

Instruction Manual

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P6013A PROBE

070-0603-00

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P6013A

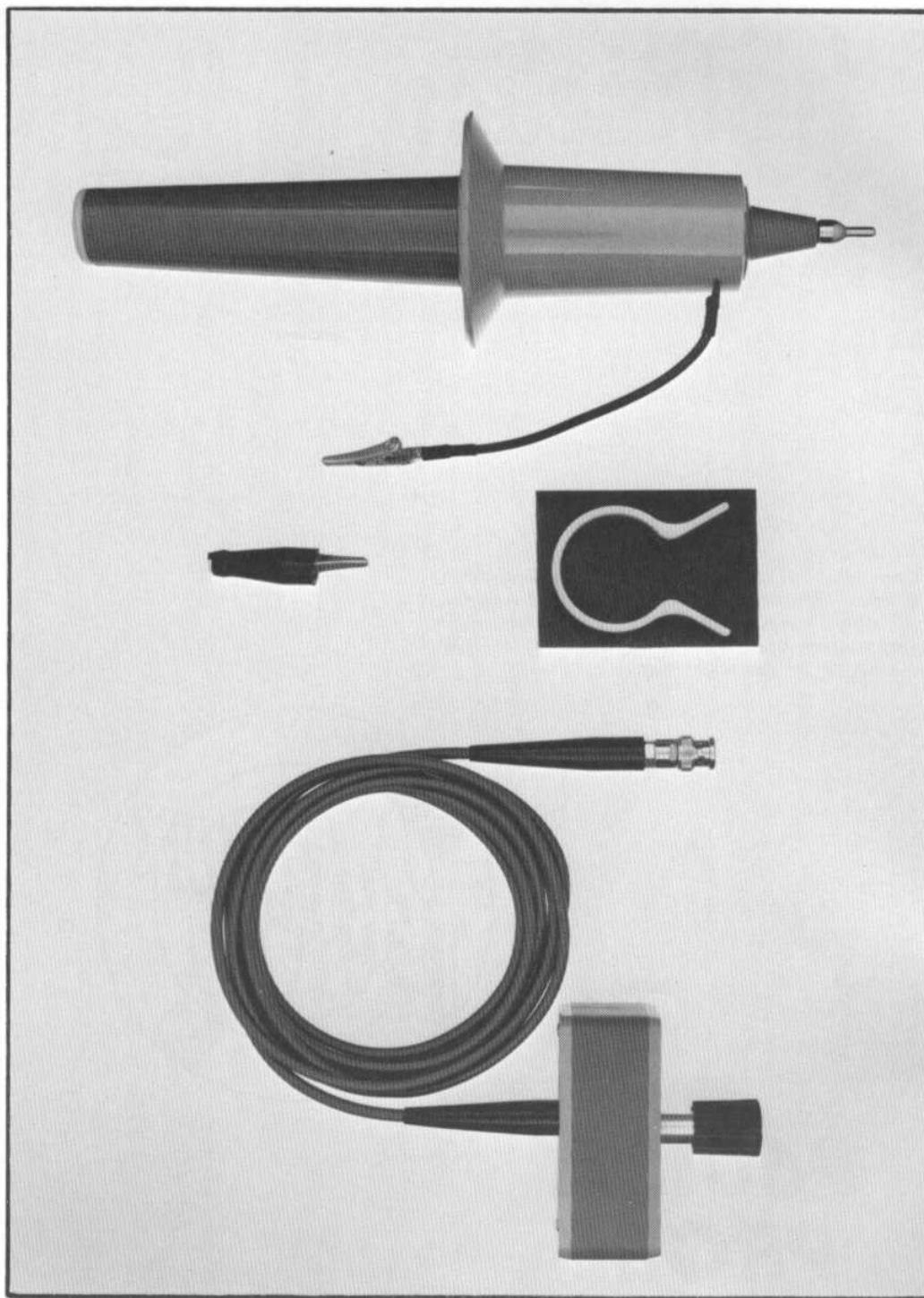


Fig. 1. P6013A Probe and Accessories.

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P6013A PROBE

OPERATING INSTRUCTIONS

General

The Type P6013A Probe was developed to provide a means of observing waveforms of high amplitude on a conventional oscilloscope. The 1000:1 attenuation factor incorporated into the P6013A enables the user to observe waveforms or pulses with a peak amplitude of as much as 12 kV up to 100 kHz¹ (kilohertz) in frequency, or DC voltages up to 12 kV without damage to the probe or the oscilloscope.

The P6013A Probe is designed for electrical and mechanical protection of its internal components, and is covered with thermoplastic offering high impact strength. Weight of the probe alone is ten ounces. The cable has a resistive center conductor, with the value of the resistance chosen to provide optimum performance of the probe. The cable assembly may be removed and replaced. The P6013A may be ordered either with a BNC connector (shown at left) or a UHF connector.

Electrical Characteristics

Attenuation—1000:1

Input Impedance—100 meg, 3 pF

Risetime (with Type 545B Oscilloscope and Type K Plug-In)—14 ns

Maximum Voltage Rating (below 100 kHz)—

Max DC—12 kV

Max Peak Pulse—12 kV

Max Peak AC—12 kV

Maximum Voltage Rating (above 100 kHz)—
Refer to Derating Curves, Fig. 2.

COMPENSATING THE PROBE

The electrical components in the compensating box of the Type P6013A Probe includes four variable trimmer capacitors and two potentiometers. The RC networks in the box are arranged to affect the observed shape of the waveform at different but overlapping points during the first 300 μ s of the pulse.

Five of these adjustments compensate for variations in input capacitance from one instrument to another. For accuracy in pulse and transient

¹ Hz = hertz (cycles per second).

measurements, the probe should be checked frequently.

To check the probe, connect it to the Input connector of the oscilloscope. Set the Calibrator control for an output signal of suitable amplitude. Touch the probe tip to the Cal Out connector and adjust the oscilloscope controls for a display of several cycles. Optimum response is indicated by a flat-top square wave.

Attenuation Adjustment

Before compensating the probe, the attenuation must be checked. To do this, set the Volts/Div of the oscilloscope or plug-in to 0.05 V/Div and the Calibrator control to 100 volts. Touch the probe tip to the Cal Out connector and check for two major graticule divisions of deflection on the CRT screen. If the deflection is more or less than two major divisions, readjust R117 until exactly two major divisions are obtained.

Compensation

To compensate the probe, start by first adjusting C113. This setting affects the front corner and general level of that portion of the waveshape that can be compensated—in other words, the first 300 μ s of the waveform. After positioning the front corner, adjust C114, C115 and C116. Adjusting C114 affects the waveshape from 0.5 to 100 μ s. C115 affects the waveshape from 2 μ s to 120 μ s, and C116 affects the waveshape from 5 μ s to 150 μ s. Since there is interaction between the adjustments of the trimmer capacitors, it will be necessary to repeat the sequence.

A variable peaking resistor (R112) is provided to compensate the first 0.3 μ s of the waveshape. Adjustment of this resistance requires the use of a Tektronix Type 105 Square-Wave Generator, or another square-wave generator capable of producing a pulse with a risetime of 15 ns or less.

If the compensation has been properly adjusted for an oscilloscope of 20-pF input capacitance, adjustment for another input capacitance can generally be achieved by readjusting C113 only.

MAINTENANCE

Circuit troubles that might be expected in the Type P6013A generally fall into three categories. The troubles and their remedies include:

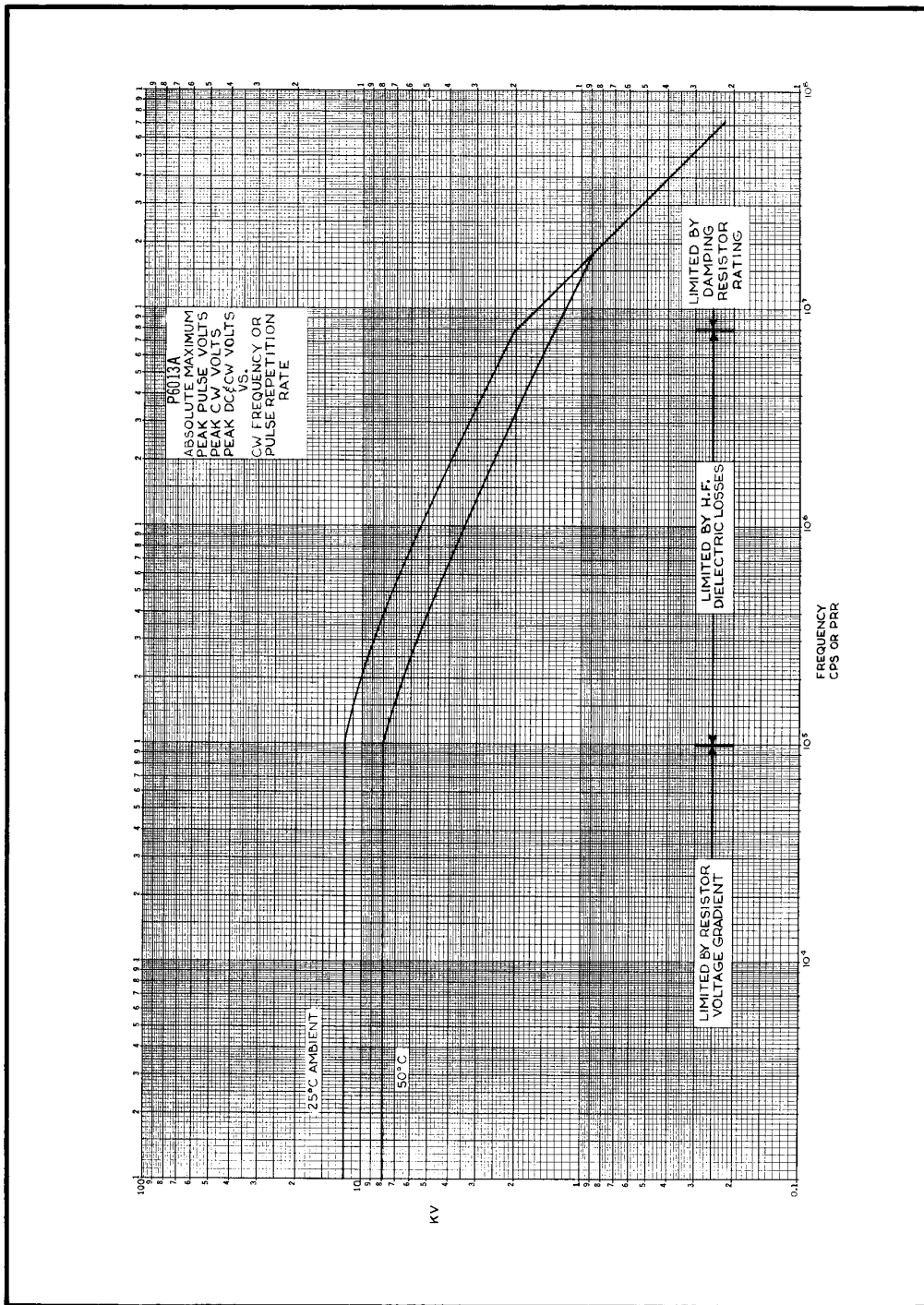


Fig. 2. P6013A Derating Curves.

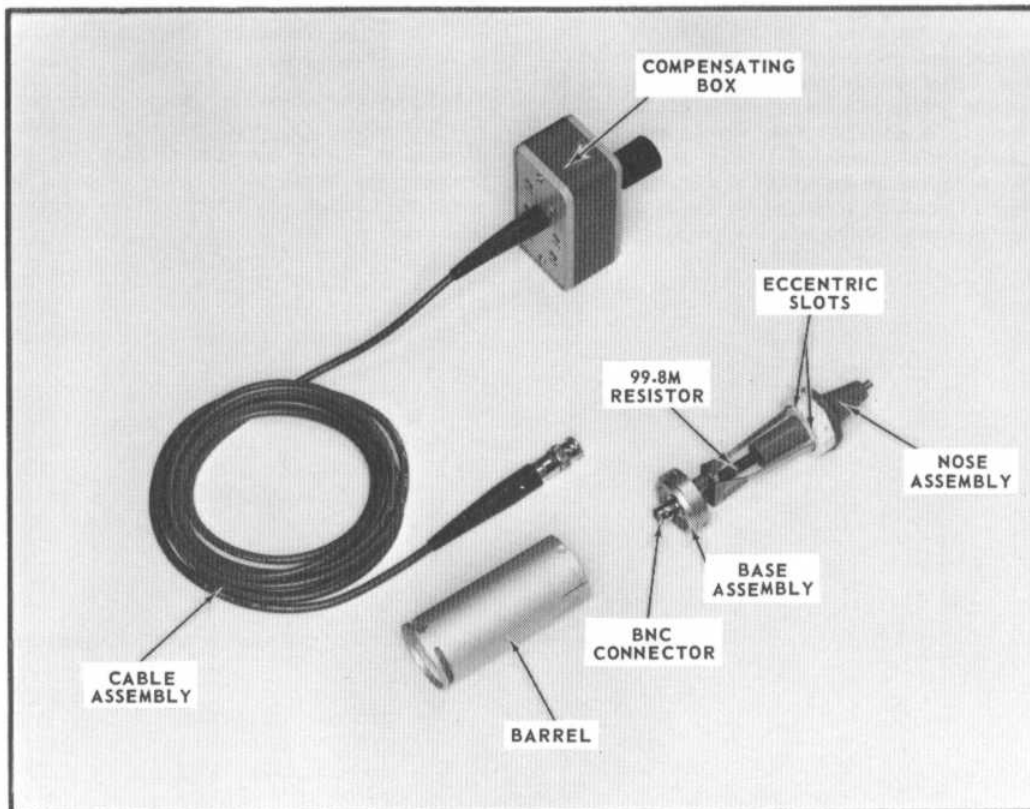


Fig. 3. Probe Assembly.

1. Open center conductor in cable. This is found by connecting the compensating box to the Input connector of the oscilloscope plug-in and touching the probe tip to the Cal Out connector. An open center conductor is indicated if no signal appears on the oscilloscope screen with 100 volts out of the Calibrator. Replace cable assembly.

2. Open 99.8-meg resistor in probe body. This results in AC coupling and is indicated by decay of the Cal signal. To replace the 99.8-meg resistor, dismantle the probe by unscrewing the handle, disconnecting the cable assembly, and pushing the metal barrel out of the probe body (see Fig. 3). Then remove the screws from both ends of the barrel and slide the nose and base assembly out. Insert the replacement nose assembly into the base assembly, being sure that the metal capacitor fingers of the base assembly fit properly into the eccentric circular slots in the nose assembly. Do not bend the

metal fingers any more than absolutely necessary in getting them inserted into the slots. When this has been done, reinsert the base and nose assembly into the barrel. The nose assembly has six screw holes in the light-colored plastic portion, while the barrel has only three screw holes. This is for compensation purposes. When the nose and base have been reinserted in the barrel, line up the screw holes at the nose end. Insert one screw and tighten it down firmly. At the base end, insert the three screws in the slotted holes, but do not tighten them clear down yet.

Connect the probe for use and insert the tip in the Cal Out connector. Compensate the waveform as nearly as possible with the trimmers in the compensating box. If a dip or rise continues to appear in the waveform beyond the portion compensated by C116, this can normally be compensated by rotating the base portion of the internal probe assembly, using the three screw

P6013A

holes in the base to turn it. It is possible that complete compensation can only be done by removing the screw from the nose end of the probe and rotating the nose assembly within the barrel to the next position. This should enable you to completely compensate the waveform to a perfect square wave. When compensation is completed in this manner, insert the remainder of the screws in the nose end and tighten down all screws at both nose and base. Re-insert the barrel into the probe body and

again test the wave shape with a Cal signal. Minor compensations of the compensating box may again be necessary after complete re-assembly of the probe.

3. Open connection in compensating box. This is indicated by an obvious error in attenuation ratio. Open the compensating box by removing the screws in the cover. Replace or reconnect internal components in the conventional manner.

ELECTRICAL PARTS**10 feet UHF (*015-0081-00)****10 feet BNC (*015-0083-00)**

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Description
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CapacitorsTolerance $\pm 20\%$ unless otherwise indicated.

C110	281-0047-00	Peaking		Var
C113	281-0044-00	80-480 pF	Mica	Var
C114	281-0023-00	9-180 pF	Mica	Var
C115	281-0023-00	9-180 pF	Mica	Var
C116	281-0044-00	80-480 pF	Mica	Var

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

R110 ¹						
R111	301-0911-00	910 Ω	$\frac{1}{2}$ W			5%
R112	311-0150-00	500 Ω		Var		
R113	309-0129-00	34 k Ω	$\frac{1}{2}$ W		Prec	1%
R114	309-0136-00	25.6 k Ω	$\frac{1}{2}$ W		Prec	1%
R115	309-0136-00	25.6 k Ω	$\frac{1}{2}$ W		Prec	1%
R116	323-0318-00	20 k Ω	$\frac{1}{2}$ W		Prec	1%
R117	311-0245-00	10 k Ω		Var		
R118	302-0151-00	150 Ω	$\frac{1}{2}$ W			

¹Furnished as a unit with Probe Nose Assembly (*206-0070-00)

P6013A

25 feet UHF (*015-0082-00)

25 feet BNC (*015-0084-00)

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Description
----------	-----------------------	-------------

Capacitors

Tolerance $\pm 20\%$ unless otherwise indicated.

C110	281-0047-00	Peaking		Var		
C113	281-0044-00	80-480 pF	Mica	Var		
C114	281-0023-00	9-180 pF	Mica	Var		
C115	281-0044-00	80-480 pF	Mica	Var		
C116	281-0044-00	80-480 pF	Mica	Var		
C117	283-0032-00	470 pF	Cer		500 V	5%

Inductor

L113	*108-0412-00	1.7 μ F
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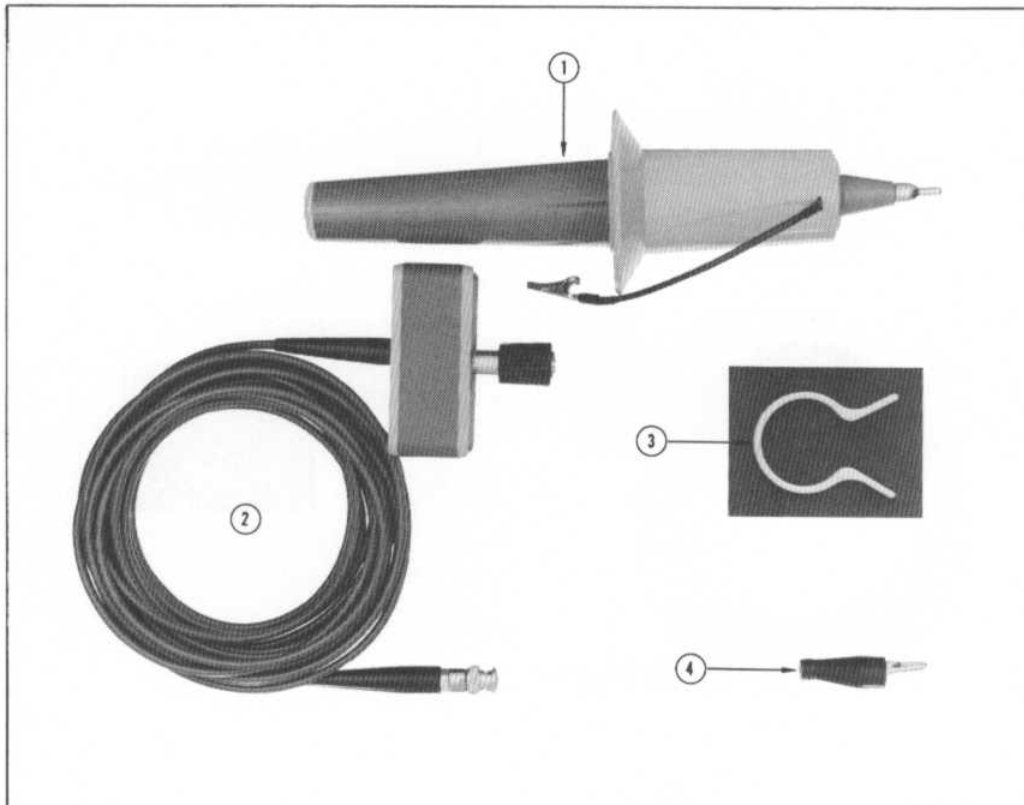
Resistors

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

R110 ²						
R112	311-0249-00	1 k Ω		Var		
R113	309-0129-00	34 k Ω	$\frac{1}{2}$ W		Prec	1%
R114	309-0136-00	25.6 k Ω	$\frac{1}{2}$ W		Prec	1%
R115	309-0136-00	25.6 k Ω	$\frac{1}{2}$ W		Prec	1%
R116	323-0318-00	20 k Ω	$\frac{1}{2}$ W		Prec	1%
R117	311-0245-00	10 k Ω		Var		

²Furnished as a unit with Probe Nose Assembly (*206-0070-00)

P6013A PROBE PACKAGE 10 FEET (BNC)

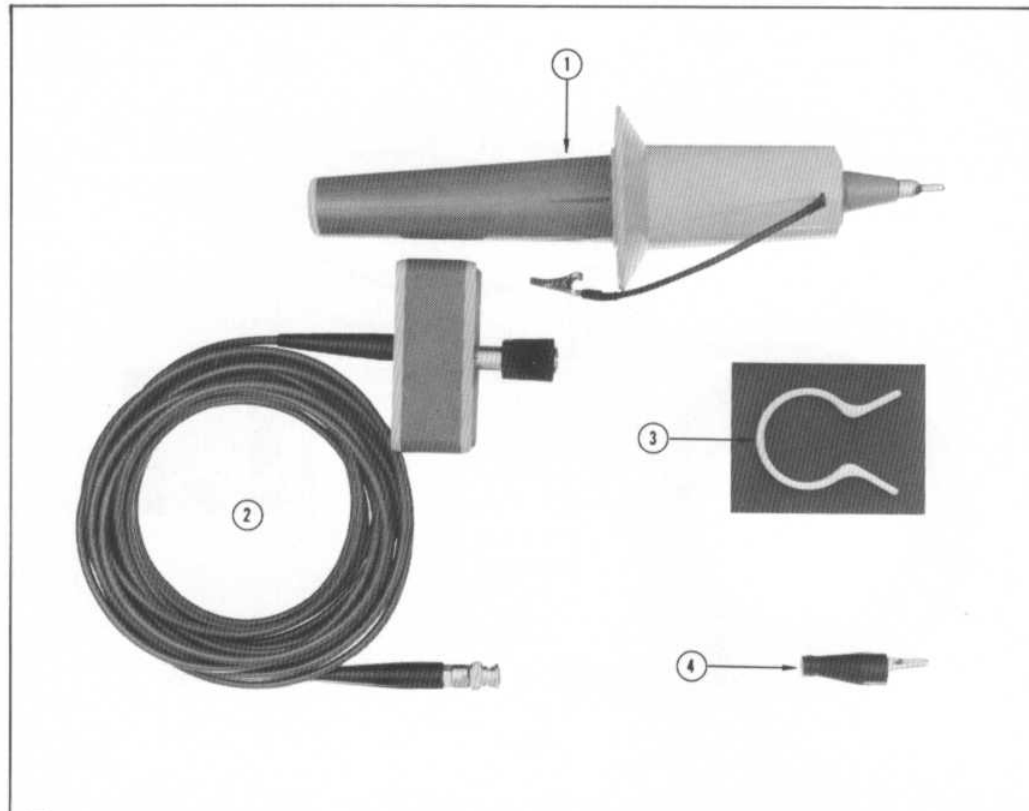


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REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
					1 2 3 4 5
	PROBE PACKAGE				
1-4	010-0177-01			1	PROBE PACKAGE, P6013A, 10 feet, BNC
	- - - - -			-	package includes:
	PROBE ONLY				
1	010-0178-01			1	PROBE, P6013A, 10 feet
	STANDARD ACCESSORIES				
2	015-0083-00			1	COMPENSATOR BOX ASSEMBLY, 10 feet, BNC
3	352-0056-00			1	HOLDER, probe
4	344-0005-00			1	CLIP, assembly, alligator
	202-0139-00		6834X	1	CASE, storage
	436-0062-01		6834X	1	TRAY, plastic
	016-0129-00	X6835		1	CASE, carrying (not shown)
	004-0217-00			1	PAD, urethane
	070-0603-00			1	MANUAL, instruction

B

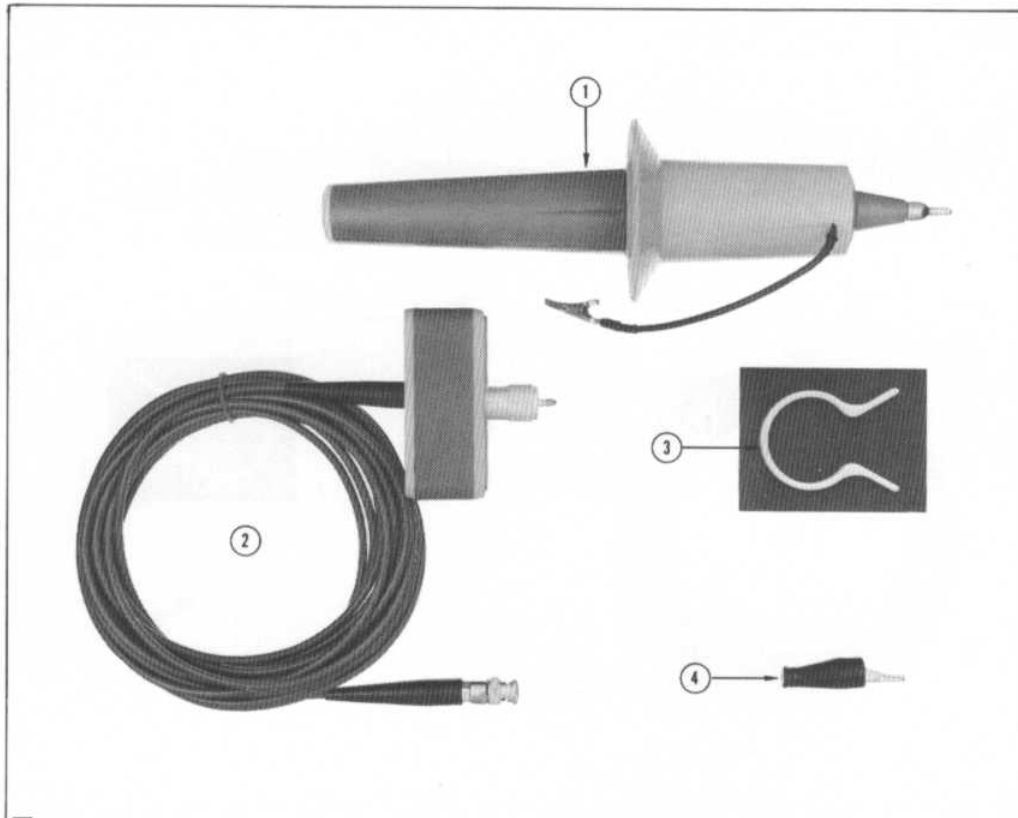
P6013A PROBE PACKAGE 25 FEET (BNC)



A

REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		QTY.	DESCRIPTION
		EFF.	DISC.		
1-4	010-0175-01			1	PROBE PACKAGE, 25 feet, BNC package includes:
1	010-0176-01			1	PROBE, P6013A, 25 feet
2	015-0084-00			1	COMPENSATOR BOX ASSEMBLY, 25 feet, BNC
3	352-0056-00			1	HOLDER, probe
4	344-0005-00			1	CLIP, assembly, alligator
	202-0139-00		6834X	1	CASE, storage
	436-0062-01		6834X	1	TRAY, plastic
	016-0129-00	X6835		1	CASE, carrying (not shown)
	004-0217-00			1	PAD, urethane
	070-0603-00			1	MANUAL, instruction

P6013A PROBE PACKAGE 10 FEET (UHF)

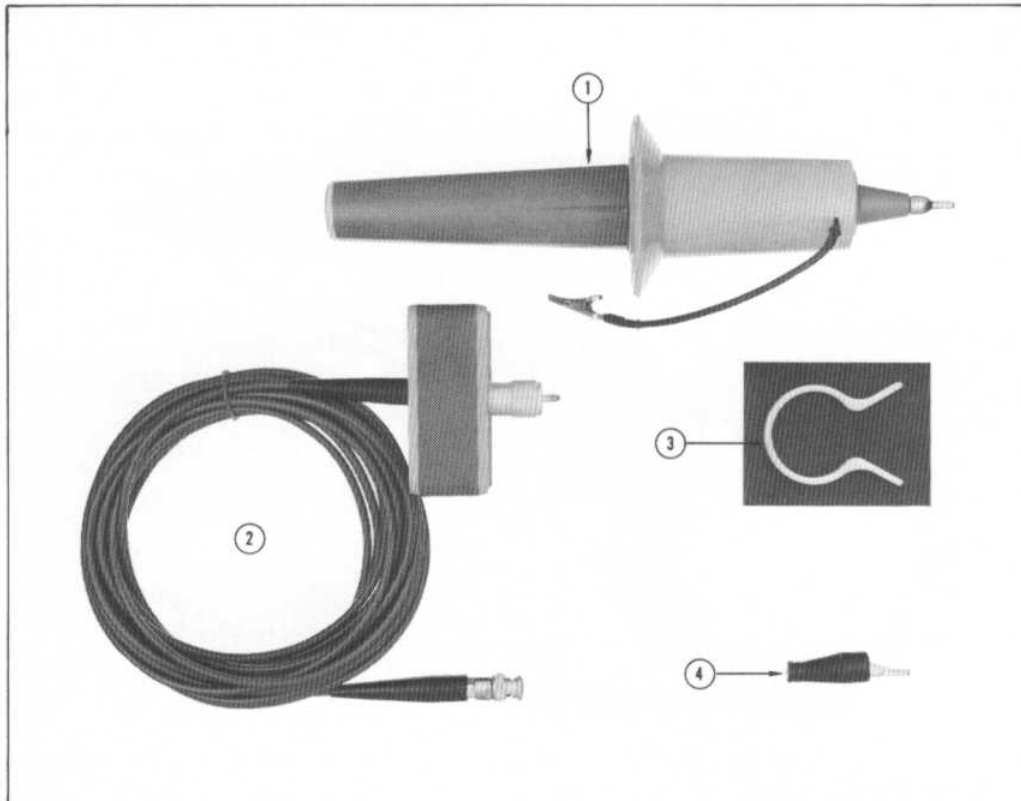


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REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
1-4	010-0181-01			1	PROBE PACKAGE, P6013A, 10 feet, UHF package includes:
1	010-0178-01			1	PROBE, P6013A, 10 feet
2	015-0081-00			1	COMPENSATOR BOX ASSEMBLY, 10 feet, UHF
3	352-0056-00			1	HOLDER, probe
4	344-0005-00			1	CLIP, assembly, alligator
	202-0139-00		6834X	1	CASE, storage
	436-0062-01		6834X	1	TRAY, plastic
	016-0129-00	X6835		1	CASE, carrying (not shown)
	004-0217-00			1	PAD, urethane
	070-0603-00			1	MANUAL, instruction

B

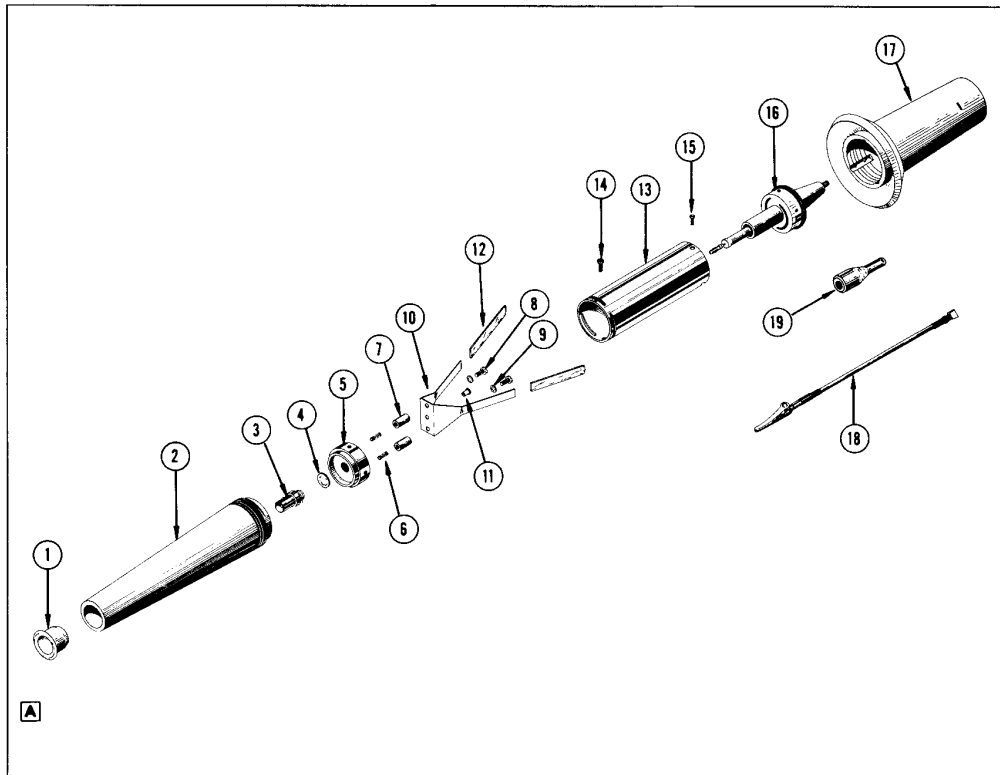
P6013A PROBE PACKAGE 25 FEET (UHF)



A

REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
1-4	010-0179-01			1	PROBE PACKAGE, 25 feet, UHF
-	-			-	package includes:
1	010-0176-01			1	PROBE, P6013A, 25 feet
2	015-0082-00			1	COMPENSATOR BOX ASSEMBLY, 25 feet, UHF
3	352-0056-00			1	HOLDER, probe
4	344-0005-00			1	CLIP, assembly, alligator
	202-0139-00		6834X	1	CASE, storage
	436-0062-01		6834X	1	TRAY, plastic
	016-0129-00	X6835		1	CASE, carrying (not shown)
	004-0217-00			1	PAD, urethane
	070-0603-00			1	MANUAL, instruction

PROBE REPLACEABLE PARTS

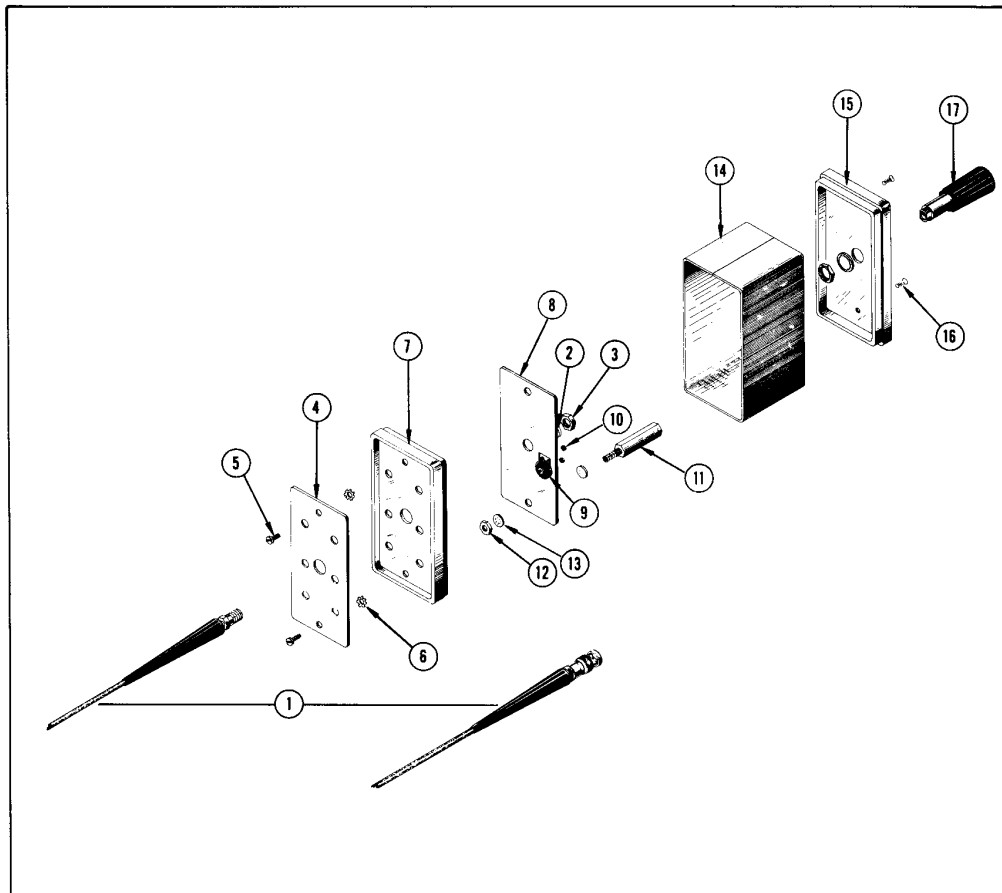


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REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q	T	DESCRIPTION
		EFF.	DISC.			
1	134-0068-00			1	1	PLUG, handle
2	367-0017-01			1	1	HANDLE, probe
3	131-0106-00	6835	6834	1	1	CONNECTOR, coaxial, 1 contact, female
	131-0342-00			1	1	CONNECTOR, coaxial, 1 contact, female
4	-			-	-	LOCKWASHER, internal
5	358-0306-00	6706	6705	1	1	BASE, probe body
6	213-0150-00			2	2	SCREW, set, 4-40 x 1/4 inch
	213-0115-00			2	2	SCREW, set, 4-40 x 5/16 inch HHS
7	384-0557-00			2	2	ROD, spacing, 13/32 inch long
	-			-	-	mounting hardware for each: (not included.w/rod)
8	211-0008-00			1	1	SCREW, 4-40 x 1/4 inch, PHS
9	210-0004-00			1	1	LOCKWASHER, internal, #4
10	-			1	1	CAPACITOR, base peaking
11	210-0659-00			1	1	EYELET
12	162-0537-00			2	2	TUBING, 2 1/4 inches long
13	205-0006-00			1	1	SHELL, inner body
14	211-0008-00			3	3	SCREW, 4-40 x 1/4 inch, PHS
15	211-0030-00			3	3	SCREW, 2-56 x 1/4 inch, FHS
16	206-0070-00			1	1	NOSE ASSEMBLY
17	204-0244-01			1	1	BODY, probe, for 010-0176-01 only
	204-0245-01			1	1	BODY, probe, for 010-0178-01 only
18	175-0192-00			1	1	CABLE, ground lead, 7 inches
19	206-0116-00			1	1	TIP, probe

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COMPENSATOR BOX ASSEMBLY 10 FEET (BNC)



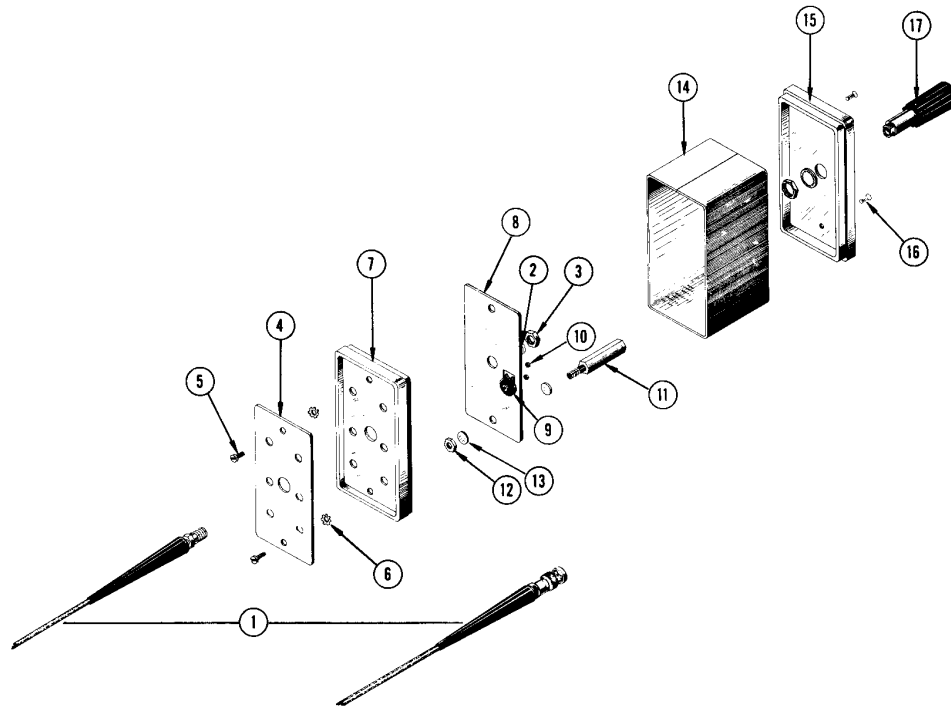
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REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
				1 2 3 4 5	
1	015-0083-00 ----- 175-0682-00 -----			1	COMPENSATOR BOX ASSEMBLY, 10 ft., BNC - assembly includes: - CABLE ASSEMBLY - mounting hardware: (not included w/cable assembly)
2	210-0012-00			1	LOCKWASHER, internal, 3/8 x 1/2 inch
3	210-0590-00			1	NUT, hex., 3/8-32 x 7/16 inch
4	200-0625-01 -----			1	COVER, identification - mounting hardware: (not included w/cover)
5	211-0097-00			2	SCREW, 4-40 x 5/16 inch, PHS
6	210-0003-00			2	LOCKWASHER, external, #4

COMPENSATOR BOX ASSEMBLY 10 FEET (BNC) (cont)

REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		QTY.	DESCRIPTION
		EFF.	DISC.		
7	200-0626-01			1	COVER, box, front
8	441-0630-03			1	CHASSIS, compensator
9	-----			2	RESISTOR, variable
				-	mounting hardware for each: (not included w/resistor)
10	210-0504-00			2	NUT, hex., 0-80 x 5/32 inch
11	361-0047-00			2	SPACER, threaded, 1.172 inches long
	-----			-	mounting hardware for each: (not included w/spacer)
12	210-0410-00			1	NUT, hex., 10-32 x 5/16 inch
13	210-0010-00			2	LOCKWASHER, internal, #10
14	380-0080-03			1	HOUSING, wrap-around
15	200-0627-00			1	COVER, box, rear
	-----			-	mounting hardware: (not included w/cover)
16	211-0038-00			2	SCREW, 4-40 x 5/16 inch, FHS
17	131-0319-00			1	CONNECTOR, locking, BNC

COMPENSATOR BOX ASSEMBLY 25 FEET (BNC)



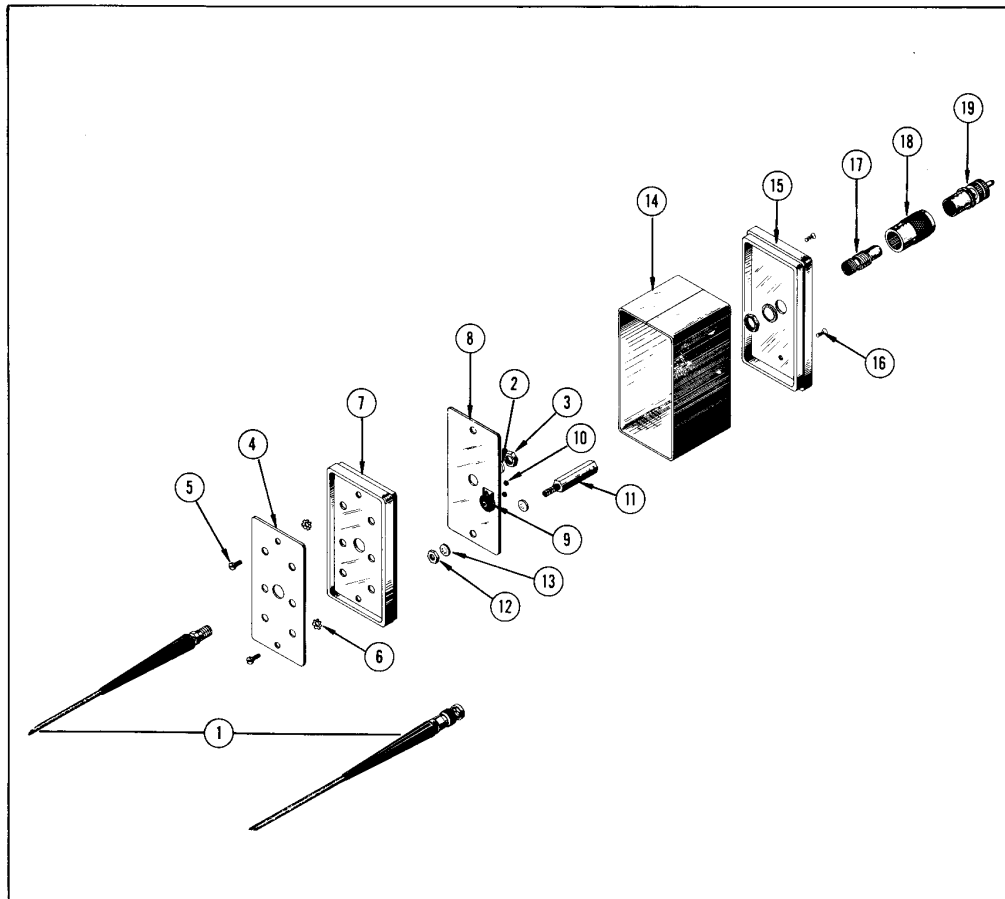
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REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q					DESCRIPTION	
		EFF.	DISC.	T	Y.	1	2	3		4
	015-0084-00			1						COMPENSATOR BOX ASSEMBLY, 25 ft., BNC
	- - - - -			-						assembly includes:
1	175-0683-00		6805	1						CABLE ASSEMBLY
	175-0683-01	6806		1						CABLE ASSEMBLY
	- - - - -			-						mounting hardware: (not included w/cable assembly)
2	210-0012-00			1						LOCKWASHER, internal, 3/8 x 1/2 inch
3	210-0590-00			1						NUT, hex., 3/8-32 x 7/16 inch
	- - - - -			-						mounting hardware: (not included w/cover)
4	200-0625-01			1						COVER, identification
	- - - - -			-						mounting hardware: (not included w/cover)
5	211-0097-00			2						SCREW, 4-40 x 5/16 inch, PHS
6	210-0003-00			2						LOCKWASHER, external, #4

COMPENSATOR BOX ASSEMBLY (BNC) (cont)

REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
7	200-0626-01			1	COVER, box, front
8	441-0630-03			1	CHASSIS, compensator
9	- - - - -			2	RESISTOR, variable
	- - - - -			-	mounting hardware for each: (not included w/resistor)
10	210-0504-00			2	NUT, hex., 0-80 x 5/32 inch
11	361-0047-00			2	SPACER, threaded, 1.172 inches long
	- - - - -			-	mounting hardware for each: (not included w/spacer)
12	210-0410-00			1	NUT, hex., 10-32 x 5/16 inch
13	210-0010-00			2	LOCKWASHER, internal, #10
14	380-0080-04			1	HOUSING, wrap-around
15	200-0627-00			1	COVER, box, rear
	- - - - -			-	mounting hardware: (not included w/cover)
16	211-0038-00			2	SCREW, 4-40 x 5/16 inch, FH5
17	131-0319-00			1	CONNECTOR, locking, BNC

COMPENSATOR BOX ASSEMBLY 10 FEET (UHF)



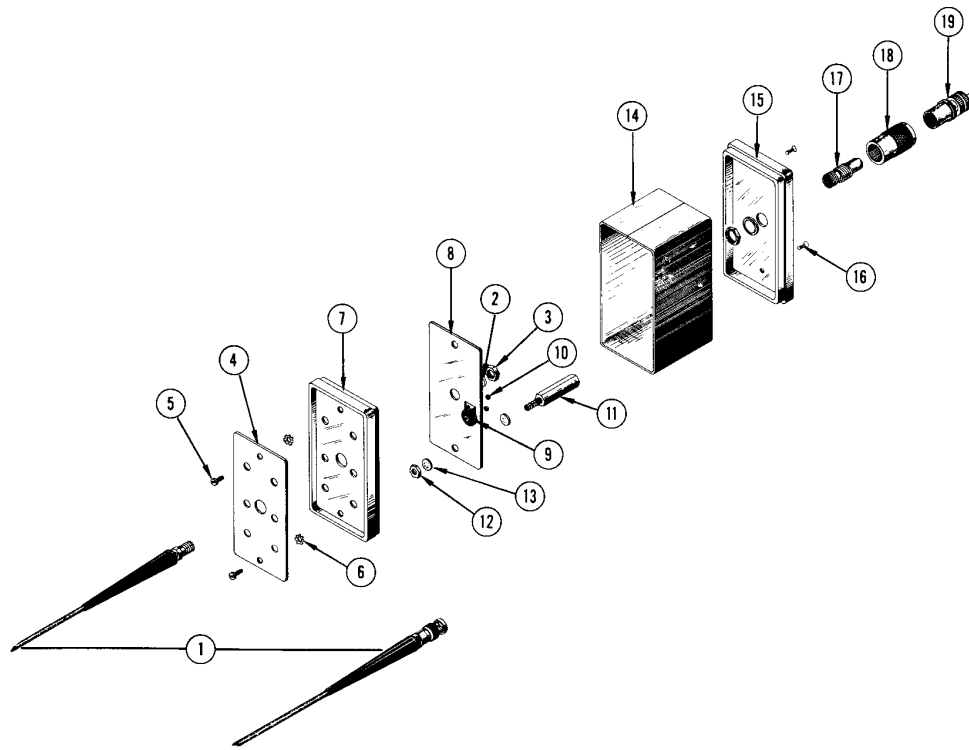
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REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
	015-0081-00			1	COMPENSATOR BOX ASSEMBLY, 10 ft., UHF
1	175-0682-00			1	assembly includes: CABLE ASSEMBLY
2	210-0590-00			1	mounting hardware: (not included w/assembly)
3	210-0012-00			1	NUT, hex., 3/8-32 x 7/16 inch
4	200-0626-01			1	LOCKWASHER, internal, 3/8 x 1/2 inch
5	211-0097-00			2	COVER, identification
6	210-0003-00			2	mounting hardware: (not included w/cover)
					SCREW, 4-40 x 5/16 inch, PHS
					LOCKWASHER, external, #4

COMPENSATOR BOX ASSEMBLY 10 FEET (UHF) (cont)

REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q T Y.	DESCRIPTION
		EFF.	DISC.		
7	200-0626-01			1	COVER, box, front
8	441-0630-03			1	CHASSIS, compensator
9	-----			2	RESISTOR, variable
				-	mounting hardware for each: (not included w/resistor)
10	210-0504-00			2	NUT, hex., 0-80 x 5/32 inch
11	361-0047-00			2	SPACER, threaded, 1.172 inches long
				-	mounting hardware for each: (not included w/spacer)
12	210-0410-00			1	NUT, hex., 10-32 x 5/16 inch
13	210-0010-00			2	LOCKWASHER, internal, #10
14	380-0080-01			1	HOUSING, wrap-around
15	200-0627-00			1	COVER, box rear
				-	mounting hardware: (not included w/cover)
16	211-0038-00			2	SCREW, 4-40 x 5/16 inch, FHS
17	102-0006-00			1	REDUCER
18	200-0026-00			1	COVER, connector
19	131-0168-00			1	CONNECTOR, coaxial, 1 contact, male

COMPENSATOR BOX ASSEMBLY 25 FEET (UHF)

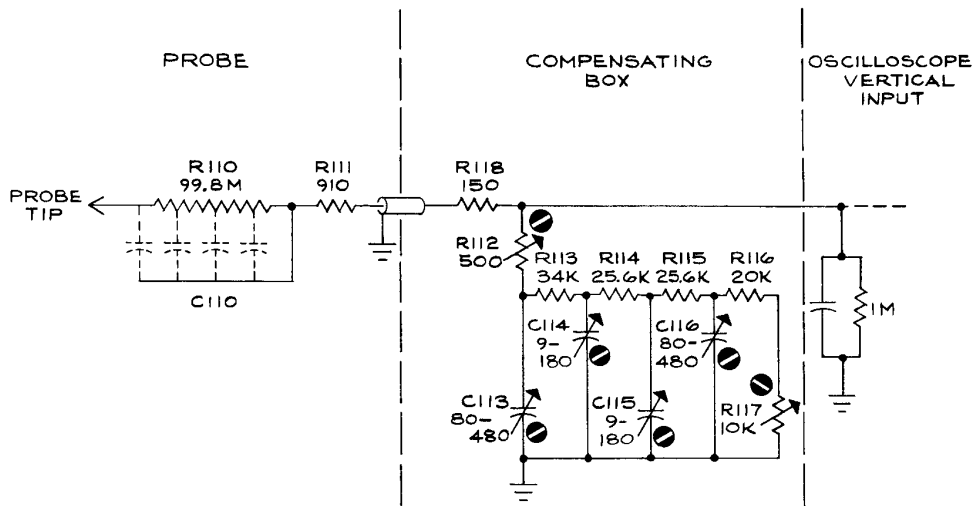


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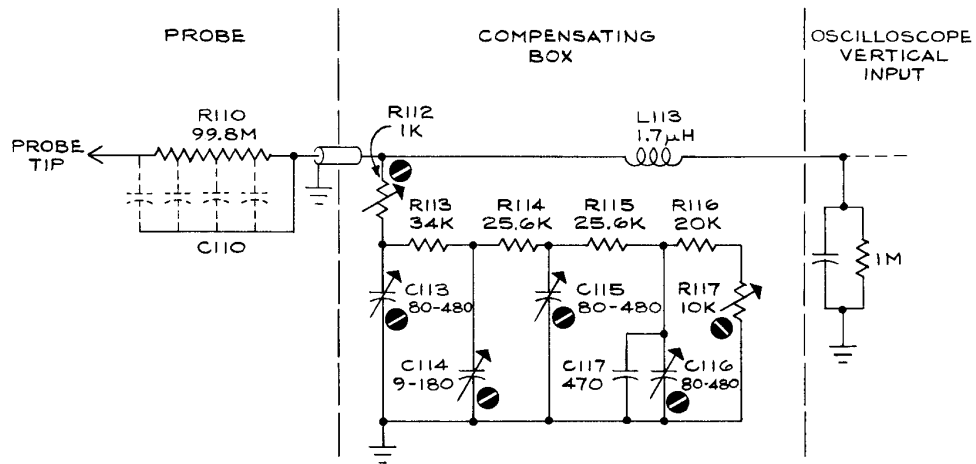
REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q					DESCRIPTION	
		EFF.	DISC.	Y.	1	2	3	4		5
	015-0082-00			1						COMPENSATOR BOX ASSEMBLY, 25 ft., UHF
	- - - - -			-						assembly includes:
1	175-0683-00		6805	1						CABLE ASSEMBLY
	175-0683-01	6806		1						CABLE ASSEMBLY
	- - - - -			-						mounting hardware: (not included w/assembly)
2	210-0590-00			1						NUT, hex., 3/8-32 x 7/16 inch
3	210-0012-00			1						LOCKWASHER, internal, 3/8 x 1/2 inch
4	200-0625-01			1						COVER, identification
	- - - - -			-						mounting hardware: (not included w/cover)
5	211-0097-00			2						SCREW, 4-40 x 5/16 inch, PHS
6	210-0003-00			2						LOCKWASHER, external, #4
7	200-0626-01			1						COVER, box, front

COMPENSATOR BOX ASSEMBLY 25 FEET (UHF) (cont)

REF. NO.	TEKTRONIX PART NO.	SERIAL/MODEL NO.		Q	DESCRIPTION
		EFF.	DISC.	T	
				Y.	1 2 3 4 5
8	441-0630-03			1	CHASSIS, compensator
9	-----			2	RESISTOR, variable
				-	mounting hardware for each: (not included w/resistor)
10	210-0504-00			2	NUT, hex., 0-80 x 5/32 inch
11	361-0047-00			2	SPACER, threaded, 1.172 inches long
	-----			-	mounting hardware for each: (not included w/spacer)
12	210-0410-00			1	NUT, hex., 10-32 x 5/16 inch
13	210-0010-00			2	LOCKWASHER, internal, #10
14	380-0080-02			1	HOUSING, wrap-around
15	200-0627-00			1	COVER, box, rear
	-----			-	mounting hardware: (not included w/cover)
16	211-0038-00			2	SCREW, 4-40 x 5/16 inch, FHS
17	102-0006-00			1	REDUCER
18	200-0026-00			1	COVER, connector
19	131-0168-00			1	CONNECTOR, coaxial, 1 contact, male



10' P6013A



25' P6013A