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Instruction Manual

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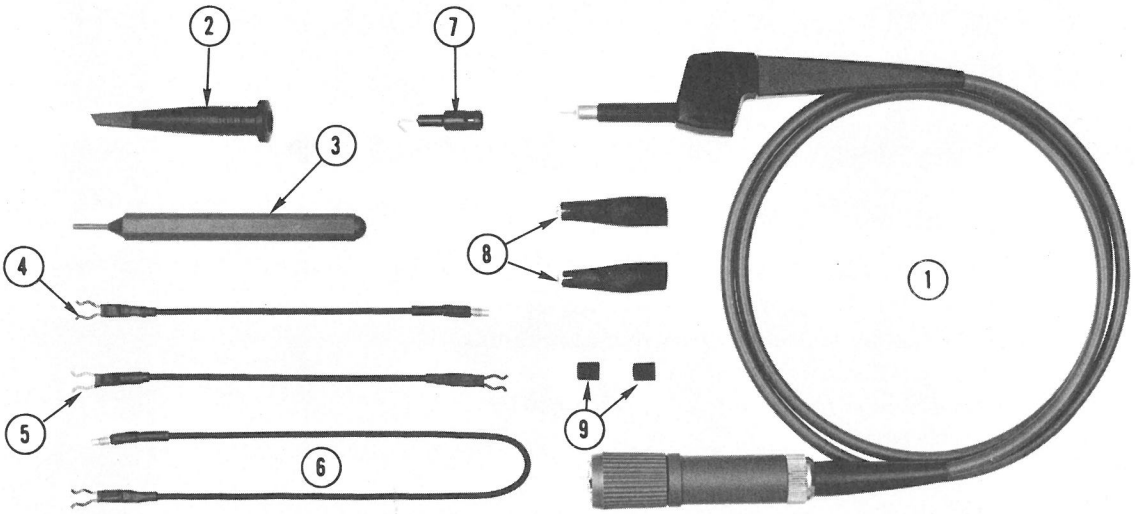
010-6055-01



P6055 PROBE

Tektronix, Inc. ● P. O. Box 500 ● Beaverton, Oregon 97005 ● Phone 644-0161 ● Cables: Tektronix

070-1115-00



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Fig. 1-1. P6055 Probe and Standard Accessories.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty 1 2 3 4 5	Description
					PROBE PACKAGE
1 thru 9	010-6055-01			1	PROBE PACKAGE, P6055
	----------			-	probe package includes:
					PROBE ONLY
1-1	010-6055-00			1	PROBE, P6055
					STANDARD ACCESSORIES
-2	013-0107-01			1	TIP, probe, retractable, hook
-3	003-0675-00			1	SCREWDRIVER, probe adjust
-4	175-0124-00			1	LEAD, electrical, 5 inch
-5	175-1256-00			1	LEAD, electrical, 6 inch
-6	175-0125-00			1	LEAD, electrical, 12 inch
-7	206-0114-00			1	TIP, probe
-8	344-0046-00			2	CLIP, probe
-9	166-0404-01			2	TUBE, insulating
	352-0090-00			1	HOLDER, probe (not shown)
	070-1115-00			1	MANUAL, instruction (not shown)

Ⓐ

SECTION 1
SPECIFICATION

Change information, if any, affecting this section will be found at the rear of this manual.

Description

The P6055 is a miniature, low-capacitance, passive 10X probe designed for use with Tektronix differential amplifiers. The probe can be adjusted to match instruments with an input capacitance ranging from 20 pF to 47 pF. The attenuation ratio is adjustable to 10X (including the input resistance of the amplifier unit).

A special locking type BNC connector provides readout information to the readout circuitry in Tektronix instruments featuring scale-factor readout. The connector is also compatible with other Tektronix instruments using BNC input connectors, and aids in achieving a high CMRR.

When two P6055 probes are used at the inputs of a differential amplifier, the adjustable attenuation ratio permits precise gain matching, thus improving the common-mode rejection ratio of the system. Variable capacitances in the compensation box permit the probe to be compensated for uniform frequency-response characteristics, providing a high CMRR from DC to high frequencies.

Use of a special low-noise coaxial cable helps maintain the high CMRR of the system even when the probes are moved.

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(s) 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 item is given in its own instruction manual.

TABLE 1-1

ELECTRICAL CHARACTERISTICS

Characteristic	Performance Requirement	Supplemental Information
Attenuation	Adjustable to 10X when connected to an input with an impedance of 1 MΩ, ±2%.	
Input Resistance		1 MΩ, ±0.5%. See X_p, R_p vs. Frequency curves in Section 2.
Input Capacitance		≃ 10 pF to ≃ 12.5 pF when compensated to an amplifier input capacitance of 20 pF to 47 pF.
Compensation Range	20 to 47 pF	
Step Response (Probe only)		
Risetime		4 ns or less
Maximum Input Voltage		500 V (DC + peak AC), derated with frequency. See curves.
CMRR		
Probe Pair with 7A13 or Type 1A5 (At Probe Tip)	20,000:1 from DC to 1 kHz, decreasing to 100:1 at 20 MHz.	See CMRR vs. Frequency curve.

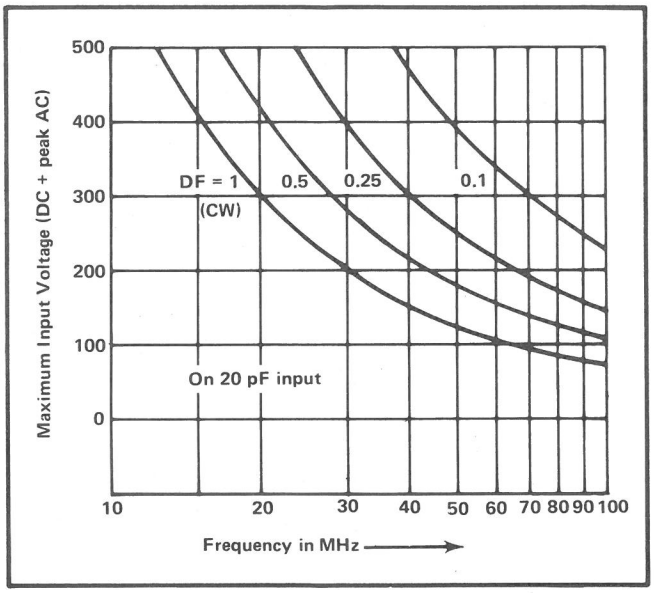


Fig. 1-2. P6055 Probe voltage derating with frequency curves at 25°C ambient temperature.

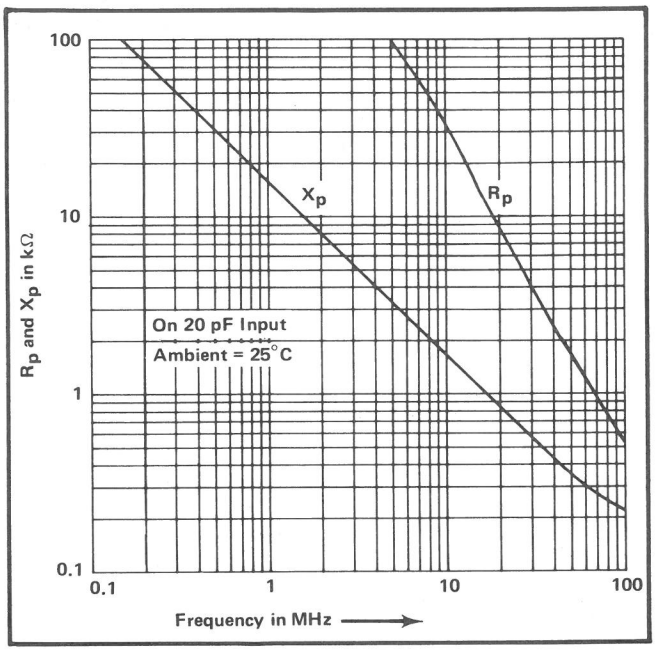


Fig. 1-3. P6055 Probe, typical R_p, X_p vs. frequency curves at an ambient temperature of 25°C.

TABLE 1-2

ENVIRONMENTAL CHARACTERISTICS

Characteristic	Performance Requirement
Temperature	
Non-Operating Range	−55°C to +75°C
Operating Range	0°C to +50°C
Altitude	
Non-Operating	To 50,000 feet
Operating	To 15,000 feet
Shock	
Non-Operating	To 400 g's, 1/2 sine, 1/2 ms, 1 ms and 2 ms duration.
Transportation	Qualifies under National Safe Transit Committee Test Procedure 1A, Category 1 V (48-inch drop).

TABLE 1-3

PHYSICAL CHARACTERISTICS

Characteristic	Description	Supplemental Information
Dimensions		
Probe Body	Length: ≃ 5.1 inches	Includes tip and boot
	Width: ≃ 0.56 inch	
	Max. Height: ≃ 1 inch	
Cable	≃3.5 feet between strain relief bases	
Compensation Housing	Length: ≃ 2.88 inches	Includes connector
	Max. Diameter: ≅ 0.75 inch	Includes connector
Weight		
Complete with Accessories	Net: ≃ 5 ounces (without Instruction Manual)	
	Shipping: ≃ 11 ounces	

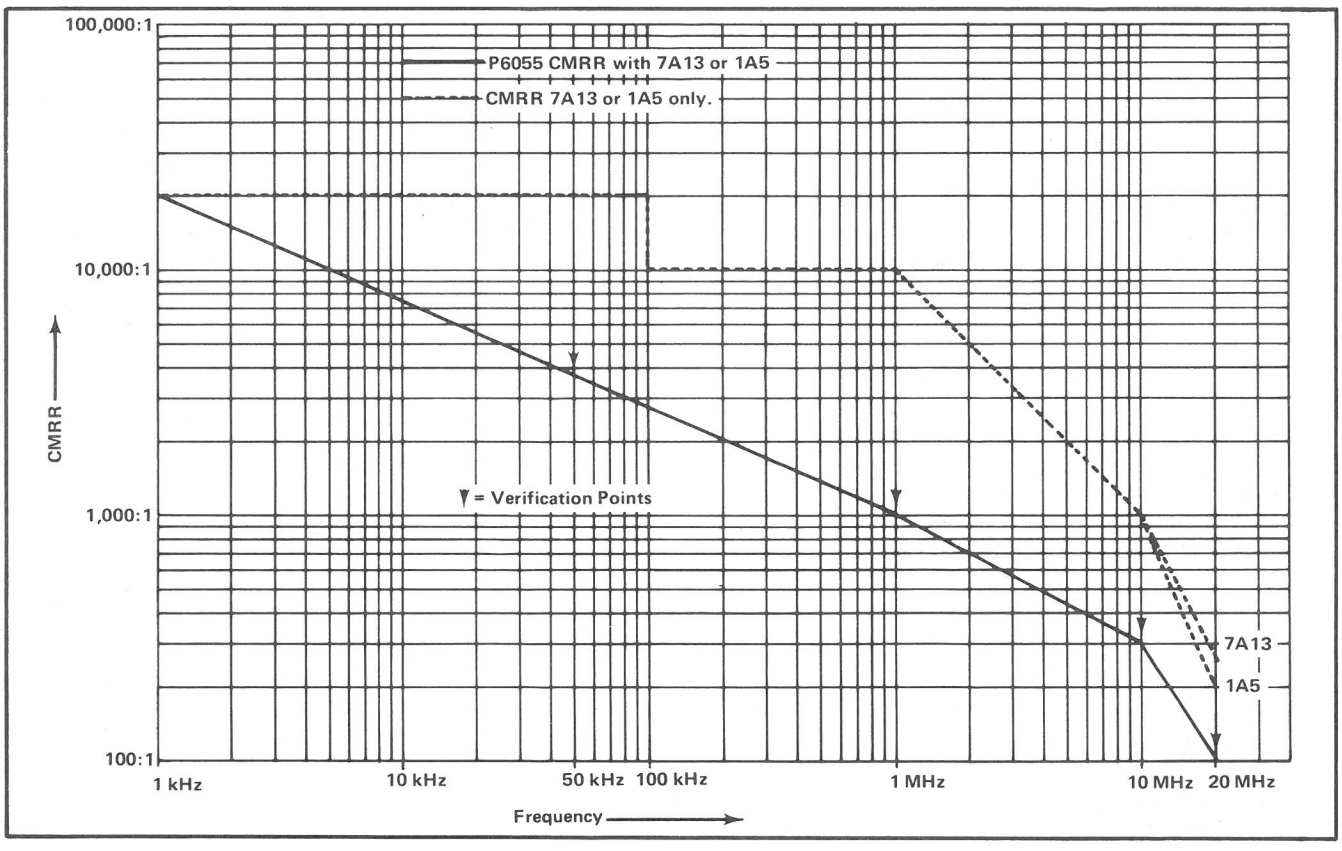


Fig. 1-4. P6055 Probe pair, CMRR vs. frequency (with 7A13 or 1A5).

SECTION 2
OPERATING INSTRUCTIONS

Introduction

The P6055 is a low-capacitance miniature probe with an attenuation ratio that is adjustable to an exact 10X. It is designed for use with Tektronix wide-band differential amplifiers, such as the 7A13 and Type 1A5, and is typically used in pairs for high common-mode rejection ratio applications. The input capacitance, DC attenuation, and high-frequency characteristics are adjustable to permit close matching of a probe pair over a broad range of frequencies.

When used singly, for differential comparator measurements, the precisely adjustable attenuation retains the high accuracy typical of this measurement technique.

Probe-Oscilloscope Compensation

Differential applications require careful matching of both sides of the differential measurement system. In calibrating a probe pair to obtain optimum CMRR, the adjustments compensate for unbalances in the differential amplifier as well as between the probes themselves. Therefore, the probes remain calibrated only for the inputs to which they are adjusted. If the probes are interchanged on the differential amplifier inputs or moved to another instrument, recalibration is necessary. This is also true when using a single probe in differential comparator measurements.

Calibration is not difficult but must be done properly to achieve the high CMRR characteristics. Adjustment procedures for using the P6055 singly in comparator measurements, or in pairs for differential applications, may be found in Section 4 of this manual.

NOTE

Before making any adjustments, see CAUTION in Section 4.

CMRR Considerations

Common-mode signals are those signals which are identical in amplitude, frequency, and phase. CMRR (common-mode rejection ratio) is a figure of merit for differential measurement systems. Common-mode performance is normally expressed as a ratio, such as 10,000:1. This indicates, for example, that 10 volts of common-mode signal at the inputs results in 1 millivolt at the output (with no loss, other than probe attenuation, of the desired signal).

The specified CMRR of a system assumes that the points being measured have identical source impedances. The measurement system input impedance represents a loading effect on the source, and thus affects the common-mode signal voltage seen by the system. Measurement points having a significant difference in source impedance will present an unbalanced common-mode signal to the test system, thus degrading the CMRR performance.

Use of a pair of P6055 probes ahead of the differential amplifier inputs reduces loading at mid-to-high frequencies (due to lower input capacitance), and thus decreases the effect of source impedance differences.

In some cases, the probe compensations have sufficient range to adjust to a balance even in the presence of source impedance differences at the test points. The proper adjustment procedure in this case is: (a) first, compensate the probes for best CMRR with both probe tips connected to the same test point. Identify the nature of the common-mode signal at this time. (b) Then, connect the probe tips to the desired test points and recompensate for best CMRR, making sure that the adjustments are attenuating **only** the common-mode signal. The best CMRR can be obtained by making final adjustments with the signal to be measured. Of course, this may somewhat degrade CMRR performance of the test system for other frequencies, requiring a "touch up" when changing frequencies or moving the probe tips to other test points.

Another advantage in using the P6055 for differential measurements is the extended dynamic range. For example, the Type 1A5 Differential Amplifier specifies ±0.5 V or less for CMRR measurements at 10 MHz. With a pair of P6055 probes, the dynamic range becomes ±5 V for 10 MHz. The 10X increase in range, with a probe pair, applies at all frequencies and settings of the Volts/Div switch, up to the maximum input voltage rating of the probe.

For differential comparator applications, the increased voltage capability permits measurements up to 50 V to be made with resolution to 10 mV/Div (1 mV/Div plus 10X probe attenuation).

Probe Grounding

When using a pair of P6055 probes in a CMRR measurement, neither probe should be grounded to the equipment under test. Instead, the probe shields should be connected together (at the probe body) using the Probe-to-Probe Ground Strap (175-1256-00). See Fig. 2-1 for details.

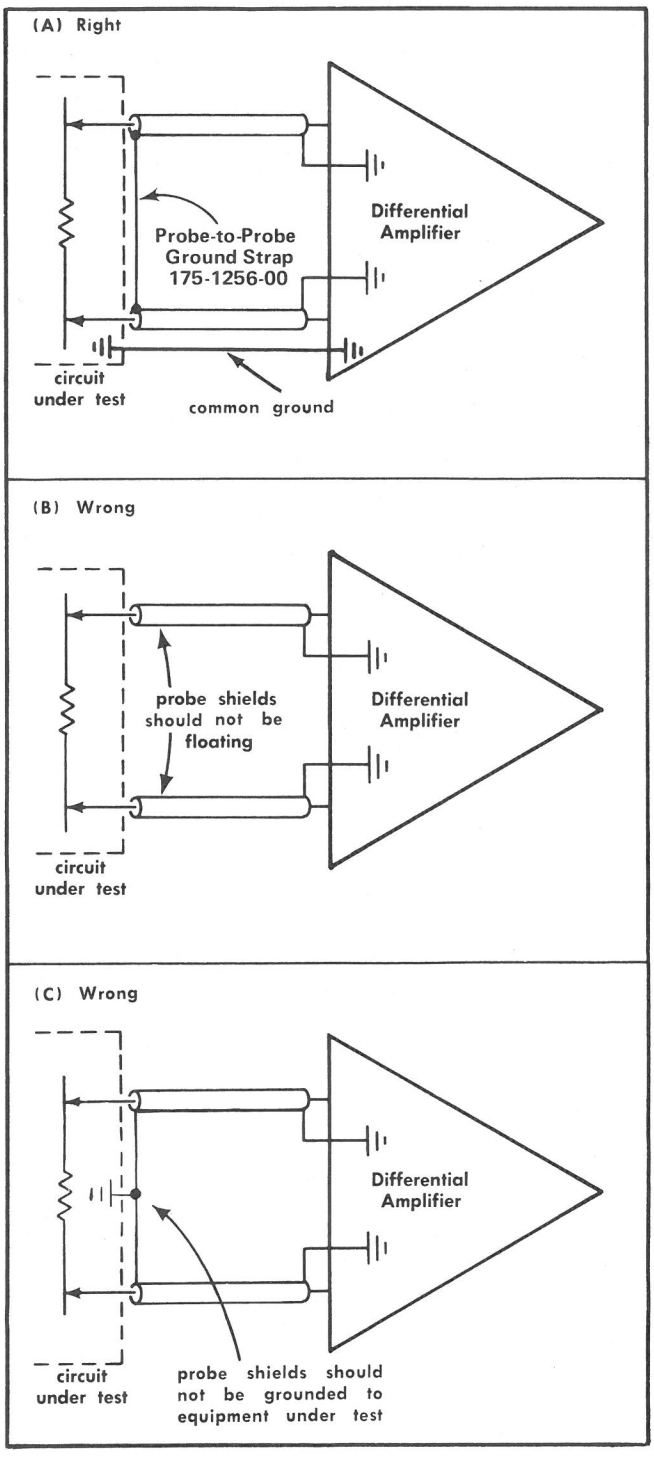


Fig. 2-1. Connecting a differential amplifier across a circuit, using P6055 Probes.

In making differential comparator or other single probe measurements, a ground is necessary. The ground lead should be as short as practical to minimize chances of "ringing". A passive probe such as the P6055 is a capacitance divider for high-frequency components. An inductance 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.

If the ground lead must be long, loop the lead through a small ferrite core to introduce losses in the resonant circuit. A chassis-mounted connector and probe tip-to-connector adapter is the recommended method to obtain a minimum-inductance ground path.[1]

Maximum Input Voltage and Derating Curves

The maximum input voltage without damage to the P6055 Probe is 500 V (DC + peak AC) at low frequencies. As the frequency increases to a point where the input capacitive reactance decreases significantly, the maximum allowable input voltage decreases. When measuring repetitive pulses with a known Duty Factor, the maximum input voltage can be determined by:

$$E_{max} = \frac{\text{Voltage from curve at CW frequency}}{\sqrt{\text{Duty Factor}}}$$

where Duty Factor $= \frac{\text{Pulse Duration}}{\text{Pulse Period}}$. Fig. 1-2 shows the voltage derating vs. frequency curves.

Circuit Loading

Although the input DC resistance of the P6055 Probe is 1 MΩ, it can load any high impedance circuit it is connected into and distort the normal 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. Fig. 1-3 shows R_p and X_p curves as a function of frequency. These curves should be referred to when making measurements at high frequencies.

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

SECTION 3
MAINTENANCE

General

The P6055 is constructed to withstand the rigors of normal everyday usage, but is susceptible to damage if treated carelessly. Avoid sharp kinks or heavy pulls on the cable. Avoid subjecting the probe to excessive environmental conditions (see Section 1). When not in use, probes should be stored in drawers or supported by the plastic probe holder 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 a small percentage will make it difficult or impossible to achieve a common-mode balance with another probe.

The components that are most subject to breakage due to accidental misuse are the probe tip assembly and the cable. Refer to the exploded view in the rear of this manual for the following procedures. Use a low-wattage pencil-tip soldering iron for all soldering operations.

Probe Tip Assembly Replacement

1. Slide the strain relief boot (located just behind the probe body) back several inches on the cable. Then, slide back the rear cover (transition body section) of the probe body.

2. Using a 5/64-inch hex wrench, remove the mounting screw (located just above the cable end in the probe body).

3. Carefully slide the probe tip assembly off the front of the probe, exposing the resistor/capacitor assembly. **Do not** disturb placement of the bare lead lying parallel to the resistor/capacitor assembly.

4. Reassemble with a new probe tip assembly by reversing the above procedure. **Do not** force the new assembly into position. The miniature banana plug (on the resistor lead) must plug into the tip.

Cable Replacement

1. Disassemble the probe body using steps 1 through 4 of Probe Tip Assembly Replacement procedure.

2. Unsolder the cable center conductor at the capacitor.

3. Remove the cable end-fitting from the mounting plate, using a 9/32-inch open-end wrench.

4. Unscrew the knurled nut (at the cable end of the compensating housing) and slide it and the compensator box cover back on the cable several inches.

5. Slide the strain relief boot (located just behind the compensator box) back several inches on the cable.

6. Unsolder the cable center conductor at the P.C. board.

7. Remove the cable from the compensator box by unscrewing the 7/16-inch nut at the rear of the housing while holding the box.

8. Reassemble with the new cable by reversing the above procedure.

CAUTION

The cable center conductor is a very small resistive wire and the exposed ends can be easily broken. Handle with care when inserting the cable through probe fittings. The fine wire is difficult to solder so each end of the replacement cable is fitted with a small metal grommet. Make solder connections to the metal grommet.

For replacement of other probe components, refer to the exploded view and parts list. These will indicate which parts are replaceable individually or as assemblies. Use the procedures above to disassemble the probe body or compensator box.

SECTION 4
PERFORMANCE CHECK /CALIBRATION

Introduction

The following procedures may be used to check performance of the P6055 as specified under Performance Requirement in Section 1, or they will serve as a calibration procedure. By performing the complete procedure, the probe is checked and restored to its original performance standards. The recommended equipment listed is required for both the Performance Check and Calibration procedure.

Limits, tolerances, and waveforms provided in the calibration steps are furnished as guides to calibrating the probe. They are not intended as specifications.

Low-frequency compensation of the probe is required whenever the probe is transferred from one instrument or input channel to another. If the probe is to be used in measurements above 3 to 4 MHz or for observing fast-rise pulses, the HF TERM adjustment should be checked and adjusted as needed for optimum performance. When a probe pair is to be used for differential measurements, all calibration steps should be performed to assure the excellent CMRR performance. The P6055 is quite stable and will stay in adjustment if always used with the amplifier input to which it has been calibrated.

Two adjustment procedures are provided. The first describes how to adjust a single P6055 for use in differential comparator measurements. The second outlines the adjustment of two probes to obtain optimum common-mode rejection ratio in differential measurements.

Before starting the performance check and calibration procedure, it is important to ensure that the test equipment used is properly calibrated and that the differential amplifier meets its CMRR specification.

Equipment and Test Fixtures Required

The following list of equipment or its equivalent is required to conduct a performance check or calibration. Test equipment used must meet or exceed the specified performance requirements.

1. Test Oscilloscope. Bandwidth, DC to 30 MHz or greater; minimum deflection factor, 1 mV/division; two vertical input channels providing choice of independent channel operation, differential mode, or differential comparator mode; CMRR in differential mode, at least 20,000:1 from DC to 100 kHz and at least 1000:1 at 10 MHz; comparison voltage range, 0 V to at least 4 V. A Tektronix 7000-Series Oscilloscope with a 7B51 Time Base and a 7A13 Differential Comparator was used in this procedure. A Tektronix 540-Series Oscilloscope with a Type 1A5 Differential Amplifier will provide similar capabilities.

2. Constant Amplitude Signal Generator. Output signal amplitude, selectable up to 5.0 V into 50 Ω and 10.0 V into 1 MΩ; frequency range, selectable at 50 kHz, 1 MHz, 10 MHz, and 20 MHz. A Tektronix Type 191 was used in this procedure.

3. Square-Wave Generator. Output signal amplitude, variable up to 500 mV into 50 Ω; risetime, 1 ns or less; repetition rate, approx. 100 kHz. A Tektronix Type 106 was used in this procedure.

4. (Two) Adapters, Probe Tip-to-BNC male; Tektronix Part No. 013-0084-01.

5. Termination Adapter, 50 Ω, Probe Tip-to-GR; Tektronix Part No. 017-0088-00.

6. Adapter, BNC Female-to-GR; Tektronix Part No. 017-0063-00.

7. Adapter, BNC T; Tektronix Part No. 103-0030-00.

CAUTION

***Do not** use a metallic screwdriver to make the compensation adjustment in the probe body. The adjusting screw is at the same potential as the probe tip. Signal voltage levels used in this calibration procedure are not normally dangerous, but other signal sources may be used which may be at lethal potentials.*

ABRIDGED PROCEDURE

The following abridged procedures may be used as a performance check or calibration guide by the experienced calibrator, or they may be used as a record. (Tektronix, Inc. authorizes reproduction of the abridged procedure by any user of the equipment.) The step numbers and titles are identical to those used in the complete procedure.

Procedure 1

Adjustment Procedure for Differential Comparator Measurements

1. Check/Adjust DC Attenuation

   DC Attenuation is adjustable to a precise 10X.

2. Check/Adjust Probe Low-Frequency Compensation

   Probe Compensation range is ⩽ 20 pF to ⩾ 47 pF.

3. Check/Adjust Probe High-Frequency Compensation

   Waveform distortion is not more than +3%, −3%, or 4% P-P.

Procedure 2

Adjustment Procedure for Common-Mode Operation (2 Probes)

1. Check/Adjust Probe Pair for Optimum CMRR

   CMRR of probe pair with 7A13 or Type 1A5: 20,000:1 at DC, decreasing to 100:1 at 20 MHz.

DETAILED PROCEDURE

These procedures describe control settings when using a Tektronix 7000-Series Oscilloscope and 7A13 Differential Comparator. A Tektronix 540-Series Oscilloscope with a Type 1A5 Differential Amplifier may be used with equally good results. Names of controls and input connectors are slightly different, but the techniques of use are the same.

When the probe(s) meets the requirements in the Performance Check steps, it will meet all Electrical Characteristics listed under Performance Requirement in Section 1.

Preliminary Procedure

a. Preset the oscilloscope and differential comparator unit controls as follows:

Differential Comparator

Comparison Voltage (V_C)	+4.000
+Input	GND
−Input	GND
Volts/Div	10 mV
BW	Full
Position	Centered

Oscilloscope

Calibrator	4 V, 1 kHz

Time Base

Time/Div	1 ms
Triggering Controls	Auto, Triggered Display

b. Turn on the test oscilloscope, square-wave generator, and constant amplitude signal generator power switches and allow enough warmup time for the instruments to stabilize. (Typically 20 minutes.)

Procedure 1

Adjustment Procedure for Differential Comparator Measurements

1. Check/Adjust DC Attenuation

Requirement—DC Attenuation is adjustable to a precise 10X.

a. Position the trace to the center graticule line.

b. Change the +Input to DC and the −Input to V_C. Then connect the Calibrator output to the +Input connector.

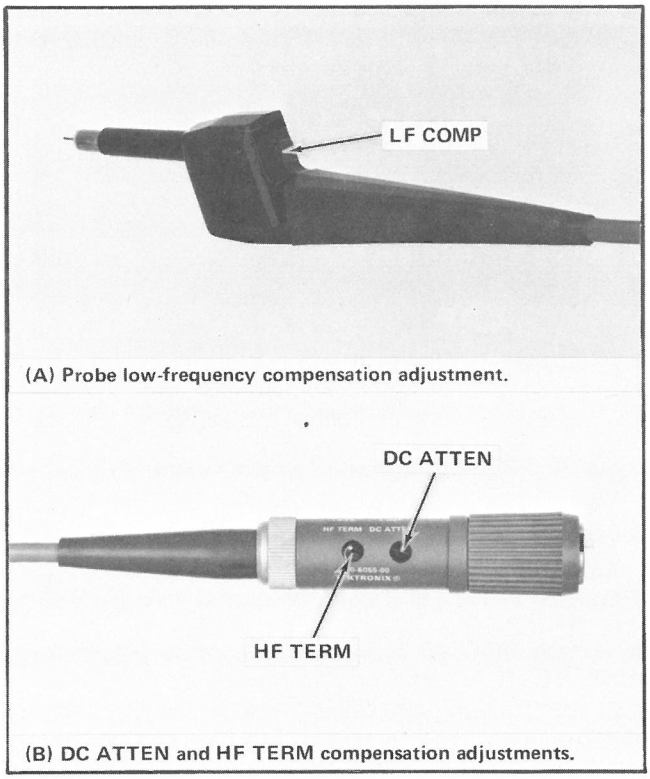
c. Adjust the Comparison Voltage to set the top of the calibrator waveform on the center graticule line. Note the V_C reading. Remove the patch cord.

d. Connect the P6055 to the +Input and the probe tip to the Calibrator output using a Probe Tip-to-BNC Adapter (013-0084-01). Set the Volts/Div to 1 mV and both the + and −Inputs to Gnd. Position the trace to the center graticule line, then change the +Input to DC and the −Input to V_C. Set the V_C to the same voltage as noted in part c.

e. ADJUST—the DC ATTEN potentiometer in the probe compensation box (see Fig. 4-1B) to set the top of the calibrator waveform on the center graticule line. The adjustment should have a range of approximately 3 major divisions under these conditions.

2. Check/Adjust Probe Low-Frequency Compensation

Requirement—Probe compensation range: ⩽ 20 pF to ⩾ 47 pF.



(A) Probe low-frequency compensation adjustment.

(B) DC ATTEN and HF TERM compensation adjustments.

Fig. 4-1. Location of probe compensation adjustments.

a. Change the Time/Div to .2 ms, +Input to DC, −Input to Gnd, Volts/Div switch to 10 mV, and the Calibrator to 0.4 V. The P6055 should remain connected as in Step 1d. Center the display.

b. CHECK—the compensation range of the P6055 as follows:

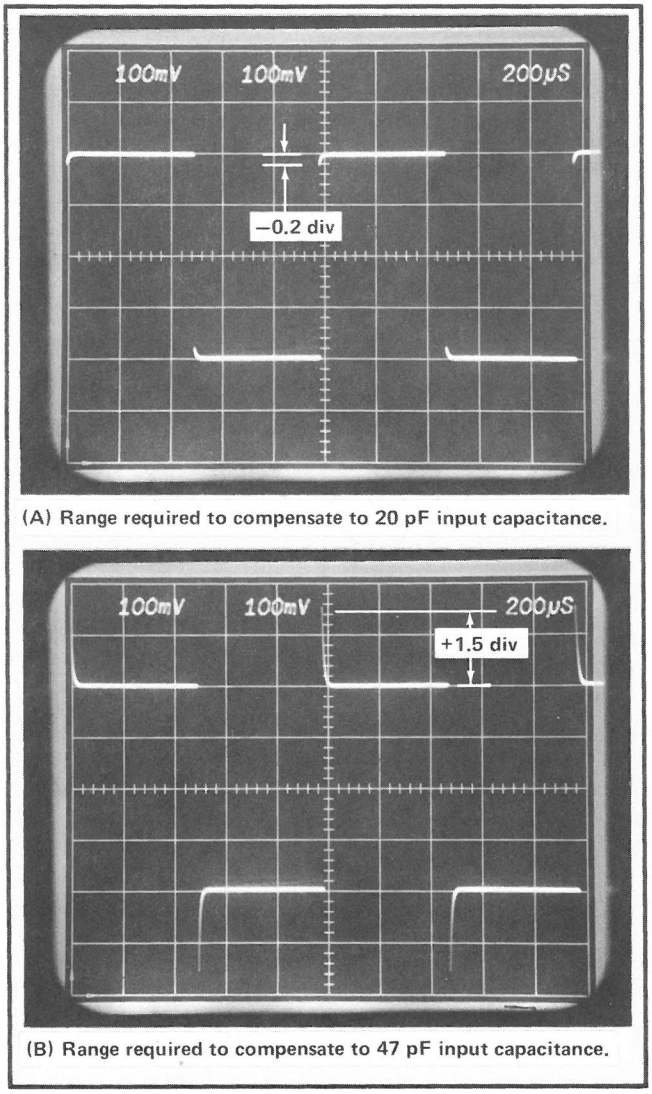
1. Adjust the LF COMP (see Fig. 4-1A) with the accessory screwdriver until the CCW limit is reached.

2. CHECK—Rolloff or undershoot should be approximately 5% of the 4 division square wave, or −0.2 division. (See Fig. 4-2A.) This verifies that the probe LF COMP adjustment will compensate to an input capacitance of 20 pF, −0.4 pF.

3. Adjust the LF COMP to the CW limit (maximum overshoot).

4. CHECK—Overshoot should equal or exceed 37.5% of the 4 division square wave, or 1.5 divisions. (See Fig. 4-2B.) This verifies that the probe will compensate to an input capacitance of 47 pF, +2.5 pF.

c. ADJUST—the probe LF COMP for a square corner.



(A) Range required to compensate to 20 pF input capacitance.

(B) Range required to compensate to 47 pF input capacitance.

Fig. 4-2. Measurement of probe low-frequency compensation range.

3. Check/Adjust Probe High-Frequency Compensation

Requirement—Waveform distortion (aberrations) should not exceed +3%, −3%, or 4% P-P.

a. Connect the probe tip to the +Output of the Square-Wave Generator, using a Probe Tip-to-GR Termination Adapter (017-0088-00). Set the generator Repetition Rate Range to 100 kHz, Symmetry to center, Hi Amplitude/Fast Rise switch to Fast Rise, and set the +Transition Amplitude control for a 5 division display. On the Time Base, change the Time/Div to .2 µs.

b. ADJUST—the HF TERM adjustment in the probe compensation box (see Fig. 4-1B) for a square corner on the pulse. This adjustment affects the leading edge.

The P6055 Probe is now calibrated for use in single-probe differential comparator applications.

Procedure 2

Adjustment Procedure for Common-Mode Operation (2 Probes)

1. Check/Adjust Probe Pair for Optimum CMRR

Requirement—CMRR of probe pair with 7A13 or Type 1A5: 20,000:1 at DC, decreasing to 100:1 at 20 MHz.

NOTE

Before performing this procedure, it is recommended that the CMRR of the differential amplifier be checked to ensure that it meets its performance requirements.

Initial Setup

Attach a BNC T connector (103-0030-00) to the oscilloscope Calibrator output and connect a pair of P6055 Probes to the +Input and −Input on the differential comparator. Connect the probe tips to the BNC T, using a pair of Probe Tip-to-BNC Adapters (013-0084-01).

a. Set the Calibrator to 0.4 V, 1 kHz, Time/Div to .2 ms, Volts/Div to 10 mV, +Input to DC, and −Input to Gnd. Center the display, which should be 2 cycles of a square wave 4 divisions in amplitude.

b. ADJUST—the +Input probe low-frequency compensation (see Fig. 4-1A) for a square corner on the positive leading edge.

c. Change the +Input to Gnd and the −Input to DC. Center the display.

d. ADJUST—the −Input probe low-frequency compensation for a square corner on the negative leading edge.

e. Move the +Input probe tip from the Calibrator to the +Output of the square-wave generator, using a Probe Tip-to-GR Termination Adapter. Set the generator repetition rate to 100 kHz and the output to Fast Rise. Set the +Transition Amplitude for a 5 division display. Change the Time/Div to .2 µs, the +Input to DC, and the −Input to Gnd.

f. ADJUST—the +Input probe HF TERM (see Fig. 4-1B) for a square leading corner at the **top** of the pulse.

g. Remove the +Input probe from the generator output and connect the −Input probe to this point. Change the +Input to Gnd and the −Input to DC. Center the trace.

h. ADJUST—the −Input probe HF TERM for a square leading corner at the **bottom** of the pulse. Disconnect the probe tip from the generator.

i. Change the Volts/Div to 1 mV and the +Input and −Input to Gnd. Center the trace. Then set the +Input and −Input to DC. Change the Time/Div to 1 ms and the Calibrator to 40 V. Connect both probe tips to the calibrator output, using adapters and the BNC T.

j. ADJUST—the DC ATTEN (see Fig. 4-1B) on either probe to balance out the square wave component. Disregard any remaining spikes at this time.

k. Attach the BNC T connector to the output of the Constant Amplitude Signal Generator, using a GR-to-BNC Female Adapter (017-0063-00). Connect both probe tips to the BNC T using Probe Tip-to-BNC Adapters. Set the signal generator frequency to 50 kHz and the output amplitude to 5 V.

l. On the differential comparator, set the +Input to DC, the −Input to Gnd, and the Volts/Div to .2 (2 Volts/Div including 10X attenuation of probe). Change the oscilloscope Time/Div to 20 µs. Set the signal generator variable amplitude to obtain a display of 5 divisions P-P (10 volts).

NOTE

The signal generator is not terminated in 50 Ω with this setup, so the output amplitude is 2X normal.

m. Change the −Input to DC and the Volts/Div to 1 mV. Center the display.

n. ADJUST—the LF COMP of either probe to obtain minimum display amplitude. If the P-P amplitude (excluding noise) still exceeds .27 division, adjust the DC ATTEN on either probe for minimum amplitude. (See Fig. 4-1B.) Fig. 4-3 shows a typical display at completion of this step.

o. Change the signal generator frequency to 10 MHz and the Time/Div to .1 µs.

p. ADJUST—the HF TERM on either probe to obtain minimum display amplitude. The P-P amplitude should be 3.3 divisions or less.

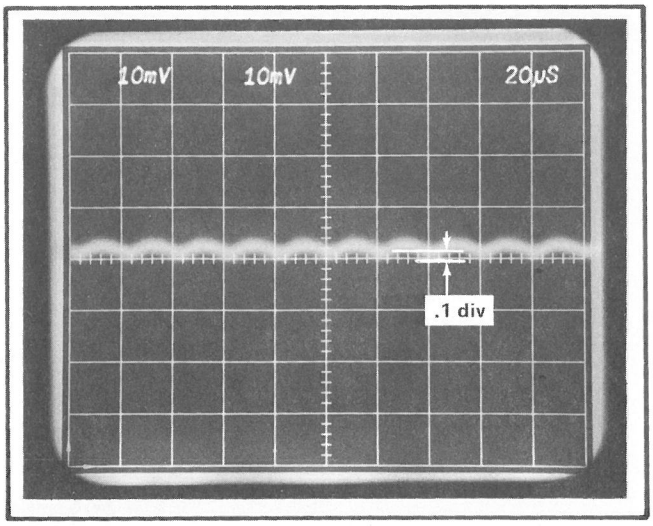


Fig. 4-3. Typical common-mode signal remaining after a probe pair has been properly compensated. Input is 10 V at 50 kHz.

q. Change the signal generator frequency to 20 MHz and the Volts/Div to 2 mV (20 mV with 10X probe attenuation).

r. CHECK—Peak to peak amplitude of the display. It should be 5 divisions (100 mV) or less. If the amplitude exceeds 5 divisions, a slight readjustment of HF TERM should be made.

NOTE

Some interaction exists between the LF COMP, DC ATTEN, and HF TERM adjustments. After performing the initial adjustments, optimum CMRR is obtained by repeating the procedure (steps n through r) two or three times. Use Table 4-1 to check Verification Points.

TABLE 4-1

Verification Points for CMRR (with 7A13)

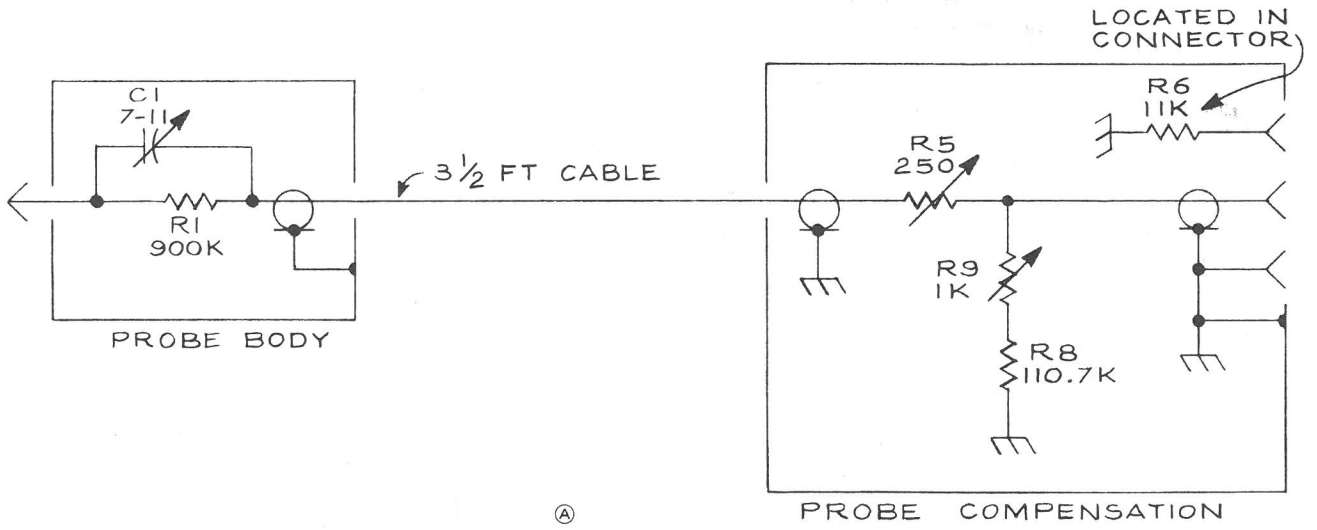
Signal Generator		Volts/Div (at probe tips)	Time/ Div	Amplitude	CMRR
Frequency	Amplitude				
50 kHz	10 V	10 mV	20 μs	.27 div or less	3700:1
1 MHz	10 V	10 mV	1 μs	1 div or less	1000:1
10 MHz	10 V	10 mV	.1 μs	3.3 div or less	300:1
20 MHz	10 V[1]	20 mV	.05 μs	5 div or less[2]	100:1

[1] 5 V if Type 1A5 is used.

[2] 2.5 div with Type 1A5.

This pair of P6055 Probes is now calibrated for use in common-mode signal applications if used on the inputs to which they are attached. If they are interchanged, or moved to another differential amplifier, they must be recalibrated for optimum CMRR.

P6055 10X PROBE DIAGRAM



ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description		
			CHASSIS			
			Capacitor			
Tolerance ±20% unless otherwise indicated.						
C1[1]						
			Resistors			
Resistors are fixed, composition, ±10% unless otherwise indicated.						
R1	325-0102-00		900 kΩ	1/4 W	Prec	1/10%
R6	317-0113-00		11 kΩ	1/8 W		5%
			CIRCUIT BOARD Assembly			
	*670-1407-00		Complete Board			
			Resistors			
Resistors are fixed, composition, ±10% unless otherwise indicated.						
R5	311-0978-01		250 Ω, Var			
R8	325-0101-00		110.7 kΩ	1/20 W	Prec	1/10%
R9	311-0635-02		1 kΩ, Var			

[1] **Available with 386-1939-02 assembly only.**

MECHANICAL PARTS LIST

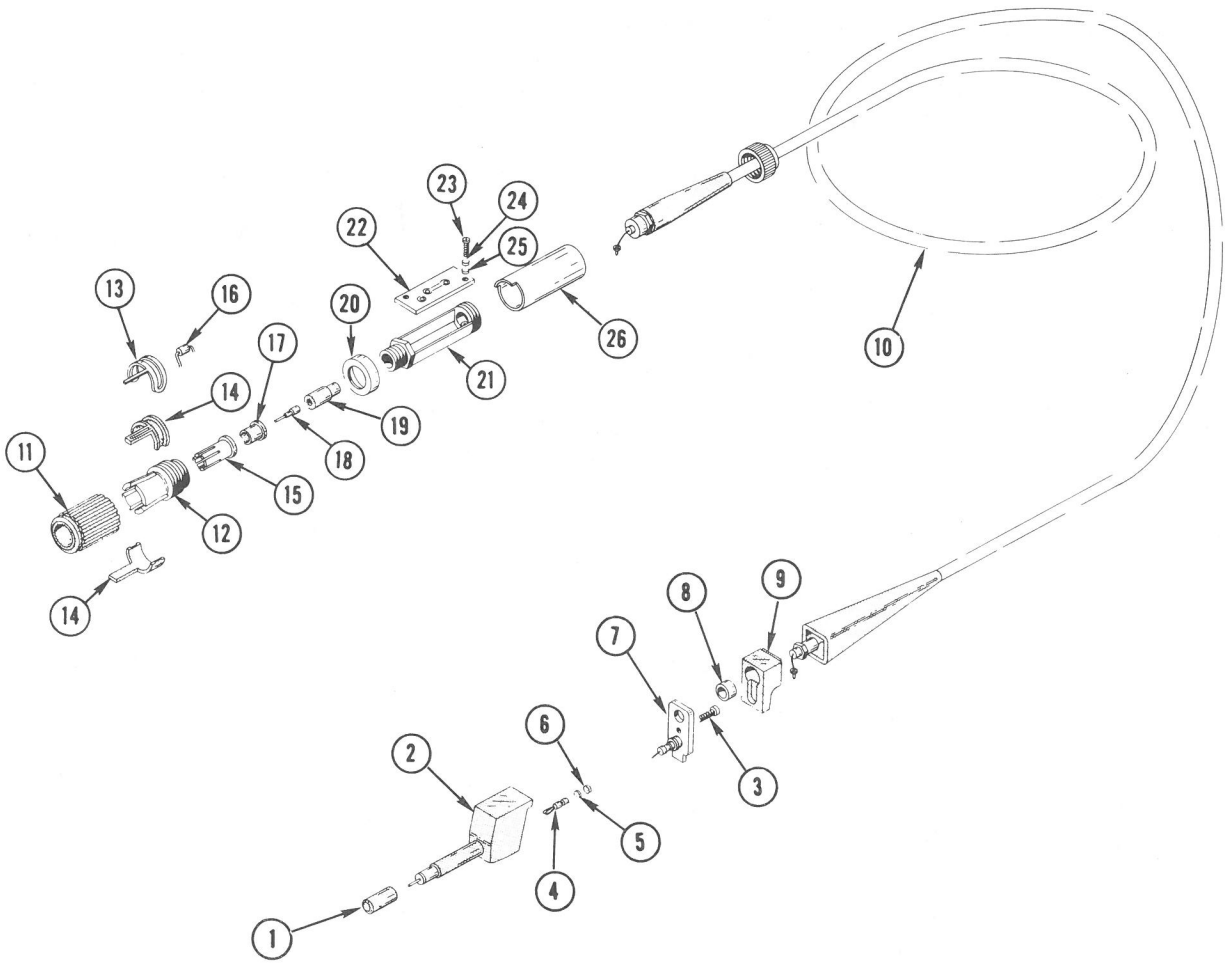


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty 1 2 3 4 5	Description
					REPLACEMENT PARTS
	010-6055-00			1	PROBE, P6055 w/o accessories
	- - - - - -			-	probe includes:
1	015-0201-00			1	TIP, probe, IC test
2	204-0465-01			1	BODY-PROBE TIP ASSEMBLY
	- - - - - -			-	mounting hardware: (not included w/probe tip assembly)
3	211-0162-00			1	SCREW, 2-56 x 0.188 inch, cap HS
4	214-0592-00			1	CONTACT, wire form
5	210-0997-00			1	WASHER, guide, 0.135 inch diameter
6	210-1004-00			1	WASHER, guide, 0.155 inch diameter
7	386-1939-02			1	PLATE, mounting, probe nose w/insulator and capacitor
8	361-0412-00			1	SPACER, sleeve, 0.10 inch long
9	204-0464-00			1	BODY SECTION, probe nose, transition
10	175-1260-01		7141	1	CABLE ASSEMBLY, RF, w/eyelets
	175-1260-02	7142		1	CABLE ASSEMBLY, RF, w/eyelets
11	205-0142-00			1	SHELL, connector, BNC locking
12	204-0473-00			1	BODY, outer, BNC
13	131-1049-00			1	CONTACT, electrical, connector readout
14	342-0076-00			2	INSULATOR, connector, BNC locking
15	204-0472-00			1	BODY, inner, BNC
16	- - - - - -			1	RESISTOR, see electrical parts list
17	358-0072-00			1	BUSHING, insulator, 0.323 inch long
18	214-0109-01			1	CONTACT, electrical
19	342-0077-00			1	INSULATOR, sleeve
20	200-1197-01			1	COVER, end, compensator box
21	426-0613-03			1	FRAME, compensator box
22	670-1407-00			1	CIRCUIT BOARD ASSEMBLY
	- - - - - -			-	circuit board assembly includes:
	388-1964-00			1	CIRCUIT BOARD
	- - - - - -			-	mounting hardware: (not included w/circuit board assembly)
23	211-0160-00			2	SCREW, 0-80 x 0.188 inch, Fil HS
24	210-0065-00			2	WASHER, lock 0.062 ID x 0.13 inch OD
25	210-1107-00			2	WASHER, flat, 0.062 ID x 0.13 inch OD
26	200-1210-00			1	COVER, compensator box

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