

Tektronix[®]
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SG 502
OSCILLATOR

INSTRUCTION MANUAL

TEKTRONIX®

**SG 502
OSCILLATOR**

INSTRUCTION MANUAL

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

Serial Number _____

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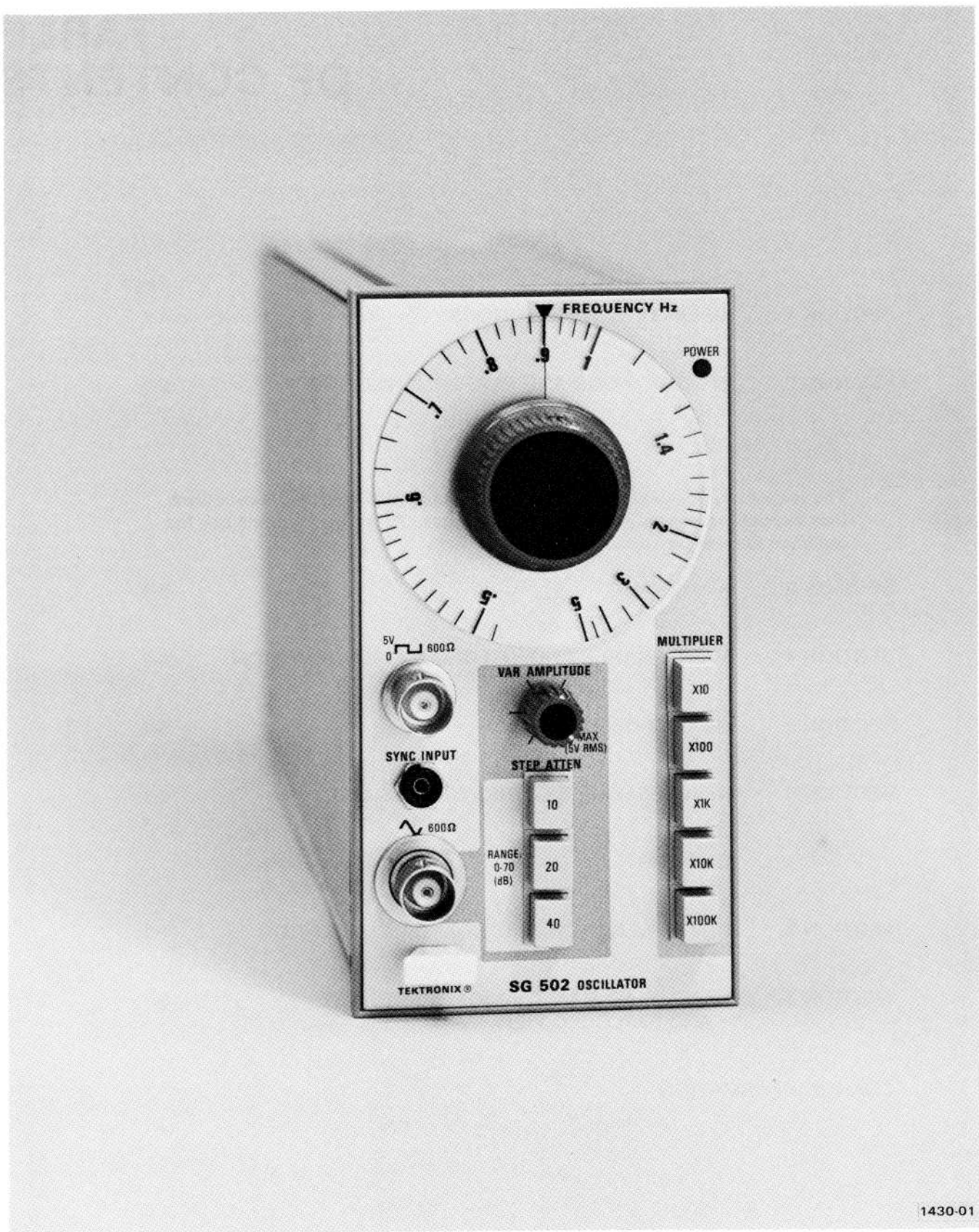
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WARNING

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

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CHANGE INFORMATION



1430-01

Fig. 1-1. SG 502 Oscillator Plug-In Module.

OPERATING INSTRUCTIONS

INSTRUMENT DESCRIPTION

The SG 502 generates low distortion sine waves and square waves over a frequency range of 5 Hz to 500 kHz. A stable RC oscillator provides 5 V rms output under no load, or 2.5 V rms into a 600 Ω load. A continuously-variable control affords greater than 40 dB sine-wave attenuation in addition to pushbutton-selected 10, 20, and 40 dB steps. A 0 to +5 V fixed amplitude square wave, at the same frequency as the sine wave, is available from a separate front panel connector. The SG 502 also features an external sync input which locks the output frequency to

a synchronizing signal. A single dial and five decade pushbuttons provide frequency selection.

The electrical characteristics are valid only if the SG 502 is calibrated at an ambient temperature between +20°C and +30°C and operated between 0°C and +50°C, unless otherwise noted. The outputs must be terminated in 600 Ω loads.

PREPARATION FOR USE

Installation and Removal

CAUTION

Turn the Power Module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry.

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 SG 502 circuit board edge connector.

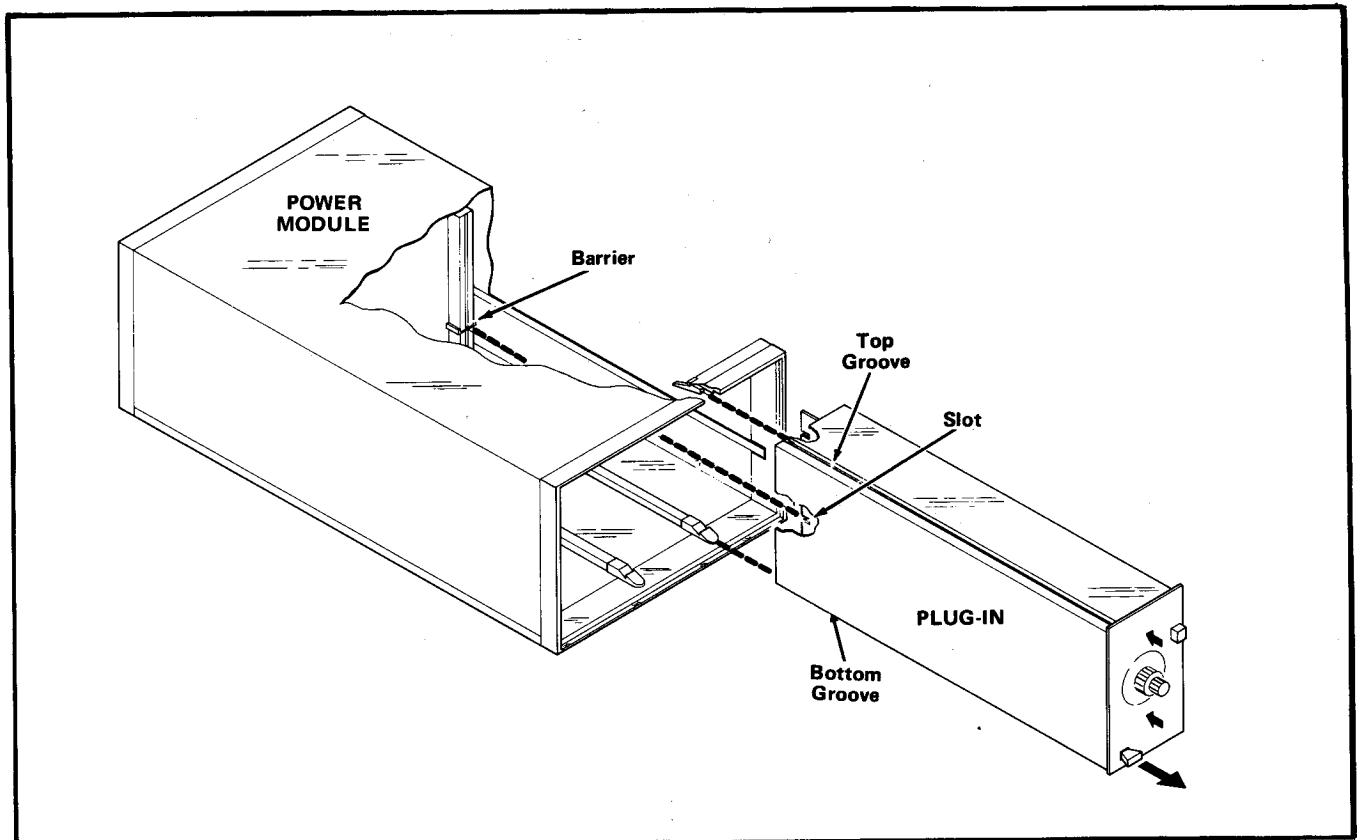


Fig. 1-2. Plug-In Module Installation/removal.

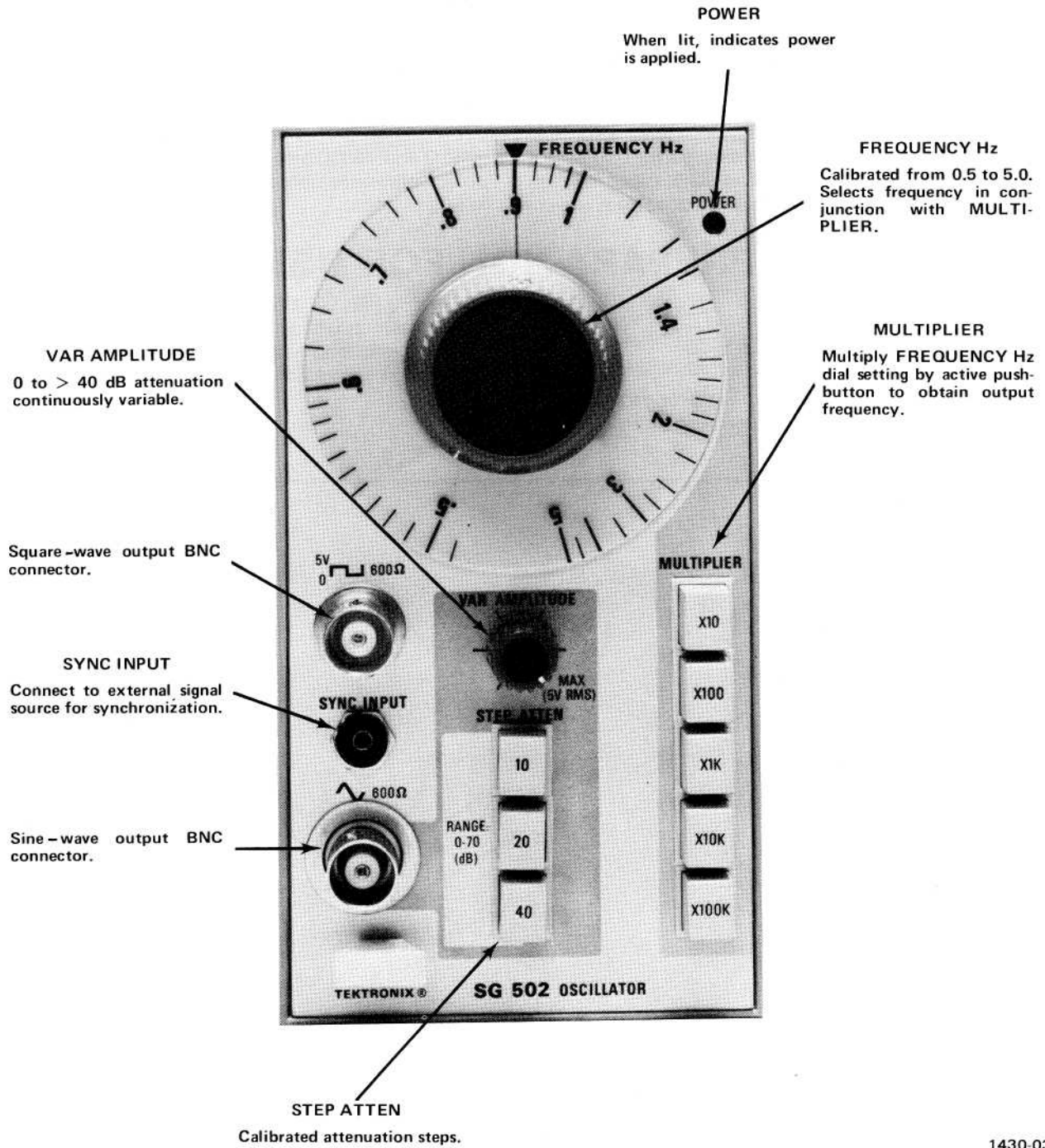


Fig. 1-3. Front panel controls and connectors.

Align the SG 502 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 SG 502, pull on the release latch, located in the lower left corner, until the interconnecting jack disengages and the SG 502 will slide out.

Apply power to the SG 502 by pulling out the power switch knob of the Power Module.

Controls and Connectors

Refer to Fig. 1-3. Even though the SG 502 is fully calibrated and ready to use, the functions and actions of the controls and connectors should be reviewed before attempting to use it. Note the STEP ATTEN pushbuttons are push-push actions, while all the rest are self-cancelling actions. Note also that the POWER light is the only visual indication that the power is being applied to the SG 502.

OPERATING CONSIDERATIONS

Making Connections

Fig. 1-4 shows an equivalent circuit for the $600\ \Omega$ sine-wave and square-wave outputs of the SG 502. A $50\ \Omega$ coaxial cable adds about $30\ \text{pF}$ per foot to the output. Use short cables to avoid reduced sine-wave amplitude and rounded square waves, especially at higher frequencies.

Synchronization With an External Device

To synchronize the SG 502 with an external oscillator, plug the sine-wave output of the external oscillator into the SYNC INPUT jack on the front panel. Attempting synchronization with other than a sine-wave may cause harmonic distortion of the SG 502 output. Maximum purity is obtained when both signals are the same frequency.

The frequency range over which the synchronization occurs depends upon the amplitude of the synchronizing signal. The voltage required for synchronization varies linearly from $0\ \text{V}$ (when the frequencies are identical) to approximately $5\ \text{V rms}$ (when the frequencies differ by 5%).

Approximately a $1\ \text{V p-p}$ sine wave at the oscillator frequency is available from the SYNC INPUT connector. The source impedance is $10\ \text{k}\Omega$.

Synchronizing an External Device

The $+5\ \text{V}$ square-wave output can be used to synchronize an external device such as a counter or oscilloscope. The square-wave amplitude will be $+5\ \text{V}$ open-circuited, and will decrease as the load impedance decreases.

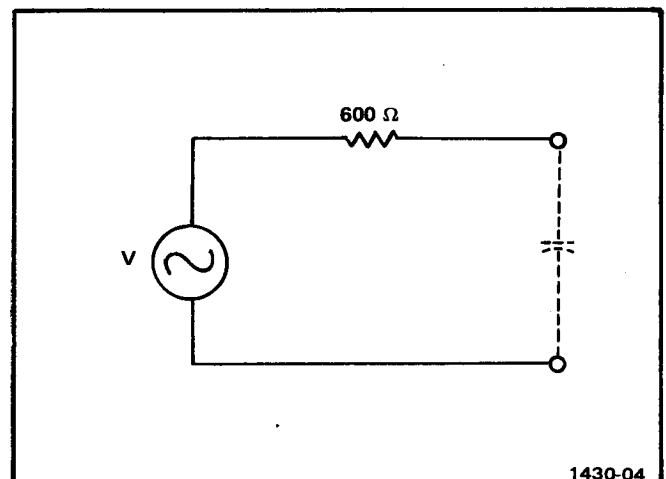


Fig. 1-4. Equivalent $600\ \Omega$ output circuits.

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 individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

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

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Refer to the following table for carton test strength requirements.

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

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

4. Seal carton with shipping tape or industrial stapler.

SHIPPING CARTON TEST STRENGTH

Gross Weight (lb)	Carton Test Strength (lb)
0-10	200
10-30	275
30-120	375
120-140	500
140-160	600

SPECIFICATION AND PERFORMANCE CHECK

SPECIFICATIONS

Table 2-1

Electrical Characteristics

Characteristics	Performance Requirements	Supplemental Information
Sine Wave		
Frequency Range	5 Hz to 500 kHz	
Calibration Accuracy	Within 5% of dial setting from 5 Hz to less than 50 kHz; within 10% of dial setting from 50 kHz to 500 kHz	
Amplitude Response	Within 0.3 dB over entire range (1 kHz reference)	
Maximum Output Voltage	5 V rms, open circuit, 2.5 V rms into a 600 Ω load	
Harmonic Distortion	Less than 0.035% from 20 Hz to 50 kHz. Less than 0.15% over the remaining frequency range	
Hum/Noise	Less than 0.1% of rated output	
Attenuation	0 to greater than 40 dB continuously variable. 10, 20, and 40 dB steps within $\pm 2\%$ for each step	
Square Wave		
Frequency Range	5 Hz to 500 kHz	
Amplitude	Approximately +5 V open-circuit (+2.5 V into a 600 Ω load)	
Rise and Fall Time	Less than 50 ns into 50 Ω or 600 Ω ; terminated and measured at the front panel	
Sync Input		
Input Impedance		10 k Ω

PERFORMANCE CHECK

Introduction

This procedure checks the electrical characteristics of the SG 502 that appear in the Specification. If the instrument fails to meet the requirements given in this performance check, the calibration procedure should be performed. This procedure can also be used by an incoming inspection facility to determine acceptability of performance.

The electrical characteristics are valid only if the SG 502 is calibrated at an ambient temperature of +20°C to +30°C and operated at an ambient temperature of 0°C to +50°C. Forced air circulation is required for ambient temperatures above +40°C.

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

Specifications and Performance Check—SG 502

Test Equipment Required

The following test equipment, or equivalent, is required to perform the performance check. Test equipment characteristics listed are the minimum required to verify the performance of the equipment under test. Substitute equipment must meet or exceed the stated requirements. All test equipment is assumed to be operating within 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 2-2
List of Test Equipment Requirements

Description	Performance Requirements	Application	Example
Oscilloscope	Bandwidth, dc to 50 MHz; minimum deflection factor, 5 mV/div; sweep rate, to at least 50 ns/div; differential comparator amplifier, comparison voltage, 0 V to ± 10 V.	Used throughout procedure to provide display.	a. Tektronix 5440, 5A45, 5A13N, 5B42 Oscilloscope System.
Counter	Maximum Frequency, 500 kHz; Period Avg mode capable to 10^3 ; Output sensitivity, 5 V; Display accuracy, 1 count in 10^3 .	Used for step 1.	a. Tektronix DC 503. ¹
Distortion Analyzer	Measure harmonic distortion, less than .035% from 20 Hz to 50 kHz; less than 0.15% over the remaining frequency range.	Used for steps 3, 4, and 6.	a. Hewlett-Packard HP334A.
Power Module	Accepts TM 500-series plug-ins.	Provides power for SG 502 and DC 503.	a. Tektronix TM 503.
10X passive probe	Compatible with test oscilloscope to be used	Used for steps 7 and 8.	a. Tektronix P6060 probe.
Termination	Impedance, 50 Ω ; connectors, BNC; accuracy, 2%	Output termination for signal generators, if amplifier is not 50 Ω input impedance.	a. Tektronix Part No. 011-0049-01.
Termination	Impedance, 600 Ω ; connectors, BNC.	Output termination for signal generators, if amplifier is not 600 Ω input impedance.	a. Tektronix Part No. 011-0092-00.
Adapter	Connectors, banana plug to BNC.	Harmonic distortion and sine-wave output check.	a. Tektronix Part No. 103-0090-00.
Cable	Impedance, 50 Ω ; type RG-58U; length, 42 inches; connectors, BNC.	Used for signal connection throughout procedure.	a. Tektronix Part No. 012-0057-01.

¹Requires TM 500 series power module.

Preliminary Procedure

1. Ensure that the correct nominal line selector block has been installed on the line selector pins on the Power Module interface board and the regulating range selected includes the applied line voltage. Refer to the installation section of the Power Module manual.

2. Ensure that all test equipment is suitably adapted to the applied line voltage.

3. Install the SG 502 into the Power Module, and if applicable, install the TM 500 series test equipment into the test equipment Power Module.

4. Connect the equipment under test and the test equipment to a suitable line voltage source. Turn all equipment on and allow at least 20 minutes for the equipment to stabilize.

Initial Control Settings

Set the following controls during warm-up time:

Oscilloscope

Intensity, Focus Set for well-defined trace and normal brightness.

Differential Comparator

Volts/Div	1 V
Variable	fully clockwise (cal)
+ Input	DC
– Input	GND
Bandwidth Limit	pushbutton in (Full bandwidth)

Time Base Plug-in

Seconds/Div	1 ms
Main Variable	fully clockwise (cal)
Triggering	
+ Slope	selected
Auto Trig	selected
AC Coupl	selected
Source	Left
Position	Set so trace starts at left side of graticule.
Swp Mag	normal sweep

Counter

CH A	(not used)
CH B	
Level	External source and mid-range
Attenuation	X1
Coupling	dc
+ Slope	selected
Function	Period B
N/Clock Rate switch	10 ³ —1 ms
Hold	fully counterclockwise (minimum)

SG 502

VAR AMPLITUDE	fully clockwise
MULTIPLIER switch	X100K (pushbutton in)
STEP ATTEN	all pushbuttons out
FREQUENCY Hz dial	any position

PERFORMANCE CHECK PROCEDURE

1. Check Dial Accuracy; dial accuracy is within 5%, 5 Hz to less than 50 kHz; within 10%, 50 kHz to 500 kHz.

a. Connect a 50 Ω cable to the SG 502 Square-wave output connector.

b. Connect a 600 Ω termination to the other end of the cable.

c. Connect the 600 Ω termination to the Counter CH B input connector.

d. CHECK—Dial settings and display using the following chart.

SG 502 MULTIPLIER	SG 502 FREQUENCY Hz dial	Counter RATE Switch	Counter Reading
X100K	5	10 ³	1.80—2.20 μs
X10K	5	10 ³	18.0—22.0 μs
X1K	5	10 ³	190—210 μs
X100	5	1	1.90—2.10 ms
X10	5	1	19.0—21.0 ms
X10	.5	1	190—210 ms
X100	.5	1	19.0—21.0 ms
X1K	.5	1	1.90—2.10 ms
X10K	.5	10 ³	190—210 μs
X100K	.5	10 ³	18.0—22.0 μs
X100K	1	10 ³	9.00—11.0 μs
X10K	1	10 ³	95.0—105 μs
X1K	1	1	.095—1.05 ms
X100	1	1	9.50—10.5 ms
X10	1	1	95.0—105ms

e. Disconnect the 600 Ω termination from the Counter and connect it to the SG 502 sine-wave output connector.

f. Disconnect the 50 Ω cable from the SG 502 square-wave output connector, and connect it to the Vertical Amplifier + Input.

2. Check Sine-wave Amplitude; response is within .3 dB over entire range (1 kHz reference).

a. Set time-base Time/Div switch to .5 μs.

b. Set the time-base triggering controls for an un-triggered condition.

c. Adjust SG 502 VAR AMPLITUDE control for a 6 division display on the oscilloscope.

d. Use the following chart to check the sine-wave response.

SG 502 MULTIPLIER Switch	SG 502 FREQUENCY Hz dial	Oscilloscope display Amplitude Limits
X10	.5	5.79 to 6.21 div
X100	.5	"
X1K	.5	"
X10K	.5	"
X100K	.5	"
X100K	1	"
X10K	1	"
X1K	1	"
X100	1	"
X10	1	"
X10	5	"
X100	5	"
X1K	5	"
X10K	5	"
X100K	5	"

e. Disconnect the 50 Ω cable from the Vertical Amplifier + Input connector.

3. Check Sine-wave Output Voltage; 2.5 V rms, into 600 Ω, ±0.15 V.

a. Preset the following front-panel control setting:

Distortion Analyzer	
Function	Voltmeter
Meter Range	3 volts
Input	Norm
SG 502	
Var Amplitude	Fully cw

b. Connect a Banana-to-BNC adapter to the Distortion Analyzer Input.

c. Connect the 50 Ω cable from the 600 Ω termination on the SG 502, to the adapter.

d. CHECK—Meter reads between 2.45 and 2.65 volts on the 0 to 3 volt scale.

e. Disconnect the cable from the adapter, and connect it to the + Input of the Vertical Amplifier.

4. Check Attenuation; 10, 20, and 40 dB steps within $\pm 2\%$ for each step.

- a. Set SG 502 FREQUENCY dial to 1.
- b. Set SG 502 MULTIPLIER switch to X1K (pushbutton in).
- c. Adjust SG 502 VAR AMPLITUDE control for a 5 division display on test oscilloscope.
- d. Set SG 502 STEP ATTEN switch to 10 (pushbutton in).
- e. Set 5A13N Volts/Div switch to 0.5 V/Div.
- f. CHECK—Display on test oscilloscope is between 3.1 and 3.3 divisions in amplitude.
- g. Set SG 502 STEP ATTEN switch to 20 (pushbutton in).
- h. Push and release SG 502 STEP ATTEN 10 switch (pushbutton out).
- i. Set 5A13N Volts/Div switch to 0.1 V.
- j. CHECK—Display on test oscilloscope is between 4.9 and 5.1 divisions in amplitude.
- k. Set SG 502 STEP ATTEN switch to 40 (pushbutton in).
- l. Push and release SG 502 STEP ATTEN 20 switch (pushbutton out).
- m. Set 5A13N Volts/Div switch to 10 mV.
- n. CHECK—Display on test oscilloscope is between 4.9 and 5.1 divisions in amplitude.
- o. Set 5A13N Volts/Div switch to 1 V.
- p. Push and release SG 502 STEP ATTEN 40 switch (pushbutton out).
- q. Adjust SG 502 VAR AMPLITUDE slowly counterclockwise and observe display on test oscilloscope for a smooth decrease in amplitude.
- r. Set SG 502 VAR AMPLITUDE fully clockwise.

5. Check Hum/Noise; is less than 0.1% of rated output.

- a. Adjust SG 502 VAR AMPLITUDE for a 6-division display on the test oscilloscope.
- b. Set SG 502 FREQUENCY dial to 5 and MULTIPLIER switch to X10 (pushbutton in).
- c. Set the time-base sweep rate to 20 ms.
- d. Set the 5A13N – Input to Vc (pushbutton in), and the Volts/Div switch to 5 mV.
- e. Adjust the 5A13N Comparison Voltage Fine control to position the top of the trace to the center of the graticule area.
- f. CHECK—Hum/Noise is less than 1.2 division.
- g. Set the time-base sweep rate to 10 ms.
- h. Set the SG 502 MULTIPLIER switch to X100 (pushbutton in).
- i. CHECK—Hum/Noise is less than 1.2 division.
- j. Set SG 502 MULTIPLIER switch to X1K (pushbutton in).
- k. CHECK—Hum/Noise is less than 1.2 division.
- l. Set SG 502 MULTIPLIER switch to X10K (pushbutton in).
- m. Set the time-base sweep rate to 5 ms.
- n. Set the 5A13N Comparison Voltage Fine control so the Volts display reads 3.00, then adjust the control counterclockwise to position the top of the trace to the center of graticule area.
- o. CHECK—Hum/Noise is less than 1.2 division.
- p. Set SG 502 MULTIPLIER switch to X100K (pushbutton in).
- q. CHECK—Hum/Noise is less than 1.2 division.
- r. Remove the 50 Ω cable from the 5A13N + Input.
- s. Set the 5A13N – Input to GND.

Specifications and Performance Check—SG 502

6. Check Harmonic Distortion; is less than 0.035% from 20 Hz to 50 kHz; less than 0.15% over the remaining frequency range.

- a. Preset the following front-panel controls settings:

SG 502 Oscillator

VAR AMPLITUDE	fully clockwise
MULTIPLIER switch	X10 (pushbutton in)
STEP ATTEN	pushbuttons out
FREQUENCY Hz dial	.5

HP334A Distortion Analyzer

Line	ON
Input	Norm
Function	Set Level
Sensitivity	Min
Vernier	midrange
Mode	Automatic
Frequency	5 Hz
Frequency Range	1 Hz
Balance Coarse and Fine	midrange
High Pass Filter	OUT
Meter Range	Set Level

- b. Connect a Banana plug to BNC adapter to the Analyzer INPUT.

- c. Connect a 600 Ω termination to the Banana plug to BNC adapter.

- d. Connect a 50 Ω cable from the SG 502 sine-wave output connector to the 600 Ω termination.

- e. Set the Analyzer Sensitivity and Vernier for a meter reading of 1 on the 0 to 1 scale.

- f. Set Analyzer Function control to Distortion.

- g. Adjust Analyzer Frequency dial and Balance controls for minimum reading on the meter.

- h. Set the Analyzer Meter Range control to .3 on the percentage scale.

- i. CHECK—Analyzer meter reads less than 1.5 on the 0 to 3 scale.

- j. Set Analyzer Meter Range and the Function controls to Set Level.

- k. Set SG 502 Frequency dial to 2, and the MULTIPLIER switch to X100.

- l. Set Analyzer Frequency dial to approximately 20; set Analyzer Frequency Range control to X10 (frequency 200 Hz).

- m. Set Analyzer Vernier control for a meter reading of 1 on the 0 to 1 scale.

- n. Set Analyzer Function control to Distortion.

- o. Adjust Analyzer Frequency dial and Balance controls for minimum reading on the meter.

- p. Set Analyzer Meter Range control to .1 on the percentage scale.

- q. CHECK—Analyzer meter reads less than .035 on the 0 to .1 scale.

- r. Set Analyzer Meter Range and Function controls to Set Level.

- s. Set SG 502 FREQUENCY dial to 5, and the MULTIPLIER switch to X1K.

- t. Set Analyzer Frequency dial to approximately 50.

- u. Set Analyzer Frequency Range control to X100, (frequency 5 kHz).

- v. Repeat parts m, n, o, and p of this step.

- w. CHECK—Analyzer meter reads less than .035 on the 0 to .1 scale.

- x. Set Analyzer Meter Range and Function controls to Set Level; set Analyzer Frequency Range control to X1K (frequency 50 kHz).

- y. Set SG 502 MULTIPLIER switch to X10K.

- z. Repeat parts m, n, o, and p of this step.

- aa. CHECK—Analyzer meter reads less than .035 on the 0 to .1 scale.

- ab. Set Analyzer Meter Range and Function controls to Set Level.

- ac. Set SG 502 MULTIPLIER switch to X100K.

- ad. Set Analyzer Frequency Range control to X10K, (frequency 500 kHz).

- ae. Repeat parts m, n, and o of this step.

- af. Set Analyzer Meter Range control to .3 on the percentage scale.

- ag. CHECK—Analyzer meter reads less than 1.5 on the 0 to 3 scale.

- ah. Remove the 600 Ω termination and 50 Ω cable from the SG 502 and the Analyzer.

7. Check Square-wave amplitude; 2.5 V into 600 Ω, within 250 mV.

- a. Preset the following front-panel control settings:

Oscilloscope

Intensity, Focus Set for well-defined trace and normal brightness.

Differential Comparator Plug-In

Volts/Div 50 mV
 Variable fully clockwise (cal)
 + Input DC
 - Input GND

Time Base Plug-In

Time/Div 1 ms
 Variable fully clockwise (cal)
 Triggering
 Level/Slope positive slope region
 Mode AUTO TRIG
 Coupling AC
 Source Internal
 Position Set so trace starts at left side of graticule.
 Swp Mag out

SG 502

FREQUENCY Hz dial 5
 MULTIPLIER Switch X100K (pushbutton in)

- b. Connect a 600 Ω termination to the SG 502 square-wave output connector.
- c. Connect a 10X probe to the 5A13N + Input connector.
- d. Connect the probe ground clip to the outer portion of the 600 Ω termination.
- e. Connect the probe tip to the inner connector of the 600 Ω termination.
- f. CHECK—Display on test oscilloscope is between 4.5 and 5.5 division in amplitude.

8. Check Square-wave rise and fall time; 50 ns or less.

- a. Leave controls of test equipment and cable connections as described in step 7 a through e.
- b. Set 5A45 Volts/Div switch to 20 mV.
- c. Adjust the 5A45 Variable control for a 6-division display.
- d. Set time-base Time/Div switch to 50 ns.
- e. CHECK—Waveform rises from its 10% to 90% point within 50 ns (1 division).
- f. Adjust the time-base Level/Slope control to its negative slope region.
- g. CHECK—Waveform falls from its 90% to 10% point within 50 ns (1 division).
- h. Remove all connections from the SG 502 and 5A45.

This completes the performance check of the SG 502.



WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

ADJUSTMENT

Introduction

This adjustment procedure is to be used to restore the SG 502 to its original performance specification. 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.

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

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 following test equipment is required to perform the Adjustment Procedure. A dc voltmeter with the following specifications is required for checking the dc power supplies: Range: ± 20 volts; Accuracy: 1% or better; Recommended equipment: Tektronix DM 501 Digital Multimeter.

A flexible plug-in extender, Tektronix Part No. 067-0645-01, is useful for troubleshooting or adjusting the SG 502; however, the complete Adjustment Procedure can be performed without use of the extender.

A TM 500-series Power Module is required for troubleshooting or adjusting the SG 502. Recommended equipment: Tektronix TM 503.

Preparation

a. Remove the left side cover of the SG 502 to gain access to the component side of the circuit board. Pull the rear end of the side cover outward from the side of the instrument (the cover snaps into place).

b. If the SG 502 is to be adjusted without use of the flexible plug-in extender, remove the Power Module cabinet cover.

c. Install the SG 502 into the left Power Module compartment, or if appropriate, connect the SG 502 to the Power Module by means of the flexible plug-in extender.

d. Set the Power Module for the line voltage to be applied (see Power Module manual) and connect it to the line voltage source. Be sure that the power switch is off.

e. Install all TM 500-series equipment, including the SG 502 into the Power Module.

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

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

Initial Control Settings

Set the following controls during warm-up time:

SG 502 Oscillator

VAR AMPLITUDE	fully clockwise
MULTIPLIER switch	X100K (pushbutton in)
STEP ATTEN	all pushbuttons out
FREQUENCY Hz dial	any position

Adjustment—SG 502

1. Check Power Supply Voltages

- Connect the digital voltmeter between +20 V test point on the circuit board, and chassis ground. See Fig. 3-1 for voltage test point location.
- CHECK—For a meter reading of +21.0 to +19.0 volts.
- Repeat part a of this step for the -20 volt supply.
- CHECK—For a meter reading of -21.0 to -19.0 volts.
- Disconnect the digital voltmeter.

2. Adjust AGC Voltage

- Connect the digital voltmeter between the AGC test point on the circuit board, and chassis ground. See Fig. 3-1 for test point location.
- Set the Oscillator FREQUENCY Hz dial to 5, the VAR AMPLITUDE control fully clockwise, and press in the X100K MULTIPLIER pushbutton. All STEP ATTEN pushbuttons must be out.
- ADJUST—AGC Adjust, R115, for a meter reading of -2.5 volts. See Fig. 3-1 for adjustment location.
- Disconnect the digital voltmeter.

3. Adjust Output Voltage

- Connect an ac voltmeter between the sinewave output BNC connector on the front panel and chassis ground.
- Turn the VAR AMPLITUDE control fully clockwise and check that all STEP ATTEN pushbuttons are out.
- Set the FREQUENCY Hz dial and the MULTIPLIER pushbuttons for a 1 kHz signal.
- ADJUST—Gain Adjust, R191, for a meter reading of 5 volts, rms. See Fig. 3-1 for adjustment location.
- Connect a 600 Ω termination to the BNC sinewave output connector.
- Connect an ac voltmeter between the 600 Ω termination and chassis ground.
- CHECK—For a meter reading of 2.5 volts, rms.
- Disconnect the voltmeter and remove the 600 Ω termination.

This completes the Adjustment procedure of the SG 502 Oscillator.

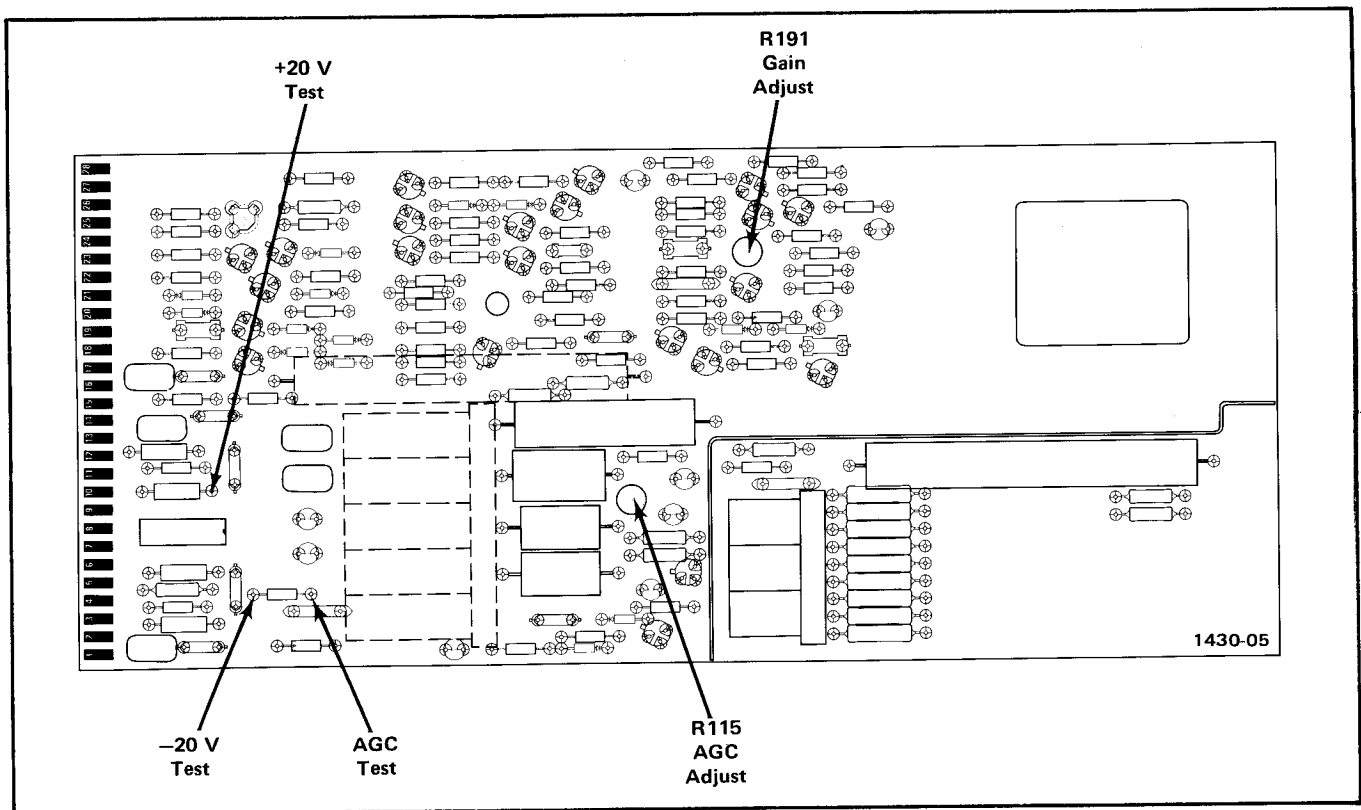


Fig. 3-1. Location of test points, AGC and Gain adjustments.

MAINTENANCE AND INTERFACING INFORMATION

Preventive Maintenance

There are no special preventive maintenance procedures that apply to the SG 502. 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 SG 502.

Functions Available at Rear Connector

A slot between pins 23 and 24 on the rear connector identifies the SG 502 as a member of the signal source family. Insert a barrier in the corresponding position of the Power Module jack to prevent other than signal source plug-ins from being used in that compartment. This protects the plug-in should specialized connections be made to that compartment. Consult the Building A System section of the Power Module manual for further information.

Signal outputs, or other specialized connections, are made to the rear interface connectors as shown in Fig. 4-1. The Sync In and Sync Ground are not factory wired. The Sync Out signal is a sine wave of the same frequency as the output signal. It has an amplitude of at least 1 V rms, which is essentially constant over the entire frequency range. The source impedance is 1 k Ω . Use this signal to trigger external devices such as oscilloscopes or counters etc.

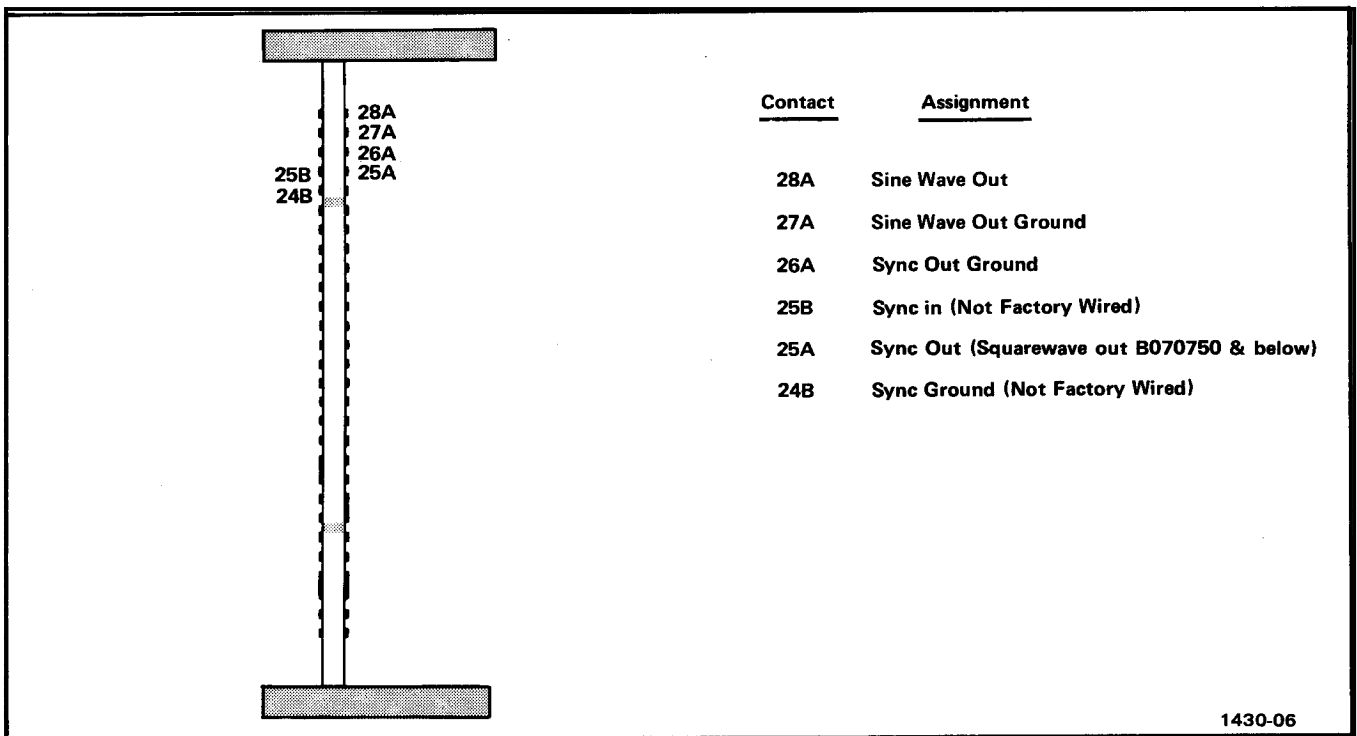


Fig. 4-1. Input/Output assignments at rear connector.

CIRCUIT DESCRIPTION

Introduction

This section of the manual contains a description of the circuitry used in the SG 502 Oscillator. Individual descriptions are separated into the following parts: Sync Input, Oscillator Amplifier, Automatic Gain Control, Frequency Control, Buffer Amplifier, Attenuator, Square-Wave Output, and Power Supply. Refer to the appropriate diagrams in the Diagrams section of this manual while reading the circuit description.

Sync Input

The Sync Input signal is applied to the + side (Q10A) of the oscillator amplifier through C10 and R10.

Oscillator Amplifier

Dual FET's Q10A and Q10B provide differential amplification, with Q70, R71, R73 and R75 serving as their constant current source. The FET's drive differential transistors Q20 and Q24, with Q30, R32, R35, and R36 serving as their constant current source. Q86 supplies constant current to emitter-follower Q80, which drives output emitter-followers Q82 and Q88. Positive feedback for oscillation occurs through R117 and C12.

Automatic Gain Control (AGC)

Peak detector Q90 and FET Q110 compose an automatic gain control circuit. The FET operates as a variable resistor in a divider configuration composed of R115 (AGC adjustment), R116, and R117. The divider is connected from the output of the oscillator amplifier to ground, and varies the amount of positive feedback. Voltage at the gate of Q110 is proportional to the peak sine-wave amplitude. The shunt capacitors provide smoothing at the various frequencies.

Frequency Control

The output from Q82 and Q88 is fed back to the minus input (Q10B) of the oscillator amplifier as negative feedback through the bridged T notch filter. Minimum voltage transfer occurs at the output frequency. Adjusting the ganged controls R50A and R50B (labeled FREQUENCY Hz and located on the front panel) varies the notch frequency.

Buffer Amplifier

The buffer amplifier (Q120, Q128, and Q130) provides isolation between the oscillator amplifier and the output circuitry. Q120 and Q128 form a differential amplifier supplied by a constant current source Q130, R130, R132, and R133. The collector of Q120 drives the base of Q140, cascaded with Q145. The collector of Q145 drives Q150 and Q154 in a common emitter configuration. CR150 and CR154 provide proper biasing. Negative feedback occurs through C120. Gain is set by Gain Adjust 191.

Attenuator

Four T sections, three fixed and one variable, comprise the constant-impedance 600 Ω attenuator. R160 determines the input impedance. Each section except the variable is switchable in or out to provide attenuation steps.

Square-Wave Output

The output sine-wave from the buffer amplifier is fed through R195 to diodes CR195, CR196, CR198, and CR199, which limit the positive and negative excursions. Collectors of Q200 and Q210, a differential amplifier, are further clamped by diodes CR200 and CR202. The output, at 600 Ω , is taken from the collector of Q220, which forms a differential amplifier with Q230. Their constant current source is supplied by Q235, R235, R238, and R240. Positive feedback from the collector of Q230 ensures fast switching. Diodes CR210 and CR212 limit the voltage excursions and ensure operation in the non-saturated mode.

Power Supply

Integrated circuit U320 provides the regulated dc voltage supply for the circuits. Conduction of the series-pass transistors in the mainframe is controlled by the current through U320. This current determines the voltage drop across R320 and R340. Therefore, U320 carries only part of the necessary current, with the remainder being supplied by the series-pass transistors. The voltage drop across R322 and R342 activates hard current-limiting in U320. R348 determines the output voltage, while C322 and C342 provide negative ac feedback for smoothing.

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
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
02111	SPECTROL ELECTRONICS CORPORATION	17070 EAST GALE AVENUE	CITY OF INDUSTRY, CA 91745
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
17117	ELECTRONIC MOLDING CORP.	96 MILL ST.	WOONSOCKET, RI 02895
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
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
80740	BECKMAN INSTRUMENTS, INC.	2500 HARBOR BLVD.	FULLERTON, CA 92634
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E WASHINGTON STREET P O BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-2215-00			CKT BOARD ASSY:MAIN	80009	670-2215-00
C10	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C12	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C18	281-0656-00			CAP.,FXD,CER DI:22PF,5%,500V	72982	374-000COG0220J
C50 ¹	285-0784-01			CAP.,FXD,PLSTC:10.0UF,3%,25V	80009	285-0784-01
C51 ¹	285-0895-00			CAP.,FXD,PLSTC:1.0UF,3%,25V	80009	285-0895-00
C52 ¹	285-0891-00			CAP.,FXD,PLSTC:0.1UF,3%,100V	80009	285-0891-00
C53 ¹	285-0753-01			CAP.,FXD,PLSTC:0.01UF,3%,100V	80009	285-0753-01
C54 ¹	285-0754-01			CAP.,FXD,PLSTC:995UF,3%,400V	80009	285-0754-01
C55	283-0632-00			CAP.,FXD,MICA D:10PF,1%,100V	00853	D151E870P0
C91	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
C97	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C101	290-0531-00			CAP.,FXD,ELCTLT:100UF,20%,10V	90201	TDC107M010WLC
C103	290-0531-00			CAP.,FXD,ELCTLT:100UF,20%,10V	90201	TDC107M010WLC
C105	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C107	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C109	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C110	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C112	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C120	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055COG0100F
C140	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C146	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
C150	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055COG0100F
C160	290-0208-00			CAP.,FXD,ELCTLT:350UF,+75-15%,15V	56289	113D357C7015P1
C200	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	04222	7001-1364
C321	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C322	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C324	290-0528-00			CAP.,FXD,ELCTLT:15UF,20%,50V	90201	TDC156M050WLC
C325	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C330	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C341	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C342	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C344	290-0528-00			CAP.,FXD,ELCTLT:15UF,20%,50V	90201	TDC156M050WLC
C345	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C350	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
CR80	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR86	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR90	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR91	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR150	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR154	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR195	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR196	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR198	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR199	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR200	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR202	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR210	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR212	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR322	152-0066-00	XB040000		SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR324	152-0107-00	XB040000		SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR342	152-0066-00	XB040000		SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00

¹Available as a matched set; part number 295-0161-00. The letter suffix and the tolerance should be the same for all of the timing capacitor in the assembly.

Replaceable Electrical Parts—SG 502

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
CR344	152-0107-00	XB040000		SEMICONV DEVICE:SILICON,400V,400MA	80009	152-0107-00
DS346	150-0109-00			LAMP, INCAND:18V,26MA	71744	CM7220
J10	136-0187-00			JACK, TIP:	17117	4653-113-0
J180	131-0274-00			CONNECTOR, RCPT, :BNC	91836	KC79-67
J205	210-0774-00			EYELET, METALLIC:0.152 OD X 0.245 INCH L, BRS	80009	210-0774-00
	210-0775-00			EYELET, METALLIC:0.126 OD X 0.23 INCH L, BRS	80009	210-0775-00
J210	131-0955-00			CONNECTOR, RCPT, :BNC, FEMALE, W/HARDWARE	05091	31-279
P205	131-1003-00			CONNECTOR BODY, :CKT CD MT, 3 PRONG	80009	131-1003-00
Q10A, B	151-1054-00			TRANSISTOR:SILICON, JFE, N-CHANNEL, DUAL	80009	151-1054-00
Q20	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q24	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q30	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q70	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q80	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q82	151-0302-00			TRANSISTOR:SILICON, NPN	80009	151-0302-00
Q86	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q88	151-0301-00			TRANSISTOR:SILICON, PNP	04713	2N2907A
Q90	151-0302-00			TRANSISTOR:SILICON, NPN	80009	151-0302-00
Q110	151-1021-00			TRANSISTOR:SILICON, JFE	80009	151-1021-00
Q120	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q128	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q130	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q140	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q145	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q150	151-0302-00			TRANSISTOR:SILICON, NPN	80009	151-0302-00
Q154	151-0301-00			TRANSISTOR:SILICON, PNP	04713	2N2907A
Q200	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q210	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
Q220	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q230	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
Q235	151-0188-00			TRANSISTOR:SILICON, PNP	80009	151-0188-00
R10	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R12	315-0105-00			RES., FXD, CMPSN:1M OHM, 5%, 0.25W	01121	CB1055
R15	315-0121-00			RES., FXD, CMPSN:120 OHM, 5%, 0.25W	01121	CB1215
R18	315-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.25W	01121	CB7525
R22	315-0512-00			RES., FXD, CMPSN:5.1K OHM, 5%, 0.25W	01121	CB5125
R25	315-0220-00			RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R27	315-0512-00			RES., FXD, CMPSN:5.1K OHM, 5%, 0.25W	01121	CB5125
R29	315-0220-00			RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R32	315-0561-00			RES., FXD, CMPSN:560 OHM, 5%, 0.25W	01121	CB5615
R35	315-0132-00			RES., FXD, CMPSN:1.3K OHM, 5%, 0.25W	01121	CB1325
R36	315-0392-00			RES., FXD, CMPSN:3.9K OHM, 5%, 0.25W	01121	CB3925
R38	315-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.25W	01121	CB7525
R40	315-0121-00			RES., FXD, CMPSN:120 OHM, 5%, 0.25W	01121	CB1215
R45	321-0661-00			RES., FXD, FILM:600 OHM, 1%, 0.125W	91637	MFF1816G600ROF
R50A, B	311-1502-00			RES., VAR, WW:PNL, 2 X 10K OHM, 2.75W	02111	100-9625
R55	321-0661-00			RES., FXD, FILM:600 OHM, 1%, 0.125W	91637	MFF1816G600ROF
R71	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R73	315-0392-00			RES., FXD, CMPSN:3.9K OHM, 5%, 0.25W	01121	CB3925

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R75	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
R82	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R84	315-0102-00	XB070000		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R86	315-0112-00			RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125
R88	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R91	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R93	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R95	315-0753-00		RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535	
R97	315-0302-00		RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025	
R110	321-0364-00		RES.,FXD,FILM:60.4K OHM,1%,0.125W	91637	MFF1816G60401F	
R113	321-0364-00		RES.,FXD,FILM:60.4K OHM,1%,0.125W	91637	MFF1816G60401F	
R115	311-0978-00		RES.,VAR,NONWIR:250 OHM,10%,0.50W	80740	62-67-3	
R116	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R117	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R120	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205	
R123	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205	
R125	315-0242-00		RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425	
R126	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205	
R129	315-0242-00		RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425	
R130	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025	
R132	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R133	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R140	315-0122-00		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225	
R143	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015	
R146	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R150	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205	
R154	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205	
R156	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725	
R160	321-0661-00		RES.,FXD,FILM:600 OHM,1%,0.125W	91637	MFF1816G600ROF	
R164	321-0661-00		RES.,FXD,FILM:600 OHM,1%,0.125W	91637	MFF1816G600ROF	
R165A,B	311-1440-00		RES.,VAR,NONWIR:250K X 30K OHM	01121	10M479	
R166	321-0661-00		RES.,FXD,FILM:600 OHM,1%,0.125W	91637	MFF1816G600ROF	
R170	322-0703-07		RES.,FXD,FILM:311.7 OHM,0.1%,0.25W	91637	MFF1421C311R7B	
R171	322-0702-07		RES.,FXD,FILM:421.6 OHM,0.1%,0.25 W	91637	MFF1421C421R6B	
R172	322-0703-07		RES.,FXD,FILM:311.7 OHM,0.1%,0.25W	91637	MFF1421C311R7B	
R174	322-0701-07		RES.,FXD,FILM:490.9 OHM,0.1%,0.25W	91637	MFF1421C490R9B	
R175	322-0704-07		RES.,FXD,FILM:121.2 OHM,0.1%,0.25W	91637	MFF1421C121R2B	
R176	322-0701-07		RES.,FXD,FILM:490.9 OHM,0.1%,0.25W	91637	MFF1421C490R9B	
R178	322-0700-07		RES.,FXD,FILM:588.1 OHM,0.1%,0.25W	91637	MPP1421C588R1B	
R179	321-1008-04		RES.,FXD,FILM:12.0 OHM,0.1%,0.125W	91637	MFF1816D12R00B	
R180	322-0700-07		RES.,FXD,FILM:588.1 OHM,0.1%,0.25W	91637	MPP1421C588R1B	
R191	311-0633-00		RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	82-30-0	
R194	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R195	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035	
R200	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025	
R206	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025	
R210	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025	
R212	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725	
R220	315-0301-00		RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015	
R224	321-0661-00		RES.,FXD,FILM:600 OHM,1%,0.125W	91637	MFF1816G600ROF	
R235	315-0511-00		RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115	
R238	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R240	315-0302-00		RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025	

Replaceable Electrical Parts—SG 502

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R320	301-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.50W	01121	EB2015
R321	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R322	307-0051-00			RES., FXD, CMPSN:2.7 OHM, 5%, 0.50W	01121	EB27G5
R325	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R330	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R340	301-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.50W	01121	EB2015
R341	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R342	307-0051-00			RES., FXD, CMPSN:2.7 OHM, 5%, 0.50W	01121	EB27G5
R345	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R346	315-0301-00			RES., FXD, CMPSN:300 OHM, 5%, 0.25W	01121	CB3015
R348	321-0314-00	B010100	B029999	RES., FXD, FILM:18.2K OHM, 1%, 0.125W	91637	MFF1816G18201F
R348	321-0314-00	B030000		RES., FXD, FILM:18.2K OHM, 1%, 0.125W	91637	MFF1816G18201F
R350	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
S50A	260-1449-00			SWITCH, TOGGLE:5 STA, NON-SHORT, INTERLOCK	80009	260-1449-00
S50B						
S50C						
S50D						
S50E						
S160A	260-1448-00			SWITCH, TOGGLE:3 STA, NON-SHORT	80009	260-1448-00
S160B						
S160C						
U320	156-0208-00			MICROCIRCUIT, LI:DUAL TRACKING VOLT REG	80009	156-0208-00
VR91	152-0149-00			SEMICONV DEVICE:ZENER, 0.4W, 10V, 5%	04713	1N961B
VR146	152-0149-00			SEMICONV DEVICE:ZENER, 0.4W, 10V, 5%	04713	1N961B

OPTIONS

(No options are available at this time)

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATION

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).

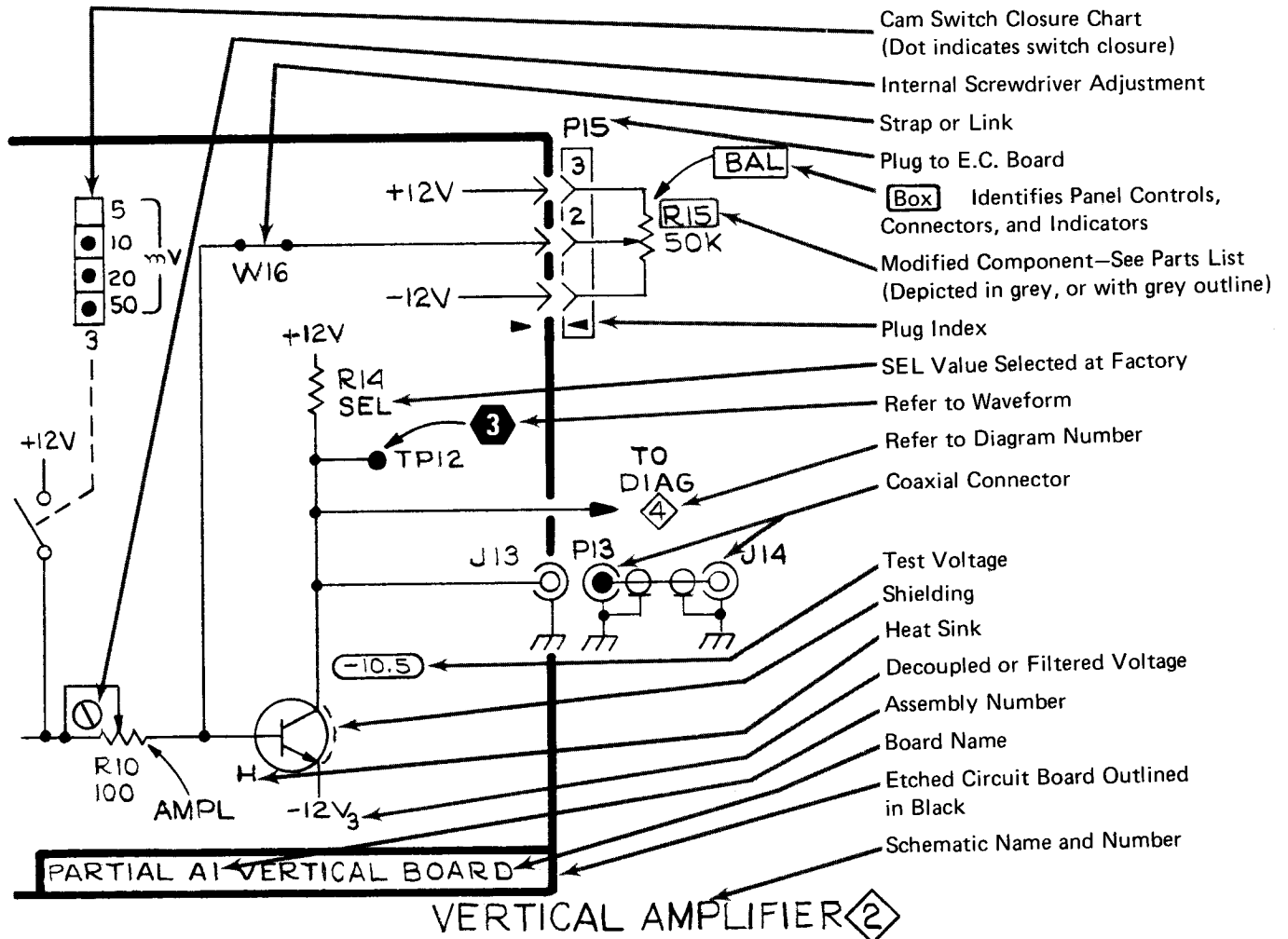
Symbols used on the diagrams are based on ANSI Standard Y32.2-1975.

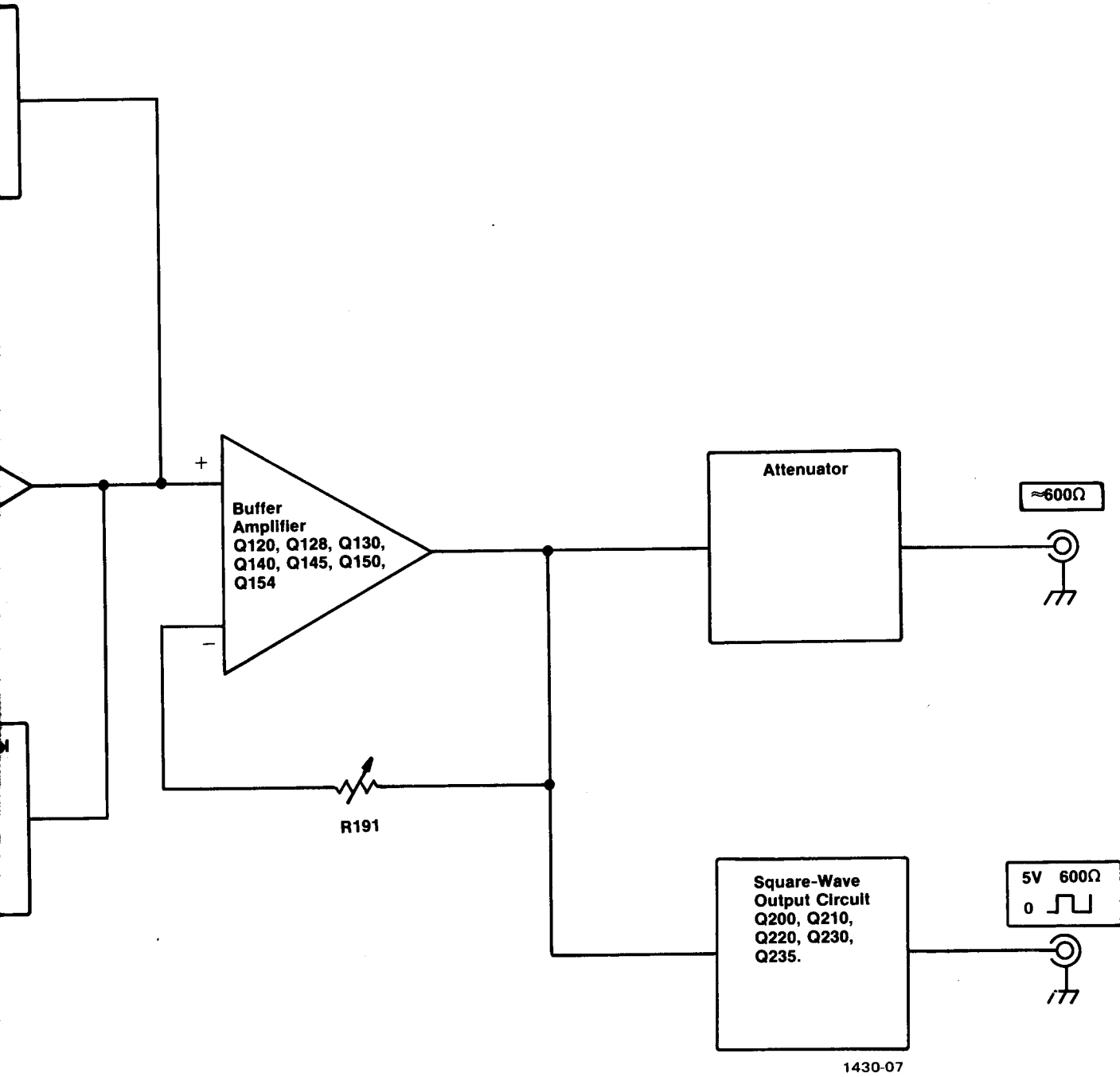
Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

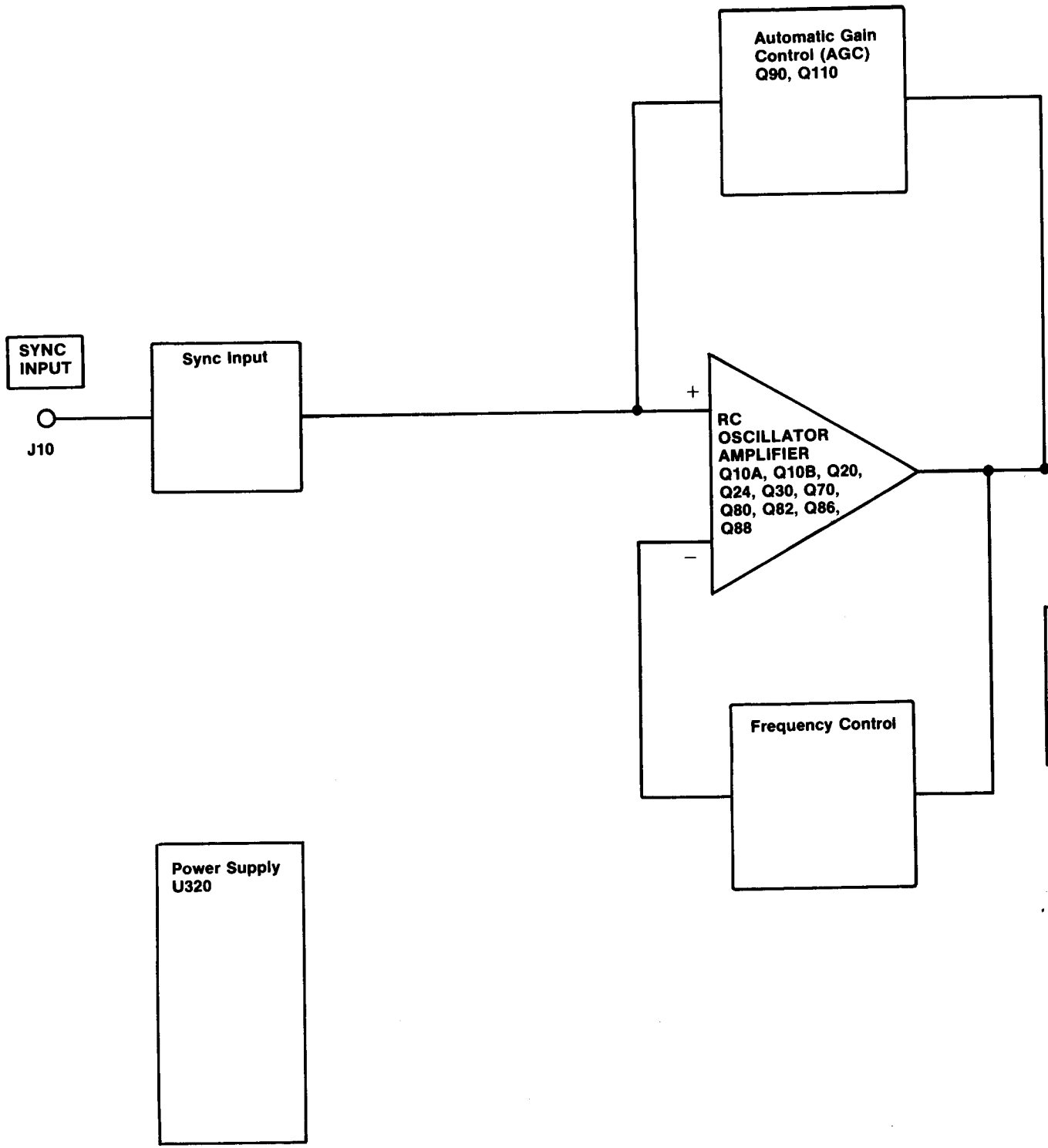
The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

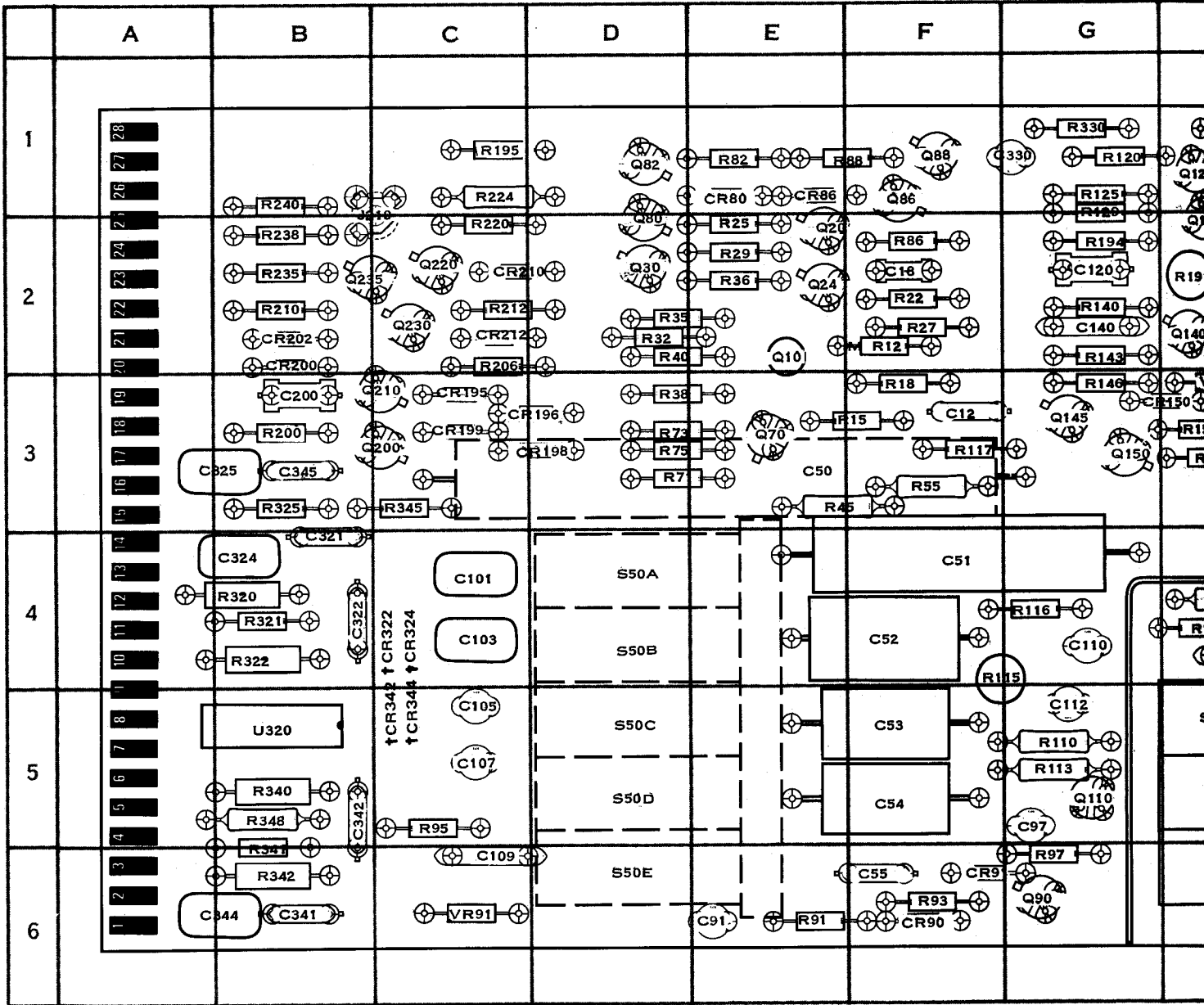
A	Assembly, separable or repairable (circuit board, etc.)	H	Heat dissipating device (heat sink, heat radiator, etc.)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor,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

The following special symbols are used on the diagrams:



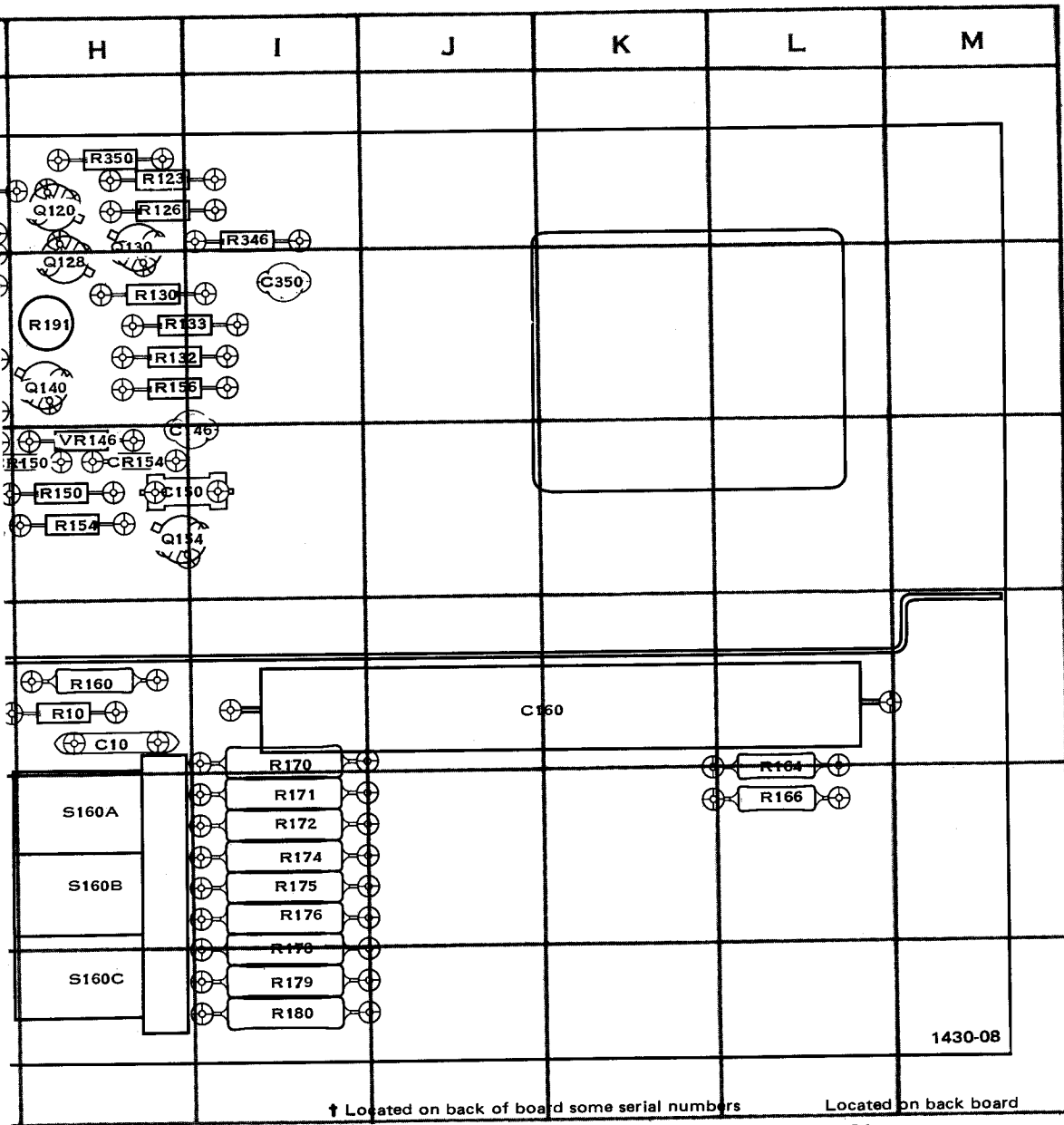






NOTE: COMPONENTS SHOWN WITH DASHED LINES ARE LOCATED ON BACK SIDE OF BOARD.

A1—Main circuit board.



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C10	H4	Q10A,B	E2	R132	H2
C12	F3	Q20	E2	R133	H2
C18	F2	Q24	E2	R140	G2
C50	E3	Q30	D2	R143	G2
C51	F4	Q70	E3	R146	G3
C52	F4	Q80	D2	R150	H3
C53	F5	Q82	D1	R154	H3
C54	F5	Q86	F1	R156	H2
C55	F6	Q88	F1	R160	H4
C91	E6	Q90	G6	R164	L4
C97	G5	Q110	G5		
C101	C4	Q120	H1	R166	L5
C103	C4	Q128	H2	R170	I4
C105	C6	Q130	H1	R171	I5
C107	C5	Q140	H2	R172	I5
C109	C6	Q145	G3	R174	I5
C110	G4	Q150	G3	R175	I5
C112	G5	Q154	H3	R176	I5
C120	G2	Q200	C3	R178	I5
C140	G2	Q210	C3	R179	I6
C146	I3	C220	C2	R180	I6
C150	H3	Q230	C2	R191	H2
C160	K4	Q235	B2	R194	G2
C200	B3			R195	C1
C321	B4			R200	B3
C322	B4	R10	H4	R206	B3
C324	B4	R12	F2	R210	B2
C325	B3	R15	F3	R212	C2
C330	G1	R18	F3	R220	C2
C341	B6	R22	F2	R224	C1
C342	B5	R25	E2	R235	B2
C344	B6	R27	F2	R238	B2
C345	B3	R29	E2	R240	B1
C350	I2	R32	D2	R320	B4
		R35	D2	R321	B4
		R36	E2	R322	B4
CR80	E1	R38	D3	R325	B3
CR86	E1	R40	D2	R330	G1
CR90	F6	R45	E3	R340	B5
CR91	F6			R341	B6
CR150	H3	R55	F3	R342	B6
CR154	H3	R71	D3	R345	C3
CR195	C3	R73	D3	R346	I1
CR196	D3	R75	D3	R348	B5
CR198	D3	R82	E1	R350	H1
CR199	C3	R84*			
CR200	B2	R86	F2	S50A	D4
CR202	B2	R88	E1	S50B	D4
CR210	C2	R91	E6	S50C	D5
CR212	C2	R93	F6	S50D	D5
CR322*†		R95	C5	S50E	D6
CR324*†		R97	G6	S160A	H5
CR342*†		R110	G5	S160B	H5
CR344*†		R113	G5	S160C	H6
		R115	F4		
DS346		R116	G4	U320	B5
		R117	F3		
J10		R120	G1	VR91	C6
J180		R123	H1	VR146	H3
J205		R125	G1		
J210	B1	R126	H1		
P205		R129	G1		
		R130	H2		

*See Parts List for
serial number ranges.

VOLTAGE AND WAVEFORM 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.

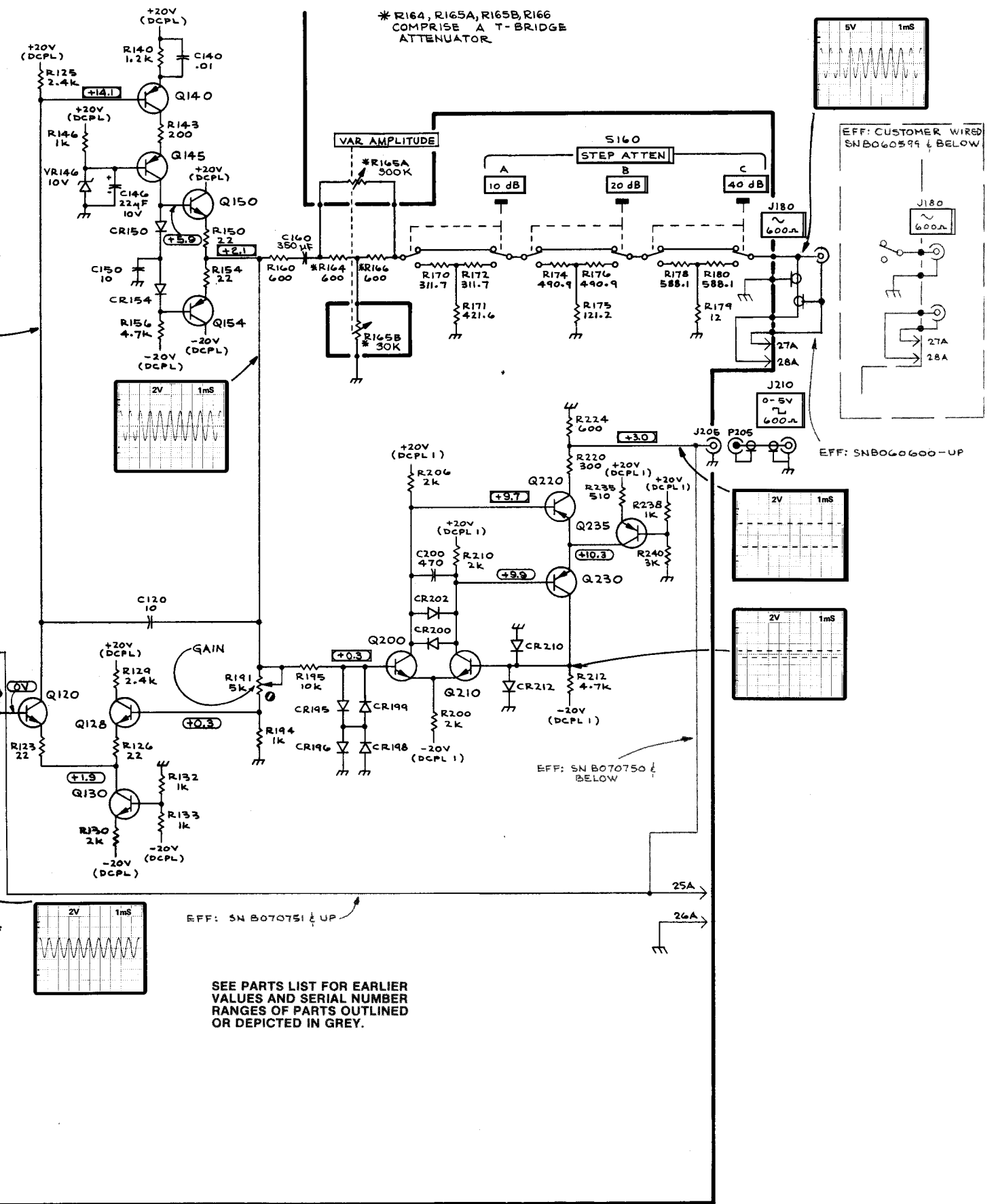
The voltages and waveforms shown on diagram 1 were taken with no input signal and the SG 502 front panel controls set as follows:

VOLTAGES		*WAVEFORMS	
FREQUENCY Hz dial	1	FREQUENCY Hz dial	1
MULTIPLIER	all pushbuttons out	MULTIPLIER	X1K
VAR ATTEN	fully clockwise	VAR ATTEN	fully clockwise
STEP ATTEN	all pushbuttons out	STEP ATTEN	all pushbuttons out

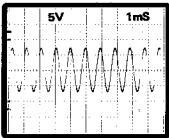
*gnd reference: center horizontal graticule line

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

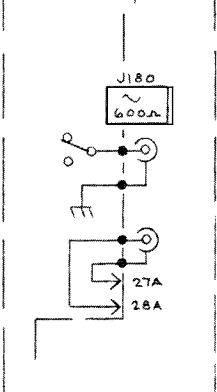
Waveform Conditions. The waveforms shown are actual waveform photographs taken with a Tektronix Oscilloscope Camera System and Projected Graticule. Vertical deflection factor shown on the waveform is the actual deflection factor from the probe tip. Voltages and waveforms on the diagrams are not absolute and may vary between instruments because of component tolerances, internal calibration, or front-panel settings. Readouts are simulated in larger-than-normal type.



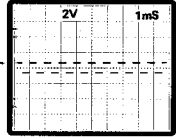
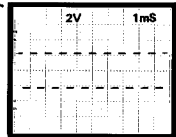
* R164, R165A, R165B, R166
COMPRISE A T-BRIDGE
ATTENUATOR



EFF: CUSTOMER WIRED
SNB060599 & BELOW



EFF: SNB060600-UP



EFF: SNB070750 &
BELOW

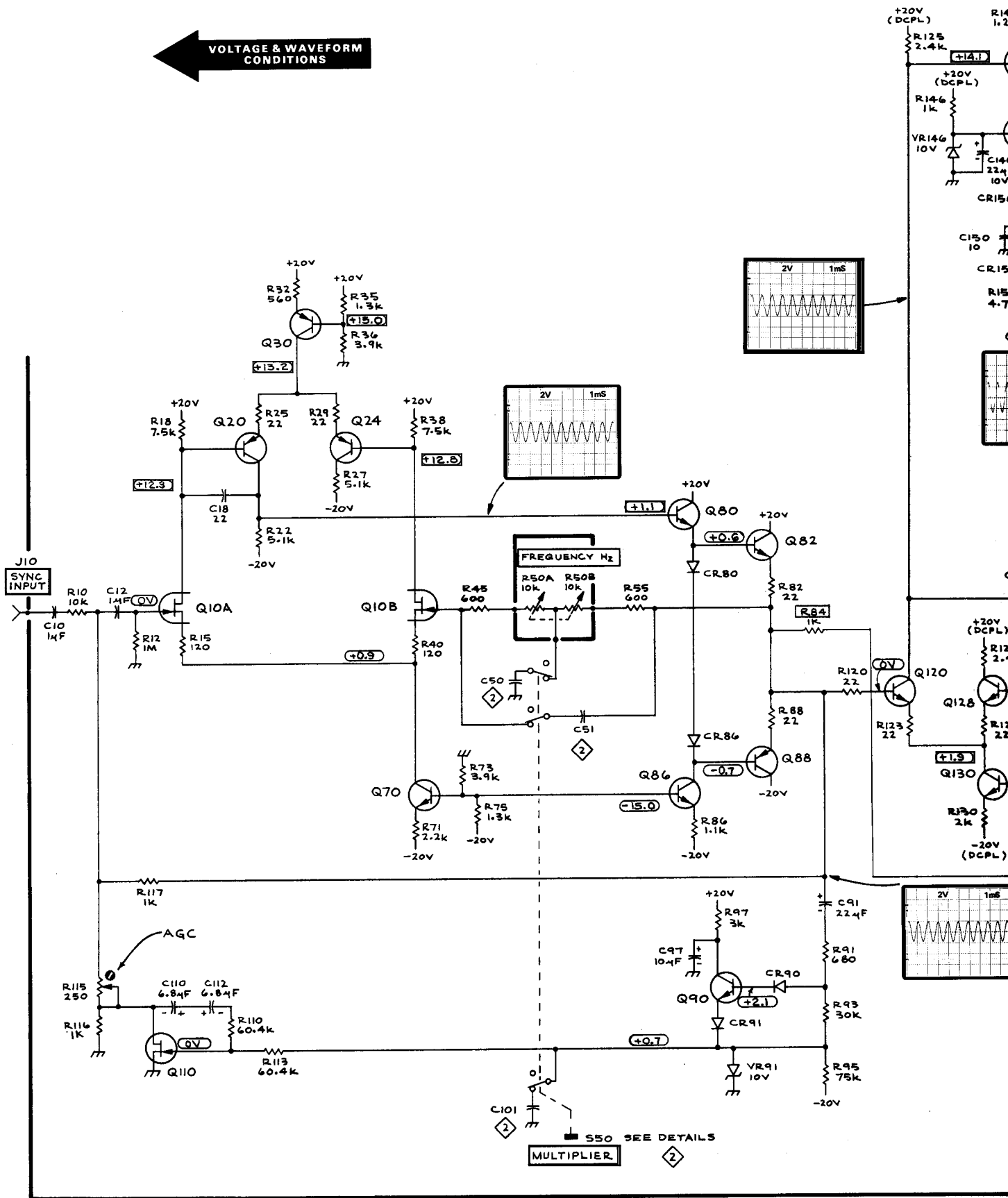
EFF: SNB070751 & UP

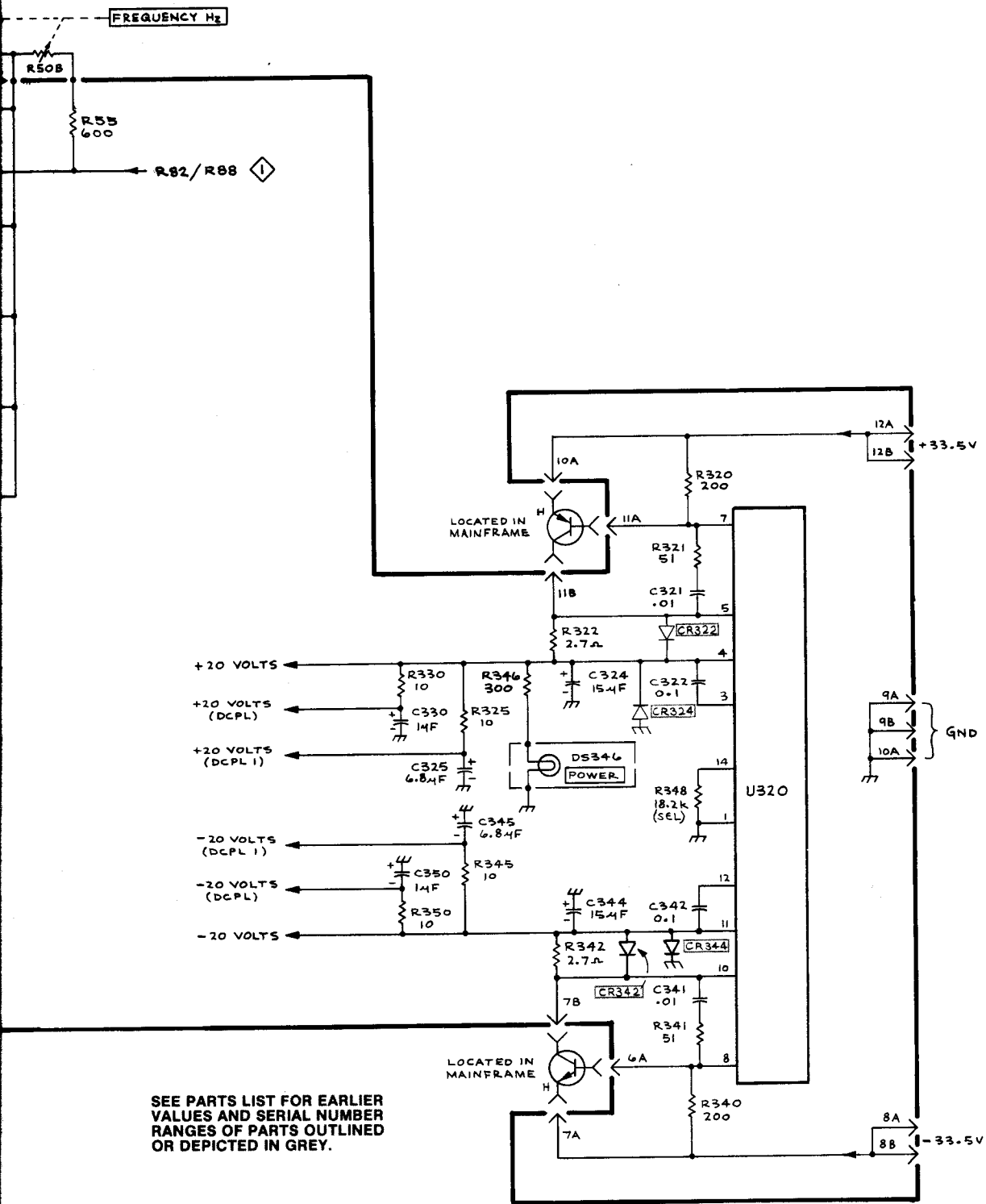
SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS OUTLINED
OR DEPICTED IN GREY.

RC OSCILLATOR



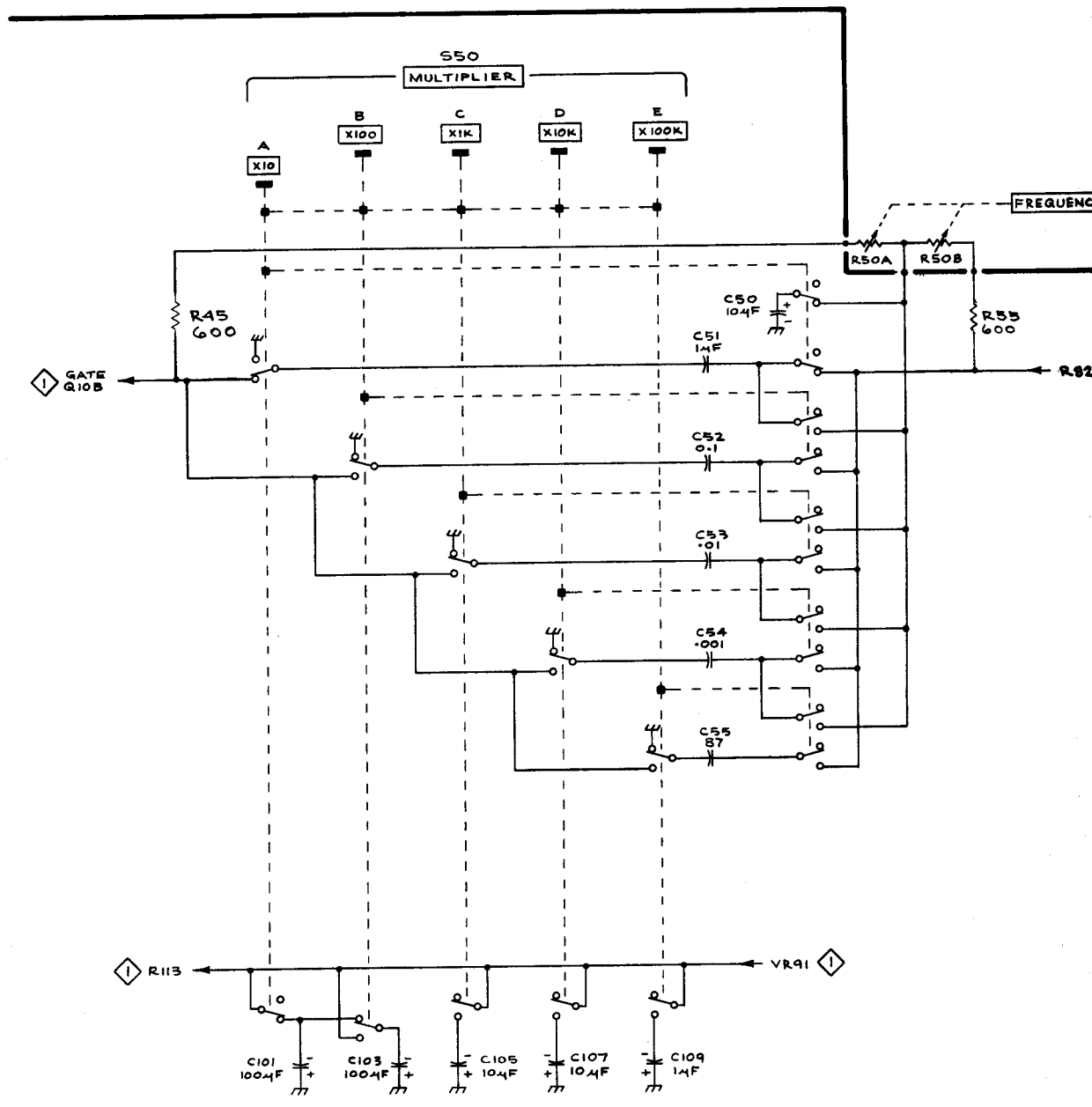
VOLTAGE & WAVEFORM CONDITIONS





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

SWITCH DETAILS & POWER SUPPLY



SEE
VAL
RAN
OR I

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

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

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

SPECIAL NOTES AND SYMBOLS

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

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

1 2 3 4 5 *Name & Description*

Assembly and/or Component

Attaching parts for Assembly and/or Component

---*---

Detail Part of Assembly and/or Component

Attaching parts for Detail Part

---*---

Parts of Detail Part

Attaching parts for Parts of Detail Part

---*---

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

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

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

ABBREVIATIONS

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

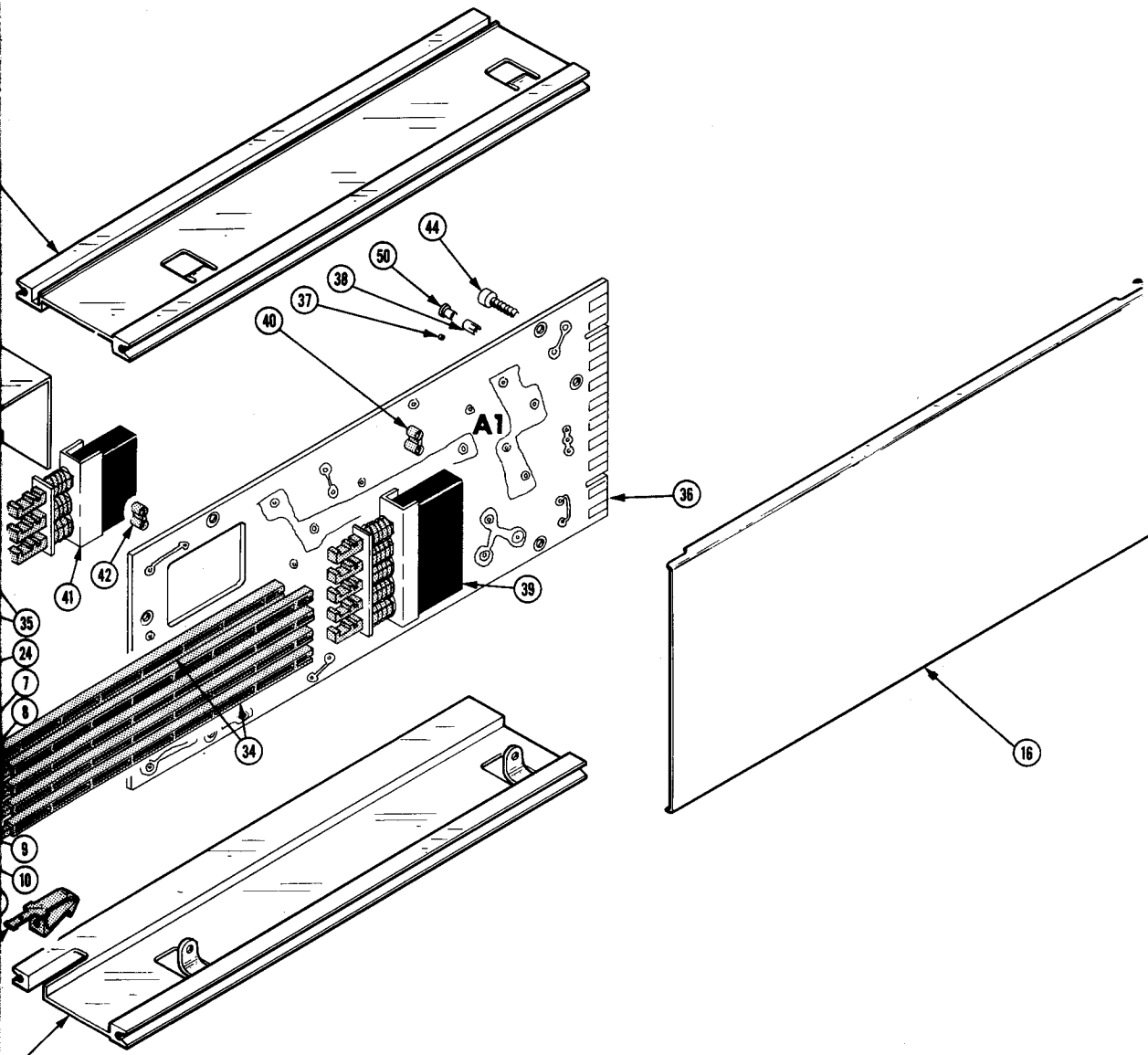
Mfr. Code	Manufacturer	Address	City, State, Zip
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
10539	JACKSON BROS., LONDON, LTD.		CROYDEN, SURREY, ENGLAND
17117	ELECTRONIC MOLDING CORP.	96 MILL ST.	WOONSOCKET, RI 02895
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
45722	USM CORP., PARKER-KALON FASTENER DIV.		CAMPBELLSVILLE, KY 42718
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
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
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101

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	366-1007-01			1						KNOB:GRAY	80009	366-1007-01
	213-0153-00			2						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-2	354-0437-02			1						RING,KNOB SKIRT:	80009	354-0437-02
										(ATTACHING PARTS)		
-3	211-0030-00	B010100	B060599	2						SCREW,MACHINE:2-56 X 0.25"82 DEG,FLH STL	83385	OBD
	211-0088-00	B060600		2						SCREW,MACHINE:2-56 X 0.281"82 DEG,FLH STL	77250	OBD
	210-0978-00	XB060600		1						WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
										-----*		
-4	366-1023-01			1						KNOB:GRAY	80009	366-1023-01
	213-0153-00			1						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-5	366-1422-01	B010100	B072369	1						KNOB:LATCH	80009	366-1422-01
	366-1690-00	B072370		1						KNOB,LATCH:	80009	366-1690-00
										(ATTACHING PARTS)		
-6	214-1840-00	B010100	B072369X	1						PIN,KNOB SECRG:0.094 OD X 0.120 INCH LONG	80009	214-1840-00
										-----*		
-7	366-1257-87			1						PUSH BUTTON:X10	80009	366-1257-87
-8	366-1402-41			1						PUSH BUTTON:X100	80009	366-1402-41
-9	366-1402-48			1						PUSH BUTTON:X1K	80009	366-1402-48
-10	366-1402-50			1						PUSH BUTTON:X10K	80009	366-1402-50
-11	366-1402-49			1						PUSH BUTTON:X100K	80009	366-1402-49
-12	366-1402-45			1						PUSH BUTTON:10	80009	366-1402-45
-13	366-1402-46			1						PUSH BUTTON:20	80009	366-1402-46
-14	366-1402-47			1						PUSH BUTTON:40	80009	366-1402-47
-15	426-0681-00			8						FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-16	337-1399-00			2						SHLD,ELECTRICAL:SIDE	80009	337-1399-00
-17	131-0274-00			1						CONNECTOR,RCPT,:BNC	91836	KC79-67
-18	136-0187-00			1						JACK,TIP:	17117	4653-113-0
										(ATTACHING PARTS)		
	210-0465-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
										-----*		
-19	131-0955-00			1						CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
										(ATTACHING PARTS)		
	210-0255-00			1						TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
										-----*		
-20	-----			1						RESISTOR,VAR:(SEE R165A,R165B EPL)		
										(ATTACHING PARTS)		
-21	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-22	210-0940-00			1						WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
										-----*		
-23	333-1643-00			1						PANEL,FRONT:	80009	333-1643-00
-24	200-0935-00			1						BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-25	378-0602-00			1						LENS,LIGHT:GREEN	80009	378-0602-00
-26	352-0157-00			1						LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-27	214-1513-01	B010100	B072369	1						LCH,PLUG-IN RET:	80009	214-1513-01
	105-0719-00	B072370		1						LATCH,RETAINING:PLUG-IN	80009	105-0719-00
										(ATTACHING PARTS)		
-28	213-0254-00			1						SCR,TPG,THD CTG:2-32 X 0.250,100 DEG,FLH	45722	OBD
										-----*		
	105-0718-00	B072370		1						RELEASE,LATCH:	80009	105-0718-00
-29	-----			1						RESISTOR,VAR:W/HARDWARE(SEE R50A,R50B EPL)		
										(ATTACHING PARTS)		
-30	211-0559-00			1						SCREW,MACHINE:6-32 X 0.375"100 DEG,FLH STL	83385	OBD
-31	407-1274-00			1						BRKT,RES.MTS:	80009	407-1274-00
										-----*		
-32	401-0161-00			1						DRIVE,TURNS,RED:6 1 REDUCTION	10539	4511/DAF
										(ATTACHING PARTS)		
-33	213-0138-00			2						SCR,TPG,THD FOR:4-40 X 0.188 INCH,PNH STL	83385	OBD
										-----*		
-34	384-1059-00			5						EXTENSION SHAFT:6.58 INCH LONG	80009	384-1059-00
-35	384-1101-00			3						EXTENSION SHAFT:4.14 INCH LONG	80009	384-1101-00
-36	-----			1						CKT BOARD ASSY:MAIN(SEE A1 EPL)		
-37	136-0252-04			87						. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-38	131-1003-00			1						. CONNECTOR BODY,:CKT CD MT,3 PRONG	80009	131-1003-00

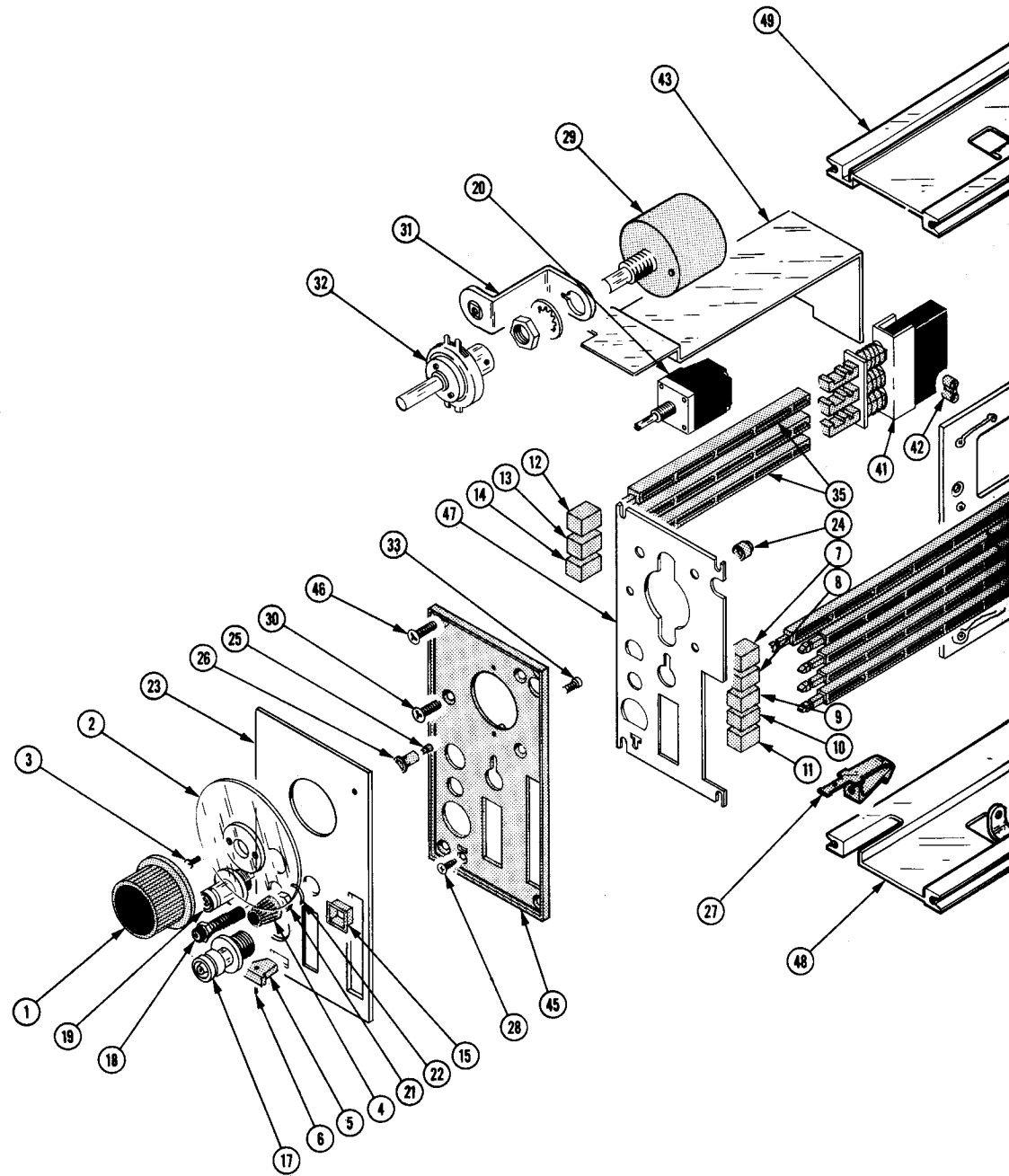
Replaceable Mechanical Parts—SG 502

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-39	-----	-----		1	.					SWITCH,PUSH:MULTIPLIER(SEE S50A-E EPL) (ATTACHING PARTS)		
-40	361-0384-00			9	.					SPACER,PB SW:0.133 INCH LONG - - - * - - -	80009	361-0384-00
-41	260-1448-00			1	.					SWITCH,PUSH:STEP ATTEN(SEE S160A-C EPL) (ATTACHING PARTS)		
-42	361-0382-00			5	.					SPACER,PB SW:BROWN,0.275 INCH LONG - - - * - - -	80009	361-0382-00
-43	337-1802-00			1	.					SHIELD,ELEC: (ATTACHING PARTS FOR CKT BOARD)	80009	337-1802-00
-44	213-0146-00			4	SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL - - - * - - -						83385	OBD
-45	386-2371-00			1	SUBPANEL,FRONT: (ATTACHING PARTS)						80009	386-237-100
-46	213-0229-00			4	SCR,TPG,THD FOR:6-20 X0.375"100 DEG,FLH STL - - - * - - -						93907	OBD
-47	337-1710-00			1	SHIELD,ELEC:REAR SUBPANEL						80009	337-1710-00
	386-3657-00	XB072380		2	SUPPORT,PLUG-IN:						80009	386-3657-00
	210-1270-00	XB072380		2	WASHER,FLAT:0.141 ID X 0.04 THK,AL						80009	210-1270-00
-48	426-0724-00			1	FR SECT,PLUG-IN:BOTTOM						80009	426-0724-00
-49	426-0725-00			1	FR SECT,PLUG-IN:TOP						80009	426-0725-00
	214-1061-00	XB010115		1	SPRING,GROUND:FLAT						80009	214-1061-00
	179-2280-00	XB060600		1	WIRING HARNESS:						80009	179-2280-00
-50	210-0774-00			1	. EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS						80009	210-0774-00
	210-0775-00			1	. EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS						80009	210-0775-00

FIG. 1 EXPLODED



SG 502 OSCILLATOR



STANDARD ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty						Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont		1	2	3	4	5			
	070-1430-01			1						MANUAL, TECH: INSTRUCTION	80009	070-1430-01

ACCESSORIES

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

Comparison of Main Characteristics		
DM 501 replaces 7D13		
PG 501 replaces 107 108	PG 501 - Risetime less than 3.5 ns into 50 Ω. PG 501 - 5 V output pulse; 3.5 ns Risetime	107 - Risetime less than 3.0 ns into 50 Ω. 108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107 108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	108 - 10 V output 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106 067-0502-01	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V. PG 506 - Does not have chopped feature.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V. 0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B 191 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01 067-0650-00	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A 181 184 2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously. 181 - Multiple time-marks 184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs. 2901 - 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 SG 502
070-1430-01CHANGE REFERENCE M34075
DATE 1-19-79

CHANGE:	DESCRIPTION	
EFF SN B073750		
ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES		
CHANGE TO:		
A1	670-2215-01	CKT BOARD ASSY:MAIN
C18	281-0612-00	CAP., FXD, CER DI:5.6PF, ±0.5PF, 500V
C110	290-0529-00	CAP., FXD, ELCTLT:47UF, 20%, 20V
C140	290-0529-00	CAP., FXD, ELCTLT:47UF, 20%, 20V
R110	321-0210-00	RES., FXD, FILM:1.5K OHM, 1%, 0.125W
R113	321-0210-00	RES., FXD, FILM:1.5K OHM, 1%, 0.125W
R115	321-0116-00	RES., FXD, FILM:158 OHM, 1%, 0.125W
R117	321-0193-00	RES., FXD, FILM:1K OHM, 1%, 0.125W
R160	321-0121-00	RES., FXD, FILM:178 OHM, 1%, 0.125W
R166	321-0157-00	RES., FXD, FILM:422 OHM, 1%, 0.125W
R165	311-2035-00	RES., VAR, NONWIR:1K OHM, 10%, 0.5W
REMOVE:		
C112	290-0517-00	CAP., FXD, ELCTLT:6.8UF, 20%, 35V
R133	315-0102-00	RES., FXD, CMPSN:1K OHM, 5%, 0.25W
R164	321-0661-00	RES., FXD, FILM:600 OHM, 1%, 0.125W
ADD:		
C27	281-0656-00	CAP., FXD, CER DI:22PF, 5%, 500V
C45	281-0546-00	CAP., FXD, CER DI:330PF, 10%, 500V
C93	281-0524-00	CAP., FXD, CER DI:150PF, ±30PF, 500V
R107	315-0270-00	RES., FXD, CMPSN:27 OHM, 5%, 0.25W
VR133	152-0149-00	SEMICONV DEVICE:ZENER, 0.4W, 10V, 5%
TEXT CORRECTIONS		
Page 3-2	For instruments B073750 & up	
	DELETE: Step 2 (No AGC Voltage Adjust)	
Page 3-2	For instruments B073749 & below	
	Step 2b. Add the following:	
	Vary the FREQUENCY Hz for a minimum DC Voltmeter reading.	
	Step 2c. Change -2.5 volts to read:-0.6 volts dc.	

CHANGE:

DESCRIPTION

SCHMATIC CHANGES

DIAGRAM 1 RC OSCILLATOR - Partial

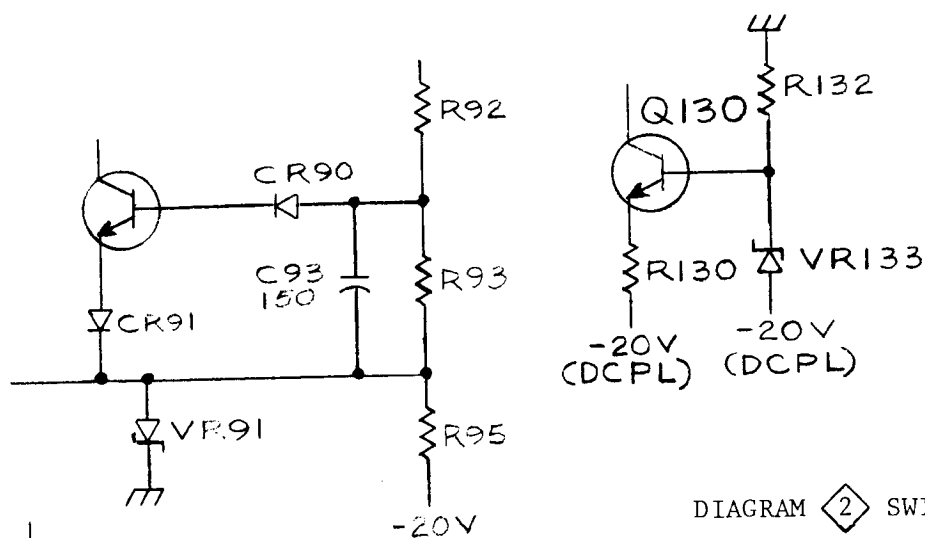
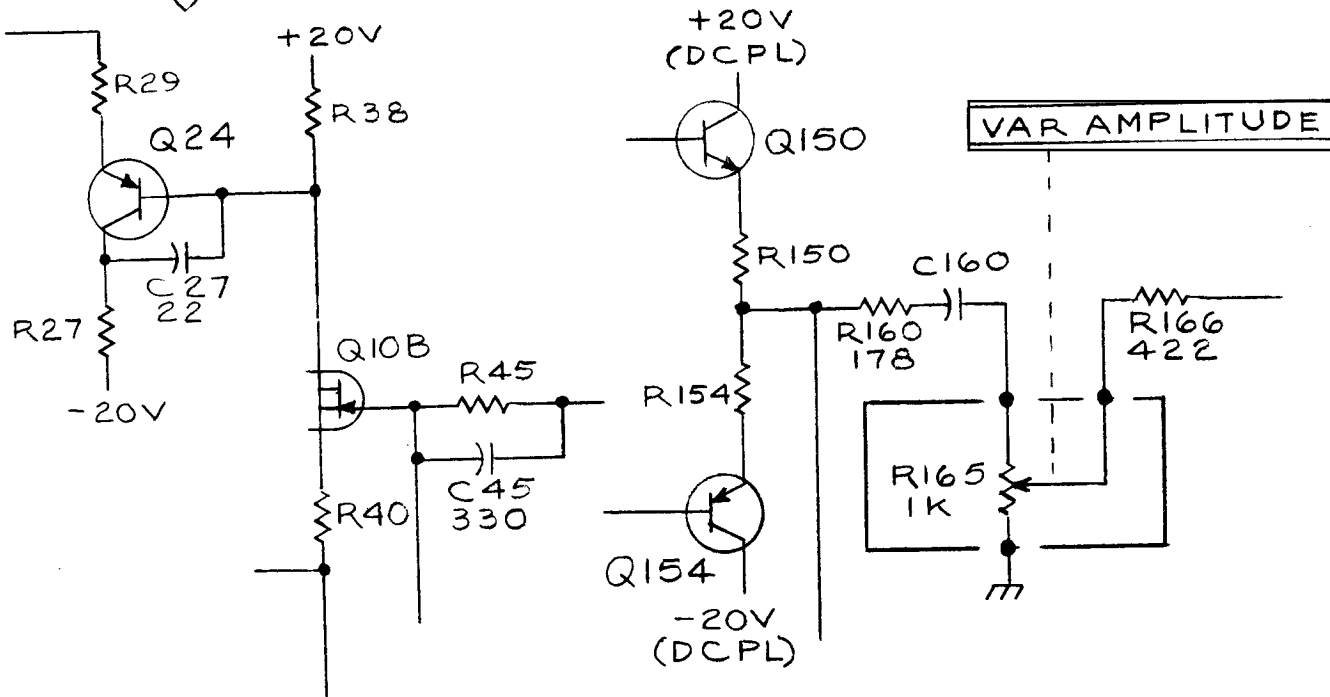
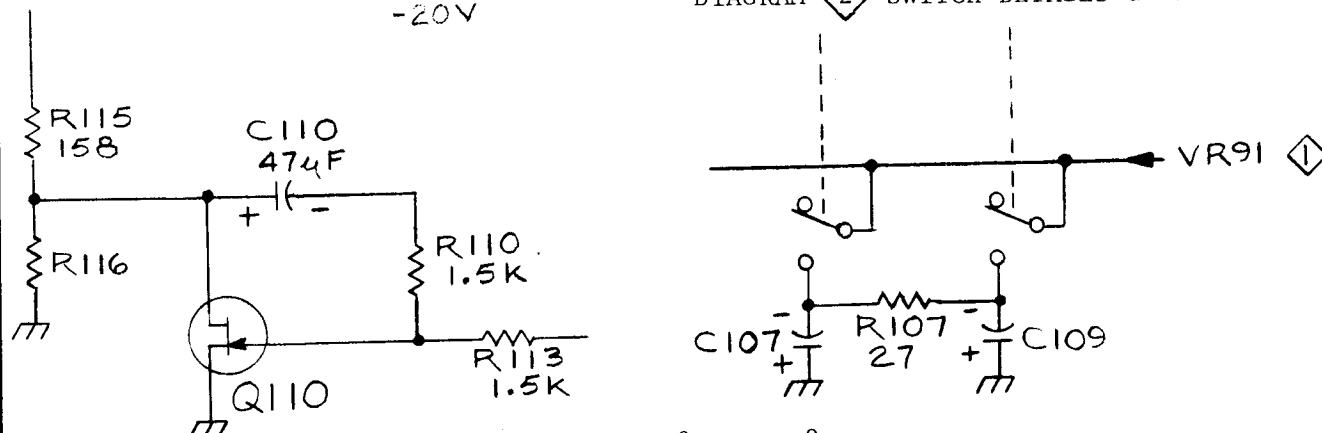


DIAGRAM 2 SWITCH DETAILS & PWR SUPPLY



CHANGE	DESCRIPTION
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SCHEMATIC CORRECTIONS

DIAGRAM 2 SWITCH DETAILS & POWER SUPPLY - Partial

R346 connects to the -20 V supply NOT the +20 volts.

