider.

The characteristics of the instrument include: high reliability, fast warm-up (1 minute), long intervals between calibrations, plug-in PC boards for ease in servicing or modifying, light weight, and other advantages of solid-stage design.

1.2 EQUIPMENT DESCRIPTION

The Model 92 is basically a programmable analog instrument with linear dc output. It is available with a full range of options and accessories as described in Chapter II. Input range programming by external contact closure or PNP transistors to ground is standard.

The instrument is sensitive, accurate, sturdily constructed, and protected against overloads. It will perform over extended periods of time without failure or need for recalibration. It is packaged as a compact bench instrument that can be easily mounted in a standard 19-inch rack using an optional rack-mounting kit.

Important input and accuracy specifications are reproduced on a reference plate fastened to the exterior top cover of the instrument. Clips for holding out-of-use accessories are provided at the rear of the instrument. Calibration instructions are reproduced on the underside of the top cover of the instrument.

Standard accessories supplied with the Model 92 Series include one each of the following:

Model 91-12F RF Probe with low-noise cable and connector.
Model 91-8B 50-ohm BNC adapter.
Model 91-13B Probe Tip (removeable) with grounding clip lead.

A complete kit of probe accessories is available as optional equipment, including a storage case with space for the Model 91-12F RF Probe and the other standard accessories.

1.2.1 Frequency Capability

The calibrated frequency range of the Model 92 extends from 10 kHz to 1.2 GHz, with uncalibrated response to beyond 8 GHz. Relative accuracy above 1.2 GHz is typically ±0.5 dB.

A Model 91-8B 50-ohm BNC Adapter is supplied as a standard accessory with the instrument for 50-ohm voltage measurements up to 600 MHz. A correction curve (Figure 8A) is included for frequencies above 50 MHz. For higher-frequency measurements and for through-line voltage measurements the optional accessory, Model 91-14A Tee Adapter, is recommended. It is designed to compensate for the rf probe capacitance and to present a good vswr (better than 1.15) up to 1.2 GHz. It may be used in conjunction with the Model 91-15A 50-ohm load for terminated voltage measurements. In a coaxial line its insertion loss is low; however, a chart (Figure 8B) is supplied showing loss vs. frequency. See Figure 4 for typical vswr.

An optional accessory, the Model 91-4C RF Probe, has a frequency range of 1 kHz to 250 MHz for lower frequency applications.

1.2.2 Voltage Capability

The Model 92 has eight ranges, from 1 millivolt full scale to 3 volts full scale, arranged in 1-3-10 sequence. No attenuator attachments are required for measurements up to 3 volts. While this range is ample for most rf voltage measurements, the capability of the instrument can be increased to 300 volts (up to 700 MHz) by using the optional accessory, Model 91-7C 100:1 Voltage Divider. Use of the 100:1 Voltage Divider also increases the input resistance of the Model 91-4C RF Probe by a factor greater than 100.

1.2.3 True RMS Response

The Model 92 provides true rms response for signal inputs below approximately 30 millivolts (below 3 volts, up to 700 MHz, with the Model 91-7C 100:1 Voltage Divider). As the input level increases, the waveform response gradually approaches peak-to-peak, calibrated on the indicator in rms. Thus, in addition to making precise sinusoidal voltage measurements at all levels, the instrument measures non-sinusoidal or asymmetrical signals within the rms region without loss of accuracy.

1.2.4 Low Noise

The Model 92 has been designed and constructed to hold noise from all sources to a minimum.

The probe cable is of special low-noise design; a vigorous flexing causes only momentary, minor deflections on the most sensitive range. The Model 91-12F Probe is not sensitive to shock or vibration; even sharp tapping on the probe barrel causes no visible deflection on any range.

Amplification takes place at 94 Hz, reducing susceptibility to any 50 or 60 Hz line-frequency-related fields. A unique circuit reduces the low-level noise originating from the mechanical chopper and renders the instrument immune to changes in chopper performance that could occur with the passage of time.

1.2.5 Minimal Zero Adjustment

Zero adjustment is not required on the upper five sensitivity ranges of the Model 92. For measurements on the lower three ranges, the ZERO control is set on the most sensitive range before operation. This control balances out small thermal voltages in the probe elements and, once adjusted, requires only infrequent checking during the course of subsequent measurements.

1.2.6 DC Output

The 92 provides a linear dc output whose current capability of 1 mA into 1000 ohms is extremely stable. When used as part of an automatic test system, the fast response of the instrument's dc output to an input step function allows more tests per unit time.

For system or external requirements, all input and output connections for the 92 are made at the card-edge connector on the rear of the instrument. (See Figure 11 for receptacle connections.)

CHAPTER II

SPECIFICATIONS

Voltage Range: 200 µV to 3V (300V up to 700 MHz with accessory 100:1 voltage divider). Voltage sensitivity is 100 µV.

Full Scale Voltage Range: 1, 3, 10, 30, 100, 300, 1000, and 3000 mV.

dBm Range: -60 to +23 dBm (+63 dBm up to 700 MHz with optional accessory, Model 91-7C 100:1 Voltage Divider).

Frequency Range: 10 kHz to 1.2 GHz (uncalibrated response to approximately 8 GHz).

Accuracy:

	1% fs plus			
300 mV to 3V	1% rdg	1% rdg	3% rdg	10% rdg
200 µVto 300mV*	2% rdg			7% rdg

10 kHz 50 kHz 150 MHz 700 MHz 1.2 GHz

*Below 1 mV, add 1% fs

Meter:

4-1/2 inch taut-band
Two linear voltage scales
0 to 3; 0.05 per division
0 to 10; 0.1 per division
One logarithmic dBm scale
-10 to +3; 0.2 per division max.

Meter Unrest: (1 mV fs range only)

Indicated Voltage	Unrest
Above 600 µV	< 1% fs
300 µV to 600 µV	< 2% fs
100 µV to 300 µV	< 5% fs

Power: 92A: 115 or 230 V ±10%, 50 to 400 Hz.
92AB: 115 or 230 V ±10%, 50 to 400 Hz, and two 18-volt rechargeable batteries

RFI: There is no detectable radiated or conducted leakage from instrument or probe.

Temperature: In accordance with ANSI (ASA) Spec. 39.7

Temperature Range	Temperature Influence	
	Instrument	RF Probe
Ref. 21° C to 25° C	0	0
Normal, 18° C to 30° C	0	±1% rdg
Severe, 10° C to 40° C	±1% rdg	±4% rdg

Waveform Response: True rms response for input levels up to 30 mV (3V to 700 MHz with 100:1 Voltage Divider), with transition to peak-to-peak (calibrated in rms) at higher levels.

Crest Factor: 420 to 1.4 depending upon input level (see Table II).

Input Impedance: See Figures 1 and 2.

VSWR: Less than 1.15 to 1.2 GHz (Return Loss greater than 23 dB). See Figures 3 and 4.

Power Sensitivity: 200 pW, minimum detectable power in 50 ohms.

DC Output: 0 to 10 Vdc proportional to rf input voltage. Source resistance of 9 kΩ; will deliver 1 mA into 1 kΩ load. Full scale input step function response time less than 100 ms on 30 mV fs to 3 V fs ranges, increasing to 1 sec. on the 1 mV fs range.

Dimensions: 5.2" H (without rubber feet), 8.3" W (1/2 of standard 19 inch rack module) 11.5" D (132 x 211 x 292 mm).

Weight:

92A: Net 7 lbs. (3.2 kg)
92AB: Net 10 lbs. (4.54 kg)

Accessories Furnished:

Model 91-12F, RF Probe. RF Probe with low-noise cable and connector assembly for measurements from 10 kHz to 1.2 GHz; see Figures 1 and 2 for input resistance and capacitance.

Model 91-13B, Probe Tip. Removable Probe Tip with grounding clip lead; for use up to approximately 100 MHz.

Model 91-8B, 50Ω BNC Adapter. Used for measurements up to 600 MHz with a 50-ohm system; for VSWR see curve of Figure 3.

Warm-Up:

Warm-up period, 1 min. Adjust zero on 1 mV range when measuring below 30 mV.

Accessory Kit (Optional) Model 91-24A:

Model 91-6C, Unterminated BNC Adapter. Used for coaxial connection up to approximately 100 MHz, or to 400 MHz when fed from a 50-ohm source in an electrically short system.

Model 91-7C, 100:1 Voltage Divider. Attenuates input signal by a factor of 100 (± 1%), permitting measurements up to 300 volts and extending the rms measuring range to 3 volts; increases input resistance by a factor of 1000; operates from 50 kHz to 700 MHz. Maximum input potential, 1000 volts, dc plus peak ac.

Model 91-14A, 50Ω Tee Adapter. Type N Tee Connector; with Model 91-15A termination (see below) permits connecting into 50-ohm line; required for measurements above approximately 100 MHz; for VSWR see curve of Figure 4.

Model 91-15A, 50Ω Termination. Type N 50-ohm termination for use with Model 91-14A Tee Connector.

Model 91-18A, Storage Case. Case for protecting and storing Model 92A accessories.

Other Accessories (Optional) Available:

Model 91-4C: Special 1 kHz to 250 MHz RF Probe. Low Frequency probe for measurements ranging from 1 kHz to 250 MHz; input resistance essentially the same as that of Model 91-12F, RF Probe.

Other Accessories (Optional) Available: (cont'd)	Model 91-16A, Unterminated Type N Adapter. May be used with all probes, except Model 91-23A. Used for coaxial connection up to approximately 100 MHz, or to 400 MHz when fed from a 50-ohm source in an electrically short system.
	Model 92-1A, Single Rack Mounting Kit. Kit for mounting one 92A/AB as one-half of a module in a standard 19-inch rack.
	Model 92-1B, Double Rack Mounting Kit. Kit for mounting two 92A/AB's side-by-side in a standard 19-inch rack.
Standard Equipment Options:	Model 92AB-02. Logic-level programming, with 8-line logic level input, TTL/DTL compatible.
	Model 92AB-03. dBV option, dB scale, referred to 1 volt.
	Model 92AB-04. dBV option, dB scale, referred to 1 volt, is read out at top scale on meter.
	Model 92AB-05. 75Ω dBm option; dBm scale, referred to 75Ω.
	Model 92AB-06. 75Ω dBm option; dBm scale, referred to 75Ω, read out on top scale on meter.
	Model 92AB-07. 50Ω dBm option; dBm scale, referred to 50Ω, read out on top scale on meter.
	Model 92AB-08. Rear signal-input option.

IMPORTANT NOTE:

Fully to exploit the capabilities of this instrument, the accessories listed below are required for the indicated ranges of operation.

Table 1. Required Accessories

MEASURING RANGE	REQUIRED ACCESSORY	REMARKS
100 MHz to 600 MHz	Model 91-8B 50Ω Adapter for shielded connection to 50-ohm line; other impedances available on request.	Supplied as standard equipment with the Model 92 Series.
Above 600 MHz	Model 91-14A Tee Connector and 91-15A 50 Ω Termination for connection into 50-ohm line.	Available separately.
1 kHz to 250 kHz	Model 91-4C RF Probe	Available separately.
Input levels up to 300V; rms response with levels to 3V.	Model 91-7C 100:1 Voltage Divider; operates over frequency range from 50 kHz to 700 MHz	Available separately.

For details on the availability of these and other Boonton Electronics Accessories for RF Voltmeters, call your local Boonton Electronics Sales Engineering Representative, or write directly to the factory at the address on the title page of this instruction book.

Table 2. Crest Factors

VOLTAGE RANGES (mV) AND CREST FACTORS								
VOLTAGE RANGE (mV)	1	3	10	30	100*	300*	1000*	3000*
CREST FACTOR**	420 to 42	70 to 14	21 to 4.2	7 to 1.4	420 to 42	70 to 14	21 to 4.2	7 to 1.4

* With accessory 100:1 Voltage Divider (see Table 1)
**Maximum permissible ratio of peak to rms value of voltage

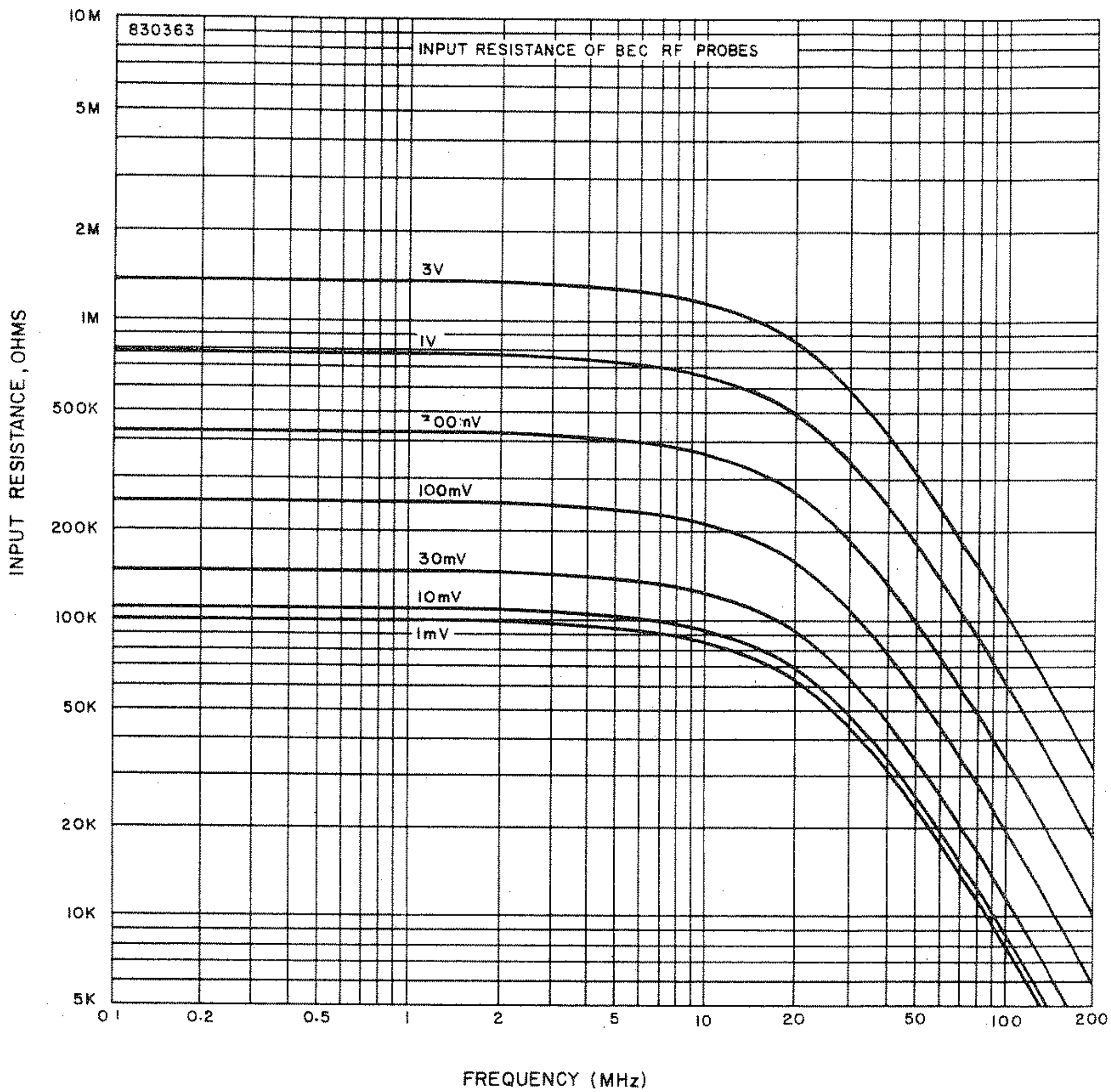


Figure 1. Input Resistance of RF Probe as a Function of Input Level and Frequency

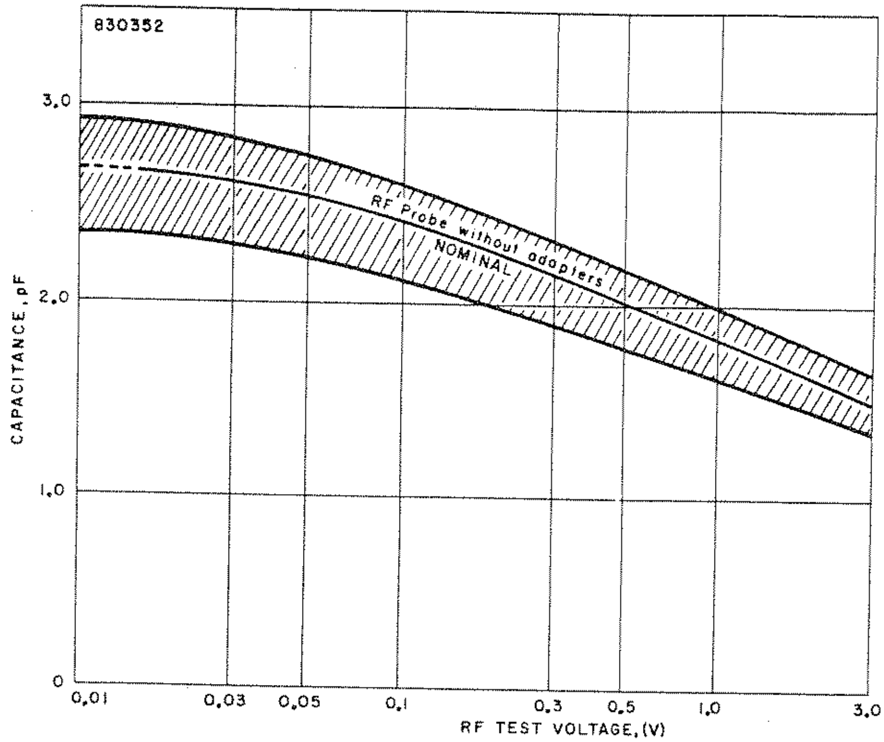


Figure 2. Input Capacitance vs. Input Level of Model 91-12F Probe (Measured at 10 MHz)

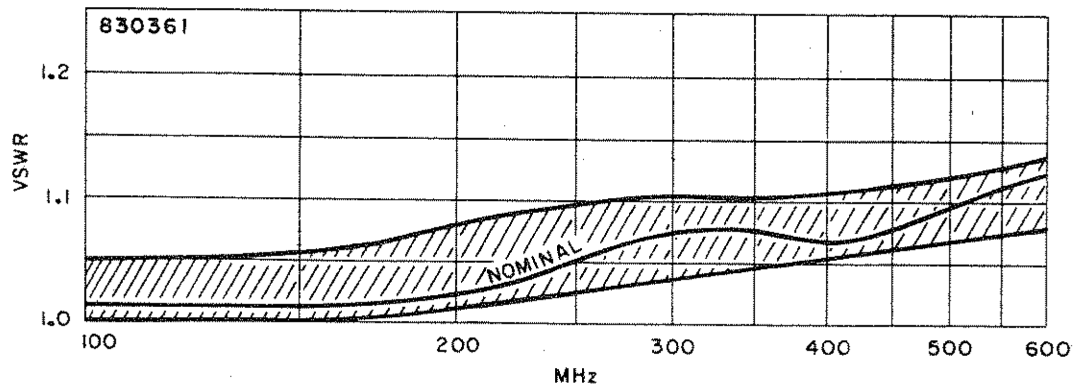


Figure 3. Typical VSWR of Model 91-12F RF Probe with Model 91-8B 50Ω BNC Adapter

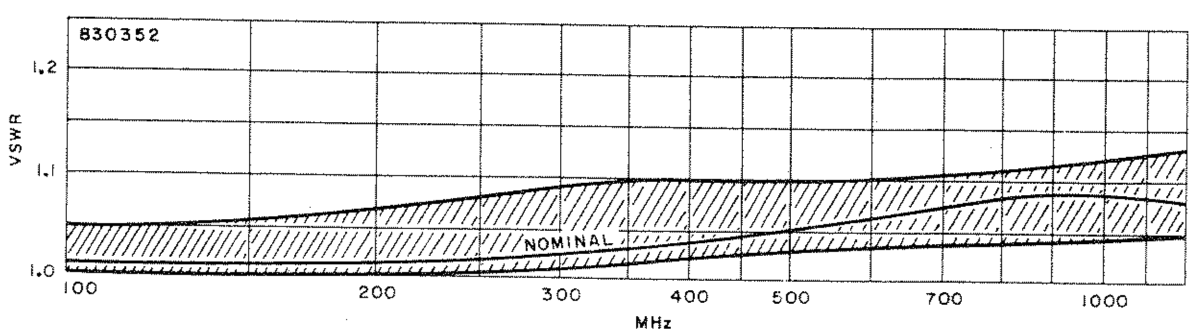


Figure 4. Typical VSWR of Model 91-12F RF Probe with Model 91-14A Type N Tee Adapter and Model 91-15A 50Ω Termination

CHAPTER III

OPERATION

3.1 INSTALLATION

The Model 92 has been inspected and tested at the factory before packing, and is shipped ready for operation. If there is any indication of shipping damage, immediately notify the carrier before attempting to put the instrument into operation.

3.1.1 Operating Controls and Indicators

The controls and indicators of the 92A are shown in Table 3A, and those of the 92AB in Table 3B.

Table 3A. Model 92A Controls and Indicators

ITEM	FUNCTION
PWR ON	This switch turns on the instrument power.
FULL SCALE	These range pushbuttons, (1, 3, 10, 30, 100, 300, 1000, and 3000 mV) and (-50, -40, -30, -20, -10, 0, +10, and +20) select the operating range.
Meter	A 4 1/2-inch taut-band meter with two linear voltage scales reading out 0 to 3 with 0.05 per division and 0-10 with 0.1 per division; and one logarithmic dBm scale reading out -10 to +3 with 0.2 per division maximum.

Table 3A. Model 92A Controls and Indicators (Con't)

ITEM	FUNCTION
PROBE (Jack)	The probe cable connects to the instrument through this PROBE jack. Always be sure that the knurled ferrule nut of the probe cable connection is tightened when in use.
ZERO (Control)	This control is used to zero the instrument.

The following items are on the rear panel:

Fuse Holder and Fuse	A fuse holder is located on the rear panel for installing either a 0.15 ampere, 115 V, or a 0.1 ampere, 220 V, Bussman MDL SLO-BLO fuse.
Slide Switch	Switch which is set to 115 V or 230 V, according to the available power source. Be sure that the proper fuse is located in the fuse holder.
Recorder Output Terminals	A DC voltage proportional to the indicator reading is available at these terminals. F.S. output = +10V Output Impedance = 9 kΩ
Component Holders (Clips)	Three component holders or component clips are located at the rear panel for securing accessories which are not in use.
REMOTE CONNECTIONS (Use with an Amphenol 225-2221-101 connector or equivalent)	A card edge connector is mounted at the rear of the instrument. See Figure 10 for the pin designations.

Table 3A. Model 92A Controls and Indicators (Con't)

ITEM	FUNCTION
 (Symbol on Rear Panel)	This safety requirement symbol has been adopted by the International Electrotechnical Commission, Document 66 (Central Office) 3, paragraph 5.3 which directs that an instrument be so labeled, if, for the correct use of the instrument, it is necessary to refer to the instruction manual. In this case it is recommended that reference be made to the instruction manual when connecting the instrument to the proper power source. Verify that the right fuse is installed for the power available and that the switch on the rear panel 0.15 A and 0.10 A, 50-400 Hz, is set to the applicable operating voltage of 115 V or 230 V. Within a brief time, the use of this symbol will be acted upon by ANSI (ASA).

Table 3B. Model 92AB Controls and Indicators

ITEM	FUNCTION
Power Switch	This is a rotary switch controlling the operating condition of the instrument. CHARGE. In this position, the instrument is off, but the charging circuits are connected to the power line. Charging time in this mode is 14 hours from zero to full charge. LINE. This position connects the instrument to the ac power line and turns it on. OFF. In this position, both charging circuits and instrument are off. BATT. This position connects the instrument to the internal battery power supply and turns it on. B. CHK. This position connects the meter across the batteries, through a series calibrating resistance. A reading of 7 or higher indicates that the batteries are sufficiently charged for reliable operation.

Table 3B. Model 92AB Controls and Indicators (Cont'd)

ITEM	FUNCTION
FULL SCALE	These range pushbuttons, (1, 3, 10, 30, 100, 300, 1000, and 3000 mV) and (-50, -40, -30, -20, -10, 0, +10, and +20) select the operating range.
METER	A 4 1/2-inch taut-band meter with two linear voltage scales reading out 0 to 3 with 0.05 per division and 0 - 10 with 0.1 per division; and one logarithmic dBm scale reading out -10 to +3 with 0.2 per division maximum.
PROBE (Jack)	The probe cable connects to the instrument through this PROBE jack. Always be sure that the knurled ferrule nut of the probe cable connection is tightened when in use.
ZERO (Control)	This control is used to zero the instrument.

The following items are on the rear panel:

Fuse Holder and Fuse	A fuse holder is located on the rear panel for installing either a 0.15 ampere, 115 V, or a 0.1 ampere, 220 V, Bussman MDL SLO-BLO fuse.
Slide Switch	Switch which is set to 115 V or 230 V, according to the available power source. Be sure that the proper fuse is located in the fuse holder.
Recorder Output Terminals	A DC voltage proportional to the indicator reading is available at these terminals. F.S. output = +10 V Output Impedance = 9 kΩ

Table 3B. Model 92AB Controls and Indicators (Cont'd)

ITEM	FUNCTION
Component Holders (Clips)	Three component holders or component clips are located at the rear panel for securing accessories which are not in use.
REMOTE CONNECTIONS (Use with an Amphenol 225-2221-103 connector or equivalent)	A card edge connector is mounted at the rear of the instrument. See Figure 10 for the pin designations.
 (Symbol on Rear Panel)	This safety requirement symbol has been adopted by the International Electrotechnical Commission, Document 66 (Central Office) 3, paragraph 5.3 which directs that an instrument be so labeled, if, for the correct use of the instrument, it is necessary to refer to the instruction manual. In this case it is recommended that reference be made to the instruction manual when connecting the instrument to the proper power source. Verify that the right fuse is installed for the power available and that the switch on the rear panel 0.15A and 0.10A, 50-400 Hz, is set to the applicable operating voltage of 115 V or 230 V. Within a brief time, the use of this symbol will be acted upon by ANSI (ASA).

3.2 OPERATING PROCEDURES

In the following paragraphs, the initial operating procedure for the 92 is described, as well as operating notes and recommended connection methods.

3.2.1 Initial Operating Procedure

a. Be sure that the serial number of the probe to be used is the same as that of the Model 92. (Each instrument is calibrated for its particular rf probe). Use of a probe other than that for which the instrument was calibrated may result in measurement errors.

b. Connect the probe cable to the PROBE jack on the front panel.

c. Check the setting of the power switch on the rear panel to be sure that it is set to the proper position for the line voltage available.

d. Plug the instrument's power cable into a power receptacle.

92A: Push PWR ON switch button.

92AB: Turn Power Switch to LINE. (or BATT.)

e. Press the 1 mV range button; the panel meter pointer should rest on zero. If it does not, use the ZERO control to set the meter to zero. (This adjustment will hold for the other ranges.) The instrument is now ready for use. (See 3.3.5)

3.3 OPERATING NOTES

While using the Model 92 is a direct and straightforward process, there are certain precautions and procedures which MUST be observed to obtain satisfactory results.

3.3.1 Overload Limits

The Model 91-12F RF Probe supplied with the Model 92 is overload-protected to 10 volts, ac, and to 400 volts, dc. EXCEEDING THESE LIMITS MAY RESULT IN PERMANENT DAMAGE TO THE PROBE.

The Model 91-8B 50-ohm Adapter should not be subjected to continuous overload of more than 10 volts (dc + rms ac) to avoid excessive heating of the terminating resistor.

Where voltages above these limits are likely to be encountered, the Model 91-7C 100:1 Voltage Divider is required. Maximum rating of the Voltage Divider is 1000 volts, dc + peak ac.

3.3.2 Connection for Measurements Below 100 MHz

The RF Probe supplied with the Model 92 is equipped with a detachable tip and ground lead. For measurements of signals below approximately 100 MHz, this tip provides a convenient means for both signal and ground connection.

3.3.3 Connection for Measurements Above 100 MHz

For frequencies above 100 MHz, the probe tip should NOT be used with the Model 92. Connection should be made directly to the center contact of the probe with the ground connection kept as short as possible (see Figure 5).

The connection recommendations outlined in Table 4 below should be followed to maintain specified accuracy.

Table 4. Connection Recommendations

FREQUENCY	SIGNAL CONNECTION
Up to 100 MHz	Probe with tip and grounding lead, or with Model 91-8B (supplied). Probe with Model 91-14A/15A (optional).
100 to 250 MHz	Probe without tip (see Fig. 5), or probe with Model 91-8B (supplied). Probe with Model 91-14A/15A (optional).
250 to 600 MHz	Probe with Model 91-8B (supplied). Probe with Model 91-14A/15A (optional).
600 MHz to 1.2 GHz	Probe with Model 91-14A and Model 91-15A (see Figure 6) (optional).

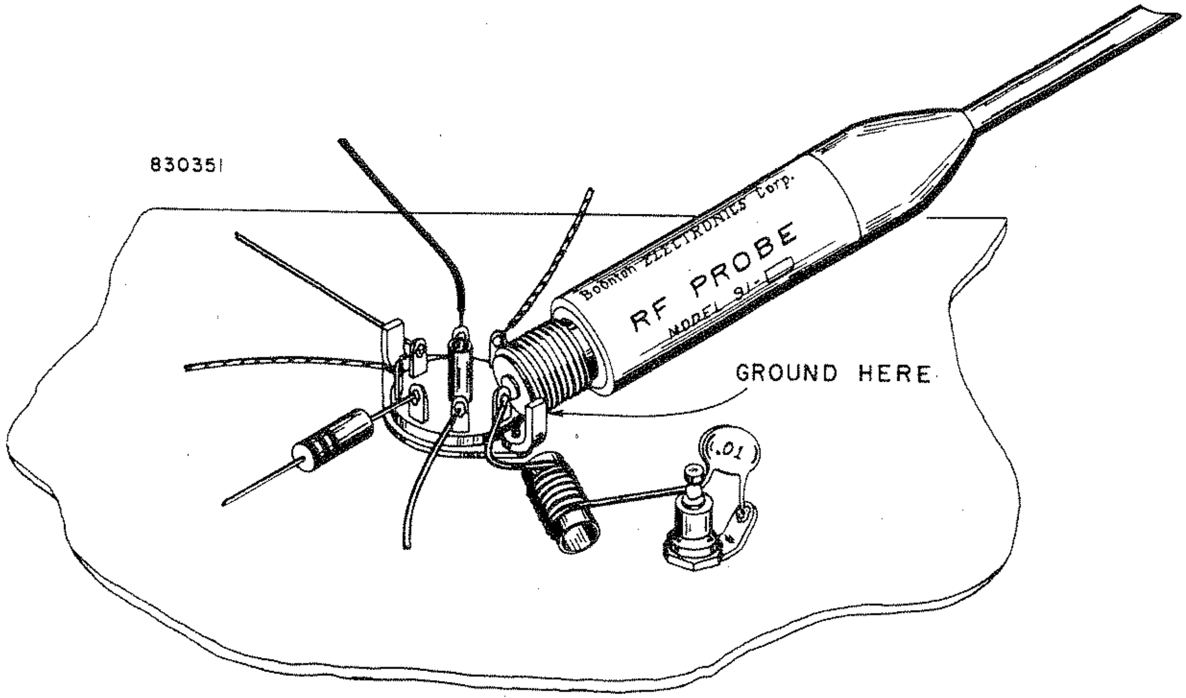


Figure 5. Method for making low-inductance connections to test signal point directly using the RF Probe. (Use for in-circuit measurements when lowest capacitance loading is required or when ground lead inductance of probe tip cannot be tolerated).

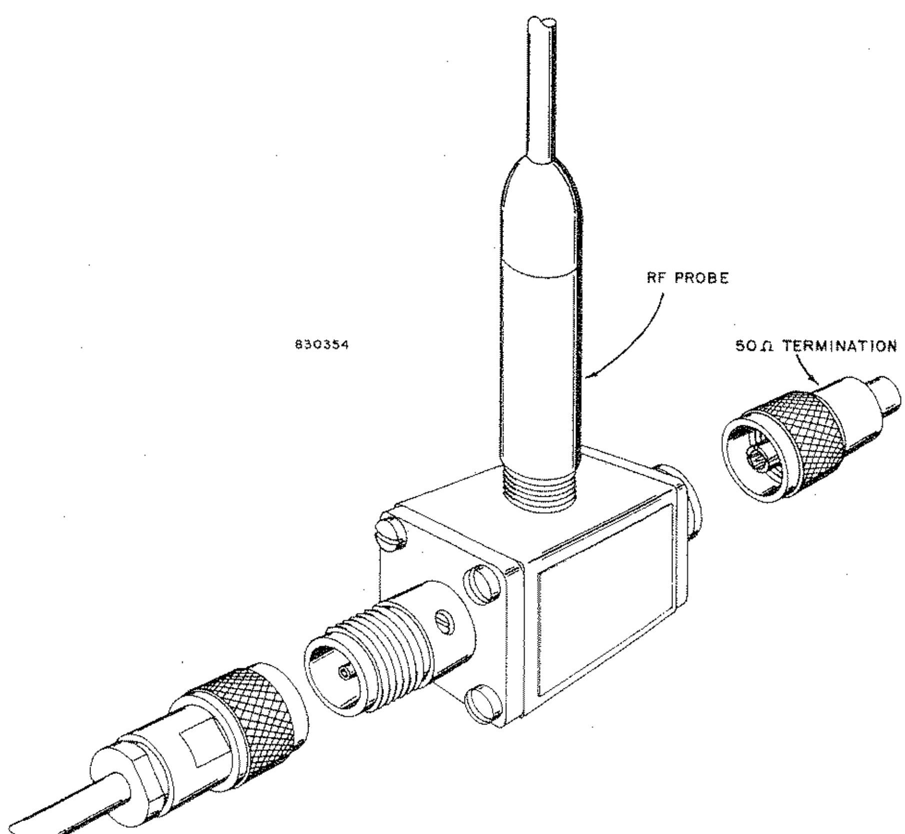


Figure 6. Assembly of Model 91-14A Type N Tee Adapter

3.3.4 Low-Level Measurements

The Model 92 will provide reliable, reproducible measurements of signal levels as low as 200 microvolts, and has a sensitivity of 100 microvolts.

Preliminary zero adjustment is essential when using the lowest range scale to achieve the specified accuracy, and is strongly recommended for all ranges up to 30 millivolts.

3.3.5 Making the Zero Adjustment

When the instrument is to be used on the 1 mV range, the following zero adjustment procedure should be followed:

a. Set the FULL SCALE range selector to the 1 mV position.

b. Be sure that no voltage is applied to the probe, and that it is adequately shielded from local fields. This can be done by partially unscrewing the probe cap until the tip just breaks contact with the internal connector, leaving the metal shell engaged with the body threads. Alternately, the probe tip can be removed and the 50-ohm termination (Model 91-8B) mounted in its place.

c. Adjust the ZERO control to bring the meter reading to zero. Noise will cause the reading to fluctuate up to ± 5% of full scale. Adjust the ZERO control so that the reading averages zero.

3.3.6 Signal Overload on 1 mV Range

On the most sensitive (1 mV) range, application of a large ac signal overloads the amplifier and a short time is required for the high-impedance input circuit to discharge. This effect is significant for signals above approximately 100 millivolts. Typically, application of a 1 volt signal will require a recovery time of about thirty-seconds before subsequent measurements should be made. It should be noted, however, that such overloads cause no damage to the equipment as long as they are within the limits outlined in paragraph 3.3.1.

3.3.7 Temperature Effects

The accuracy specifications for the Model 92 apply over temperatures from 50°F to 104°F. Outside of these limits operation of the equipment is possible but appreciable inaccuracies can be expected. However, no permanent change in probe characteristics will result from any reasonable high or low temperature exposure.

It should be noted that inaccuracies of measurement resulting from temperature effects may occur shortly after soldering to the probe tip, or measuring with the probe in the vicinity of heat sources such as resistors, heat sinks, vacuum tubes, and so forth.

When making low-level measurements (below approximately 2 millivolts) it is important to make sure that the probe has attained a uniform temperature throughout its body. A temperature gradient between the inside and outside of the probe can generate a small thermal voltage that may contribute to the dc output of the detector diodes.

3.3.8 Hum, Noise, and Spurious Pick-up

When measuring low-level signals, precautions should always be taken to avoid the possibility of errors of measurement resulting from hum, noise, or stray rf pick-up. Although all low-frequency hum and noise are attenuated at the input, it is still possible for unwanted high-level signals to cause errors. In some cases it may be necessary to provide extra shielding around the probe connections to reduce stray pick-up. Typical sources of spurious radiation are: induction or dielectric heating units, diathermy machines, local radio transmitters and grip dip meters.

3.4 DC OUTPUT

The dc output provided at the rear panel binding posts is a linear function (typically within 1%) of the input level, as long as the input signal is greater than 20% of full scale. For inputs less than 20% of full scale the output is NOT linear, but may be corrected by referring to paragraph 3.6 and Figure 7. Polarity of the dc output is positive with respect to the instrument ground, the negative dc output terminal being at ground potential. Output resistance is 9 kΩ.

3.5 LOW-FREQUENCY MEASUREMENTS

The Model 91-12F RF Probe supplied with the Model 92 provides measurements within the specified accuracy from 10 kHz to 1.2 GHz. For measurements at lower frequencies the Model 91-4C RF Probe is available. It operates over a frequency range from 1 kHz to 250 MHz.

Important Note: After installing the Model 91-4C RF Probe, the Model 92 must be checked for accuracy of calibration, and recalibrated if required (see Paragraphs 5.3 and 5.4).

3.6 CORRECTION CURVES FOR ACTUAL VOLTAGE vs METER READING

Use the curves of Figure 7 to correct for non-linearity below 20% of full scale on each range.

3.7 LOSS vs FREQUENCY CORRECTION FOR MODEL 91-8B

Use the curve of Figure 8A to make corrections for high-frequency roll-off when using the Model 91-8B 50Ω Adapter.

3.8 LOSS vs FREQUENCY CORRECTION CURVE FOR MODEL 91-14A

Use the curve of Figure 8B to make corrections for transmission loss when using the Model 91-14A Type N Tee Adapter.

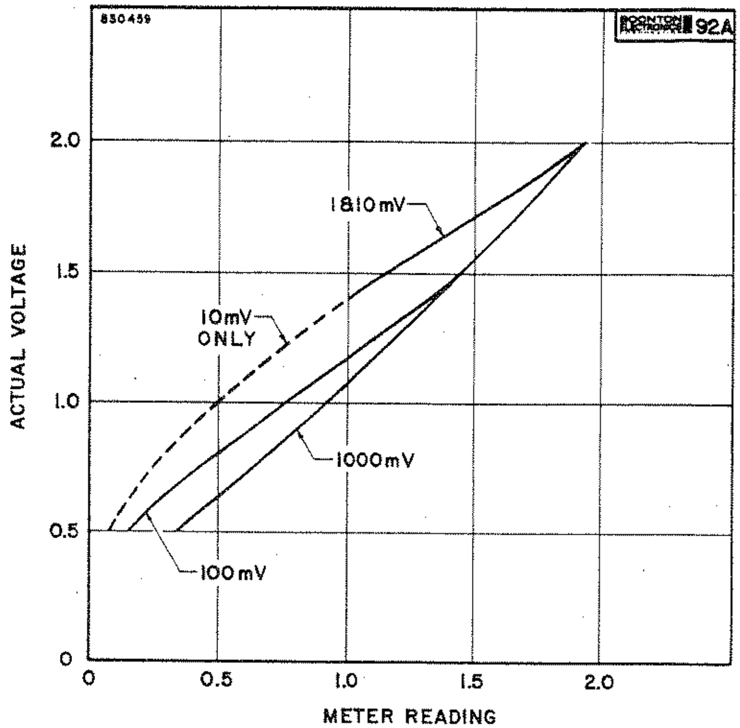
3.9 BATTERY OPERATION

When the instrument is operating on the ac power line the batteries are kept charged automatically. When the instrument is not in use the switch can be left in the LINE position to maintain the batteries at full charge. To test the battery condition, turn the switch to the B. CHK position. The meter should read at least 7 for batteries near full charge. To charge the batteries quickly, turn the switch to the CHARGE position, which charges at double the rate of the LINE position. Approximately 14 hours are required to bring them from discharged to full charge condition.

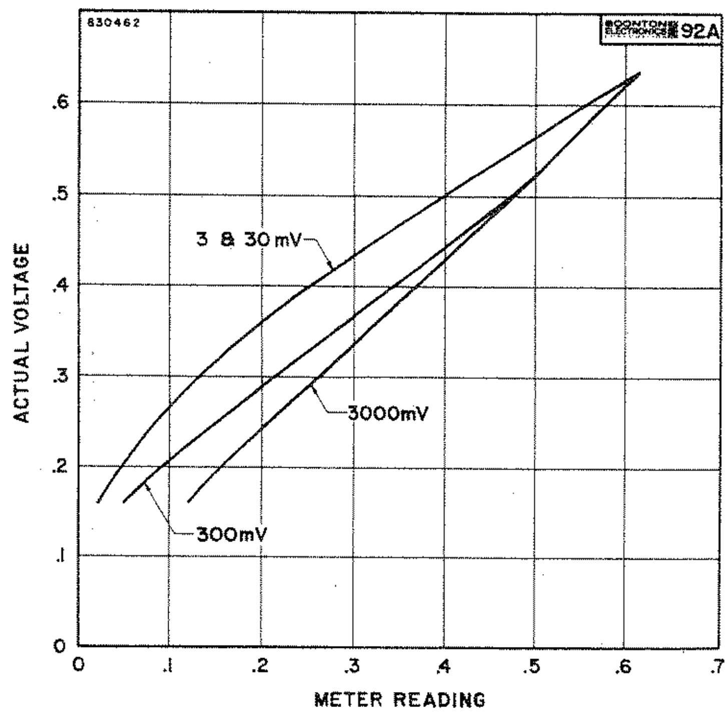
3.10 MODEL 92A/AB-02 (LOGIC LEVEL) OPTION

The additional circuitry required for the Logic Level option is contained in an enclosure mounted on the rear panel of the instrument. The external connector, in this case, will mount on the top of the Logic-Level enclosure. See Schematic diagram 830490 in the back of this manual for the external connections.

Ranging and other functions are controlled by remote logic inputs; logic 1 = +3.0 V or more, and logic 0 = +0.3 V or less. The system is TTL compatible.



Down-Scale Correction (0 to 10 scale)



Down-Scale Correction (0 to 3 scale)

Figure 7. Correction Curves, Actual Voltage vs. Meter Reading (for use with the Model 92A and Model 92A Option Instruments)

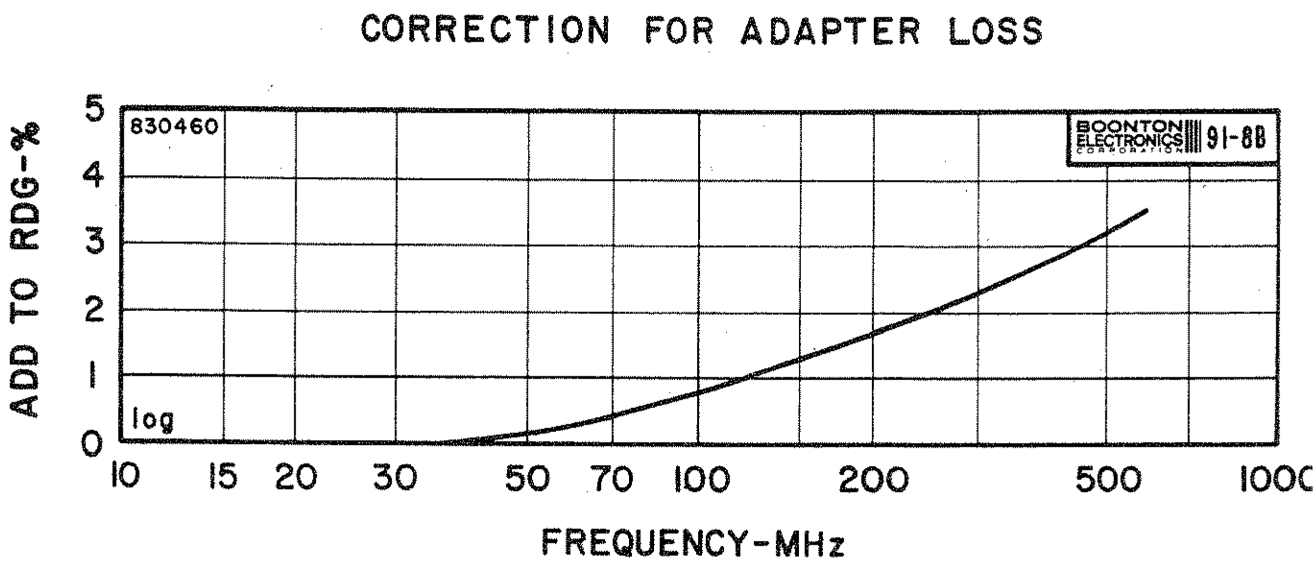


Figure 8A. Model 91-8B 50Ω BNC Adapter Correction Curve. (Add to meter readings)

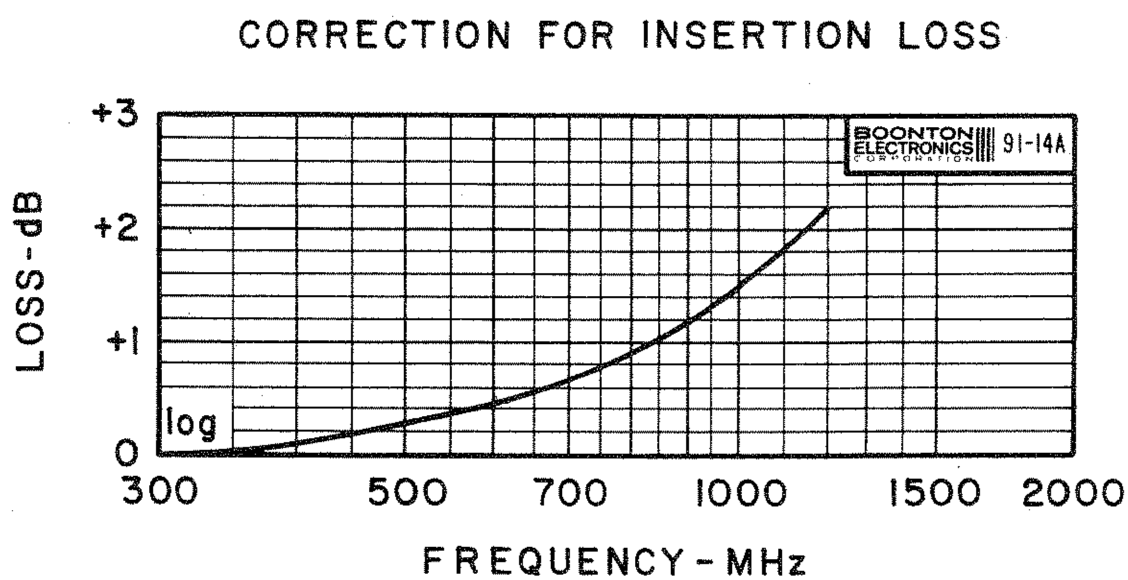


Figure 8B. Model 91-14A Type N Tee Adapter Correction Curve. (Input voltage to tee adapter is indicated by voltmeter. Subtract the correction from the indicated value, in dB, to obtain output voltage of tee)