

Tektronix®

**AM 503
CURRENT PROBE
AMPLIFIER**

INSTRUCTION MANUAL



**PLEASE CHECK FOR CHANGE INFORMATION
AT THE REAR OF THIS MANUAL.**

**AM 503
CURRENT PROBE
AMPLIFIER**

INSTRUCTION MANUAL

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

Serial Number _____

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INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag,
or stamped on the chassis. The first number or letter
designates the country of manufacture. The last five digits
of the serial number are assigned sequentially and are
unique to each instrument. Those manufactured in the
United States have six unique digits. The country of
manufacture is identified as follows:

B000000	Tektronix, Inc., Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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WARNING

The remaining portion of this Table of Contents lists servicing instructions that expose personnel to hazardous voltages. These instructions are for qualified service personnel only.

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CHANGE INFORMATION

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OPERATOR'S SAFETY SUMMARY

The following text contains a two-part summary of general safety precautions that must be observed during all phases of operation, service, and repair of this instrument.

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual



This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment



DANGER — High voltage.



Protective ground (earth) terminal.



ATTENTION — refer to manual.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating as specified in the parts list for your product.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product

covers or panels. Do not operate the product without the covers and panels properly installed.

Do Not Operate Without Covers (for TM 500 plug-ins only)

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

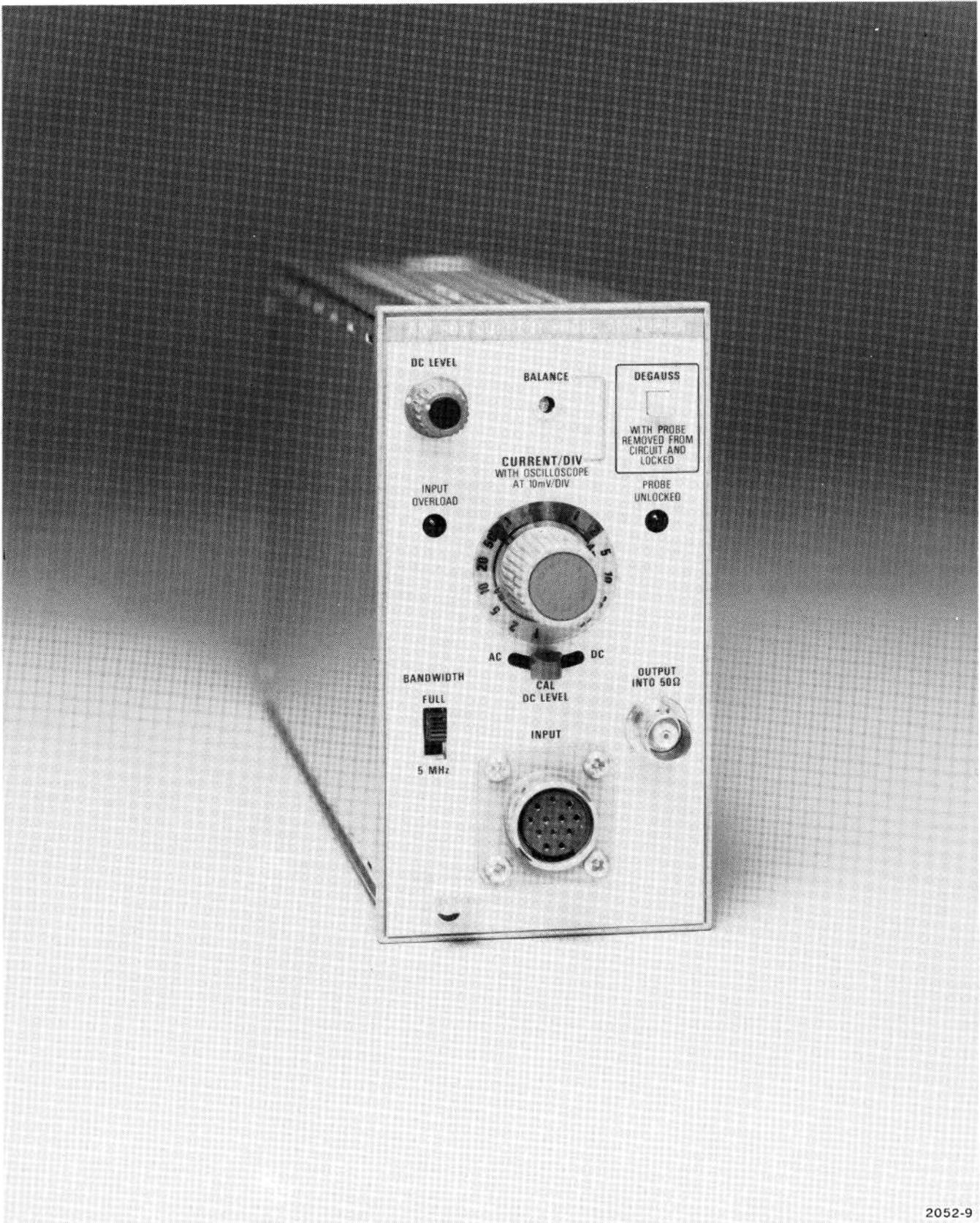
Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



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OPERATING INSTRUCTIONS

NOTE

All references to the P6302 probe also apply to the A6302 probe.

All references to the P6303 probe also apply to the A6303 probe.

Description

The AM 503 Current Probe Amplifier is designed for use with any of the compatible current probes (see Mechanical Parts list for accessories). The input attenuator is calibrated in a 1, 2, 5 sequence, and the attenuator knob-skirt illumination provides direct indication of current/division. An auto-scale switch changes the knob-skirt illumination automatically to match the sensitivity of the probe used.

Bandwidth is selectable for either FULL (limited by current probe in use) or 5 MHz. Input coupling is selectable (ac or dc); ac provides a means of measuring low amplitude ac signals on a high level dc current.

The AM 503 operates in TEKTRONIX TM 500-Series power modules only. It will operate in any compartment of a multiple-compartment power module.

Installation and Removal

CAUTION

Turn the power module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry. It is also recommended that the power module be turned off before removing the AM 503. Refer to Fig. 1-1. Check to see that the plastic barriers on the interconnecting jack of the selected power module compartment match the cut-outs in the AM 503 circuit board edge connector.

Align the upper and lower groove of the AM 503 chassis with the upper and lower guides of the selected compartment. Push the module in and press firmly to seat the circuit board in the interconnecting jack.

To remove the AM 503, pull on the release latch

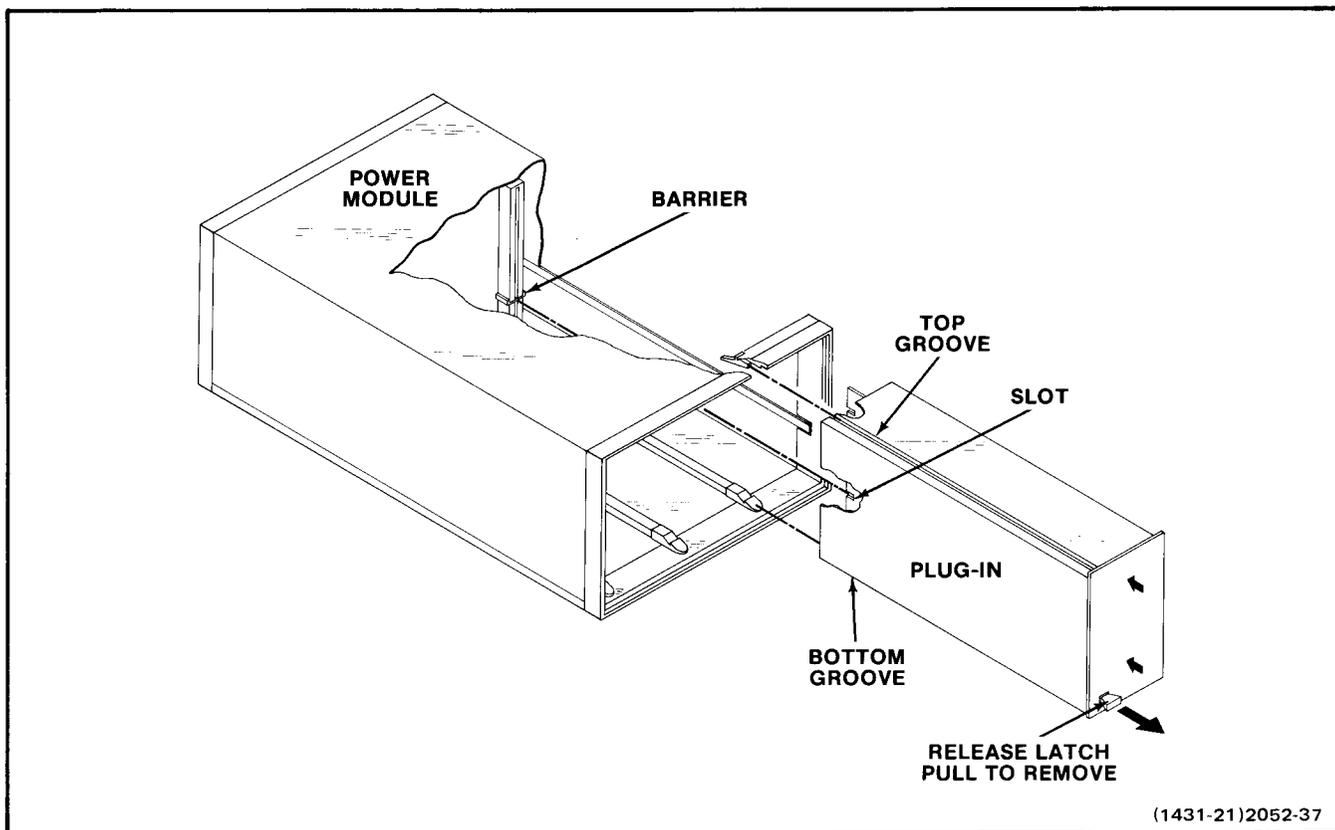


Fig. 1-1. Plug-in installation and removal.

Operating Instructions—AM 503

(located in the lower left corner) until the interconnecting jack disengages and the AM 503 will slide out.

OPERATING CONSIDERATIONS

Introduction

The remainder of this section contains the operating information required to obtain the most effective performance from the instrument. This includes the function and actions of the controls and connectors, input connections, and a general description of the operating modes and procedures for making basic measurements.

Controls and Connectors

All of the major controls and connectors for operation of the AM 503 are located on the front panel of the unit. A brief functional description of each control and connector is included in Fig. 1-2.

Monitor Oscilloscope

The bandwidth required 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.

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

Ground-clip Leads

Ground-clip leads are furnished with some current probes to ground the cable shield at the probe end. The ground lead is used to reduce high-frequency electrostatic voltages that could couple into the probe and cause errors in measuring. A ground lead is normally not used in the lower (1, 2, 5, and 10 mA) sensitivity positions of the attenuator switch because of undesirable chassis currents that may appear in these more sensitive positions.

When observing high-frequency signals, use the shortest practical ground-clip lead available.

Output Connection

Output connection can be accomplished through the OUTPUT INTO 50 Ω connector or the rear interconnecting jack at pin 28A. Pin 28A at the rear interconnecting jack is terminated in 50 Ω . Connector J480, located on the

right side upper-rear of the instrument, is where the output cable connects for rear interface output. With the output cable connected for rear interface output, a termination is not required because of the internal (factory wired) termination. The monitor oscilloscope input impedance should not be 50 Ω if the rear interface connection is used. It will cause an impedance mis-match and possible loading of the AM 503.

Changing output to rear interface. Remove the right side snap-in cover from the AM 503. Unplug the coaxial cable from the rear of the OUTPUT INTO 50 Ω connector. Carefully align the coaxial cable at the upper-rear coaxial connector; pressing firmly, insert the cable.



The coaxial cable connector center pin is easily bent and alignment is critical when making the connection for rear interface output.

With the output cable (internal) connected to the rear interconnecting jack output, the front-panel OUTPUT INTO 50 Ω connector will not have an output signal available.

Connecting the AM 503

Install the AM 503 into the TM 500-Series power module. Ensure that the power module into which the AM 503 will be installed is suitably adapted to the line voltage to be applied.

Connect a 50 Ω cable with bnc connectors (and if necessary, a 50 Ω termination for impedance matching) to the monitor oscilloscope vertical input.

Set the monitor oscilloscope vertical sensitivity for 10 mV/Div. The horizontal sweep speed should be consistent with the signal frequency to be examined.

Connect a current probe to the AM 503 INPUT connector.

Turn all equipment on and allow 20 minutes for the equipment to warm up and stabilize.

Using the AM 503 with Probe

Set the monitor oscilloscope vertical input to ground and position the trace vertically to graticule center. Reset the monitor oscilloscope vertical input to dc coupling.

Set the AM 503 AC-CAL DC LEVEL-DC switch to the CAL DC LEVEL position. Rotate the DC LEVEL control to position the monitor oscilloscope trace to graticule center.

With the current probe slide in the closed position (not connected around a conductor) press and release the DEGAUSS button.

NOTE

Removal of any magnetic flux present in the probe transformer core always requires degaussing the probe. This is important after connecting or reconnecting the probe, or after making measurements in excess of the instrument range.

Set the AM 503 AC-CAL DC LEVEL-DC switch to DC. Set the CURRENT/DIV full clockwise. Adjust the screwdriver BALANCE control to position the monitor oscilloscope trace to graticule center.

The AM 503 and current probe are balanced, degaussed, and ready to measure current in a conductor. The CURRENT/DIV switch is calibrated for use at the 10 mV/Div monitor oscilloscope vertical sensitivity. However, for low amplitude currents (less than 2 mA), added resolution may be gained by changing the monitor oscilloscope sensitivity to 5 mV/Div. With the vertical sensitivity at 5 mV/Div, the AM 503 1 mA/Div sensitivity becomes 0.5 mA/Div.

The AM 503 internal circuitry, in conjunction with a 10X probe, has a feature for automatically changing the amplifier gain. When the gain is changed for a 10X probe, the CURRENT/DIV knob-skirt illumination changes to display the corresponding switch range. If a 10X probe is used (e.g., P6303), the lowest range on the CURRENT/DIV switch becomes 10 mA/Div. Again, the monitor oscilloscope sensitivity can be changed to increase the monitor oscilloscope resolution for viewing lower amplitude signals.

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 the insertion impedance should be considered to minimize loading. Consult the Instruction sheet for the probe in use to find the relationship of frequency to insertion impedance deviation.

High Currents



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

When measuring over 40 amperes peak (with a 1X probe), the AM 503 output may overdrive the monitor oscilloscope vertical display. When measuring these high currents, change the monitor oscilloscope vertical sensitivity to 20 mV/Div. With the vertical sensitivity at 20 mV/Div, the AM 503 5 A/Div sensitivity becomes 10 A/Div.

Maximum Currents

The maximum peak-to-peak currents (approximate) in amperes vs. signal frequency derating curve is listed in the appropriate instruction sheet for the current probe in use. Current is derated for a continuous signal to prevent excessive heating in the probe head.

INPUT OVERLOAD indicator light. The front panel indicator lights when the measured current exceeds the maximum dc current rating of the probe in use. The monitor oscilloscope display (regardless of input coupling) may be inaccurate with the INPUT OVERLOAD lamp lit.

SPECIFICATION AND PERFORMANCE CHECK

Performance Conditions

The electrical characteristics are valid only if the AM 503 has been calibrated at an ambient temperature between +20°C and +30°C and is operating at an ambient temperature between 0°C and +50°C, unless otherwise stated.

Items listed in the Performance Characteristics column of the Electrical Characteristics are verified by completing the Performance Check in this section of the manual. Items listed in the Supplemental Information column are not verified in this manual. The items are either explanatory notes or performance characteristics for which no limits are specified.

SPECIFICATION

Table 2-1
ELECTRICAL CHARACTERISTICS

Characteristics	Performance Characteristics	Supplemental Information
Bandwidth (–3 dB) Full		OUTPUT terminated into 50 Ω, DC function
Amplifier Only	DC to at least 100 MHz.	
with P6303	DC to at least 15 MHz.	
with P6302	DC to at least 50 MHz.	
5 MHz	5 MHz, ±1 MHz	
ac coupled, lower limit	≤7 Hz	
Rise time (full bandwidth)	≤3.5 ns	
Noise		BANDWIDTH Full, function in CAL DC LEVEL; dc level adjusted for zero dc out
Ampl random (1st two cw positions of CURRENT/DIV switch)	≤4 mV	
Ampl random (CURRENT/DIV switch ranges except 1st two cw positions)	≤0.8 mV	BANDWIDTH Full, function in DC; CURRENT/DIV full cw; DC LEVEL adjusted for zero dc out
Random (typical probes) P6302	≤0.3 mA (Tangentially measured)	
P6303	≤3 mA (Tangentially measured)	
Attenuator Accuracy	Within 3% of indicated Current/Division	

Table 2-1 (cont)
ELECTRICAL CHARACTERISTICS

Characteristics	Performance Characteristics	Supplemental Information
Deflection Factor (typical probes)		
P6302	1 mA to 5 A/div in a 1, 2, 5 sequence	
P6303	10 mA to 50 A/div in a 1, 2, 5 sequence	
Thermal Drift Amplifier Only		In first two cw positions; 2 mV/°C or less at OUTPUT (from +15°C to +35°C ambient) In all but first two cw positions; ≤ 0.4 mV/°C at OUTPUT (from +15°C to +35°C ambient)
OUTPUT dynamic range	+80 mV and -80 mV with less than 5% compression (into 50 Ω)	CURRENT/DIV set to 5 mA/Div. Monitor oscilloscope set for 20 mV/div
POWER CONSUMPTION		
Standard Instrument		≈17 W

Table 2-2
ENVIRONMENTAL CHARACTERISTICS

Characteristics	Information
Temperature	Test to procedures of MIL-STD-810C Methods 502.1 and 501.1 using Procedure I as specified in MIL-T-28800B paragraph 4.5.5.1.3 and 4.5.5.1.4.
Operating	0°C to +50°C.
Non-operating	-55°C to +75°C.
Humidity	
Operating	+50°C to 95% relative humidity.
Non-operating	+60°C to 95% relative humidity. Test to MIL-STD-810C Method 507.1 Procedure IV, modified as specified in MIL-T-28800B paragraph 4.5.5.1.1.2.
Altitude	Test to MIL-STD-810C Method 500.1 Procedure I as specified in MIL-T-28800B paragraph 4.5.5.2.
Operating	To 15,000 feet.
Non-operating	To 50,000 feet.

Table 2-2 (cont)

ENVIRONMENTAL CHARACTERISTICS

Characteristics	Information
Vibration Operating and Non-operating	With the instrument operating, the vibration frequency is swept from 10 to 55 to 10 Hz. Vibrate 15 minutes in each of the three major axes at 0.015" total displacement. Hold 10 minutes at any major resonance, or if none, at 55 Hz. Total time, 75 minutes.
Shock Non-operating	30 g's 1/2 sine, 11 ms duration, 3 shocks in each direction along 3 major axes, for a total of 18 shocks.
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.

Table 2-3

PHYSICAL CHARACTERISTICS

Characteristics	Information
Maximum Overall Dimensions	
Height	≈5 inches (12.7 cm)
Width	≈2.6 inches (6.7 cm)
Length	≈11.7 inches (29.8 cm)
Front Panel	
Finish	Anodized aluminum
Net Weight	≈2 lbs.

PERFORMANCE CHECK

Introduction

This procedure checks the electrical characteristics of the AM 503 that appear in the Specification section of this manual. If the instrument fails to meet the requirements given in this performance check, the adjustment procedure should be performed. This procedure can also be used by an incoming inspection facility to determine acceptability of performance.

The electrical characteristics in Section 2 are valid only if the AM 503 is calibrated at an ambient temperature of +20°C to +30°C and operated at an ambient temperature of 0°C to +50°C.

Tolerances that are specified in this Performance Check procedure apply to the instrument under test and do not include test equipment error.

Test Equipment Required

The following test equipment, or equivalent, is required to perform the performance check. Test equipment characteristics listed are the minimum required to verify the performance of the equipment under test. Substitute equipment must meet or exceed the stated requirements. All test equipment is assumed to be operating within tolerances.

Specification and Performance Check—AM 503

Special test devices are used where necessary to facilitate the procedure. Most of these are available from

Tektronix, Inc., and can be ordered through your local Tektronix Field Office or representative.

**Table 2-4
LIST OF TEST EQUIPMENT REQUIREMENTS**

Description	Minimum Specifications	Usage	Examples
1. Test Oscilloscope	Bandwidth: dc to 150 MHz; minimum vertical deflection 5 mV/Div; minimum Time/Div, 2 ns.	All amplifier output measurements	TEKTRONIX 7704A with 7A16A Amplifier and 7B80 Time Base
2. Power Module TM 500-Series	AM 503 and test	Provide power to equipment	TEKTRONIX TM 503 or TM 506 or TM 515
3. Digital Voltmeter	Ranges (ac rms), 0—200 mV, 0—2 V; Accuracy, $\pm 0.5\%$ ± 1 count at 1 kHz.	Dynamic range	TEKTRONIX DM 502 ^a
4. Calibration Generator	<p>Amplitude Calibrator and two pulse modes: High Amplitude and Fast Rise Amplitude Calibrator.</p> <p>Amplitude to 5 V, p-p into 50 Ω; period, approx. 1 ms.</p> <p>High Amplitude Output: Period 1 μs to 10 ms; duty cycle, approx. 50%; amplitude range, 0.5 V or less to at least 5 V.</p> <p>Leading edge aberrations within 2%, into 50 Ω.</p> <p>Fast Rise Output. Period 1 μs to 10 ms; duty cycle, approx. 50%; amplitude range, 100 mV or less to at least 1.0 V into 50 Ω. Rise time (terminated in 50 Ω), 1.0 ns or less; leading edge aberrations, within 2% during first 10 ns; flatness within 0.5% after first 10 ns; trigger output (terminated in 50 Ω), positive going signal is at least 1.0 V.</p>	Noise. Rise Time Bandwidth	TEKTRONIX PG 506 ^a Pulse Generator
5. Constant Amplitude Sine-Wave Generator	Frequency range, to at least 50 MHz with 50 kHz reference frequency; Amplitude range to 4 V p-p; impedance, 50 Ω ; amplitude accuracy (50 kHz reference) within 3% of indicated amplitude on 5 V range, into 1% termination; flatness, output amplitude does not	Bandwidth Checks	TEKTRONIX SG 503 ^a Leveled Sine-Wave Generator

Table 2-4 (cont)

LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Minimum Specifications	Usage	Examples
5. Constant Amplitude Sine-Wave Generator (cont)	vary more than 3% from actual amplitude of 50 kHz reference to 50 MHz.		
6. Function Generator	Output frequency, approx. 5 Hz to 1 kHz; amplitude, (into 50 Ω), or 5 V p-p; Amplitude flatness (sine wave), ±1.5 dB throughout required frequency range.	Ac low frequency —3 dB point check. Dynamic range	TEKTRONIX FG 502 ^a
7. Cable (3 required)	Impedance, 50 Ω; length, 42 inches; connectors, bnc	Used in all test setups.	Tektronix Part No. 012-0057-01
8. Termination (2 required)	Impedance, 50 Ω, in-line; connectors, bnc	Used in all test setups	Tektronix Part No. 011-0049-01
9. Special Adapter	Impedance, 25 Ω, in-line; connectors, bnc	Used in all test setups	See Fig. 3-1
10. Adapter	bnc 'T'	AC Dynamic Range	Tektronix Part No. 103-0030-00
11. 10X Attenuator (3 required)	Impedance, 50 Ω; connectors, bnc	Noise; Dynamic range	Tektronix Part No. 011-0059-02

^a Requires TM 500-Series Power Module.

Preliminary Procedure

1. Ensure that all power switches are off.
2. Ensure that all test equipment and the power module into which the AM 503 under test will be installed are suitably adapted to the line voltage to be applied.
3. Install the AM 503 into the power module, and if applicable, install all other TM 500-Series test equipment into the power module.
4. Connect the power module(s) and test equipment to a suitable line voltage source. Turn all equipment on and allow at least 20 minutes for the equipment to warm up and stabilize.

1. Check Current/Division Accuracy

Set the following controls as indicated:

AM 503

CURRENT/DIV	5 A
Coupling	DC
BANDWIDTH	FULL

Calibration Generator

Amplitude	10 V
Mode	std ampl

Monitor Oscilloscope

Volts/Div	5 mV
Time/Div	50 μs
Input Coupling	dc
Triggering	ext

Specification and Performance Check—AM 503

a. Connect the OUTPUT of the AM 503 to the input of the monitor oscilloscope using a 50 Ω cable and a 50 Ω terminator.

b. Connect the Ampl Output of the calibration generator to the AM 503 INPUT using the special adapter (see Fig. 3-1) and a 50 Ω cable.

c. Using the AM 503 DC LEVEL control and the monitor oscilloscope vertical position control, center the display.

d. Check—that the signal amplitude is two divisions.

e. Set the AM 503, calibration generator, and monitor oscilloscope as indicated in Table 2-2.

f. Check—that the signal amplitude in each step is five divisions ±0.15 division.

**Table 2-2
CURRENT/DIVISION ACCURACY
CONTROL SETTINGS**

AM 503	Calibration Generator	Monitor Oscilloscope VOLTS/DIV
2.0 A	10.0 V	5 mV
1.0 A	10.0 V	10 mV
0.5 A	5.0 V	10 mV
0.2 A	2.0 V	10 mV
0.1 A	1.0 V	10 mV
50 mA	0.5 V	10 mV
20 mA	0.2 V	10 mV
10 mA	0.1 V	10 mV
5 mA	50 mV	10 mV
2 mA	20 mV	10 mV
1 mA	20 mV	20 mV

g. Remove test connections.

2. Check AC Dynamic Range

Set the following controls as indicated:

AM 503

CURRENT/DIV 5 mA
Coupling DC
BANDWIDTH FULL

Low Frequency Sine-Wave Generator

Frequency 100 Hz
Amplitude Minimum
Offset Off (in)

Monitor Oscilloscope

Volts/Div 20 mV
Coupling dc
Time/Div 5 ms

a. See Fig. 2-1 for test setup.

b. Set the sine-wave generator for 28.3 mV, rms out of the AM 503 (monitor oscilloscope indicates 80 mV, peak-to-peak).

c. Set monitor oscilloscope input coupling to gnd. Position trace vertically four divisions below the center graticule line.

d. Reset monitor oscilloscope input coupling to dc.

e. Set AM 503 coupling to CAL DC LEVEL.

f. Adjust AM 503 DC LEVEL to position trace vertically four divisions below the center graticule line.

g. Reset the AM 503 coupling to DC.

h. Using the AM 503 DC LEVEL control, center the signal on the center graticule line.

i. Check—DVM should read at least 26.9 mV rms or greater.

j. Set monitor oscilloscope input coupling to gnd.

k. Position the trace vertically four divisions above the center graticule line.

l. Reset the monitor oscilloscope input coupling to dc.

m. Set the AM 503 coupling to CAL DC LEVEL.

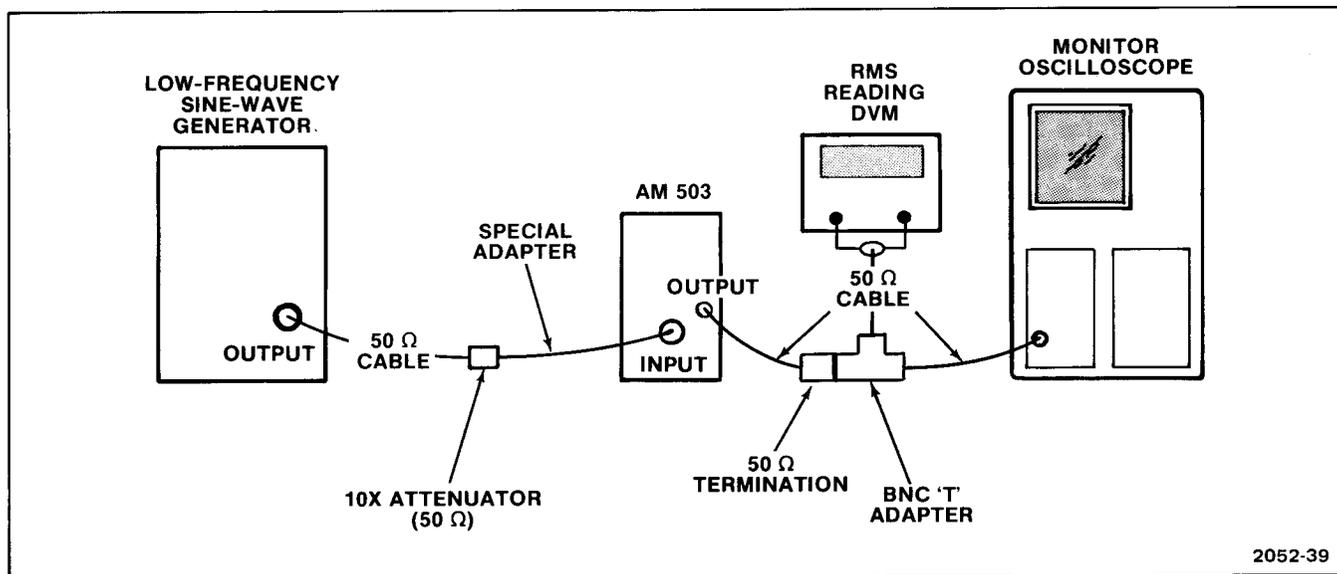


Fig. 2-1. Test setup for AC Dynamic Range Check.

n. Adjust the AM 503 DC LEVEL control to position the trace four divisions above the center graticule line.

o. Set the AM 503 coupling to DC.

p. Using the AM 503 DC LEVEL control, center the signal on the center graticule line.

q. Check—DVM should read at least 26.9 mV rms or greater.

r. Remove test connections.

3. Check Amplifier Noise

Set the following controls as indicated:

AM 503

CURRENT/DIV	1 mA
BANDWIDTH	FULL
Coupling	CAL DC LEVEL

Calibration Generator

Mode	Fast Rise
Period	1 ms
Pulse Amplitude	midrange

(Use short cables.)

Monitor Oscilloscope

Volts/Div	10 mV
Time/Div	10 μ s
Input Coupling	gnd
Triggering	ext

a. Using a 50 Ω cable and a 50 Ω termination, connect the AM 503 OUTPUT to the input of the monitor oscilloscope.

b. Attach the three 10X attenuators to the +Fast Rise Output of the calibration generator. Using a 50 Ω cable and the special adapter, connect the AM 503 INPUT to the attenuators.

c. Set the monitor oscilloscope vertical Position control so that the trace is on the center graticule line.

d. Set the monitor oscilloscope input coupling to dc.

e. Using the AM 503 DC LEVEL control, position the trace to the center graticule line.

f. Set the AM 503 coupling to DC.

Specification and Performance Check—AM 503

g. Decrease the calibration generator output amplitude until the two traces just merge (no dark area between the traces, see Fig. 2-2).

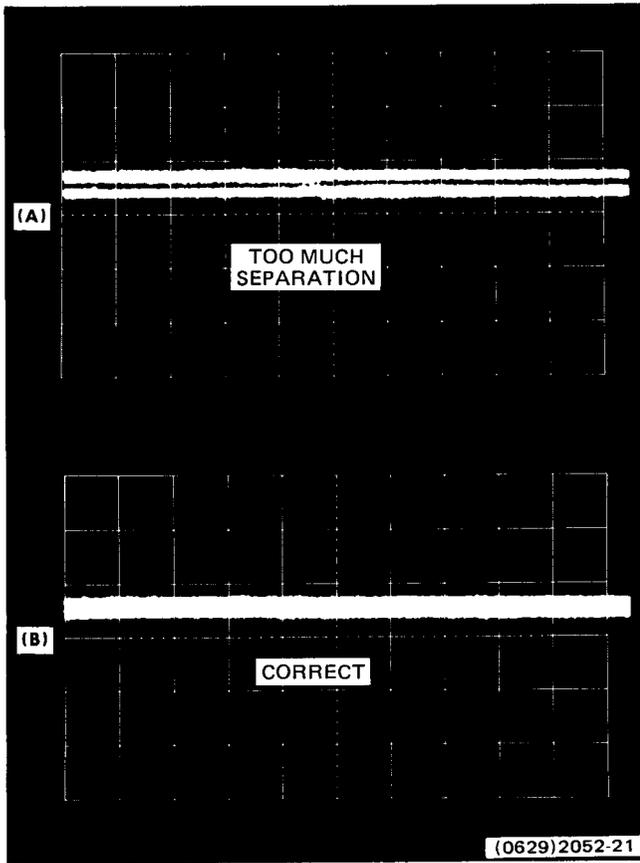


Fig. 2-2. Display of tangentially measured noise (A) incorrect; dark area showing between traces, (B) correct display.

- h. Remove one 10X attenuator.
- i. Divide display amplitude by 10. Example: 1.9 divisions of display at 10 mV/Div = 19 mV. Divide 19 mV by 10; then the noise = 1.9 mV.
- j. Check—for a maximum of 4 mV of noise.
- k. Set the AM 503 CURRENT/DIV to 2 mA.
- l. Check—using the procedure in part i, for a maximum of 4 mV of noise.
- m. Set AM 503 CURRENT/DIV to 5 mA.
- n. Repeat parts b through i.

o. Check—for a maximum of 0.8 mV of noise.

p. Repeat parts n and o for all remaining settings of the AM 503 CURRENT/DIV control.

NOTE

At 20 mV/Div with monitor oscilloscope, go to High Amplitude Output on Calibration generator. Remove 10X attenuator on 0.1 A setting. Remove last 10X attenuator on 1.0 A setting.

4. Check Rise Time/Bandwidth

Set the following controls as indicated:

AM 503

CURRENT/DIV	20 mA
BANDWIDTH	FULL
Coupling	DC

Calibration Generator

Mode	Fast Rise
Period	1 μ s
Amplitude	Minimum

Monitor Oscilloscope

Volts/Div	10 mV
Bandwidth	Full
Time/Div	.02 μ s
Magnifier	X10
Triggering	ext

a. Using the 50 Ω cable and 50 Ω termination, connect the AM 503 OUTPUT to the input of the monitor oscilloscope.

b. Using the special adapter and a 50 Ω cable, connect the calibration generator Fast Rise Output to the AM 503 INPUT.

c. Set the display amplitude to five divisions using the calibration generator Pulse Amplitude control.

d. Set the test oscilloscope to Internal Triggering and, using the Triggering Level and horizontal Position controls, obtain a display of the waveform leading edge.

e. Measure the rise time (10%—90% point).

f. Check—that the rise time is 3.5 ns or less.

Specification and Performance Check—AM 503

g. Disconnect the calibration generator from the special adapter.

h. Connect the sine-wave generator Output to the special adapter.

i. Set the following controls as indicated:

AM 503

CURRENT/DIV	5 mA
BANDWIDTH	FULL
Coupling	DC

Leveled Sine-Wave Generator

Frequency Range (MHz)	REF 350 kHz
Amplitude Multiplier	X .01
Output Amplitude	3.0

Monitor Oscilloscope

Volts/Div	10 mV
Time/Div	50 μ s
Triggering	ext

j. Adjust the Output Amplitude control of the sine-wave generator for a six-division display.

k. Increase the frequency of the sine-wave generator until the display is reduced to 4.2 divisions.

l. Check—that the sine-wave generator frequency is at least 100 MHz.

m. Change the following controls as indicated:

AM 503

BANDWIDTH	5 MHz
-----------	-------

Sine-Wave Generator

Frequency Range	Ref 350 kHz
-----------------	-------------

n. Adjust Output Amplitude of the sine-wave generator for a six-division display.

o. Increase the frequency of the sine-wave generator until the display amplitude is reduced to 4.2 divisions.

p. Check—that the sine-wave generator frequency is at least 4 MHz and not more than 6 MHz.

q. Disconnect the cable from the Output of the sine-wave generator and connect to the Output of the function generator.

r. Set the following controls as indicated:

AM 503

CURRENT/DIV	20 mA
BANDWIDTH	5 MHz
Coupling	AC

Function Generator

Frequency	1 kHz
Amplitude	Minimum

Monitor Oscilloscope

Volts/Div	50 mV
Time/Div	10 μ s
Triggering	ext

s. Set the function generator Amplitude control for a six-division display.

t. Decrease the frequency of the function generator until the display is reduced to 4.2 divisions.

u. Check—that the function generator frequency is not more than 7 Hz.

5. DC Level and Balance

Set the following controls as indicated:

AM 503

Current/Div	1 mA
Bandwidth	Full
Coupling	Cal DC

Monitor Oscilloscope

Volts/Div	10 mV
Time/Div	10 μ s
Triggering	ext

Specification and Performance Check—AM 503

a. Set monitor oscilloscope input coupling to gnd. Position trace vertically at the center of the CRT.

b. Reset monitor oscilloscope input coupling to DC.

NOTE

If the trace has moved from the gnd setting, there is an offset problem with the monitor oscilloscope.

c. Using a 50 Ω cable and a 50 Ω feed-through terminator, connect the AM 503 OUTPUT to the input of the monitor oscilloscope.

d. Reset the AM 503 coupling to DC.

e. Adjust the front panel balance so there is a minimal shift on monitor oscilloscope trace between the Cal DC Level position and the DC position on the AM 503.

f. Remove test set-up.

This complete the performance check.

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

ADJUSTMENT

Introduction

This adjustment procedure is to be used to restore the AM 503 to original performance specifications. Adjustment need not be performed unless the instrument fails to meet the Performance Requirements of the Electrical Characteristics listed in the Specification section, or the Performance Check cannot be completed satisfactorily.

Completion of all adjustment steps in this procedure ensures that the instrument will meet the performance requirements listed in the Specification section. However, to fully ensure satisfactory performance, it is recommended that the Performance Check be performed after any adjustment is made.

Adjustment Instructions

The alphabetical instructions under each step (a, b, c, etc.) may contain Check, Examine, or Adjust as the first word of the instruction. These terms are defined as follows:

1. Check—indicates that the instruction accomplishes a performance requirement check. Each performance requirement is derived from the instrument specification as listed in Table 2-1, Electrical Characteristics.

2. Examine—usually precedes an Adjust instruction and describes how to determine whether the adjustment is necessary. Measurement limits following the word Examine are not to be interpreted as performance limits derived from the instrument specifications. They are provided as indicators of a properly functioning instrument and to aid in the adjustment process.

3. Adjust—describes which adjustment to use to make

the desired result. We recommend that adjustments not be made if a previous Check or Examine instruction indicates that no adjustment is necessary.

Adjustment Interval

To maintain instrument accuracy, check the performance of the Current Probe Amplifier every 1,000 hours of operation, or every six months if used infrequently.

Services Available

Tektronix, Inc. provides complete instrument repair and adjustment at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

Test Equipment Required

The test equipment listed in Table 3-1, or equivalent, is required for adjustment of the AM 503. Specifications given for the test equipment are the minimum necessary for accurate adjustment and measurement. All test equipment is assumed to be correctly calibrated and operating within specification.

If other test equipment is substituted, control settings or calibration setup may be altered to meet the requirements of the equipment used.

A flexible plug-in extender, Tektronix Part No. 067-0645-02, is useful for troubleshooting or adjusting the AM 503; however, the complete Adjustment Procedure can be performed without use of the extender.

Table 3-1

LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Applications	Examples
Oscilloscope	Bandwidth, to 150 MHz; vertical sensitivity, 10 mV/Div; sweep rate, 2 ms.	Gain, Compensation, and Degauss adjustment.	TEKTRONIX 7704A main-frame and 7A16A/7B80 plug-ins.

Table 3-1 (cont)

LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Applications	Examples
Calibration Generator	Pulse Output: period 1 μ s to 10 ms; duty cycle, \approx 50%; amplitude range, 0.5 V or less to at least 5 V. Leading edge aberrations \leq 2%, into 50 Ω . Rise time (terminated into 50 Ω) \leq 10 ns.	Gain and Compensation adjustment.	TEKTRONIX PG 506 ^a Pulse Generator.
Digital Voltmeter	Range, 0 to 20 V; accuracy within 0.2%.	Power supply voltage check.	TEKTRONIX DM 502A ^a Digital Multimeter.
Probe	1X	Gain adjustment.	TEKTRONIX P6101.
Termination	Impedance, 50 Ω ; connector, bnc.	All measurements.	Tektronix Part No. 011-0049-01.
Cable (2 required)	Impedance, 50 Ω ; length, 42 inches; connectors, bnc.	All measurements.	Tektronix Part No. 012-0057-01.
Resistor	Fixed wire-wound, 3 Ω , 3 W, 5%.	Degauss adjustment.	Tektronix Part No. 308-0441-00.
Special Adapter		Used for all inputs to AM 503.	See Fig. 3-1.

^a Requires TM 500-Series Power Module.

Preparation

- a. Construct Special Adapter as shown in Fig. 3-1.
- b. Remove the left side cover of the AM 503 to gain access to the adjustments. Pull the rear end of the side cover outward from the side of the instrument (the cover snaps into place).
- c. Be sure that the power switch is off. Set the power module for the line voltage to be applied and connect it to the line voltage source.
- d. Install the other TM 500-Series equipment into the power module.

- e. Turn on all test equipment and allow 20 minutes for warm up and stabilization.

1. Adjust Power Supply Voltages

- a. Connect the DVM between each voltage test point and ground for the supplies listed in Table 3-2. See Fig. 3-2 for test point and adjustment locations.
- b. Examine—each supply voltage to determine if it is within the range given.
- c. Adjust—each supply voltage with the indicated adjustment.

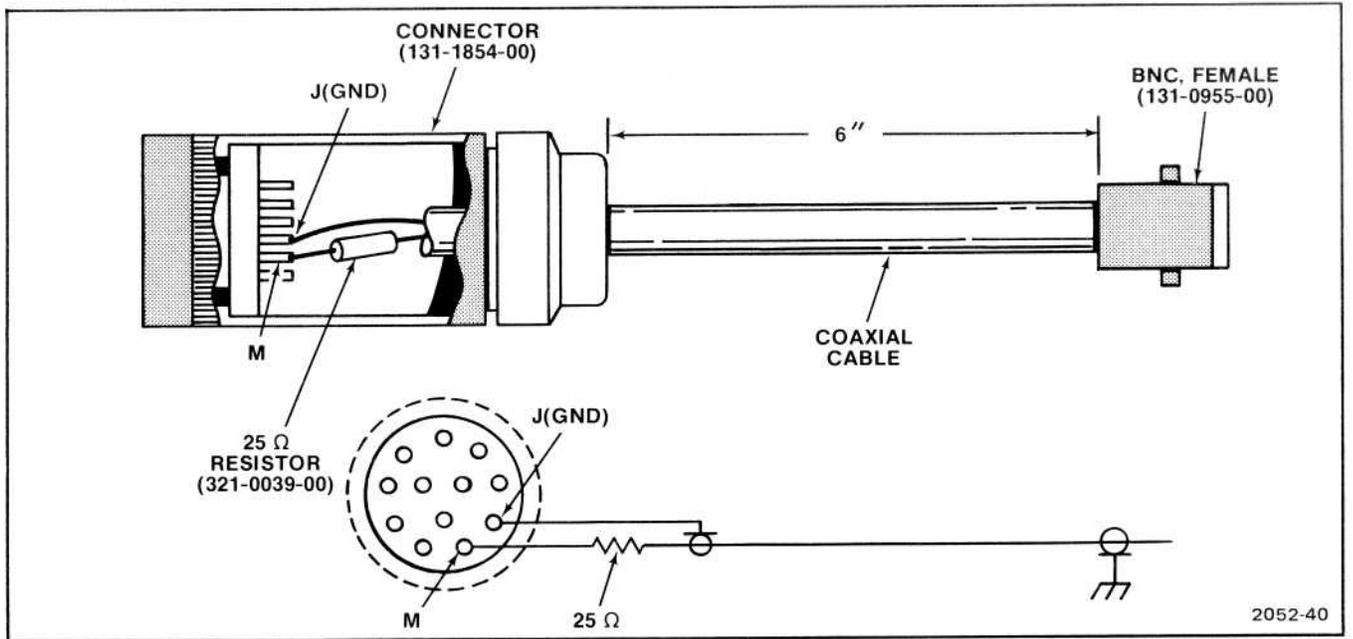


Fig. 3-1. Construction details for Special Adapter.

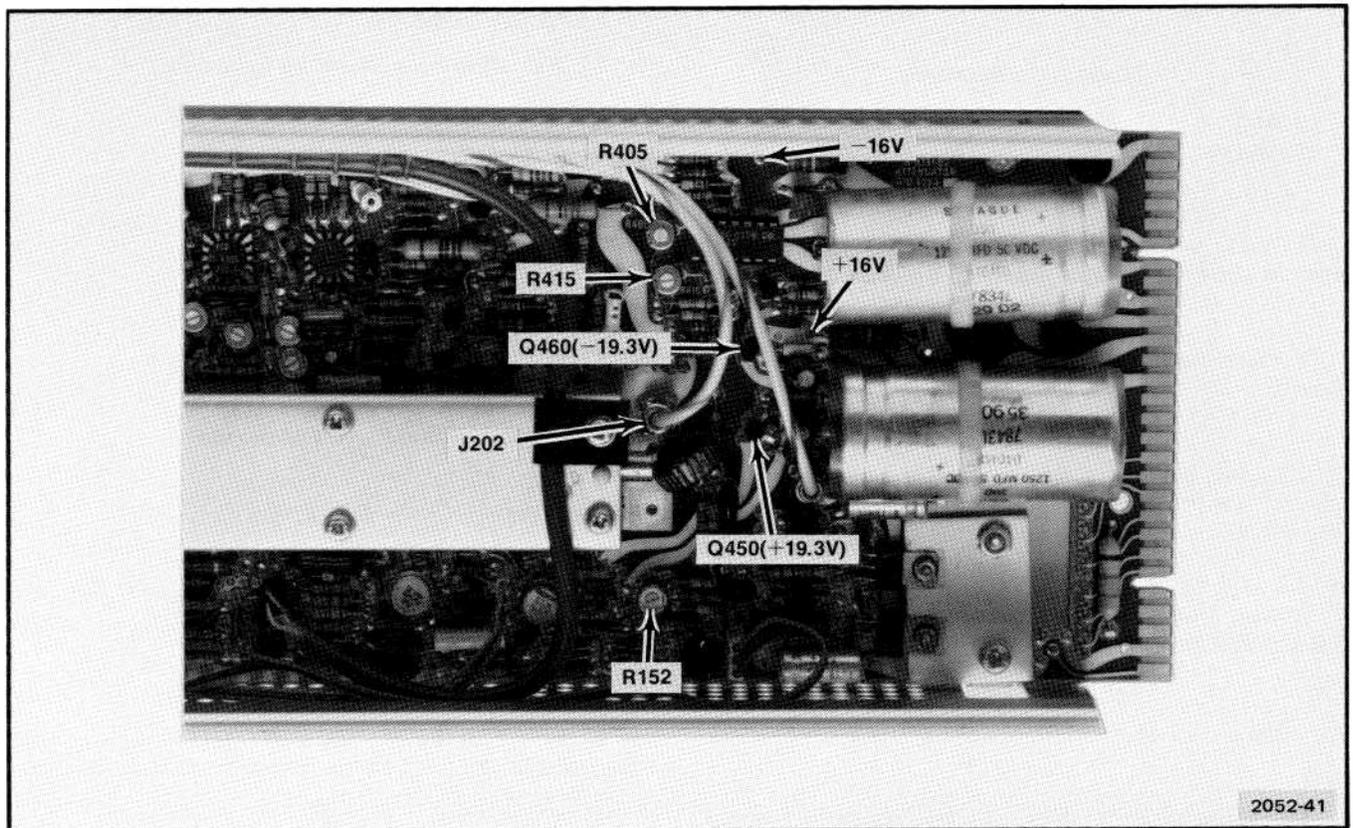


Fig. 3-2. Power supply test point and adjustment locations.

Table 3-2
POWER SUPPLY TEST POINTS, LIMITS, AND ADJUSTMENTS

Supply	Test Point	Limits	Adjustment
-16 V	R422	-16.1 V to -15.9 V	R405
+16 V	R412	+15.9 V to +16.1 V	R415
+19.3 V	Q450 emitter	+18 V to +21.5 V	no adjustment
-19.3 V	Q460 emitter	-21.5 V to -18 V	no adjustment

2. Adjust Gain

Set the following controls as indicated:

AM 503

CURRENT/DIV .1 A
Coupling DC
BANDWIDTH FULL

Calibration Generator

Period 1 ms
Mode Fast Rise*
Pulse Amplitude Minimum
*Rising edge -1 V to 0 V

Monitor Oscilloscope

Volts/Div 50 mV
Time/Div .5 ms

a. Using the special adapter and 50 Ω cable, connect the calibration generator output to the AM 503 INPUT.

b. Place the 1X probe on J202 (on the back side of the board).

c. Using the calibration generator pulse amplitude control, set the display amplitude for 200 mV, (ignoring the first 10 μ s of each pulse).

d. With a 50 Ω cable and a 50 Ω termination, connect the AM 503 OUTPUT to the monitor oscilloscope.

e. Set the monitor oscilloscope to 10 mV.

f. Examine—for a four-division display on the monitor oscilloscope.

g. Adjust—R344 for a four-division display (see Fig. 3-3).

h. Set the current/Div on the AM 503 to 50 mA. (Display will now be 8 divisions.)

i. Connect a jumper wire between P346 (see Fig. 3-3) and ground.

j. Examine—for a display of 4.4 to 4.6 divisions.

k. Adjust—R346 for a display of 4.5 divisions.

3. Adjust Compensation

Set the following controls as indicated:

AM 503

CURRENT/DIV 5 mA
Coupling DC

Calibration Generator

Period 1 μ s
Mode Fast Rise*
Pulse Amplitude Minimum
*Rising edge -1 V to 0 V

Monitor Oscilloscope

Volts/Div 10 mV
Time/Div 200 ns

a. Using a 50 Ω cable, the special adapter, and a 10X attenuator, connect the calibration generator fast rise output to the AM 503 INPUT.

b. Using a 50 Ω cable and a 50 Ω termination, connect the AM 503 OUTPUT to the monitor oscilloscope input.

c. Adjust the calibration generator pulse amplitude for a six-division display.

d. Set the monitor oscilloscope time/div to 20 ns.

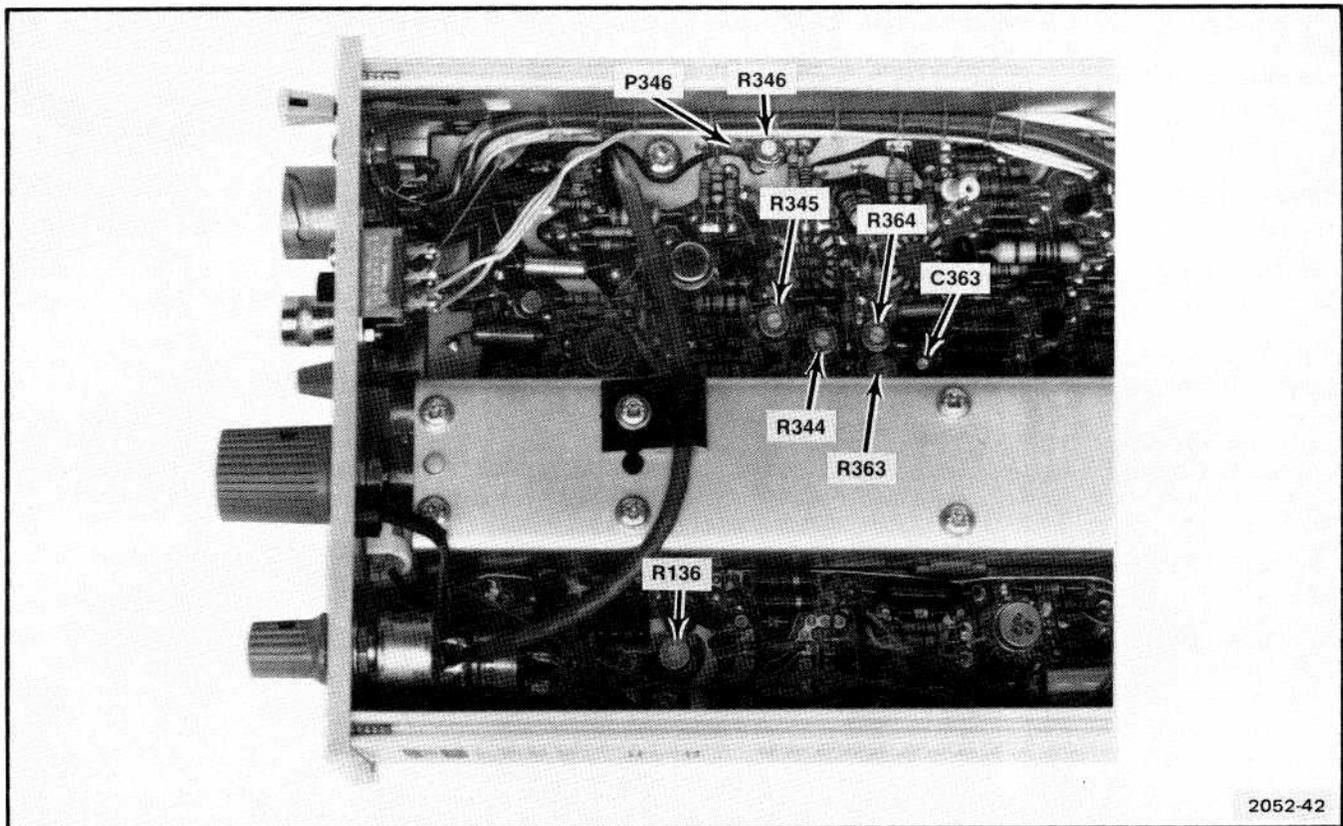


Fig. 3-3. Gain and compensation adjustment locations.

e. Examine—front corner of waveform for correct compensation (ignore long-term roll-off caused by L202).

f. Adjust—R364, R345, C363, and R363 for optimum compensation.

g. Refer to Fig. 3-4 for example.

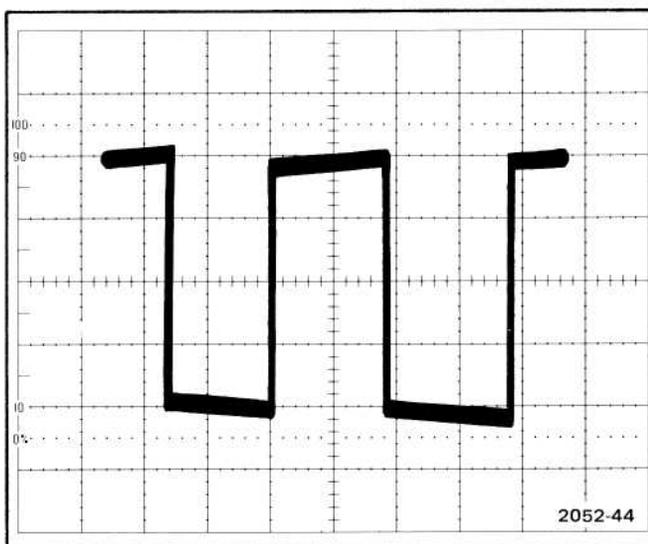


Fig. 3-4. Example of correct compensation.

NOTE

If compensation adjustments are made, it is necessary to re-check the bandwidths of the instrument. Refer to the RISE TIME/BANDWIDTH procedure in Section 2, Performance Check.

h. Remove test connections.

4. Adjust Degauss Offset/Signal Amplitude

Set the following controls as indicated:

AM 503

CURRENT/DIV	Fully clockwise
R136	Fully counterclockwise
Coupling	CAL DC LEVEL

Monitor Oscilloscope

Volts/Div	10 mV
Time/Div	1 ms
Triggering	ext
Input Coupling	gnd

Adjustment—AM 503

a. Connect a 50 Ω coaxial cable from the AM 503 OUTPUT through a 50 Ω termination to the monitor oscilloscope input.

b. Position trace to the center graticule line using the monitor oscilloscope vertical Position control.

c. Set monitor oscilloscope input coupling to dc.

d. Using the AM 503 DC LEVEL control, re-position the trace to the center graticule line.

e. Set the AM 503 Coupling to DC.

f. Press and hold the AM 503 DEGAUSS button.

g. Examine—trace positioned at center graticule line.

h. Adjust—R152, Degauss Offset (see Fig. 3-2), for zero volts dc (trace positioned on center graticule line).

i. Connect the 3.0 Ω resistor between pins M and N of the AM 503 INPUT connector.

j. Set the AM 503 CURRENT/DIV fully counter-clockwise.

k. Press and hold the DEGAUSS button.

l. Adjust—R136, Degauss Level (see Fig. 3-3), for a 4.4 divisions ± 0.4 division display.

This completes the AM 503 Adjustment Procedure.

MAINTENANCE

This section of the manual contains information about preventative maintenance, corrective maintenance, and troubleshooting.

PREVENTIVE MAINTENANCE

Preventive maintenance steps performed on a regular basis will enhance the reliability of the instrumentation system. However, periodic checks of the semiconductors in the absence of a malfunction are not recommended as preventive maintenance measures. See the semiconductor checking information under Troubleshooting Techniques, which follows. A convenient time to perform preventive maintenance is just before instrument calibration.

Cleaning

The AM 503 should be cleaned as operating conditions require. Accumulation of dirt on the components acts as an insulating blanket and prevents efficient heat dissipation, which can cause overheating and component breakdown.

CAUTION

Avoid the use of chemical cleaning agents that might damage the plastics used in this instrument. In particular, avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Exterior. Loose dust accumulated on the front panel can be removed with a soft cloth or small brush. Remaining dirt can be removed with a cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

Interior. Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high-humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry, low-pressure air. Remove any remaining dirt with a soft brush, or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

Visual Inspection

The AM 503 should be inspected occasionally for such defects as broken connections, improperly seated semi-

conductors, damaged circuit boards, and heat-damaged parts.

The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent recurrence of the damage.

Lubrication

Generally, there are no components in the AM 503 that require lubrication.

Pushbutton and Slide Switches. The switches are lubricated prior to leaving the factory and should not require further lubrication. However, if they become electrically noisy, cleaning and lubrication may solve the problem.

Cam Switches. In most cases, the factory lubrication of these switches is adequate for the life of the instrument. The switch contacts are designed to operate dry.

If the switch has been disassembled for the replacement of switch sub-parts, a lubrication kit containing the necessary lubricating materials and instructions is available through any Tektronix Field Office. Order Tektronix Part No. 003-0342-01. General Electric Versilube® G-322L silicone grease may be applied sparingly so that the lubricant does not get on the contacts. Refer to Fig. 4-1 for lubrication instructions.

CORRECTIVE MAINTENANCE

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

Obtaining Replacement Parts

Most electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, you should be able to obtain many of the

standard electronic components from a local commercial source in your area. Before you purchase or order a part from a source other than Tektronix Inc., please check the Replaceable Electrical Parts list for the proper value, rating, tolerance and description.

NOTE

When selecting replacement parts, it is important to remember that the physical size and shape of a component may affect its performance in the instrument, particularly at high frequencies. Each part should be a direct replacement unless it is known that a different component will not adversely affect instrument performance.

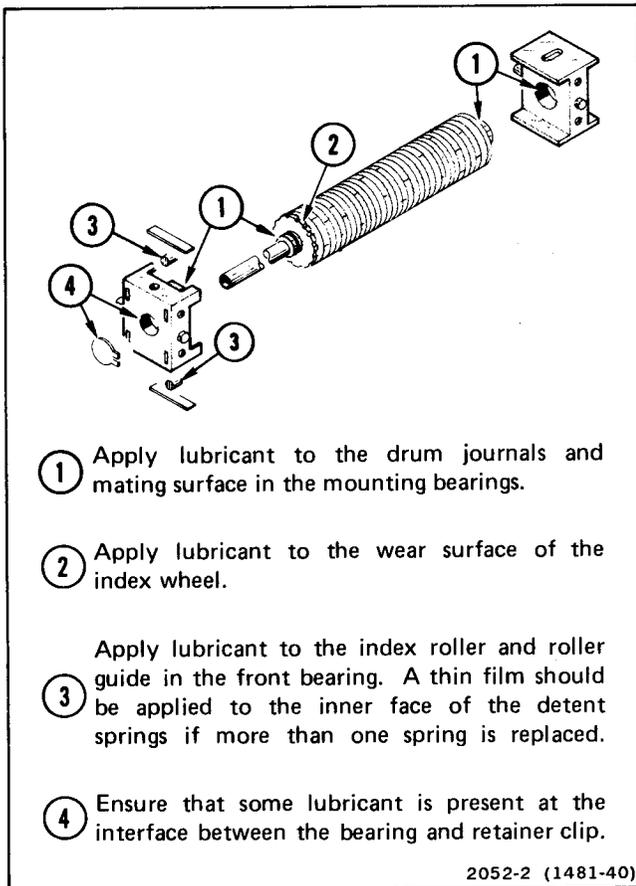


Fig. 4-1. Lubrication procedure for a typical cam switch.

Some electrical parts are manufactured or selected by Tektronix, Inc. to satisfy particular requirements, or are manufactured for Tektronix, Inc. to our specifications. Most of the mechanical parts used in this instrument are manufactured by Tektronix, Inc. To determine the manufacturer of parts, refer to parts list cross index, Mfr. Code number to Manufacturer.

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include circuit number).
4. Tektronix part number.

TROUBLESHOOTING

The following information is provided to help troubleshoot the AM 503. Information contained in other sections of this manual should be used along with the following information to aid in locating a defective component. An understanding of the circuit operation is very helpful in locating troubles, particularly where integrated circuits are used.

Control Settings

Incorrect control settings can indicate a trouble that does not exist. If there is any question about the correct function or operation of any control, see the Operating Instructions section of the manual.

Testing Equipment

Generally, a wide-band oscilloscope, a probe, and a multimeter are all that is needed to perform basic waveform and voltage checks for diagnostic purposes. The Adjustment Procedure lists specific equipment and the features necessary to adequately check out the AM 503.

Circuit Isolation

Note the symptom. It often identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check the affected circuits by making waveform and voltage measurements.

Incorrect operation of all circuits often means trouble in the power supplies. Using a multimeter, check first for correct voltages of the individual regulated supplies according to the plug-in module schematics and calibration procedures. Then check the unregulated supplies of the power modules. Defective components elsewhere in the instruments can appear as power supply problems. In these instances, suspected circuits should be disconnected from apparently bad power supplies one at a time to narrow the search.

Voltages and Waveforms

Often defective components can be located by using waveform and voltage indications when they appear on the schematic or in the calibration procedures. Such waveforms and voltage labels are typical indications and will vary between instruments. To obtain operating conditions similar to those used to take these readings, refer to the first diagram in the service sections.

Semiconductor Checks

Periodic checks of the semiconductors in the AM 503 are not recommended. The best check of semiconductor performance is actual operation of the instrument. More details on checking semiconductor operation are given under TROUBLESHOOTING.

Component Checking

If a component cannot be disconnected from its circuit, then the effects of the associated circuitry must be considered when evaluating the measurement. Except for soldered-in transistors and integrated circuits, most components can be lifted at one end from the circuit board.

Transistors and IC's. Turn the power switch off before removing or replacing any semiconductor.

A good check of transistor operation is actual performance under operating conditions. A transistor can most effectively be checked by substituting a new component for it (or one which has been checked previously). However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions. A suction-type desoldering tool must be used to remove soldered-in transistors; see component replacement procedure for details.

Integrated circuits can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of the circuit description is essential to troubleshooting circuits using IC's. Operating waveforms, logic levels, and other operating information for the IC's are given in the circuit description information of the appropriate manual. Use care when checking voltages and waveforms around the IC's so that adjacent leads are not shorted together. A convenient means of clipping a test probe to the 14- and 16-pin in-line IC's is with an integrated-circuit test clip. This device also doubles as an extraction tool.

Lead configurations for the semiconductors used in this instrument are shown in Fig. 4-2.

Diodes. Do not use an ohmmeter that has a high internal current. High currents may damage the diode.

A diode may be checked for an open or shorted condition by measuring the resistance between terminals. With an ohmmeter scale having an internal source of between 800 mV and 3 V, the resistance should be very high in one direction and very low when the leads are reversed.

Resistors. Check the resistors with an ohmmeter. Resistor tolerances are given in the Replaceable Electrical Parts list in every manual. Resistors do not normally need to be replaced unless the measured value varies widely from the specified value.

Capacitors. A leaky or shorted capacitor can be detected by checking resistance with an ohmmeter on the highest scale. Use an ohmmeter which will not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacity meter, or by checking whether it passes AC signals.

Power Supply. If incorrect operation of the power supply is suspected, first check that the power-module line selector block is in the correct position (see Power Module Instruction Manual). Use a dc voltmeter to check each supply voltage, and check ripple with a test oscilloscope. Voltages are measured between the power supply test points and chassis ground. Power supply test points are shown in the Calibration section of the manual. Check that each power supply is within the tolerance given in Table 4-1.

If a power supply is within the tolerance given in Table 4-1, the supply can be assumed to be working correctly. If outside the given tolerance, the supply may be misadjusted or operating incorrectly. Use the procedure given in the Adjustment section to adjust the 16-volt power supplies.

Table 4-1

POWER SUPPLY TOLERANCES

Power Supply	Output Voltage	Maximum Ripple Peak-to-Peak
+16 V	15.9 to 16.1	2 mV
-16 V		
+19.3 V		150 mV
-19.3 V	18.3 to 20.3	

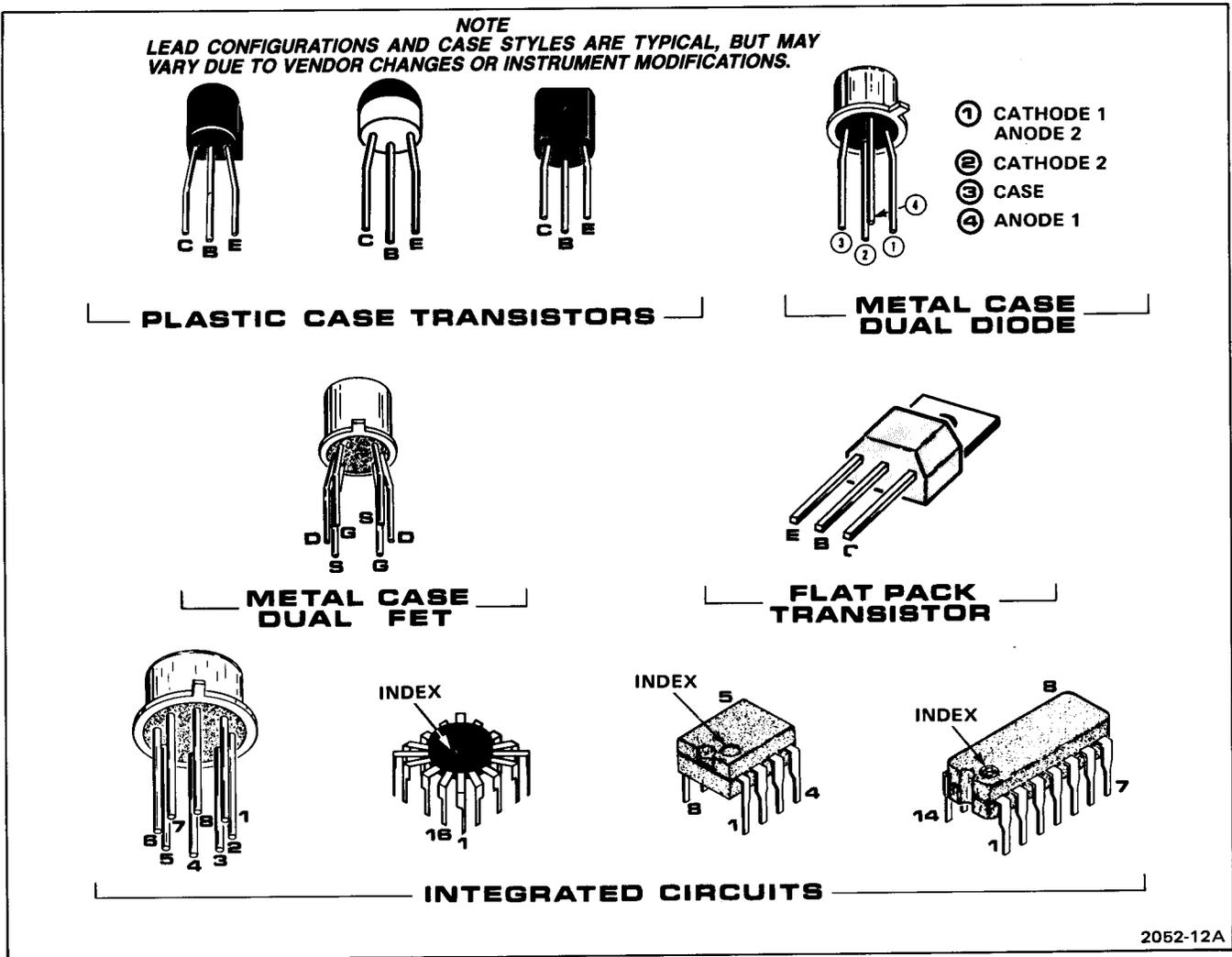


Fig. 4-2. Semiconductor lead configurations.

SOLDERING TECHNIQUES

The choice of soldering iron is determined by the repair to be made.

WARNING

To avoid electric shock, disconnect the instrument from the power source before soldering.

When soldering on circuit boards, use a 15 to 40-watt pencil-type soldering iron with a 1/8-inch wide, wedge-shaped tip. Keep the tip properly tinned for best heat transfer to the solder joint. Avoid excessive heat; apply heat only long enough to remove the component or to

make a good solder joint. Use only 60/40 rosin-core, electronic-grade solder. Apply only enough solder to make a firm solder joint.

CAUTION

The circuit board in this instrument is a multi-layer type board with conductive paths laminated between the top and bottom board layers. All soldering should be done with extreme care to prevent breaking the connections to the center conductors; only experienced maintenance personnel should attempt repair of these boards.

For metal terminals, (e.g., switch terminals, potentiometers, etc.) a higher wattage soldering iron is required

to accomplish the work. For example, if the component is connected to the chassis or other large heat-radiating surface, a 75-watt, or larger, soldering iron may be required.

The following technique should be used to replace a component on a circuit board:

1. Grip the component lead with long-nose pliers. Touch the soldering iron to the lead at the solder connection. Do not lay the iron directly on the board, as it may damage the board.

2. When the solder begins to melt, gently pull the lead out. If unable to pull the lead without using force, try removing the opposite end of the component.

NOTE

Some component leads may be difficult to remove if their leads were bent during machine insertion in the manufacturing process. The bent lead held the component in place during a flow-soldering process.

If a component lead is extremely difficult to remove, it may be helpful to straighten the leads on the back side of the board with a small screwdriver or pliers while heating the soldered connection.

If it is desired to remove solder from a circuit-board hole for installation of a new component, use a solder-removing wick.

3. Bend the leads of the new component to fit the holes in the board. If the component is replaced while the board is mounted in the instrument, cut the leads so they will just protrude through the board. Insert the leads into the holes in the board so the component is firmly seated against the board (or as positioned originally). If it does not seat properly, heat the solder and gently press the 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 heatsink.

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

6. Clean the area around the solder connection with a

flux-removing solvent. Be careful not to remove information printed on the board.

COMPONENT REMOVAL AND REPLACEMENT

WARNING

To avoid electric shock, disconnect the instrument from the power source before replacing components.

The exploded-view drawing associated with the Replaceable Mechanical Parts list may be helpful in the removal or disassembly of individual components or sub-assemblies. Component locations and circuit board locations are shown in the Diagrams section.

Circuit Boards

If a circuit board is damaged beyond repair, replace the entire board assembly. Part numbers are given in the Replaceable Electrical Parts list for completely wired boards.

Circuit Board Removal

1. Remove the knob from the CURRENT/DIV switch, and pull the knob off of the AC-CAL DC LEVEL-DC switch.
2. Disconnect all cables that terminate on the circuit board.
3. Remove 4 screws holding the circuit board to the frame tabs.
4. Slide the circuit board toward the rear of the frame until clear of the front panel and lift out.
5. To replace the circuit board, reverse the order of removal.

Switches

Three types of switches are used in this instrument: push-button, cam, and slide. The push-button or slide switch should be replaced as a unit if damaged. The following information is provided for the cam switch; your local Tektronix Field Office or representative can provide additional repair information.

Cam Switches. The cam switch used in this instrument consists of a rotating cam that mates with contacts on the circuit board. These contacts are activated by lobes on the cam as the switch is rotated. A cam switch can be disassembled for inspection, cleaning, repair, or replacement.



Repair of a cam switch should be undertaken only by experienced maintenance personnel.

A cam switch repair kit is available (Tektronix Part No. 003-0708-00) which contains special tools for use in repairing or replacing the switch contacts.

Use the following procedure to remove and replace a cam switch:

1. Remove the circuit board following instructions in Circuit Board Removal, in this section.
2. Remove eight screws that secure switch to circuit board.
3. Remove cam-switch assembly from board.
4. To replace cam switch, reverse the order of removal.

Semiconductors

Semiconductors should be replaced only when actually defective. Unnecessary replacement of semiconductors may affect the adjustment of the instrument. If removed from sockets during routine maintenance, return them to their original sockets.



To avoid component damage, power must be turned off before removing or replacing semiconductors.

Replacement devices should be of the original type or a direct replacement. Figure 4-2 shows the lead configurations of the semiconductors used in this instrument. When removing integrated circuits, pull the device out of the socket slowly and evenly. Try to avoid having one end of the integrated circuit disengage from the socket before the other, as pulling unevenly may damage pins.

Interconnecting Pins

Two methods of interconnection are used to connect

the circuit board with other components. When the interconnection is made with a coaxial cable, a special lead-end connector plugs into a socket on the board. When the interconnection is made with a wire lead, a lead-end pin connector is used. This connector mates with the interconnecting pin soldered into the board.

COAXIAL-TYPE LEAD-END CONNECTORS. Replacement of the coaxial-type lead-end connectors requires special tools and techniques; only experienced maintenance personnel should attempt to remove and replace these connectors. It is recommended that the cable be replaced as a unit. For cable part numbers, see Replaceable Mechanical Parts list. An alternative solution is to refer the replacement of the defective connector to your local Tektronix Field Office or representative.

LEAD-END PIN CONNECTORS. The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the associated leads. To remove and replace a damaged lead-end connector, remove the old pin connector from the lead and clamp the replacement connector to the lead.

If the lead-end connectors become dislodged from the plastic holder, they can be re-installed as follows (see Fig. 4-3):

1. Bend grooved portion of holder (part nearest cable) away from cable in the direction of its hinged side.
2. Re-insert terminal connector into its proper hole in the holder and bend the grooved part of the holder back to its vertical position so connector(s) fit into groove.

Some of the pin connectors are grouped together and mounted in a plastic holder; the result is that these connectors are removed and installed as a multi-pin connector. To provide correct orientation of this multi-pin connector when it is replaced, an arrow is stamped on the circuit board and a matching arrow is molded into the plastic housing of the multi-pin connector. See Fig. 4-3. Be sure these arrows are aligned as the multi-pin connector is replaced. If the individual lead-end pin connectors are removed from the plastic holder, note the color of the individual wires for replacement.

CIRCUIT-BOARD PINS. Replacement of circuit-board pins on multi-layer boards is not recommended; refer such repairs to your local Tektronix Field Office or representative.

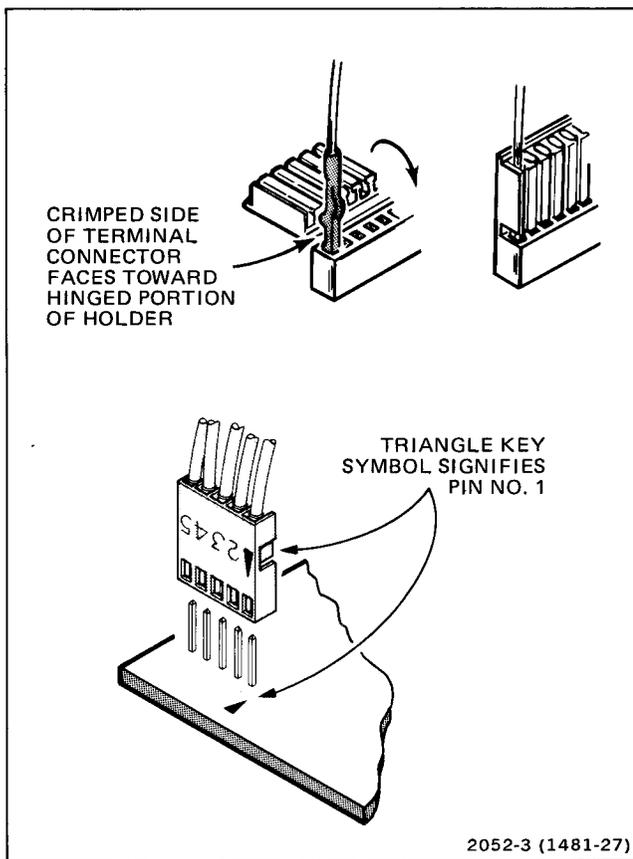


Fig. 4-3. Installation of lead-end connectors.

A circuit-board pin-replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.

Use the following procedure to remove and replace a damaged circuit-board pin:

1. Grip the pin with long-nose pliers. Touch the soldering iron to the pin at the solder connection. Do not lay the iron directly on the board, as the board may be damaged.

2. When the solder begins to melt, gently pull the damaged pin from the board. Leave the ferrule in the hole, if possible. Refer to Fig. 4-4.

3. If the ferrule remains in the circuit board, remove the spare ferrule from the replacement pin and press the new pin into the hole in the circuit board.

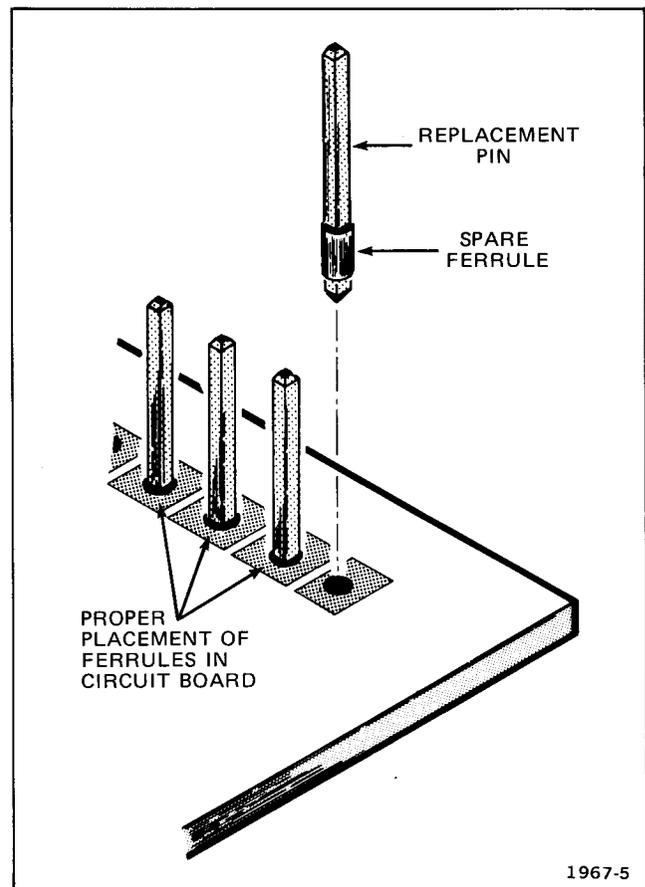


Fig. 4-4. Circuit-board pin and ferrule assembly.

If the ferrule is removed with the damaged pin, carefully clean out the hole using a solder-removing wick and a scribe. Then press the replacement pin, with its attached spare ferrule, into the hole.

4. Position the replacement pin in the same manner as the old pin.

5. Solder the pin to the circuit board on each side of the board.

TROUBLESHOOTING PROCEDURE

This procedure lists most of the probable causes of a number of possible troubles. The trouble symptom is followed by a check procedure that lists the components that should be checked. See the component locator grid in the Diagrams section for component location.

Table 4-2 (cont)
TROUBLESHOOTING

A. TROUBLE SYMPTOM: No signal at OUTPUT connector. (cont)	
CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. Cable from J380 is properly installed (may be connected for rear interface output).	
2. ±16 V Supply	a. F402, F406 b. C402, C406 c. U410 d. Q155, Q166 e. R412, R422
3. ±19.3 V Supply	a. Q450, Q460 b. VR452, VR462 c. U145
4. ±3 V Supply	a. VR100 b. VR172
5. Voltage at P202 with DEGAUSS button depressed is 11 V, p-p (with probe connected).	a. Cables from J100 to P160 and P202 are properly installed. b. Q155, Q165 c. Q115 d. U145 e. U135 f. Q130
6. Press and release DEGAUSS button and set level at P202 to zero volt with BALANCE control. Voltage at P202 should be 20 mV, p-p, with 40 mA, p-p, into 1X probe (e.g., P6302).	a. U110 b. Check probe.
7. Set Coupling to CAL DC LEVEL, adjust DC LEVEL control for zero volt out of OUTPUT connector and check bias voltages on schematics 2 and 3.	a. Q230 b. Q360 c. Q385 d. Q390 e. Q395 f. U370 g. U350 h. Q310, Q310 i. Q315, Q325

Table 4-2 (cont)
TROUBLESHOOTING

A. TROUBLE SYMPTOM: No signal at OUTPUT connector (cont)	
8. Rotate CURRENT/DIV throughout its full range and note that there is no sudden loss of signal at OUTPUT connector.	a. R206 b. R208 c. R210 d. R212 e. R214
B. TROUBLE SYMPTOM: Unable to zero output level with Coupling in CAL DC LEVEL	
CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. ±16 V Supply	a. F402, F406 b. R403, R407 c. U410 d. Q155, Q166
2. Check bias voltages on schematics 2 and 3.	a. Q230 b. Q360 c. Q385 d. Q390 e. Q395 f. U370 g. U350 h. Q310, Q320 i. Q315, Q325
3. Wiper of R302 adjusts between - and +15 volts; with no sudden discontinuities.	a. R302 b. R300, R304
C. TROUBLE SYMPTOM: Unable to set signal at OUTPUT to zero with BALANCE control	
CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. P160 and P202 plugged into the correct sockets.	
2. ±19.3 V Supply	a. Q450, Q460 b. VR452, VR462
3. ±3 V Supply	a. VR100 b. VR172
4. Voltage at P202 with	a. Cables from J100 to P160

Table 4-2 (cont)
TROUBLESHOOTING

C. TROUBLE SYMPTOM: Unable to set signal at OUTPUT to zero with BALANCE control (cont)

DEGAUSS depressed is 11 V p-p with probe connected.	and P202 are properly installed b. Q155 c. Q115 d. U145 e. U135 f. Q130
5. With probe removed and INPUT pin E shorted to pin F,E BALANCE should vary dc voltage at P160 from at least -5 V to greater than +5 V.	a. P110 b. U110 c. R120
CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
6. With probe reconnected, press and release DEGAUSS button and set OUTPUT level to zero with BALANCE control.	a. U110 b. Check probe using "Probe Check" following this troubleshooting table.
D. TROUBLE SYMPTOM: No Degauss Signal	
CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. ± 16 V Supply	a. F402, F406 b. U410 c. Q155, Q166 d. R403, R407
2. ± 19.3 V Supply	a. Q450, Q460 b. VR452, VR462
3. Voltage at U135, pin 6, with DEGAUSS button depressed is 7 V p-p ± 1 V at about 160 Hz.	a. Q130 b. U135 c. R136
4. Voltage at P202 with DEGAUSS button depressed is 11 V, p-p with probe connected.	a. Q155 b. Q115 c. U145

Table 4-2 (cont)
TROUBLESHOOTING

E. TROUBLE SYMPTOM: Excessive Droop in Pulse Response

CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. Probe is CLOSED	
2. ± 3 V Supply	a. VR100 b. VR172
3. R364 Adjustment	
4. Voltage at P202 with DEGAUSS button depressed is 11 V, p-p with probe connected	a. Cables from J100 to P160 and P202 are properly installed. b. Q155, Q165 c. Q115 d. U145
5. Press and release DEGAUSS button and set OUTPUT voltage at P202 to zero with BALANCE control. Voltage at P202 should be 20 mV, p-p, with 40 mA, p-p, into P6302 probe.	a. U110 b. Check probe as shown in "Probe Check" following this troubleshooting table.

F. TROUBLE SYMPTOM: Excessive Pulse Aberrations or Poor Bandwidth

CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. ± 16 V Supply	a. F402, F406 b. U410 c. Q155, Q166 d. R403, R407
2. Gain Adjustment (R344)	a. Set gain per step B in Adjustments procedure, Section 6.
3. Aberrations Adjustments (R345 and R363)	a. Adjust per step C2 in Adjustments procedure, Section 6.
4. With Coupling set to CAL DC LEVEL, adjust DC LEVEL for zero volt at OUTPUT connector and check bias	a. Q230 b. Q360 c. Q385 d. Q390 e. Q395

Table 4-2 (cont)
TROUBLESHOOTING

F. TROUBLE SYMPTOM: Excessive Pulse Aberrations or Poor Bandwidth (cont)

voltages on schematics 2 and 3 in Section 9.	f. U370 g. U350 h. Q310, Q320 i. Q315, Q325
5. Press and release DEGAUSS button and set voltage out at J202 to zero volt. Voltage at P202 should be 20 mV, p-p, with less than 3% droop with 40 mA, p-p into P6302 probe.	a. U110 b. ±3 V Supply c. Check probe as shown in "Probe Check" following this troubleshooting table.

G. TROUBLE SYMPTOM: Excessive Line-Frequency Ripple at AM 503 OUTPUT connector

CHECK:	If CHECK indicates a problem, examine the following components and replace, if necessary.
1. Is AM 503 grounded to display device (monitor oscilloscope)?	a. Be sure AM 503 is grounded to display device.

Table 4-2 (cont)
TROUBLESHOOTING

G. TROUBLE SYMPTOM: Excessive Line-Frequency Ripple at AM 503 OUTPUT connector (cont)

2. Voltage level across C402 or C406 should be between 24 and 34 volts with maximum ripple 4.5 V, p-p.	a. Circuit-board edge connector is properly plugged into power supply module. b. F402, F406
3. ±16 V Supply level and ripple shown in Table 4-1.	a. U410 b. R403, R407
4. ±19.3 V Supply level and ripple shown in Table 4-1.	a. Q450, Q460 b. VR452, VR462

ADJUSTMENT AFTER REPAIR

After any electrical component has been replaced, the adjustment of that particular circuit should be checked, as well as other closely related circuits. Refer to the Adjustment section of the manual.

CIRCUIT DESCRIPTION

Introduction

This section of the manual contains a description of the circuitry used in the AM 503 Current Probe Amplifier. The description begins with a discussion of the instrument, using the block diagram shown in the Diagrams section.

Block Diagram Description

The block diagram shows the states and the basic interconnections of each major circuit in the description. The number by each title on the block diagram and circuit description refers to the corresponding circuit diagram in the Diagrams section of this manual.

Typical Current Probe. The probe area (depicted in grey tint) is shown to give a general overview of the signal flow from the typical probe. The current probe Hall device output is fed to the Hall device preamp (part of the DC Amplifier), Hall Disconnect, and Power Amplifier. The Power Amplifier output is fed back through the probe transformer to the input attenuators.

With a square wave input, the probe Hall device output and the probe transformer output are combined as shown in Fig. 5-1, to produce the square wave that is fed to the attenuators (Fig. 5-1D) and is seen at the OUTPUT connector.

DC Amplifier

The Hall Device Preamplifier provides single-ended output to the Hall Disconnect (Q115) which switches the Hall device output out of the circuit when using the degauss function.

The Power Amplifier provides gain, crossover-frequency compensation, and input overload indication.

The Degauss Oscillator provides a decaying sine-wave signal, through the Power Amplifier, to the probe transformer to remove residual magnetism in the transformer core.

The DC Amplifier also contains a deflection sensitivity indicator circuit. With a 1X probe (e.g., P6302) connected to the INPUT, the 1X lamp is lit (behind the knob-skirt) to indicate the proper deflection sensitivity. Another lamp is lit (10X) behind the knob-skirt when using a 10X probe (e.g., P6303).

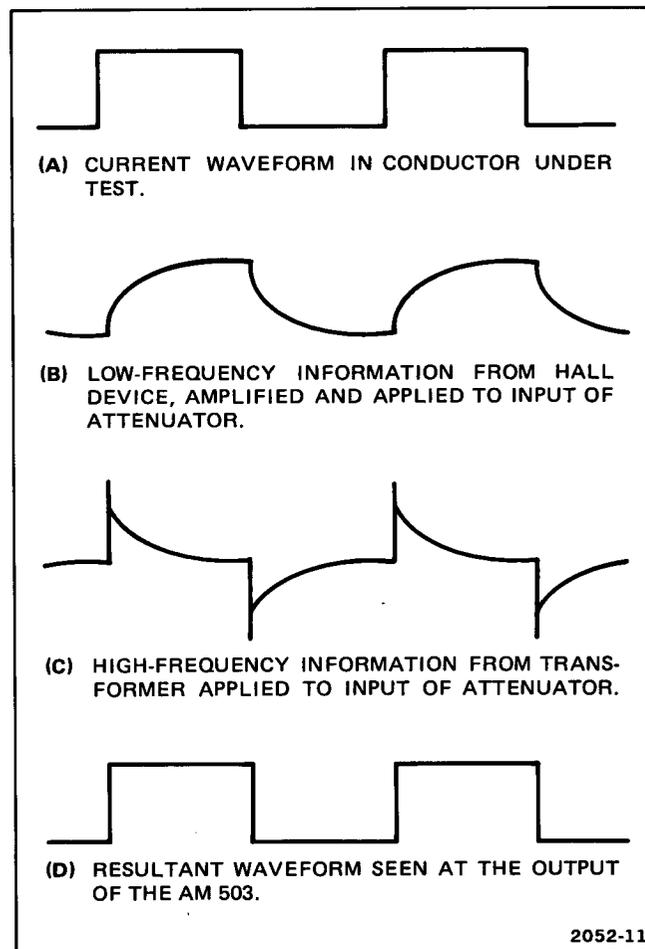


Fig. 5-1. AM 503 and probe waveforms.

A PROBE UNLOCKED lamp (on) indicates that the probe slide is not completely closed or locked.

Attenuator

The attenuator provides current-per-division sensitivities in a 1-2-5 sequence from 1 mA to 5 A for a 1X probe, and from 10 mA to 50 A for a 10X probe. It also provides a 25 Ω input termination for the DC Amplifier in all attenuator positions.

The attenuator also includes a source follower (Q230 A and B) that isolates the attenuator output from the X2 Gain Amplifier (on the Output Amplifier block diagram).

Circuit Description—AM 503

Output Amplifier

The X2 Gain Amplifier provides gain and a means of setting the output amplifier dc level (front-panel DC LEVEL control).

The selectable-gain amplifier provides a choice between two gains: one gain for the 1X probe and another for the 10X probe.

The selectable-bandwidth amplifier provides a choice of full bandwidth (100 MHz for the AM 503) or bandwidth limited to 5 MHz. The bandwidth is selected by BANDWIDTH switch S370.

The output amplifier provides current drive to the OUTPUT INTO 50 Ω connector, J390. It also provides, via S200A, 5X attenuation in the 50 mA to 50 A CURRENT/DIV switch positions.

Power Supply

The power supply provides four regulated voltages, -16 , $+16$, -19.3 , and $+19.3$ V to the AM 503.

Detailed Circuit Description

Circuits unique to this instrument are described in detail in this discussion. Complete schematic diagrams are located in the Diagrams section of this manual. Refer to these schematics throughout the following circuit description. The number inside the diamond after a heading refers to the schematic diagram for that circuit.

DC AMPLIFIER

Deflection Sensitivity Lamp Drivers

This circuit consists of Q180, Q185, VR187, DS190, DS192, and associated components.

One of the two lamps (DS190 or DS192), located behind the CURRENT/DIV knob-skirt, illuminates the appropriate deflection factor selector for either a 1X or 10X probe.

With a 1X probe (e.g., P6302) connected to the INPUT connector, pin L of the connector remains ungrounded. Q180 is biased off through R176. With Q180 biased off, Q185 is biased on through divider network R181, R182, R183, and DS190 (current in DS190 is not sufficient to light the lamp). With Q185 biased on (saturated), its collector is at about -15.5 V, lighting DS192 (1X) through R189.

Connecting a 10X probe (e.g., P6303) to the INPUT

connector grounds pin L and the anode of CR175. Q180 collector current illuminates DS190, the 10X indicator; its collector voltage reverse-biases Q185. When Q185 is turned off, it turns off the 1X indicator (DS192).

Hall-Device Preamp

The Hall-device preamplifier consists of operational amplifier U110, its associated components, and the BALANCE control (R120).

With a probe connected to the INPUT connector and the probe coupled around a current-carrying conductor (e.g., a conductor carrying dc or low-frequency ac), the conductor magnetic field induces a voltage (through the probe transformer) at the output of the Hall device. The resultant dc or low-frequency output voltage is applied from pins E and F of the INPUT connector via R104 and R105, to pins 2 and 3 of U110.

To cancel any offset from the Hall device, a portion of the Hall device dc bias voltage is applied through a selected resistor in the probe, via pin H of the INPUT connector and R102, to pin 2 of U110.

BALANCE control R120 provides fine adjustment to cancel dc offset in the probe.

Hall Disconnect

The Hall disconnect switch consists of CR115, CR116, and Q115. In normal operation, Q115 gate is at about zero volt and Q115 is conducting. Signals from U110 are applied to Q115 drain through R116 and passed through Q115 to pin 2 of U145. Diodes CR115 and CR116 clamp the drain of Q115 when the signal levels exceed about $+0.5$ V or -0.5 V.

Pressing the DEGAUSS switch (S125) applies -16 V through R122 to Q115 gate and junction of R124 and C124. C124 discharges and Q115 turns off.

When the DEGAUSS switch is released, Q115 remains biased off for approximately 1 second by the time constant of C124-R124, allowing the output of the degauss oscillator time (as determined by C126-R127) to decay to zero. The result is that the signal path is interrupted when the DEGAUSS button is pressed and released, permitting the probe transformer core to be degaussed by the degauss oscillator. The output is fed to the J100 (pins N and K), through P160.

Degauss Oscillator 

The Degauss Oscillator consists of sine-wave oscillator U135, gain-regulating FET Q130, and associated components, including output-amplitude control R136.

In normal operation (DEGAUSS switch open), C126 charges to -16 V through R127. FET Q130 is biased off and the oscillator circuit is not operating.

When DEGAUSS switch S125 is depressed, it discharges C126, which turns on Q130. The Q130 drain-to-source resistance, in series with the parallel combination of R130 and RT135, increases the gain of U135, causing the circuit to oscillate. The RC network (R138, C138, R137, C137) applies positive feedback to U135 non-inverting input and sets the frequency of oscillation at approximately 160 Hz.

The oscillator (U135) output amplitude is limited by an AGC circuit composed of CR133, C133, R132, and R133. The oscillator output is rectified by CR133 and filtered by C133. This negative voltage is applied through R132 to Q130 gate to control its drain-to-source resistance and maintain the oscillator output at a constant level, as long as the DEGAUSS is held pressed. Oscillator output reaches U145 via R140.

When the DEGAUSS switch is released, Q130 remains biased on for approximately 0.5 second by R127-C126 time constant. As Q130 drain-to-source resistance increases (as Q130 goes toward cutoff) the oscillator output amplitude decays, degaussing the probe core.

Power Amplifier 

This circuit consists of U145, Q155, Q165, VR166, VR167, CR167, CR168, and associated components, including the degauss offset control, R152.

The 160 Hz degaussing signal from U135 low-frequency input signal is applied to pin 2 of U145. Degaussing offset (R152) adjusts the offset (at J160) of the power amplifier when the DEGAUSS button is pressed.

Output signals from U145 (pin 6) drive the bases of Q155 and Q165, a complementary amplifier. R159, R156, R160, and R162 form the dc bias network for Q155-Q165. Thermal resistors RT156 and RT160 compensate for bias current changes due to temperature variation. CR158 and CR166 are protection diodes.

From dc to the crossover region, the Hall device provides all or most of the signal to the input attenuators.

Above the crossover region, the probe transformer core provides the signal to the input attenuators.

A feedback system permits the Hall device and transformer core to operate at very low flux densities. This is accomplished by applying the output of the power amplifier (Q155 and Q165) to the probe transformer coil. The current through the transformer coil causes a flux in the core opposite and approximately equal to the flux generated by the current being measured. This feedback system permits the Hall-device element and ferrite core to operate at very low flux densities, providing excellent sensitivity and linearity.

Above the crossover region the output of the Hall device diminishes. At this time L168 blocks the ac signal from the power amplifier and the cable between the input attenuator and J160 is terminated in 50Ω by C168-R168.

The remainder of the resistance-capacitance networks (R121, R129, R123, and C125) provide smooth transition in the crossover region. L202-R202, in series with the 25Ω input impedance of the attenuator  terminates the coaxial cable at high frequencies.

Input Overload Indicator 

If the output from Q155-Q165 swings about 12 V above or below zero, CR168 illuminates.

Zeners VR166 and VR167 (back to back) provide approximately 10 V drop from the output of Q155-Q165. Bridge rectifier CR167 provides drive to CR168 on both negative and positive output swings.

ATTENUATOR**Attenuator Source Follower** 

Q230A is a source follower with Q230B providing constant current. R220 limits current drive to Q230A gate. Dual diode CR226 provides current protection by limiting Q230 gate voltage swing to about ± 10 V.

R204, R216, and the attenuator sections provide a constant 25Ω input termination throughout the full attenuator range.

OUTPUT AMPLIFIER**X2-Gain Amplifier** 

This circuit consists of Q310A and B, Q315, Q325, and

Circuit Description—AM 503

associated components in a cascode amplifier having a gain of two.

DC LEVEL control (R302) sets the dc level of the output amplifier at the 50 Ω output connector (J390).

Selectable-Gain Amplifier

The selectable-gain amplifier consists of U350, gain control R346, and associated components.

When P346 is at ground potential (through pin B of J100), the gain of U350 is decreased by a factor of about two. This gain is adjustable by R346.

R344 is a gain adjust and R345 is high-frequency compensation.

Selectable-Bandwidth Amplifier

This amplifier consists of U370 and associated components, including HF Comp (R363); LF Comp (R364); bandwidth selecting switch S370; and networks R370-R372, R373-R374.

With the BANDWIDTH switch in the 5 MHz position, U370 output is from pins 6 and 8, through a low-pass filter network L380-L383, C380-C383, to Q390.

With the BANDWIDTH switch in the FULL position, the signal path from U370 is changed to pins 5 and 9, bypassing the low-pass filter network.

Q360 is a current-source for U370. Q360 current level is established by the voltage level set by Q385 circuitry. A common-mode signal is fed back from VR380 to the base of Q360, thus minimizing common-mode dc bias drift. VR380 (normally not conducting) is protection for U370.

Output Amplifier

Q390 and Q395, cascaded emitter followers, isolate the output of U370 from the OUTPUT INTO 50 Ω connector (J390).

Switch S200A (CURRENT/DIV) connects a 5 times attenuation network in the 50 mA to 50 A positions.

Power Supply

The ac voltages from the power module (edge connector pins 13A, 13B, 1A, and 1B) are rectified by bridge rectifiers CR402 and CR406. The rectifier output is filtered by C402 and C406.

The regulating circuit consists of a dual-tracking regulator (U410), and two series-pass transistors (located in the power module) to provide regulated -16 and $+16$ V. Q440 and Q470 limit the voltage into U410 to $+20$ and -20 V.

The output voltage of the -16 V supply is adjusted by the Volts control (R405). The Balance control (R415) sets the $+16$ V supply output to match the -16 V supply.

R403 and R407 are the load-current-sensing resistors. They set the bias on the series-pass transistors (located in the power module). The output voltage is sensed at the sense input (U410, pins 4 and 11). This sense voltage determines the current in R403 and R407. For example, if the voltage at the $+16$ V output decreases, the $+$ sensing circuit increases the current in R403, which increases the forward bias on the series-pass transistor. Thus, the output voltage increases to $+16$ V.

The current through VR452 and VR462 is set to cause 20 V drop across them. This 20 V sets the pass-transistor bases (Q450-Q460) at 20 V. With 20 V on the base, the output is at about 19.3 V.

REPLACEABLE ELECTRICAL 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.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

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.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00853	SANGAMO MESTON INC SANGAMO CAPACITOR DIV	SANGAMO RD P O BOX 178	PICKENS SC 29671
01121	ALLEN-BRADLEY CO	1201 SOUTH 2ND ST	MILWAUKEE WI 53204
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	M GENESEE ST	AUBURN NY 13021
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR GROUP	5005 E MCDOWELL RD	PHOENIX AZ 85008
05347	ULTRONIX INC	461 N 22ND ST	GRAND JUNCTION CO 81501
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV	464 ELLIS ST	MOUNTAIN VIEW CA 94042
07716	TRM INC TRM ELECTRONICS COMPONENTS	2850 MT PLEASANT AVE	BURLINGTON IA 52601
12697	TRM IRC FIXED RESISTORS/BURLINGTON		
12954	CLAROSTAT MFG CO INC MICROSEMI CORP	LOWER WASHINGTON ST 8700 E THOMAS RD P O BOX 1390	DOVER NH 03820 SCOTTSDALE AZ 85252
14193	CAL-R INC	1601 OLYMPIC BLVD	SANTA MONICA CA 90404
14752	ELECTRO CUBE INC	1710 S DEL MAR AVE	SAN GABRIEL CA 91776
14936	GENERAL INSTRUMENT CORP DISCRETE SEMI CONDUCTOR DIV	600 N JOHN ST	HICKSVILLE NY 11802
15238	ITT SEMICONDUCTORS A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP	500 BROADWAY P O BOX 168	LAWRENCE MA 01841
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507
34333	SILICON GENERAL INC	11651 MONARCH ST	GARDEN GROVE CA 92641
34371	HARRIS SEMICONDUCTOR DIV OF HARRIS CORP	P O BOX 883	MELBOURNE FL 32901
51642	CENTRE ENGINEERING INC	2820 E COLLEGE AVE	STATE COLLEGE PA 16801
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195
56289	SPRAGUE ELECTRIC CO	87 MARSHALL ST	NORTH ADAMS MA 01247
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
58361	GENERAL INSTRUMENT CORP OPTOELECTRONICS DIV	3400 HILLVIEW AVE	PALO ALTO CA 94304
59660	TUSONIX INC	2155 N FORBES BLVD	TUCSON, ARIZONA 85705
59821	CENTRALAB INC SUB NORTH AMERICAN PHILIPS CORP	7158 MERCHANT AVE	EL PASO TX 79915
71400	MCGRAM-EDISON CO BUSSMANN MFG DIV	502 EARTH CITY PLAZA P O BOX 14460	ST LOUIS MO 63178
71744	GENERAL INSTRUMENT CORP LAMP DIV	4433 N RAVENSWOOD AVE	CHICAGO IL 60640
75042	TRM INC TRM ELECTRONIC COMPONENTS	401 N BROAD ST	PHILADELPHIA PA 19108
75915	IRC FIXED RESISTORS PHILADELPHIA DIV		
76493	LITTELFUSE INC BELL INDUSTRIES INC MILLER J M DIV	800 E NORTHWEST HWY 19070 REYES AVE P O BOX 5825	DES PLAINES IL 60016 COMPTON CA 90224
79727	C-M INDUSTRIES	550 DAVISVILLE RD P O BOX 96	MARMINSTER PA 18974
80009	TEKTRONIX INC	4900 S M GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
91637	DALE ELECTRONICS INC	P O BOX 609	COLUMBUS NE 68601

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
AR135				(SELECTED, NOMINAL VALUE)		
A1	670-4353-00	B010100	B029999	CIRCUIT BD ASSY:MAIN PLUG-IN	80009	670-4353-00
A1	670-4353-01	B030000	B047648	CIRCUIT BD ASSY:MAIN PLUG IN	80009	670-4353-01
A1	670-4353-02	B047649	B049499	CIRCUIT BD ASSY:MAIN PLUG IN	80009	670-4353-02
A1	670-4353-03	B049500	B054926	CIRCUIT BD ASSY:MAIN PLUG-IN	80009	670-4353-03
A1	670-4353-04	B054927	B063180	CIRCUIT BD ASSY:MAIN PLUG IN	80009	670-4353-04
A1	670-4353-06	B063181		CIRCUIT BD ASSY:MAIN PLUG IN	80009	670-4353-06
C100	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C101	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C103	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C108	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C110	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C112	283-0647-00			CAP, FXD, MICA DI:70PF, 1%, 100V	00853	D155E700FO
C124	285-1097-00			CAP, FXD, PLASTIC:0.47UF, 10%, 50V	14752	23081A474K
C125	283-0693-00			CAP, FXD, MICA DI:1730PF, 1%, 500V	00853	D195F1731FO
C126	290-0525-00			CAP, FXD, ELCTLT:4.7UF, 20%, 50V	05397	T3688475M050AS
C133	283-0177-00			CAP, FXD, CER DI:1UF, +80-20%, 25V	04222	SR302E105ZAA
C137	285-1050-00			CAP, FXD, PLASTIC:0.1UF, 1%, 200V	14752	23081C104F
C138	283-0051-00			CAP, FXD, CER DI:0.0033UF, 5%, 100V	04222	SR301A332JAA
C140	290-0536-00			CAP, FXD, ELCTLT:10UF, 20%, 25V TANTALUM	05397	T3688106M025AS
C146	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C148	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C153	283-0600-00	B010100	B019999	CAP, FXD, MICA DI:43PF, 5%, 500V	00853	D105E430JO
C153	283-0676-00	B020000		CAP, FXD, MICA DI:82PF, 1%, 500V	00853	D105E820FO
C155	290-0272-00			CAP, FXD, ELCTLT:47UF, 20%, 50V	56289	1090476X0050F2
C156	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C160	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C165	290-0272-00			CAP, FXD, ELCTLT:47UF, 20%, 50V	56289	1090476X0050F2
C168	283-0114-00			CAP, FXD, CER DI:1500PF, 5%, 200V	59660	805-534-Y500152J
C172	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C176	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C187	283-0204-00	B010100	B020286	CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C218	283-0212-00	B010100	B032319	CAP, FXD, CER DI:2UF, 20%, 50V	04222	SR405E205MAA
C218	283-0339-00	B032320		CAP, FXD, CER DI:0.22UF, 10%, 50V	05397	C330C224K5R5CA
C220	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C232	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C234	290-0134-00			CAP, FXD, ELCTLT:22UF, 20%, 15V	05397	T1108226M015AS
C242	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C244	290-0134-00			CAP, FXD, ELCTLT:22UF, 20%, 15V	05397	T1108226M015AS
C306	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C308	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C313	283-0077-00	B010100	B029999	CAP, FXD, CER DI:330PF, 5%, 500V	59660	831-5008331J
C323	283-0077-00	B010100	B029999	CAP, FXD, CER DI:330PF, 5%, 500V	59660	831-5008331J
C328	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C345	283-0600-00	B010100	B029999	CAP, FXD, MICA DI:43PF, 5%, 500V	00853	D105E430JO
C345	283-0615-00	B030000		CAP, FXD, MICA DI:33PF, 5%, 500V	00853	D155E330JO
C351	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C360	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA
C363	283-0615-00	B010100	B029999	CAP, FXD, MICA DI:33PF, 5%, 500V	00853	D155E330JO
C363	281-0158-00	B030000		CAP, VAR, CER DI:7-45PF, 25V	59660	518-006 G 7-45
C364	283-0210-00	B010100	B029999	CAP, FXD, CER DI:0.0056UF, 20%, 100V	51642	300 100-X7R-562M
C364	283-0639-00	B030000	B047648	CAP, FXD, MICA DI:56PF, 1%, 100V	00853	D155E560FO
C364	283-0600-00	B047649		CAP, FXD, MICA DI:43PF, 5%, 500V	00853	D105E430JO
C365	-----	B010100	B029999	(SELECTED)		
C365	283-0212-00	B030000		CAP, FXD, CER DI:2UF, 20%, 50V	04222	SR405E205MAA
C366	283-0238-00	B030000	B047648	CAP, FXD, CER DI:0.01UF, 10%, 50V	04222	SR155C203KAA
C366	283-0268-00	B047649		CAP, FXD, CER DI:0.015UF, 20%, 50V	04222	3439-050C-153K
C367	283-0204-00			CAP, FXD, CER DI:0.01UF, 20%, 50V	04222	SR155E103MAA

Replaceable Electrical Parts--AM 503

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
C380	283-0625-00			CAP,FXD,MICA DI:220PF,1%,500V	00853	0105F221F0
C383	283-0600-00			CAP,FXD,MICA DI:43PF,5%,500V	00853	0105E430J0
C385	283-0204-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	SR155E103MAA
C388	290-0517-00			CAP,FXD,ELCTLT:6.8UF,20%,35V	05397	T368B685M035AZ
C391	283-0615-00	8010100	8047648	CAP,FXD,MICA DI:33PF,5%,500V	00853	0155E330J0
C391	283-0779-00	8047649		CAP,FXD,MICA DI:27 PF,2%,500V	00853	0155E270G0
C393	281-0593-00			CAP,FXD,CER DI:3.9PF,+/-0.25PF,500V	59660	301-080 C0J0399C
C394	281-0626-00			CAP,FXD,CER DI:3.3PF,+/-0.1PF,500V	59660	301-000C0J0-339B
C396	283-0629-00			CAP,FXD,MICA DI:62PF,1%,500V	00853	0105E620F0
C398	283-0204-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	SR155E103MAA
C402	290-0334-00			CAP,FXD,ELCTLT:1250UF,+75-10%,50V	56289	530282
C406	290-0334-00			CAP,FXD,ELCTLT:1250UF,+75-10%,50V	56289	530282
C413	283-0111-00			CAP,FXD,CER DI:0.1UF,20%,50V	05397	C330C104M5U1CA
C414	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAA
C423	283-0111-00			CAP,FXD,CER DI:0.1UF,20%,50V	05397	C330C104M5U1CA
C434	283-0204-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	SR155E103MAA
C436	283-0204-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	SR155E103MAA
C444	283-0204-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	SR155E103MAA
C446	283-0204-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	SR155E103MAA
C452	290-0782-00	8030000		CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULA1V4R7TEA
C462	290-0782-00	8030000		CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULA1V4R7TEA
CR103	150-1001-00			LT EMITTING DIO:RED,660NM,100MA MAX	58361	MV5024
CR115	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR116	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR127	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR133	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR158	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR166	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR167	152-0585-00			SEMICONO DVC,DI:RECT,SI,200V,1A	14936	M02M-30
CR168	150-1001-00			LT EMITTING DIO:RED,660NM,100MA MAX	58361	MV5024
CR175	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR226	152-0321-00			SEMICONO DVC,DI:SM,SI,30V,0.1A,00-75	07263	FSA1480
CR320	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR380	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR383	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR386	152-0141-02			SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR402	152-0585-00			SEMICONO DVC,DI:RECT,SI,200V,1A	14936	M02M-30
CR406	152-0585-00			SEMICONO DVC,DI:RECT,SI,200V,1A	14936	M02M-30
CR452	152-0141-02	8020000	8029999	SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
CR462	152-0141-02	8020000	8029999	SEMICONO DVC,DI:SM,SI,30V,150MA,30V,00-35	03508	0A2527 (1N4152)
OS190	150-0046-00			LAMP,INCAND:10V,0.04A,#2107D,MIRE LEAD	71744	CM2107
OS192	150-0046-00			LAMP,INCAND:10V,0.04A,#2107D,MIRE LEAD	71744	CM2107
F402	159-0064-00	8010100	8019999	FUSE,CARTRIDGE:DIN,1A,250V,10SEC	75915	212001
F402	159-0107-00	8020000		FUSE,CARTRIDGE:DIN,2A,250VAC,SLOW	71400	GDC-2A
F406	159-0064-00	8010100	8019999	FUSE,CARTRIDGE:DIN,1A,250V,10SEC	75915	212001
F406	159-0107-00	8020000		FUSE,CARTRIDGE:DIN,2A,250VAC,SLOW	71400	GDC-2A
J100	131-1315-01			CONN,RCPT,ELEC:8NC,FEMALE	80009	131-1315-01
J160	131-1003-00			CONN,RCPT,ELEC:CKT 8D MT,3 PRONG	80009	131-1003-00
J202	131-1003-00			CONN,RCPT,ELEC:CKT 8D MT,3 PRONG	80009	131-1003-00
J380	131-1003-00			CONN,RCPT,ELEC:CKT 8D MT,3 PRONG	80009	131-1003-00
J480	131-1003-00			CONN,RCPT,ELEC:CKT 8D MT,3 PRONG	80009	131-1003-00
L168	108-0245-00			CHOKERF:FIXED,3.9UH	76493	B6310-1
L202	108-0853-00	8010100	8047648	COIL,RF:FIXED,48.7UH	80009	108-0853-00
L202	108-0200-00	8047649		COIL,RF:FIXED,52UH	80009	108-0200-00
L380	108-0345-00			COIL,RF:FIXED,1.89UH	80009	108-0345-00
L383	108-0345-00			COIL,RF:FIXED,1.89UH	80009	108-0345-00
Q115	151-1059-00			TRANSISTOR:FET,N-CHAN,T0-106	04713	ORDER BY DESCR
Q130	151-1059-00			TRANSISTOR:FET,N-CHAN,T0-106	04713	ORDER BY DESCR
Q155	151-0390-00			TRANSISTOR:NPN,SI,X-81	04713	SPS34140RMP5U45

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
Q165	151-0391-00			TRANSISTOR:PMP,SI,X-81	04713	SPS6867K
Q180	151-0254-00	B010100	B047648	TRANSISTOR:DARLINGTON,NPN,SI	03508	X38L3118
Q180	151-0190-00	B047649		TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q185	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q230	151-1032-00			TRANSISTOR:FE,DUAL N-CHAN,SI,TO-78A	04713	SFD1032
Q310	153-0609-00	B010100	B029999	SEMICOND DVC SE:MATCHED PAIR	80009	153-0609-00
Q310	151-0461-00	B030000		TRANSISTOR:NPN,SI,TO-78	04713	SRF572
Q315	151-0188-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0188-00
Q320	153-0609-00	B010100	B029999	SEMICOND DVC SE:MATCHED PAIR	80009	153-0609-00
Q325	151-0188-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0188-00
Q360	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q385	151-0188-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0188-00
Q390	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q395	151-0188-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0188-00
Q440	151-0347-00	B020000		TRANSISTOR:NPN,SI,TO-92	04713	SPS7951
Q450	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q460	151-0188-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0188-00
Q470	151-0350-00	B020000		TRANSISTOR:PMP,SI,TO-92	04713	SPS6700
R100	308-0243-00			RES,FXD,MM:240 OHM,5%,3M	14193	SA31-2400J
R102	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
R103	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
R104	321-0162-00			RES,FXD,FILM:475 OHM,1%,0.125M,TC=TO	19701	5033ED475R0F
R105	321-0162-00			RES,FXD,FILM:475 OHM,1%,0.125M,TC=TO	19701	5033ED475R0F
R106	321-0354-00			RES,FXD,FILM:47.5K OHM,1%,0.125M,TC=TO	19701	5043ED47K50F
R108	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
R110	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
R112	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
R113	321-0354-00			RES,FXD,FILM:47.5K OHM,1%,0.125M,TC=TO	19701	5043ED47K50F
R114	321-0269-00			RES,FXD,FILM:10.0K OHM,1%,0.125M,TC=TO	19701	5033ED10K0F
R116	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
R118	321-0269-00			RES,FXD,FILM:10.0K OHM,1%,0.125M,TC=TO	19701	5033ED10K0F
R120	311-0580-00			RES,VAR,NONMM:PNL,50K OHM,0.5M	01121	M-8155
R121	321-0200-00			RES,FXD,FILM:1.18K OHM,1%,0.125M,TC=TO	19701	5033ED11K80F
R122	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=TO	19701	5033ED1K00F
R123	321-0183-00			RES,FXD,FILM:787 OHM,1%,0.125M,TC=TO	07716	CEAD787R0F
R124	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25M	01121	CB2255
R126	315-0470-00	B030000		RES,FXD,FILM:47 OHM,5%,0.25M	57668	NTR25J-E47ED
R127	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25M	19701	5043CX470K0J92U
R128	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
R129	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125M,TC=TO	19701	5033ED499R0F
R130	315-0200-00	B010100	B019999	RES,FXD,FILM:20 OHM,5%,0.25M	19701	5043CX20R00J
R130	315-0300-00	B020000		RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
R132	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
R133	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25M	57668	NTR25J-E100K
R134	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25M	57668	NTR25J-E100K
R135				(SELECTED,NOMINAL VALUE)		
R135	321-0230-00	B047649	B063100	RES,FXD,FILM:2.43K OHM,1%,0.125M,TC=TO	19701	5043ED2K430F
R135	321-0227-00	B063101		RES,FXD,FILM:2.26K OHM,1%,0.125M,TC=TO	07716	CEAD22600F
R136	311-1267-00	B010100	B047648	RES,VAR,NONMM:TRMR,5K OHM,0.5M	32997	3329P-L58-502
R136	311-1264-00	B047649		RES,VAR,NONMM:TRMR,1.5K OHM,0.5M	32997	3329P-L58-152
R137	321-0269-00			RES,FXD,FILM:10.0K OHM,1%,0.125M,TC=TO	19701	5033ED10K0F
R138	321-0431-00			RES,FXD,FILM:301K OHM,1%,0.125M,TC=TO	07716	CEAD30102F
R140	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25M	19701	5043CX820R0J
R142	315-0241-00	B010100	B029999	RES,FXD,FILM:240 OHM,5%,0.25M	19701	5043CX240R0J
R145	321-0135-00	B010100	B019999	RES,FXD,FILM:249 OHM,1%,0.125M,TC=TO	07716	CEAD249R0F
R145	315-0241-00	B020000		RES,FXD,FILM:240 OHM,5%,0.25M	19701	5043CX240R0J
R146	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
R148	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
R150	315-0243-00	B010100	B029999	RES,FXD,FILM:24K OHM,5%,0.25M	57668	NTR25J-E24K0

Replaceable Electrical Parts--AM 503

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
R150	315-0123-00	8030000		RES,FXD,FILM:12K OHM,5%,0.25M	57668	NTR25J-E12K0
R151	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125M,TC=TO	19701	5033ED4K990F
R152	311-1271-00			RES,VAR,NONMM:TRMR,50K OHM,0.5M	32997	3329P-L58-503
R153	315-0243-00	8010100	8029999	RES,FXD,FILM:24K OHM,5%,0.25M	57668	NTR25J-E24K0
R153	315-0123-00	8030000		RES,FXD,FILM:12K OHM,5%,0.25M	57668	NTR25J-E12K0
R156	321-0181-00			RES,FXD,FILM:750 OHM,1%,0.125M,TC=TO	07716	CEAD750R0F
R158	308-0441-00			RES,FXD,MM:3 OHM,5%,3M	14193	SA31-3R00J
R159	322-0292-00			RES,FXD,FILM:10.7K OHM,1%,0.25M,TC=TO	19701	5043R010K70F
R160	321-0181-00			RES,FXD,FILM:750 OHM,1%,0.125M,TC=TO	07716	CEAD750R0F
R162	322-0292-00			RES,FXD,FILM:10.7K OHM,1%,0.25M,TC=TO	19701	5043R010K70F
R166	308-0441-00			RES,FXD,MM:3 OHM,5%,3M	14193	SA31-3R00J
R168	321-0068-00			RES,FXD,FILM:49.9 OHM,0.5%,0.125M,TC=TO	91637	CMF55116G49R90F
R169	315-0620-00			RES,FXD,FILM:62 OHM,5%,0.25M	19701	5043CX63R00J
R172	308-0243-00			RES,FXD,MM:240 OHM,5%,3M	14193	SA31-2400J
R174	315-0822-00	8010100	8020286	RES,FXD,FILM:8.2K OHM,5%,0.25M	19701	5043CX8K200J
R175	315-0274-00	8010100	8047648	RES,FXD,FILM:270K OHM,5%,0.25M	57668	NTR25J-E270K
R175	315-0103-00	8047649		RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
R176	315-0274-00			RES,FXD,FILM:270K OHM,5%,0.25M	57668	NTR25J-E270K
R181	302-0271-00			RES,FXD,CMPSPN:270 OHM,10%,0.5M	01121	EB 2711
R182	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25M	57668	NTR25J-E06K8
R183	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25M	19701	5043CX15K00J
R185	315-0512-00	8010100	8020286	RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
R187	315-0512-00	8010100	8020286	RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
R189	302-0271-00			RES,FXD,CMPSPN:270 OHM,10%,0.5M	01121	EB 2711
R202	321-0040-00			RES,FXD,FILM:25.5 OHM,1%,0.125M,TC=TO	91637	CMF55116G25R50F
R204	307-1040-00			TERM,THK FILM:50 OHM	80009	307-1040-00
R206	307-1020-00			ATTENUATOR,FXD:2X,50 OHM	80009	307-1020-00
R208	307-1020-00			ATTENUATOR,FXD:2X,50 OHM	80009	307-1020-00
R210	307-1023-00			ATTENUATOR,FXD:5X,50 OHM	80009	307-1023-00
R212	307-1024-00			ATTENUATOR,FXD:10X,50 OHM	80009	307-1024-00
R214	307-1024-00			ATTENUATOR,FXD:10X,50 OHM	80009	307-1024-00
R216	307-1040-00			TERM,THK FILM:50 OHM	80009	307-1040-00
R220	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JED1K0
R222	315-0203-00	8010100	8032319	RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
R222	315-0164-00	8032320		RES,FXD,FILM:160K OHM,5%,0.25M	57668	NTR25J-E160K
R224	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
R232	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
R234	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25M	57668	NTR25J-E620E
R236	321-0030-00			RES,FXD,FILM:20.0 OHM,1%,0.125M,TC=TO	57668	CRB14FXE 20 OHM
R242	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
R244	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25M	57668	NTR25J-E620E
R246	321-0030-00			RES,FXD,FILM:20.0 OHM,1%,0.125M,TC=TO	57668	CRB14FXE 20 OHM
R300	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
R302	311-0546-00	8010100	8050202	RES,VAR,NONMM:TRMR,10K OHM,0.5M	01121	M-8154A
R302	311-0429-00	8050203		RES,VAR,NONMM:PNL,100K X 10K OHM,0.5M	12697	CM33098
R304	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
R306	321-0243-00	8010100	8029999	RES,FXD,FILM:3.32K OHM,1%,0.125M,TC=TO	19701	5033ED3K32F
R306	321-0279-00	8030000		RES,FXD,FILM:7.87K OHM,1%,0.125M,TC=TO	07716	CEAD78700F
R308	321-0032-00	8010100	8029999	RES,FXD,FILM:21.0 OHM,1%,0.125M,TC=TO	57668	RB14FXE 21E0
R308	321-0068-00	8030000		RES,FXD,FILM:49.9 OHM,0.5%,0.125M,TC=TO	91637	CMF55116G49R90F
R311	322-0172-00	8030000		RES,FXD,FILM:604 OHM,1%,0.25M,TC=TO	75042	CEBT0-6040F
R312	321-0111-00			RES,FXD,FILM:140 OHM,1%,0.125M,TC=TO	07716	CEAD140R0F
R313	315-0151-00	8010100	8029999	RES,FXD,FILM:150 OHM,5%,0.25M	57668	NTR25J-E150E
R313	321-0068-00	8030000		RES,FXD,FILM:49.9 OHM,0.5%,0.125M,TC=TO	91637	CMF55116G49R90F
R314	321-0111-00			RES,FXD,FILM:140 OHM,1%,0.125M,TC=TO	07716	CEAD140R0F
R315	308-0553-00			RES,FXD,MM:680 OHM,1%,3M,TC=20PPM	05347	M53 680 F
R317	321-0010-00	8010100	8029999	RES,FXD,FILM:12.4 OHM,1%,0.125M,TC=TO	57668	RB14FXE 12E4
R317	321-0068-00	8030000		RES,FXD,FILM:49.9 OHM,0.5%,0.125M,TC=TO	91637	CMF55116G49R90F
R321	322-0172-00	8030000		RES,FXD,FILM:604 OHM,1%,0.25M,TC=TO	75042	CEBT0-6040F

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
R323	315-0151-00	8010100	8029999	RES, FXD, FILM:150 OHM, 5%, 0.25M	57668	NTR25J-E150E
R323	321-0068-00	8030000		RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R326	321-0216-00	8010100	8029999	RES, FXD, FILM:1.74K OHM, 1%, 0.125M, TC=TO	07716	CEAD17400F
R326	315-0821-00	8030000		RES, FXD, FILM:820 OHM, 5%, 0.25M	19701	5043CX820R0J
R327	321-0242-00			RES, FXD, FILM:3.24K OHM, 1%, 0.125M, TC=TO	19701	5043ED3K240F
R328	317-0680-00			RES, FXD, CMPSN:68 OHM, 5%, 0.125M	01121	886805
R330	322-0662-00	8010100	8029999	RES, FXD, FILM:334 OHM, 1%, 0.25M	75042	CEBT0-3340F
R330	321-0140-00	8030000		RES, FXD, FILM:280 OHM, 1%, 0.125M, TC=TO	07716	CEAD280R0F
R332	321-0068-00	8010100	8029999	RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R332	321-0097-00	8030000		RES, FXD, FILM:100 OHM, 1%, 0.125M, TC=TO	91637	CMF551166100R0F
R334	321-0068-00	8010100	8029999	RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R334	321-0097-00	8030000		RES, FXD, FILM:100 OHM, 1%, 0.125M, TC=TO	91637	CMF551166100R0F
R335	322-0109-00			RES, FXD, FILM:133 OHM, 1%, 0.25M, TC=TO	91637	MFF1421G133R0F
R336	321-0111-00			RES, FXD, FILM:140 OHM, 1%, 0.125M, TC=TO	07716	CEAD140R0F
R338	321-0111-00			RES, FXD, FILM:140 OHM, 1%, 0.125M, TC=TO	07716	CEAD140R0F
R340	315-0121-00			RES, FXD, FILM:120 OHM, 5%, 0.25M	19701	5043CX120R0J
R344	311-1260-00			RES, VAR, NONNM:TRMR, 250 OHM, 0.5M	32997	3329P-L58-251
R345	311-1259-00			RES, VAR, NONNM:TRMR, 100 OHM, 0.5M	32997	3329P-L58-101
R346	311-1268-00	8010100	8047648	RES, VAR, NONNM:TRMR, 10K OHM, 0.5M	32997	3329P-L58-103
R346	311-1267-00	8047649		RES, VAR, NONNM:TRMR, 5K OHM, 0.5M	32997	3329P-L58-502
R347	315-0102-00			RES, FXD, FILM:1K OHM, 5%, 0.25M	57668	NTR25J-E01K0
R349	321-0222-00			RES, FXD, FILM:2.00K OHM, 1%, 0.125M, TC=TO	19701	5033ED2K00F
R351	315-0103-00			RES, FXD, FILM:10K OHM, 5%, 0.25M	19701	5043CX10K00J
R352	321-0173-00			RES, FXD, FILM:619 OHM, 1%, 0.125M, TC=TO	07716	CEAD619R0F
R353	322-0167-00			RES, FXD, FILM:536 OHM, 1%, 0.25M, TC=TO	07716	CCAD536R0F
R354	321-0068-00			RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R355	322-0109-00			RES, FXD, FILM:133 OHM, 1%, 0.25M, TC=TO	91637	MFF1421G133R0F
R356	321-0068-00			RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R357	321-0068-00			RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R358	321-0068-00			RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R360	321-0085-00			RES, FXD, FILM:75 OHM, 1%, 0.125M, TC=TO	57668	CR814FXE 75 OHM
R361	321-0085-00			RES, FXD, FILM:75 OHM, 1%, 0.125M, TC=TO	57668	CR814FXE 75 OHM
R362	301-0131-00			RES, FXD, FILM:130 OHM, 5%, 0.5M	19701	5053CX130R0J
R363	311-1263-00	8010100	8029999	RES, VAR, NONNM:1K OHM, 10%, 0.50M	32997	3329P-L58-102
R363	311-1260-00	8030000	8047648	RES, VAR, NONNM:TRMR, 250 OHM, 0.5M	32997	3329P-L58-251
R363	311-1265-00	8047649		RES, VAR, NONNM:TRMR, 2K OHM, 0.5M	32997	3329P-L58-202
R364	311-1265-00	8010100	8047648	RES, VAR, NONNM:TRMR, 2K OHM, 0.5M	32997	3329P-L58-202
R364	311-1260-00	8047649		RES, VAR, NONNM:TRMR, 250 OHM, 0.5M	32997	3329P-L58-251
R365	315-0222-00	8030000		RES, FXD, FILM:2.2K OHM, 5%, 0.25M	57668	NTR25J-E02K2
R366	315-0911-00	8030000		RES, FXD, FILM:910 OHM, 5%, 0.25M	57668	NTR25J-E910E
R367	315-0103-00			RES, FXD, FILM:10K OHM, 5%, 0.25M	19701	5043CX10K00J
R368	315-0682-00			RES, FXD, FILM:6.8K OHM, 5%, 0.25M	57668	NTR25J-E06K8
R370	315-0152-00			RES, FXD, FILM:1.5K OHM, 5%, 0.25M	57668	NTR25J-E01K5
R372	321-0176-00			RES, FXD, FILM:665 OHM, 1%, 0.125M, TC=TO	07716	CEAD665R0F
R373	315-0152-00			RES, FXD, FILM:1.5K OHM, 5%, 0.25M	57668	NTR25J-E01K5
R374	321-0176-00			RES, FXD, FILM:665 OHM, 1%, 0.125M, TC=TO	07716	CEAD665R0F
R376	321-0130-00			RES, FXD, FILM:221 OHM, 1%, 0.125M, TC=TO	91637	MFF1816G221R0F
R377	323-0185-00			RES, FXD, FILM:825 OHM, 1%, 0.5M, TC=TO	19701	5033R0825R0F
R380	321-0097-00			RES, FXD, FILM:100 OHM, 1%, 0.125M, TC=TO	91637	CMF551166100R0F
R382	301-0681-00			RES, FXD, FILM:680 OHM, 5%, 0.5M	01121	EB6815
R383	321-0097-00			RES, FXD, FILM:100 OHM, 1%, 0.125M, TC=TO	91637	CMF551166100R0F
R384	301-0681-00			RES, FXD, FILM:680 OHM, 5%, 0.5M	01121	EB6815
R386	321-0068-00			RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R387	321-0306-00			RES, FXD, FILM:15.0K OHM, 1%, 0.125M, TC=TO	19701	5033ED15J00F
R388	315-0822-00			RES, FXD, FILM:8.2K OHM, 5%, 0.25M	19701	5043CX8K200J
R390	322-0212-00			RES, FXD, FILM:1.5K OHM, 1%, 0.25M, TC=TO	75042	CEBT0-1581F
R391	321-0068-00	8010100	8020286	RES, FXD, FILM:49.9 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116649R90F
R391	321-0066-00	8020287		RES, FXD, FILM:47.5 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116647R50F
R392	315-0122-00			RES, FXD, FILM:1.2K OHM, 5%, 0.25M	57668	NTR25J-E01K2

Replaceable Electrical Parts--AM 503

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
R393	315-0470-00			RES, FXD, FILM:47 OHM, 5%, 0.25M	57668	NTR25J-E47ED
R394	321-0135-00			RES, FXD, FILM:249 OHM, 1%, 0.125M, TC=TO	07716	CEAD249R0F
R395	323-0183-00			RES, FXD, FILM:787 OHM, 1%, 0.5M, TC=TO	19701	5053R0787R0F
R396	315-0391-00			RES, FXD, FILM:390 OHM, 5%, 0.25M	57668	NTR25J-E390E
R397	315-0151-00			RES, FXD, FILM:150 OHM, 5%, 0.25M	57668	NTR25J-E150E
R398	315-0511-00	8010100	8054926	RES, FXD, FILM:510 OHM, 5%, 0.25M	19701	5043CX510R0J
R398	301-0361-00	8054927		RES, FXD, FILM:360 OHM, 5%, 0.5M	19701	5053CX360R0J
R399	321-0078-01			RES, FXD, FILM:63.4 OHM, 0.5%, 0.125M, TC=TO	91637	CMF55116663R400
R403	317-0101-00	8010100	8063100	RES, FXD, CMPSN:100 OHM, 5%, 0.125M	01121	881015
R403	315-0101-00	8063101		RES, FXD, FILM:100 OHM, 5%, 0.25M	57668	NTR25J-E 100E
R404	321-0380-00	8010100	8047648	RES, FXD, FILM:88.7K OHM, 1%, 0.125M, TC=TO	07716	CEA088701F
R404	321-0387-00	8047649		RES, FXD, FILM:105K OHM, 1%, 0.125M, TC=TO	07716	CEAD10502F
R405	311-1271-00			RES, VAR, NONNH:TRMR, 50K OHM, 0.5M	32997	3329P-L58-503
R406	321-0377-00	8010100	8047648	RES, FXD, FILM:82.5K OHM, 1%, 0.125M, TC=TO	07716	CEA082501F
R406	321-0369-00	8047649		RES, FXD, FILM:68.1K OHM, 1%, 0.125M, TC=TO	19701	5043ED68K10F
R407	317-0101-00			RES, FXD, CMPSN:100 OHM, 5%, 0.125M	01121	881015
R412	308-0755-00	8010100	8019999	RES, FXD, MM:0.75 OHM, 5%, 2M	75042	BMH-R7500J
R412	308-0679-00	8020000		RES, FXD, MM:0.51 OHM, 5%, 2M	75042	BMH 0.51 OHM 5%
R414	321-0356-00			RES, FXD, FILM:49.9K OHM, 1%, 0.125M, TC=TO	19701	5033ED49K90F
R415	311-1268-00			RES, VAR, NONNH:TRMR, 10K OHM, 0.5M	32997	3329P-L58-103
R416	321-0356-00			RES, FXD, FILM:49.9K OHM, 1%, 0.125M, TC=TO	19701	5033ED49K90F
R422	308-0755-00	8010100	8019999	RES, FXD, MM:0.75 OHM, 5%, 2M	75042	BMH-R7500J
R422	308-0679-00	8020000		RES, FXD, MM:0.51 OHM, 5%, 2M	75042	BMH 0.51 OHM 5%
R432	307-0103-00			RES, FXD, CMPSN:2.7 OHM, 5%, 0.25M	01121	CB2765
R436	315-0100-00			RES, FXD, FILM:10 OHM, 5%, 0.25M	19701	5043CX10RR00J
R442	307-0103-00			RES, FXD, CMPSN:2.7 OHM, 5%, 0.25M	01121	CB2765
R446	315-0100-00			RES, FXD, FILM:10 OHM, 5%, 0.25M	19701	5043CX10RR00J
R452	315-0102-00			RES, FXD, FILM:1K OHM, 5%, 0.25M	57668	NTR25JED1K0
R454	315-0471-00	8010100	8019999	RES, FXD, FILM:470 OHM, 5%, 0.25M	57668	NTR25J-E470E
R454	315-0430-02	8020000		RES, FXD, CMPSN:43 OHM, 5%, 0.25M	01121	CB4305
R458	308-0240-00	8047649		RES, FXD, MM:2 OHM, 5%, 3M	05347	MS3-2R00J
R462	315-0102-00			RES, FXD, FILM:1K OHM, 5%, 0.25M	57668	NTR25JED1K0
R464	315-0471-00	8010100	8019999	RES, FXD, FILM:470 OHM, 5%, 0.25M	57668	NTR25J-E470E
R464	315-0430-02	8020000		RES, FXD, CMPSN:43 OHM, 5%, 0.25M	01121	CB4305
R480	323-0068-00			RES, FXD, FILM:49.9 OHM, 1%, 0.5M, TC=TO	75042	CECTO-49R90F
RT135	307-0122-00			RES, THERMAL:50 OHM, 10%, NTC	14193	1815-500K
RT156	307-0126-00			RES, THERMAL:100 OHM, 10%, NTC	14193	2021-101-D
RT160	307-0126-00			RES, THERMAL:100 OHM, 10%, NTC	14193	2021-101-D
RT342	307-0126-00			RES, THERMAL:100 OHM, 10%, NTC	14193	2021-101-D
S125	260-1421-00			SWITCH, PUSH:1 BTN, 2 POLE, INSTRUMENT ID	59821	ORDER BY DESCR
S200	263-1111-00			SM CAM ACTR AS:CURRENT/DIV (S200A)	80009	263-1111-00
S200	105-0243-00			ACTUATOR, SWITCH:AC, DC (S200B)	80009	105-0243-00
S370	260-0816-00			SWITCH, SLIDE:DPDT, 0.5A, 125V	79727	6F-126-0012A
U110	156-0317-00			MICROCKT, LINEAR:OPNL AMPL	80009	156-0317-00
U135	156-0067-00	8010100	8056559	MICROCKT, LINEAR:OPNL AMPL, SEL	04713	MC1741CP1
U135	156-0067-01	8056560		MICROCKT, LINEAR:OPNL AMPL, CHECKED	04713	MC1741CP10S
U145	156-0317-00	8010100	8049499	MICROCKT, LINEAR:OPNL AMPL	80009	156-0317-00
U145	156-0317-03	8049500		MICROCKT, LINEAR:OPNL AMPL, SCREENED & TESTED	34371	HA2-2625-7
U350	155-0078-11	8010100	8033930	MICROCKT, LINEAR:SELECTED	80009	155-0078-11
U350	155-0078-10	8033931		MICROCKT, LINEAR:VERTICAL AMPLIFIER ML	80009	155-0078-10
U370	155-0078-11	8010100	8033930	MICROCKT, LINEAR:SELECTED	80009	155-0078-11
U370	155-0078-10	8033931		MICROCKT, LINEAR:VERTICAL AMPLIFIER ML	80009	155-0078-10
U410	156-0208-00	8010100	8049499	MICROCKT, LINEAR:DUAL TRKG V RGLTR, SEL	34333	S68195/3501AJ
U410	156-0208-01	8049500		MICROCKT, LINEAR:DUAL TRKG V RGLTR, SCRN	80009	156-0208-01
VR100	152-0278-00			SEMICONV DVC, DI:ZEN, SI, 3V, 5%, 0.4M, 00-7	04713	S2635009K20
VR113	152-0278-00			SEMICONV DVC, DI:ZEN, SI, 3V, 5%, 0.4M, 00-7	04713	S2635009K20
VR166	152-0306-00			SEMICONV DVC, DI:ZEN, SI, 9.1V, 5%, 0.4M, 00-7	12954	1N8608

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
VR167	152-0306-00	B010100	B047648	SEMICOND DVC,DI:ZEN,SI,9.1V,5%,0.4M,DO-7	12954	1N9608
VR172	152-0278-00			SEMICOND DVC,DI:ZEN,SI,3V,5%,0.4M,DO-7	04713	SZG35009K20
VR187	152-0226-00	B010100	B020286	SEMICOND DVC,DI:ZEN,SI,5.1V,5%,0.4M,DO-7	04713	SZ12262RL
VR380	152-0278-00			SEMICOND DVC,DI:ZEN,SI,3V,5%,0.4M,DO-7	04713	SZG35009K20
VR452	152-0304-00	B010100	B029999	SEMICOND DVC,DI:ZEN,SI,20V,5%,0.4M,DO-7	15238	Z5411
VR452	152-0680-00	B030000		SEMICOND DVC,DI:ZEN,SI,19.3V,1%,0.4M	04713	SZG266
VR462	152-0304-00	B010100	B029999	SEMICOND DVC,DI:ZEN,SI,20V,5%,0.4M,DO-7	15238	Z5411
VR462	152-0680-00	B030000		SEMICOND DVC,DI:ZEN,SI,19.3V,1%,0.4M	04713	SZG266
M452	131-0566-00	B030000	B047648	BUS,COND:DUMMY RES,0.094 00 X 0.225 L	24546	OMA 07
M462	131-0566-00	B030000	B047648	BUS,COND:DUMMY RES,0.094 00 X 0.225 L	24546	OMA 07

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 (μF).
- Resistors = Ohms (Ω).

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

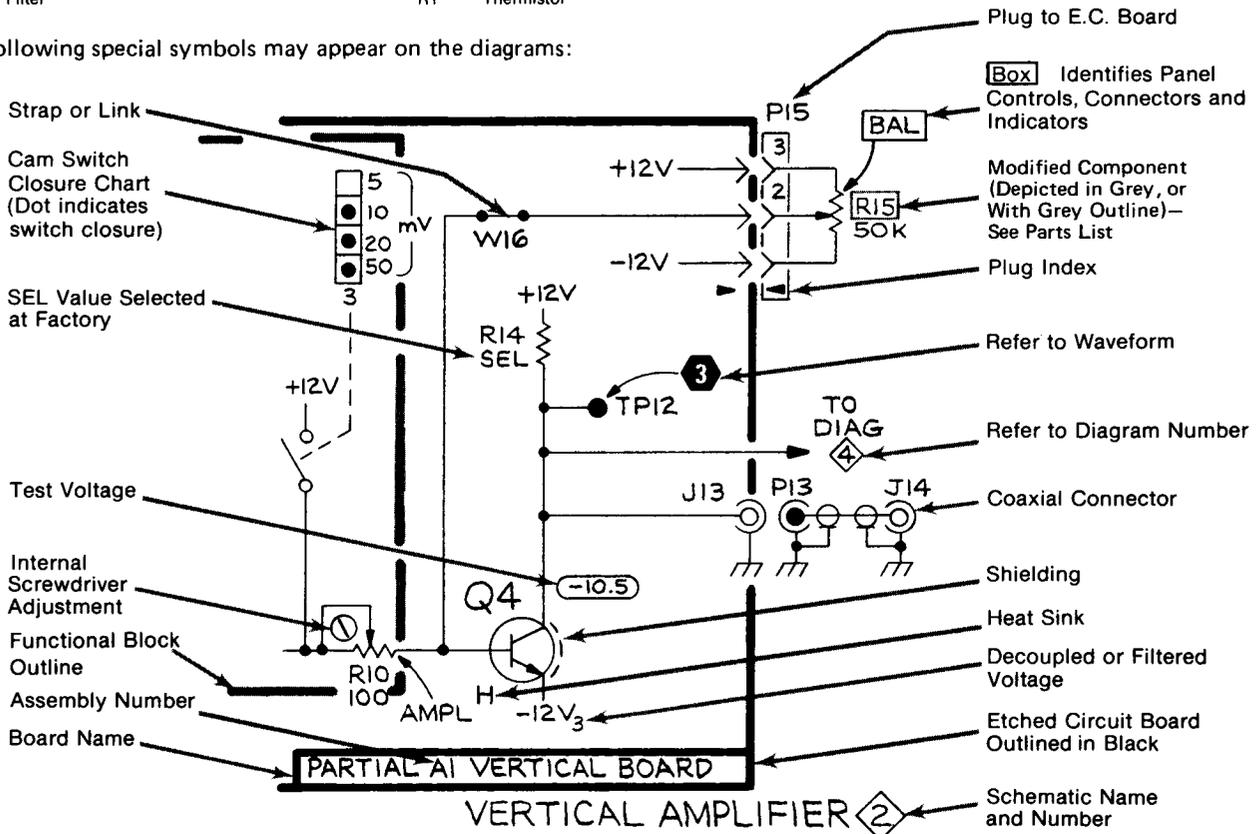
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

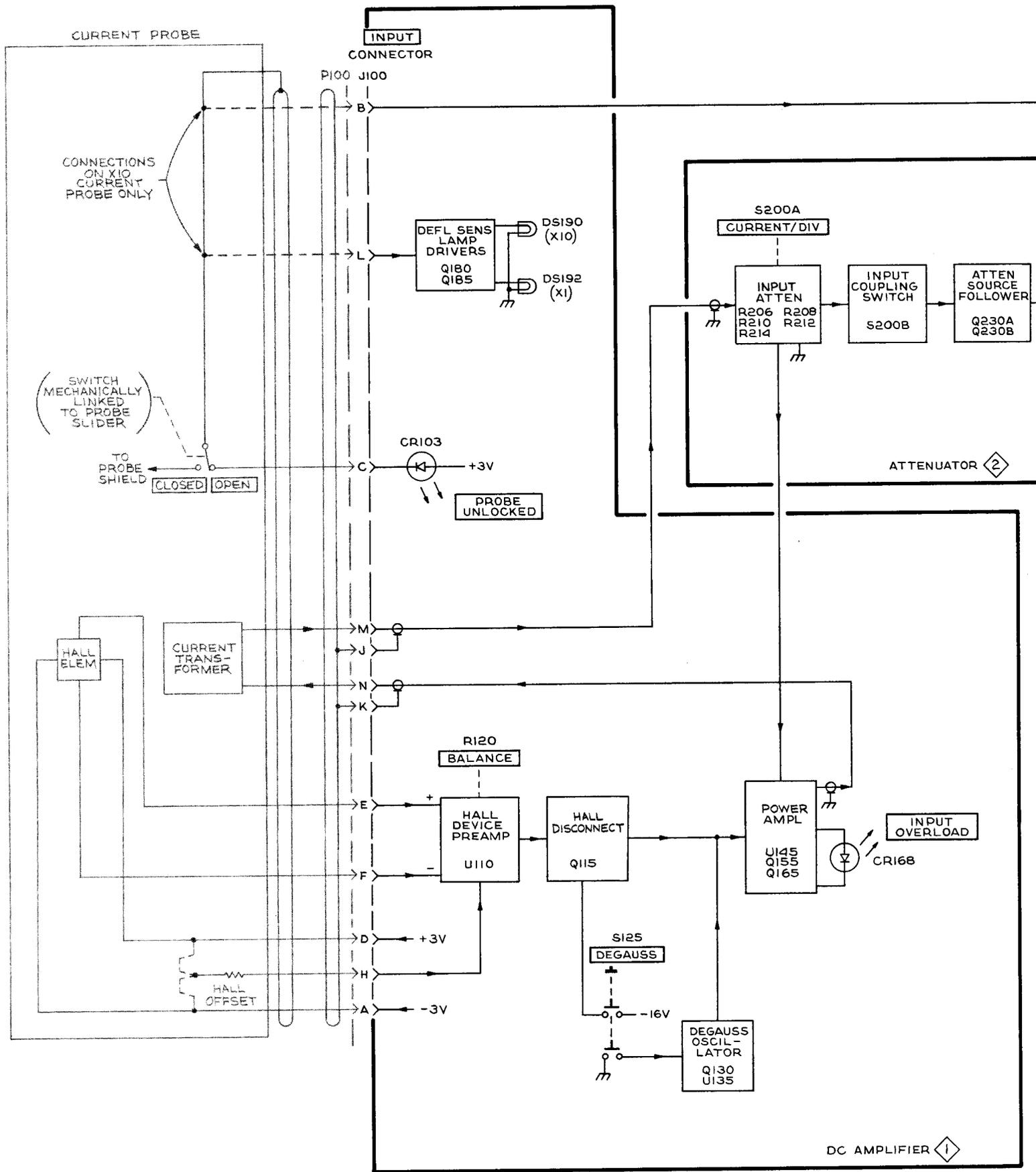
- Y14.15, 1966 Drafting Practices.
- Y14.2, 1973 Line Conventions and Lettering.
- Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

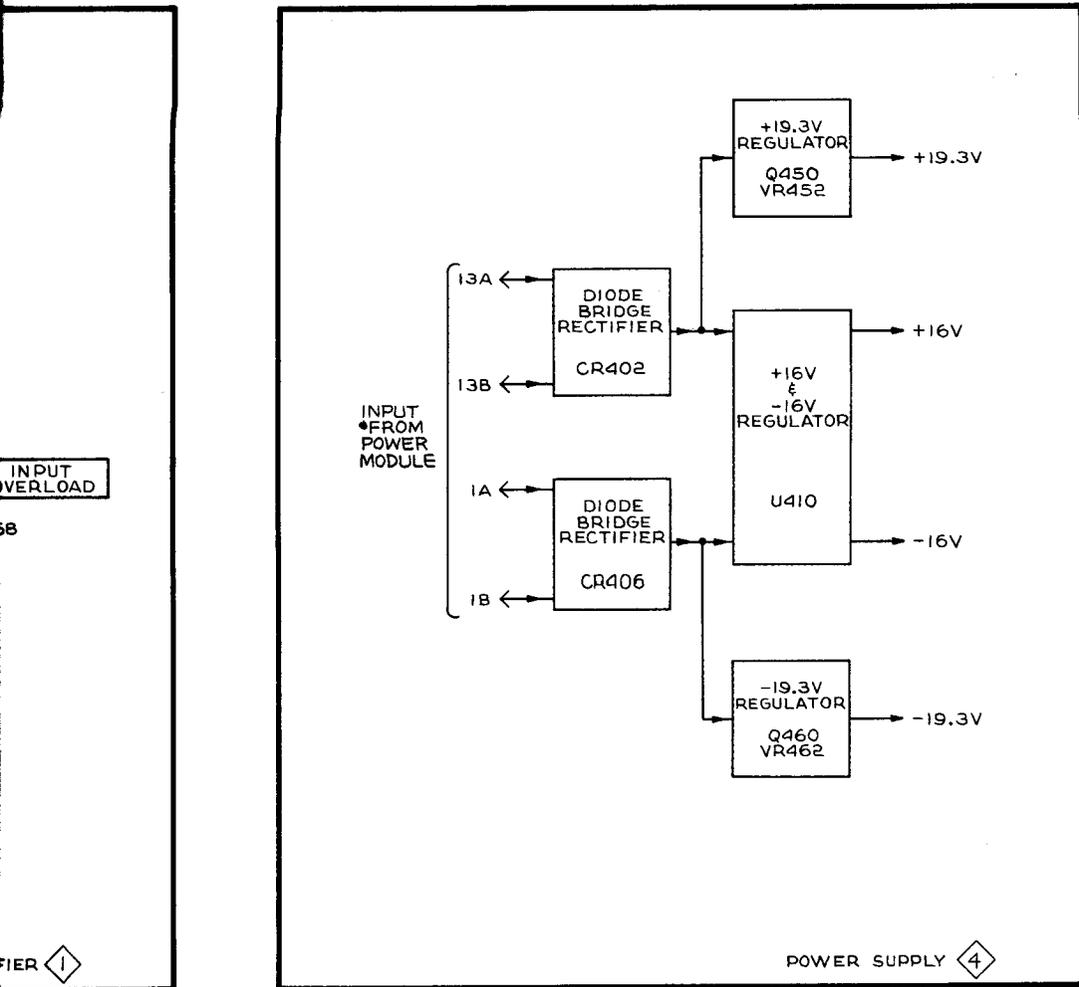
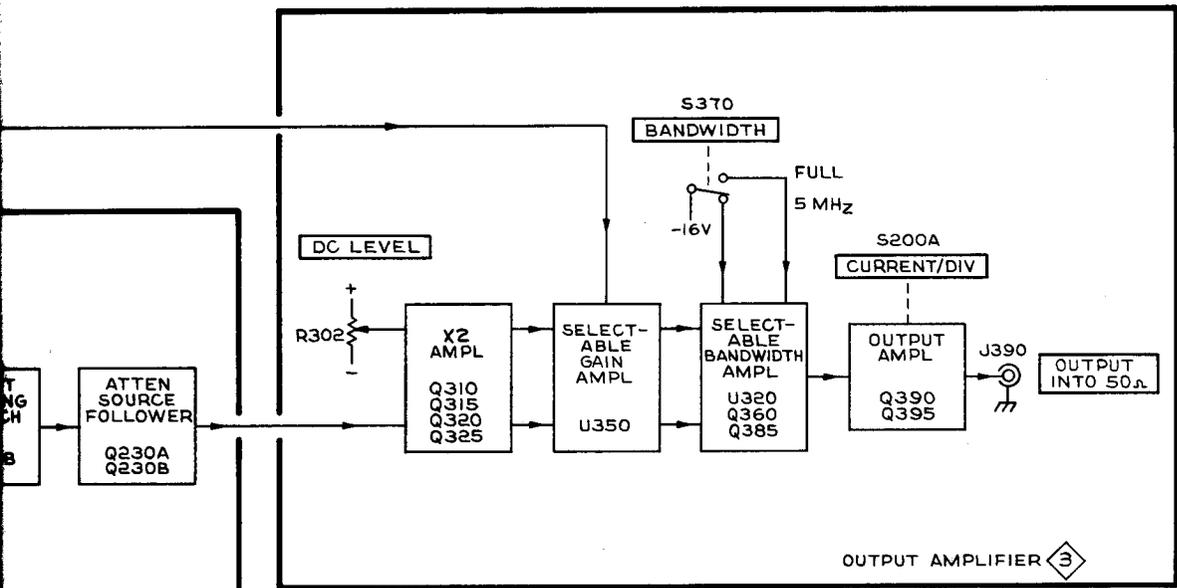
The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

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

The following special symbols may appear on the diagrams:



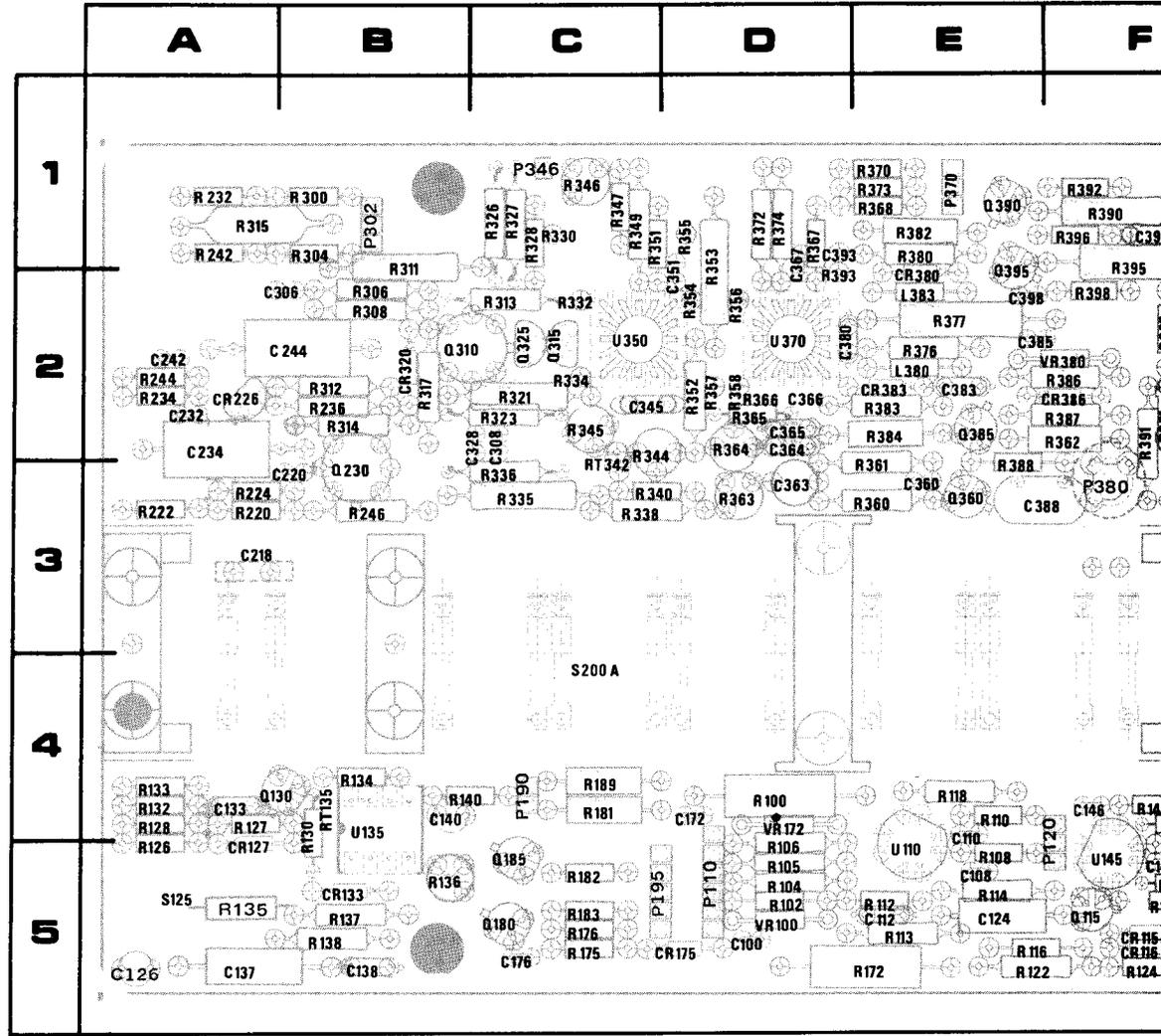




BLOCK DIAGRAM

BLOCK DIAGRAM

AMPLIFIER BOARD
COMPONENT LOCATIONS
SN B030830 & ABOVE

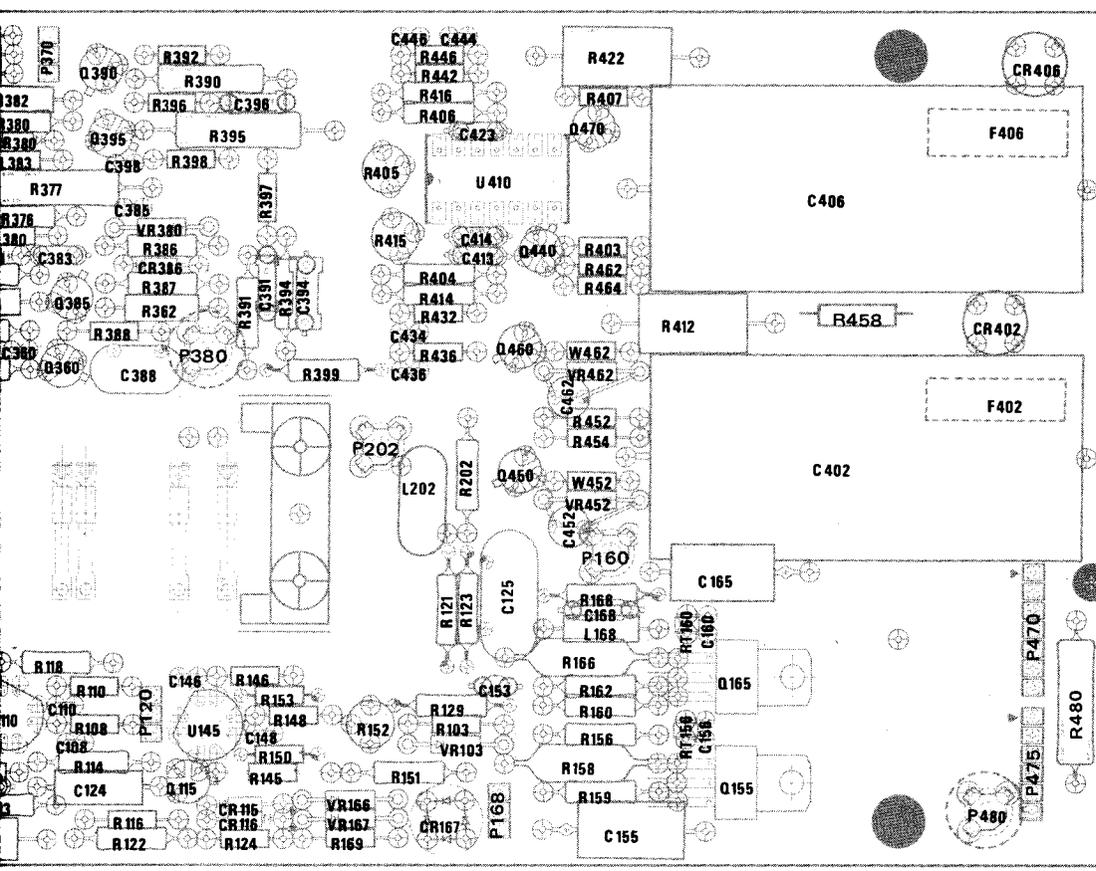


† Located on back of board

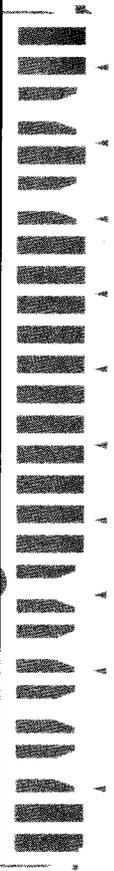
*See Parts List for
serial number ranges.

Fig. 7-1. A1—Amplifier circuit board with component loca

E	F	G	H	I	J
---	---	---	---	---	---



(2538-20)2052-43



board with component locations of components (SN B030830 & above).

CKT NO	GRID LOC	CKT NO	GRID LOC						
C100	5D	CR133	5B	R112	5E	R314	2B	R404	2G
C108	5E	CR167	5G	R113	5E	R315	1A	R405	2G
C110	4E	CR175	5D	R114	5E	R317	2B	R406	1G
C112	5E	CR226	2A	R116	5E	R321	2C	R407	1H
C124	5E	CR320	2B	R118	4E	R323	2C	R412	3H
C125	4G	CR380	2E	R121	4G	R326	1C	R414	2G
C133	4A	CR383	2E	R122	5E	R327	1C	R415	2G
C137	5A	CR386	2F	R123	4G	R328	1C	R416	1G
C138	5B	CR402	3J	R124	5F	R330	1C	R422	1H
C140	4B	CR406	1J	R126	5A	R332	2C	R432	2G
C146	4F			R127	4A	R334	2C	R436	3G
C148	5F	F402 †	3J	R128	4A	R335	3C	R442	1G
C153	4G	F406 †	1J	R129	5G	R336	3C	R446	1G
C155	5H			R130	4B	R338	3C	R452	3H
C156	5H	L168	4H	R132	4A	R340	3C	R454	3H
C160	4H	L202	3G	R133	4A	R344	2C	R458 *	3I
C165	4I	L380	2E	R134	4B	R345	2C	R462	2H
C168	4H	L383	2E	R135 *	5A	R346	1C	R464	2H
C172	4D			R136	5B	R347	1C	R480	5J
C176	5C	P110	5D	R137	5B	R349	1C	RT135	4B
C218 †	3A	P120	5F	R138	5B	R351	1C	RT156	5H
C220	3B	P160	4H	R140	4B	R352	2D	RT160	4H
C232	2A	P168	5G	R145	5F	R353	1D	RT342	3C
C234	2A	P190	4C	R146	4F	R354	2D		
C242	2A	P195	5C	R148	5F	R355	1D	S125	5A
C244	2B	P202	3G	R150	5F	R356	2D	S200A	4C
C306	2B	P302	1B	R151	5G	R357	2D		
C308	2C	P346	1C	R152	5G	R358	2C	U110	5E
C328	2C	P370	1E	R153	4F	R360	3E	U135	4B
C345	2C	P380 †	3F	R156	5H	R361	3E	U145	5F
C351	2D	P470	4J	R158	5H	R362	2F	U350	2C
C360	3E	P475	5J	R159	5H	R363	3D	U370	2D
C363	3D	P480 †	5J	R160	5H	R364	2D	U410	2G
C364	2D			R162	4H	R365	2D		
C365	2D	Q115	5F	R166	4H	R366	2D	VR100	5D
C366	2D	Q130	4A	R168	4H	R367	1D	VR103	5G
C367	1D	Q155	5I	R169	5G	R368	1E	VR166	5G
C380	2D	Q165	4I	R172	5E	R370	1E	VR167 *	5G
C383	2E	Q180	5C	R175	5C	R372	1D	VR172	4D
C385	2E	Q185	5C	R176	5C	R373	1E	VR380	2F
C388	3E	Q230	3B	R181	4C	R374	1D	VR452	3H
C391	2F	Q310	2B	R182	5C	R376	2E	VR462	3H
C393	1D	Q315	2C	R183	5C	R377	2E		
C394	2F	Q325	2C	R189	4C	R380	1E	W452 *	3H
C396	1F	Q360	3E	R202	3G	R382	1E	W462 *	3H
C398	2E	Q385	2E	R220	3A	R383	2E		
C402	3I	Q390	1E	R222	3A	R384	2E		
C406	2I	Q395	2E	R224	3A	R386	2F		
C413	2G	Q440	2H	R232	1A	R387	2F		
C414	2G	Q450	3G	R234	2A	R388	3E		
C423	2G	Q460	3G	R236	2B	R390	1F		
C434	3G	Q470	1H	R242	1A	R391	2F		
C436	3G			R244	2A	R392	1F		
C444	1G	R100	4D	R246	3B	R393	2D		
C446	1G	R102	5D	R300	1B	R394	2F		
C452	4H	R103	5G	R304	1B	R395	2F		
C462	3H	R104	5D	R306	2B	R396	1F		
		R105	5D	R308	2B	R397	2F		
CR115	5F	R106	5D	R311	2B	R398	2F		
CR116	5F	R108	5E	R312	2B	R399	3F		
CR127	5A	R110	4E	R313	2C	R403	2H		

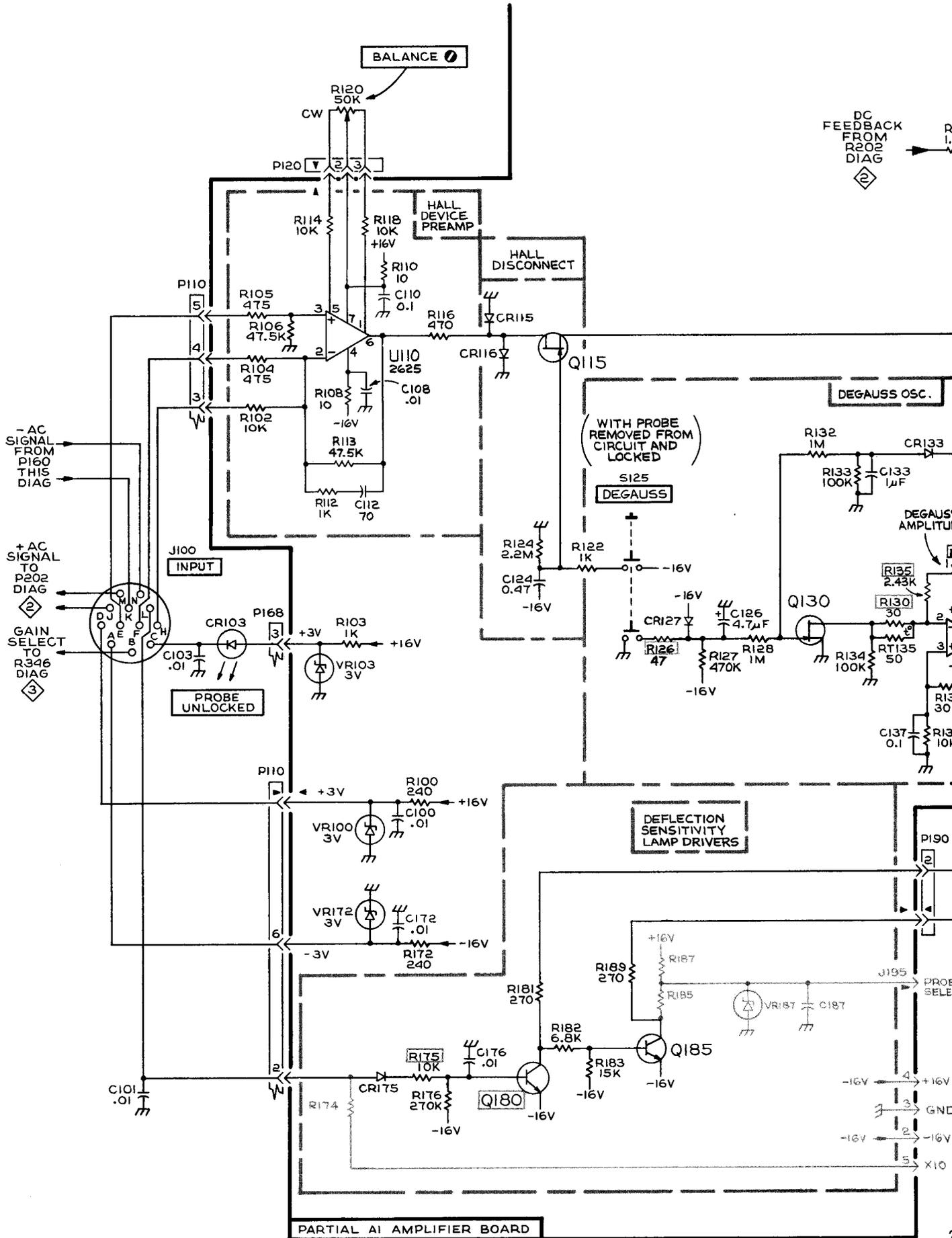
**CONDITIONS USED TO MEASURE
DC VOLTAGES ON SCHEMATICS**

Probe not connected to input.

Bandwidth set to full.

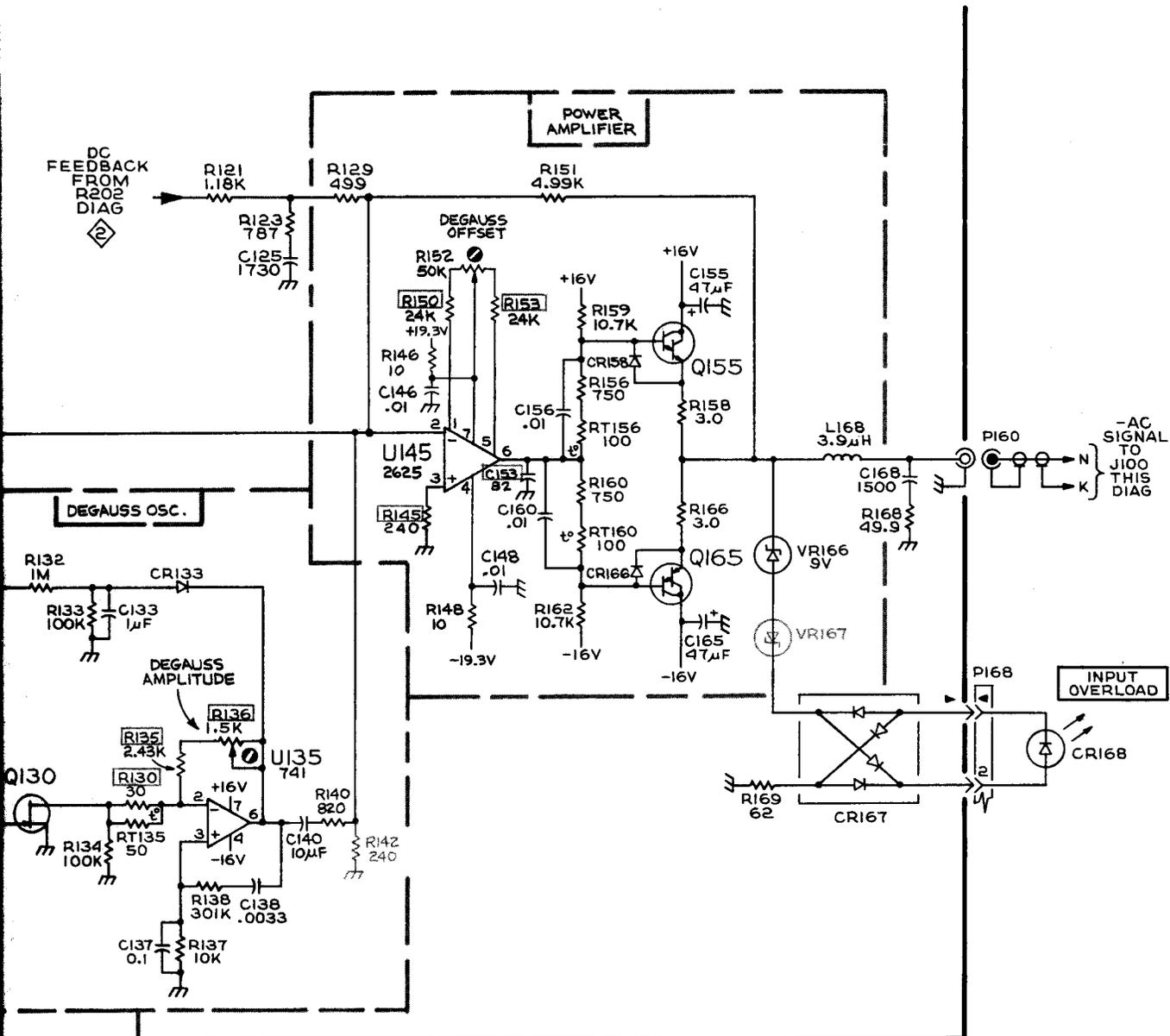
AC-CAL DC Level—DC set to CAL DC LEVEL.

Set voltage at output to zero volts (into 50 ohms) with DC Level control.



AM503

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SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

2052-33
REV MAR 1984

DC AMPLIFIER

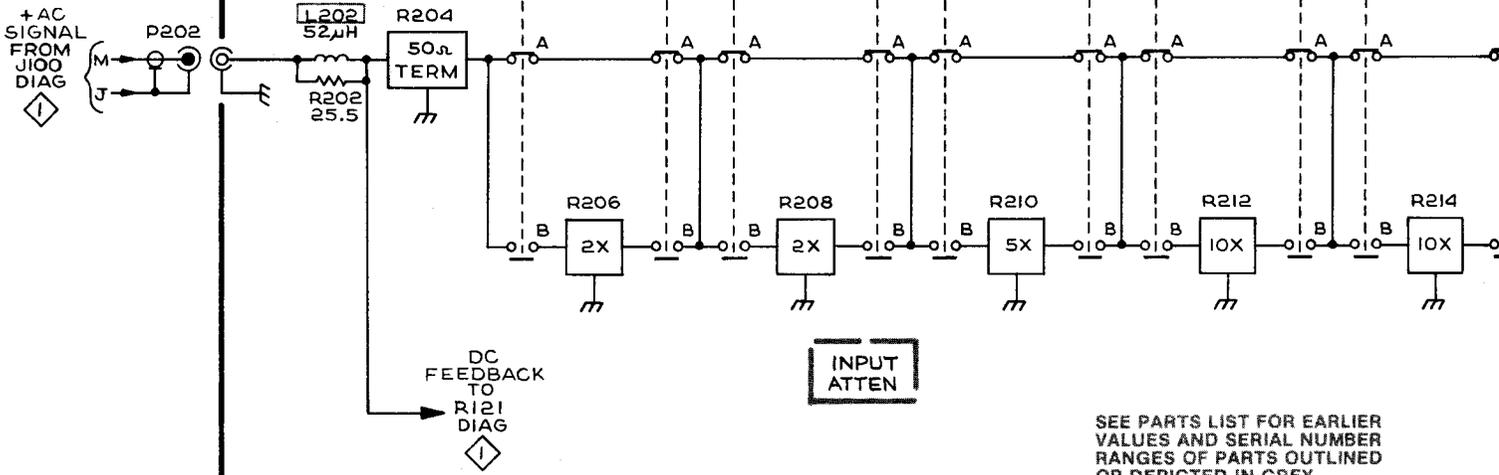
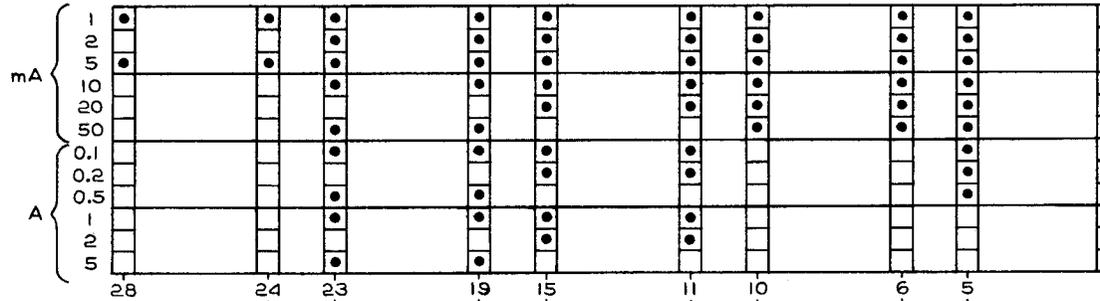
DC AMPLIFIER



CKT NO	GRID LOC										
R352	2D	R368	1E	R391 *	2F	R414	2G	RT160	4H	VR103	5G
R353	1D	R370	1E	R392	1F	R415	2G	RT342	3C	VR166	5G
R354	2D	R372	1D	R393	2D	R416	1G	RT135	4B	VR167	5G
R355	1D	R373	1E	R394	2F	R422 *	1H			VR172	4D
R356	2D	R374	1D	R395	2F	R432	2G	S125	5A	VR187 *	4C
R357	2D	R376	2E	R396	1F	R436	3G	S200A	4C	VR380	2F
R358	2C	R377	2E	R397	2F	R442	1G			VR452 *	3H
R360	3E	R380	1E	R398	2F	R446	1G	U110	5E	VR462 *	3H
R361	3E	R382	1E	R399	3F	R452	3H	U135	4B		
R362	2F	R383	2E	R403	2H	R454 *	3H	U145	5F		
R363 *	3D	R384	2E	R404	2G	R462	2H	U350 *	2C		
R364	2D	R386	2F	R405	2G	R464 *	2H	U370 *	2D		
R365	2D	R387	2F	R406	1G	R480	5J	U410	2G		
R366	2D	R388	3E	R407	1H						
R367	1D	R390	1F	R412 *	3H	RT156	5H	VR100	5D		

VOLTAGE & WAVEFORM
CONDITIONS

S200A
CURRENT/DIV
(WITH OSCILLOSCOPE)
AT 10mV/DIV

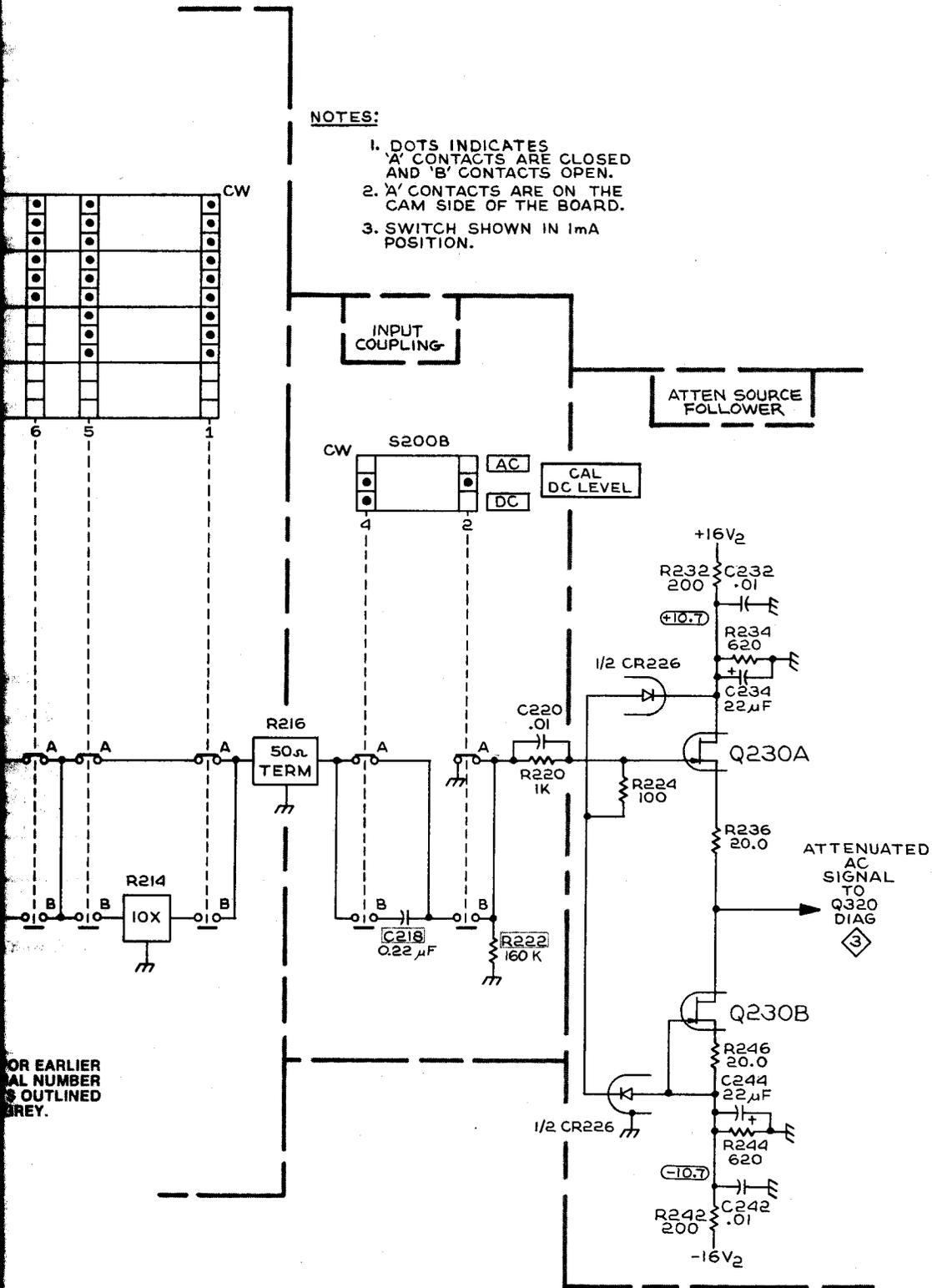


SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS OUTLINED
OR DEPICTED IN GREY.

PARTIAL A1 AMPLIFIER BOARD

NOTES:

1. DOTS INDICATES 'A' CONTACTS ARE CLOSED AND 'B' CONTACTS OPEN.
2. 'A' CONTACTS ARE ON THE CAM SIDE OF THE BOARD.
3. SWITCH SHOWN IN 1mA POSITION.



OR EARLIER
AL NUMBER
S OUTLINED
GREY.

ATTENUATOR ②

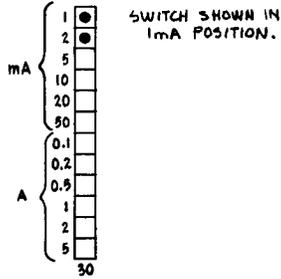
ATTENUATOR

②

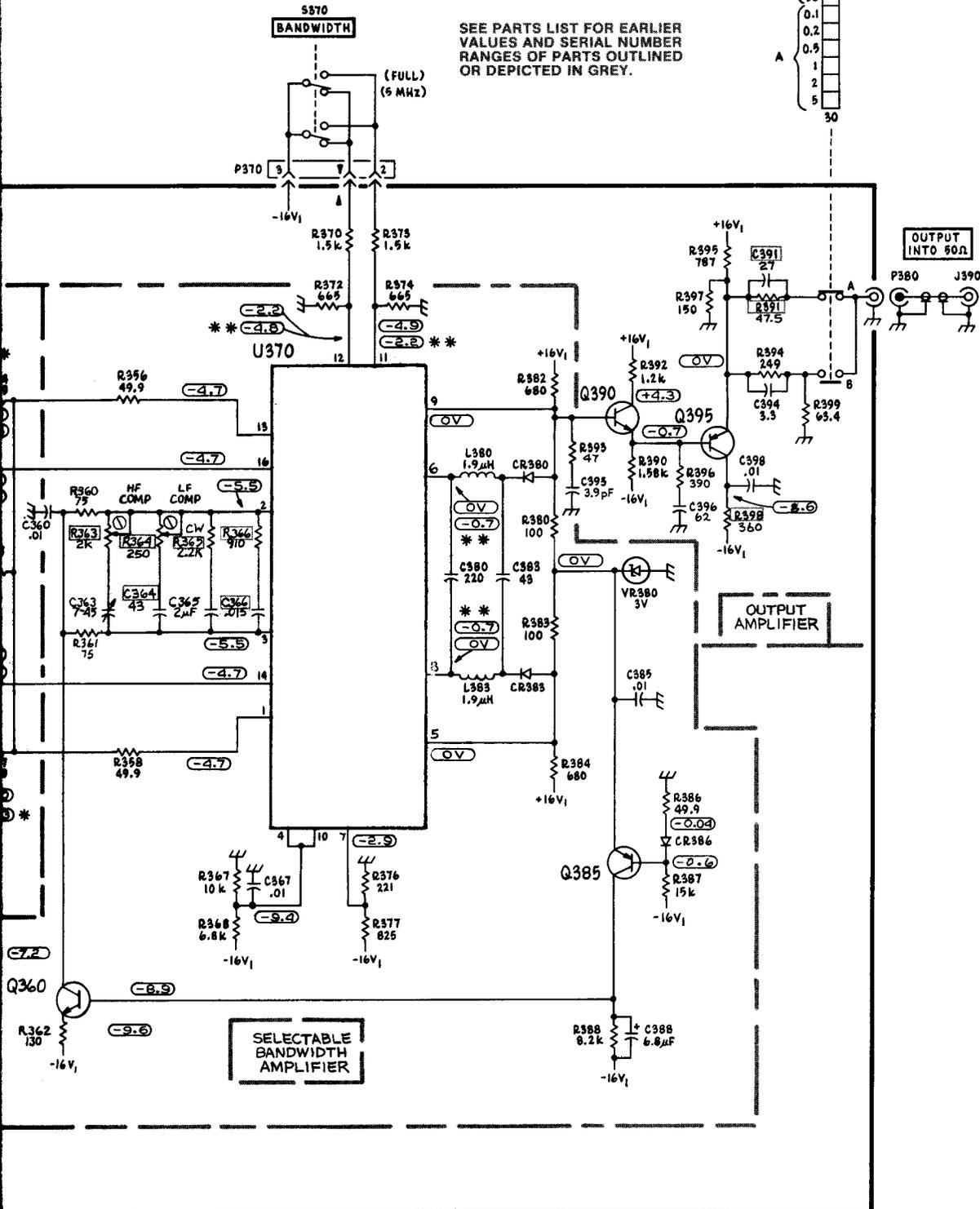
SEE DIAG 2

5200A CURRENT/DIV

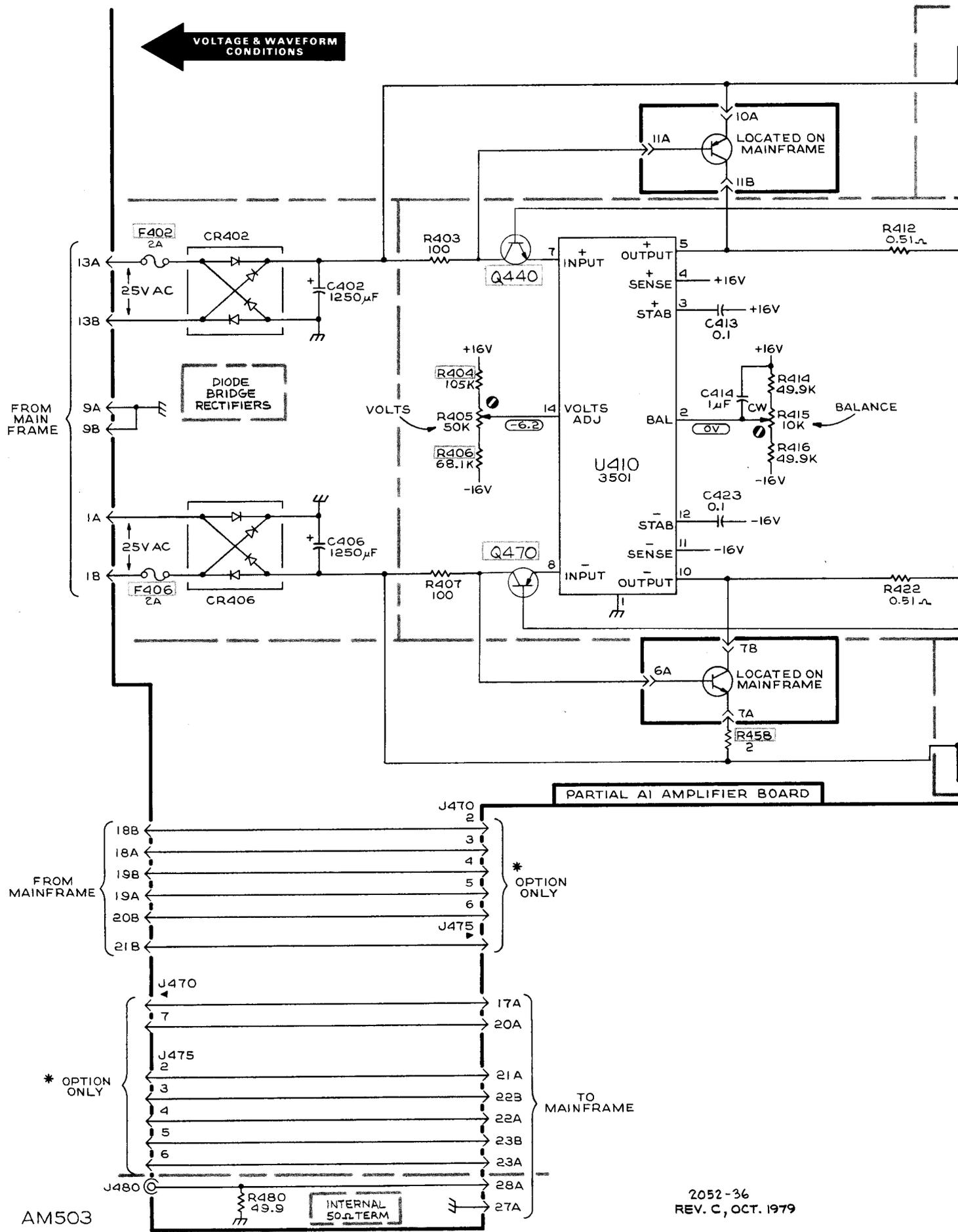
(WITH OSCILLOSCOPE) AT 10 mV/DIV



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

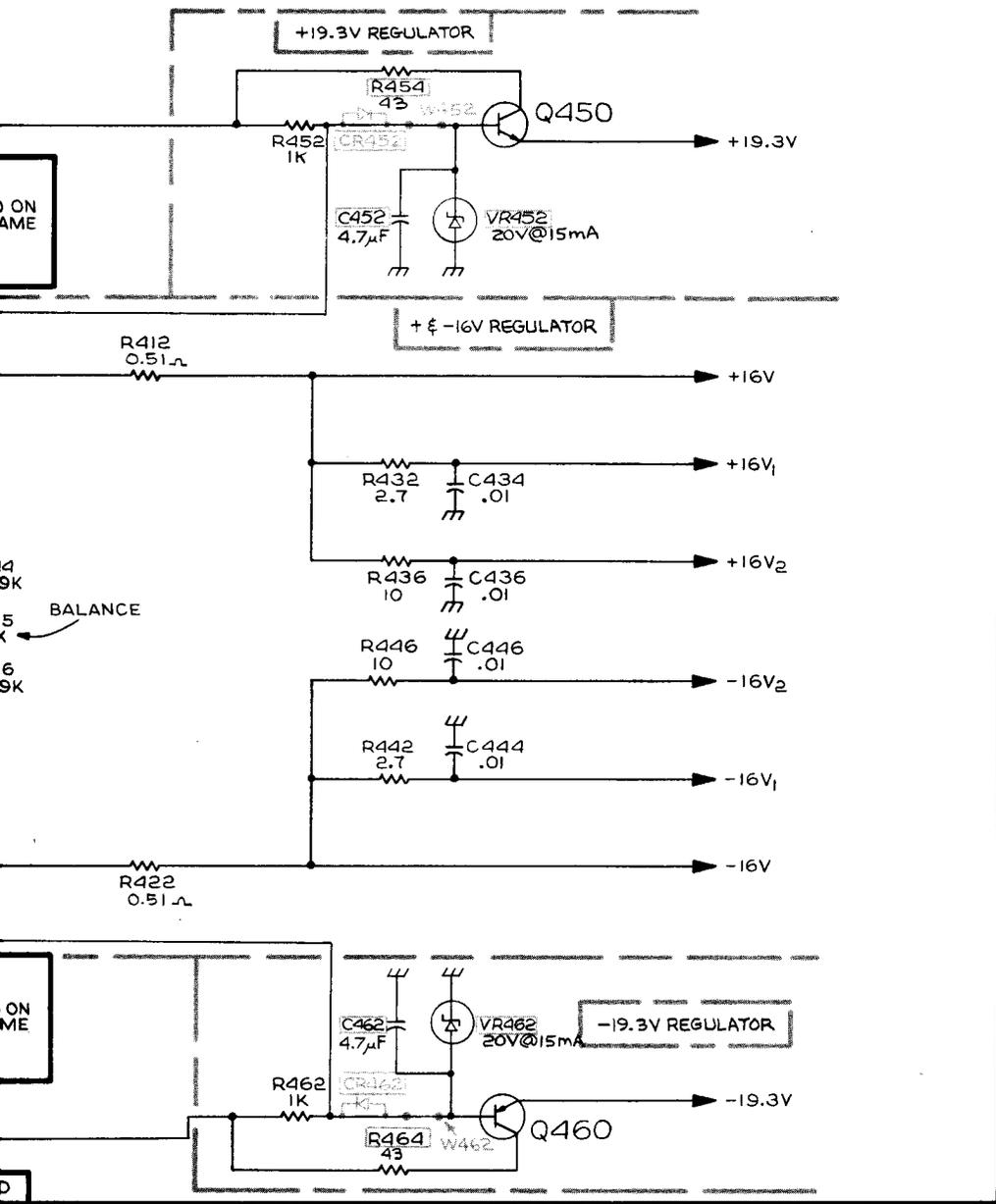


VOLTAGE & WAVEFORM CONDITIONS



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REV. C, OCT. 1979



POWER SUPPLY



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

NOTE:
 * OPTION NOT ASSIGNED AT THIS DATE.

REPLACEABLE MECHANICAL 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.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

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

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
Assembly and/or Component
Attaching parts for Assembly and/or Component
-----*-----
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
-----*-----
Parts of Detail Part
Attaching parts for Parts of Detail Part
-----*-----

```

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.

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.

ABBREVIATIONS

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

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

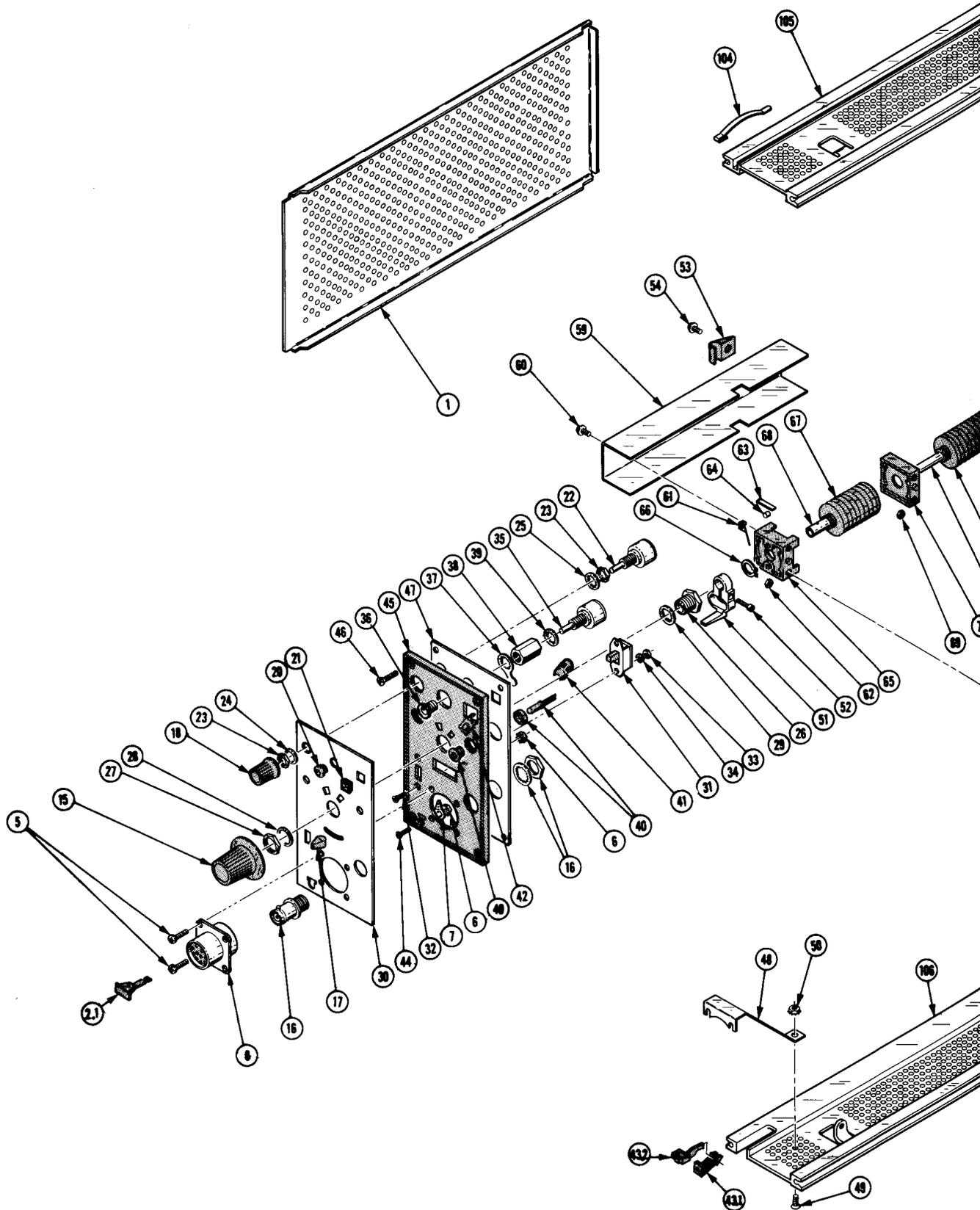
Mfr. Code	Manufacturer	Address	City, State, Zip Code
01536	TEXTRON INC CAMCAR DIV	1818 CHRISTINA ST	ROCKFORD IL 61108
02660	SEMS PRODUCTS UNIT BUNKER RAMO CORP	2801 S 25TH AVE	BROOKVIEW IL 60153
06383	AMPHENOL NORTH AMERICA DIV	17301 RIDGELAND	TINLEY PARK IL 60477
09822	PANDUIT CORP	RICHARDS AVE	NORMAL CT 06852
12327	BURNDY CORP	9301 ALLEN DR	CLEVELAND OH 44125
18203	FREEMAY CORP	SKYLINE DRIVE	MONTVILLE NJ 07045
22526	ENGELMANN MICROMAVE CO	30 HUNTER LANE	CAMP HILL PA 17011
24546	DU PONT E I DE NEMOURS AND CO INC	550 HIGH ST	BRADFORD PA 16701
27238	DU PONT CONNECTOR SYSTEMS	630 E LAMBERT RD P O BOX 630	BREA CA 92621
45722	CORNING GLASS WORKS		CAMPBELLSVILLE, KY 42718
61957	BRISTOL INDUSTRIES		
61957	USM CORP., PARKER-KALON FASTENER DIV	140 FEDERAL ST	BOSTON MA 02107
70278	SUB OF EMMART INDUSTRIES INC	17333 HEALY	DETROIT, MI 48212
73743	ALLIED STEEL AND CONVEYORS, DIV. OF SPARTON CORP.	446 MORGAN ST	CINCINNATI OH 45206
77900	FISCHER SPECIAL MFG CO	SAINT CHARLES RD	ELGIN IL 60120
78189	SHAKEPROOF DIV OF ILLINOIS TOOL WORKS	ST CHARLES ROAD	ELGIN IL 60120
79136	ILLINOIS TOOL WORKS INC	47-16 AUSTEL PLACE	LONG ISLAND CITY NY 11101
79807	SHAKEPROOF DIVISION	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	HALDES KOHINOOR INC	4900 S M GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
83385	WROUGHT WASHER MFG. CO.	3221 N BIG BEAVER RD	TROY MI 48098
83486	TEKTRONIX INC		
85480	MICRODOT MANUFACTURING INC	1101 SAMUELSON RD	ROCKFORD IL 61101
86928	GREER-CENTRAL DIV	727 W GLENDALE AVE	MILWAUKEE WI 53209
93907	ELCO INDUSTRIES INC	701 SONORA AVE	GLENDALE CA 91201
TK0435	BRADY M H CO	600 18TH AVE	ROCKFORD IL 61101
TK0507	SEASTROM MFG CO INC		
	TEXTRON INC		
	CAMCAR DIV		
	LEMIS SCREEN CO	4114 S PEORIA	CHICAGO IL 60609
	O HARA METAL PRODUCTS CO	542 BRANNAN ST	SAN FRANCISCO CA 94107

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No.		Qty	12345 Name & Description	Mfr.	
		Effective	Dscont			Code	Mfr. Part No.
1-1	337-1399-04			2	SHIELD,ELEC:SIDE	80009	337-1399-04
-2	366-1286-04	8010100	8036697	1	KNOB:LATCH	80009	366-1286-04
-2.1	366-1690-00	8036698		1	KNOB,LATCH:SIL GY,0.53 X 0.23 X 1.059 (ATTACHING PARTS)	80009	366-1690-00
-3	214-1840-00	8010100	8036697	1	PIN,KNOB SECRG:0.12L X 0.94-0.100,ACETAL (END ATTACHING PARTS)	80009	214-1840-00
-4	179-2415-00			1	WIRING HARNESS:PROBE SIGNAL & BIAS (ATTACHING PARTS)	80009	179-2415-00
-5	211-0012-00			4	SCREW,MACHINE:4-40 X 0.375,PNH,STL,CD PL	83385	ORDER BY DESCR
-6	210-0586-00			4	NUT,PL,ASSEM MA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-7	210-0261-00			1	TERMINAL,LUG:0.14 ID,PLAIN,BRASS (END ATTACHING PARTS)	80009	210-0261-00
-8	131-1855-00			1	HARNESS ASSEMBLY INCLUDES: .CONN,RCPT,ELEC:165 SERIES,12 FEMALE CONT	02660	165-12
-9	352-0171-00			1	.HLDR,TERM CONN:1 WIRE,BLACK	80009	352-0171-00
-10	352-0161-00			1	.HLDR,TERM CONN:3 WIRE,BLACK	80009	352-0161-00
-11	352-0164-00			1	.HLDR,TERM CONN:6 WIRE,BLACK	80009	352-0164-00
-12	131-0707-00			10	.CONTACT,ELEC:22-26 AWG,BRS,CU BE GLD PL	22526	47439-000
-13	210-0774-00			2	.EYELET,METALLIC:0.152 OD X 0.218 L,BRS	80009	210-0774-00
-14	210-0775-00			2	.EYELET,METALLIC:0.126 OD X 0.205 L,BRS	80009	210-0775-00
-15	366-1669-00			1	KNOB:GY,CUR/DIV,0.189 ID X 0.72 OD X 0.79 H	80009	366-1669-00
-15	213-0153-00			2	.SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	27238	ORDER BY DESCR
-16	-----			1	CONNECTOR,RCPT:(SEE J100 REPL)		
-17	366-0215-05			1	KNOB:GY,FOR LEVER,0.375 H,M/RTNR SPR	80009	366-0215-05
-18	366-0494-05			1	KNOB:GY,0.127 ID X 0.5 OD X 0.531 H	80009	366-0494-05
-18	213-0153-00			1	.SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	27238	ORDER BY DESCR
-19	366-1559-00			1	PUSH BUTTON:SIL GY,0.18 SQ X 0.43	80009	366-1559-00
-20	358-0301-02			1	BUSHING,SLEEVE:0.16 ID X 0.205 OD X 0.125 L	80009	358-0301-02
-21	426-1072-00			1	FRAME,PUSH BTN:SILVER GRAY PLSTC	80009	426-1072-00
-22	-----			1	RESISTOR,VAR:(SEE R302 REPL) (ATTACHING PARTS)		
-23	210-0583-00			2	NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
-24	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 OD X 0.02,STL	79807	ORDER BY DESCR
-25	210-0046-00			1	WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL (END ATTACHING PARTS)	77900	1214-05-00-0541C
-26	358-0029-05			1	BSHG,MACH THD:0.375-32 X 0.5HEX,BRS,0.438L (ATTACHING PARTS)	80009	358-0029-05
-27	220-0495-00			1	NUT,PLAIN,HEX:0.375-32 X 0.438,BRS,CD PL	73743	ORDER BY DESCR
-28	210-0978-00			1	WASHER,FLAT:0.375ID X 0.024THK,STL,0.500	12327	ORDER BY DESCR
-29	210-0012-00			1	WASHER,LOCK:0.384 ID,INTL,0.022 THK,STL (END ATTACHING PARTS)	77900	1220-02-00-0541C
-30	333-2131-00			1	PANEL,FRONT:	80009	333-2131-00
-31	-----			1	SWITCH,SLIDE:(SEE S370 REPL) (ATTACHING PARTS)		
-32	211-0030-00			2	SCREW,MACHINE:2-56 X 0.25,FLH,82 DEG,STL	83385	ORDER BY DESCR
-33	220-0627-00			2	NUT,PLAIN,HEX:2-56 X 0.156 HEX,BRS NP	73743	10002-56-101
-34	210-0001-00			2	WASHER,LOCK:#2 INTL,0.013 THK,STL (END ATTACHING PARTS)	77900	1202-00-00-0541C
-35	-----			1	RESISTOR,VAR:(SEE R120 REPL) (ATTACHING PARTS)		
-36	358-0409-00			1	BSHG,MACH THD:0.25-32 X 0.159 ID 0.247 L	80009	358-0409-00
-37	210-0223-00			1	TERMINAL,LUG:0.26 ID,LOCKING,BRZ TIN PL	86928	5441-37
-38	210-0471-00			1	NUT,SLEEVE:0.25-32 X 0.594 L X 0.312 HEX,AL	80009	210-0471-00
-39	210-0046-00			1	WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL (END ATTACHING PARTS)	77900	1214-05-00-0541C
-40	-----			2	LAMP,LED:(SEE CR168,CR103 REPL)		
-41	337-1430-00			2	SHIELD,ELEC:	80009	337-1430-00
-42	378-0703-00			2	LENS,LIGHT:HOLDER,CLEAR	80009	378-0703-00
-43	214-1513-01	8010100	8036697	1	LCH,PL-IN RTNG:PLASTIC	80009	214-1513-01
-43.1	105-0719-00	8036698		1	LATCH,RETAINING:PLUG-IN	80009	105-0719-00
-43.2	105-0718-01	8036698		1	BAR,LATCH RLSE: (ATTACHING PARTS)	80009	105-0718-01
-44	213-0254-00	8010100	8036697	1	SCR,TPG,TF:2-32 X 0.25,SPCL TYPE,FLH,STL (END ATTACHING PARTS)	45722	ORDER BY DESCR
-45	386-3501-00			1	SUBPANEL,FRONT: (ATTACHING PARTS)	80009	386-3501-00
-46	213-0229-00			4	SCREW,TPG,TF:6-20 X 0.375,TYPE B,FLH	93907	ORDER BY DESCR

Replaceable Mechanical Parts--AM 503

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No.		Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
		Effective	Dscont				
1-					(END ATTACHING PARTS)		
-47	337-2292-00			1	SHIELD,ELEC:FRONT PANEL	80009	337-2292-00
-48	337-2369-00	8010100	8061549	1	SHIELD,ELEC:CONNECTOR	80009	337-2369-00
	337-2369-01	8061550		1	SHIELD,ELEC:CONNECTOR	80009	337-2369-01
					(ATTACHING PARTS)		
-49	211-0101-00			1	SCREW,MACHINE:4-40 X 0.25,FLH,100 DG,STL	83385	ORDER BY DESC
-50	210-0586-00			1	NUT,PL,ASSEM MA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					(END ATTACHING PARTS)		
-51	105-0243-00			1	ACTUATOR,SWITCH:AC,DC	80009	105-0243-00
					(ATTACHING PARTS)		
-52	213-0214-00			1	SCREW,CAP:2-56 X 0.375,SKT HD,STL CD PL	70278	ORDER BY DESC
					(END ATTACHING PARTS)		
-53	343-0081-00			2	STRAP,RETAINING:0.125 DIA,NYLON	85480	CPNY-1728K
					(ATTACHING PARTS)		
-54	211-0207-00			2	SCR,ASSEM MSHR:4-40 X 0.312,PNH,STL	83385	ORDER BY DESC
					(END ATTACHING PARTS)		
	672-0574-00	8010100	8047648	1	CIRCUIT BD ASSY:ATTENUATOR	80009	672-0574-00
	672-0574-01	8047649	8049499	1	CIRCUIT BD ASSY:ATTENUATOR	80009	672-0574-01
	672-0574-02	8049500		1	CIRCUIT BD ASSY:ATTENUATOR	80009	672-0574-02
					(ATTACHING PARTS)		
-55	213-0146-00			4	SCREW,TPG,TF:6-20 X 0.312,TYPE B,PNH,STL	83385	ORDER BY DESC
	210-0801-01	8010100	8047648	3	WASHER,FLAT:0.14 ID X 0.025 THK,STL NP	86928	ORDER BY DESC
	210-0801-01	8047649		2	WASHER,FLAT:0.14 ID X 0.025 THK,STL NP	86928	ORDER BY DESC
					(END ATTACHING PARTS)		
					CKT BOARD ASSY INCLUDES:		
	131-0963-00			1	.CONTACT,ELEC:GROUNDING,PH BRZ,M/BRACKET	TK0507	ORDER BY DESC
-56	-----			7	.ATTEN/TERM,FXD:(SEE R204,R206,R208,R210, .R212,R214 AND 216 REPL)		
-57	344-0248-00			7	.CLIP,ATTENUATOR:0.866 L,CU 8E	80009	344-0248-00
	263-1111-00			1	.SM CAM ACTR AS:CURRENT/DIV	80009	263-1111-00
					(ATTACHING PARTS)		
-58	211-0116-00			8	.SCR,ASSEM MSHR:4-40 X 0.312,PNH,BRS,POZ	77900	ORDER BY DESC
					(END ATTACHING PARTS)		
					ACTR ASSEMBLY INCLUDES:		
-59	200-1950-00			1	..COVER,CAM SM:7 & 31 ELEMENTS	80009	200-1950-00
					..(ATTACHING PARTS)		
-60	211-0244-00			8	..SCR,ASSEM MSHR:4-40 X 0.312,PNH STL	01536	ORDER BY DESC
					..(END ATTACHING PARTS)		
-61	131-0963-00			1	..CONTACT,ELEC:GROUNDING,PH BRZ,M/BRACKET	TK0507	ORDER BY DESC
-62	210-0406-00			3	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-63	214-1139-03			2	..SPRING,FLAT:0.885 X 0.156 CU 8E RED CLR	80009	214-1139-03
-64	214-1752-00			2	..ROLLER,DETENT:0.125 OD X 0.16,SST	80009	214-1752-00
-65	401-0180-00			1	..BEARING,CAM SM:FR & REAR,0.8 & 0.83 DIA	80009	401-0180-00
					..(ATTACHING PARTS)		
-66	354-0390-00			1	..RING,RETAINING:BASIC EXT,U/O 0.375DIA	79136	5100-37-ZD
					..(END ATTACHING PARTS)		
-67	105-0716-00			1	..ACTUATOR,CAM SM:AC-DC	80009	105-0716-00
-68	384-0878-01			1	..SHAFT,CAM SM:1.166 L X 0.248 OD OUTER CON	80009	384-0878-01
					..CENTRIC M/DRIVER		
-69	210-0406-00			3	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-70	401-0178-01			1	..BEARING,CAM SM:CENTER REAR,0.378 ID,PLSTC	80009	401-0178-01
-71	210-0406-00			3	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-72	407-1199-00	8010100	8050999	1	..BRACKET,COVER:A85	80009	407-1199-00
	407-1199-03	8051000		1	..BRACKET,COVER:PLASTIC,FINISHED	80009	407-1199-03
-73	105-0651-00			1	..ACTUATOR,CAM SM:ATTENUATOR	80009	105-0651-00
-74	384-1424-01	8010100	8053639	1	..SHAFT,CAM SM:7.4 L X 0.188 DIA	80009	384-1424-01
	384-1478-03	8053640		1	..SHAFT,CAM SM:14.0 L X 0.188 OD,INTMD CONC	80009	384-1478-03
					..CENTRIC M/DRIVER		
-75	210-0406-00			4	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-76	214-1139-03			2	..SPRING,FLAT:0.885 X 0.156 CU 8E RED CLR	80009	214-1139-03
-77	214-1752-00			2	..ROLLER,DETENT:0.125 OD X 0.16,SST	80009	214-1752-00
-78	401-0180-00			1	..BEARING,CAM SM:FR & REAR,0.8 & 0.83 DIA	80009	401-0180-00
					..(ATTACHING PARTS)		
-79	354-0390-00			1	..RING,RETAINING:BASIC EXT,U/O 0.375DIA	79136	5100-37-ZD
					..(END ATTACHING PARTS)		
-80	-----			1	..CKT BOARD ASSY:MAIN PLUG-IN(SEE A1 REPL)		
-80.1	200-2433-00	8047649		1	..COVER,PROT:CONTACTS,PLASTIC	80009	200-2433-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
1-81	-----			1		..SWITCH,PUSH:(SEE S125 REPL)		
-82	361-0385-00			2		..SPACER,P8 SM:0.164 L,GREEN POLYCARBONATE	80009	361-0385-00
-83	136-0252-07			108		..SOCKET,PIN CONN:M/O OIMPLE	22526	75060-012
-84	131-0608-00			39		..TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
-85	131-1003-00			4		..CONN,RCPT,ELEC:CKT 80 MT,3 PRONG	80009	131-1003-00
-86	344-0255-00			4		..CLIP,ELECTRICAL:FUSE,CKT 80 MT,CU BE	80009	344-0255-00
-87	343-0149-00			2		..STRAP,TIEDOWN,E:6.75 L,PLASTIC	06383	ORDER BY DESCR
-88	214-1797-00			14		..PIN,ATTEN CLIP:	80009	214-1797-00
-89	-----			2		..TRANSISTOR:(SEE Q155 AND Q165 REPL) ..(ATTACHING PARTS)		
-90	211-0001-00			2		..SCREN,MACHINE:2-56 X 0.25,PNH,STL	83385	ORDER BY DESCR
-91	220-0627-00			2		..NUT,PLAIN,HEX:2-56 X 0.156 HEX,BRS NP	73743	10002-56-101
	210-0801-01			1		..WASHER,FLAT:0.14 ID X 0.025 THK,STL NP	86928	ORDER BY DESCR
-92	210-0001-00			2		..WASHER,LOCK:#2 INTL,0.013 THK,STL	77900	1202-00-00-0541C
-93	210-1156-00			2		..WASHER,SHLDR:0.0910 X 0.200 X0.0850,NYL ..(END ATTACHING PARTS)	80009	210-1156-00
-94	342-0166-00			2		..INSULATOR,PLATE:TRANSISTOR,MICA	80009	342-0166-00
-95	214-2407-00			1		..HEAT SINK,XSTR:2 EA 0.125,0.141 DIA HOLES ..(ATTACHING PARTS)	80009	214-2407-00
-96	211-0097-00			1		..SCREN,MACHINE:4-40 X 0.312,PNH,STL	TK0435	ORDER BY DESCR
-97	210-0586-00			1		..NUT,PL,ASSEM MA:4-40 X 0.25,STL CD PL ..(END ATTACHING PARTS)	78189	211-041800-00
	136-0514-00	8010100	8056559	1		..SKT,PL-IN ELEK:MICROCIRCUIT,8 DIP	09922	01L88P-108
	136-0269-02	8010100	8056559	1		..SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP	09922	01L814P-108T
-98	136-0728-00	8056560		1		..SKT,PL-IN ELEK:MICROCKT,14 CONTACT	09922	01L814P-108
-99	131-1030-00	8010100	8033999	13		..CONT ASSY,ELEC:CAM SMITCH,BOTTOM	80009	131-1030-00
	131-1030-00	8034000		3		..CONT ASSY,ELEC:CAM SMITCH,BOTTOM	80009	131-1030-00
	131-1030-01	8034000	8047648	10		..CONT ASSY,ELEC:CAM SMITCH,BOTTOM	80009	131-1030-01
	131-1030-00	8047649	8049985	13		..CONT ASSY,ELEC:CAM SMITCH,BOTTOM	80009	131-1030-00
	131-1030-01	8049986	8059852	13		..CONT ASSY,ELEC:CAM SMITCH,BOTTOM	80009	131-1030-01
	131-1030-06	8059853		13	(ATTACHING PARTS)	80009	131-1030-06
-100	210-3082-00			13		..EYELET,METALLIC:0.047 00 X 0.133 L,BRS NP ..(END ATTACHING PARTS)	61957	56494 (MODIFIED)
-101	131-1031-00			13		..CONT ASSY,ELEC:CAM SMITCH, TOP	80009	131-1031-00
-102	214-0973-00	8010100	8029999	1		..HEAT SINK,XSTR:TO-92,CU BE CD PL	80009	214-0973-00
-103	136-0269-02			1		..SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP	09922	01L814P-108T
	131-0566-00	8030000		2		..BUS,COND:DUMMY RES,0.094 00 X 0.225 L	24546	0MA 07
-104	214-1061-00			1		CONTACT,ELEC:GROUNDING,CU BE	80009	214-1061-00
-105	426-0725-05			1		FR SECT,PLUG-IN:TOP	80009	426-0725-05
-105.1	386-3657-01	8036698		2		SUPPORT,PLUG-IN:	83486	ORDER BY DESCR
-105.2	210-1270-00	8036698		2		WASHER,FLAT:0.14110 X 0.04THK,AL,0.21900	80009	210-1270-00
-106	426-0724-14			1		FR SECT,PLUG-IN:BOTTOM	80009	426-0724-14
	198-0001-00			1		WIRE SET,ELEC:	80009	198-0001-00
	131-0707-00			11		..CONTACT,ELEC:22-26 AWG,BRS,CU BE GLD PL	22526	47439-000
-107	175-0825-00			AR		..CABLE,SP,ELEC:2,26 AWG,STRO,PVC JKT,RBN	80009	175-0825-00
-108	175-0826-00			AR		..CABLE,SP,ELEC:3,26 AWG,STRO,PVC JKT,RBN	80009	175-0826-00
-109	352-0169-02			1		..HLDR,TERM CONN:2 WIRE,RED	80009	352-0169-02
	352-0161-00			1		..HLDR,TERM CONN:3 WIRE,BLACK	80009	352-0161-00
	352-0161-03			1		..HLDR,TERM CONN:3 WIRE,ORANGE	80009	352-0161-03
	352-0161-04			1		..HLDR,TERM CONN:3 WIRE,YELLOW	80009	352-0161-04
	210-0774-00			1		..EYELET,METALLIC:0.152 00 X 0.218 L,BRS	80009	210-0774-00
	210-0775-00			1		..EYELET,METALLIC:0.126 00 X 0.205 L,BRS	80009	210-0775-00



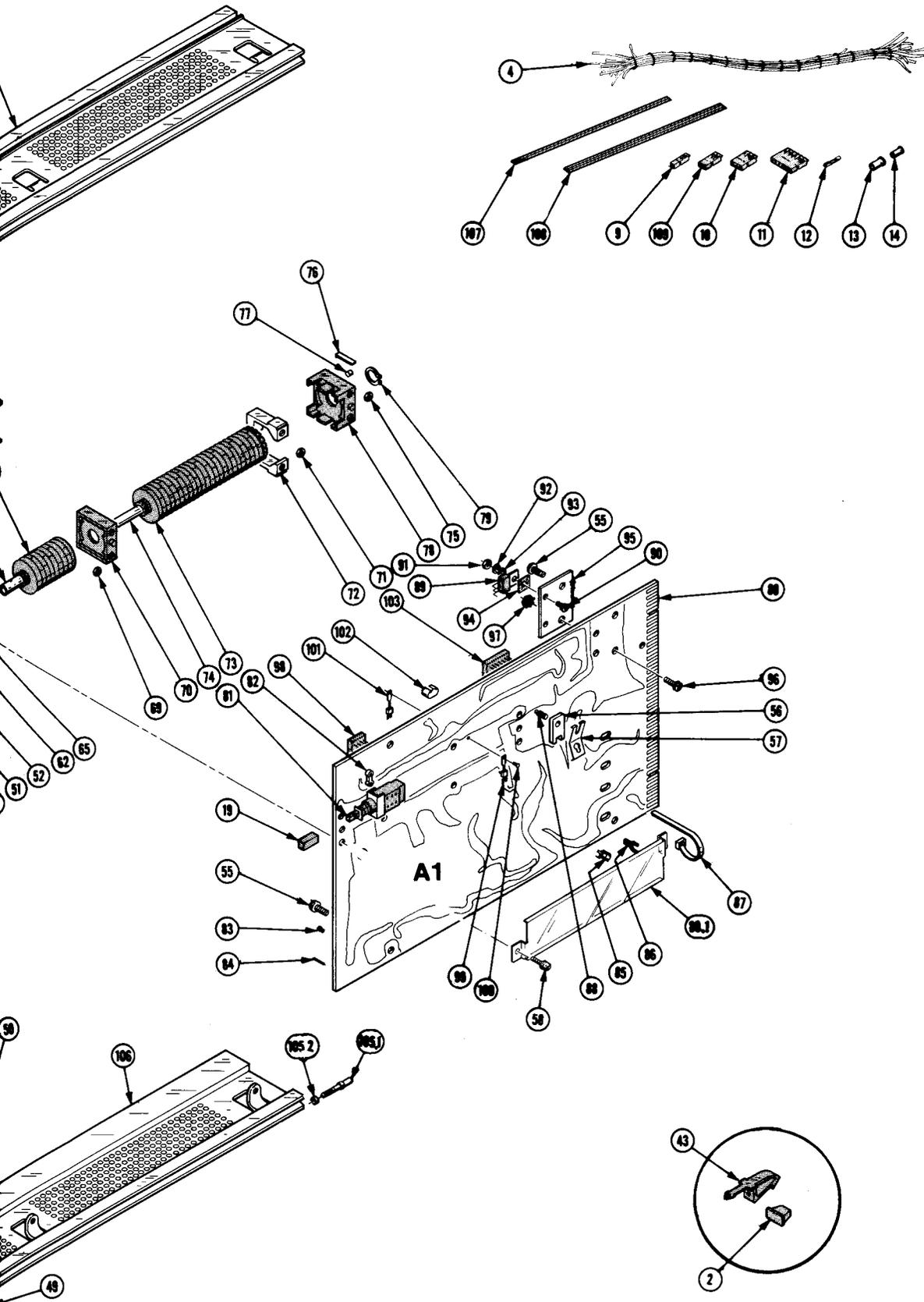
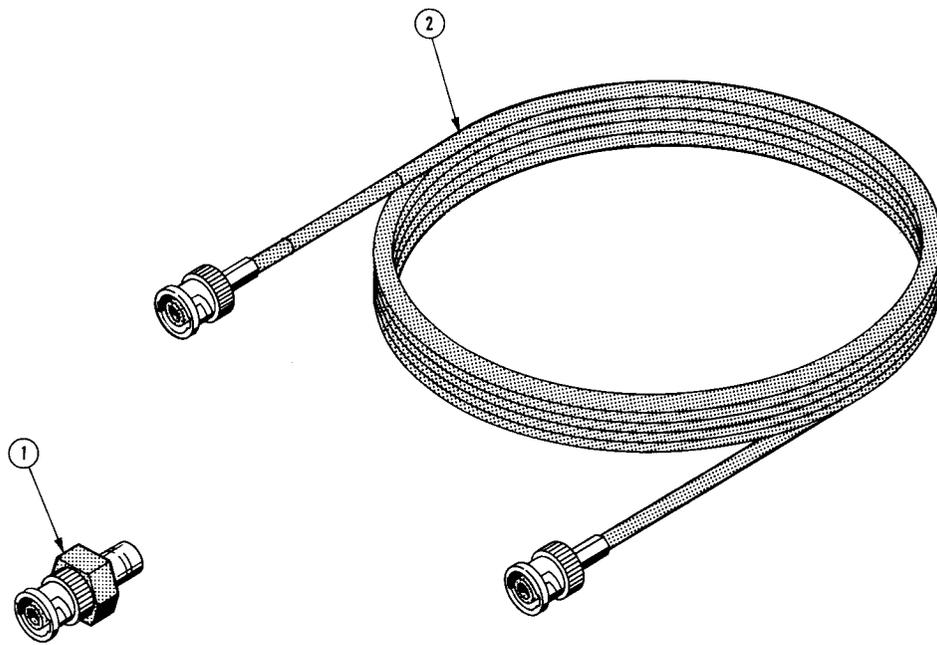


Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective Dscont	Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
2-					STANDARD ACCESSORIES		
-1	011-0049-01		1		TERMN, COAXIAL:50 OHM, 2M, BNC	18203	T132 D6
-2	012-0057-01		1		CABLE ASSY, RF:50 OHM COAX, 43.0 L	80009	012-0057-01
	070-2052-01		1		MANUAL, TECH: INSTR	80009	070-2052-01
					OPTIONAL ACCESSORIES		
	-----		1		PROBE CURRENT:A6302		
	-----		1		PROBE, CURRENT:A6303		



MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

DESCRIPTION

PG 60

Description

This manual insert describes Tektronix mods 51712, 58635, portions of 35696, 46477, 47304, 52308, 52315, and other manual changes.

Specification Change

Replace the portion of Table 2-1 that is shown on page 2-1 with the following:

**Table 2-1
ELECTRICAL CHARACTERISTICS**

Characteristics	Performance Requirements	Supplemental Information
Bandwidth (−3 db) Full		OUTPUT terminated into 50 Ω, DC coupled.
AM 503 only	DC to at least 100 MHz.	
with P6302	DC to at least 50 MHz.	
with P6303	DC to at least 15 MHz.	
5 MHz	5 MHz, ±1 MHz.	
ac coupled, lower limit	≤7 Hz	
Risetime (full bandwidth) AM 503 only	≤3.5ns	
with P6302	≤7 ns	
with P6303	≤23 ns	
Random Noise, AM 503 only (1st two cw positions of CURRENT/DIV switch)	≤4 mV	BANDWIDTH Full, coupling in CAL DC LEVEL; dc level adjusted for zero out.
(except 1st two positions of CURRENT/DIV switch)	≤0.8 mV	
Random Noise, typical probes P6302 only	≤0.3 mA (tangentially measured)	BANDWIDTH Full, coupling in DC; CURRENT/DIV full cw; DC LEVEL adjust- ed for zero dc out.
P6303 only	≤3 mA (tangentially measured)	
Attenuator Accuracy	Within 3% of indicated CURRENT/DIV.	

DESCRIPTION

Adjustment Procedure Changes

Replace Fig. 3-3, Fig. 3-4, and steps d through h of part 3, "Adjust Compensation", with the new steps d through i, beginning on page 3-4, as follows:

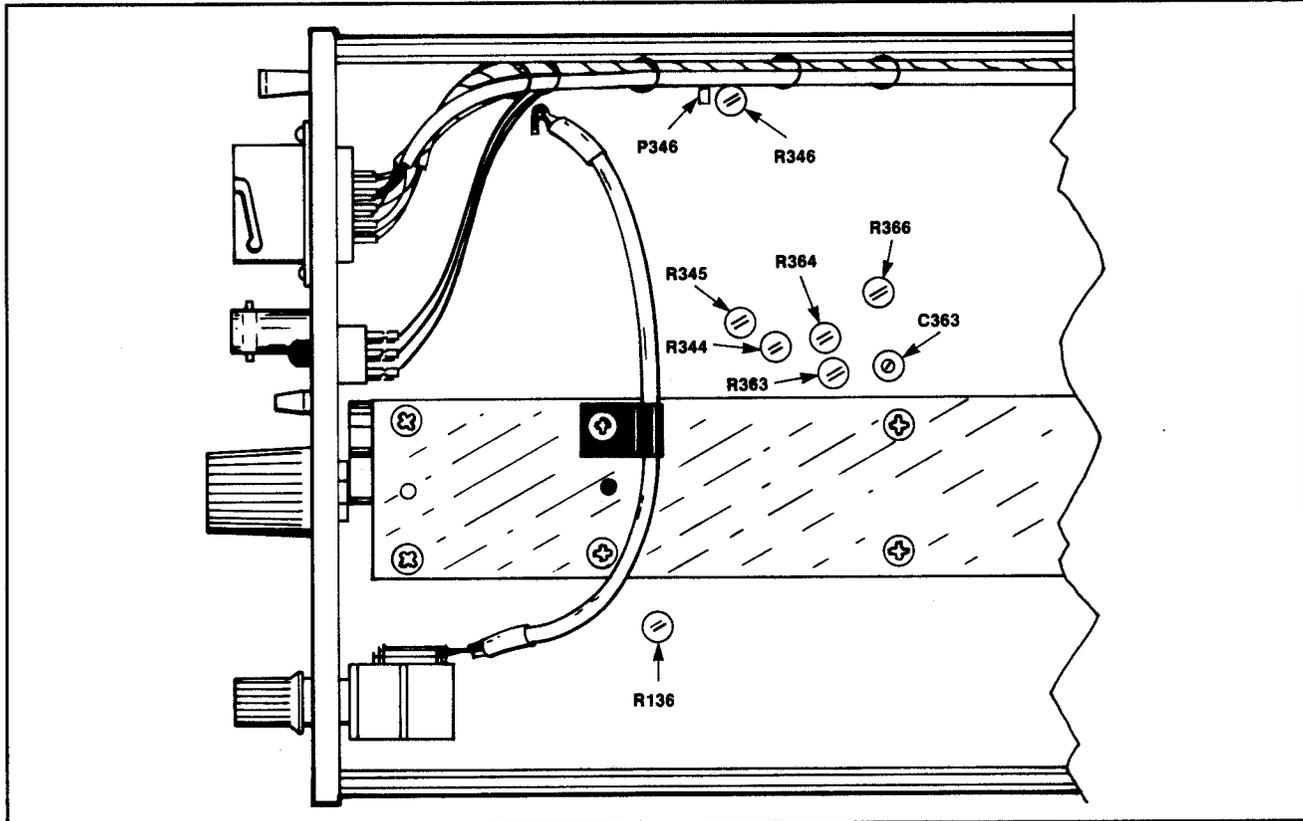


Fig. 3-3. Gain and compensation adjustment locations.

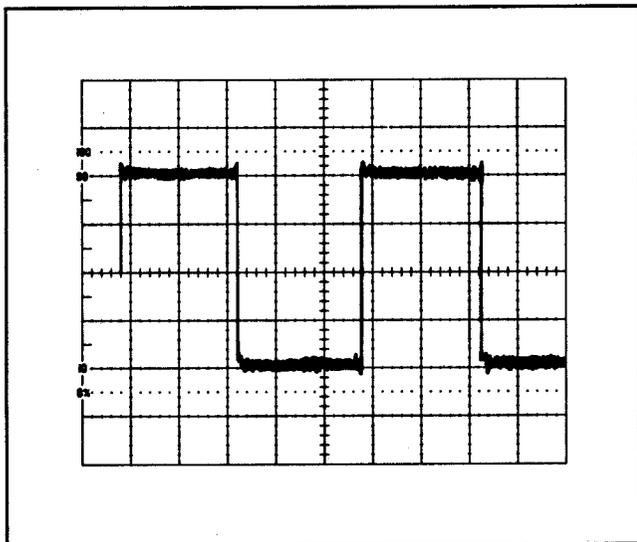


Fig. 3-4. Example of correct compensation.

- d. Examine—the long term waveform.
- e. Adjust—R366 for optimum compensation.
- f. Set the monitor oscilloscope TIME/DIV to 20 ns.
- g. Examine—the front corner of the waveform for correct compensation.
- h. Adjust—R364, R345, C363, and R363 for optimum compensation. Refer to Fig. 3-4 for example.

NOTE

If compensation adjustments are made, it is necessary to re-check the bandwidths of the instrument. Refer to the RISE TIME/BANDWIDTH procedure in Section 2, Performance Check.

- i. Remove all test connections.

DESCRIPTION

Replaceable Electrical Parts List and Schematic Changes

REMOVE:

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Reference
C234	290-0134-00	B069999		CAP,FXD,ELCTLT:22UF,20%,15V	M58635
C244	290-0134-00	B069999		CAP,FXD,ELCTLT:22UF,20%,15V	M58635
R232	315-0201-00	B069999		RES,FXD,CMPSN:200 OHM,5%,0.25W	M58635
R234	315-0621-00	B069999		RES,FXD,CMPSN:620 OHM,5%,0.25W	M58635
R242	315-0201-00	B069999		RES,FXD,CMPSN:200 OHM,5%,0.25W	M58635
R244	315-0621-00	B069999		RES,FXD,CMPSN:620 OHM,5%,0.25W	M58635
VR166	152-0306-00	B047648		SEMICONV DEV:ZEN,9.1V,5%0.4W,	M58635

ADD:

C311	283-0194-00	B063201		CAP,FXD,CER DI:4.7UF,20%,50V	M51712
C395	283-0194-00	B063201		CAP,FXD,CER DI:4.7UF,20%,50V	M51712
VR168	152-0306-00	B047649		SEMICONV DEV:ZEN,9.1V,5%0.4W,	M58635
VR232	152-0217-00	B070000		SEMICONV DEV,DI:ZEN,SI,8.2V,5%,0.4W	M58635
VR242	152-0217-00	B070000		SEMICONV DEV,DI:ZEN,SI,8.2V,5%,0.4W	M58635

CHANGE TO:

A1	670-4353-08	B070000		CIRCUIT BD ASSY:MAIN PLUG-IN	M58635
C232	283-0191-00	B070000		CAP,FXD,CER DI:0.022UF,20%,50V	M58635
C242	283-0191-00	B070000		CAP,FXD,CER DI:0.022UF,20%,50V	M58635
Q230	151-1090-00	B063201		TRANSISTOR:FET,DUAL,N CHANNEL,SI	M51712
R135	321-0210-00	B070000		RES,FXD,FILM:1.5K OHM,1%,0.125W	M58635
R136	311-1266-00	B070000		RES,VAR,NONWW:TRMR,2.5K OHM,0.5W	M58635
R220	315-0474-00	B070000		RES,FXD,CMPSN:470K OHM,5%,0.25W	M58635
R328	315-0680-00	B063181		RES,FXD,CMPSN:68 OHM,5%,0.25W	M52308
R366	311-0635-00	B070000		RES,VAR,NONWW:1K OHM,0.5W	M58635
R407	315-0101-00	B063181		RES,FXD,CMPSN:100 OHM,5%,0.25W	M52308
S370	260-1833-00	B055859		SWITCH,SLIDE:DPDT,0.5A,125V	M46477

DESCRIPTION

Diagram Changes

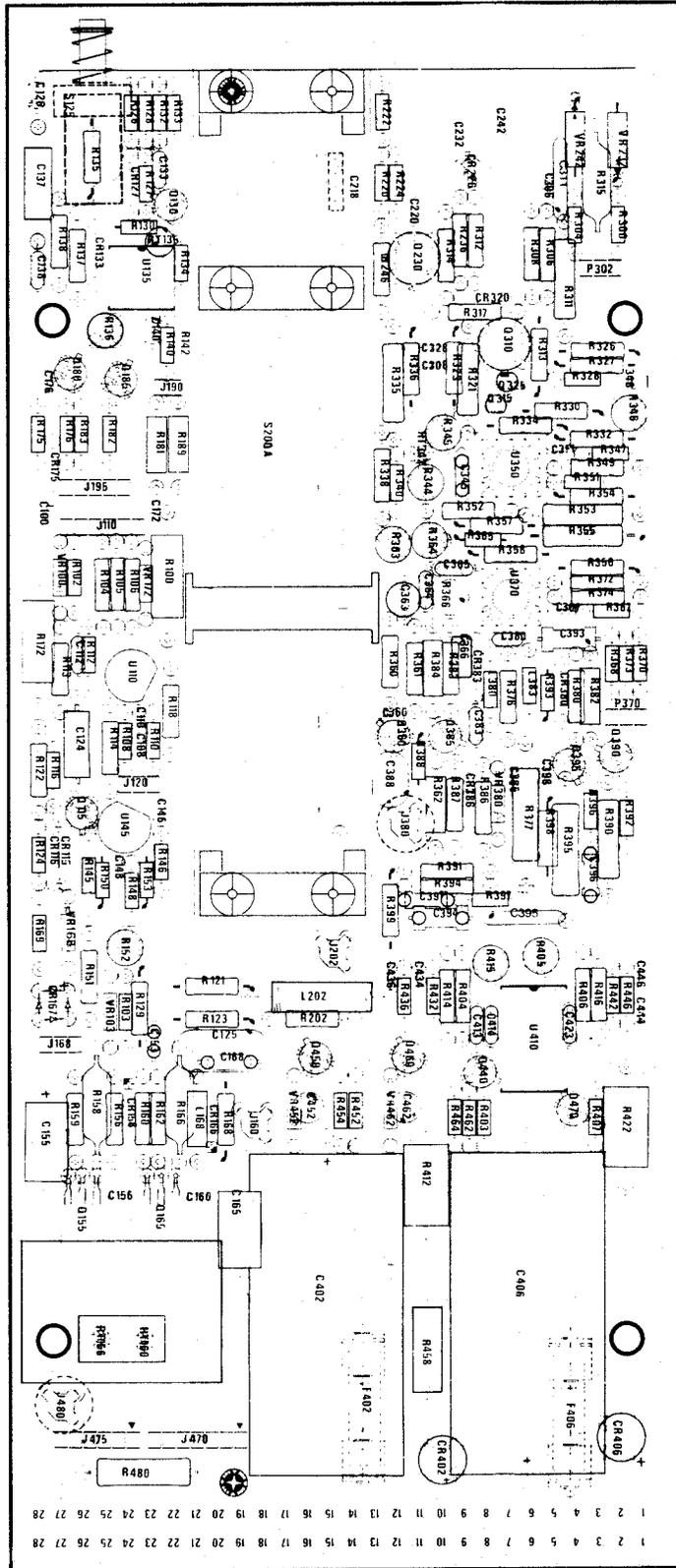
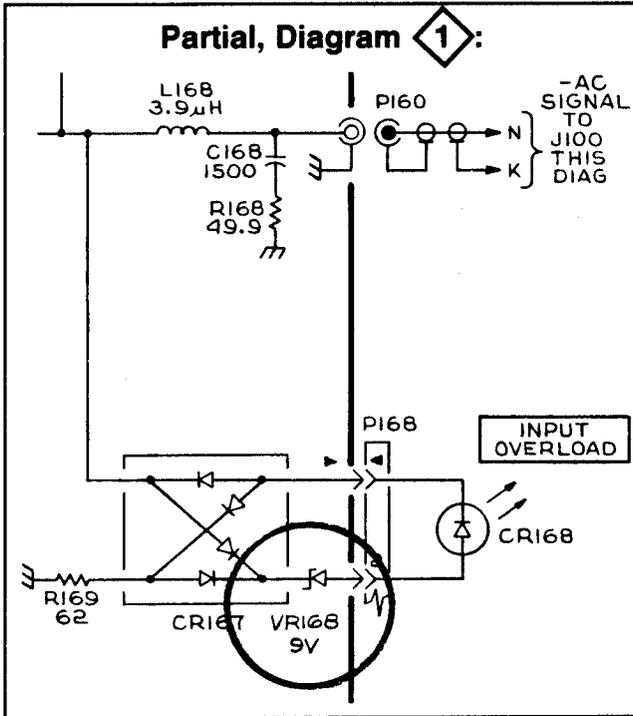


Fig. 7-1. A1 - Amplifier circuit board component locations.

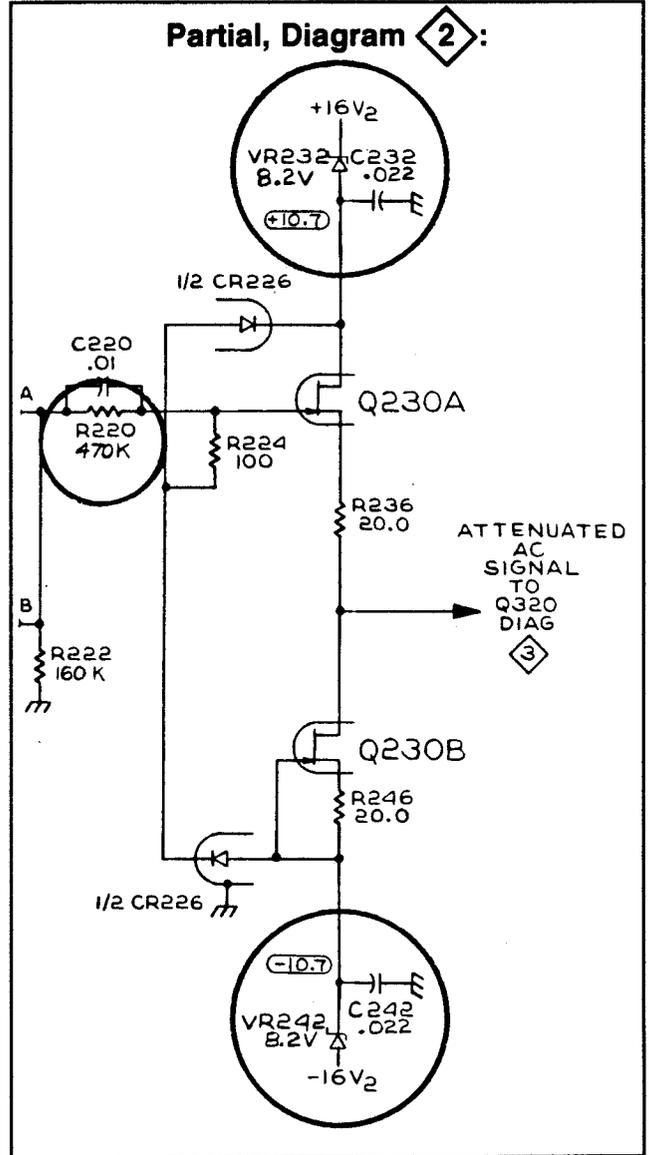
DESCRIPTION

Diagram Changes (cont.)

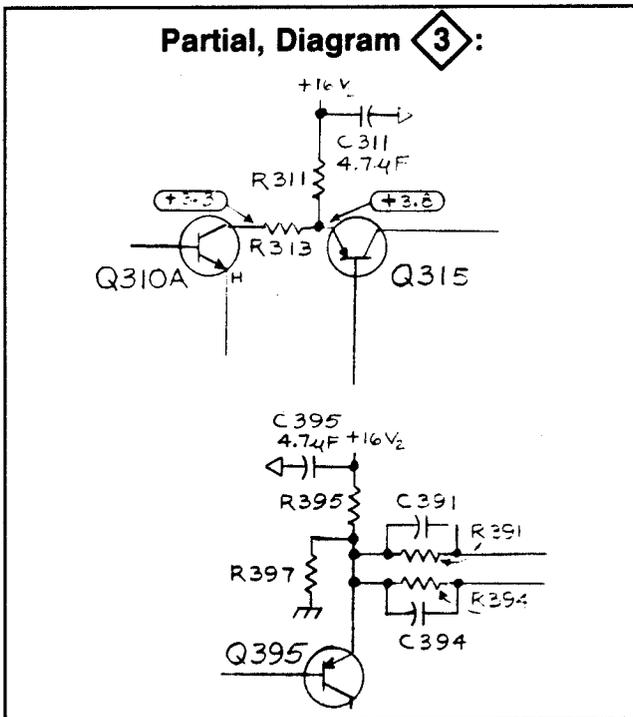
Partial, Diagram 1:



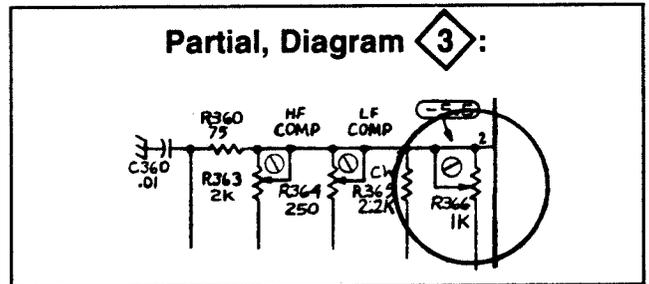
Partial, Diagram 2:



Partial, Diagram 3:



Partial, Diagram 3:



DESCRIPTION

Replaceable Mechanical Parts List Changes**ADD:**

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Reference
	214-2593-00	B063181	1		HEAT SINK,XSTR:TO-5,AL	M51712

CHANGE TO:

1-54	211-0244-00		2		SCR,ASSEM WSHR:4-40 X 0.312,PNH STL CD	(COR.)
	672-0574-00	B010100 B047648	1		CIRCUIT BD ASSY:ATTENUATOR	
	672-0574-01	B047649 B049499	1		CIRCUIT BD ASSY:ATTENUATOR	
	672-0574-02	B049500 B063180	1		CIRCUIT BD ASSY:ATTENUATOR	
	672-0574-04	B063181 B069999	1		CIRCUIT BD ASSY:ATTENUATOR	M51712
	672-0574-06	B070000	1		CIRCUIT BD ASSY:ATTENUATOR	M58635
-58	211-0292-00		8		SCR,ASSEM WSHR:4-40 X 0.29,BRS NI PL,POZ	(COR.)
-83	136-0252-07	B010100 B063180	112		SOCKET,PIN CONN:W/O DIMPLE	
	136-0252-07	B063181 B069999	71		SOCKET,PIN CONN:W/O DIMPLE	M52308
	136-0252-07	B070000	29		SOCKET,PIN CONN:W/O DIMPLE	M58635
-86	344-0255-00	B010100 B069999	4		CLIP,ELECTRICAL:FUSE,KT BD MT,CU BE	
	344-0326-00	B070000	4		CLIP,ELECTRICAL:FUSE,BRASS	M58635
-98	136-0728-00	B056560 B063180	1		SKT,PL-IN ELEK:14 CONTACT	M52308
-99	131-1030-00	B010100 B039999	13		CONT ASSY,ELEC:CAM SWITCH,BOTTOM	
	131-1030-00	B034000 B047648	3		CONT ASSY,ELEC:CAM SWITCH,BOTTOM	
	131-1030-01	B034000 B047648	10		CONT ASSY,ELEC:CAM SWITCH,BOTTOM	
	131-1030-00	B047649 B049985	13		CONT ASSY,ELEC:CAM SWITCH,BOTTOM	
	131-1030-01	B049986 B059852	13		CONT ASSY,ELEC:CAM SWITCH,BOTTOM	
	131-1030-00	B059853	13		CONT ASSY,ELEC:CAM SWITCH,BOTTOM	M52315
-103	136-0269-02	B010100 B056559	1		SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW	M47304
	131-0566-00	B030000 B047648	2		BUS CONDUCTOR:DUMMY RESISTOR	M35696