Tektronix®

COMMITTED TO EXCELLENCE

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

SG 505
OPTION 02
OSCILLATOR

INSTRUCTION MANUAL

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

070-4359-00
Product Group 75

Serial Number _____

First Printing NOV 1982

Printed in U.S.A. Specification and price change privileges are reserved.

PREFACE

The information in this instruction manual describes only the Option 02 version of the SG 505 Oscillator. All references in this manual to the SG 505 Oscillator refer only to the Option 02 version, unless otherwise indicated.

A separate instruction manual is available for the standard SG 505 Oscillator, with Option 01 information. Contact your local Tektronix field office or representative for ordering information.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

NOTE

The following illustrations are located in the diagrams foldout section at the rear of this manual.

LIST OF TABLES

NOTE

The following tables are located in the diagrams foldout section at the rear of this manual.

OPERATORS SAFETY SUMMARY

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

TERMS

In This Manual

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

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

As Marked on Equipment

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

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

SYMBOLS

In This Manual

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

As Marked on Equipment

DANGER — High voltage.

Protective ground (earth) terminal.

ATTENTION — refer to manual.

Refer to manual

Power Source

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

Grounding the Product

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

Danger Arising From Loss of Ground

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

Use The Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Operate Plug-In Unit Without Covers

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

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary

Do Not Service Alone

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

Use Care When Servicing With Power On

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

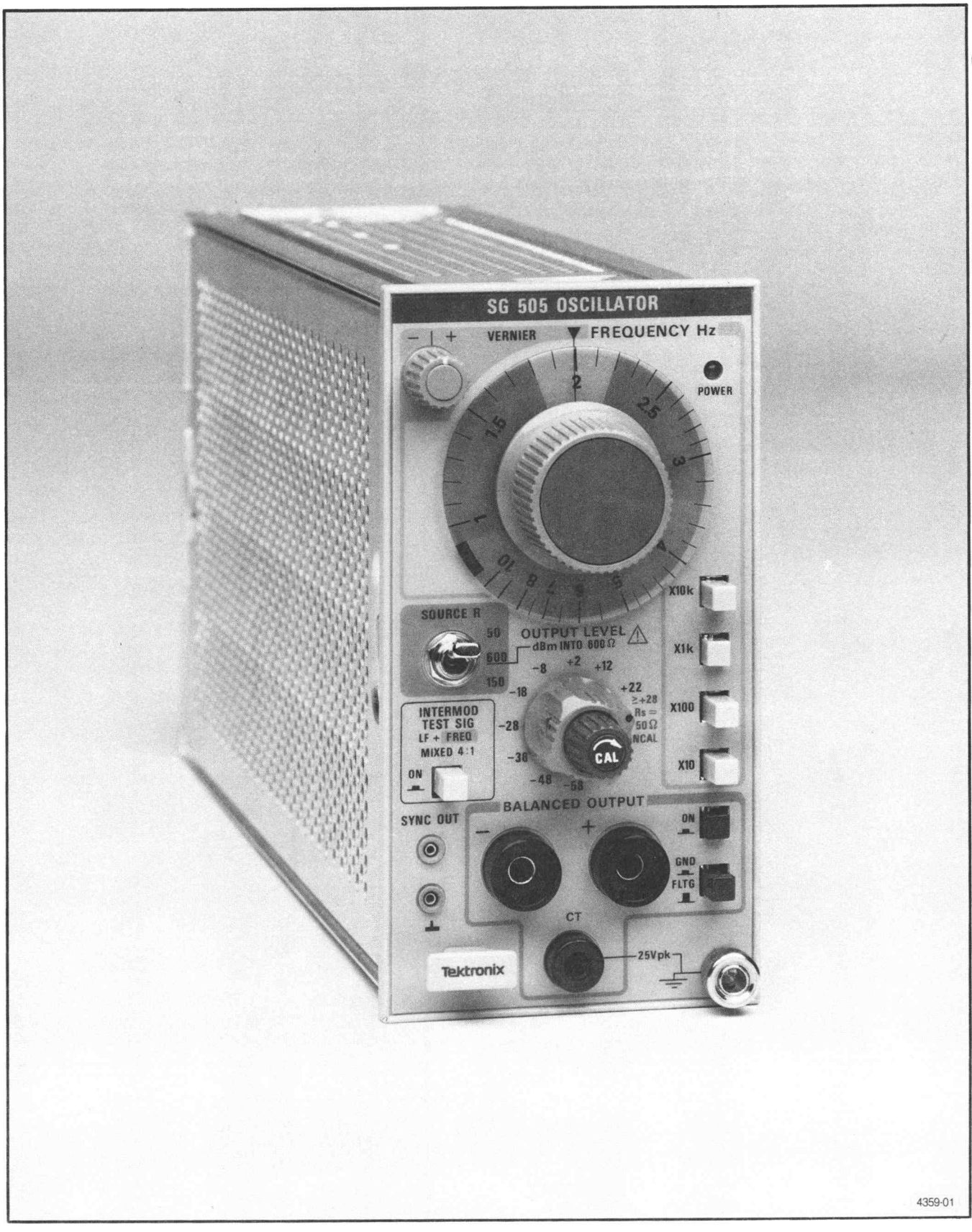
Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

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

Do Not Wear Jewelry

Remove jewelry before servicing this instrument. Rings, necklaces, and other metallic objects could come into contact with dangerous voltages and currents.



SG 505 Option 02 Oscillator.

SPECIFICATION

Introduction

The TEKTRONIX SG 505 Option 02 Oscillator generates an ultra low distortion sine wave over the freqency range from 10 Hz to 100 kHz. This balanced output can be floated or referenced to chassis ground. The oscillator also provides a fixed amplitude ground referenced sine wave signal at the SYNC OUT connector that is identical in frequency to the signal from the OUTPUT connector. Versions of both output signals are available at the rear interface connector. The output source impedance is selectable.

The Option 02 SG 505 also provides an intermodulation test signal function. This signal consists of a low frequency sine wave mixed with the selected frequency in a 4:1 amplitude ratio. The lower frequency sine wave is internally selectable for 60 Hz or 250 Hz. The SG 505 is designed to operate in one compartment of any TM 500 or TM 5000 Series Power Module.

Standard Accessories

1 Instruction Manual
1 Cable

Refer to the Accessories page at the back of this manual for part numbers.

Performance Conditions

The limits stated in the Performance Requirements column of the specification tables are valid with the following conditions:

1. The instrument's internal adjustments are performed at an ambient temperature between +20° and +30°C.

2. The instrument must be in a non-condensing environment whose limits are described under Environmental.

3. Allow twenty minutes warm-up time for operation to specified accuracy; sixty minutes after exposure to or storage in high-humidity (condensing) environment.

Items listed in the Performance Requirements column of the Electrical Characteristics are verified by completing the Performance Check in the Checks and Adjustments section of this manual. Information given in the Supplemental Information and Description columns of the following tables is provided for user information only and should not be interpreted to be Performance Check requirements.

Table 1-1
ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirements	Supplemental Information
	FRONT PANEL	
FREQUENCY		
Range	10 Hz to 100 kHz in four overlapping bands.	Typically 9 Hz to 110 kHz. Nominal range of each band is 0.90 to 11.0.
Vernier Range	$\geq \pm 1\%$ of frequency setting.	
Dial Accuracy	$\pm 3\%$ of setting with vernier at center.	
Drift		Typically less than 0.01%/°C and 0.03%/hour.
OUTPUT LEVEL		
Calibrated Output (f = 1 kHz)		Maximum output $\geq$ 21 V rms unloaded.
Rs = 600 Ω in CAL detent	+22 dBm (9.75 V rms) $\pm$0.2 dB into 600 Ω	Maximum output with variable out of CAL position increases to +22.7 dBm.
Rs = 50 Ω just ccw of CAL detent		+28 dBm (19.46 V rms) $\pm$0.3 dB into 600 Ω and at least +30 dBm (12.25 V rms) into 150 Ω.
Attenuator Step Accuracy (f = 1 kHz)	$\pm$0.1 dB for any 10 or 20 dB step change.	Range is +22 dBm to −68 dBm.
Stability		Typically better than 0.01 dB/°C and 0.03 dB/hour.
Variable Range	At least 11 dB.	Nominal range is +0.7 dB to $<$ −10 dB.
Settling Time		$\leq$ 5 seconds to 0.2 dB of final value, 20 Hz −100 kHz; typically $<$ 3 seconds above 100 Hz. Worst case transient overshoot is $\leq$ 3 dB.
LEVEL FLATNESS (1 kHz ref, R_L = 600 Ω)		
10 Hz - 20 kHz	$\pm$0.1 dB	
20 kHz - 100 kHz	$\pm$0.2 dB	Flatness is above 50 kHz unspecified on −58 dBm and −68 dBm ranges.
OUTPUT		
Impedance		Floating or grounded through approximately 30 Ω. Output impedance does not change with OUTPUT ON/OFF selection. Capacitance between output common and chassis ground in floating mode $\simeq$ to 330 pF.
	Balanced and selectable: 600 Ω $\pm$2%, 150 Ω $\pm$2%, 50 Ω $\pm$3%	Impedance to CT is one-half the selected impedance.

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
	FRONT PANEL (cont)	
OUTPUT (cont)		
Balance (f ≤ 20 kHz, Output GNDed)	≤ 0.5% mismatch of output open-circuit voltages referenced to CT.	
Typical Dc Offset		< 0.5% of output ac rms voltage.
Maximum Floating Voltage		±25 V peak, CT to GND.
DISTORTION (Maximum Specified Output, R_L ≥ 600 Ω)		
20 Hz - 20 kHz	≤ 0.0008% (−102 dB) THD	Typically ≤ 0.0003% THD
10 Hz - 20 Hz, 20 kHz - 50 kHz	≤ 0.0018% (−95 dB) THD	
50 kHz - 100 kHz	≤ 0.0056% (−85 dB) THD	
SYNC OUTPUT		
Signal	Sine wave with same frequency as OUTPUT. 200 mV rms ±20% to 20 kHz; at least 120 mV rms at 100 kHz.	THD is typically ≤ 3% and phase shift from OUTPUT is typically ≤ 5°, 20 Hz to 20 kHz.
Impedance		Nominally 1 kΩ, ground referenced and isolated from main output.
INTERMOD TEST SIGNAL		
Signal	LF sine wave mixed with normal oscillator output in a 4 (±0.1) to 1 amplitude ratio.	With oscillator set for 7 kHz test signal conforms with SMPTE recommendation. SYNC OUT signal is low frequency component only.
LF Frequency	Internally selectable 60 Hz (±2%) or 250 Hz (±2%).	
Level	Composite peak-to-peak output is within ±0.2 dB of the normal oscillator mode sine wave output.	
Typical Residual IMD		≤ 0.0005% from 2.5 kHz to 10 kHz and ≤ 0.001% from 10 kHz to 20 kHz.

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
	REAR INTERFACE	
Buffered Main Output		Pins 25A and 26A. To prevent possible instrument damage, do not float output in excess of ±25 V peak. Output impedance is approximately 600 Ω. For specified distortion performance of the front panel main output, the rear interface load impedance must be ⩾ 1 kΩ. This output is intended to provide an ac signal level reference for gain measurements. THD is typically ⩽ 0.03% for frequencies ⩽ 20 kHz. Pins 25A and 26A are balanced and floating; 25A is inverted from + output, 26A inverted from − output. Signal is attenuated 20 dB and buffered from the actual output signal at the front panel connector.
Sync Output		Pins 27B and 28B (ground). Approximately 200 mV rms sine wave identical to front panel SYNC output signal. Output impedance is approximately 50 Ω and always ground referenced.

Table 1-2
MISCELLANEOUS

Characteristics	Performance Requirements	Supplemental Information
Power Consumption		15 VA or less.
Internal Power Supplies		
+17 V		Nominally +17.0 V ±3%
−17 V		Nominally −17.0 V ±5%
Fuse Data		3 AG, 1A, 250 V, fast blow
Recommended Adjustment Interval		2000 hours or 12 months
Warm-up Time		20 minutes (60 minutes after storage in high humidity environment).

Table 1-3
ENVIRONMENTAL[a]

Characteristics	Description	
TEMPERATURE		Meets MIL-T-28800C, class 5.
Operating	0°C to +50°C	
Nonoperating	−40°C to +75°C	
HUMIDITY	95% RH, 0°C to 40°C 45% RH, to 50°C	Exceeds MIL-T-28800C, class 5.
ALTITUDE		Exceeds MIL-T-28800C, class 5.
Operating	4.6 km (15,000 ft)	
Nonoperating	15 km (50,000 ft)	
VIBRATION[d]	0.38 mm (0.015") peak to peak, 5 Hz to 55 Hz, 75 minutes.	Meets MIL-T-28800C, class 5, when installed in qualified power modules.[b]
SHOCK[d]	30 g's (1/2 sine), 11 ms duration, 3 shocks in each direction along 3 major axes, 18 total shocks.	Meets MIL-T-28800C, class 5, when installed in qualified power modules.[b]
BENCH HANDLING	12 drops from 45°, 4" or equilibrium, whichever occurs first.	Meets MIL-T-28800C, class 5 when installed in qualified power modules.[b]
PACKAGED PRODUCT VIBRATION AND SHOCK[c]	Qualified under National Safe Transit Association Preshipment Test Procedures 1A-B-1 and 1A-B-2.	
ELECTROSTATIC IMMUNITY	20 kV maximum charge applied to instrument case.	
ELECTROMAGNETIC COMPATIBILITY[e]	Within limits of F.C.C. Regulations, Part 15, Subpart J, Class A; VDE 0871; and MIL-461A tests RE01, RE02, CE01, CE03, RS01; RS03, CS01, CS02, and CS06.	

[a]With power module.

[b]Refer to TM 500/5000 power module specifications.

[c]Without power module.

[d]Requires retainer clip.

[e]System performance subject to exceptions of power module or other individual plug-ins. Qualified for CS02 and CS06 in TM 5000-Series power modules with front-panel ground post or power module chassis strapped to ground.

Table 1-4
PHYSICAL CHARACTERISTICS

Characteristics	Description
FINISH	Plastic front panel.
NET WEIGHT	1.13 kg (2.49 lbs.)
ENCLOSURE TYPE AND STYLE	MIL-T-28800C, type 3, style E package with power module. (Style F in rackmount power module.)
NOMINAL OVERALL DIMENSIONS	67.06 mm (2.64")W x 308.36 mm (12.14")D x 126.24 mm (4.97")H.

OPERATING INSTRUCTIONS

Preparation for Use

The SG 505 Option 02 Oscillator is calibrated and ready for use when received. It operates in any compartment of a TM 500 or TM 5000 Series power module. Refer to the power module instruction manual for line voltage requirements and power module operation.

The SG 505 Option 02 instrument has an intermodulation test function that mixes a 60 Hz or 250 Hz sine wave with the selected output frequency. This signal is available at the BALANCED OUTPUT connectors. The SG 505 contains an internal switch that sets the lower frequency of the mixed sine wave to 60 or 250 Hz. The instrument is shipped with the switch in the 60 Hz position. Refer qualified service personnel to the Maintenance section of this manual for internal switch setting information.

CAUTION

To prevent damage to the SG 505 circuitry, turn off the power module before installing or removing the instrument. Do not use excessive force to install or remove.

Check to see that the plastic barriers on the interconnecting jack of the selected power module compartment match the cutouts in the SG 505 circuit board edge connector. Align the SG 505 chassis with the upper and lower guides (see Fig. 2-1) of the selected compartment. Push the SG 505 chassis in and press firmly to seat the circuit board edge connector in the interconnecting jack. Turn on the power module power switch. The POWER indicator on the front panel should light up.

To remove the SG 505, pull on the release latch (located in the lower left corner) until the interconnecting jack disengages and the SG 505 slides out.

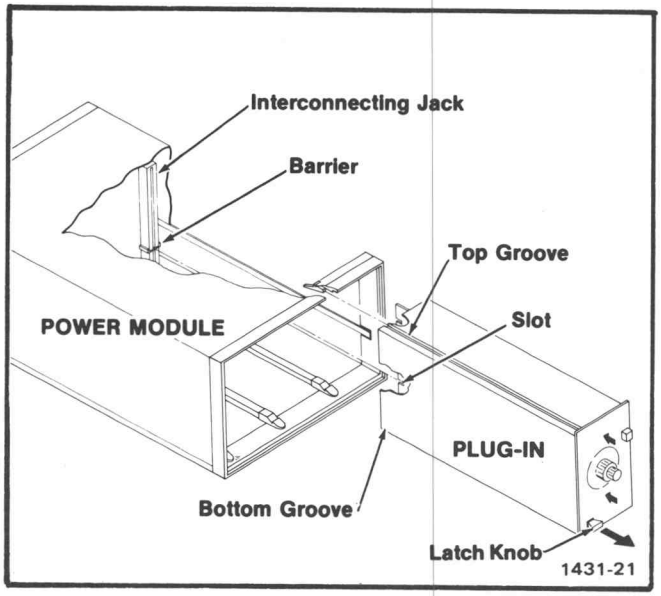


Fig. 2-1. SG 505 Option 02 installation and removal.

Repackaging Information

If the Tektronix instrument is 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 to contact. Include the complete instrument serial number and a description of the service required.

Save and reuse the package in which the 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 instrument finish. Obtain a carton of corrugated cardboard of the correct carton strength 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 the carton with shipping tape or an industrial stapler.

The carton test strength for this instrument is 200 pounds per square inch.

CONTROLS AND CONNECTORS

FREQUENCY SELECTION

(1) FREQUENCY Hz

Provides continuous frequency selection within each frequency range selected by multiplier pushbuttons.

(2) Multiplier Pushbuttons

Select any one of four frequency ranges.

(3) VERNIER

Adjusts frequency up to ±1% from selected frequency.

OUTPUT LEVEL SELECTION

(4) OUTPUT LEVEL dBm into 600 Ω ⚠

Selects one of ten amplitude level steps, calibrated in dBm into a 600 Ω load with SOURCE R set to 600 Ω.

(5) OUTPUT LEVEL CAL

Provides continuous amplitude adjustment from the calibrated OUTPUT LEVEL steps. Range is nominally +0.7 dB to <−10 dB relative to the clockwise CAL detent.

(6) SOURCE R

Selects 50, 150, or 600 Ω source impedance. Impedance to the CT terminal is one-half the selected source impedance.

(7) INTERMOD TEST SIG

Pushbutton in provides a 60 Hz or 250 Hz sine wave mixed with any selected output frequency in a 4:1 amplitude ratio. Also provides a 60 Hz or 250 Hz signal at the SYNC OUT connector. See Preparation for Use for frequency selection information.

(8) ON-OFF

Connects or disconnects the signal to the BALANCED OUTPUT connectors (does not switch CT terminal). The selected source impedance is retained at the BALANCED OUTPUT connectors regardless of pushbutton position.

(9) GND-FLTG

GND connects the CT (common) connector to chassis ground through a low impedance.

FLTG disconnects the CT (common) from chassis ground for floating operation. Do not exceed ±25 V peak floating potential between the CT connector and chassis ground.

OUTPUT CONNECTORS

(10) BALANCED OUTPUT

The + BALANCED OUTPUT connector provides a sine wave signal with the frequency selected by the FREQUENCY Hz dial and multiplier pushbuttons and the amplitude selected by the OUTPUT LEVEL control. The − BALANCED OUTPUT signal is an inverted duplicate of the + BALANCED OUTPUT. Also see INTERMOD TEST SIG (7).

CT

The CT connector provides the reference point for the + and − BALANCED OUTPUTS. The CT connector can be floated above ground or ground-referenced with the GND-FLTG pushbutton (see 9).

(11) SYNC OUT

Provides a fixed-amplitude and ground-referenced sine wave at the same frequency as the BALANCED OUTPUT signal. This signal is in phase with the + BALANCED OUTPUT. Also refer to INTERMOD TEST SIG (7).

(12) Ground Binding Post

Chassis ground.

(13) Release Latch

Pull to remove plug-in from the power module.

(14) POWER Indicator

Indicator lights when power is applied to instrument from power module.

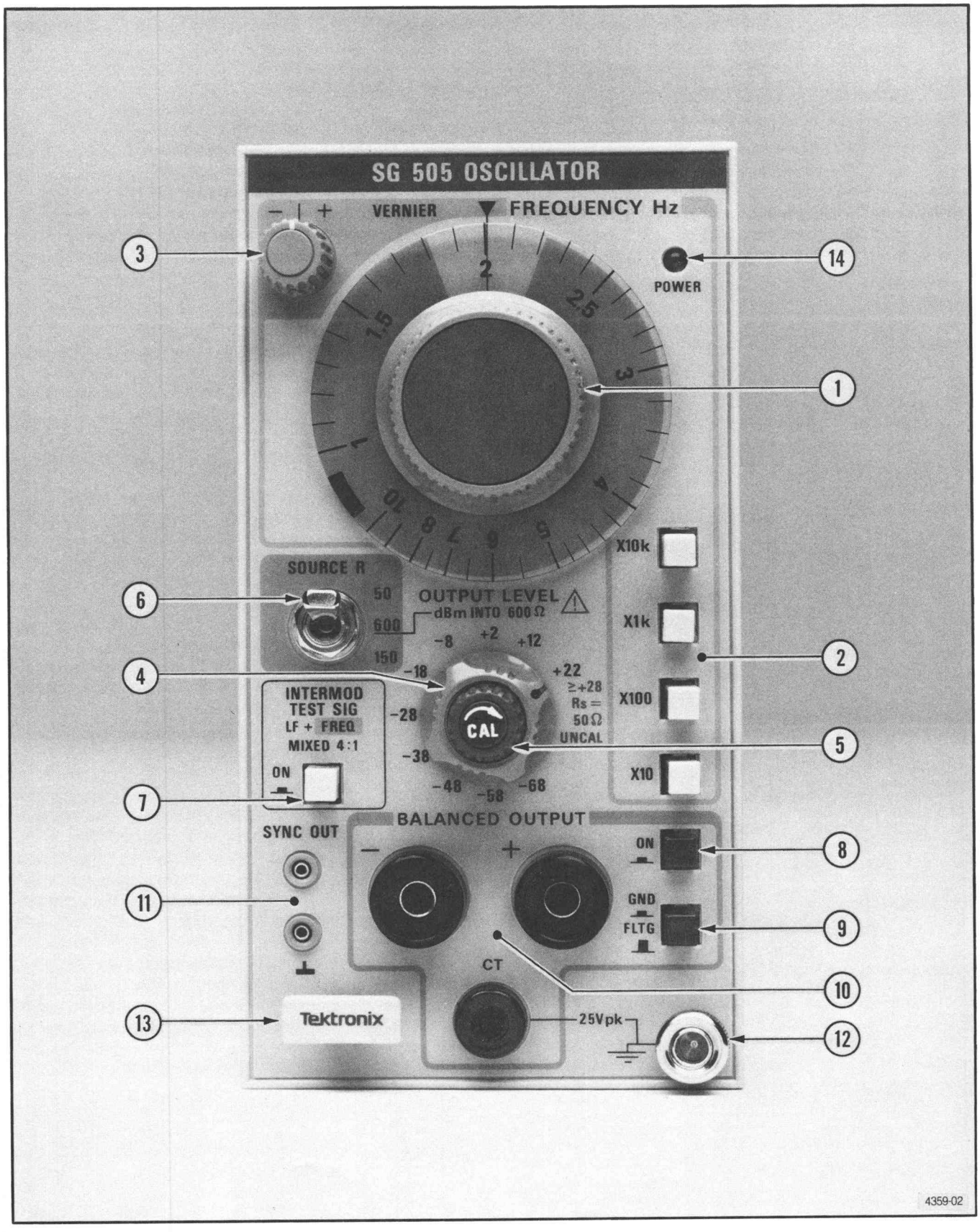


Fig. 2-2. SG 505 Option 02 front panel controls and connectors.

OPERATORS FAMILIARIZATION

General Operating Information

With the SG 505 properly installed in the power module, allow twenty minutes warmup time for operation to specified accuracy (60 minutes after storage in or exposure to a high humidity environment).

Frequency Selection

The SG 505 produces a sine wave signal at any frequency from 10 Hz to 100 kHz. To set the frequency, press the appropriate multiplier pushbutton and set the FREQUENCY Hz dial to the desired base frequency. The VERNIER control adjusts the frequency 1 percent above and below the frequency selected by the FREQUENCY Hz dial and multiplier pushbutton. With the VERNIER control at the center position, the output frequency produced is the FREQUENCY Hz dial setting multiplied by the active multiplier value. Signals at the BALANCED OUTPUT and SYNC OUT connectors are of the same frequency. The SYNC OUT signal can be used as an external signal for monitoring the frequency of the BALANCED OUTPUT, provided no more than approximately 200 mV rms is required.

Output Level Selection ⚠

The OUTPUT LEVEL selects ten level steps from +22 dBm to −68 dBm into a 600 Ω load with SOURCE R set to 600 Ω. If SOURCE R is set to 50 Ω, the level will increase by about 5.3 dB into 600 Ω. If SOURCE R is set to 150 Ω, the output level into a 150 Ω load is exactly 6 dB higher than the levels marked on the panel. The OUTPUT LEVEL CAL control permits continuous adjustment from the calibrated output level steps over the range of approximately +0.7 dB to < −10 dB from CAL. The signal at the BALANCED OUTPUT connectors may be ground referenced or floated up to 25 V peak, using the GND-FLTG pushbutton. The ON-OFF pushbutton connects or disconnects the signal at the BALANCED OUTPUT connectors.

Intermodulation Test Signal

With the INTERMOD TEST SIG pushbutton in, a 60 Hz or 250 Hz sine wave is mixed with any selected frequency at the OUTPUT connectors in a 4:1 amplitude ratio. The composite peak-to-peak amplitude is set equal to the peak-to-peak amplitude of the unmodulated OUTPUT signal.

In the INTERMOD TEST SIG mode, the SYNC OUT connector provides only the 60 or 250 Hz sine wave.

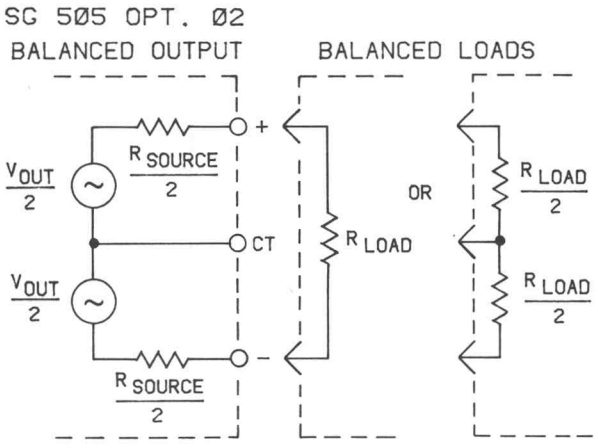
Output Connections

CAUTION

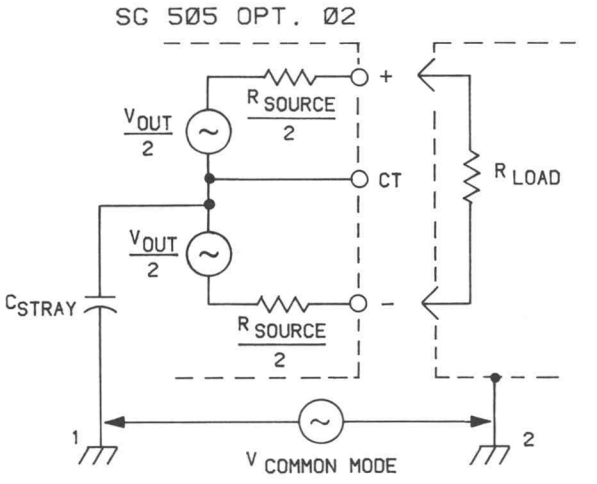
To avoid damage to the SG 505 circuitry, do not apply a voltage exceeding ±25 V peak, with respect to chassis ground, to any front panel connector or to rear interface connector pins 14A-28A and 14B-28B.

The SG 505 Option 02 is designed primarily as a balanced source of low distortion sine waves. Thus, it is intended to be used in systems where the load is also balanced or differential. The balanced configuration is preferable in high quality audio applications because of its inherently superior rejection of common mode signals, such as induced hum or RF voltage. See Fig. 2-3A and 2-3B. The SG 505 Option 02 can also be used to drive unbalanced or single-ended loads if the output is taken using either the + or − BALANCED OUTPUT connector as the high side and the CT connector as the low. In this mode, the output voltage and the source resistance are both half the calibrated or selected values. See Fig. 2-3E. Driving unbalanced loads from the full balanced output is not recommended because of possible degradation due to common mode signals such as power line hum or noise spikes coupling across one-half of the output resistance. See Fig. 2-3C. Even when the SG 505 is floating, unavoidable stray capacitances within the instrument and those associated with external cabling can cause small amounts of these common mode signals to couple to the load. The coupling magnitude is independent of the oscillators output attenuation and will become progressively worse as output amplitude is reduced. Thus, the common mode noise may dominate any distortion products in the system, especially at lower output levels. The stray capacitance can also adversely affect high frequency flatness. If the SG 505 GND-FLTG pushbutton selects GND in this configuration, then half the output voltage is short-circuited. See Fig. 2-3D. To minimize the contribution of these common mode signals, it is recommended that the SG 505 not be operated in the high power compartment of any TM 500 or TM 5000 series power module. These compartments provide higher power series-pass transistors with substantially higher stray capacitance to chassis, which couples larger amounts of common mode signals into the SG 505.

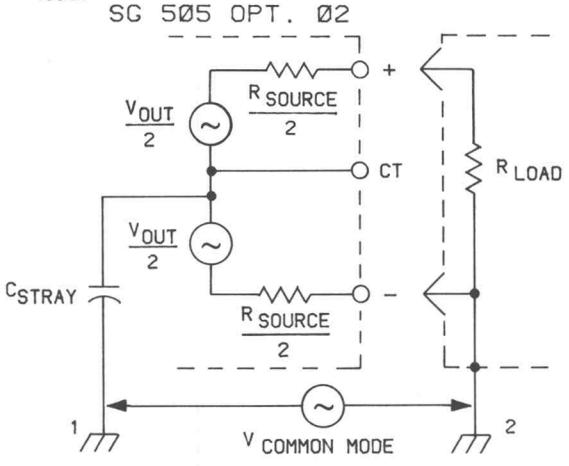
The GND-FLTG pushbutton either connects the CT connector (common) to chassis ground through approximately 30 Ω or disconnects the CT from chassis ground.



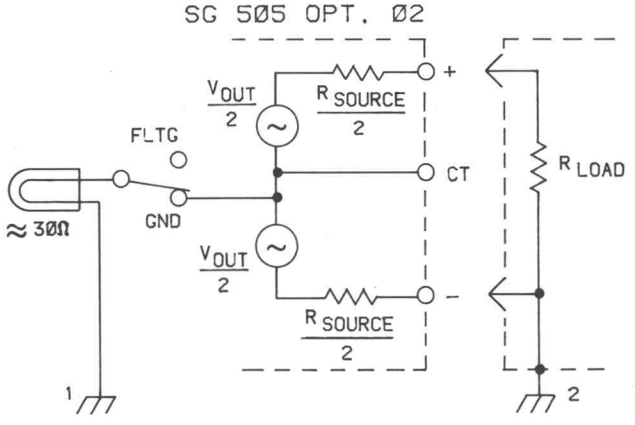
A. A balanced system = balanced source + balanced load.



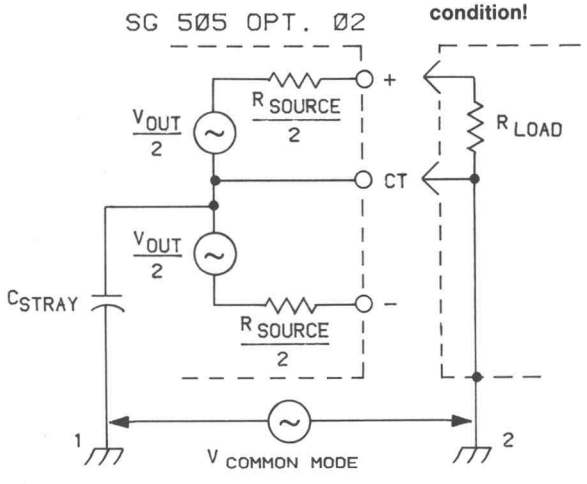
B. Common mode noise coupled in by stray capacitance — does not affect balanced load.



C. Grounded load — common mode noise appears across 1/2 R_{SOURCE}.



D. Single-ended load with GND-FLTG pushbutton in, connecting CT to chassis ground. The − BALANCED OUTPUT is effectively short-circuited. Avoid this condition!



E. Single-ended load with single-ended source — common mode signal does not appear at load.

4359-12

Fig. 2-3. Connection configurations.

Normally the SG 505 is floated to break up any ground loops between it and the load. Standard practice is to ground all sources (microphones, etc.) at the unit under test (console, etc.). See Fig. 2-4.

Under some conditions, it may be desirable to ground the SG 505 CT connector. This may be true in a high RF environment to prevent the CT from floating on RF induced in the output cables. If it is of sufficient amplitude, such RF may otherwise degrade the linearity of the SG 505 output stages. The best procedure under high RF environments is to use high-quality shielded cable. Connect the shield to the SG 505 CT terminal and a high quality 0.01 to 0.1 μF capacitor connected between the CT terminal and the chassis ground post. The RF is effectively coupled to ground, while at low frequencies the SG 505 still floats to break up ground loops. See Fig. 2-5. As an alternative, the GND-FLTG pushbutton can be pushed to GND with the cables shield connected to the ground post. Double-shielded cable will improve rejection of RF interference. See Fig. 2-6. Under worst-case conditions, use three-conductor twisted, shielded cable (double-shielded is preferred) with the shield connected to the chassis ground post and the three conductors connected to the + and – BALANCED OUTPUT and CT connectors. Ground the CT wire to the ground of the unit

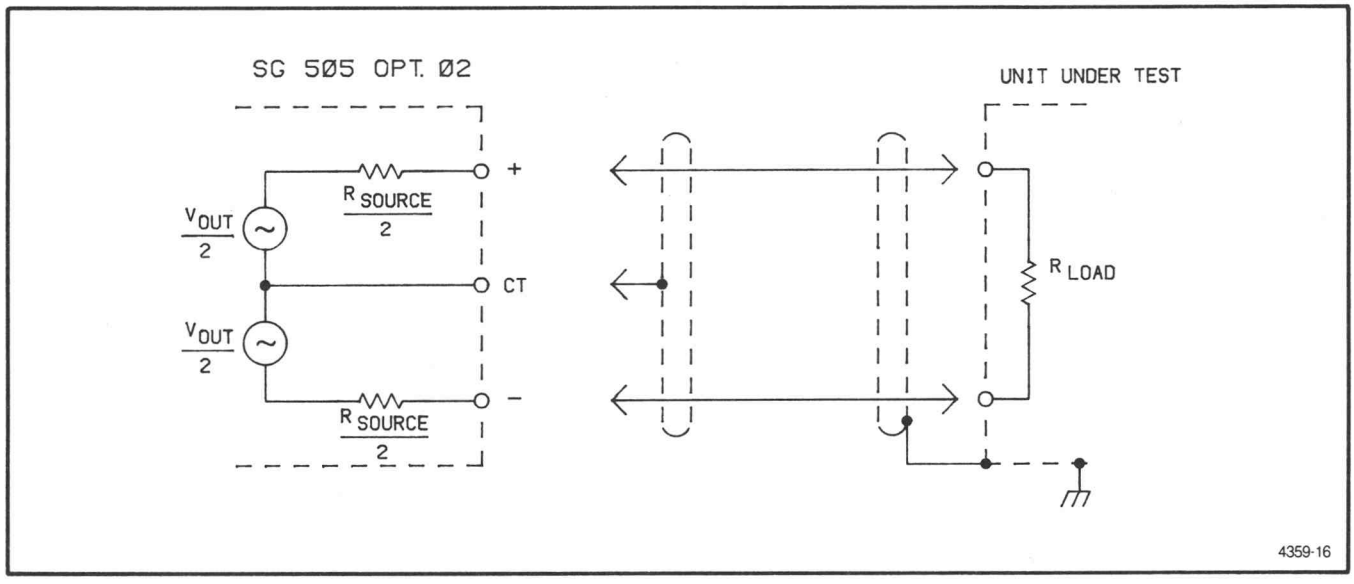


Fig. 2-4. Floating oscillator grounded to unit under test to break up ground loops.

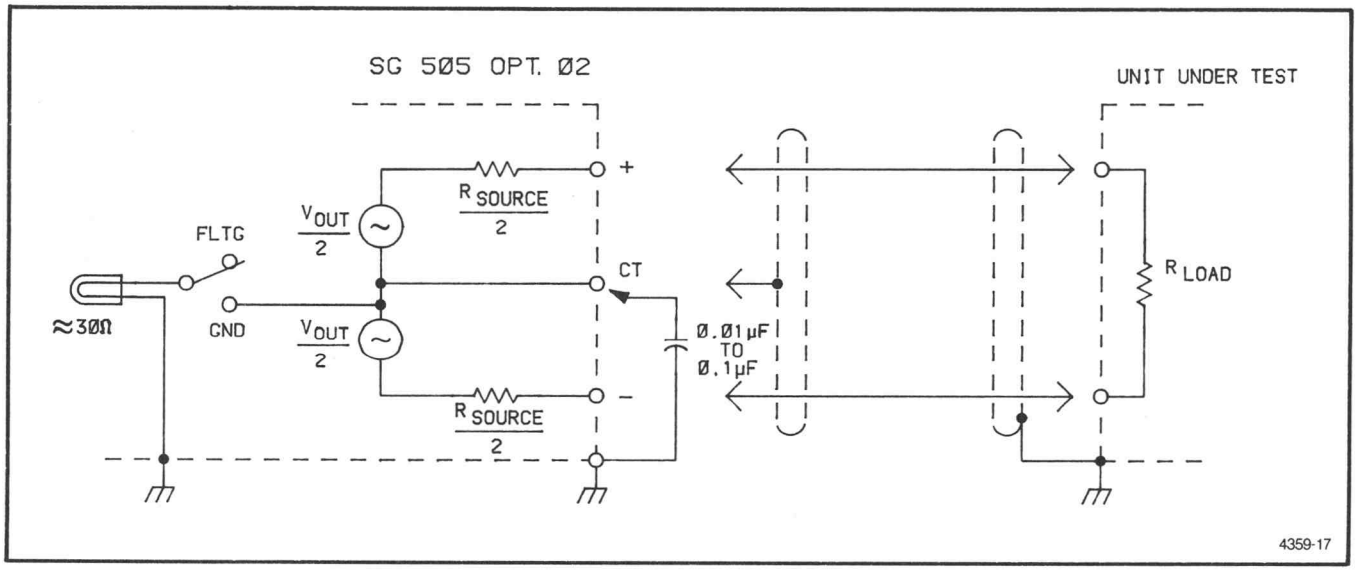


Fig. 2-5. Added capacitor between CT and chassis ground improves RFI rejection.

under test (console) and float the SG 505. The popular XLR connector allows this type of connection. See Fig. 2-7.

The sine wave at the SYNC OUT connector is in phase with the + BALANCED OUTPUT and is designed for use as an external trigger for a counter, oscilloscope, or other device. This output has a source impedance of 1 kΩ, and is always referenced to chassis ground (even when the BALANCED OUTPUT is floating).

With the INTERMOD TEST SIG pushbutton in, the signal at the SYNC OUT connector is replaced by either a 60 Hz or 250 Hz sinewave. Refer to the heading Intermodulation Test Signal located in this section.

Rear Interface Signals

The front panel BALANCED OUTPUT signal (buffered and attenuated 20 dB) is available at rear interface connector pins 25A and 26A. The signal at these pins is balanced and floating; 25A is inverted from the front panel + BALANCED OUTPUT, and 26A is inverted from the − BALANCED OUTPUT. When the rear interface Buffered Main Output signal is used, the rear interface load impedance (pins 25A and 26A) must be ⩾ 1 kΩ, to prevent OUTPUT amplitude

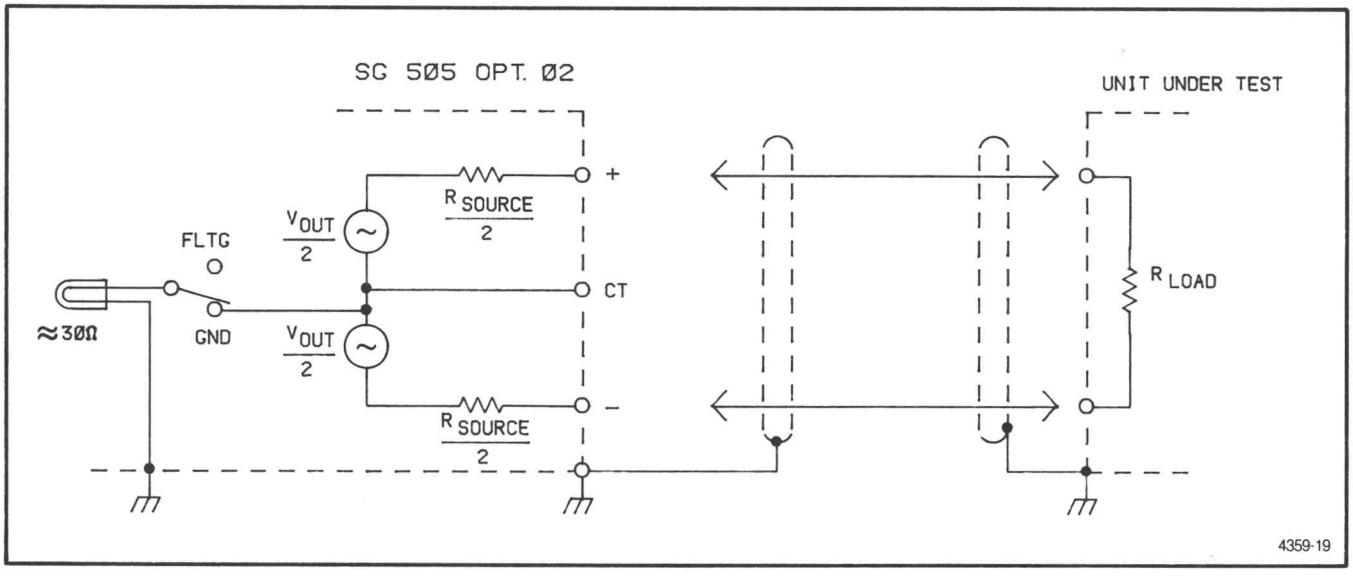


Fig. 2-6. SG 505 CT terminal grounded and cable shield connected to ground post. Reduces RF interference but may cause low frequency ground loop.

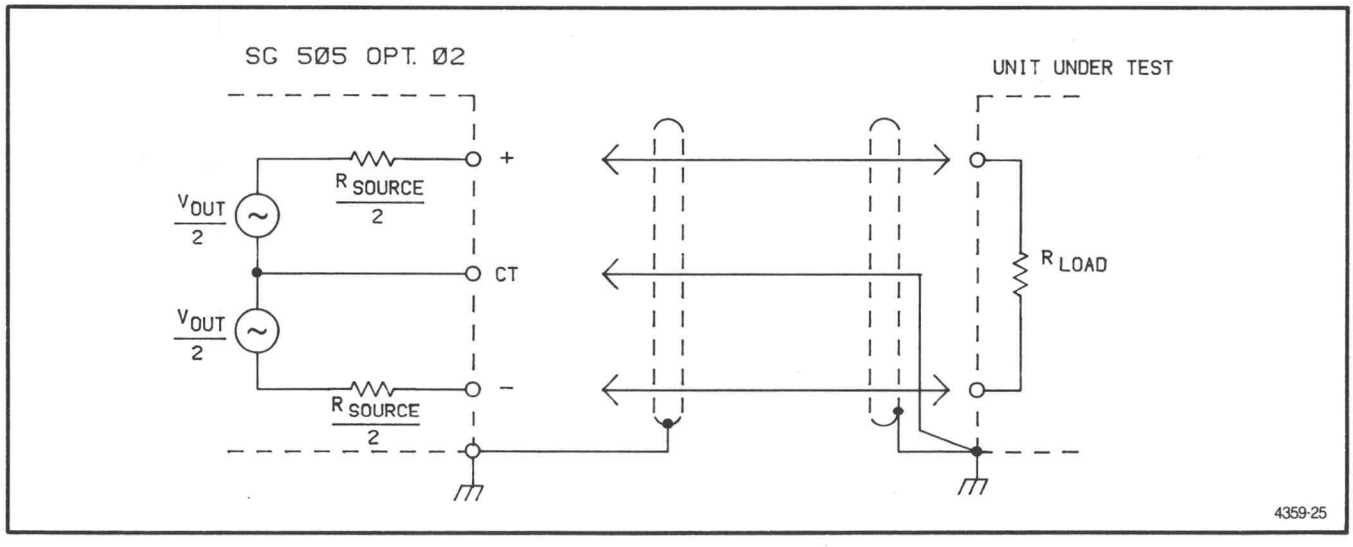


Fig. 2-7. Three conductor shielded cable allows CT to be remotely grounded while cable shield is grounded at both ends.

distortion. The ON-OFF and GND-FLTG pushbuttons affect the rear interface output signal as previously described for the front panel BALANCED OUTPUT signal.

The signal at the front panel SYNC OUT connector is also available at the rear interface connector, pins 27B and 28B (common). The output impedance at these rear interface pins is approximately 50 Ω and the signal is always referenced to ground. The INTERMOD TEST SIG pushbutton also affects the rear interface SYNC OUT signal as described for the front panel SYNC OUT signal.

THEORY OF OPERATION

Introduction

This section describes the SG 505 Option 02 circuitry. The description is divided into parts that correspond to the circuit blocks shown on the block diagram in the Diagrams and Circuit Board Illustrations section of this manual. Each of these circuit blocks is also outlined in gray on the circuit diagram on which it is shown. The numbered diamond by each title of the following description refers to the corresponding circuit diagram number. The A12 or A13 number identifies the board assembly containing the circuit.

Phase Shift Oscillator ◇1◇ A12

The phase shift or state variable oscillator consists of U1510, U1400, U1401, and associated components. Two integrators, U1400 and U1401, each having a 90° phase shift, are cascaded in a loop with inverter U1510. Combining the phase inversion of U1510 with the two 90° phase shifts of the integrators causes a 360° phase shift necessary for oscillation. Feedback occurs from pin 6 of U1401 to pin 2 of U1510 through R1517, R1527, and R510.

The output voltage rate of change of an integrator is proportional to the input voltage amplitude. An integrator's timing capacitors and gain determine the oscillator frequency. The gain around the loop is unity at the oscillation frequency. Multiplier pushbuttons (S1410) select the timing capacitors across the integrators for each frequency range. The FREQUENCY Hz dial adjusts R520 and R530 to control the gain of the integrators. A small adjustment in the gain of U1510, accomplished by the frequency VERNIER control R510, provides a ±1% change in frequency.

The signal from U1401 is routed to a network consisting of Q1410, Q1411, and associated components. This network comprises a clamp that limits the maximum output voltage from U1401 to no greater than 3 dB above the selected oscillator output level. Output voltage surges created at initial instrument turn on, or due to switching transients, are effectively eliminated.

Amplitude Detector ◇1◇ A12

This circuitry provides an accurate, relatively long time-constant agc voltage. The output signal from U1401 is also fed to the amplitude detector circuit U1500 (an amplitude controlled integrator). U1500 compares the output of U1401 to the reference voltage (−17 V supply). The average current through R1504 equals the current through R1503 when the output of U1401 is 2 V rms. The output of U1500 sets the input offset voltage to the peak detector, Q1600 and Q1610.

Peak Detector ◇1◇ A12

This circuitry provides a fast agc correction voltage. The offset voltage from U1500 and the ac signal from U1510 via C1603 are fed to a peak detector, Q1600 and CR1510. This circuitry produces a negative voltage proportional to the negative peak voltage of the ac signal. The agc filter capacitors are combinations of C1611,C1421, C1523, and C1420, depending on the frequency range selected. Between peaks, the agc filter capacitors charge from positive current source Q1611. Thus, the signal at the agc test point (TP1510) is a sawtooth waveform with a fast negative transition and a positive-going linear ramp. The network consisting of R1502 and C1502 provides cancellation of the fundamental frequency component of the agc signal. CR1600 speeds recovery from large positive-going transients.

Amplitude Control ◇1◇ A12

The oscillator output amplitude is controlled by Q1501. Agc voltage controls the gate of Q1501. Components R1511, R1512, R1510, R1513, C1511, and C1510 form a voltage divider network. This voltage divider provides an ac signal that is one-half the amplitude of the signal appearing at the drain to drive the gate of Q1501. A more positive gate voltage at Q1501 causes an increase in oscillator amplitude by reducing the input signal at pin 3 of U1510.

Output Buffer Amplifier ◇2◇ A12

The output signal from the phase shift oscillator on schematic 1 passes to the IMD circuitry and then through R1521, R1423, and R1518 to the output buffer amplifier Q1620 and U1520. Q1620 raises the open loop gain and lowers the noise of U1520. The voltage gain of U1520 is set by R1518, the OUTPUT LEVEL CAL control, and is variable from about 0.5 to 3. When this control is fully CW, the ganged switch is open and the buffer output amplitude is at the calibrated level set by R1423. When R1518 is not in the CW detent, the switch is closed and the gain initially increases by about 0.7 dB, then decreases as R1518 is turned in the CCW direction. Resistor R1423 is internally adjusted to set the level at the BALANCED OUTPUT connectors to +22 dBm (with S1520 in the +22 dBm position). The signal from the output buffer amplifier is fed through ON-OFF switch S1410E to J1220, where it is routed to the Option 02 board, A13.

Sync Driver and Sync Amplifier ◇2◇ A12

An opto-isolator is used in this circuitry because the SYNC OUT signal is referenced to chassis ground. Oscillator output also passes through the Option 02 board to U1300, then to the base of Q1300. Transistor Q1301 produces a dc bias current (necessary to operate the LED in the linear region) which is combined with the ac current at the oscillator frequency. Sync Lvl Adj. R1301 sets the gain of U1300 for an output of 200 mV rms at the SYNC OUT connector. The current through the LED section of opto-isolator U1300 varies the intensity of emitted light. This light intensity controls the current through the transistor section of the opto-isolator. The sync amplifier, consisting of Q1300, R1201, and R1200, converts the output current from U1300 to voltage. The output of Q1300 is coupled through R1204 to the front panel SYNC OUT connector and through R1202 to rear interface connector pin 27B. The sync signal has a rising edge corresponding to the rising edge on the + BALANCED OUTPUT.

Power Supply ◇3◇ A12

Power is supplied to the SG 505 from the 25 V ac floating winding in the power module. This 25 V ac is applied to the primary winding of T1220 through a 1 A, 250 V fuse. Each of the two secondary windings supplies 25 V ac, which is rectified by bridge rectifiers CR1113 and CR1114 and filtered by C1212 and C1211.

The two series-pass transistors in the power module and U1101A and U1101B regulate the +17 V and −17 V supply voltages. Resistors R1206 and R1205 divide the +17 V to approximately +6.8 V at pin 5 of U1101B. Operational amplifier U1101B compares the voltage at pin 5 with the +6.8 V reference voltage at pin 6, supplied by VR1201 and CR1201. CR1201 provides first-order temperature compensation for VR1201. The output of U1101B drives the series-pass transistor in the power module. If the voltage at pin 5 of U1101B moves below +6.8 V, the output of U1101B goes more negative, causing more base current flow in the PNP series-pass transistor. This raises the voltage of the +17 V supply. FET Q1110 provides base current to the PNP series-pass transistor at instrument turn on. Resistor R1207 and C1200 decouple the +17 V used in the output buffer amplifier.

The −17 V supply tracks the +17 V supply. Operational amplifier U1101A compares the voltage at pin 3 to the floating ground (common) potential at pin 2. The voltage at the junction of the voltage divider R1102 and R1101 is 0 V if the +17 V and −17 V supply voltages are correct. If the −17 V supply voltage moves toward ground, the output of U1101A goes more positive, causing increased base current and conduction in the NPN series-pass transistor which causes the −17 V to go more negative.

Current limit for the +17 V supply is provided by Q1102, R1100, and R1122. The maximum output for each supply is approximately 250 mA. At this current the series-pass transistor emitter voltage is approximately 0.65 V more negative than ground. If the output of U1101B attempts to drive the transistor emitter voltage more negative than −0.65 V, the current limiting transistor conducts, diverting base current from the series-pass transistor. The negative current limit operates in a similiar manner.

IMD Oscillator ◇4◇ A13

This circuit generates the low frequency (LF) portion of the intermodulation test signal and mixes the LF signal with the main oscillator signal in a 4:1 amplitude ratio (four parts LF to one part main frequency). The LF frequency is either 60 or 250 Hz.

The IMD circuit contains a Wein bridge oscillator composed of U1230 and associated components. Switch S1130 selects either a 60 or 250 Hz LF output at U1230-6. The oscillator is set to 60 Hz by C1130, C1032, R1130, and R1134. With the switch set for 250 Hz, resistors R1132 and R1136 are added to the circuit to increase the oscillation frequency.

A peak detector consisting of CR1230 and Q1332 controls the gain of the oscillator by adjusting the voltage at the gate of Q1330. The Im Rat Adj, R1339, is an internal adjustment that sets the amplitude of the signal from U1230.

The SG 505 main oscillator signal enters the IMD circuit at J1520-5, passes through R1330 and two parts of switch S1320, and returns to the Main board (A12). With the INTERMOD TEST SIG pushbutton in, S1320 connects the IMD oscillator circuit to the main oscillator signal line. The IMD signal is resistively summed with the main oscillator signal by R1230, R1232, and R1332.

Inverting Buffer and Power Amplifiers ◇5◇ A13

The sine wave signal from the output buffer amplifier passes through the ON-OFF switch (Main board, schematic 2), and to the Option 02 board (schematic 5) at J1220. The signal passes through a 10 dB attenuator consisting of R1223, R1127 in parallel with R1123, and S1520-13. Resistors R1422 with S1520-11, and R1424 with S1520-12 provide additional 10 and 20 dB steps of attenuation for the −58 and −68 dBm output levels.

The signal is then routed to two identical low-distortion power amplifiers. The power amplifier at the top of schematic 5 amplifies the signal to the − BALANCED OUTPUT at the

front panel. To provide the + BALANCED OUTPUT, the phase of the signal to the lower power amplifier is inverted by U1120, a unity gain buffer. This buffer is feed-forward compensated by C1026 and R1022 for wide bandwidth. The Bal Adj., R1126, matches the gain of the power amplifiers so that the voltage differential at the + and − BALANCED OUTPUT connectors is exactly twice the voltage between either output and CT (common).

In the top power amplifier on schematic 5, the signal passes through a differential amplifier, Q1211 and Q1210. Q1202 and Q1200 form a current mirror load to increase the gain of the differential amplifier. The signal is then buffered by Q1214 and fed to Q1215. A quasi-current source load, consisting of Q1112 with R1002, permits Q1215 to have high voltage gain. Both Q1112 and Q1114 buffer the signal and split its phase before sending it to the fully complementary output stage. Output transistors Q1000, Q1010, and Q1100, Q1110 are paralleled in pairs for better power handling. The four resistors at the emitters of these output transistors ensure power sharing. R1014 determines the standing bias current in the output transistors. Components C1220 and R1220, C1022 and R1020, and C1020 form a three-pole compensation network for the amplifier for improved high frequency performance. Overall negative feedback is provided by R1120 and C1120. Diodes CR1210 and CR1200 are clamps to control the clipping characteristics of the amplifier. CR1010 and CR1020, with the four resistors at the output transistor emitters, establish the amplifier output current limit. Servo amplifier U1210A with C1210 guarantees a very low dc output voltage.

The power amplifier connected to the + BALANCED OUTPUT is identical in operation to the amplifier connected to the − BALANCED OUTPUT.

Output Attenuators and Rear Interface Buffers ◇5◇ A13

The outputs of the power amplifiers are routed to two hybrid resistor networks, R1510 and R1530. These networks are 25 Ω, 20 dB/step attenuators. Cam switch contacts S1520-1 through 5 select the attenuator taps for R1510, which attenuates the signal to the − BALANCED OUTPUT, while contacts S1520-6 through 10 select the taps on the + BALANCED OUTPUT attenuator, R1530. Contacts S1520-11,12, and 13 select the 10 and 20 dB attenuators before the power amplifiers. The cam switch contacts associated with the output attenuators and with the pre-attenuation (before the power amplifiers) operate together to set the proper attenuation for the various output levels, as shown in the table in the lower left corner of schematic 5.

The attenuated outputs are routed to the SOURCE R switch, S500A and B, for source impedance selection. The 600 and 150 Ω switch positions add two additional resistors (contained in each hybrid network), to increase each 25 Ω output to 75 Ω (a 150 Ω differential) and 300 Ω (600 Ω differential).

After source impedance selection, the signals are passed to the front panel + and − BALANCED OUTPUT connectors. Capacitors C500 and C510 improve rejection of any interference that may be induced on cables attached to the output connectors. The output signals are also fed to the rear interface buffers U1430A and B. These buffers invert and attenuate the outputs by a factor of 10 (20 dB). The outputs of these buffers are routed to the rear interface connector contacts 25A and 26A via cable assembly W520.

CHECKS AND ADJUSTMENTS

Introduction

This section consists of a Performance Check and an Adjustments procedure. The Performance Check verifies only the electrical specifications listed under Performance Requirements in the Specification section of this manual. The Adjustments procedure describes a sequential adjustment of internal controls should it be necessary to restore the instrument performance to the electrical specifications listed in the Specifications section.

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

Test Equipment Requirements

Below is a list of equipment required to perform the Performance Check and Adjustments procedures. Other equipment may be substituted when suitable. Tolerances that are specified in the Performance Check and Adjustments procedure apply to the instrument under test and do not include test equipment error.

Table 4-1
LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Application		Example
		Performance Check Step	Adjustments Step	
TM 500 or TM 5000 Series Power Module		All steps	All Steps	TEKTRONIX TM 503, TM 504, TM 506 or TM 5006
Counter	0.1 Hz resolution at 10 Hz.	1, 2, 13	1	TEKTRONIX DC 504 Digital Counter[b]
Calibration Fixture	80 dB notch at 10 Hz, 20 Hz; 60 dB notch at 20 kHz, 50 kHz, 100 kHz.	4, 5, 9		TEKTRONIX 067-0938-00 Calibration Fixture[b]
Wide Band Rms Voltmeter[a]	±0.2% at 1 kHz. ±0.5% from 10 Hz to 100 kHz.	3, 4, 6, 7, 11	2, 3	Hewlett Packard 3403C or Fluke 8502[a]
Ohmmeter	±0.2% of reading or better.	10		TEKTRONIX DM 501A Digital Multimeter[b]
Oscilloscope		5, 8, 9, 12	4	TEKTRONIX 7704A or 7603 Oscilloscope
Differential Comparator	Comparison voltage; 6 V overload capability, 50 mV/div gain.	5, 8, 12	4	TEKTRONIX 7A13 Differential Comparator Amplifier
Time Base	General Purpose, 10 μs/div sweep rate.	5, 8, 12	4	TEKTRONIX 7B50A Time Base
Spectrum Analyzer	10 Hz resolution; 80 dB dynamic range; −60 dB reference level	9		TEKTRONIX 7L5/L3 Spectrum Analyzer

Table 4-1 (cont)

Description	Performance Requirements	Application		Example
		Performance Check Step	Adjustments Step	
Differential Amplifier	Gain of 1, 10, 100, 1000, 10 k; output swing >10 V.	4, 5, 9		TEKTRONIX AM 502 Differential Amplifier[b]
4 ea. Coaxial cables with male bnc connectors	50 Ω	All steps	All steps	Tektronix Part No. 012-0057-01
1 ea. Extender cable			All steps	Tektronix Part No. 067-0645-02
2 ea. Bnc female to dual banana adapters		10		Tektronix Part No. 103-0090-00
Termination	50 Ω	9		Tektronix Part No. 011-0049-01
3 ea. Coaxial cable	50 Ω, 18 inch	3, 4, 5, 6, 7, 8, 9	2	Tektronix Part No. 012-0076-00
Resistors:				
1 ea.	600 Ω, 0.5%, 1/2 W	3, 6, 7, 8	4	Tektronix Part No. 323-0607-01
2 ea.	300 Ω, 0.1%, 1/8 W		2	Tektronix Part No. 321-0808-07
Double banana plug	For convenience in attaching resistors			Pomona 1330-ST-O or MDP-ST
1 ea. Cable with banana plugs	2 conductor, balanced and shielded	3, 6, 7, 12	4	Pomona 1167-36
2 ea. Bnc male to dual banana adapter		12	4	Tektronix Part No. 103-0035-00

[a]Fluke 8502 specified accuracy at 10 Hz and 100 kHz is 1.0%.

[b]Requires a TM 500 or TM 5000 Series Power Module.

The numbers in Table 4-1 columns refer to the Performance Check or Adjustment step in which the equipment is used. The following list indexes the steps for each procedure.

Performance Check steps:

1. Check Frequency Accuracy
2. Check Frequency Vernier Range
3. Check Output Level Accuracy and Balance
4. Check Output Level Step Accuracy
5. Check Output Level Step Accuracy (alternative method)
6. Check Output Level Variable Range
7. Check Level Flatness
8. Check Level Flatness (alternative method)
9. Check Distortion
10. Check Output Impedance
11. Check Sync Out Amplitude
12. Check Intermodulation Test Signal Ratio
13. Check Intermodulation Test Signal Frequency

Adjustment Procedure steps:

1. Adjust Frequency Hz Dial
2. Adjust Output Level Amplitude and Balance
3. Adjust Sync Out Amplitude
4. Adjust Intermodulation Test Signal Ratio

PERFORMANCE CHECK

Introduction

This procedure checks the electrical characteristics of the SG 505 Option 02 listed under Performance Requirements in the Specification section of this manual. If the instrument fails to meet the requirements given in this Performance Check, the Adjustments procedure should be performed. The Performance Check should be performed with the instrument operating at an ambient temperature between 0°C and 50°C. For convenience, some steps in this procedure check the performance of this instrument at only one value in the specified performance range. Any value, with appropriate limits, within the specified range may be substituted.

Test Equipment Required

Test equipment used in the Performance Check is listed in Table 4-1 at the beginning of this section.

Preparation

1. Ensure that all power switches are off and that the power module and all test equipment are adapted for the line voltage available.

2. Install the SG 505 in the power module and connect the power module and test equipment to the line voltage source.

3. Turn on the power module and test equipment. Allow at least 20 minutes warmup time for the SG 505 (60 minutes after storage in a high humidity environment).

PROCEDURE

1. Check Frequency Accuracy

a. Set the SG 505 controls as follows:

VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
ON-OFF	ON (in)
SOURCE R	600
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 SYNC OUT through the bnc to tip-jack cable to the counter input.

c. Set the counter resolution and the SG 505 controls as listed in Table 4-2.

d. CHECK—that the counter reads within the limits listed in Table 4-2 for each frequency.

e. Leave the connections and controls settings and proceed to the next step.

Table 4-2
FREQUENCY ACCURACY CHECK

Counter Resolution	SG 505 Frequency Hz		Counter Reading Limits (kHz)
	Dial	Pushbutton	
0.1 Hz	1	×10	0.0097 to 0.0103
	2		0.0194 to 0.0206
	5		0.0485 to 0.0515
	7		0.0679 to 0.0721
	10		0.0970 to 0.1030
1 Hz	10	×100	0.970 to 1.030
	7		0.679 to 0.721
	5		0.485 to 0.515
	2		0.194 to 0.206
	1		0.097 to 0.103
1 Hz	1	×1k	0.970 to 1.030
	2		1.940 to 2.060
	5		4.850 to 5.150
	7		6.790 to 7.210
	10		9.700 to 10.300
10 Hz	10	×10k	97.00 to 103.00
	7		67.90 to 72.10
	5		48.50 to 51.50
	2		19.40 to 20.60
	1		9.70 to 10.30

2. Check Frequency Vernier Range

a. Change the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k

b. Set the counter resolution to 1 Hz.

c. Adjust the FREQUENCY Hz dial for a counter reading of 1000 Hz.

d. Rotate the VERNIER control fully CCW.

e. CHECK—that the counter reading is $\leq$ 0.990 kHz.

f. Rotate the VERNIER control fully CW.

g. CHECK—that the counter reads $>$ 1.010 kHz.

h. Remove all connections to the SG 505.

3. Check Calibrated Output Level Accuracy and Balance

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + and − BALANCED OUTPUT connectors through a two-conductor balanced, shielded cable (shield to CT) or a bnc to dual banana adapter and a coaxial cable to the rms voltmeter input.

c. Connect a 600 Ω resistor between the SG 505 + and − BALANCED OUTPUT connectors.

d. CHECK—that the rms voltmeter reads between 9.528 and 9.977 V rms.

e. Remove the 600 Ω load resistor.

f. Move the balanced, shielded cable or the bnc to dual banana adapter to connect to the − BALANCED OUTPUT connector (high) and the CT connector (low).

g. CHECK—that the rms voltmeter reads approximately 9.75 V rms. Record the actual reading.

h. Move the balanced, shielded cable or the bnc to dual banana adapter to connect to the + BALANCED OUTPUT connector (high) and the CT connector (low).

i. CHECK—that the rms voltmeter reads within 0.5% of the reading recorded in step 3g.

j. Remove all connections to the SG 505.

4. Check Attenuator Step Accuracy

Step 5 is an alternative method for checking attenuator step accuracy. Either step 4 or step 5 may be performed.

This step verifies the + and − BALANCED OUTPUTs separately.

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + BALANCED OUTPUT and CT connectors through a bnc to dual banana adapter and a coaxial cable to the input of the calibration fixture as shown in Fig. 4-1. Connect a 600 Ω resistor across the + BALANCED OUTPUT to CT. Set the MODE of the calibration fixture to FLAT.

c. Connect the output of the calibration fixture to the differential amplifier + input with a coaxial cable.

d. Connect the differential amplifier output through a coaxial cable to the wide band rms voltmeter input. Set the differential amplifier + input to ac coupled and ground the − input. Set the high frequency −3 dB control to 30 kHz and the low frequency −3 dB control to 1 Hz.

e. Set the ATTEN pushbutton on the calibration fixture to the position shown in Table 4-3, column b and set the differential amplifier gain and mode to the values shown in Table 4-3, column c.

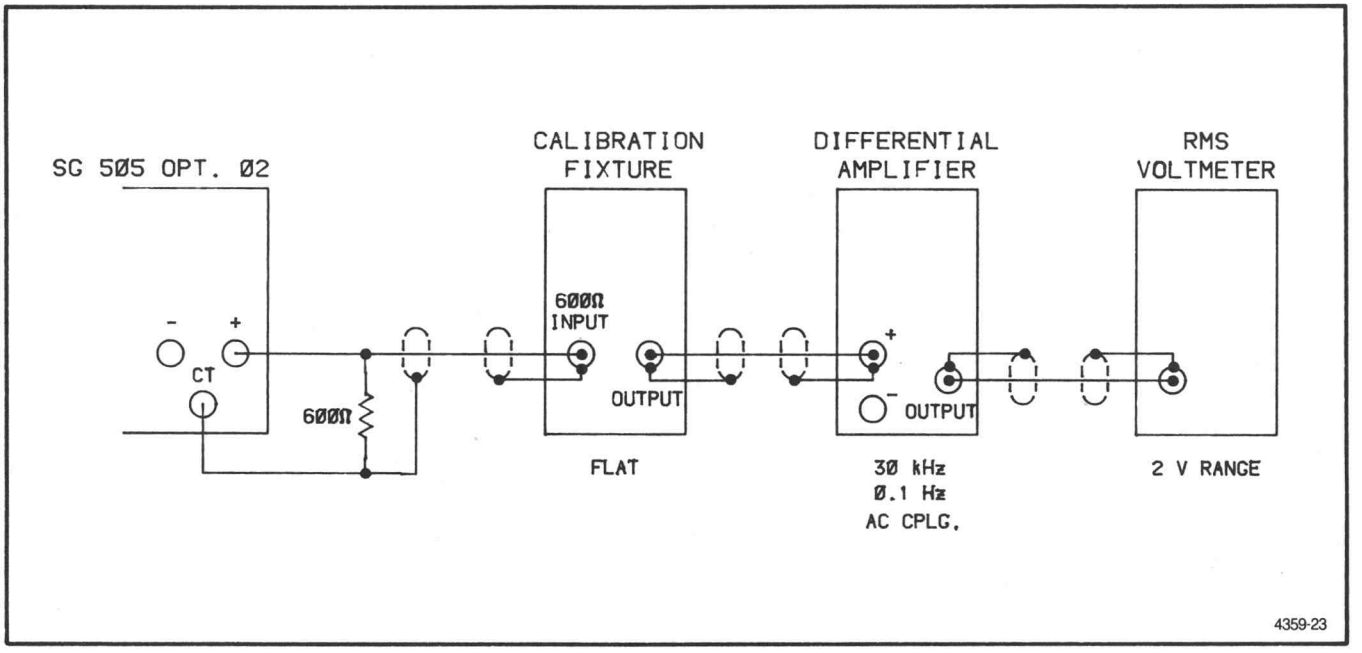


Fig. 4-1. Attenuator step accuracy setup.

Table 4-3
ATTENUATOR STEP ACCURACY

Column a SG 505 OUTPUT LEVEL (dBm)	Column b Calibration Fixture ATTEN	Column c AM 502 GAIN	Column d −10 dB Check	Column e −20 dB Check
			SG 505 OUTPUT LEVEL (dBm)	
+22	−60	500, NORM	+12	+2
+12	−60	2K, NORM	+2	−8
+2	0	500, ÷100	−8	−18
−8	0	2K, ÷100	−18	−28
−18	0	5K, ÷100	−28	−38
−28	0	200, NORM	−38	−48
−38	0	500, NORM	−48	−58
−48	0	2K, NORM	−58	−68
−58	0	5K, NORM	−68	Not applicable

f. Set the SG 505 OUTPUT LEVEL control to the value listed in the table, column a.

g. Adjust the differential amplifier variable gain for an rms voltmeter reading of 1.800 V ±0.002 V.

h. Set the SG 505 OUTPUT LEVEL control to the value listed in the table, column d.

i. CHECK—that the rms voltmeter reads between 0.562 to 0.576 V.

j. Set the SG 505 OUTPUT LEVEL control to the value listed in the table, column e.

k. Set the rms voltmeter to the 200 mV range and CHECK that it reads between 177.9 to 182.1 mV.

l. Repeat step 4 parts e through k for each of the remaining lines in the table.

m. Repeat step 4 parts b through l with the SG 505 output taken from the − BALANCED OUTPUT connector and CT.

n. Remove all connections to the SG 505.

5. Check Attenuator Step Accuracy (alternative method)

This step verifies the + and − BALANCED OUTPUTs separately.

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + BALANCED OUTPUT and CT connectors through a bnc to dual banana adapter and a coaxial cable to the input of the calibration fixture as shown in Fig. 4-1. Connect a 600 Ω resistor across the + BALANCED OUTPUT to CT. Set the MODE of the calibration fixture to FLAT. See Fig. 4-1.

c. Connect the output of the calibration fixture to the differential amplifier + input with a coaxial cable.

d. Set the differential amplifier inputs to dc coupled and not grounded. Set the high frequency −3 dB control to 30 kHz and the low frequency −3 dB control to 1 Hz. Connect the differential amplifier output through a coaxial cable to the oscilloscope differential comparator + input.

e. Set the differential comparator volts/div to 50 mV/div. Set the differential comparator inputs to gnd and adjust the vertical position control to place the trace on the center horizontal graticule line. Then make certain the dc comparison voltage is connected to the − input of the differential comparator via front panel selection and the + input is dc coupled.

f. Set the ATTEN pushbutton on the calibration fixture to the position shown in Table 4-3, column b and set the differential amplifier gain control and mode as listed in the first line of the table, column c.

g. Set the differential comparator voltage to 2.545 V.

h. Set the SG 505 OUTPUT LEVEL control to the value shown in the table, column a.

i. Adjust the differential amplifier variable gain to position the waveform peaks on the oscilloscope display to the center horizontal graticule line.

j. Change the SG 505 OUTPUT LEVEL control to the value shown in the table, column d, without changing the OUTPUT LEVEL CAL position.

k. Adjust the differential comparator voltage to position the waveform peaks on the center horizontal graticule line.

l. CHECK—that the differential comparator voltage is within these limits: 0.795 to 0.814 volts.

m. Set the SG 505 OUTPUT LEVEL control to the value listed in the table, column e.

n. Adjust the differential comparator voltage to position the waveform peaks on the center horizontal graticule line.

o. CHECK—that the differential comparator voltage is between 0.251 and 0.258 V.

p. Repeat step 5 parts f through o for the remaining lines of the table.

q. Repeat step 5 parts b through p with the SG 505 output taken from the − BALANCED OUTPUT connector and CT.

r. Remove all connections to the SG 505.

6. Check Output Level Variable Range

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + and − BALANCED OUTPUT connectors through a two-conductor balanced shielded cable (shield to CT) or a bnc to dual banana adapter and a coaxial cable to the rms voltmeter input.

c. Connect a 600 Ω resistor between the SG 505 + and − BALANCED OUTPUT connectors. The rms voltmeter should read approximately 9.75 V. Note the reading.

d. Turn the SG 505 OUTPUT LEVEL CAL control slightly CCW (just out of detent).

e. CHECK—that the rms voltmeter reads ≥ 10.57 V rms or ≥ 0.7 dB (1.084×) higher than the reading obtained in step c.

f. Turn the SG 505 OUTPUT LEVEL CAL control fully CCW.

g. CHECK—that the rms voltage reads ≤ 2.98 V rms or ≤ 11 dB (0.282×) below the reading obtained in part e.

h. Leave the connections and control settings and proceed to the next step.

7. Check Level Flatness

Step 8 is an alternative method for checking level flatness. Either step 7 or step 8 may be performed.

a. Change the SG 505 controls as follows:

OUTPUT LEVEL CAL fully CW

b. Connect the SG 505 + and − BALANCED OUTPUT connectors through a two-conductor balanced, shielded cable (shield to CT) or a dual banana to bnc adapter and an 18 inch coaxial cable to the wide band rms voltmeter input. Connect a 600 Ω resistor between the SG 505 + and − BALANCED OUTPUT connectors.

c. Adjust the variable OUTPUT LEVEL CAL control for a voltmeter reading of 9.75 V. Do not change this control position for the rest of step 7.

d. Set the SG 505 FREQUENCY Hz dial and FREQUENCY Hz pushbutton as listed in Table 4-4.

e. CHECK—that the rms voltmeter reading is within the limits listed in Table 4-4.

f. Repeat step 7 parts c through e for the remaining lines of the table. Additional frequencies may be checked. Frequencies at or below 20 kHz should give a voltmeter reading between the first set of limits listed; for frequencies above 20 kHz, the second voltmeter limits apply.

g. Remove all connections to the SG 505.

Table 4-4
LEVEL FLATNESS CHECK

SG 505 FREQUENCY Hz Dial	SG 505 FREQUENCY Hz Pushbutton	Rms Voltmeter Reading Limits
1 2	×10 ×10k	9.638 to 9.863 V rms
5 10	×10k ×10k	9.528 to 9.977 V rms

8. Check Level Flatness (alternative method)

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + BALANCED OUTPUT (high) and CT (low) connectors through a bnc to dual banana adapter and an 18 inch coaxial cable to the oscilloscope differential comparator + input.

c. Connect a 300 Ω resistor from the SG 505 + BALANCED OUTPUT connector to the CT connector.

d. Set the differential comparator volts/div to 50 mV/div, set both input couplings to ground and adjust the vertical position to place the trace on the center horizontal graticule line. Then make certain the dc comparison voltage is connected to the − input of the differential comparator via front panel selection and the + input is dc coupled.

e. Adjust the differential comparator voltage to 6.893 V. Adjust the SG 505 OUTPUT LEVEL CAL control to position the waveform peaks on the center horizontal graticule line.

f. Change the SG 505 FREQUENCY Hz dial and pushbutton as listed in Table 4-5.

g. Adjust the differential comparator voltage to reposition the waveform peaks on the center horizontal graticule line.

h. CHECK—that the comparator voltage readout is within the limits listed in Table 4-5 for each frequency setting.

i. Repeat parts b through h with the connections to the SG 505 between the − BALANCED OUTPUT connector (high) and the CT connector (low).

Table 4-5
LEVEL FLATNESS CHECK (alternative method)

SG 505 FREQUENCY Hz		Comparator Voltage Limits
Dial	Pushbutton	
1	×10	
2	×10	6.814 to 6.973 V
2	×10k	
10	×10k	6.736 to 7.054 V

9. Check Distortion

NOTE

A complex and lengthy procedure is required to verify the SG 505 ultra-low distortion. Unless there is reason to suspect the SG 505 may not meet its distortion specification because of recent repair or accidental abuse, it is suggested that this procedure be omitted. Distortion can be easily and quickly checked to the residual limits of almost any commercially available distortion or spectrum analyzer.

The distortion of each half of the SG 505 BALANCED OUTPUT is verified separately in this procedure.

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz	
Pushbutton	×10
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	just out of detent
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect a 600 Ω resistor between the SG 505 + BALANCED OUTPUT connector (high) and the CT connector (low). Connect a 300 Ω load resistor between the SG 505 − BALANCED OUTPUT connector and the CT connector. Refer to Fig. 4-2 for connection details. Connect the + BALANCED OUTPUT to CT output through a coaxial cable to the calibration fixture 600 Ω input. Connect the calibration fixture output through an 18 inch coaxial cable to the differential amplifier + input. Connect the differential amplifier output through a coaxial cable to spectrum analyzer input. Connect a 50 Ω termination to the differential amplifier − input (or push the GND button). Set the differential amplifier gain to 100 and the mode ÷100 out. Set both input couplings to dc. Set the high frequency −3 dB control to 1 MHz and the low frequency −3 dB control to 0.1 Hz.

c. Set the calibration fixture controls as follows:

NOTCH FREQUENCY	10 Hz
MODE	Flat (out)
ATTEN	−60 dB (in)

d. Set the spectrum analyzer controls as follows:

FREQUENCY	50 Hz/div
RESOLUTION	coupled
TIME/DIV	10 sec/div
LOG	10 dB/div
SOURCE MODE	Free Run, Normal

Set the spectrum analyzer controls to 1 MΩ, dBv.

e. Set the spectrum analyzer A & B to off and manual sweep. Adjust the spectrum analyzer manual sweep control to position the dot in line with the 10 Hz graticule mark (peak amplitude on the spectrum analyzer trace). See Fig. 4-3. Adjust the spectrum analyzer reference level control to position the dot vertically on the top graticule line. This line is the −60 dB reference level.

f. Set the calibration fixture Mode to Notch (in) position and the Atten to 0 dB (out). Adjust the SG 505 VERNIER control and the calibration fixture Adj For Null controls to

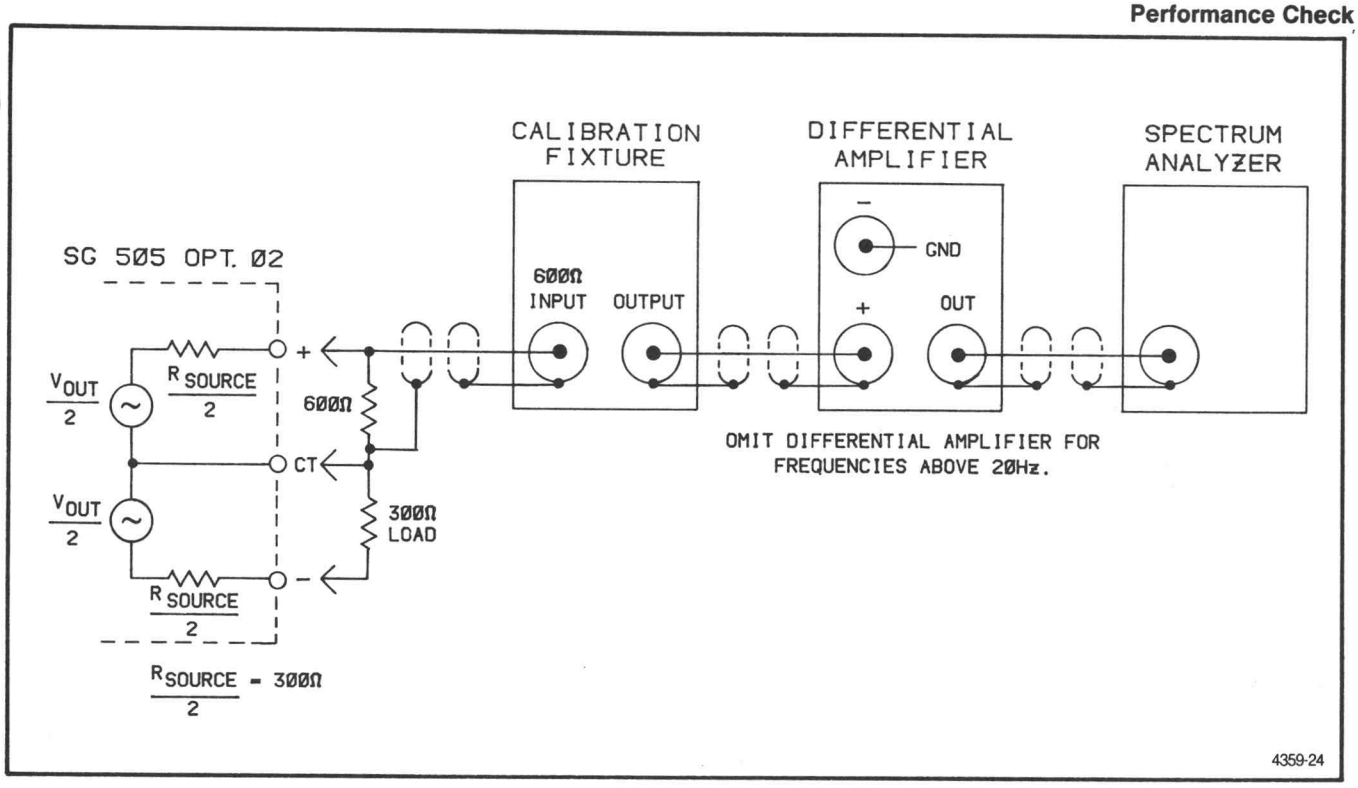


Fig. 4-2. Distortion measurement set-up for SG 505 + BALANCED OUTPUT. To measure distortion of − BALANCED OUTPUT, reverse connections to the SG 505 + and − BALANCED OUTPUTS.

position the dot vertically to the most stable point below the −80 dB level on the display. (see Fig. 4-3). Set the spectrum analyzer A & B to the on position and normal sweep mode.

NOTE

For the 10 Hz distortion check only, it may be necessary to adjust the spectrum analyzer reference level down 10 or 20 dB to raise the 2nd harmonic out of the 0 Hz spur, being careful to keep the fundamental nulled on the crt. The deeper the null you can obtain, the easier it will be to identify the 2nd harmonic. Note that the −60 dB reference level will also decrease by 10 or 20 dB when this adjustment is made. Reset the reference level back before continuing on to the 20 Hz distortion measurements.

g. Note the 2nd, 3rd, 4th, and 5th harmonics on the displayed waveform (see Fig. 4-4). If the harmonic amplitudes on either side of the 0 Hz are slightly different, average the two readings for each harmonic.

NOTE

Due to the purely passive nature of the 067-0938-00 Calibration Fixture, the losses at the various harmonics must be taken into account to correct the harmonic values noted on the spectrum analyzer display. The loss (correction) factors in Table 4-6 must be added to the displayed values to obtain corrected values.

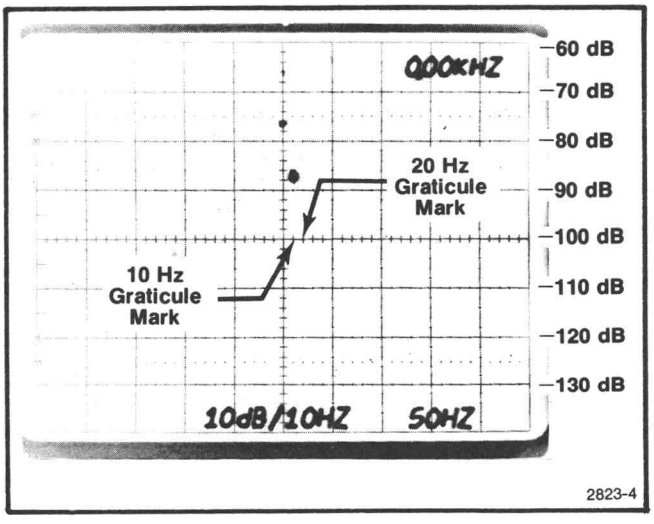


Fig. 4-3. 10 Hz null adjustment.

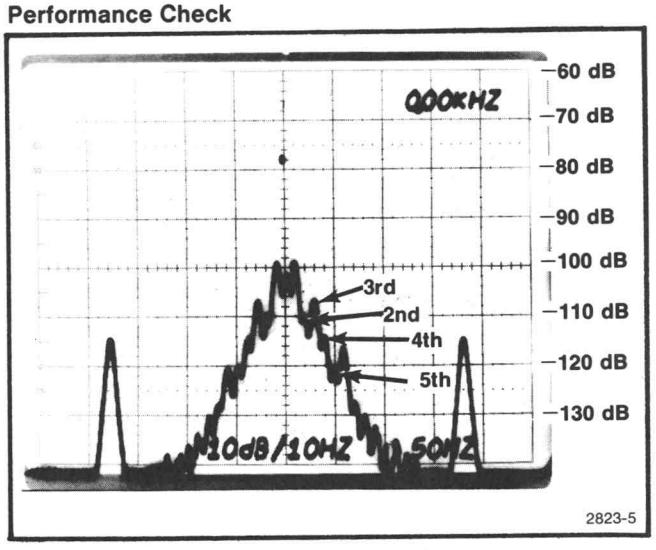


Fig. 4-4. 10 Hz harmonic distortion display.

h. Compute the total harmonic distortion (THD) using the harmonic values noted and either of the two following methods.

Table 4-6
HARMONIC CORRECTION FACTORS

Harmonic	Notch Frequency Setting		
	10 Hz to 20 kHz	50 kHz	100 kHz
2nd	9.5	10	10.5
3rd	6.0	6.5	7
4th	4.5	5	5.5
5th	3.5	4	4.5

Formula Method for Computing THD:

Substitute the harmonic values (in dB), noted in step 9 part g, in the following formula:

$$THD = 20 \times \log_{10} A$$

$$A = \sqrt{10^{(2nd+9.5)/10} + 10^{(3rd+6)/10} + 10^{(4th+4.5)/10} + 10^{(5th+3.5)/10}}$$

The numbers added to the harmonic values in the formula are correction factors for the calibration fixture at 10 Hz Notch Frequency.

For example, using the harmonic distortion levels in Fig. 4-2 and the corrections factors in the previous formula:

$$\begin{aligned}
\text{2nd harmonic} &= -110\text{ dB} + 9.5 = -100.5\\
\text{3rd harmonic} &= -107\text{ dB} + 6 = -101\\
\text{4th harmonic} &= -115\text{ dB} + 4.5 = -110.5\\
\text{5th harmonic} &= -121\text{ dB} + 3.5 = -117.5
\end{aligned}$$

dividing by 10 and raising 10 to this power gives:

$$\begin{aligned}
-100.5 \div 10 &= -10.05 & 10^{-10.05} &= 89.12 \times 10^{-12}\\
-101 \div 10 &= -10.1 & 10^{-10.1} &= 79.43 \times 10^{-12}\\
-110.5 \div 10 &= -11.05 & 10^{-11.05} &= 8.91 \times 10^{-12}\\
-117.5 \div 10 &= -11.05 & 10^{-11.75} &= 1.77 \times 10^{-12}\\
& & & 179.2 \times 10^{-12}
\end{aligned}$$

taking the square root results in:

$$\sqrt{179.2 \times 10^{-12}} = 1.34 \times 10^{-5}$$

taking the log:

$$\log_{10} 1.34 \times 10^{-5} = -4.87$$

multipling by 20:

$$-4.87 \times 20 = -97.46\text{ dB THD}$$

Table Method for Computing THD:

Add the calibration fixture correction factors to the harmonic distortion levels noted in step 9 part g. For example, using the harmonic distortion levels in Fig. 4-4 and the calibration fixture correction factors for 10 Hz Notch Frequency:

$$\begin{aligned}
\text{2nd harmonic} &= -110\text{ dB} + 9.5 = -100.5\\
\text{3rd harmonic} &= -107\text{ dB} + 6 = -101\\
\text{4th harmonic} &= -115\text{ dB} + 4.5 = -110.5\\
\text{5th harmonic} &= -121\text{ dB} + 3.5 = -117.5
\end{aligned}$$

Compute the arithmetic difference between the two numerically lower dB values—in this case, −100.5 and −101. Locate this difference value (0.5) in Table 4-7. If the difference value falls between two of the difference values in the table, interpolate the corresponding value in the Additive Factor column. Algebraically add the number in the Additive Factor column (2.77) to the numerically lower dB value:

$$\begin{array}{r} -100.50 \\ 2.77 \\ \hline -97.73 \end{array}$$

Table 4-7
FACTORS FOR THD COMPUTATION

Difference Value	Additive Factor
0.0	3.01
0.5	2.77
1.0	2.54
2.0	2.12
3.0	1.76
4.0	1.46
5.0	1.19
6.0	0.97
7.0	0.79
8.0	0.64
9.0	0.51
10.0	0.41
11.0	0.33
12.0	0.27
13.0	0.21
14.0	0.17
15.0	0.14
16.0	0.11
17.0	0.09
18.0	0.07
19.0	0.05
20.0	0.04

Now repeat the process (find the arithmetic difference) using the resulting number (−97.73) and the next numerically lower dB value:

$$\begin{array}{r} -110.50 \\ -\ 97.73 \\ \hline 12.77 \end{array}$$

The value opposite 12.77 in Table 4-7 is approximately 0.23. Algebraically adding 0.23 to −97.73 = −97.50. Repeat the process using −97.50 and the remaining dB value to be combined, −117.5:

$$\begin{array}{r} -117.50 \\ -\ 97.50 \\ \hline 20.00 \end{array}$$

The value opposite 20.00 in the table is approximately 0.04.

$$\begin{array}{r} -97.50 \\ 0.04 \\ \hline -97.46 = \text{THD} \end{array}$$

i. CHECK—that the calculated THD is less than −95 dB.

j. Change the SG 505 FREQUENCY Hz dial to 2. Change the calibration fixture Notch Frequency to 20 Hz.

k. Repeat step 9 parts e through h using the 20 Hz graticule mark on the display for step 9 part e (see Fig. 4-3).

l. CHECK—that the calculated THD is less than −102 dB (see Fig. 4-5 for harmonics at 20 Hz).

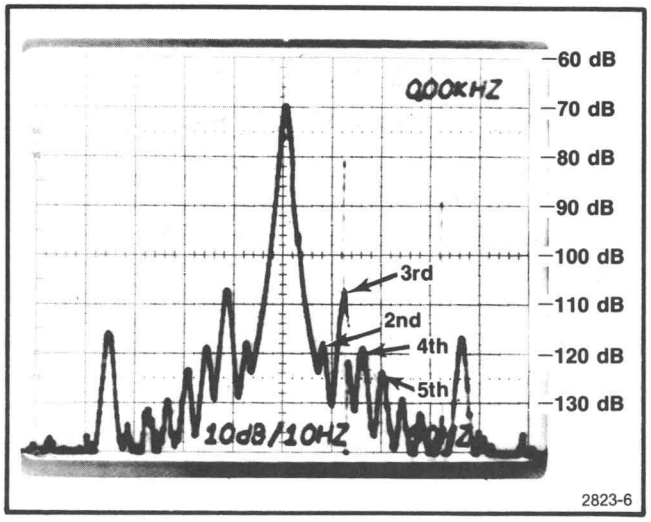


Fig. 4-5. 20 Hz harmonic distortion display.

m. Set the SG 505 FREQUENCY Hz pushbutton to 10 kHz (in). Change the calibration fixture Notch Frequency to 20 kHz.

n. Set the calibration fixture Mode to Flat (out) and the Atten to −60 dB (in) position. Change the spectrum analyzer to 10 kHz/div and 0.1 sec/div. Adjust the dot marker to position the 0 Hz spur on the far left vertical graticule. Remove the differential amplifier and connect the calibration fixture output through the 18 inch coaxial cable to the spectrum analyzer input.

o. Adjust the spectrum analyzer reference level control to position the 20 kHz peak on the top horizontal graticule line. This line is the −60 dB reference level (see Fig. 4-6).

p. Set the calibration fixture Mode to Notch (in) and Atten to 0 dB (out). Adjust the SG 505 VERNIER control and the two calibration fixture Adjust for Null controls to position the 20 kHz peak below the top horizontal graticule line (see Fig. 4-6).

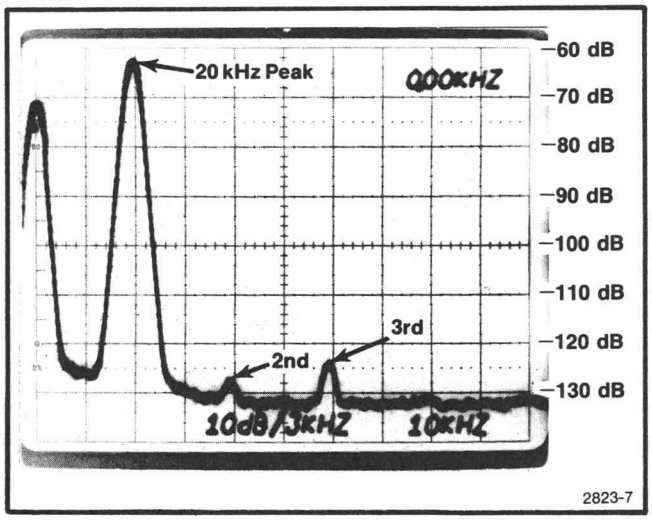


Fig. 4-6. 20 kHz harmonic distortion display.

q. Note the 2nd, 3rd, 4th, and 5th harmonics on the waveform, or as many of these harmonics as are visible. See Fig. 4-6 and compute the THD using the formula in step 9 part h.

r. CHECK—that the calculated THD is less than −102 dB.

s. Set the SG 505 FREQUENCY Hz dial to 5. Change the calibration fixture Notch Frequency to 50 kHz. Change the spectrum analyzer to 50 kHz/div.

t. Repeat step 9 parts n through q, except position the 50 kHz peak (2nd peak) of the waveform (see Fig. 4-6).

NOTE

The loss (correction) factors for the 067-0938-00 Calibration Fixture at the 50 kHz and 100 kHz frequencies are slightly different from the correction factors for the lower frequencies (see Table 4-6).

u. CHECK—that the calculated THD is less than −95 dB.

v. Set the SG 505 FREQUENCY Hz dial to 10. Change the calibration fixture Notch Frequency to 100 kHz.

w. Repeat step 9 parts n through q, except position the 100 kHz peak (2nd peak) of the waveform. The waveform is similar to that in Fig. 4-6.

x. CHECK—that the calculated THD is less than −85 dB.

y. Move the SG 505 output cable and 600 Ω resistor to connect between the − BALANCED OUTPUT (high) and CT (low). Move the 300 Ω load to connect between the SG 505 + BALANCED OUTPUT and CT connectors. Repeat the Distortion Check beginning with step 9a.

z. Remove all connections to the SG 505.

10. Check Output Resistance

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+2
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	OFF (out)
GND-FLTG	GND (in)
INTERMOD TEST SIG	OFF (out)

b. Connect the ohmmeter to the SG 505 + and − BALANCED OUTPUT connectors through the ohmmeter's probe cables.

c. CHECK—that the ohmmeter reading is between 588 and 612 Ω.

d. Verify that the resistance from the SG 505 + BALANCED OUTPUT connector to the CT connector, and between the − BALANCED OUTPUT and CT connector is between 294 and 306 Ω.

e. Set the ohmmeter to the 200 Ω scale. Short the ohmmeter leads together. If the reading is not zero, then subtract the difference from each of the following measurements. Connect the ohmmeter leads between the SG 505 + and − BALANCED OUTPUT connectors.

f. Set the SG 505 SOURCE R switch to 150 Ω.

g. CHECK—that the ohmmeter reads between 147 and 153 Ω.

h. Verify that the resistance between the SG 505 + BALANCED OUTPUT and CT, and between the − BALANCED OUTPUT and CT is between 73.5 and 76.5 Ω.

i. Set the SG 505 SOURCE R switch to 50 Ω.

j. CHECK—that the ohmmeter reads between 48.5 and 51.5 Ω between the + and − BALANCED OUTPUT connectors.

k. Verify that the resistance between the + BALANCED OUTPUT and CT, and between the − BALANCED OUTPUT and CT connectors is between 24.55 and 25.75 Ω.

l. Remove all connections to the SG 505.

11. Check Sync Out Amplitude

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	GND (in)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 SYNC OUT through a bnc to tip-jack coaxial cable to the rms voltmeter input.

c. CHECK—that the voltmeter reads between 0.160 and 0.240 V rms.

d. Remove all connections to the SG 505.

12. Check Intermodulation Test Signal Ratio

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	7
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + and − BALANCED OUTPUTs through a two-conductor balanced shielded cable (shield to CT) and banana to bnc male adapters to the + and − differential comparator (amplifier) inputs, or perform step c.

c. Connect the SG 505 + BALANCED OUTPUT and CT connectors through a bnc to dual banana adapter and coaxial cable to the + differential comparator (amplifier) input. Connect the banana plug (shielded side) of another bnc to dual banana adapter to the shielded side (connected to CT) of the bnc adapter. Connect a short banana cable from the unshielded side on the second adapter to the − BALANCED OUTPUT connector. Connect another coaxial cable from the second adapter to the − differential comparator (amplifier) input.

d. Set the oscilloscope vertical sensitivity to 5 V/div and input coupling switches to ac on each channel.

e. Adjust the SG 505 OUTPUT LEVEL CAL control and the oscilloscope vertical gain for a 25 V p-p display (five divisions).

f. Set the SG 505 INTERMOD TEST SIG pushbutton on (in).

g. CHECK—that the amplitude of the composite signal on the display is between 4.89 and 5.12 divisions, peak-to-peak.

h. Adjust the SG 505 OUTPUT LEVEL CAL control so the high frequency signal is 1 division in amplitude on the display.

i. CHECK—that the amplitude of the low frequency signal on the display is between 3.9 and 4.1 divisions.

j. Remove all connections to the SG 505.

13. Check Intermodulation Test Signal Frequency

a. Connect the SYNC OUT through a bnc to tip-jack cable to the counter input.

b. Set the counter to 0.1 Hz resolution.

c. CHECK—that the counter reads between 58.8 and 61.2 Hz if the low frequency is set to 60 Hz or between 245 and 255 Hz if the low frequency is set to 250 Hz.

d. Remove all connections to the SG 505.

This completes the Performance Check procedure for the SG 505.

ADJUSTMENTS

Introduction

This procedure need not be performed unless the instruments fails to meet the performance requirements of the electrical characteristics listed in the Specification section of this manual. To ensure instrument accuracy, perform the adjustment of the instrument every 2000 hours of operation or every twelve months if used infrequently. Adjustment may be required after a repair has been made. If adjustment of internal controls does not bring the instrument performance within the limits listed in the Specification section, troubleshooting is indicated. Adjustments should be made with the instrument operating at an ambient temperature of 20°C to 30°C.

Test Equipment Required

Test equipment used for adjustment of the SG 505 is listed at the beginning of this manual section.

Preparation

To gain access to the adjustable components, remove the left side cover of the SG 505 by turning the plastic lock at the rear of the side cover. Adjustment locations are shown in the illustration provided with each step.

Connect the SG 505 to the power module via the extender cable. Connect the test equipment and the power module to a suitable line voltage source. Turn on the power module and test equipment; allow at least 20 minutes warm-up time for the SG 505 (60 minutes after storage in a high humidity environment).

PROCEDURE

1. Adjust Frequency Hz Dial

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	3.2 (first mark to the right of 3 on the dial)
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 SYNC OUT through a bnc to tip-jack cable to the counter input. Set the counter for 1 Hz resolution.

c. ADJUST—the SG 505 frequency for 3.200 kHz as follows: Loosen internal set screw #1 located on the reduction drive shaft of the FREQUENCY Hz potentiometer assembly R530 and R520 (see Fig. 4-7). Position the FREQUENCY Hz dial to 3.2 (the first mark to the right of 3 on the dial). Loosen set screw #2 and turn the potentiometer shaft with pliers until the counter reading is 3.200 kHz. Tighten set screw #2 without moving the FREQUENCY Hz dial. Turn the FREQUENCY Hz dial to gain access to set screw #1 and tighten. Reposition the SG 505 FREQUENCY Hz dial to 3.200 kHz.

d. CHECK—that the counter reads between 3.104 and 3.296 kHz. If the reading is outside these limits, repeat part c to re-adjust the frequency.

e. Remove all connections to the SG 505.

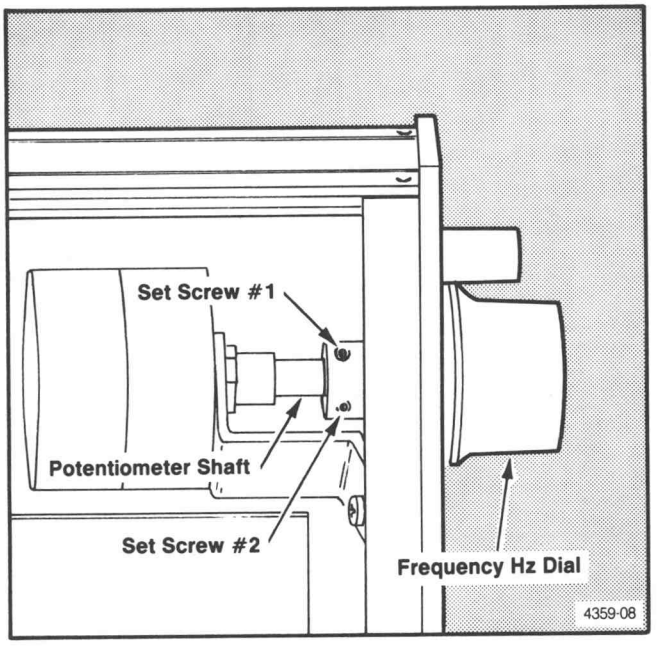


Fig. 4-7. FREQUENCY Hz dial adjustment.

2. Adjust Output Level Amplitude and Balance

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 — BALANCED OUTPUT and CT connectors through a bnc to dual banana adapter and a coaxial cable to the rms voltmeter input.

c. Connect one 300 Ω resistor between the — BALANCED OUTPUT and CT connectors, and another 300 Ω resistor between the + BALANCED OUTPUT and CT.

d. ADJUST—A12 R1423, Amp Cal Adj, for a voltmeter reading of 4.875 V rms. Refer to Fig. 4-8 for the adjustment location.

e. Remove both 300 Ω load resistors from the SG 505 connectors.

f. CHECK—that the voltmeter reads approximately 9.75 V rms. Record the reading.

g. Move the SG 505 connections to the + BALANCED OUTPUT and CT connectors.

h. ADJUST—A13 R1126, Bal Adj, for a voltmeter reading equal to the reading recorded in part f. Refer to Fig. 4-9 for the adjustment location.

i. Remove all connections to the SG 505.

3. Adjust Sync Out Amplitude

a. Set the SG 505 controls as follows:

FREQUENCY Hz Dial	1
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22

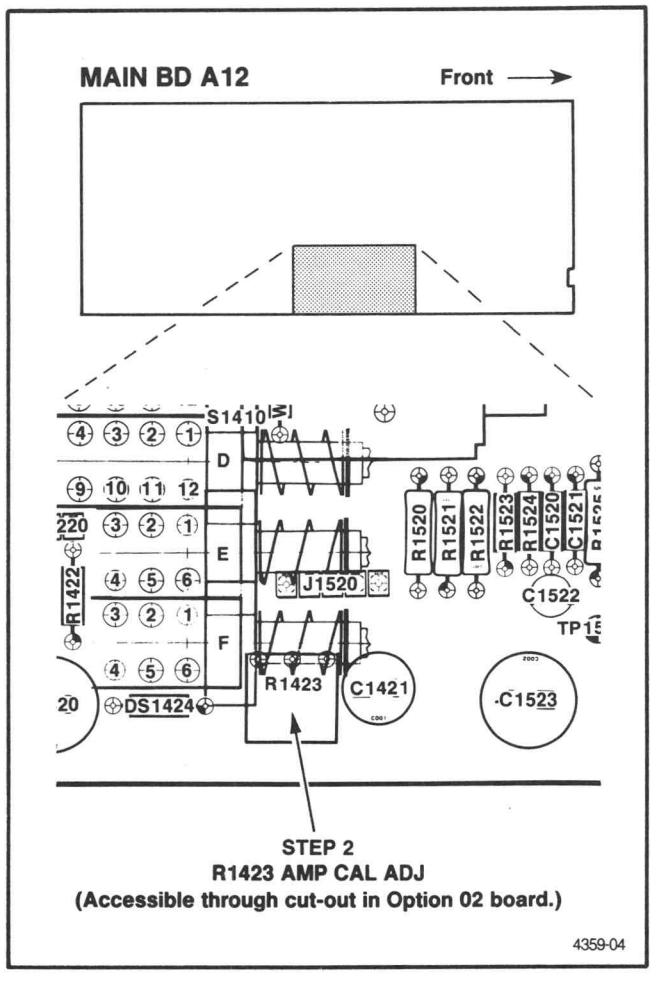


Fig. 4-8. Location of R1423, Amp Cal Adj.

OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 SYNC OUT through a bnc to tip-jack cable to the rms voltmeter.

c. ADJUST—A12 R1301, Sync Level Adj, for a voltmeter reading of 0.2 V rms. Refer to Fig. 4-10 for the adjustment location.

d. Remove all connections to the SG 505.

4. Adjust Intermodulation Test Signal Ratio

a. Set the SG 505 controls as follows:

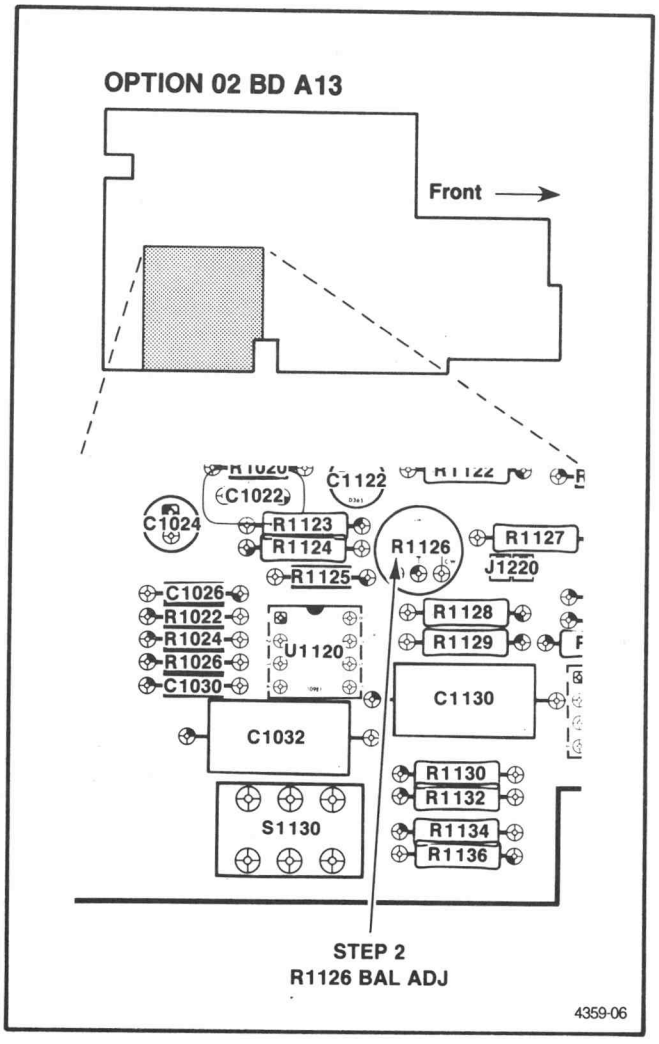


Fig. 4-9. Location of R1126, Bal Adj.

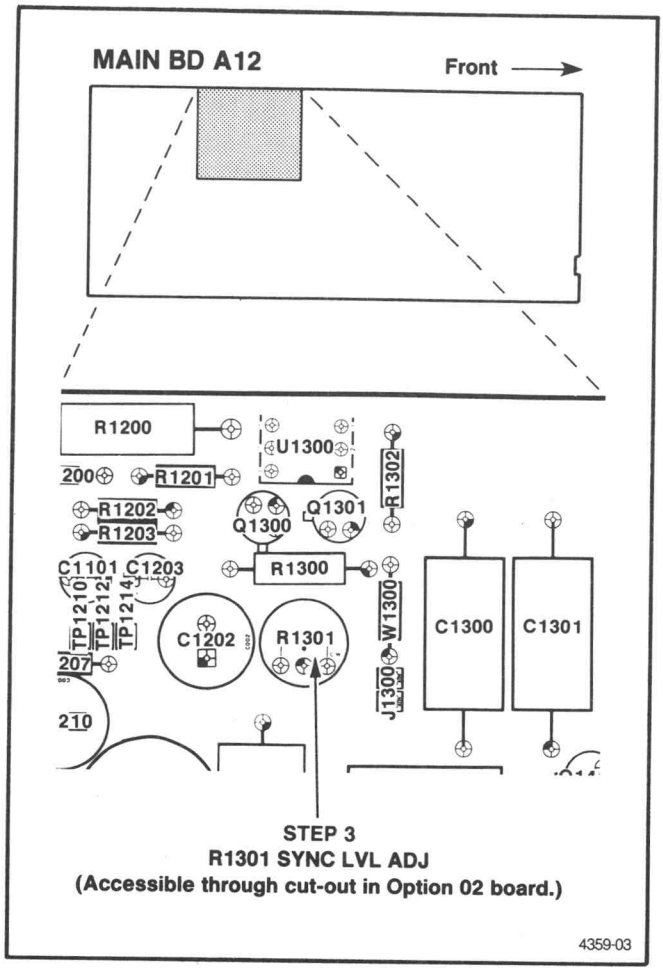


Fig. 4-10. Location of R1301, Sync Lvl Adj.

FREQUENCY Hz Dial	7
FREQUENCY Hz Pushbutton	×1k
VERNIER	centered
OUTPUT LEVEL	+22
OUTPUT LEVEL CAL	fully CW
SOURCE R	600
ON-OFF	ON (in)
GND-FLTG	FLTG (out)
INTERMOD TEST SIG	OFF (out)

b. Connect the SG 505 + and − BALANCED OUTPUT connectors through a two-conductor balanced, shielded cable (shield to CT) and two bnc male to dual banana adapters to the differential comparator (amplifier) + and − inputs, or perform part c.

c. Connect the SG 505 BALANCED OUTPUT + (high) and CT (low) connectors through a bnc to dual banana adapter and coaxial cable to the + differential comparator (amplifier) input. Connect the shielded banana plug of another bnc to dual banana adapter to the shielded side (connected to CT) of the adapter previously installed. Connect a short banana cable between the unshielded side of the second adapter and the − BALANCED OUTPUT connector. Connect another coaxial cable from the second adapter to the − differential comparator (amplifier) input.

d. Connect a 600 Ω load resistor from the + to − BALANCED OUTPUTs.

e. Set the oscilloscope vertical sensitivity to 5 V/div.

f. ADJUST—the SG 505 OUTPUT LEVEL CAL control for a 25 V p-p display. Position the display to align the peaks with a horizontal graticule line.

g. Set the SG 505 INTERMOD TEST SIG to ON (in).

h. ADJUST—A13 R1339, IM Ratio Adj, so the composite signal amplitude is 5 divisions, peak-to-peak. Refer to Fig. 4-11 for the adjustment location.

i. Remove all connections to the SG 505.

This completes the Adjustments procedure for the SG 505.

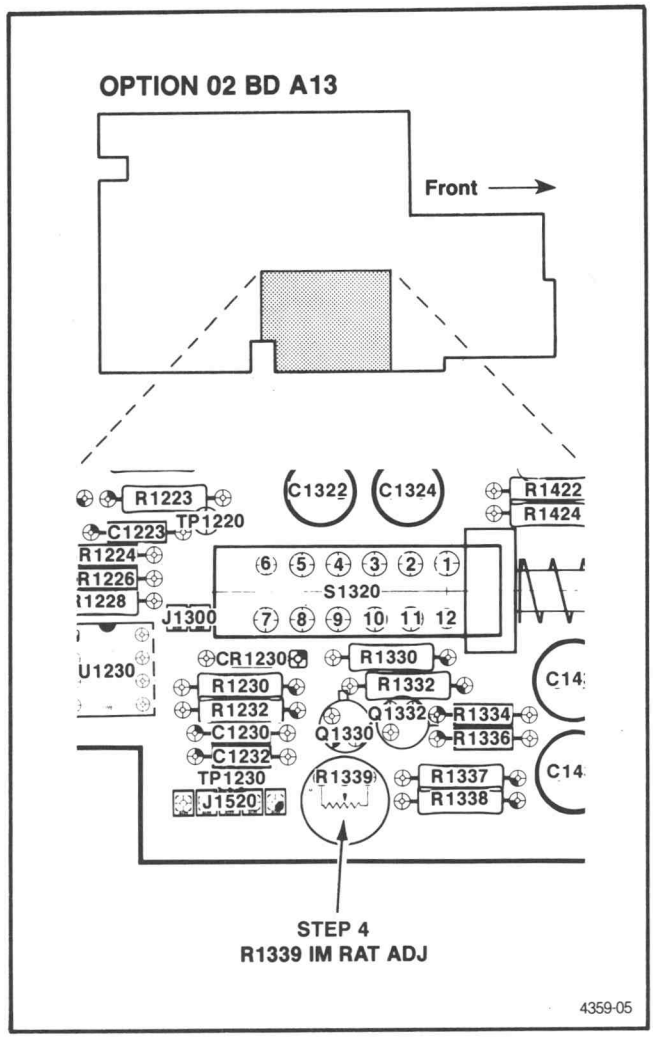


Fig. 4-11. Location of R1339, Im Ratio Adj.

MAINTENANCE

Introduction

To ensure accurate measurements, check the performance of this instrument after each 2000 hours of operation or every twelve months if used infrequently. In addition, replacement of components may necessitate checking the internal adjustments. Complete instructions are given in the Checks and Adjustments section.

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

Obtaining Replacement Parts

Most electrical and mechanical parts can be ordered through your local Tektronix Field Office or representative. However, you should be able to obtain many of the standard electronic components from a local commercial source in your area. Before you purchase or order a part from a source other than Tektronix, Inc., please check the electrical parts list for the proper value, rating, tolerance, and description.

Ordering Parts. When ordering replacement parts from Tektronix, Inc., it is important that all of the following information be included to ensure receiving the proper parts.

1. Instrument type (include modification or option numbers).

2. Instrument serial number.

3. A description of the part (if electrical, include circuit and assembly numbers).

4. Tektronix part number.

Cleaning Instructions

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

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

CAUTION

To prevent getting water inside the instrument during external cleaning, use only enough water to dampen the cloth or swab.

DO NOT use chemical cleaning agents as they may damage the plastics used in the instrument or on the front panel. In particular, avoid chemicals that contain benzene, toluene, xylene, acetone or similar solvents.

Interior. Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry, low pressure air. Then use a soft brush.

Isopropyl alcohol can be used to clean major repairs to the circuit board; however, flush the board well with clean, isopropyl alcohol. Make certain that resin or dirt is completely removed from board areas of high impedance circuitry.

After cleaning, use dry, low-velocity air (approximately 5 lb/in^2) to blow-dry the board. To finish drying the board, place it in an oven at 40° to 60°C for a minimum of twenty-four hours.

Circuit Board Removal and Installation

This procedure gives directions for removing first the Option 02 board, and then the Main board. For troubleshooting or parts replacement requiring access to the back of the Option 02 board or the component side of the Main board, follow the procedure through step 6.

WARNING

To avoid personal injury or instrument damage, do not disassemble the instrument while power is applied.

1. Remove both side covers by turning the plastic lock at the rear of each cover.

2. On the Option 02 board, disconnect the rear output cable (P1000 in the upper, rear corner) and the two cables to the SOURCE R switch. Be careful not to overstress the wires where they connect to the switch.

3. Remove the INTERMOD TEST SIG pushbutton shaft by spreading the shaft ends where they attach to the switch (using a straight-slot screwdriver), until the shaft can be slid forward and off of the switch.

4. Remove the four Pozidriv screws on the Option 02 board that connect to the OUTPUT LEVEL switch assembly.

5. Near the back of the Option 02 board, remove the two Pozidriv screws that mount the circuit board to the standoffs between the two boards.

6. Carefully lift the Option 02 board up about one-half inch to clear the plastic tabs on the OUTPUT LEVEL switch assembly. With the board elevated, carefully slide the board back, and then tilt the top edge away from the chassis.

At this point, the instrument is functional and can be powered up via a rear interface cable connected to the power module. Since the internal cable is not connected to the SOURCE R switch, the BALANCED OUTPUT signals are not routed to the front panel connectors. These signals can be accessed at TP1410 (−) and TP1412 (+). Notice on schematic 5 that these points access the signals before the output attenuators. Also, the disconnected rear output cable disables the output signals to the rear interface connectors. The Main board output is accessible at TP1520 (on the Main board), and at TP1220 (on the Option 02 board, attenuated by 10 dB because S1520-13 cannot be closed). For locations of test points on the boards, refer to Fig. 8-2, Main board; and Fig. 8-4, Option 02 board in the pullout pages at the rear of this manual.

7. To remove the Option 02 board from the chassis, disconnect the cables from the back of the board. Note the proper locations for connecting the 2 two-wire cable connectors, P1220 and P1300, for reference when reassembling the instrument.

CAUTION

To avoid causing the OUTPUT LEVEL switch assembly to malfunction when the instrument is reassembled, be careful not to bend the gold switch contacts mounted on the back of the Option 02 board.

The remainder of this procedure describes how to remove the Main board. Make certain power is not applied to the instrument while disassembling it.

8. Carefully pry off the cap holding the POWER indicator in the front panel.

9. Unsolder the wire from the FREQUENCY Hz shaft assembly to the circuit board.

10. Disconnect the cables that connect the Main board to chassis-mounted components.

11. Remove the four Pozidriv screws that attach the Main board to the top and bottom rails. Mark the position of the plastic board guides along the length of the top rail, for reference when reassembling the instrument.

12. Remove the top rail and back plate as a unit by removing the two bullet screws at the bottom edge of the back plate, and the two Pozidriv screws in the front edge of the top rail.

13. Remove the Main board.

To reassemble the instrument, follow this procedure in reverse order. Be careful to reconnect the cables with the arrows marked on the cable connectors matching the arrows marked on the circuit board. When installing the Option 02 board, be careful not to bend the switch contacts mounted on the back of the board.

Low Frequency Selection

The SG 505 contains an internal switch (S1130) that may be positioned to select either a 60 Hz or 250 Hz low frequency

in the intermodulation test signal mode. The switch is located toward the rear of the Option 02 board (A13). Figure 5-1 shows the location of the switch on the Option 02 board, and the switch positions.

Troubleshooting Aids

Troubleshooting Charts. As an aid in locating problem areas, troubleshooting charts are provided for the SG 505. These charts are located in the foldout pages in the Diagrams and Illustrations section. The numbered diamond in the troubleshooting chart title or chart body refers to the corresponding schematic diagram that shows the associated components.

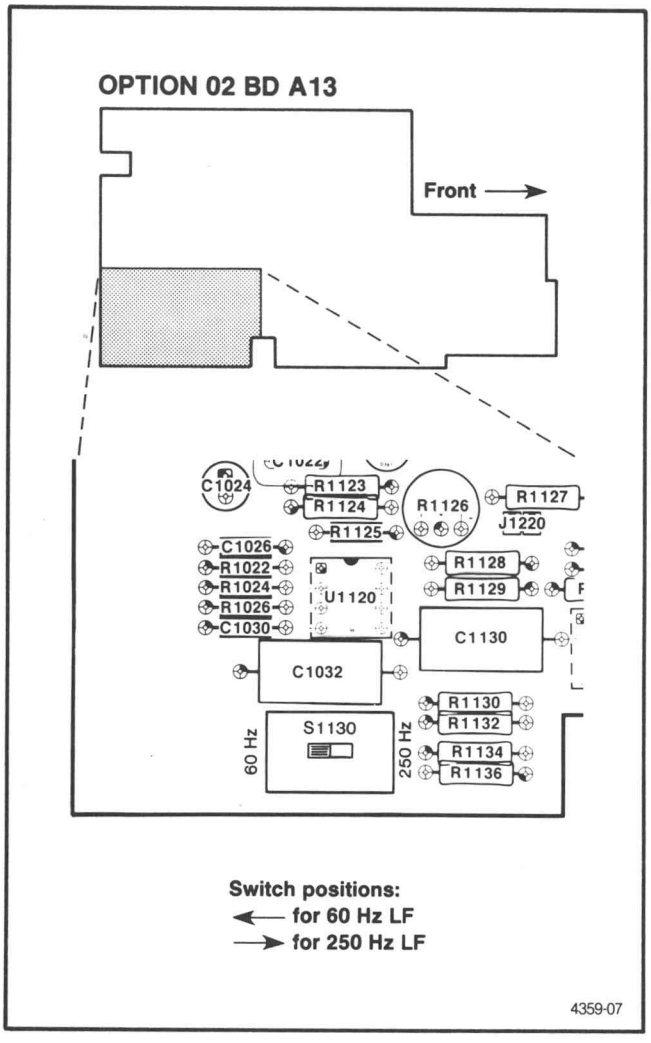


Fig. 5-1. Intermodulation signal low frequency switch.

Diagrams. Complete circuit diagrams are located in the foldout pages in the Diagrams and Illustrations section. The portions of the circuit mounted on circuit boards are enclosed by a solid line. The circuit number of each component in this instrument is shown on a diagram. See the first page of the Diagrams and Illustrations section for definitions of the symbols and reference designators used on the diagrams.

Circuit Board Illustrations. In conjunction with the circuit diagrams are circuit board illustrations. Each component shown on a diagram is also identified on the circuit board illustration by its circuit number. A table is provided with each diagram listing the components on the associated diagram by assembly and circuit number. The table also lists the component grid locations on both the diagram and circuit board illustrations.

Troubleshooting Equipment

Before using any test equipment to make measurements on static sensitive components or assemblies, be certain that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

Static-Sensitive Components

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 5-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.

2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.

3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.

4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.

5. Keep the component leads shorted together whenever possible.

6. Pick up components by the body, never by the leads.

7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only special antistatic suction type or wick type desoldering tools.

Table 5-1
RELATIVE SUSCEPTIBILITY TO STATIC DISCHARGE DAMAGE

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs. (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

[a]Voltage equivalent for levels:

1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V(est.)
8 = 900 V
9 = 1200 V

(Voltage discharged from a 100 pF capacitor through a resistance of 100 Ω.)

OPTIONS

The SG 505 Option 02 Oscillator adds balanced output with higher output levels, an intermodulation test signal function, and selectable source impedance.

The information in this manual describes only the Option 02 version of the SG 505 Oscillator. A separate instruction manual is available which contains information for both the standard and Option 01 SG 505 Oscillator.

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.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

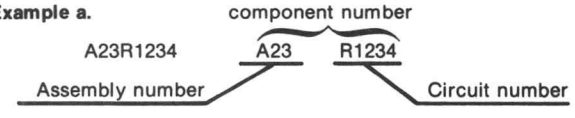
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

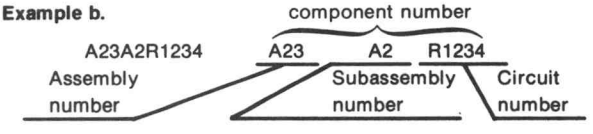
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

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.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000KR	LAMB INDUSTRIES	P.O. BOX 25110	PORTLAND, OR 97225
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
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
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	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
05828	GENERAL INSTRUMENT CORP ELECTRONIC SYSTEMS DIV.	600 W JOHN ST.	HICKSVILLE LI, NY 11802
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
07716	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, BURLINGTON DIV.	2850 MT. PLEASANT	BURLINGTON, IA 52601
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
09019	GENERAL ELECTRIC CO. SEMI-CONDUCTOR PRODUCTS DEPT. OPERATIONAL PLANNING AND CUSTOMER ENGINEERING	ELECTRONICS PARK	SYRACUSE, NY 13201
09023	CORNELL-DUBILIER ELECTRONIC DIVISION FEDERAL PACIFIC ELECTRIC CO.	2652 DALRYMPLE ST.	SANFORD, NC 27330
12969	UNITRODE CORPORATION	580 PLEASANT STREET	WATERTOWN, MA 02172
14552	MICRO SEMICONDUCTOR CORP.	2830 E FAIRVIEW ST.	SANTA ANA, CA 92704
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
17856	SILICONIX, INC.	2201 LAURELWOOD DRIVE	SANTA CLARA, CA 95054
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
20932	EMCON DIV OF ILLINOIS TOOL WORKS INC.	11620 SORRENTO VALLEY RD P O BOX 81542	SAN DIEGO, CA 92121
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
50434	HEWLETT-PACKARD COMPANY	640 PAGE MILL ROAD	PALO ALTO, CA 94304
53184	XCITON CORPORATION	5 HEMLOCK STREET	LATHAM, NY 12110
54473	MATSUSHITA ELECTRIC, CORP. OF AMERICA	1 PANASONIC WAY	SECAUCUS, NJ 07094
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
57668	R-OHM CORP.	16931 MILLIKEN AVE.	IRVINE, CA 92713
71279	CAMBRIDGE THERMIONIC CORP.	445 CONCORD AVE.	CAMBRIDGE, MA 02138
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
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
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
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
99392	MEMPCO/ELECTRA INC., ROXBORO DIV.	P O BOX 1223	ROXBORO, NC 27573

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12	670-7755-00			CKT BOARD ASSY:MAIN	80009	670-7755-00
A13	670-7740-00			CKT BOARD ASSY:OPTION 02	80009	670-7740-00
A12	670-7755-00			CKT BOARD ASSY:MAIN	80009	670-7755-00
A12C1100	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1101	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
A12C1110	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A12C1112	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A12C1113	290-0778-00			CAP.,FXD,ELCTLT:5UF,+50-10%,100V	54473	ECE-A50N1
A12C1121	290-0764-00			CAP.,FXD,ELCTLT:5UF,+50-10%,100V	56289	500D142
A12C1200	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A12C1201	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A12C1202	290-0771-00			CAP.,FXD,ELCTLT:220UF,+50-10%,10VDC	56289	502D231
A12C1203	290-0920-00			CAP.,FXD,ELCTLT:33UF,+50-10%,35V	55680	35ULB33V-T
A12C1210	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A12C1211	290-0831-00			CAP.,FXD,ELCTLT:470UF,+50-10%,50V	55680	ULB1H471TKAANA
A12C1212	290-0831-00			CAP.,FXD,ELCTLT:470UF,+50-10%,50V	55680	ULB1H471TKAANA
A12C1300	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1301	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1310	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1311	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1312	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1314	290-0778-00			CAP.,FXD,ELCTLT 5UF,+50-10%,100V	54473	ECE-A50N1
A12C1316	283-0766-00			CAP.,FXD,MICA D:47PF,1%,500V	00853	D155E470D0
A12C1320	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1321	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1322	295-0191-00			CAP SET,MATCHED:2 EA 1.0UF/0.1UF/0.01UF	80009	295-0191-00
A12C1400	283-0603-00			CAP.,FXD,MICA D:113PF,2%,300V	00853	D153F1130G0
A12C1401	283-0603-00			CAP.,FXD,MICA D:113PF,2%,300V	00853	D153F1130G0
A12C1402	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A12C1403	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1405	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A12C1406	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A12C1407	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1420	290-0987-00			CAP.,FXD,ELCLT:150UF,20%,16V	80009	290-0987-00
A12C1421	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A12C1500	283-0597-00			CAP.,FXD,MICA D:470PF,10%,300V	00853	D153E471K0
A12C1501	283-0597-00			CAP.,FXD,MICA D:470PF,10%,300V	00853	D153E471K0
A12C1502	290-0746-00			CAP.,FXD,ELCTLT:47UF,+50-10%,16V	55680	16U-47V-T
A12C1503	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1504	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1505	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0020HA1
A12C1506	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A12C1510	290-0746-00			CAP.,FXD,ELCTLT:47UF,+50-10%,16V	55680	16U-47V-T
A12C1511	290-0746-00			CAP.,FXD,ELCTLT:47UF,+50-10%,16V	55680	16U-47V-T
A12C1512	281-0811-00			CAP.,FXD,CER DI:10PF,10%,100V	72982	8035D2AADC1G100K
A12C1513	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1514	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A12C1520	281-0767-00			CAP.,FXD,CER DI:330PF,20%,100V	12969	CGB331MEX
A12C1521	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1522	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
A12C1523	290-0987-00			CAP.,FXD,ELCLT:150UF,20%,16V	80009	290-0987-00
A12C1524	281-0811-00			CAP.,FXD,CER DI:10PF,10%,100V	72982	8035D2AADC1G100K
A12C1600	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A12C1601	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A12C1602	283-0212-00			CAP.,FXD,CER DI:2UF,20%,50V	72982	8141N064Z5U205M
A12C1603	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,50V	72982	8131N031Z5U0105Z
A12C1610	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1611	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0020HA1

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12C1620	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A12C1621	281-0759-00			CAP.,FXD,CER DI:22PF,10%,100V	72982	8035D9AADC1G220K
A12C1622	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A12CR1113	152-0779-00			SEMICOND DEVICE:RECT,SI,200V,0.75A	05828	RW02M
A12CR1114	152-0779-00			SEMICOND DEVICE:RECT,SI,200V,0.75A	05828	RW02M
A12CR1200	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1201	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1412	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1413	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1501	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1502	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1504	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1510	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1600	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12DS1424	150-0077-01			LAMP,INCAND:14V,0.08A	08806	2182D
A12F1220	159-0022-00			FUSE,CARTRIDGE:3AG,1A,250V,FAST-BLOW	71400	AGC 1
A12J1000	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A12J1220	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A12J1300	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A12J1500	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A12J1510	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A12J1520	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A12Q1102	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A12Q1104	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1110	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A12Q1300	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A12Q1301	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A12Q1410	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A12Q1411	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A12Q1501	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
A12Q1600	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A12Q1610	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A12Q1611	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A12Q1620	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A12R1101	321-0603-07			RES.,FXD,FILM:15K OHM,0.1%,0.125W	91637	MFF1816C15001B
A12R1102	321-0603-07			RES.,FXD,FILM:15K OHM,0.1%,0.125W	91637	MFF1816C15001B
A12R1103	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A12R1106	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A12R1108	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A12R1110	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A12R1111	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A12R1120	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A12R1121	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A12R1122	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A12R1123	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A12R1200	303-0202-00			RES.,FXD,CMPSN:2K OHM,5%,1W	01121	GB2025
A12R1201	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A12R1202	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A12R1203	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1204	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A12R1205	321-0316-00			RES.,FXD,FILM:19.1K OHM,1%,0.125W	91637	MFF1816G19101F
A12R1206	321-0333-00			RES.,FXD,FILM:28.7K OHM,1%,0.125W	91637	MFF1816G28701F
A12R1207	315-0560-00			RES.,FXD,CMPSN:56 OHM,5%,0.25W	01121	CB5605
A12R1208	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A12R1300	301-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.50W	01121	EB8215
A12R1301	311-1560-00			RES.,VAR,NONWIR:5K OHM,20%,0.50W	73138	91-82-0
A12R1302	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12R1400	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A12R1401	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A12R1402	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A12R1405	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A12R1410	321-0304-00			RES.,FXD,FILM:14.3K OHM,1%,0.125W	91637	MFF1816G14301F
A12R1411	321-0236-00			RES.,FXD,FILM:2.8K OHM,1%,0.125W	91637	MFF1816G28000F
A12R1412	321-0236-00			RES.,FXD,FILM:2.8K OHM,1%,0.125W	91637	MFF1816G28000F
A12R1413	321-0304-00			RES.,FXD,FILM:14.3K OHM,1%,0.125W	91637	MFF1816G14301F
A12R1414	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1415	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1420	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1421	315-0514-00			RES.,FXD,CMPSN:510K OHM,5%,0.25W	01121	CB5145
A12R1422	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1423	311-2101-00			RES.,VAR,NONWIR:TRMR,2K OHM,10%,0.5W	73138	72-268-0
A12R1499	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1500	321-0204-00			RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
A12R1501	321-0204-00			RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
A12R1502	321-0279-00			RES.,FXD,FILM:7.87K OHM,1%,0.125W	91637	MFF1816G78700F
A12R1503	321-0410-00			RES.,FXD,FILM:182K OHM,1%,0.125W	91637	MFF1816G18202F
A12R1504	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A12R1505	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A12R1506	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A12R1507	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1509	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
A12R1510	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A12R1511	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	24546	NA4D1004F
A12R1512	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	24546	NA4D1004F
A12R1513	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A12R1514	321-0214-00			RES.,FXD,FILM:1.65K OHM,1%,0.125W	91637	MFF1816G16500F
A12R1515	321-0353-00			RES.,FXD,FILM:46.4K OHM,1%,0.125W	91637	MFF1816G46401F
A12R1516	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A12R1517	321-0225-06			RES.,FXD,FILM:2.15K OHM,0.25%,0.125W	91637	MFF1816C21500C
A12R1518	311-1403-00			RES.,VAR,NONWIR:5K OHM,20%,0.50W	01121	18M651
A12R1519	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1521	321-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.125W	91637	MFF1816G24300F
A12R1522	321-0333-00			RES.,FXD,FILM:28.7K OHM,1%,0.125W	91637	MFF1816G28701F
A12R1523	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A12R1524	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1525	321-0270-00			RES.,FXD,FILM:6.34K OHM,1%,0.125W	91637	MFF1816G63400F
A12R1526	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A12R1527	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
A12R1600	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
A12R1601	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
A12R1602	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A12R1609	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
A12R1610	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A12R1611	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A12R1612	321-1263-02			RES.,FXD,FILM:5.42K OHM,0.5%,0.125W	91637	MFF1816D54200D
A12R1613	321-0364-00			RES.,FXD,FILM:60.4K OHM,1%,0.125W	91637	MFF1816G60401F
A12R1620	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A12R1621	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A12S1410A-F	260-1985-00			SWITCH,PUSH:6 BUTTON,0/2/4 POLE	80009	260-1985-00
A12T1220	120-1459-00			XFMR,PWR,STU:LF	80009	120-1459-00
A12TP1210	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12TP1510	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12TP1520	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12U1101	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458N

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12U1300	156-0109-00			CPLR,OPTOELECTR:LED & PHOTOTRANSISTOR	09019	H11AX881
A12U1400	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
A12U1401	156-1338-01			MICROCIRCUIT,LI:OPNL AMPL,SELECTED	18324	NE5534AN
A12U1500	156-1149-00			MICROCIRCUIT,LI:OPERATIONAL AMP,JFET INPUT	27014	LF351N
A12U1510	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
A12U1520	156-1338-01			MICROCIRCUIT,LI:OPNL AMPL,SELECTED	18324	NE5534AN
A12VR1201	152-0760-00			SEMICOND DEVICE:ZEN,SI,6.2V,2%,400MW	04713	SZ630205
A12VR1600	152-0226-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	14552	TD3810980
A12W1518	131-0566-00			BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200E0

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A13	670-7740-00			CKT BOARD ASSY:OPTION 02	80009	670-7740-00
A13C1000	281-0797-00			CAP.,FXD,CER DI:15PF,10%,100V	72982	8035D9AADC0G150K
A13C1010	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A13C1020	281-0862-00			CAP.,FXD,CER DI:0.001UF,+80-20%,100V	20932	401-ES-100AD102Z
A13C1022	283-0788-00			CAP.,FXD,MICA D:267PF,1%,500V	09023	CD15FD(267)F03
A13C1024	290-0891-00			CAP.,FXD,ELCTLT:1UF,+75-10%,50V	55680	25U1A10V-T
A13C1026	281-0811-00			CAP.,FXD,CER DI:10PF,10%,100V	72982	8035D2AADC1G100K
A13C1030	281-0788-00			CAP.,FXD,CER DI:470PF,10%,100V	72982	8005H9AADW5R471K
A13C1032	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
A13C1110	290-0920-00			CAP.,FXD,ELCTLT:33UF,+50-10%,35V	55680	35ULB33V-T
A13C1112	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A13C1120	283-0601-00			CAP.,FXD,MICA D:22PF,10%,300V	00853	D153C220K0
A13C1122	290-0920-00			CAP.,FXD,ELCTLT:33UF,+50-10%,35V	55680	35ULB33V-T
A13C1130	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
A13C1200	290-0950-00			CAP.,FXD,ELCTLT:100UF,+50-10%,50V	55680	50ULB100VA-T
A13C1210	285-1189-00			CAP.,FXD,MTLZD:0.1UF,5%,100V	99392	C280MAH/J100K
A13C1212	285-1189-00			CAP.,FXD,MTLZD:0.1UF,5%,100V	99392	C280MAH/J100K
A13C1220	281-0791-00			CAP.,FXD,CER DI:270PF,10%,100V	72982	8035D2AADX5R271K
A13C1222	281-0791-00			CAP.,FXD,CER DI:270PF,10%,100V	72982	8035D2AADX5R271K
A13C1223	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A13C1230	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A13C1232	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A13C1310	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A13C1312	290-0920-00			CAP.,FXD,ELCTLT:33UF,+50-10%,35V	55680	35ULB33V-T
A13C1320	283-0601-00			CAP.,FXD,MICA D:22PF,10%,300V	00853	D153C220K0
A13C1322	290-0973-00			CAP.,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101M
A13C1324	290-0973-00			CAP.,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101M
A13C1326	290-0920-00			CAP.,FXD,ELCTLT:33UF,+50-10%,35V	55680	35ULB33V-T
A13C1400	281-0797-00			CAP.,FXD,CER DI:15PF,10%,100V	72982	8035D9AADC0G150K
A13C1410	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A13C1420	281-0862-00			CAP.,FXD,CER DI:0.001UF,+80-20%,100V	20932	401-ES-100AD102Z
A13C1422	283-0788-00			CAP.,FXD,MICA D:267PF,1%,500V	09023	CD15FD(267)F03
A13C1430	290-0846-00			CAP.,FXD,ELCTLT:47UF,-10+75%,35 WVDC	54473	ECE-A35V47LU
A13C1432	290-0846-00			CAP.,FXD,ELCTLT:47UF,-10+75%,35 WVDC	54473	ECE-A35V47LU
A13C1434	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	04222	7001-1336
A13C1530	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	04222	7001-1336
A13CR1010	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1020	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1200	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A13CR1202	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A13CR1210	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1220	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1230	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1410	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1420	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13J1000	131-1425-00			CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
A13J1220	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A13J1300	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A13J1520	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A13J1610	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A13J1630	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A13J1632	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
A13Q1000	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
A13Q1010	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
A13Q1100	151-0389-00			TRANSISTOR:SILICON,PNP	80009	151-0389-00
A13Q1110	151-0389-00			TRANSISTOR:SILICON,PNP	80009	151-0389-00
A13Q1112	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A13Q1114	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A13Q1200	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A13Q1202	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A13Q1204	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A13Q1206	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A13Q1210	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A13Q1211	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A13Q1212	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A13Q1213	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A13Q1214	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A13Q1215	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A13Q1216	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A13Q1217	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A13Q1300	151-0389-00			TRANSISTOR:SILICON,PNP	80009	151-0389-00
A13Q1310	151-0389-00			TRANSISTOR:SILICON,PNP	80009	151-0389-00
A13Q1312	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A13Q1320	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A13Q1330	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A13Q1332	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A13Q1400	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
A13Q1410	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
A13R1000	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1002	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A13R1004	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1010	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1012	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1014	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A13R1020	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A13R1022	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1024	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A13R1026	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
A13R1100	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1102	321-0185-00			RES.,FXD,FILM:825 OHM,1%,0.125W	91637	MFF1816G825R0F
A13R1104	321-0185-00			RES.,FXD,FILM:825 OHM,1%,0.125W	91637	MFF1816G825R0F
A13R1106	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1110	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1112	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1114	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A13R1116	315-0244-00			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2445
A13R1120	321-1722-07			RES.,FXD,FILM:3.39K OHM,0.1%,0.125W	24546	NE55E3391B
A13R1122	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A13R1123	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A13R1124	321-0821-00			RES.,FXD,FILM:2.12K OHM,1%,0.125W	91637	MFF1816G21200F
A13R1125	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
A13R1126	311-1557-00			RES.,VAR,NONWIR:25K OHM,20%,0.50W	73138	91-79-0
A13R1127	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A13R1128	321-0310-00			RES.,FXD,FILM:16.5K OHM,1%,0.125W	91637	MFF1816G16501F
A13R1129	321-0748-06			RES.,FXD,FILM:4.95K OHM,0.25%,0.125W	91637	MFF1816C49500C
A13R1130	321-1329-03			RES.,FXD,FILM:26.4K OHM,0.25%,0.125W	91637	MFF1816D26401C
A13R1132	321-1619-07			RES.,FXD,FILM:8.334K OHM,0.1%,0.125W	91637	MFF1816C83340B
A13R1134	321-1329-03			RES.,FXD,FILM:26.4K OHM,0.25%,0.125W	91637	MFF1816D26401C
A13R1136	321-1619-07			RES.,FXD,FILM:8.334K OHM,0.1%,0.125W	91637	MFF1816C83340B
A13R1200	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A13R1202	321-0309-00			RES.,FXD,FILM:16.2K OHM,1%,0.125W	91637	MFF1816G16201F
A13R1204	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A13R1206	321-0309-00			RES.,FXD,FILM:16.2K OHM,1%,0.125W	91637	MFF1816G16201F
A13R1210	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A13R1212	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A13R1214	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A13R1216	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A13R1220	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A13R1221	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A13R1222	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A13R1223	321-1684-07			RES.,FXD,FILM:2.162K OHM,0.1%,0.125W	07716	CEAE21620B
A13R1224	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A13R1226	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A13R1228	321-0639-00			RES.,FXD,FILM:9.6K OHM,1%,0.125W	91637	MFF1816G96000F
A13R1230	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A13R1232	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A13R1300	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1302	321-0185-00			RES.,FXD,FILM:825 OHM,1%,0.125W	91637	MFF1816G825R0F
A13R1304	321-0185-00			RES.,FXD,FILM:825 OHM,1%,0.125W	91637	MFF1816G825R0F
A13R1306	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1310	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1312	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1314	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A13R1316	315-0244-00			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2445
A13R1320	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A13R1322	321-1722-07			RES.,FXD,FILM:3.39K OHM,0.1%,0.125W	24546	NE55E3391B
A13R1330	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499R0F
A13R1332	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A13R1334	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1336	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A13R1337	321-0301-00			RES.,FXD,FILM:13.3K OHM,1%,0.125W	91637	MFF1816G13301F
A13R1338	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
A13R1339	311-1564-00			RES.,VAR,NONWIR:TRMR,500 OHM,0.5W	73138	91-86-0
A13R1400	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1402	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A13R1404	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A13R1410	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1412	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A13R1414	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A13R1420	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A13R1422	321-0636-00			RES.,FXD,FILM:100 OHM,0.5%,0.125W	91637	MFF1816D100R0D
A13R1424	321-0145-01			RES.,FXD,FILM:316 OHM,0.5%,0.125W	91637	CMF55-116G316R0D
A13R1430	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A13R1432	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A13R1510	307-1178-00			ATTEN,VAR:200B PER STEP FOR 4 STEP,250 OHM	80009	307-1178-00
A13R1530	307-1178-00			ATTEN,VAR:200B PER STEP FOR 4 STEP,250 OHM	80009	307-1178-00
A13R1532	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A13R1534	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A13R1536	321-0385-04			RES.,FXD,FILM:100K OHM,0.1%,0.125W	91637	MFF1816D10002B
A13R1538	321-0385-04			RES.,FXD,FILM:100K OHM,0.1%,0.125W	91637	MFF1816D10002B
A13S1130A,B	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
A13S1320A-D	260-1486-00			SWITCH,PUSH:1 BUTTON,PB1,4P,PUSH-PUSH	80009	260-1486-00
A13S1520	263-1214-00			SW CAM ACTR AS:ATTENUATOR	80009	263-1214-00
A13TP1220	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A13TP1230	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A13TP1410	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A13TP1412	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A13U1120	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
A13U1210	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072ACP
A13U1230	156-0742-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM318N
A13U1430	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072ACP

Replaceable Electrical Parts—SG 505 OPT. 02

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
C500	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
C510	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
DS510	150-1029-00			LT EMITTING DIO:GREEN,565NM,35MA	53184	XC209G
J500	136-0387-00			JACK,TIP:GRAY	71279	450-4352-01-0318
J550	136-0387-00			JACK,TIP:GRAY	71279	450-4352-01-0318
J650	136-0731-00			JACK,TIP:BLACK	80009	136-0731-00
J660	136-0731-00			JACK,TIP:BLACK	80009	136-0731-00
J670	136-0138-00			JACK,TIP:BANANA,BLACK	80009	136-0138-00
R510	311-1712-00			RES.,VAR,NONWIR:20K OHM,10%,1W	01121	SPSG040S203UA
R520	311-1502-00			RES.,VAR,WW:PNL,2 X 10K OHM,2.75W	02111	1009625
R530	311-1502-00			RES.,VAR,WW:PNL,2 X 10K OHM,2.75W	02111	1009625
S500A-B	260-2125-00			SWITCH,TOGGLE:DPDT,0.4A,20V	000KR	6203-T02-N-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

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

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

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

Abbreviations are based on ANSI Y1.1-1972.

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

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

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

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

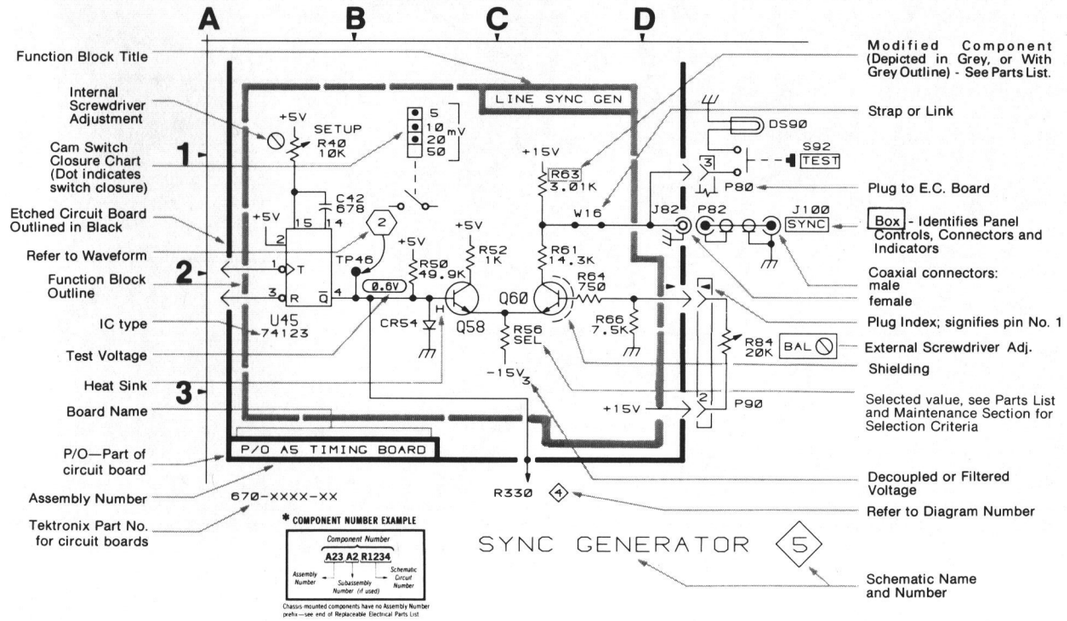
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.



OSCILLATOR AND OUTPUT CIRCUITS ◇1 ◇2 ◇5

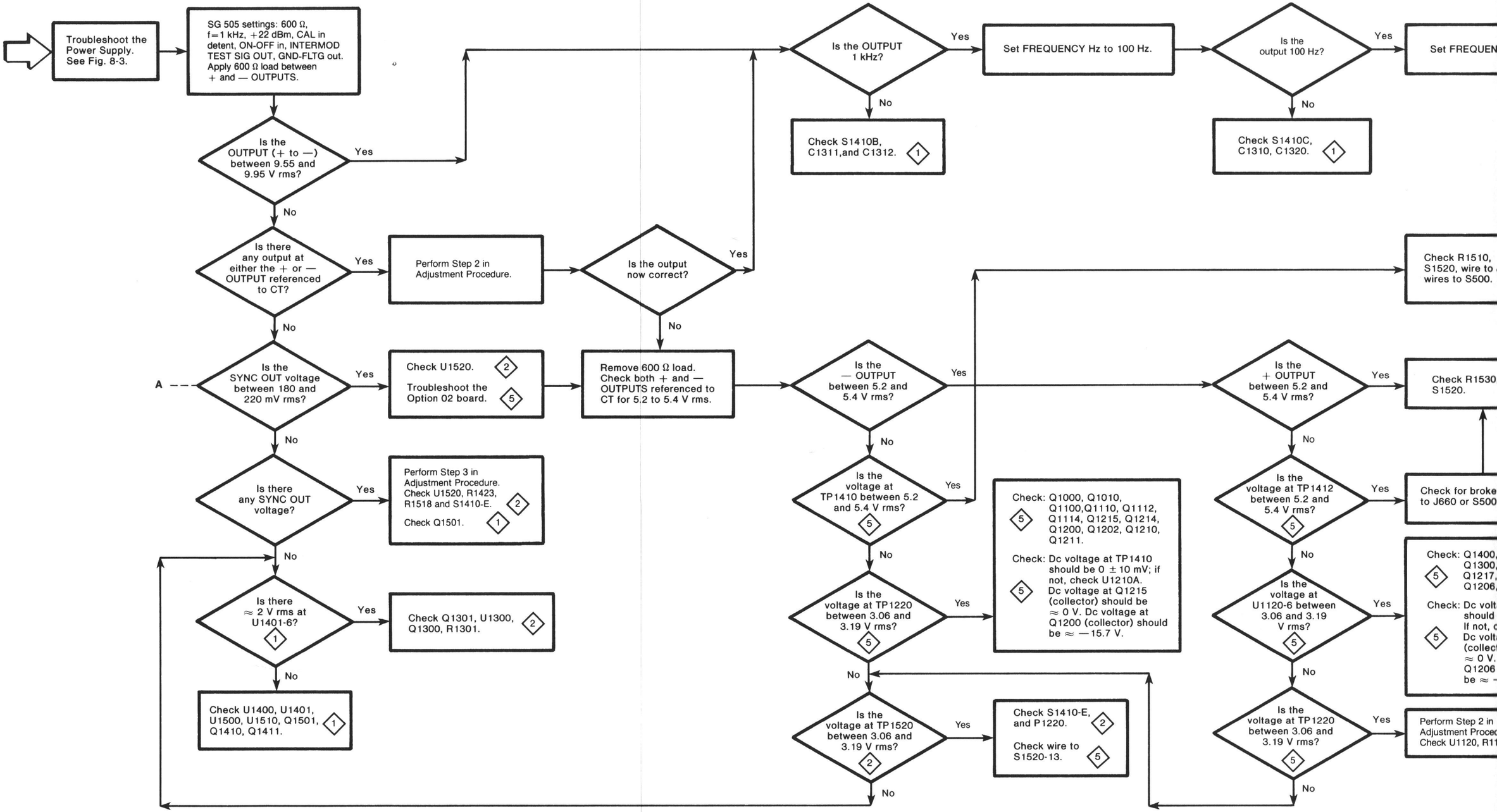
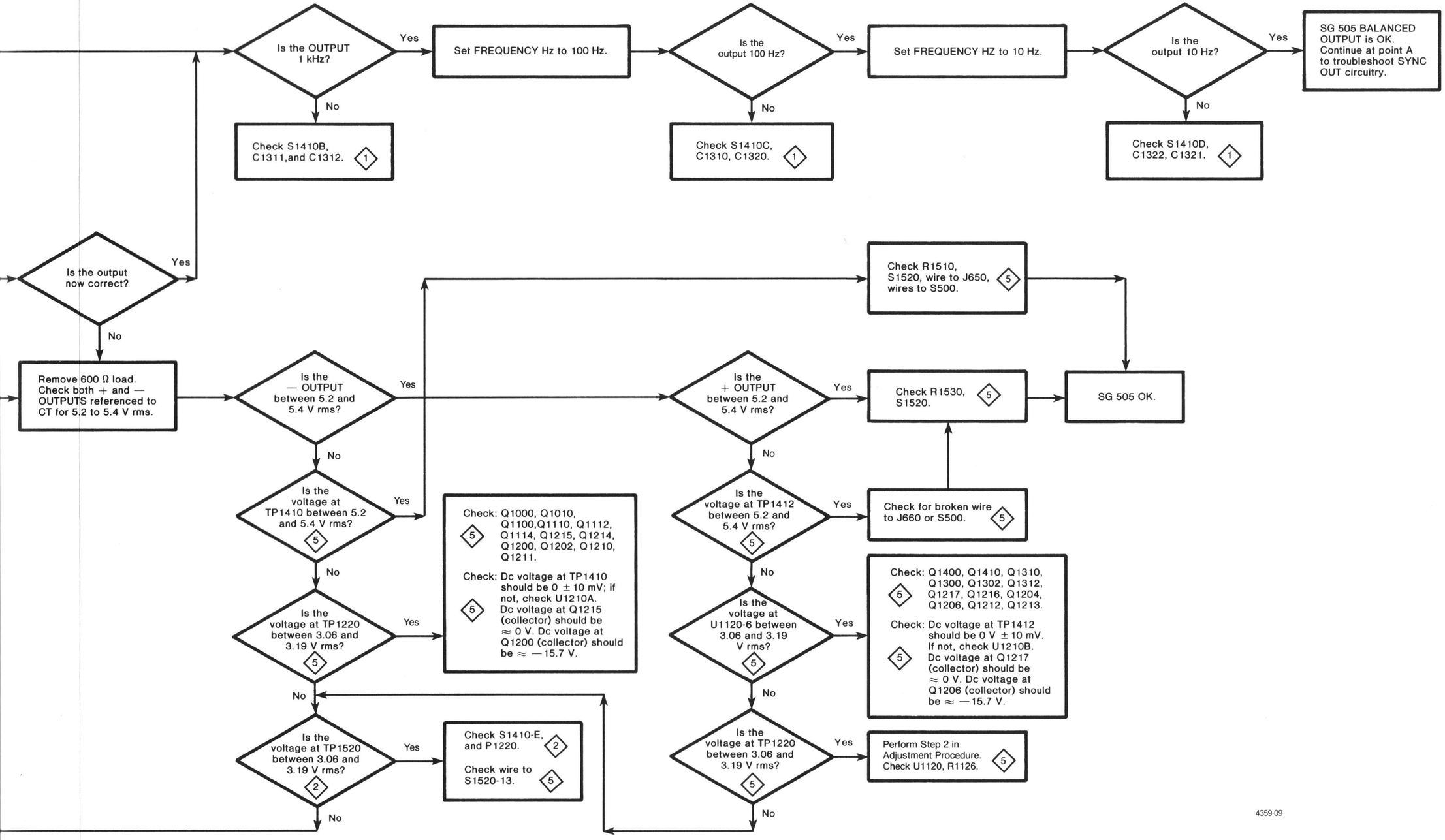


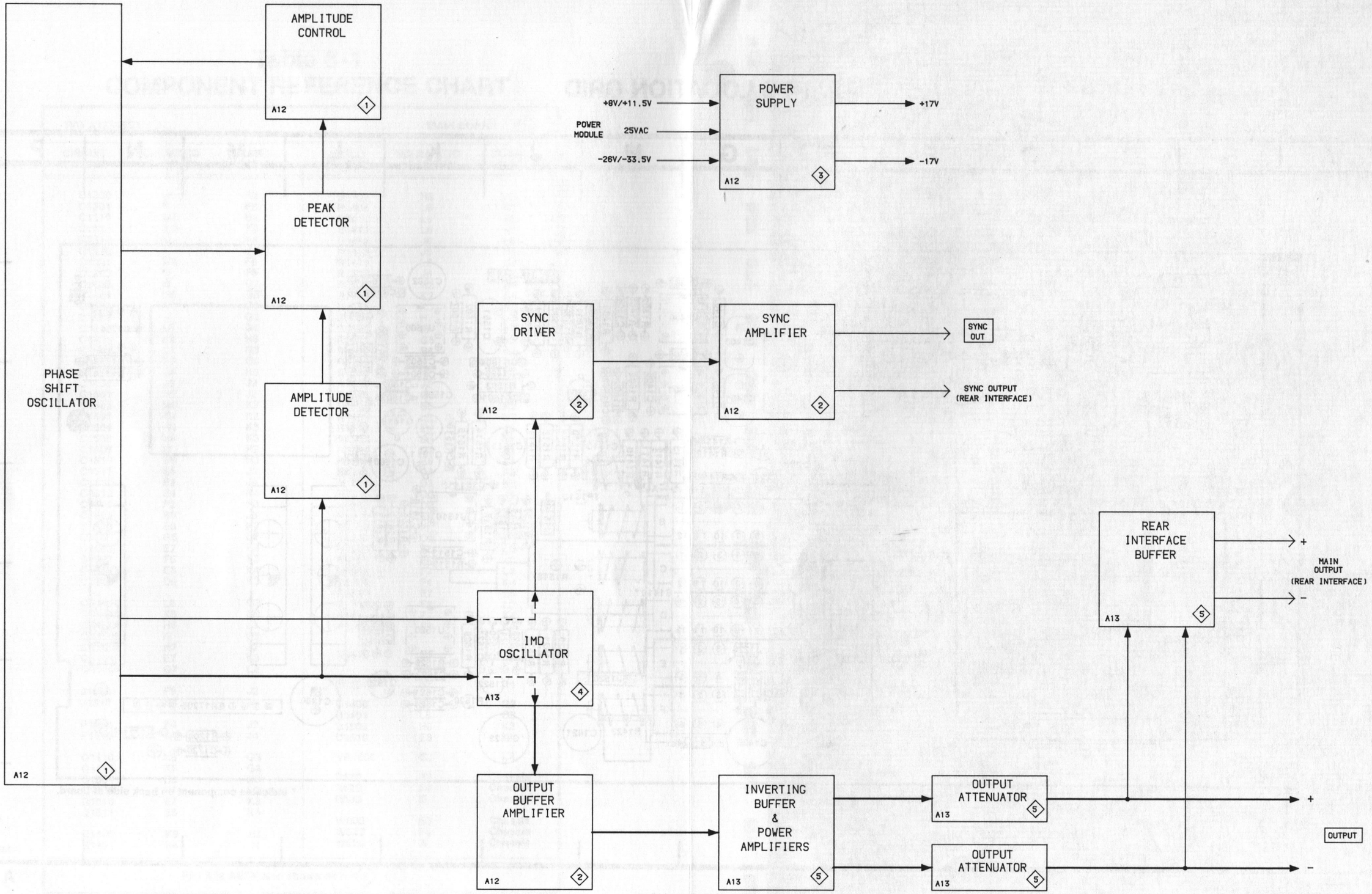
Fig. 8-1. Troubleshooting flow chart — oscillator and output circuits.

OSCILLATOR AND OUTPUT CIRCUITS ◇1◇ ◇2◇ ◇5◇



4359-09

Fig. 8-1. Troubleshooting flow chart — oscillator and output circuits.

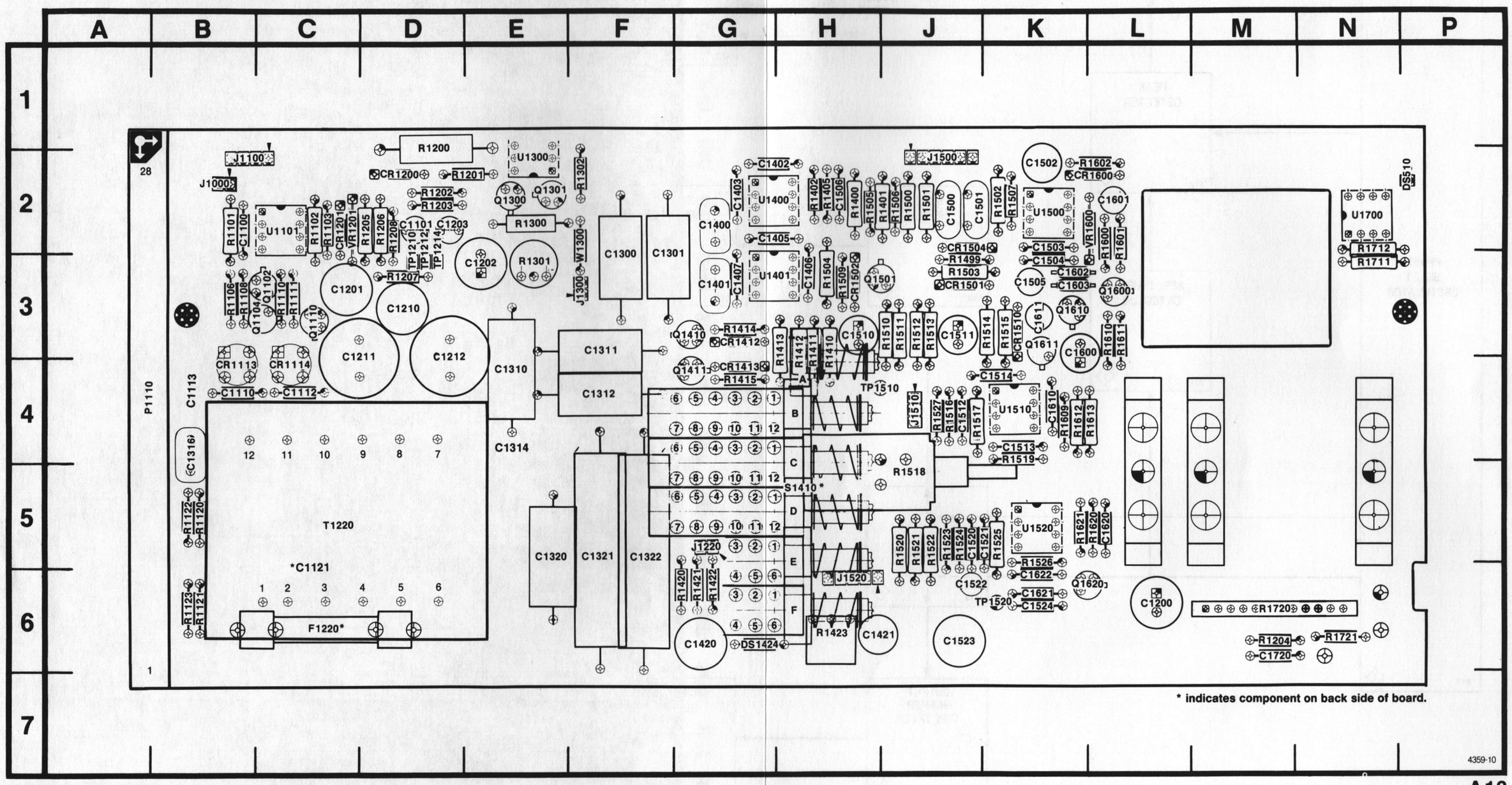


SG 505 OPT. 02

4359-31

BLOCK DIAGRAM JCS

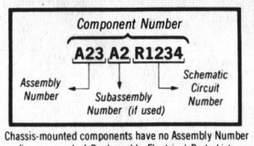
PARTS LOCATION GRID



* indicates component on back side of board.

A12

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

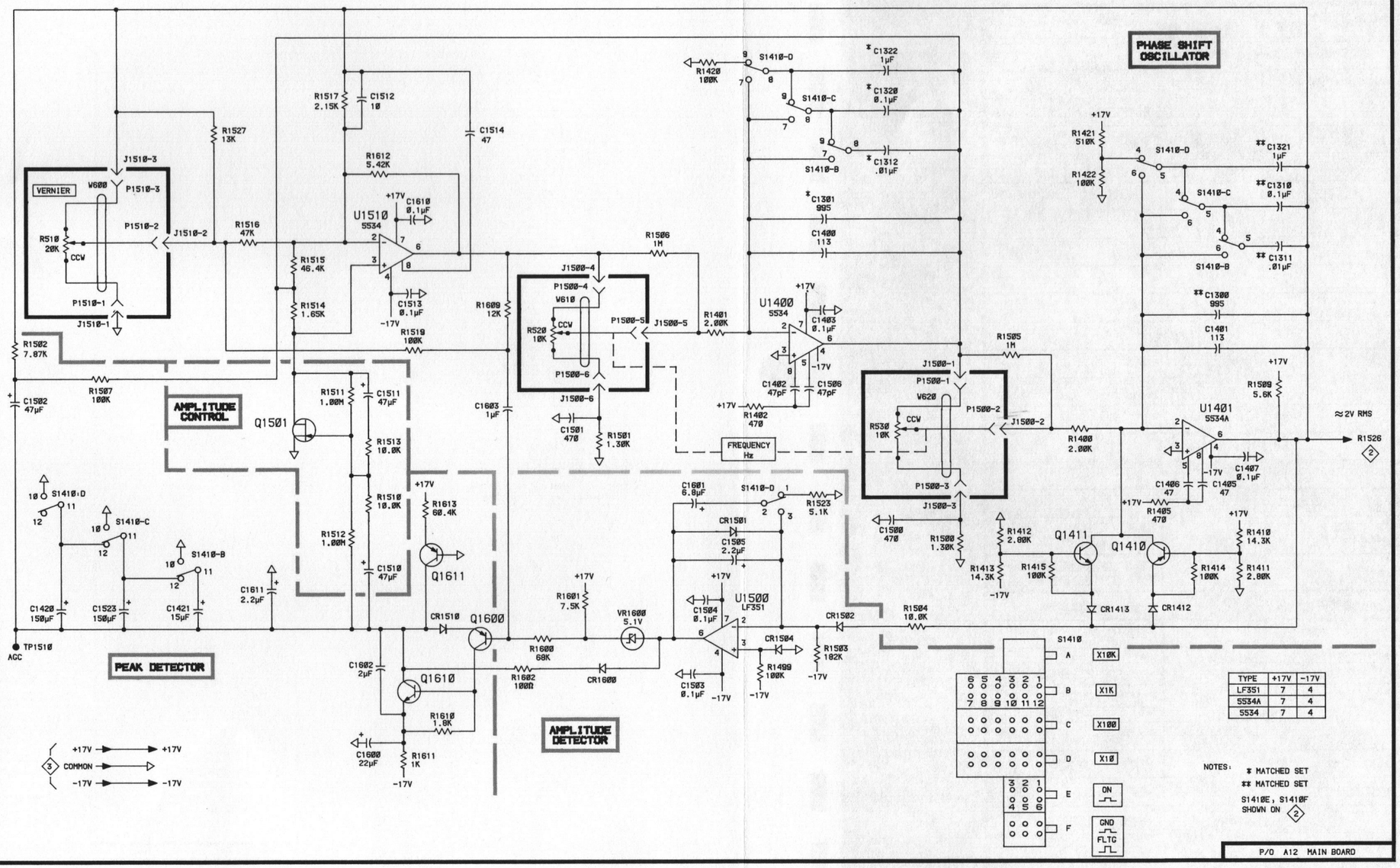
Fig. 8-2. Main Board (A12).

Table 8-1
COMPONENT REFERENCE CHART

P/O A12 ASSY — MAIN BOARD ◇1

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1300	L4	F2
C1301	I3	F2
C1310	M3	E4
C1311	M3	F3
C1312	I3	F4
C1320	I2	E5
C1321	M2	F5
C1322	I2	F5
C1400	I3	G2
C1401	L4	G3
C1402	H4	G2
C1403	I4	G2
C1405	L5	G2
C1406	L5	H3
C1407	L5	G3
C1420	B6	G6
C1421	C6	H6
C1500	J6	J2
C1501	F5	J2
C1502	B5	K2
C1503	G7	K2
C1504	H6	K3
C1505	H6	K3
C1506	I4	H2
C1510	E6	H3
C1511	E5	J3
C1512	E2	J4
C1513	E4	K4
C1514	F2	K4
C1523	B6	J6
C1600	E8	K3
C1601	G5	L2
C1602	E7	K3
C1603	F5	K3
C1610	E3	K4
C1611	D6	K3
CR1412	L6	G3
CR1413	K6	G4
CR1501	H6	J3
CR1502	I7	H3
CR1504	H7	J2
CR1510	E7	K3
CR1600	G7	L2
J1500	F3	J2
J1510	B4	J4
P1500	F4	J2
P1510	B4	J4
Q1410	K6	G3
Q1411	K6	G4
Q1501	D5	H3
Q1600	F7	L3
Q1610	E7	K3
Q1611	E6	K3
R1400	K5	H2
R1401	H4	J2
R1402	H5	H2
R1405	L6	H2
R1410	L6	H3
R1411	L6	H3
R1412	J6	H3
R1413	J6	H3
R1414	L6	G3
R1415	J6	G4
R1420	H2	G6
R1421	K2	G6
R1422	K3	G6
R1499	H7	J3
R1500	I6	J2
R1501	G5	J2
R1502	B4	K2
R1503	I7	J3
R1504	I6	H3
R1505	J4	H2
R1506	G3	J2
R1507	B5	K2
R1509	L5	H3
R1510	E5	J3
R1511	D5	J3
R1512	D6	J3
R1513	E5	J3
R1514	D4	K3
R1515	D3	K3
R1516	D3	J4
R1517	D2	J4
R1519	E4	K4
R1523	I6	J5
R1527	C2	J4
R1600	F7	L2
R1601	F6	L2
R1602	F7	L2
R1609	F4	K4
R1610	E7	L3
R1611	E8	L3
R1612	E2	K4
R1613	E6	L4
S1410	B5	H5
TP1510	B7	H4
U1400	H4	G2
U1401	L5	G3
U1500	H6	K2
U1510	E3	K4
VR1600	G7	L2
R510	B3	Chassis
R520	F4	Chassis
R530	I5	Chassis
W600	B3	Chassis
W610	F4	Chassis
W620	I5	Chassis

P/O A12 ASSY also shown on ◇2 ◇3



SG 505 OPT. Ø2

4359-26

Table 8-2
REAR INTERFACE CONNECTOR ASSIGNMENTS MAIN BOARD (A12)

FUNCTION	PIN B		PIN A	FUNCTION
SYNC COMMON	28	SG BARRIER SLOT	28	
SYNC OUTPUT	27		27	
	26		26	BUFFERED MAIN OUTPUT
	25		25	BUFFERED MAIN OUTPUT
	24		24	
	23	TM 500 BARRIER SLOT	23	
	22		22	
	21		21	
	20		20	
	19		19	
	18		18	
	17		17	
	16		16	
	15		15	
	14		14	
	13		13	
	12		12	
COLLECTOR LEAD OF PNP SERIES-PASS	11		11	BASE LEAD OF PNP SERIES-PASS
	10		10	EMITTER LEAD OF PNP SERIES-PASS
±26V COMMON	9		9	±26V COMMON
	8		8	-26V DC *
COLLECTOR LEAD OF NPN SERIES-PASS	7		7	EMITTER LEAD OF NPN SERIES-PASS
	6	REAR VIEW OF PLUG-IN	6	BASE LEAD OF NPN SERIES-PASS
	5		5	
+8V COMMON	4		4	+8V COMMON
+8V COMMON	3		3	+8V COMMON
	2		2	+8V FILTERED DC *
25V AC	1		1	25V AC

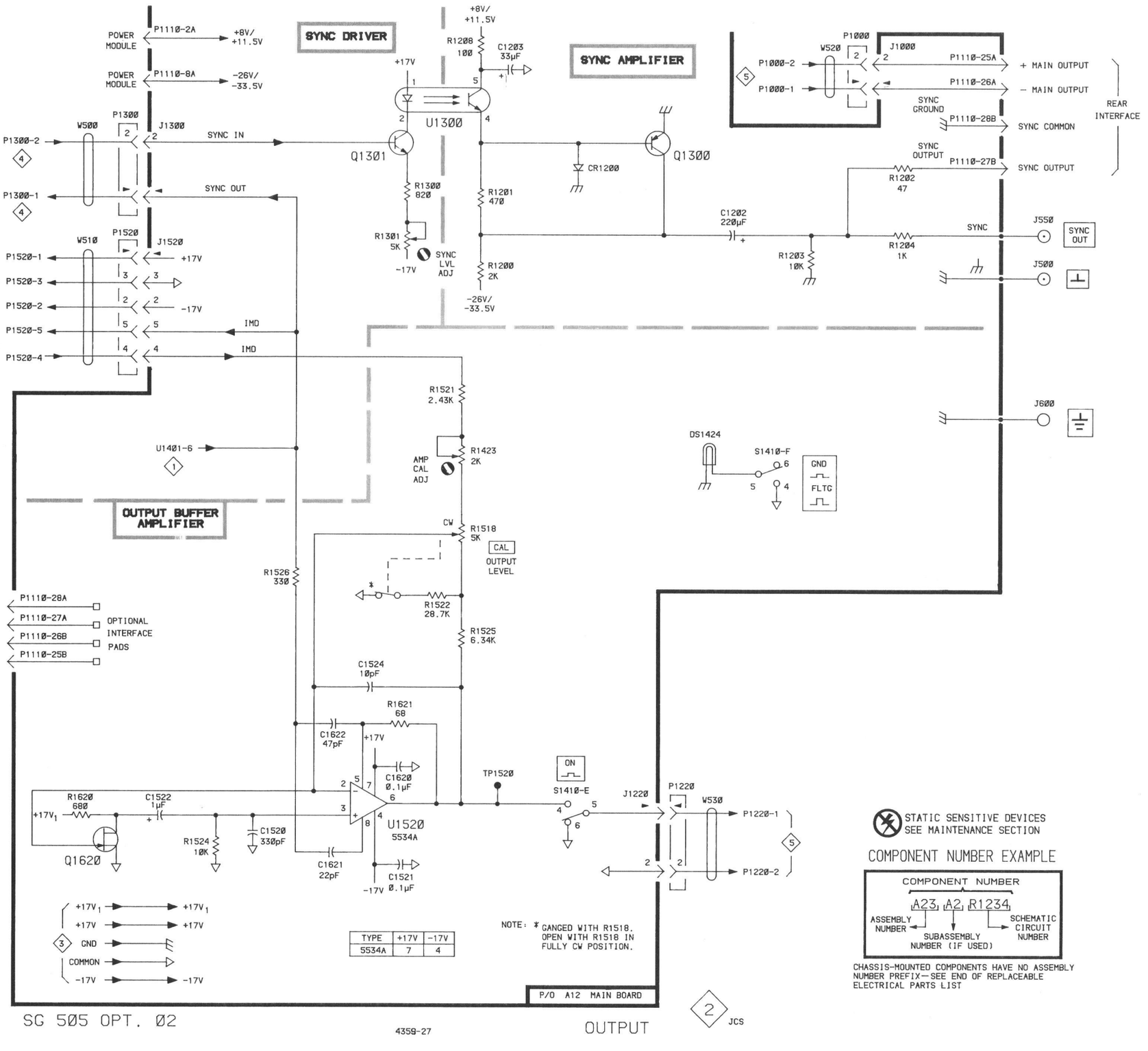
* NOMINAL VALUE - MAY BE HIGHER IN SOME INSTRUMENTS

Table 8-3
COMPONENT REFERENCE CHART

P/O A12 ASSY — MAIN BOARD ◇2◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1202	G3	E3
C1203	E1	D2
C1520	C8	J5
C1521	D8	J5
C1522	B7	J6
C1524	D6	K6
C1620	D7	L5
C1621	D8	K6
C1622	D7	K6
CR1200	F2	D2
DS1424	G4	G6
J1000	I1	B2
J1220	F7	G5
J1300	C2	F3
J1520	C3	H6
P1000	H1	B2
P1110	C1	A4
P1220	G7	G5
P1300	B2	F3
P1520	B3	H6
Q1300	G2	E2
Q1301	D2	E2
Q1620	B8	K6
R1200	E3	D1
R1201	E2	D2
R1202	I2	D2
R1203	H3	D2
R1204	I3	M6
R1208	E1	D2
R1300	E2	E2
R1301	D3	E3
R1423	E4	H6
R1518	E5	J5
R1521	E4	J5
R1522	E6	J5
R1524	C8	J5
R1525	E6	K5
R1526	C5	K5
R1620	B7	L5
R1621	D7	K5
S1410	F7	H5
TP1520	E7	K6
U1300	E2	E2
U1520	E8	K5
J500	J3	Chassis
J550	J3	Chassis
J600	J4	Chassis
W500	B2	Chassis
W510	B3	Chassis
W520	H1	Chassis
W530	G7	Chassis

P/O A12 ASSY also shown on ◇1◇ ◇3◇



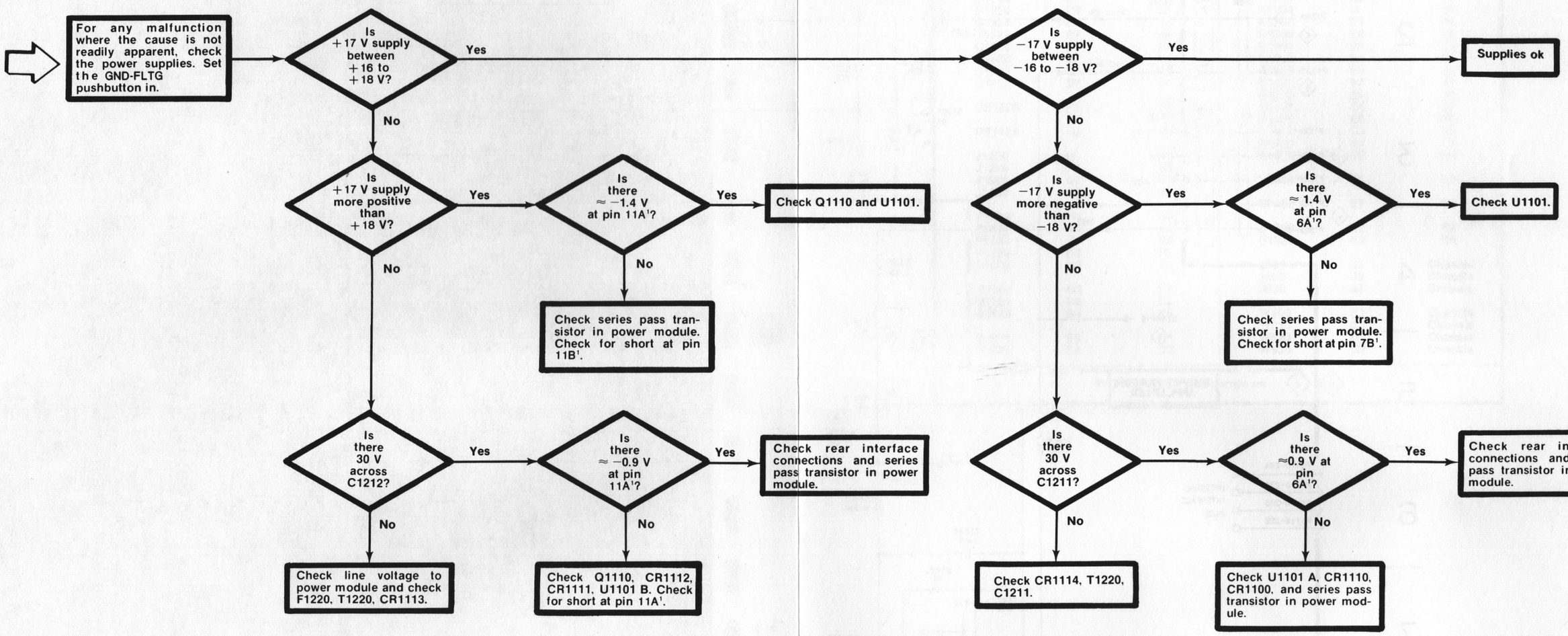
SG 505 OPT. 02

4359-27

OUTPUT

JCS

POWER SUPPLY 3



¹On rear interface connector.

(2823-16)4359-22

Fig. 8-3. Troubleshooting flow chart — power supply.

Table 8-4
COMPONENT REFERENCE CHART

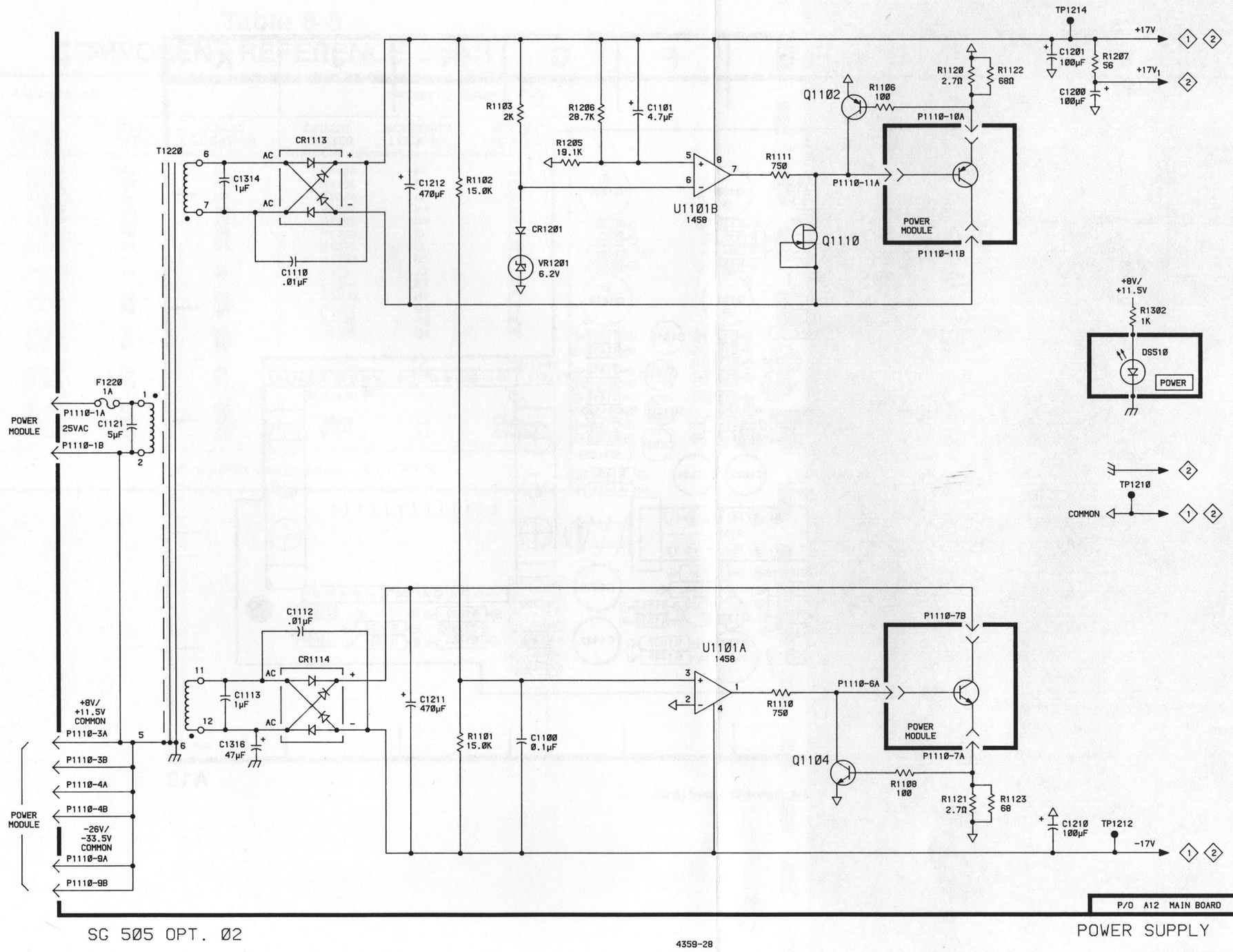
P/O A12 ASSY — MAIN BOARD ◇3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1100	E7	B2
C1101	F2	D2
C1110	C3	B4
C1112	C6	C4
C1113	C7	B4
C1121	B4	C6
C1200	J2	L6
C1201	J1	C3
C1210	J8	D3
C1211	D7	C3
C1212	D3	D3
C1314	C2	E4
C1316	C7	B4
CR1113	C2	B4
CR1114	C6	C4
CR1201	E3	C2
DS510	J4	P2
F1220	B4	C6
P1110	B4	A4
Q1102	H2	C3
Q1104	G7	B3
Q1110	H3	C3
R1101	E7	B2
R1102	E2	C2
R1103	E2	C2
R1106	H2	B3
R1108	H7	B3
R1110	G7	C3
R1111	G2	C3
R1120	I2	B5
R1121	I8	B6
R1122	I2	B5
R1123	I8	B6
R1205	E2	D2
R1206	F2	D2
R1207	J1	D3
R1302	J4	F2
T1220	B2	C5
TP1210	J5	D2
TP1212	J8	D2
TP1214	J1	D2
U1101	G6	C2
U1101	F3	C2
VR1201	E3	C2

P/O A12 ASSY also shown on ◇1 ◇2

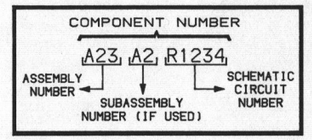
A | B | C | D | E | F | G | H | I | J | K

1 2 3 4 5 6 7 8



STATIC SENSITIVE DEVICES
SEE MAINTENANCE SECTION

COMPONENT NUMBER EXAMPLE



CHASSIS-MOUNTED COMPONENTS HAVE NO ASSEMBLY NUMBER PREFIX—SEE END OF REPLACEABLE ELECTRICAL PARTS LIST

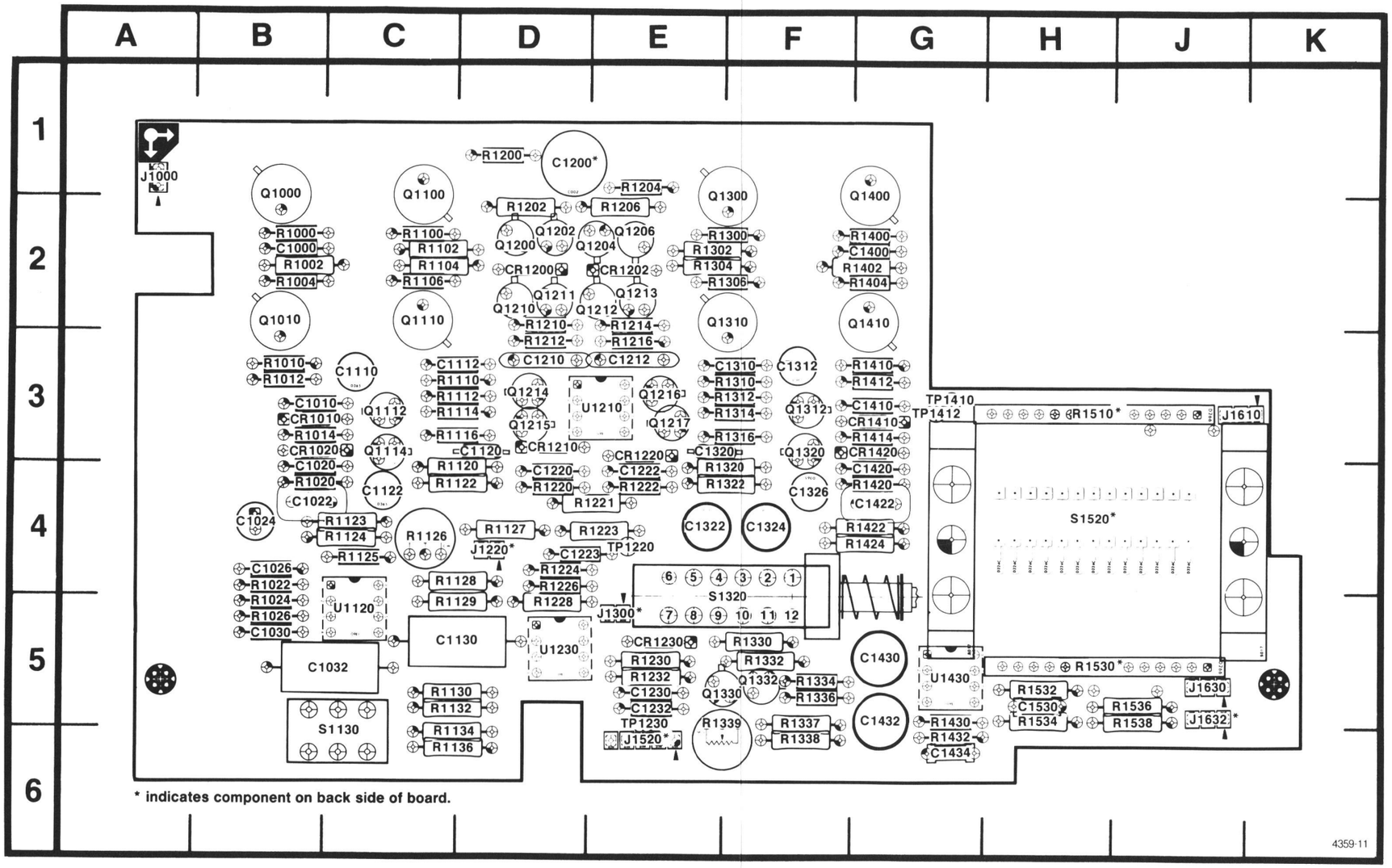
SG 505 OPT. 02

4359-28

POWER SUPPLY

3 JCS

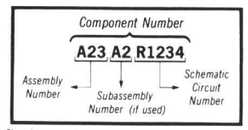
PARTS LOCATION GRID



A13

Fig. 8-4. Option 02 board (A13).

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

Table 8-5
COMPONENT REFERENCE CHART

P/O A13 ASSY — OPTION 02 BOARD ◇4

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1032	F4	C5	R1134	F4	C6
C1130	G4	C5	R1136	F4	C6
C1223	I5	D4	R1224	I4	D4
C1230	C5	E5	R1226	H4	D4
C1232	C5	E5	R1228	D6	D4
C1430	E6	G5	R1230	I3	E5
C1432	D7	G5	R1232	I2	E5
			R1330	I2	F5
CR1230	H4	E5	R1332	J3	F5
			R1334	E7	F5
J1300	B7	E5	R1336	H7	F5
J1520	B2	E5	R1337	G5	F5
			R1338	G6	F6
P1300	J7	E5	R1339	G6	F6
P1520	K1	E5			
			S1130	E4	C5
Q1330	D6	F5	S1320	C3	F4
Q1332	H6	F5			
			U1230	G3	D5
R1129	F3	C5			
R1130	G4	C5	W500	A7	Chassis
R1132	G4	C5	W510	A2	Chassis

P/O A13 ASSY also shown on ◇5

P1520-5 (2) → W510 P1520 5 → J1520 5 → IMD

IMD → 8 S1320 9 → R1330 499 → 12 S1320 11 → IMD → J1520 4 → W510 P1520 4 → P1520-4 (2)

S1320 7 → R1232 2.49K → 10 S1320

S1320 ON 3 / OFF 1 / 2

R1129 4.95K

U1230 318: 3 (+), 2 (−), 6

R1136 8.334K

R1134 26.4K

C1130 0.1µF

S1130 5 / 60Hz 4 / 6 250Hz

C1032 0.1µF

R1130 26.4K

R1132 8.334K

S1130 2 / 60Hz 3 / 1 250Hz

R1230 1.24K

R1332 1.24K

R1226 10K

R1224 10K

C1223 .01µF

CR1230

+17V → +17V

C1230 0.1µF

5 COMMON

C1232 0.1µF

−17V → −17V

R1228 9.60K

Q1330

C1430 47µF

R1334 1K

C1432 47µF −17V

+17V

R1337 13.3K

R1339 500 IM RAT ADJ

R1338 4.64K

Q1332

R1336 1M −17V

STATIC SENSITIVE DEVICES
SEE MAINTENANCE SECTION

COMPONENT NUMBER EXAMPLE

COMPONENT NUMBER: A23 A2 R1234

- A23 — ASSEMBLY NUMBER
- A2 — SUBASSEMBLY NUMBER (IF USED)
- R1234 — SCHEMATIC CIRCUIT NUMBER

CHASSIS-MOUNTED COMPONENTS HAVE NO ASSEMBLY NUMBER PREFIX—SEE END OF REPLACEABLE ELECTRICAL PARTS LIST

P1300-1 (2) → W500 P1300 → J1300 → SYNC → 6 4 S1320 5 → SYNC → J1300 2 → W500 P1300 → P1300-2 (2)

TYPE	+17V	−17V
318	7	4

S1320: 6 5 4 3 2 1 / 7 8 9 10 11 12

INTERMOD TEST SIG
LF + FREQ MIXED 4:1
ON

P/O A13 OPTION 02 BOARD

SG 505 OPT. 02

IMD OSCILLATOR

4 JCS

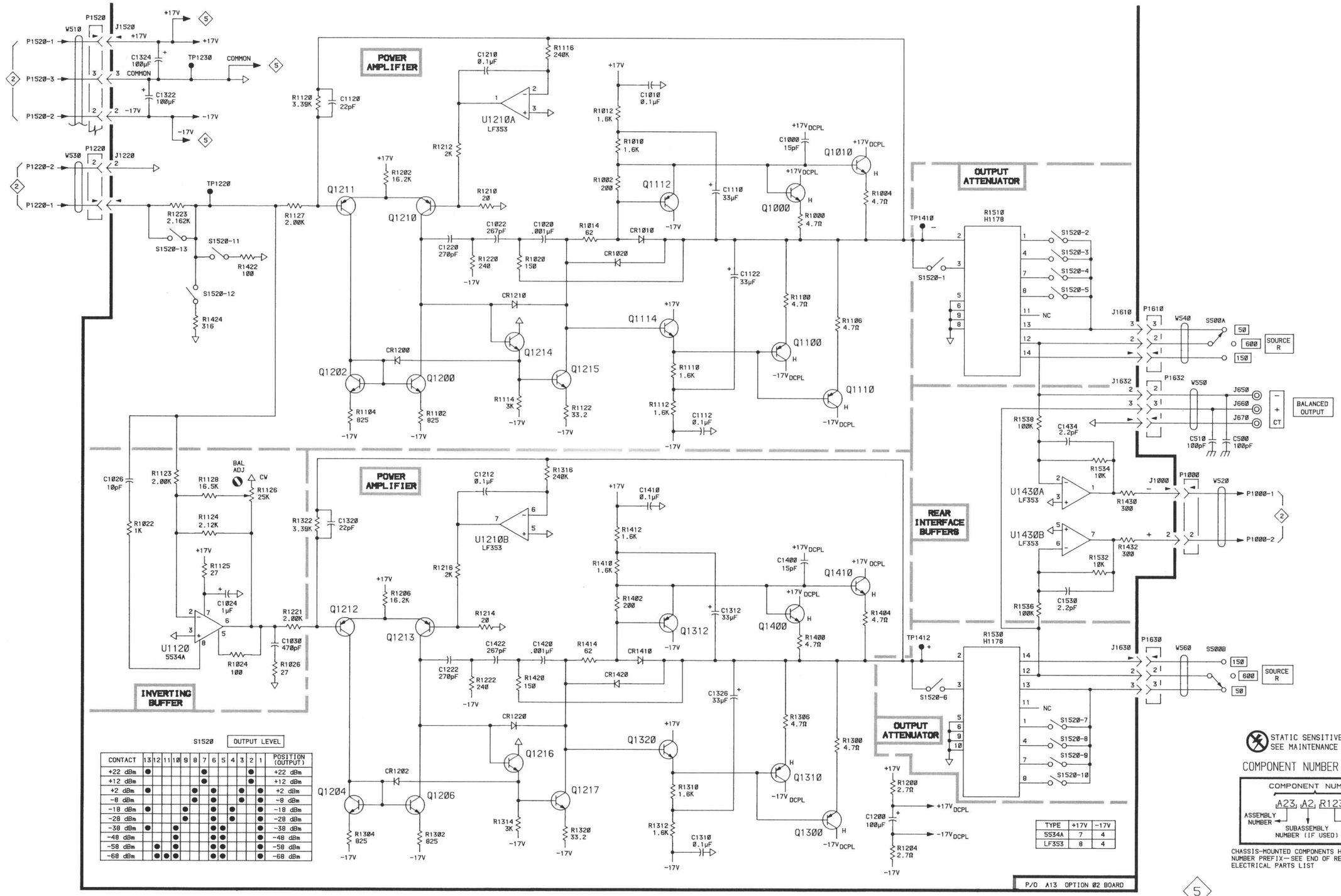
4359-29

Table 8-6
COMPONENT REFERENCE CHART

P/O A13 ASSY — OPTION 02 BOARD ◇5◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1000	I2	B2
C1010	H2	B3
C1020	G3	B4
C1022	F3	B4
C1024	C7	B4
C1026	B6	B4
C1030	D7	B5
C1110	I3	C3
C1112	H5	D3
C1120	E2	D3
C1122	I3	C4
C1200	J9	D1
C1210	F1	D3
C1212	F6	E3
C1220	F3	D4
C1222	F8	E4
C1310	H9	F3
C1312	I7	F3
C1320	E6	E3
C1322	C2	E4
C1324	B1	F4
C1326	I8	F4
C1400	I7	G2
C1410	H6	G3
C1420	G7	G4
C1422	F7	G4
C1434	L5	G5
C1530	L7	H5
CR1010	H3	B3
CR1020	G3	B3
CR1200	E4	D2
CR1202	E9	E2
CR1210	F4	D3
CR1220	F8	E3
CR1410	H7	G3
CR1420	G8	G3
J1000	M6	A1
J1220	B2	D4
J1520	B1	E5
J1610	M4	J3
J1630	M7	J5
J1632	M5	J5
P1000	N6	A1
P1220	B2	D4
P1520	B1	E5
P1610	M4	J3
P1630	M7	J5
P1632	M5	J5
Q1000	I3	B1
Q1010	J2	B2
Q1100	I4	C1
Q1110	J5	C2
Q1112	H2	C3
Q1114	H4	C3
Q1200	F5	D2
Q1202	D5	D2
Q1204	D9	E2
Q1206	F9	E2
Q1210	E3	D2
Q1211	E3	D2
Q1212	E7	E2
Q1213	E7	E2
Q1214	G4	D3
Q1215	G4	D3
Q1216	G9	E3
Q1217	G9	E3
Q1300	J9	F1
Q1310	J9	F2
Q1312	H7	F3
Q1320	H8	F3
Q1400	I7	G1
Q1410	J7	G2
R1000	J3	B2
R1002	G2	B2
R1004	J3	B2
R1010	H2	B3
R1012	G2	B3
R1014	G3	B3
R1020	G3	B4
R1022	B6	B4
R1024	C8	B5
R1026	D8	B5
R1100	I4	C2
R1102	F5	C2
R1104	E5	C2
R1106	J4	C2
R1110	H4	D3
R1112	H5	D3
R1114	F5	C3
R1116	G1	C3
R1120	D2	C4
R1122	G5	C4
R1123	C6	C4
R1124	C6	C4
R1125	C7	C4
R1126	D6	C4
R1127	D3	D4
R1128	C6	C4
R1200	K9	D1
R1202	E2	D2
R1204	K10	E1
R1206	E7	E2
R1210	F3	D2
R1212	F2	D3
R1214	F7	E2
R1216	F7	E3
R1220	F3	D4
R1221	D7	D4
R1222	F8	E4
R1223	C3	E4
R1300	J8	F2
R1302	F9	E2
R1304	E9	E2
R1306	I8	E2
R1310	H9	F3
R1312	H9	F3
R1314	F9	F3
R1316	G6	F3
R1320	G9	F4
R1322	D6	F4
R1400	J7	G2
R1402	H7	G2
R1404	J7	G2
R1410	G7	G3
R1412	H6	G3
R1414	G7	G3
R1420	G8	G4
R1422	D3	G4
R1424	C4	G4
R1430	M6	G5
R1432	M6	G5
R1510	K3	H3
R1530	K7	H5
R1532	M6	H5
R1534	M6	H5
R1536	L7	J5
R1538	L5	J5
S1520	K3	H4
TP1220	C3	E4
TP1230	C1	E5
TP1410	K3	G3
TP1412	K7	G3
U1120	C7	C5
U1210	F2	E3
U1430	L6	G5
C500	N5	Chassis
C510	N5	Chassis
J650	N5	Chassis
J660	N5	Chassis
J670	N5	Chassis
S500	N4	Chassis
W510	B1	Chassis
W520	N6	Chassis
W530	B2	Chassis
W540	M4	Chassis
W550	N5	Chassis
W560	N7	Chassis

P/O A13 ASSY also shown on ◇4◇



SG 505 OPT. Ø2

4359-30

HIGH LEVEL OUTPUT

5 Jcs

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
K0099	JACKSON BROS (LONDON) LTD.	258 BROADWAY	NEW YORK, NEW YORK 10007
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRUS DRIVE	BEAVERTON, OR 97005
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
06383	PANDUIT CORPORATION	17301 RIDGELAND	TINLEY PARK, IL 60477
09922	BURNDY CORPORATION	RICHARDS AVENUE	NORWALK, CT 06852
13103	THERMALLOY COMPANY, INC.	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS, TX 75234
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
70276	ALLEN MFG. CO.	P. O. DRAWER 570	HARTFORD, CT 06101
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
78584	STEWART STAMPING CORP.	630 CENTRAL PARK AVE.	YONKERS, NY 10704
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
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
93907	TEXTRON INC. CAMCAR DIV	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	337-3039-00			2		SHIELD,ELEC:SIDE	80009	337-3039-00
-2	105-0932-00			2		LATCH,PANEL:SIDE	80009	105-0932-00
-3	214-3364-00			2		FASTENER,LATCH:ACETAL,SIL GRAY	80009	214-3364-00
-4	366-1007-05			1		KNOB:GY,0.252 ID X1.17 OD X 0.7 H	80009	366-1007-05
	213-0153-00			2		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-5	354-0557-04			1		RING,KNOB SKIRT:CLEAR,1.875 OD	80009	354-0557-04
						(ATTACHING PARTS)		
-6	211-0030-00			2		SCREW,MACHINE:2-56 X 0.25"82 DEG,FLH STL	83385	OBD
						- - - * - - -		
-7	366-1146-00			1		KNOB:GRAY,IF GAIN	80009	366-1146-00
	213-0246-00			1		. SETSCREW:5-40 X 0.093 ITL BK OXD,HEX SKT	71159	OBD
-8	366-1031-08			1		KNOB:GY,CAL/W/ARROW,0.127 ID,0.392 OD	80009	366-1031-08
	213-0246-00			1		. SETSCREW:5-40 X 0.093 ITL BK OXD,HEX SKT	71159	OBD
-9	366-1170-03			1		KNOB:GRAY,0.25 ID X 0.706 OD,0.6H	80009	366-1170-03
	213-0153-00			2		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-10	358-0029-05			1		BSHG,MACH THD:0.274 ID X 0.438"L,NP BRS	80009	358-0029-05
						(ATTACHING PARTS)		
-11	210-0590-00			1		NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-12	210-0978-00			1		WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
-13	210-0255-00			1		TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	80009	210-0255-00
						- - - * - - -		
-14	344-0195-01			1		CLIP,ELECTRICAL:CAM SHAFT	80009	344-0195-01
-15	----- -----			2		JACK,TIP:(SEE J500,J550 REPL)		
-16	366-1851-01			1		KNOB,LATCH:IVORY,GY,0.625 X 0.25 X 1.09	80009	366-1851-01
-17	105-0865-00			1		BAR,LATCH RLSE:	80009	105-0865-00
-18	105-0866-00			1		LATCH,RETAINING:SAFETY	80009	105-0866-00
-19	214-3143-00			1		SPRING,HLEXT:0.125 OD X 0.545 L, X LOOP	80009	214-3143-00
-20	----- -----			2		JACK,TIP:(SEE J650,J660 REPL)		
						(ATTACHING PARTS)		
-21	210-0465-00			2		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-22	210-0223-00			2		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-23	210-0940-00			2		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-24	342-0147-00			2		INSULATOR,BSHG:	80009	342-0147-00
						- - - * - - -		
-25	----- -----			1		JACK,TIP:(SEE J670 REPL)		
						(ATTACHING PARTS)		
-26	210-0583-00			1		NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-27	210-0046-00			1		WASHER,LOCK:0.261 ID,INTL,0.018 THK,BRS	78189	1214-05-00-0541C
-28	210-0269-00			1		TERMINAL,LUG:NON LOCKING,0.257" MTG HOLE	78584	905-020
-29	210-0895-00			1		WSHR,SHOULDERED:0.375 OD X 0.105 INCH THK	80009	210-0895-00
						- - - * - - -		
-30	220-0633-00			1		NUT,PLAIN,KNURL:0.25-28 X 0.25 INCH L,BRS	80009	220-0633-00
-31	355-0239-00			1		STUD,SHOULDERED:BINDING POST	80009	355-0239-00
-32	----- -----			1		RES.,VAR:(SEE R510 REPL)		
						(ATTACHING PARTS)		
-33	210-0583-00			1		NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-34	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
						- - - * - - -		
-35	----- -----			1		SWITCH,TOGGLE:(SEE S500A-B REPL)		
						(ATTACHING PARTS)		
-36	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
						- - - * - - -		
-37	401-0161-00			1		DRIVE,TURNS,RED:6 1 REDUCTION	K0099	4511/DAF
						(ATTACHING PARTS)		
-38	213-0138-00			2		SCR,TPG,TF:4-24 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-39	213-0020-00			2		. SETSCREW:6-32 X 0.125 INCH,HEX.SOC STL	70276	OBD
-40	333-3007-00			1		FRONT PNL ASSY:	80009	333-3007-00
-41	352-0157-00			1		LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-42	210-1258-00			1		WASHER,FLAT:0.265 ID X 0.375 OD INCH AL	86928	5712-71-32
-43	200-0935-00			1		BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-44	----- -----			1		RES.,VAR,WW:(SEE R520,R530 REPL)		
						(ATTACHING PARTS)		
-45	210-0590-00			1		NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-46	210-0255-00			1		TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	80009	210-0255-00
-47	210-0051-00			1		WASHER,LOCK:INTL,0.425" ID X 0.615 OD,STL	78189	1220-08-00-0541C
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-48	407-2975-00			1		BRACKET,VAR RES:	80009	407-2975-00
						(ATTACHING PARTS)		
-49	211-0507-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-50	343-0149-00			1		CLAMP,LOOP:NYLON	80009	343-0149-00
-51	337-3046-00			1		SHIELD,ELEC:REAR SUBPANEL	80009	337-3046-00
-52	426-0725-24			1		FR SECT,PLUG-IN:TOP	80009	426-0725-24
						(ATTACHING PARTS)		
-53	211-0101-00			2		SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
-54	213-0146-00			2		SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
						- - - * - - -		
-55	214-3406-00			1		SPRING,FLAT:1.48 L X 0.125W	80009	214-3406-00
-56	366-1512-00			1		PUSH BUTTON:GRAY,0.18 SQ X 0.83 INCH LG	80009	366-1512-00
-57	384-1506-00			1		EXTENSION SHAFT:2.764 L X 0.187 OD,NYLON	80009	384-1506-00
-58	----- -----			1		CKT BOARD ASSY:OPT. 02(SEE A13 REPL)		
						(ATTACHING PARTS)		
-59	211-0292-00			4		SCR,ASSEM WSHR:4-40 X 0.29,BRS NI PL	78189	OBD
						- - - * - - -		
	----- -----			-		CKT BOARD ASSY INCLUDES:		
-60	131-0604-00			13		. CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-61	----- -----			18		. TERMINAL PIN:(SEE A13J1220,1300,1520,		
	----- -----			-		. 1610,1630,1632 REPL)		
-62	----- -----			4		. TERM,TEST POINT:(SEE A13TP1220,1230,		
	----- -----			-		. 1410,1412 REPL)		
-63	----- -----			1		. SW PUSH:(SEE A13S1320A-D REPL)		
-64	361-0384-00			2		. SPACER,PB SW:0.133 INCH LONG	80009	361-0384-00
-65	136-0727-00			4		. SKT,PL-IN ELEK:MICROCKT,8 CONTACT	09922	DILB8P-108
-66	214-1291-00			8		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207SB
-67	342-0324-00			8		. INSULATOR,DISC:TO-5 TRANSISTOR	13103	7717-5N-BLUE
-68	131-1425-00			1		. CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
	263-1214-00			1		. SW CAM ACTR AS:ATTENUATOR	80009	263-1214-00
-69	354-0390-00			1		. . RING,RETAINING:0.338 ID X 0.025" THK,STL	79136	5100-37MD
-70	210-0406-00			7		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	12161-50
-71	401-0180-00			1		. . BEARING,CAM SW:FRONT & REAR	80009	401-0180-00
-72	214-1139-02			1		. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1		. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-73	214-1752-00			2		. . ROLLER,DETENT:	80009	214-1752-00
-74	384-0878-18			1		. . SHAFT CAM SW:OUTER CNCTRC,W/DRVR,TIME/CM	80009	384-0878-18
-75	105-0938-00			1		. . ACTUATOR,CAM SW:ATTENUATOR	80009	105-0938-00
-76	401-0178-01			1		. . BEARING,CAM SW:CENTER/REAR	80009	401-0178-01
-77	384-0496-00			1		EXTENSION SHAFT:4.82 L X 0.123 OD EPOXY-GL	80009	384-0496-00
-78	376-0051-00			1		CPLG,SHAFT,FLEX:0.127 ID X 0.375 ID DELRIN	80009	376-0051-00
	213-0022-00			4		. SETSCREW:4-40 X 0.188 INCH,HEX SOC STL	74445	OBD
-79	129-0570-00			2		POST,ELEC-MECH:0.188 HEX X 0.976"LONG,BRS	80009	129-0570-00
						(ATTACHING PARTS)		
-80	211-0292-00			4		SCR,ASSEM WSHR:4-40 X 0.29,BRS NI PL	78189	OBD
						- - - * - - -		
-81	351-0612-00			2		GUIDE,CKT BOARD:NYLON,1.0 L	80009	351-0612-00
-82	----- -----			1		CKT BOARD ASSY:MAIN(SEE A12 REPL)		
						(ATTACHING PARTS)		
-83	211-0292-00			4		SCR,ASSEM WSHR:4-40 X 0.29,BRS NI PL	78189	OBD
						- - - * - - -		
	----- -----			-		CKT BOARD ASSY INCLUDES:		
-84	----- -----			3		. TERM,TEST POINT:(SEE A12TP1210,1510,		
	----- -----			-		. 1520 REPL)		
-85	----- -----			1		. RES.,VAR:(SEE A12R1518 REPL)		
						(ATTACHING PARTS)		
-86	210-0583-00			1		. NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-87	210-0223-00			1		. TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-88	210-0905-00			1		. WASHER,FLAT:0.256 ID X 0.05 THK,BRS	83385	OBD
						- - - * - - -		
-89	361-0515-00			1		. SPACER,SWITCH:PLASTIC	80009	361-0515-00
-90	----- -----			20		. TERMINAL PIN:(SEE A12J1000,1220,1300,		
	----- -----			-		. 1500,1510,1520 REPL)		
-91	136-0727-00			6		. SKT,PL-IN ELEK:MICROCKT,8 CONTACT	09922	DILB8P-108
-92	346-0120-00			1		. STRAP,TIEDOWN:5.5 L MIN,PLASTIC	06383	SST 1.5M

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-93	136-0252-07			3		. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-94	344-0326-00			2		. CLIP,ELECTRICAL:FUSE,BRASS	75915	102071
-95	334-2990-00			1		. MARKER,IDENT:CAUTION	80009	334-2990-00
-96	----- -----			1		. SW PUSH:(SEE A12S1410 REPL)		
-97	361-0411-00			4		. SPACER,PUSH SW:0.13 W X 0.375 INCH L,PLSTC	71590	J64285-00
-98	384-1370-00			6		EXTENSION SHAFT:4.68" L,MOLDED PLSTC	80009	384-1370-00
-99	366-1512-00			4		PUSH BUTTON:GRAY,0.18 SQ X 0.83 INCH LG	80009	366-1512-00
-100	366-1512-01			2		PUSH BUTTON:CHARCOAL GY,0.18 SQ X 0.8	80009	366-1512-01
-101	426-0724-25			1		FR SECT,PLUG-IN:BOTTOM	80009	426-0724-25
						(ATTACHING PARTS)		
-102	211-0025-00			1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
	211-0101-00			1		SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
-103	213-0146-00			2		SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
						- - - * - - -		
-104	386-4866-00			1		SUPPORT,FRAME:REAR	80009	386-4866-00
						(ATTACHING PARTS)		
-105	213-0868-00			2		SCREW,TPG,TF:6-32 X 0.375 L,FILM,STEEL	93907	OBD
-106	386-3657-01			2		SUPPORT,PLUG IN:	93907	OBD
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
						WIRE ASSEMBLIES		
	175-1178-00			1		CABLE ASSY,RF:50 OHM COAX,20.0 L	80009	175-1178-00
	175-2771-00			1		CA ASSY,SP,ELEC:3.26 AWG,5.0L	80009	175-2771-00
	----- -----			-		(FROM A13J1630 TO S500A-B)		
	352-0161-03			1		. CONN BODY,PL,EL:3 WIRE ORANGE	80009	352-0161-03
	175-2773-00			1		CA ASSY,SP,ELEC:6,26 AWG,4.0L	80009	175-2773-00
	----- -----			-		(FROM A12J1500 TO R520,R530)		
	352-0164-06			1		. CONN BODY,PL,EL:6 WIRE BLUE	80009	352-0164-06
	175-2774-00			1		CA ASSY,SP,ELEC:5,26 AWG,3.0L	80009	175-2774-00
	----- -----			-		(FROM A12J1520 TO A13J1520)		
	352-0163-05			2		. CONN BODY,PL,EL:5 WIRE GREEN	80009	352-0163-05
	175-2854-00			1		CA ASSY,SP,ELEC:2,26 AWG,5.0 L	80009	175-2854-00
	----- -----			-		(FROM A12J1300 TO A13J1300)		
	352-0169-00			2		. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
	175-3060-00			2		CA ASSY,SP,ELEC:2,26 AWG,5.0 L,RIBBON	80009	175-3060-00
	----- -----			-		(FROM A12J1000 TO A13J1000)		
	----- -----			-		(FROM A12J1220 TO A13J1220)		
	352-0169-04			2		. CONN BODY,PL,EL:2 WIRE YELLOW	80009	352-0169-04
	175-3064-00			2		CA ASSY,SP,ELEC:3,26 AWG,3.0 L,RIBBON	80009	175-3064-00
	----- -----			-		(FROM A12J1610 TO S500A-B)		
	----- -----			-		(FROM A12J1632 TO J650,J660 J670)		
	352-0161-06			1		. CONN BODY,PL,EL:3 WIRE BLUE	80009	352-0161-06
	175-5139-00			1		CA ASSY,SP,ELEC:3,26 AWG,6.0 L,RIBBON	80009	175-5139-00
	----- -----			-		(FROM A12J1510 TO R510)		
	352-0161-01			1		. CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01

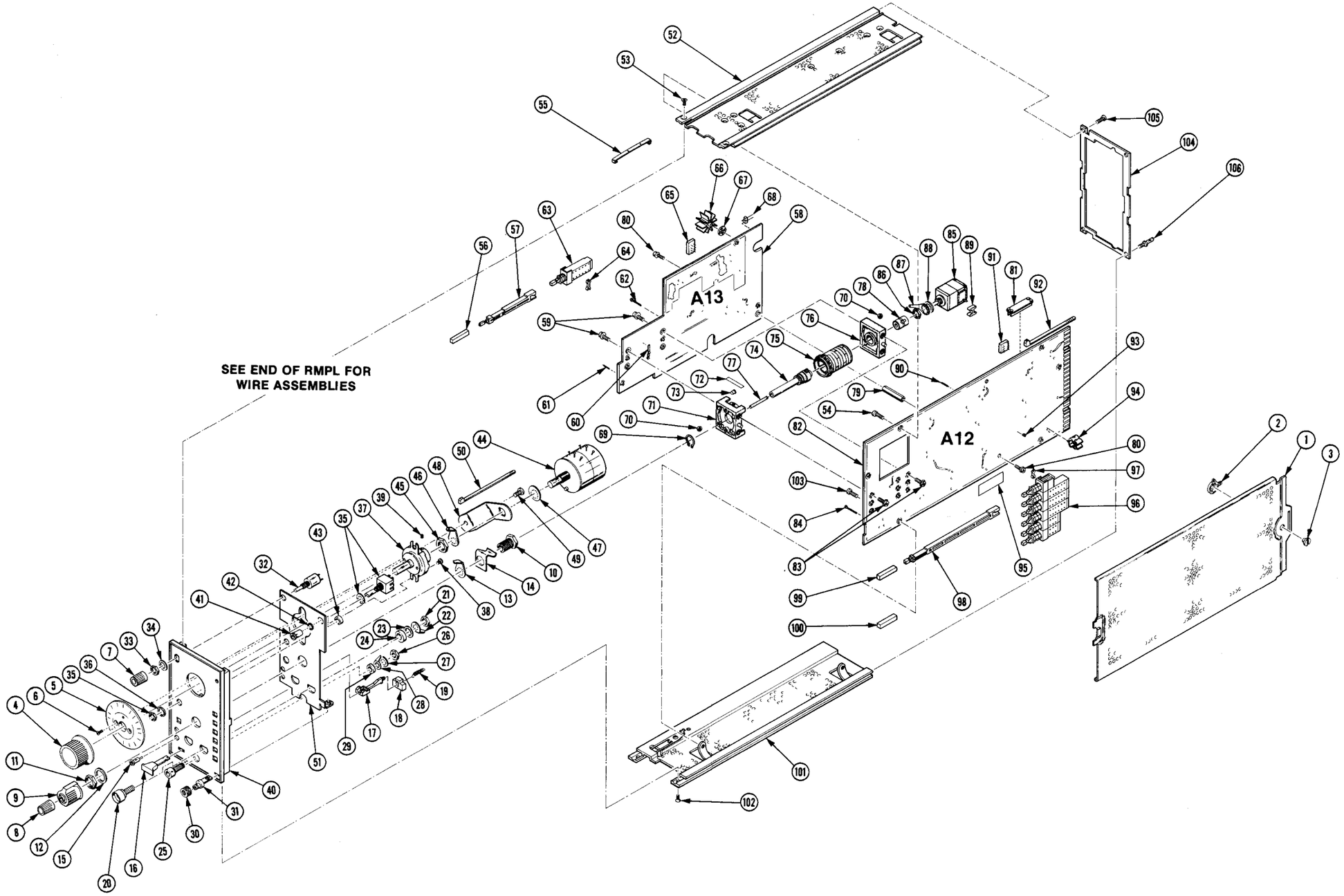

SEE END OF RMPL FOR
WIRE ASSEMBLIES
A13
A12

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
						ACCESSORIES		
	070-4359-00			1		MANUAL,TECH:INSTRUCTION	80009	070-4359-00

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 11/12/82 Change Reference: C1/1182

Product: SG 505 Option 02 Manual Part No.: 070-4359-00

DESCRIPTION

EFF SN: ALL

REPLACEABLE MECHANICAL PARTS LIST CHANGES

Wire Assemblies Page

REMOVE:

175-1178-00	1 CABLE ASSY,RF: 50 OHM COAX,20.0 L

ACCESSORIES PAGE CHANGES

ADD:

175-1178-00	1 CABLE ASSY,RF: 50 OHM COAX,20.0 L

Tektronix
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 11-23-82 Change Reference: C2/1182

Product: SG505 OPTION 02 OSCILLATOR Manual Part No.: 070-4359-00

DESCRIPTION

EFF SN: SEE BELOW

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

CHANGE:				PC
A12R1205	B010190	321-0315-03	RES,FXD,FILM: 19.1K OHM,0.25%,0.125W	5
A12R1206	B010190	321-0332-07	RES,FXD,FILM: 28.0K OHM,0.25%,0.125W	5
A13C1032	B010107	285-0891-03	CAP,FXD,PLASTIC: 0.1UF,+1.5-0.25%,100V	4
A13C1130	B010107	285-0891-03	CAP,FXD,PLASTIC: 0.1UF,+1.5-0.25%,100V	4

DIAGRAM CHANGES

DIAGRAM  POWER SUPPLY COMPONENT REF. CHART

CHANGE:

R1206 (location F2) to 28.0 K OHM.