Tektronix®
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PS 503A
DUAL
POWER SUPPLY

INSTRUCTION MANUAL

TEKTRONIX®

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DUAL
POWER SUPPLY

INSTRUCTION MANUAL

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

Serial Number _____

070-1834-01

First Printing SEPT 1974

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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.

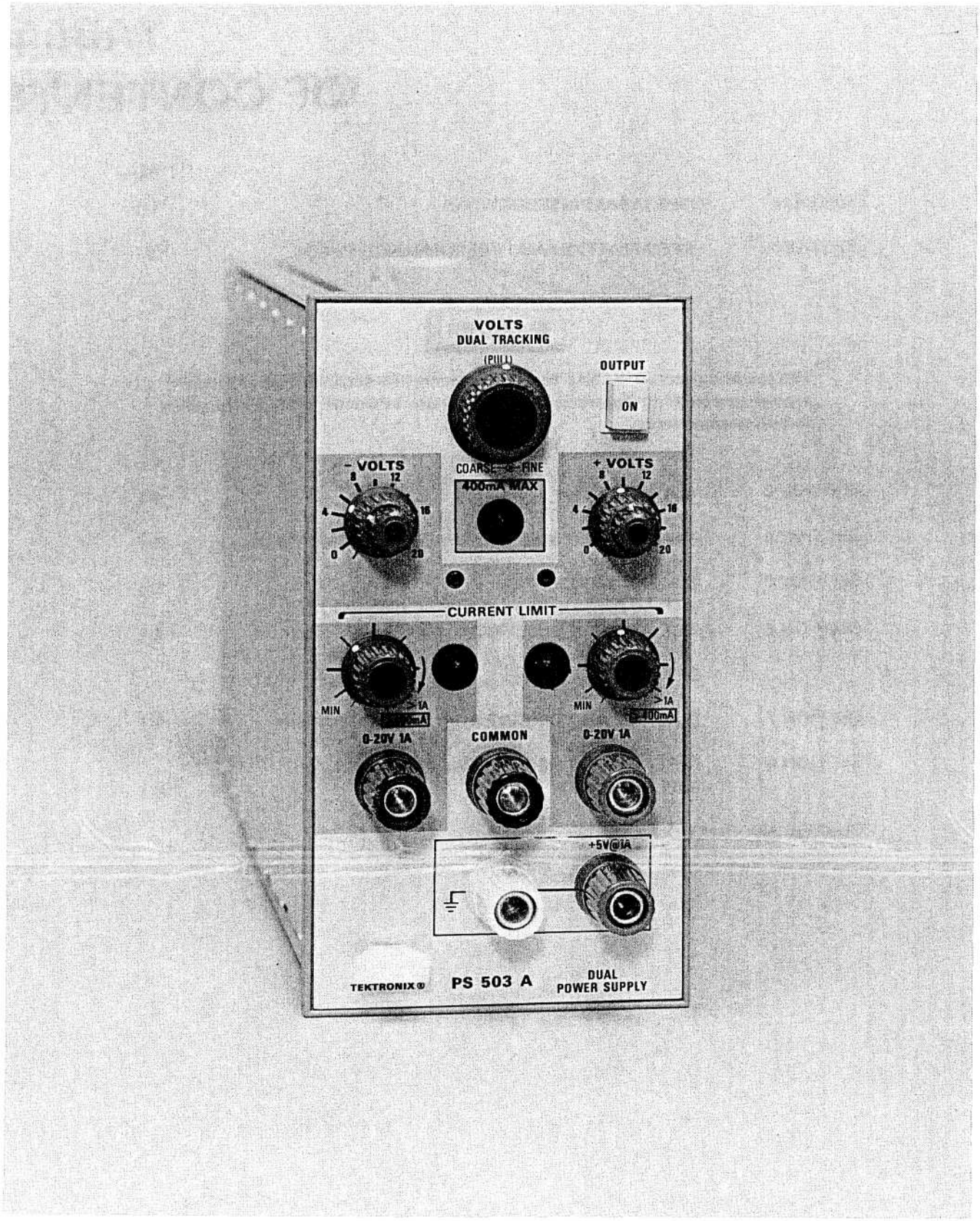


Fig. 1-1. PS 503A Dual Power Supply plug-in module.

OPERATING INSTRUCTIONS

INTRODUCTION

Description

The PS 503A is a dual 0 to 20 V dc constant-voltage, current-limited, floating power supply. It is designed to operate in the high-power compartment of the TM 504 or TM 506 Power Module. In the high-power compartment, it provides a floating dual 0 to 20 V dc at 1.0 A. Operating in a standard compartment of a TM 500 Series Power Module, the PS 503A supplies a floating dual 0 to 20 V dc at 400 mA.

The supply is designed for conveniently powering complementary and linear integrated circuits such as operational and differential amplifiers as well as differential comparators. A ground referenced +5 V auxiliary supply (suitable for bipolar logic, light-emitting diodes, incandescent displays and similar applications) is also included. With the floating supply available for powering discrete interface circuits and level shifting, the PS 503A can be used for many digital/analog applications.

The plus and minus outputs from the dual floating power supplies are independently variable or both variable at a constant ratio by a common control. Each supply provides either a plus or minus 0 to 20 V dc with respect to the common terminal. By connecting across the plus and minus terminals, the PS 503A can provide 0 to 40 V dc. Either terminal may be grounded or floated to 350 V (dc + peak ac). Each supply also features continuously variable current limiting from less than 50 mA to 400 mA (standard compartment) or 1 A (high power compartment) at both 20 V and 40 V output.

The presence and variability of the output voltage is verified by the VOLTS indicator light on the front panel. The brightness of this light varies with output voltage. A panel-mounted light-emitting diode (LED) indicates when the PS 503A is operating in a standard compartment of a TM 500 Series Power Module and the output current is limited to a maximum of 400 mA. Other panel-mounted, light-emitting diodes indicate when either the + or − supply goes into current-limiting. Hard limiting is indicated by maximum brightness of the light-emitting diode as well as a dimming of the VOLTS indicator light if the supply output voltage is above approximately 10 V. These functions are easily verified by momentarily shorting the output of the supply.

Installation and Removal

CAUTION

Turn the power module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry. Because of the high current drawn by the PS 503A, it is also recommended that the power module be turned off before removing the PS 503A. Refer to Fig. 1-2. Check to see that the plastic barriers on the interconnecting jack of the selected power module compartment match the cut-outs in the PS 503A circuit board edge connector.

Align the PS 503A 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 PS 503A, pull on the release latch located in the lower left corner, until the interconnecting jack disengages and the PS 503A will slide out.

Controls and Connectors

Refer to Fig. 1-3. Even though the PS 503A is fully calibrated and ready to use, the functions and actions of the controls and connectors should be reviewed before attempting to use it. Press the OUTPUT button to apply power to the PS 503A.

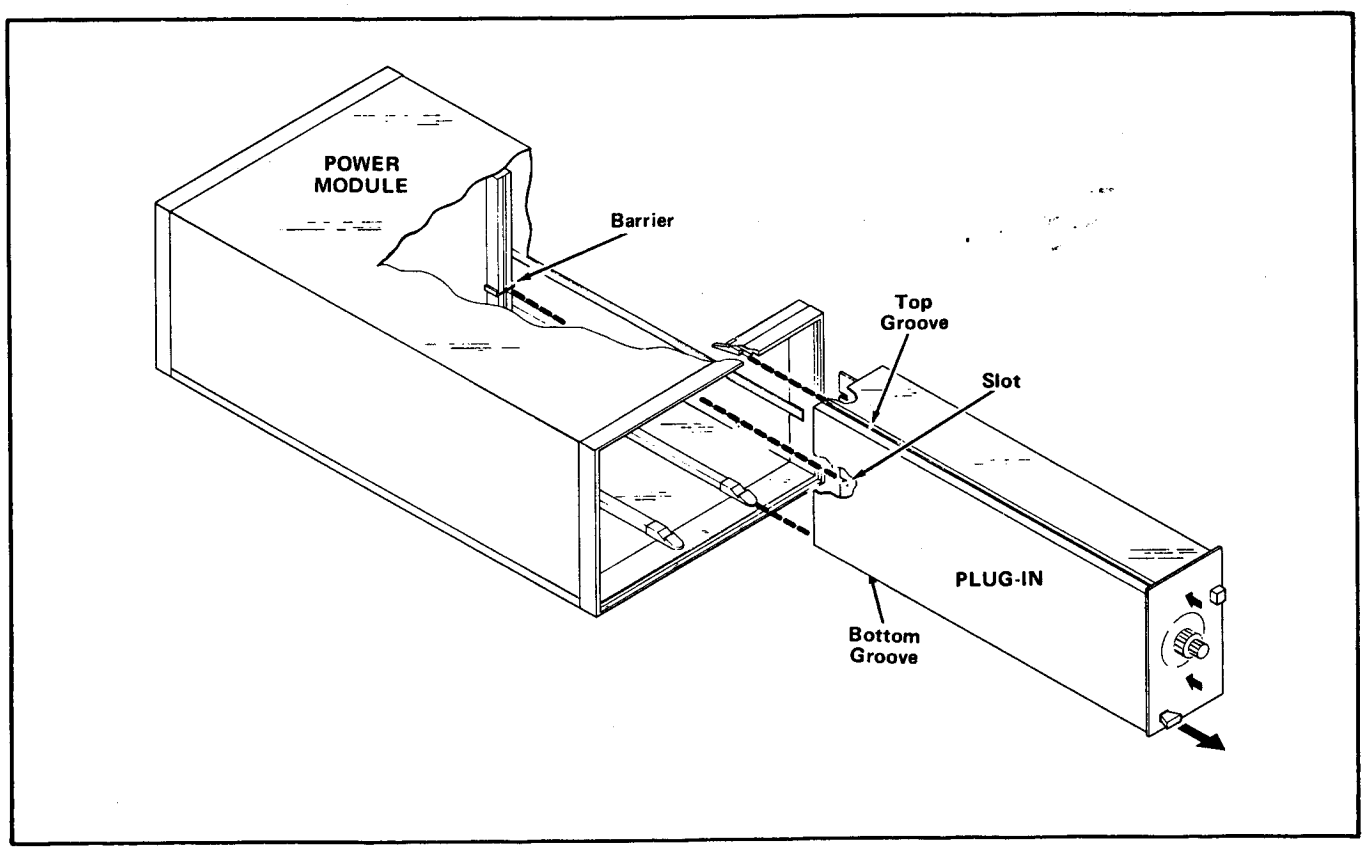


Fig. 1-2. Plug-in module installation/removal.

OPERATING CONSIDERATIONS

Overheating

The PS 503A is designed to operate at an ambient temperature from 0°C to +50°C. However, when operating several power supplies in a multi-plug-in power module, especially at low output voltages, or when operating close to other heat-producing equipment, internal temperature may exceed safe limits and actuate a thermal cutout in the power module. Refer to the power module instruction manual for more complete information.

Load and Monitor Connections

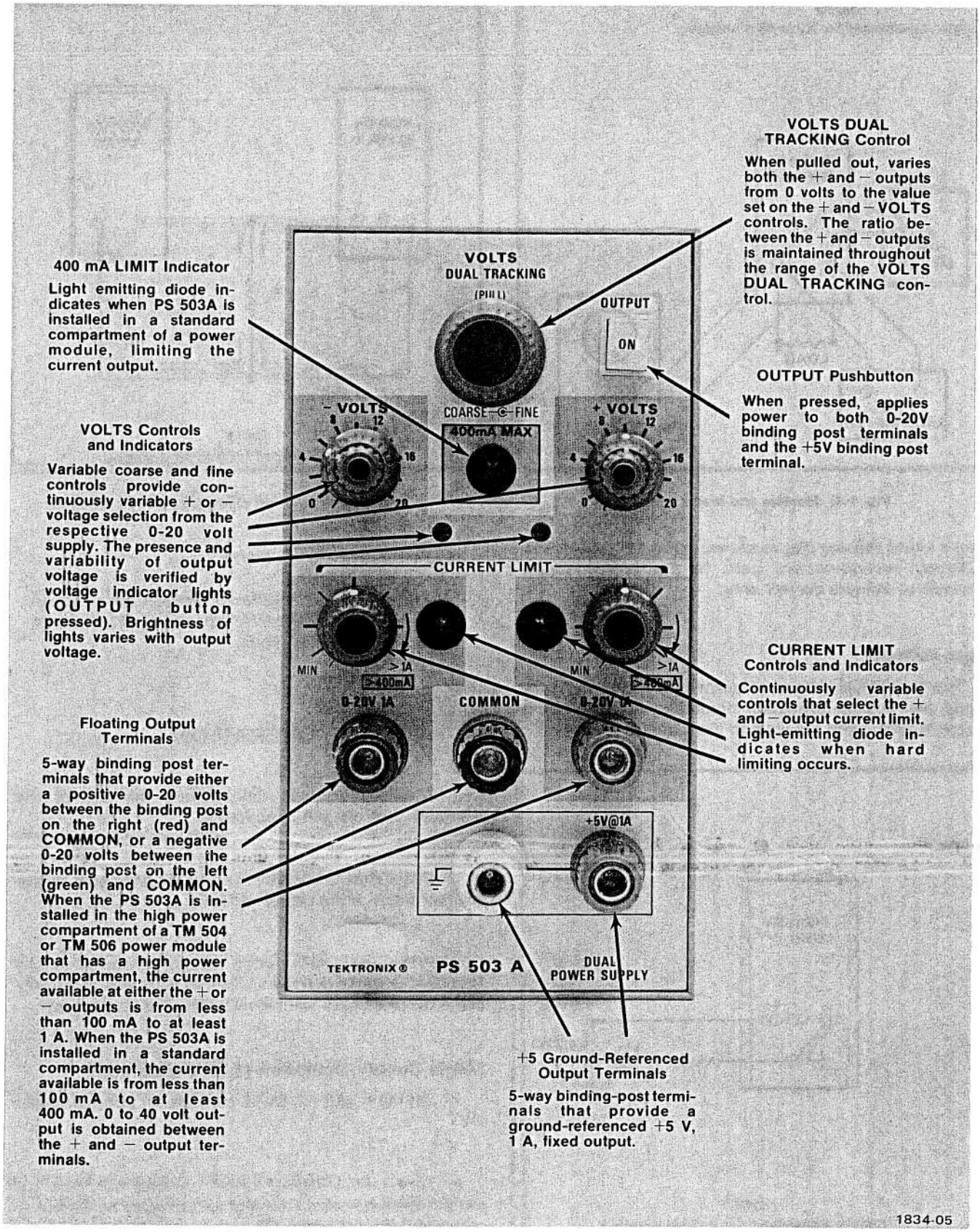
Improper connections between the power-supply output and the load(s) or monitoring device(s) are a common cause of errors. Multiple loads or monitoring devices must be connected directly to the output terminals with separate pairs of leads as shown in Fig. 1-4. Avoid using clip leads, since their contact resistance can exceed the output impedance of the PS 503A and cause significant measurement error.

Grounded and Floating Operation

The PS 503A is a + and −20 V "floating" supply since no internal connections are made to either the chassis or ground. The supply can thus be used as a positive or negative supply by simply connecting between the common and the negative or positive output terminal. However, there may be undesirable effects caused by grounding the supply to the chassis while the load is grounded at some point removed from the supply chassis. For example, if a remote load is connected as shown in Fig. 1-5, ground currents containing the power-line frequency could result and create excessive noise and ripple in series with the load. Thus, floating operation is recommended to ensure against problems caused by undersirable ground currents.

Reverse Current Loading

In some bias supply and digital circuitry applications the load might behave as a current source for part of its operating cycle. Since the output circuit of a series-regulated supply is unidirectional, current will not pass in the opposite direction except through undesirable paths. The internal reverse-current diodes conduct only when the PS 503A terminal voltage reverses and therefore will not work when the voltage is correctly polarized. Connec-



400 mA LIMIT Indicator

Light emitting diode indicates when PS 503A is installed in a standard compartment of a power module, limiting the current output.

VOLTS Controls and Indicators

Variable coarse and fine controls provide continuously variable + or – voltage selection from the respective 0-20 volt supply. The presence and variability of output voltage is verified by voltage indicator lights (OUTPUT button pressed). Brightness of lights varies with output voltage.

Floating Output Terminals

5-way binding post terminals that provide either a positive 0-20 volts between the binding post on the right (red) and COMMON, or a negative 0-20 volts between the binding post on the left (green) and COMMON. When the PS 503A is installed in the high power compartment of a TM 504 or TM 506 power module that has a high power compartment, the current available at either the + or – outputs is from less than 100 mA to at least 1 A. When the PS 503A is installed in a standard compartment, the current available is from less than 100 mA to at least 400 mA. 0 to 40 volt output is obtained between the + and – output terminals.

VOLTS DUAL TRACKING Control

When pulled out, varies both the + and – outputs from 0 volts to the value set on the + and – VOLTS controls. The ratio between the + and – outputs is maintained throughout the range of the VOLTS DUAL TRACKING control.

OUTPUT Pushbutton

When pressed, applies power to both 0-20V binding post terminals and the +5V binding post terminal.

CURRENT LIMIT Controls and Indicators

Continuously variable controls that select the + and – output current limit. Light-emitting diode indicates when hard limiting occurs.

+5 Ground-Referenced Output Terminals

5-way binding-post terminals that provide a ground-referenced +5 V, 1 A, fixed output.

Fig. 1-3. PS 503A controls and connectors.

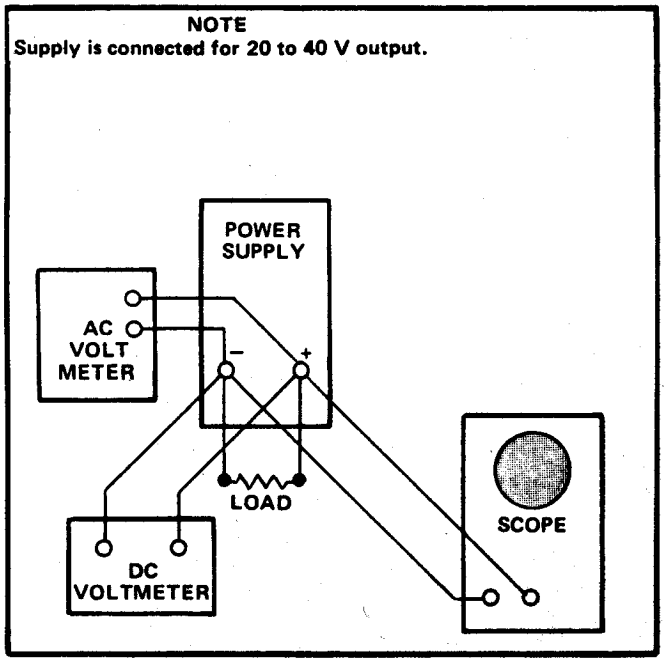


Fig. 1-4. Monitor and load connections.

ting a shunt resistor (R_S) as shown in Fig.1-6 provides an external, reverse-current path to the power supply sources or delivers current only.

Over-voltage

The PS 503A is protected from over-voltage conditions by an over-voltage protection circuit that shuts down the power supply when the voltage rises to about 26 V dc.

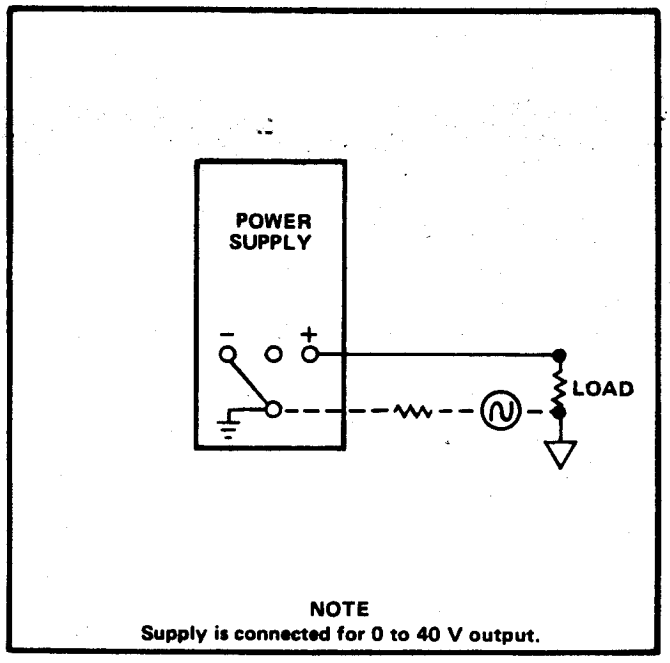


Fig. 1-5. Ground loop created by grounded remote lead.

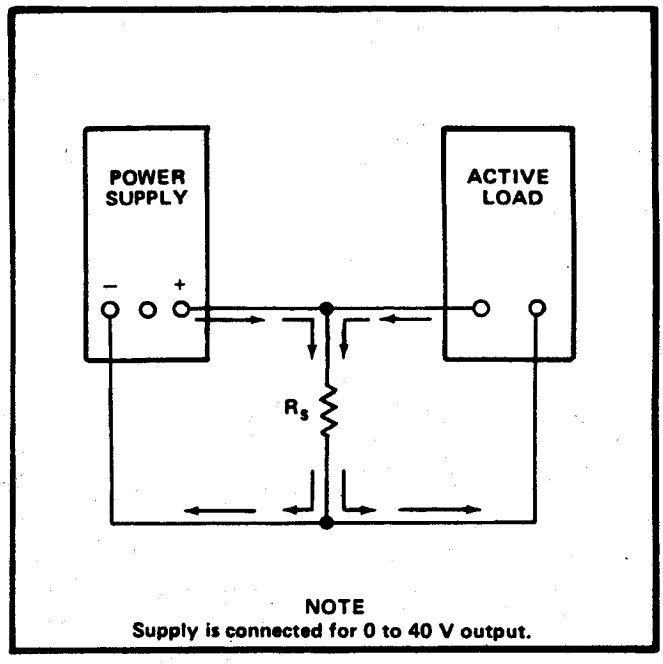


Fig. 1-6. Reverse current shunt (R_S) with active load.

NOTE

The point at which the overvoltage protection blows the fuse may be changed for specific applications by changing the Zener diode.

OPERATION

The following steps demonstrate the use of the PS 503A controls and connectors.

1. Install the PS 503A into (preferably) the high-power compartment of the power module.

2. Press the OUT button to apply power to the PS 503A. Observe that the + and − VOLTS indicator lights come on (the lights will be very dim at low voltages).

Single Supply Operation (±20 V Maximum)

1. Set the + and − VOLTS controls for approximately 2 V.

2. Turn the CURRENT LIMIT controls fully ccw (to protect the ammeter). Connect an ammeter between the common terminal and the + or − terminal and adjust the appropriate CURRENT LIMIT control for the maximum desired current output.

3. Remove the ammeter. Connect the load between the common terminal and the + or − terminal. Adjust the + or − VOLTS control for the desired output.

Combined Supply Operation (40 V Maximum)

1. Set the + and − VOLTS control for approximately 2 V and turn the CURRENT LIMIT controls fully ccw (to protect the ammeter).

2. Connect an ammeter between the + and − terminals. First adjust one CURRENT LIMIT control for the maximum desired current output; then adjust the other CURRENT LIMIT control until the CURRENT LIMIT indicator just reaches maximum brightness, i.e., both supplies at the same CURRENT LIMIT setting.

3. Remove the ammeter. Connect the load between the + and − terminals and set the + and − VOLTS controls so that both settings added together equal the desired output voltage. (See Dual-Tracking Operation for varying the output with the VOLTS DUAL TRACKING control.)

Dual-Tracking Operation

When pulled out, the VOLTS DUAL TRACKING control varies the output of both supplies at a constant ratio from zero to the value set on the + and − VOLTS controls. For example, if the + and − VOLTS controls are set for maximum output (approximately 20 V), both outputs can be varied from zero to 20 V with the VOLTS DUAL TRACKING control (1:1 ratio). Likewise, if one supply is set for 10 V and the other for 20 V, each 1 V change in the 10 V output will be matched by a 2 V change in the 20 V output (2:1 ratio).

Note also that no matter where the VOLTS DUAL TRACKING control is set, the outputs will return to the voltage selected by the + and − VOLTS control when the VOLTS DUAL TRACKING control is pushed in. Therefore, rapid selection of two preset outputs from each supply is achieved by merely switching the VOLTS DUAL TRACKING control in or out.

When the + and − supplies are connected as described under Combined Supply Operation, the VOLTS DUAL TRACKING control will vary the output from zero to the value selected by the + and − VOLTS controls added together.

Stair-Step Operation

The PS 503A can be operated to provide a "stair-step" output characteristic by choosing certain load limits and control settings. For example, Fig. 1-7 shows the stair-step output from the PS 503A when a variable load (R_L) is connected between the + and − output terminals. With each supply set for maximum voltage and current (40 V, 1 A) the output voltage remains constant from open circuit until the load reaches approximately 40 Ω as illustrated by the solid line in Fig. 1-7. At this crossover point, the output voltage decreases with the load and the output current is limited at 1 A. Therefore, below approximately 40 Ω, both supplies act as current sources with output voltage variable with the load. Since both supplies are set for the same output voltage, each supply shares equally in the power output I^2R. If one supply is set for a lower output voltage than the other, output power is shared at the same ratio as the output voltage.

Now, by setting supply E_2 for a current limit of 0.5 A and varying the load over the same range, the supplies act as constant-voltage sources until the load reaches approximately 80 Ω. At that crossover point, the supply set for 0.5 A (E_2) becomes a current source and its output

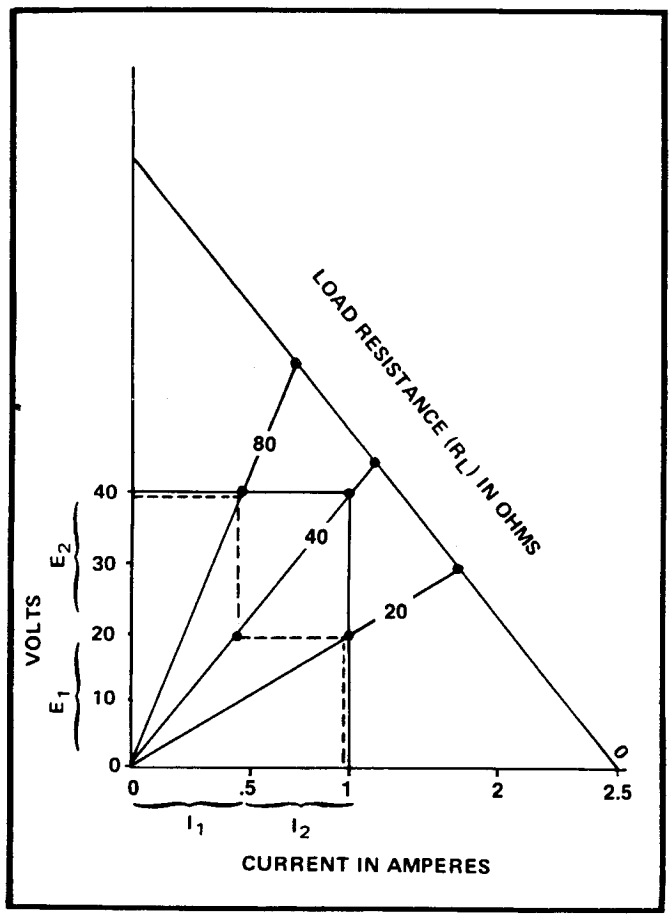


Fig. 1-7. Output characteristics with various currents, voltages, and loads.

voltage decreases with the load. At approximately 40 Ω and 20 V, supply E_2 no longer contributes to the power output. Subsequently, supply E_1 supplies all the output power and operates as a constant-voltage source with output current variable with the load. Then, at approximately 20 Ω, supply E_1 crosses over and becomes a current source at its maximum output of 1 A. Thus, by choosing the appropriate load limits and control settings, any of the four operating characteristics is possible.

A second stair-step output can be preselected and switched in or out with the VOLTS DUAL TRACKING control (see Dual-Tracking Operation for details on the function of the VOLTS DUAL TRACKING control).

Series-Connected Supplies

The outputs of two or more PS 503A's can be connected in series as shown in Fig. 1-8 to obtain an output voltage equal to the sum of the output voltages from each supply. Each supply must be adjusted individually to obtain the desired output voltage (see Dual-Tracking Operation for varying the output of both supplies with the VOLTS DUAL TRACKING control).

NOTE

The PS 503A has internal diodes connected across the output to protect the series-connected supplies against reverse polarity if the load is shorted, or one of the supplies is not on.

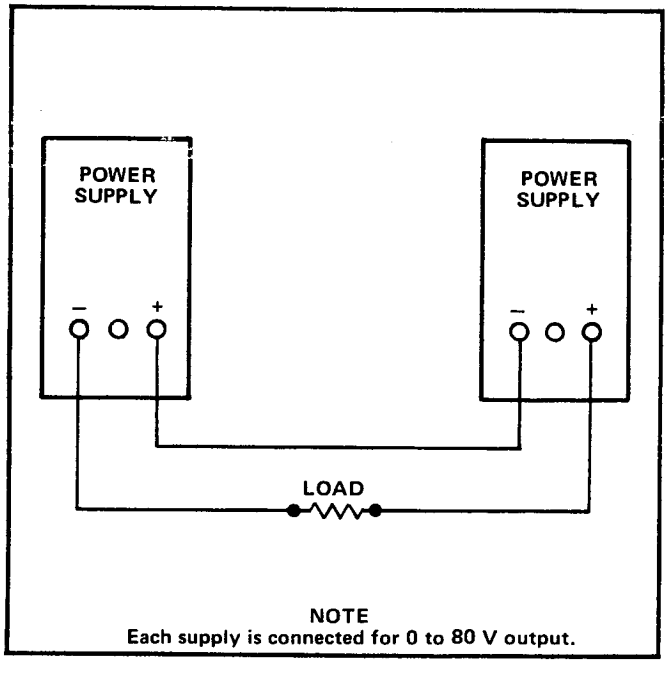


Fig. 1-8. Supplies series-connected.

Parallel-Connected Supplies

CAUTION

Parallel operation is not recommended unless a forward biased diode capable of handling the required current and voltage is inserted between each power supply and the load. Failure to do this may cause power supply damage.

The outputs of two or more PS 503's can be connected in parallel as shown in Fig. 1-9 to obtain an output current equal to the sum of the output currents from each supply. Each supply must be adjusted individually to obtain the desired output current.

NOTE

The + and − supplies are internally connected in series. Therefore, the + and − supplies cannot be externally connected in parallel to obtain an output current equal to the sum of the currents from each supply.

One supply should be set for the desired output voltage and the other for a slightly higher voltage. The supply set for the desired voltage will then become a constant voltage source, while the supply with the higher voltage output becomes a current source (due to automatic crossover), which results in their output voltage decreasing to that of the supply with the lowest output voltage.

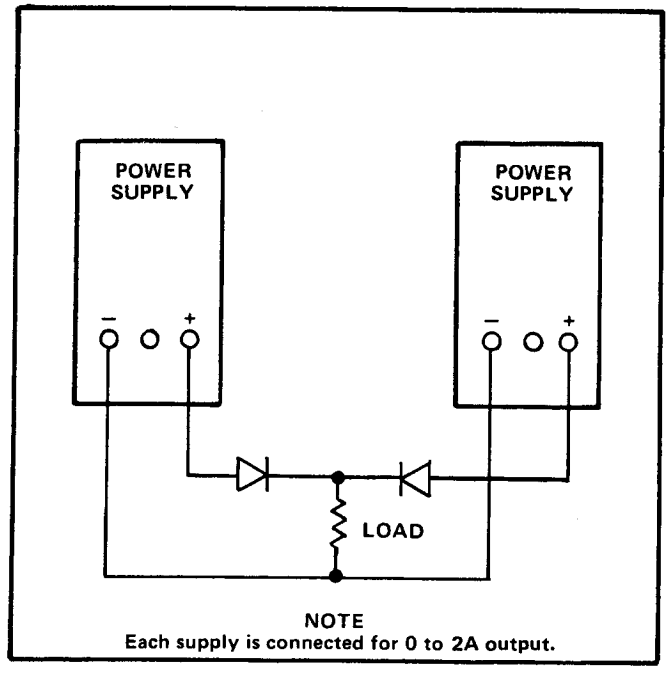


Fig. 1-9. Supplies parallel-connected.

SPECIFICATION AND PERFORMANCE CHECK

SPECIFICATION

Performance Conditions

The electrical characteristics are valid only if the PS 503A 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 noted.

Items listed in the Performance Requirements column are verified by completing the Performance Check in this manual. Items listed in the Supplemental Information column are not verified in this manual; they are either explanatory notes or performance characteristics for which no limits are specified.

Table 2-1

ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirements	Supplemental Information
	Plus and Minus 20 V Floating Supplies	
Voltage Outputs		0 V (±100 mV) to at least 20 V dc (20.1, −.1, +.4 V dc) with respect to common terminal, or 0 V to at least 40 V dc across the plus and minus terminals. Outputs either independently variable or both variable at a constant ratio of a common control (Dual Tracking).
Variable Current Limiting	Less than 100 mA to at least 1A when installed in a high-power compartment. Less than 100 mA to at least 400 mA when installed in a low power compartment.	Maximum limit; 1.5 A Maximum limit; 600 mA
Minimum Resolution		50 mV

Table 2-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
Load Regulation	Within 3 mV with a 1 A load change.	Within 1 mV with a 400 mA load change.
Transient Recover		≤20 μs for a constant voltage to recover within 20 mV for a nominal output voltage after a 400 mA change in output current.
Line Regulation	Within 5 mV for a ±10% line voltage change.	
Ripple and Noise (2 Hz to 2 MHz instrument not in current limiting.)	3 mV peak-to-peak or less with a 1 A load.	1 mV peak-to-peak or less with a 400 mA load (noise and ripple increase unpredictably when current is being limited).
Temperature Coefficent		0.025%/°C or less.
Stability		0.1% +5 mV (or less) of drift in 8 hours. Line voltage, load and temperature held constant.
Supply Isolation from Ground		350 V (dc + peak ac).
Dual Tracking Mode Offset Error	If the two supplies are set independently to any given voltage ratio, and if both supplies are then monitored and varied a given amount (by using the VOLTS DUAL TRACKING control), the two supplies will maintain the same voltage ratio as initially set within 50 mV; until one supply reaches either 0 V or 20 V.	
+5 V Ground Reference Supply		
Output	4.75 V dc to 5.25 V dc with a 5 ohm load.	Measured at a temperature between +20°C and +30°C.
Load Regulation	Within 100 mV with a 1 A load change.	
Line Regulation	Within 50 mV for a ±10% line voltage change.	Measured at a temperature between +20°C and +30°C.
Ripple and Noise (2 Hz to 2 MHz)	5 mV peak-to-peak or less with a 1 A load.	
Long Term Stability		0.5% or less of drift.
Overload Protection		Fixed (automatic) current limiting and over-temperature shutdown.

Table 2-2

ENVIRONMENTAL

Characteristics	Performance Requirements	Supplemental Information
Temperature		
Operating	0° C to +50° C.	
Storage	−40° C to +75° C.	
Altitude		
Operating	To 15,000 feet.	
Storage	To 50,000 feet.	
Vibration		
Operating and Non-Operating	With the instruments complete and operating, vibration frequency swept from 10 to 50 to 10 Hz at 1 minute per sweep. Vibrate 15 minutes in each of the three major axes at 0.015" total displacement. Hold 3 minutes at any major resonance, or if none, at 50 Hz. Total time, 54 minutes.	
Shock		
Operating and Non-Operating	30 g's, 1/2 sine, 11 ms duration, 2 shocks in each direction along 3 major axes, for a total of 12 shocks.	

Table 2-3

PHYSICAL

Characteristic	Information
Overall Dimensions (measured at maximum points)	
Height	5.0 inches 12.7 cm
Width	2.6 inches 6.6 cm
Length	11.75 inches 29.7 cm
Net Weight (Instrument only)	1 lb 13 oz 821 grams

PERFORMANCE CHECK

Introduction

This procedure checks the electrical characteristics of the PS 503A that appear in the Specification portion of this section. Limits and tolerances given in the Supplemental Information column are provided for user and service information only, and should not be interpreted as requirements for this Performance Check.

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

Limits and tolerances given in this Performance Check are for the instrument under test and do not include test equipment error. Limits and tolerances in this procedure are instrument performance requirements only if stated as such in the Specification portion of this section.

Test Equipment Required

The following test equipment, or equivalent, is required to perform the performance check and adjustment procedure. 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 tolerance.

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	Performance Requirements	Application	Example
Oscilloscope	Bandwidth, dc to 2 MHz; minimum deflection factor, 1 mV/div; sweep rate, 10 ms/div to 1 μs/div.	Used throughout procedure to provide display.	Tektronix 5110, 5B10N Oscilloscope System.
Digital voltmeter	Range, zero to 1000 volts; accuracy, within 0.1%.	Voltage measurements.	Tektronix DM 501 Digital Multimeter.*
Power Module	Four compartments or more, with one high-power compartment.	All tests.	Tektronix TM 504 or TM 506.
Autotransformer with ac voltmeter	Capable of supplying an output voltage from 90 to 132 volts, ac; 120 W of power at the upper limits.	Regulation and ripple checks.	General Radio W10MTR3W Variac Autotransformer.
Coaxial cable	Impedance, 50 Ω; length, 42 inches; connectors, bnc.	Provides signal interconnection.	Tektronix Part No. 012-0057-01.
Patch cord (2 required)	Banana-plug-jack to banana-plug-jack; length, 18 inches.	Provides signal interconnection.	Tektronix Part No. 012-0031-00 (black), 012-0039-00 (red).

Table 2-4 (cont)

Description	Performance Requirements	Application	Example
Adapter	Bnc female to dual-banana plugs.	Provides signal interconnection.	Tektronix Part No. 103-0090-00.
Load resistor	20 Ω, 20 W, 5%, (two 10 Ω, 10 W in series).	Load tests.	Tektronix Part No. 308-0246-00.
Load resistor	5 Ω, 5 W, 5%.	Load tests.	Tektronix Part No. 308-0179-00.
Resistor (2 required)	4.99 kΩ, 1/2 W, 1% or better.	Dual tracking detector test.	Tektronix Part No. 323-0260-00.
1X passive probe	Compatible with 5A-series amplifiers used in oscilloscope.	Provides signal interconnection.	Tektronix P6028 Probe.

*Requires TM 500-Series Power Module.

Preliminary Procedure

1. Ensure that all test equipment and the PS 503A under test are suitably adapted to the line voltage to be applied. Refer to the installation section of the power module manual.

2. Be certain that the POWER switch on the power module is off and that the OUTPUT pushbutton on the PS 503A is in the out position.

3. Install the PS 503A in the far right (high power) compartment of the power module.

4. Connect the power module to the autotransformer and connect the autotransformer to the line voltage source. Set the autotransformer voltage output control for zero volt output.

5. Set all front-panel controls on the PS 503A fully counterclockwise (ccw). Apply power to the power module and press in the OUTPUT pushbutton on the PS 503A. Push the PS 503A VOLTS DUAL TRACKING control in.

6. Adjust the autotransformer to the nominal line voltage and check that the two VOLTS indicator lights on the PS 503A are on.

7. Set the vertical deflection factor for 1 mV/div and sweep rate for 5 ms/div on the test oscilloscope. Use ac coupling for the vertical amplifier unit during this procedure.

8. Connect all test equipment to a suitable line voltage source.

9. Turn on all test equipment and allow at least twenty minutes for the equipment to warm-up and stabilize.

NOTE

During warm-up time, attach banana pins to the leads of the 20 Ω and 5 Ω load resistors so that they can be inserted in the holes of the dual-banana adapter. This allows the load resistors to be connected as close as possible to the output terminals on the PS 503A so contact resistance is kept to a minimum.

Performance Check Procedure

1. Check 0-20 Volt Output Voltage

a. Check that all controls on the PS 503A front panel are fully ccw and that the 400 mA MAX indicator light is off (this light should remain off as long as the PS 503A is installed in the high-power compartment of the power module). Also check that both CURRENT LIMIT indicator lights are off. (For instruments SN B022064-below, these lights may be on; if so, adjust the appropriate CURRENT LIMIT control cw just enough to turn them off).

b. Set the digital voltmeter to the 2 volts dc range. Use patch cords to connect the +20 V floating output terminals of the PS 503A to the digital voltmeter input terminals; connect the red patch cord from the 0–20V red binding post to the digital voltmeter high input terminal, and the black patch cord from the COMMON (black) binding post to the digital voltmeter low input terminal.

c. Check that the PS 503A + VOLTS controls are fully ccw and check for a meter reading of .0000, within ±100 mV.

d. Set the digital voltmeter to the 200 volts dc range and set the PS 503A + VOLTS controls fully cw.

e. Check—for a meter reading of at least +20.1 volts, but less than +20.4 volts.

f. Adjust the PS 503A + VOLTS controls fully ccw and move the red patch cord from the 0–20V red binding post to the 0–20V green binding post on the PS 503A.

g. Repeat parts 1c through 1e, using the PS 503A − VOLTS controls to check the −20 V supply.

h. Set the PS 503A − VOLTS controls fully ccw and move the red patch cord back to the 0–20V red binding post on the PS 503A. Check to be certain that all PS 503A front-panel controls are fully ccw.

2. Check Variable Current Limiting

a. Adjust the PS 503A + VOLTS controls for +5.0 V output. Move the red patch cord to the PS 503A 0–20V green binding post and adjust the PS 503A − VOLTS controls for −5.0 V output. Move the red patch cord back to the PS 503A 0–20V red binding post.

b. Disconnect the red patch cord from the digital voltmeter high input terminal and set the digital voltmeter to the 2000 mA dc range. Reconnect the red patch cord to the digital voltmeter high input terminal.

c. Check—for a current reading of less than 100 mA for the +20 V supply. The PS 503A + CURRENT LIMIT light should be on.

d. Move the red patch cord from the PS 503A 0–20V red binding post to the PS 503A 0–20V green binding post.

e. Check—for a current reading of less than 100 mA for the −20 V supply. The PS 503A − CURRENT LIMIT light should be on.

f. Rotate the PS 503A − CURRENT LIMIT control fully cw.

g. Check—for a current reading of more than 1000 mA, but less than 1500 mA for the −20 V supply.

h. Reconnect the red patch cord to the PS 503A 0–20V red binding post and rotate the PS 503A + CURRENT LIMIT control fully cw.

i. Check—for a current reading of more than 1000 mA, but less than 1500 mA for the +20 V supply.

j. Set all controls on the PS 503A front panel fully ccw and retain the digital voltmeter connections to the PS 503A.

3. Check Load Regulation

a. Disconnect the red patch cord from the digital voltmeter input terminal and set the digital voltmeter to the 20 volts dc range. Reconnect the red patch cord to the digital voltmeter high input terminal; the meter reading should indicate approximately zero volts. Both CURRENT LIMIT lights on the PS 503A front panel should be off and remain off during the load regulation check.

b. Rotate the CURRENT LIMIT control on the PS 503A fully cw.

@

c. Adjust the PS 503A + VOLTS fine and coarse controls for a meter reading between +19.900 and +19.980 volts. Note and record the exact open-circuit voltage reading before applying the adapter (with load resistor attached) in part d of this step.

d. Insert the leads of the 20 Ω, 5% resistor into the holes of a dual-banana plug adapter and connect the adapter to the patch cord jacks, which remain connected to the PS 503A 0–20V red and the COMMON binding post terminals. Observe correct polarity for the adapter (GND to COMMON).

e. CHECK—that the meter reading does not change more than 3 mV (three counts of the most right-hand digit).

NOTE

If the reading on the digital voltmeter changes by more than 3 mV, another 20 Ω, load resistor having a resistance value closer to 20 Ω should be used, or the voltage output from the PS 503A can be reduced to +19.000 (step 3c).

f. Remove the adapter (with load resistor) from the PS 503A patch cord jacks. Move the red patch cord to the 0–20V green binding post terminal.

g. Adjust the PS 503A – VOLTS fine and coarse controls for a meter reading between –19.900 and –19.980 volts. Note and record the exact open-circuit voltage reading before applying the adapter (with load resistor attached) in part h of this step.

h. Insert the leads of the 20 Ω, 5% resistor into the holes of a dual-banana adapter and connect the adapter to the patch cord jacks, which remain connected to the PS 503A 0–20V green and the COMMON binding post terminals. Observe correct polarity for the adapter (GND to COMMON).

i. Check—that the meter reading does not change more than 3 mV (three counts of the most right-hand digit).

4. Check Line Regulation

a. Note the exact voltage reading displayed on the digital voltmeter with the adapter and load resistor still attached to the PS 503A 0–20V green and COMMON binding post terminals (–19.900 to –19.980 volts).

b. Adjust the autotransformer 10% below and 10% above the nominal line voltage setting.

c. Check—that the voltage reading displayed on the digital voltmeter does not change more than ±5 mV (5 counts) for each 10% line voltage change. Readjust the autotransformer to the nominal line voltage.

d. Remove the adapter (with load resistor) from the patch cord jacks. Move the red patch cord to the 0–20V red binding post terminal. Reconnect the adapter (with load resistor) to the patch cord jacks. Observe correct polarity for the adapter (GND to COMMON).

e. Note the exact voltage reading displayed on the digital voltmeter with the adapter and load resistor still attached to the 0–20V red and COMMON binding post terminals (+19.900 to +19.980 volts).

f. Adjust the autotransformer 10% below and 10% above the nominal line voltage setting.

g. Check—that the voltage reading displayed on the digital voltmeter does not change more than ±5 mV (5 counts) for each 10% line voltage change. Readjust the autotransformer to the nominal line voltage.

5. Check Ripple and Noise

a. Disconnect the patch cords from the PS 503A 0–20V red and COMMON binding post terminals and reconnect the dual-banana adapter (with load resistor) directly to the 0–20V red and COMMON binding post terminals; observe correct polarity of the adapter (GND to COMMON).

b. Connect the output of the adapter to the vertical input of the oscilloscope, using a 42-inch bnc cable. Set the oscilloscope vertical deflection factor for 1 mV/div (calibrated).

c. Slowly adjust the autotransformer output voltage 10% below and then 10% above the nominal line voltage.

d. Check—the signal display on the oscillosocpe for less than 3 mV peak-to-peak (within three vertical divisions) at all points of the specified voltage limits.

e. Readjust the autotransformer to the nominal line voltage.

f. Connect the adapter (with load resistor attached) to the PS 503A 0–20V green and COMMON binding post terminals; observe correct polarity of the adapter (GND to COMMON).

g. Repeat steps 5c through 5e to check the ripple and noise of the PS 503A −20 V supply.

h. Readjust the autotransformer to the nominal line voltage and disconnect all connections from the PS 503A.

6. Check Dual Tracking Mode Offset Error

a. Pull out the PS 503A VOLTS DUAL TRACKING control and set it fully ccw to ensure minimum output voltage while connecting the resistors.

b. Connect the two 4.99 kΩ, 1% resistors in series between the PS 503A 0–20V green and 0–20V red binding post terminals. Do not connect the junction of the two resistors to the COMMON terminal or the chassis.

c. Connect the black patch cord from the digital voltmeter low terminal to the PS 503A COMMON binding post, and the red patch cord from the digital voltmeter high terminal to the PS 503A 0–20V red binding post.

d. Set the PS 503A VOLTS DUAL TRACKING control fully cw and adjust the PS 503A + VOLTS controls for a meter reading of +18 V, ±0.1 volt.

e. Connect the red patch cord to the 0–20V green binding post and adjust the PS 503A − VOLTS controls for a meter reading of −18 V, ±0.1 volt.

f. Disconnect the red patch cord from the 0–20V green binding post and connect it to the junction of the two 4.99 kΩ, 1% resistors. Check that the digital voltmeter indicates a dc voltage less than 1 V.

g. Set the digital voltmeter to the 2-volts dc range and adjust either the + VOLTS or − VOLTS controls on the PS 503A to obtain a meter reading of 0 V dc (±100 mV).

h. Adjust the PS 503A VOLTS DUAL TRACKING control slowly from cw to ccw.

i. Check—that the meter reading remains within ±25 mV of zero volts.

j. Set the PS 503A VOLTS DUAL TRACKING control fully ccw and push the control knob in. Disconnect both patch cords and the two resistors from the binding post terminals.

7. Check +5 Volt Output Voltage

a. Connect the digital voltmeter between the +5V@1A ground referenced red binding post and the ground white binding post.

b. Push in the OUTPUT button and check that the two VOLTS indicator lights are on.

c. Check—for a meter reading of +4.75 to +5.25 volts.

d. Connect a 5 Ω, resistor between the +5V@1A ground referenced red binding post and the ground (white) binding post.

e. Check—that the meter reading does not change by more than 100 mV.

8. Check +5 Volt Output Voltage Regulation

a. Adjust the autotransformer output voltage from the low limit to the high limit as indicated in Table 2-5.

b. Check—that the digital voltmeter reading does not change more than 50 mV for a plus 10% or minus 10% line voltage change.

c. Disconnect the digital voltmeter.

d. Connect the probe of the test oscilloscope between the +5V binding post and the ground (white) binding post.

e. Adjust the autotransformer output voltage from the low limit to the high limit as indicated in Table 2-5.

f. Check—the test oscilloscope display for not more than 5 mV peak-to-peak ripple and noise.

g. Return the autotransformer to the nominal line voltage setting.

h. Disconnect the test oscilloscope probe from the binding posts.

i. Press and release the PS 503A OUTPUT button to turn off the power to the PS 503A.

Table 2-5

POWER MODULE UNIVERSAL TRANSFORMER

Line Selector Block Position	Regulating Ranges	
	110-Volts Nominal	220-Volts Nominal
L	90 VAC to 110 VAC	180 VAC to 220 VAC
M	99 VAC to 121 VAC	198 VAC to 242 VAC
H	108 VAC to 132 VAC	216 VAC to 264 VAC
Line Fuse Data	1.6 A slow-blow	0.8 A slow-blow

9. Check Variable Current Limiting

a. Turn the power off to the TM 500 Series Power Module and remove the PS 503A from the high-power compartment and install the PS 503A in the low-power compartment.

b. Turn on the power to the power module and press the PS 503A OUTPUT button in. Set all front panel controls fully ccw and allow approximately three minutes for the equipment to stabilize.

c. Check—that the 400 mA MAX indicator light is on.

d. Adjust the PS 503A + VOLTS and − VOLTS coarse controls to the 4 V position (leave the fine controls fully ccw).

e. Set the digital voltmeter to the 2000 mA position and connect the black patch cord from the digital voltmeter low terminal to the PS 503A COMMON binding post and the red patch cord from the digital voltmeter high terminal to the PS 503A 0−20V red binding post.

f. Set the PS 503A + and − CURRENT LIMIT controls fully cw.

g. Check—that the digital voltmeter indicates a current reading of more than 400 mA, but less than 600 mA. The + CURRENT LIMIT light should be on.

h. Move the red patch cord from the 0−20V red binding post to the 0−20V green binding post.

i. Check—that the digital voltmeter display indicates a current reading of more than 400 mA, but less than 600 mA. The − CURRENT LIMIT light should be on.

j. Set the PS 503A − CURRENT LIMIT control fully ccw.

k. Check—that the digital voltmeter indicates a current reading of less than 100 mA. The − CURRENT LIMIT light should remain on.

l. Move the red patch cord from the 0−20V green binding post to the 0−20V red binding post and set the PS 503A + CURRENT LIMIT control fully ccw.

m. Check—that the digital voltmeter indicates a current reading of less than 100 mA. The + CURRENT LIMIT light should be on.

n. Turn off all power to the power module. Push and release the PS 503A OUTPUT button and set all other front-panel controls fully ccw.

o. This completes the Performance Check Procedure for the PS 503A.

ADJUSTMENT

Introduction

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

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 2-4 or equivalent, is required for adjustment of the PS 503A. 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 need to be altered to meet the requirements of the equipment used.

Preparation

a Remove the left-hand and right-hand side covers of the PS 503A to gain access to the component side of the circuit boards. Pull the rear end of the side cover outward from the side of the instrument (the cover snaps into place).

b. Install the PS 503A into the far right (high power) power module compartment, or if appropriate, connect the PS 503A to the power module by means of the flexible plug-in extender. If a flexible extender is used, current limiting switch S95 must be engaged in the maximum current (HI) position. See Fig. 3-1 for switch location.

c. Set the power module for the line voltage to be applied (see power module manual) and connect it to the autotransformer, then connect the autotransformer to the line voltage source. Be sure that the power switch is off.

d. Install all TM 500-series equipment, including the PS 503A into the power module.

e. Connect all test equipment to a suitable line voltage source.

f. Turn on all test equipment and allow at least twenty minutes for the equipment to warm-up and stabilize.

g. Set the autotransformer to the nominal line voltage setting.

Initial Control Settings

Set the following controls during warm-up time:

PS 503A Dual Power Supply

− VOLTS (coarse and fine)	fully ccw
+ VOLTS (coarse and fine)	fully cww
CURRENT LIMIT	
Plus supply	fully ccw
Minus supply	fully ccw
VOLTS DUAL TRACKING	pushed in and fully ccw

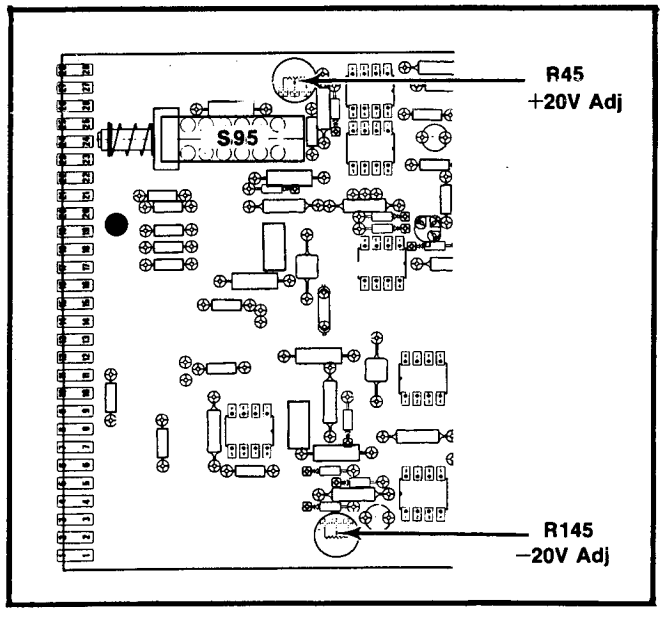


Fig. 3-1. Location of +20 V and −20 V adjustment.

1. Adjust 20 Volt Output Voltages

a. Check—that all controls on the PS 503A front panel are fully ccw and the 400 mA MAX indicator light is off (this light should remain off as long as the PS 503A is installed in the high-power compartment of the power module). Also check that both CURRENT LIMIT indicator lights are off. (For instruments SN B022064-below, these lights may be on; if so, rotate the appropriate CURRENT LIMIT control cw just enough to turn them off).

b. Set the digital voltmeter to the 2 volts dc range and check for a meter reading of zero volts, ±100 mV.

c. Set the digital voltmeter to the 200 volts dc range. Use patch cords to connect the plus 20 V floating output terminals of the PS 503A to the digital voltmeter input terminals; red patch cord from the 0—20V red binding post to the digital voltmeter high input terminal, and the black patch cord from the COMMON (black) binding post to the digital voltmeter low input terminal.

d. Turn the PS 503A + VOLTS fine and coarse controls fully cw.

e. Adjust—R45, +20 Adj, for a meter reading of +20.2 volts, ±0.1 volt. See Fig. 3-1 for adjustment location.

f. Adjust the PS 503A + VOLTS fine and coarse controls fully ccw and move the red patch cord from the 0—20V red binding post to the 0—20V green binding post.

g. Turn the PS 503A − VOLTS fine and coarse controls fully cw.

h. Adjust—R145, −20 Adj, for a meter reading of −20.2 volts, ±0.1 volt. See Fig. 3-1 for adjustment location.

i. Adjust the PS 503A − VOLTS fine and coarse controls fully ccw.

j. This completes the adjustment portion of this procedure. However, to verify satisfactory performance after adjustment, perform the complete Performance Check procedure as specified in Section 2 of this manual.

MAINTENANCE AND INTERFACING INFORMATION

PREVENTIVE MAINTENANCE

There are no special preventive maintenance procedures that apply to the PS 503A. Refer to the power module instruction manual for general preventive maintenance procedures and instructions.

CORRECTIVE MAINTENANCE

Refer to the power module instruction manual for general corrective maintenance procedures and instructions.

TROUBLESHOOTING

Use the Performance Check, Adjustment Procedure, and Circuit Description as aids to locate trouble in the event of equipment failure. The test equipment listed in the Performance Check and Adjustment Procedures will prove useful in troubleshooting the PS 503A.

FUNCTIONS AVAILABLE AT REAR CONNECTOR

Pins are available at the rear connector for routing signals to and from the PS 503A for specialized applications (see Fig. 4-1, Input-Output Assignments for Plug-In Rear Interface Connector). One or more compartments of a multi-plug-in power module can be wired with barriers installed to provide specific functions between compartments. See power module instruction manual for additional information.

FUNCTION PROGRAMMING OF REAR INTERFACE CONNECTOR

Remote Resistance Program

Remove the jumpers from F - F (+Volts supply) and H - H (−Volts supply). Install jumpers between E - E (+Volts supply) and G - G (−Volts supply).

Connect a 10.0 kΩ, 1% resistor between pins 28A and 28B (+Volts supply) and pins 27A and 27B on the interface connector. Install the PS 503A into a TM 500 Series Power Module. Connect a digital voltmeter between the +20-volt and common output terminals and between the −20-volt and common output terminals. Adjust R45, +Adj and R145, −Adj to obtain a 20 V reading for each supply or the supply being programmed. Turn off the PS 503A and remove the 10.0 kΩ, 1% resistor.

NOTE

Do not turn on the PS 503A without a program resistor connected between pins 28A and 28B (+Volts supply) and pins 27A and 27B (−Volts supply) on the interface connector or the over-voltage protection circuit will cause the fuse to blow.

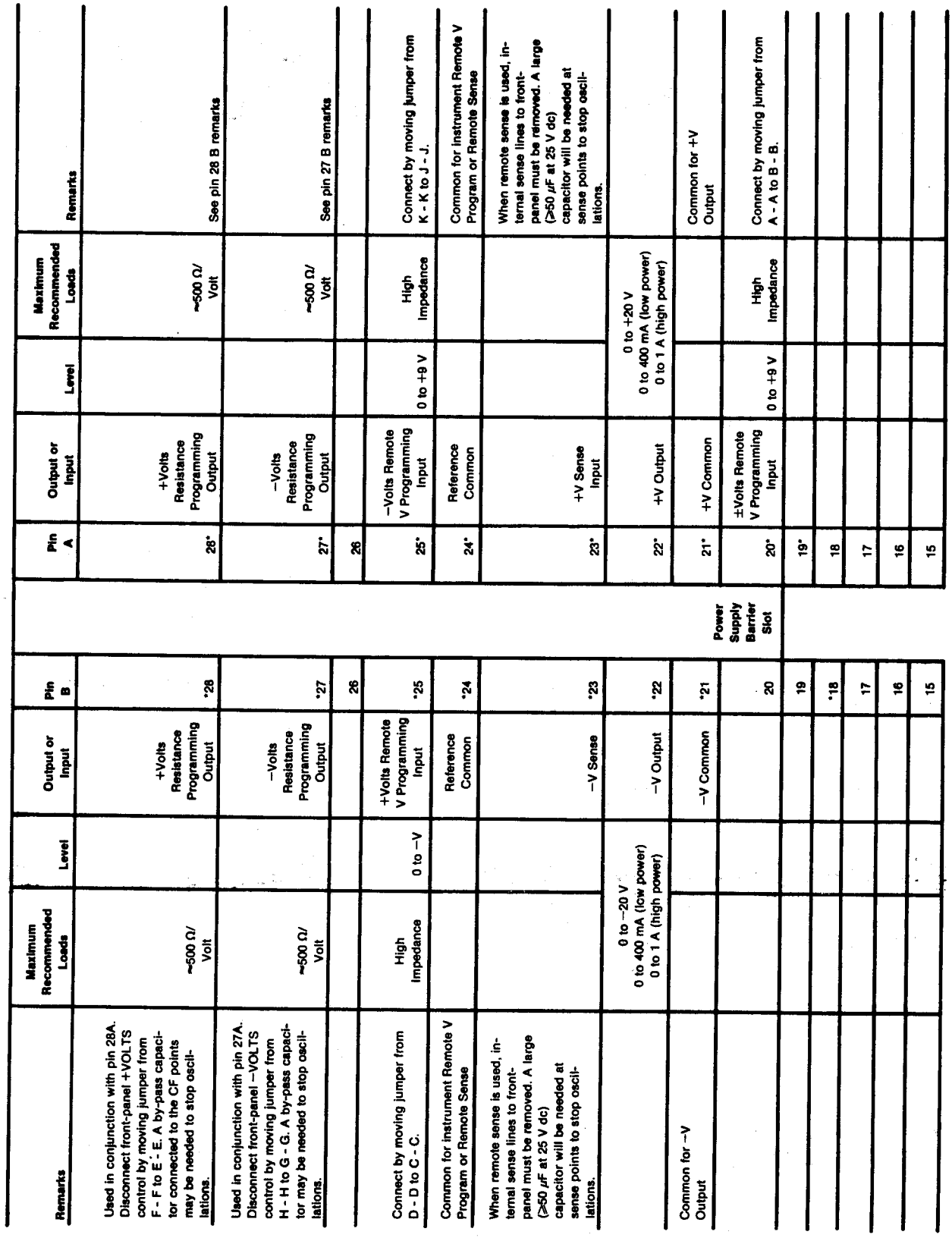
The PS 503A has now been programmed at 500 Ω/volt up to 20 V, i.e., a 1 kΩ change in the program resistor results in a 2 V change in the PS 503A output.

A capacitor connected across the points marked C_F+ or C_F− may be needed to stop oscillations caused by the lead length associated with the program resistor.

Remote Voltage Program

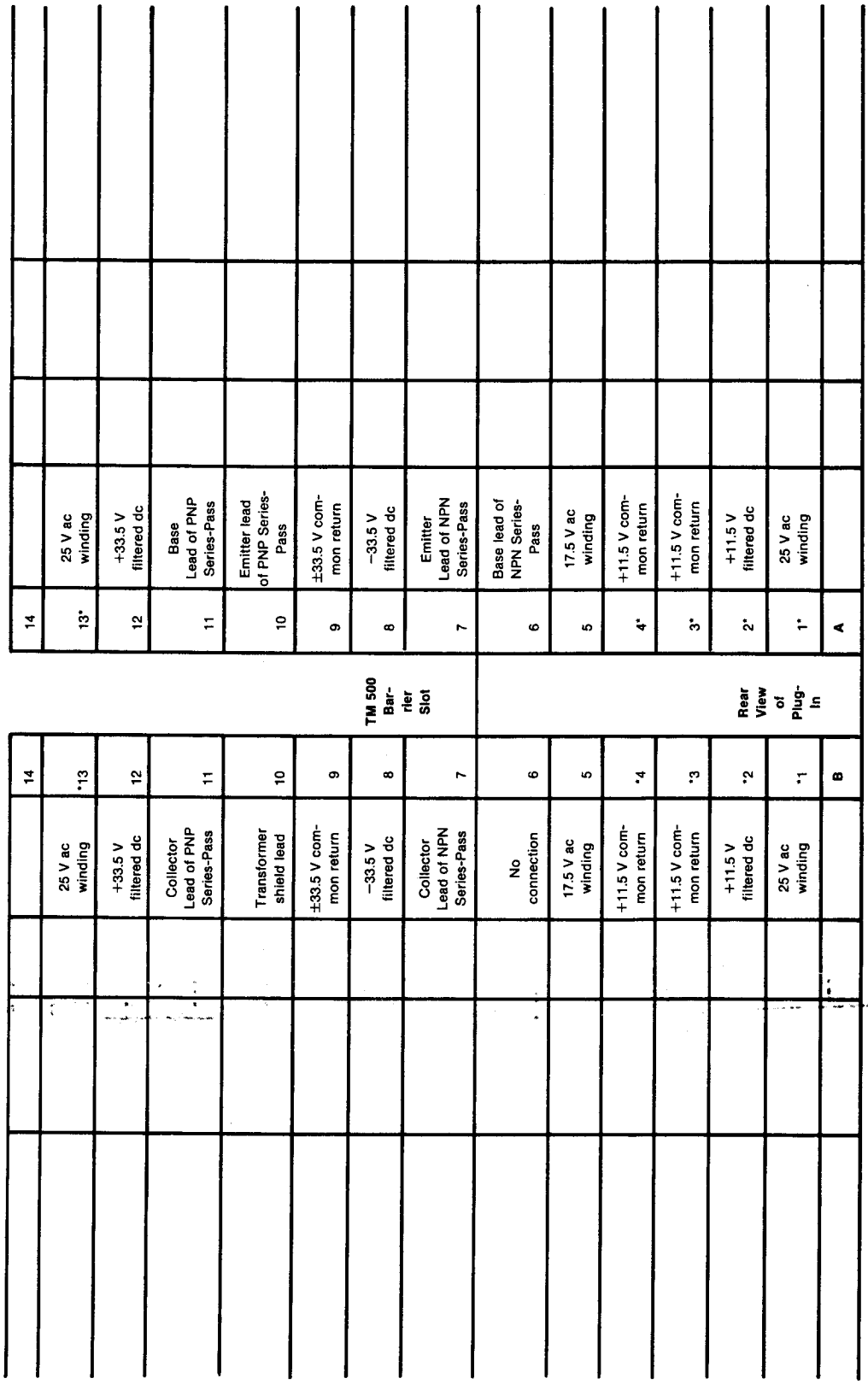
Dual Tracking. Remove the jumper from A - A, then connect a jumper between B - B.

Connect the + lead of the remote voltage to pin 20A and the − lead to pin 24A and 24B on the interface connector. Install the PS 503A into a TM 500 Series Power Module. Connect a digital voltmeter between the +20 V and common output terminals and between the −20 V and common output terminals. Apply 9 V from the remote voltage source to the PS 503A. Adjust R45, +Adj and R145, −Adj to obtain a 20 V reading for each supply.



Remarks	Maximum Recommended Loads	Level	Output or Input	Pin B		Pin A	Output or Input	Level	Maximum Recommended Loads	Remarks
Used in conjunction with pin 28A. Disconnect front-panel +VOLTS control by moving jumper from F - F to E - E. A by-pass capacitor connected to the CF points may be needed to stop oscillations.	~500 Ω/ Volt		+Volts Resistance Programming Output	*28		28*	+Volts Resistance Programming Output		~500 Ω/ Volt	See pin 28 B remarks
Used in conjunction with pin 27A. Disconnect front-panel −VOLTS control by moving jumper from H - H to G - G. A by-pass capacitor may be needed to stop oscillations.	~500 Ω/ Volt		−Volts Resistance Programming Output	*27		27*	−Volts Resistance Programming Output		~500 Ω/ Volt	See pin 27 B remarks
				26		26				
Connect by moving jumper from D - D to C - C.	High Impedance	0 to −V	+Volts Remote V Programming Input	*25		25*	−Volts Remote V Programming Input	0 to +9 V	High Impedance	Connect by moving jumper from K - K to J - J.
Common for instrument Remote V Program or Remote Sense			Reference Common	*24		24*	Reference Common			Common for instrument Remote V Program or Remote Sense
When remote sense is used, internal sense lines to front-panel must be removed. A large (≥50 μF at 25 V dc) capacitor will be needed at sense points to stop oscillations.			−V Sense	*23		23*	+V Sense Input			When remote sense is used, internal sense lines to front-panel must be removed. A large (≥50 μF at 25 V dc) capacitor will be needed at sense points to stop oscillations.
	0 to −20 V 0 to 400 mA (low power) 0 to 1 A (high power)		−V Output	*22		22*	+V Output	0 to +20 V 0 to 400 mA (low power) 0 to 1 A (high power)		
Common for −V Output			−V Common	*21		21*	+V Common			Common for +V Output
				20	Power Supply Barrier Slot	20*	±Volts Remote V Programming Input	0 to +9 V	High Impedance	Connect by moving jumper from A - A to B - B.
				19		19*				
				*18		18				
				17		17				
				16		16				
				15		15				

Fig. 4-1. Input-Output pin assignments for Rear-Interface connector (Rear View).



Assignments listed for pins 1A-13A and 1B-13B are available in all power modules; however only those pins marked with an asterisk (*) are used by the PS 503A.

Fig. 4-1 (cont). Input-Output pin assignments for Rear-Interface connector (Rear View).

The PS 503A has now been programmed so that a 9 V remote input voltage results in a 20 V output. By removing C34 and applying a waveform that varies between 0 and +9 V, both + and − supply outputs will follow the input remote voltage source. The slew rate and accuracy when operated this way is dependent on the load and the change in the output voltage.

Individual Supplies. Remove the jumper from D - D (+Volts supply) and K - K (−Volts supply). Install jumpers between C - C (+Volts supply) and J - J (−Volts supply).

Connect the + lead of the remote voltage to pin 24A or 24B (+Volts supply) or pin 25A (−Volts supply) and the − lead to pin 25B (+Volts supply) or pin 24A or 24B (−Volts supply) on the interface connector. Install the PS 503A into a TM 500 Series Power Module. Connect a digital voltmeter between the +20 V and common output terminals and between the −20 V and common output terminals. Apply 9 V from the remote voltage source to the PS 503A. Adjust R45, +Adj and R145 −Adj to obtain a 20 V reading for each supply or the supply being programmed.

The PS 503A individual supplies have now been programmed so that a 9 V remote input voltage results in a 20 V output. One or both supplies may now be independently swept from 0 to 20 V. The slew rate depends on the load and the change in output voltage.

Remote Output (Remote Sensing)

+Volts Supply. Remove the + sense wire (blk-red wire) from the post of the red-connector and the + sense common wire (wht-red) from the upper front portion of the circuit board. Insulate the bare end of the wire.

Connect the remote load between pin 21A (+Volts supply common) and pin 22A (+Volts supply output) on the interface connector.

Connect interface connector pins 24A and 24B to pin 21A (+Volts supply common) at the remote load connection.

Connect interface connector pin 23A (+Volts supply sense input) to pin 22A (+Volts supply sense output) at the remote load connection.

Install a 50 μF, 25 V dc (minimum rating) capacitor across the remote load. To stop oscillations caused by lead length an additional capacitor may be needed across the point marked C_F+.

−Volts Supply. Remove the − sense wire (blk-vio wire) from the post of the green connector and the − sense common wire (wht-red) from the lower front portion of the circuit board. Insulate the bare ends of the wires.

Connect the remote load between pin 21B (−Volts supply common) and pin 22B (−Volts supply output) on the interface connector.

Connect interface connector pins 24A and 24B to pin 21B (−Volts supply common) at the remote load connection.

Connect interface connector pin 23B (−Volts supply input) to pin 22B (−Volts supply output) at the remote load connection.

Install a 50 μF, 25 V dc (minimum rating) capacitor across the remote load. To stop oscillations caused by lead length an additional capacitor may be needed across the point marked C_F−.

Combined Supplies. Remove the + sense wire (blk-red wire) from the post of the red-connector and the − sense wire (blk-vio wire) from the post of the green connector. Remove from the charcoal gray connector two of the wires. Insulate the bare ends of the wires.

Connect the remote load between pin 22A (+Volts supply output) or pin 22B (−Volts supply output) on the interface connector.

Connect interface connector pins 24A and 24B to both pin 21A (+Volts supply common) and pin 21B (−Volts supply common) at the remote load connection.

Connect interface connector pin 23A (+Volts supply sense input) to pin 22A (+Volts supply sense output) and pin 23B (−Volts supply input) to pin 22B (−Volts supply output) at the remote load connections.

Install a 50 μF, 25 V dc (minimum rating) capacitor across the remote load. To stop oscillations caused by lead length an additional capacitor may be needed across the points marked C_F+ and C_F−.

Dual Operation of +Volts and −Volts Supplies. Remove the + sense wire (blk-red wire) from the post of the red-connector and the − sense wire (blk-vio wire) from the post of the green connector. Remove from the charcoal

gray connector two of the wires. Insulate the bare ends of the wires.

Connect the remote load between pin 21A (+Volts supply common) and pin 22A (+Volts supply output) and between pin 21B (−Volts supply common) and pin 22B (−Volts supply output) on the interface connector.

Connect interface connector pins 24A and 24B to both pin 21A (+Volts supply common) and pin 21B (−Volts supply common) at the remote load connection.

Connect interface connector pin 23A (+Volts supply sense input) to pin 22A (+Volts supply sense output) and pin 23B (−Volts supply input) to pin 22B (−Volts supply output) at the remote load connection.

Install a 50 μF, 25 V dc (minimum rating) capacitor across the remote load. To stop oscillations caused by lead length an additional capacitor may be needed across the points marked C_F+ and C_F-.

REPACKAGING FOR SHIPMENT

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

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

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument, on all sides. Seal carton with shipping tape or industrial stapler.

The carton test strength for your instrument is 200 pounds.

CIRCUIT DESCRIPTION

Introduction

This section of the manual contains a description of the circuitry used in the PS 503A Dual Power Supply. Individual descriptions are separated into the following parts: Dual Tracking, Reference Supply, Automatic Crossover, Constant Voltage/Current Limited Output, Load Regulation, Power Line Regulation, Power Supplies, Over-voltage Protection, and Output Current Selection. Refer to the appropriate diagrams in the Diagrams section of this manual while reading the circuit description.

NOTE

The negative and positive supplies operate identically. The two supplies are internally connected with a common front-panel VOLTS DUAL TRACKING control for varying the output of both supplies at a constant ratio. Therefore, except for Dual Tracking operation, this discussion will cover only the positive supply.

Dual Tracking

When the VOLTS DUAL TRACKING knob is pulled out, S30 disconnects the input to the reference buffers (U35 and U135) from the fixed voltage at the collector of Q30 and connects it to the potentiometer wiper arm of the VOLTS DUAL TRACKING control, R30.

Reference Supply

The reference supply consists of temperature-compensated, constant-current circuit Q30-Q25-VR24. This circuit furnishes constant voltage to voltage-follower buffer U35 and to the current limiting circuitry. Voltage-follower buffer U35 supplies voltage to inverter-follower buffer U135. The U135 buffer then supplies reference voltage to + voltage error amplifier U45. The constant current circuit supplies current to the current-limiting circuitry via Q80.

Automatic Crossover

The positive supply employs two operational amplifiers; U45 and U55. Amplifier U45 controls output voltage, while U55 controls output current. For any value of load resistance, the power supply acts either as a constant-voltage source or a current source—but never both. Automatic crossover is accomplished by combining the outputs from pin 6 of U45 and U55 in a negative-true, "OR" gate configuration (see Fig. 5-1). The amplifier with the lower output voltage at pin 6 causes its associated diode (CR45 or CR48) to conduct, which eventually reverse biases the other diode. A portion of the current available from R87 is then diverted away from the base of Q85 and to the amplifier with the lower output. The remainder of the current drives the base of Q85, which in turn controls the current through the series-pass transistor in the Power Module to the load.

Constant Voltage/Current Limited Output

Output current or voltage varies when an imbalance occurs between the comparison voltage at pin 2 and 3 of either U45 or U55. This imbalance is caused by a change in the load resistance or in the reference voltage selected by CURRENT LIMIT control R70 or by + VOLTS coarse control R50A. Fig. 5-2 illustrates the output characteristics of the power supply with various currents, voltage and loads.

CURRENT LIMIT control R70 establishes the non-inverting reference input to pin 3 of U55, the current-controlling amplifier.

With no load connected to the output terminals, $R = \infty$, $I = 0$ and $E = S_{VL}$, the front-panel voltage limit setting (see Fig. 5-2). When a load is connected to the power supply output terminal, output current increases, which results in an increase in the voltage drop across current-sensing resistor R67. This drop provides the inverting input to pin 2 of U55. If the voltage at pin 2 exceeds the reference voltage at pin 3, then the voltage at pin 6 drops to a level where CR48 turns on and CR45 is reverse biased; thus, control crosses over to U55, the current controlling amplifier. U55 holds the voltage at pin 2 to that set at pin 3 by R70, the CURRENT LIMIT control (S_{CL}). The supply is now in current-limit operation (see Fig. 5-2).

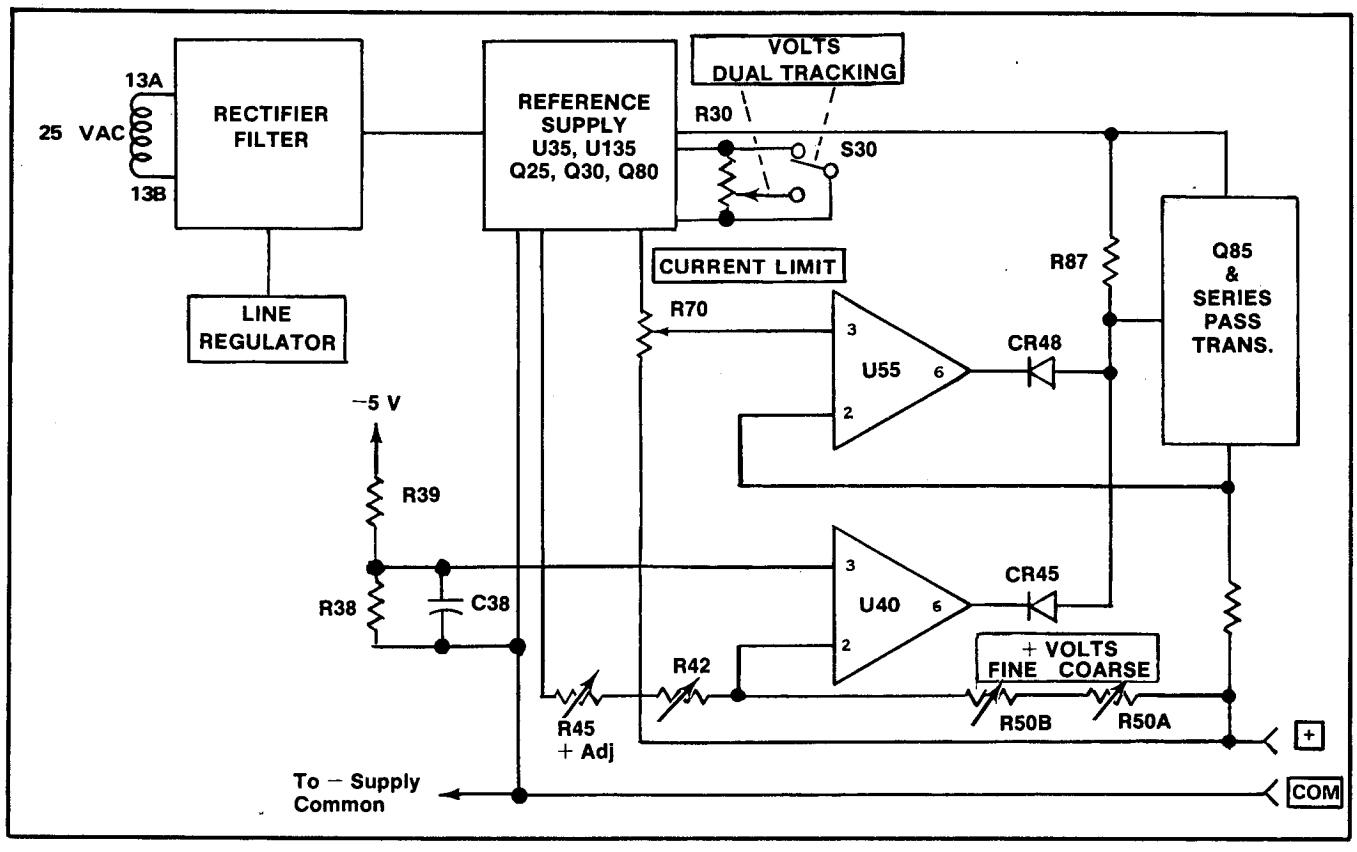


Fig. 5-1. Simplified block diagram of PS 503A.

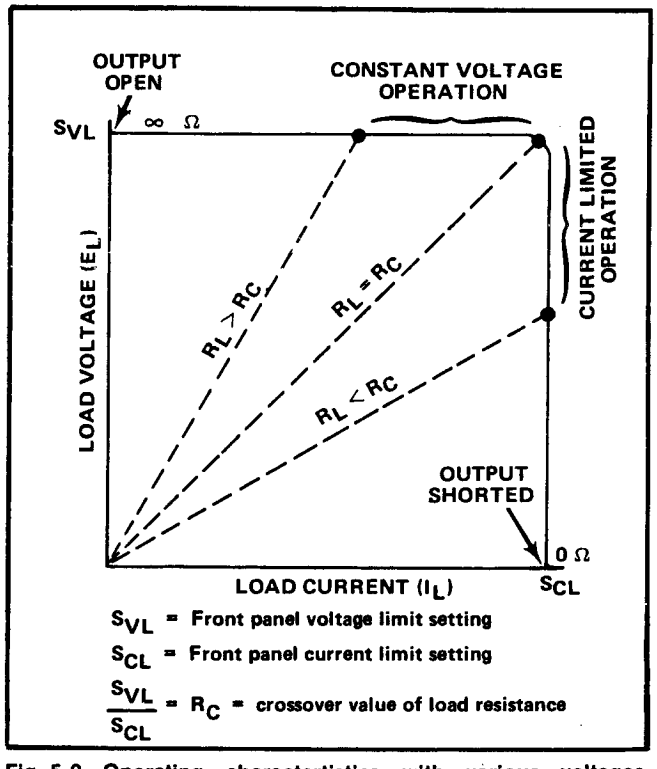


Fig. 5-2. Operating charactertistics with various voltages, current, and loads.

Load Regulation

With no load connected to the output terminals, all of the output current flows through feedback divider R50A-R50B-R42 (approximately 2 mA/V) and back to the minus side of C10. When a load is connected to the output terminals, output current must increase to maintain the output voltage.

An increase in output current cannot occur unless the drive to the base of Q85 and the series-pass transistor (located in power module) is also increased. The increase in the voltage differential between pin 2 and 3 of U45 necessary to drive Q85 and the series-pass transistor (refer to the discussion of constant voltage/current limited operation) is obtained by applying the lower voltage at the + output terminal to the inverting input (pin 2) of U45 causes a more positive output at pin 6 of U45, reducing the conduction of CR45. The current no longer going through CR45 now goes to the base of Q85.

Power Line Regulation

Q15 and associated components make-up a shut-down equalizer circuit. When the TM 500 Series Power Module

power switch is turned off, or power fails, the shut-down equalizer circuit will cause the supply (+ or −) that has the lightest load to reduce its output voltage to prevent spiking of the lightly loaded supply as the filter capacitor is discharged.

Power Supplies

+27 V Integrated Circuit Pre-regulator. Zener diode VR20 and emitter follower Q20 form a voltage regulator to supply U35 and U135.

+5 V Ground-Referenced Supply. The power module supplies +11.5 V through pins 2A and B and 3A and B on the plug-in rear connector to pins 1 and 3 of integrated circuit U1. U1 provides a regulated +5 V output limited at 1 A from pins 2 and 3 to output connectors J1 and J2 on the front panel.

Over-voltage Protection

When the voltage at the PS 503A front-panel + output terminal reaches about 26 volts, over-voltage protection silicon controlled rectifier (scr) Q65 turns on. Q65 turning on shorts the +33 volts supply to the COMMON terminal, causing the power supply to shut down.

NOTE

By changing Zener diode VR64, different over-voltage levels can be obtained.

Output Current Selection

If the PS 503A is operated in any compartment of a TM 500 Series Power Module except the high power compartment of the TM 504 and TM 506 Power Modules, S95 reduces the current limit to 400 mA and turns on 400 mA limit indicator LED.

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
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
58474	SUPERIOR ELECTRIC CO., THE	383 MIDDLE ST.	BRISTOL, CT 06010
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71744	CHICAGO MINIATURE LAMP WORKS	4433 RAVENSWOOD AVE.	CHICAGO, IL 60640
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-3291-00	B010100	B022064	CKT BOARD ASSY:MAIN	80009	670-3291-00
A1	670-3291-01	B022065		CKT BOARD ASSY:MAIN	80009	670-3291-01
C2	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C3	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C10	290-0320-00			CAP.,FXD,ELCTLT:4500UF,40V	56289	D45528-DFP
C19	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C20	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C34	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C38	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C60	290-0117-00			CAP.,FXD,ELCTLT:50UF,+75-10%,50V	56289	30D506G050DD9
C64	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C85	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C110	290-0320-00			CAP.,FXD,ELCTLT:4500UF,40V	56289	D45528-DFP
C119	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C120	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C138	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C160	290-0117-00			CAP.,FXD,ELCTLT:50UF,+75-10%,50V	56289	30D506G050DD9
C167	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
CR10	152-0462-00			SEMICOND DEVICE:SILICON,200V,2.5A	04713	SDA10228
CR24	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR35	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR45	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR46	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR48	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR55	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR60	152-0040-00			SEMICOND DEVICE:SILICON,600V,1A	80009	152-0040-00
CR66	152-0040-00	XB022065		SEMICOND DEVICE:SILICON,600V,1A	80009	152-0040-00
CR78	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR110	152-0462-00			SEMICOND DEVICE:SILICON,200V,2.5A	04713	SDA10228
CR135	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR145	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR146	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR148	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR155	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR160	152-0040-00			SEMICOND DEVICE:SILICON,600V,1A	80009	152-0040-00
CR167	152-0040-00	XB022065		SEMICOND DEVICE:SILICON,600V,1A	80009	152-0040-00
CR185	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
DS48	150-1001-00			LAMP,LED:RED,2V,100MA	28480	5082-4403
DS50	150-0109-00			LAMP,INCAND:18V,26MA	71744	CM7220
DS95	150-1001-00			LAMP,LED:RED,2V,100MA	28480	5082-4403
DS148	150-1001-00			LAMP,LED:RED,2V,100MA	28480	5082-4403
DS150	150-0109-00			LAMP,INCAND:18V,26MA	71744	CM7220
F10	159-0016-00			FUSE,CARTRIDGE:3AG,1.5A,250V,FAST-BLOW	71400	AGC 1 1/2
F110	159-0016-00			FUSE,CARTRIDGE:3AG,1.5A,250V,FAST-BLOW	71400	AGC 1 1/2
J1	129-0064-01			POST,BDG,ELEC:RED,5-WAY MINIATURE	58474	BB10167G2BX
J2	129-0064-02			POST,BDG,ELEC:WHITE,5-WAY,MINIATURE	58474	DF21WTC
J3	129-0064-00			POST,BDG,ELEC:CHARCOAL,5-WAY MINIATURE	58474	BINP BB10167G13T
J60	129-0064-01			POST,BDG,ELEC:RED,5-WAY MINIATURE	58474	BB10167G2BX
J160	129-0064-03			POST,BDG,ELEC:GREEN,5-WAY MINIATURE	58474	DF21GNC
Q15	151-0302-00			TRANSISTOR:SILICON,NPN	04713	2N2222A
Q20	151-0136-00			TRANSISTOR:SILICON,NPN	02735	35495
Q25	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q30	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q65	151-0506-00			TRANSISTOR:SILICON,SCR	03508	C106B2
Q80	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q85	151-0365-00			TRANSISTOR:SILICON,NPN	03508	D42C8
Q115	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q120	151-0208-00			TRANSISTOR:SILICON,PNP	80009	151-0208-00
Q165	151-0342-00	B010100	B022064X	TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q170	151-0506-00			TRANSISTOR:SILICON,SCR	03508	C106B2
Q185	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q190	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q195	151-0364-00			TRANSISTOR:SILICON,PNP	80009	151-0364-00
R3	301-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.50W	01121	EB2415
R14	321-0303-00			RES.,FXD,FILM:14K OHM,1%,0.125W	91637	MFF1816G14001F
R15	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R17	305-0751-00			RES.,FXD,CMPSN:750 OHM,5%,2W	01121	HB7515
R20	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R24	301-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.50W	01121	EB1525
R26	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	91637	MFF1816G576R0F
R28	321-0108-00			RES.,FXD,FILM:130 OHM,1%,0.125W	91637	MFF1816G130R0F
R29	321-0192-00			RES.,FXD,FILM:976 OHM,1%,0.125W	91637	MFF1816G976R0F
R30[1]	311-1310-00			RES.,VAR,NONWIR:20K OHM,20%,1W	01121	10M654
R34	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R36	321-0254-00			RES.,FXD,FILM:4.32K OHM,1%,0.125W	91637	MFF1816G43200F
R38	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R39	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
R42	321-0240-00	B010100	B022064	RES.,FXD,FILM:3.09K OHM,1%,0.125W	91637	MFF1816G30900F
R42	321-0250-00	B022065		RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R45	311-1560-00	B010100	B022064	RES.,VAR,NONWIR:5K OHM,5%,0.50W	73138	91A-50000M
R45	311-1561-00	B022065		RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A R2500
R48	303-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,1W	01121	GB1225
R50A,B	311-1759-00			RES.,VAR,NONWIR:10K OHM/1K OHM,20%,0.50W	01121	13M053
R55	301-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.50W	01121	EB5115
R64	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R65	307-0051-00	B010100	B022064X	RES.,FXD,CMPSN:2.7 OHM,5%,0.50W	01121	EB27G5
R66	315-0102-00	XB022065		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R67	308-0245-00			RES.,FXD,WW:0.6 OHM,5%,2W	91637	RS2B162ER6000J
R70	311-1524-00	B010100	B010319	RES.,VAR,NONWIR:20K OHM,10%,1W	01121	73M4G048L202M
R70	311-1197-00	B010320		RES.,VAR,NONWIR:20K OHM,10%,1W	12697	381-CM39696
R72	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
R73	315-0681-00	XB022065		RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R74	321-0173-00			RES.,FXD,FILM:619 OHM,1%,0.125W	91637	MFF1816G619R0F
R78	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R80	321-0216-00	B010100	B022064	RES.,FXD,FILM:1.74K OHM,1%,0.125W	91637	MFF1816G17400F
R80	321-0213-00	B022065		RES.,FXD,FILM:1.62K OHM,1%,0.125W	91637	MFF1816G16200F
R85	301-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.50W	01121	EB8225
R87	301-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.50W	01121	EB3025
R90	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
R95	301-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.50W	01121	EB3025
R114	321-0303-00			RES.,FXD,FILM:14K OHM,1%,0.125W	91637	MFF1816G14001F
R115	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R117	305-0751-00			RES.,FXD,CMPSN:750 OHM,5%,2W	01121	HB7515

[1]Furnished as a unit with S30.

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R120	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R134	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R136	321-0254-00			RES.,FXD,FILM:4.32K OHM,1%,0.125W	91637	MFF1816G43200F
R138	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R139	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
R142	321-0240-00	B010100	B022064	RES.,FXD,FILM:3.09K OHM,1%,0.125W	91637	MFF1816G30900F
R142	321-0250-00	B022065		RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R145	311-1560-00	B010100	B022064	RES.,VAR,NONWIR:5K OHM,5%,0.50W	73138	91A-50000M
R145	311-1561-00	B022065		RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A R2500
R148	303-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,1W	01121	GB1225
R150A,B	311-1759-00			RES.,VAR,NONWIR:10K OHM/1K OHM,20%,0.50W	01121	13M053
R155	301-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.50W	01121	EB5115
R164	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R165	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R167	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R170	307-0051-00	B010100	B022064X	RES.,FXD,CMPSN:2.7 OHM,5%,0.50W	01121	EB27G5
R174	308-0245-00			RES.,FXD,WW:0.6 OHM,5%,2W	91637	RS2B162ER6000J
R176	321-0173-00			RES.,FXD,FILM:619 OHM,1%,0.125W	91637	MFF1816G619R0F
R178	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
R180	311-1524-00	B010100	B010319	RES.,VAR,NONWIR:20K OHM,10%,1W	01121	73M4G048L202M
R180	311-1197-00	B010320		RES.,VAR,NONWIR:20K OHM,10%,1W	12697	381-CM39696
R182	315-0681-00	XB022065		RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R185	321-0282-00	B010100	B022064	RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
R185	321-0287-00	B022065		RES.,FXD,FILM:9.53K OHM,1%,0.125W	91637	MFF1816G95300F
R187	321-0224-00			RES.,FXD,FILM:2.1K OHM,1%,0.125W	91637	MFF1816G21000F
R190	321-0213-00			RES.,FXD,FILM:1.62K OHM,1%,0.125W	91637	MFF1816G16200F
R192	301-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.50W	01121	EB3025
R194	301-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.50W	01121	EB8225
R196	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
S1	260-1332-00			SWITCH,PUSH:	80009	260-1332-00
S30	311-1310-00			RES.,VAR,NONWIR:20K OHM,20%,1W	01121	10M654
S95	260-1310-01			SWITCH,PUSH:	80009	260-1310-01
U1	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	27014	LM340T-5
U35	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U45	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U55	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U135	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U145	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U155	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
VR17	152-0195-00	B010100	B022064	SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0195-00
VR17	152-0280-00	B022065		SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR20	152-0147-00			SEMICOND DEVICE:ZENER,0.4W,27V,5%	81483	1N971B
VR24	152-0306-00			SEMICOND DEVICE:ZENER,0.4W,9.1V,5%	81483	1N960B
VR30	152-0212-00			SEMICOND DEVICE:ZENER,0.5W,9V,5%	80009	152-0212-00
VR64	152-0265-00			SEMICOND DEVICE:ZENER,0.4W,24V,5%	04713	1N970B
VR117	152-0195-00	B010100	B022064	SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0195-00
VR117	152-0280-00	B022065		SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR120	152-0147-00			SEMICOND DEVICE:ZENER,0.4W,27V,5%	81483	1N971B
VR164	152-0265-00			SEMICOND DEVICE:ZENER,0.4W,24V,5%	04713	1N970B

OPTIONS

(No options are available at this time)

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.

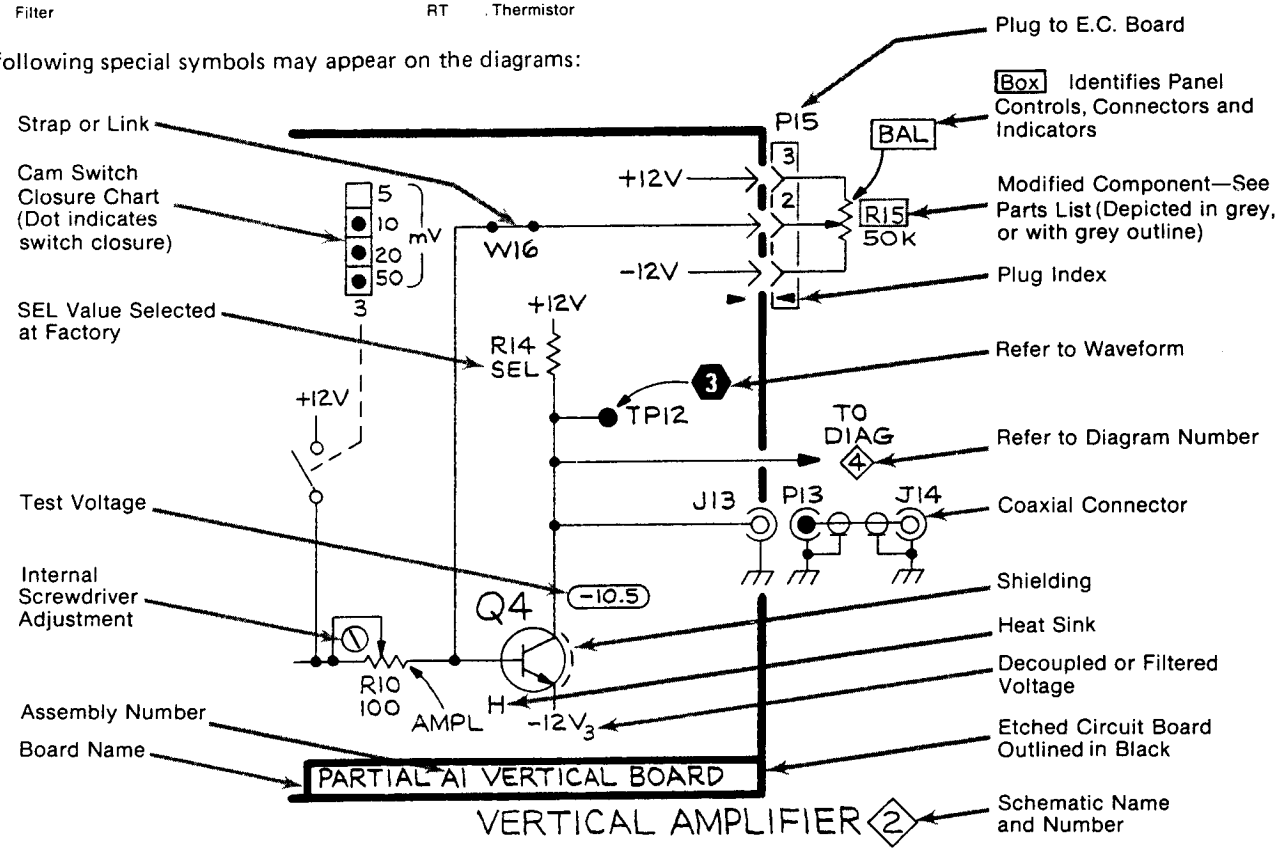
Abbreviations are based on ANSI Y1.1-1972.
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

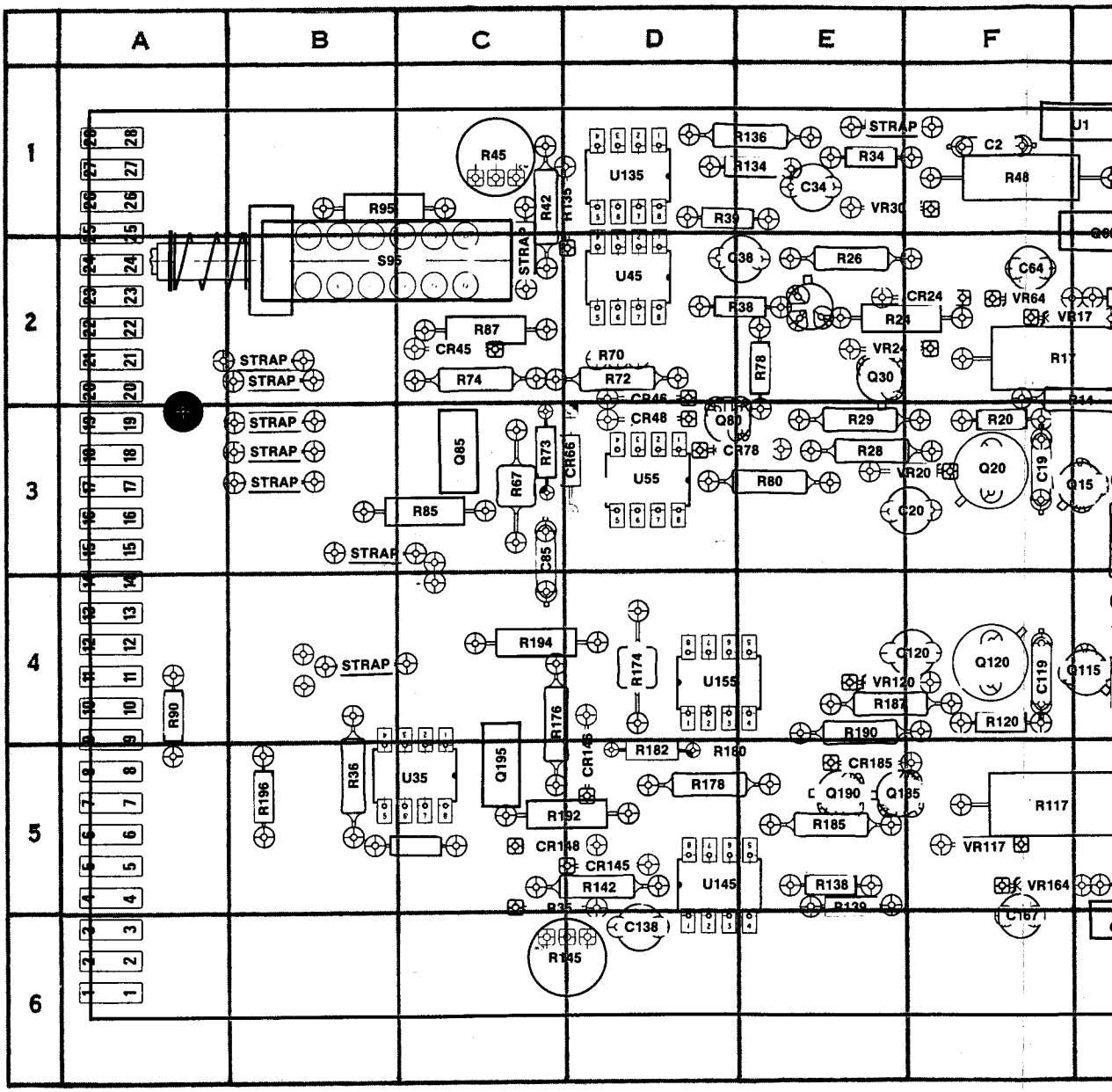
Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

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

The following special symbols may appear on the diagrams:

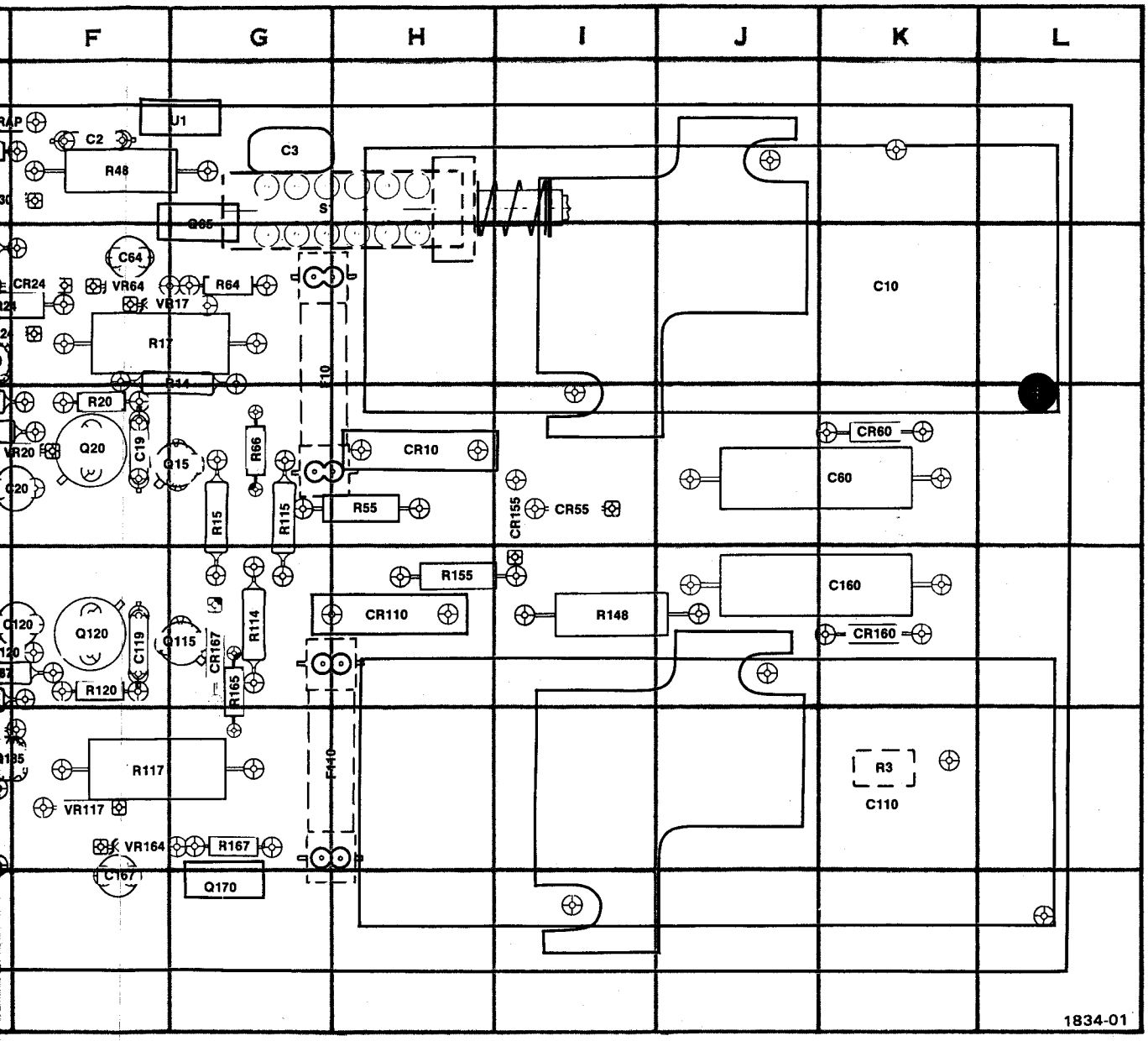




A1 MAIN CIRCUIT BOARD

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO
C2	F1	C119	F4	CR55	I3	CR185	E5	Q115	G4	R24	E2	R45
C3	G1	C120	E4	CR60	K3			Q120	F4	R26	E2	R55
C10	K2	C138	D6	CR66	C3	F10	G2	Q170	G6	R28	E3	R64
C19	F3	C160	K4	CR78	D3	F110	G5	Q185	E5	R29	E3	R66
C20	E3	C167	F5	CR110	H4			Q190	E5	R34	E1	R67
C34	E1			CR145	D5	Q15	F3	Q195	C5	R35	C5	R70
C38	D2	CR10	H4	CR146	D5	Q20	F3	R3	K5	R36	B5	R72
C60	K3	CR24	F2	CR148	C5	Q30	E2	R14	F2	R38	D2	R73
C64	F2	CR45	C2	CR155	I3	Q65	G1	R15	G3	R39	D1	R74
C85	C3	CR46	D2	CR160	K4	Q80	D3	R17	F2	R48	F1	R78
C110	K5	CR48	D3	CR167	G4	Q85	C3	R20	F3	R42	C1	R80

@



IN CIRCUIT BOARD (SN BO22065—above)

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
R24	E2	R45	C1	R85	C3	R138	E5	R182	D5	U1	F1	VR64	F2
R26	E2	R55	H3	R87	C2	R139	E5	R185	E5	U35	C5	VR117	F5
R28	E3	R64	G2	R90	A4	R142	D5	R187	E4	U45	D2	VR120	E4
R29	E3	R66	G3	R95	B1	R145	C6	R190	E4	U55	D3	VR164	F5
R34	E1	R67	C3	R114	G4	R148	I4	R192	C5	U135	D1		
R35	C5	R70	D2	R115	G3	R165	G4	R194	C4	U145	D5		
R36	B5	R72	D2	R117	F5	R167	G5	R196	B5	U155	D4		
R38	D2	R73	C3	R120	F4	R174	D4						
R39	D1	R74	C2	R134	E1	R176	C4			VR20	E3		
R48	F1	R78	E2	R135	C1	R178	D5	S1	G1	VR30	E1		
R42	C1	R80	E3	R136	E1	R180	D5	S95	B1	VR24	E2		

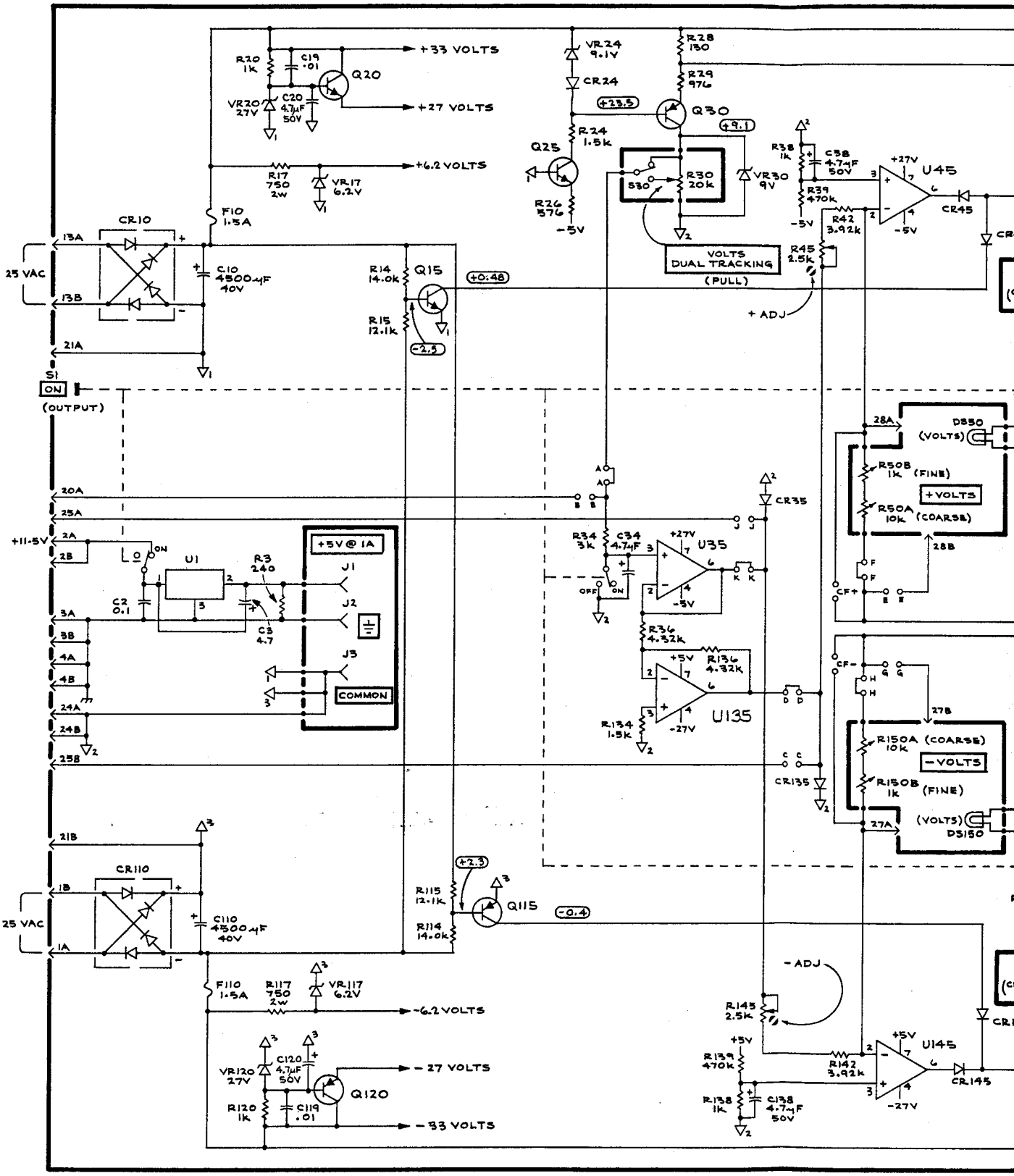
VOLTAGE CONDITIONS

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

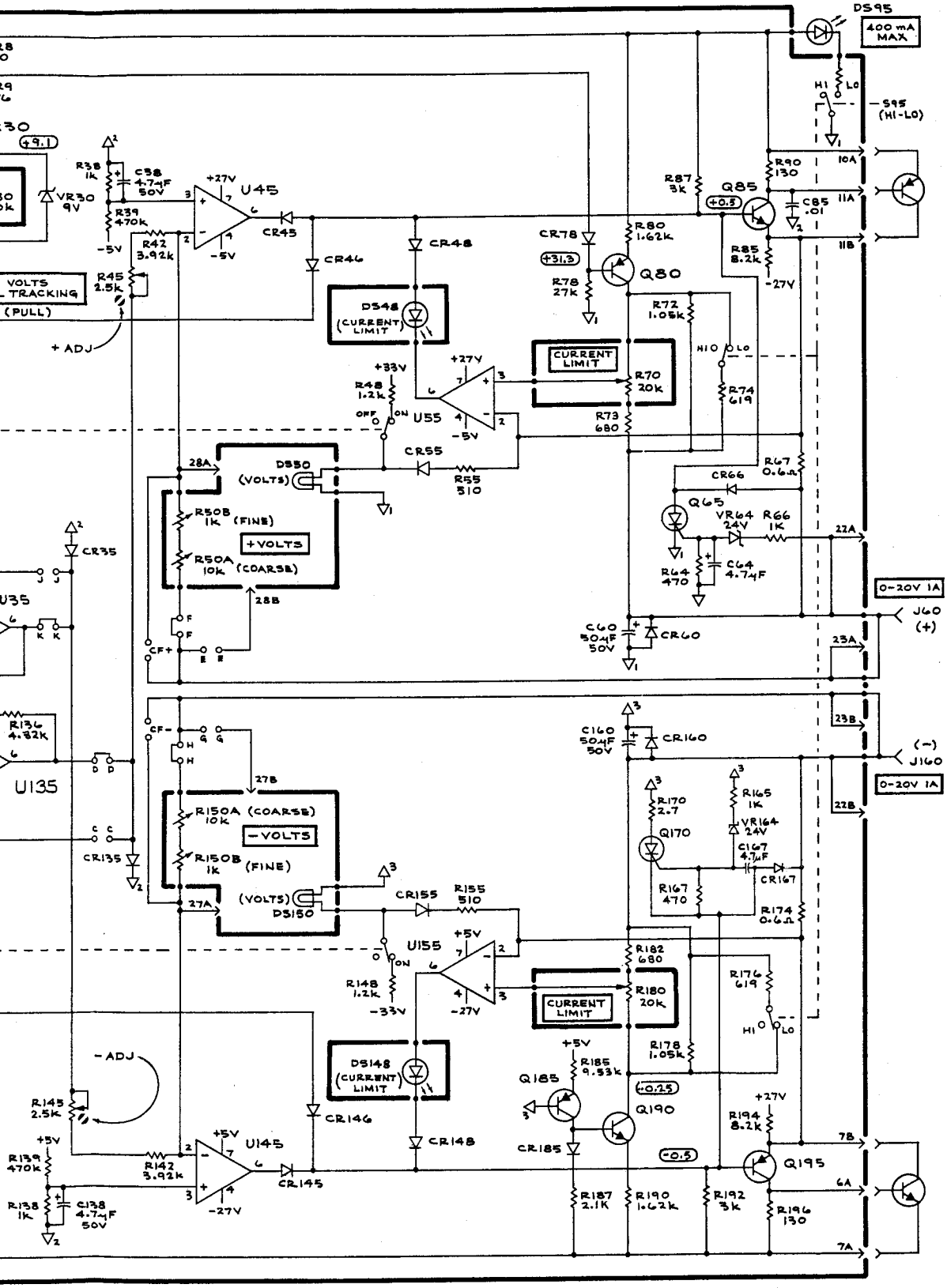
The voltages shown on diagram 1 were taken with the PS 503A front panel controls (knob type) fully counterclockwise. The OUTPUT button was in the ON position. No external load was connected to the binding post output terminals.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 mΩ input impedance (TEKTRONIX DM 501 Digital Multimeter or TEKTRONIX 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).



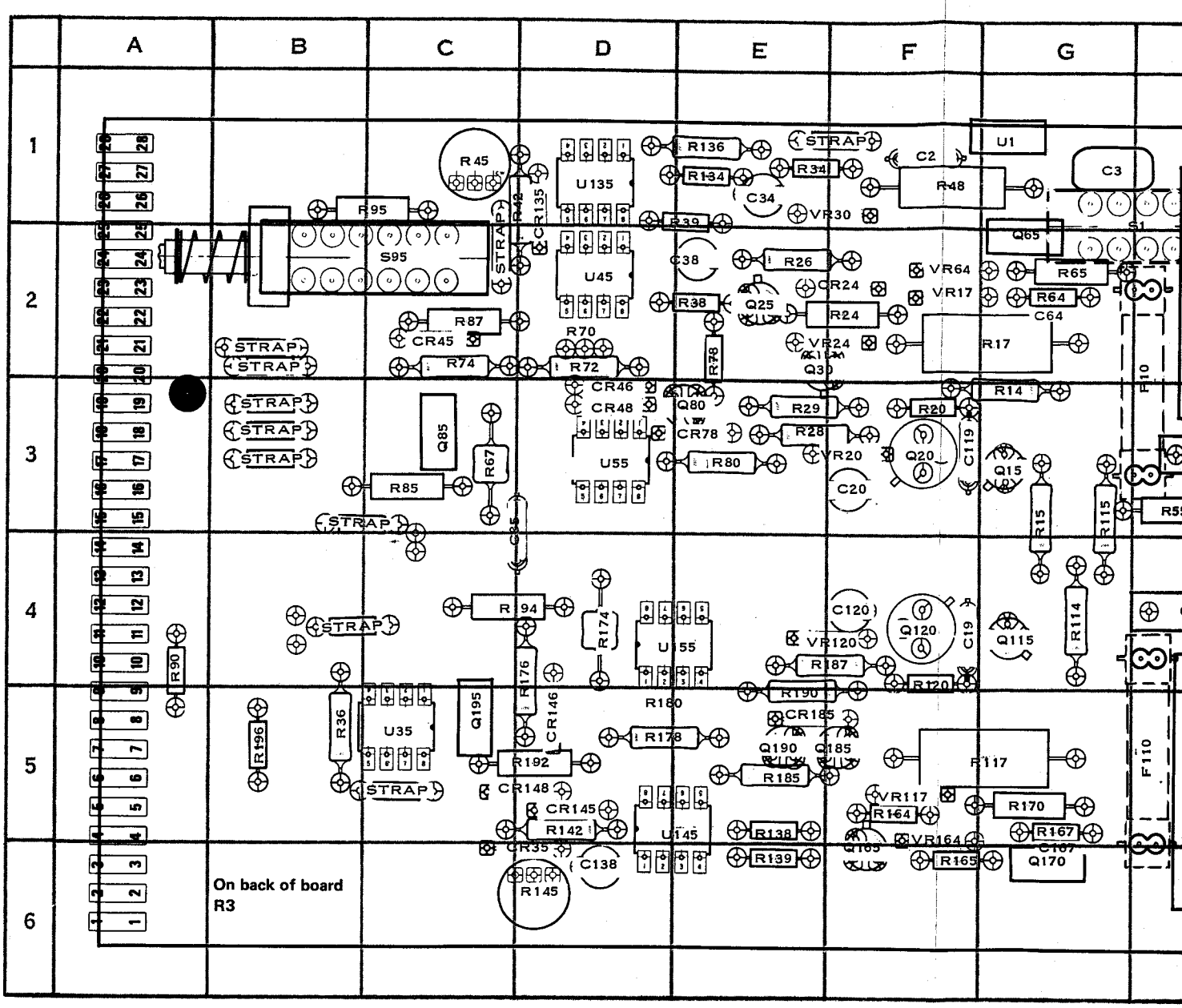
PS 503A

1834-02
REV. D, FEB. 1977



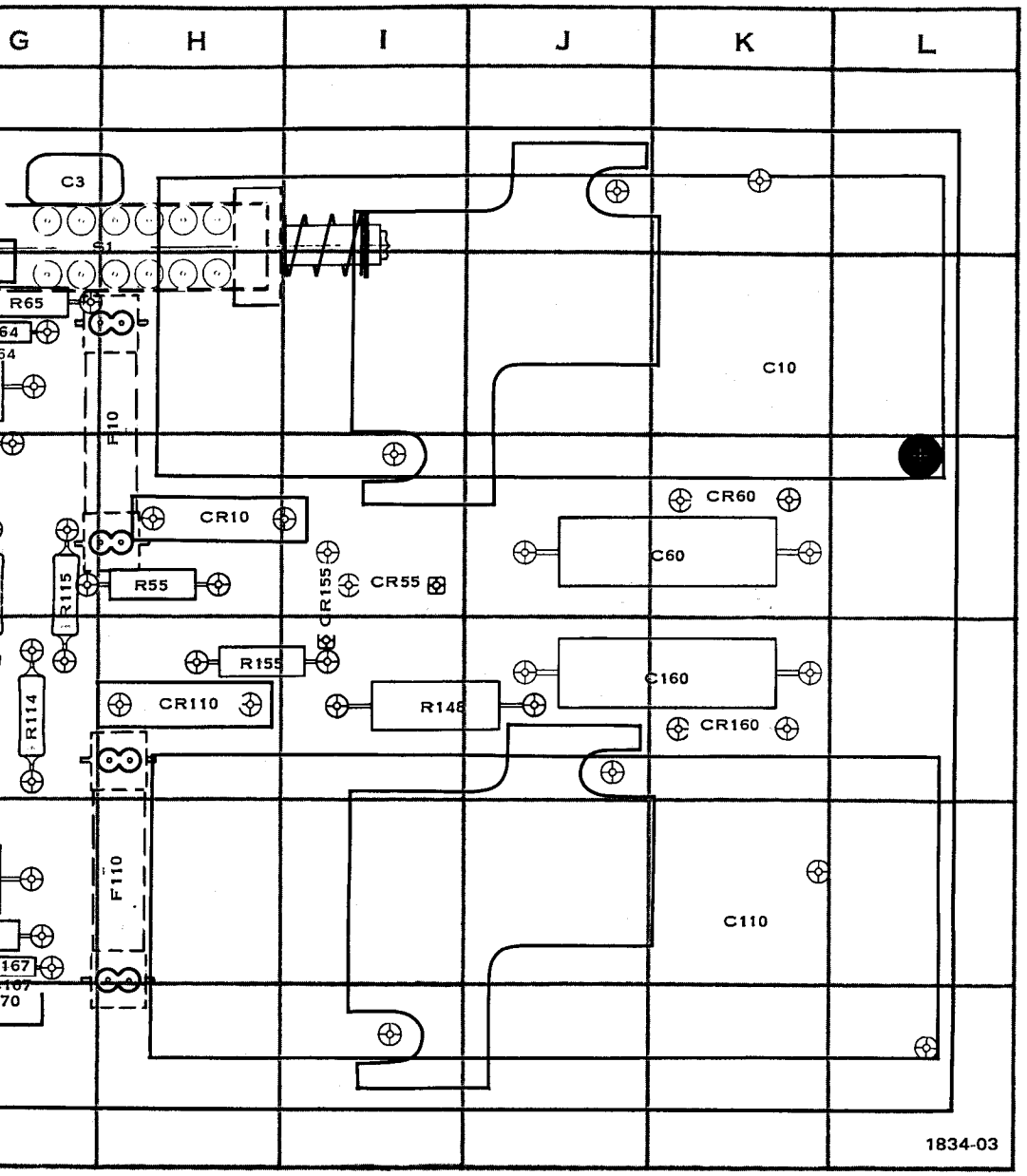
1834-02
REV. D, FEB. 1977

POWER SUPPLY ◇1
(SN B022065 & ABOVE)



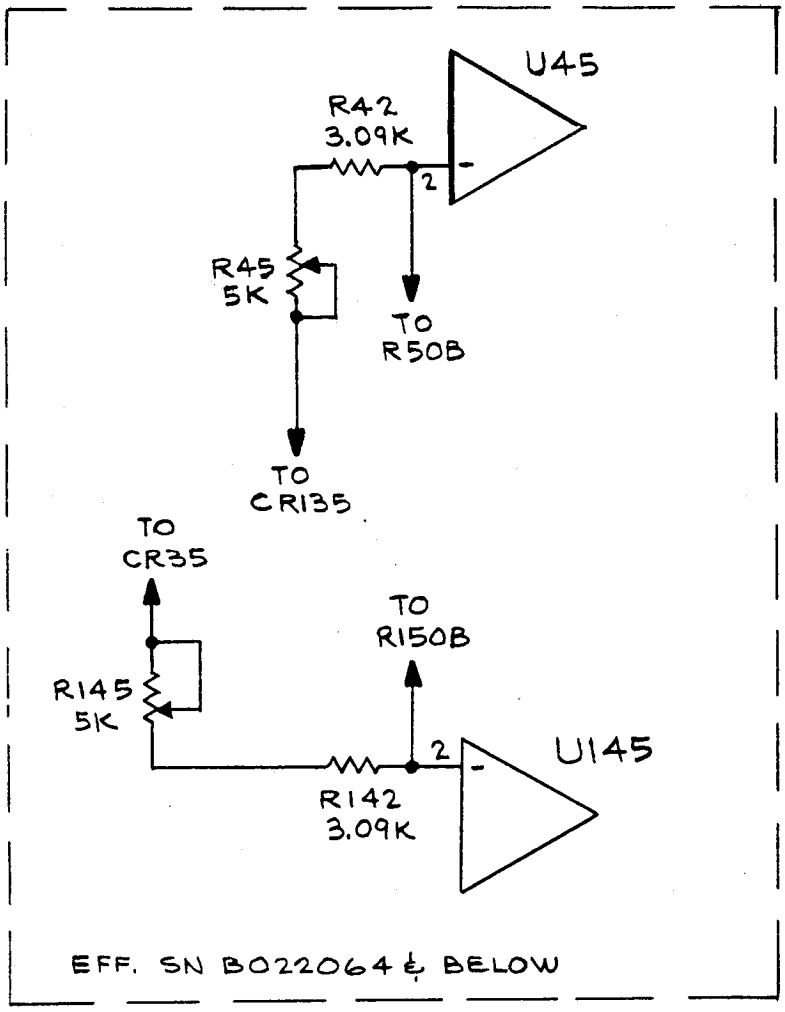
A1 MAIN CIRCUIT BOARD (SN BO22064–b

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO
C2	F1	C119	F3	CR48	D3	CR185	E5	Q85	C3	R17	G2	R45	C1	R85
C3	G1	C120	F4	CR55	I3			Q115	G4	R20	F3	R48	F1	R87
C10	K2	C138	D6	CR60	K3	F10	H2	Q120	F4	R24	F2	R55	H3	R90
C19	F4	C160	K4	CR78	E3	F110	H5	Q165	F6	R26	E2	R64	G2	R95
C20	F3	C167	G5	CR110	H4			Q170	G6	R28	E3	R65	G2	R114
C34	E1			CR135	D1	Q15	G3	Q185	F5	R29	E3	R67	C3	R115
C38	E2	CR10	H3	CR145	D5	Q20	F3	Q190	E5	R34	E1	R70	D2	R117
C60	K3	CR24	F2	CR146	D5	Q25	E2	Q195	C5	R36	B5	R72	D2	R120
C64	G2	CR35	D6	CR148	D5	Q30	E2			R38	E2	R74	C2	R134
C85	D4	CR45	C2	CR155	I3	Q65	G2	R14	G3	R39	E1	R78	E2	R136
C110	K5	CR46	D3	CR160	K4	Q80	E3	R15	G3	R42	D1	R80	E3	R138

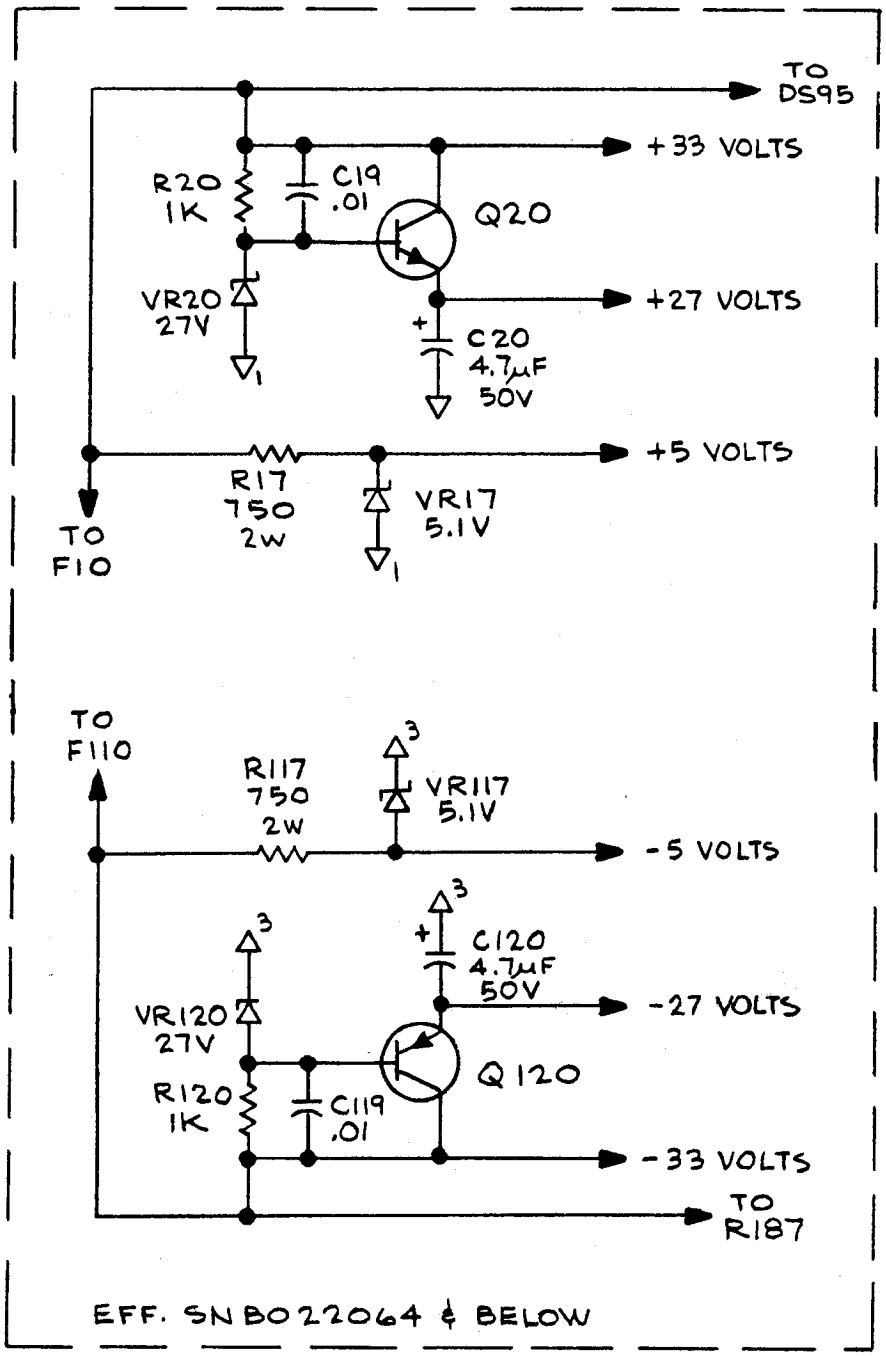


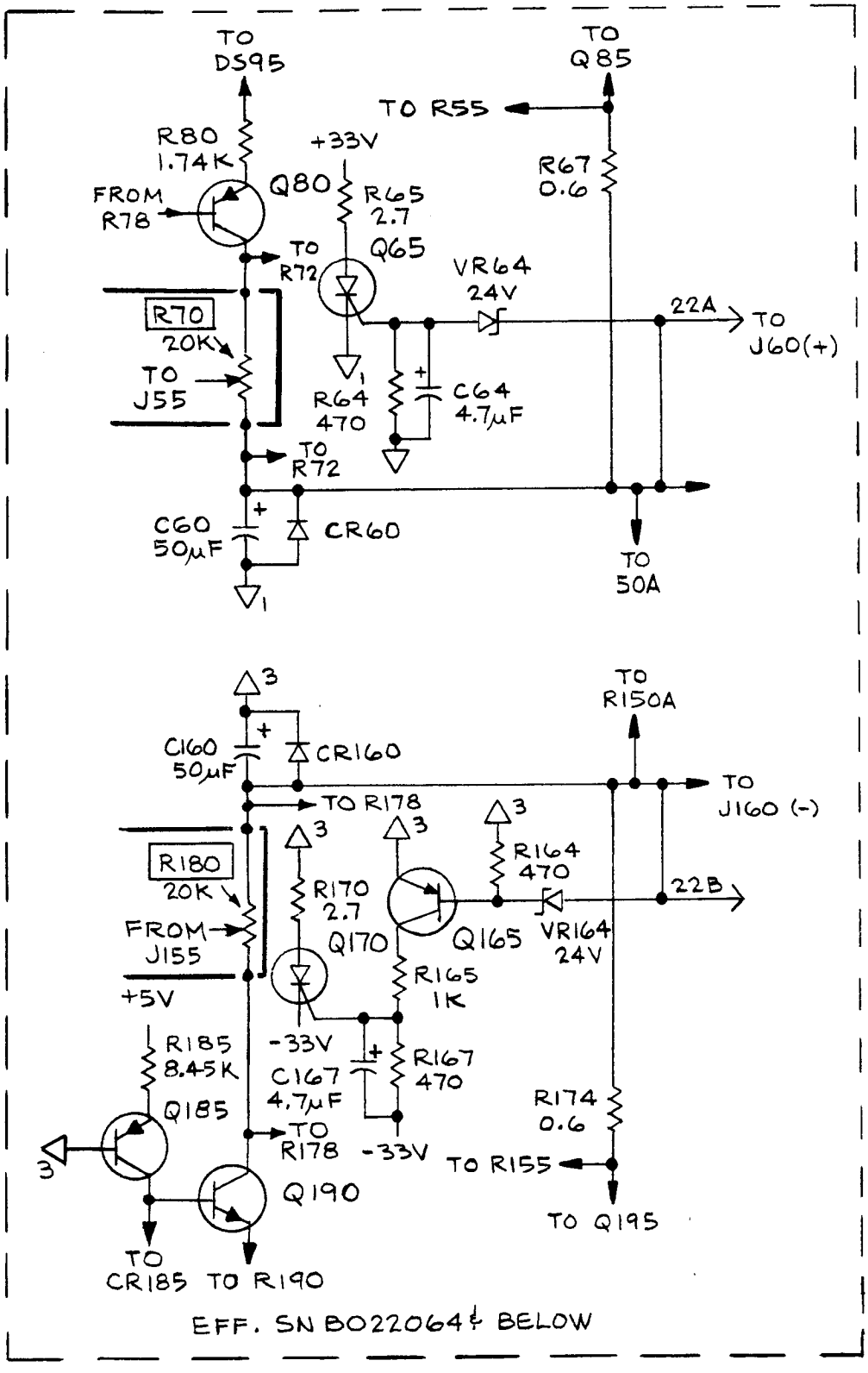
N BO22064–below)

RID OC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C1	R85	C3	R139	E6	R178	D5	U1	G1	VR30	F1
F1	R87	C2	R142	D5	R180	D5	U35	C5	VR64	F2
H3	R90	A4	R145	D6	R185	E5	U45	D2	VR117	F5
G2	R95	C1	R148	I4	R187	F4	U55	D3	VR120	F4
G2	R114	G4	R155	H4	R190	E5	U135	D1	VR164	F5
C3	R115	G3	R164	F5	R192	D5	U145	E5		
D2	R117	G5	R165	F6	R194	D4	U155	E4		
D2	R120	F4	R167	G5	R196	B5				
C2	R134	E1	R170	G5			VR17	F2		
E2	R136	E1	R174	D4	S1	H2	VR20	F3		
E3	R138	E5	R176	C2	S95	C2	VR24	E2		


U45
R42
3.09K
2
R45
5K
TO
R50B
TO
CR135
TO
CR35
TO
R150B
R145
5K
2
U145
R142
3.09K
EFF. SN B022064 & BELOW

PS 503A


TO DS95
+33 VOLTS
R20 1K
C19 .01
Q20
VR20 27V
+27 VOLTS
C20 4.7µF 50V
+5 VOLTS
R17 750 2W
VR17 5.1V
TO F10
TO F110
R117 750 2W
VR117 5.1V
-5 VOLTS
C120 4.7µF 50V
-27 VOLTS
VR120 27V
Q120
R120 1K
C119 .01
-33 VOLTS
TO R187
EFF. SN B022064 & BELOW



PARTIAL POWER SUPPLY

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

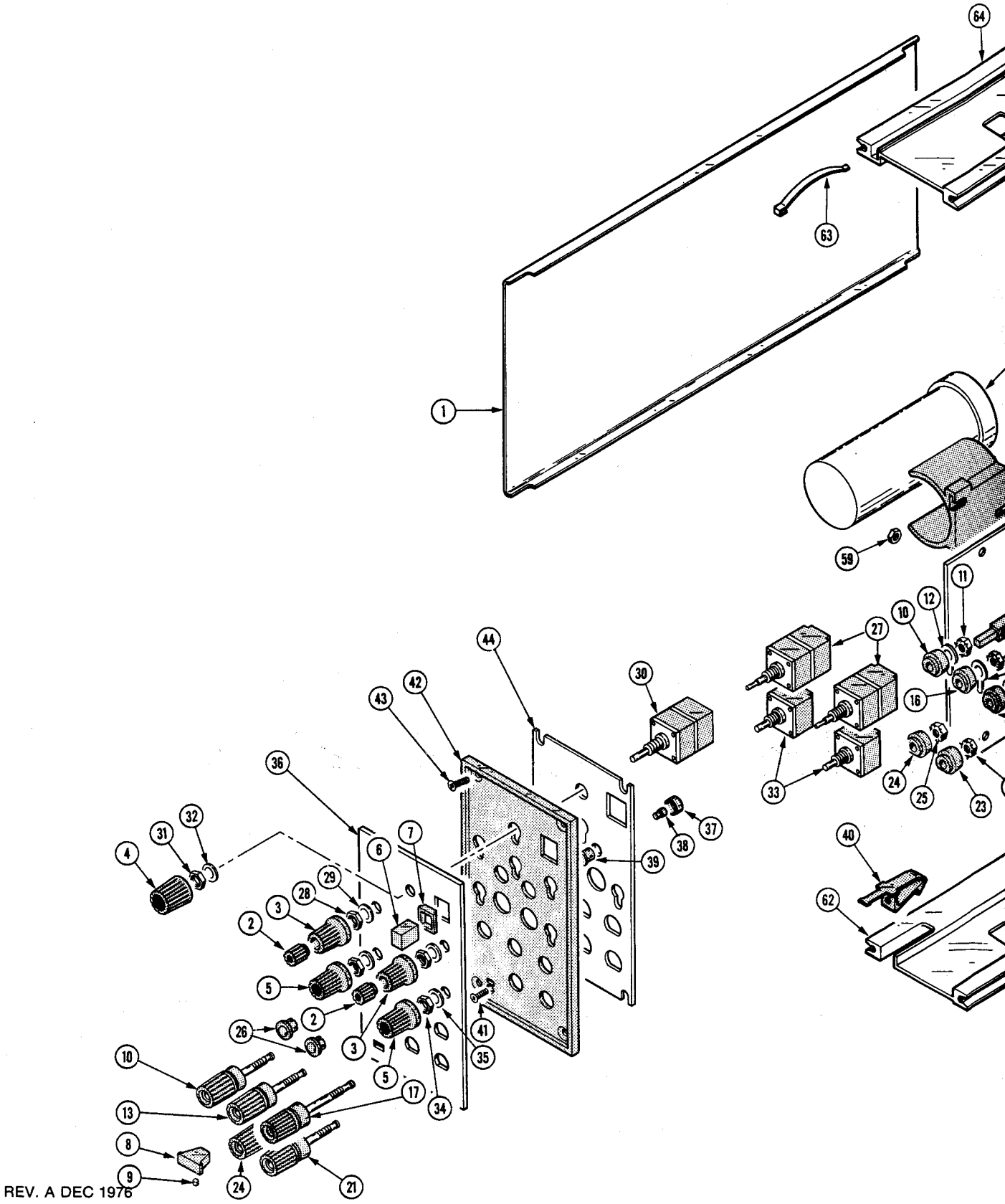
"	INCH
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
45722	USM CORP., PARKER-KALON FASTENER DIV.		CAMPBELLSVILLE, KY 42718
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
58474	SUPERIOR ELECTRIC CO., THE	383 MIDDLE ST.	BRISTOL, CT 06010
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty 1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	337-1399-00			2	SHLD,ELECTRICAL:SIDE	80009	337-1399-00
-2	366-1319-00			2	KNOB:GRAY	80009	366-1319-00
	213-0239-00			1	. SETSCREW:3-48 X 0.062 INCH,HEX SOC STL	71159	OBD
-3	366-1077-00			2	KNOB:GRAY	80009	366-1077-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-4	366-0497-00			1	KNOB:GRAY	80009	366-0497-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-5	366-0494-00			2	KNOB:GRAY	80009	366-0494-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-6	366-1257-74			1	PUSH BUTTON:"ON"	80009	366-1257-74
-7	426-0681-00			1	FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-8	366-1422-01	B010100	B025429	1	KNOB:LATCH	80009	366-1422-01
	366-1690-00	B025430		1	KNOB,LATCH:	80009	366-1690-00
					(ATTACHING PARTS)		
-9	214-1840-00	B010100	B025429	1	PIN,KNOB SECRG:0.094 OD X 0.120 INCH LONG	80009	214-1840-00
					- - - * - - -		
-10	129-0064-03			1	POST,BDG,ELEC:GREEN,5-WAY MINIATURE	58474	DF21GNC
					(ATTACHING PARTS)		
-11	210-0457-00			1	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-12	210-0224-00			1	TERMINAL,LUG:0.20 ID X 0.344 OD,SE,BRS	86928	A373-148-1
					- - - * - - -		
-13	129-0064-00			1	POST,BDG,ELEC:CHARCOAL,5-WAY MINIATURE	58474	BINP BB10167G13T
					(ATTACHING PARTS)		
-14	210-0457-00			1	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-15	210-0224-00			1	TERMINAL,LUG:0.20 ID X 0.344 OD,SE,BRS	86928	A373-148-1
-16	358-0181-00			1	INSULATOR,BSHG:CHARCOAL	58474	BB10166G13BX
					- - - * - - -		
-17	129-0064-01			1	POST,BDG,ELEC:RED,5-WAY MINIATURE	58474	BB10167G2BX
					(ATTACHING PARTS)		
-18	210-0457-00			1	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-19	210-0224-00			1	TERMINAL,LUG:0.20 ID X 0.344 OD,SE,BRS	86928	A373-148-1
-20	358-0181-01			1	INSULATOR,BSHG:RED	58474	BB1066G2
					- - - * - - -		
-21	129-0064-01			1	POST,BDG,ELEC:RED,5-WAY MINIATURE	58474	BB10167G2BX
					(ATTACHING PARTS)		
-22	210-0457-00			1	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-23	358-0181-01			1	INSULATOR,BSHG:RED	58474	BB1066G2
					- - - * - - -		
-24	129-0064-02			1	POST,BDG,ELEC:WHITE,5-WAY,MINIATURE	58474	DF21WTC
					(ATTACHING PARTS)		
-25	210-0457-00			1	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
					- - - * - - -		
-26	----- -----			3	LAMP,LED:(SEE DS48,DS95 & DS148 EPL)		
-27	----- -----			2	RES.,VARIABLE:(SEE R50A,B & R150A,B EPL)		
					(ATTACHING PARTS)		
-28	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-29	210-0940-00			2	WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
					- - - * - - -		
-30	----- -----			1	RES.,VARIABLE:(SEE R30 EPL)		
					(ATTACHING PARTS)		
-31	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-32	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
					- - - * - - -		
-33	----- -----			2	RES.,VARIABLE:(SEE R70 & R180 EPL)		
					(ATTACHING PARTS)		
-34	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-35	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
					- - - * - - -		
-36	333-2027-00			1	PANEL,FRONT:	80009	333-2027-00
-37	200-0935-00			2	BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-38	378-0602-01			2	LENS,LIGHT:AMBER	80009	378-0602-01
-39	352-0157-00			2	LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-40	214-1513-01	B010100	B025429	1		LCH,PLUG-IN RET:	80009	214-1513-01
	105-0719-00	B025430		1		LATCH,RETAINING:PLUG-IN	80009	105-0719-00
						(ATTACHING PARTS)		
-41	213-0254-00			1		SCR,TPG,THD CTG:2-32 X 0.250,100 DEG,FLH	45722	OBD
						- - - * - - -		
	105-0718-00	B025430		1		RELEASE,LATCH:	80009	105-0718-00
-42	386-2232-01			1		SUBPANEL,FRONT:	80009	386-2232-01
						(ATTACHING PARTS)		
-43	213-0229-00			4		SCR,TPG,THD FOR:6-20 X0.375"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-44	337-1638-01			1		SHIELD,ELEC:	80009	337-1638-01
-45	384-1101-00			1		EXTENSION SHAFT:4.14 INCH LONG	80009	384-1101-00
-46	----- -----			1		MICROCIRCUIT,LI:(SEE U1 EPL)		
						(ATTACHING PARTS)		
-47	210-0406-00			1		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-48	211-0038-00			1		SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-49	----- -----			1		CKT BOARD ASSY:MAIN(SEE A1 EPL)		
						(ATTACHING PARTS)		
-50	213-0146-00			4		SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-51	131-0566-00			10		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
-52	136-0514-00			6		. SOCKET,PLUG IN:MICROCIRCUIT,8 CONTACT	73803	C9308-02
-53	260-1332-00			1		. SWITCH,PUSH:(STEP SW)	80009	260-1332-00
-54	361-0384-00			2		. SPACER,PB SW:0.133 INCH LONG	80009	361-0384-00
-55	260-1310-01			1		. SWITCH,PUSH:(BANDWIDTH)	80009	260-1310-01
-56	361-0382-00			2		. SPACER,PB SW:BROWN,0.275 INCH LONG	80009	361-0382-00
-57	----- -----			2		. CAP.,FXD,ELCTLT:(SEE C10 & C110 EPL)		
-58	352-0322-00			2		. RETAINER,CAP.:	80009	352-0322-00
						(ATTACHING PARTS)		
-59	210-0407-00			1		. NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-60	211-0534-00			1		. SCR,ASSEM,WSHR:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-61	344-0154-00			4		. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
-62	426-0724-00			1		FR SECT,PLUG-IN:BOTTOM	80009	426-0724-00
-63	214-1061-00			1		SPRING,GROUND:FLAT	80009	214-1061-00
-64	426-0725-09			1		FR SECT,PLUG-IN:TOP	80009	426-0725-09
-65	179-2191-00	B010100	B022064	1		WIRING HARNESS:CHASSIS	80009	179-2191-00
	179-2191-01	B022065		1		WIRING HARNESS:CHASSIS	80009	179-2191-01
	131-0707-00	XB022065		6		. CONTACT,ELEC:0.40 L,22-26 AWG WIRE	22526	47439
	352-0169-00	XB022065		1		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
	352-0169-01	XB022065		1		. CONN BODY,PL,EL:2 WIRE BROWN	80009	352-0169-01
	352-0169-02	XB022065		1		. CONN BODY,PL,EL:2 WIRE RED	80009	352-0169-00



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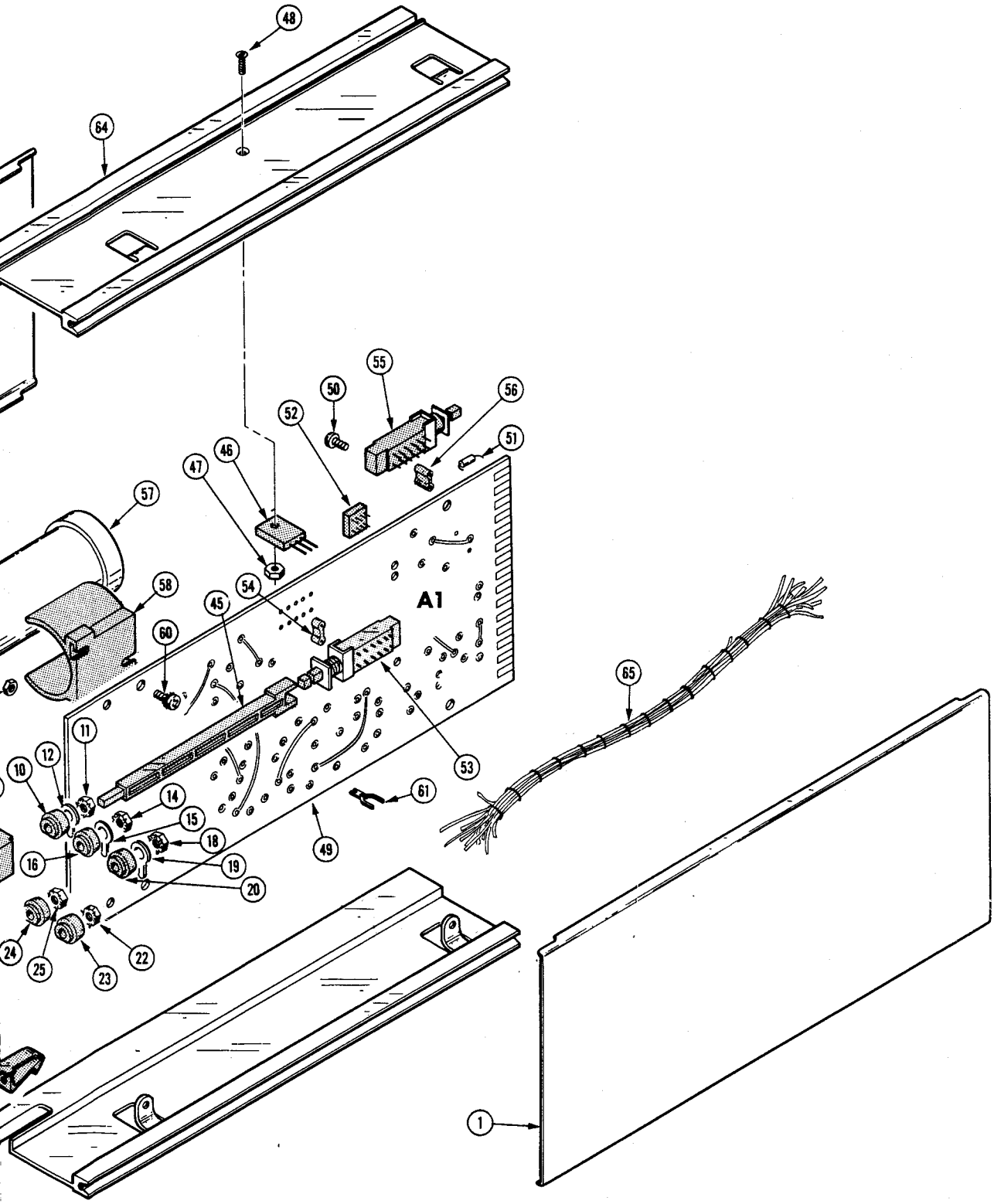
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PS503A

STANDARD ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
	070-1834-01			1		MANUAL,TECH:INSTRUCTION	80009	070-1834-01

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.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime.	108 - 10 V output pulse; 1 ns Risetime.
111	PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - ±5 V output.	114 - ±10 V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ±5 V dc Offset. Has ±5 V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; ±10 V output. Short-proof output.
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output.
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114	PG 502 - ±5 V output	114 - ±10 V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ±5 V output.	115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; ±10 V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has ±5 V output.	2101 - Paired and Delayed pulse; 10 V output.
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191	SG 503 - Frequency range 250 kHz to 250 MHz.	191 - Frequency range 350 kHz to 100 MHz.
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Marker outputs, 5 sec to 1 μs. Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μs, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Marker outputs, 5 sec to 2 ns. Sinewave available at 50, 20, 10, 5, and 2 ns. Separate trigger pulses of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μs. Marker amplifier provides positive or negative time marks of 25 V min. Marker intervals of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μs.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Marker outputs, 5 sec to 0.1 μs. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

TEKTRONIX®
committed to technical excellence

MANUAL CHANGE INFORMATION

PRODUCT PS 503A
070-1834-01

CHANGE REFERENCE M31869
DATE 6-14-77 REV.

CHANGE:	DESCRIPTION

EFF SN B026130

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

A1	670-3291-02	CKT BOARD ASSY:MAIN
C3	290-0522-00	CAP.,FXD,ELCTLT:1.0UF,20%,50V

ADD:

C4	290-0745-00	CAP.,FXD,ELCTLT:22UF,+50-10%,25V

DIAGRAM <1> POWER SUPPLY