



# Tektronix P6010 Oscilloscope Probe Instruction Manual

[Home](#) » [Tektronix](#) » Tektronix P6010 Oscilloscope Probe Instruction Manual 

## Contents

- 1 Tektronix P6010 Oscilloscope Probe
- 2 WARRANTY
- 3 CHARACTERISTICS
- 4 OPERATING INSTRUCTIONS
- 5 ACCESSORIES
- 6 Operating Instructions
- 7 MAINTENANCE AND CALIBRATION
- 8 MAINTENANCE
- 9 CALIBRATION
- 10 PARTS LIST AND SCHEMATIC
- 11 ABBREVIATIONS
- 12 SPECIAL NOTES AND SYMBOLS
- 13 PROBE and STANDARD ACCESSORIES
- 14 REPLACEABLE PARTS (3.5 foot)
  - 14.1 REPLACEABLE PARTS (6 foot)
- 15 REPLACEABLE PARTS (9 foot)
- 16 ELECTRICAL PARTS LIST
- 17 Documents / Resources
- 18 Related Posts

# Tektronix

**Tektronix P6010 Oscilloscope Probe**

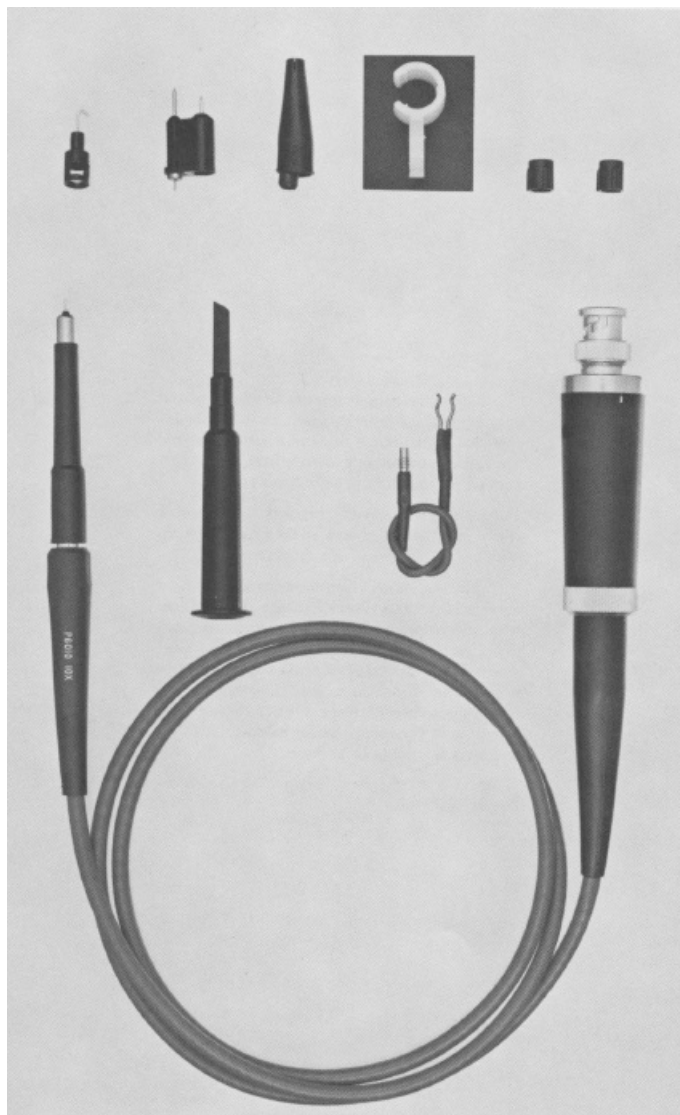


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## **WARRANTY**

All Tektronix instruments are warranted against defective materials and workman ship for one year. Tektronix transformers, manufactured in our own plant, are war- ranted for the life of the instrument. Any questions with respect to the war ranty mentioned above should be taken up with your Tektronix Field Engineer. Tektronix repair and replacement-part service is geared directly to the field, there fore all requests for repairs and replace ment parts should be directed to the Tek- tronix Field Office or Representative in your area. This procedure will assure you the fastest possible service. Please include the instrument Type and Serial number with all requests for parts or service. Specifications and price change priv- ileges reserved.

**P6010**



## CHARACTERISTICS

### General Information

The P6010 Probe is a passive probe with 10X attenuation of signals. It has a small diameter Probe Body for use in compact circuitry. The probe consists of a Probe Body assembly, a Cable Assembly, and a Compensating Box with a BNC connector. The Cable Assembly is available in 3.5-foot, 6-foot, or 9-foot lengths. The Compensating Box houses a network which provides optimum transient response when the probe is used with wide-band oscilloscopes. The probe can be compensated to match the instrument being used, by adjusting the variable capacitor through the hole in the Compensating Box. The probe can be used with plug-in units or oscilloscopes having a 1-megohm input paralleled by 14 to 21 picofarads, and is factory calibrated for 20 picofarads.

### Input Impedance

The input impedance is 10 megohms paralleled by less than 10 picofarads with the 35-foot cable, less than 12 picofarads with the 6-foot cable, and less than 14.5 picofarads with the 9-foot cable (measured at 140 kHz). See Figs. 3-3, 3-4, and 3-5 for input impedance vs. frequency curves.

### Attenuation

Attenuation is 10X,  $\pm 3\%$  with plug-in or oscilloscope.

### Voltage Rating

The maximum DC or AC peak input voltage is 500V, below 12 megacycles. See Fig. 3-6 for Derating Curves.

### Risetime

The risetime of the probe is less than 2 nano-seconds with the 3.5-foot and 6-foot cables, and less than 4

nanoseconds with the 9-foot cable.

## **Transient Response**

The maximum ringing or rolloff is :2%.

## **Connecting Cable**

The cable is made with a special resistive center which provides critical damping of re-flections. ‘

## **Environmental Capability**

The probe will operate normally at temperatures to 75 degrees Celsius.

# **OPERATING INSTRUCTIONS**

## **General Information**

The P6010 Probe enables you to connect an oscilloscope into a circuit with minimum loading and without impedance matching. Due to slight variations in input capacitance between instruments, even of the same type, it is necessary to compensate the probe when-ever changing from one instrument to another. Recheck compensation before making critical measurements. Lack of compensation can cause measurement error since both waveshape and magnitude of the display are affected. The probe is provided with an adjustment to match the probe time constant to the time constant of the instrument. The following procedure should be used to compensate the probe.

## **Compensation**

1. Set the oscilloscope calibrator for an out-put of suitable amplitude.
2. Touch the probe tip to the calibrator out- put connector.
3. Set the sweep rate to display several cycles of the output signal.
4. Through the hole in the Compensating Box, rotate the capacitor (C105) with a small non-conducting screwdriver to obtain a flat-top presentation of the calibrator output signal. See Fig. 2-1.

# **ACCESSORIES**

## **Bayonet Ground Adapter**

The Bayonet Ground Adapter provides a convenient means of connecting the probe to the signal source, when a ground is nearby. Place the ground pin on the ground connection, and push down until the probe tip contacts the signal source. The Bayonet Ground Adapter is especially useful in high-frequency applications due to the short length of the ground lead.

## **Ground Lead**

The Ground Lead clips to the probe between the Probe Body and the Cable Assembly.

## **Insulating Sleeve**

When the ground lead is connected to the probe place the insulating sleeve over the exposed connection to avoid short circuits.

## **Miniature Alligator Clip**

The insulated Alligator Clip screws onto the Ground Lead.

## **Hook Tip**

The Hook Tip provides a stable means of holding onto a test point.

### Pincher Tip

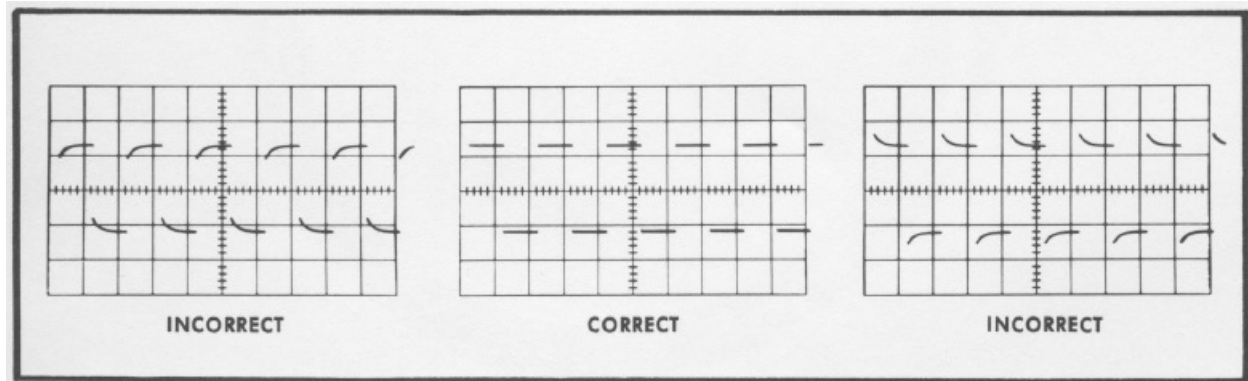
The Pincher Tip provides a positive connection to a test point.

### Insulating Tubes

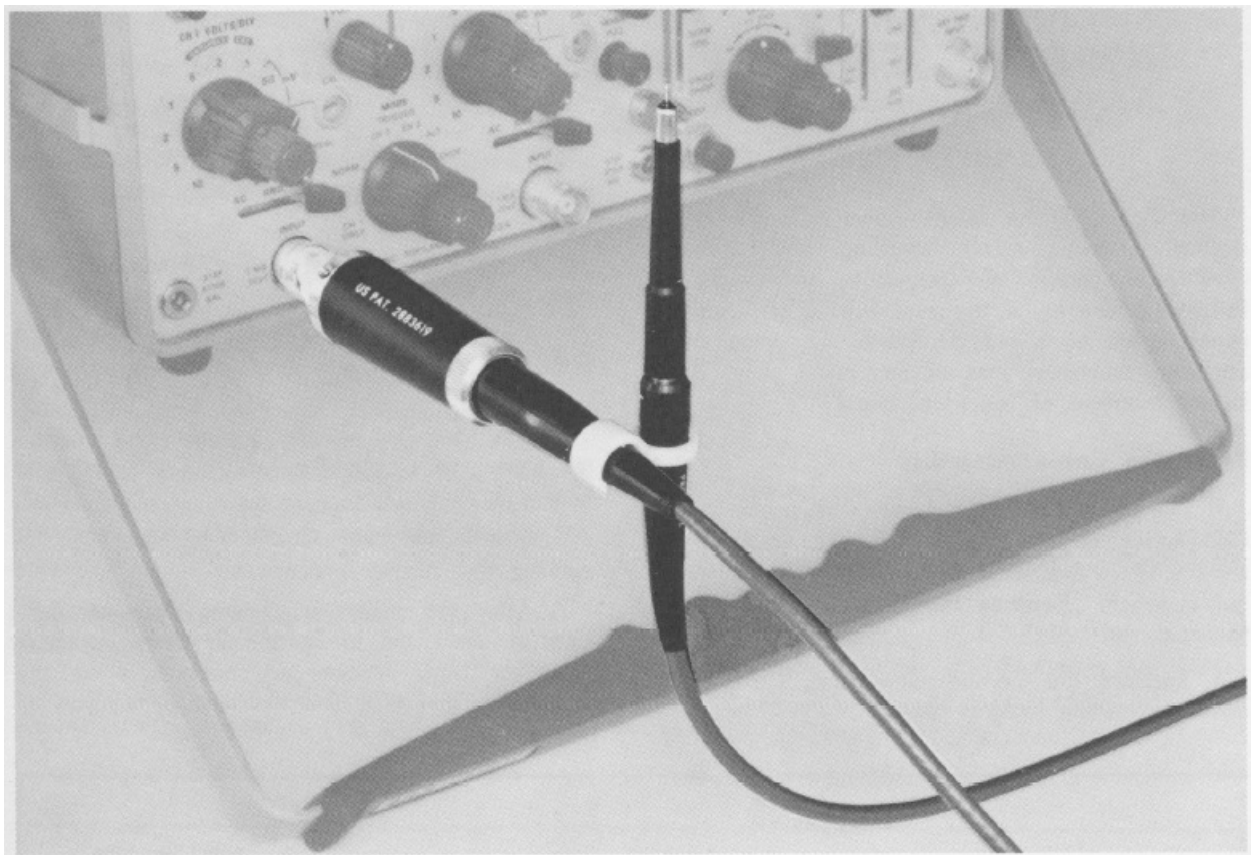
When using the probe without one of the above tips, place an insulating tube over the tip of the probe to avoid short circuits.

### Probe Holder

The Probe Holder provides a convenient means of storing the probe when not in use. After connecting the probe to the instrument being used, place the wide half of the Probe Holder around the cable and slide onto the tapered portion of the Cable Assembly near the Compensating Box. When the probe is not in use, place the tapered portion near the Probe Body into the holder. See Fig. 2-2.



## Operating Instructions



## MAINTENANCE AND CALIBRATION

### MAINTENANCE

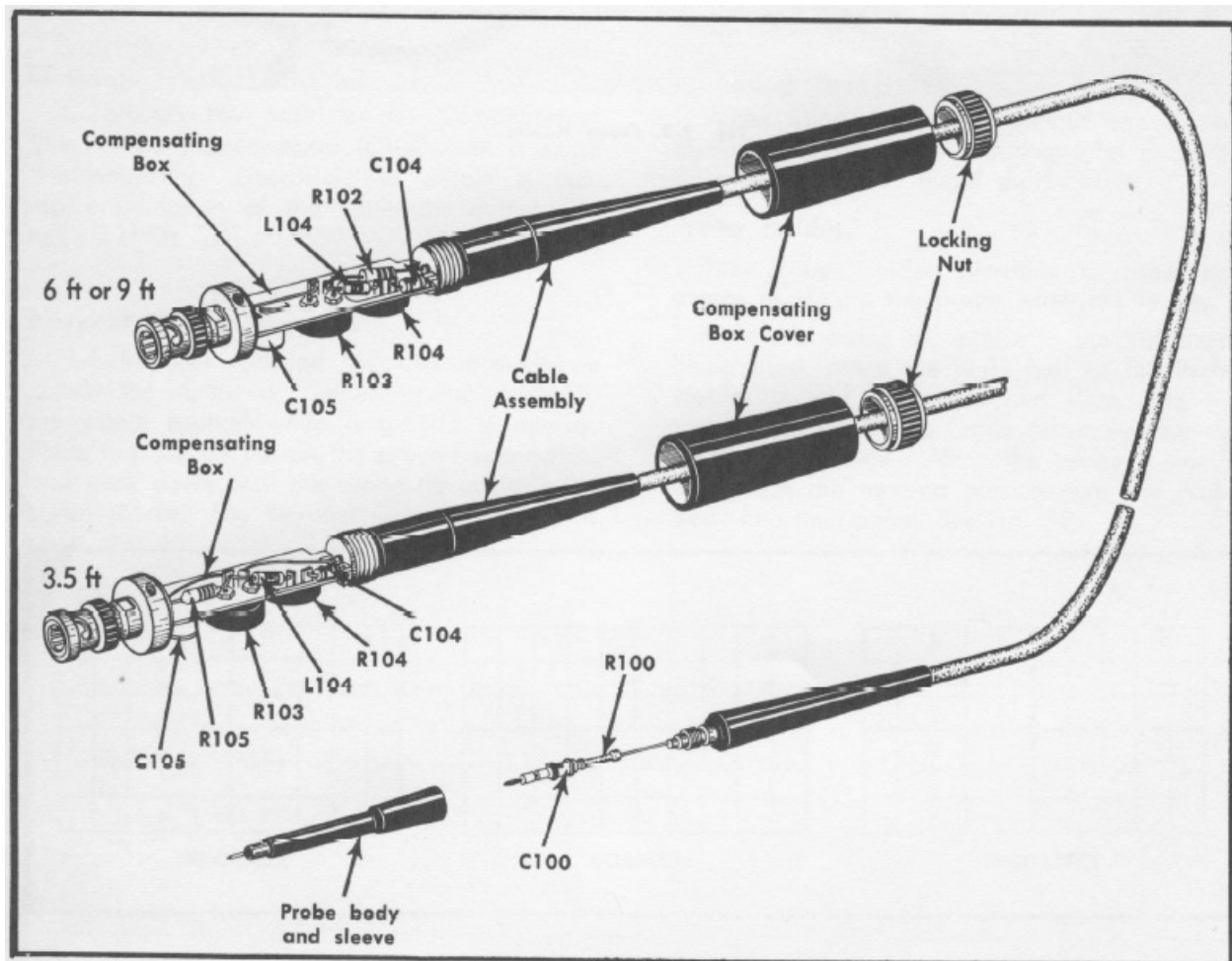
The P6010 Probe is designed to withstand normal operation and handling and should give many hours of

continuous use without failure. However, if the probe fails or breaks, replacement parts are available. See mechanical and electrical lists in Section 4. Fig. 3-1 shows location of electrical parts.

### Replacing Cable Assembly

If the coaxial cable between the probe and Compensating Box should fail, the Cable Assembly is available complete with fittings and cable reliefs. Replace the Cable Assembly as follows:

1. Remove the Compensating Box Cover by unsecuring the locking nut.
2. Unsolder the connection to the end of the Cable Assembly, using a heat sink.
3. Remove the snap ring holding the Compensating Box to the Cable Assembly, and separate the two.
4. Unscrew the Probe Body and Sleeve Assembly from the other end of the Cable Assembly.
5. Unsolder the parallel resistor and capacitor from the Cable Assembly, again using a heat sink.
6. Install the new Cable Assembly by reversing the above procedure.
7. After the probe is reassembled, compensate as described in Section 2. Then compensate for high frequencies according to the procedure given in the Calibration portion of this section.



### Replacing Components

To replace any electrical parts in either the Compensating Box or the probe tip you need only a pair of long-nose pliers and a soldering iron. Use a heat sink to protect the components from excessive heat.

## CALIBRATION

The P6010 Probe is factory calibrated for use with instruments having approximate input characteristics of 1 megohm paralleled by 20 picofarads, and an input time constant of 20  $\mu$ SEC. The probe can be used with instruments having an input capacitance of from 14 to 21 picofarads. An occasional check of the high-frequency

compensating network should be made.

### **High Frequency Compensating Equipment Needed:**

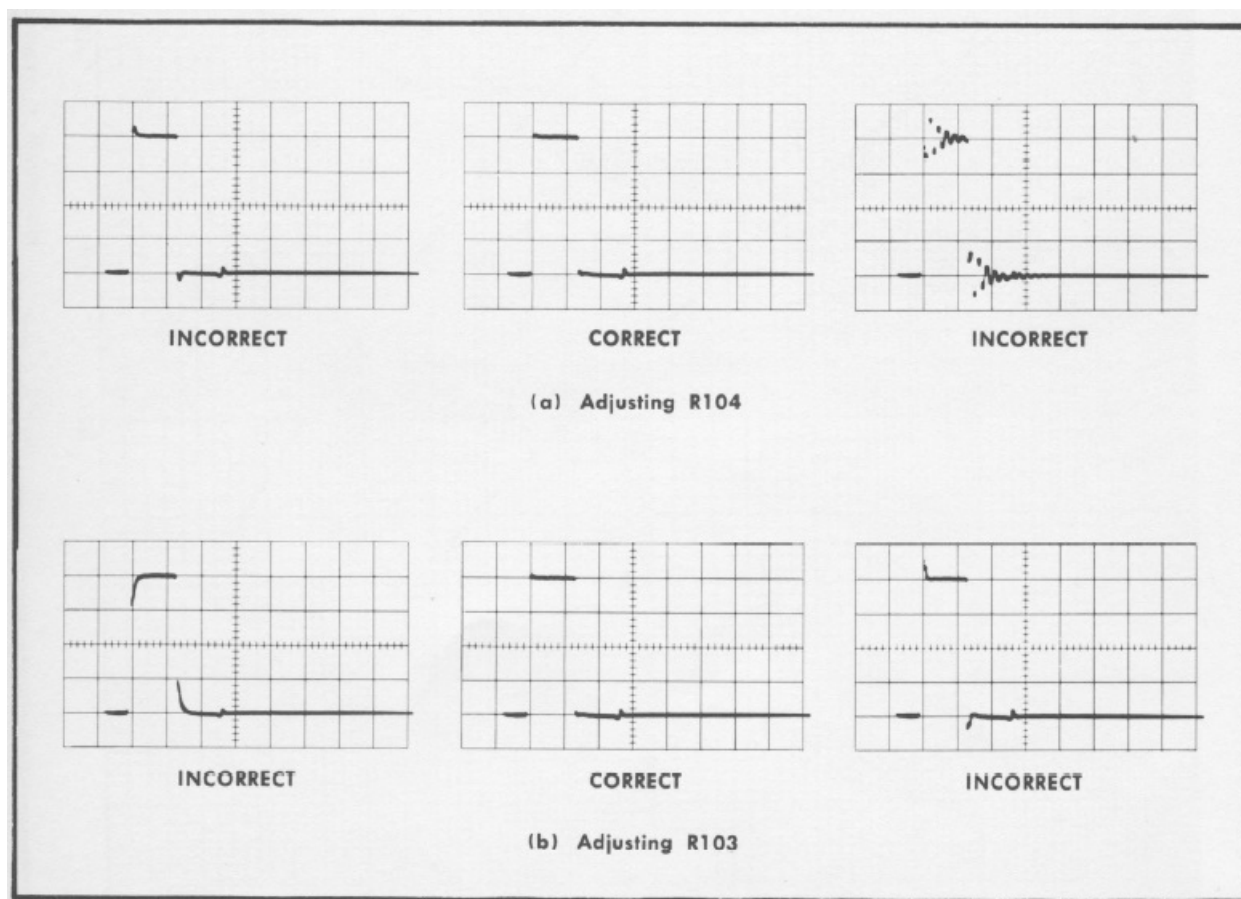
1. Test Scope (with 20 pt input capacitance)
2. 509 Pulser (109 or 110)
3. GR-to-BNC Adapter
4. 500 BNC Termination (011-0049-00)
5. BNC-to-Probe Adapter (013-0084-00)
6. 50 to 100 nanosecond Charge Line

Set the Test Scope as follows:

- CALIBRATOR 1V
- TIME/DIV .5 mSEC
- MAG OFF
- VOLTS/DIV 50 mV/DIV
- AC-GND-DC DC
- TRIGGERING INT SOURCE

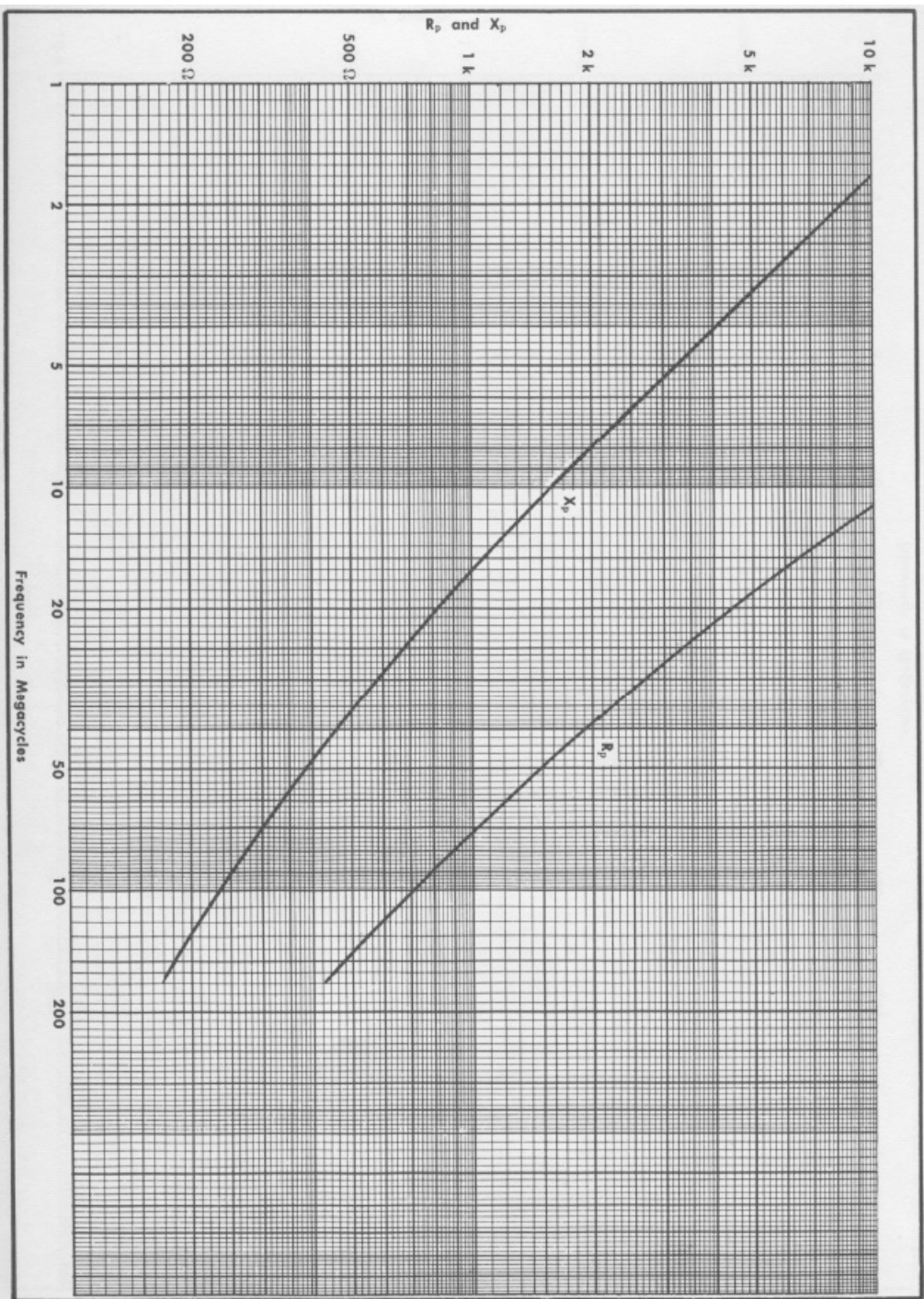
### **Procedure:**

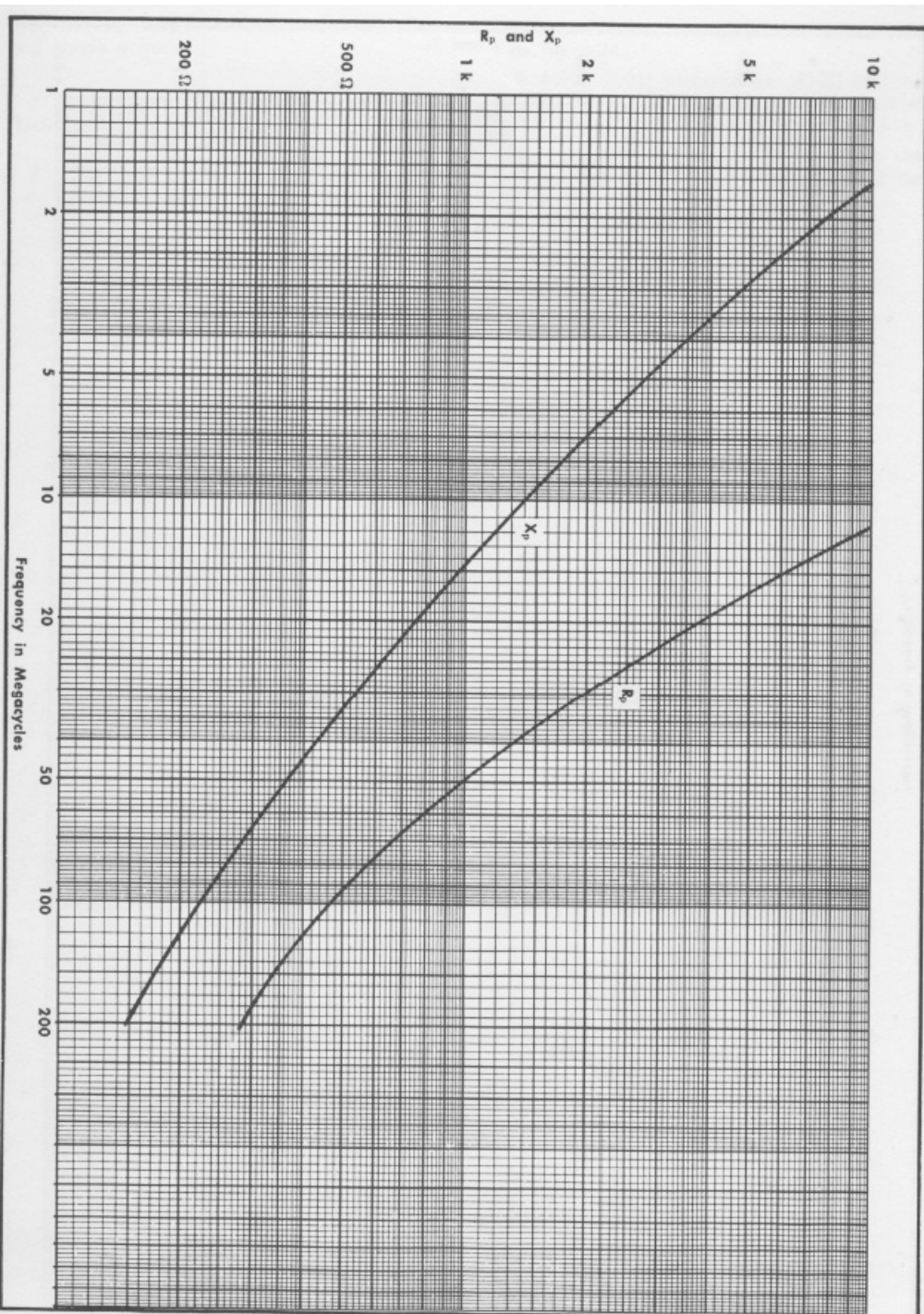
1. Connect the probe to Test Scope input.
2. Using the Calibrator, adjust C105 for proper square-wave response. (See Section 2.)
3. To the output of the Pulser, connect the GR-to-BNC Adapter, 509 BNC Termination, BNC-to-Probe Adapter, and Probe, in that order.
4. Connect one end of the Charge Line to the Pulser. Leave the other end open.
5. Set Pulser VOLTAGE RANGE to 5.

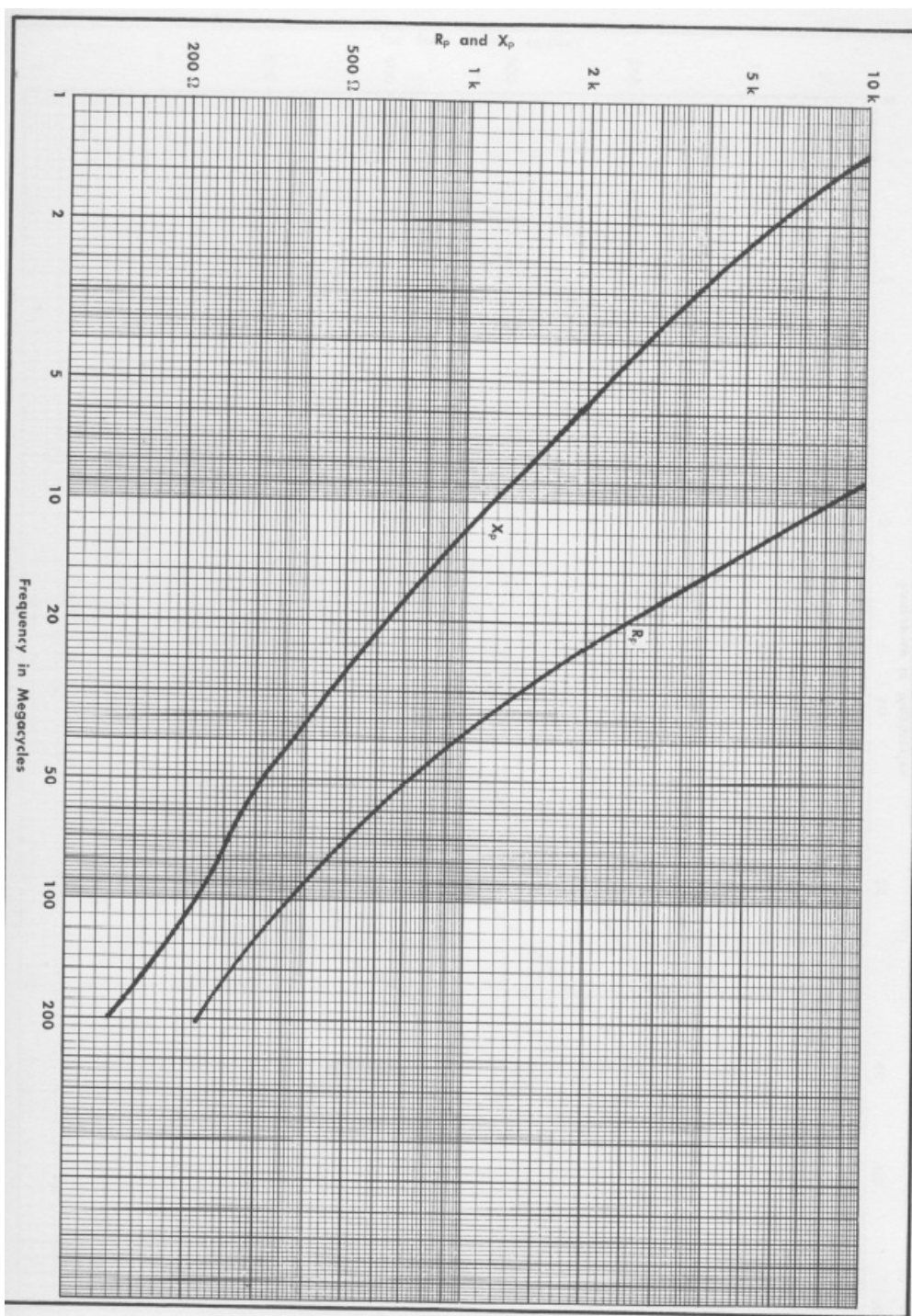


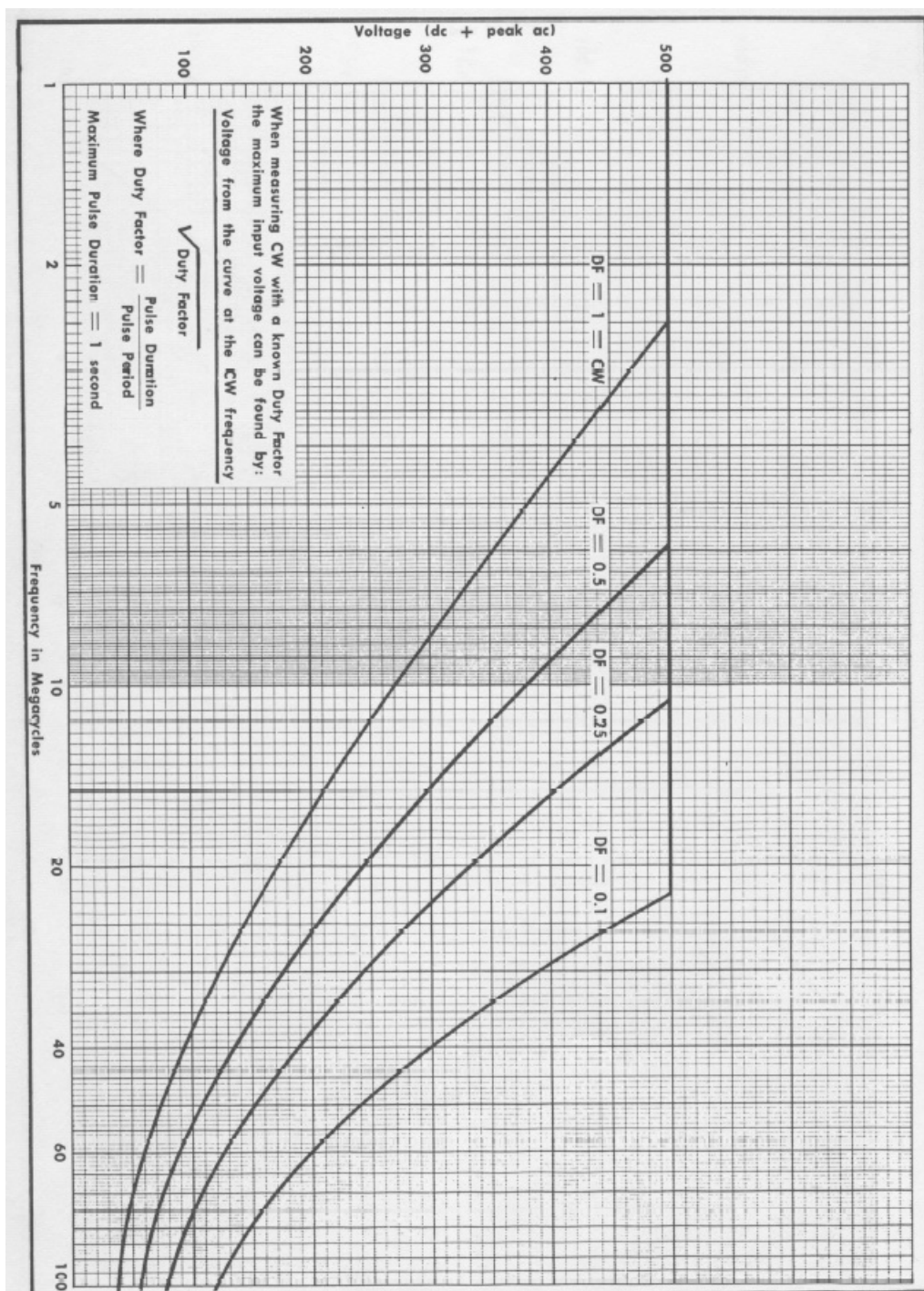
## Maintenance and Calibration—P6010

- Set Test Scope TIME/DIV to .1 "SEC/DIV and obtain a trace.
- Adjust Pulser AMPLITUDE for 4CM de-flection.
- Using a non-conducting screwdriver, adjust 1k potentiometer (R104) to remove ringing and obtain a square corner on waveform.(See Fig. 3-20.)
- Adjust 2009 potentiometer (R103) until the leading corner of the pulse is on the same level as the trailing end of the pulse. (See Fig. 3-2b.)
- Readjust R103 and R104 to obtain the best possible flat-top and front corner of the pulse.









## PARTS LIST AND SCHEMATIC

### HOW TO ORDER PARTS

Replacement parts are available from or through your local Tektronix Field Office. Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, for your order to contain the following information: Part number including any suffix, instrument type, serial number, and modification number if applicable. If a part you have ordered has been replaced with a new or improved part, your local Field Office will contact you concerning any change in part number.

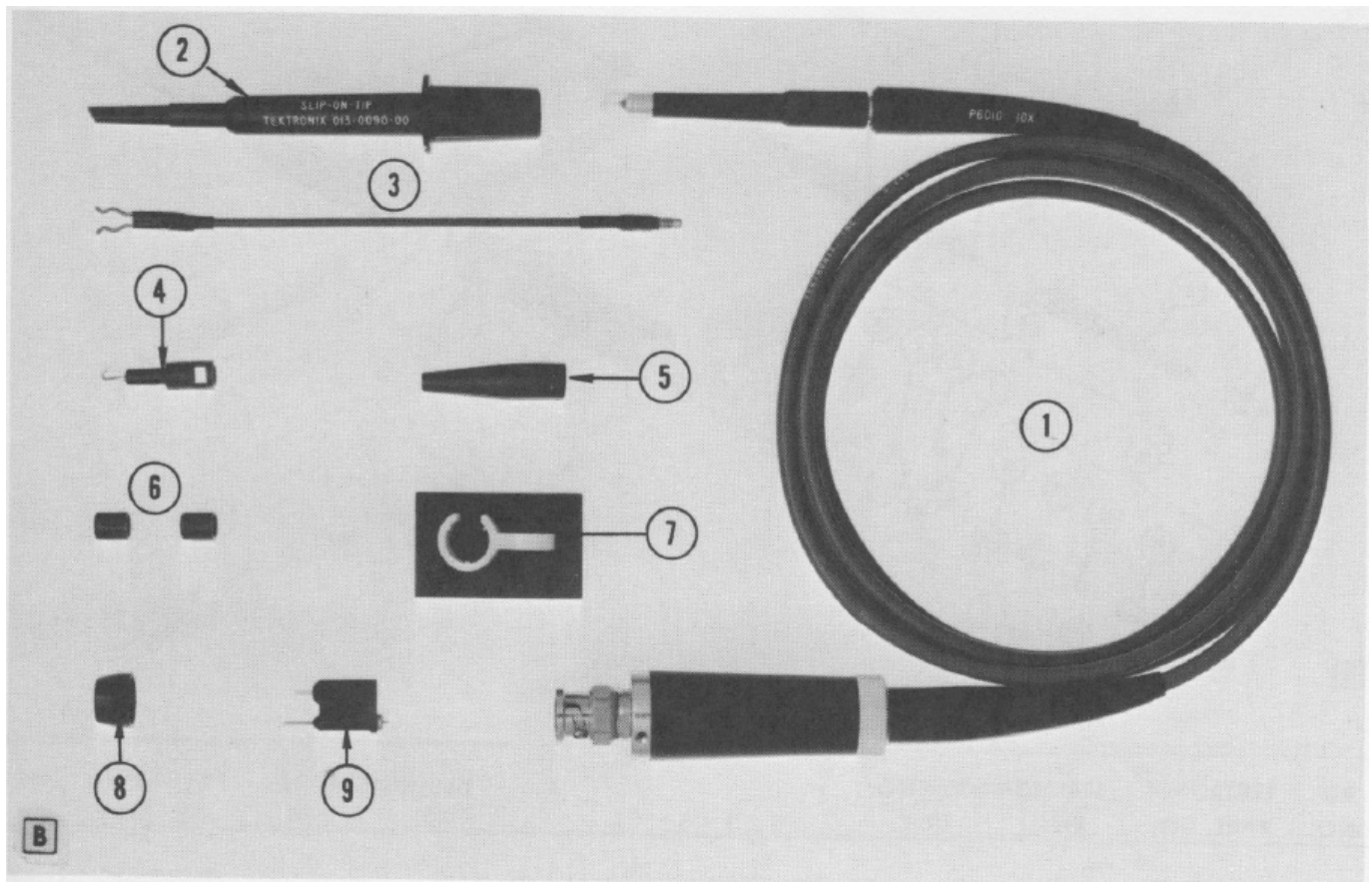
### ABBREVIATIONS

BHS	Binding Head Steel	p	Pico, or $10^{-12}$
f	Farad	PHS	Pan Head Steel
K or k	Kilohms, or kilo ( $10^3$ )	Var.	Variable
M or meg	Megohms, or mega ( $10^6$ )	w	Watt
$\Omega$	Ohm	w/	With

## SPECIAL NOTES AND SYMBOLS

- X000 Part first added at this serial number.
- OOOX Part removed after this serial number.
- 000—000 Asterisk preceding Tektronix Part Number indicates manufactured by or for Tektronix, also reworked or checked components.
- Use 000-000 Part number indicated is direct replacement. 0 Internal screwdriver adjustment.

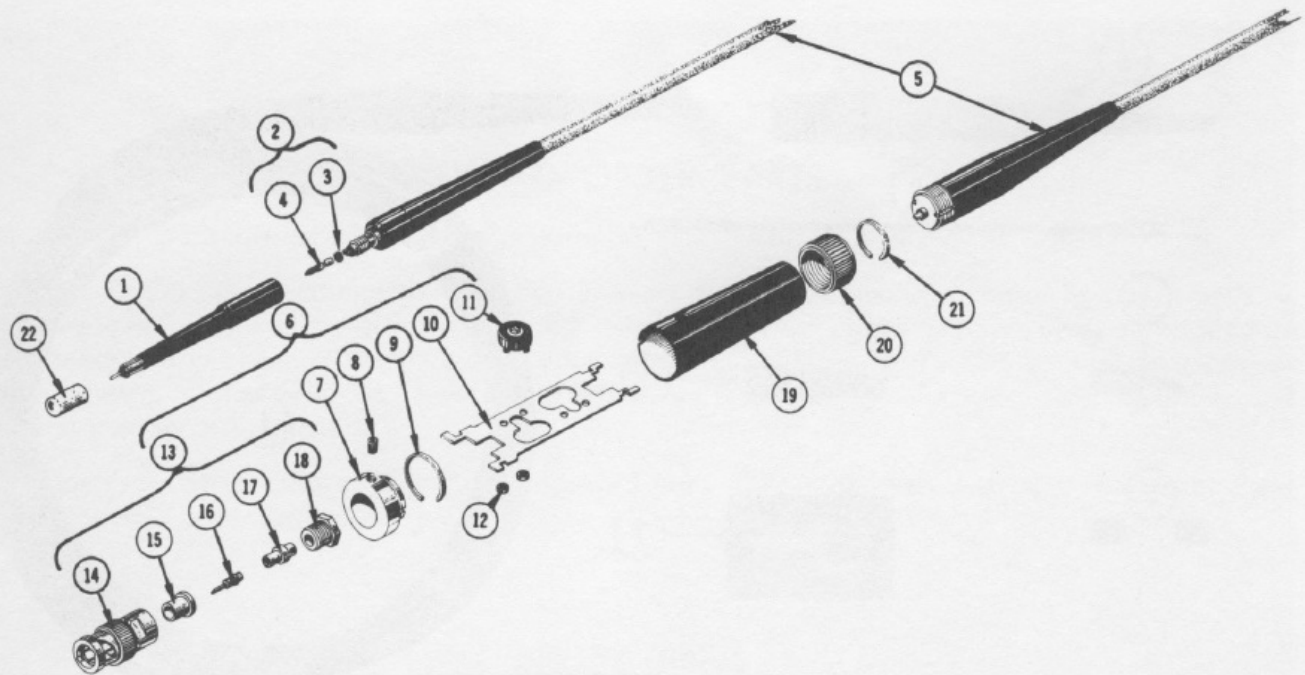
## PROBE and STANDARD ACCESSORIES



REF.	TEKTRONIX	SERIAL/MODEL NO.		Q					
NO.	PART NO.	EFF.	DISC.	T					
				Y.	1	2	3	4	5
PROBE PACKAGE									
1—9	010-0188-00			1	PROBE PACKAGE, P6010, 3.5 foot				
	010-0185-00			1	PROBE PACKAGE, P6010, 6 foot				
	010-0201-00			1	PROBE PACKAGE, P6010, 9 foot				
	- - - - -			-	package includes:				
PROBE ONLY									
1	010-0187-00				PROBE, P6010, 3.5 foot				
	010-0184-00				PROBE, P6010, 6 foot				
	010-0200-00				PROBE, P6010, 9 foot				
STANDARD ACCESSORIES									
2	013-0090-00			1	HOOK TIP, retractable				
3	175-0124-00			1	CABLE, ground lead, 5 inch				
4	206-0114-00			1	TIP, probe				
5	344-0046-00			1	CLIP, probe				
6	166-0404-00			2	TUBE, insulating, molded				
7	352-0090-00			1	HOLDER, probe				
8	166-0433-00	X6746		1	SLEEVE, insulating, gnd strap				
9	013-0085-00			1	ADAPTER, bayonet ground				
	367-0105-00	X6926		1	HANDLE, hook tip (not shown)				

## REPLACEABLE PARTS (3.5 foot)

**B**



- 1 204-0252-00
- 2 206-0148-00
- - - - -
- 3 210-1004-00
- 4 214-0592-00
- - - - -
- - - - -

- 5 175-0337-01
- 6 015-0063-00
- - - - -
- 7 354-0270-01
- - - - -
- 8 213-0020-00

- 9 354-0273-00
- 10 441-0636-00
- 11 - - - - -
- - - - -
- 12 210-0504-00

- 13 131-0428-00
- - - - -
- 14 134-0044-00
- 15 358-0072-00
- 16 214-0109-01
- 17 166-0217-00
- 18 132-0081-00

- 19 200-0630-00
- 20 354-0271-00
- 21 354-0272-00
- 22 200-0372-00

- 1 ASSEMBLY, body and sleeve
- 1 ASSEMBLY, attenuator sub-  
assembly includes:
- 2 WASHER, guide
- 1 CONTACT, wire form
- 1 RESISTOR, R100
- 2 CAPACITOR, C100, C104

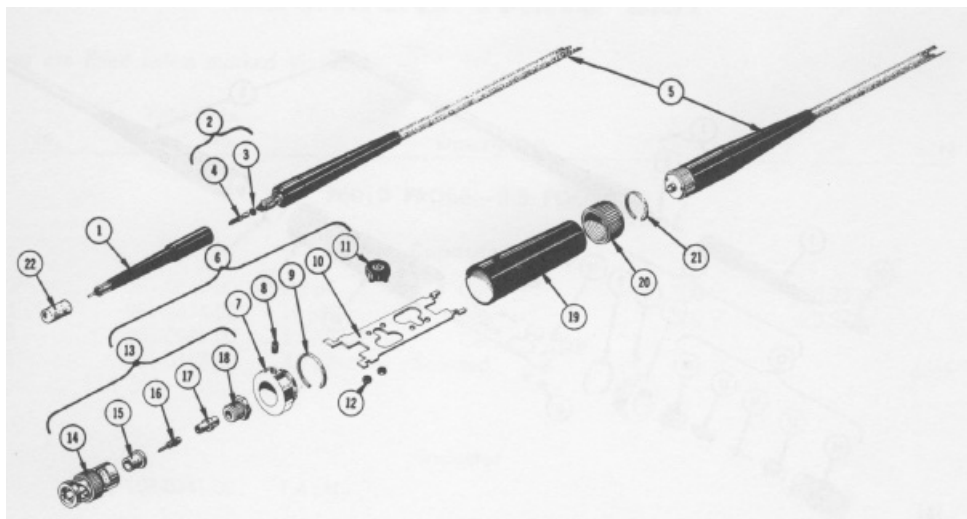
- 1 CABLE ASSEMBLY, 3.5 foot
- 1 ASSEMBLY, compensating box, 3.5 foot  
assembly includes:
- 1 RING, front, compensating box
- mounting hardware: (not included w/ring)
- 1 SCREW, set, 6-32 x 1/8 inch, HSS

- 1 RING, external, 0.625 inch ID
- 1 CHASSIS, compensating box
- 2 RESISTOR, variable, R103, R104
- mounting hardware for each: (not included w/resistor)
- 2 NUT, hex., 0-80 x 5/32 inch

- 1 ASSEMBLY, connector, 1 contact, BNC  
assembly includes:
- 1 PLUG, probe
- 1 BUSHING, insulator
- 1 PIN, probe contact, male
- 1 TUBE, spacer, insulator
- 1 NUT, BNC

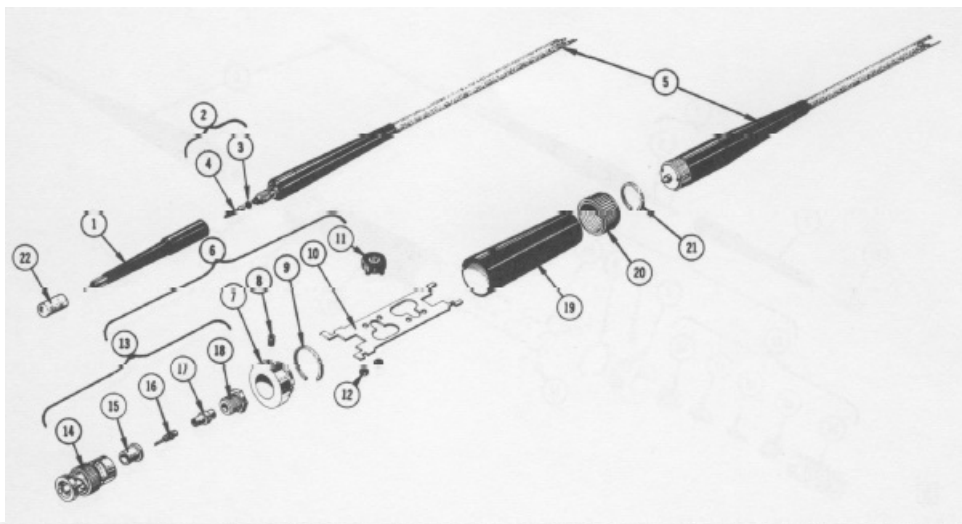
- 1 COVER, compensating box
- 1 RING, locking compensating box
- 1 RING, external, 0.467 inch ID
- 1 CAP, protective, plastic

**REPLACEABLE PARTS (6 foot)**



REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	1	2	3	4	5	DESCRIPTION
		EFF.	DISC.							
1	204-0252-00			1						ASSEMBLY, body and sleeve
2	206-0149-00			1						ASSEMBLY, attenuator
	- - - - -			-						assembly includes:
3	210-1004-00			2						WASHER, guide
4	214-0592-00			1						CONTACT, wire form
	- - - - -			1						RESISTOR, R100
	- - - - -			2						CAPACITOR, C100, C104
5	175-0337-00			1						CABLE ASSEMBLY, 6 foot
6	015-0063-00			1						ASSEMBLY, compensating box, 6 foot
	- - - - -			-						assembly includes:
7	354-0270-01			1						RING, front, compensating box
	- - - - -			-						mounting hardware: (not included w/ring)
8	213-0020-00			1						SCREW, set, 6-32 x 1/8 inch, HSS
9	354-0273-00			1						RING, external, 0.625 inch ID
10	441-0636-00			1						CHASSIS, compensating box
11	- - - - -			2						RESISTOR, variable, R103, R104
	- - - - -			-						mounting hardware for each: (not included w/resistor)
12	210-0504-00			2						NUT, hex., 0-80 x 5/32 inch
13	131-0428-00			1						ASSEMBLY, connector, 1 contact, BNC
	- - - - -			-						assembly includes:
14	134-0044-00			1						PLUG, probe
15	358-0072-00			1						BUSHING, insulator
16	214-0109-01			1						PIN, probe contact, male
17	166-0217-00			1						TUBE, spacer, insulator
18	132-0081-00			1						NUT, BNC
19	200-0630-00			1						COVER, compensating box
20	354-0271-00			1						RING, locking, compensating box
21	354-0272-00			1						RING, external, 0.457 inch ID
22	200-0372-00			1						CAP, protective, plastic

## REPLACEABLE PARTS (9 foot)



REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
1	204-0252-00			1	ASSEMBLY, body and sleeve
2	206-0146-00			1	ASSEMBLY, attenuator
-	- - - - -			-	assembly includes:
3	210-1004-00			2	WASHER, guide
4	214-0592-00			1	CONTACT, wire form
-	- - - - -			1	RESISTOR, R100
-	- - - - -			2	CAPACITOR, C100, C104
5	175-0337-04			1	CABLE ASSEMBLY, 9 foot
6	015-0077-00			1	ASSEMBLY, compensating box, 9 foot
-	- - - - -			-	assembly includes:
7	354-0270-01			1	RING, front, compensating box
-	- - - - -			-	mounting hardware: (not included w/ring)
8	213-0020-00			1	SCREW, set, 6-32 x 1/8 inch, HSS
9	354-0273-00			1	RING, external, 0.625 inch ID
10	441-0636-00			1	CHASSIS, compensating box
11	- - - - -			2	RESISTOR, variable, R103, R104
-	- - - - -			-	mounting hardware for each: (not included w/resistor)
12	210-0504-00			2	NUT, hex., 0-80 x 5/32 inch
13	131-0428-00			1	ASSEMBLY, connector, 1 contact, BNC
-	- - - - -			-	assembly includes:
14	134-0044-00			1	PLUG, probe
15	358-0072-00			1	BUSHING, insulator
16	214-0109-01			1	PIN, probe contact, male
17	166-0217-00			1	TUBE, spacer, insulator
18	132-0081-00			1	NUT, BNC
19	200-0630-00			1	COVER, compensating box
20	354-0271-00			1	RING, locking, compensating box
21	354-0272-00			1	RING, external, 0.467 inch ID
22	200-0372-00			1	CAP, protective, plastic

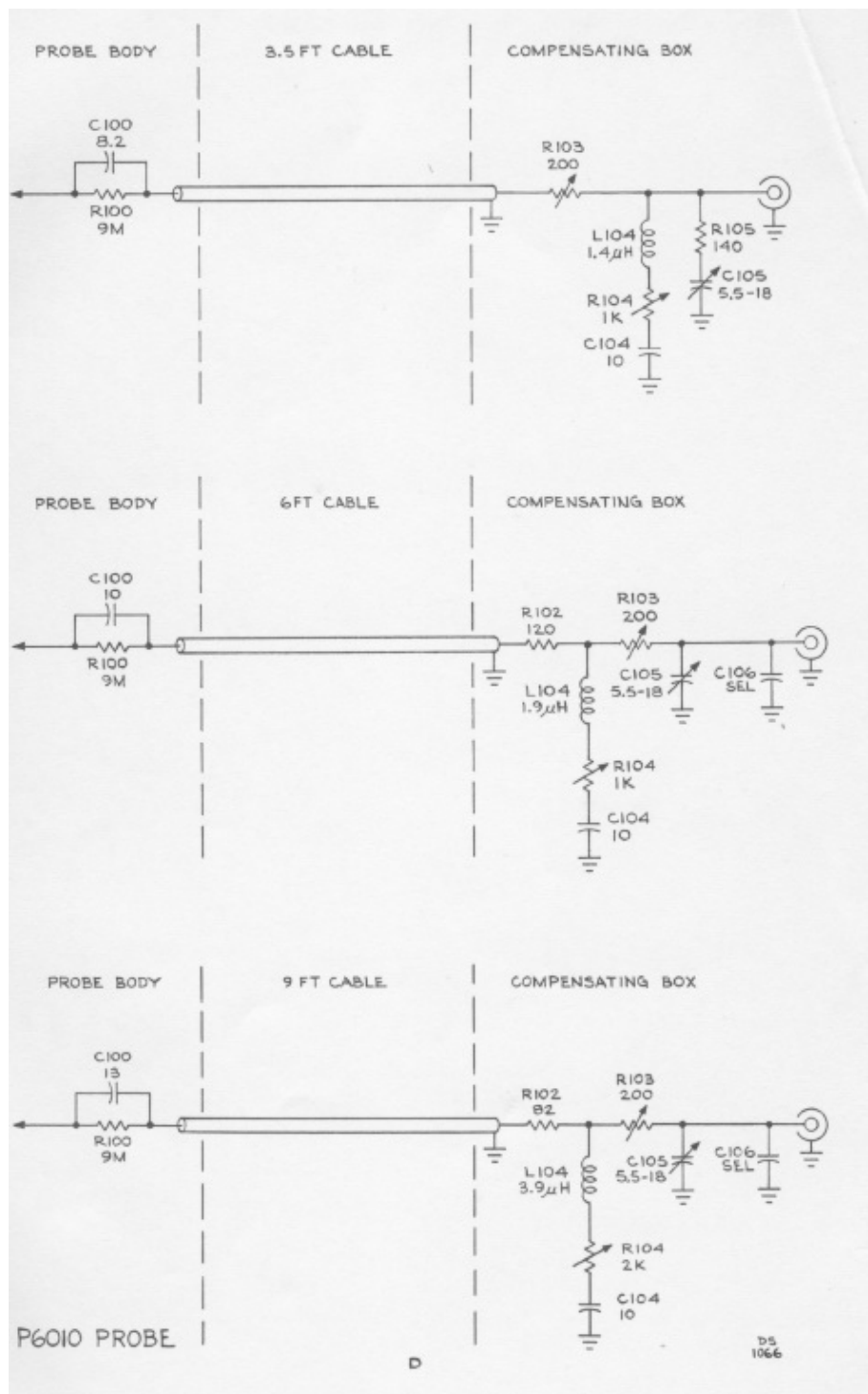
## ELECTRICAL PARTS LIST

Capacitors						
C100 <sup>1</sup>	281-0645-00	8.2 pF	Cer		500 V	±0.25 pF
C104	281-0634-00	10 pF	Cer		500 V	±0.25 pF
C105	281-0061-00	5.5-18 pF	Cer	Var		
C106 <sup>2</sup>	281-0618-00	4.7 pF	Selected			6645
Inductor						
L104	*108-0341-00	1.4 μH				
Resistors						
R100 <sup>1</sup>	319-0037-00	9 MΩ	1/4 W		Prec	2%
R103	311-0303-00	200 Ω		Var		±20%
R104	311-0249-00	1 kΩ		Var		±20%
R105	321-0111-00	140 Ω	1/8 W		Prec	1%
P6010 PROBE—6 FOOT						
Capacitors						
C100 <sup>3</sup>	281-0634-00	10 pF	Cer		500 V	±0.25 pF
C104	281-0634-00	10 pF	Cer		500 V	±0.25 pF
C105	281-0061-00	5.5-18 pF	Cer	Var		
C106 <sup>2</sup>	281-0618-00	4.7 pF	Selected			6645
Inductor						
L104	*108-0345-00	1.9 μH				
Resistors						
R100 <sup>3</sup>	319-0037-00	9 MΩ	1/4 W		Prec	2%
R102	315-0121-00	120 Ω	1/4 W			5%
R103	311-0303-00	200 Ω		Var		±20%
R104	311-0249-00	1 kΩ		Var		±20%

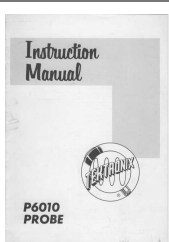
<sup>1</sup>Also available in Attenuator Assembly, Tektronix Part No. \*206-0148-00.  
<sup>2</sup>Added if necessary.  
<sup>3</sup>Also available in Attenuator Assembly, Tektronix Part No. \*206-0149-00.

Capacitors						
Ckt. No.	Tektronix Part No.	Description				
C100 <sup>4</sup>	281-0657-00	13 pF	Cer		500 V	2%
C104	281-0634-00	10 pF	Cer		500 V	±0.25 pF
C105	281-0061-00	5.5-18 pF	Cer	Var		
C106 <sup>5</sup>	281-0618-00	4.7 pF	Selected			
Inductor						
L104	108-0245-00	3.9 μH				
Resistors						
R100 <sup>4</sup>	319-0037-00	9 MΩ	1/4 W		Prec	2%
R102	315-0820-00	82 Ω	1/4 W			5%
R103	311-0303-00	200 Ω		Var		±20%
R104	311-0648-00	2 kΩ		Var		±20%

- Also available in Attenuator Assembly, Tektronix Part No. \*206-0146-00.
- Added if necessary.



## Documents / Resources



[Tektronix P6010 Oscilloscope Probe](#) [pdf] Instruction Manual  
P6010, Oscilloscope Probe, P6010 Oscilloscope Probe

