

Instruction Manual

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Original



P6008 **ENVIRONMENTAL** **PROBE**

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P6008 PROBE

WITH STANDARD ACCESSORIES

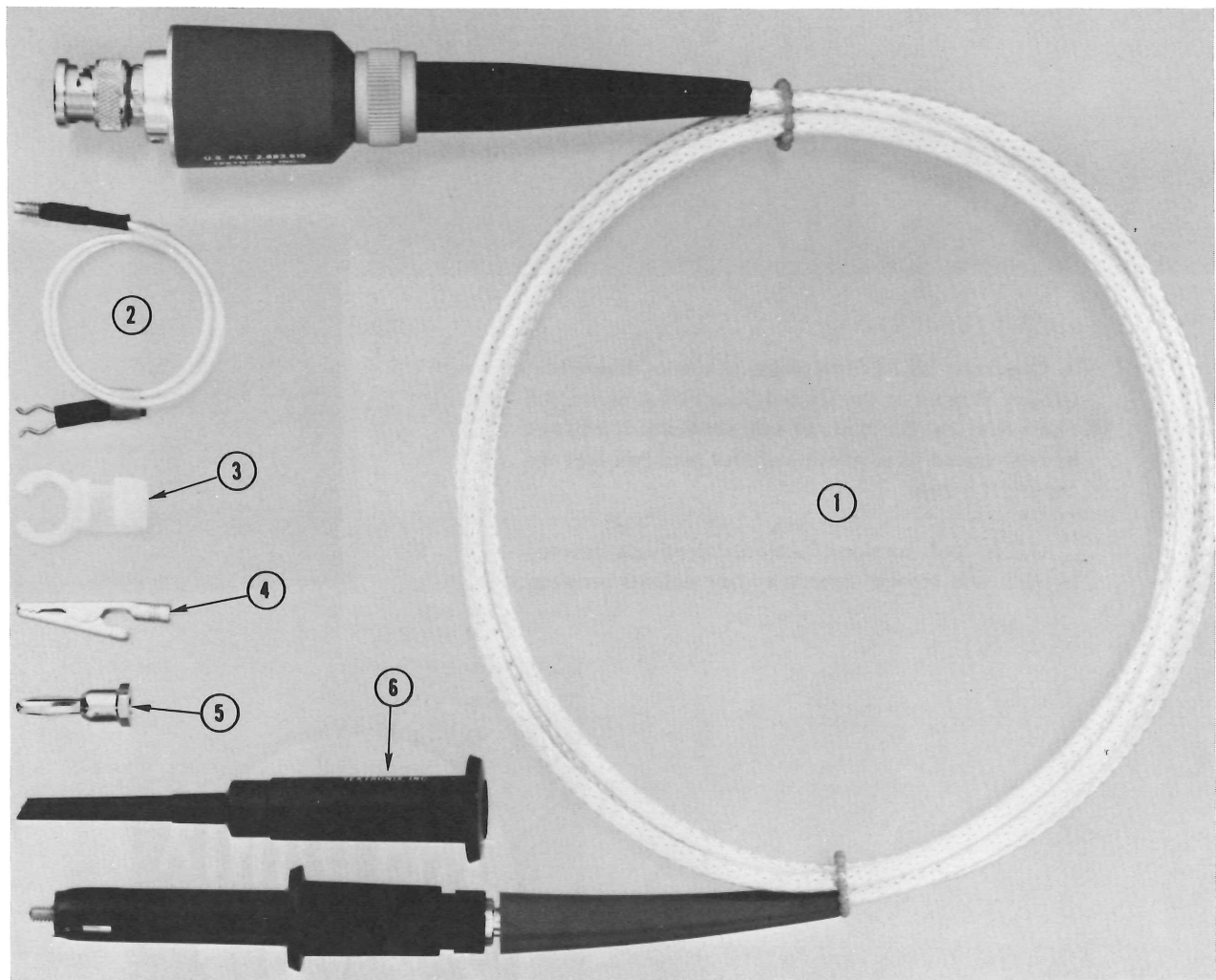


Fig. & Index No.	Tektronix Part No.	Serial/Model No. EffDisc	Q					Description	(A)	
			t	y	1	2	3			4

Fig. 1. P6008 Environmental Probe with accessories.

SECTION 1

SPECIFICATION

Description

The P6008 Environmental Probe is a rugged, passive probe providing 10X attenuation of signals. It is designed primarily for use in applications involving temperature extremes, such as signal monitoring in equipment during environmental testing in an oven or refrigeration chamber. Performance of the probe remains basically unchanged over its entire specified operating temperature range.

The probe consists of a probe body assembly, a 6-foot coaxial cable, and a compensation box assembly with a BNC connector. The probe body and cable are constructed of special temperature-resistant materials, and the compensator assembly (connected at the oscilloscope) is of standard construction.

The compensation box houses adjustments to permit matching the high-frequency characteristics of the probe to the oscilloscope in use. Capacitive compensation in the probe body is adjustable, making the probe useful with any plug-in unit or oscilloscope having an input resistance of 1 M Ω and an input capacitance ranging from 15 pF to 55 pF.

ELECTRICAL CHARACTERISTICS

The following characteristics apply when the probe is calibrated at an ambient temperature between +20°C and +30°C and operated within the limitations stated in this Specification section. The probe must be used with a calibrated oscilloscope amplifier system, and all equipment used in checking these characteristics must be calibrated and given sufficient warmup time to stabilize. Warmup time for each instrument is stated in its own instruction manual.

Characteristic	Specification
Attenuation	10X within 4%, with 1 M Ω , $\pm 2\%$ inputs

Characteristic	Specification
Input Resistance	10 M Ω within 2.5% with 1 M Ω , $\pm 2\%$ inputs (See X_p, R_p vs frequency curves)
Input Capacitance	
With 15 pF instrument	10 pF or less
With 55 pF instrument	14 pF or less
Compensation Range	Adjustable to match instruments having an input capacitance of 15 pF to 55 pF
Bandwidth (–3 dB)	100 MHz with Tektronix 454A, or instrument of greater bandwidth. (Depends on bandwidth of instrument)
Maximum Input Voltage	600 V (DC + peak AC), derated with frequency. See derating curves.
Temperature Range	
Storage	–55°C to +75°C
Operating	
Probe and Cable	–50°C to +150°C
Compensation Box	–15°C to +55°C
Altitude	
Storage	To 50,000 feet
Operating	To 15,000 feet
Net Weight	
With Accessories	Approx. 8 ounces

Specification—P6008 Environmental Probe

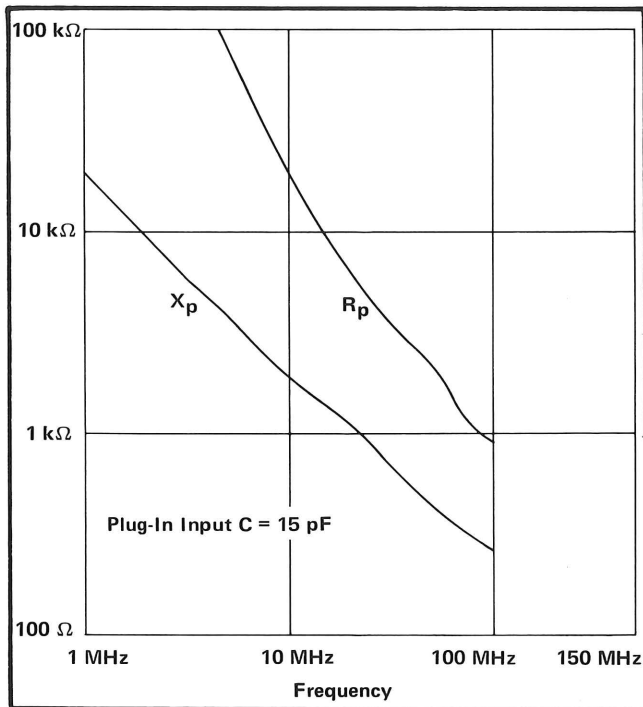


Fig. 1-2. P6008 Environmental Probe, typical X_p , R_p vs. frequency curves when used with an instrument having 15 pF input capacitance.

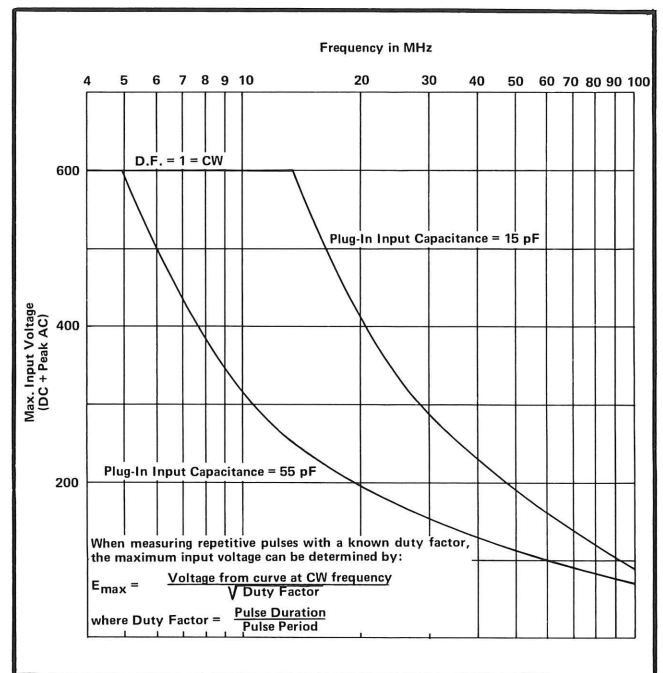


Fig. 1-3. P6008 Environmental Probe, voltage derating with frequency curves at 25° ambient temperature.

SECTION 2

OPERATING INSTRUCTIONS

General Information

The P6008 Environmental Probe provides a means of connecting an oscilloscope to a test point in circuitry which is being used or tested under conditions of temperature extremes. The probe presents minimum circuit loading because of its high input impedance.

For uniform attenuation of signals over a range of frequencies, the probe must be compensated for the oscilloscope input with which it is used. Slight variations in input capacitance between instruments (even of the same type) affect compensation. Improper compensation can cause measurement error, since both amplitude and waveshape of the display are affected.

If signals containing frequencies above 7 MHz or pulses with a risetime faster than 50 ns are to be viewed, the probe should be checked for fast-rise pulse response. The Calibration Procedure in Section 4 outlines complete calibration of the probe.

Input Compensation

To compensate the P6008 Probe, proceed as follows:

- 1) Hold the probe body and loosen the locking sleeve several turns (see Fig. 2-1).
- 2) Touch the probe tip to the oscilloscope calibrator output connector.
- 3) Set the Time/Div to display several cycles of the calibrator signal and set the Volts/Div for a display amplitude of several divisions.
- 4) Hold the probe base and turn the probe body to obtain a flat-topped square wave display, free of overshoot or rolloff. Fig. 2-1(b) shows correct and incorrect adjustments.
- 5) Hold the probe body and carefully tighten the locking sleeve while observing the display.

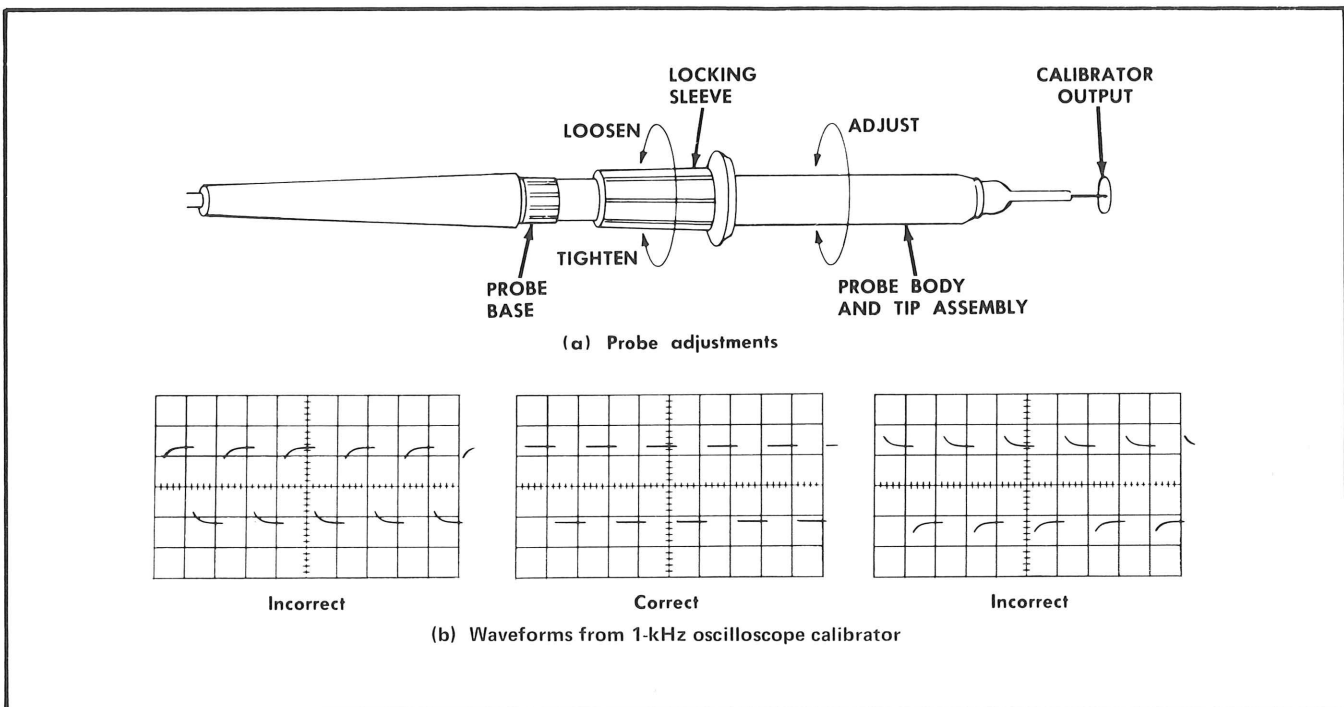


Fig. 2-1. Probe compensation.

Circuit Loading

For DC voltages, the loading may be considered the series resistance of the probe and the oscilloscope input resistance, or 10 M Ω . Due to input capacitance and stray capacitances associated with the series resistance, loading increases directly with frequency. Refer to Fig. 1-2 before making AC measurements, especially from high-impedance sources.

Voltage Derating

The maximum voltage rating of the probe is determined mainly by the power dissipation of the cable center conductor. Heating effects in the cable increase with frequency. Therefore, as the frequency increases the maximum voltage applied must decrease. Fig. 1-3 shows maximum input voltage vs. frequency.

SECTION 3

MAINTENANCE

General

The P6008 Environmental Probe is designed to withstand normal handling and operation at temperature extremes and should give many hours of use without failure. However, if the probe fails or breaks, replacement parts are available. Refer to the mechanical and electrical parts lists in the rear of this manual for order information. Substitution of non-standard parts is not advisable if original performance is to be restored.

Replacing Cable Assembly

If the coaxial cable between the probe body and the compensation box should fail, the cable assembly is available complete with fittings and cable reliefs.

Replace the cable assembly as follows:

1. Remove the Compensation Box Cover by unscrewing the Locking Nut that holds it in place (see Fig. 3-2).
2. Unsolder the cable center conductor (at R5, the 75 Ω resistor).
3. Use a thin 7/16-inch end wrench to remove the Cable Assembly from the Compensation Box.
4. Turn the Locking Sleeve to unlock the Probe Body and Tip Assembly and remove both by unscrewing from the end of the Base Bushing Assembly (see Fig. 3-1).
5. Unscrew the Sleeve from the plastic Inner Base Bushing.
6. Use thin 11/32- and 3/8-inch end wrenches to remove the Base Bushing Assembly from the end of the Cable Assembly.

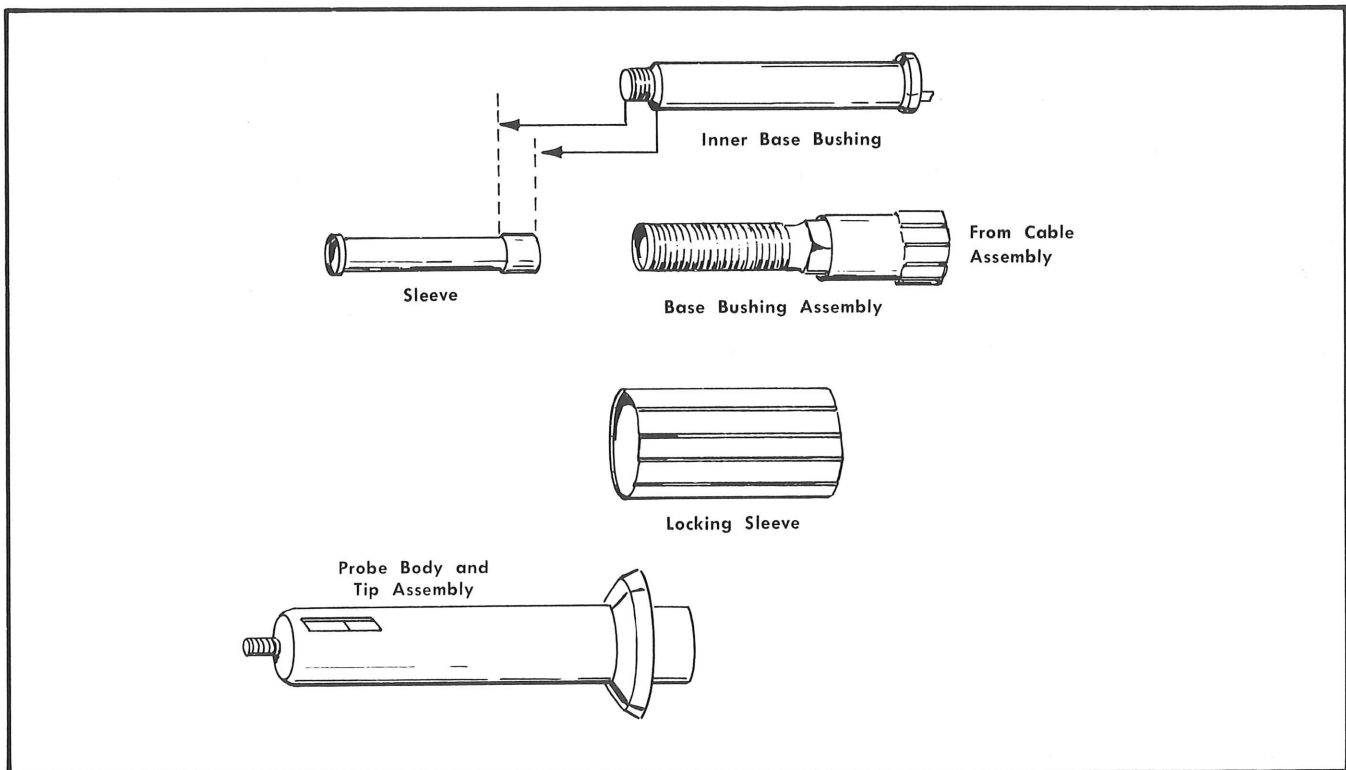


Fig. 3-1. P6008 Probe Body Assembly.

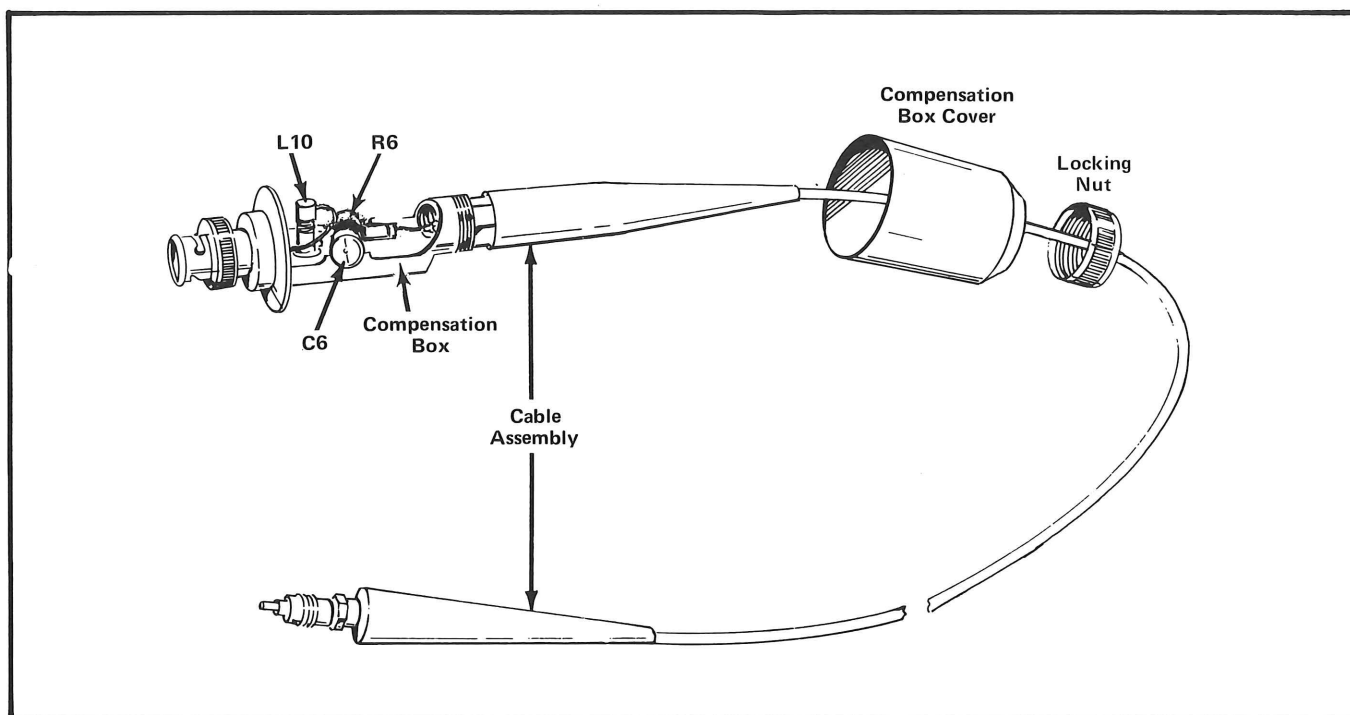


Fig. 3-2. P6008 Probe Compensation Box Assembly.

7. Use a scribe to lift the wire from the thread groove of the Inner Base Bushing and remove the bushing.

8. Unsolder the bare wire from the center terminal of the Cable Assembly.

9. Install the new Cable Assembly by reversing the above procedure. After assembling the probe parts, calibration of the probe should be checked (see Section 4).

Replacing Components in the Compensation Box

Only a pair of long-nose pliers and a soldering iron are required to replace parts in the Compensation Box.

Use a heat sink (tip of long-nose pliers) to protect the new components from excessive heat. If replacing the variable inductor, be careful not to strip the plastic threads. The proper nut pressure is from 2 to 5 inch-pounds.

Replacing the Probe Body and Tip Assembly (with 9-megohm resistor factory installed)

If the 9-megohm resistor (R1) fails, do not try to replace the resistor. Replace the entire Probe Body and Tip Assembly as shown in Fig. 3-1. Order from your local Tektronix Field Office.

SECTION 4

CALIBRATION PROCEDURE

Introduction

The following outlines the calibration procedure for the P6008 Environmental Probe. Equipment and test fixtures required are indicated in Fig. 4-1.

Low-frequency compensation of the probe is necessary whenever the probe is transferred from one instrument or input channel to another. If the probe is to be used in measurements above about 7 MHz or to observe fast-rise pulses, the high-frequency compensation (in the compensation box) should be checked and adjusted as needed for optimum performance. When used consistently with the same instrument, the probe will normally need to be checked only when the instrument requires a calibration check.

Preliminary Procedure

a. Install the P6008 Probe on the input connector of the test oscilloscope.

b. Set the Volts/Div to 20 mV and the Time/Div to 1 ms.

c. Turn the test oscilloscope power on and allow enough warmup time for the instrument to stabilize.

1. Adjust Low-Frequency Compensation

a. Attach a Probe Tip-to-BNC Adapter (Tektronix Part No. 013-0054-00) to the probe tip and connect the adapter to the oscilloscope 1 V Cal output. Adjust triggering controls for a stable display.

b. Loosen the locking sleeve at the rear of the probe body and turn the probe body to obtain a flat-topped square wave display, free of overshoot or rolloff.

Hold the probe body and carefully tighten the locking sleeve while observing the square wave.

2. Adjust High-Frequency Compensation

a. Connect equipment as shown in Fig. 4-1(A).

b. Set the Volts/Div on the test oscilloscope to 10 mV and the Time/Div to 0.02 μ s. Adjust triggering for a stable display.

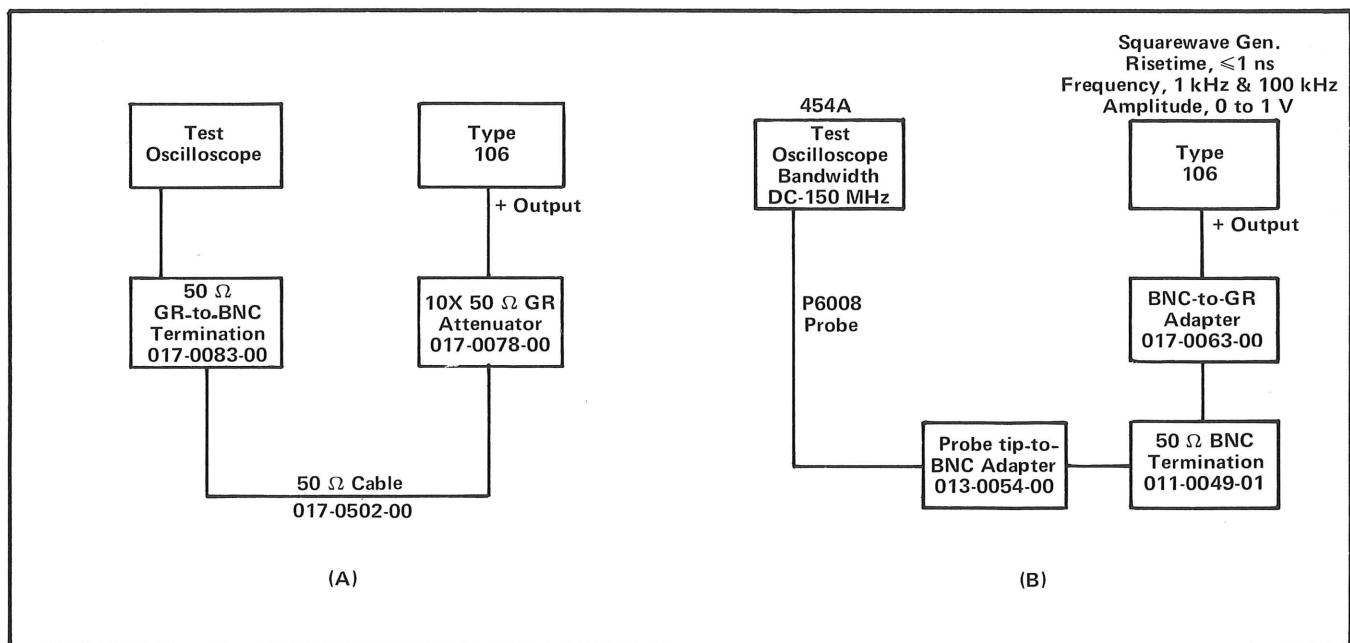


Fig. 4-1. Equipment connections for step 2.

Calibration—P6008 Environmental Probe

c. Set the square wave generator controls to provide a bright, fast-rise display with an amplitude of 4 to 5 divisions.

d. Note the pulse shape and aberrations.

e. Remove the cable, attenuator, and termination from the square wave generator and the test oscilloscope. Connect the probe, etc. as shown in Fig. 4-1(B).

f. CHECK—High-frequency response, by comparing the probe/oscilloscope pulse response against the display obtained in Step d. Aberrations from the reference response should not exceed +3%, -3%, or 4% P-P of the pulse amplitude.

g. If aberrations are excessive, proceed as follows:

1) Loosen the locking nut on the compensation box and slide the compensation box cover back on the cable.

2) Adjust R6, C6, and L10 (in the compensation box) for the best overall response. Variations in the flatness of the square wave should not exceed +3%, -3%, or 4% P-P (beyond aberrations noted in Step d).

3) Change the repetition rate of the square wave generator to 1 kHz and set the Time/Div of the test oscilloscope to 1 ms.

4) Loosen the locking sleeve at the probe body and adjust the compensation by turning the probe body until the square wave display has a flat top. Tighten the locking sleeve while observing the display.

This concludes the Calibration Procedure. Slide the compensation box cover back in place and tighten the locking nut.

ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Capacitors				
Tolerance $\pm 20\%$ unless otherwise indicated.				
C1 ¹				
C6	281-0060-00		2-8 pF, Var	Cer
Inductor				
L10	*114-0153-00		0.15-0.25 μ H, Var	Core 276-0506-00
Resistors				
Resistors are fixed, composition, $\pm 10\%$ unless otherwise indicated.				
R1 ¹				
R5	301-0750-00		75 Ω	1/2 W
R6	311-0249-00		1 k Ω , Var	5%

¹Furnished as a unit with *204-0144-01 (Probe Body and Tip Assembly)

MECHANICAL PARTS LIST

Replacement Parts

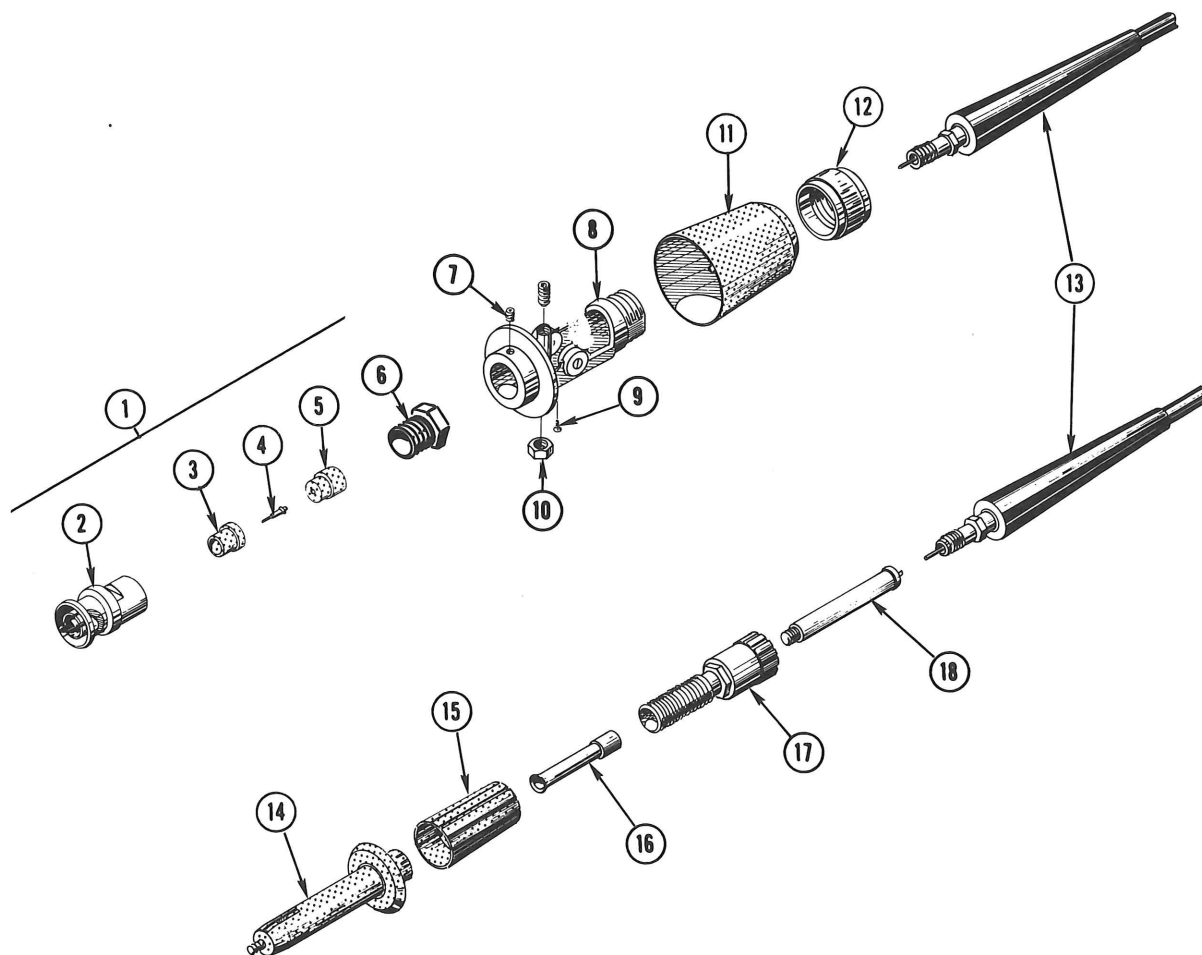
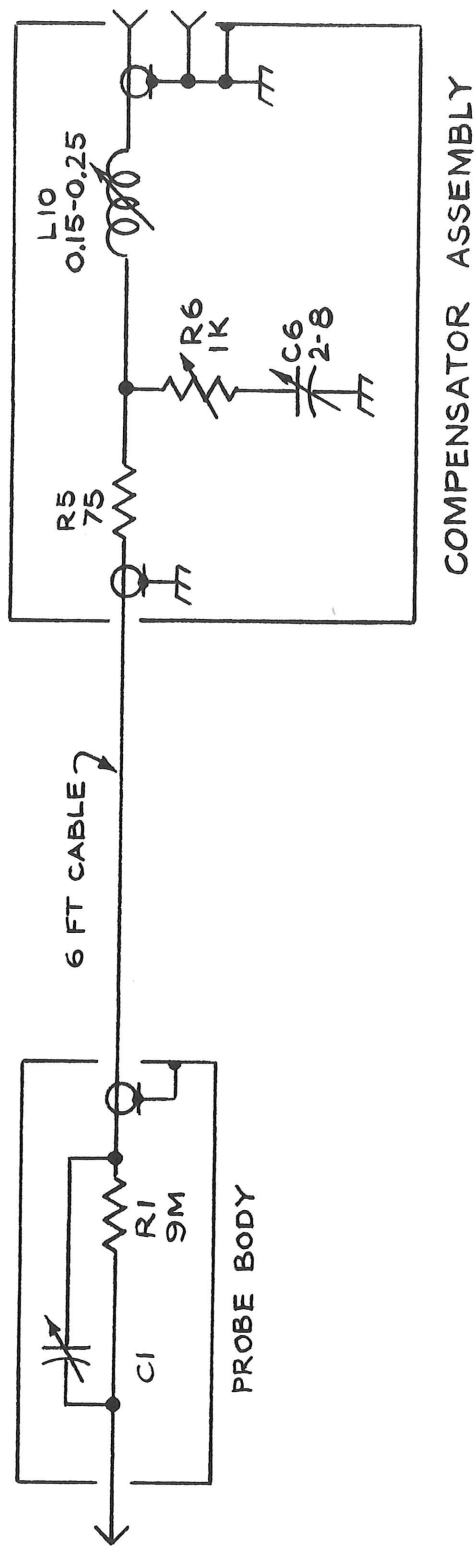


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Qty	Description				
				1	2	3	4	5
	010-0130-01		1	PROBE, P6008, environmental				
	- - - - -		-	probe includes:				
1	131-0428-00		1	CONNECTOR, receptacle, electrical BNC				
	- - - - -		-	connector includes:				
2	134-0044-00		1	PLUG, probe				
3	358-0072-00		1	INSULATOR, bushing, 0.323 inch long				
4	214-0109-01		1	PIN, probe contact, male				
5	166-0217-00		1	TUBE, spacer, insulator, 0.625 inch long				
6	132-0081-00		1	NUT, BNC				
7	213-0020-00		1	SETSCREW, 6-32 x 0.125 inch, HSS				
8	204-0147-00		1	BODY, compensating				
9	213-0121-00		1	SCREW, 0-80 x 0.95 inch, RHS				
10	210-0504-00		2	NUT, hex., 0-80 x 0.156 inch				
11	205-0046-02		1	SHELL, compensating				
12	210-0576-00		1	NUT, locking, knurled				
13	175-1271-00		1	CABLE ASSEMBLY, 6 foot				
14	204-0144-01		1	BODY ASSEMBLY, w/resistor				
15	166-0285-01		1	SLEEVE, 0.618 inch diameter				
16	166-0282-00		1	SLEEVE, 1.025 inches long				
17	358-0194-01		1	BUSHING, base				
18	358-0192-01		1	BUSHING, inner base				
	070-1173-00		1	MANUAL, instruction (not shown)				



P6008

IOX ENVIRONMENTAL PROBE

