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INSTRUCTION MANUAL



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TEKTRONIX®

P6202

PROBE

WITH OPTIONS

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

070-2067-00

INSTRUCTION MANUAL

Serial Number _____ First Printing April 1976

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WARNING

THE REMAINING SECTIONS OF THIS MANUAL CONTAIN SERVICING INSTRUCTIONS. THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRICAL SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CALLED OUT IN THE OPERATING INSTRUCTIONS UNLESS QUALIFIED TO DO SO.

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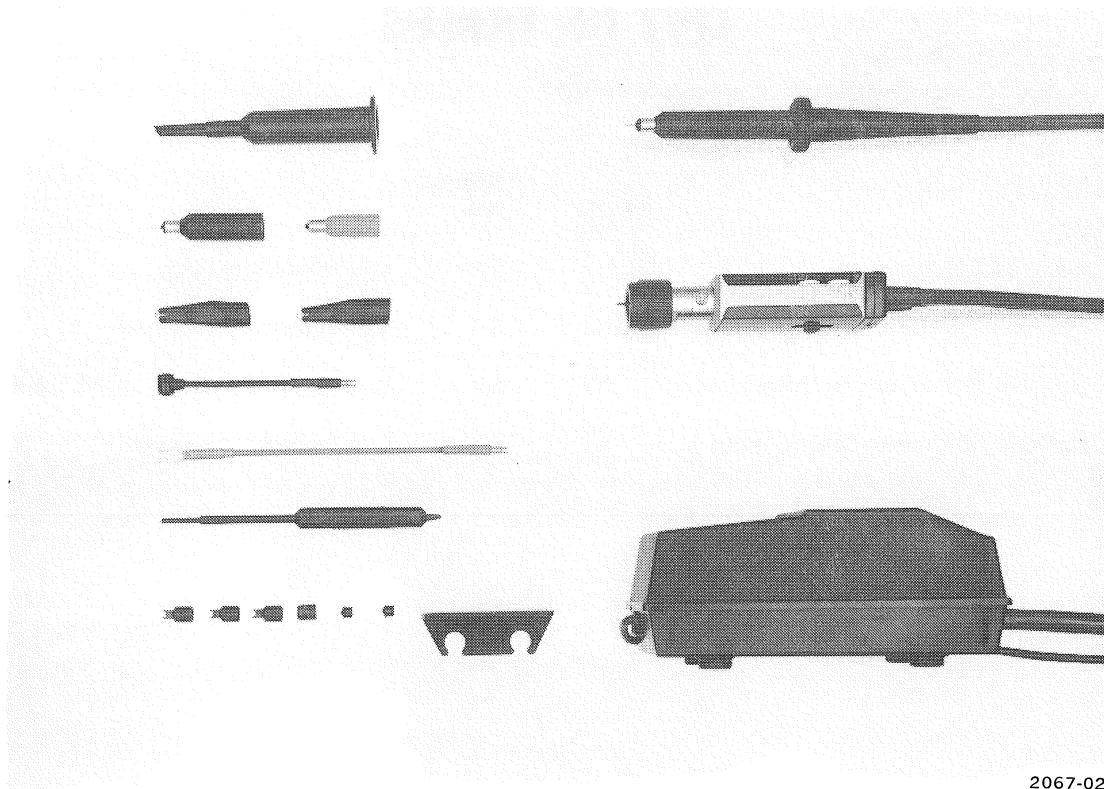
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P6202 Probe.

SPECIFICATIONS

The P6202 is a dc to 500 MHz FET probe with an attenuation factor of 10. The P6202 provides active probe measurement capabilities for oscilloscopes or other instruments. With its self-contained power supply, the probe is independent of oscilloscope power. No probe-power output on the oscilloscope is needed.

The miniature probe tip allows use of standard miniature probe tip accessories. A coding pin on the BNC output connector actuates the 10X readout or scale factor indicator on instruments having readout or automatic scale-factor switching. A LOAD switch, located on the output BNC connector, allows use of the probe with instruments having either high-impedance or 50 Ω inputs.

The P6202 provides switched DC OFFSET capabilities with COARSE and FINE controls.

TABLE 1-1
Electrical

Characteristics	Performance Requirement
Bandwidth (Probe Only)	Dc to at least 500 MHz (–3 dB) (Equivalent to a risetime of 0.7 ns).
Attenuation	10X within 4%.
Input Impedance	
Resistance	10 M Ω within 2%.
Capacitance	Approximately 2.0 pF, dc to 500 MHz.

TABLE 1-1 (CONT.)

Electrical

Characteristics	Performance Requirement
Input Dynamic Range	0 to + or -6.0 V.
Dc Offset Range	0 to + or -55 V max.
Tangential Noise	$150\text{ }\mu\text{V}$ or less at the probe output (equivalent to 1.5 mV or less at the probe tip).
Dc Thermal Drift	$150\text{ }\mu\text{V}/^{\circ}\text{C}$ or less at the probe output (equivalent to $1.5\text{ mV}/^{\circ}\text{C}$ at the probe tip).
Output Load Required	
Load Switch Set to EXT	$50\text{ }\Omega$ within 1%.
Load Switch Set to INT	$500\text{ k}\Omega$ or higher.
Maximum Nondestructive Input Voltage	+ or -200 V (dc + peak ac).
Signal Delay (Probe tip to output connector)	Approximately 12 ns .
Power Requirements	115 V ac within 20% or 230 V ac within 20% (switch selected), 50 to 60 Hz.

TABLE 1-2
Environmental

Characteristic	Performance Requirement
Operating Temperature	0° to +50° C.
Operating Altitude	To 15,000 Ft.

TABLE 1-3
Optional 10X Attenuator

Characteristic	Performance Requirement
Attenuation	10X within 2%.
Input Resistance	10 M Ω within 2%.
Input Capacitance	Approximately 2 pF, dc to 500 MHz.
Input Dynamic Range	+ or –60 V (with probe).
Dc Offset Range	+ or –200 V (with probe).
Max Nondestructive Input Voltage	+ or –200 V (dc + peak ac).
Bandwidth (with probe)	Dc to at least 500 MHz (equivalent to a risetime of 0.7 ns or less).

TABLE 1-4
Optional AC Coupler

Characteristic	Performance Requirement
Bandwidth (–3 dB)	16 to 500 MHz (equivalent to a risetime of 0.7 ns or less).
Max Input Voltage	+ or –200 V (dc + peak ac).

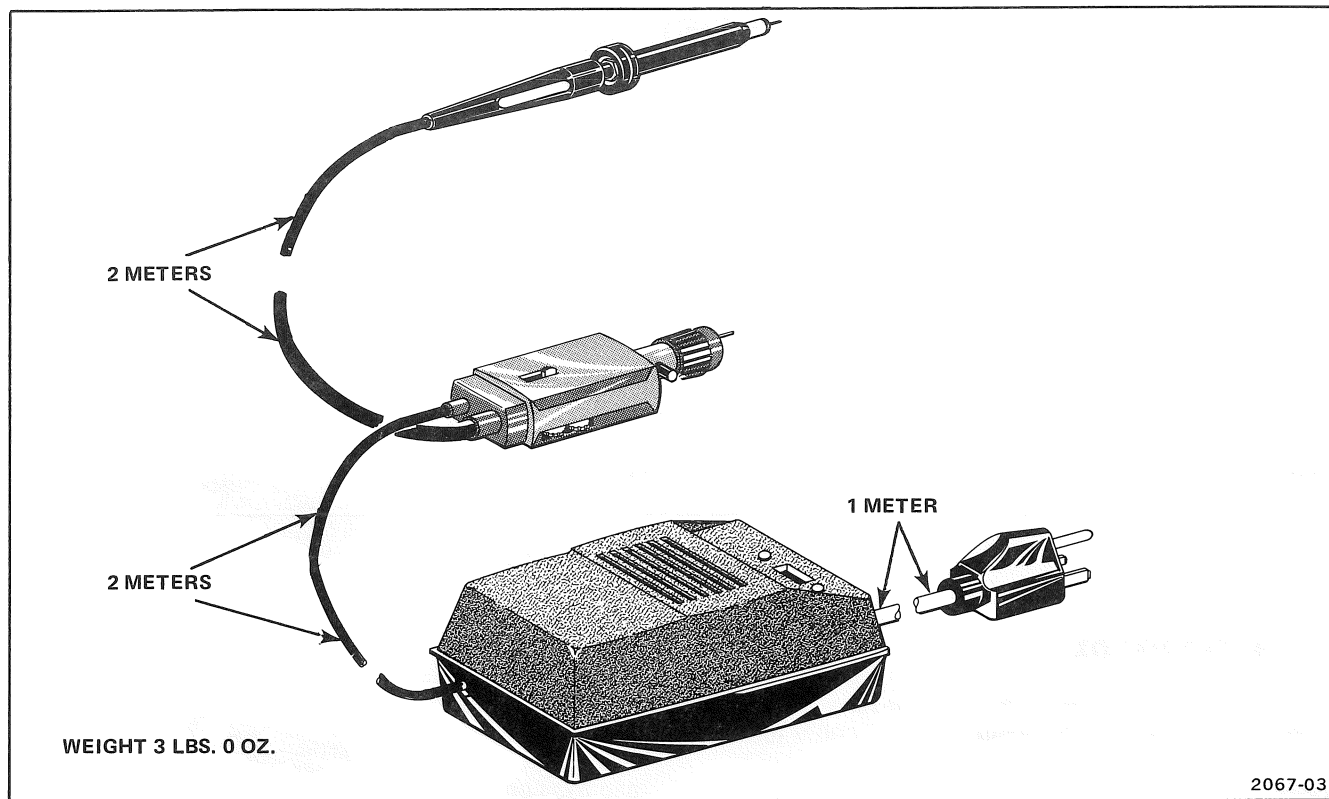


Figure 1-1. Dimensional Drawing.

RECOMMENDED ACCESSORIES

The following accessories have been selected from our catalog specifically for your instrument. They are listed as a convenience to help you meet your measurement needs. For detailed information and prices, refer to a Tektronix Products Catalog or contact your local Tektronix Field Representative.

AC COUPLER

Couples the signal being measured to the probe through a capacitor. This eliminates the need to readjust the DC OFFSET controls for each measurement. The AC Coupler simplifies measurement when you don't need to know the signals dc component.

Order 010-0360-00



10X ATTENUATOR

The 10X Attenuator extends the dynamic range of the probe to + or - 60 V. It also extends DC OFFSET range to + or - 200 V (dc + peak ac).

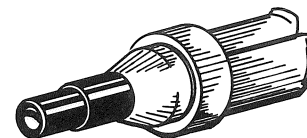
Order 010-0384-00



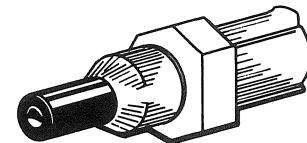
PROBE TIP TO COAXIAL CONNECTOR ADAPTERS

These adapters allow the probe to be directly connected to a signal source having a coaxial connector.

Miniature Probe Tip to GR, Order 017-0076-00



Miniature Probe Tip to GR 50 Ω Termination, Order 017-0088-00



Probe Tip to BNC, Order 013-0084-01



OPERATING INSTRUCTIONS

SAFETY INFORMATION

The instrument is provided with a three-wire power cord with a three-terminal, polarized plug for connection to the power source. The grounding terminal of the plug is directly connected to the instrument frame as recommended by national and international safety codes. Color coding of cord conductors is given in Table 2-1.

TABLE 2-1

Power Cord Conductor Identification

Conductor	Color	Alternate Color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Blue	White
Grounding (Earthing)	Green-Yellow	Green-Yellow

Do not disconnect the P6202 safety ground and float the probe. Floating the probe to make differential voltage measurements creates a shock hazard. Also you could cross grounds and cause instrument damage. If you need to make

differential measurements, use two probes and a dual-channel oscilloscope with Add and Invert features.

PROBE HANDLING

The P6202 is designed to be as rugged as possible consistent with extended high-frequency response and miniature size. However, as with all precision devices, handle the probe and cable carefully to avoid damage.

Take care not to crush the cables or to pull hard on them.

Treat the probe tip with care. When inserting the probe tip into the AC Coupler, 10X Attenuator, or other accessory jacks; use care to align the tip with the jack.

Avoid dropping the probe body. The probe body contains some of the most sensitive circuitry in the probe.

When not in use, protect the probe tip by slipping the IC Test Tip Adapter over the probe tip.

CONTROLS AND CONNECTORS

The following information will familiarize the operator with the location and operation of the P6202 external controls and connectors. These controls and connectors are accessible from outside the probe. All other controls are internal and should not be adjusted except by qualified service personnel. Refer to Figure 2-1.

- ① **Power Supply**—Contains the power supply circuitry for the probe.
- ② **Primary Power Cord**—For connection to the ac power source.
- ③ **Line Voltage Selector (115-230)**—Sets the P6202 power supply to operate from a nominal ac line voltage of either 115 or 230 volts.
- ④ **DC OFFSET**—Selects either + or – offset. Set to OFF to disable the DC OFFSET circuit.
- ⑤ **FINE**—Controls the amount of dc offset. This control has about one tenth the range of the COARSE control.

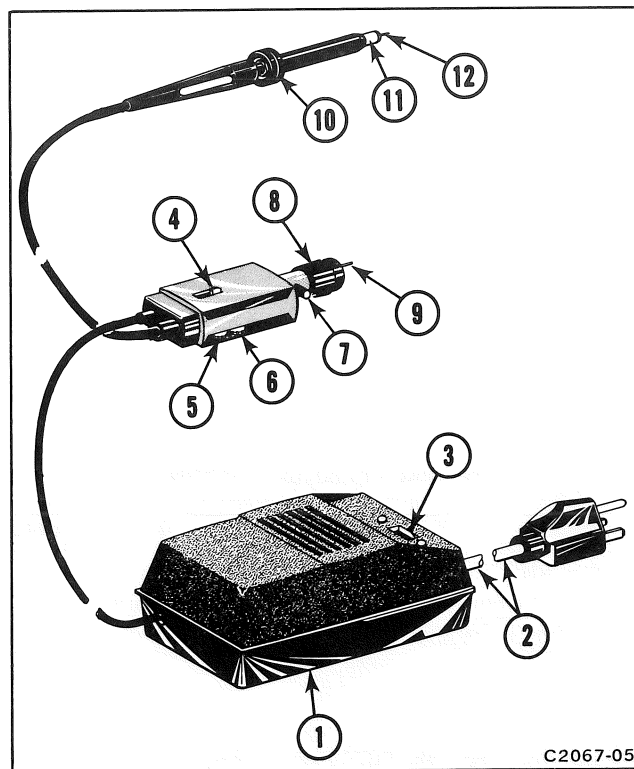


Figure 2-1. Controls and connectors.

⑥ **COARSE**—Controls the amount of dc offset. This control has about ten times the range of the FINE control.

⑦ **50 Ω** —Selects the source of the 50 Ω load required by the output of the P6202.

INT—A precision 50 Ω resistor is internally connected across the output of the P6202. Use this position when the P6202 is connected to an instrument having an input impedance of 500 k Ω or greater.

EXT—The internal load is removed from the output of the P6202. Use this position when the P6202 is connected to an instrument having an input impedance of 50 Ω within 1%.

⑧ **Output BNC Connector**—For connection of the probes output to the input of an oscilloscope or other instrument.

⑨ **Probe Coding Pin**—When connected to an instrument with a probe coding input connector, this pin activates the circuitry in the instrument which auto-

matically includes the attenuation factor of the probe in the scale factor indication. Does not automatically include the additional attenuation factor of the optional 10X Attenuator.

⑩ **Ground**—The standard accessory ground leads are connected here.

⑪ **Ground Ring**—The metal ring near the probe tip is connected to the earth ground terminal of the power cord. Use the standard accessory insulating sleeve when probing in crowded circuitry to avoid possible short circuits.

⑫ **Probe Tip**—Touch the probe tip to the source of the signal you wish to measure.

FIRST TIME OPERATION

Use the following procedure to become familiar with the basic operation of the P6202.

1. Set the P6202 Power Supply to operate from the available line voltage (115 or 230 V) and plug in the power cord.

2. Set DC OFFSET to OFF.
3. Set the oscilloscope deflection factor to 1 V and center the display vertically.
4. Connect the P6202 BNC connector to the input of the oscilloscope.
5. Set the 50 Ω switch on the probe according to the input impedance of the oscilloscope (INT for 1 M Ω input and EXT for 50 Ω input).
6. Connect the probe to the signal source. If necessary, center the display with the DC OFFSET controls (see DC OFFSET Operation).
7. Set the oscilloscope vertical and horizontal deflection factors to obtain the desired display.

MEASUREMENT CONSIDERATIONS

To obtain the most accurate measurements you should become familiar with the following considerations.

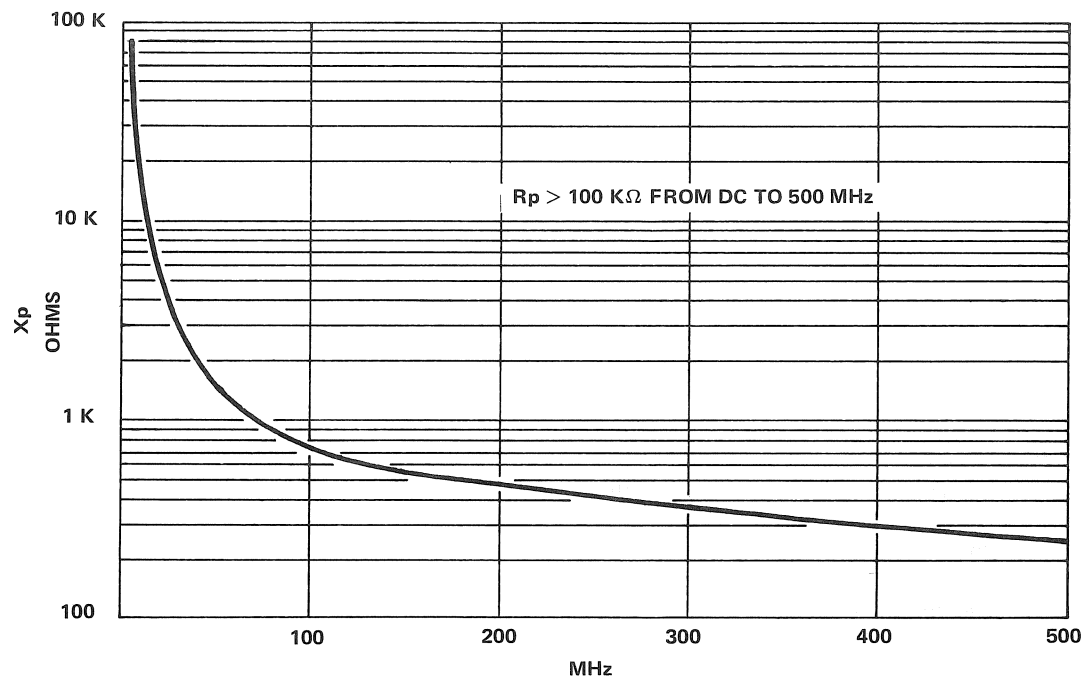
Signal Connection

The input impedance of the probe is 10 M Ω shunted by about 2 pF. Figure 2-2 shows the shunt input resistance and capacitive loading of the probe and optional attenuator as a function of frequency. Refer to this graph when loading is a concern. When possible, connect the probe to a low-impedance point in the circuit under test to minimize loading.

To measure a signal, touch the probe tip or accessory tip to the signal source. The hook tip is an included accessory which allows hands-free connection to the signal source.

A good ground connection reduces noise, especially when measuring low-amplitude signals. Use the shortest ground lead possible to avoid ground loops.

If the source of the signal you wish to measure has a coaxial connector, you may use a coaxial to probe tip adapter for signal connection. See the Recommended Accessories in Section 1 of this manual.



2067-06

Figure 2-2. P6202 input R_p and X_p (with or without optional 10X attenuator).

Deflection Factor

When used with instruments having readout or automatic scale factor switching, the 10X attenuation factor of the P6202 is automatically calculated in the scale factor indicated by the instrument. If the instrument you are using doesn't have readout or automatic scale factor switching, multiply the indicated scale factor by 10 to obtain the correct scale factor.

Use of the optional 10X attenuator provides an overall attenuation factor of 100. The attenuation factor of the optional attenuator is not automatically computed in the scale factor indicated by the instrument. If you use the attenuator, multiply the indicated scale factor by 10 (100 if the instrument doesn't have readout or scale factor switching) to obtain the correct scale factor.

Dynamic Range

The dynamic (signal) range for the P6202 probe and the probe with the optional 10X Attenuator is shown in Figure 2-3. The maximum signal capability for the probe alone is ± 6 V peak (12 V p-p). The signal can be offset ± 55 V providing a maximum dynamic window of ± 61 V (dc + peak ac). If the signal you wish to measure exceeds these limits, use the optional 10X Attenuator. The 10X Attenuator extends the maximum dynamic window to ± 200 V (dc + peak ac).

If the full dynamic range of the probe is used, a signal compression of up to 3% may occur.

Maximum Voltage and Power Limitations

NOTE

The maximum nondestructive voltage may exceed the limits of the dynamic window. For accurate measurements observe the limits given under Dynamic Range (see Fig. 2-3).

The P6202 can withstand up to 200 V (dc + peak ac) at low frequencies. The frequency and duty factor of the measured signal affect the maximum voltage limitations of the P6202. The maximum voltage derating curve (Fig. 2-4) shows the decrease in maximum voltage as frequency increases.

You may connect the probe to peak voltages exceeding the maximum voltage derating curve, but not to exceed 200 V (dc + peak ac), if the average power dissipation does not exceed the maximum. Use the following formula to calculate the maximum peak voltage you can measure.

$$E_{\text{peak}} = \frac{\text{voltage from derating curve}}{\sqrt{\text{duty factor}}}$$

where duty factor = pulse duration X repetition rate

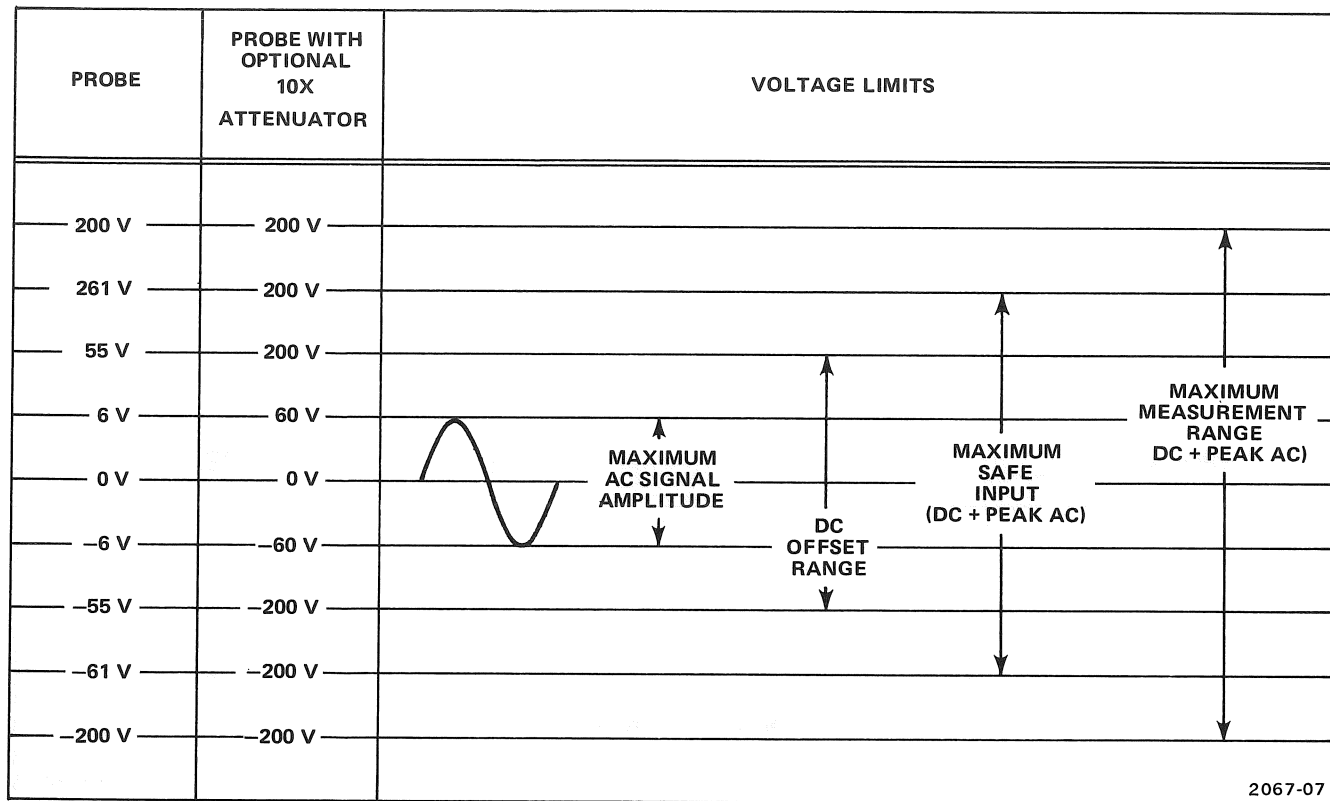
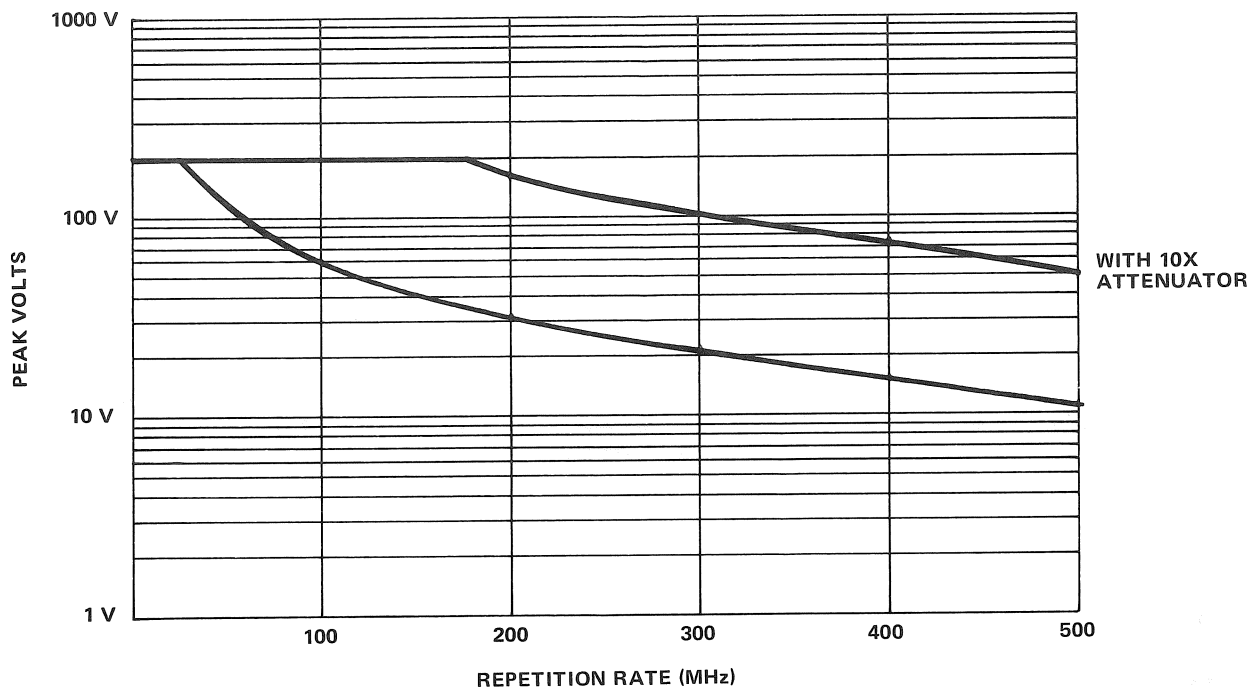


Figure 2-3. Dynamic and offset limitations for P6202 probe and probe with optional 10X attenuator.



2067-08

Figure 2-4. P6202 maximum input voltage.

System Bandwidth

When the probe output is connected to an instrument, the bandwidth of both the probe and the instrument affect the bandwidth of the system. For instance, if both the probe and the instrument have a bandwidth of 500 MHz (-3 dB at 500 MHz) then the system will be -6 dB at 500 MHz. The systems -3 dB point will be at about 350 MHz. Figure 2-5 is a graph of system bandwidth as a function of instrument bandwidth.

DC OFFSET OPERATION

CAUTION

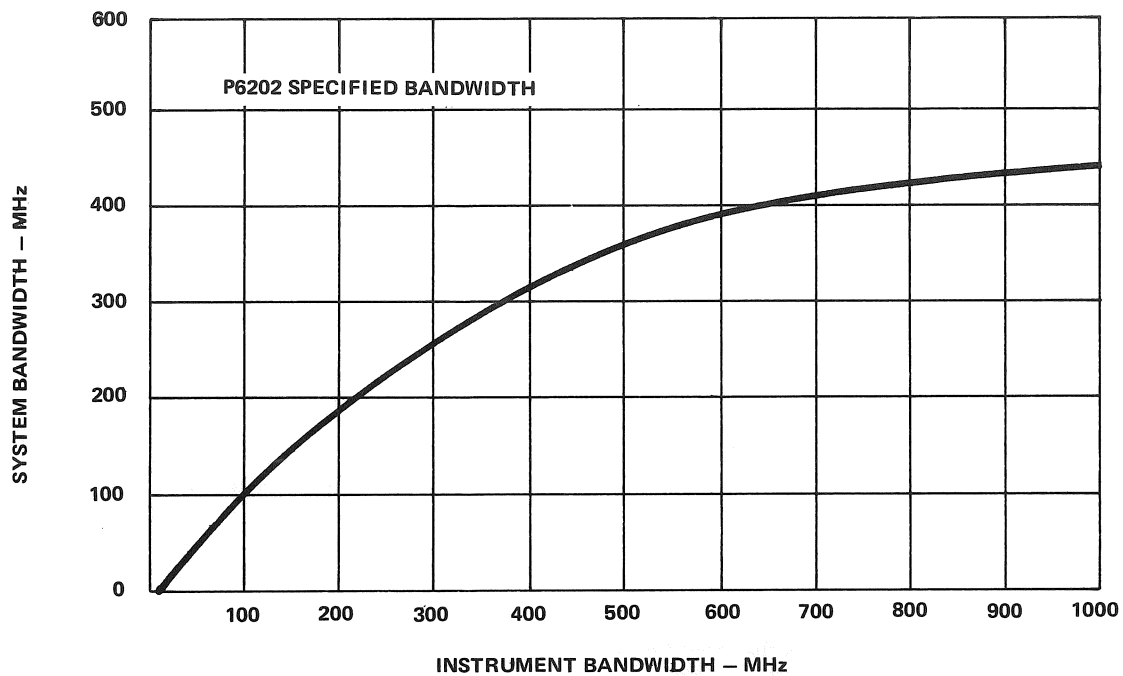
Use of the optional 10X Attenuator increases the range of the DC OFFSET controls by a factor of 10. However, instrument damage may occur if you exceed the maximum input voltage of 200 V (dc + peak ac).

The probes DC OFFSET capability allows the input signal to be positioned to the center of the probe amplifier's dynamic range. This ensures optimum probe transient response. To operate the DC OFFSET, use the following procedure.

1. Set the oscilloscope input coupling switch to GND (or remove the probe from the oscilloscope input).
2. Position the trace to the center of the crt. After centering the trace, do not readjust the oscilloscope vertical position controls. Instead, use the probe DC OFFSET controls to vertically position the display.
3. Set the oscilloscope input coupling switch to DC (or reconnect the probe to the oscilloscope input).
4. Connect the probe to the desired signal source.
5. Center the display with the DC OFFSET controls. Adjust the vertical and horizontal deflection factors to obtain the desired display.

NOTE

When using the optional AC Coupler, set the DC OFFSET switch to OFF.



2067-09

Figure 2-5. P6202 system bandwidth.

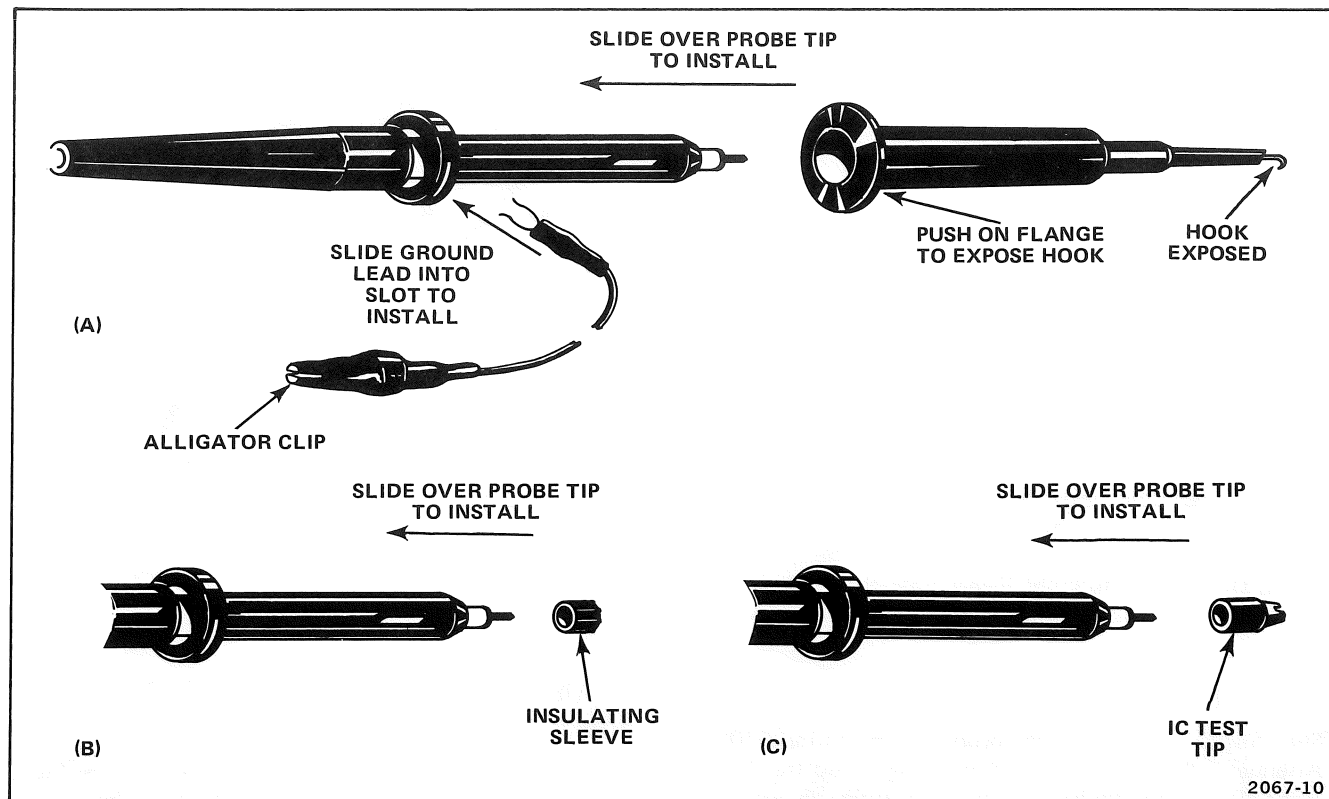


Figure 2-6. Use of included accessories.

USE OF INCLUDED ACCESSORIES

Retractable Hook Tip

The Retractable Hook Tip slides on over the probe tip. It will also slide on over the optional 10X Attenuator or AC Coupler tips (see Fig. 2-6A).

3 and 5 Inch Ground Leads

Push the Ground Lead clip into the slot on the flange of the probe body (see Fig. 2-6A). The minigator clip screws onto the free end of the lead.

Insulating Sleeve

Slide the Insulating Sleeve over the probe tip, the optional 10X Attenuator tip, or the optional AC Coupler tip to insulate the metal ground surface just behind the tip (see Fig. 2-6B). Use of the Insulating Sleeve prevents accidentally shorting the ground surface to the circuitry under test.

IC Test Tip

Slide the IC Test Tip over the probe tip, the optional 10X Attenuator tip, or the optional AC Coupler tip (see Fig. 2-6C). The slotted tip helps keep the tip from sliding off the IC pin. It also prevents shorting IC pins together with the probe tip (see Fig. 2-7).

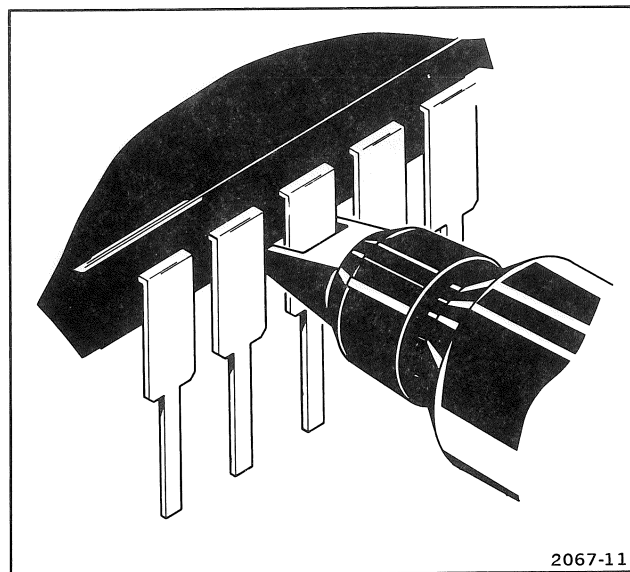


Figure 2-7. IC test tip.

USE OF RECOMMENDED ACCESSORIES

10X Attenuator

The 10X Attenuator slides on over the probe tip (see Fig. 2-8). The Hook Tip, IC Test Tip, Insulating Sleeve, and optional AC Coupler slide on over the Attenuator tip in the same manner as they do over the probe tip.

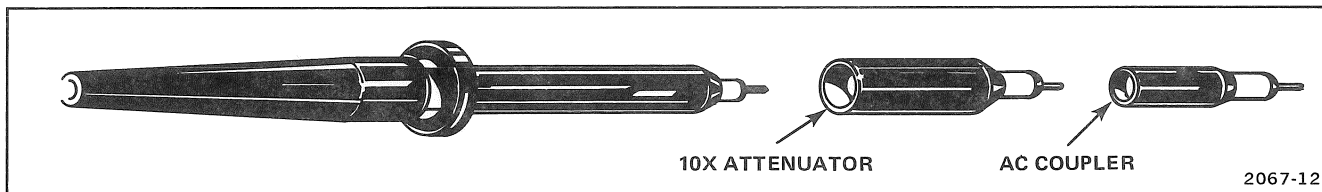


Figure 2-8. Use of optional 10X Attenuator and optional AC Coupler.

The 10X Attenuator increases the dynamic range and DC OFFSET capabilities of the probe by a factor of 10. However, due to the maximum input voltage limits, the maximum DC OFFSET range is limited to ± 200 V (dc + peak ac).

To obtain the correct deflection factor when using the 10X Attenuator, multiply the indicated deflection factor by 10 (100 if the instrument used does not have readout or automatic scale factor switching).

AC Coupler

The AC Coupler slides on over the probe tip or the optional 10X Attenuator tip (see Fig. 2-8). The Hook Tip, IC Test

Tip, and Insulating Sleeve slide on over the AC Coupler tip in the same manner as they do over the probe tip.

The AC Coupler blocks the dc component of the signal measured. Bandwidth when using the AC Coupler is at least 16 Hz to 500 MHz. Maximum input voltage is ± 200 V (dc + peak ac).

Probe Tip to Coaxial Connector Adapters

One end of the adapter has a coaxial connector, either GR or BNC. The probe tip, Attenuator tip, or AC Coupler tip slides into the other end of the adapter (see Fig. 2-9).

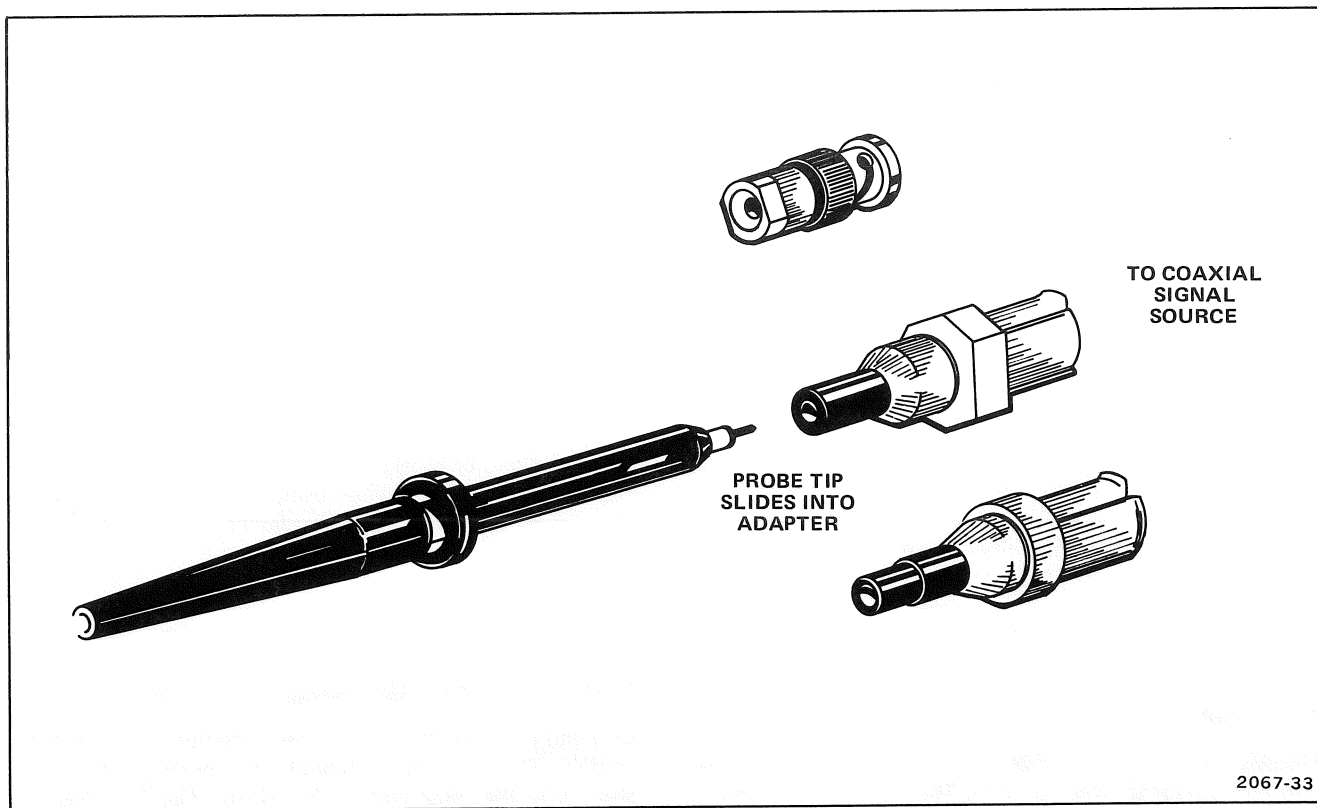


Figure 2-9. Use of optional Probe Tip to Coaxial Adapters.

PERFORMANCE CHECK

This procedure verifies the electrical specifications listed in Table 1-1. This procedure does not include adjustment instructions. The Adjustment Procedure should be performed by qualified service personnel only.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are for the P6202 under test only. Test equipment error is not included except as noted. These limits and tolerances are performance guides and should not be interpreted as performance specifications unless they are also found in Table 1-1.

TEST EQUIPMENT REQUIRED

You will need the test equipment listed in Table 3-1 to do a complete Performance Check. The test equipment specifications given are the minimum necessary for accurate results. More accurate equipment may be used but this will not increase the accuracy of the results.

TABLE 3-1
Test Equipment Required

Description	Minimum Specification	Usage	Examples of Applicable Test Equipment
1. Real time oscilloscope	Bandwidth, dc to about 15 MHz. Vertical deflection factor, 5 mV to 1 V (doesn't include probe attenuation factor). Vertical accuracy, $\pm 3\%$.	Output zero check, attenuation factor check, high frequency gain check, and DC OFFSET range check.	a. Tektronix T921. b. Tektronix 7704A with 7A15A vertical plug-in.
2. Sampling oscilloscope	Bandwidth, dc to 1 GHz. Input impedance, 50 Ω . Vertical deflection factor, 50 mV. Horizontal sweep rate, 20 ps.	Probe risetime check.	a. Tektronix 7704A with a 7S12 sampling plug-in using an S-1 sampling head.

TABLE 3-1 (CONT.)
Test Equipment Required

Description	Minimum Specification	Usage	Examples of Applicable Test Equipment
3. Standard amplitude calibration generator	Output, square wave. Repetition rate, 1 kHz. Amplitude, 5 V p-p and 50 V p-p $\pm 0.25\%$.	Attenuation factor check and high frequency gain check.	a. Tektronix PG 506.
4. Fast-rise pulse generator	Output amplitude, 200 mV or greater. Rise time, 100 ps or less. Output impedance, 50 Ω .	Probe risetime check.	a. Tektronix 284 Pulse Generator.
5. Dc voltage source	Output, + and – 55 V dc $\pm$ about 1 V	DC OFFSET range check.	a. Tektronix PG 505.
6. Adapter	Connections, BNC female to GR.	Signal Interconnection.	a. Tektronix Part 017-0063-00.
7. Adapter	Connections, miniature probe tip to GR 50 Ω termination.	Signal Interconnection.	a. Tektronix Part 017-0088-00.
8. Adapter	Connectors, miniature probe tip to BNC.	Signal interconnection.	a. Tektronix Part 013-0084-01.
9. Termination	Connectors, BNC. Impedance, 50 Ω .	Signal termination.	a. Tektronix Part 011-0049-01.
10. Cable	Length, 42 inches. Connectors, BNC.	Signal interconnection.	a. Tektronix Part 012-0057-01.

INDEX TO PERFORMANCE CHECK (SHORT FORM PROCEDURE)

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1. Check Output Zero (± 10 mV)	3-3
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5. Check Probe Risetime (≤ 0.7 ns) and Bandwidth (≥ 500 MHz)	3-6

1. CHECK OUTPUT ZERO (± 10 mV)

a. Set the P6202 Line Voltage Selector to the available line voltage. Plug in the power cord.

b. Connect the P6202 BNC connector to the vertical input of the real time oscilloscope.

c. Set P6202:

50 ΩINT

DC OFFSET.OFF

¹ Set Vertical Deflection Factor to 5 mV if the oscilloscope you are using does not automatically include the attenuation factor of the probe in the deflection factor indication.

d. Set oscilloscope:

Vertical Deflection

Factor.50 mV¹

Input CouplingGND

Trigger ModeAUTO

e. Vertically position the trace to the center horizontal graticule line.

f. Set oscilloscope Input Coupling to DC.

g. CHECK—Trace is within 2 divisions of the center horizontal graticule line.

2. CHECK ATTENUATION FACTOR ($10 \pm 4\%$)

a. Disconnect the P6202 BNC connector from the oscilloscope vertical input.

b. Connect the standard amplitude calibration generator to the real time oscilloscope input via an unterminated 50 Ω BNC cable.

c. Set the calibration generator for a 0.1 V standard amplitude output.

d. Set the oscilloscope vertical deflection factor to 0.01 V/division. Adjust the oscilloscope variable control for exactly 5 divisions of vertical deflection. This eliminates any oscilloscope vertical deflection error from the measurement. Do not readjust the variable control until told to do so.

e. Disconnect the BNC cable from the calibration generator and the oscilloscope.

f. Connect a probe tip to BNC adapter to the output of the calibration generator. Connect the P6202 probe tip to the adapter. Connect the P6202 BNC connector to the vertical input of the real time oscilloscope.

g. Set the calibration generator for a 1.0 V standard amplitude signal.

h. CHECK—Display amplitude is 5 divisions $\pm 4\%$ (4.8 to 5.2 divisions with a 5 division signal).

i. Do not change equipment setting or setup. This setup is used in the next step.

3. HIGH FREQUENCY GAIN ($\pm 5\%$, 6% p-p TOTAL ROLLOFF OR OVERSHOOT WITHIN FIRST 4 ns, 4% p-p AFTER 4 ns)

a. CHECK—Front corner undershoot or overshoot is within $\pm 5\%$, or 6% p-p total (or less) within the first 4 ns (± 0.25 div or 0.3 div p-p with a 5 division signal), and within 0.2 div p-p after 4 ns.

b. Disconnect probe tip from probe tip adapter and set oscilloscope variable to the calibrated position.

4. DC OFFSET RANGE (AT LEAST + AND – 55 V)

a. Set real time oscilloscope vertical deflection factor to 10 V (1 V if the oscilloscope you are using does not automatically include the attenuation factor of the probe in the scale factor indication).

b. Use the oscilloscope vertical position control to position the trace to the center horizontal graticule line.

c. Set the P6202 COARSE and FINE controls for minimum offset (see Fig. 3-2). Set DC OFFSET switch to +.

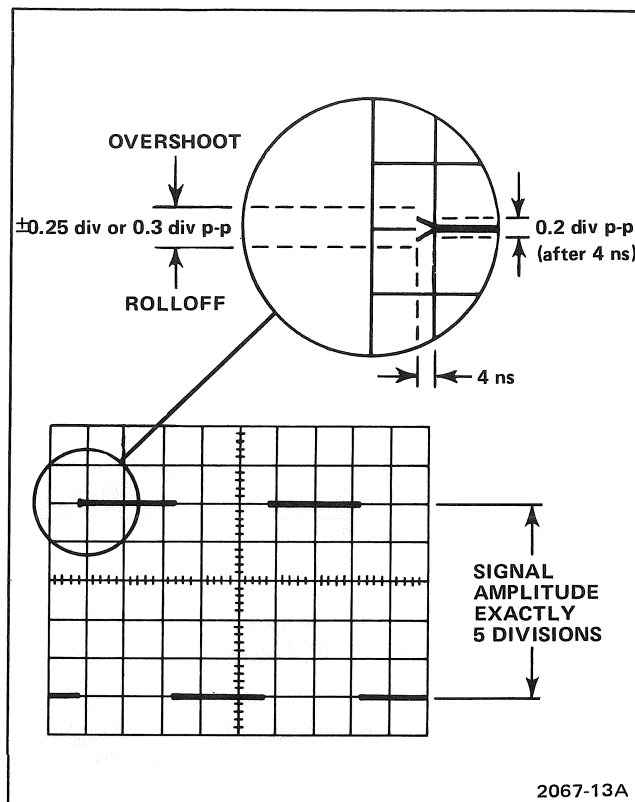


Figure 3-1. High frequency gain limits.

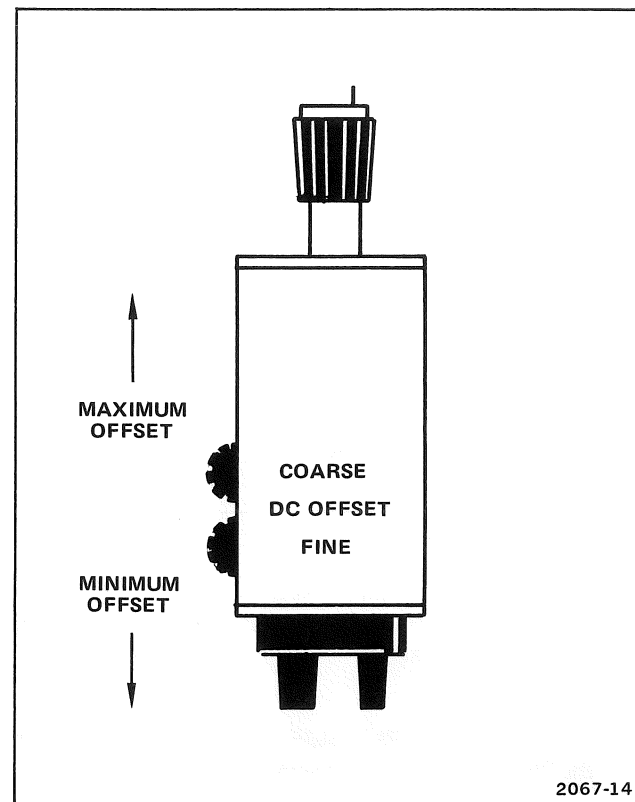


Figure 3-2. COARSE and FINE controls.

- d. Set the dc voltage source to +55 V.
- e. Connect the probe tip to the dc voltage source.

f. Set the COARSE and FINE controls for maximum offset (see Fig. 3-2).

g. CHECK—Trace moved downward to the center horizontal graticule or below.

h. Set DC OFFSET switch to —.

i. Set dc voltage source to —55 V.

j. CHECK—Trace moved upward to the center horizontal graticule line or above.

k. Set the DC OFFSET switch to OFF and disconnect the P6202 from the oscilloscope.

5. CHECK PROBE RISETIME (≤ 0.7 ns) AND BANDWIDTH (≥ 500 MHz)

a. Set sampling oscilloscope:

Vertical Deflection

Factor50 mV

Sweep Rate20 ps

b. Connect the pulse output of the pulse generator to the vertical input of the sampling oscilloscope via a GR to BNC adapter and a 50 Ω BNC cable.

c. Adjust the oscilloscope variable for a display amplitude of exactly 5 divisions.

d. Using the oscilloscope vertical position control, shift the display 1/2 division (see Fig. 3-3).

e. Measure the displayed risetime (system risetime) and record for use in part m. of this check (see Fig. 3-3).

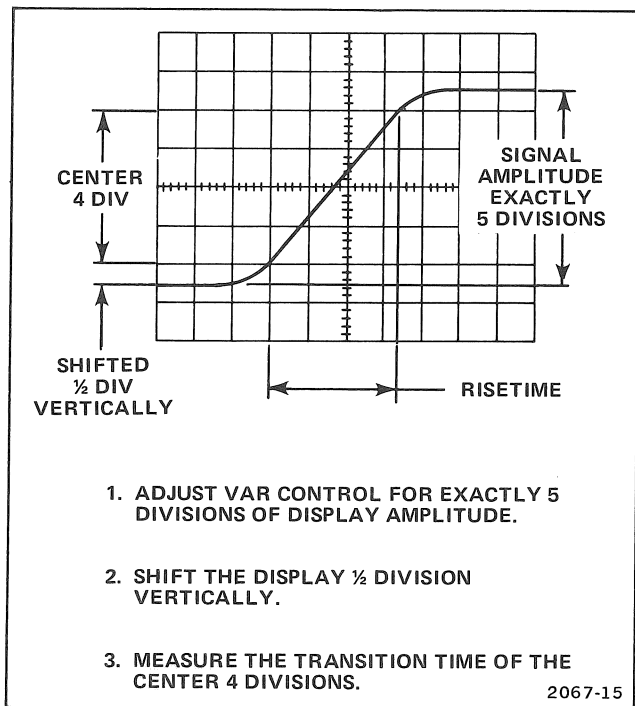


Figure 3-3. Risetime.

f. Disconnect GR to BNC adapter and 50 Ω BNC cable.

g. Connect the 50 Ω termination to the probe tip adapter to the pulse output of the pulse generator. Connect the P6202 probe tip to the adapter. Connect the P6202 BNC connector to the vertical input of the sampling oscilloscope.

h. Set P6202 50 Ω switch to EXT.

i. Set the sampling oscilloscope horizontal deflection factor to 200 ps.

j. Adjust sampling oscilloscope vertical deflection factor and variable controls for a display amplitude of exactly 5 divisions.

k. Using the oscilloscope vertical position control, shift the display 1/2 division vertically (see Fig. 3-3).

l. Measure the displayed risetime and record for use in part m. of this check (see Fig. 3-3).

m. Use the following formula to calculate probe risetime:

$$\text{PROBE RISETIME} = \sqrt{\left[\begin{array}{c} \text{DISPLAYED} \\ \text{RISETIME} \\ \text{FROM PART E} \end{array} \right]^2 - \left[\begin{array}{c} \text{SYSTEM} \\ \text{RISETIME} \\ \text{FROM PART L} \end{array} \right]^2}$$

n. CHECK—Calculated probe risetime is 0.7 ns or less. This indicates a bandwidth of 500 MHz or greater calculated from the formula:

$$\text{BANDWIDTH} = \frac{0.35}{\text{RISETIME}}$$

o. Disconnect test equipment.

END OF PROCEDURE

CIRCUIT DESCRIPTION

WARNING

SERVICING INFORMATION IN THE FOLLOWING SECTIONS IS INTENDED FOR USE BY QUALIFIED SERVICE PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK DO NOT REMOVE INSTRUMENT COVERS OR PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

BLOCK DIAGRAM DISCUSSION

Figure 4-1 shows a block diagram of the P6202. The input signal is attenuated by R12 and R14 and applied to the Input Source Follower. The Input Source Follower provides a high input impedance. The output of the Input Source Follower goes to the First Emitter Follower which provides signal current gain. The output of the First Emitter Follower goes to the Output Emitter Follower. The Output Emitter Follower provides the final current gain needed to drive the low-impedance output. Negative feedback from the Output Emitter Follower to the constant-current source for the Input Source Follower is supplied through C29 and R29. To measure ac signals riding on dc levels, the DC OFFSET controls null the gate of the Input Source Follower to 0 V dc through R14. The Power Supply provides the dc voltages needed to power the P6202.

PROBE AMPLIFIER



Input Source Follower

Q16A is connected as a source follower. Q16B provides a constant current source for Q16A.

The input signal passes through a voltage divider composed of R12 and R14. Resistors R10, R41, R42, R44, and R45 are also part of the voltage divider, but have little effect on the signal because they are so small in comparison to R12 and R14. The resulting signal, at the gate of Q16A, is 20% of the signal at the probe tip (an attenuation factor of 5). C12 adjusts to compensate the voltage divider for high-frequency losses caused by stray capacitance and the input capacitance of Q16A.

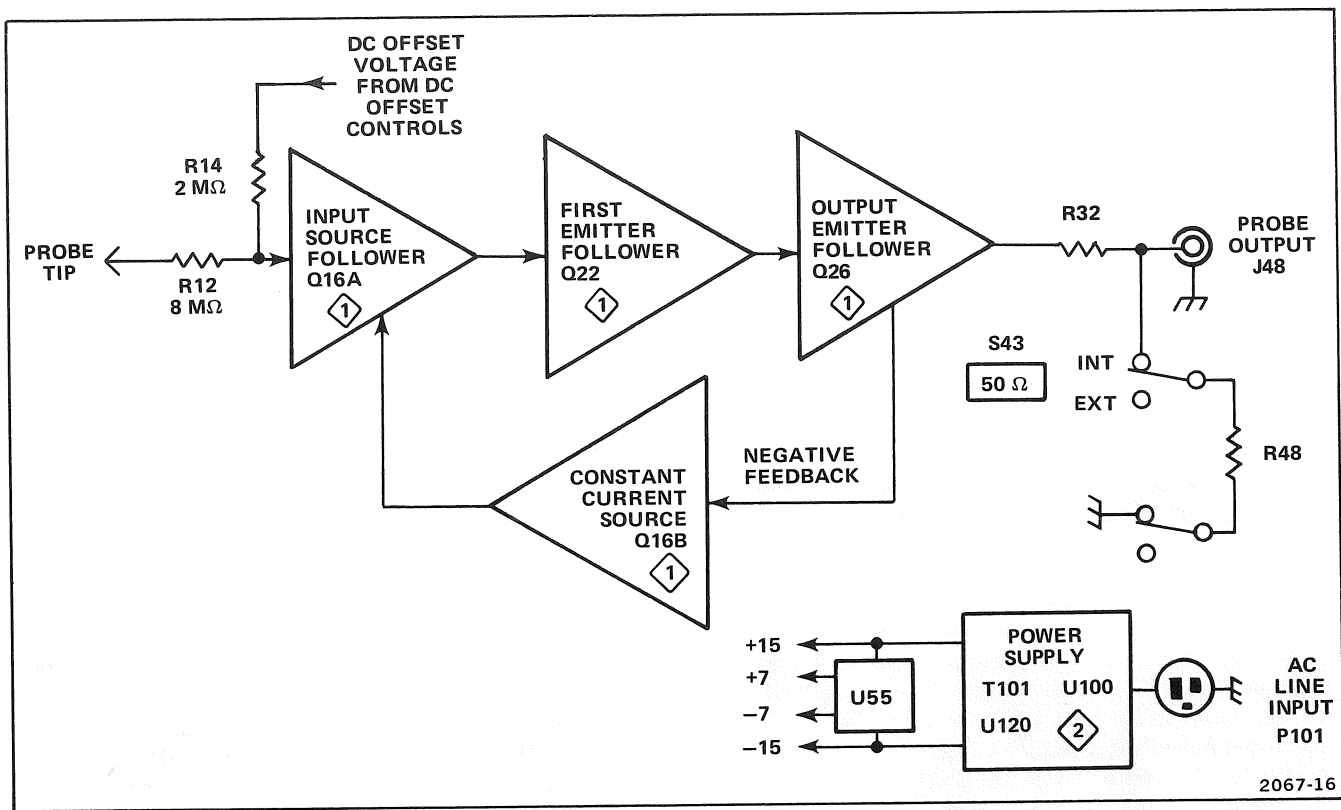


Figure 4-1. Block diagram of P6202.

R50 provides a slight adjustment of the bias on Q16B to set the output dc level to 0 V dc when the DC OFFSET switch is set to OFF and when no signal is connected to the probe tip.

First Emitter Follower

The First Emitter Follower is composed of Q22. This stage provides the current gain needed to drive the Output Emitter Follower, Q26.

Output Emitter Follower

The Output Emitter Follower is composed of Q26. The signal at the emitter of Q26 passes through a voltage divider composed of R32 and the $50\ \Omega$ output load, either internal or external. About 53% of the signal available at the emitter of Q26 passes to the output BNC connector (an attenuation factor of 1.9). This, combined with the attenuation factor of 5 to the gate of the Input Source Follower and the losses in the 3 follower stages, provides an overall attenuation factor of 10.

Q26 is longtailed to -15 V through R28 for stability. This eliminates problems caused by current starving Q26 on large negative-going transitions of the input signal.

Negative feedback to the gate of Q16B is provided through R29 and C29. This compensates for minor nonlinearities in the input attenuator (R12-R14).

C31, R31, and C33 compensate for losses in the coaxial cable.

Dc Offset

If the signal at the probe tip rides on a dc level, the instantaneous voltage (dc + peak ac) can overdrive the Input Source Follower. The DC OFFSET controls can remove the dc component of the signal at the gate of Q16A.

EXAMPLE

A 1 V ac signal at the probe tip rides on -25 V dc. This signal is attenuated by 5 (see Input Source Follower) and applied to the gate of Q16A. The resulting signal at the gate of Q16A is 0.2 V ac riding on -5 V dc.

The DC OFFSET switch is set to $-$. This supplies a positive voltage to the junction of R14 and C14. The DC OFFSET controls are adjusted to supply $+6.25\text{ V}$ dc to junction. This voltage is divided by R14 and R12.

With -25 V dc at one end of R12 and $+6.25$ at one end of R14, the junction of R12 and R14 is nulled to 0 V dc.

Voltage Regulator IC, U55

Integrated circuit U55 is a dual-voltage regulator. U55 drops the +15 V and -15 V supplies to +7 and -7 V.

VR59 limits the maximum possible power dissipation of U55 to within its allowable limits.

POWER SUPPLY



The Power Supply provides +15 V dc to power the P6202.

S101 connects the primaries of T101 in series for 230 V operation (lower turns ratio) or in parallel for 115 V operation (higher turns ratio).

The +15 V supply is full-wave rectified by CR103 and CR106. The -15 V supply is full-wave rectified by CR104 and CR105.

U110 and U120 are integrated-circuit voltage regulators. R110 and R120 adjust the reference voltage to set the output to +15 and -15 V dc respectively.

MAINTENANCE

This section contains information for use in preventive maintenance, troubleshooting, and corrective maintenance.

COVER REMOVAL

CAUTION

To prevent shorting of components, disconnect the power cord before removing the covers.

PROBE BODY COVER

Turn the probe body cover counterclockwise to remove (see Fig. 5-1).

PROBE CONTROL BODY COVERS

There are two covers on the probe control body. To remove, press firmly on the edge and pry off (see Fig. 5-2).

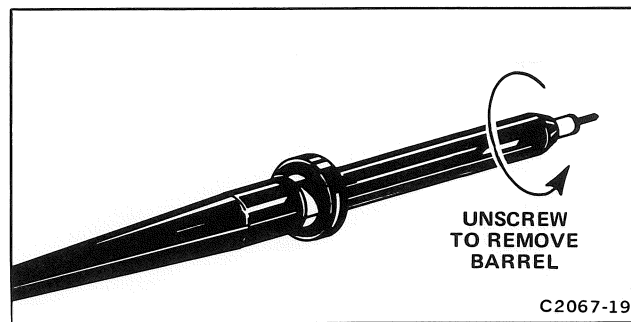


Figure 5-1. Probe body cover removal.

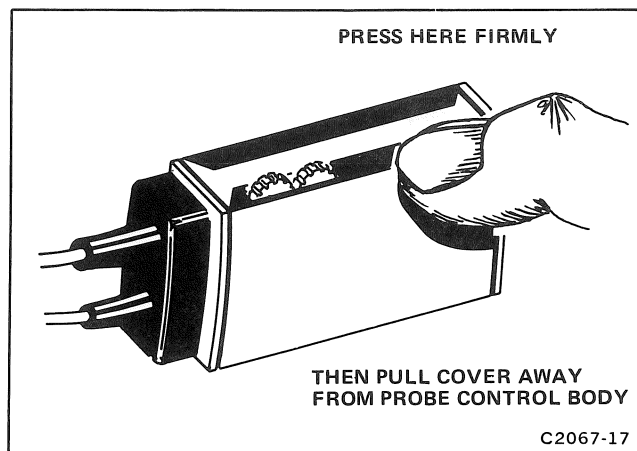


Figure 5-2. Probe control body cover removal.

POWER SUPPLY COVER

Remove the four screws on the bottom of the power supply. There are components connected to each half of the cover. Carefully pull the covers apart.

PREVENTIVE MAINTENANCE

Preventive maintenance consists primarily of cleaning and visual inspection. When performed on a regular basis, preventive maintenance will increase instrument reliability. The frequency of preventive maintenance depends on the severity of the probes environment. The most convenient time to perform preventive maintenance is just before performing an adjustment procedure.

CLEANING

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics and circuit boards used in this instrument. Especially avoid chemicals which contain benzene, toluene, xylene, acetone or similar solvents.

Normally the circuit boards in the probe body or probe control body will not require cleaning unless a cover has been left off for an extended period of time. Use dry, low-pressure air (about 9 lbs/in²) to blow away accumulated dust.

CAUTION

If you use any liquid cleaner, allow ample drying time before applying power.

Remove any remaining dust or dirt with a cotton tipped applicator dipped in a solution of mild detergent and water.

VISUAL INSPECTION

After cleaning, check for such defects as poor or damaged connections, damaged parts, bent leads, and heat-damaged components. A heat damaged component usually indicates other trouble in the instrument. To prevent a recurrence of the damage, be sure to find and correct the cause of overheating.

SEMICONDUCTOR CHECKS

All semiconductors in the P6202, except U55, are part of an assembly. They cannot be individually checked or replaced. The best check of semiconductor performance is proper operation in the instrument.

RECALIBRATION

To ensure measurement accuracy, readjust the probe every 1000 hours of operation or every six months if used infrequently. The adjustment procedure is very easy to

perform and requires a minimum amount of test equipment (see Section 6 in this manual). If you wish to verify the probes specifications after adjustment perform the Performance Check (see Section 3 of this manual).

TROUBLESHOOTING

The following information is provided to aid troubleshooting the P6202. Along with the following information, use the schematic diagrams in Section 8 and the circuit descriptions in Section 4.

TROUBLESHOOTING PRECAUTIONS

Due to the unique design, the circuitry in the probe body is very sensitive. Therefore, none of the components on the probe body circuit board can be replaced. Do not try to unsolder any of the components on the probe body circuit board. The heat necessary to remove a component may cause damage to the component.

Before removing the probe body cover, be sure you have disconnected the power cord. The metal threads, which hold on the cover, may short some of the components on the probe body circuit board.

To avoid instrument damage and a possible shock hazard, be sure you disconnect the power cord before performing any assembly or disassembly procedures.

TROUBLESHOOTING AIDS

Troubleshooting Table

Table 5-1 gives a listing of some possible problems and their probable causes.

TABLE 5-1
Possible Trouble and Probable Causes

Trouble	Probable Causes	Action
Wrong Gain	1. INT-EXT switch in wrong position.	Set INT-EXT switch to INT for load $>500\text{ k}\Omega$ or EXT for load of $50\text{ }\Omega \pm 1\%$.
	2. Faulty INT-EXT switch.	Replace INT-EXT switch.
	3. C12 misadjusted (for wrong high-frequency gains only).	Readjust C12. See Adjustment Procedure.
	4. Input signal exceeds probe dynamic range limits.	Reduce signal amplitude or use optional 10X attenuator.
	5. Defective Probe assembly.	Replace probe assembly.
Unable to adjust output zero (R50) with no signal input	1. OFFSET switch in + or — position.	Set switch to OFF.
	2. R50 or R51 defective.	Replace R50 or R51.
	3. Defective power supply ($\pm 15\text{ V}$).	Check ± 15 volt supply. Replace if defective.
	4. Defective ± 7 volt supplies.	Check R55, R57 and U55. Replace if necessary.
	5. Defective probe assembly.	Replace probe assembly.

TABLE 5-1 (CONT.)
Possible Trouble and Probable Causes

Trouble	Probable Causes	Action
Trace will not move when adjusting COARSE and FINE controls	1. DC OFFSET switch set to OFF.	Set DC OFFSET switch to + or —.
	2. Defective OFFSET switch.	Replace OFFSET switch.
	3. Defective COARSE or FINE control.	Replace control.
Intermittent probe operation	1. Broken or unsoldered wire, connection, or component.	Visually check for damage and repair any damage found.
	2. Broken probe cable or faulty probe assembly.	Replace probe assembly.
	3. Broken power supply cable or defective power supply.	Replace power supply assembly.
	4. Faulty INT-EXT switch assembly.	Replace INT-EXT switch.

Diagrams

Complete circuit diagrams are given in Section 8. The portions of the circuit mounted on circuit boards are enclosed with heavy lines. The component number and electrical values of each component is shown on the diagram.

Circuit Board Illustrations

On the page facing a diagram is an illustration of the circuit board containing the circuitry shown on the diagram. Each component shown on the illustration is identified by its circuit number.

Voltages and Waveforms

Typical voltages are given on the schematic diagram (see Section 8). Typical waveforms are shown on the page opposite the diagram. Each waveform is numbered. The number is given on the diagram and the circuit board illustration to indicate where the waveform was obtained. Voltage and waveform test conditions are also given.

TROUBLESHOOTING EQUIPMENT

The following equipment is useful in troubleshooting.

1. Digital Multimeter

Description: Voltmeter; 10 M Ω input impedance, 0 to 150 Volts dc range, 0.15% dc voltage accuracy, 4½ digit display. Ohmmeter; 0 to 20 M Ω range.

Recommended: Tektronix DC501.

2. Test Oscilloscope

Description: Dc to at least 15 MHz bandwidth, 5 mV to 5 V/division deflection factor.

Recommended: Tektronix T935 portable oscilloscope.

TROUBLESHOOTING TECHNIQUES

The following techniques are listed in an order which checks the simple possibilities before proceeding with extensive troubleshooting. The first few checks ensure proper connection, operation, and calibration. If you don't locate the problem by these checks, the remaining steps should aid in locating the defective component. Replace defective components using the procedures given under Component and Subassembly Replacement.

Check Control Settings

Incorrect control settings can indicate a trouble that does not exist. See Section 2, Operating Instructions, for information on control operation.

Check Associated Equipment

Associated equipment, on either the input or output of the probe, may be defective. A signal you expect to see might not exist or might be distorted at the point you are testing. Also, if you are using the probe with an oscilloscope the vertical amplifier may be defective or the vertical controls may be misadjusted.

Check Instrument Calibration

The miscalibration of the P6202 or the test oscilloscope can cause an apparent error in a measurement.

Visual Check

Many problems can be located visually. Check for broken wires, damaged connections, and damaged circuit boards. If you find a heat damaged component, find the cause of overheating to prevent a recurrence of the problem.

Check Table 5-1

Table 5-1 lists some possible problems and the probable causes.

Check Waveforms and Voltages

Typical voltages are shown on the schematic diagram (see Section 8). Waveforms are shown on the page facing the diagram.

Each waveform is numbered. The point where a waveform was obtained is indicated by a number on the schematic diagram and on the circuit board illustration.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component or subassembly replacement and instrument repair. Special techniques required to replace components in this instrument are given here.

OBTAINING REPLACEMENT PARTS

Standard Parts

All electrical and mechanical part replacements for this instrument can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components may be available locally in less time. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating and description.

NOTE

Physical size and shape of a component may affect Instrument performance, particularly at high frequencies. Always use direct-replacement components, unless you know that a substitute will not degrade instrument performance.

Special Parts

In addition to the standard electronic components, some special components are used in this instrument. Some components are manufactured or selected by Tektronix, Inc. to meet specific performance requirements. Others are manufactured for Tektronix, Inc. according to our specifications (see Cross Index Manufacturers Code Number to Manufacturer in Replaceable Parts List for code numbers). Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

Circuit Boards and Subassemblies

Wired circuit boards and subassemblies for the P6202 can be ordered from Tektronix Inc. See the Replaceable Parts List for which subassemblies are replaceable.

Ordering Parts

When ordering replacement parts from Tektronix, Inc., include all of the following information to insure receiving the proper parts.

1. Instrument type (include modification or option numbers).
2. Instrument serial number.

3. A description of the part (if electrical, include the circuit number).
4. Tektronix part number.

SOLDERING TECHNIQUES

WARNING

To prevent electrical shock or damage to the instrument, always disconnect the instrument from the power source before soldering.

CAUTION

Do not do any soldering on the probe body circuit board. The heat can damage the sensitive circuitry on the board.

Use ordinary 60/40 solder and a 15 watt pencil-type soldering iron for most soldering. Using a soldering iron with higher wattage-rating on etched circuit boards can cause the etched circuit wiring to separate from the board base material.

The following procedure should be used when soldering on a circuit board. Also see Component and Subassembly Replacement for special instructions for removing specific components.

1. Grip component lead with long-nose pliers. Touch soldering iron to lead at solder connection. Do not lay iron directly on board.
2. When solder begins to melt, pull lead out gently. This should leave clean hole in board. If not, hole can be cleaned by reheating solder and placing sharp object (e. g. toothpick) into the hole to clean it out. A vacuum-type desoldering tool also can be used for this purpose.
3. Bend leads of new component to fit holes in board. If component is replaced while board is mounted in instrument, cut leads so they just protrude through board. Insert leads into holes in board with component firmly seated against board (or as positioned originally). If it does not seat properly, heat solder and gently press component into place.
4. Touch the iron to the connection and apply a small amount of solder to make a firm solder joint. To protect heat-sensitive components, hold the lead between the component body and the solder joint with a pair of long-nose pliers or other heat sink.

5. Clip excess lead that protrudes through board (if not clipped in step 3).

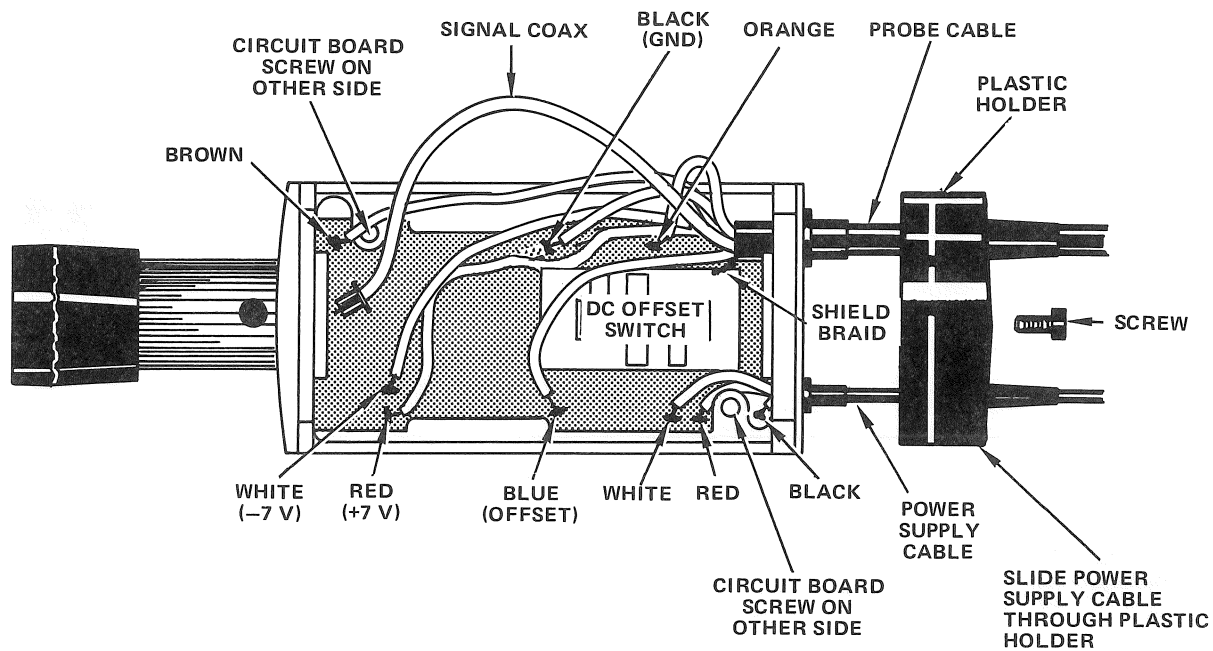
COMPONENT AND SUBASSEMBLY REPLACEMENT

Use the following procedures for replacing circuit boards and subassemblies in the P6202.

Probe and Probe Cable Assembly

Because of the unique nature of the circuitry, you must replace a defective probe body circuit board as an assembly. The assembly includes the probe circuit board, probe cable, and plastic fitting. See the Replaceable Parts List for the part number of this assembly.

1. Remove the covers from the probe control body (see Fig. 5-2).
2. Grasp the blue signal coax, near the output BNC, with a pair of long-nose pliers (see Fig. 5-3). Pull the coax out of the connector. This may be easier if you slightly loosen the two screws holding the probe control body circuit board. Don't forget to tighten them curing reassembly.



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Figure 5-3. Probe control body.

3. Unsolder the six probe cable wires from the probe control body circuit board (see Fig. 5-3).

4. Remove the phillips screw from the plastic holder on the cable end of the probe control body (see Fig. 5-3). Slide the plastic holder away from the probe control body.

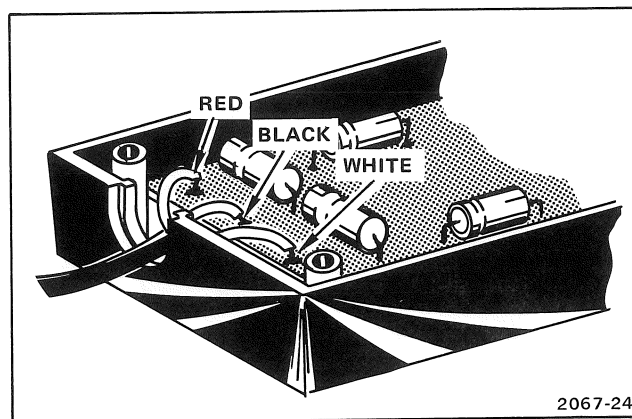
5. Unsolder the probe cable shield braid from the DC OFFSET switch frame.

6. Remove the power supply covers.

7. Unsolder the three power supply wires from the circuit board (see Fig. 5-4).

8. Slide the power supply cable through the plastic holder (see Fig. 5-3).

9. Slide the probe cable out of the probe control body. The plastic holder is part of the assembly.



2067-24

Figure 5-4. Power supply.

Power Supply

1. Remove the probe control body covers (see Fig. 5-2).
2. Remove the screw from the cable end of the probe control body (see Fig. 5-3).
3. Unsolder the three power supply cable wires from the probe control body circuit board (see Fig. 5-4).

4. Pull the power supply cable out of the probe control body.
5. Remove the power supply covers.
6. Unsolder the three power supply cable wires from the power supply circuit board (see Fig. 5-4).
7. Pull the power supply cable, the strain relief and plastic holder.

NOTE

When installing a new power supply, you must unsolder the new power supply cable from the power supply circuit board in order to feed it through the plastic holder.

Probe Control Body Circuit Board

1. Remove the probe control body covers.
2. Disconnect the blue signal coax from near the output BNC connector.(see Fig. 5-3).

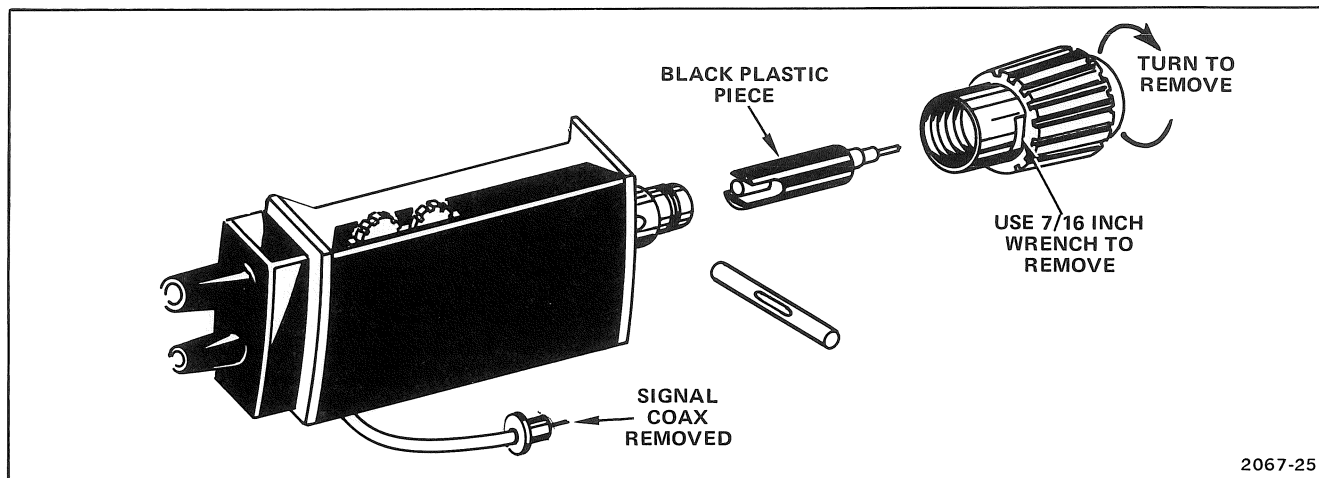
3. Unsolder all wires from probe control body circuit board (see Fig. 5-3).

4. Unsolder the shield braid from the DC OFFSET frame.

5. Remove the two screws holding the probe control body circuit board and remove the board. Do not loose the two small metal spacers under the circuit board.

50 Ω Switch

1. Remove the probe control body covers (see Fig. 5-2).
2. Unplug the blue signal coax from near the output BNC connector (see Fig. 5-3).
3. Using a 7/16 inch open end wrench, loosen the BNC shell and carefully remove (see Fig. 5-5).
4. Grasp the black plastic piece just exposed and pull to remove (see Fig. 5-5).
5. Grasp the 50 Ω switch and pull to remove (see Fig. 5-5).



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Figure 5-5. 50 Ω switch removal.

NOTE

When reinstalling the switch, be sure the clip side is correctly oriented (see Fig. 5-5).

When installing a replacement IC, be sure to clip the leads as shown in Figure 5-6.

Integrated Circuit—U55

U55 is soldered on the probe control body circuit board (see Fig. 5-6). It isn't very easy to remove by unsoldering the leads. If you are sure U55 is defective, the easiest way to remove it is to clip the leads.

DC Offset Switch

The DC OFFSET switch is very difficult to remove without damaging the probe control body circuit board. If possible, have the switch replaced at a Tektronix Service Center.

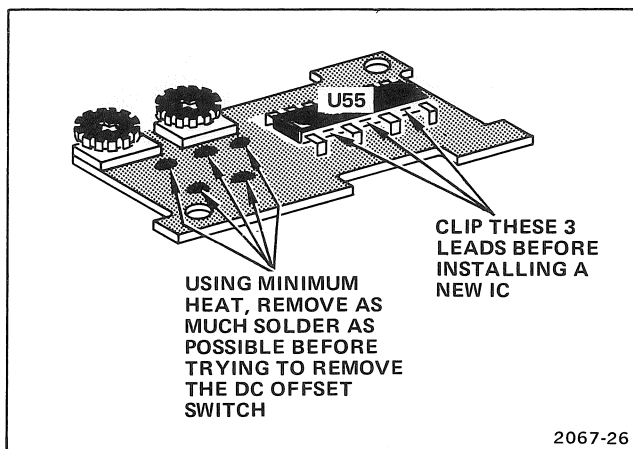


Figure 5-6. U55 removal.

If you must replace the switch yourself, use the following procedure.

1. Remove the probe control body covers.
2. Unsolder the shield braid and the ground strap from the switch frame.

3. Using a vacuum desoldering tool or Solderwick [®], remove as much solder as possible from the 5 switch leads (see Fig. 5-6).

4. Carefully pull the switch away from the board heating the terminals as necessary. Use as little heat as possible to avoid damage to the circuit board.

Zero Output Adjustment—R50

R50 is soldered onto the probe control body circuit board. The solder terminals are difficult to get to. Use the following procedure to remove R50.

1. Remove the probe control body covers.
2. Remove the two screws holding the probe control body circuit board. Don't loose the metal spacers under the circuit board.
3. Unsolder the two shield braids from the DC OFFSET switch frame. This allows you to move the probe control body circuit board away from the casting to gain access to the leads of R50.

4. Use the smallest solder tip possible on a 15 watt soldering iron. Unsolder the two leads of R50 from the DC OFF-SET side of the circuit board (see Fig. 5-7A). Pry R50 away from the board as you heat the leads. When the two leads are sufficiently exposed, cut them with a pair of small wire cutters.

5. Bend R50 away from the circuit board. Unsolder or clip the remaining lead of R50 (see Fig. 5-7B). (see Fig. 5-7B).

Probe Tip Replacement

If you use the P6202 without any of the accessory slip-on tips, the unprotected probe tip is subject to breaking or bending. Trying to straighten a bent tip will weaken it and may break it. See Figure 5-8 for replacement instructions.

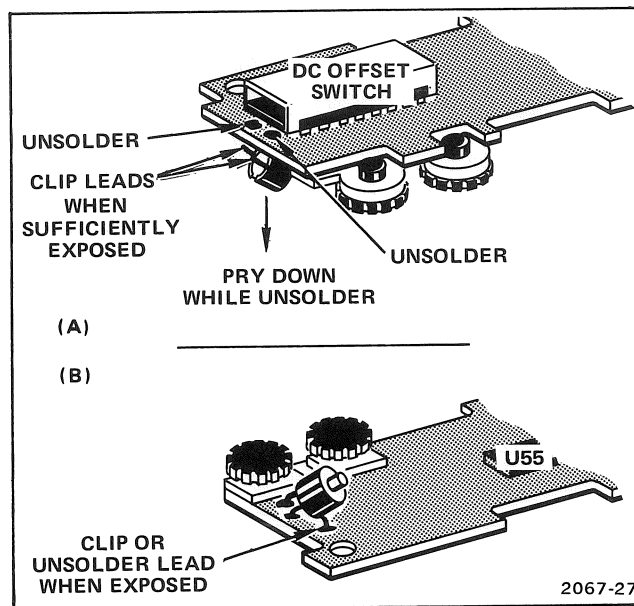


Figure 5-7. R50 removal.

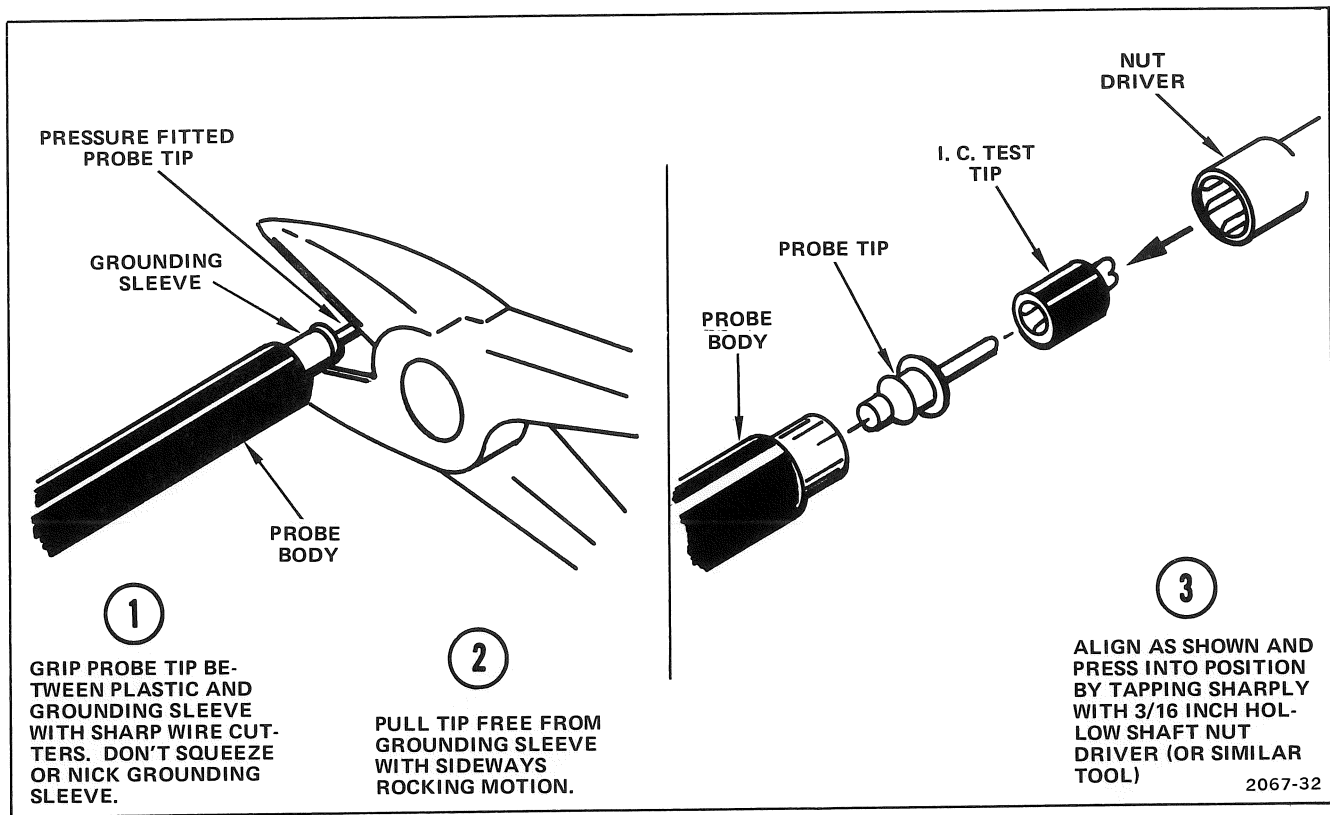


Figure 5-8. Probe tip replacement.

ADJUSTMENTS

INTRODUCTION

PURPOSE OF THIS PROCEDURE

Performance of this procedure on a regular basis ensures optimum performance of your P6202. We recommend performing an Adjustment Procedure every 1000 hours of operation or every six months if used infrequently.

This procedure gives instructions for adjusting the P6202 to design center and does not check the probes specifications. If you wish to verify the performance of the probe, see the Performance Check in Section 3 of this manual.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are for the P6202 under test only. Test equipment error is not included. These limits and tolerances are adjustment guides and should not be interpreted as performance specifications unless they are also found in Table 1-1.

TEST EQUIPMENT REQUIRED

The P6202 requires a minimum amount of test equipment to perform a complete adjustment procedure. See Table 6-1 for the test equipment you will need.

TABLE 6-1
Test Equipment Required

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
1. Real time oscilloscope	Bandwidth, dc to about 15 MHz.	Output Zero adjustment, high frequency gain adjustment.	a. Tektronix T921 oscilloscope. b. Tektronix 7704A with a 7A16 Vertical plug-in.

**TABLE 6-1 (CONT.)
Test Equipment Required**

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
2. Screwdriver	Length, 3 inch shaft. Bit size, 3/32 inch.	Variable component adjustment.	a. Xcelite R3323.
3. Adjustment tool		Variable component adjustment.	a. P6202 included accessory, Tektronix part 003-0675-00.

INDEX TO ADJUSTMENT PROCEDURE (SHORT FORM PROCEDURE)

	PAGE
1. Adjust Output Zero (R50)	6-3
2. Adjust High Frequency Gain (C12).	6-4

ADJUSTMENT PROCEDURE

1. ADJUST OUTPUT ZERO (R50)

- a. Remove the probe control body cover (see Fig. 6-1).
- b. Set the P6202 Line Voltage Selector to the available line voltage. Plug in the P6202 line cord.
- c. Connect the P6202 BNC connector to the vertical input of the oscilloscope.
- d. Set P6202:
50 Ω INT
DC OFFSET OFF
- e. Set oscilloscope:
Vertical
Sensitivity 50 mV¹
Input Coupling GND
Trigger Mode AUTO

¹ 5 mV if the oscilloscope you are using does not automatically include the attenuation factor of the probe in the scale factor indication.

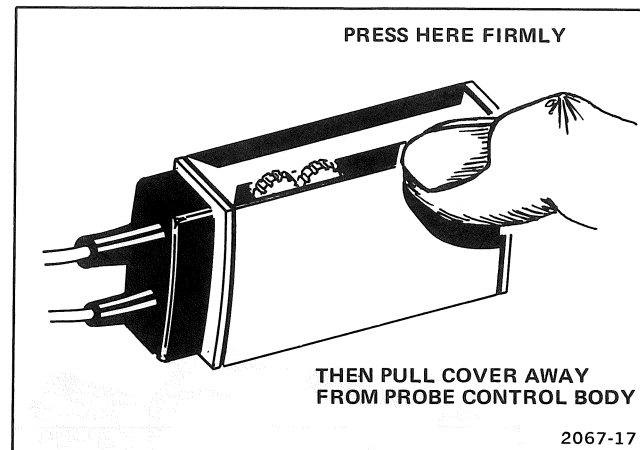


Figure 6-1. Probe control body cover removal.

- f. Vertically position the trace to the center horizontal graticule line.
- g. Set the oscilloscope Input Coupling to DC.

h. ADJUST—R50 (see Fig. 6-2) to move the trace back to the center horizontal graticule line.

2. ADJUST HIGH FREQUENCY GAIN (C12)

CAUTION

To avoid shorting components, disconnect the power cord while removing the probe barrel.

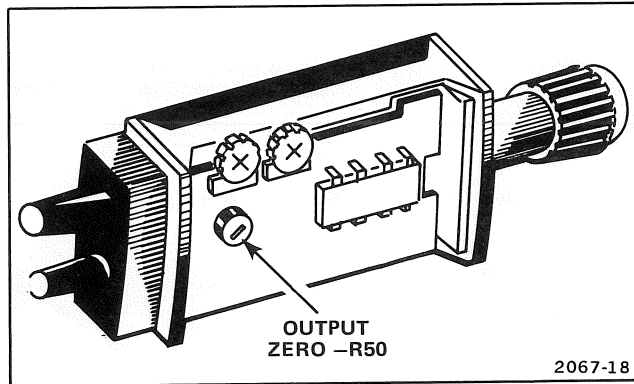


Figure 6-2. Output zero adjustment location.

a. Remove the probe barrel from the P6202 (see Fig. 6-3).

b. Connect the P6202 to a 1 kHz squarewave (see Fig. 6-4). Use the probe adjust or calibrator output on the oscilloscope if so equipped.

c. Set the oscilloscope horizontal sweep rate for 0.2 milliseconds per division.

d. Adjust the oscilloscope vertical sensitivity for a display amplitude of about 5 divisions.

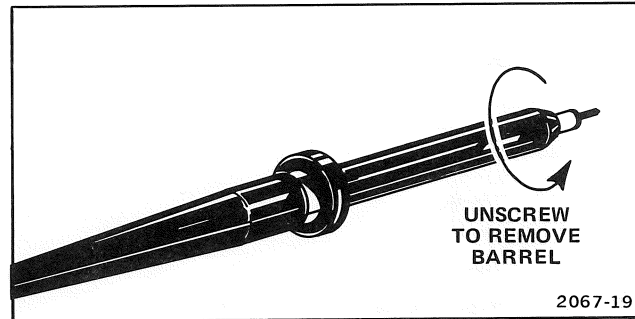
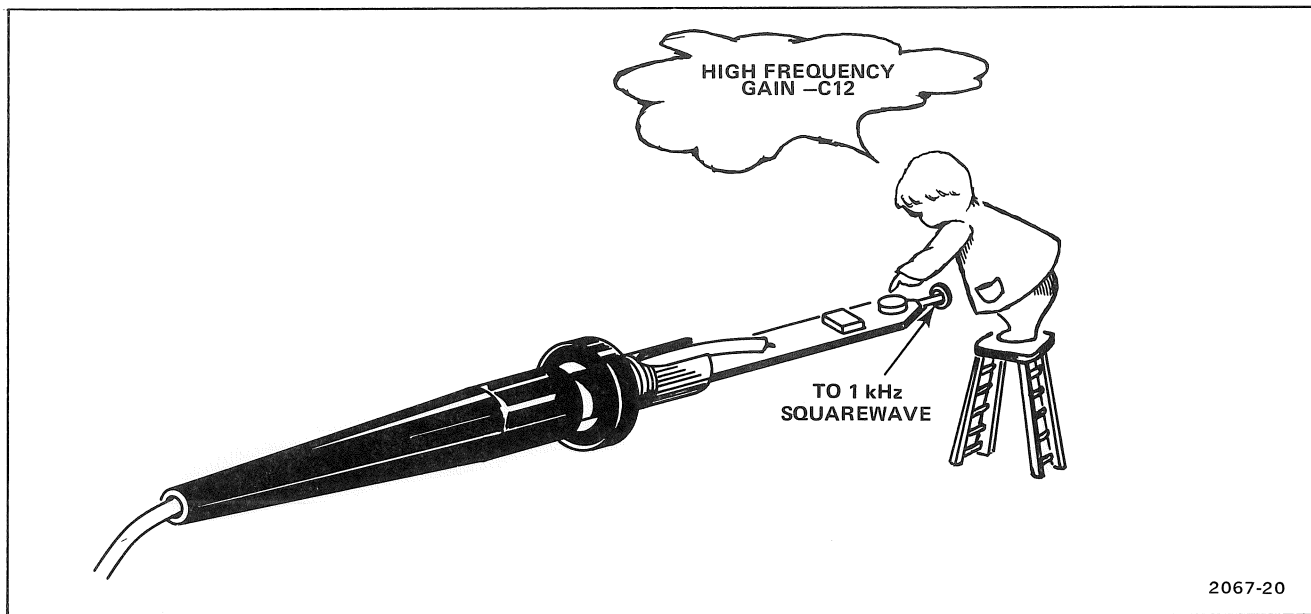


Figure 6-3. Probe body cover removal.



2067-20

Figure 6-4. High frequency gain adjustment.

e. ADJUST—C12 (see Fig. 6-4) for a slightly spiked waveform. If you adjust for a perfectly flat top, the front corner will rolloff slightly when the probe barrel is reinstalled.

f. Reinstall the probe barrel and check for a flat-top waveform.

g. Disconnect test equipment.

END OF ADJUSTMENT PROCEDURE

INSTRUMENT OPTIONS

At the time of this printing, there are no options available for the P6202.

2017-2018



DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).
 Values less than one are in microfarads (μ F).
 Resistors = Ohms (Ω).

Symbols used on the diagrams are based on USA Standard Y32.2-1967.

Logic symbology is based on MIL-STD-806B in terms of positive logic.
 function performed and may differ from the manufacturer's data.

Logic symbols depict the logic

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc.)	H	Heat dissipating device (heat sink, heat radiator, etc.)	RT	Thermistor
AT	Attenuator, fixed or variable	HR	Heater	S	Switch
B	Motor	HY	Hybrid circuit	T	Transformer
BT	Battery	J	Connector, stationary portion	TC	Thermocouple
C	Capacitor, fixed or variable	K	Relay	TP	Test point
CB	Circuit breaker	L	Inductor, fixed or variable	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CR	Diode, signal or rectifier	LR	Inductor/resistor combination	V	Electron tube
DL	Delay line	M	Meter	VR	Voltage regulator (zener diode, etc.)
DS	Indicating device (lamp)	P	Connector, movable portion	Y	Crystal
E	Spark Gap	Q	Transistor or silicon-controlled rectifier	Z	Phase shifter
F	Fuse	R	Resistor, fixed or variable		
FL	Filter				

The following special symbols are used on the diagrams:

Cam Switch Closure Chart

Internal Screwdriver
Adjustment
Test Voltage

Plug to E.C. Board

Panel Adjustment

Plug Index

Modified Component—
See Parts List
Refer to Waveform

Refer to Diagram Number

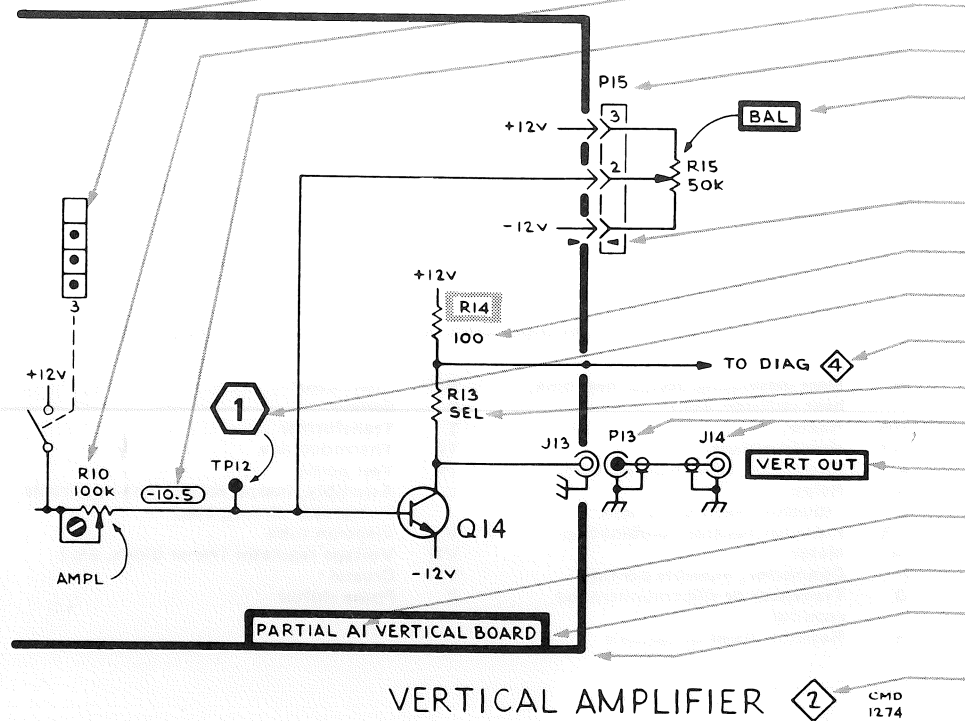
SEL Value Selected at Factory
Coaxial Connector

Panel Connector

Assembly Number

Board Name

Etched Circuit Board Outlined
in Black
Schematic Name and Number



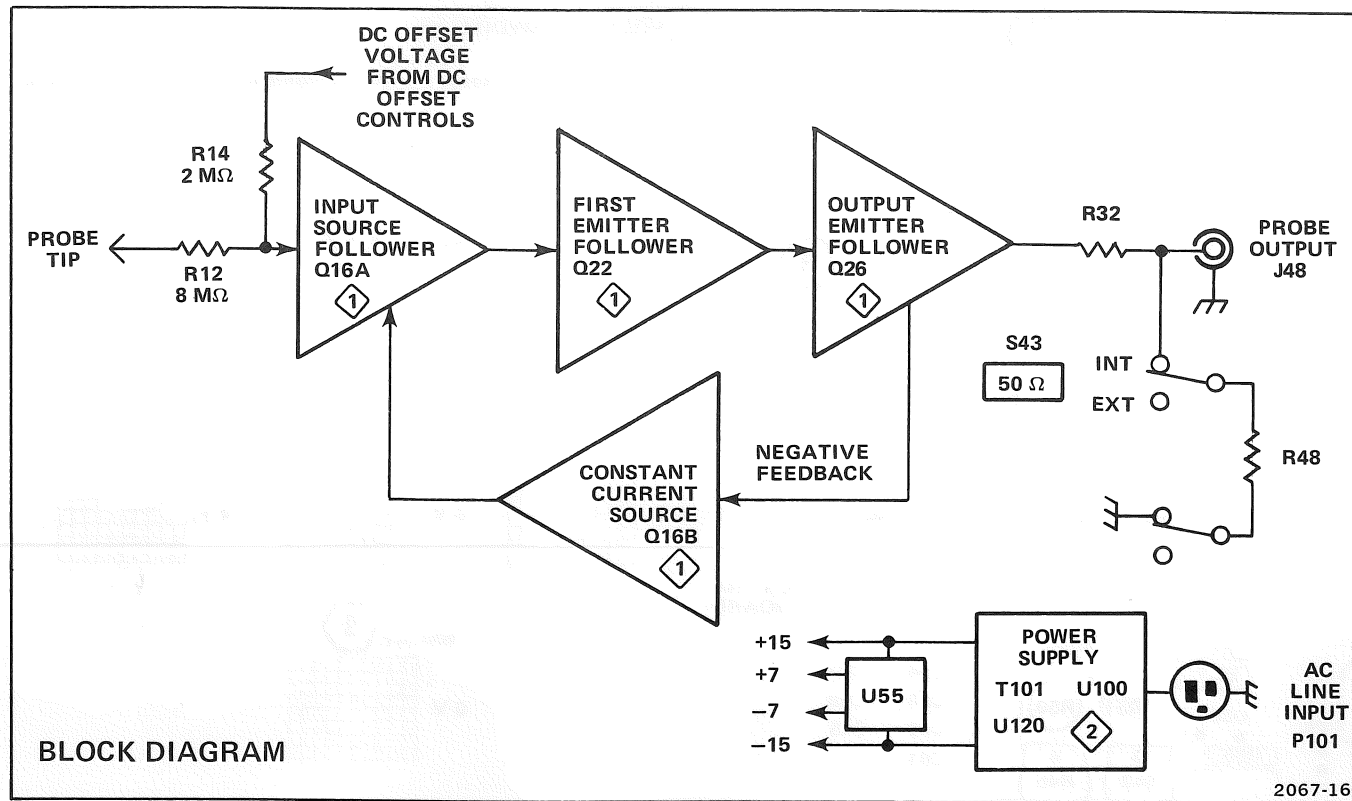


FIG. 8-1 FIG. 8-2

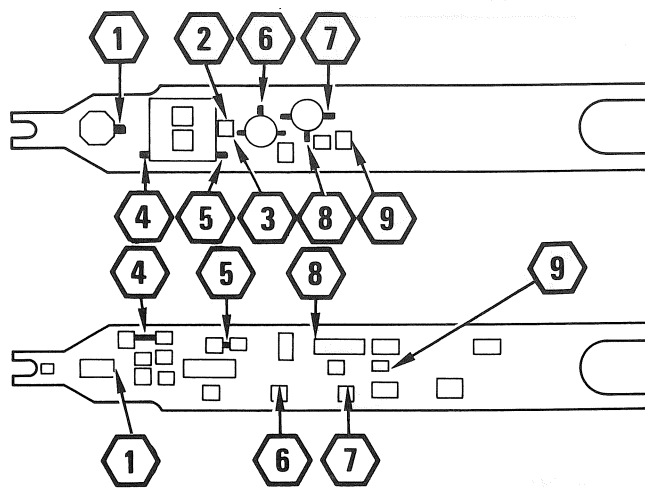
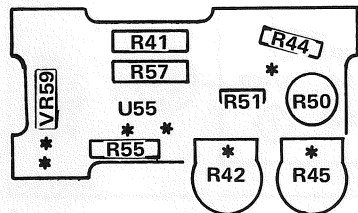


Figure 8-1. Probe body circuit board.



* COMPONENTS LOCATED
ON BACK SIDE OF BOARD

- | | |
|-----|-----|
| C54 | C67 |
| C58 | C68 |
| C60 | S45 |
| C61 | |

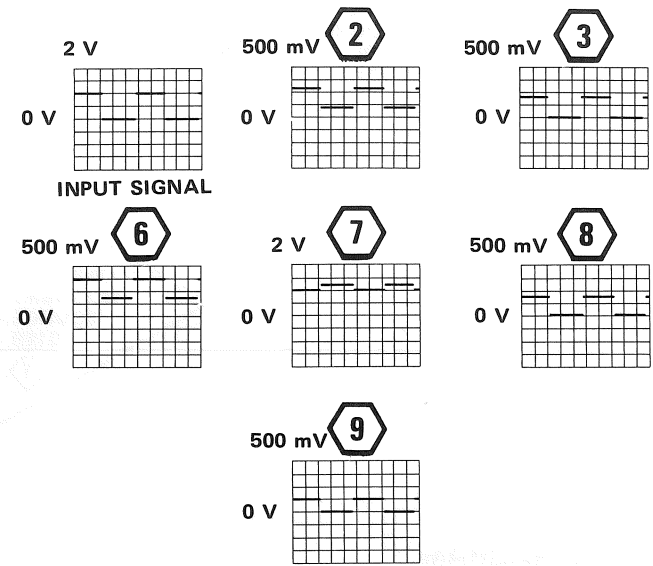
Figure 8-2. Probe control body circuit board.

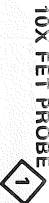
VOLTAGE CONDITIONS

DC OFFSET. OFF.
OUTPUT ZERO (R50).Set according to adjustment procedure.
No input signal.

WAVEFORM CONDITIONS

As above except connect probe tip to a 4 volt 1 kHz squarewave.





IOX FET PROBE

FIG. 8-3.

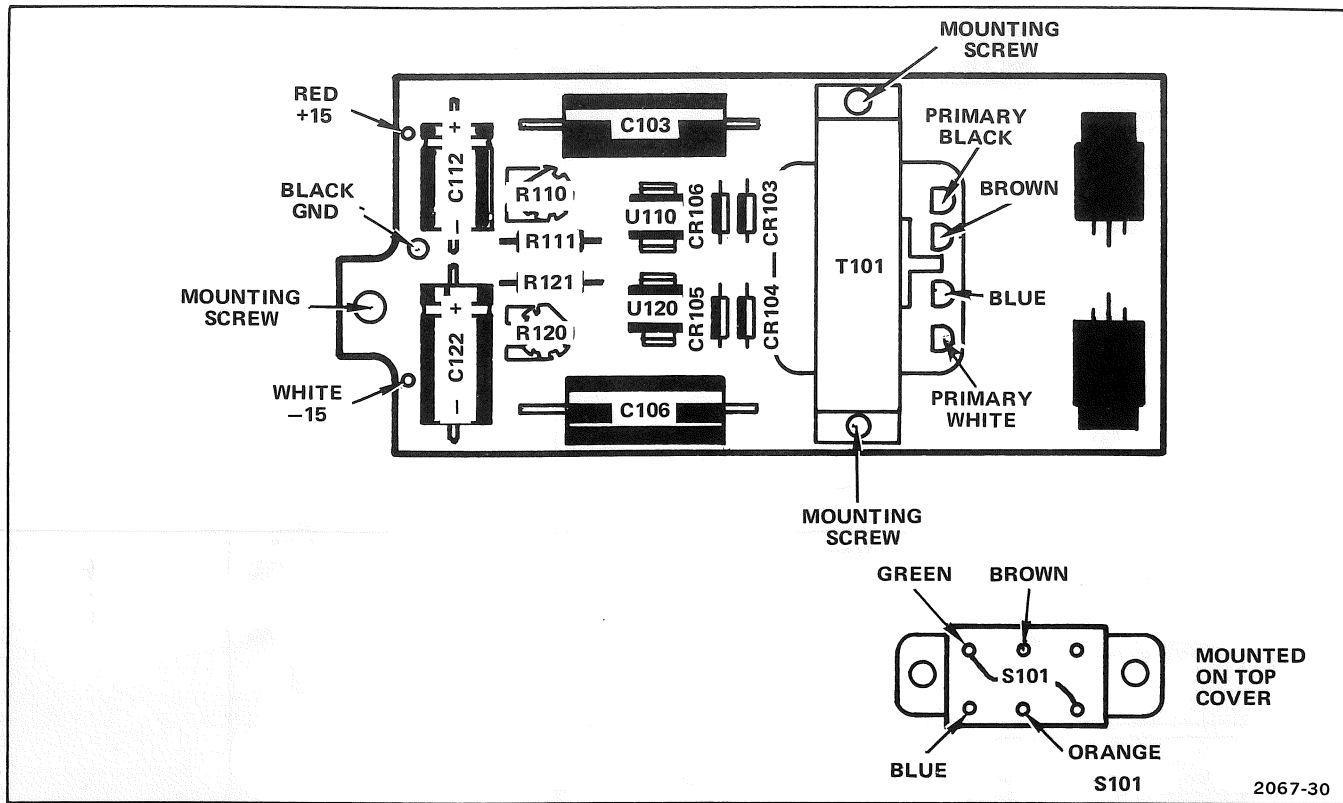
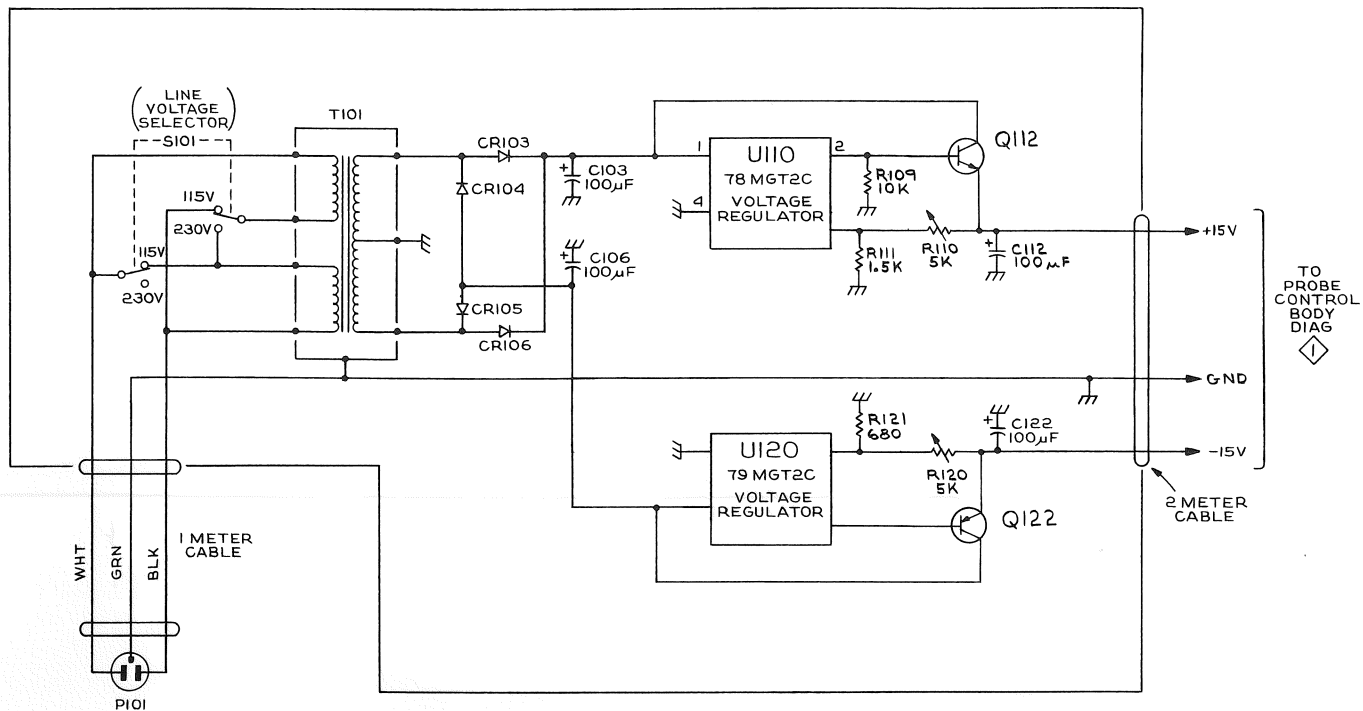


Figure 8-3. Power supply circuit board.



P6202

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POWER SUPPLY ②

REPLACEABLE PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

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, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1	2	3	4	5	Name & Description
					<i>Assembly and/or Component</i>
					<i>Attaching parts for Assembly and/or Component</i>
					- - - * - - -
					<i>Detail Part of Assembly and/or Component</i>
					<i>Attaching parts for Detail Part</i>
					- - - * - - -
					<i>Parts of Detail Part</i>
					<i>Attaching parts for Parts of Detail Part</i>
					- - - * - - -

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVEING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OB	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDEN	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

ALPHABETIC

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
05006	TWENTIETH CENTURY PLASTICS INC.	415 E. WASHINGTON BLVD.	LOS-ANGELES, CA 90015
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
49956	RAYTHEON CO.	141 SPRING ST.	LEXINGTON, MA 02173
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-4384-00		CKT BOARD ASSY:PROBE	80009	670-4384-00
C54	283-0156-00		CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C58	283-0156-00		CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208E102Z
C60	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C61	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C67	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C68	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
R41	321-0226-00		RES.,FXD,FILM:2.21K OHM,1%,0.125W	75042	CEAT0-2211F
R42	311-1863-00		RES.,VAR,NONWW:5K OHM,10%,0.5W	32997	3352T1502
R44	321-0322-00		RES.,FXD,FILM:22.1K OHM,1%,0.125W	75042	CEAT0-2212F
R45	311-1863-00		RES.,VAR,NONWW:5K OHM,10%,0.5W	32997	3352T1502
R50	311-1862-00		RES.,VAR,NONWW:5K OHM,10%,0.5W	32997	3326H
R51	317-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.125W	01121	BB1045
R55	321-0312-00		RES.,FXD,FILM:17.4K OHM,1%,0.125W	75042	CEAT0-1742F
R57	321-0371-00		RES.,FXD,FILM:71.5K OHM,1%,0.125W	75042	CEAT0-7152F
S45	260-0984-00		SWITCH,SLIDE:DP3POSN,0.5A,125VAC-DC	79727	G-128SPC/7140
U55	156-0496-00		MICROCIRCUIT,LI:VOLTAGE REGULATOR,DUAL TRKG	49956	RC4194D
VR59	152-0278-00		SEMICOND DEVICE:ZENER,0.4W,3V,5%	07910	1N4372A

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-	010-6202-01		1						PROBE,VOLTAGE:P6202,2 METER L,10X,W/ACCESS	80009	010-6202-01
	010-6202-00		1						. PROBE,VOLTAGE:P6202,2 METER L,10X,P ONLY	80009	010-6202-00
-1	200-1063-00		1						. . CABLE,NIP,ELEC:	80009	200-1063-00
-2	119-0774-01		1						. . POWER SUPPLY:W/CRIMP-ON FERRULE	80009	119-0774-01
-3	210-0774-00		1						. . EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS	80009	210-0774-00
-4	210-0775-00		1						. . EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS	80009	210-0775-00
-5	206-0232-00		1						. . PROBE SUBASSEMB:	80009	206-0232-00
									(ATTACHING PARTS)		
-6	211-0173-00		1						. . SCREW,MACHINE:4-40 X 0.375,FLH,STL	83385	OBD
	-----								- - - * - - -		
	206-0233-00		-						. . . PROBE SUBASSEMBLY INCLUDES:		
	----- ¹		1						. . . TIP ASSY,PROBE:	80009	206-0233-00
-7	----- ²		1						 TIP,TEST PROD:IC TEST		
-8	----- ²		1						 TIP,TEST PROD:W/BODY		
-9	204-0708-00		1						 BODY ASSY,PROBE:	80009	204-0708-00
-10	343-0619-00		1						 COLLAR,CND CLIP:0.78 DIA,PLASTIC	80009	343-0619-00
-11	131-1799-00		1						. . CONN,RCPT,ELEC:BNC FEMALE	80009	131-1799-00
-12	358-0072-00		1						. . INSULATOR,BSHG:	80009	358-0072-00
-13	131-1893-00		1						. . CONTACT,ELEC:CENTER CONDUCTOR	80009	131-1893-00
-14	342-0337-00		1						. . INSULATOR,BSHG:0.084 ID X 0.66 L,TEFLON	80009	342-0337-00
-15	262-0998-00		1						. . SWITCH ASSEMBLY:	80009	262-0998-00
-16	200-0851-34		1						. . COVER,COMP BOX:W/SPOT FACE	80009	200-0851-34
-17	200-0851-35		1						. . COVER,COMP BOX:W/SLOT	80009	200-0851-35
	200-2028-00		1						. . COVER,SWITCH:1.2 L X 0.312 W,VINYL	80009	200-2028-00

¹Available only in packs of 10, part number 015-0201-01 or packs of 100, part number 015-0201-02.

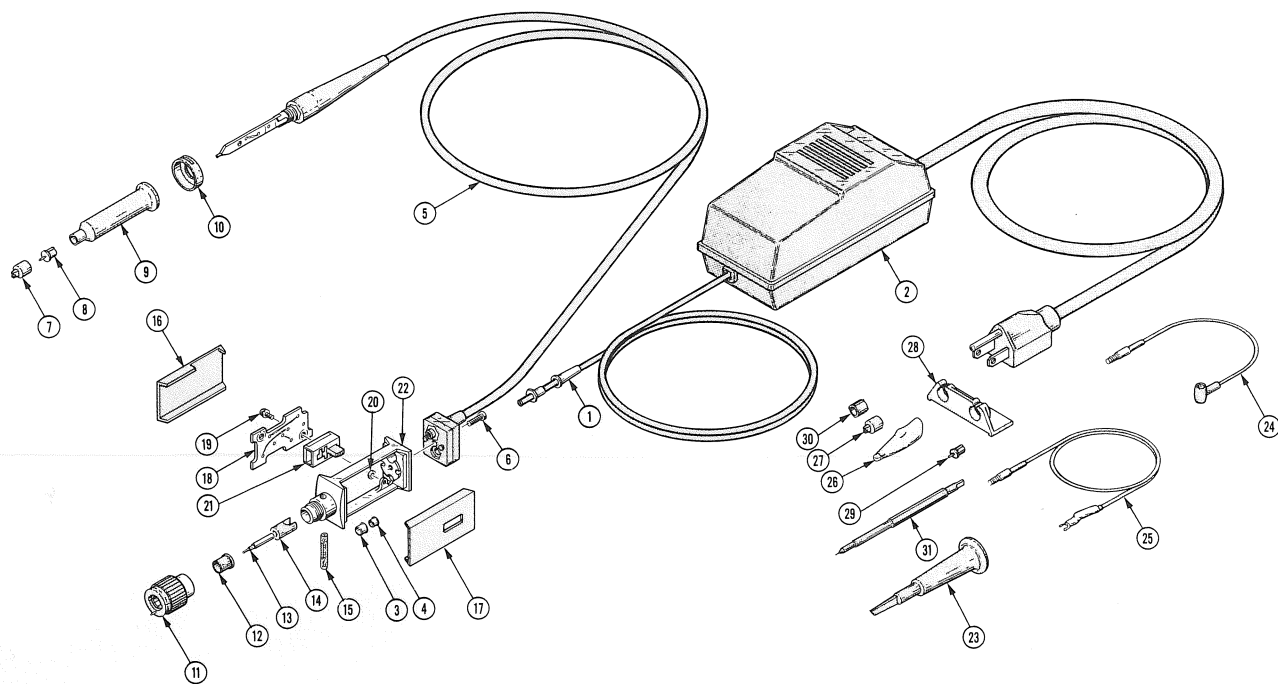
²Available only in packs of 10, part number 206-0230-01 or packs of 100, part number 206-0230-02.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-18	-----	-----		1	.	.	CKT BOARD ASSY:PROBE(SEE EPL)			(ATTACHING PARTS)		
-19	211-0180-00			2	.	.	SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS				83385	OBD
-20	210-1257-00			2	.	.	WASHER,FLAT:0.94 ID X 0.075 THK,BRASS				80009	210-1257-00
							- - - * - - -					
-21	-----	-----		-	.	.	CKT BOARD ASSY INCLUDES:					
-22	426-0423-13			1	.	.	SWITCH,SLIDE:(SEE S45 EPL)				80009	426-0423-13
				1	.	.	FRAME,COMP BOX:					
STANDARD ACCESSORIES												
-23	013-0097-01			1	TIP,PROBE:RETRACTABLE						80009	013-0097-01
-24	175-0849-00			1	LEAD,ELECTRICAL:3 INCHES LONG						80009	175-0849-00
-25	175-1017-00			1	LEAD,ELECTRICAL:5 INCHES LONG						80009	175-1017-00
-26	344-0046-00			2	CLIP,SPR RTNR:						80009	344-0046-00
-27	-----	-----		1	TIP,TEST PROD:IC TEST							
-28	352-0351-00			1	HLDR,TEST PROD:						80009	352-0351-00
-29	-----	-----		2	TIP,TEST PROD:W/BODY							
-30	166-0404-01			1	INS SLV,ELEC:FOR 0.188 DIA PROBE BSHG						80009	166-0404-01
-31	003-0675-01			1	ADJ TOOL,PROBE:						80009	003-0675-01
	016-0378-00			1	CASE,CARRYING:						80009	016-0378-00
	016-0521-00			1	POUCH,ACCESSORY:						05006	OBD
	062-1803-00			1	PROBE CARD:						80009	062-1803-00
	070-2067-00			1	MANUAL,TECH:INSTRUCTION						80009	070-2067-00

¹Available only in packs of 10, part number 015-0201-01 or packs of 100, part number 015-0201-02.

²Available only in packs of 10, part number 206-0230-01 or packs of 100, part number 206-0230-02.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-										OPTIONAL ACCESSORIES		
	010-0384-00			1						ATTEN HD, PROBE: P6202, 10X	80009	010-0384-00
	010-0360-00			1						TIP TEST PROD: CAPACITOR, COUPLER HEAD	80009	010-0360-00



Exploded View—P6202





