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# Instruction Manual

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## **P6061 PROBE**

JAN 06 1972

010-6061-07

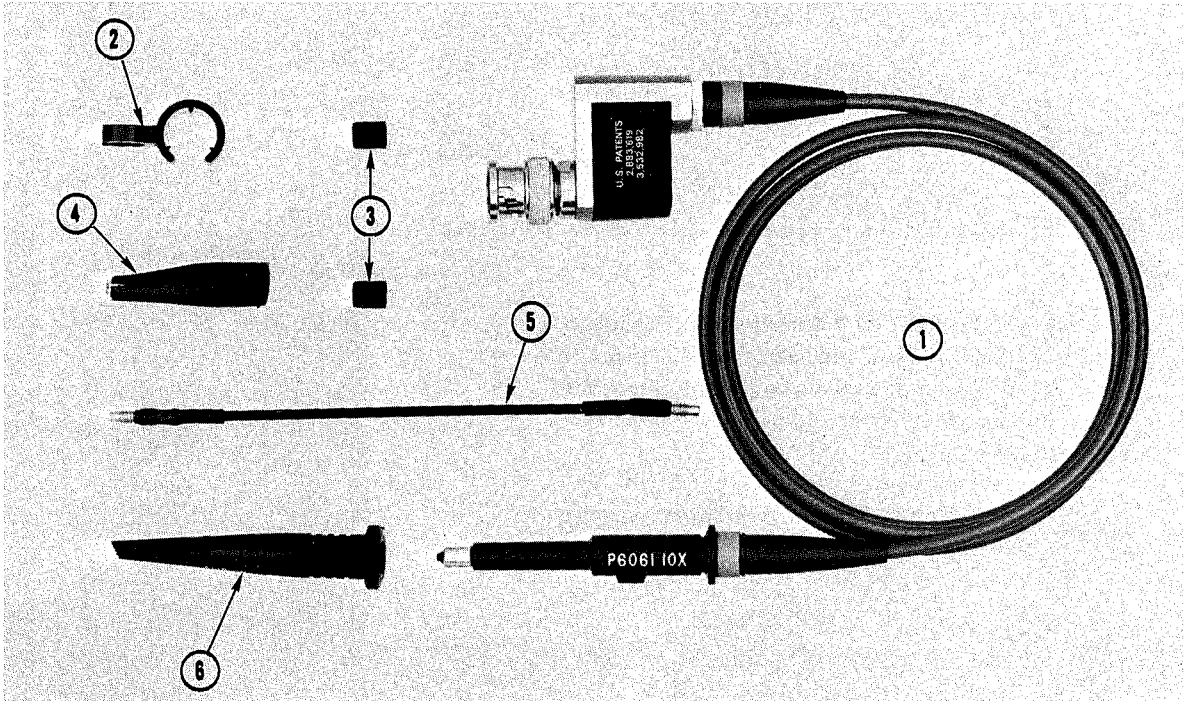


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q	Description
		Eff	Disc		
PROBE PACKAGE					
1	010-6061-01			1	PROBE PACKAGE, P6061, 3.5 foot
thru	010-6061-03			1	PROBE PACKAGE, P6061, 6 foot
6	010-6061-05			1	PROBE PACKAGE, P6061, 9 foot
	- - - - -			-	probe package includes:
PROBE ONLY					
1	010-6061-00			1	PROBE, P6061, 3.5 foot
	010-6061-02			1	PROBE, P6061, 6 foot
	010-6061-04			1	PROBE, P6061, 9 foot
STANDARD ACCESSORIES					
2	352-0234-00			1	HOLDER, probe, plastic
3	166-0404-01			2	TUBE, insulating, plastic
4	344-0046-00			1	CLIP, probe, alligator type
5	175-0848-01			1	LEAD, electrical, 5 inches long
6	013-0107-01			1	TIP, probe, retractable hook

Fig. 1-1. P6061 Probe.

## TEXT CORRECTION

Fig. 1-1 P6061 Probe

ADD: to STANDARD ACCESSORIES

131-1098-02 1 CONTACT, electrical, readout (not shown)

CHANGE: Index No. 6 (013-0107-01) to read:

6 013-0105-00 1 TIP, probe, retractable hook

SECTION 2 OPERATING INSTRUCTIONS

Page 2-2 Use of Probe Accessories

ADD: the following:

Readout Contact Spring (131-1098-02) - The contact spring illustrated in Fig. 2-3 is intended for use when the P6061 is to be used with a Tektronix 430-Series Oscilloscope. The spring serves to ground the electrical contact ring on the vertical input connector of these instruments, changing the deflection factor (Volts/Div) to 10X normal reading and thus correcting for the 10X attenuation of the probe.

To install the spring on the BNC connector, hold the spring so that the right-angle bend in the spring faces forward (away from the Compensator Box). Hook the opposite end of the spring around the connector, just behind the outer flange. Work the spring onto the connector with a twisting, rocking motion. Fig. 2-3 shows the spring properly mounted.

Do not mount the spring on the connector if the P6061 is to be used with a Tektronix 7000-Series Oscilloscope having the CRT Readout capability, since this will cause an incorrect readout display.

Probe Tip Adapter (I.C. Test) (015-0201-00) - This item is not listed under Standard Accessories, but may be found in the exploded view and Replaceable Parts list in the rear of this manual. The I.C. test adapter is placed on the probe tip at the factory to serve as a tip protector. The adapter

is especially useful when probing the leads on a flat-pack type I.C. The configuration prevents the probe tip from shorting adjacent leads together and insulates the ground surface just behind the tip. The adapter is also convenient for probing other circuit points, such as resistor and capacitor leads.

The adapter must be removed from the probe tip before attaching the Retractable Hook Tip or Insulating Tube.

SECTION 5 REPLACEABLE PARTS

Page 5-2 Index No. 12 (200-0372-00)

CHANGE TO READ:

12 015-0201-00 1 ADAPTER, probe tip (I.C. Test)

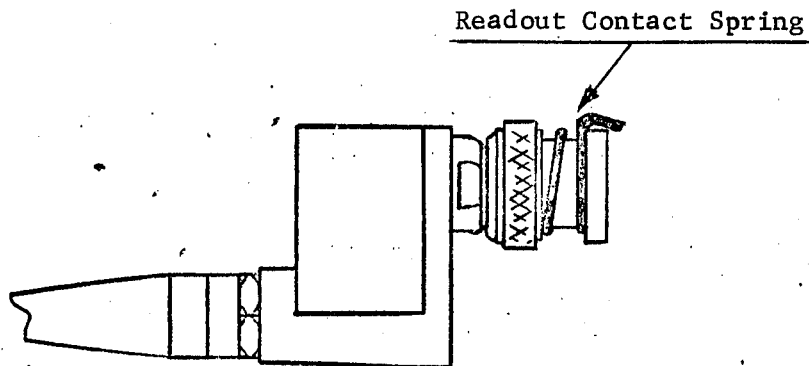


Fig. 2-3. P6061 BNC connector, showing the Readout Contact Spring in proper position.

# SECTION 1

## CHARACTERISTICS

### Description

The P6061 Probe is a miniature passive, 10X attenuation probe, designed specifically for use with the Tektronix 453A Oscilloscope and the 7A18 Dual-Trace Amplifier with 7403 Oscilloscope.

The probe consists of a small-diameter probe body assembly (especially useful in compact circuitry), a 3.5-foot, 6-foot, or 9-foot cable, and a compensator box with a BNC connector.

### SPECIFICATION

The following performance data is valid provided (a) the probe has been calibrated at an ambient temperature between +20°C and +30°C, (b) the probe is used within the environmental conditions stated below, and (c) the probe is operated in conjunction with a calibrated oscilloscope system.

Characteristic	Specification
Attenuation	10X, accurate within 3%
Input Resistance	10 MΩ accurate within 2% (See X <sub>p</sub> , R <sub>p</sub> vs frequency curves)
Input Capacitance	
3.5-foot Probe	≈9.5 pF
6.0-foot Probe	≈12.5 pF
9.0-foot Probe	≈13.5 pF

Characteristic	Specification
Input Compensation	Adjustable to match an input capacitance of 20 pF
Bandwidth (−3 dB)	≥60 MHz with 453A. Depends on the bandwidth of the oscilloscope system
Maximum Input Voltage	500 V (DC + peak AC) to 3.5 MHz, derated to 40 V at 50 MHz (See voltage derating curve)
Temperature Range	
Storage	−55°C to +75°C
Operating	−15°C to +75°C
Altitude	
Storage	To 50,000 feet
Operating	To 15,000 feet
Humidity	
Storage and Operating	To 95% relative humidity
Cable Length	Nominally 3.5 feet, 6 feet, or 9 feet between strain relief bases
Weight	
Net	≈2.4 ounces

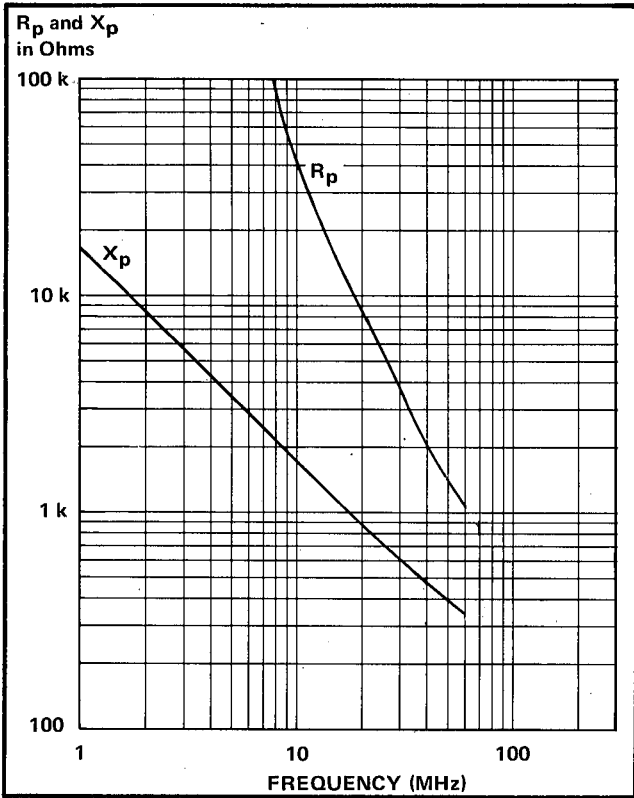


Fig. 1-2. P6061 Probe (3.5-foot cable), typical X<sub>p</sub>, R<sub>p</sub> versus frequency curves.

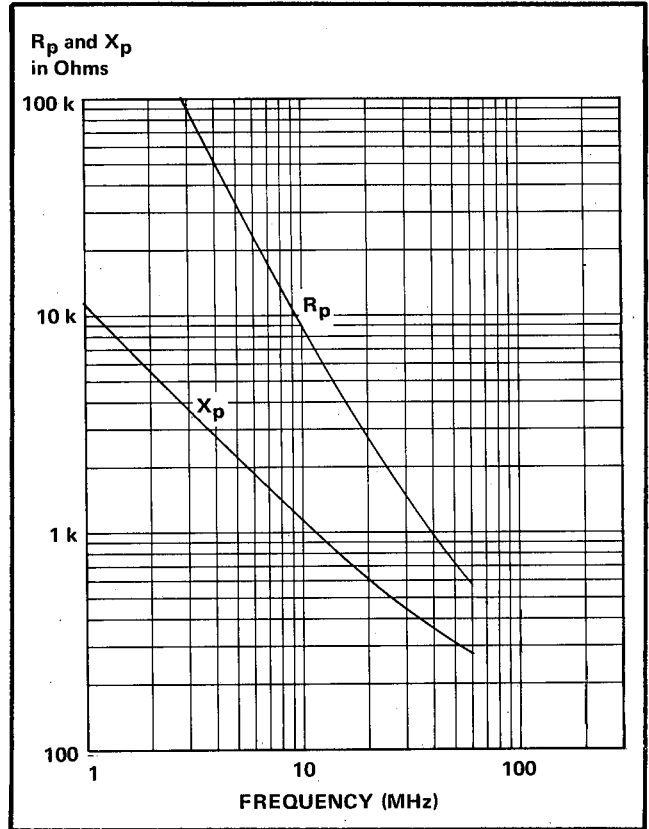


Fig. 1-4. P6061 Probe (9.0-foot cable), typical X<sub>p</sub>, R<sub>p</sub> versus frequency curves.

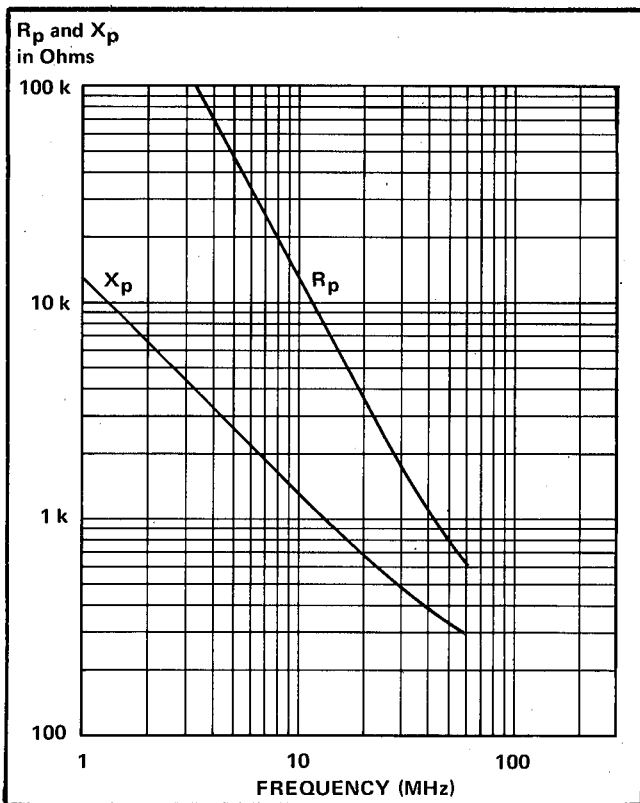


Fig. 1-3. P6061 Probe (6.0-foot cable), typical X<sub>p</sub>, R<sub>p</sub> versus frequency curves.

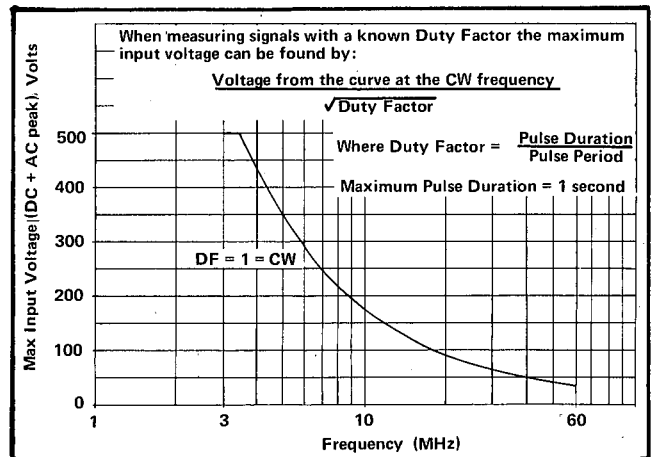


Fig. 1-5. P6061 Probe, typical voltage derating with frequency curve.

# SECTION 2

## OPERATING INSTRUCTIONS

### Introduction

The P6061 Probe is a miniature passive probe providing 10X attenuation of the signal. The probe is designed to monitor the signal source with minimum circuit loading while maintaining waveform fidelity.

The P6061 Probe is intended specifically for use with the Tektronix 453A Oscilloscope and the 7A18 Dual-Trace Amplifier with a 7403 Oscilloscope. Use with instruments having a greater bandwidth is not recommended, since aberrations would be excessive.

### Probe Compensation

Due to slight variations in the input capacitance between oscilloscope input amplifiers (even of the same type), it is usually necessary to compensate the probe whenever it is transferred from one instrument to another, or from one channel to another of dual (multi-trace) units. Improper compensation will produce waveshape distortion and/or amplitude measurement error of the display.

To compensate the P6061 Probe, proceed as follows:

(a) Touch the probe tip to the oscilloscope calibrator output connector and set the Volts/Div and Time/Div controls so that several cycles of the calibrator square-wave are displayed with an amplitude of approximately one-half the screen height.

(b) Adjust the probe compensation (Fig. 2-1), through the access hole in the compensation box, for optimum pulse flat top. Fig. 2-2 illustrates the correct and incorrect square-wave response.

### Voltage Rating and Derating Curves

The maximum allowable input voltage of the P6061 Probe is 500 V (DC + peak AC) at the low frequency end of its range. As the frequency increases, the maximum allowable input voltage decreases. Fig. 1-5 shows the voltage derating curves for the P6061 Probe. In no case can the peak pulse voltage exceed the DC voltage limit.

### Circuit Loading

Although the input DC resistance of the P6061 Probe is 10 M $\Omega$ , it can load any high impedance circuit it is con-

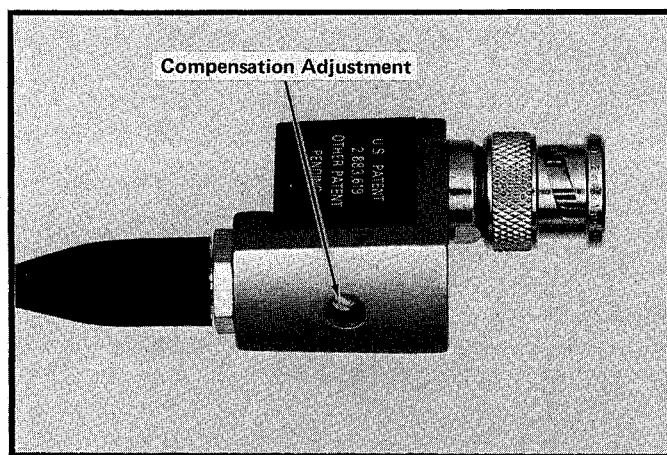


Fig. 2-1. Location of probe compensation adjustment.

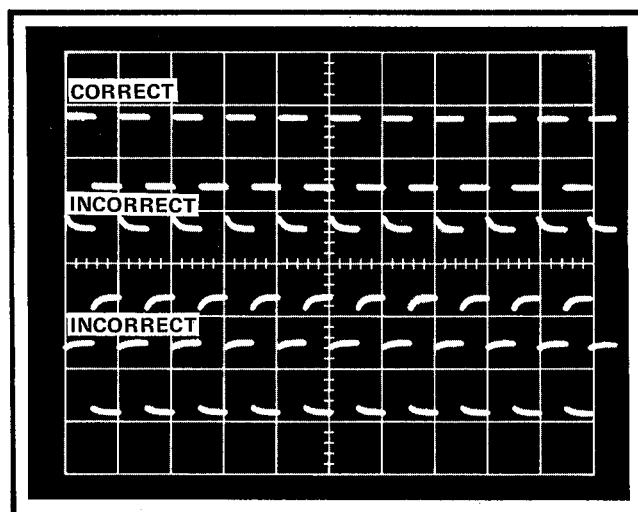


Fig. 2-2. Probe compensation.

nected into, and distort the actual waveform present. To minimize this loading effect, select the lowest impedance points to check waveforms. At higher frequencies, the equivalent probe input impedance decreases because of the input capacitance of the probe. Therefore, the probe loading increases with frequency. Figs. 1-2, 1-3, and 1-4 shows  $R_p$  and  $X_p$  curves as a function of frequency. These curves should be referred to when making measurements at higher frequencies.

### Ground Lead Length and Considerations

A passive probe such as the P6061 is a capacitance divider for high frequency components. An inductance

## Operating Instructions—P6061

formed by a long ground lead will form a series resonant circuit which will "ring" if driven by a signal containing significant frequency components at or above circuit resonance. These oscillations can appear on the oscilloscope display and distort the true waveform.

To check for ground lead inductance problems, change the ground return path and look for signal shape changes. If the ground lead must be long, loop the lead through a small ferrite core to introduce losses in the resonant circuit. The spring-loaded bayonet ground or a chassis-mounted connector and probe tip-to-connector adapter are the recommended methods to obtain a minimum-inductance ground path.

The inductance that appears on the ground side may also apply to the probe tip if short lengths of wire are connected to extend the tip. Therefore, try to touch the probe tip directly to the signal source for all waveform measurements.<sup>1</sup>

<sup>1</sup>Measurement Concept Booklet; Probe Measurements, Tektronix Part No. 062-1120-00, is a recommended treatise on probe use and measurement evaluation.

## Use of Probe Accessories

The standard accessories supplied with the P6061 Probe facilitate connecting the probe into a test circuit. Use as follows:

**Retractable Hook Tip** — Slip on over probe tip. Pull back at flange while holding probe body to expose the hook tip.

**5-inch Ground Lead** — Screw one threaded end into side of probe body. The minigator clip may be screwed onto the other end.

**Insulating Tube** — The small plastic tube may be slid over the probe tip to insulate the ground surface (just behind the tip) when probing in compact circuitry.

**Probe Holder** — This item serves as temporary storage for the probe between uses. Slide the broad ring of the holder over the boot at the compensator box. The probe body may then be placed in the other ring for storage.



# SECTION 3

## MAINTENANCE

### General

The P6061 Probe is an extremely rugged device, but is susceptible to damage if treated carelessly. Avoid kinking or straining the cable or subjecting the probe to excessive environmental conditions. When not in use, probes should be stored in drawers or supported by the plastic probe hangers supplied with the probe.

If the probe is damaged, replacement parts are available through your local Tektronix Field Office or representative. The mechanical and electrical parts lists at the back of this manual provide the Tektronix part numbers for the components, and instructions on how to order replacement parts.

Substitution of **non-standard** parts is **not** advisable if the original performance is to be restored. Even shortening the cable by more than a few percent will have a noticeable effect on the probe's transient response. The resistive center conductor has been specifically selected to damp and eliminate the reflections that would exist in an undetermined system. If this resistive element is reduced, the reflections will not be properly damped and may cause noticeable signal distortions.

### Connector Replacement

1. Remove the snap-fit cover on the compensation box. See Fig. 3-1 for instructions.
2. Unsolder the center conductor of the connector from the circuit board. Tilt the board back away from the connector while applying heat to the conductor to achieve separation.
3. Loosen the 7/16-inch nut (part of the connector), unscrew, and remove the connector.
4. Install the new connector, performing steps 1 through 3 (above) in reverse order. Keep board tilted back away from the connector until the 7/16-inch nut is tightened.

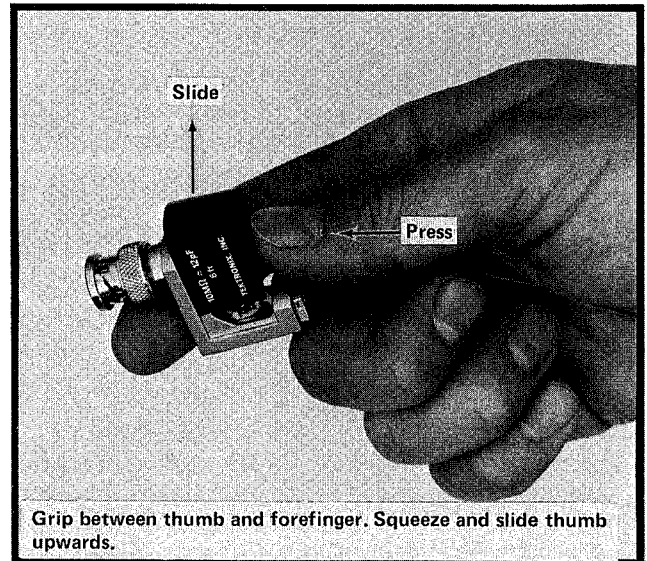


Fig. 3-1. Removal of cover on compensation box.

### Cable Replacement

1. Remove the snap-fit cover on the compensation box. (See Fig. 3-1.)
2. Unsolder the cable center conductor from the circuit board.
3. Remove the 7/16-inch cable bushing from the compensation box.
4. Unscrew the probe body from the cable.
5. Unsolder the cable center conductor from the resistor/capacitor lead (located in the probe head).
6. Pull the resistor/capacitor assembly from the holder.
7. Insert the resistor/capacitor assembly into the holder of the new probe cable and re-assemble the probe, reversing the procedure given in steps 1 through 6 above.

# P6061 Probe

## ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description		
3-1/2 Foot Cable						
Capacitors						
Tolerance $\pm 20\%$ unless otherwise indicated.						
C1	281-0722-00		7.5 pF	Cer	500 V	$\pm 0.1$ pF
C6	281-0175-00		7-25 pF, Var	Cer	350 V	
Resistors						
Resistors are fixed, composition, $\pm 10\%$ unless otherwise indicated.						
R1	325-0021-00		9 M $\Omega$	1/4 W	Prec	1%
R6	322-0123-00		187 $\Omega$	1/4 W	Prec	1%
6 Foot Cable						
Capacitors						
Tolerance $\pm 20\%$ unless otherwise indicated.						
C1	281-0672-00		11.4 pF	Cer	500 V	1%
C8	281-0171-00		15-42 pF, Var	Cer	200 V	
Resistors						
Resistors are fixed, composition, $\pm 10\%$ unless otherwise indicated.						
R1	325-0021-00		9 M $\Omega$	1/4 W	Prec	1%
R6	322-0107-00		127 $\Omega$	1/4 W	Prec	1%
R8	315-0101-00		100 $\Omega$	1/4 W		5%
9 Foot Cable						
Capacitors						
Tolerance $\pm 20\%$ unless otherwise indicated.						
C1	281-0727-00		12.8 pF	Cer	500 V	$\pm 0.1$ pF
C8	281-0171-00		15-42 pF, Var	Cer	200 V	

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
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Resistors

Resistors are fixed, composition,  $\pm 10\%$  unless otherwise indicated.

R1	325-0021-00	9 M $\Omega$	1/4 W	Prec	1%
R6	322-0105-00	121 $\Omega$	1/4 W	Prec	1%
R8	322-0124-00	191 $\Omega$	1/4 W	Prec	1%

# P6061 Probe

## REPLACEABLE PARTS

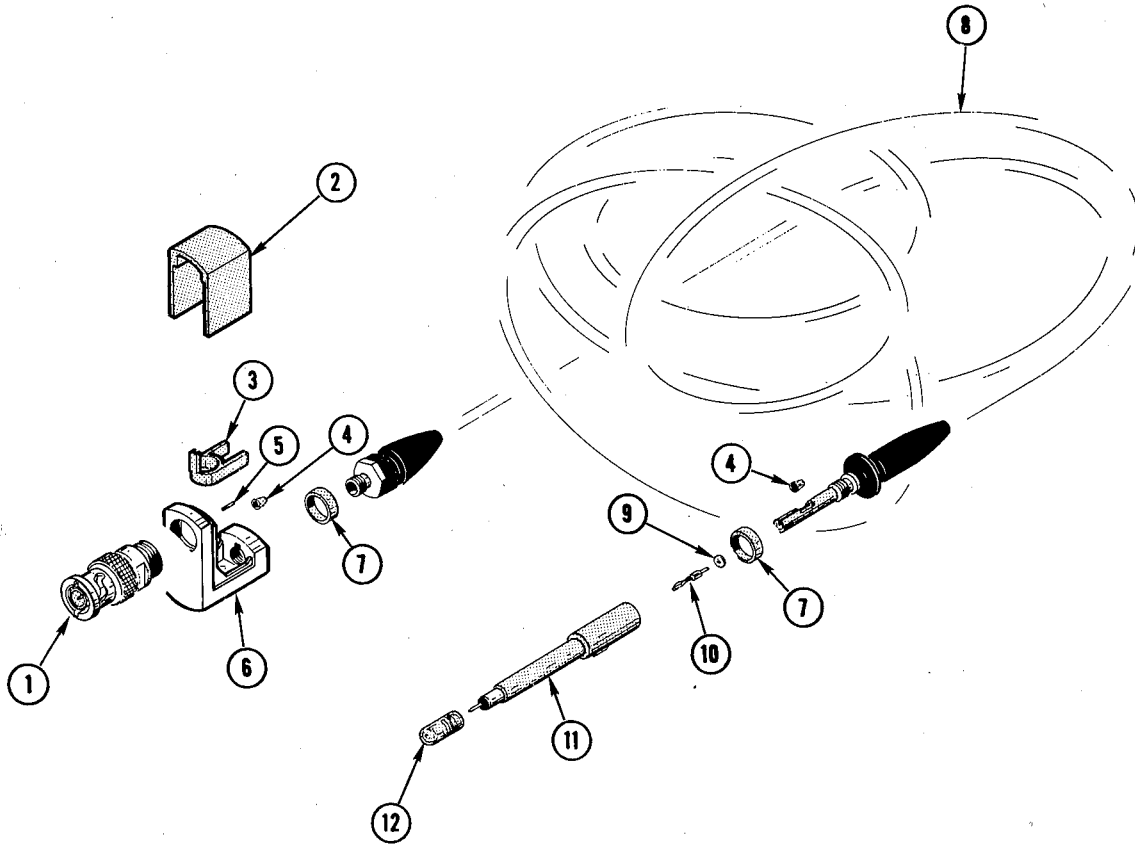
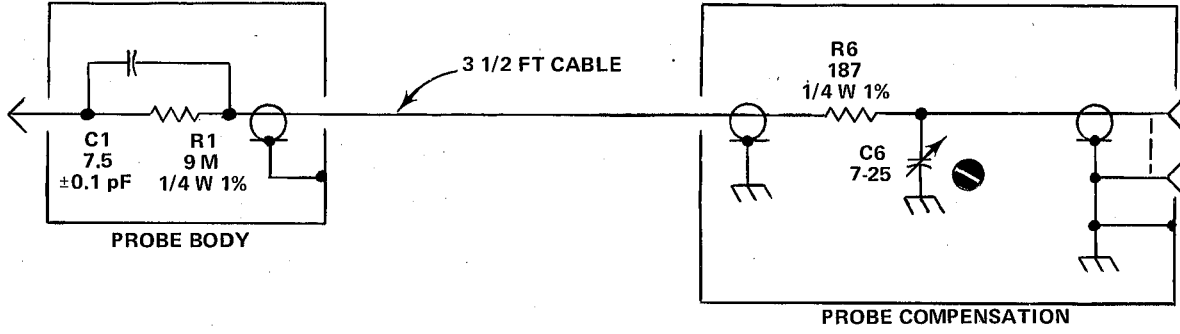


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q	Description
		Eff	Disc		
	010-6061-00			1	PROBE, P6061, 3.5 foot
	010-6061-02			1	PROBE, P6061, 6 foot
	010-6061-04			1	PROBE, P6061, 9 foot
	- - - - -			-	probe includes:
1	131-0602-00			1	CONNECTOR, receptacle, electrical, female BNC
2	200-1158-07			1	COVER, compensating box, for 010-6061-00
	200-1158--8			1	COVER, compensating box, for 010-6061-02
	200-1158-09			1	COVER, compensating box, for 010-6061-04
3	354-0396-00			1	RING, capacitor mounting
4	210-0698-00			2	EYELET, 0.047 inch OD
5	214-0506-06			1	PIN, connector, straight

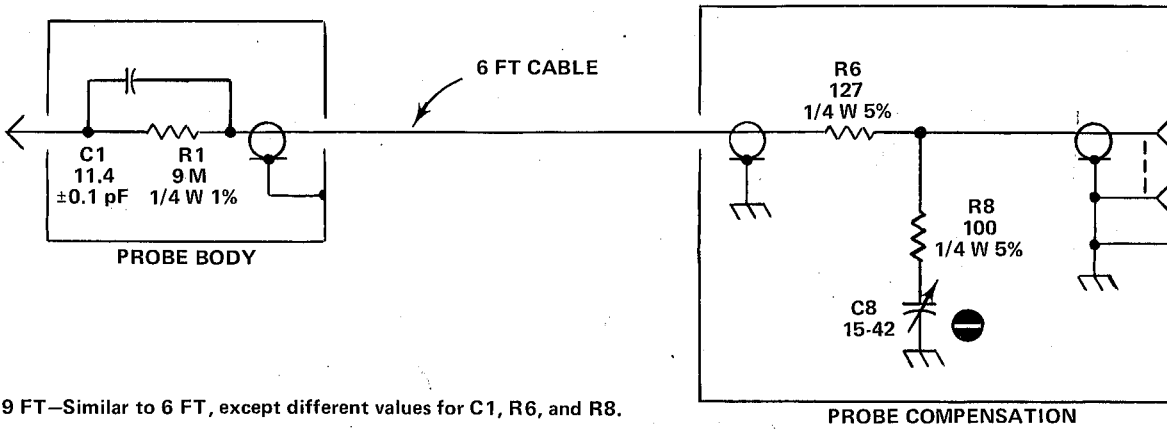
REPLACEABLE PARTS

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q					Description	
		Eff	Disc	t	y	1	2	3		4
6	426-0690-01			1						FRAME, compensating box
7	334-1636-00			2						BAND, marker, orange
8	175-1173-00			1						CABLE ASSEMBLY, 3.5 foot, for 010-6061-00
	175-1174-00			1						CABLE ASSEMBLY, 6 foot, for 010-6061-02
	175-1205-00			1						CABLE ASSEMBLY, 9 foot, for 010-6061-04
9	210-1004-00			1						WASHER, guide, plastic
10	214-0592-00			1						CONTACT, wire form
11	204-0447-01			1						BODY ASSEMBLY, probe
12	200-0372-00			1						CAP, end, plastic
	070-1182-00			1						MANUAL, instruction (not shown)

SCHEMATIC DIAGRAM



P6061 10X PROBE



9 FT—Similar to 6 FT, except different values for C1, R6, and R8.

10X PROBE