TEKTRONIX®

P6303/AM 503
Current Probe and Amplifier

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
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Serial Number ____________

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WARRANTY

This Tektronix product is warranted against defective materials and workmanship, under normal use, for a period of one year from date of initial shipment. Tektronix will repair or replace, at its option, those products determined to be defective within the warranty period and returned, freight prepaid, to a Tektronix Service Center. There is no implied warranty for fitness of purpose.

Please direct all requests for service or replacement parts to the nearest Tektronix Service Center or Field Office; include the type or part number of the product and its serial number.

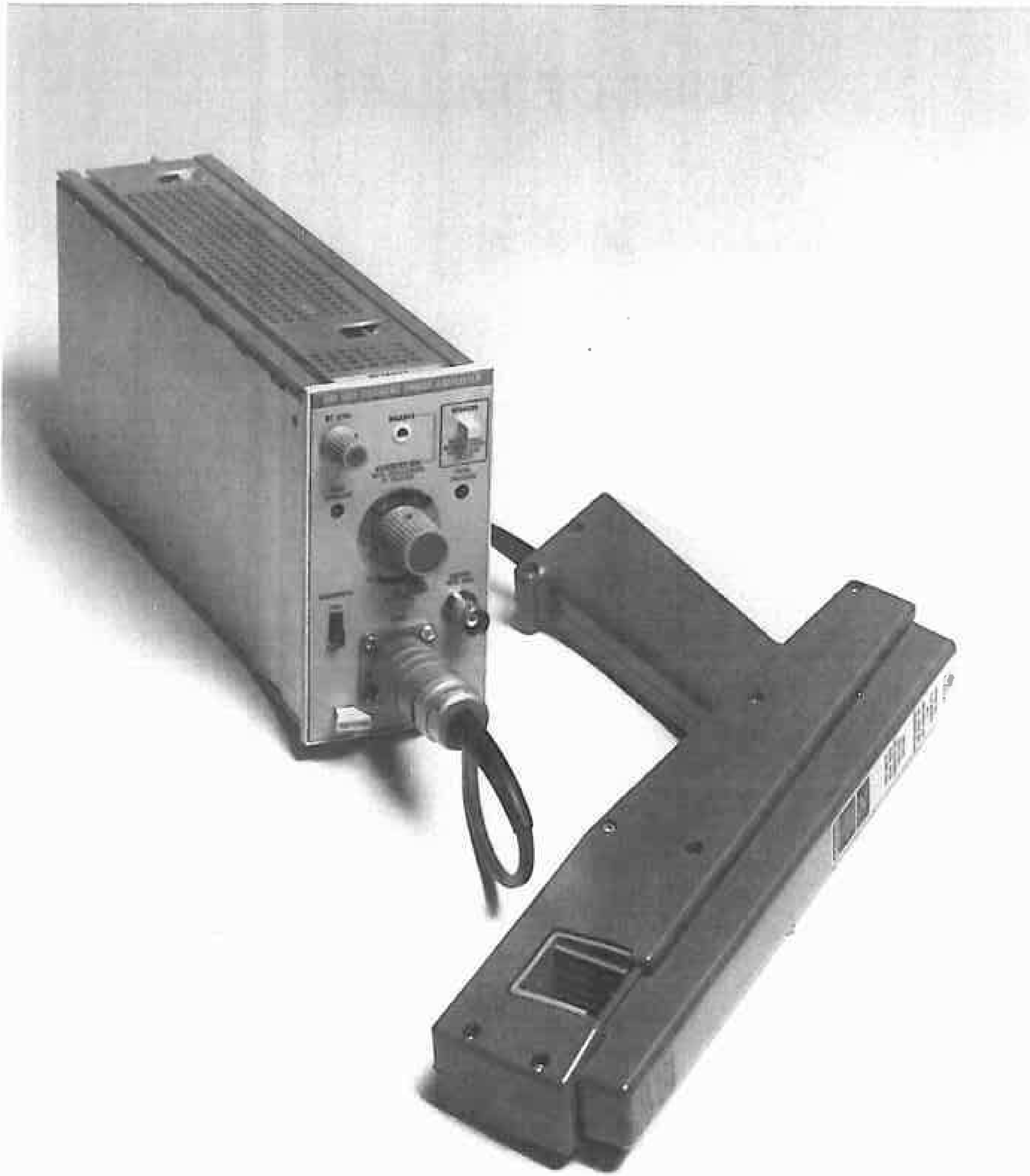

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Figure 1-1. P6303 Current Probe and AM 503 Current Probe Amplifier.

GENERAL INFORMATION

This section contains a brief description of the AM 503 and its performance characteristics and the accessories and documents supplied.

INTRODUCTION

Description

The Tektronix P6303 is a current probe designed to operate with an AM 503, a plug-in[1] current-probe amplifier. The AM 503 operates with an oscilloscope system having an input sensitivity of 10 mV/div and an input impedance of either 50 ohms or 1 megohm (if test oscilloscope has 1 MΩ input, terminate the connnecting coaxial cable in 50 Ω).

TM 500-Series Instruments

The Tektronix AM 503 Current Probe Amplifier is a member of the growing TM 500 line of Test and Measurement instruments. This product line consists of both general and special-purpose instruments such as digital multimeters, counter-timers, variable dc power supplies, pulse generators, function generators, calibration generators, signal processors, and others. Each instrument is a plug-in module.

Power module mainframes with 1, 3, 4, 5, and 6 compartments are available. The power module provides power and a housing for the plug-in modules, and permits internal signal interconnection between plug-in instruments to reduce clutter or to allow two or more instruments to perform a function which neither could perform alone.

Each user can thus select from a broad choice of instruments to assemble a multi-function test set to fit his needs. This test set is compact and portable; yet it can be quickly reconfigured by exchanging plug-in instruments when test needs change. The TM 500-systems can be reconfigured for bench-top, rackmount, roll-about, and portable applications. For more information on the TM 500-line, contact your local Tektronix Field Office or representative.

[1] Use in TM 500-Series Power Module.

INSTALLATION

The P6303/AM 503 is calibrated and ready for use when received. The AM 503 operates only in a TM 500-Series Power Module.

CAUTION

Turn the power module off before inserting or removing the AM 503; otherwise, the AM 503 circuitry may be damaged.

To install (refer to Figure 1-2), align the upper and lower rails of the AM 503 with the power module tracks and push the AM 503 into the module until the front panel is flush with the front of the power module.

To remove the AM 503, pull on the release latch at the bottom of the front panel. Continue pulling on the release latch to slide the AM 503 out of the power module.

REPACKAGING FOR SHIPMENT

If the instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner, name of an individual (with address) at your firm who can be contacted, complete instrument serial number, and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

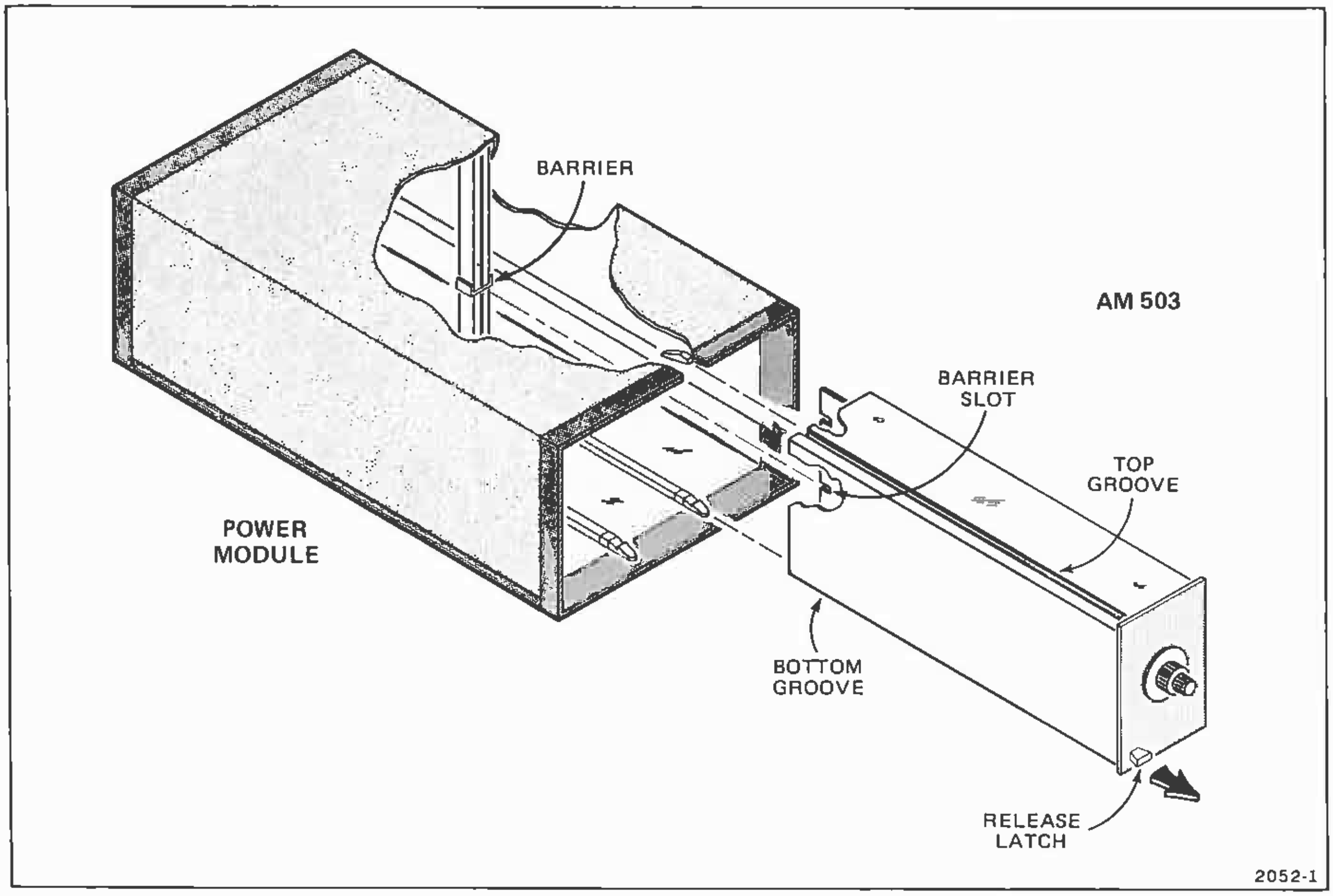

Figure 1-2. Installing and removing the AM 503.

1. Obtain a corrugated cardboard carton having inside dimensions no less than six inches more than the instrument dimensions; this will allow for cushioning. See Table 1-1 for carton test strength requirements.

TABLE 1-1

Shipping Carton Test Strength

Gross Weight	Carton Test Strength
0-4.5 kg (0-10 lbs)	90 kg (200 lbs)
4.5-13.5 kg (10-30 lbs)	124 kg (275 lbs)
13.5 kg (30-120 lbs)	169 kg (375 lbs)
54-63 kg (120-140 lbs)	225 kg (500 lbs)
63-72 kg (140-160 lbs)	270 kg (600 lbs)

2. Surround the instrument with polyethylene sheeting to protect the instrument finish.

3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.

4. Seal carton with shipping tape or industrial stapler.

SPECIFICATION

The following instrument specification applies over an ambient temperature range of 0°C to +50°C, providing the instruments were calibrated in an ambient temperature range between +20°C and +30°C. The amplifier and probe must operate for at least 20 minutes before making measurements.

TABLE 1-2
Electrical

Characteristic	Performance Requirement	
Maximum input current		
Dc + peak ac	100 A	
Peak pulse	500 A (Not to exceed 10,000 A•μs product for pulses greater than 100 A)	
Maximum voltage	700 V dc + peak ac on a bare conductor	
Bandwidth	FULL*	5 MHz*
Dc coupled	dc to ⩾15 MHz	dc to 5 MHz ±1 MHz
Ac coupled	7 Hz or less to ⩾15 MHz	7 Hz or less to 5 MHz ±1 MHz
	*Bandwidth is selected by the BANDWIDTH switch on the front panel of the AM 503	
Risetime	23 ns or less, at full bandwidth	
Sensitivity	10 mA/div to 50 A/div With sensitivity of oscilloscope at 10 mV/div and output of AM 503 terminated in 50 Ω	
Noise, random	3 mA or less, tangentially measured	
Trace shift, random	15 mA or less, p-p	
Conductor size, maximum	2.54 cm x 2.11 cm (1 inch by 0.83 inch)	

TABLE 1-2 (cont)

Characteristic	Performance Requirement
Accuracy	±3% of indicated CURRENT/DIV on AM 503
Output dynamic range (with output terminated in 50 Ω)	±5 divisions with less than 5% compression

TABLE 1-3
Environmental

Characteristic	Performance Requirement
Temperature	
Operating	0°C to +50°C
Non-operating	−40°C to +75°C

TABLE 1-4
Physical

Dimensions	P6303	AM 503
Length	26.8 cm (10.55 inches)	29.7 cm (11.7 inches)
Width	4.06 cm (1.60 inches)	6.70 cm (2.6 inches)
Height	15.57 cm (6.14 inches)	12.7 cm (5.0 inches)

STANDARD ACCESSORIES

1	Instruction Manual	070-2538-00
1	Cable, Coaxial with BNC connectors, 50 Ω, 42 inch	012-0057-01
1	Terminator, 50 Ω, with BNC connectors	011-0049-01
1	Case, carrying, for P6303	016-0622-00

OPERATING INFORMATION

This section of the manual will familiarize the operator or technician with the location and operation of the external controls, connectors, and indicators.

FRONT-PANEL CONTROLS, CONNECTORS, AND INDICATORS

The controls, connectors, and indicators of the AM 503 are located on its front panel, as shown in Figure 2-1. Figure 2-2 shows the controls and connectors of the P6303. The numbers refer to brief descriptions of each item.

Operating information is provided under Functional Check in this section.

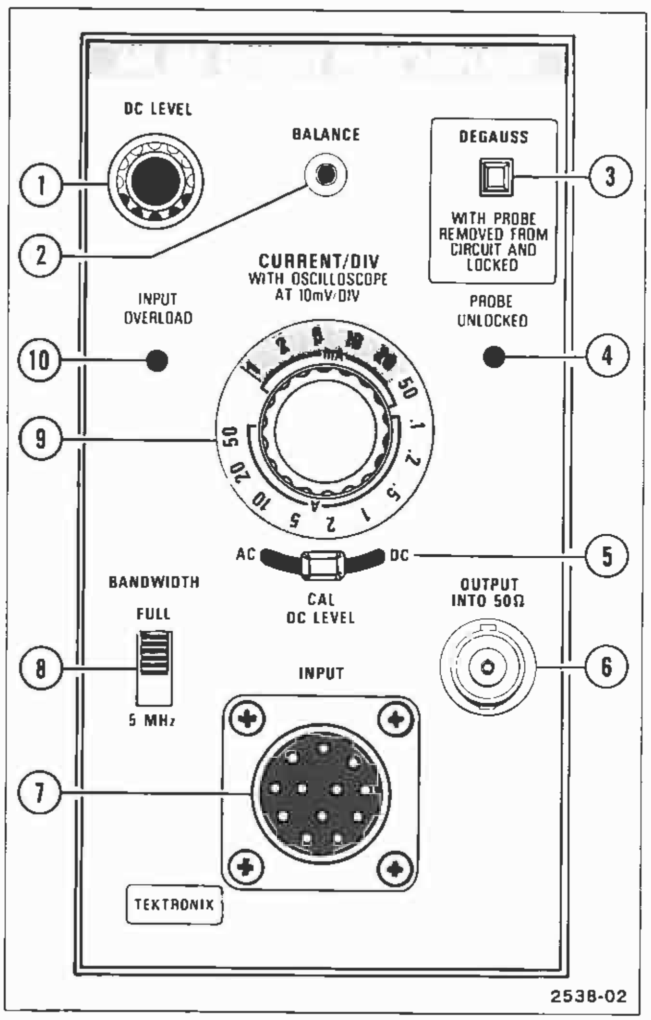

Figure 2-1. Controls, indicators, and connectors on AM 503.

(1) **DC LEVEL Control**: Adjusts the OUTPUT dc level to at least + and −100 mV.

(2) **BALANCE (screwdriver adjustment)**: Permits operator to balance probe for minimum trace shift while changing CURRENT/DIV settings.

(3) **DEGAUSS (push-button switch)**: Momentary contact switch for energizing probe degauss circuit.

(4) **PROBE UNLOCKED Indicator**: Indicates probe slider is not in LOCKED position.

(5) **AC-CAL DC LEVEL-DC Switch**: Selects coupling mode for input signal. The text calls this the "coupling" switch.

AC: The ac component of the signal is coupled to the amplifier and the dc component is blocked.

DC: Both ac and dc components of the input signal are coupled to the Output Amplifier input.

CAL DC LEVEL: Grounds the input of the output amplifier to permit adjusting the dc level of the output amplifier. Adjust front panel DC LEVEL control for zero volts out at OUTPUT into 50 Ω connector, J390.

(6) **OUTPUT Connector:** Bnc connector for connecting amplifier output to oscilloscope system (must be terminated into 50 Ω).

(7) **INPUT Connector:** Provides connection for current probe.

(8) **BANDWIDTH Switch:** Provides a choice of bandwidths.

FULL: Permits amplifier and probe system to operate at full rated bandwidth.

5 MHz: Reduces the upper bandwidth limit to about 5 MHz to increase the signal-to-noise ratio for low-frequency, low-level measurements.

9 **CURRENT/DIV Switch** :Selects deflection factor from 10 mA/DIV to 50 A/DIV, depending on the current probe used with the AM 503, oscilloscope system deflection factor set for 10 mV/Div.

10 **INPUT OVERLOAD Indicator** :Indicates that the input current exceeds the maximum dc input current rating of the P6303. The current readout on the oscilloscope may be inaccurate whether the AM 503 is AC or DC coupled.

NOTE

The user may desire to route the signal out the rear connector of the Mainframe to permit interconnection between the AM 503 output signal and the input of an adjacent plug-in instrument. This may be accomplished by disconnecting the coaxial end plugged into J390 (OUTPUT) and plugging it into J480 (see diagram 5). No termination is required, because J480 is already terminated on the board (R480).

FUNCTIONAL CHECK

General Information

The bandwidth of the oscilloscope used with the AM 503 depends upon the frequency of the signal being measured. Oscilloscope vertical bandwidth should be at least twice the frequency of the signal being measured.

The probe used depends on both the current and the frequency characteristics of the signal being measured. The P6303 measures currents from 0 to 100 A peak (dc to 15 MHz).

Conventional current flowing in the direction of the arrow on the current-probe slider produces a positive deflection of the oscilloscope display.

Connecting the AM 503

Plug the AM 503 into the TM 500-Series Power Module.

Connect a 50 Ω cable with BNC connectors to the oscilloscope vertical input. (If the input impedance of the oscilloscope is not 50 Ω, connect a 50 Ω terminator between the cable and the oscilloscope.)

Set the oscilloscope vertical deflection to 10 mV/Div.

The oscilloscope Time/Div setting should be consistent with the signal frequency being examined.

Connect the P6303 connector to the AM 503 probe INPUT connector.

Switch the TM 500-Series Power Module and oscilloscope power switches on.

NOTE

To remove any magnetic flux present in the probe transformer core, always degauss the probe after connecting the probe to the AM 503 or sensing currents greater than the instrument range. To degauss, press and release the DEGAUSS button (front panel of AM 503) while the current probe is disconnected from any current-carrying conductor. Be sure that the slider is in the LOCKED position.

Using the AM 503 And Probe

Switch the coupling switch, on the AM 503, to the CAL DC LEVEL position.

Set the oscilloscope input coupling switch to GND and position the trace to graticule center. Do not move the oscilloscope's POSITION control to change position after this. Use the AM 503's DC LEVEL control to change vertical position.

Move the coupling switch to DC and adjust DC LEVEL control on AM 503 to position the oscilloscope trace to graticule center.

Press and release the DEGAUSS button on the AM 503. Set the coupling switch to DC, and adjust the BALANCE control (screwdriver adjustment on the front panel) to set the oscilloscope trace to graticule center. A more precise balance can be achieved by putting the CURRENT/DIV control at 1 mA.

CAUTION

Do not let probe transformer core touch bare conductors. The core is not insulated.

NOTE

The probe may be connected or disconnected with the AM 503 turned on. It must be degaussed after being connected or re-connected.

The P6303 Current Probe measures magnetic flux around a conductor, which is caused by current in that conductor. Remember this when reading dc currents in ferrous leads (like transistor leads) that may be magnetized. This lead flux causes erroneous readings in the more sensitive settings of the AM 503.

NOTE

When Probe is not in use, leave slide in LOCKED position.

Direction of Current Flow

To display correct polarity, the probe should be clamped around a conductor with the arrow pointing in the direction of conventional current flow—plus to minus.

High Currents

When measuring high currents, do not disconnect the probe cable from the AM 503 while the probe is clamped around a conductor. With the probe cable disconnected, the high voltage developed in the secondary winding may damage the current probe transformer.

Maximum Input Current

Figure 2-3 shows the approximate maximum input current in amperes, peak-to-peak, vs. signal frequency. Current is derated for a continuous signal to prevent excessive heat in the probe head.

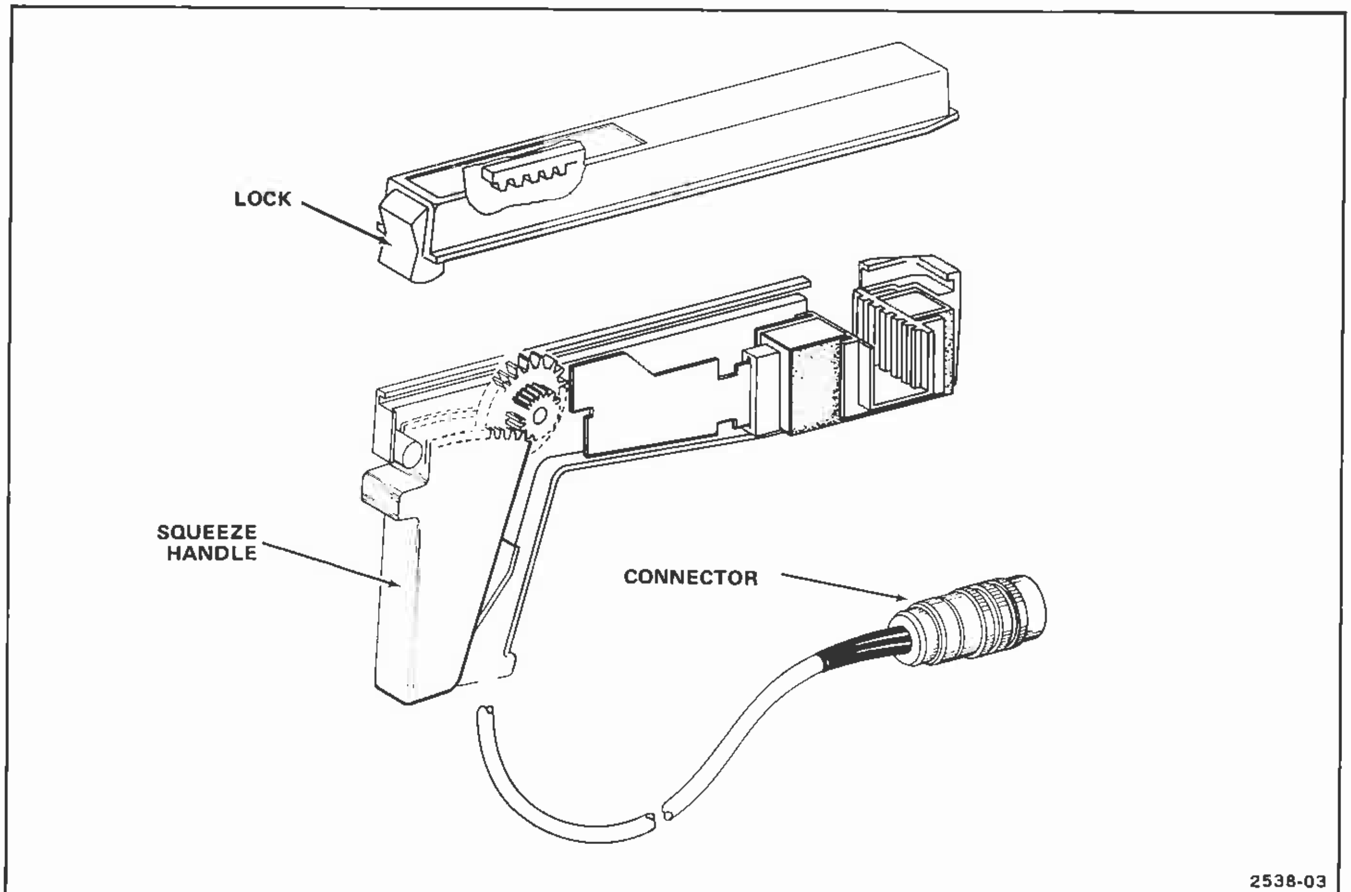

Figure 2-2. Controls and connectors on P6303.

Insertion Impedance

The insertion impedance of the current probe is the equivalent circuit that is placed in the circuit under test when the probe is clamped around a conductor. When observing fast-rise signals, consider the insertion impedance.

Figure 2-4 shows the relationship of frequency to insertion impedance for P6303 Current Probe.

To minimize loading of critical circuits, clamp the probe at the low, or ground, end of a circuit whenever possible.

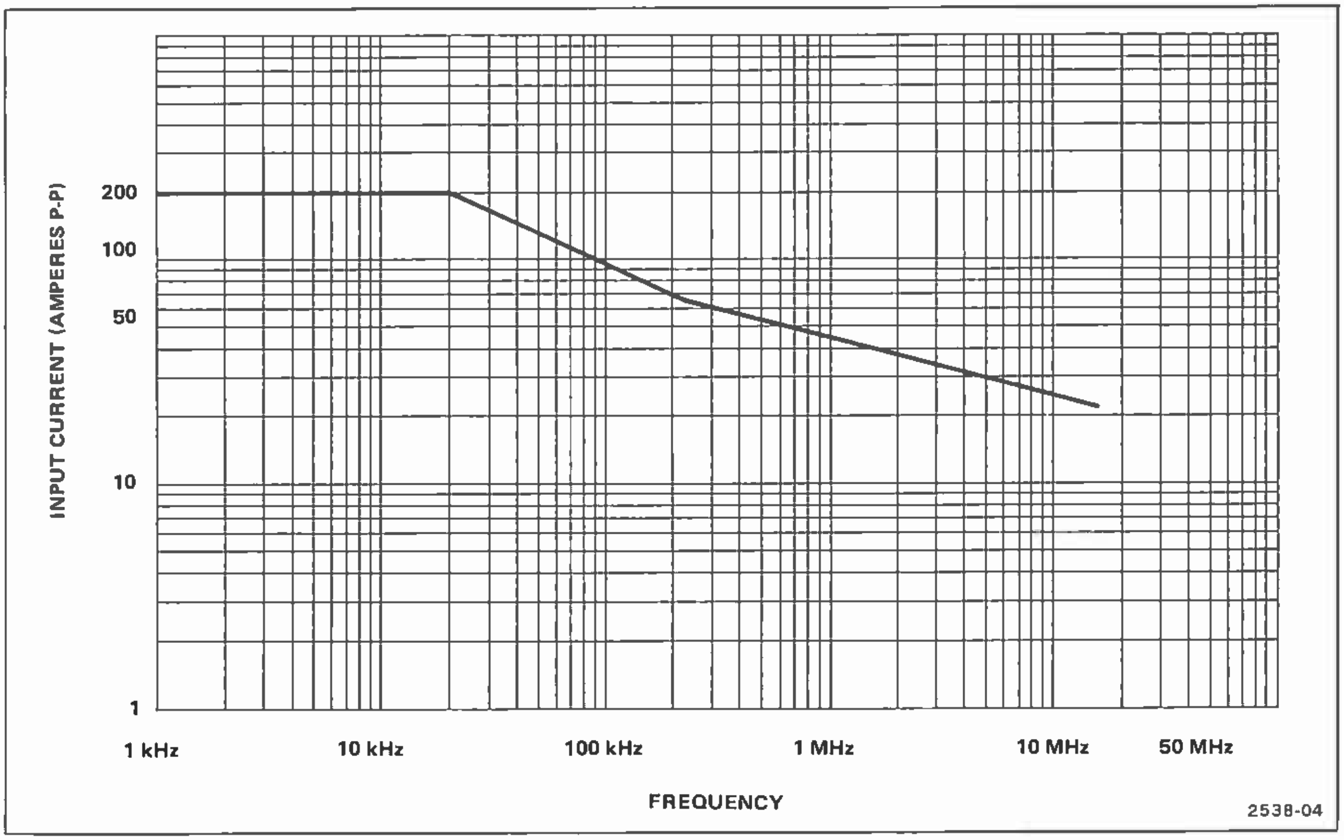

Figure 2-3. Maximum input current versus frequency, for P6303.

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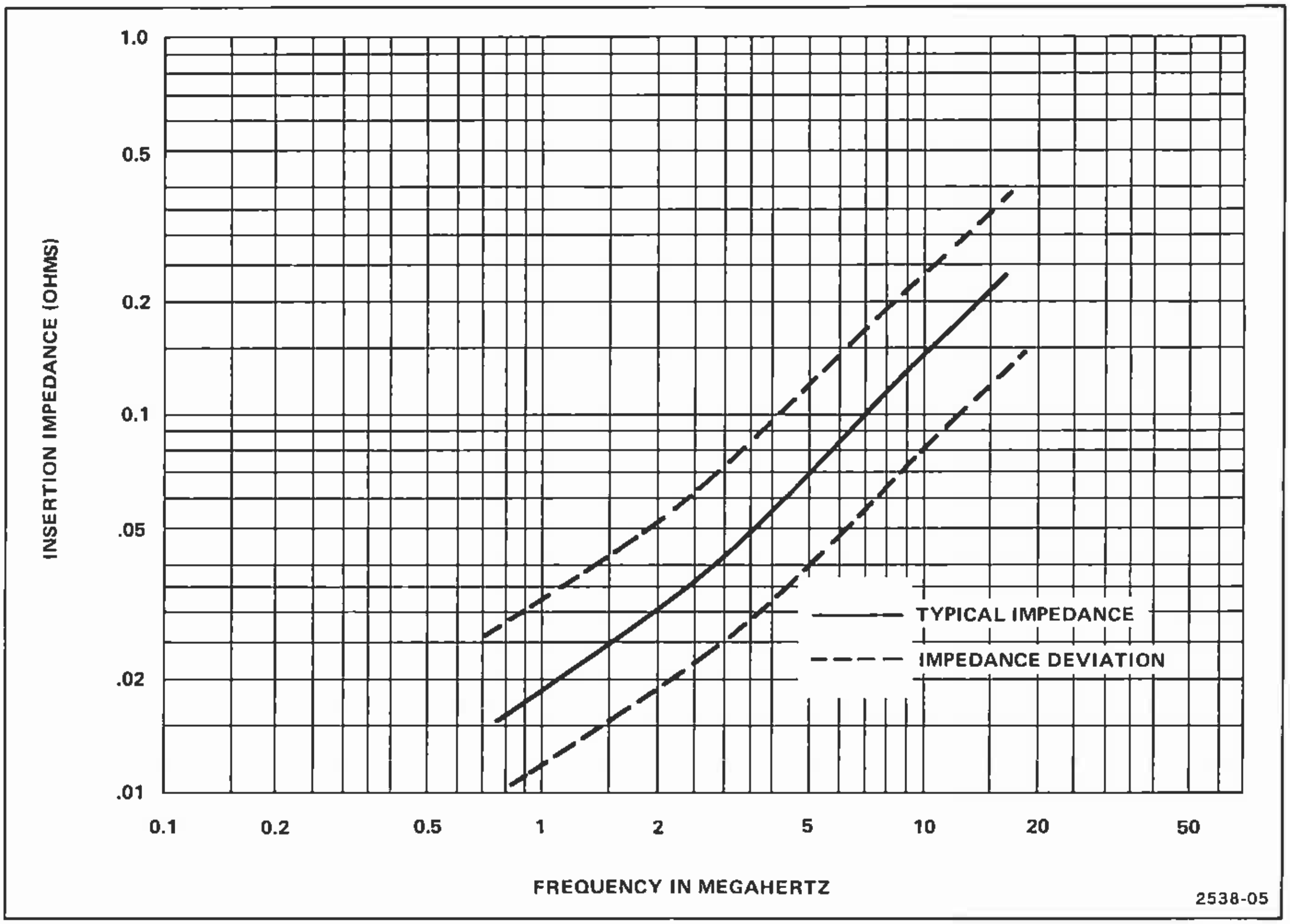

Figure 2-4. Insertion impedance versus frequency, for P6303.