TEK SERVICE MANUAL

070-6737-00
Product Group 46

CFG250 FUNCTION GENERATOR

SERVICE

Tektronix
COMMITTED TO EXCELLENCE

CFG250
FUNCTION GENERATOR
SERVICE

WARNING

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

Please Check for
CHANGE INFORMATION
at the Rear of This Manual

First Printing SEP 1988

Tektronix
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INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag, or stamped on the chassis. The first two digits designate the country of manufacture. The last five digits of the serial number are unique to each instrument. The country of manufacture is identified as follows:

B000000	Tektronix, Inc., Beaverton, Oregon, U.S.A.
E200000	Tektronix United Kingdom, Ltd., London
G100000	Tektronix Guernsey, Ltd., Channel Islands
HK00000	Hong Kong
H700000	Tektronix Holland, NV, Heerenveen, The Netherlands
J300000	Sony/Tektronix, Japan

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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 and do 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.

Terms as Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the markings, 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. For maximum input voltage see Tables 1-1 and 1-2.

Symbols as Marked on Equipment

DANGER—High voltage.

Protective ground (earth) terminal.

ATTENTION—Refer to manual.

Replace fuse as specified—Refer to manual.

Power Source

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

Grounding the Product

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

Danger Arising From Loss of Ground

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

Use the Proper Power Cord

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

Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see Figure 2-2.

Use the Proper Fuse

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

Do Not Operate In an Explosive Atmosphere

To avoid explosion, do not operate this instrument in an explosive atmosphere.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the instrument without the covers and panels properly installed.

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.

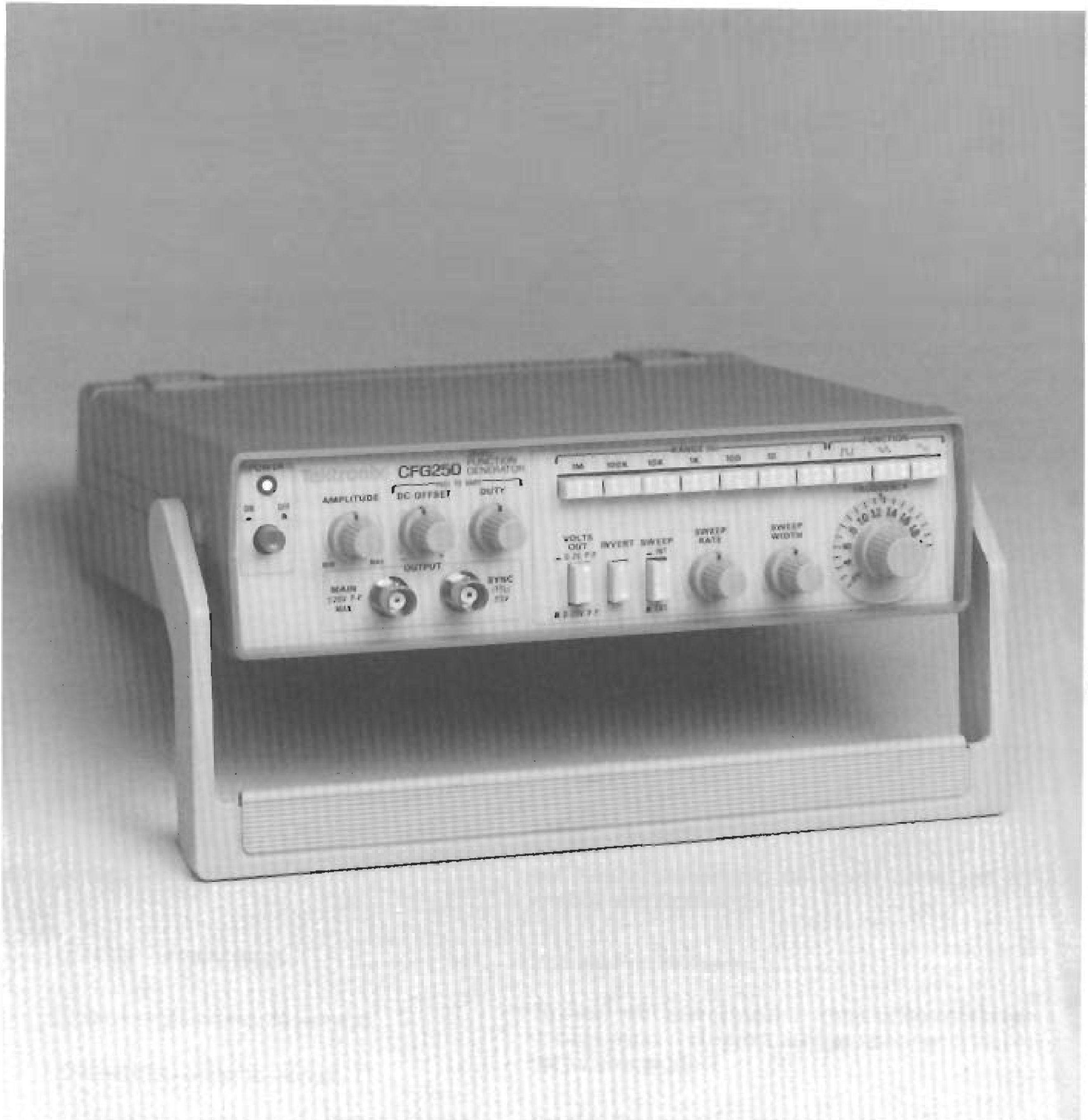
Use Care When Servicing With Power On

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

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

Power Source

This product is intended to operate from a power source that does 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 connector in the power cord is essential for safe operation.



6737-02

The CFG250 Frequency Generator.

GENERAL INFORMATION

INTRODUCTION

The TEKTRONIX CFG250 2 MHz FUNCTION GENERATOR produces square, triangle, and sine waves, and TTL compatible signals. The frequency range of the waveforms are from 0.2 Hz to 2 MHz. The maximum output amplitude of the waveform is 20 V p-p. The symmetry of the output waveform may also be varied. The output waveform can be frequency modulated by internal sweep or from an external voltage source.

The instrument can be used for such applications as testing audio amplifier, ultrasonic, and servo systems.

The CFG250 has a locking, multiposition handle that folds under the instrument to allow stacking with other instruments of the same series.

Standard accessories provided with the CFG250 include: a power cord and operators manual. For part numbers and further information about standard and optional accessories, refer to the Accessories page at the back of this manual. For additional information, contact your Tektronix Sales Office or Distributor and the Tektronix products catalog.

SPECIFICATION

The Operational characteristics given in Table 1-1 are valid when the instrument has been adjusted at an ambient temperature between +21°C and +25°C, has had a warm-up period of at least 30 minutes (with the cabinet in place), and is operating at an ambient temperature between 10°C and +40°C, with 75% maximum relative humidity.

Table 1-1

General Characteristics

Characteristics	Performance Requirements	
OPERATIONAL		
Frequency		
Range Selection	1 Hz to 1 MHz in seven steps (1, 10, 100, 1 K, 10 K, 100 K, and 1 M).	
Multiplier	Variable from 0.2 to 2.0 times the range selection.	
Accuracy	±5% of full scale.	
Internal Sweep	Linear.[a]	
Rate	0.5 Hz (2 second period) to 50 Hz (20 millisecond period), continuously variable.[a]	
Width	Variable from 1:1 to 100:1.[a]	
Sine-Wave Distortion	< 1% from 10 Hz to 100 kHz (maximum output into 50 Ω termination).	
Triangle Wave Linearity (Measured between 10% and 90% points)		
20 Hz to 100 kHz	≥ 99%.[a]	
200 kHz to 2 MHz	≥ 97%.[a]	
Square-Wave Response (Measured between 10% and 90% points)	≤ 100 ns.	
OUTPUT		
MAIN	VOLTS OUT	
	0.2 V p-p	0-20 V p-p
Open Circuit	≤ 10 mV p-p to ≥ 1.8 V	≤ 100 mV p-p to ≥ 20 V
50 Ω termination	≤ 5 mV p-p to ≥ 0.9 V	≤ 50 mV p-p to ≥ 9 V
Impedance	50 Ω ±10%.[a]	
SYNC (TTL)		
Open Circuit	> 3 V p-p.	
Rise Time and Fall Time	≤ 25 ns.	
DC OFFSET	±20 V minimum into an open circuit.	
Duty Cycle (Square Wave and Triangle Wave)	5 to 1 minimum duty cycle change (50% at maximum counterclockwise position).	
VCF INPUT Impedance	10 kΩ ±10%.[a]	
External Voltage Controlled Sweep Range	100:1 minimum for 0 to +10 V dc input with FREQUENCY control set at 2.0.	

[a] **Performance Requirement not check in manual.**

Table 1-1 (cont)

Characteristics	Performance Requirements
ELECTRICAL CHARACTERISTICS	
Line Voltage Range	90 Vac to 110 Vac, 108 Vac to 132 Vac, 198 Vac to 242 Vac, and 216 Vac to 250 Vac at 50-60 Hz.[a]
Power Consumption	20 VA, 17 W.[a]
ENVIRONMENTAL CHARACTERISTICS	
Temperature	
Operating	10°C to +40°C (+50°F to +104°F), 75% relative humidity.
Nonoperating	-10°C to +60°C (14°F to 140°F), 80% relative humidity.
PHYSICAL	
Width	240 mm (90.5 in).
Height	64 mm (2.5 in).
Depth	190 mm (7.5 in).
Weight	1.7 kg (3.7 lb).

[a] Performance Requirement not check in manual.

PREPARATION FOR USE

SAFETY

This section of the manual tells how to proceed with the initial start-up of the instrument.

Refer to the Safety Summaries at the front of this manual for power source, grounding, and other safety considerations pertaining to the use of the instrument. Before connecting the CFG250 to a power source, read both this section and the Safety Summaries.

LINE VOLTAGE

CAUTION

This instrument may be damaged if operated with the LINE VOLTAGE SELECT switches set for the wrong line voltage.

This product is intended to operate from a power source that does not supply more than 250 Vrms between the ac input conductors or between either ac input conductor and ground. Before connecting the power cord to a power-input source, verify that the LINE VOLTAGE SELECT switches on the Rear Panel are set to the correct line voltage setting. Figure 2-1 shows the location of the LINE VOLTAGE SELECT switches, power cord receptacle, and power fuse.

POWER CORD

A protective ground connection, the third wire in the power cord, is necessary for safe operation. To avoid electrical shock, plug the power cord into a properly wired receptacle before making any connections to the equipment input terminals. Do not remove the ground lug from the power cord for any reason. Use only the power cord and connector specified for this equipment.

Instruments are shipped with the required power cord as ordered by the customer (see Figure 2-2). Contact your Tektronix representative or Tektronix Field Office for additional power-cord information.

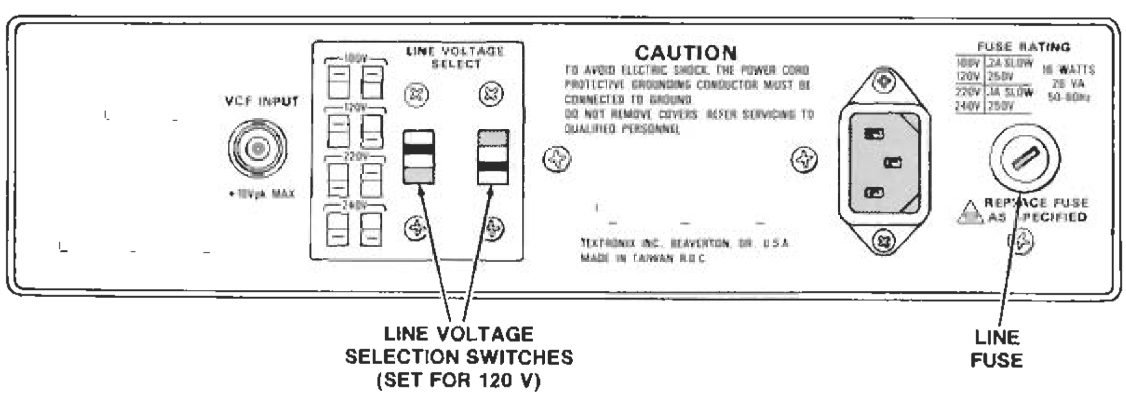


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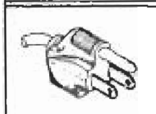
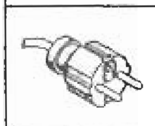
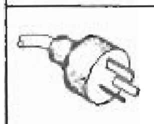
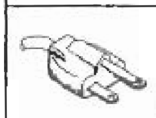
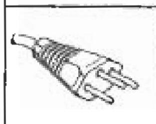
Figure 2-1. Rear Panel.

Plug Configuration	Option	Power Cord/ Plug Type	Line Voltage	Reference Standards [b]
	U.S. Std.	U.S. 120V	120V	ANSI C73.11 NEMA 5-15-P IEC 83 UL 198.6
	A1	EURO 220V	220V	CEE(7), II, IV, VII IEC 83 IEC 127
	A2	UK[a] 240V	240V	BS 1363 IEC 83 IEC 127
	A3	Australian 240V	240V	AS C112 IEC 127
	A4	North American 240V	240V	ANSI C73.20 NEMA 6-15-P IEC 83 UL 198.6
	A5	Switzerland 220V	220V	SEV EC 127

[a] A 6A, type C fuse is also installed inside the plug of the Option A2 power cord.

[b] Reference Standards Abbreviations:

ANSI—American National Standards Institute
AS—Standards Association of Australia
BS—British Standards Institution
CEE—International Commission on Rules for the Approval of Electrical Equipment
IEC—International Electrotechnical Commission
NEMA—National Electrical Manufacturer's Association
SEV—Schweizervischer Elektrotechnischer Verein
UL—Underwriters Laboratories Inc.

Figure 2-2. Optional power cords.

FUSES

CAUTION

The instrument may be damaged if operated with the wrong type and rating line fuses installed.

WARNING

Unplug the power cord and disconnect the test leads from any voltage source before checking or changing the fuses.

Verify the proper value of the fuses with the following procedure. Figure 2-1, Rear Panel, shows the location of the fuse:

1. Disconnect the power cord from the power-input source.
2. Press in the fuse-holder cap and release it with a slight counterclockwise rotation.
3. Pull the cap (with the attached fuse inside) out of the fuse holder.
4. Verify proper fuse value.
5. Install the proper fuse and reinstall the fuse-holder cap.

DETAILED OPERATING INFORMATION

For detail operating information about the instrument, refer to the Operators Manual.

THEORY OF OPERATION

INTRODUCTION

This section contains a general description of the CFG250 Function Generator circuitry. General operation of the instrument is described in the Block Diagram Description. Each functional circuit is described in more detail in the Detailed Circuit Description.

The schematic diagram and the circuit board illustrations are located in the Diagrams section near the rear of this manual. To understand the circuit descriptions in this section, refer to both the Block Diagram, Figure 3-1 in this section, and to the schematic diagram.

BLOCK DIAGRAM DESCRIPTION

The VCF (Voltage Controlled Frequency) circuit generates positive and negative control signals that adjust the frequency within the selected range and the duty cycle of the output waveform. This is accomplished by varying the voltage level of the positive- and negative-control signal with the FREQUENCY and DUTY controls in the VCF circuit. The positive and negative control signals are fed to the Triangle-Wave Generator.

The positive and negative control signals regulates the charging rate of the Triangle-Wave Generator timing capacitors. The charging and discharging rate of the timing capacitor develops a positive and negative linear voltage ramp that is a triangle waveform. The amplitude of the triangle waveform is set by current control signal from the Square-Wave Generator. The output of the triangle waveform generator is applied to the Square-Wave Generator, the Sine-Wave Generator, and the FUNCTION switches.

In the Square-Wave Generator, two comparators circuits are used to develop a square waveform from the applied triangle waveform and to generate a current control signal for the Triangle-Wave Generator. The output of the Square-Wave Generator is applied to TTL Conversion circuit and to the FUNCTION switches.

The TTL Conversion circuit changes the square-wave signal to a TTL compatible signal. The TTL compatible signal is applied to the SYNC OUTPUT connector.

The triangle waveform to the Sine-Wave circuit is applied to the three symmetrical constant-current sources. The diode constant current sources change the triangle waveform to a sine waveform that is fed to an operational amplifier for buffering before being applied to the FUNCTION switch.

The FUNCTION switches select the waveform to be applied to the Output Amplifier. The Output Amplifier increases the amplitude of the waveform about 10 times. The output waveform amplitude is selectable between 0.2 V p-p and 20 V p-p. A front panel DC OFFSET control varies the dc voltage level of the output waveform.

The output waveforms can be frequency modulated by an internal sawtooth waveform from the Sweep circuit or by external signal. The internal sawtooth signal and external signal are applied to the SWEEP switch that routes the selected signal to the input of the VCF circuit. The sawtooth sweep signal rate and amplitude are adjustable by front panel controls. The external signal is applied to the VCF input connector located on the rear panel.

The power supply consists of a full-wave bridge rectifier that supplies two unregulated and three regulated voltages to the circuits of the Function Generator.

DETAILED CIRCUIT DESCRIPTION

Voltage Controlled Frequency

The VCF (Voltage Controlled Frequency) circuitry develops positive and negative control voltages for the Triangle-Wave and Square- Wave generators. The **VCF** circuit consists of operational amplifiers U1, U2, U3, and U4, transistors Q1 and Q2, and associated circuitry.

The positive control voltage is developed by Operational Amplifiers U1 and U3 and transistor Q1; negative control voltage is developed by Operational Amplifiers U2 and U4 and transistor Q2.

The FREQUENCY control sets the current level to pin 2 of U1 and U2. An increase in current from the FREQUENCY control increases the frequency of the output waveform; a decrease in current from the FREQUENCY control decreases the frequency of the output waveform. The Hi Freq Adj potentiometer R6 sets the maximum frequency limit. The Sym Adj Potentiometers R10 and R18 adjust for zero volts difference between the respective inputs of U1 and U2.

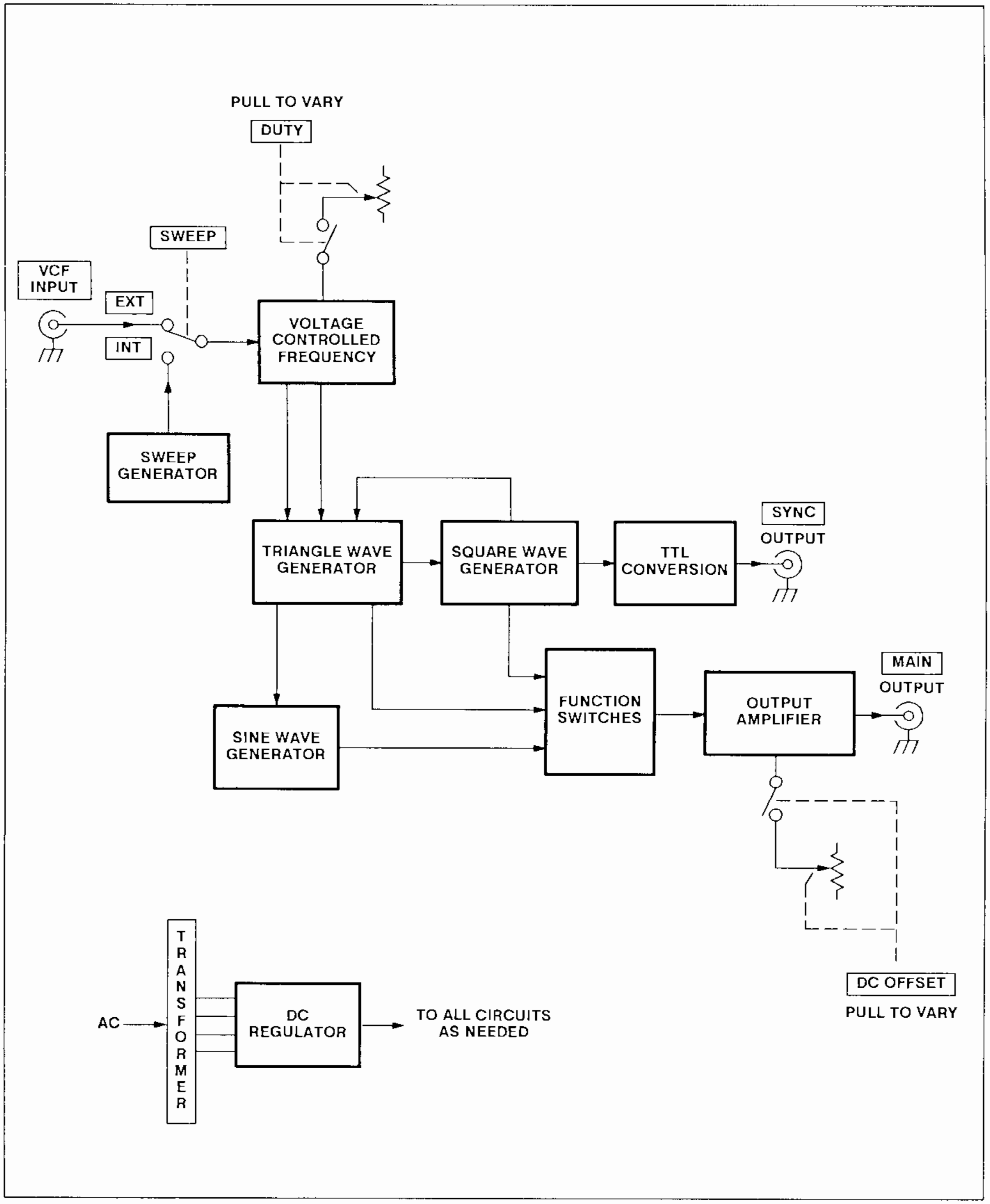


Figure 3-1. Block Diagram.

Potentiometers R10 and R18 adjust the dc offset for the positive and negative control voltages to set the waveform symmetry. The outputs of U1 and U2 are fed to Q1, Q2, U3 and U4.

The current rate for the positive or the negative control voltages can be adjusted by adding a potentiometer (DUTY control R20) to the emitters of Q1 or Q2. This is done by pulling out the DUTY control knob to add the potentiometer to the circuit. and rotating it. The emitter current to be adjusted is selected by the INVERT switch SW8. Adjusting the current rate for the positive or the negative control voltage varies the charging or discharging rate of the timing capacitor in the Triangle-Wave Generator and thereby varying the duty factor of the output waveforms.

Frequency modulation of the instrument output waveform is performed by applying either the internal sweep waveform or an external signal to the input of VCF circuit. The signal for frequency modulation is selected by the SWEEP switch.

Triangle-Wave Generator

The Triangle-Wave Generator provides a linear voltage ramp to the FUNCTION switches, the Square-Wave Generator, and the Sine-Wave Generator. The linear voltage ramp is produced by maintaining a constant current through selectable timing capacitors. The Triangle-Wave Generator consists of transistors Q3, Q4, Q5, U5C, and U5D, the disconnect diodes, and timing capacitors and resistors.

The selection of the timing capacitor(s) and resistor(s) by the RANGE (Hz) switch SW6 sets the frequency range of the output waveforms. Charging current through Q3 and Q4 for setting the frequency in a selected range is regulated by the VCF circuit which applies a positive control voltage to Q3 and negative control voltage to Q4.

The current control signal from the square wave circuit to the disconnect diodes (D1 through D8) determines which current source (Q3 or Q4) is connected to the selector timing capacitors. The current control signal switches between +1.8 V and -1.8 V.

Assume the current control signal is +1.8 V, diodes D1 and D3 are reverse biased and diodes D7 and D8 are forward biased. Current through the selected timing resistors, to transistor Q3, and diodes D2 and D4 charges the timing capacitor positive. When the ramp reaches about +1.2 V, the current control signal switches to -1.8 V. Diodes D1 and D3 are then forward biased and diodes D7 and D8 are reverse biased. Current flows through transistor Q4, diodes D5 and D6 and the timing resistor reversing the charge on the timing capacitor. When the timing capacitor charges to about -1.2 V level, and the current control signal switches to repeat the cycle.

The triangle waveform is buffered by Q5, U5C and U5D then applied to the FUNCTION switches, the Sine-Wave Generator and the Square-Wave Generator. The amplitude of the triangle waveform at pin 10 of U5D is about 1 V. The Zero Adj potentiometer, R33, sets the triangle waveform equally above and below the 0 V level.

Square-Wave Generator

The Square-Wave Generator changes the triangle waveform into a square wave signal. The square-wave signal is applied to the TTL Conversion circuit, and to the FUNCTION switches for application to the output amplifier. A second signal (current control) sets the voltage level of the triangle waveform positive and negative ramps.

The triangle-wave signal is fed to differential comparator U5A and U5B through a voltage divider, R35 and R36, that divides the signal by two. The triangle wave is converted to a square wave by U5A and U5B and applied to differential comparators Q6 and Q7. The square wave from Q6 is fed to the FUNCTION switches,and to TTL Conversion circuit. The square wave signal is conditioned by diodes D32 through D35 before being applied to the Output Amplifier.

The square wave from Q7 provides positive feedback to U5B and a control signal to triangle wave disconnect diodes D1 through D8. The control signal switches the triangle waveform between the positive- and negative-going ramps. Transistor U5B sets the voltage level for the triangle wave positive and negative going ramps. The Upper and Lower Sine Dis Adj potentiometers R43 and R45 adjust the triangle waveform positive and negative going ramps by changing the duty factor of the current-control signal. The CURRENT CONTROL signal is fed back to the disconnect diodes (D1 through D8) of the Triangle-Wave Generator.

Sine-Wave Generator

The signal from the Triangle-Wave Generator is applied to the three sine shapers in the Sine-Wave Generator. Each sine shaper consists of four disconnect diodes that convert different portions of the triangle wave into a partial sinewave. The partial sine waves are summed together at the junction R60, R63, R66, R68, and R69 to form a complete sine wave. The sine wave is fed into operational amplifier U7 where it is conditioned and amplified before being applied to the FUNCTION switches. Potentiometer R74 sets the gain for U7.

Output Amplifier

The output amplifier circuit is a non-inverting amplifier that has a gain of about 10 (20 dB).

The waveform signal from the FUNCTION switches is applied to differential amplifier Q9 and Q10 through the AMPLITUDE control. The collector of Q10 controls the constant current source of Q11 and Q12. The constant current source of Q11 and Q12 drives current amplifier Q13 and Q14. Both Q13 and Q14 draw minimum current when the signal level to Q9 and Q10 is about 0V.

As the waveform signal goes positive, the emitter of Q9 draws current away from the emitter of Q10. Current that was drawn by Q10 is now being drawn by Q11. Transistor Q11 draws more current than Q12, causing an unbalance in the two current sources. The collector of Q11 goes positive turning Q14 off and Q13 on. The positive waveform signal is passed through Q13 to the OUTPUT MAIN connector and to the base of Q10, the inverting input of the differential amplifier Q9 and Q10.

When the waveform signal goes negative, Q10 draws more current than Q9. Transistor Q12 draws current away from Q11, placing a more negative voltage on the collector of Q11, turning Q13 off and Q14 on. The negative waveform signal is passed through Q14 to the OUTPUT MAIN connector and to the inverting input of the differential amplifier Q9 and Q10.

The feedback network to Q9 and Q10 consist of R87, C30, and C31. Potentiometer R82 presets the dc offset of the output amplifier to 0 V. When DC OFFSET is in PULL TO VARY position, a positive or negative dc offset can be added to the output level of the amplifier.

The waveform signal is applied directly to the OUTPUT connector or through the divide by 10 voltage divider of R98 and R99. The VOLTS OUT switch is a push-push type that selects 0-20 V p-p in Out position or 0-2 V p-p in In position.

TTL Conversion

The TTL Conversion circuit changes the square-wave signal to a TTL compatible signal. The circuit consists of U6, a dual positive-NAND gate.

The square wave from Q6 is applied to pins 1 and 9 of U6 through diodes D28, D29, and D30. The diodes D28 through D30 shift the dc level of the square wave from 1.8 V to 3.6 V. The NAND gates of U6 invert the square-wave signal being applied to the OUTPUT SYNC connector. The output voltage is 0 V to 4 V open circuit.

Sweep Generator

The Sweep Generator circuit provides a sawtooth waveform that is applied to the VCF circuit for frequency modulating (FM) the output waveforms.The Sweep circuit consists of integrator U9, transistor Q17, inverting buffer U10, and associated components.

At initial instrument turn on, the sweep circuit starts with U9A pin 2 being more negative than pin 3. The output voltage of U9A ramps up linearly due to the charging of C45. The charge rate of C45 is set by the SWEEP RATE control R106. The charging of C45 develops a linear positive voltage ramp at pin6 of U9B. When pin 6 becomes more positive (about 10 V) than pin 5 of U9B, the output of U9B goes LO. This LO turns on Q17 clamping pin 2 of U9A and pin 5 of U9B at about 0V, causing the output voltage of U9A to fall rapidly toward the negative supply level. This will lower the input voltage to pin 6 of U9B. When pin 6 becomes more negative then pin 5, the output of U9B goes HI turning off Q17. With Q17 turned off, pin 2 becomes more negative then pin 3 of U9A allowing the cycle to repeat again.

The sweep signal from the output of U9A is applied to unity gain Inverting Buffer U10. The output of U10 is applied to the SWEEP switch through SWEEP WIDTH control. The SWEEP WIDTH control selects the amplitude of the sawtooth signal to be applied to the input of VCF circuit through the SWEEP switch.

Power Supply

The power supply provides two unregulated supplies and three regulated supplies to operate the instrument.

POWER INPUT. The POWER switch applies line voltage through the LINE VOLTAGE SELECT switch to the primary side of the power transformer. POWER indicator connected between -15 V and ground indicates if the instrument is On or Off.

+30 V and -30 V. The dc outputs of the bridge rectifier D52 through D55 supplies the unregulated +30 V and -30 V. These two voltages are filtered by C41 and C43 and fed to the output amplifier and regulated supplies of +15 V, +5 V, and -15 V,

+15 V. The +15 V regulated output is provided from the +30 V supply input to a three-terminal voltage regulator. Transistors Q18 and Q19 monitors the the voltage drop across R118 and applies overload shutdown signal to pin 2 of Q15.

+5 V. The +5 V regulated supply is provided by the series-pass transistor Q8. Zener diode D31 sets the base voltage level for Q8.

-15 V. The -15 V regulated supply is provided by series-pass transistor Q16 and operational amplifier U8. The control voltage for Q16 is provided by U8 that monitors the voltage across the voltage divider of R102 and R103.

PERFORMANCE CHECK PROCEDURE

INTRODUCTION

This procedure checks the electrical characteristics listed in the Specification part of Section 1 of this manual. If the instrument fails to meet the requirements given in this performance check, the Calibration Procedure in Section 5 should be done. This performance check may also be used as an acceptance test or as a troubleshooting aid.

You do not have to remove the instrument case to do this procedure. All checks can be made with controls and connectors accessible from the outside.

To ensure instrument accuracy, check its performance after every 2000 hours of operation, or once each year if used infrequently. If these checks indicate a need for readjustment or repair, refer the instrument to a qualified service person.

TEST EQUIPMENT NEEDED

The test equipment listed in Table 4-1 is a complete list of the equipment needed for this performance check and the adjustment procedure in Section 5. All test equipment is assumed to be operating within tolerance. Detailed operating instructions for test equipment are not given in this procedure. If operating information is needed, refer to the appropriate test equipment instruction manual.

Table 4-1

Test Equipment Required

Item and Description	Minimum Specification	Purpose	Example of Applicable Test Equipment
1. Frequency Counter	Frequency: Dc to above 2 MHz. Accuracy: Within one part of 10^5 $\pm$ count.	Output waveform checks and adjustments, and VCF input check.	TEKTRONIX DC 504A
2. Variable dc Power Supply	Output: 0 V to 10 V.	Check VCF INPUT	TEKTRONIX CPS250
3. Distortion Analyzer	Frequency: 10 Hz to 100 Hz. Distortion resolution: < 1%.	Check sine wave distortion	TEKTRONIX AA 501A DISTORTION ANALYZER
4. Test Oscilloscope with 10X probe	Bandwidth: dc to 50 MHz. Minimum deflection factor: 5 mV/div Accuracy: $\pm$3%.	Gain and transient response checks.	Tektronix 2225 Oscilloscope
5. Adapter	BNC female to dual banana plug.	Single interconnections.	Tektronix Part Number 103-0090-00
6. Coaxial Cable (2 required)	Impedance: 50 Ω. Length: 36 in. Connectors: BNC	Signal interconnections.	Tektronix Part Number 012-0057-01
7. Termination	Impedance: 50 Ω. Connectors: BNC	Signal Termination.	Tektronix Part Number 011-0049-01
8. Alignment Tool	Length: 1-in shaft. Bit size: 3/32 in. Low Capacitance: insulated.	Adjust variable capacitors and resistors.	Tektronix Part Number 003-0675-00

PREPARATION

Connect the test equipment to an appropriate ac-power-input source and connect the CFG250 to a variable autotransformer that is set to 120 Vac. Apply power and allow 20 minutes for the instrument to warm up and stabilize.

Set the following controls for the instrument under test during warm-up time:

AMPLITUDE	MIN
DC OFFSET	Push in and midrange
DUTY	Push in and midrange
RANGE (Hz)	1K
FUNCTION	All buttons out
VOLTS OUT	0–20V P-P
INVERT	Button out
SWEEP	EXT
SWEEP RATE	Midrange
SWEEP WIDTH	Midrange
FREQUENCY	2.0

PROCEDURE

1. Check Dc Offset Range

a. Connect CFG250 MAIN OUTPUT connector to the test oscilloscope vertical input connector via a 50 Ω cable.

b. Set the test oscilloscope vertical deflection to 2 V per division and input coupling switch to GND position.

c. Vertically position the baseline trace to the bottom horizontal graticule line. Set the the input coupling switch to DC input.

d. Pull the DC OFFSET knob out and rotate the control clockwise to the + position.

e. CHECK—Baseline trace is positioned more than 5 divisions above the bottom horizontal graticule line.

f. Set the vertical input coupling switch to GND (0 V) and vertically position the baseline trace to the top horizontal graticule line. Set the the input coupling switch to DC input.

g. Rotate the DC OFFSET control counter-clockwise to the – position.

h. CHECK—Baseline trace is positioned more than 5 divisions below the top horizontal graticule line.

2. Check MAIN OUTPUT Amplitude

a. Set the test oscilloscope front-panel controls for free running sweep at 0.1 ms and calibrated vertical deflection of 20 mV per division.

b. Set:

DC OFFSET	Push in and midrange
FUNCTION	∿ button in

c. CHECK—Sine-wave amplitude into an open circuit for limits given in Table 4-2.

Table 4-2
Output Amplitude Into an Open Circuit

VOLTS OUT	AMPLITUDE Position	Test Oscilloscope Volts/Div Settings	Test Oscilloscope Display Amplitude
0-20V P-P	MIN	20 mV	≤ 5 divisions
	MAX	5 V	≥ 4 divisions
0-2V P-P	MIN	5 mV	≤ 2 divisions
	MAX	0.5 V	≥ 3.6 divisions

d. Disconnect the 50 Ω cable from the test oscilloscope and connect the 50 Ω termination to the end of the cable. Reconnect the 50 Ω cable to the test oscilloscope.

e. CHECK—Sine-wave amplitude for limits given in Table 4-3 using the 50 Ω termination.

f. Push the FUNCTION ⊓⊔ button in.

g. Repeat part e for square-wave amplitude.

Table 4-3
Output Amplitude
Into a 50 Ω Termination

VOLTS OUT	AMPLITUDE Position	Test Oscilloscope	
		Volts/Div Settings	Display Amplitude
0-20V P-P	MIN	10 mV	≤5 divisions
	MAX	2 V	≥4.5 divisions
0-2V P-P	MIN	5 mV	≤1 divisions
	MAX	0.2 V	≥4.5 divisions

3. **Check Square Wave Rise Time and Fall Time**

a. Set:

AMPLITUDE	MAX (fully clockwise)
DC OFFSET	Off (knob in and midrange)
VOLTS OUT	0-20V P-P
RANGE (Hz)	1M
FREQUENCY	1.0

b. Set the test oscilloscope vertical deflection to 1 V per division. Adjust the oscilloscope vertical variable control for a 5-division display. Set the sweep speed to 20-ns per division, and trigger to positive slope for a rise-time display. Ensure that the 50 Ω cable is terminated with the 50 Ω termination.

c. Vertically position the trace so that the zero reference of the waveform touches the 0% graticule line and the top of the waveform touches the 100% graticule line.

d. CHECK—The rise time is 100 ns or less between the 10% and 90% points of the square wave.

e. Set the test oscilloscope trigger to negative slope for a fall-time display. Reposition the waveform on the screen if necessary.

f. CHECK—The fall time is 100 ns or less between the 10% and 90% points of the square wave.

g. Disconnect the test equipment from the instrument. Return the test oscilloscope vertical variable control back to the calibrated detent.

4. **Check SYNC OUTPUT Amplitude**

a. Connect the instrument SYNC OUTPUT connector to the test oscilloscope vertical input connector via a 50 Ω cable and a 50 Ω termination.

b. Set the test oscilloscope vertical deflection to 0.2 V per division.

c. CHECK—Display amplitude is 5-divisions (1 V) or greater.

5. **Check SYNC OUTPUT Rise Time**

a. Set the test oscilloscope vertical deflection and variable control for an exact 5-division display. Set the sweep speed to 10-ns per division.

b. Set the test oscilloscope trigger to positive slope for a rise-time display.

c. Vertically position the trace so that the zero reference of the waveform touches the 0% graticule line and the top of the waveform touches the 100% graticule line.

d. CHECK—The rise time is 25 ns or less between the 10% and 90% points of the TTL sync pulse.

e. Disconnect the test equipment from the instrument.

6. **Check Output Frequency Accuracy**

a. Set:

AMPLITUDE	MAX (fully clockwise)
DC OFFSET	Off (knob in and midrange)
VOLTS OUT	0-20V P-P

b. Connect CFG250 OUTPUT connector to the frequency counter via a 50 Ω cable and a 50 Ω termination.

c. CHECK—Output frequencies at 0.2 and 2.0 on the FREQUENCY control for all RANGE (Hz) settings as given in Table 4-4.

Table 4-4
Accuracy of Output Frequency

RANGE (Hz)	Test Oscilloscope	
	0.2	2.0
1 M	100 KHz to 300 kHz	1.9 MHz to 2.1 MHz
100 K	10 kHz to 30 kHz	190 kHz to 210 kHz
10 K	1.0 kHz to 3.0 kHz	19 kHz to 21 kHz
1 K	100 Hz to 300 Hz	1.9 kHz to 2.1 kHz
100	10 Hz to 30 Hz	190 Hz to 210 Hz
10	1.0 Hz to 3.0 Hz	19 Hz to 21 Hz
1	0.10 Hz to 0.30 Hz	1.9 Hz to 2.1 Hz

7. Check External Voltage Controlled Sweep Range

a. Set:

RANGE (Hz)	1K
FUNCTION	∿ button in
SWEEP	EXT
FREQUENCY	2.0

b. Adjust the 0-20 V power supply to be connected to the instrument VCF connector for 0 volts out.

c. Connect the instrument SYNC OUTPUT connector to the test oscilloscope vertical input connector via a 50 Ω cable and a 50 Ω termination.

d. Connect the 0-20 V power supply to the instrument VCF INPUT connector via BNC female to dual banana adapter and a 50 W cable. Ensure the ground side of the BNC female to dual banana connector adapter goes to the - binding post of the power supply.

e. Increase the output voltage of the the 0-20 V power supply until the output frequency of the instrument decreases to 20 Hz as read on the frequency counter.

f. CHECK—The output voltage of the 0-20 V power supply is less than +10 V.

g. Disconnect the test equipment from the instrument.

8. Check Sine-Wave Distortion

a. Connect CFG250 OUTPUT connector to the distortion analyzer via a 50 Ω cable and a 50 Ω termination.

b. CHECK—For less than 1% distortion for frequencies given in Table 4-5.

Table 4-5
Sine-Wave Distortion

RANGE (Hz)	FREQUENCY Control Setting	Distortion Analyzer Frequency	Percent Distortion
100 K	1.0	100 kHz	< 1%
10 K	2.0	20 kHz	< 1%
1 K	2.0	2 kHz	< 1%
100	2.0	200 Hz	< 1%
10	2.0	20 Hz	< 1%

c. Disconnect the test equipment from the instrument.

ADJUSTMENT PROCEDURE

To ensure instrument accuracy, this Adjustment Procedure should be done every 2000 hours of operation or at least once each year if used infrequently.

PREPARATION FOR ADJUSTMENT

Make the adjustments in this procedure at an ambient temperature of +21°C to +25°C (+69.8°F to +77°F) and a relative humidity of 75% or less.

It is necessary to remove the top cover from the instrument to gain access to the adjustments located on the component side of the Main circuit board. Disconnect the power cord from the CFG250 and follow the top case and side panels removal instructions in the Maintenance section of this manual.

Test equipment needed for these adjustments is described in Table 4-1 at the beginning of the Performance Check Procedure. Refer to the appropriate test equipment instruction manuals for test equipment operating information.

Connect the test equipment to an appropriate ac-power-input source and connect the CFG250 to a variable autotransformer that is set to 120 Vac. Apply power and allow 20 minutes for the instrument to warm up and stabilize.

Set the following controls for the instrument under test during warm-up time:

AMPLITUDE	MIN (fully counterclockwise)
DC OFFSET	Push in and midrange
DUTY	Push in and midrange
RANGE (Hz)	1K
FUNCTION	All buttons out
VOLTS OUT	0-20V P-P
INVERT	Button out
SWEEP	EXT
SWEEP RATE	Midrange
SWEEP WIDTH	Midrange
FREQUENCY	2.0

PROCEDURE

1. Adjust Triangle DC Level (R46)

a. Connect the test oscilloscope and its 10X probe tip to the gate of Q5 and the probe common lead to the instrument chassis ground.

b. Set the test oscilloscope vertical deflection to 50 mV per division and horizontal deflection to 0.5 ms per division.

c. Set the test oscilloscope vertical input coupling switch to GND (0 V) and vertically center the baseline trace on the center horizontal graticule line.

d. Set the test oscilloscope vertical input coupling switch to DC.

e. ADJUST—Zero Adj (R33) to center the display equally above and below the center horizontal graticule line.

f. Disconnect the test equipment from the instrument.

2. Adjust Internal Dc Offset (R82)

a. Connect CFG250 OUTPUT connector via a 50 Ω cable to vertical input of the test oscilloscope.

b. Set the test oscilloscope vertical deflection factor to 10 mV per division and input coupling switch to GND (0 V). Vertically center the baseline trace on the center horizontal graticule line.

c. Set the test oscilloscope vertical input coupling switch to DC.

d. ADJUST—The Int Offset Adj (R82) to vertically center the baseline trace exactly on the center horizontal graticule line.

3. Check Dc Offset Range

a. Set the test oscilloscope vertical deflection to 2 V per division and input coupling switch to GND position.

b. Vertically position the baseline trace to the bottom horizontal graticule line. Set the the input coupling switch to DC input.

c. Pull the DC OFFSET knob out and rotate the control clockwise to the + position.

d. CHECK—Baseline trace is positioned more than 5 divisions above the bottom horizontal graticule line.

e. Set the vertical input coupling switch to GND (0 V) and vertically position the baseline trace to the top horizontal graticule line. Set the the input coupling switch to DC input.

f. Rotate the DC OFFSET control counterclockwise to the − position.

g. CHECK—Baseline trace is positioned more than 5 divisions below the top horizontal graticule line.

4. Adjust Square Wave Amplitude (R56)

a. Set the test oscilloscope front-panel controls for free running sweep at 0.1 ms and calibrated vertical deflection of 5 V per division.

b. Set:

AMPLITUDE	MAX (fully clockwise)
DC OFFSET	Push in and midrange
FUNCTION	⎍⎍ button in

c. ADJUST—Sq Amp Adj (R56) for a amplitude of 4-division display (20 V).

5. Adjust Sine Wave Amplitude (R74)

a. Push the FUNCTION ∿ button in.

b. ADJUST—Sine Amp Adj (R74) for a amplitude of 4-division display (20 V).

6. Check MAIN OUTPUT Amplitude

a. CHECK—Sine wave display amplitude into an open circuit for limits given in Table 5-1.

Table 5-1
Output Amplitude Into an Open Circuit

VOLTS OUT	AMPLITUDE Position	Test Oscilloscope Volts/Div Settings	Test Oscilloscope Display Amplitude
0-20V P-P	MIN	20 mV	≤ 5 divisions
	MAX	5 V	≥ 4 divisions
0-2V P-P	MIN	5 mV	≤ 2 divisions
	MAX	0.5 V	≥ 3.6 divisions

b. Disconnect the 50 Ω cable from the test oscilloscope and connect the 50 Ω termination to the end of the cable. Reconnect the 50 Ω cable to the test oscilloscope.

c. CHECK—Sine-wave amplitude for limits given in Table 5-2 using the 50 Ω termination.

Table 5-2
Output Amplitude Into a 50 Ω Termination

VOLTS OUT	AMPLITUDE Position	Test Oscilloscope Volts/Div Settings	Test Oscilloscope Display Amplitude
0-20V P-P	MIN	10 mV	≤ 5 divisions
	MAX	2 V	≥ 5 divisions
0-2V P-P	MIN	5 mV	≤ 1 divisions
	MAX	0.2 V	≥ 4.5 divisions

d. Push the FUNCTION ⎍⎍ button in.

e. Repeat part c for square wave amplitude.

7. Adjust Sine-Wave Distortion (R43 and R46)

a. Set:

AMPLITUDE	MAX (fully clockwise)
RANGE (Hz)	10
VOLTS OUT	0-20V P-P
FUNCTION	∿ button in

b. Connect CFG250 OUTPUT connector to the distortion analyzer via a 50 Ω cable and a 50 Ω termination.

c. Connect CFG250 OUTPUT connector via a 50 Ω cable and a 50 Ω termination to the distortion analyzer input connectors.

d. ADJUST—Upper Sine Dis Adj (R43) and Lower Sine Dis Adj (R46) for less than 0.5% of distortion as read by the distortion analyzer.

e. CHECK—For less than 1% distortion for frequencies given in Table 5-3.

Table 5-3
2.0 Sine-Wave Distortion

RANGE (Hz)	FREQUENCY Control Setting	Distortion Analyzer Frequency	Percent Distortion
100K	2.0	200 kHz	< 1%
10K	2.0	20 kHz	< 1%
1K	2.0	2 kHz	< 1%
100	2.0	200 Hz	< 1%
10	2.0	20 Hz	< 1%

8. Adjust VCF Input (R10 and R18)

a. Set:

AMPLITUDE	MAX (fully clockwise)
RANGE (Hz)	100
FREQUENCY	0.2

b. Connect the digital multimeter common lead to the chassis and the positive lead to pin 3 of U1. Note the multimeter reading for use in part d.

c. Move the positive lead from pin 3 to pin 2 of U1.

d. ADJUST—Sym Adj (R10) so that the multimeter reading is the same as in part b.

e. Disconnect the multimeter from the instrument.

f. ADJUST—Sym Adj (R18) for less than 0.5% of distortion as read by the distortion analyzer.

g. CHECK—For less than 1% distortion for frequencies given in Table 5-4.

Table 5-4
0.2 Sine-Wave Distortion

RANGE (Hz)	FREQUENCY Control Setting	Distortion Analyzer Frequency	Percent Distortion
100K	0.2	20 kHz	< 1%
10K	0.2	2 kHz	< 1%
1K	0.2	200 kHz	< 1%
100	0.2	20 Hz	< 1%

9. Adjust Frequency Accuracy (R6)

a. Set:

RANGE (Hz)	100K
FUNCTION	⩘ button in
FREQUENCY	2.0

b. Connect CFG250 OUTPUT connector to the frequency counter via a 50 Ω cable and a 50 Ω termination.

c. ADJUST—Hi Freq Adj (R6) for a frequency counter reading between 190 kHz and 210 kHz.

d. CHECK—Output frequencies at 0.2 and 2.0 on the FREQUENCY control for RANGE (Hz) settings between 100K and 1 as given in Table 5-5.

Table 5-5
Accuracy of Frequency Ranges from 100K to 1

RANGE (Hz)	FREQUENCY Control	
	0.2	2.0
100K	10 kHz to 30 kHz	190 kHz to 210 kHz
10K	1.0 kHz to 3.0 kHz	19 kHz to 21 kHz
1K	100 Hz to 300 Hz	1.9 kHz to 2.1 kHz
100	10 Hz to 30 Hz	190 Hz to 210 Hz
10	1.0 Hz to 3.0 Hz	19 Hz to 21 Hz
1	0.10 Hz to 0.30 Hz	1.9 Hz to 2.1 Hz

e. Repeat parts c and d for all 2.0 FREQUENCY control settings as necessary.

10. Adjust 1 MHz Range Frequency (C8)

a. Set:

AMPLITUDE	MAX (fully clockwise)
RANGE (Hz)	1M
FREQUENCY	2.0

b. ADJUST—1 MHz Range Freq Adj (C8) for a frequency counter reading of between 1.9 MHz and 2.1 MHz.

c. Rotate the FREQUENCY control to 0.2 position.

d. CHECK—The frequency counter reads between 100 kHz and 300 kHz.

e. Repeat parts a to d as necessary.

f. Disconnect the test equipment from the instrument.

11. Adjust Square Wave Rise Time and Fall Time (C31)

a. Set:

AMPLITUDE	MAX (fully clockwise)
RANGE (Hz)	1M
FUNCTION	⊓⊔⊓ button in
FREQUENCY	1.0

b. Connect CFG250 OUTPUT connector via a 50 Ω cable and a 50 Ω termination to vertical input of the test oscilloscope.

c. Set the test oscilloscope vertical deflection to 1 V per division. Adjust the vertical variable control for a 5-division display and set the sweep speed to 20-ns per division.

d. Set the test oscilloscope trigger to positive slope for a rise-time display.

e. Vertically position the trace so that the zero reference of the waveform touches the 0% graticule line and the top of the waveform touches the 100% graticule line.

f. ADJUST—2MHz Sq TRTF Adj (C31) for a square wave rise time of less than 100 ns.

g. Set the test oscilloscope trigger to negative slope for a fall-time display. Reposition the waveform on the screen if necessary.

h. CHECK—Square wave fall time is less than 100 ns.

i. Repeat parts d through i until square wave rise time and fall time is less than 100 ns.

j. Disconnect the test equipment from the instrument.

12. Check SYNC OUTPUT Amplitude

a. Connect the instrument SYNC OUTPUT connector to the test oscilloscope vertical input connector via a 50 Ω cable and a 50 Ω termination.

b. Set the test oscilloscope vertical deflection to 0.2 V per division.

c. CHECK—Display amplitude is 5-divisions or greater.

13. Check SYNC OUTPUT Rise Time

a. Set the test oscilloscope vertical deflection and variable control for an exact 5-division display. Set the sweep speed to 10-ns per division.

b. Set the test oscilloscope trigger to positive slope for a rise-time display.

c. Vertically position the trace so that the zero reference of the waveform touches the 0%

graticule line and the top of the waveform touches the 100% graticule line.

d. CHECK—The rise time is 25 ns or less between the 10% and 90% points of the TTL sync pulse.

e. Disconnect the test equipment from the instrument.

14. Check External Voltage Controlled Sweep Range

a. Set:

RANGE (Hz)	1K
FUNCTION	∿ button in
SWEEP	EXT
FREQUENCY	2.0

b. Connect CFG250 OUTPUT connector to the frequency counter via a 50 Ω cable and a 50 Ω termination.

c. Adjust the 0–20 V power supply to be connected to the instrument VCF connector for 0 volts out.

d. Connect the 0–20 V power supply to the instrument VCF INPUT connector via BNC female to dual banana adapter and a 50 Ω cable. Ensure the ground side of the BNC female to dual banana connector adapter goes to the – binding post of the power supply.

e. Increase the output voltage of the the 0–20 V power supply until the output frequency of the instrument decreases to 20 Hz as read on the frequency counter.

f. CHECK—The output voltage of the 0–20 V power supply is less than +10 V.

g. Disconnect the test equipment from the instrument.

CFG250 TROUBLESHOOTING TIPS

NOTE

Check resistors with an ohmmeter. Refer to the Replaceable Parts list for the tolerances of resistors used in this instrument. Refer to the parts list or schematic for component values. Also refer to Troubleshooting Techniques in this section for more detailed troubleshooting methods. Voltages given in troubleshooting Tips procedure are not absolute and may vary between instruments.

No Output Waveforms

1. Check that the power cord is connected to a suitable ac-power source.
2. Check LINE VOLTAGE SELECT switches are set to correct line voltage.
3. Check line fuse FS3 for open.
4. Check for correct initial front panel control settings.
5. Check the power supply for the following voltages:
   a. Check for unregulated +30 V at the cathodes of D53 and D55.
   b. Check for +15 V at the mounting screw of Q15.
   c. Check for +5 V at pin 14 of U6.
   d. Check for −15 V at pin 4 of U2.
   e. Check for unregulated −30 V at the mounting screw of Q16.
6. Check for waveforms at the junction R95, R96, and R98.
7. Check dc offset is set at 0 V.
8. Check at the base of Q9 for waveforms.
9. Check AMPLITUDE control and FUNCTION switches for continuity.

No Triangle Wave Output

1. Check pin 10 of U5 for a 1 V p–p triangle wave.
2. Check Q5 gate for about 2.4 V p–p triangle wave.
3. Check RANGE (Hz) switches for proper operation.
4. Rotate the FREQUENCY control from 2.0 to 0.2 and check for the following voltage changes.
   a. Dc voltage level at pins 3 and 6 of U3 varies from +7.4 V to +14 V.
   b. Dc voltage level at pins 3 and 6 of U4 varies from −7.4 V to −14 V.
   c. Dc voltage level at pin 6 of U1 varies from +1.8 V to +0.67 V.
   d. Dc voltage level at pin 6 of U2 varies from −1.8 V to −0.67 V.
5. Set the FREQUENCY control to 0.2. Check that the voltage levels at pins 2 of U1 and U2 are the same.
6. Check the center tap of the FREQUENCY control for a voltage change from −1.8 V to 0 V.

No Sine Wave Output

1. Check pin 12 of U7 for a 2 V p–p sine wave.
2. Check for sine wave at the junction of R68 and R69.
3. Check for defective diodes D36 through D47.
4. Check Sine-Wave Generator side of R57 for triangle wave.

No Square Wave Output

1. Check for 2 V p–p square wave at the FUNCTION switches side of R56.
2. Check collectors of Q6 and Q7 for 2 V p–p square wave.
3. Check pin 4 of U5 for 0.5 V p–p square wave.
4. Check pins 1 and 5 of U5 for 0.3 V p–p square wave.
5. Check pin 10 of U5 for 1 V p–p triangle wave.

No Sweep Function Output

1. Check for sawtooth signal at R1.
2. Check pin 6 of U10 for sawtooth signal from +1.2 V to −10 V.
3. Check pin 1 of U9 for a sawtooth signal from +10 V to −1.2 V.
4. Check pin 5 of U9 for +10 V square pulse.
5. Check resistors R105 through R108 for correct values.

CAUTION

Excessive heat can cause the etched circuit conductors to separate from the circuit board. Never allow the solder extractor tip to remain at one place on the board for more than three seconds. Solder wick, spring-actuated or squeeze-bulb solder suckers, and heat blocks (for desoldering multipin components) must not be used. Damage caused by poor soldering techniques can void the instrument warranty.

3. Bend the leads of the replacement component to fit the holes in the circuit board. If the component is replaced while the board is installed in the instrument, cut the leads so they protrude only a small amount through the reverse side of the circuit board. Excess lead length may cause shorting to other conductive parts.

4. Insert the leads into the holes of the board so that the replacement component is positioned the same as the original component. Most components should be firmly seated against the circuit board.

5. Touch the soldering iron tip to the connection and apply enough solder to make a firm solder joint. Do not move the component while the solder hardens.

6. Cut off any excess lead protruding through the circuit board (if not clipped to the correct length in step 3).

7. Clean the area around the solder connection with an approved flux-removing solvent. Be careful not to remove any of the printed information from the circuit board.

REMOVAL AND REPLACEMENT INSTRUCTIONS

WARNING

To avoid electrical shock, disconnect the instrument from the power input source before removing or replacing any component or assembly.

The exploded-view drawings in the Replaceable Parts list may be helpful during removal and replacement procedure. Component locations are shown in the Diagram section.

Read these instructions before attempting to remove or install any assemblies or components.

Cabinet Assembly

The removal procedure for the cabinet assembly is divided into two parts. the first part removes the top cabinet for servicing the top portion of the instrument. The second part describe how to remove the bottom cabinet from the instrument.

To remove the Cabinet Assembly from the instrument perform the following procedure:

1. Unplug the power cord from its rear panel connector.

2. Place the instrument upside down on a clean, flat surface.

NOTE

Do not remove the two front rubber pads from the bottom cabinet.

3. Remove the four cabinet-securing screws from the bottom of the instrument. The two front screws are located between the two front feet and the edge of the bottom cabinet. The two rear screws secure the rear rubber pads to the bottom cabinet. Remove the rear pads that are loose and save for reinstallation.

WARNING

Potentially dangerous voltages exist at several points throughout this instrument. If it is operated with the covers removed, do not touch exposed connections or components. Before replacing parts, disconnect the ac-power source from the instrument.

4. Remove the bottom cabinet and handle from the instrument.

NOTE

Removal of the bottom cabinet and handle will access the component side of the circuit boards and internal adjustments (see the Adjustment Procedure in section 5).

5. Remove four support posts (one at each corner) and one screw (middle of the Main board) near the rear-panel mounted transformer securing the Main board to the top cabinet.

6. Remove Rear-Panel and Front-Panel Assemblies from the slots in the top cabinet.

7. Remove the top cabinet from the instrument.

To reinstall the Cabinet Assembly, perform the reverse of the preceding steps.

Front-Panel Assembly

The Front-Panel Assembly can be removed and reinstalled a follows:

1. Perform the Cabinet Assembly removal procedure steps 1 through 7.

2. Disconnect the following connectors from the Main board, noting their locations for reinstallation reference:

   a. J1, a three-wire connector located at the left edge of the Main board.

   b. J2, a six-wire connector located at the left edge of the Main board.

   c. J3, a three-wire connector located at the left side of the Main board.

   d. J4, a two-wire connector located at the right side of the Main board.

   e. J5, a four-wire connector located at the right side of the Main board.

3. Remove two screws securing the POWER switch to the Front-Panel Assembly. Pull the Power switch button out of the Front-Panel Assembly hole.

4. Remove the screw securing the ground lug and ground wire to the Front-Panel Assembly ground post.

5. Disconnect the left-center connector (three wires) from the Switch board.

NOTE

The left-center connector is part of the Main board assembly. Remove the tiedown strap that secures the left-center connector wires to the Front-Panel assembly wiring harness.

6. Remove the left-center connector wires from the Front-Panel assembly wiring harness.

7. Unsolder the two coaxial cables from the right-rear sides of the Main board to the six-wire connector on the Switch board.

8. Remove the Front-Panel Assembly away from the Main Assembly.

To reinstall the Front-Panel Assembly, perform the reverse of the preceding steps.

Switch Board

The Switch Board Assembly can be removed and reinstalled a follows:

1. Perform the Cabinet Assembly removal procedure steps 1 through 4.

2. Remove all four connectors from the Switch board, noting their location for reinstallation reference.

3. Unsolder the wire from G11 solder pad at the left rear corner of the Switch board.

4. Remove the two top screws that secures the Switch board to the Front-Panel Assembly. Remove the Switch board from the instrument.

To reinstall the Switch Board Assembly, perform the reverse of the preceding steps.

Rear-Panel Assembly

The Front-Panel Assembly can be removed and reinstalled a follows:

1. Perform the Cabinet Assembly removal procedure steps 1 through 6.

2. Perform the Front-Panel Assembly removal procedure steps 3 and 4.

3. Disconnect J6, six-wire connector located at the middle of the Main board near fuses FS1 and FS2.

4. Unsolder two wires from VCF INPUT connector at the G9 and ground pads on the Main board.

5. Unsolder the green wire from the Rear Assembly ground lug at the ground pad on the Main board. The ground pad is located on the right side of the Main board near the power transformer.

6. Remove the Rear-Panel Assembly away from the Main Assembly.

To reinstall the Rear-Panel Assembly, perform the reverse of the preceding steps.

Main Board

The Main Board Assembly can be removed and reinstalled a follows:

1. Perform the Cabinet Assembly removal procedure steps 1 through 6.

2. Perform the Front-Panel Assembly removal procedure steps 1 through 8.

3. Perform the Rear-Panel Assembly removal procedure steps 1 through 6.

To reinstall the Main Board, perform the reverse of the preceding steps.

NOTE

When replacing assemblies in the instrument replace any tiedown straps that was clipped during disassembly.

OPTIONS

INTERNATIONAL POWER CORDS

Instruments are shipped with the detachable power cord option ordered by the customer. Descriptive information about international power cord options is given in Section 2. The following list describes the power cords available for this instrument.

Standard	North American, 120 V
Option A1	Universal Euro, 220 V
Option A2	UK, 240 V
Option A3	Australian, 240 V
Option A4	North American, 240 V
Option A5	Switzerland, 220 V

REPLACEABLE 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.

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.

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
**** END ATTACHING PARTS ****
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
**** END ATTACHING PARTS ****
Parts of Detail Part
Attaching parts for Parts of Detail Part
**** END ATTACHING PARTS ****

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.

ABBREVIATIONS

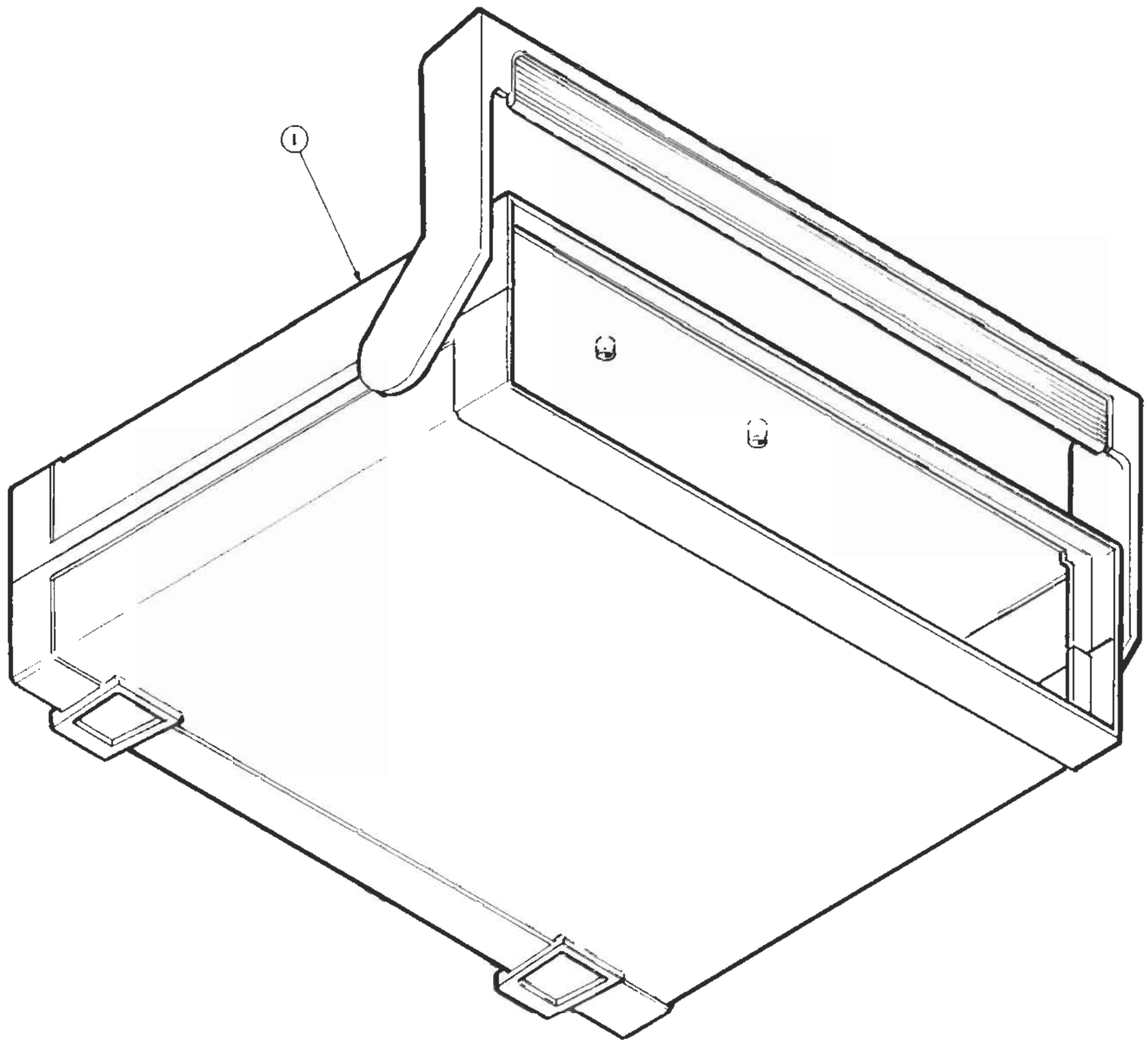
	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED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

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
	ESCORT	2ND FLOOR NO.37 POA HSIN RD SHIN TIEN	TAI PEI, TAIWAN
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97707-0001

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	118-7936-00			1	CABINET ASSY:	80009	118-7936-00
					CASE,TOP: (QTY. 1)		15-25585-6
					.WTIH SHIELDING FOIL ATTACHED		11-25005-1
					CASE,BOTTOM: (QTY. 1)		15-25585-6A
					HANDLE: (QTY. 1)		15-25598-4
					FOOT,FRONT: (QTY. 2)		16-25593-5
					SCREW,PLASTIC; (QTY. 2)		15-25047-1
					POST,INSERT: (QTY. 4)		3-25595-1
					FOOT,REAR:BLACK (QTY. 2)(348-1105-00)		16-25593-6

FIG. 1 CABINET



CFG250

FIG. 2 CABINET

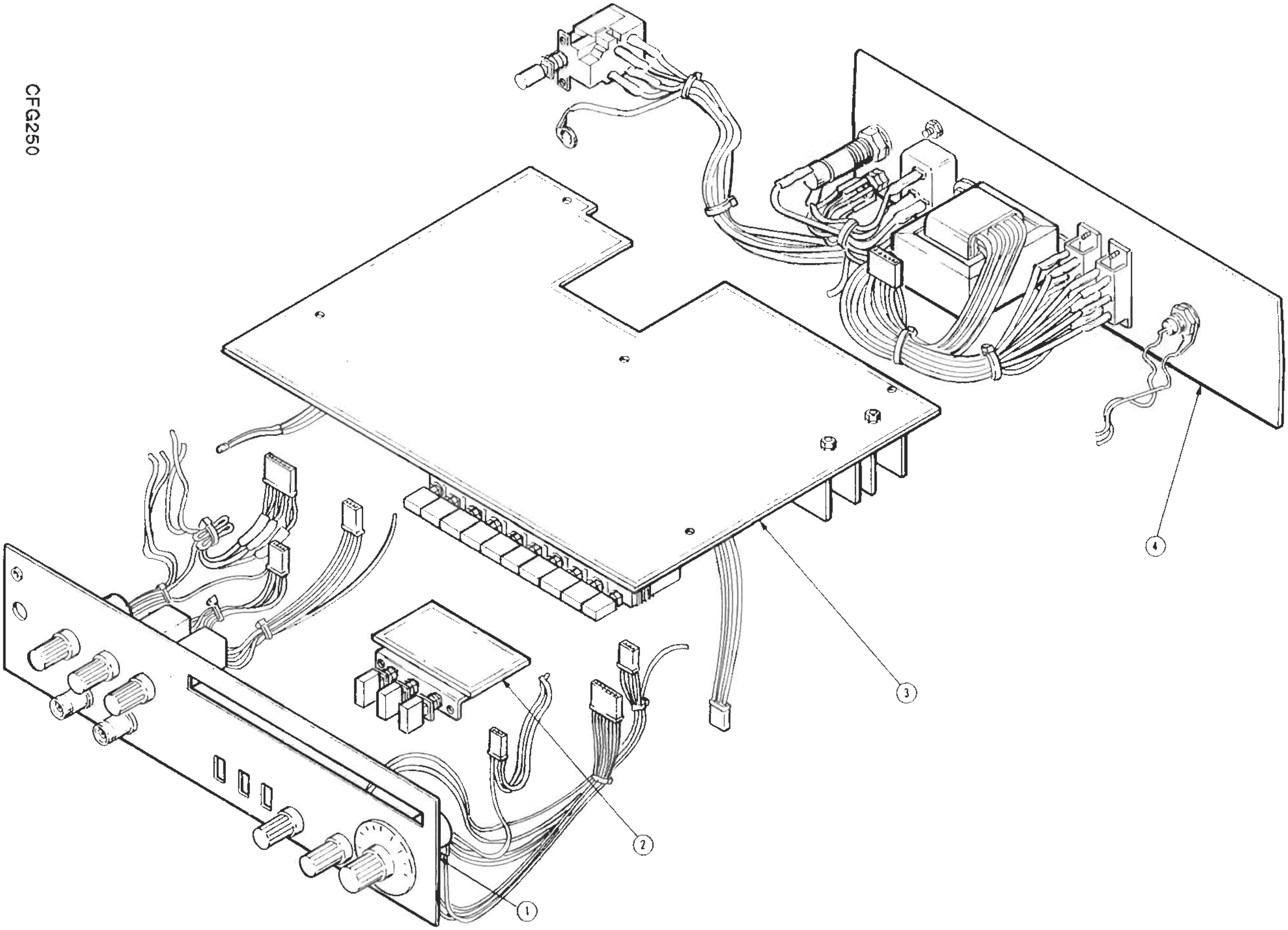


Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Serial/Assembly No. Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-1	118-7937-00			1	FRONT PNL ASSY:	80009	118-7937-00
					FRONT PANEL: (QTY. 1)		1-25002-4
					CFG250 OVERLAY: (QTY. 1)		24-25107-1
					HOLDER,LED: (QTY. 1)		15-25489-1
					SOCKET,BNC:W/NUT (QTY. 3)		30-25437-1
					SWITCH,PUSH:10 POLE,INTERLOCK (QTY. 1)		80-25588-2
					BUTTON:GY,RECTANGULAR(QTY. 10)(134-0211-00)		15-25426-5
					KNOB:DOVE GRAY,94HB (QTY. 5)(366-0701-00)		15-25713-4
					KNOB:DOVE GRAY,94HB (QTY. 1)		15A-25717-3
-2	118-7940-00			1	CIRCUIT BD ASSY:SWITCH	80009	118-7940-00
					CIRCUIT BD ASSY:SWITCH (QTY. 1)		25-25020-1A
					SOCKET:3 POSITION (QTY. 2)		30-2210T-4
					SOCKET:4 POSITION (QTY. 1)		30-2210T-2
					SOCKET:6 POSITION (QTY. 1)		30-2210T-3U
					WAFER:3 POSITION (QTY. 2)		30-25663-3
					WAFER:4 POSITION (QTY. 1)		30-25663-4
					WAFER:6 POSITION (QTY. 1)		30-25663-6
					SWITCH,PUSH:3 POLE,PUSH-PUSH (QTY. 1)		80-25598-1
					PIN:2.4 (QTY. 1)		30-25628-4
					BUTTON:GY,RECTANGULAR(QTY. 3)(134-0211-00)		15-25426-5
-3	118-7939-00			1	CIRCUIT BD ASSY:MAIN	80009	118-7939-00
					CAPACITOR:10UF,+80/-20%,25V (C20,21,33,34, 37,38,50)		31-106Z25-2
					CAP:220UF,+80/-20%,35V (C19,46,48,97,100)		31-227Z35-2
					CAPACITOR:1000UF,+80/-20%,35V (C41,43)		31-108Z35-2
					CAPACITOR:100PF,5%,500V (C2,3)		31-101J500-3
					CAPACITOR:0.01UF,10%,100V (C23,24,39,40, 40,44,47,49)		31-103K100-3
					CAPACITOR:0.047UF,+80/-20%,50V (C1,4,18,22,35,36)		31-473Z50-3
					CAPACIATOR:100UF (C15)		
					CAPACITOR:1.5PF,+/-0.25PF,50V (C30)		31-1R5Y50-3N
					CAPACITOR:5PF,+/-0.25PF,50V (C28,26)		31-5R0Y50-3N
					CAPACITOR:22PF,10%,50V (C25)		31-220K50-3N
					CAPACITOR:29PF,10%,50V (C27,29)		31-390K50-3N
					CAPACITOR:56PF,10%,50V (C16)		31-560K50-3N
					CAPACITOR:68PF,10%,50V (C7)		31-680K50-3N
					CAPACITOR:0.01UF,2%,630V (C10)		31-103G630-4M
					CAPACITOR:0.1UF,2%,100V (C11)		31-104G100-4M
					CAPACITOR:0.33UF,10%,100V (C45)		31-334K100-4M
					CAPACITOR:1.0UF,2%,250V (C12)		31-105G250-4M
					CAPACITOR:10UF,10%,25V (C17)		31-106K25-6
					CAPACITOR:0.001UF,2%,50V (C9)		31-102G50-8
					TRIMMER:2-8PF (C31)		32-25559-1
					TRIMMER:6-70PF (C8)		32-25401-1
					RESISTOR:15 OHM,5%,1W (R93,94)		33-150J1-5
					RESISTOR:47 OHM,5%,2W (R97,100)		33-470J2-5
					RESISTOR:51 OHM,5%,1/2W (R99)		33-510J2T-3
					RESISTOR:100 OHM,5%,1W (R95,96)		33-101J1-5
					RESISTOR:470 OHM,5%,1/2W (R98)		33-471J2T-3
					RESISTOR:49.9 OHM,1%,1/8W (R57)		33-49R9F8T-6DT
					RESISTOR:63.4 OHM,1%,1/8W (R69)		33-63R4F8T-6DT
					RESISTOR:127 OHM,1%,1/8W (R66)		33-1270F8T-6DT
					RESISTOR:162 OHM,1%,1/8W (R79)		33-1620F8T-6DT
					RESISTOR:200 OHM,1%,1/8W (R63)		33-2000F8T-6DT
					RESISTOR:309 OHM,1%,1/8W (R60)		33-3090F8T-6DT
					RESISTOR:316 OHM,1%,1/8W (R88)		33-3160F8T-6DT
					RESISTOR:348 OHM,1%,1/8W (R23,28)		33-3480F8T-6DT
					RESISTOR:499 OHM,1%,1/8W (R42)		33-4990F8T-6DT
					RESISTOR:1K OHM,1%,1/8W (R12,14,35,36,119)		33-1001F8T-6DT
					RESISTOR:2K OHM,1%,1/8W (R39,78)		33-2001F8T-6DT
					RESISTOR:2.26K OHM,1%,1/8W (R86)		33-2261F8T-6DT
					RESISTOR:3.01K OHM,1%,1/8W (R11,19)		33-3011F8T-6DT
					RESISTOR:4.02K OHM,1%,1/8W (R37,38)		33-4021F8T-6DT
					RESISTOR:4.99K OHM,1%,1/8W (R21,26)		33-4991F8T-6DT
					RESISTOR:7.15K OHM,1%,1/8W (R22,27)		33-7151F8T-6DT
					RESISTOR:7.5K OHM,1%,1/8W (R52)		33-7501F8T-6DT
					RESISTOR:10K OHM,1%,1/8W (R41,58)		33-1002F8T-6DT
					RESISTOR:10.5K OHM,1%,1/8W (R54,55)		33-1052F8T-6DT

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-					RESISTOR:11K OHM,1%,1/8W (R102,103)		33-1102F8T-6DT
					RESISTOR:11.3K,1%,1/8W (R59)		33-1132F8T-6DT
					RESISTOR:12.1K,1%,1/8W (R61,62)		33-1212F8T-6DT
					RESISTOR:13K,1%,1/8W (R44,45)		33-1302F8T-6DT
					RESISTOR:18.2K,1%,1/8W (R87)		33-1822F8T-6DT
					RESISTOR:24.9K,1%,1/8W (R64,65)		33-2492F8T-6DT
					RESISTOR:30.1K,1%,1/8W (R40)		33-3012F8T-6DT
					RESISTOR:33.2K,1%,1/8W (R9)		33-3322F8T-6DT
					RESISTOR:49.9K,1%,1/8W (R17)		33-4992F8T-6DT
					RESISTOR:75K,1%,1/8W (R24,29)		33-7502F8T-6DT
					RESISTOR:100K,1%,1/8W (R2,5,8,13,15,16)		33-1003F8T-6DT
					RESISTOR:750K,1%,1/8W (R25,30)		33-7503F8T-6DT
					RESISTOR:0 OHM,5%,1/8W (R118)		33-000J8T-7
					RESISTOR:47 OHM,5%,1/8W (R121)		33-470J8T-7
					RESISTOR:51 OHM,5%,1/8W (R53,107)		33-510J8T-7
					RESISTOR:100 OHM,5%,1/8W (R89)		33-101J8T-7
					RESISTOR:150 OHM,5%,1/8W (R73)		33-151J8T-7
					RESISTOR:220 OHM,5%,1/8W (R50)		33-221J8T-7
					RESISTOR:240 OHM,5%,1/8W (R117)		33-241J8T-7
					RESISTOR:470 OHM,5%,1/8W (R32)		33-471J8T-7
					RESISTOR:680 OHM,5%,1/8W (R72)		33-681J8T-7
					RESISTOR:910 OHM,5%,1/8W (R47)		33-911J8T-7
					RESISTOR:1K,5%,1/8W (R31,68,70,76)		33-102J8T-7
					RESISTOR:1.2K,5%,1/8W (R51,80)		33-122J8T-7
					RESISTOR:1.5K,5%,1/8W (R104)		33-152J8T-7
					RESISTOR:2.2K,5%,1/8W (R101)		33-222J8T-7
					RESISTOR:2.7K,5%,1/8W (R34,48,49,116)		33-272J8T-7
					RESISTOR:3K,5%,1/8W (R90,92)		33-302J8T-7
					RESISTOR:4.7K,5%,1/8W (R81)		33-472J8T-7
					RES:5.1K,5%,1/8W (R71,83,105,109,111,113)		33-512J8T-7
					RESISTOR:6.8K,5%,1/8W (R75)		33-682J8T-7
					RESISTOR:10K,5%,1/8W (R1,110,112,114,120)		33-103J8T-7
					RESISTOR:12K,5%,1/8W (R84)		33-123J8T-7
					RESISTOR:15K,5%,1/8W (R7)		33-153J8T-7
					RESISTOR:33K,5%,1/8W (R91)		33-333J8T-7
					RESISTOR:39K,5%,1/8W (R108)		33-393J8T-7
					RESISTOR:3.3K,5%,1/8W (R3)		33-332J8T-7
					RES,VAR:10K W/SWITCH (R20,85)		33-1033-02D
					RES,VAR:1K (R77)		34-1022-05D
					RES,VAR:10K (R106,115)		34-1032-05D
					RES,VAR:5K (R4)		34-5022-06D
					SVR:1K,20% (R74,82)		34-1021-08E
					SVR:2.2K,20% (R43,46,56)		34-2221-08E
					SVR:4.7K,20% (R33)		34-4721-08E
					SVR:10K,20% (R10,18)		34-1031-08E
					SVR:22K,20% (R6)		34-2231-08E
					DIODE:ZENER,10V,10%,1/2W (D50)		35-25113-10
					DIODE:ZENER,RD5.6EB2 (D31)		35-25113-5R6
					DIODE:1N4148 (D1 THRU 30,32 THRU 49,56)		35-25111-1
					DIODE:1N4001 (D52 THRU 55)		35-25112-1
					TRANSISTOR: 2SC1815GR (Q1,4,8,12)		36-25238-3
					TRANSISTOR:2SA1015GR (Q2,3,6,7,11,17)		36-25239-3
					TRANSISTOR:2SC1674K (Q9,10)		36-25340-1
					TRANSISTOR:2N2219A (Q13)		36-25342-1
					TRANSISTOR: 2N2905 (14)		36-25343-1
					TRANSISTOR: TIP32B (Q16)		36-25367-1
					MICROCKT:FET,2N5485 (Q5)		37-25522-1
					MICROCKT:HA17741 (Q5)		38-25411-1
					MICROCKT:UA308 (U3,4)		38-25412-1
					MICROCKT:MC3386P (U5)		38-25406-1
					MICROCKT:CA3030 (U7)		38-25413-1
					MICROCKT:HA17358 (U9)		38-25410-1
					MICROCKT:HD7420 (U6)		39-25575-1
					MICROCKT:LM317T (Q15)		41-25422-1
					LT EMITTING DIODE:ORANGE (D51)		64-25232-10
					FUSE:250V,250MA,SLOW (F1,2)(159-0309-00)		62-25592-3U
					INDUCTANCE:1MH,10% (L1)		43-1001K-4
-4	118-7938-00			1	REAR PNL ASSY:	80009	118-7938-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-					REAR PANEL: (QTY. 1)		1-25053-1
					FUSE:250V,0.2A,SLOW BLOW (FS3)		62-25611-1U
					FUSE HOLDER:CARRIER (QTY. 1)		62-25604-1
					FUSE HOLDER:BASE (QTY. 1)		62-25604-3
					SWITCH:LINE VOLTAGE (S4,S5)		80-25605-1
					AC POWER JACK: (QTY. 1)		30-25625-1
					TRANSFORMER:EI-48 (T1)		36-1923-915
					SWITCH:POWER (S3)		80-25604-1
					.HOLDER: (QTY. 1)		1-25057-1
					.SCREW: (QTY. 2)		4-11103-0602
					.WASHER: (QTY. 2)		6-12103-03
					SAFETY GROUND CONNECTION:		
					.LUG:FOUR LEG (QTY. 1)		1-25071-1
					.LUG,GROUND: (QTY. 1)		6-13103-02A
					.SCREW,GROUND: (QTY. 1)		4-1113R5-1002
					.NUT,GROUND: (QTY. 1)		5-1429R5-02
					.WASHER,GROUND:FLAT (QTY. 1)		6-1113R5-02
					.BNC,VFC INPUT:W/NUT (QTY. 1)		30-25437-1
					BUTTON:RED,ROUND (QTY. 1)(134-0210-00)		15-25619-1A

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
3-					ACCESSORIES		
	070-6737-00			1	MANUAL,TECH:SERVICE,CFG250	80009	070-6737-00
	161-0248-00			1	CABLE ASSY,PWR,:	80009	161-0248-00
	214-4205-00			1	HARDWARE KIT:CFG250	80009	214-4205-00

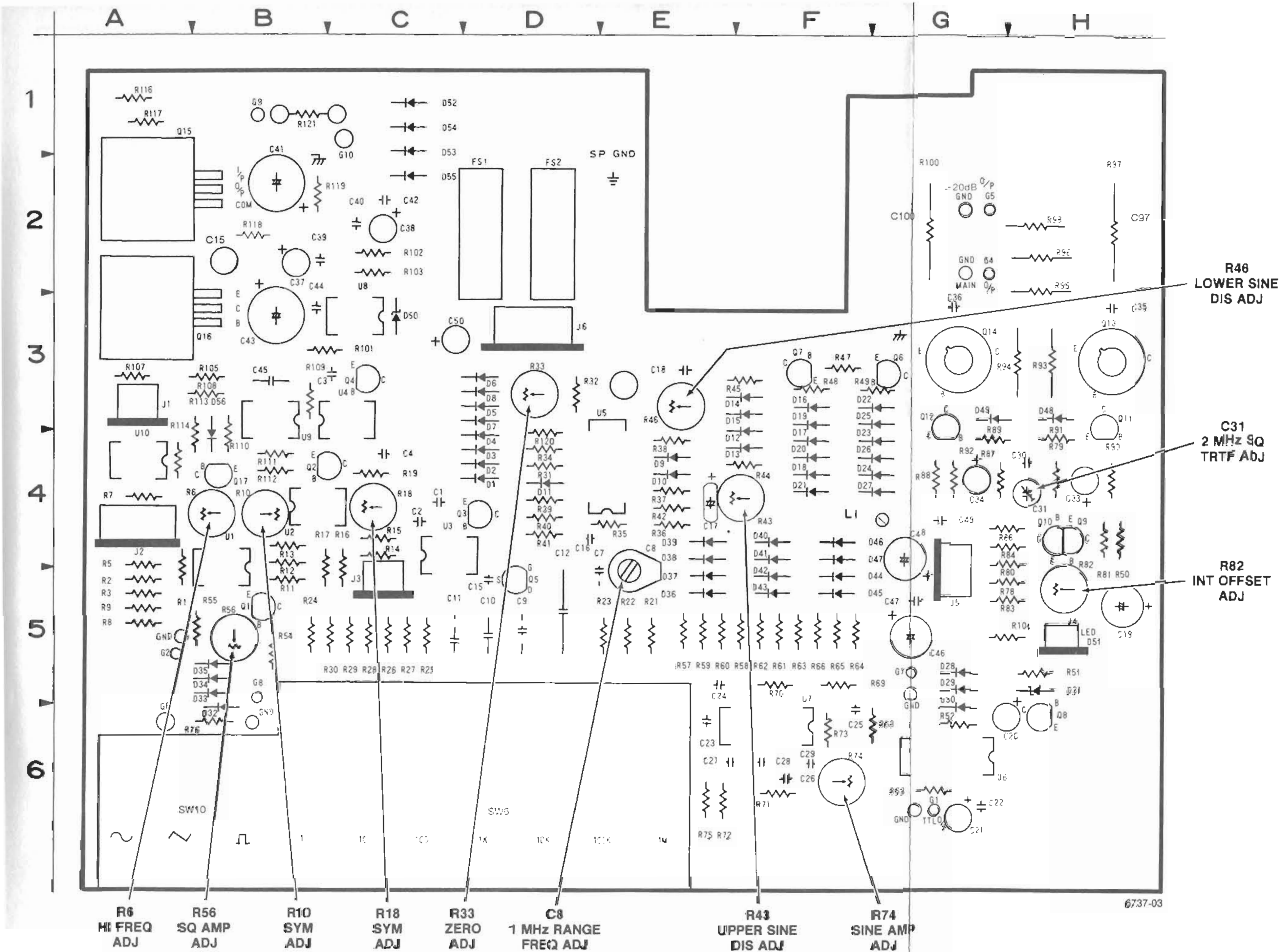
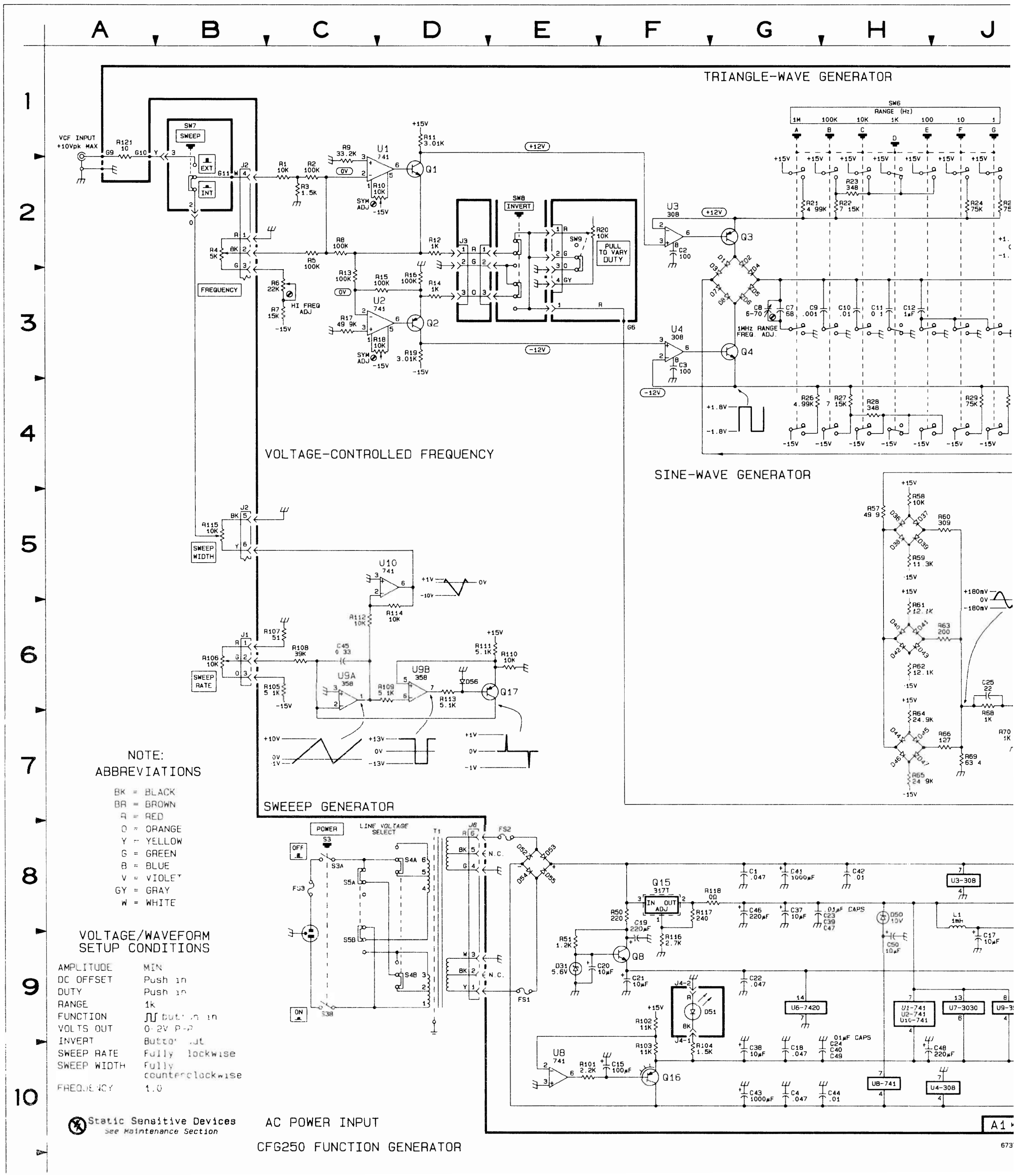


Figure 9-3. Main board and adjustment locations.



NOTE:
ABBREVIATIONS

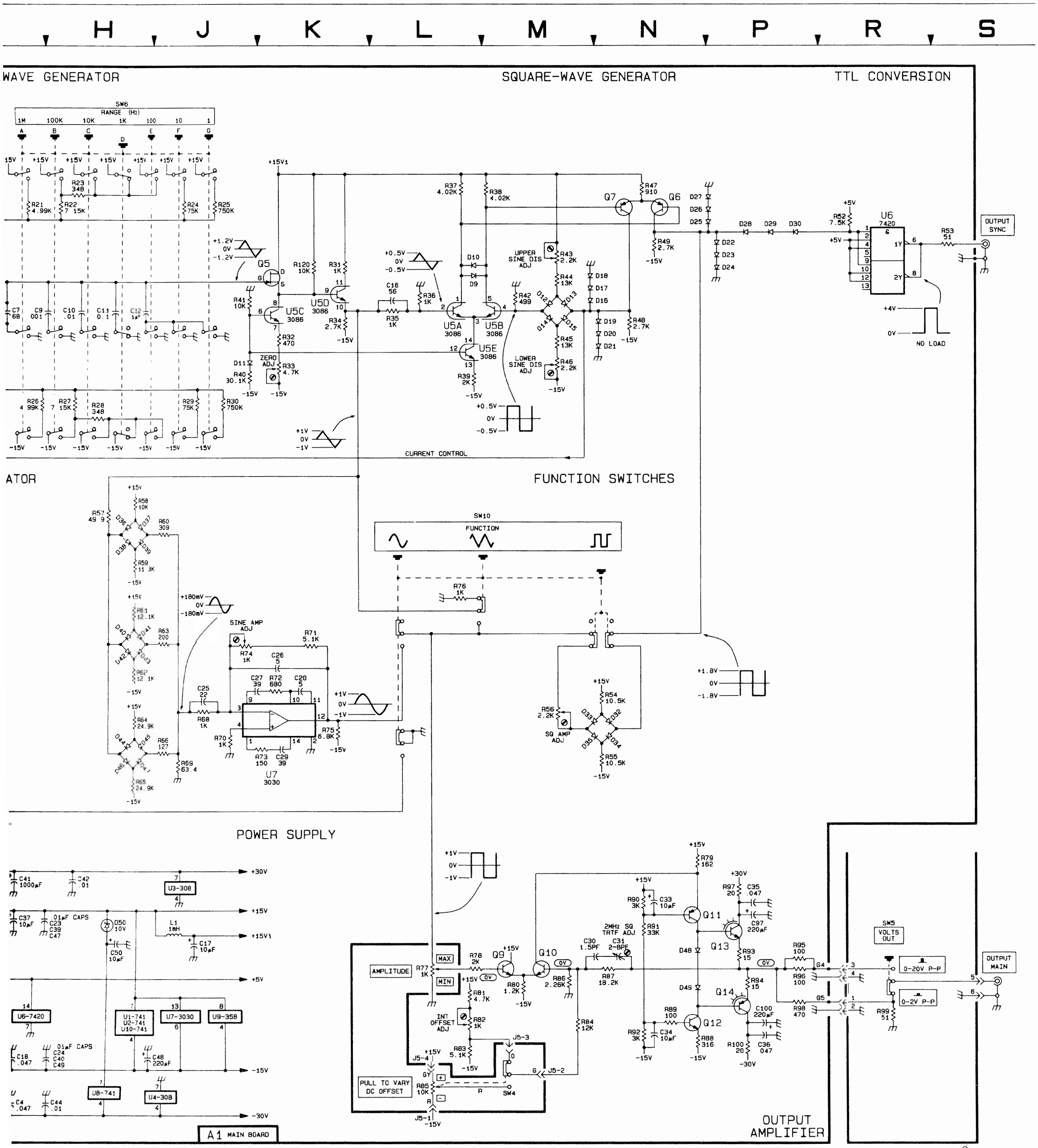
BK = BLACK
BR = BROWN
R = RED
O = ORANGE
Y = YELLOW
G = GREEN
B = BLUE
V = VIOLET
GY = GRAY
W = WHITE

VOLTAGE/WAVEFORM
SETUP CONDITIONS

AMPLITUDE	MIN
DC OFFSET	Push in
DUTY	Push in
RANGE	1k
FUNCTION	⊓⊔ button in
VOLTS OUT	0.2V P-P
INVERT	Button out
SWEEP RATE	Fully clockwise
SWEEP WIDTH	Fully counterclockwise
FREQUENCY	1.0

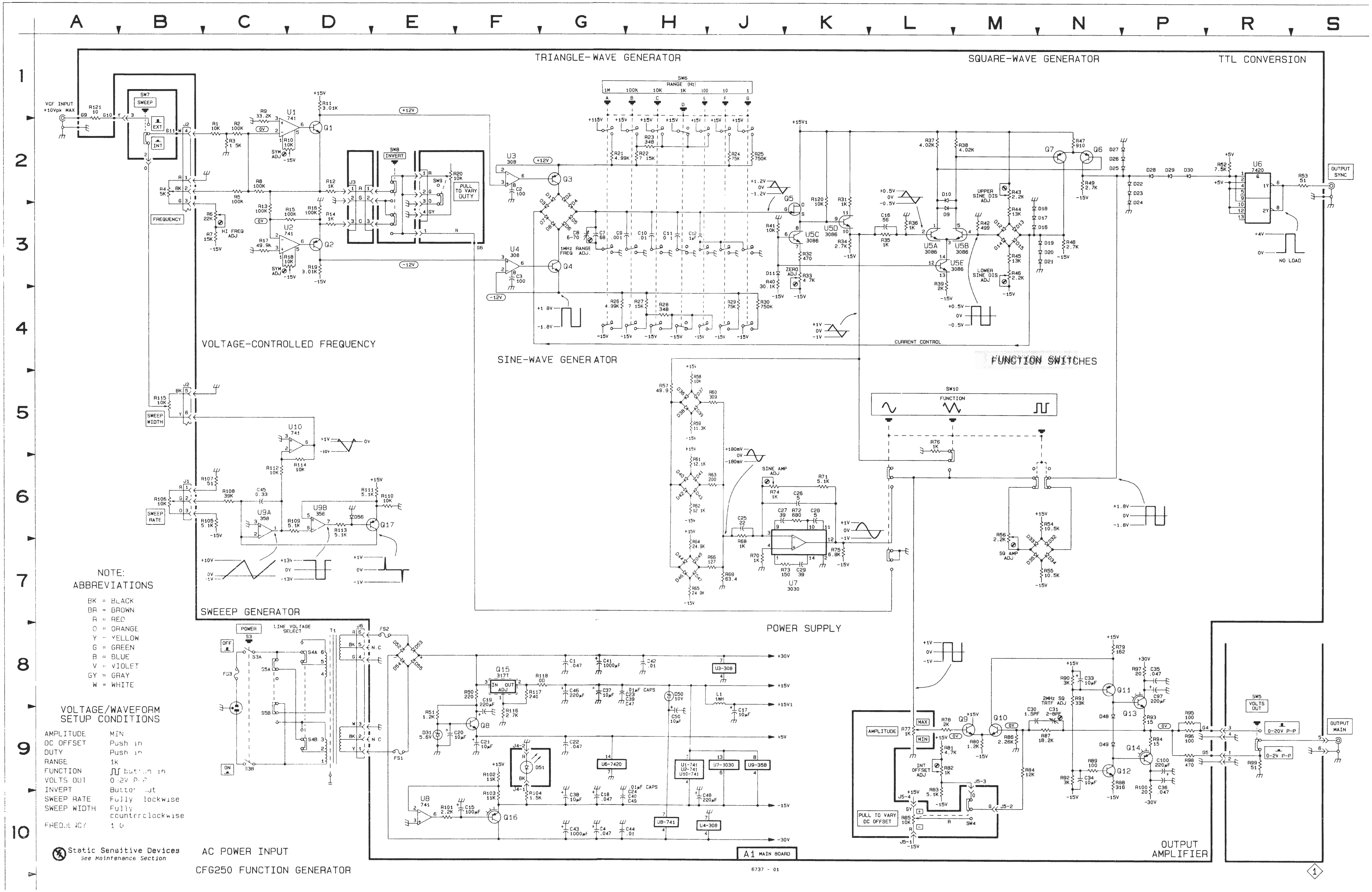
Static Sensitive Devices
See Maintenance Section

CFG250 FUNCTION GENERATOR


H J K L M N P R S
WAVE GENERATOR
SQUARE-WAVE GENERATOR
TTL CONVERSION
SW6
RANGE (Hz)
1M 100K 10K 1K 100 10 1
OUTPUT SYNC
NO LOAD
CURRENT CONTROL
UPPER SINE DIS ADJ
LOWER SINE DIS ADJ
ZERO ADJ
ATOR
FUNCTION SWITCHES
SW10
FUNCTION
SINE AMP ADJ
SQ AMP ADJ
POWER SUPPLY
OUTPUT AMPLIFIER
AMPLITUDE
MAX
MIN
INT OFFSET ADJ
PULL TO VARY DC OFFSET
2MHz SQ TRTF ADJ
SW5
VOLTS OUT
0-20V P-P
0-2V P-P
OUTPUT MAIN
A1 MAIN BOARD

6737 - 01

1



A B C D E F G H J K L M N P R S
1 2 3 4 5 6 7 8 9 10
TRIANGLE-WAVE GENERATOR
SQUARE-WAVE GENERATOR
TTL CONVERSION
VOLTAGE-CONTROLLED FREQUENCY
SINE-WAVE GENERATOR
FUNCTION SWITCHES
SWEEEP GENERATOR
POWER SUPPLY
OUTPUT AMPLIFIER
AC POWER INPUT
VCF INPUT +10Vpk MAX
OUTPUT SYNC
OUTPUT MAIN
0-20V P-P
0-2V P-P
FREQUENCY
SWEEP WIDTH
SWEEP RATE
PULL TO VARY DUTY
PULL TO VARY DC OFFSET
AMPLITUDE
CURRENT CONTROL
NO LOAD
NOTE:
ABBREVIATIONS
BK = BLACK
BR = BROWN
R = RED
O = ORANGE
Y = YELLOW
G = GREEN
B = BLUE
V = VIOLET
GY = GRAY
W = WHITE
VOLTAGE/WAVEFORM
SETUP CONDITIONS
AMPLITUDE MIN
DC OFFSET Push in
DUTY Push in
RANGE 1k
VOLTS OUT 0-2V P-P
INVERT Button out
SWEEP RATE Fully clockwise
SWEEP WIDTH Fully counterclockwise
Static Sensitive Devices
See Maintenance Section
CFG250 FUNCTION GENERATOR
A1 MAIN BOARD
6737 - 01