

# Instructions



**P6150**

**For 50 Ohm Oscilloscopes**

**070-7173-01**

**Warning**

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

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Or contact us by e-mail:

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An operator will direct your call.

To write us

Tektronix, Inc.

P.O. Box 1000

Wilsonville, OR 97070-1000

# General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

## To Avoid Fire or Personal Injury

**Connect and Disconnect Properly.** Do not connect or disconnect probes or test leads while they are connected to a voltage source.

**Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

**Do Not Operate With Suspected Failures.** If you suspect there is damage to this product, have it inspected by qualified service personnel.

**Do Not Operate in Wet/Damp Conditions.**

**Do Not Operate in an Explosive Atmosphere.**

**Keep Product Surfaces Clean and Dry.**

## Symbols and Terms



**Terms in this Manual.** These terms may appear in this manual:

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**CAUTION.** *Caution statements identify conditions or practices that could result in damage to this product or other property.*

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# Operating Basics

The P6150 is a high-frequency low-capacitance passive probe designed to be used with 11800 Series oscilloscopes. The P6150 comes standard with a one meter SMA male-to-male cable assembly and 1X and 10X attenuators. The probe head has a female SMA connector that screws into the cable assembly.

The low capacitance and constant input resistance of the P6150 make it possible to probe high-frequency circuits without disturbing the circuit with a large capacitive load.

This manual describes the operation of the P6150 probe connected to a Tektronix 11801/11802 sampling oscilloscope with SD-24/SD-26 sampling head. The P6150 probe may also be used with any 50  $\Omega$  input instrumentation.



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**CAUTION.** Before connecting the probe to the SD-24 sampling head, you should eliminate potential electrostatic build up from the probe cable. To discharge the cable with the probe head attached, momentarily connect the probe tip to the cable or probe ground. A charge stored in the 50  $\Omega$  cable (if at high enough voltage) can damage the SD-24 input.

To maintain consistent signal quality, torque system SMA connectors to 5 inch-pounds.

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Do not exceed the input voltage rating of the sampling head ( $\pm 3$  V for SD-24) or damage to the head can result. The peak input voltage rating is increased by the attenuation factor of the probe head (for example, 10X times  $\pm 3$  V is  $\pm 30$  V).

The RMS input voltage rating is limited by the power handling capacity of the attenuator resistor. For example, if the 10X attenuator is rated at 1/4 watt, the RMS input voltage should be limited to less than 12.5 V<sub>RMS</sub>.

The ceramic probe tip resistor network in the 10X probe head is very susceptible to damage if excessive vertical or angular pressure is applied.



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**CAUTION.** The ceramic resistor network is in danger of breaking if more than five pounds of vertical (down) pressure or more than three pounds of angular pressure (pressure that will cause the resistor to attempt to flex), is applied to the probe tip or ceramic resistor.

Avoid excessive vertical or angular pressure, dropping or hitting the probe, or allowing the probe to swing against a hard surface. Always place the probe-tip protector (supplied) on the tip when the probe is not in use.

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## System Response

Figure 1 shows typical system responses with various cable and attenuator combinations. The system consists of a Tektronix 11801 sampling oscilloscope and SD-24 TDR sampling head driven by the internal calibrator pulser.

1. Response of 22 cm cable (174-1120-00); 50 mV/div,  $t_r = 30$  ps.
2. Response of 1 m cable (174-1341-00); 50 mV/div,  $t_r = 43$  ps.
3. Response of 1 m cable with the 10X probe head in the probe tip adapter. (013-0251-00); 5 mV/div,  $t_r = 39$  ps.
4. Response of the 10X probe head with 22 cm cable (174-1120-00); 5 mV/div,  $t_r = 32$  ps.

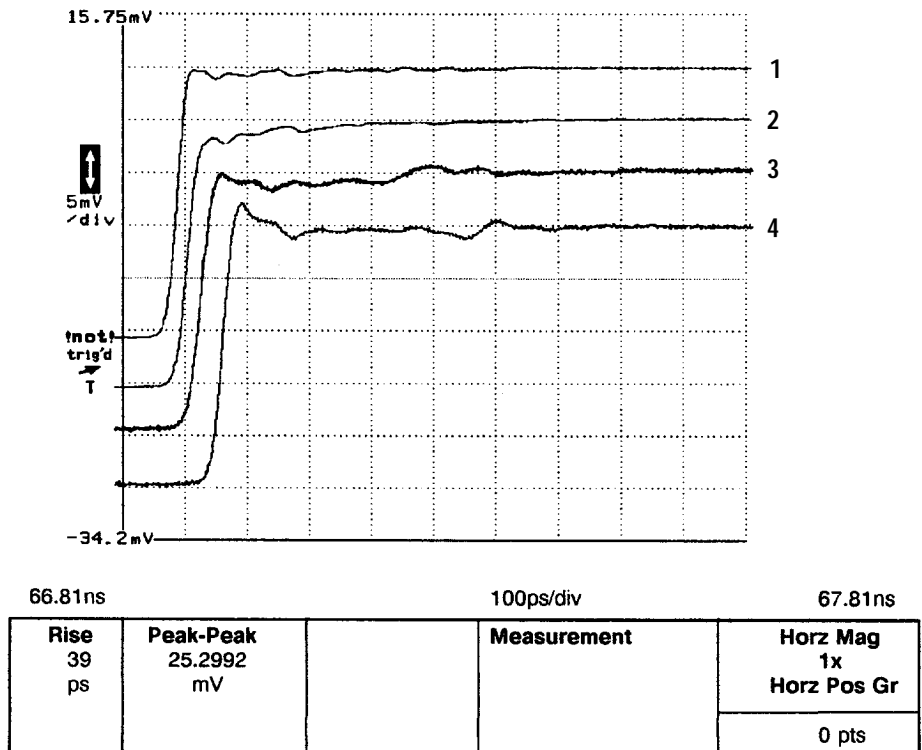


Figure 1: Typical system response



## Probe Tip Grounding

The quality of ground at the probe tip affects performance. For minimum rise time and aberrations, keep the ground lead short and the ground contact as close as possible to the point being probed.

Figure 3 shows typical system responses with different probe tip grounding methods. Measurements were taken with the 10X attenuator head while probing the microstrip line on the probe tip adapter (013-0251-00).

1. Response with 013-0251-00 probe tip adapter,  $t_r = 38$  ps.
2. Response with ground clip cut to the probe tip length. (package of 20 included with accessories: 020-1708-00;  $t_r = 52$  ps.
3. Response with full length ground clip. (package of 20 included with accessories: 020-1708-00);  $t_r = 81$  ps.

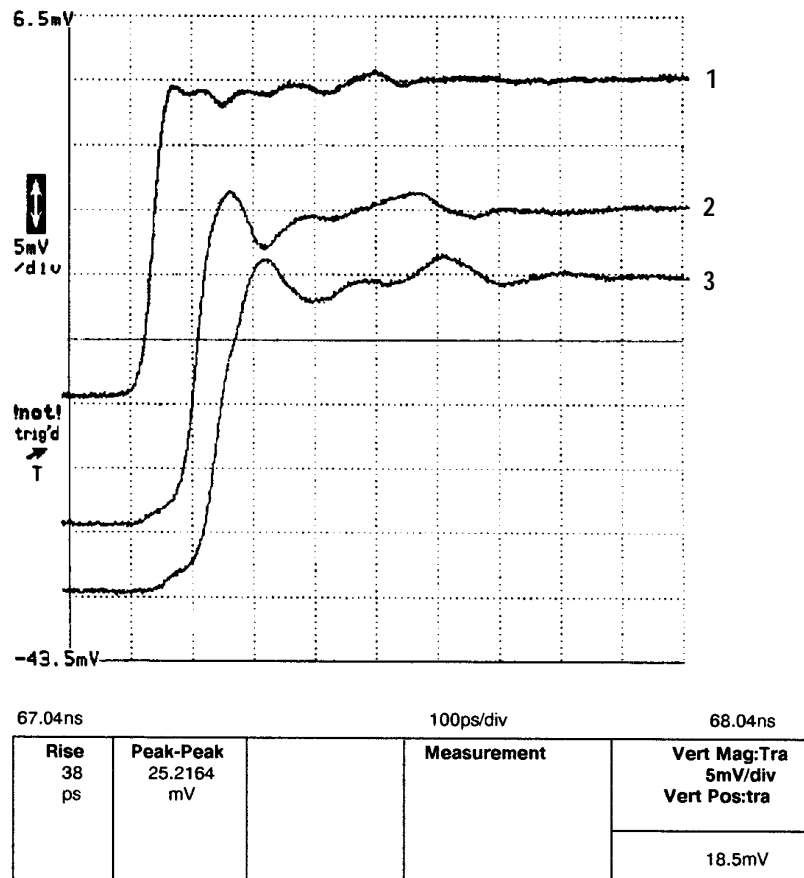


Figure 2: Probe tip grounding

## Input Impedance

Typical input impedance vs frequency of the 10X attenuator.

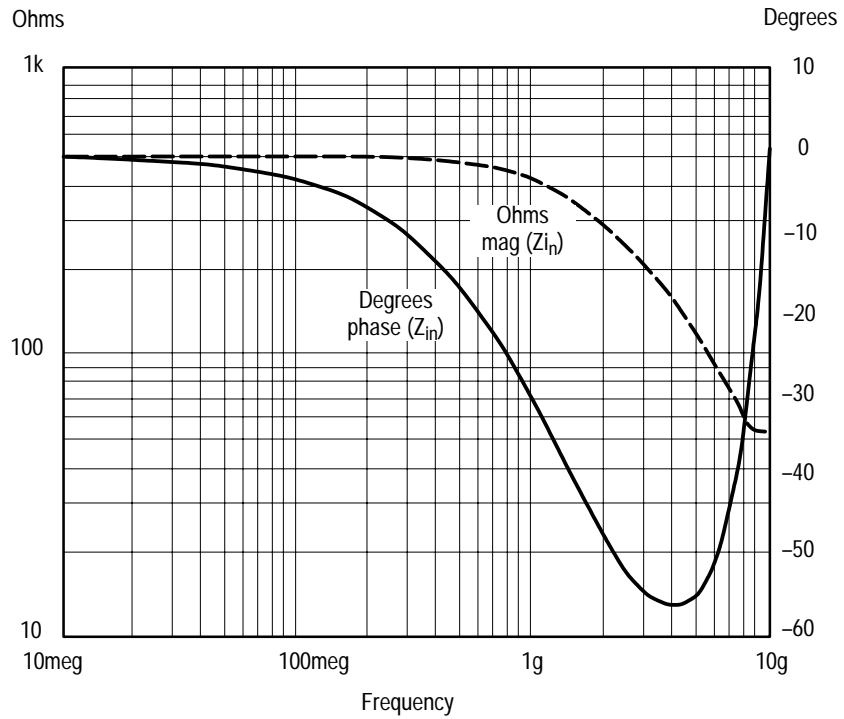


Figure 3: Input impedance

## Attenuator Color Coding

Table 1 identifies P6150 probe tip attenuation factors by color color coding.

Table 1: Probe tip attenuation factors

Color	Attenuation Factor
Black	1X
Blue	10X

## Maintenance

Use the following procedures to clean and maintain the P6150 probe.

### Cleaning

Remove accumulated dust from the outside of the probe with a soft cloth or a small brush. Remove any remaining dirt with a soft cloth dampened in a mild detergent and water solution. Do not use abrasive cleaners.



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**CAUTION.** Do not use cleaning agents that may damage the plastic components of the probe. In particular, avoid solvents such as benzene, toluene, xylene, acetone, or MEK.

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### Probe Module Replacement

The P6150 probe heads are sealed and contain no user-serviceable parts.

# Specifications

The following specifications apply when the instrument warms up for a period of at least 20 minutes in an environment that does not exceed the limits described in Table 3 below.

**Table 2: Electrical characteristics**

Characteristic	1X	10X
Attenuation Tolerance <sup>1,2</sup>	±2%	±2%
Input Resistance <sup>1</sup>	50 Ω +2% -1%	500 Ω ±1.25%
Input Capacitance	N/A	≤0.15 pF
Maximum Continuous Nondestructive Input Voltage	Oscilloscope maximum input voltage	12.5 V <sub>RMS</sub>
Bandwidth at Probe Tip <sup>3</sup>	≥3.0 GHz	9 GHz
Rise Time at Probe Tip <sup>3</sup>	≤170 ps	≤38.8 ps
Signal Delay	4.40 ±0.1 ns	4.40 ±0.1 ns

<sup>1</sup> System characteristic.

<sup>2</sup> Oscilloscope input must be 50 Ω ±1%.

<sup>3</sup> In-system measurement.

**Table 3: Environmental characteristics**

Characteristic	Description
Temperature Range	
Operating	-15° C to +55° C (+5° F to +131° F)
Nonoperating	-62° C to +85° C (-80° F to +185° F)
Humidity <sup>1</sup>	Five cycles (120 hr) at 95% to 97% relative humidity 30° C to 60° C

<sup>1</sup> Reference to MIL-E-1600F, paragraph 4.5.9 through 4.5.9.5.1, class 4.

**Table 4: Physical characteristics**

Characteristic	Description
Length	1 m (3.3 ft.)
Shipping Weight	595 g (1.31 lbs. )

# Replaceable Parts

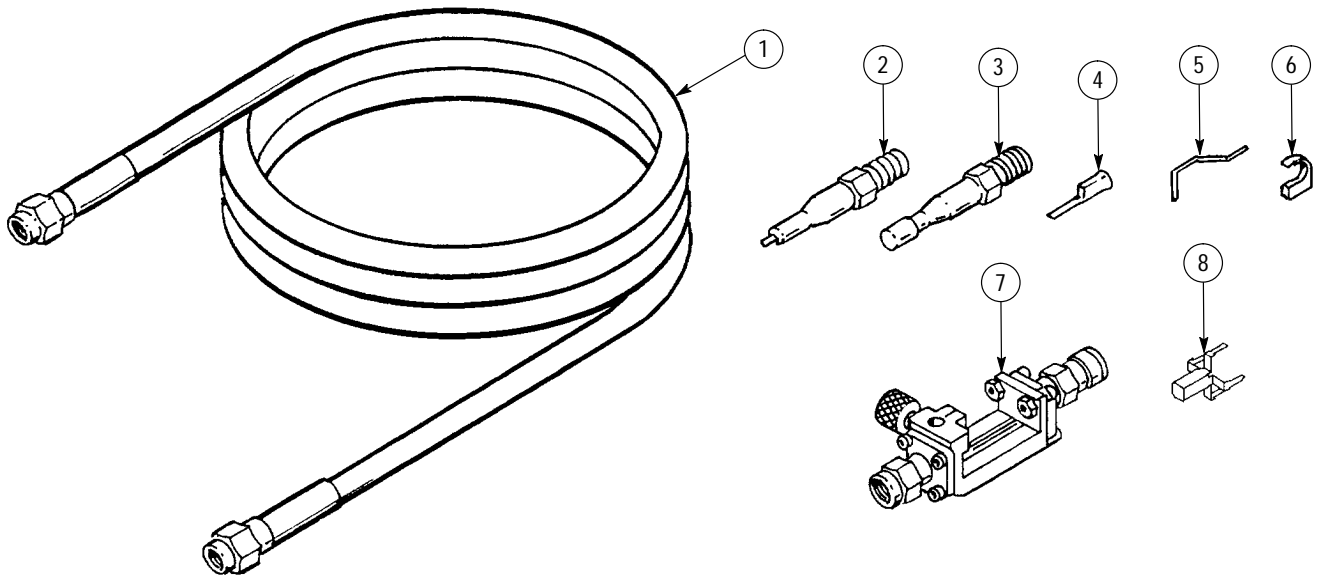


Figure 4: P6150 probe with accessories

## Replaceable Parts

### Replaceable parts: P6150 probe and accessories

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
<b>P6150</b>							
4-1	174-1341-00			1	CABLE ASSY,RF:50 OHM COAX,39.37 L,8-N	60381	500-1117-00
-2	206-0398-00			1	PROBE HEAD ASSY:1X P6150	80009	206-0398-00
-3	206-0399-00		8905	2	PROBE HEAD ASSY:10X,RES NTWK,450 OHM	80009	206-0399-00
	206-0399-02	8906		2	PROBE HEAD ASSY:10X RES NTWK,450 OHM	80009	206-0399-02
<b>STANDARD ACCESSORIES</b>							
	020-1708-00			1	ACCESSORY PKG:STANDARD ACCESS TO P6150	80009	020-1708-00
-4	-----			20	.CONTACT,ELEC:GND,CLIP,PH,BRZ (ORDER 020-1708-00)		
-5	-----			10	.CONTACT,ELEC:GND,LEAD,0.025 WIRE NICKEL (ORDER 020-1708-00)		
-6	-----			3	.CONTACT,ELEC:0.025 NICKEL ALLOY 52 WIRE (ORDER 020-1708-00)		
	070-7173-00			1	SHEET,TECHNICAL:P6150	TK2548	PER TEK P/N
	174-1341-00			1	CABLE ASSY,RF:50 OHM COAX,39.37 L,8-N	60381	500-1117-00
<b>OPTIONAL ACCESSORIES</b>							
	174-1120-00			1	CA ASSY,RF:COAXIAL,RFD,50 OHM,8.5 L	TK2469	174-1120-00
	206-0398-00			1	PROBE HEAD ASSY:1X	80009	206-0398-00
	206-0398-01		8904	1	PROBE HEAD ASSY:PKG OF 5,1X	80009	206-0398-01
	206-0399-00		8904	1	PROBE HEAD ASSY:10X,RES NTWK,450 OHM	80009	206-0399-00
	206-0399-01		8904	1	PROBE HEAD ASSY:PKG OF 3,10X	80009	206-0399-01
	206-0399-02	8905		1	PROBE HEAD ASSY:10X	80009	206-0399-02
-7	013-0251-00			1	ADAPTER,P TIP:SMA TO P6150	80009	013-0251-00
-8	131-4209-00			1	CONNECTOR,PROBE:PROBE TO CKT BD ADAPTER	80009	131-4209-00

### Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
60381	PRECISION INTERCONNECT CORP.	16640 SW 72ND AVE	PORTLAND, OR 97224
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
TK2469	UNITREK CORPORATION	3000 LEWIS & CLARK HWY SUITE 2	VANCOUVER, WA 98661